



**FREEFIELD LTD.**

Ottawa, Ontario, Canada

**ENVIRONMENTAL  
NOISE AND VIBRATION IMPACT  
ASSESSMENT  
FOR THE  
PROPOSED RESIDENTIAL  
SUBDIVISION  
AT  
WILSON AVENUE EXTENSION**

**CITY OF BELLEVILLE**



*Prepared for*

**RIC (Midland Land) Inc.**

*Prepared by*

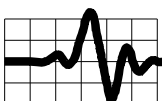
**Freefield Ltd.**

**4<sup>th</sup> July 2022**

# **ENVIRONMENTAL NOISE AND VIBRATION IMPACT ASSESSMENT FOR THE PROPOSED RESIDENTIAL SUBDIVISION AT WILSON AVENUE EXTENSION CITY OF BELLEVILLE**

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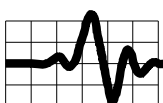
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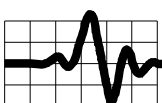
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**Resumes, Dr. Hugh Williamson, Michael Wells**



# ENVIRONMENTAL NOISE AND VIBRATION IMPACT ASSESSMENT FOR THE PROPOSED RESIDENTIAL SUBDIVISION AT WILSON AVENUE EXTENSION CITY OF BELLEVILLE

## 1.0 INTRODUCTION

Freefield Ltd. has been retained by RIC (Midland Land) Inc. to undertake an environmental noise and vibration impact assessment for the proposed residential subdivision located at Part of Lots 15, 16, 17, 26 & 27, Plan 135, Part of Lots 6 & 7, Plan 1819 Part of Wilson Avenue, Plan 6 in the City of Belleville, County of Hastings Ontario.

The assessment considers noise and vibration impacts from surface transportation sources including traffic on nearby road and rail corridors and stationary noise impacts from the nearby industrial area at the interior and exterior noise sensitive areas of the future residences. Where appropriate, the analysis proposes noise mitigation measures which will satisfy the CN Rail Requirements and provincial guidelines as noted below.

This assessment has been carried out in accordance with the Ministry of Environment, Conservation and Parks (MECP) publication, *NPC-300<sup>1</sup>* and Canadian National Railway Properties Inc., *Principal Main Line Requirements<sup>2</sup>*.

This analysis is based on a site visit plus drawings and information received electronically from Innovative Planning Solutions. Rail traffic information was obtained from CN Rail. Road traffic information was obtained from a recent road traffic study<sup>8</sup>.

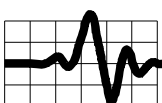
### 1.1 General Description of the Site and Surrounding Area:

The proposed residential development is located immediately east of Palmer Road between Palmer Road and Sidney Street approximately 260 m south of Moira Street West.

The development will consist of 82 single detached lots, 71 townhouse units, a park, a cell tower and storm water management (SWM) facilities.

Access to the site will be via Wilson Avenue which will be extended in a westerly direction to connect to Palmer Road.

The site and surrounding lands are relatively flat with no significant changes in elevation. The site is predominantly clear and is located on land zoned General Industrial (M2) and Urban Holding (UH).



To the north of the site, the land is zoned Residential Fourth Density (R4), Residential fifth Density (R5), Urban Holding (UH) with a small pocket of Rural Residential (RR) located to the north-west. This land primarily consists of residential dwellings. Further north lies Moira Street West and the right-of-way for the CN main line at an approximate distance of 260 m and 280 m respectively from the site's northern boundary.

To the east of the site, the land is zoned General Industrial (M2) and Prestige Industrial Commercial (MCP-3). This land is vacant on the north side of Wilson Avenue with several existing industrial and commercial facilities located on the south side of Wilson Avenue. Further east, fronting Sidney Road lies a narrow strip of land zoned Residential Sixth Density (R6) on the north side of Wilson Avenue which is occupied by a number of existing multi-unit residential buildings. It is noted the vacant lands on the north side of Wilson Ave, abutting the sites eastern boundary and extending to the R6 zoned land (balance of 40 Wilson Avenue) is owned by the applicant.

To the south of the site, the land is zoned General Industrial (M2). This land consists of an existing industrial facility. Further south the land is zoned Residential Second Density (R2) and Open space (OS).

Palmer Road lies immediately west of the site. Further west on the western side of Palmer Road the land is zoned Residential Fourth Density (R4). This land primarily consists of residential dwellings.

Refer to Zoning Plan in Appendix 1.

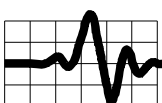
## **1.2 Acoustic Environment:**

MECP guideline, NPC-300, is concerned with noise and vibration, as applicable, from aircraft, surface transportation i.e. road and rail, and stationary noise i.e. noise from mechanical equipment associated with industrial and or commercial facilities.

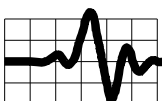
Based on field investigations and a review of the location it was determined that the main sources of environmental noise and vibration which are addressed in this report are as follows:

- Surface transportation impacts of noise from vehicular traffic on Moira Street West, Sidney Street and Palmer Road and noise and vibration impacts from rail traffic on the CN main line which carries both VIA passenger and freight traffic, and,
- Noise impacts from the stationary sources associated with the existing industrial zoned lands located to the south of the site. Refer figures A2.1.1 and A3.1.1.

NPC-300 guidelines require that noise control measures for transportation and stationary sources of noise be assessed separately, with the final selection of noise control measures ensuring compliance with all applicable sound level limits, see NPC-300, Section C7.7.



Refer to Section 2.0 for detailed assessment of surface transportation impacts at the development and Section 3.0 for the assessment of stationary noise impacts at the development. Conclusions and recommendations of the consolidated study are contained in Section 4.0 of this report.



## 2.0 SURFACE TRANSPORTATION NOISE AND VIBRATION IMPACTS

### 2.1 Introduction

Noise impacts from vehicular traffic on Moira Street West, Sidney Street, Palmer Road, and noise and vibration impacts from rail traffic on the CN main line which carries both VIA passenger and freight traffic have been assessed, as applicable, on the outdoor and indoor living areas of the proposed development. Refer Figures 2.1.1 to 2.1.2, Appendix 2.1 and Table 2.2.1, Appendix 2.2.

### 2.2 Methodology and Assessment Criteria

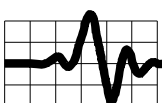
For residential development, the procedures and criteria for noise assessment are set out in the MECP guideline NPC-300<sup>1</sup>. These noise criteria are to be met at proposed residential developments using control measures such as site design, set-backs, noise barriers, acoustical requirements for building components and ventilation requirements. In some circumstances, warning clauses related to noise are required on titles, leases and sale agreements.

For assessment of noise from road and rail traffic, the following methodology is used:

- Estimates of noise are based on future traffic volumes, forecast a minimum 10 years into the future, taken as 2033 for road and 2032 for rail in this study.
  - Rail Traffic: Current rail traffic volumes were obtained from CN. Future rail traffic was obtained using the growth rate suggested by CN, 2.5% per annum.
  - Moira Street West, Sidney Road and Palmer Road: Traffic data was obtained from JD Northcote Engineering Inc. “Wilson Avenue Development Traffic Impact Study”, dated 28<sup>th</sup> July, 2021<sup>8</sup>, with future traffic volumes based on a compound growth rate of 1.5% per annum. Based on information received from JD Engineering a conservative approach to calculate Average Annual Daily Traffic (AADT) volume for each road corridor was applied using the following formula:

$$\text{AADT} = \text{Peak Hour Volume} \times 10$$

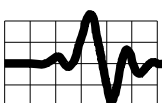
- Where, to remain conservative Peak Hour Volume is the greater of the AM or PM peak hour period.
  - Forecast traffic volumes are shown in Tables 2.2.2 and 2.2.3. Appendix 2.6. contains reference documents for the forecasts obtained from CN and JD Northcote Engineering Inc.
- Noise generated by road and rail traffic is predicted using STAMSON<sup>3,4,5</sup>, a traffic noise model developed by the MECP. The traffic data to be used in this model are forecast future volumes. STAMSON takes into account such factors as distance from the road or





railway, height, nature of the intervening buildings and terrain, and noise barriers, if present. For rail traffic, whistle noise from nearby level crossings is included in the STAMSON calculations, if applicable. It is noted the City of Belleville has anti-whistling by-laws for all rail crossings in the vicinity of the site, hence, noise from train whistles has not been included in this analysis. Whistles may be used at certain times in an emergency as a safety precaution. Noise from whistles used in emergency situations is not required to be assessed as per MECP guidelines.

- Noise from future road and rail traffic is predicted at critical points of reception in the proposed residential subdivision. In all cases outdoor sound levels are calculated and used for assessment. Two types of points of reception are considered for residential buildings<sup>1</sup>.
  - Outdoor Living Area (OLA) points of reception: Assumed in the rear yard of each lot, 1.5 m above ground.
  - Plane of window points of reception: Locations where rooms for living/dining or sleeping are located in residences. It is assumed that residences (detached, semi-detached or townhomes) for lots with a maximum building height of 10.6 m will be a maximum of 3-stories, hence, third storey plane of window points of reception, assessed at 9 m above grade, the worst case, are used in this analysis.
  - Day and Night sound levels are predicted as A-weighted equivalent sound levels,  $L_{AEO}$ , (i.e. average levels) for Day (07:00 to 23:00) and Night (23:00 to 07:00) periods. A-weighting is a frequency correction to sound pressure levels which approximates the response of the human ear and is used extensively for environmental noise assessments. Results are expressed in dBA, A-weighted decibels.
- Based on the calculated future outdoor sound levels, the specifications for mitigation measures such as noise barriers, building component requirements, ventilation requirements and warning clauses are determined for each residence according to criteria set out in the MECP Guidelines<sup>1</sup> which is summarised below.
  - Outdoor Living Areas: The sound level criteria for Outdoor Living Areas, as set out in Table 2.3.1 in Appendix 2.3, applies only during the day. Warning Clauses may apply as set out in Table 2.3.6. Assessment for OLA's is to be carried out by combining road and rail noise but does not include whistle noise.
  - Ventilation Requirements: The assessment of ventilation requirements, and related Warning Clauses, is based on day and night plane of window sound levels, not including whistle noise. See Table 2.3.6 in Appendix 2.3.



Assessment for ventilation requirements is to be carried out by combining road and rail noise but does not include whistle noise.

- Building Components: When outdoor plane of window day, night or 24-hour sound levels exceed certain thresholds, then the external building components of the dwelling (walls, windows and doors) must be designed to achieve specified indoor sound level limits, See Tables 2.3.2, 2.3.3, 2.3.4 and 2.3.5. For the assessment of building component requirements, sound levels from road and rail sources are calculated separately. The acoustical descriptors of the building components are done separately for road and rail traffic noise, then subsequently combined to determine the required building components. Whistle noise, if applicable, is included in the assessment of building component requirements.
- Warning clauses, when required, are to be placed on title documents, sale agreements and lease agreements, see Table 2.3.7. Additional warning clauses may be required by the rail authorities, see Table 2.3.8, for example of CN requirements applicable to specific areas of this site<sup>2</sup>.

### Vibration Impact Assessment

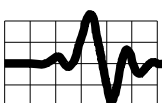
- CN requires on-site testing for vibration for any proposed dwelling within 75 m of a railway right-of-way. If site vibration conditions (from rail traffic) exceed 0.14 mm/s RMS between 4 and 200 Hz, isolation measures will be required to ensure living areas do not exceed 0.14 mm/s RMS on and above the first floor of the dwelling.
- As shown in Figure 2.1.1 and Table 2.2.1, the closest lots in the proposed Wilson Avenue Extension Subdivision are 260 m from the CN right-of-way. Hence, no on-site testing is required. As such on-site testing has not been carried out as it is anticipated that vibration levels from passing trains will be well below the CN limit.

## **2.3 Points of Reception**

For the evaluation of noise impacts a representative series of points of reception for particular locations were selected, POR 1 to POR 6 as shown in Figure A2.1.2. These locations were selected to represent the worst-case impacts with respect to the road and rail noise impacts on-site, refer POR 1, as well as locations on-site less exposed to traffic noise, refer POR 2 to POR 6, to determine the extent and type of required outdoor noise control measures, ventilation and warning clauses and / or building component design for these less exposed locations.

For points of reception POR 1, POR 3 and POR 4 two types of points of reception have been evaluated, an outdoor point of reception in the rear yard and plane of window points of reception on the exposed sides of the future residential buildings.

For points of reception, POR 2 and POR 4, located in the western portion of the site, located in the first row of lots with respect to Moira Street West, the CN Right-of-way and Palmer Road



outdoor living area (OLA) points of reception only have been assessed. At these locations noise impacts at the OLA were calculated to determine the extent of the required noise control measures and warning clauses that have been recommended. Plane of Window impacts at these locations were not assessed, as these locations do not represent worst case noise impacts with respect to requirements for building component design and ventilation.

For point for reception POR 6, noise impacts at plane of window (POW) points of reception only have been assessed. At this location noise impacts at the POW were calculated to determine the extent of the recommended building component design. Outdoor living area impacts at this location were not assessed as this location is similar to POR 1 and does not represent worst case noise impacts with respect to requirements for outdoor noise control measures.

It is noted, for points for reception POR 3, POR 4 and POR 6, noise impacts at the POW locations from rail traffic only were assessed to determine the extent of the area requiring building component design, as it was found, based on results at worst-case locations, refer POR 1, that noise impacts from road traffic was not critical at these locations with respect to requirements for building component design.

The points of reception, for all locations assessed, were selected assuming minimum side and rear boundary setbacks for the dwellings, 0.5 m and 3 m respectively. Depending on the lot location, plane of window points of reception have been assessed on several sides of a future dwelling to ensure that the side exposed to the highest noise level is considered.

The geometric parameters used as inputs to the STAMSON noise calculations are given in Table 2.2.1.

## 2.4 Noise Impact Assessment

Based on the future traffic projections and assumptions discussed in the previous section, sound levels were calculated at each of the selected points of reception using the MECP STAMPSON noise modelling software<sup>5</sup>.

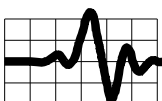
The results of the calculations, for road, rail and combined road and rail are contained in Table 2.2.4, 2.2.5 and 2.2.6. Samples of the outputs of the STAMPSON software are given in Appendix 2.4.

Assessment of noise impacts and required mitigation, based on these calculations and the MECP NCP-300 Guideline<sup>1</sup> criteria, is presented in Appendix 2.3, and summarised below:

### Outdoor Noise Control Measures

Table 2.2.4 and Table 2.2.5 contains an analysis of future outdoor daytime noise levels at the Outdoor Living Area (OLA) Points of Reception with respect to control measures and warning clauses to meet MECP requirements. The results are as follows.

For POR 2, representing Lot 10, results are 57.2 dBA during the daytime period. As such Control Measures (such as barriers) are not required but should be considered. Control



measures were considered, however, were not considered technically or economically feasible. As future outdoor daytime noise levels are greater than 55 dBA and less than 60 dBA, Warning clause Type A, as noted below, taken from provincial noise guidelines, is required for this block to meet MECP requirements.

**Warning Clause Type A:**

***"Purchasers/Tenants are advised that sound levels due to increasing (road) (transitway) (rail) (air) traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment, Conservation and Parks noise criteria."***

For POR 1, representing Lot 9, without a noise barrier, results exceed 60 dBA during the daytime period. As such control measures (barriers) are required to reduce the Leq to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible. As shown in Table 2.2.4, results at POR 1 *with* a 2.2 m high noise barrier, are between 55 dBA and 60 dBA, hence, Warning clause Type B, as noted below, is required for this block to meet MECP requirements. It is noted higher noise barriers were considered; however, these were deemed not technically or economically feasible.

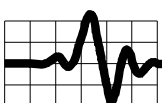
**Warning Clause Type B:**

***"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) (transitway) (rail) (air) traffic may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment, Conservation and Parks noise criteria."***

To confirm the extent of the recommended noise barrier and application of warning clauses, Type A and Type B, noise impacts were calculated at POR 3, representing Lot 21, located in the first row of residences facing the CN Main Line and Moira Street West, as well as at POR 5, representing Lot 1, located in the first row east of Palmer Road at the proposed intersection of Wilson Avenue (Extension). In addition, noise impacts were calculated at POR 4, representing Lot 36, located in the second row with respect to Moira Street West, the CN Main Line and Palmer Road. The results, as shown in Table 2.2.4, indicate that the recommended 2.2 m high noise barrier is required to extend for the full length of the western site boundary and along the northern site boundary for the full width of the rear boundary of Lot 9.

Future outdoor daytime noise levels, at POR 2 and POR 5, *with* the 2.2 m high noise barrier in location noted above, are between 55 dBA and 60 dBA, hence, Warning clause Type B, as noted above, is required.

For POR 3 and POR 4 results are below 55 dBA during the daytime period, as such control measures and warning clauses are not required.



Based on the results at POR 3 and POR 4, predicted daytime sound levels at the outdoor living areas associated with all other lots are below 55 dBA, hence, control measures and warning clauses are not required.

The location of the required noise barrier and Lots/Blocks requiring Warning Clause Type A or B is shown on Figures 2.1.3 and 2.1.4.

Noise barriers are to be solid, having no gaps, and are to have a surface density of no less than 20 kg/m<sup>2</sup>.

### **Ventilation Requirements & Warning Clauses**

The predicted plane of window noise levels, shown in Table 2.2.5, indicate that there is a provincial requirement, in NPC-300, that all residential buildings / units in the sub-division be constructed with forced air heating with provision for central air-conditioning with would allow installation of central air-conditioning by the occupant so windows and exterior doors can remain closed, thereby ensuring that the indoor sound levels are within the Ministry of Environment, Conservation and Parks noise criteria and that Warning Clause Type C, taken from provincial guidelines, as noted below, is to be applied:

#### **Warning Clause Type C:**

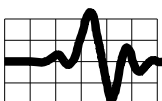
***"This dwelling unit has been fitted with a forced air heating system and the ducting etc. was sized to accommodate central air-conditioning. Installation of central air-conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the Ministry of Environment, Conservation and Parks noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with the noise criteria of MECP Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts on and in the immediate vicinity of the subject property."***

This clause should be included in Agreements of Purchase and Sale or Lease Agreements and incorporated into the relevant Development Agreements which are registered on title of the property.

#### **CN General Warning Clause Requirement**

As set out in the Canadian National Railway Properties Inc., Principal Main Line Requirements<sup>2</sup>, the Warning Clause set out in Table 13 is a requirement for each dwelling unit within 300 m of the railway right-of-way. This clause is to be applied to the title documents, sale agreements and lease agreements for all lots within 300 m of the CN Right of Way.

The lots which are to have this CN Warning Clause are: Lots 8 – 24 (subject site).



### **Building Components**

As indicated in Table 2.3.4, where outdoor noise levels exceed various thresholds for living rooms and bedrooms, then building components, walls, windows, etc. must be designed to achieve the indoor sound level criteria set out in Table 2.3.2.

As shown in Table 2.2.6, the predicted noise levels from road traffic at all worst-case plane of window point of reception, POR 1, are less than 65 dBA during the daytime period 07:00 to 23:00, assessed as living and dining areas, and less than 60 dBA at plane of window locations during the nighttime period 23:00 to 07:00, assessed as bedroom locations, therefore compliance with Ontario Building Code (OBC) is sufficient to meet indoor noise level criteria in relation to road traffic noise impacts.

As shown in Table 2.2.6, the predicted noise levels from rail traffic at POR 1 and POR 4 exceed 55 dBA during the evening and nighttime period, 23:00 to 07:00 assessed as bedroom locations, hence, building component design is required to achieve acceptable indoor sound levels.

As predicted noise levels from rail traffic at POR 1 and POR 4 are representative of impacts at POR 2 (Lot 10) as well as Lots 11 to 20, and Lots 29 to Lot 36 respectively, the requirement for building component design to achieve indoor noise criteria during the nighttime period also applies to these locations.

The areas of the Wilson Avenue Extension Subdivision requiring building component design are shown on Figure 2.1.5. At all other locations compliance with Ontario Building Code is sufficient to meet indoor noise level criteria in relation to rail traffic noise impacts.

Indoor noise levels from rail traffic were calculated at the worst-case location, represented by POR 1, using IBANA-Calc<sup>6</sup>, a software for indoor noise calculation developed by NRC.

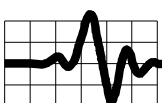
The results of indoor noise calculations are shown in Table 2.2.7 with the resulting requirements for the construction of external walls, and limits on the maximum combined areas of external windows and doors are presented in Table 2.2.8. Refer Appendix 2.5 for additional information related to assessment of indoor noise impacts.

It is noted, the assessed location is the worst-case location, that is, the part of building and site most exposed to rail traffic noise, hence, the building components designed for this location will ensure compliance at all other areas in the subdivision requiring building component design.

At all other locations compliance with the OBC is sufficient to meet the indoor sound level criteria.

## **2.5 Vibration Impact Assessment**

Maximum vibration levels during the passing of a train are primarily dependent on the level of vibration excitation from the train engines, ground conditions between the tracks and the point of reception, and the distance between the tracks and the residences.

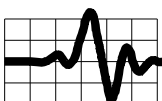


CN Principal Main Line Requirements<sup>2</sup> state the following.

*Ground-borne vibration transmission to be evaluated in a report through site testing to determine if dwellings within 75 metres of the railway rights-of-way will be impacted by vibration conditions in excess of 0.14 mm/sec RMS between 4 Hz and 200 Hz. The monitoring system should be capable of measuring frequencies between 4 Hz and 200 Hz,  $\pm 3$  dB with an RMS averaging time constant of 1 second. If in excess, isolation measures will be required to ensure living areas do not exceed 0.14 mm/sec RMS on and above the first floor of the dwelling.*

As shown in Table 2.2.1, the northern boundary of the closest lots is 260 m from the CN right-of way. At this distance, no site testing is required as the likelihood of significant ground-borne vibrations from passing trains is minimal.

It is concluded that significant ground-borne vibrations from passing trains are highly unlikely in dwellings of the proposed Wilson Avenue Extension Subdivision due to the distance between the Subdivision and the CN right-of-way. Further assessment is not required.



## 3.0 STATIONARY NOISE SOURCE NOISE IMPACTS

### 3.1 Introduction

Stationary noise impacts from the nearby industrial zoned lands were assessed at critical locations of the proposed sub-division for compliance with the Ontario Ministry of Environment, Conservation and Parks (MECP) sound level criteria.

An area plan showing the site with respect to the nearby sources of industrial noises and locations on-site selected for analysis, is provided in Figure 3.1.1. A land use and zoning map is provided in Appendix 1.

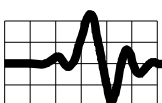
### 3.2 Methodology and Assessment Criteria for Stationary Sources

- Identification of the significant sources of noise in the surrounding environment.
- Identification of noise sensitive points of reception on site. Potential points of reception include plane of window locations of residences and outdoor points of reception representing outdoor amenity areas. In the current study, locations selected for assessment were considered at worst case locations with respect to the identified sources of stationary noise. In certain instances, noise levels were monitored in the same direction from the source, but at a greater distance, to estimate the magnitude of the identified source, with respect to other sources of environmental noise that impacts the site.
- Determination of the MECP sound level limits<sup>1</sup> which apply at the locations selected for assessment.
- Noise monitoring at selected points of reception at the sub-division.
- Based on the results of the monitoring, noise levels due to equipment operations at the nearby industrial and commercial facilities, were compared to the MECP sound level limits applicable during daytime, evening and nighttime periods.
- At certain locations, in proximity to potential sources of noise not in operation, a qualitative assessment of noise, based on the type of facility and on-site exposure, has been presented

### 3.3 Noise Source Summary

Monitored sound levels at each point of reception are the result of a combination of multiple sources of sound which can be classified as follows:

- Noise from the nearby industrial and commercial operations, referred to as stationary noise sources.
- Background sound:





- From nature (sounds from birds, insects, leaves rustling, etc.), referred to as ambient noise sources.
- From human activity not associated with the nearby industrial and commercial facilities (traffic noise, lawn mowing, garden maintenance etc.) referred to as extraneous noise sources.
- Background sound level means the sound level that is present in the environment, produced by noise sources other than the sources of noise under impact assessment.<sup>5-7</sup>

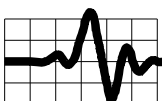
The potential sources of stationary noise impacting the site are associated with one industrial operation as shown on Figure 3.1.1, and listed below:

- Source S1 (Funeral Crematorium Facility): Noise from a HVAC equipment including 1 x Make-up Air Unit and a number of exhaust stacks located on the roof of building. It is noted the large diameter process exhaust located on the roof of this building did not appear to be operational.

#### **Insignificant Noise Sources:**

Other nearby potential sources of stationary noise, assessed as insignificant noise sources (INS) during the site due to the location of operation are shown on Figure 3.1.1 and listed below:

- INS\_1 (Self-storage facility): Noise from customers accessing storage units was inaudible at all measurements locations. This facility was operating at the time of measurements, hence, the cumulative impact of noise sources associated with this operation are included in the measurement data.
- INS\_2 (Commercial Offices): Potential noise from a HVAC equipment including 3 x Make-up Air Units located on the roof of building. It is assumed this equipment was in operation providing cooling to the interior of the building during noise measurements, hence, the cumulative impact of noise associated with this operation are included in the measurement data.
- INS\_3 (Self-storage facility): No mechanical equipment was visible. Noise from customers accessing storage units was inaudible at all measurements locations.
- INS\_4 (Commercial Offices): Noise from a HVAC equipment including 2 x Make-up Air Units located on the roof of building. It is noted, due to location of equipment and proximity to Sidney Street, noise from this equipment was inaudible and assessed as insignificant.
- INS\_5 (Automotive Repair Shop): Potential noise from vehicle maintenance and servicing operations occurring inside insulated building emitted into the environment. It is noted the automotive repair shop was not in operation during noise measurements,



however, due to the large distance from the site boundary this facility has been assessed as an insignificant noise source in this assessment.

- **INS\_6 (Delivery and Disposal Facility):** Potential noise from vehicles accessing the site, all other operations appear to occur inside the insulated building. It is noted the delivery and disposal facility was not in operation during noise measurements, however, due to the location of the access road and internal operations this facility has been assessed as an insignificant noise source in this assessment.

Extraneous noise sources not associated with the nearby industrial / commercial operations that contributed to a greater or lesser extent to the monitored noise levels included noise impacts associated with road traffic on nearby roads and noise from nature i.e. birds and leaves rustling with the latter particular evident at monitoring location NML 4. A discussion of the impact of the extraneous noise sources on the monitored levels at specific points of reception is discussed in Section 3.6.

### 3.4 Points of Reception

To assess noise impacts from the nearby industrial / commercial operations a total of four (4) noise measurement locations (NML) were selected to represent noise impacts at the worst-case noise sensitive points of reception (POR) in the vicinity of the identified sources of noise.

The noise measurement locations which have been selected for detailed evaluation are shown in Figure 3.1.1 and listed in Table 3.2.1.

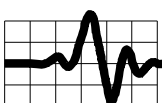
### 3.5 Assessment Criteria & Performance Limits:

Sound level limits as specified in MECP guideline NPC-300<sup>1</sup>, depend on the acoustical classification of the area as Class 1, 2, 3 or 4.

**Class 1 area** 'an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as urban hum.'

**Class 2 area** 'an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas: sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00 hours); and low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 hours (19:00 or 23:00 to 07:00 hours).'

**Class 3 area** 'a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as: a small community; agricultural area; a rural resort area such as a cottage or resort area; or, a wilderness area.'



**Class 4 area** ‘an area or specific site that would otherwise be defined as Class 1 or 2 and which: is an area intended for development with new noise sensitive land use(s) that are not yet built; is in proximity to existing, lawfully established stationary source(s); and, has formal confirmation from the land use planning authority with the Class 4 area classification which is determined during the land use planning process. Additionally, areas with existing noise sensitive land use(s) cannot be classified as Class 4 areas.’

Due to the relatively high levels of road traffic and urban character of the site, the area in which the proposed subdivision is located is subject to traffic noise and other urban noise such as lawn mowing and maintenance, on a 24-hour basis. As such all locations on-site are classified as a Class 1 Area (Urban).

For a Class 1 Area (Urban) the applicable outdoor sound level limits at noise sensitive receptors, based on 1-hour equivalent sound levels,  $L_{EQ}$ , are either the exclusion noise limits given in Table A3.2.2 and Table A3.2.2, or higher limits if established by an assessment of background noise.

A background sound assessment was not carried out; hence, the exclusion level limits set out in Table A3.2.2 and A3.2.3 have been applied at all points of reception according to their location in a Class 1 Area (Urban).

### 3.6 Noise Monitoring

Noise monitoring was carried out on the 10<sup>th</sup> July 2021, at each of the selected noise measurement locations (NML), to determine the noise impacts from the nearby industrial and commercial facilities at the worst-case future residences (Lots) associated with the development.

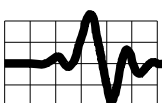
Noise measurements were carried out using a Bruel and Kjaer sound level meter, a Type 2270. The meter was field calibrated using a Bruel and Kjaer Type 4231 Field Calibrator before and after each series of measurements. The field calibration did not vary by more than 0.1 dB over the periods of the measurements.

In addition, the meter and field calibrator are laboratory calibrated on an annual basis. Copies of the relevant annual calibration certificates are contained in Appendix 3.4.

Monitoring at each location was carried out during the daytime period (07:00 – 19:00).

The sound level sound meter was set to frequency analyser advanced mode, recording the equivalent sound level,  $L_{eq}$ , on a manual basis. A minimum of two measurements were carried out at each location, which shows the variability of sound levels that fall within each overall monitoring period.

$L_{eq}$  average sound levels over the overall periods of monitoring were calculated during the post-processing of the results.



In addition to  $L_{eq}$  data the sound level meters collected  $L_{AS90}$ . In certain instances,  $L_{AS90}$  parameter is a more appropriate indication of the noise impacts. See discussion Section 3.7.

Meteorological conditions during the measurement period were generally well suited to noise measurements, i.e. temperature around 26 °C, no precipitation, clear skies and the relative humidity below 60 %. Wind generally slight, less than 20 km/hour during the measurement periods. Copies of meteorological conditions during noise monitoring can be provided upon request.

All measurements were made with microphones mounted on tripods, 1.5 m above the ground and at least 3 m away from any major obstacles.

### **3.7 Impact Assessment:**

Noise monitoring results and an assessment of compliance to MECP criteria at each noise monitoring location are presented in Table 3.2.4.

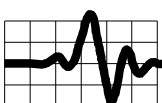
Each location was assessed to plane of window and outdoor point of reception criteria for the MECP defined daytime, evening and nighttime periods.

Due to the close proximity to nearby roads, and the significant volume of traffic during the daytime period, extraneous noise from traffic and other sources dominated at NML 4. Because of the dominance of traffic noise described above, the  $L_{AS90}$  data monitored at NML 4 has been used to assess compliance at these locations as is appropriate under MECP guidelines, NPC-233.<sup>5</sup>

This statistical parameter tends to eliminate the transient noise associated with road traffic or other extraneous sources of noise and provides a better, more accurate, measure of the steady noise impacts from the nearby industrial and commercial operations.

As shown in Table 3.2.4 it can be seen noise impacts from operations at the nearby industrial and commercial operations at all noise monitoring locations comply with the applicable MECP guideline limits for daytime (07:00 to 19:00), evening (19:00 to 23:00) and nighttime (23:00 to 07:00) periods.

Noise measurement data is provided in Appendix 3.3.



## 4.0 CONCLUSIONS AND RECOMMENDATIONS

A noise impact assessment of surface transportation and stationary noise source impacts has been conducted according to the Ministry of Environment, Conservation and Parks (MECP) publication, *NPC-300<sup>1</sup>* and Canadian National Railway Properties Inc., *Principal Main Line Requirements*.<sup>2</sup>

Noise generated from road and rail traffic on Sidney Street, Moira Street West, Palmer Road and the CN Principle Main Line as well as equipment and operations at the nearby industrial and commercial facilities have been assessed at critical locations at the proposed Wilson Avenue Extension Subdivision.

It has been found that noise levels at the proposed Wilson Avenue Extension Subdivision will be in compliance with the MECP sound level limits providing the recommendations as specified in this report are followed.

The recommendations are summarized below:

### 4.1 Surface Transportation Noise Impact Conclusions and Recommendations

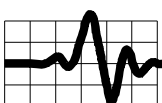
4.1.1 **Outdoor Noise Control Measures:** Noise impacts at Outdoor Living Areas associated with lots located in the first row east of Palmer Road are predicted to exceed MECP sound level criteria without mitigation. As such, a 2.2 m high barrier is required in location shown in Figure 2.1.3 to reduce noise levels to below 60 dBA and as close to 55 dBA as technically, administratively and economically possible. With the recommended 2.2 m high barrier noise impacts at these lots are between 55 dBA and 60 dBA during the daytime period, hence, comply with MECP sound level criteria. At all other locations on-site, noise impacts at Outdoor Living Areas, are below 60 dBA, hence, control measures are not required.

4.1.2 **Ventilation Requirements & Warning Clauses:** Predicted outdoor living area and plane of window noise levels, shown in Table 2.2.5, indicate that there is a requirement for all dwellings to be fitted with a forced air heating system and the ducting etc. sized to accommodate central air-conditioning. In addition, there is a requirement for warning clauses at various locations on-site, as shown on Figure 2.1.4, and summarised below:

4.1.2.1 Warning Clause Type A, taken from the provincial noise guideline and noted below, is required for Lots 10 – 20 (subject site):

#### Warning Clause Type A:

*"Purchasers/Tenants are advised that sound levels due to increasing (road) (transitway) (rail) (air) traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment, Conservation and Parks noise criteria."*



- 4.1.2.2 Warning Clause Type B, taken from the provincial noise guideline and noted below, is required for Lots 1 – 9 and Lots 74 – 82.

Warning Clause 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) (transitway) (rail) (air) traffic may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of Environment, Conservation and Parks noise criteria."***

- 4.1.2.3 Warning Clause Type C noted below, taken from the provincial noise guidelines, is required for all dwellings within the sub-division.

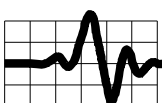
Warning Clause Type C:

***"This dwelling unit has been fitted with a forced air heating system and the ducting etc. was sized to accommodate central air-conditioning. Installation of central air-conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of Environment, Conservation and Parks noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with the noise criteria of MECP Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts on and in the immediate vicinity of the subject property."***

- 4.1.2.4 As set out in the Canadian National Railway Properties Inc., Principal Main Line Requirements<sup>2</sup>, the Warning Clause set out in Table 2.2.8 is a requirement for each dwelling unit within 300 m of the railway right-of-way. The lots which are to have this CN Warning Clause are: Lots 8 – 24.

CN General 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."***



4.1.2.5 These clauses should be included in Agreements of Purchase and Sale or Lease Agreements and incorporated into the relevant Development Agreements which are registered on title of the property.

4.1.3 **Building Components:** Building component design, including exterior walls and exterior windows (including patio doors), was required at certain areas in the subdivision to achieve acceptable indoor sound levels from rail traffic during the nighttime period.

The areas of the Wilson Avenue Extension Subdivision requiring building component design are shown on Figure 2.1.5.

Indoor noise levels at the worst-case location within the area requiring building component design were calculated based on the following construction assemblies for exterior walls and windows:

- Exterior walls were modelled as vinyl siding, consisting of 11 mm OSB, 140 mm wood studs on 406 mm centre with glass fibre cavity insulation, 1 of 13 mm gypsum board with an STC 37 rating.
- Exterior windows (including patio doors) were modelled as vinyl double slider window (seals not taped) with a minimum STC 27 rating.
- Alternative construction permitted providing the minimum STC ratings noted above are achieved.

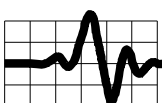
With the recommended construction as noted above, indoor sound levels are predicted to meet MECP criteria at all areas on-site requiring building component design.

At all other locations building components (walls and windows) designed to comply with the Ontario Building Code will be sufficient to achieve acceptable indoor sound levels.

Spray foam or closed cell insulation is not recommended in above grade exterior walls at any location in the sub-division given the poor acoustic performance of this material without prior review by a qualified acoustical consultant to ensure indoor noise levels comply with MECP criteria.

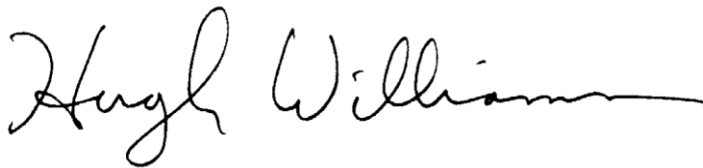
## 4.2 Stationary Noise Source Impacts Conclusions and Recommendations

It has been found that noise impacts from operations at the nearby industrial and commercial zoned lands at all noise monitoring locations comply with the applicable MECP guideline limits for daytime (07:00 to 19:00), evening (19:00 to 23:00) and nighttime (23:00 to 07:00) periods.

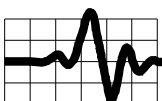




Michael Wells, B. Architecture (Hons), B.Sc. Arch. Registered Architect of NSW, ARN: 8111  
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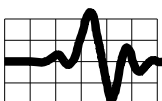
Hugh Williamson, Ph.D., P.Eng.  
Member, Canadian Acoustical Society





## **References**

1. Ministry of Environment, Conservation and Parks (MECP) Document NPC-300, *Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning*, August 2013.
2. Canadian National Railway Properties Inc., *Principal Main Line Requirements*, received from CN February 2019.
3. Ministry of Environment, Conservation and Parks (MECP), *Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT)*, 1989.
4. Ministry of Environment, Conservation and Parks (MECP), *Sound from Trains Environmental Analysis Method (STEAM)*, 1990.
5. Ministry of Environment, Conservation and Parks (MECP), *STAMSON Software, Version 5.04, 2000*. (Software implementation of References 5 and 6.)
6. National Research Council Canada, *IBANA-Calc, Version 1.2 Rev. 122*, method and software for calculation of indoor sound levels due to outdoor noise levels.
7. Publications Ontario, *Ontario Building Code, OBC*.
8. JD Northcote Engineering Inc. “Wilson Avenue Development Traffic Impact Study”, dated 28<sup>th</sup> July, 2021.



# Appendix 1

## Zoning Plan and Land Use Designations

### Contents:

- **City of Belleville Zoning Bylaw (Source: City of Belleville Zoning Map Viewer)**

### Legend:

■	C7 (10245)
■	CC (10245)
■	CD (2076-80)
■	CH (2076-80)
■	CR (10245); CR (2076-80)
■	M1 (10245); M1 (3014)
■	M2 (10245); M2 (2076-80); M2 (3014)
■	M2C (10245)
■	M3 (10245); M3 (3014)
■	M4 (10245)
■	MCP (10245)
■	MR (2076-80)
■	MW (2076-80)
■	SI (3014)
■	CF (10245); CF (2076-80); CF (3014)
■	NH (10245); NH (2076-80)
■	O1 (10245); O1 (2076-80)
■	O1 (3014)
■	O2 (10245)
■	O3 (10245)
■	OS (3014)
■	E (10245); E (2076-80)
■	E (3014)
■	ES (3014)
■	H (3014)
■	PA (3014)
■	A1 (2076-80)
■	RU (10245); RU (3014); A2 (2076-80)
■	R1 (10245); R1 (3014)
■	R2 (10245); R2 (2076-80); R2 (3014)
■	R3 (10245); R3 (3014)
■	R4 (10245); R4 (2076-80); R4 (3014)
■	R5 (10245); R5 (2076-80)
■	R6 (10245); R6 (2076-80)
■	R7 (10245)
■	R8 (10245)
■	ER (3014)
■	RR (10245); RR (2076-80); RR (3014)
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■	RH (10245); RH (3014)
■	UH (10245); UH (2076-80)

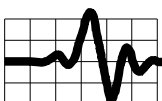
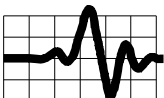
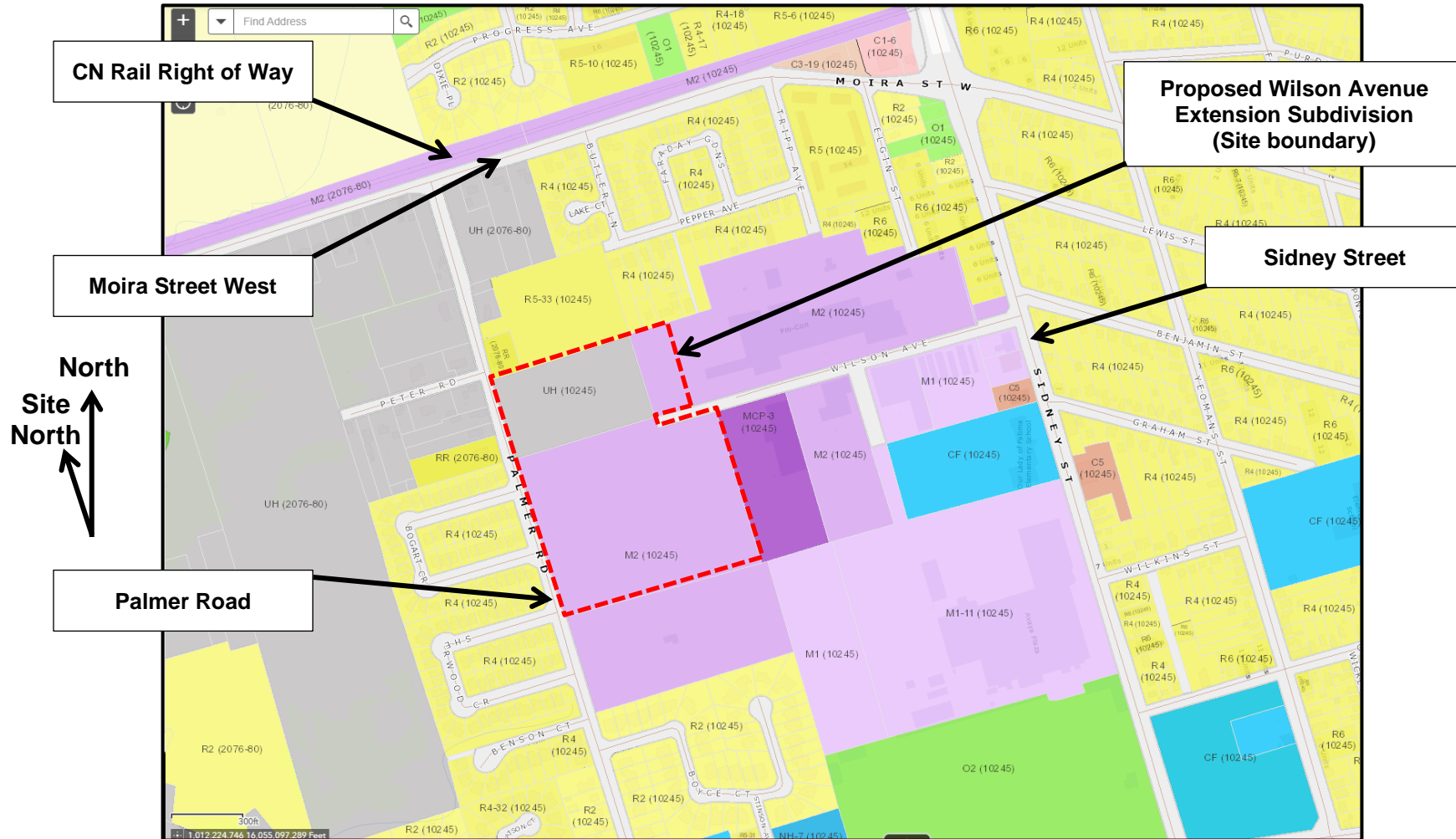


Figure 1.1 - Zoning Plan - City of Belleville Zoning Bylaw (Source: City of Belleville Zoning Map Viewer)



## Appendix 2

# Surface Transportation Impacts

### Contents:

#### 2.1 Figures

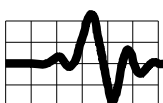
- Figure 2.1.1: Proposed Wilson Avenue Extension Subdivision and nearby surface transportation corridors
- Figure 2.1.2: Proposed Wilson Avenue Extension Subdivision Lot Plan showing Points of Reception
- Figure 2.1.3: Proposed Wilson Avenue Extension Subdivision Lot Plan showing Recommended Noise Mitigation
- Figure 2.1.4: Proposed Wilson Avenue Extension Subdivision Lot Plan showing Warning Clause Requirements
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- Table 2.2.8: Summary of Building Component Requirements

#### 2.3 Noise Criteria and Warning Clauses

- Table 2.3.1 Summary of Sound Level Criteria for Outdoor Living Areas Surface Transportation (Road and Rail)
- Table 2.3.2 Sound Level Limits for Indoor Areas, Road and Rail
- Table 2.3.3 Supplementary Sound Level Limits for Indoor Spaces, Road and Rail
- Table 2.3.4: Summary of Road and Rail Noise Daytime (07:00 – 23:00) & Nighttime (23:00 – 07:00) Building Component Requirements
- Table 2.3.5: Exterior Wall Requirement for Rail Noise for the First Row of



Dwellings next to Railway Tracks

Table 2.3.6: Combination of Road and Rail Noise Day-time (07:00 – 23:00) & Night-time (23:00 – 07:00) Outdoor, Ventilation and Warning Clause Requirements

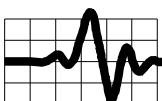
Table 2.3.7: MECP Warning Clauses

Table 2.3.8: CN General Warning Clause

**A2.4 Sample Outputs from STAMSON**

**A2.5 Indoor Sound Level Calculations**

**A2.6 Reference Documents for Road and Rail Traffic Forecasts**

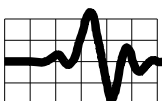


## **Appendix 2.1**

# **Figures**

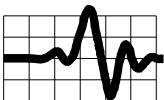
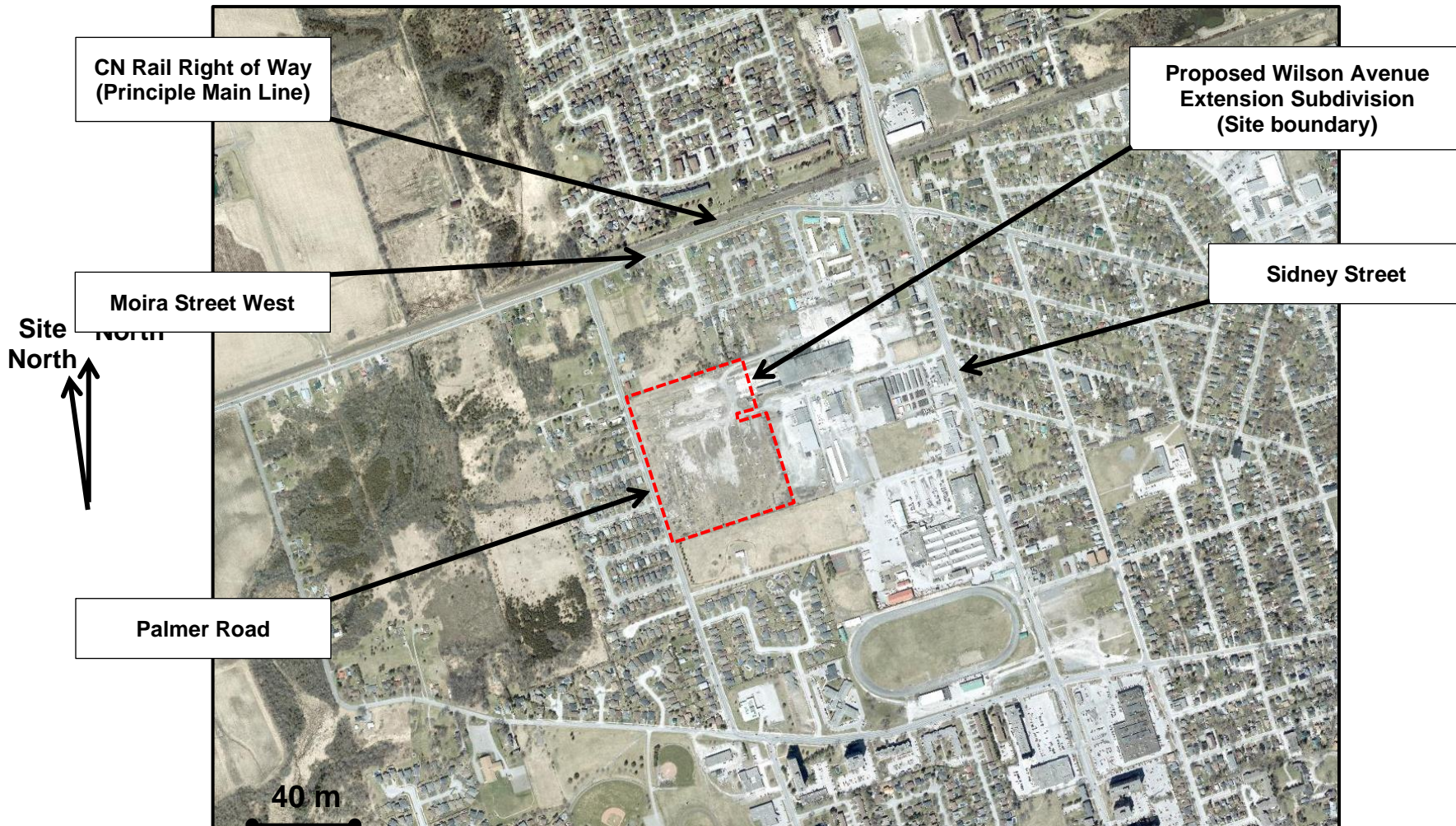
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- Figure 2.1.4: Proposed Wilson Avenue Extension Subdivision Lot Plan showing Warning Clause Requirements
- Figure 2.1.5: Proposed Wilson Avenue Extension Subdivision Lot Plan showing Building Component Design Requirements

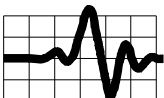
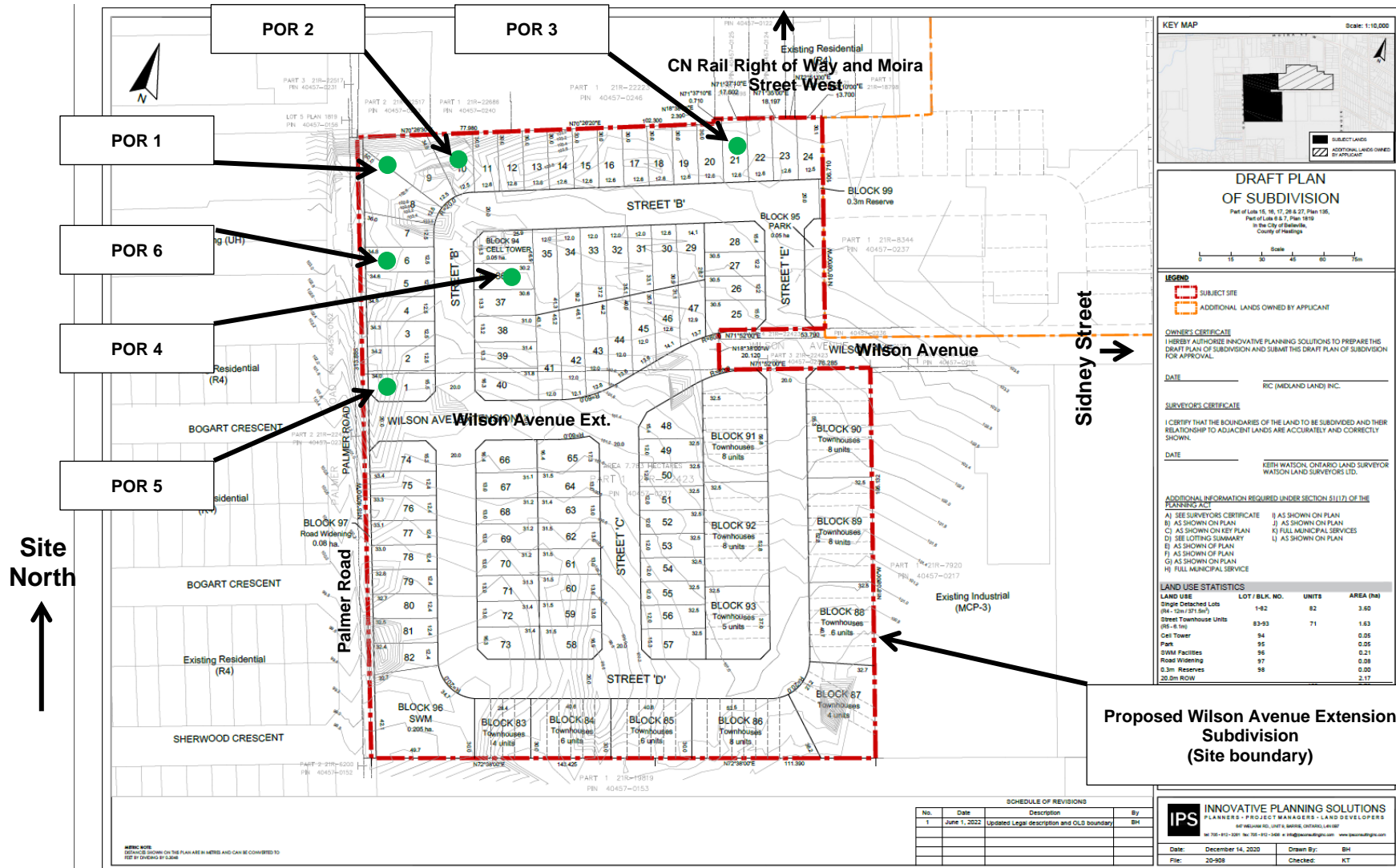




**Figure 2.1.1: Proposed Wilson Avenue Extension Subdivision and nearby surface transportation corridors (Source: City of Belleville Map Viewer)**

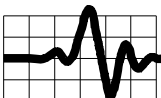
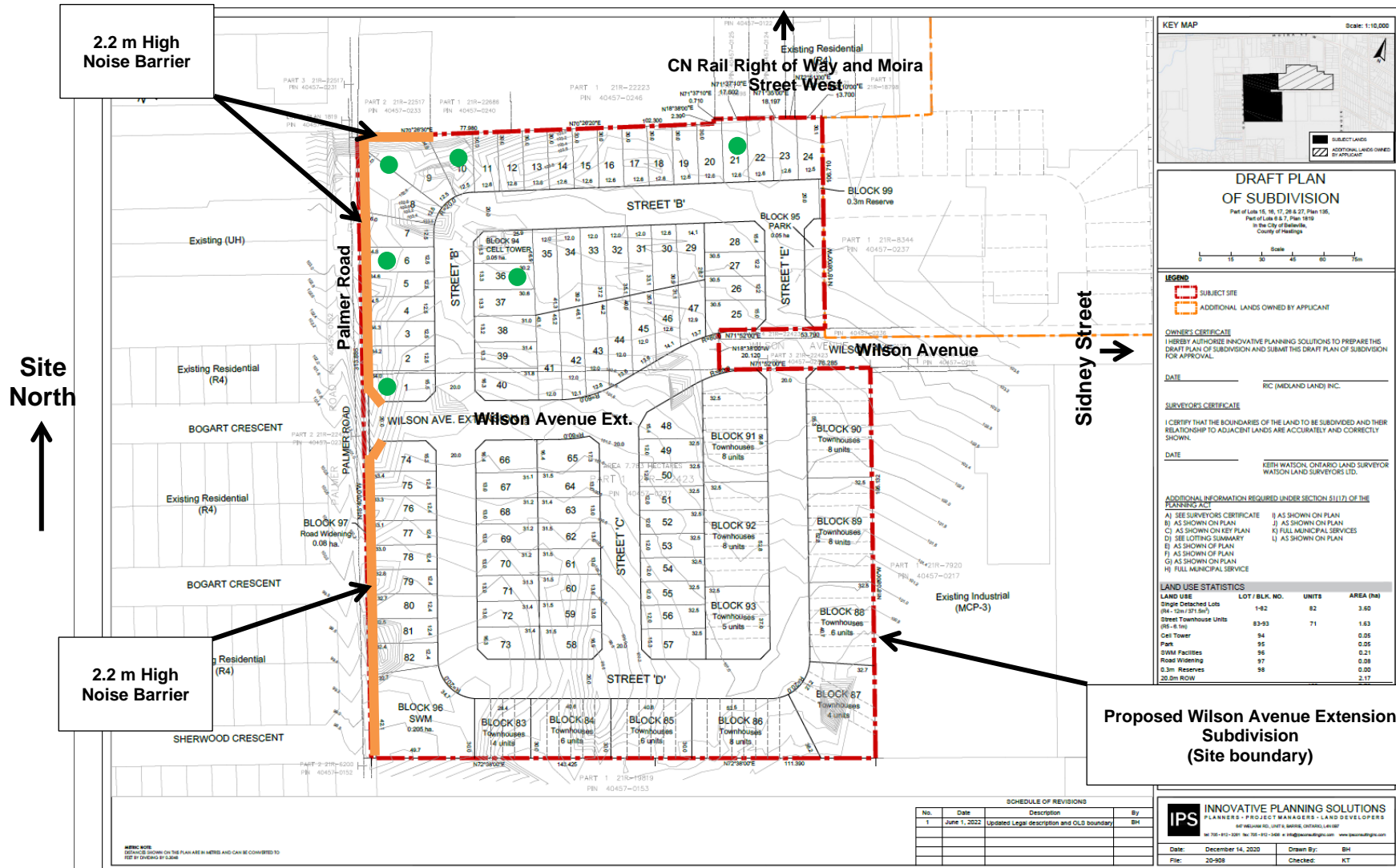


**Figure 2.1.2: Proposed Wilson Avenue Extension Subdivision Lot Plan showing Points of Reception (Source: Baseplan provided by Innovative Planning Solutions)**



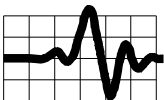
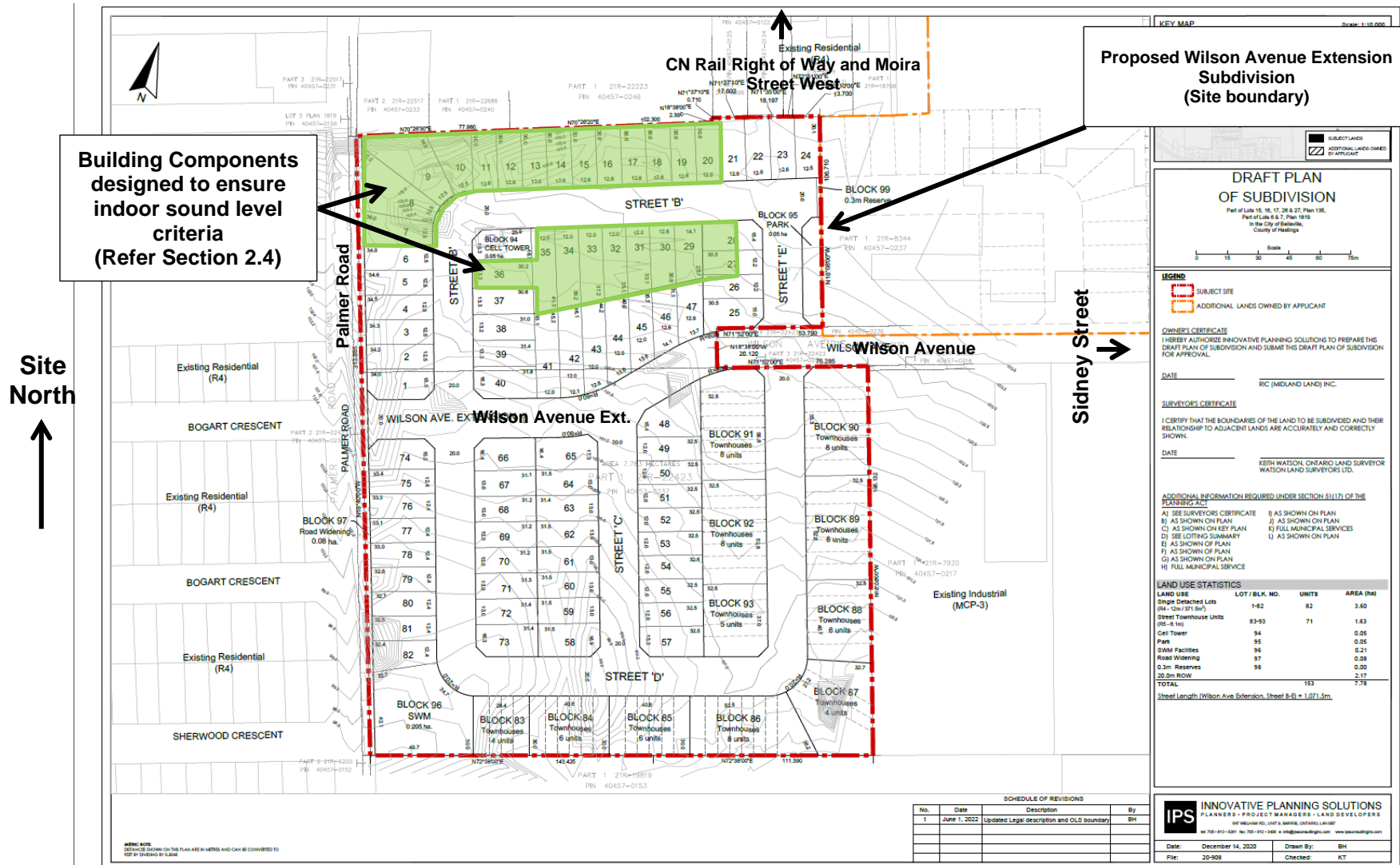


**Figure 2.1.3: Proposed Wilson Avenue Extension Subdivision Lot Plan showing Recommended Noise Mitigation (Source: Baseplan provided by Innovative Planning Solutions)**





**Figure 2.1.5: Proposed Wilson Avenue Extension Subdivision Lot Plan showing Building Component Design Requirements (Source: Baseplan provided by Innovative Planning Solutions)**

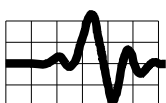


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- Table 2.2.6: Traffic Noise Impacts for Building Component Requirements
- Table 2.2.7: Calculated Indoor Sound Levels for Typical Room Sizes for Areas Requiring Building Component Design (Assessed at POR 5 worst-case location)
- Table 2.2.8: Summary of Building Component Requirements

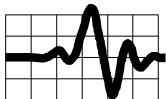


**Table 2.2.1: Modelled Points of Reception**

Symbol	Location	Moira Street West (East / West)		Sidney Street (Northbound)		Sidney Street (Southbound)		Palmer Road (North / South)		CN Rail Right of Way		Height (m) <sup>1</sup>	Description
		Distance (m)	Angle (deg)	Distance (m)	Angle (deg)	Distance (m)	Angle (deg)	Distance (m)	Angle (deg)	Distance (m)	Angle (deg)		
POR 1	Outdoor Living Area (located in rear yard)	263	180	500+ <sup>2</sup>	180	500+ <sup>2</sup>	180	15	180	283	180	1.5	Outdoor Living Area
	Third floor level window – Northern Facade (Facing Moira Street West)	260.5	180	500+ <sup>2</sup>	90	500+ <sup>2</sup>	90	18	90	280.5	180	9	Plane of window (living / bedroom)
	Third floor level window – Eastern Façade (Facing Sidney Street)	260.5	90	500+ <sup>2</sup>	180	500+ <sup>2</sup>	180	n/a	n/a	280.5	90	9	Plane of window (living / bedroom)
	Third floor level window – Western Façade (Facing Palmer Road)	260.5	90	n/a	n/a	n/a	n/a	18	180	280.5	90	9	Plane of window (living / bedroom)
POR 2	Outdoor Living Area (located in rear yard)	263	180	500+ <sup>2</sup>	180	500+ <sup>2</sup>	180	40	180	180	283	1.5	Outdoor Living Area
POR 3	Outdoor Living Area (located in rear yard)	263	180	500+ <sup>2</sup>	180	500+ <sup>2</sup>	180	120	180	180	283	1.5	Outdoor Living Area
POR 4	Outdoor Living Area (located in rear yard)	263+ <sup>2</sup>	180	500+ <sup>2</sup>	180	500+ <sup>2</sup>	180	60	180	335	180	1.5	Outdoor Living Area
POR 5	Outdoor Living Area (located in rear yard)	263+ <sup>2</sup>	180	500+ <sup>2</sup>	180	500+ <sup>2</sup>	180	15	180	378	180	1.5	Outdoor Living Area
POR 6	Third floor level window – Northern Facade (Facing CN Rail Right of Way)	263+ <sup>2</sup>	180	500+ <sup>2</sup>	180	500+ <sup>2</sup>	180	15	180	320	180	1.5	Plane of window (living / bedroom)

Notes:

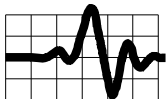
1. Height measured from ground level
2. Distance used in acoustic calculations noted. Actual distance equal to or greater than distance noted.



**Table 2.2.2: Future Road Traffic Volumes**

Road Segment	Input Data							Day Volumes, 7:00 - 23:00			Night Volumes, 23:00 - 7:00		
	Segment	AADT (24 hours)	Posted Speed	Split Day	Split Night	Medium Trucks	Heavy Trucks	Cars	Medium Trucks	Heavy Trucks	Cars	Medium Trucks	Heavy Trucks
	Type		kph	7:00-23:00	23:00-7:00	%	%	no.	no.	no.	no.	no.	no.
<b>Moira Street West, 2-Lane Arterial Undivided Road (2-UAU)*</b>													
East / West	S1	13,050	50	0.92	0.08	7	5	10565	840	600	919	73	52
<b>Sidney Street, 4-Lane Arterial Undivided Road (4-UAU)*</b>													
Northbound	S2	9305	50	0.92	0.08	7	5	7533	599	428	655	52	37
Southbound	S3	9305	50	0.92	0.08	7	5	7533	599	428	655	52	37
<b>Palmer Road, 2-Lane Urban Collector Undivided (2-UCU)*</b>													
North / South	S4	4,640	50	0.92	0.08	7	5	3757	299	213	327	26	19

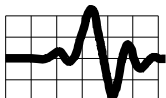
\*Future Mature Traffic Volumes from JD Engineering, "Wilson Avenue Development City of Belleville, Traffic Impact Study for ROMPSEN", dated July 28, 2021. AADT Volume calculated from PM Peak Hour volumes for all road segments using a factor of AADT = 10 x PM Peak Hour Volume (PM Peak Hour Volumes were used as these were the higher of the two peak hour periods (AM/PM) for all segments.



**Table 2.2.3: Future Rail Traffic Volumes**

Rail			2021 Current (CN Data)				Forecast 2031, 2.5% growth rate			
Train Type	Segment	Period	Max. Speed km/h	Volumes No. Trains	No. Cars	No. Engines	Max. Speed km/h	Volumes No. Trains	No. Cars	No. Engines
Passenger	S5	07:00 - 23:00	153	29	10	2	153	39	10	2
Freight	S5	07:00 - 23:00	105	14	140	4	105	19	140	4
Way Freight	S5	07:00 - 23:00	105	5	25	4	105	7	25	4
Passenger	S5	23:00 - 07:00	153	4	10	2	153	6	10	2
Freight	S5	23:00 - 07:00	105	9	140	4	105	12	140	4
Way Freight	S5	23:00 - 07:00	105	6	25	4	105	8	25	4

\*Based on data from Canadian National Railways (CN), see Appendix 2.6

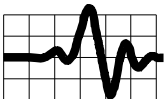


**Table 2.2.4: Traffic Noise Impacts for Outdoor Living Area (OLA)**

Symbol	Location	Moir Street West (East / West)		Sidney Street (Northbound / Southbound)		Palmer Road (North / South)		CN Rail Right of Way			Combined (Road and Rail)		Description of Recommendations and Mitigation
		Day	Night	Day	Night	Day	Night	Day	Night	24-hr	Day	Night	
		dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	
POR 1 (Un-mitigated)	Outdoor Living Area	41.7	-	35.7	-	60.7	-	54.9	-	-	61.8	-	Control Measures required to bring noise levels below 60 dBA and as close to 55 dBA as feasible.
POR 1 (w/ 2.2 m high barrier)	Outdoor Living Area	41.7	-	35.7	-	54.7	-	54.9	-	-	57.9**	-	Result with 2.2 m high barrier below 60 dBA**
POR 2	Outdoor Living Area	41.7	-	35.7	-	53.0	-	54.9	-	-	57.2**	-	Control Measures (barriers) not required but should be considered.
POR 3	Outdoor Living Area	41.7	-	35.7	-	36.8	-	48.9	-	-	50.0	-	Not required
POR 4	Outdoor Living Area	41.7	-	35.7	-	47.2	-	53.9	-	-	55.0	-	Not required
POR 5	Outdoor Living Area	41.7	-	35.7	-	59.7	-	47.1	-	-	60.0**	-	Result with 2.2 m high barrier below 60 dBA

\* Daytime Noise Impacts based on Leq 16 h (07:00 – 23:00).

\*\* Resultant Leq includes shielding provided by the recommended 2.2 m high noise barrier shielding first row of houses east of Palmer Road.





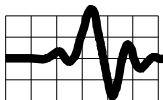
**Table 2.2.5: Traffic Noise Impacts for Ventilation and Warning Clause Requirements**

Symbol	Location	Moira Street West		Sidney Street		Palmer Road		CN Rail			Combined		Ventilation Requirements <sup>(1)</sup>	Warning Clauses <sup>(2)</sup>
		(East / West)		(Northbound / Southbound)		(North / South)		Right of Way			(Road and Rail)			
		Day	Night	Day	Night	Day	Night	Day	Night	24-hr	Day	Night		
		dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA		
POR 1 (un-mitigated)	Outdoor Living Area	41.7	-	35.7	-	60.7	-	54.9	-	-	61.8	-	Not applicable	Refer POR 1 (with 2.2 m barrier) below
	Third floor level window – Northern Façade	44.9	37.3	36.5	28.9	58.2	50.7	58.2	58.3	58.2	61.3	59.0	Forced air heating with provision for central air-conditioning	Required Type C
	Third floor level window – Eastern Façade	41.9	34.3	39.5	31.9	-	-	55.2	55.3	55.2	55.5	55.3	Forced air heating with provision for central air-conditioning	Required Type C
	Third floor level window – Western Façade	41.9	34.3	-	-	61.2	53.7	55.2	55.3	55.2	62.2	57.6	Forced air heating with provision for central air-conditioning	Required Type C
POR 1 (w/ 2.2 m barrier)	Outdoor Living Area	41.7	-	35.7	-	54.7	-	54.9	-	-	57.9**	-	Not applicable	Required Type B
POR 2	Outdoor Living Area	41.7	-	35.7	-	53.0	-	54.9	-	-	57.2	-	Not applicable	Required Type A
POR 3	Outdoor Living Area	41.7	-	35.7	-	36.8	-	48.9	-	-	50.0	-	Not applicable	Required Type A
POR 4	Outdoor Living Area	41.7	-	35.7	-	47.2	-	53.9	-	-	55.0	-	Not applicable	Required Type A
POR 5	Outdoor Living Area	41.7	-	35.7	-	59.7	-	47.1	-	-	60.0**	-	Not applicable	Required Type B

\*Daytime Noise Impacts based on Leq 16 h (07:00 – 23:00), Night Impacts based on Leq 8 h (23:00 – 07:00).

\*\* Resultant Leq includes shielding provided by the recommended 2.2 m high noise barrier shielding first row of houses east of Palmer Road.

- Notes: 1. Ventilation Requirements - Refer Table A1.5, Appendix 1  
2. Warning Clause Requirements - Refer Tables A1.5 and A1.6, Appendix 1



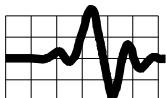
**Table 2.2.6: Traffic Noise Impacts for Building Component Requirements**

Symbol	Location	Combined (Road)		Criteria for Roads for Design to Achieve Indoor Noise Levels, dBA		CN Rail Right of Way			Criteria for Rail for Design to Achieve Indoor Noise Levels, dBA		Building Component Design Requirement
		Day	Night	Day	Night	Day	Night	24-hr	Day	Night	
		dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	
POR 1** (Lot 9)	Third floor level window – Northern Façade	45.5	37.9	>65	>60	58.2	58.3	58.2	>60	>55	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A2.3.2.*
	Third floor level window – Eastern Façade	43.9	36.3	>65	>60	55.2	55.3	55.2	>60	>55	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A2.3.2.*
	Third floor level window – Western Façade	41.9	34.3	>65	>60	55.2	55.3	55.2	>60	>55	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A2.3.2.*
POR 3***	Third floor level window – Northern Façade	-	-	>65	>60	52.2	52.3	52.2	>60	>55	Compliance with Ontario Building Code
	Third floor level window – Eastern Façade	-	-	>65	>60	49.2	49.3	49.2	>60	>55	Compliance with Ontario Building Code
	Third floor level window – Western Façade	-	-	>65	>60	49.2	49.3	49.2	>60	>55	Compliance with Ontario Building Code
POR 4***	Third floor level window – Northern Façade	-	-	>65	>60	55.9	56	55.9	>60	>55	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A2.3.2.*
	Third floor level window – Eastern Façade	-	-	>65	>60	52.9	53	52.9	>60	>55	Compliance with Ontario Building Code
	Third floor level window – Western Façade	-	-	>65	>60	52.9	53	52.9	>60	>55	Compliance with Ontario Building Code
POR 6	Third floor level window – Northern Façade	-	-	>65	>60	54.6	54.7	54.7	>60	>55	Compliance with Ontario Building Code
	Third floor level window – Eastern Façade	-	-	>65	>60	51.6	51.7	51.7	>60	>55	Compliance with Ontario Building Code
	Third floor level window – Western Façade	-	-	>65	>60	51.6	51.7	51.7	>60	>55	Compliance with Ontario Building Code

\*Daytime Noise Impacts based on Leq 16 h (07:00 – 23:00), Nighttime Noise Impacts based on Leq 8 h (23:00 – 07:00).

\*\* Analysis shows that the proposed construction of external walls and windows is sufficient to meet City of Ottawa ENCG indoor sound level criteria, see discussion in Section 5.0.

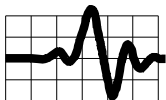
\*\*\*Building component design requirement also applicable to Lot 7 to Lot 8 (represented by POR 1), Lot 10 to Lot 20 (represented by POR 1) and Lot 28 to Lot 36 (represented by POR 4) with similar exposure to CN Main Line. Noise impacts from nearby roads not critical at these locations with respect to building design requirements.



**Table 2.2.7: Calculated Indoor Sound Levels for Typical Room Sizes for Areas Requiring Building Component Design (Assessed at POR 1 worst-case location)**

Room Description	L (m)	W (m)	Ceiling Height (m)	Floor Area (sq. m.)	Wall 1 Area (sq. m.)	Wall 2 Area (sq. m.)	Window Area (sq. m.)	Window Area (% Floor)	Outdoor Noise (dBA)	Fully Exposed Wall	Half Exposed Wall	Indoor Noise (dBA)
<b>Vinyl Siding, Bedroom, Night (Limit 35 dBA)</b>												
Typical (12' x 10')	3.6	3.0	2.4	10.8	8.6	7.2	15.0	139	59	31	27	32

See Appendix 3 for Sample Calculations

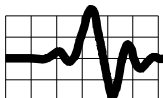


**Table 2.2.8: Summary of Building Component Requirements**

Mitigation Area	External Wall Construction	External Window Construction	Maximum External Window Area as percentage (%) of Floor Area (1)
Refer Figure 2.1.5 (Assessed at POR 1)	<ul style="list-style-type: none"> <li>○ Assessed as vinyl siding, consisting of 11 mm OSB, 140 mm wood studs on 406 mm centre with glass fibre cavity insulation, 1 of 13 mm gypsum board.</li> <li>○ <b>Minimum STC 37</b></li> <li>○ Alternative construction permitted providing the minimum STC rating for exterior walls is achieved.</li> </ul>	<ul style="list-style-type: none"> <li>○ Assessed as Vinyl double slider window (seals not taped)</li> <li>○ <b>Minimum STC 27</b></li> <li>○ Alternative construction permitted providing the minimum STC rating for exterior windows is achieved.</li> </ul>	139

**Notes:**

(1) Combined area of external windows and doors as a percentage of room floor area.

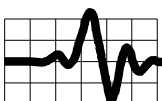


## **Appendix 2.3**

# **Noise Criteria and MECP Warning Clauses**

**For further information refer to:**

**MECP Document NPC-300: Environmental Noise Guideline, Stationary  
and Transportation Sources – Approval and Planning, August 2013<sup>1</sup>**



**Table 2.3.1 Summary of Sound Level Criteria for Outdoor Living Areas  
Surface Transportation (Road and Rail)**

Time Period	Leq 16 hr (dBA)
16 hr, 07:00 – 23:00	55

\*Reference: NPC-300, Table C-1.

**Table 2.3.2 Sound Level Limits for Indoor Areas, Road and Rail**

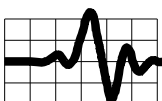
Type of Space	Time Period	Required Leq (dBA)	
		Road	Rail
Living/dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	16 hr., 07:00 – 23:00	45	40
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	8 hr., 23:00 – 07:00	45	40
Sleeping Quarters	16 hr., 07:00 – 23:00	45	40
	8 hr., 23:00 – 07:00	40	35

Reference: NPC-300 Table C-2. Sound levels are calculated with the windows closed.

**Table 2.3.3 Supplementary Sound Level Limits for Indoor Spaces,  
Road and Rail**

Type of Space	Time Period	Required Leq (dBA)	
		Road	Rail
General offices, reception areas, retail stores, etc.	16 hr., 07:00 – 23:00	50	45
Theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.	16 hr., 07:00 – 23:00	45	40
Sleeping quarters of hotels/motels	8 hr., 23:00 – 07:00	45	40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	8 hr., 23:00 – 07:00	40	35

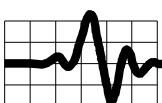
Reference: NPC-300 Table C-9. Sound levels are calculated with the windows closed.



**Table 2.3.4: Summary of Road and Rail Noise Daytime (07:00 – 23:00) & Nighttime (23:00 – 07:00) Building Component Requirements**

Assessment Location & Time		Outdoor Leq (dBA)	Building Component Requirements
<b>Plane of the Living/Dining Room Windows</b>  ♦ Daytime (07:00 – 23:00)	Road	Less than or equal to 65	Building compliant with Ontario Building Code
		Greater than 65	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
	Rail	Less than or equal to 60	Building compliant with Ontario Building Code
		Greater than 60	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
<b>Plane of Bedroom Window</b>  ♦ Nighttime (23:00 – 07:00)	Road	Less than or equal to 60	Building compliant with Ontario Building Code
		Greater than 60	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.
	Rail	Less than or equal to 55	Building compliant with Ontario Building Code
		Greater than 55	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria in Table A1.2.

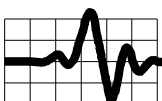
\*Reference: NPC-300, Section C7.1 Road Noise Control Measures



**Table 2.3.5: Exterior Wall Requirement for Rail Noise for the First Row of Dwellings next to Railway Tracks**

Assessment Location	Distance to Tracks	Sound Level dBA (whistle noise included)	Façade Material Requirement
<b>Outside Bedroom or Living/Dining Room Windows of a Nighttime Receptor</b>  ♦ 24 hr.	Less than 100 m	Leq <sub>24 hr</sub> less than or equal to 60	No additional requirement
		Leq <sub>24 hr</sub> greater than 60	Brick veneer or masonry equivalent
	Greater than 100 m	Leq <sub>24 hr</sub> less than or equal to 60	No additional requirement
		Leq <sub>24 hr</sub> greater than 60	No additional requirement

\*Reference: NPC-300, Section C7.2.3

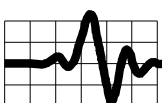




**Table 2.3.6: Combination of Road and Rail Noise Day-time (07:00 – 23:00) & Night-time (23:00 – 07:00) Outdoor, Ventilation and Warning Clause Requirements**

Assessment Location & Time	Outdoor Leq (dBA)	Ventilation Requirements	Outdoor Control Measures	Warning Clauses (see Table A1.6)
<b>Outdoor Living Area (OLA)</b>  ◆ Day-time (07:00 – 23:00)	Less than or equal to 55	N/A	None Required	Not Required
	Greater than 55 to less than 60	N/A	Control Measures (barriers) not required but should be considered.	Type A required if resultant Leq exceeds 55 dBA
	Greater than 60	N/A	Control measures (barriers) required to reduce the Leq to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.	Type B required if resultant Leq exceeds 55 dBA
<b>Plane of the Living/Dining Room Windows</b>  ◆ Day-time (07:00 – 23:00)	Less than or equal to 55	None Required	N/A	Not Required
	Greater than 55 to less than or equal to 65	Forced air heating with provision for central air-conditioning	N/A	Required Type C
	Greater than 65	Central ducted air-conditioning	N/A	Required Type D
<b>Plane of Bedroom Window</b>  ◆ Night-time (23:00 – 07:00)	Less than or equal to 50	None Required	N/A	Not Required
	Greater than 50 to less than or equal to 60	Forced air heating with provision for central ducted air-conditioning	N/A	Required Type C
	Greater than 60	Central ducted air-conditioning	N/A	Required Type D

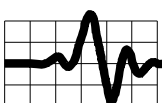
\*Reference: NPC-300, Section C7.1 and C7.2. Reference: For air-conditioning system requirements see NPC-300, Sections C7.8.1. For assessment of rail noise in this table, whistle noise is not included.



**Table 2.3.7: MECP Warning Clauses (may be used individually or in combination)**

Type	Warning Clause
<b>Type A</b>	"Purchasers/Tenants are advised that sound levels due to increasing road traffic (rail traffic) (air traffic) may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of Environment."
<b>Type B</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 (rail traffic) (air 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 Environment."
<b>Type C</b>	"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air-conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of Environment."
<b>Type D</b>	"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 Environment."
<b>Type E (for Stationary Sources)</b>	"Purchasers/tenants are advised that due to the proximity of the adjacent industry (facility) (utility), sound levels from the industry (facility) (utility) may at times be audible."
<b>Type F (For Class 4 Areas)</b>	"Purchasers/tenants are advised that sound levels due to the adjacent industry (facility) (utility) are required to comply with sound level limits that are protective of indoor areas and are based on the assumption that windows and exterior doors are closed. This dwelling unit has been supplied with a ventilation/air conditioning system which allows windows and exterior doors to remain closed."

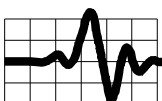
Reference: NPC-300, Sections C8.1



**Table 2.3.8: CN Warning Clause<sup>2</sup>**

**CN General 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.”

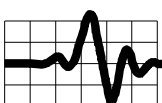


## **Appendix 2.4**

# **Sample Outputs from STAMSON**

### **Contents:**

- POR 1 – Segment 4    -    Outdoor Living Area facing West - Unmitigated**
- POR 1 – Segment 4    -    Outdoor Living Area facing West – with 2.2 m high barrier**



STAMSON 5.0 SUMMARY REPORT Date: 24-08-2021 17:24:28  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7vos4.te Time Period: Day/Night 16/8 hours  
Description: POR 1 OLA - Daytime - Palmer Road - Unmitigated

Road data, segment # 1: S4\_PALMER (day/night)

-----  
Car traffic volume : 3757/327 veh/TimePeriod  
Medium truck volume : 299/26 veh/TimePeriod  
Heavy truck volume : 213/19 veh/TimePeriod  
Posted speed limit : 50 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: S4\_PALMER (day/night)

-----  
Angle1 Angle2 : -90.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 1 / 3  
House density : 25 %  
Surface : 1 (Absorptive ground surface)  
Receiver source distance : 15.00 / 18.00 m  
Receiver height : 1.50 / 1.50 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

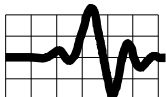
Result summary (day)

-----  
! source ! Road ! Total  
! height ! Leq ! Leq  
! (m) ! (dBA) ! (dBA)  
-----  
1.S4\_PALMER ! 1.49! 60.72! 60.72  
-----  
Total 60.72 dBA

Result summary (night)

-----  
! source ! Road ! Total  
! height ! Leq ! Leq  
! (m) ! (dBA) ! (dBA)  
-----  
1.S4\_PALMER ! 1.50! 48.88! 48.88  
-----  
Total 48.88 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.72  
(NIGHT): 48.88



STAMSON 5.0 SUMMARY REPORT Date: 08-10-2021 17:46:44  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7b1os4.te Time Period: Day/Night 16/8 hours  
Description: POR 1 - Outdoor Living Area with 2.2 m Barrier

Road data, segment # 1: S4\_PALMER (day/night)

-----  
Car traffic volume : 3757/327 veh/TimePeriod  
Medium truck volume : 299/26 veh/TimePeriod  
Heavy truck volume : 213/19 veh/TimePeriod  
Posted speed limit : 50 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: S4\_PALMER (day/night)

-----  
Angle1 Angle2 : -90.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 1 (Absorptive ground surface)  
Receiver source distance : 15.00 / 15.00 m  
Receiver height : 1.50 / 1.50 m  
Topography : 2 (Flat/gentle slope; with barrier)  
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg  
Barrier height : 2.20 m  
Barrier receiver distance : 3.00 / 3.00 m  
Source elevation : 0.00 m  
Receiver elevation : 0.00 m  
Barrier elevation : 0.00 m  
Reference angle : 0.00

Result summary (day)

-----  
! source ! Road ! Total  
! height ! Leq ! Leq  
! (m) ! (dBA) ! (dBA)  
-----  
1.S4\_PALMER ! 1.49! 54.70! 54.70  
-----  
Total 54.70 dBA

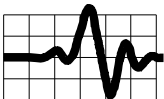
Barrier table for segment # 1: S4\_PALMER (day)

Barrier Height	Elev of Barr Top	Road Leq dBA	Tot Leq dBA
3.70	3.70	49.01	49.01
4.20	4.20	47.80	47.80
4.70	4.70	46.92	46.92
5.20	5.20	46.28	46.28
5.70	5.70	45.81	45.81
6.20	6.20	45.46	45.46
6.70	6.70	45.20	45.20
7.20	7.20	45.00	45.00
7.70	7.70	44.85	44.85
8.20	8.20	44.74	44.74

Result summary (night)

source	Road height (m)	Total Leq (dBA)
1.S4_PALMER	1.50	47.19
Total		47.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.70  
(NIGHT): 47.19





## **Methodology**

Where needed for the determination of building component requirements, indoor noise levels in residences have been calculated using IBANA-Calc<sup>6</sup>, a method and software developed by the National Research Council Canada.

The results of indoor noise calculations are shown in Table 2.2.7 and the resulting building component requirements are listed in Table 2.2.811.

The calculations assume standard OBC compliant constructions:

- Standard double-glazed windows or doors, STC 27
- Standard vinyl sided exterior wall construction, STC 37.

All transmission loss and STC ratings are based on NRC testing as detailed in the IBANA-calc outputs.

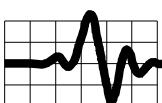
The result of the analysis is a restriction on the maximum combined external window and door area as a percentage of room floor area for noise sensitive rooms (bedrooms) as set out in Table 2.2.8. Typical room sizes are assumed which have been found to have similar results compared to small and larger rooms.

Other details of the calculations are as follows.

- Bedrooms:
  - Two walls are exposed to rail noise, the largest wall fully exposed and the smaller side wall half exposed (-3dBA).
  - Window area is maximized in the fully exposed wall, the balance of window area is in the half-exposed wall.
- Construction Details, the external elements used in the calculations have the lowest STC of the commonly used constructions which meet the Ontario Building Code.  
Assumed constructions:
  - Vinyl siding: 37 STC, Vinyl siding, consisting of 11 mm OSB, 140 mm wood studs on 406 mm centre with glass fibre cavity insulation, 1 of 13 mm gypsum board.
  - Windows: STC 27, consisting of Vinyl double slider window.

Considering the outdoor sound levels (Table 2.2.6), and the indoor criteria (Table 2.3.2 and 2.3.3), the most critical cases are:

- Bedrooms at night.





Noise Sound Insulation Scenario Calculation Results

Project: Wilson Avenue Extension  
**ProjectID: Bedroom, Facade Facing Rail, Night**  
 Date:2021-04-29  
 Outdoor level: NEF 27 or Leq24 59 or Ldn 60 dBA

Source Spectrum details:  
 100% Freight Train Diesel  
 Corrections:

Receiving room:

Floor Area: 10.8 ft<sup>2</sup>  
 Absorbtion: 120% of floor area

Construction Description:

Element 1: VIN1\_WFUR19(406)\_OSB11\_WS140(406)\_GFB152\_G13

Construction Type: 2by6 Wall  
 Area: 0.64 m<sup>2</sup>  
 Test ID: TLA-99-019a  
 Test Date: 1999-01-19

Vinyl siding, 19 mm wood furring strips on 406 mm centre, 11 mm OSB, 140 mm wood studs on 406 mm centre with glass fibre cavity insulation, 1 of 13 mm gypsum board.

Element 2: GL3\_AIR13\_GL3

Construction Type: Window  
 Area: 8.00 m<sup>2</sup>  
 Test ID: TLA-99-149a  
 Test Date: 1999-04-14

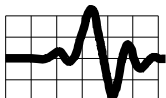
Vinyl slider window (seals not taped).

Sound Level vs. Frequency - Spectrum Values:  
 Frequency(Hz) Indoor Sound Level(dB)

Frequency(Hz)	Indoor Sound Level(dB)
50	46.8
63	40.3
80	47.7
100	40.4
125	30.8
160	27.3
200	29.0
250	24.9
315	28.6
400	26.8
500	24.5
630	18.6
800	17.4
1000	13.3
1250	9.8
1600	10.4
2000	8.4
2500	7.2
3150	6.6
4000	9.1
5000	8.8

A-Weighted Sound Level vs. Frequency - Spectrum Values:  
 Frequency(Hz) A-Wtd Sound Level(dBA)

Frequency(Hz)	A-Wtd Sound Level(dBA)
50	16.6
63	14.1
80	25.2
100	21.3
125	14.7
160	13.9
200	18.1
250	16.3
315	22.0
400	22.0
500	21.3
630	16.7
800	16.6
1000	13.3
1250	10.4
1600	11.4
2000	9.6
2500	8.5
3150	7.8
4000	10.1
5000	9.3



Transmission Loss vs. Frequency - Spectrum Values:

Frequency(Hz) Transmission Loss(dB)

Frequency(Hz)	Transmission Loss(dB)
50	19.6
63	19.1
80	20.0
100	19.2
125	18.7
160	19.2
200	19.6
250	22.1
315	18.2
400	22.9
500	25.0
630	30.0
800	30.2
1000	33.0
1250	35.1
1600	36.1
2000	35.7
2500	36.2
3150	37.4
4000	34.4
5000	33.9

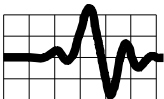
Single Number Ratings

Outdoor Sound Level:	59 dBA
<b>Indoor Sound Level:</b>	<b>31 dBA</b>
A-wtd Level Reduction:	28 dB
A-wtd Reduction re Standard Source:	27 dB
OITC Rating:	25 dB

Source Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz) Source Sound Level(dB)

Frequency(Hz)	Source Sound Level(dB)
50	68.1
63	61.2
80	69.4
100	61.3
125	51.2
160	48.2
200	50.3
250	48.7
315	48.5
400	51.5
500	51.2
630	50.3
800	49.3
1000	48.0
1250	46.6
1600	48.3
2000	45.9
2500	45.1
3150	45.9
4000	45.4
5000	44.8



Noise Sound Insulation Scenario Calculation Results

Project: Wilson Avenue Extension  
ProjectID: **Bedroom, Facade 90 deg to rail, night**

Date: 2021-04-29  
Outdoor level: NEF 24 or Leq24 56 or Ldn 57 dBA

Source Spectrum details:

100% Freight Train Diesel  
Corrections:

Receiving room:

Floor Area: 10.8 ft<sup>2</sup>  
Absorbtion: 120% of floor area

Construction Description:

Element 1: VIN1\_OSB11\_WS140(406)\_GFB152\_G13

Construction Type: 2by6 Wall  
Area: 0.20 m<sup>2</sup>  
Test ID: TLA-99-029a  
Test Date: 1999-01-21

Vinyl siding, 11 mm OSB, 140 mm wood studs on 406 mm centre with glass fibre cavity insulation, 1 of 13 mm gypsum board.

Element 2: GL3\_AIR13\_GL3

Construction Type: Window  
Area: 7.00 m<sup>2</sup>  
Test ID: TLA-99-149a  
Test Date: 1999-04-14

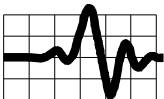
Vinyl slider window (seals not taped).

Sound Level vs. Frequency - Spectrum Values:  
Frequency(Hz) Indoor Sound Level(dB)

Frequency(Hz)	Indoor Sound Level(dB)
50	42.9
63	36.3
80	43.7
100	36.1
125	26.3
160	23.4
200	25.4
250	21.3
315	25.0
400	23.3
500	20.9
630	15.0
800	13.8
1000	9.7
1250	6.2
1600	6.9
2000	4.8
2500	3.6
3150	3.0
4000	5.5
5000	5.2

A-Weighted Sound Level vs. Frequency - Spectrum Values:  
Frequency(Hz) A-Wtd Sound Level(dBA)

Frequency(Hz)	A-Wtd Sound Level(dBA)
50	12.7
63	10.1
80	21.2
100	17.0
125	10.2
160	10.0
200	14.5
250	12.7
315	18.4
400	18.5
500	17.7
630	13.1
800	13.0
1000	9.7
1250	6.8
1600	7.9
2000	6.0
2500	4.9
3150	4.2
4000	6.5
5000	5.7



Transmission Loss vs. Frequency - Spectrum Values:

Frequency(Hz) Transmission Loss(dB)

Frequency(Hz)	Transmission Loss(dB)
50	19.7
63	19.4
80	20.2
100	19.7
125	19.3
160	19.3
200	19.4
250	21.9
315	18.0
400	22.7
500	24.8
630	29.8
800	30.0
1000	32.8
1250	34.9
1600	35.9
2000	35.5
2500	36.0
3150	37.2
4000	34.1
5000	33.7

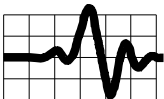
Single Number Ratings

Outdoor Sound Level:	56 dBA
<b>Indoor Sound Level:</b>	<b>27 dBA</b>
A-wtd Level Reduction:	29 dB
A-wtd Reduction re Standard Source:	27 dB
OITC Rating:	25 dB

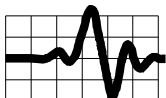
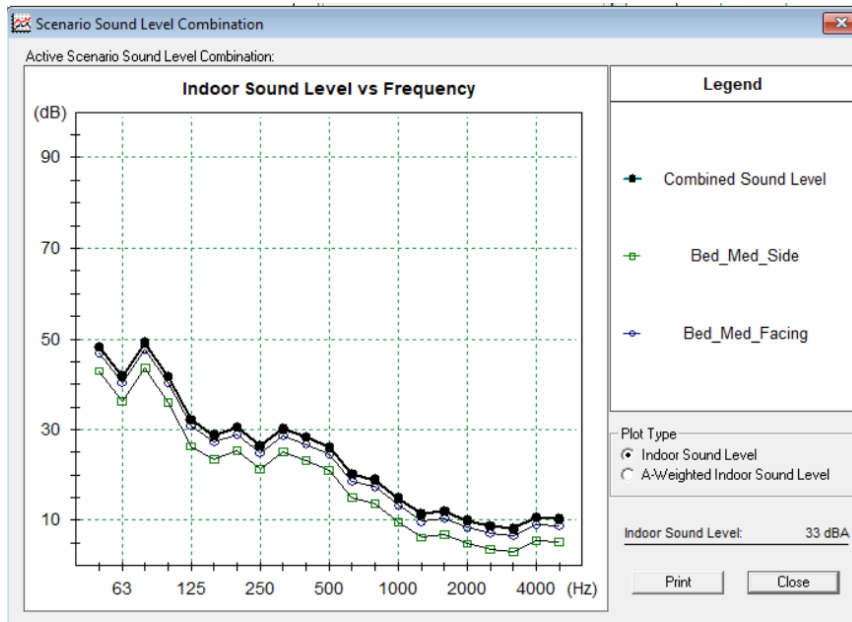
Source Sound Level vs. Frequency - Spectrum Values:

Frequency(Hz) Source Sound Level(dB)

Frequency(Hz)	Source Sound Level(dB)
50	65.1
63	58.2
80	66.4
100	58.3
125	48.2
160	45.2
200	47.3
250	45.7
315	45.5
400	48.5
500	48.2
630	47.3
800	46.3
1000	45.0
1250	43.6
1600	45.3
2000	42.9
2500	42.1
3150	42.9
4000	42.4
5000	41.8



**Combining to obtain Indoor Noise Level for Area B, Bedroom, Night:**

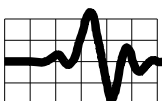


## **Appendix 2.6**

### **Reference Documents for Road and Rail Traffic Forecasts**

**Contents:**

- **Train Traffic Data from CN, 14 June 2021**
- **Road Traffic Data for 2033 from JD Northcote Engineering, 5<sup>th</sup> August 2021**



## Train Traffic Data, 14 June 2021 (Source: CN)

Date: 2021/06/14

KNG-222.23 - Sidney Street Belleville ON

Dear Michael:

**Re: Re: Train Traffic Data – CN Kingston Subdivision near Sidney Raod, Belleville ON**

---

The following is provided in response to Michael's 2021/04/30 request for information regarding rail traffic in the vicinity of Sidney Rd at approximately Mile 222.23 on CN's Kingston Subdivision.

Typical daily traffic volumes are recorded below. However, traffic volumes may fluctuate due to overall economic conditions, varying traffic demands, weather conditions, track maintenance programs, statutory holidays and traffic detours that when required may be heavy although temporary. For the purpose of noise and vibration reports, train volumes must be escalated by 2.5% per annum for a 10-year period.

Typical daily traffic volumes at this site location are as follows:

**\*Maximum train speed is given in Miles per Hour**

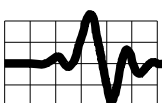
Type of Train	0700-2300			
	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	14	140	65	4
Way Freight	5	25	65	4
Passenger	29	10	95	2

Type of Train	2300-0700			
	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	9	140	65	4
Way Freight	6	25	65	4
Passenger	4	10	95	2

The volumes recorded reflect westbound and eastbound freight and passenger operations on CN's Kingston Subdivision.

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There are three (3) at-grade crossings in the immediate vicinity of the study area at Mile 221.34 Geddes Street, Mile 222.72 Farm Xing and Mile 222.90 Farm Xing. Anti-whistling bylaws are in effect at these crossings. Please note that engine warning whistles may be sounded in cases of emergency, as a safety and or warning precaution at station locations and pedestrian crossings and occasionally for operating requirements.

With respect to equipment restrictions, the gross weight of the heaviest permissible car is 286,000 lbs.



The double mainline track is considered to be continuously welded rail throughout the study area. The location is near CN Belleville Yard and train movements may exacerbate extra noise and vibration. Be advised, that any development within 1000m of a yard should take extra measures to understand and assess noise impacts and the creation of noise due to CN operations within the yard as this is not reflected in the data provided.

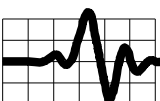
The Canadian National Railway continues to be strongly opposed to locating developments near railway facilities and rights-of-way due to potential safety and environmental conflicts. Development adjacent to the Railway Right-of-Way is not appropriate without sound impact mitigation measures to reduce the incompatibility. For confirmation of the applicable rail noise, vibration and safety standards, Adjacent Development, Canadian National Railway Properties at [Proximity@cn.ca](mailto:Proximity@cn.ca) should be contacted directly.

I trust the above information will satisfy your current request.

Sincerely,

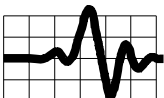
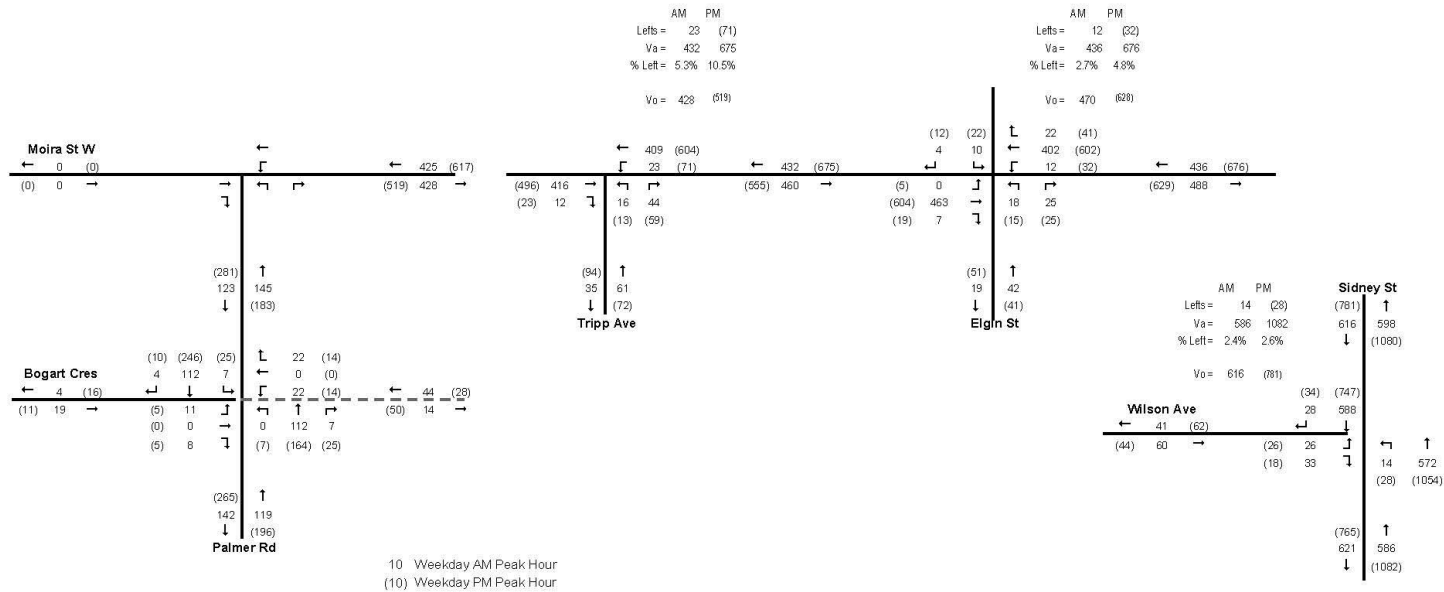


Michael Vallins P.Eng  
Manager, Public Works- Eastern Canada  
[Permits.gld@cn.ca](mailto:Permits.gld@cn.ca)





**Project Road Traffic Data showing midblock volumes for Year 2033 (Source: from JD Northcote Engineering, 5<sup>th</sup> August 2021)**



## Appendix 3

# Stationary Noise Impacts

### Contents:

#### 3.1 Figures

Figure 3.1.1: Area Plan showing the proposed Wilson Avenue Extension Subdivision, nearby sources of stationary noise and selected noise monitoring locations (NML)

#### 3.2 Tables

Table 3.2.1: Noise Monitoring Locations

Table 3.2.2: MECP Exclusion Limit Values for One-Hour Equivalent Sound Level (Leq, dBA) at Outdoor Points of Reception

Table 3.2.3: MECP Exclusion Limit Values for One-Hour Equivalent Sound Level (Leq, dBA) at Plane of Window of Noise Sensitive Spaces

Table 3.2.4: Acoustic Assessment Summary Table

#### 3.3 Noise Measurement Data

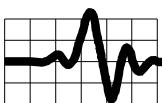
Table 3.3.1 Noise Monitoring Location Measurement Data – NML 1

Table 3.3.2 Noise Monitoring Location Measurement Data – NML 2

Table 3.3.3 Noise Monitoring Location Measurement Data – NML 3

Table 3.3.4 Noise Monitoring Location Measurement Data – NML 4

#### 3.4 Instrument Calibration Certificates

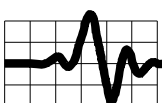


## **Appendix 3.1**

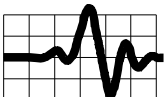
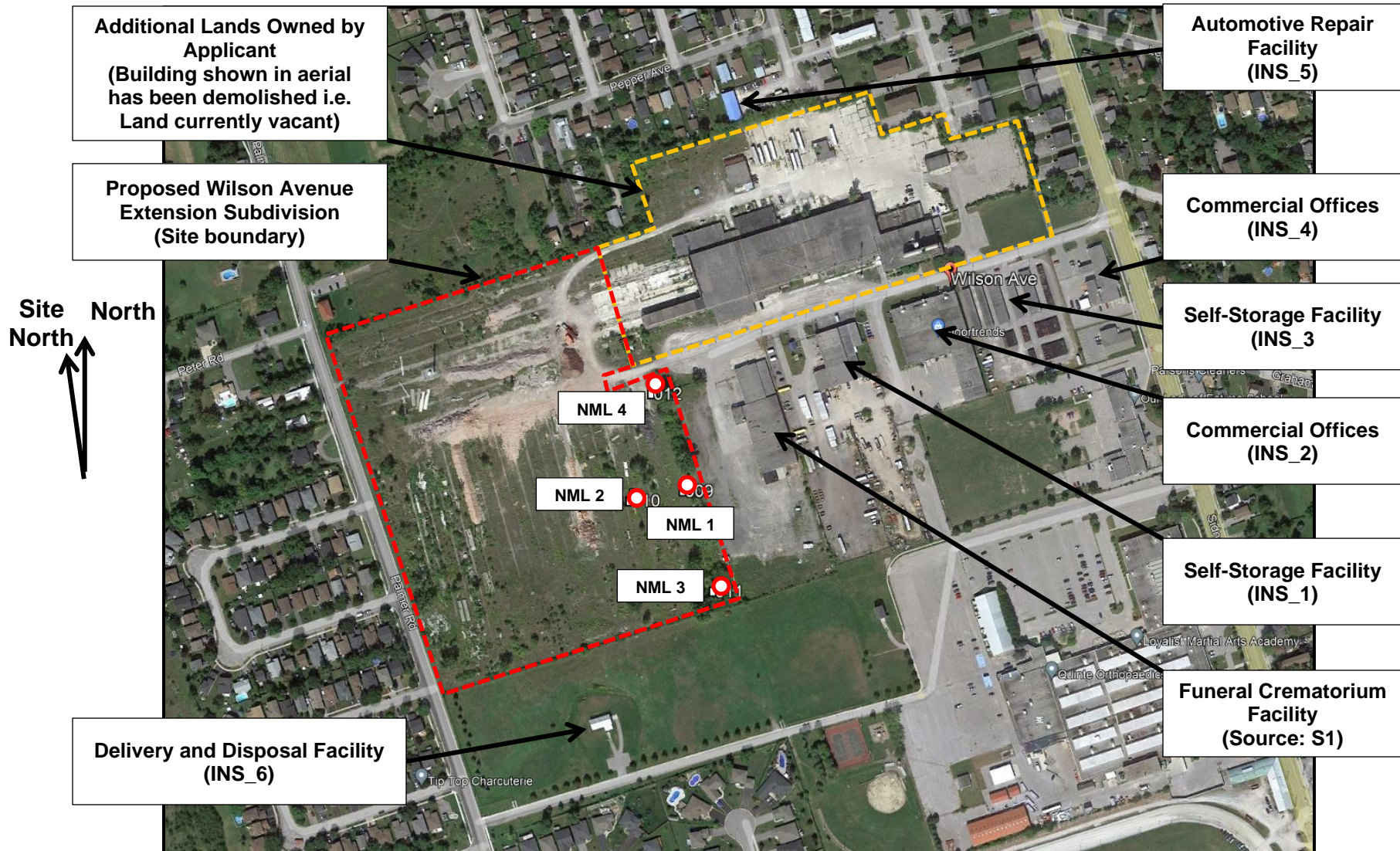
### **Figures**

#### **Contents:**

Figure 3.1.1: Area Plan showing the proposed Wilson Avenue Extension Subdivision, nearby sources of stationary noise and selected noise monitoring locations (NML)



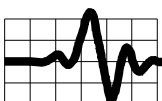
**Figure 3.1.1: Area Plan showing the proposed Wilson Avenue Extension Subdivision, nearby sources of industrial noise and selected noise monitoring locations (NML)**





**Table 3.2.1: Noise Monitoring Locations**

<b>Noise Measurement Location (NML)</b>	<b>Nearby Sources of Potential Stationary Noise (Source)</b>
NML 1	S1
NML 2	S1
NML 3	S1
NML 4	S1



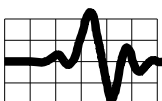
**Table 3.2.2: MECP Exclusion Limit Values for One-Hour Equivalent Sound Level (Leq, dBA) at Outdoor Points of Reception**

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	55
19:00 – 23:00	50	45	40	55

**Table 3.2.3: MECP Exclusion Limit Values for One-Hour Equivalent Sound Level (Leq, dBA) at Plane of Window of Noise Sensitive Spaces**

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	50	45	60
19:00 – 23:00	50	50	40	60
23:00 – 07:00	45	45	40	55

Note: Sound level limits are based on 1-hour equivalent sound levels.

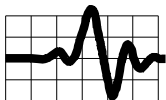


**Table 3.2.4: Acoustic Assessment Summary Table**

Noise Measurement Location (NML)	Monitored Sound Level at NML Daytime Period (dBA)	Performance Limit at POR Daytime Period (dBA) <sup>1</sup>	Performance Limit at POR Evening Period – 19:00 to 23:00 (dBA) <sup>1</sup>	Performance Limit at POR Nighttime Period 23:00 to 07:00 (dBA) <sup>1</sup>	Compliance with Performance Limit (Yes/No)
NML 1	42.6	50	50	45	Yes
NML 2	41.2	50	50	45	Yes
NML 3	40.9	50	50	45	Yes
NML 4	37.6	50	50	45	Yes

Notes:

1. Performance limits are based on 1-hour equivalent sound levels, Leq except where site reconnaissance determined LAS 90 data was more applicable. Refer Section 3.6 for further details.



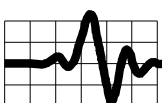


# **Appendix 3.3**

## **Noise Measurement Data**

### **Contents:**

- Table 3.3.1 Noise Monitoring Location Measurement Data – NML 1
- Table 3.3.2 Noise Monitoring Location Measurement Data – NML 2
- Table 3.3.3 Noise Monitoring Location Measurement Data – NML 3
- Table 3.3.4 Noise Monitoring Location Measurement Data – NML 4



**Table 3.3.1 Noise Monitoring Location Measurement Data – NML 1**

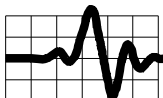
Project Name	Start Time	Elapsed Time	LAeq	LAS90	Source	Notes
Project 001	2021-07-10 11:50	00:05:10	42.5	37.7	S1	Low urban hum.
Project 002	2021-07-10 11:56	00:02:17	42.6	39.4	S1	Noise from road traffic mixed with natural sounds i.e. noise from leaves rustling audible.
<b>Result</b>			42.6	38.6		Occasional car engines noise associated with revving was audible in distance.

**Table 3.3.2 Noise Monitoring Location Measurement Data – NML 2**

Project Name	Start Time	Elapsed Time	LAeq	LAS90	Source	Notes
Project 003	2021-07-10 12:02	00:05:01	41.3	37.4	S1	Low urban hum.
Project 004	2021-07-10 12:07	00:00:06	41.6	38.5	S1	Noise from road traffic mixed with natural sounds i.e. noise from leaves rustling audible.
Project 005	2021-07-10 12:08	00:01:02	40.5	39.2	S1	Occasional car engines noise associated with revving was audible in distance.
<b>Result</b>			41.2	38.4		Train pass by audible during measurement period 'Project 003'. Whistle noise from train faintly audible during measurement period "Project 004"

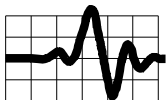
**Table 3.3.3 Noise Monitoring Location Measurement Data – NML 3**

Project Name	Start Time	Elapsed Time	LAeq	LAS90	Source	Notes
Project 006	2021-07-10 12:14	00:02:31	41.8	34.3	S1	Low urban hum.
Project 007	2021-07-10 12:17	00:02:48	39.6	34.8	S1	Noise from road traffic mixed with natural sounds i.e. noise from leaves rustling audible.
<b>Result</b>			40.9	34.6		Occasional car engines noise associated with revving was audible in distance. Industrial noise faintly audible in distance



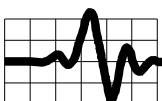
**Table 3.3.4 Noise Monitoring Location Measurement Data – NML 4**

Project Name	Start Time	Elapsed Time	LAeq	LAS90	Source	Notes
Project 008	2021-07-10 12:25	00:02:37	41.6	36.8	S1	Moderate urban hum audible.
Project 009	2021-07-10 12:29	00:01:15	49.0	38.3	S1	Noise from road traffic very audible. Predominantly coming from Sidney Street.
Result			46.7	37.6		Noise from natural sounds i.e. bird call / leaves rustling audible. Strong influence of bird call during measurement period "Project 009". Occasional car engine noise associated with revving was audible in distance.



# **Appendix 3.4**

## **Instrument Calibration Certificates**





[www.pylonelectronics.com](http://www.pylonelectronics.com)

**Pylon Electronics Inc.**  
147 Colonnade Road  
Ottawa, ON K2E 7L9

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## CERTIFICATE OF CALIBRATION

<b>Description</b>	SOUND ANALYZER	<b>Work Order</b>	N0909084
<b>Model Number</b>	2270	<b>Serial Number</b>	3008643
<b>Instrument Id</b>	N/A	<b>Cal Procedure</b>	BE1713-32
<b>Manufacturer</b>	BRUEL & KJAER	<b>Cal Date</b>	22 Feb 2021
<b>Customer Name</b>	FREEFIELD LTD.	<b>Recall Cycle</b>	52 Weeks
		<b>Next Cal Date</b>	22 Feb 2022
		<b>Purchase Order</b>	Credit Card

**Calibration Environment:** Temperature 23.1 °C Relative Humidity 36.2 %RH

**Received Condition:** Within Tolerance

**Completed Condition:** Within Tolerance

**Remarks:** The unit calibrated with Preamp ZC 0032 S/N 23073 and Mic 4189 S/N 2985656

### Standards Used to Establish Traceability

<u>Instrument Type</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due Date</u>
SOUND LEVEL CALIBRATOR	4231	240-1151	15 Sep 2021
1/2" MICROPHONE	4166	240-709	20 Jun 2021
PISTONPHONE	4220	354-017	2 Nov 2021
FFT SIGNAL ANALYZER SYSTEM	3550	354-759	15 Oct 2021
MICROPHONE PREAMP	2639T	355-164	24 Feb 2021

Pylon certifies that, at the time of calibration, the above listed instrument meets or exceeds all of the specifications defined on the Test Data Sheet (TDS), unless otherwise indicated. The Certificate received and completed conditions and the TDS specifications are based on the procedure(s) and/or specification(s) referenced on the TDS unless otherwise indicated. Any statement of compliance is made without taking measurement uncertainty into account and is based on the instrument's performance against the test limits documented on the test data sheet.

The above listed instrument has been calibrated using standards that are traceable to the International System of Units (SI) through a National Metrological Institute (such as NRC or NIST). Pylon's quality system meets the requirements of ISO/IEC 17025:2017. Unless otherwise specified, Pylon maintains a minimum of a 4:1 ratio between the equipment under test and the measurement system.

This report consists of two parts with separate page numbering schemes: the Certificate of Calibration and the Test Data Sheet (TDS). Copyright of this report is owned by the issuing laboratory and may not be reproduced, other than in full, except with the prior written permission of the issuing laboratory.

Test data As Found and Final (as left) results are the same unless reported otherwise. Certificate remarks identify if adjustments were performed.

Metrologist : 062

Quality Assurance: 301

Date of Issue: 23 Feb 2021

F083 Rev 16  
pylcert1

HALIFAX

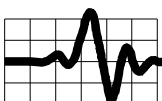
MONTREAL

OTTAWA

TORONTO

EDMONTON

CALGARY









[www.pylonelectronics.com](http://www.pylonelectronics.com)

**Pylon Electronics Inc.**  
147 Colonnade Road  
Ottawa, ON K2E 7L9

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## CERTIFICATE OF CALIBRATION

Description	SOUND LEVEL CALIBRATOR	Work Order	N0909086
Model Number	4231	Serial Number	2730374
Instrument Id	N/A	Cal Procedure	33K3-4-2871-1
Manufacturer	BRUEL & KJAER	Cal Date	22 Feb 2021
Customer Name	FREEFIELD LTD.	Recall Cycle	52 Weeks
		Next Cal Date	22 Feb 2022
		Purchase Order	Credit Card

Calibration Environment: Temperature 22.9 °C Relative Humidity 35.2 %RH

Received Condition: Within Tolerance

Completed Condition: Within Tolerance

### Standards Used to Establish Traceability

Instrument Type	Model	Asset #	Cal Due Date
4145 BRUEL&KJAER 1" MICROPHONE	4145	240-054	11 Feb 2022
1/2" MICROPHONE	4166	240-709	20 Jun 2021
PISTONPHONE	4220	354-017	2 Nov 2021
FFT SIGNAL ANALYZER SYSTEM	3550	354-759	15 Oct 2021
MICROPHONE PREAMP	2639T	355-164	24 Feb 2021

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Metrologist : 062

Quality Assurance: 301

Date of Issue: 23 Feb 2021

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pylcert1

HALIFAX

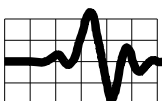
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OTTAWA

TORONTO

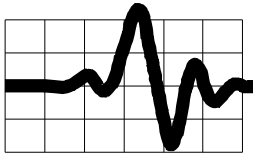
EDMONTON

CALGARY







**RESUMÉ: Dr. HUGH WILLIAMSON, P.Eng.**

**QUALIFICATIONS:** Ph.D. Mechanical Engineering, University of New South Wales, 1972  
B.Sc. Mechanical Engineering, (with Distinction), University of Alberta, 1967  
Member, Professional Engineers, Ontario  
Member, Canadian Acoustical Association

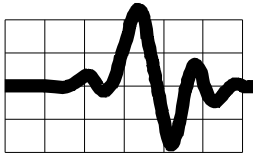
- KEY COMPETENCIES:**
- Environmental noise and vibration assessments, Environmental Compliance Approval (ECA). Noise assessment for land use planning
  - Architectural and building acoustics, acoustics of office spaces, meeting rooms, auditoriums and studios, noise and vibration control of building mechanical services.
  - Industrial noise and vibration assessment and control.
  - Transportation noise and vibration.

**PROFESSIONAL EXPERIENCE:**

Hugh Williamson is a professional engineer with many years of experience in the measurement, analysis and control of noise and vibration. Freefield Ltd. was incorporated in 2017 and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to joining Freefield Ltd. Hugh Williamson founded and directed Hugh Williamson Associates Inc. which specialized in consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. His career included extensive periods in industry as well as university level research and teaching. He is a former Director of the Acoustics and Vibration Unit at the Australian Defence Force Academy. He has published over 50 engineering and scientific papers and has been an invited speaker on noise and vibration at national and international conferences. He has more than 25 years of experience as a consultant.

**CLIENT LIST:**

Hugh Williamson has provided consulting services to large and small clients including: National Research Council, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group, R. W. Tomlinson Limited, Geo. Tackaberry Construction, Miller Paving, City of Ottawa.



## RESUMÉ: MICHAEL WELLS

**QUALIFICATIONS:** Registered Architect of NSW, Registration Number: 8111

B. Architecture (Hons), University of Sydney, 2002

B.Sc. Architecture, University of Sydney, 1999

Member, Canadian Acoustical Association

Member, Australian Acoustical Society

Associate Member, INCE-USA

**KEY**

**COMPETENCIES:**

- Environmental noise and vibration assessments, Environmental Compliance Approval (ECA). Noise assessment for land use planning.
- Architectural and building acoustics, acoustics of office spaces, meeting rooms, auditoriums and studios, noise and vibration control of building mechanical services.
- Industrial noise and vibration assessment and control.
- Transportation noise and vibration.
- Design services including sketch design, design development (development / permit applications), contract documents, tendering and contract administration.

**PROFESSIONAL EXPERIENCE:**

Michael Wells is a professional Architect registered in NSW, Australia, with many years of experience in the measurement, analysis and control of noise and vibration. Michael Wells is a founding Director of Freefield Ltd. which was incorporated in 2017, and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to establishing Freefield Ltd., his career included working for Hugh Williamson Associates Inc. specializing in acoustics, noise and vibration consulting services, and, the founding of Michael Wells Architect in Sydney, Australia, specializing in the design of institutional, commercial and residential projects. He is the former Director of Architectural Workshops Australia and Vision Blue Pty Ltd. He has more than 15 years of experience as a consultant.

**CLIENT LIST:**

Michael Wells has provided consulting services to large and small clients including: National Research Council, R. W. Tomlinson, G. Tackaberry & Sons Construction, Miller Paving, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group and Industry Canada.