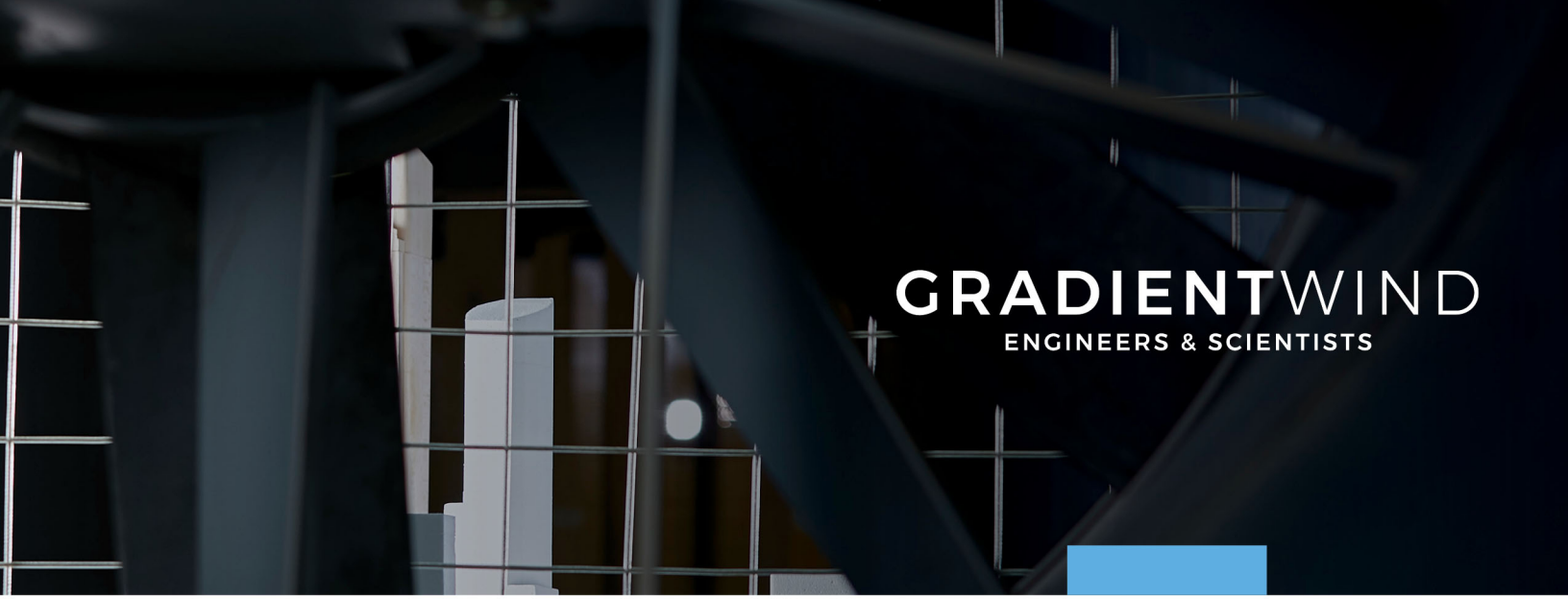
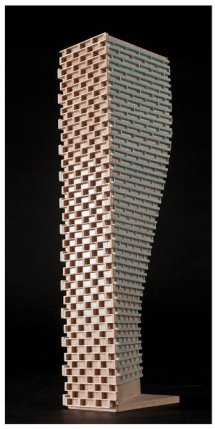


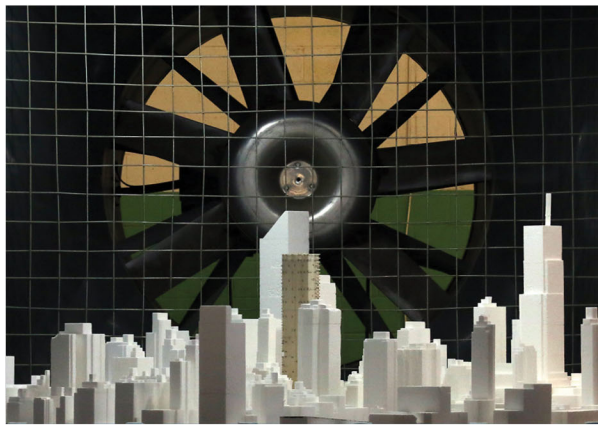
GRADIENTWIND
ENGINEERS & SCIENTISTS

TRANSPORTATION NOISE AND VIBRATION ASSESSMENT

2009-2013 Prince of Wales Drive
Ottawa, Ontario

GRADIENT WIND REPORT: 22-190 – Transportation Noise and Vibration R2





July 23th, 2024

PREPARED FOR

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EXECUTIVE SUMMARY

This report describes a transportation noise and vibration assessment undertaken for the property located at 2009-2013 Prince of Wales Drive in Ottawa, Ontario. The proposed development comprises seven lots and a private road located between Prince of Wales Drive and the Rideau River.

The major sources of transportation noise include Prince of Wales Drive, the Via Rail corridor (Beachburg Subdivision), and the Ottawa Macdonald-Cartier International Airport. The development resides within the Airport Vicinity Development Zone between the Airport Operating Influencing Zone (i.e., Noise Exposure Forecast (NEF) or Noise Prediction Forecast (NEP) 30 contour) and the NEF 25 contour. As the site is in proximity to the Via Rail corridor, ground vibration measurements were conducted following the procedure outlined in Section 4.3.2. 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) and the City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications, (iv) railway information obtained from Via Rail; (v) site plan and cross-section drawings provided by Jane Thompson Architect in December 2023; and (vi), ground-borne vibration criteria as specified by RAC / FCM, and CN guidelines[1].

The results of the current analysis indicate that plane of window noise levels will range between 62 and 66 dBA during the daytime period (07:00-23:00) and between 55 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (66 dBA) occurs at Lot 7, which is nearest and most exposed to Prince of Wales Drive and the VIA Rail corridor. As such, upgraded building components with a higher Sound Transmission Class (STC) rating will be required to mitigate surface transportation noise. With regard to aircraft noise, the development falls within the NEF 25 composite contour line indicating that noise levels from aircraft flyovers will approach 57 dBA (24-hr L_{eq}). As a result, upgraded building components with a higher Sound Transmission Class (STC) rating will also be required to mitigate aircraft noise and surface transportation sources.

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

Section 5.1 outlines the STC requirements for the exterior wall, glazing, and roof assembly to ensure indoor noise levels meet the criteria specified by ENCG and NPC-300. Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. Warning Clauses will be required to address noise from roadway, railway, and aircraft traffic noise as summarized in Section 6.

Unmitigated noise levels at the rear yards are expected to exceed 60 dBA during the daytime period. While a barrier investigation was undertaken, it was determined that its implementation is not technically, economically, and administratively feasible for the lots with a rear yard backing onto the VIA Rail corridor. This is due to the steep embankment between the site's grade level and the elevated railway tracks, as can be seen in Figure 7. A screen of 7 m or higher would be required to break the line of sight between the OLA receptor and the top of the train. The City of Ottawa only allows for a maximum wall height of 2.5 m[2]. A berm is also not feasible due to the grading and need for a swale as a rail safety measure. A Warning Clause will be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Gradient Wind collected vibration data at two locations V1 and V2 situated towards the south side of the property parcel, nearest to the rail corridor. After review and processing of the data, the worst-case measured RMS value for events along the property line were found to be 0.51 mm/s (86 dBV). For events along the 30 m setback line, the worst-case RMS value was found to be 0.14 mm/s (75 dBV).

Since measured vibration levels do not exceed the criterion of 0.14 mm/s RMS at the potential foundation of the dwellings, concerns due to vibration impacts on the site are not expected. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

[2] ENCG, Part 5, Page 6

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Mr. Alex Sivasambu to undertake a transportation noise and vibration assessment for the property located at 2009-2013 Prince of Wales Drive in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise and vibration levels generated by local roadway, railway, and aircraft traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[3] and Ministry of the Environment, Conservation and Parks (MECP)[4] guidelines. Noise calculations were based on site plan and cross-section drawings provided by Jane Thompson Architect in December 2023, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications, and railway traffic data obtained from Via Rail. Assessment of aircraft noise has been assessed based on its proximity to the airport and the nearest Noise Exposure Forecast contour line, as per Annex 10 in the City of Ottawa's OP. As the site is in proximity to the Via Rail corridor, ground vibration measurements were collected, as per the procedure outline in Section 4.3.2.

2. TERMS OF REFERENCE

The proposed development comprises seven lots and a private road located between Prince of Wales Drive and the Rideau River. The site is surrounded by Prince of Wales Drive to the west, residential land to the north, the Rideau River to the east, and the VIA Rail corridor to the south. Low-rise residential buildings are positioned in all compass directions. The south and east perimeters of the parcel of land contain a landscaped area, and between the new road and the landscaped space are buildable areas with a driveway for each lot. The six lots nearest to Prince of Wales Drive will be new, and the last lot will consist of an existing 1-storey brick sided dwelling located at 2009 Prince of Wales Drive.

The major sources of transportation noise include Prince of Wales Drive, the Via Rail corridor (Beachburg Subdivision), and the Ottawa Macdonald-Cartier International Airport. The development resides within

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

the Airport Vicinity Development Zone between the Airport Operating Influencing Zone (i.e., Noise Exposure Forecast (NEF) or Noise Prediction Forecast (NEP) 30 contour) and the NEF 25 contour. As the site is within 75m of the VIA Rail corridor, ground vibration measurements were collected, as described in Section 4.3.2.

The Beachburg Subdivision has a branch owned by Canadian National Rail, approximately 200 m west of the site. Historically, rail volumes on this line are very low with only a few trains a week. Furthermore the 3-year network plan, according to the Railway Association of Canada, states that the line is set to be discontinued in the near future. Therefore, this section of rail was considered to be insignificant and thus disregarded from the analysis.

Outdoor living areas associated with each lot, excluding Lot 3, will be located at the rear fully or partially exposed to the roadway and railway sources. Figure 1 illustrates a complete site plan with surrounding context.

Furthermore, the stationary noise impacts of the proposed development onto the surroundings were determined to be insignificant as no major mechanical equipment is planned. The only anticipated mechanical systems are residential air conditioners which, according to MECP noise guidelines, are not considered stationary noise sources. However, the location and installation of these systems are expected to comply with the noise regulations stipulated in *NPC-216: Residential and Air Conditioning Devices*[5], or local noise by-laws. As a result, noise from these units onto the surrounding area is anticipated to be minimal.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise and vibration levels on the study buildings produced by local roadway, railway, and aircraft traffic, and (ii) ensure that interior noise and vibration levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 of this report.

[5] Ontario Ministry of the Environment and Energy – Residential Air Conditioning Devices, Publication NPC-216, Toronto Municipal Code, Toronto, 1993

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 by 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.

The ENCG specifies that surface transportation noise (road and rail) and airport noise should be evaluated separately. The overall building attenuation parameters are then combined. Section 4.2 and 4.3 addresses the methodology for the evaluation of roadway/railway and aircraft noise, respectively.

4.2 Roadway & Railway Traffic Noise

4.2.1 Criteria for Roadway and Railway Traffic Noise

For surface roadway and railway traffic noise, 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, which has the same energy as a time varying noise level over a period of time. For roadways and railways, 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 (that is relevant to this study) is 40 and 35 dBA for living rooms and sleeping quarters respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD AND RAIL)[6]

Type of Space	Time Period	Road L_{eq} (dBA)	Rail L_{eq} (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50	45
Living/dining/den areas of residences, **sleeping quarters**, 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 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[7]. 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 triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[8].

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 characteristics of railway sound, the indoor sound level criteria are more stringent by 5 dB as compared to the roadway traffic criteria. This difference typically results in requirements for upgraded glazing elements to provide better noise attenuation from the building envelope. Interior noise level criteria include the influence from rail crossings and warning whistle bursts.

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

For designated Outdoor Living Areas (OLAs), the sound level limit is 55 dBA during the daytime period. An excess above the limit, between 55 dBA and 60 dBA, is acceptable only in cases where the required noise control measures are not feasible for technical, economic or administrative reasons. The development proposes several rear yards which have been identified as noise sensitive OLAs and were included in the assessment.

4.2.2 Theoretical Roadway and Railway Noise Predictions

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

Roadway and railway traffic noise calculations were performed by treating each segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were 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 (paved) ground. For select receptors, the ground surface was taken to be absorptive due to the presence of soft (lawn) ground. The river surface was taken to be fully reflective.
- Topography was assumed to be a flat/gentle slope for receptors influenced by Prince of Wales Drive.
- The VIA Rail corridor was modelled with a maximum elevation difference of 6.5 meters from average grade level.
- Receptor height was taken to be 4.5 metres for 2-storey buildings at the centre of the Plane of Window (POW) and 1.5 meters for the Outdoor Living Area (OLA).
- Noise receptors were strategically placed at 7 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 3 and 4.
- VIA Rail trains were modeled as diesel trains with 2 locomotives and 5 cars per train travelling at a maximum speed of 73 km/hr (45 MPH), as per the data provided by Via Rail.
- The rail line is approximately 6.5 m above the average grade.

4.2.3 Roadway and Railway 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[9] 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. For railway volumes, the data was projected to 2033 at an annual rate of 2.5% per year. Information received from Via can be seen in Appendix C. Table 2 summarizes the AADT values used for each roadway and VIA Rail line included in this assessment.

TABLE 2: TRANSPORTATION TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Prince of Wales Drive	2-Lane Urban Arterial Road	60	**15,000**
VIA Rail	Passenger Rail	73	**18/4***

* Projected 2033 AADT daytime/nighttime rail traffic volumes based on the VIA Rail operating schedule.

4.2.4 Indoor Noise Calculations (Roadway and Railway)

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, brick veneer walls can achieve STC 50 or more. Standard commercially-sided exterior metal stud walls have around STC 45. 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.

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

As per Section 4.2, when daytime noise levels from road 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[10] 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

Based on published research[11], 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, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. Each lot will be sold separately to allow for a custom home to be built. 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 and compare the results obtained using methodology outlined in the National Research Council of Canada's Building Practice Note # 56 (BPN 56)[12].

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

[10] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985
[11] CMHC, Road & Rail Noise: Effects on Housing
[12] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

there is excitation of the ground, such as from a train. 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 millimeters 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 Ground Vibration Criteria

The Canadian Railway Association and Canadian Association of Municipalities have set standards for new sensitive land developments within 300 metres of a railway right-of-way, as published in their document *Guidelines for New Development in Proximity to Railway Operations*[13], which indicate 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. As the main vibration source is due to a mainline railway, the 0.14 mm/s RMS (75 dBV) vibration criteria and 35 dBA ground borne noise criteria were adopted for this study.

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

4.3.2 Field Measurement Assessment Procedure

Existing levels of ground vibrations due to the rail line were determined by field measurements using Instantel model MicroMate seismograph capable of recording three components of ground velocity, one vertical and two horizontals. Measurements were conducted from 10:00 AM August 30th, 2023, to 04:30 PM September 1st, 2023. The measurement period was divided between two locations. One location was selected along the south property line of the development adjacent to the rail corridor right of way, as identified in Table 3 and Figure 5. The second measurement site was selected towards the southeast of the site, at the 30 m setback line from the right of way. This location would be the closest to the south façades of the future dwellings. Seismograph measurements were set to a minimum trigger level of 0.14 mm/s peak partial velocity (PPV), which is the lowest setting of the equipment.

TABLE 3: VIBRATION MEASUREMENT LOCATIONS

Receptor	Location Description	Placement of Seismographs from the Rail Corridor Centerline (m)
V1	Southern Property Line	13 (0 m from ROW)
V2	30 m setback line	43 (30 m from ROW)

4.4 Aircraft Traffic Noise

4.4.1 Criteria for Aircraft Noise

As per the City of Ottawa, the ENCG[14] establishes the sound level criteria for aircraft noise with reference to the Ottawa Macdonald Cartier International Airport located near the intersection of Hunt Club Road and Limebank Road. There are four vicinity zones surrounding the Ottawa Macdonald Cartier International Airport that indicate the intensity of the noise levels within the area illustrated in the Annex 10 - Land Use Constraints Due to Aircraft Noise[15]. For convenience, Annex 10 has been reproduced in Figure 6 of this report. Noise generated from aircraft traffic is represented as Effective Perceived Noise Levels (EPNL), a unit of noise measurement that accounts for variations in the human perception of pure tones and noise duration. Plotted EPNL around airports are represented by Noise Exposure Forecast (NEF) and Noise Exposure Projection (NEP) contours which represent the current and future operations of the airport.

[14] City of Ottawa Environmental Noise Control Guidelines, January 2016
[15] City of Ottawa Official Plan – Annex 10 (Land Use Constraints Due to Aircraft Noise)

The NEF / NEP (NEP) contour lines define the region around the airport exposed to various levels of aircraft noise impacting noise-sensitive areas, ranging from low to high outdoor noise levels. The Ottawa Airport Vicinity Development Zone is the furthest zone around the airport and holds that the development within the highlighted area will experience a minimum NEF/NEP of 25. The Airport Operating Influencing Zone (AOIZ) is the region representing 30 NEF/NEP contour where the noise levels have increased and will cause noise disruption to noise-sensitive developments. No new noise-sensitive development is allowed within the AOIZ except for infill development. For infill developments residing within the Airport Operating Influencing Zone (AOIZ), the ENCG inquires that a noise assessment is to be performed to ensure that noise mitigation measures are incorporated into the building design[16]. The composite line noise contour NEF/NEP 35 illustrates the area closest to the airport and is where the highest noise levels occur. Within this region, new developments are not permitted to be constructed in the outlined vicinity.

According to accepted research[17], Health and Welfare Canada states that people continuously exposed to NEF/NEP values less than 35 will not suffer adverse physical or psychological effects. Sociological surveys[18] have indicated that negative community reactions to noise levels may start at about 25 NEF/NEP. Table 4 identifies the sound level criteria for relevant indoor spaces exposed to aircraft noise. Where developments are within the AOIZ, building components must be designed to achieve the indoor criteria outlined in Table 4.

[16] City of Ottawa Official Plan
[17] CMHC, Road & Rail Noise: Effects on Housing
[18] Noise in Urban and Suburban Areas. Bolt, Beanik and Newman, Inc., Washington, January 1967

TABLE 4: INDOOR AIRCRAFT SOUND LEVEL CRITERIA[19]

Type of Space	NEF/NEP	L_{eq} (dBA)
General offices, reception areas, retail stores, etc.	15	47
Individual or semi-private offices, conference rooms, etc.	10	42
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, Sleeping quarters of hotels/motels	5	37
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	0	32

4.5 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, brick veneer walls can achieve STC 50 or more. Standard commercially-sided exterior metal stud walls have around STC 45. 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.

As per Section 4.2, when daytime noise levels from road and rail sources at the plane of the window exceed 65 dBA and 60 dBA respectively, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. Noise calculations also need to be made when the aircraft noise exposure is above NEF / NEP 25 ($L_{eq\text{-}24hr}$ 57). The calculation procedure[20] considers:

[19] City of Ottawa Environmental Noise Control Guidelines, January 2016
[20] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

- 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 vary according to the intended use of a space.

Based on published research[21], 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. The indoor noise levels generated by aircraft noise were assessed using EN 12354-3:2000 "Building Acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 3: Airborne sound insulation against outdoor sound"[22]. As per the ENCG, the STC requirements were determined for all building components impacted by aircraft noise, including the following:

- Exterior wall components for living/dining/bedrooms
- Window and Patio door components for living/dining/bedrooms
- Exterior door components for living/dining/kitchens

The closest NEF/ NEP contour to the site establishes the required equivalent sound pressure levels for living areas, bedrooms, and the overall sound pressure in the geographical area being studied. Refer to Section 5.2 for the theoretical and required sound level values. For this noise assessment, the theoretical sound pressure levels produced by aircraft were found to be 57 dBA ($L_{eq\text{-}24hr}$). Once the 24-hour equivalent sound pressure is determined, the reference source spectrum provided in CMHC can be used to establish the full spectrum of aircraft sound pressure levels. The spectrum representing the 1/3 octave band sound pressure levels is used to calculate the transmission of noise on each frequency band.

Indoor and outdoor rail / road traffic noise calculations were conducted using BPN 56 to develop the required noise performance of building components.

[21] CMHC, Road & Rail Noise: Effects on Housing
[22] Sound Insulation Prediction Program, INSUL Users Manual, Mashall Day Acoustics, 2017

As detailed drawings of the building interiors were not yet available, the indoor and outdoor calculations were based on the following assumptions:

- Typical bedroom dimensions are approximately 3 meters in length and 4 meters in width.
- Typical living room dimensions are approximately 4 meters in length and 4 meters in width.
- Ceiling height is at 2.7 meters.
- Window area is 2 m^2
- The bedroom was taken to be very absorptive (absorption coefficient of 1.25), due to typical bedroom finishing, and the living room was considered to be of intermediate absorption (absorption coefficient of 0.8).

As per NPC 300[23], the indoor aircraft noise was evaluated by converting the NEF/NEP to 24-hour equivalent sound pressure level. Since the development falls within the NEF 25 composite contour line, 25 was used as the NEF variable in the following equation NEF = $L_{eq\ (24)}$ - 32 dBA, used for the conversion. After the results were determined, EN 12354-3:2000 was used to evaluate the building components attenuation to sound levels. Refer to Appendix B for the EN 12354-3:2000 details and modelling of the assemblies.

5. RESULTS AND DISCUSSION

5.1 Transportation Traffic Noise Levels

5.1.1 Roadway and Railway Noise Levels

The results of the roadway and railway traffic noise calculations are summarized in Table 5 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

[23] Environmental Noise Guideline - Stationary and Transportation Sources - Approval and Planning (NPC-300), August 2013

TABLE 5: EXTERIOR NOISE LEVELS DUE TO ROAD AND RAIL TRAFFIC (STAMSON 5.04)

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Roadway Noise Level (dBA)		Railway Noise Level (dBA)		Combined Noise Level (dBA)	
			Day	Night	Day	Night	Day	Night
1	4.5	POW — Lot 7 North Façade	63	55	-	-	63	55
2	4.5	POW — Lot 7 West Façade	66	58	56	53	66	59
3	4.5	POW — Lot 7 South Façade	62	54	61	58	64	59
4	4.5	POW — Lot 3 South Façade	51	44	62	58	62	58
5	1.5	OLA — Lot 7 Rear Yard	63	N/a*	61	N/a*	65	N/a*
6	1.5	OLA — Lot 2 Rear Yard	-	-	60	N/a*	60	N/a*
7	1.5	OLA – Lot 3 Rear Yard	-	-	62	N/a*	62	N/a*

*Nighttime noise levels are not considered for OLAs as per ENCG

The results of the current analysis indicate that plane of window noise levels will range between 62 and 66 dBA during the daytime period (07:00-23:00) and between 55 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (66 dBA) occurs at Lot 7, which is nearest and most exposed to Prince of Wales Drive and the VIA Rail corridor. The noise levels exceed the ENCG criteria requiring the need for upgraded building components. Furthermore, the results indicate that the buildings associated with each lot would require central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment. As the OLAs are also expected to exceed the ENCG noise criteria, noise mitigation in the form of a barrier will also be required for select lots. Specific noise mitigation requirements are summarized in subsequent sections.

5.1.2 Aircraft Traffic Noise Levels

The theoretical sound levels from the NEF/ NEP 25 correspond to a 24-hour equivalent sound level ($L_{eq(24)}$) of 57 dBA outside the buildings. The noise inside the dwellings would need to be reduced to 32 dBA for bedrooms and 37 dBA for indoor living rooms.

5.1.3 Noise Control Measures

The noise levels predicted due to roadway and railway traffic exceed the criteria listed in Section 4.2 for building components. In addition, the development is located between the NEF 25 contour and the AOIZ which also requires the need for upgraded building components.

Taking into consideration the surface transportation sources and aircraft sources, the building components described below should be considered in the building design to provide the necessary noise attenuation. The mitigation measures presented below are designed to mitigate the highest expected noise levels at all facades (i.e., 66 dBA). It should be noted that these measures are required for new buildings for Lots 2-7 as Lot 1 will comprise an existing 1-storey brick-cladding building.

Window and exterior walls were evaluated to determine the attenuation required for indoor sound levels assuming windows are closed. Exterior walls have been evaluated using NRC testing data and BPN 56 to determine the necessary STC for proper indoor sound attenuation. The assemblies that were chosen to provide adequate sound insulation are based on prescribed measures outlined in the ENCG[24] and Gradient Wind's past experience. Refer to Appendix B for further STC details and modelling of the assemblies.

EXTERIOR WALL STC REVIEW

The exterior walls of the development have been evaluated using NRC test data to determine the required STC requirements established by ENCG. Greater mitigation in sound levels is achieved by higher STC ratings and is determined by the material selection of the exterior walls. Exterior wall components on all façades will require a minimum brick cladding or masonry equivalent as per NPC-300 guidelines[25].

The architectural detail for the exterior wall sample is listed below. Alternative assemblies are permissible provided they meet the same transmission loss ratings on a 1/3 octave band rating.

[24] City of Ottawa Environmental Noise Control Guidelines, January 2016. Part 6, page 1
[25] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.2.3

Exterior Wall (Enhanced) – EW1

- 90 or 100 m of brick
- 25 mm air space
- 25 mm ridged insulation (not acoustic relevant)
- 13 mm of oriented strand board
- 140 mm wood studs at 400 mm o.c.
- 140 mm of acoustic batt insulation
- 15.9 mm of gypsum board

Predicted STC Rating: 53 (similar to NRC TLA-99-098a)

ROOF STC REVIEW

The roof STC requirements were determined using EN 12354-3:2000. The attic of the dwellings is required to be ventilated as per ENCG. The roof the dwelling was assumed to be inclined at an angle of 30 degrees. The recommended architectural details for the roof are listed below. Alternative assemblies are permissible provided they meet the same STC rating.

Roof – R1

- 3 mm of asphalt shingles
- 15 mm of oriented strand board
- wood trusses 600 mm O.C with ventilated attic
- 380 mm of acoustic batt insulation
- 12.7 mm of gypsum board
- Predicted STC Rating: 49 (Similar to NRC TLF-98-095a)

WINDOW AND DOOR GLAZING STC REVIEW

The window and exterior wall STC requirements for the bedroom and living/dining area were evaluated using BPN 56 and EN 12354-3:2000, as seen in Appendices B and D. While the BPN 56 results have been considered, the final recommendations are based on Gradient Wind's experience and engineering judgement.

Windows generally have lower sound attenuation in comparison to exterior walls or other building components. As a result, the STC level is lower than exterior walls, floors, roofs, and exterior doors. As per the ENCG[26], if the window area exceeds 20 percent or 50 percent of the floor area for bedrooms and dining areas, respectively, then it is necessary to acquire certification from the acoustical consultant. The recommended architectural details for the windows are listed below. Alternative assemblies are permissible provided they meet the same STC rating. Tested window assemblies should be used in the design / build phase.

Window (Bedroom and Living Room) – W1

- 3 mm inner pane
- 16 mm air space
- 6 mm outer pane

EN 12354-3:2000 Predicted STC Rating: 34

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.

[26] City of Ottawa Environmental Noise Control Guidelines, January 2016

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 dwellings will require central air conditioning, 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.

5.1.4 Noise Barrier Calculation

Noise levels at the rear yards are expected to exceed 55 dBA during the daytime period without a noise barrier. If these areas are to be used as outdoor living areas, noise control measures are required to reduce noise levels to as close as possible to 55 dBA, where technically and administratively feasible.

Given the steep embankment between the study buildings and rail line, with the rail line being approximately 6.5 m above the study site's average grade, an excessively tall noise barrier would be necessary to block the direct line of sight to the elevated railway, as demonstrated in Figure 7. Potential noise wall along the property line was investigated between a height of 2.2m to 7.0m above local grade (bottom of slope) (see Table 6). Results of the investigation showed that it would require an excessively tall barrier to provide any benefit, which is impractical.

Therefore, Gradient Wind concludes that the implementation of a noise barrier is not considered technically and administratively feasible for the lots backing onto the VIA Rail corridor, and a Warning Clause will be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

TABLE 6: RESULTS OF NOISE BARRIER INVESTIGATION

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Daytime L_{eq} Noise Levels (dBA)				
			No Barrier	With 2.2 m Barrier	With 3 m Barrier	With 4 m Barrier	With 7 m Barrier
5	1.5	OLA — Lot 7 Rear Yard	63	62	61	61	60

5.2 Ground Vibrations and Ground-borne Noise Levels

Gradient Wind collected vibration data at two locations V1 and V2 situated towards the south side of the property parcel, nearest to the rail corridor. During data collection period, the seismograph was triggered 361 times. The meter could be triggered by rail pass-bys, but also people walking, and sometimes stray electrical current. A review of the time histories and Fast Fourier Transform was used to distinguish real train pass by events, from extraneous triggered events. After review and processing of the data, the RMS value for the worst-case event along the property line was determined to be 0.51 mm/s (86 dBV).

For events along the 30 m setback line (from the right-of-way), the RMS value was calculated to be 0.14 mm/s (75 dBV). Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at the foundation, concerns due to vibration impacts on the site are not expected. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable. Sample vibration plots are provided in Appendix E.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that plane of window noise levels will range between 62 and 66 dBA during the daytime period (07:00-23:00) and between 55 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (66 dBA) occurs at Lot 7, which is nearest and most exposed to Prince of Wales Drive and the VIA Rail corridor. As such, upgraded building components with a higher Sound Transmission Class (STC) rating will be required to mitigate surface transportation noise. With regard to aircraft noise, the development falls within the NEF 25 composite contour line indicating that noise levels from aircraft flyovers will approach 57 dBA. As a result, upgraded building components with a higher Sound Transmission Class (STC) rating will also be required to mitigate aircraft noise.

Section 5.1 outlines the STC requirements for the exterior wall, glazing, and roof assembly to ensure indoor noise levels meet the criteria specified by ENCG and NPC-300. Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment.

With respect to roadway and railway sources, Warning Clauses will be required on all Lease, Purchase and Sale Agreements, as summarized below. Furthermore, a VIA Rail Warning Clause will be required in all

Lease, Purchase and Sale Agreements, as well as agreements registered on title, because the development is within 300 m of the VIA Rail corridor.

Type D:

> *"This dwelling unit has been supplied with a central air conditioning 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, Conservation and Parks."*

VIA Rail Warning Clause:

> *"Warning: VIA 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). VIA 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 Warning Clause:

> *"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."*

With respect to aircraft noise, the following Warning Clause will also be required on all Lease, Purchase and Sale Agreements, as summarized below:

> *"Purchasers/building occupants are forewarned that this property/dwelling unit is located in a noise sensitive area due to its proximity to Ottawa Macdonald-Cartier International Airport.*
>
> *In order to reduce the impact of aircraft noise in the indoor spaces, the unit has been designed and built to meet provincial standards for noise control by the use of components and building systems that provide sound attenuation. In addition to the building components (i.e. walls, windows, doors, ceiling-roof), since the benefit of sound attenuation is lost when windows or doors are left open, this unit has been fitted with a central air conditioning system.*
>
> *Despite the inclusion of noise control features within the dwelling unit, noise due to aircraft operations may continue to interfere with some indoor activities and with outdoor activities, particularly during the summer months. The purchaser/building occupant is further advised that the Airport is open and operates 24 hours a day, and that changes to operations or expansion of the airport facilities, including the construction of new runways, may affect the living environment of the residents of this property/area.*
>
> *The Ottawa Macdonald-Cartier International Airport Authority, its acoustical consultants and the City of Ottawa are not responsible if, regardless of the implementation of noise control features, the purchaser/occupant of this dwelling finds that the indoor and/or outdoor noise levels due to aircraft operations are of or are offensive."*

Noise levels at the rear yards are expected to exceed 55 dBA during the daytime period without a noise barrier. Further analysis investigated the noise mitigating impact of installing a potential noise wall 2.2m to 7m above local grade along the property line (see Table 6). Results of the investigation proved that noise levels can only be reduced to 57 dBA with the inclusion of a 7.0 m tall barrier along the property line. This is due to the steep embankment between the site's grade level and the elevated railway tracks, as can be seen in Figure 7. As such, implementation of a noise barrier is not considered technically and

administratively feasible for the lots with a rear yard backing onto the VIA Rail corridor. A Warning Clause will be required in all Lease, Purchase and Sale Agreements, as summarized below:

Type B:

> *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic and rail traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."*

Gradient Wind collected vibration data at two locations V1 and V2 situated towards the south side of the property parcel, nearest to the rail corridor. After review and processing of the data, the RMS value for events along the property line was calculated to be 0.51 mm/s (86 dBV). For events along the 30 m setback line, the RMS value was calculated to be 0.14 mm/s (75 dBV).

Since measured vibration levels do not exceed the criterion of 0.14 mm/s RMS at the potential foundation of the dwellings, concerns due to vibration impacts on the site are not expected. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

In advance of the issuance of the building permit, the analysis should be revised based on final plans to ensure that mitigation measures are sufficient, and the requirements are met. Furthermore, in advance of issuance of occupancy permits, the subject site should be inspected to ensure that acoustical requirements have been implemented. The following table provides a summary of acoustic mitigation measures required for this development:

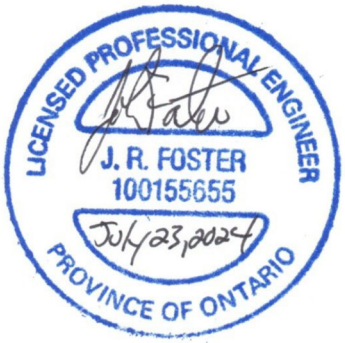
TABLE 7: SUMMARY OF MITIGATION MEASURES REQUIRED

Lot #	Window STC (Living Room / Bedroom)	Exterior Wall STC	Roof STC	Ventilation Requirements	Warning Clauses on Lease, Purchase, and Sale Agreements
1	N/A	Existing dwelling			
2 - 7	STC 34 / STC 34	STC 56	STC 56	Air Conditioning	Type D, Type B, VIA Rail, CN, Airport Proximity

This concludes our vibration and roadway, railway, and aircraft traffic noise assessment. 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.

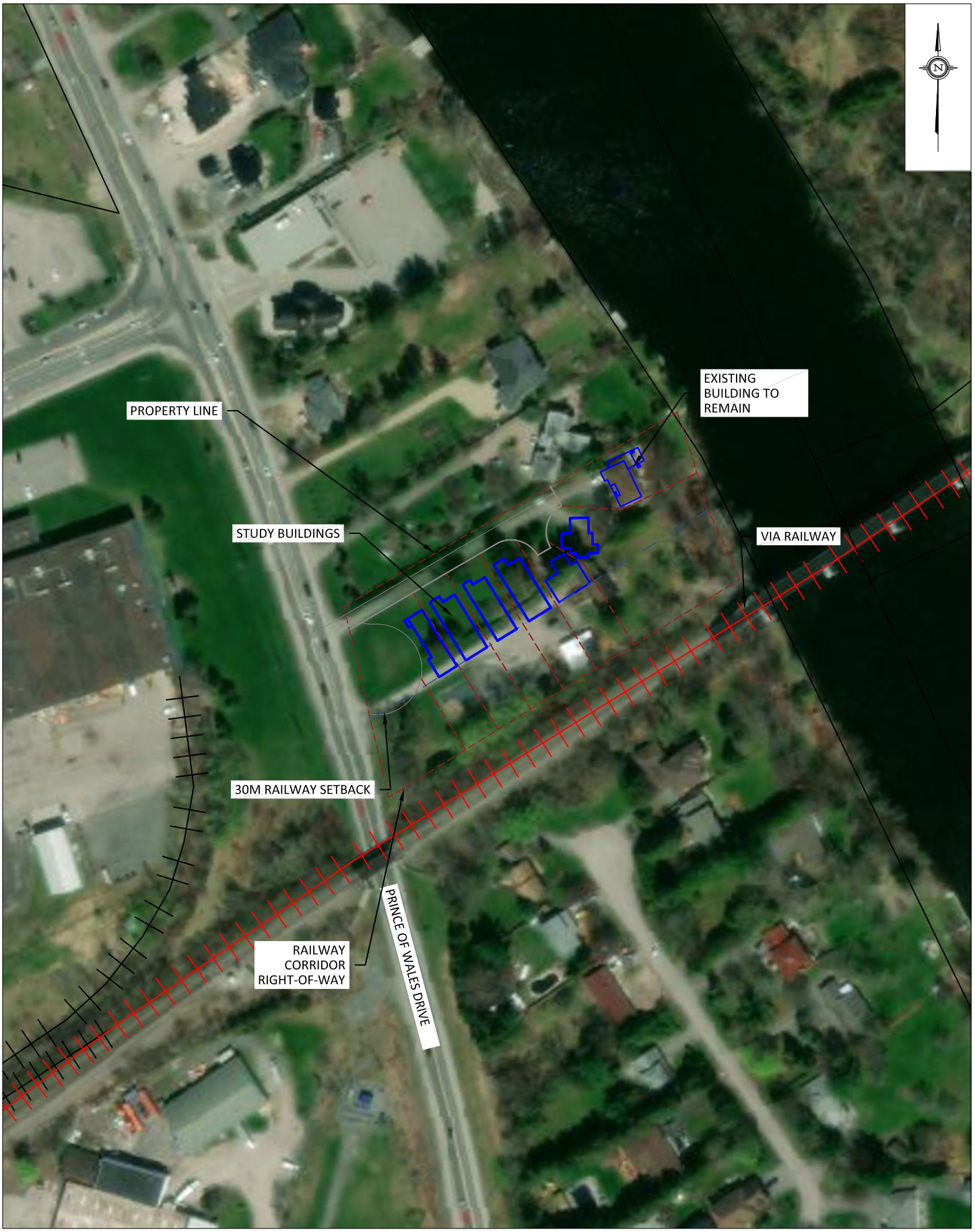
Sincerely,

Gradient Wind Engineering Inc.



Joshua Foster, P.Eng.
Lead Engineer

GW22-190 -Transportation Noise & Vibration R2



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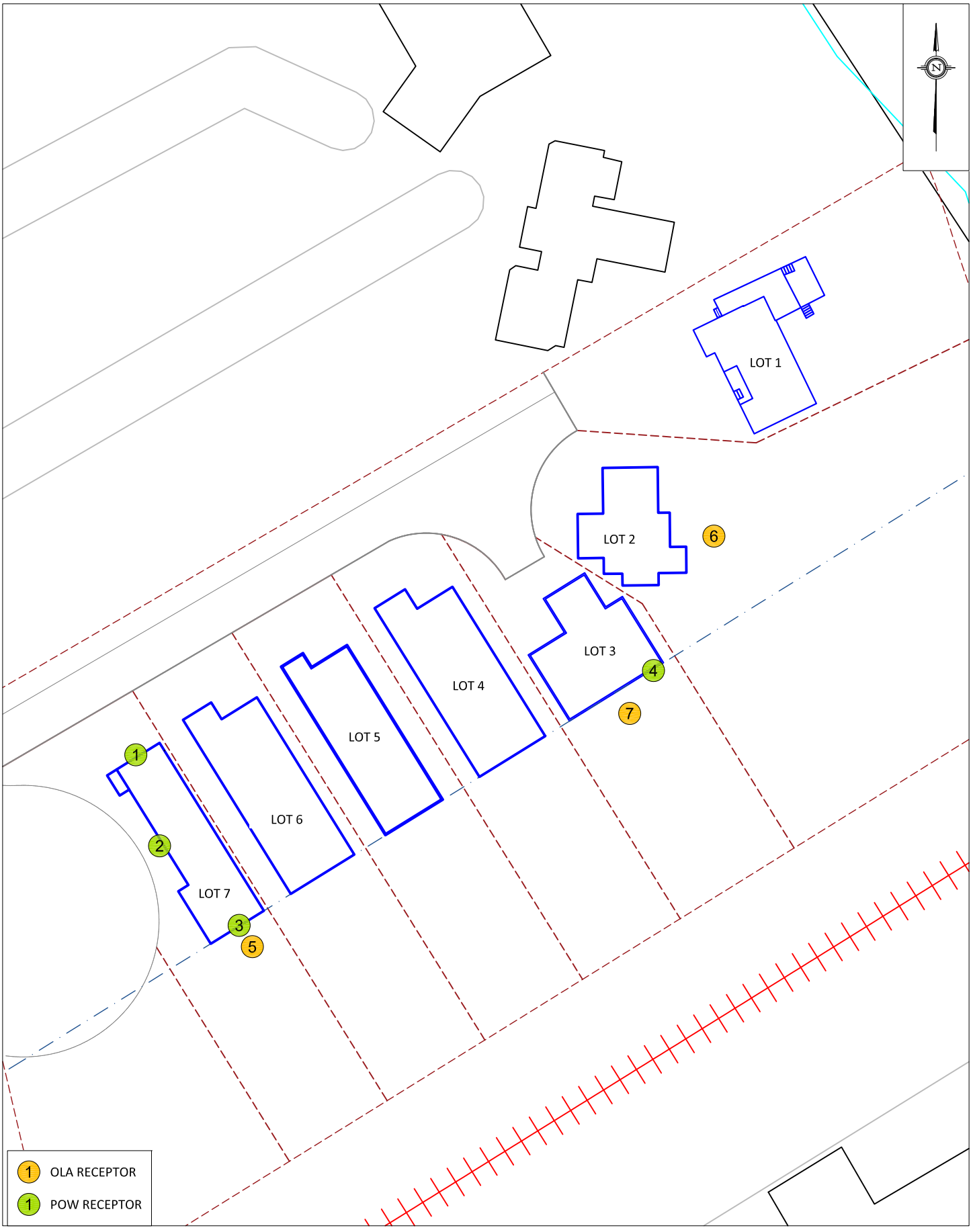
PROJECT	2009-2013 PRINCE OF WALES DRIVE, OTTAWA TRANSPORTATION NOISE AND VIBRATION ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW22-190 -1
DATE	JULY 23, 2024
DRAWN BY	J.F.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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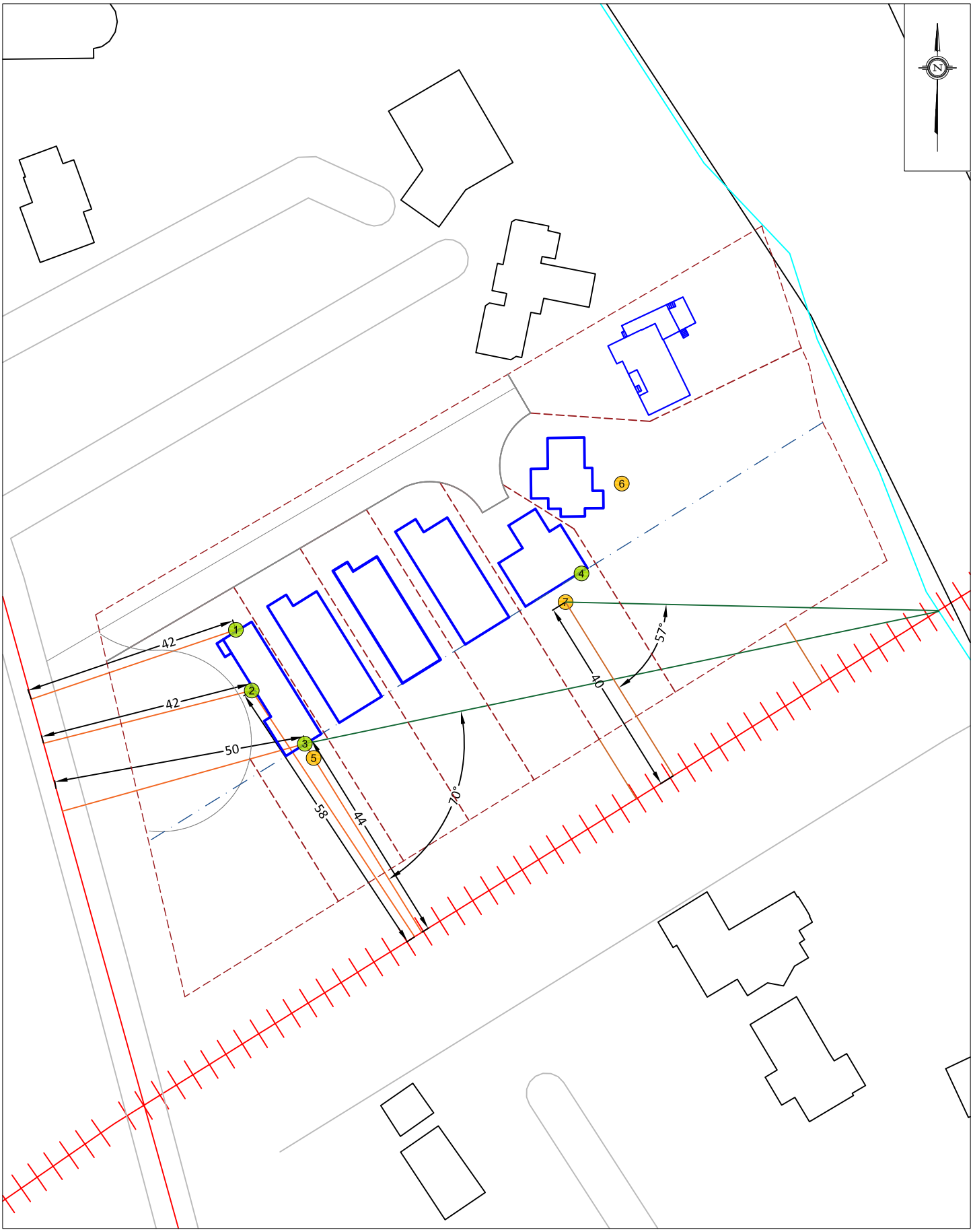
PROJECT	2009-2013 PRINCE OF WALES DRIVE, OTTAWA TRANSPORTATION NOISE AND VIBRATION ASSESSMENT
SCALE	1:150 (APPROX.)
DRAWING NO.	GW22-190 -2
DATE	JULY 23, 2024
DRAWN BY	J.F.
DESCRIPTION	FIGURE 2: RECEPTOR LOCATIONS



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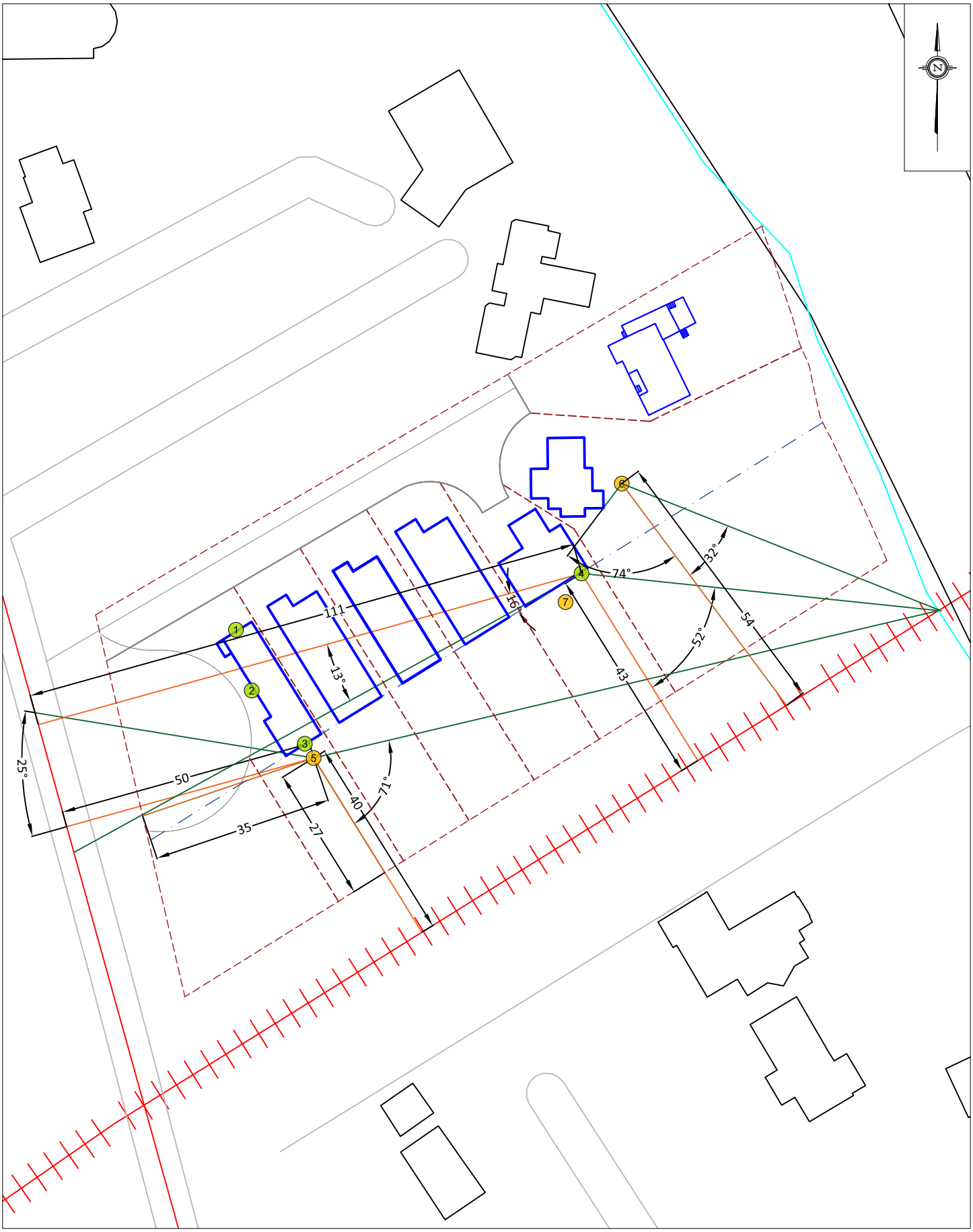
PROJECT	2009-2013 PRINCE OF WALES DRIVE, OTTAWA TRANSPORTATION NOISE AND VIBRATION ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-190 -3
DATE	JULY 23, 2024
DRAWN BY	J.F.

DESCRIPTION

FIGURE 3:
STAMSON INPUT PARAMETERS



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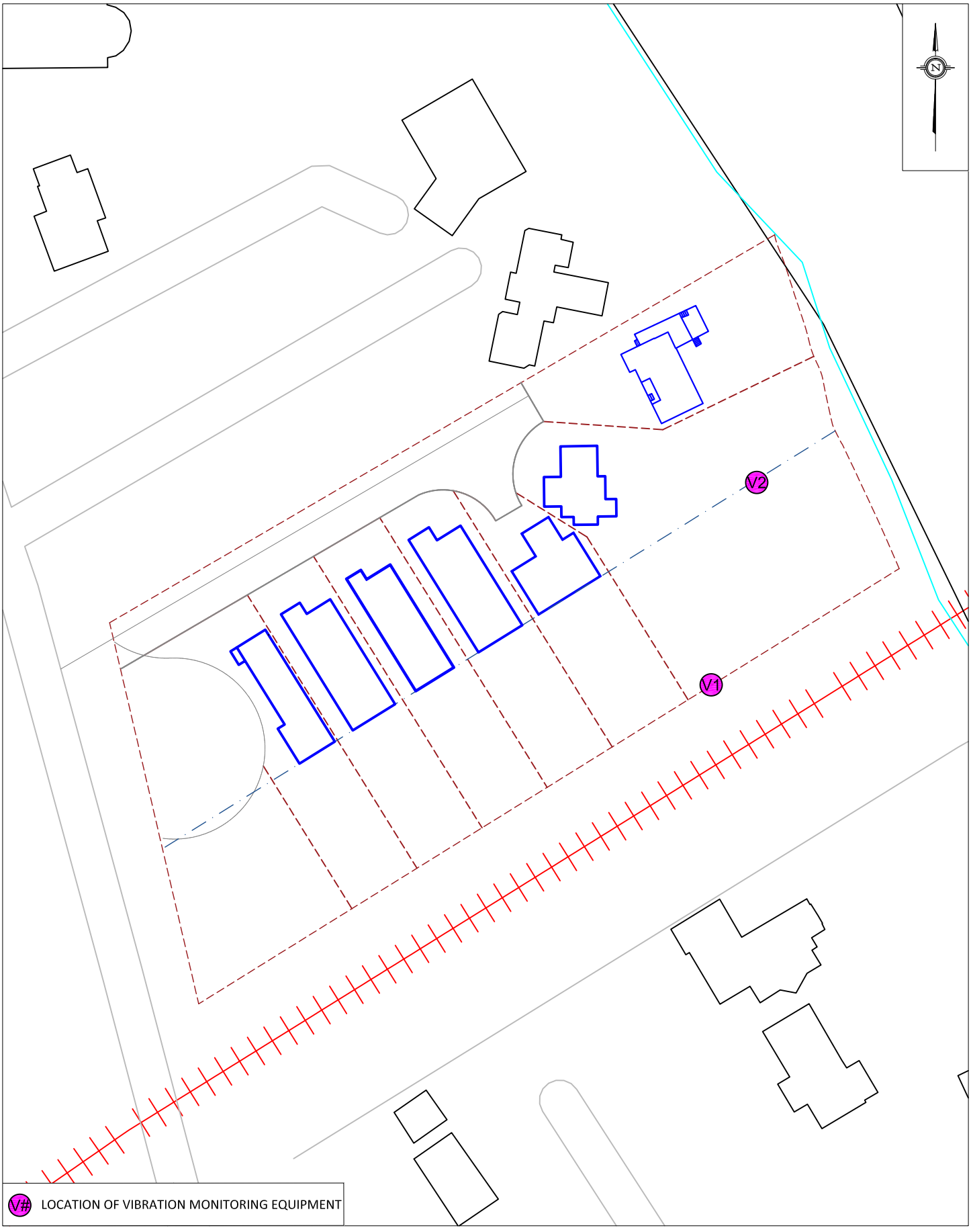
PROJECT	2009-2013 PRINCE OF WALES DRIVE, OTTAWA TRANSPORTATION NOISE AND VIBRATION ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-190 -4
DATE	JULY 23, 2024
DRAWN BY	J.F.

DESCRIPTION

FIGURE 4:
STAMSON INPUT PARAMETERS (2)



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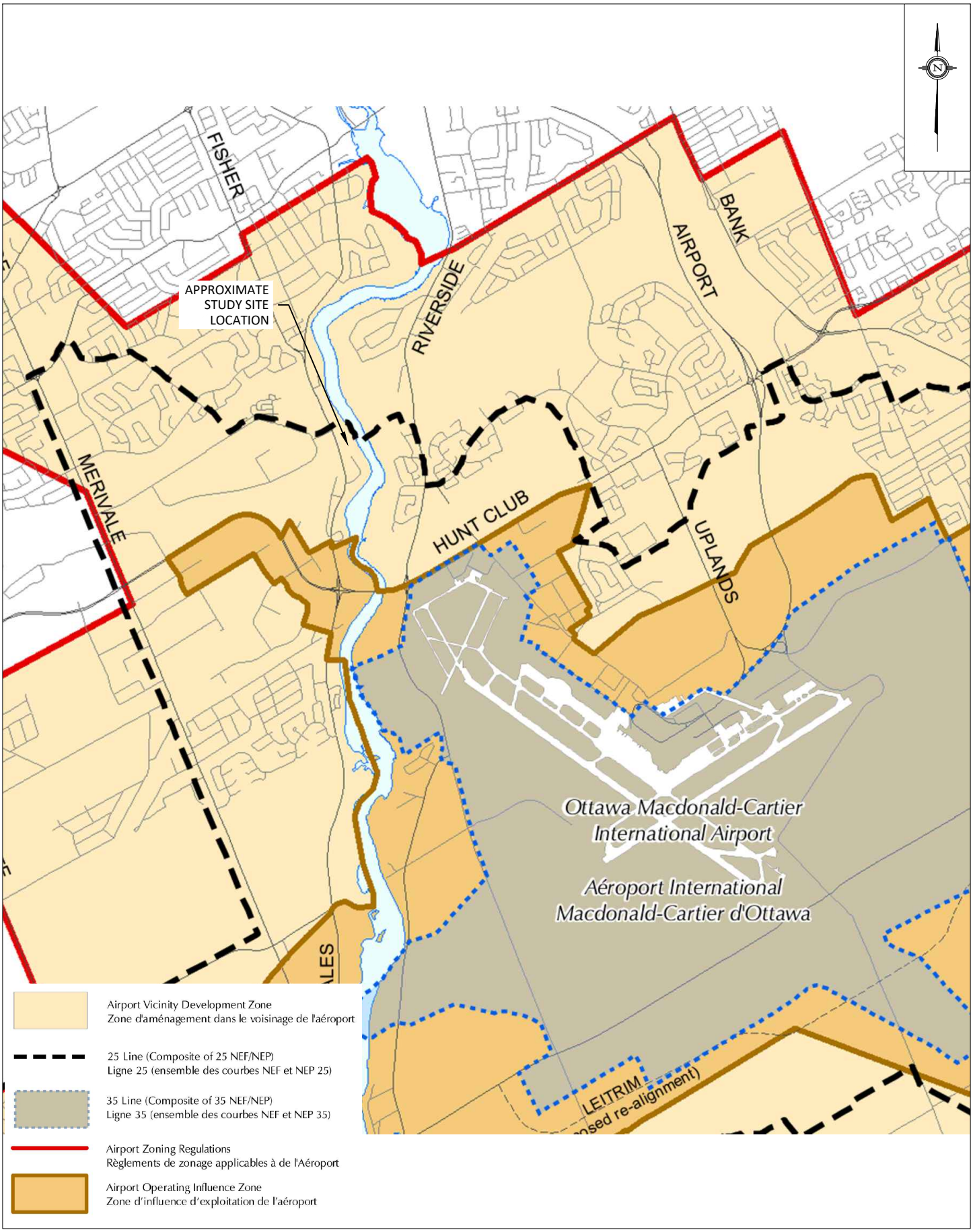
PROJECT	2009-2013 PRINCE OF WALES DRIVE, OTTAWA TRANSPORTATION NOISE AND VIBRATION ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-190 -5
DATE	JULY 23, 2024
DRAWN BY	J.F.

DESCRIPTION

FIGURE 5:
VIBRATION MONITORING LOCATIONS



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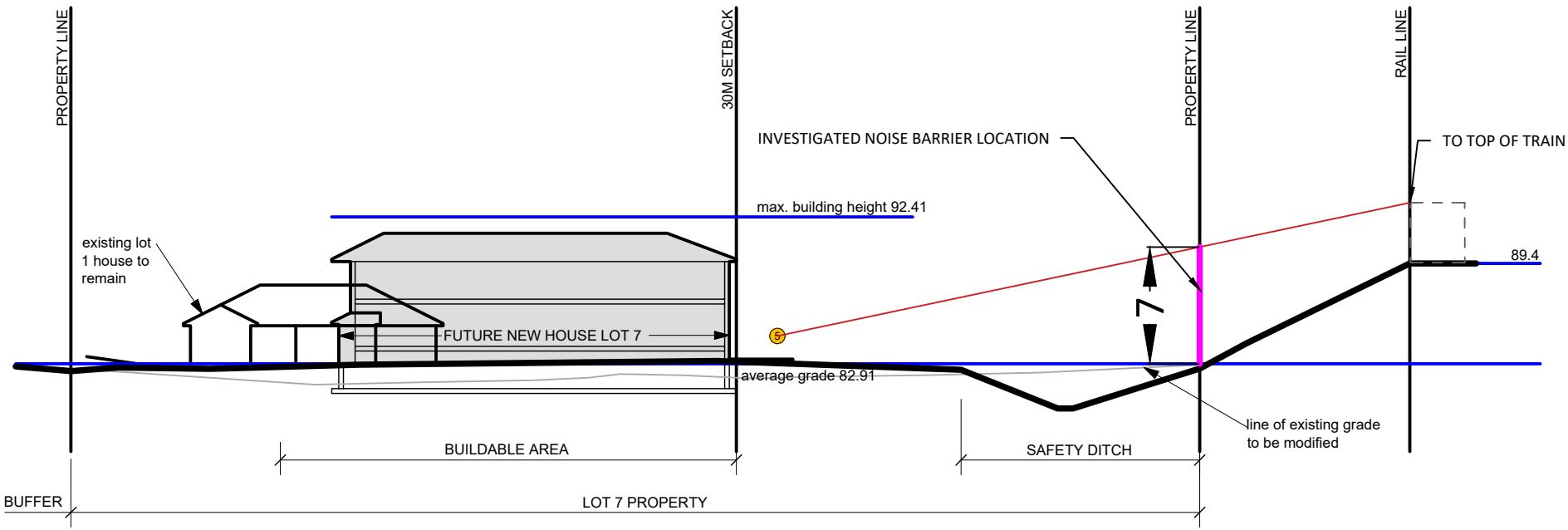
PROJECT	2009-2013 PRINCE OF WALES DRIVE, OTTAWA TRANSPORTATION NOISE AND VIBRATION ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-190 -5
DATE	OCTOBER 28, 2022
DRAWN BY	G.G.

DESCRIPTION

FIGURE 6:
ANNEX 10 - LAND USE CONSTRAINTS DUE TO AIRCRAFT NOISE WITH REFERENCE TO STUDY SITE



1 OLA RECEPTOR

LINE OF SIGHT

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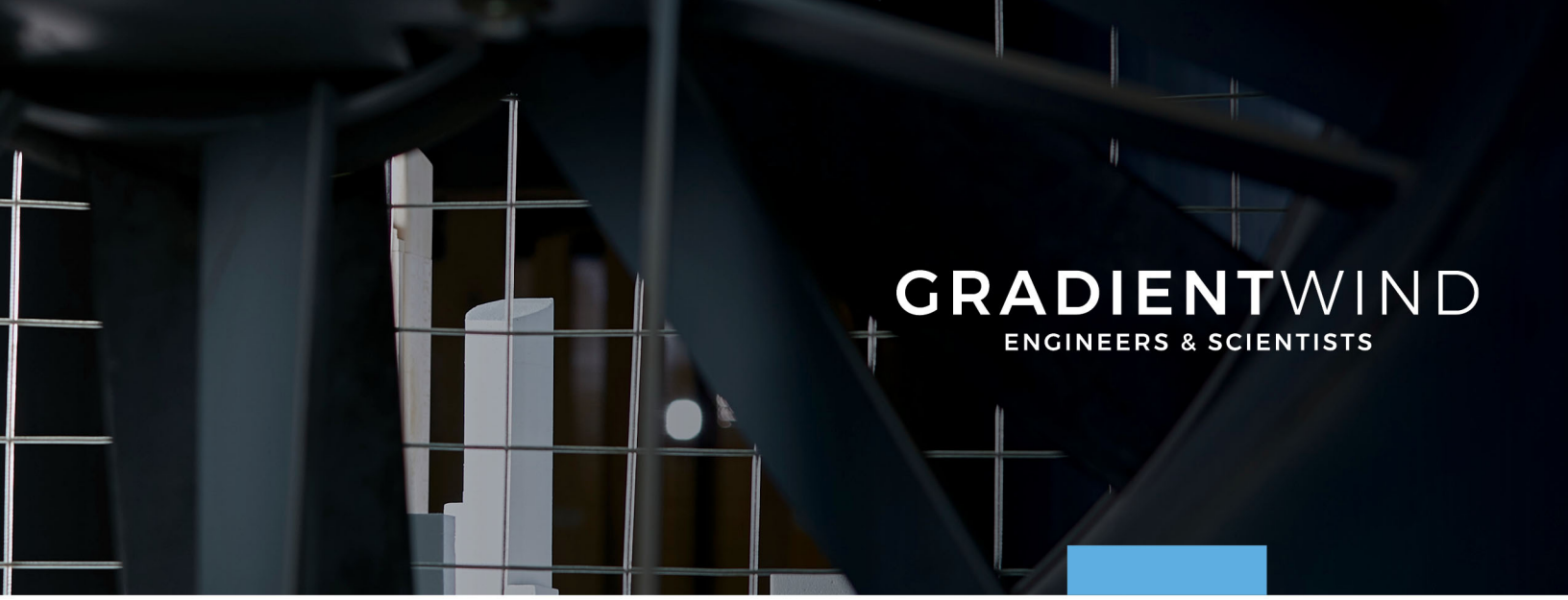
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-190-7
DATE	NOVEMBER 1ST, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE 7:
LOT 7 CROSS-SECTION - RECEPTOR 5 LINE OF SIGHT



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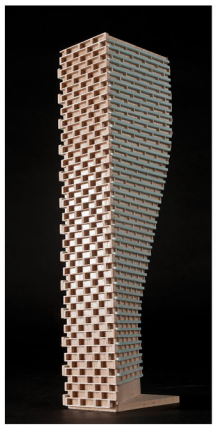
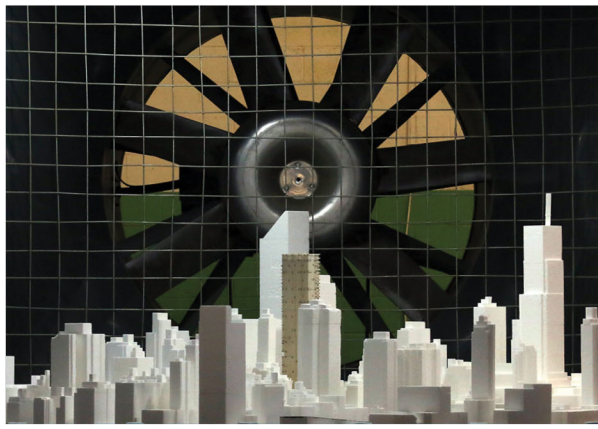




APPENDIX A

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: 26-06-2024 09:34:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: POW (day/night)
----------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (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  :  42.00 / 42.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.51 + 0.00) = 62.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  70.00   0.00  -4.47  -3.01   0.00   0.00   0.00  62.51
-------------------------------------------------------------------------------

Segment Leq : 62.51 dBA

Total Leq All Segments: 62.51 dBA


Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.92 + 0.00) = 54.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  62.40   0.00  -4.47  -3.01   0.00   0.00   0.00  54.92
-------------------------------------------------------------------------------

Segment Leq : 54.92 dBA

Total Leq All Segments: 54.92 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 62.51
                           (NIGHT): 54.92
```

```
STAMSON 5.0         NORMAL REPORT         Date: 26-06-2024 09:44:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Rail data, segment # 1: VIA (day/night)
---------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA (day/night)
-------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  58.00 / 58.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00


Results segment # 1: VIA (day)
------------------------------

LOCOMOTIVE (0.00 + 55.64 + 0.00) = 55.64 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.30  67.05  -7.64  -3.78   0.00   0.00   0.00  55.64
-------------------------------------------------------------------------

WHEEL (0.00 + 45.86 + 0.00) = 45.86 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.41  58.12  -8.25  -4.00   0.00   0.00   0.00  45.86
-------------------------------------------------------------------------

Segment Leq : 56.07 dBA

Total Leq All Segments: 56.07 dBA
```

```
Results segment # 1: VIA (night)
--------------------------------

LOCOMOTIVE (0.00 + 52.12 + 0.00) = 52.12 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.30  63.53  -7.64  -3.78   0.00   0.00   0.00  52.12
-------------------------------------------------------------------------

WHEEL (0.00 + 42.34 + 0.00) = 42.34 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.41  54.60  -8.25  -4.00   0.00   0.00   0.00  42.34
-------------------------------------------------------------------------

Segment Leq : 52.55 dBA

Total Leq All Segments: 52.55 dBA


Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (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  :  42.00 / 42.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.52 + 0.00) = 65.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  70.00   0.00  -4.47   0.00   0.00   0.00   0.00  65.52
-------------------------------------------------------------------------------

Segment Leq : 65.52 dBA

Total Leq All Segments: 65.52 dBA


Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.93 + 0.00) = 57.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  62.40   0.00  -4.47   0.00   0.00   0.00   0.00  57.93
-------------------------------------------------------------------------------

Segment Leq : 57.93 dBA

Total Leq All Segments: 57.93 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 65.99
                           (NIGHT): 59.04
```

```
STAMSON 5.0        NORMAL REPORT        Date: 26-06-2024 12:08:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Rail data, segment # 1: VIA-Lawn (day/night)
-------------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
  1. PASSENGER   !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-----------------------------------------
Angle1   Angle2           : -70.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  44.00 / 44.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00


Rail data, segment # 2: VIA-River (day/night)
---------------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
  1. Passenger   !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: VIA-River (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   -70.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  44.00 / 44.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00
```

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

LOCOMOTIVE (0.00 + 59.87 + 0.00) = 59.87 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -70     90   0.30  67.05  -6.08  -1.10   0.00   0.00   0.00  59.87
-------------------------------------------------------------------------

WHEEL (0.00 + 50.27 + 0.00) = 50.27 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -70     90   0.41  58.12  -6.57  -1.28   0.00   0.00   0.00  50.27
-------------------------------------------------------------------------

Segment Leq : 60.32 dBA


Results segment # 2: VIA-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 52.84 + 0.00) = 52.84 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -70   0.00  67.05  -4.67  -9.54   0.00   0.00   0.00  52.84
-------------------------------------------------------------------------

WHEEL (0.00 + 43.90 + 0.00) = 43.90 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -70   0.00  58.12  -4.67  -9.54   0.00   0.00   0.00  43.90
-------------------------------------------------------------------------

Segment Leq : 53.36 dBA

Total Leq All Segments: 61.12 dBA

Results segment # 1: VIA-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 56.35 + 0.00) = 56.35 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -70     90   0.30  63.53  -6.08  -1.10   0.00   0.00   0.00  56.35
-------------------------------------------------------------------------

WHEEL (0.00 + 46.75 + 0.00) = 46.75 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -70     90   0.41  54.60  -6.57  -1.28   0.00   0.00   0.00  46.75
-------------------------------------------------------------------------

Segment Leq : 56.80 dBA
```

```
Results segment # 2: VIA-River (night)
--------------------------------------

LOCOMOTIVE (0.00 + 49.32 + 0.00) = 49.32 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -70   0.00  63.53  -4.67  -9.54   0.00   0.00   0.00  49.32
-------------------------------------------------------------------------

WHEEL (0.00 + 40.38 + 0.00) = 40.38 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -70   0.00  54.60  -4.67  -9.54   0.00   0.00   0.00  40.38
-------------------------------------------------------------------------

Segment Leq : 49.84 dBA

Total Leq All Segments: 57.60 dBA


Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.76 + 0.00) = 61.76 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  70.00   0.00  -5.23  -3.01   0.00   0.00   0.00  61.76
-------------------------------------------------------------------------------

Segment Leq : 61.76 dBA

Total Leq All Segments: 61.76 dBA


Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.16 + 0.00) = 54.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  62.40   0.00  -5.23  -3.01   0.00   0.00   0.00  54.16
-------------------------------------------------------------------------------

Segment Leq : 54.16 dBA

Total Leq All Segments: 54.16 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 64.46
                           (NIGHT): 59.22
```

```
STAMSON 5.0        NORMAL REPORT        Date: 26-06-2024 09:50:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Rail data, segment # 1: VIA-Lawn (day/night)
-------------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
  1. PASSENGER   !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-------------------------------------------
Angle1   Angle2           : -52.00 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           :   4.50 / 4.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00


Rail data, segment # 2: Via-River (day/night)
-------------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
  1. Passenger   !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (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  :  43.00 / 43.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00
```

Results segment # 1: VIA-Lawn (day)

LOCOMOTIVE (0.00 + 59.53 + 0.00) = 59.53 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-52	90	0.30	67.05	-5.95	-1.58	0.00	0.00	0.00	59.53

WHEEL (0.00 + 49.95 + 0.00) = 49.95 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-52	90	0.41	58.12	-6.43	-1.74	0.00	0.00	0.00	49.95

Segment Leq : 59.98 dBA

Results segment # 2: Via-River (day)

LOCOMOTIVE (0.00 + 55.73 + 0.00) = 55.73 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-52	0.00	67.05	-4.57	-6.75	0.00	0.00	0.00	55.73

WHEEL (0.00 + 46.79 + 0.00) = 46.79 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-52	0.00	58.12	-4.57	-6.75	0.00	0.00	0.00	46.79

Segment Leq : 56.25 dBA

Total Leq All Segments: 61.51 dBA

```
Results segment # 1: VIA-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 56.01 + 0.00) = 56.01 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -52     90   0.30  63.53  -5.95  -1.58   0.00   0.00   0.00  56.01
-----------------------------------------------------------------------

WHEEL (0.00 + 46.43 + 0.00) = 46.43 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -52     90   0.41  54.60  -6.43  -1.74   0.00   0.00   0.00  46.43
-----------------------------------------------------------------------

Segment Leq : 56.46 dBA


Results segment # 2: Via-River (night)
--------------------------------------

LOCOMOTIVE (0.00 + 52.20 + 0.00) = 52.20 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90    -52   0.00  63.53  -4.57  -6.75   0.00   0.00   0.00  52.20
-----------------------------------------------------------------------

WHEEL (0.00 + 43.27 + 0.00) = 43.27 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90    -52   0.00  54.60  -4.57  -6.75   0.00   0.00   0.00  43.27
-----------------------------------------------------------------------

Segment Leq : 52.72 dBA

Total Leq All Segments: 57.99 dBA


Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   -16.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 111.00 / 111.00 m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.85 + 0.00) = 50.85 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -16   0.57  70.00   0.00 -13.65  -5.50   0.00   0.00   0.00  50.85
-------------------------------------------------------------------------------

Segment Leq : 50.85 dBA

Total Leq All Segments: 50.85 dBA


Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 43.26 + 0.00) = 43.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -16   0.57  62.40   0.00 -13.65  -5.50   0.00   0.00   0.00  43.26
-------------------------------------------------------------------------------

Segment Leq : 43.26 dBA

Total Leq All Segments: 43.26 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 61.87
                           (NIGHT): 58.13
```

```
STAMSON 5.0         NORMAL REPORT         Date: 26-06-2024 09:47:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Rail data, segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Angle1   Angle2           : -71.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00


Rail data, segment # 2: Via-River (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. Passenger    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   -71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00
```

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

LOCOMOTIVE (0.00 + 59.90 + 0.00) = 59.90 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.39  67.05  -5.92  -1.24   0.00   0.00   0.00  59.90
-------------------------------------------------------------------------

WHEEL (0.00 + 50.35 + 0.00) = 50.35 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.50  58.12  -6.37  -1.40   0.00   0.00   0.00  50.35
-------------------------------------------------------------------------

Segment Leq : 60.36 dBA


Results segment # 2: Via-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 53.03 + 0.00) = 53.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  67.05  -4.26  -9.77   0.00   0.00   0.00  53.03
-------------------------------------------------------------------------

WHEEL (0.00 + 44.09 + 0.00) = 44.09 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  58.12  -4.26  -9.77   0.00   0.00   0.00  44.09
-------------------------------------------------------------------------

Segment Leq : 53.55 dBA

Total Leq All Segments: 61.18 dBA


Results segment # 1: VIA-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 56.37 + 0.00) = 56.37 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.39  63.53  -5.92  -1.24   0.00   0.00   0.00  56.37
-------------------------------------------------------------------------

WHEEL (0.00 + 46.82 + 0.00) = 46.82 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.50  54.60  -6.37  -1.40   0.00   0.00   0.00  46.82
-------------------------------------------------------------------------

Segment Leq : 56.83 dBA
```

```
Results segment # 2: Via-River (night)
---------------------------------------

LOCOMOTIVE (0.00 + 49.51 + 0.00) = 49.51 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  63.53  -4.26  -9.77   0.00   0.00   0.00  49.51
-------------------------------------------------------------------------

WHEEL (0.00 + 40.57 + 0.00) = 40.57 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  54.60  -4.26  -9.77   0.00   0.00   0.00  40.57
-------------------------------------------------------------------------

Segment Leq : 50.03 dBA

Total Leq All Segments: 57.65 dBA


Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: POW (day)
------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.82 + 0.00) = 62.82 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  70.00   0.00  -5.23  -1.95   0.00   0.00   0.00  62.82
-------------------------------------------------------------------------------

Segment Leq : 62.82 dBA

Total Leq All Segments: 62.82 dBA


Results segment # 1: POW (night)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.22 + 0.00) = 55.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  62.40   0.00  -5.23  -1.95   0.00   0.00   0.00  55.22
-------------------------------------------------------------------------------

Segment Leq : 55.22 dBA

Total Leq All Segments: 55.22 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 65.09
                           (NIGHT): 59.62
```

```
STAMSON 5.0         NORMAL REPORT         Date: 26-06-2024 10:13:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5b.te                Time Period: Day/Night 16/8 hours
Description:


Rail data, segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-----------------------------------------
Angle1   Angle2           : -71.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      4       (Elevated; with barrier)
No Whistle
Barrier angle1            : -71.00 deg   Angle2 : 90.00 deg
Barrier height            :   2.20 m
Elevation                 :   6.50 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Rail data, segment # 2: Via-River (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. Passenger    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   -71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      4       (Elevated; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : -71.00 deg
Barrier height            :   2.20 m
Elevation                 :   6.50 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (0.00 + 59.90 + 0.00) = 59.90 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.26  67.05  -5.36  -1.01   0.00   0.00  -2.33  58.36*
   -71     90   0.39  67.05  -5.92  -1.24   0.00   0.00   0.00  59.90
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 43.31 + 0.00) = 43.31 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.36  58.12  -5.81  -1.19   0.00   0.00  -7.81  43.31
-------------------------------------------------------------------------

Segment Leq : 59.99 dBA


Results segment # 2: Via-River (day)
------------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (0.00 + 53.03 + 0.00) = 53.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  67.05  -4.26  -9.77   0.00   0.00  -4.48  48.55*
   -90    -71   0.00  67.05  -4.26  -9.77   0.00   0.00   0.00  53.03
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 38.27 + 0.00) = 38.27 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  58.12  -4.26  -9.77   0.00   0.00  -5.83  38.27
-------------------------------------------------------------------------

Segment Leq : 53.17 dBA

Total Leq All Segments: 60.81 dBA
```

```
Results segment # 1: VIA-Lawn (night)
-------------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (0.00 + 56.37 + 0.00) = 56.37 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.26  63.53  -5.36  -1.01   0.00   0.00  -2.33  54.83*
   -71     90   0.39  63.53  -5.92  -1.24   0.00   0.00   0.00  56.37
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 39.79 + 0.00) = 39.79 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.36  54.60  -5.81  -1.19   0.00   0.00  -7.81  39.79
-------------------------------------------------------------------------

Segment Leq : 56.46 dBA


Results segment # 2: Via-River (night)
--------------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        3.19 !         3.19
       0.50 !        1.50 !        0.82 !         0.82

LOCOMOTIVE (0.00 + 49.51 + 0.00) = 49.51 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  63.53  -4.26  -9.77   0.00   0.00  -4.48  45.02*
   -90    -71   0.00  63.53  -4.26  -9.77   0.00   0.00   0.00  49.51
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 34.75 + 0.00) = 34.75 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  54.60  -4.26  -9.77   0.00   0.00  -5.83  34.75
-------------------------------------------------------------------------

Segment Leq : 49.65 dBA

Total Leq All Segments: 57.28 dBA
```

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 25.00 deg
Barrier height            :   2.20 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: POW (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 57.02 + 0.00) = 57.02 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  70.00   0.00  -5.23  -1.95   0.00   0.00  -5.80  57.02
-------------------------------------------------------------------------------

Segment Leq : 57.02 dBA

Total Leq All Segments: 57.02 dBA
```

```
Results segment # 1: POW (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 49.42 + 0.00) = 49.42 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  62.40   0.00  -5.23  -1.95   0.00   0.00  -5.80  49.42
-------------------------------------------------------------------------------

Segment Leq : 49.42 dBA

Total Leq All Segments: 49.42 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 62.33
                           (NIGHT): 57.94
```

```
STAMSON 5.0         NORMAL REPORT         Date: 26-06-2024 10:16:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5b_3m.te             Time Period: Day/Night 16/8 hours
Description:


Rail data, segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-----------------------------------------
Angle1   Angle2           : -71.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -71.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   6.50 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Rail data, segment # 2: Via-River (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. Passenger    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   -71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  60.00 / 60.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : -71.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   6.50 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        7.57 !         7.57
       0.50 !        1.50 !        5.21 !         5.21

LOCOMOTIVE (0.00 + 58.76 + 0.00) = 58.76 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.41  67.05  -5.98  -1.26   0.00   0.00  -0.04  59.76*
   -71     90   0.58  67.05  -6.75  -1.54   0.00   0.00   0.00  58.76
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 49.40 + 0.00) = 49.40 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.51  58.12  -6.43  -1.43   0.00   0.00  -0.17  50.08*
   -71     90   0.66  58.12  -7.07  -1.65   0.00   0.00   0.00  49.40
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 59.24 dBA


Results segment # 2: Via-River (day)
-----------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        5.55 !         5.55
       0.50 !        1.50 !        3.97 !         3.97

LOCOMOTIVE (0.00 + 51.27 + 0.00) = 51.27 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     -71   0.00  67.05  -6.02  -9.77   0.00   0.00  -2.38  48.88*
   -90     -71   0.00  67.05  -6.02  -9.77   0.00   0.00   0.00  51.27
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 42.33 + 0.00) = 42.33 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     -71   0.00  58.12  -6.02  -9.77   0.00   0.00  -4.71  37.62*
   -90     -71   0.00  58.12  -6.02  -9.77   0.00   0.00   0.00  42.33
-------------------------------------------------------------------------

 * Bright Zone !
```

Segment Leq : 51.79 dBA

Total Leq All Segments: 59.96 dBA

Results segment # 1: VIA-Lawn (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	7.57	7.57
0.50	1.50	5.21	5.21

LOCOMOTIVE (0.00 + 55.24 + 0.00) = 55.24 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	90	0.41	63.53	-5.98	-1.26	0.00	0.00	-0.04	56.24*
-71	90	0.58	63.53	-6.75	-1.54	0.00	0.00	0.00	55.24

* Bright Zone !

WHEEL (0.00 + 45.88 + 0.00) = 45.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	90	0.51	54.60	-6.43	-1.43	0.00	0.00	-0.17	46.56*
-71	90	0.66	54.60	-7.07	-1.65	0.00	0.00	0.00	45.88

* Bright Zone !

Segment Leq : 55.72 dBA

Results segment # 2: Via-River (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	5.55	5.55
0.50	1.50	3.97	3.97

LOCOMOTIVE (0.00 + 47.75 + 0.00) = 47.75 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-71	0.00	63.53	-6.02	-9.77	0.00	0.00	-2.38	45.36*
-90	-71	0.00	63.53	-6.02	-9.77	0.00	0.00	0.00	47.75

* Bright Zone !

```
WHEEL (0.00 + 38.81 + 0.00) = 38.81 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  54.60  -6.02  -9.77   0.00   0.00  -4.71  34.10*
   -90    -71   0.00  54.60  -6.02  -9.77   0.00   0.00   0.00  38.81
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 48.27 dBA

Total Leq All Segments: 56.44 dBA


Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 25.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: POW (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 55.01 + 0.00) = 55.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  70.00   0.00  -5.23  -1.95   0.00   0.00  -7.81  55.01
-------------------------------------------------------------------------------

Segment Leq : 55.01 dBA

Total Leq All Segments: 55.01 dBA


Results segment # 1: POW (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 47.41 + 0.00) = 47.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  62.40   0.00  -5.23  -1.95   0.00   0.00  -7.81  47.41
-------------------------------------------------------------------------------

Segment Leq : 47.41 dBA

Total Leq All Segments: 47.41 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 61.16
                           (NIGHT): 56.95
```

```
STAMSON 5.0         NORMAL REPORT         Date: 26-06-2024 10:36:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5b_4m.te             Time Period: Day/Night 16/8 hours
Description:


Rail data, segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Angle1   Angle2           : -71.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -71.00 deg   Angle2 : 90.00 deg
Barrier height            :   4.00 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   6.50 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Rail data, segment # 2: Via-River (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. Passenger    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   -71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  60.00 / 60.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : -71.00 deg
Barrier height            :   4.00 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   6.50 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        7.57 !         7.57
       0.50 !        1.50 !        5.21 !         5.21

LOCOMOTIVE (0.00 + 58.76 + 0.00) = 58.76 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.34  67.05  -5.73  -1.16   0.00   0.00  -0.07  60.09*
   -71     90   0.58  67.05  -6.75  -1.54   0.00   0.00   0.00  58.76
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 49.40 + 0.00) = 49.40 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.45  58.12  -6.18  -1.33   0.00   0.00  -1.02  49.59*
   -71     90   0.66  58.12  -7.07  -1.65   0.00   0.00   0.00  49.40
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 59.24 dBA


Results segment # 2: Via-River (day)
-----------------------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        5.55 !         5.55
       0.50 !        1.50 !        3.97 !         3.97

LOCOMOTIVE (0.00 + 51.27 + 0.00) = 51.27 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     -71   0.00  67.05  -6.02  -9.77   0.00   0.00  -4.24  47.03*
   -90     -71   0.00  67.05  -6.02  -9.77   0.00   0.00   0.00  51.27
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 37.33 + 0.00) = 37.33 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     -71   0.00  58.12  -6.02  -9.77   0.00   0.00  -5.00  37.33
-------------------------------------------------------------------------

Segment Leq : 51.44 dBA
Total Leq All Segments: 59.91 dBA
```

```
Results segment # 1: VIA-Lawn (night)
-------------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        7.57 !         7.57
       0.50 !        1.50 !        5.21 !         5.21

LOCOMOTIVE (0.00 + 55.24 + 0.00) = 55.24 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.34  63.53  -5.73  -1.16   0.00   0.00  -0.07  56.57*
   -71     90   0.58  63.53  -6.75  -1.54   0.00   0.00   0.00  55.24
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 45.88 + 0.00) = 45.88 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.45  54.60  -6.18  -1.33   0.00   0.00  -1.02  46.07*
   -71     90   0.66  54.60  -7.07  -1.65   0.00   0.00   0.00  45.88
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 55.72 dBA


Results segment # 2: Via-River (night)
--------------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        5.55 !         5.55
       0.50 !        1.50 !        3.97 !         3.97

LOCOMOTIVE (0.00 + 47.75 + 0.00) = 47.75 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  63.53  -6.02  -9.77   0.00   0.00  -4.24  43.51*
   -90    -71   0.00  63.53  -6.02  -9.77   0.00   0.00   0.00  47.75
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 33.81 + 0.00) = 33.81 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  54.60  -6.02  -9.77   0.00   0.00  -5.00  33.81
-------------------------------------------------------------------------

Segment Leq : 47.92 dBA
```

```
Total Leq All Segments: 56.39 dBA


Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 25.00 deg
Barrier height            :   4.00 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: POW (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 52.49 + 0.00) = 52.49 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  70.00   0.00  -5.23  -1.95   0.00   0.00 -10.33  52.49
-------------------------------------------------------------------------------

Segment Leq : 52.49 dBA

Total Leq All Segments: 52.49 dBA
```

```
Results segment # 1: POW (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 44.90 + 0.00) = 44.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  62.40   0.00  -5.23  -1.95   0.00   0.00 -10.33  44.90
-------------------------------------------------------------------------------

Segment Leq : 44.90 dBA

Total Leq All Segments: 44.90 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 60.63
                           (NIGHT): 56.68
```

```
STAMSON 5.0         NORMAL REPORT         Date: 26-06-2024 11:41:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5b_7m.te             Time Period: Day/Night 16/8 hours
Description:


Rail data, segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-----------------------------------------
Angle1   Angle2           : -71.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -71.00 deg   Angle2 : 90.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   6.50 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Rail data, segment # 2: Via-River (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. Passenger    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   -71.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : -71.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  27.00 / 27.00  m
Source elevation          :   6.50 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: VIA-Lawn (day)
-----------------------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        7.57 !         7.57
       0.50 !        1.50 !        5.21 !         5.21

LOCOMOTIVE (0.00 + 58.76 + 0.00) = 58.76 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.17  67.05  -4.96  -0.83   0.00   0.00  -4.31  56.95*
   -71     90   0.58  67.05  -6.75  -1.54   0.00   0.00   0.00  58.76
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 42.69 + 0.00) = 42.69 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.27  58.12  -5.41  -1.03   0.00   0.00  -8.99  42.69
-------------------------------------------------------------------------

Segment Leq : 58.87 dBA


Results segment # 2: Via-River (day)
-----------------------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        7.57 !         7.57
       0.50 !        1.50 !        5.21 !         5.21

LOCOMOTIVE (0.00 + 53.03 + 0.00) = 53.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  67.05  -4.26  -9.77   0.00   0.00  -4.84  48.18*
   -90    -71   0.00  67.05  -4.26  -9.77   0.00   0.00   0.00  53.03
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 37.81 + 0.00) = 37.81 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  58.12  -4.26  -9.77   0.00   0.00  -6.28  37.81
-------------------------------------------------------------------------

Segment Leq : 53.16 dBA

Total Leq All Segments: 59.90 dBA
```

```
Results segment # 1: VIA-Lawn (night)
-------------------------------------

Barrier height for grazing incidence
-------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        7.57 !         7.57
       0.50 !        1.50 !        5.21 !         5.21

LOCOMOTIVE (0.00 + 55.24 + 0.00) = 55.24 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.17  63.53  -4.96  -0.83   0.00   0.00  -4.31  53.43*
   -71     90   0.58  63.53  -6.75  -1.54   0.00   0.00   0.00  55.24
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 39.17 + 0.00) = 39.17 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -71     90   0.27  54.60  -5.41  -1.03   0.00   0.00  -8.99  39.17
-------------------------------------------------------------------------

Segment Leq : 55.35 dBA


Results segment # 2: Via-River (night)
--------------------------------------

Barrier height for grazing incidence
-------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        7.57 !         7.57
       0.50 !        1.50 !        5.21 !         5.21

LOCOMOTIVE (0.00 + 49.51 + 0.00) = 49.51 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  63.53  -4.26  -9.77   0.00   0.00  -4.84  44.66*
   -90    -71   0.00  63.53  -4.26  -9.77   0.00   0.00   0.00  49.51
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 34.29 + 0.00) = 34.29 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -71   0.00  54.60  -4.26  -9.77   0.00   0.00  -6.28  34.29
-------------------------------------------------------------------------

Segment Leq : 49.64 dBA

Total Leq All Segments: 56.38 dBA
```

```
Road data, segment # 1: POW (day/night)
---------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    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):  15000
    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: POW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 25.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  35.00 / 35.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: POW (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 47.48 + 0.00) = 47.48 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  70.00   0.00  -5.23  -1.95   0.00   0.00 -15.34  47.48
-------------------------------------------------------------------------------

Segment Leq : 47.48 dBA

Total Leq All Segments: 47.48 dBA
```

```
Results segment # 1: POW (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 39.89 + 0.00) = 39.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     25   0.00  62.40   0.00  -5.23  -1.95   0.00   0.00 -15.34  39.89
-------------------------------------------------------------------------------

Segment Leq : 39.89 dBA

Total Leq All Segments: 39.89 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 60.14
                           (NIGHT): 56.48
```

```
STAMSON 5.0         NORMAL REPORT         Date: 26-06-2024 09:55:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Rail data, segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: VIA-Lawn (day/night)
-----------------------------------------------
Angle1   Angle2           : -12.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  54.00 / 54.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00


Rail data, segment # 2: Via-River (day/night)
-----------------------------------------------
Train             ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type              !             !(km/h) !/Train!/Train! type !weld
------------------+-------------+-------+------+------+------+----
  1. PASSENGER    !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   -12.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  54.00 / 54.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00
```

Results segment # 1: VIA-Lawn (day)

LOCOMOTIVE (0.00 + 52.41 + 0.00) = 52.41 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-12	25	0.39	67.05	-7.73	-6.91	0.00	0.00	0.00	52.41

WHEEL (0.00 + 42.88 + 0.00) = 42.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-12	25	0.50	58.12	-8.32	-6.92	0.00	0.00	0.00	42.88

Segment Leq : 52.87 dBA

Results segment # 2: Via-River (day)

LOCOMOTIVE (0.00 + 57.86 + 0.00) = 57.86 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-12	0.00	67.05	-5.56	-3.63	0.00	0.00	0.00	57.86

WHEEL (0.00 + 48.92 + 0.00) = 48.92 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-12	0.00	58.12	-5.56	-3.63	0.00	0.00	0.00	48.92

Segment Leq : 58.38 dBA

Total Leq All Segments: 59.46 dBA

Results segment # 1: VIA-Lawn (night)

LOCOMOTIVE (0.00 + 48.89 + 0.00) = 48.89 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-12	25	0.39	63.53	-7.73	-6.91	0.00	0.00	0.00	48.89

WHEEL (0.00 + 39.36 + 0.00) = 39.36 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-12	25	0.50	54.60	-8.32	-6.92	0.00	0.00	0.00	39.36

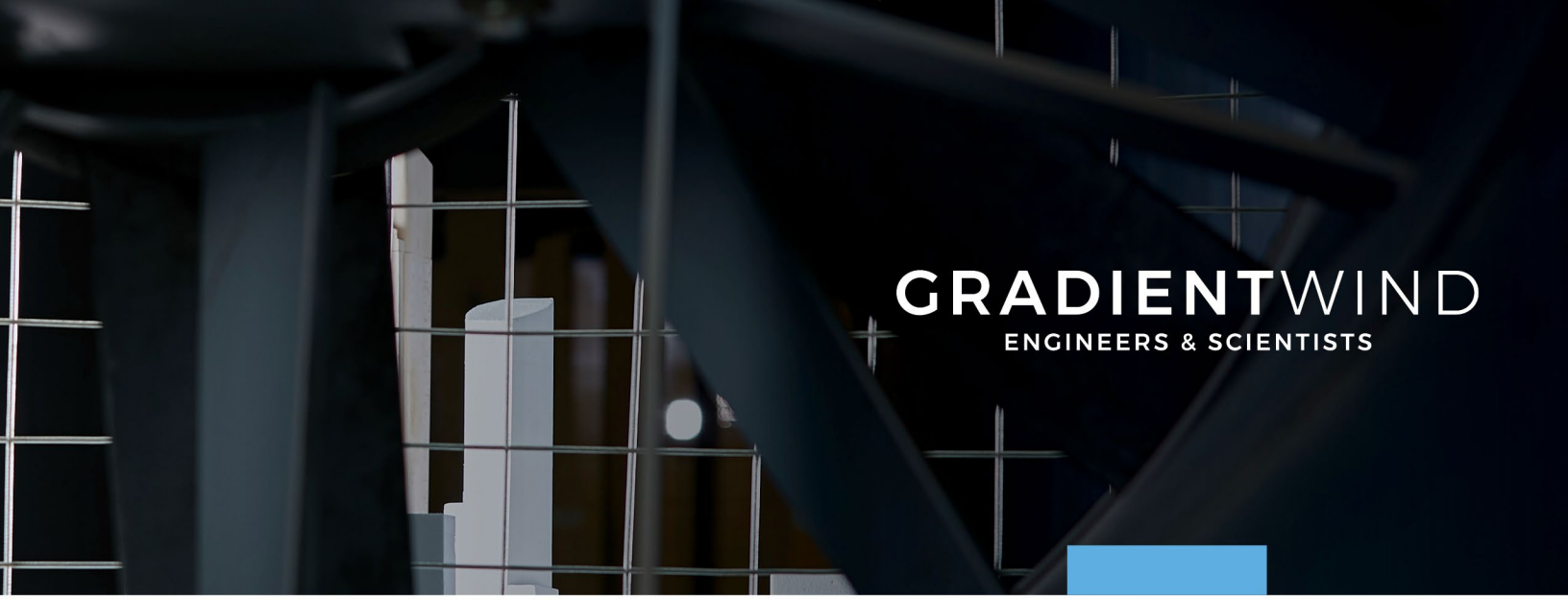
Segment Leq : 49.35 dBA

```
Results segment # 2: Via-River (night)
--------------------------------------

LOCOMOTIVE (0.00 + 54.34 + 0.00) = 54.34 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -12   0.00  63.53  -5.56  -3.63   0.00   0.00   0.00  54.34
-------------------------------------------------------------------------

WHEEL (0.00 + 45.40 + 0.00) = 45.40 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -12   0.00  54.60  -5.56  -3.63   0.00   0.00   0.00  45.40
-------------------------------------------------------------------------

Segment Leq : 54.86 dBA

Total Leq All Segments: 55.94 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 59.46
                           (NIGHT): 55.94
```

```
STAMSON 5.0        NORMAL REPORT        Date: 26-06-2024 15:23:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Rail data, segment # 1: Via-Lawn (day/night)
-------------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
  1. Passenger   !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 1: Via-Lawn (day/night)
-------------------------------------------
Angle1   Angle2           : -57.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00


Rail data, segment # 2: Via-River (day/night)
-------------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
  1. Passenger   !  18.0/4.0   !  73.0 !  2.0 !  5.0 !Diesel!  No

Data for Segment # 2: Via-River (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   -57.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      3       (Elevated; no barrier)
No Whistle
Elevation                 :   6.50 m
Reference angle           :   0.00
```

```
Results segment # 1: Via-Lawn (day)
-----------------------------------

LOCOMOTIVE (0.00 + 59.56 + 0.00) = 59.56 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -57     90   0.39  67.05  -5.92  -1.57   0.00   0.00   0.00  59.56
-------------------------------------------------------------------------

WHEEL (0.00 + 50.03 + 0.00) = 50.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -57     90   0.50  58.12  -6.37  -1.72   0.00   0.00   0.00  50.03
-------------------------------------------------------------------------

Segment Leq : 60.02 dBA


Results segment # 2: Via-River (day)
-----------------------------------

LOCOMOTIVE (0.00 + 55.43 + 0.00) = 55.43 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -57   0.00  67.05  -4.26  -7.37   0.00   0.00   0.00  55.43
-------------------------------------------------------------------------

WHEEL (0.00 + 46.49 + 0.00) = 46.49 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -57   0.00  58.12  -4.26  -7.37   0.00   0.00   0.00  46.49
-------------------------------------------------------------------------

Segment Leq : 55.95 dBA

Total Leq All Segments: 61.46 dBA


Results segment # 1: Via-Lawn (night)
-------------------------------------

LOCOMOTIVE (0.00 + 56.04 + 0.00) = 56.04 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -57     90   0.39  63.53  -5.92  -1.57   0.00   0.00   0.00  56.04
-------------------------------------------------------------------------

WHEEL (0.00 + 46.50 + 0.00) = 46.50 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -57     90   0.50  54.60  -6.37  -1.72   0.00   0.00   0.00  46.50
-------------------------------------------------------------------------

Segment Leq : 56.50 dBA
```

```
Results segment # 2: Via-River (night)
--------------------------------------

LOCOMOTIVE (0.00 + 51.90 + 0.00) = 51.90 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -57   0.00  63.53  -4.26  -7.37   0.00   0.00   0.00  51.90
-------------------------------------------------------------------------

WHEEL (0.00 + 42.97 + 0.00) = 42.97 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -57   0.00  54.60  -4.26  -7.37   0.00   0.00   0.00  42.97
-------------------------------------------------------------------------

Segment Leq : 52.42 dBA

Total Leq All Segments: 57.93 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 61.46
                           (NIGHT): 57.93
```



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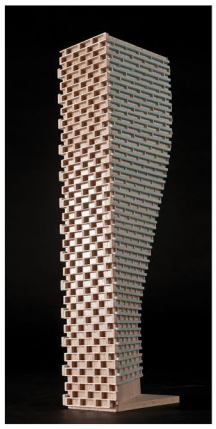
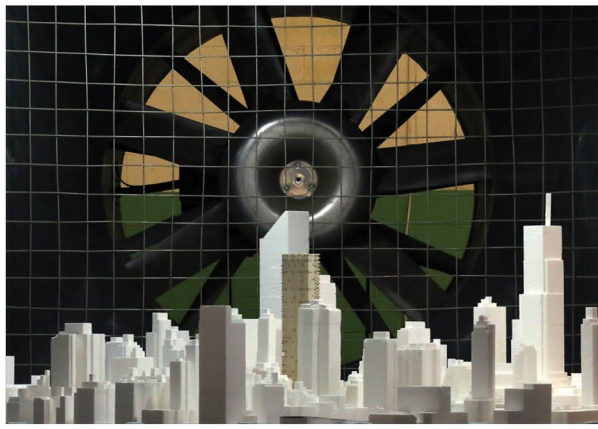




APPENDIX B

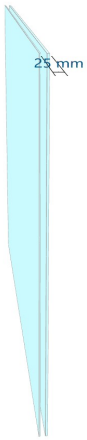
INSUL CALCULATIONS

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

Sound Insulation Prediction (v9.0.24)

Margin of error is generally within STC ±3 dB
- Key No. 11036
Job Name:
Job No.: Initials:ggarro
Date:01/11/22
File Name:Glazing STC 36.ixl

Notes:



STC 34
OITC 28

Mass-air-mass resonant frequency = =212 Hz

Panel Size = 2.0 m x 1.5 m

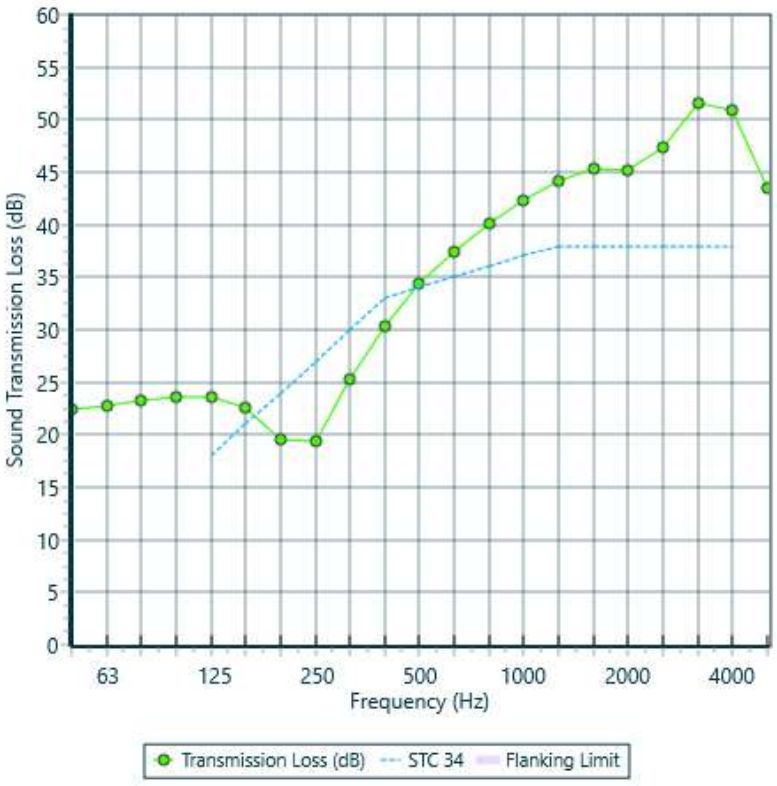
Partition surface mass = 22.5 kg/m²

System description

Pane 1 : 1 x 3 mm Glass

air: 16 mm
Pane 2 : 1 x 6 mm Glass

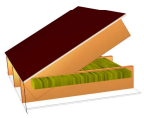
freq.(Hz)	TL(dB)	TL(dB)
50	22	
63	23	23
80	23	
100	24	
125	24	23
160	23	
200	20	
250	19	21
315	25	
400	30	
500	34	33
630	37	
800	40	
1000	42	42
1250	44	
1600	45	
2000	45	46
2500	47	
3150	52	
4000	51	47
5000	44	



Sound Insulation Prediction (v9.0.24)

Margin of error is generally within STC ±3 dB
- Key No. 11036
Job Name:
Job No.: Initials:ggarro
Date:01/11/22
File Name:Roof - R1 - STC.ixl

Notes:



STC 56
OITC 45

Mass-air-mass resonant frequency = =34 Hz

Panel Size = 2.7 m x 4.0 m

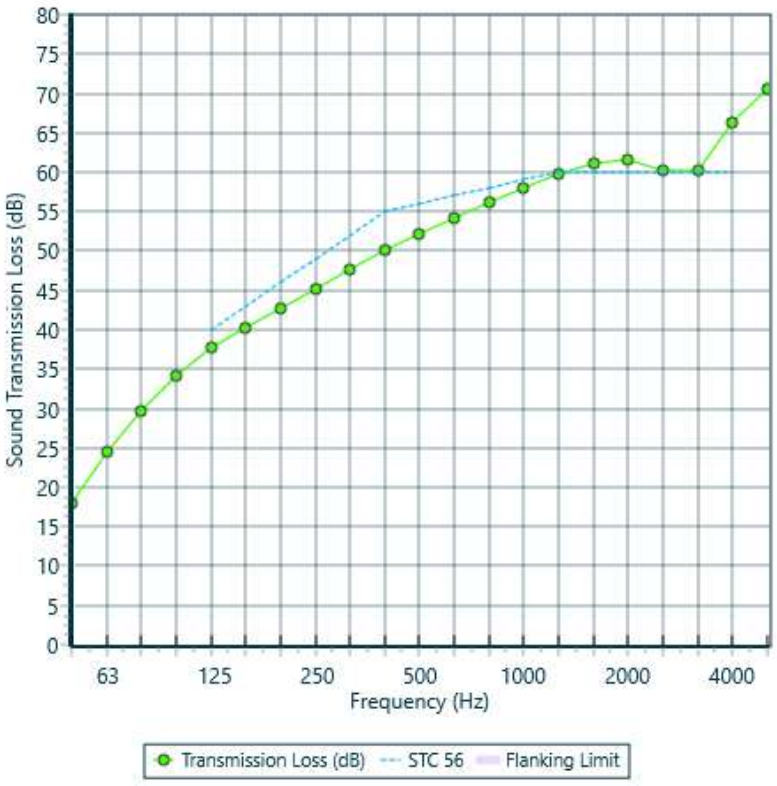
Partition surface mass = 31 kg/m²

System description

Panel 1 : 1 x 3 mm Asphalt Shingles (2.7lb/ft²) + 1 x 15 mm OSB (Oriented Strand Board)

Frame: Pitched Roof (2.6E2 mm x 45 mm), Stud spacing 600 mm ; Cavity Width 355.3 mm , 1 x Fibreglass (10kg/m3) 60mm Thickness 75 mm
Panel 2 : 1 x 12.7 mm Type C Gypsum Board

freq.(Hz)	TL(dB)	TL(dB)
50	18	
63	24	22
80	30	
100	34	
125	38	37
160	40	
200	43	
250	45	45
315	48	
400	50	
500	52	52
630	54	
800	56	
1000	58	58
1250	60	
1600	61	
2000	62	61
2500	60	
3150	60	
4000	66	64
5000	70	



APPENDIX C
VIA RAIL INFORMATION

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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APPENDIX A

"We request train speeds, train volumes, train types (Diesel or Electric), as well as the number of locomotives and cars per train for the VIA Rail Beachburg Subdivision, specifically for the corridor nearest to 2013 Prince of Wales Drive in Ottawa, Ontario."

Train Speeds: Passenger train currently in a 45 MPH zone.

Train Volumes: Passenger currently 16 movements per day.

TrainType: Diesel

Number of locomotives and cars per train: Typically, 1-2 locomotives and up to five (5) train cars.

Montreal, October 27, 2023

BY E-MAIL
(essraa.alqassab@gradientwind.com)

Access to Information and Privacy Office
3, Place Ville Marie, Suite 500
Montreal (Quebec) H3B 2C9
Fax: 514-874-0661

Email: Sandra_Melkart@viarail.ca

Sandra Melkart
514-871-6126

Ms. Essraa Al Qassab
GRADIENT WIND
127 Walgreen Road
Ottawa (Ontario) K0A 1L0

Object: Response to Access to Information Request #23-2324 AI (D)

Dear Ms. Al Qassab,

We write further to your request for access to information made under the *Access to Information Act* ("*ATIA*") and received by VIA Rail Canada Inc. ("VIA Rail") on October 5th, 2023 for the following records/information:

> ***"We request train speeds, train volumes, train types (Diesel or Electric), as well as the number of locomotives and cars per train for the VIA Rail Beachburg Subdivision, specifically for the corridor nearest to 2013 Prince of Wales Drive in Ottawa, Ontario."***

You will find enclosed hereto Appendix A which contains the requested information.

Please be advised that you may file a complaint regarding the handling of your request with the *Information Commissioner of Canada*, in accordance with the requirements of section 31 of the *ATIA*, which reads as follows:

> *"31. A complaint under this Act shall be made to the Information Commissioner in writing unless the Commissioner authorizes otherwise. If the complaint relates to a request by a person for access to a record, it shall be made within sixty days after the day in which the person receives a notice of a refusal under section 7, is given to access to all or part of the record or, in any other case, becomes aware that grounds for the complaint exist."*

Notice of complaint should be sent to the following address:

> *Office of the Information Commissioner of Canada*
> *30, Victoria Street*
> *Gatineau (Quebec) K1A 1H3*
> *E-mail: general@oic-ci.gc.ca*

Please note that you may also file a complaint online on the *Information Commissioner of Canada*'s website at the following address: https://www.oic-ci.gc.ca/en#deposer-une-plainte-submit-a-complaint.

Before submitting a complaint pursuant to the *ATIA* to the *Information Commissioner of Canada*, you may contact us to obtain more information regarding the handling of your access to information request.

Trusting the whole to be in order, we remain at your disposal should you have any questions.

Best regards,

Sandra Melkart
Access to Information and Privacy Analyst
VIA Rail Canada Inc.

Encl. Appendix A

APPENDIX D

BPN 56 CALCULATIONS

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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CALCULATIONS TO REDUCE INTERIOR ROAD AND RAIL NOISE LOT 7 WEST FAÇADE - BEDROOM

		Rail	Road		
Outdoor Sound Level	=	53	58	dBA	R2 RECEPTOR, NIGHTTIME VALUES
Source Geometry Correction:	=	0	0	dBA	
Correction For Surface Reflectio	=	3	3	dBA	
Target Indoor Noise Level:	=	35	40	dBA	
Required Noise Reduction:	=	21	21	dBA	

Rail

COMPONENT: WALL				STC Is: 53	
Noise Spectrum Type	F				
Component Category	d	Correction: (Table 5)	10		
Room Floor Area:	12 m²			-10	dBA
Component Area:	8.1 m²				
Component / Floor (%):	68 %				
Room Absorption Category:	Very Absorptive	Correction: (Table 4 Equation)	-3		dBA
				3	
Noise Reduction If Only This Component Transmits Sound Energy:				46	dBA
			Required Noise Reduction:	21	dBA
Surplus noise reduction for comparison to Table 3				25	
Component Transmits	0 % Of Sound				

COMPONENT: Surface A Window			Required Noise Reduction Is:	21	dBA
Percentage Of Sound Energy Transmitted:	100 %		Correction: (Table 3 Equation)	0	
Room Floor Area:	12 m²				
Component Area:	2 m²				
Component / Floor (%):	17 %				
Room Absortion Category:	Very Absorptive		Correction: (Table 4 Equation)	-9	dBA
Noise Spectrum	F				
Component Category	b		Correction: (Table 5)	3	dBA
			Required STC Is:	15	

Road

COMPONENT: WALL				STC Is: 53	
Noise Spectrum Type	D				
Component Category	d	Correction: (Table 5)	7		
Room Floor Area:	12 m²			-7	dBA
Component Area:	8.1 m²				
Component / Floor (%):	68 %				
Room Absorption Category:	Very Absorptive	Correction: (Table 4 Equation)	-3		dBA
				3	
Noise Reduction If Only This Component Transmits Sound Energy:				49	dBA
			Required Noise Reduction:	21	dBA
Surplus noise reduction for comparison to Table 3				28	
Component Transmits	0 % Of Sound				

COMPONENT: Surface A Window			Required Noise Reduction Is:	21	dBA
Percentage Of Sound Energy Transmitted:	100 %		Correction: (Table 3 Equation)	0	
Room Floor Area:	12 m²				
Component Area:	2 m²				
Component / Floor (%):	17 %				
Room Absortion Category:	Very Absorptive		Correction: (Table 4 Equation)	-9	dBA
Noise Spectrum	D				
Component Category	b		Correction: (Table 5)	2	dBA
			Required STC Is:	14	

	Raod	Rail	Combined
Combined Window STC	15	14	**17.8**

CALCULATIONS TO REDUCE INTERIOR ROAD AND RAIL NOISE LOT 7 WEST FAÇADE - LIVING ROOM

		Rail	Road		
Outdoor Sound Level	=	56	66	dBA	R2 RECEPTOR, DAYTIME VALUES
Source Geometry Correction:	=	0	0	dBA	
Correction For Surface Reflectio	=	3	3	dBA	
Target Indoor Noise Level:	=	40	45	dBA	
Required Noise Reduction:	=	19	24	dBA	

Rail

COMPONENT: WALL				STC Is: 53	
Noise Spectrum Type	F				
Component Category	d	Correction: (Table 5)	10		
Room Floor Area:	16 m²			-10	dBA
Component Area:	10.8 m²				
Component / Floor (%):	68 %				
Room Absorption Category:	Intermediate	Correction: (Table 4 Equation)	-1		dBA
				1	
Noise Reduction If Only This Component Transmits Sound Energy:				44	dBA
			Required Noise Reduction:	19	dBA
Surplus noise reduction for comparison to Table 3				25	
Component Transmits	0 % Of Sound				

COMPONENT: Surface A Window			Required Noise Reduction Is: 19	dBA
Percentage Of Sound Energy Transmitted:	100 %	Correction: (Table 3 Equation)	0	
Room Floor Area:	16 m²			
Component Area:	2 m²			
Component / Floor (%):	13 %			
Room Absortion Category:	Intermediate	Correction: (Table 4 Equation)	-8	dBA
Noise Spectrum	F			
Component Category	b	Correction: (Table 5)	3	dBA
		Required STC Is:	14	

Road

COMPONENT: WALL			STC Is: 53	
Noise Spectrum Type	D			
Component Category	d	Correction: (Table 5)	7	
Room Floor Area:	16 m²		-7	dBA
Component Area:	10.8 m²			
Component / Floor (%):	68 %			
Room Absorption Category:	Intermediate	Correction: (Table 4 Equation)	-1	dBA
			1	
Noise Reduction If Only This Component Transmits Sound Energy:			47	dBA
		Required Noise Reduction:	24	dBA
Surplus noise reduction for comparison to Table 3			23	
Component Transmits	1 % Of Sound			

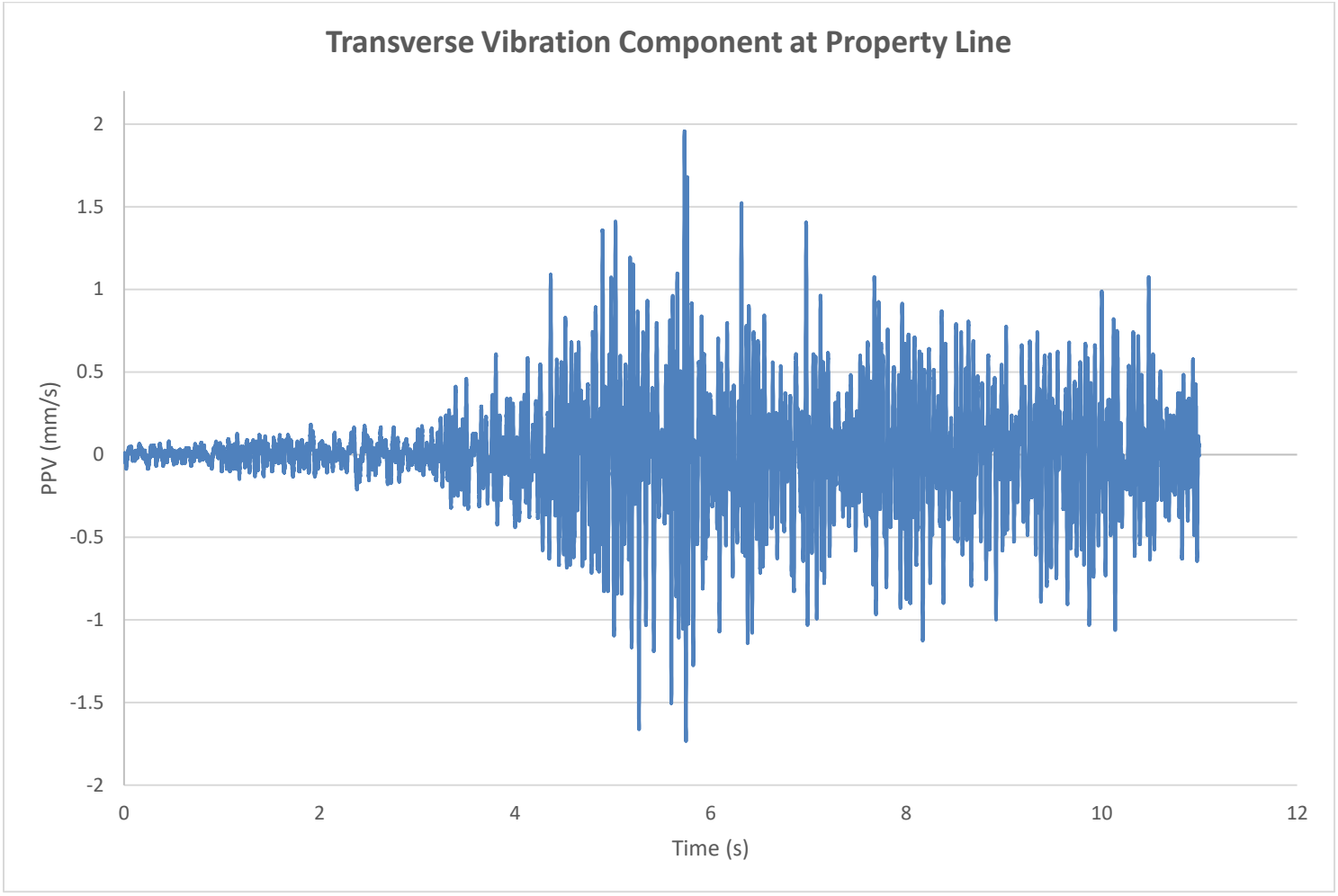
COMPONENT: Surface A Window			Required Noise Reduction Is: 24	dBA
Percentage Of Sound Energy Transmitted:	99 %	Correction: (Table 3 Equation)	0	
Room Floor Area:	16 m²			
Component Area:	2 m²			
Component / Floor (%):	13 %			
Room Absortion Category:	Intermediate	Correction: (Table 4 Equation)	-8	dBA
Noise Spectrum	D			
Component Category	b	Correction: (Table 5)	2	dBA
		Required STC Is:	18	

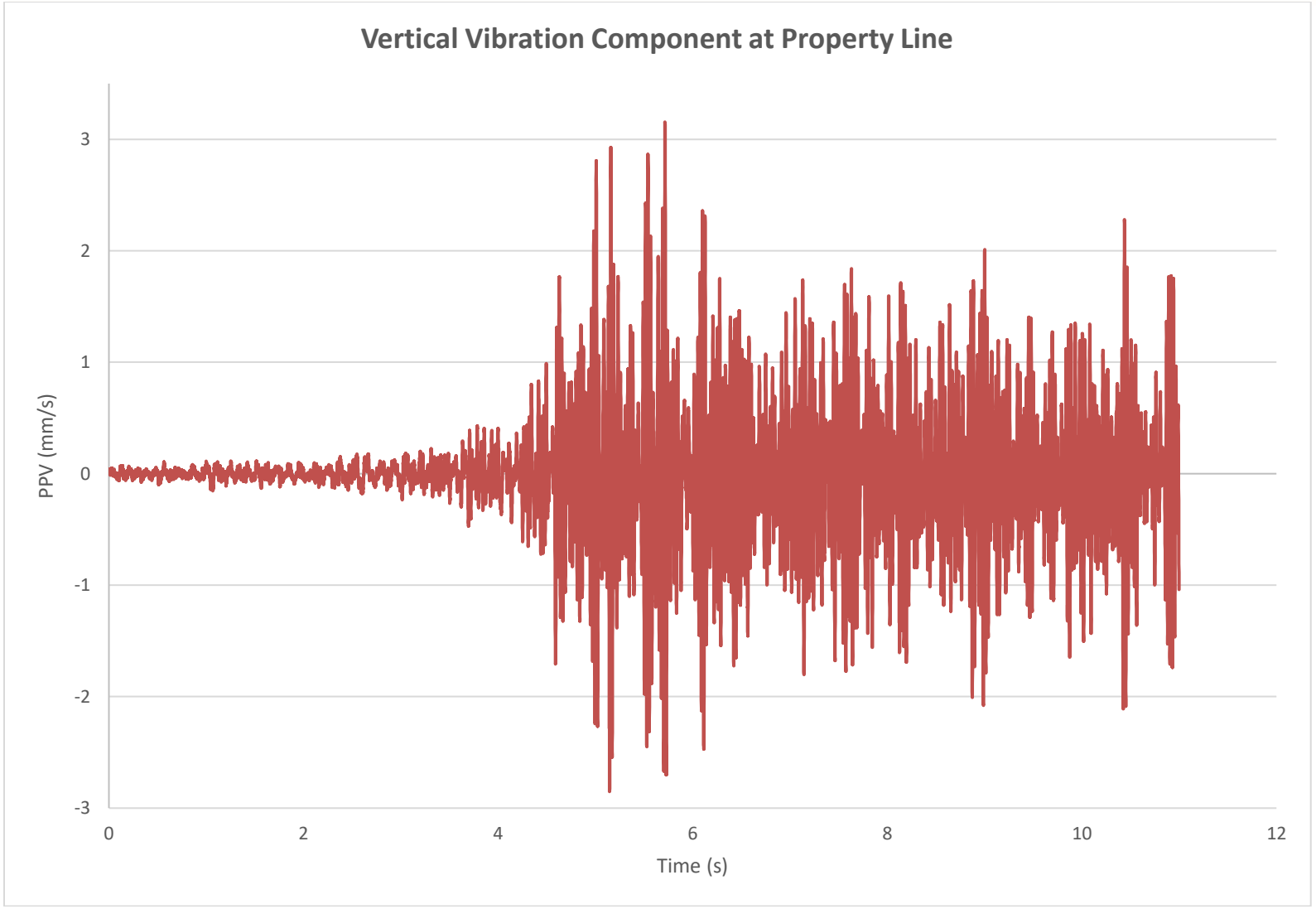
	Raod	Rail	Combined
Combined Window STC	14	18	**19.4**

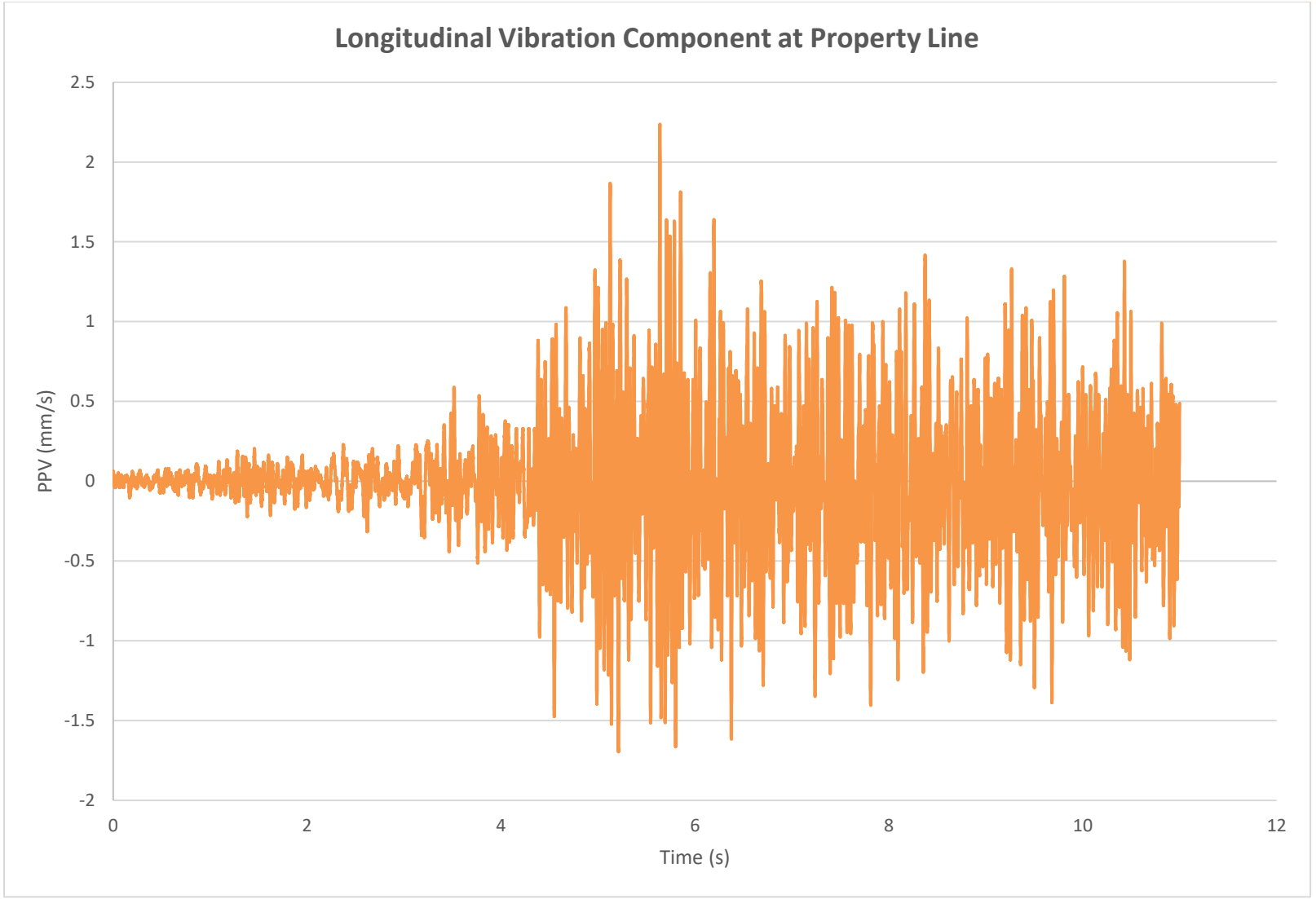
APPENDIX E

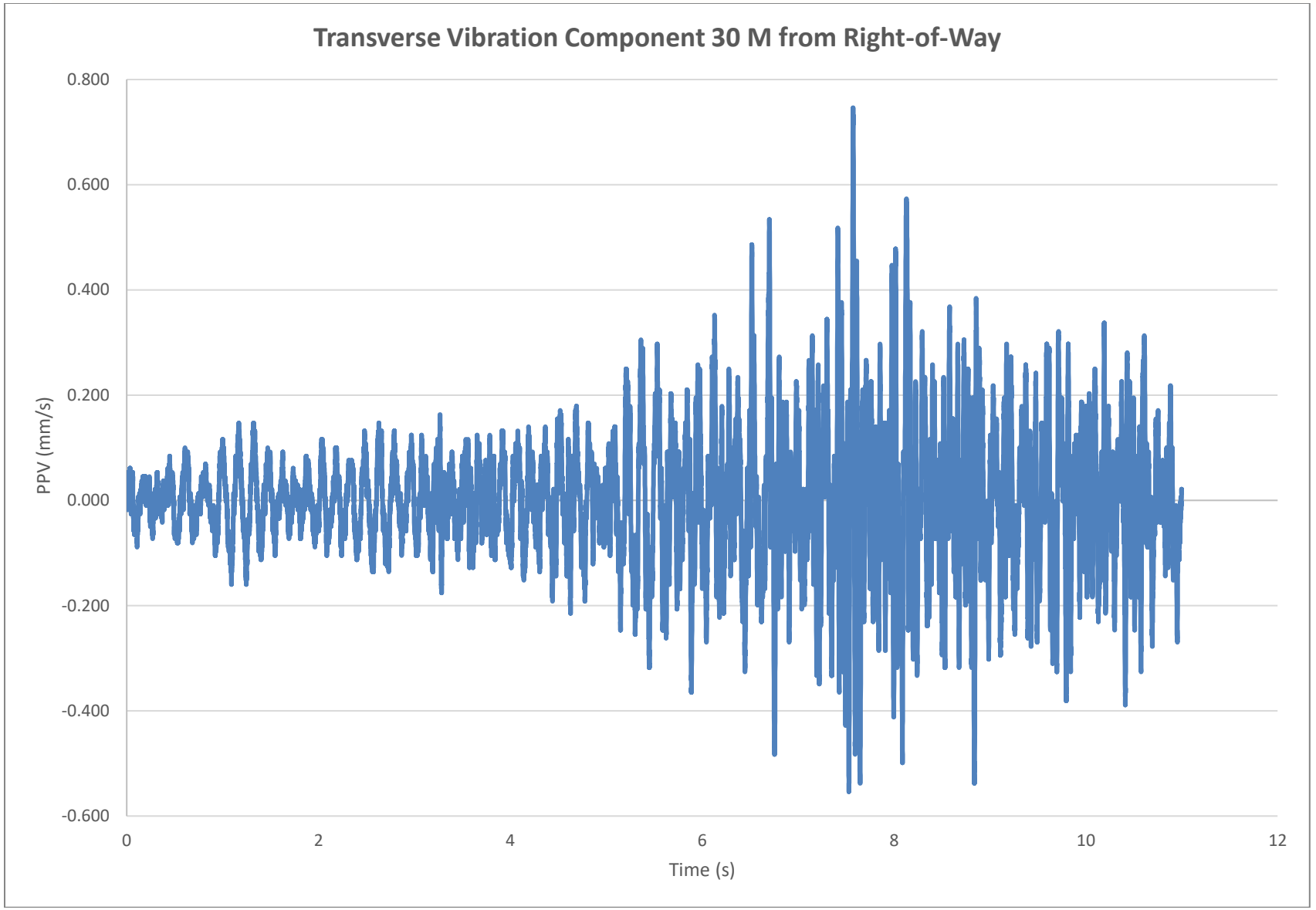
SAMPLE VIBRATION GRAPHS

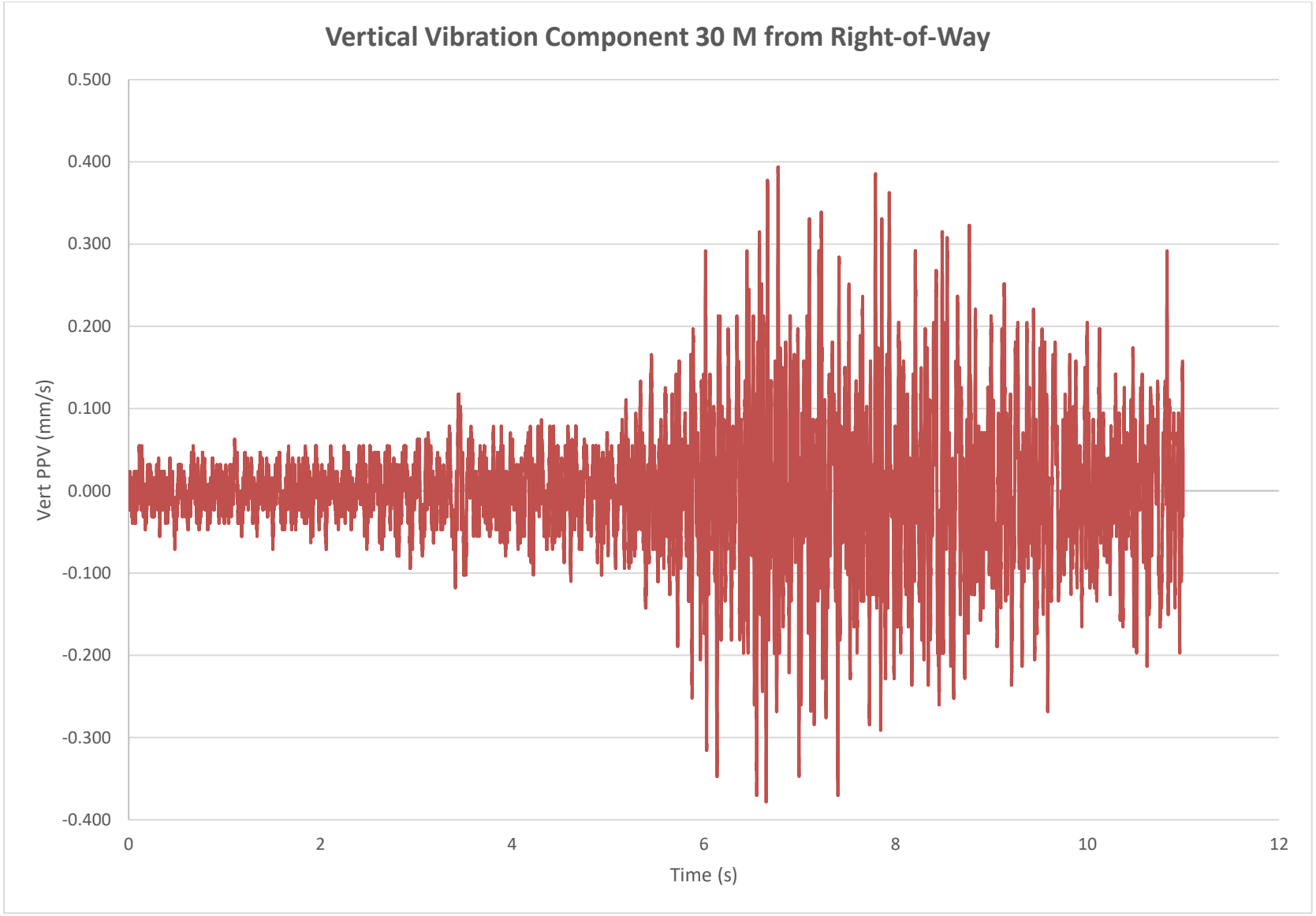
127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

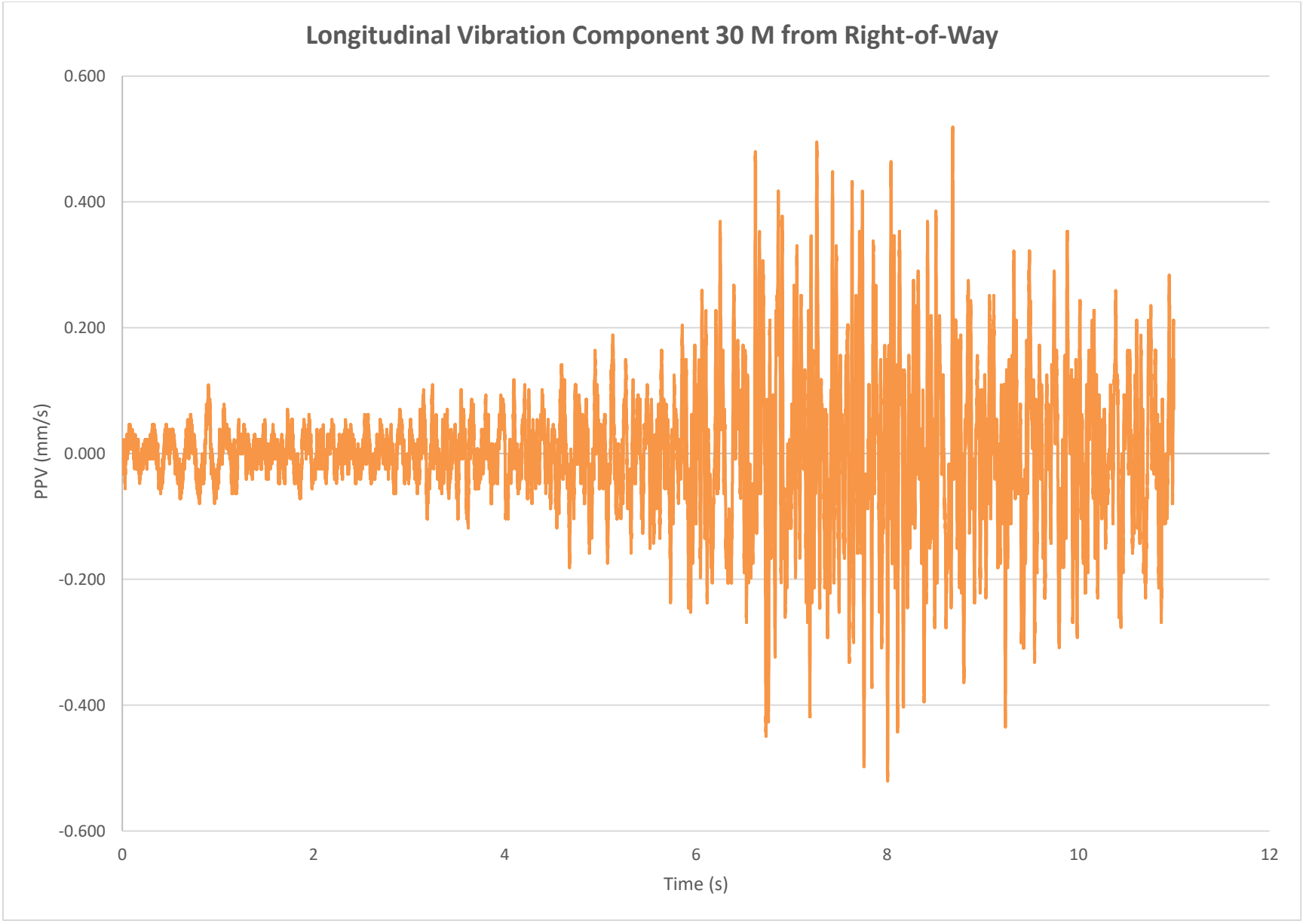

Transverse Vibration Component at Property Line
PPV (mm/s)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10
12
Time (s)


Vertical Vibration Component at Property Line
PPV (mm/s)
3
2
1
0
-1
-2
-3
0
2
4
6
8
10
12
Time (s)


Longitudinal Vibration Component at Property Line
PPV (mm/s)
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10
12
Time (s)


Transverse Vibration Component 30 M from Right-of-Way
0.800
0.600
0.400
0.200
0.000
-0.200
-0.400
-0.600
PPV (mm/s)
0
2
4
6
8
10
12
Time (s)


Vertical Vibration Component 30 M from Right-of-Way
Vert PPV (mm/s)
0.500
0.400
0.300
0.200
0.100
0.000
-0.100
-0.200
-0.300
-0.400
0
2
4
6
8
10
12
Time (s)


Longitudinal Vibration Component 30 M from Right-of-Way
0.600
0.400
0.200
0.000
-0.200
-0.400
-0.600
PPV (mm/s)
0
2
4
6
8
10
12
Time (s)