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1027458 ONTARIO INC.

# Noise and Vibration Assessment

Banwell and McHugh Mixed Use Developments  
Windsor, Ontario

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## 1.0

# Introduction

## 1.1

## Purpose and Objectives

Dillon Consulting Limited (Dillon) was retained by 1027458 Ontario Inc. (the Developer) to complete a noise and vibration assessment as requested by the City of Windsor for proposed mixed-use developments. The proposed developments are located at the corners of Banwell Road and McHugh Street, and Banwell Road and Leathorne Street, in Windsor, Ontario. This study has been completed in support of Zoning By-law and Official Plan Amendments application for the proposed development.

The noise and vibration assessment presented herein was prepared in accordance with the guidelines and requirements of the City of Windsor, the Ontario Ministry of Environment, Conservation and Parks (MECP) noise publication NPC-300 and MECP's land-use compatibility guidelines (D-series). This assessment focuses on the noise and vibration impacts from nearby transportation sources and stationary sources (i.e., nearby industrial operations) on the proposed development.

## 1.2

## The Project and Surrounding Areas

The proposed developments are located at two lots:

- **North 'B' Site** – the parcel located on the west side of Banwell Road, between the south side of the unassumed section of Leathorne Street and the north side of McHugh Street.
- **South Site** – the parcel located north of the VIA Railway corridor at the southwest corner of the Banwell Road and McHugh Street intersection.

There are residential dwellings and light industrial facilities in the immediate vicinity of the proposed development parcel. The north site is bordered by a condominium complex to the north, residential dwellings to the east (across Banwell Road) and west, and McHugh Street to the south. The south site is bordered by McHugh Street to the north, a church to the east (across Banwell Road), residential dwellings to the west, and a VIA Rail right-of-way to the south.

The subject site and surrounding area is shown in **Figure 1**. The conceptual development plan for both sites is shown in **Appendix A**.

The proposed development land parcels are currently vacant. The proposed development at the McHugh site consists of:

- Two 10-storey multiple residential dwellings;
- One eight-storey multiple residential dwelling;
- One six-storey multiple residential dwellings;
- One two-storey business office; and
- One respite home.

The proposed development at the Leathorne site consists of five (5) six-storey multiple residential dwellings.

## 2.0 Impacts from the Environment on the Proposed Development

This section investigates noise impacts from nearby transportation sources and stationary sources on the proposed development.

### 2.1 Transportation Noise Assessment

The transportation sources with the potential to impact the proposed development include rail traffic from VIA Rail's right-of-way and road traffic along Banwell Road, McHugh Street, and Tecumseh Road East. Impacts from rail and road were predicted and compared against the applicable criteria in the Ontario Ministry of Environment, Conservation and Parks (MECP) noise guideline publication, *NPC 300 – Environmental Noise Guideline – Stationary and Transportation Sources – Approvals and Planning* (2013). NPC-300 outlines noise level criteria for sensitive land uses, which assist in determining requirements for façade construction, ventilation requirements, warning clauses, and potential noise barriers for the proposed development.

#### 2.1.1 Noise Criteria

The applicable transportation noise criteria, as outlined in Part C of NPC-300, is presented in **Table 1** through **Table 5**. **Table 1** summarizes the indoor sound level limits based on the type of space assessed, time of day, transportation noise source, and the maximum allowable equivalent sound levels from railway sources. The indoor noise levels are based on the assumption of closed windows and doors.

**Table 1: Indoor Sound Level Limits for Road and Rail**

Type of Space	Time Period	Equivalent Sound Level - $L_{eq}$	
		Road	Rail
General offices, reception areas, retail stores, etc.	Daytime 07:00 - 23:00	50 dBA	45 dBA
Living/dining areas of residences, hospitals, nursing homes, schools, daycares, etc.	Daytime 07:00 - 23:00	45 dBA	40 dBA
Living/dining areas of residences, hospitals, nursing homes, etc. (except schools and daycares)	Night-time 23:00 - 07:00	45 dBA	40 dBA
Sleeping quarters of residences	Daytime 07:00 - 23:00	45 dBA	40 dBA
	Night-time 23:00 - 07:00	40 dBA	35 dBA
Sleeping quarters of hotels	Night-time 23:00 - 07:00	45 dBA	40 dBA

**Table 2** outlines the maximum equivalent plane-of-window sound levels for road and rail where if exceeded, a detailed building component design assessment is required to ensure the indoor sound level limits (see **Table 1**) are achieved.

**Table 2: Requirements for Building Component Assessment**

Assessment Location	Time Period	Equivalent Sound Level - $L_{eq}$	
		Road	Rail <sup>[1]</sup>
Plane of window for living area or sleeping quarters	Daytime (07:00 - 23:00)	65 dBA	60 dBA
	Night-time (23:00 - 07:00)	60 dBA	55 dBA

Note: [1] Whistle noise is included for the building component and indoor noise assessment.

MECP's NPC-300 Noise Guideline outlines façade construction requirements for proposed residential developments within 100 metres of rail tracks, shown in **Table 3**. These requirements apply only to the first row of dwellings.

**Table 3: Façade Construction Requirements**

Assessment Location	Equivalent Sound Level – $L_{eq}$ 24hr <sup>[1]</sup>	Façade Construction Requirement
Plane of window for living area or sleeping quarters	> 60 dBA	Brick veneer or acoustical equivalent
	≤ 60 dBA	No requirement

Note: [1] Whistle noise is included for façade construction requirements.

**Table 4** summarizes potential noise warning clauses and ventilation requirements that should be used to warn of potential annoyance due to existing noise sources related to road and rail. Whistle noise is not included in the determination of warning clause requirements.

**Table 4: Ventilation and Warning Clause Requirements for Road and Rail**

Assessment Location	Time Period	Equivalent Sound Level - $L_{eq}$ Road/Rail <sup>[1]</sup>	Ventilation and Warning Clause Requirements <sup>[2]</sup>
Plane of window for living area or sleeping quarters	Daytime (07:00 - 23:00)	≤ 55 dBA	No Requirement
		> 55 dBA and ≤ 65 dBA	Provision for the installation of central air conditioning with a Type C warning clause
		> 65 dBA	Installation of central air conditioning with a Type D warning clause

Assessment Location	Time Period	Equivalent Sound Level - $L_{eq}$ Road/Rail <sup>[1]</sup>	Ventilation and Warning Clause Requirements <sup>[2]</sup>
Plane of window for living area or sleeping quarters	Nighttime (23:00 - 7:00)	$\leq 50$ dBA	No Requirement
		$> 50$ dBA and $\leq 60$ dBA	Provision for the installation of central air conditioning with a Type C warning clause
		$> 60$ dBA	Installation of central air conditioning with a Type D warning clause

Note: [1] Whistle noise is not included in combined road/rail assessments for warning clause requirements.

[2] Warning clause types and requirements are provided in **Appendix C**.

The applicable noise criteria for Outdoor Living Areas (OLAs) specific to surface transportation are presented in **Table 5**. If the 16-Hour Equivalent Sound Level ( $L_{eq}$  16hr) at an OLA is greater than 55 dBA and less than or equal to 60 dBA, noise control measures may be applied to reduce the sound level to 55 dBA. Otherwise, prospective purchasers or tenants should be informed of potential elevated noise levels by way of warning clause Type A. For a  $L_{eq}$  16h of greater than 60 dBA, noise mitigation measures are required to reduce the noise levels to 55 dBA or less. Whistle noise is not included in the determination of the rail outdoor sound level.

**Table 5: OLA Level Limits for Road and Rail Noise**

Assessment Location	Equivalent Sound Level - $L_{eq}$ 16hr <sup>[1],[2]</sup> Road/Rail	Noise Control Measures and Warning Clause Requirements
Outdoor Living Area	$\leq 55$ dBA	No requirement
	$> 55$ dBA and $\leq 60$ dBA	Installation of noise control measure OR a Type A warning clause <sup>[1]</sup>
	$> 60$ dBA	Installation of noise control measure with a Type B warning clause

Notes: [1] Daytime only (07:00 - 23:00)

[2] Whistle noise is not included in assessment of rail noise for warning clause requirements.

### 2.1.2 Transportation Sources

In assessing potential transportation noise impacts on the proposed development, VIA Rail's Chatham subdivision, Banwell Road, McHugh Street, and Tecumseh Street East were analyzed as surface transportation sources. All traffic data used in modelling road and rail traffic is included in **Appendix B**.



### **Rail Noise Sources**

The south site of the proposed development is located directly north of VIA Rail's Chatham subdivision. Daily passenger and freight rail traffic in the area was obtained from VIA Rail as of February 21<sup>st</sup>, 2023. Daily passenger rail traffic for the year 2034 was projected based on a per annum growth of 2.5%. The City of Windsor's anti-whistling by-law is in effect in the development area; however, during a site visit completed by Dillon staff on March 15<sup>th</sup>, 2023, whistle noise was observed during train passbys. As there is an at-grade crossing at Banwell Road, trains may use their whistles in an emergency or to warn trespassers. As per the anti-whistling by-law, whistle noise was not considered as a transportation noise source. Rail traffic data forecasted to 2034 is presented in **Table 6**.

**Table 6: Future (2034) Rail Traffic Data**

<b>Train Type</b>	<b>Daytime Cars (07:00-23:00)</b>	<b>Nighttime Cars (23:00-07:00)</b>	<b>Daytime Locomotives (07:00-23:00)</b>	<b>Nighttime Locomotives (23:00-07:00)</b>	<b>24hr Locomotives</b>	<b>Speed [km/h]</b>
Passenger	66	22	17	6	88	128
Freight	193	193	6	6	386	96

### **Road Noise Sources**

The development area is located west of Banwell Road, north of Tecumseh Road East, and is bisected by McHugh Street. Average annual daily traffic (AADT) for each roadway was determined through two methods:

1. Historic AADT counts provided by the City of Windsor; and
2. Peak hour turning movement counts (TMC) were gathered in 2023 for the intersections of Banwell Street and McHugh Street, and Banwell Street and Tecumseh Road East. A peak hour TMC to AADT factor of 11 was applied to determine associated AADTs for each roadway.

The maximum AADTs were selected to represent the roadways. A 90% and 10% split for daytime and nighttime traffic volumes, respectively, were used in the analysis. The future traffic volumes were assumed to have a 1.0% annual compound growth rate. The percentage of heavy and medium trucks was taken from the peak hour turning movement counts. The forecasted future (2034) road traffic data is presented in **Table 7**.

**Table 7: Future (2034) Road Traffic Data**

<b>Roadway</b>	<b>2033 AADT</b>	<b>Medium Trucks (%)</b>	<b>Heavy Trucks (%)</b>	<b>Speed (km/h)</b>
Banwell Road	18,857	1.5	1.41	50

Roadway	2033 AADT	Medium Trucks (%)	Heavy Trucks (%)	Speed (km/h)
McHugh Street	11,726	1.59	1.38	50
Tecumseh Road East	25,837	1.18	1.1	60

### 2.1.3 Predicted Sound Level

The noise analysis was completed using Cadna/A, a noise propagation software. The Cadna/A software includes the implementation of the Transportation Noise Model (TNM) roadway algorithms, as well as the Federal Transit Administration/Federal Railroad Administration (FTA/FRA) railway algorithms. The model is capable of incorporating various site specific features, such as elevation, berms, absorptive grounds, and barriers to accurately predict noise levels at specific receptors, pertaining to noise emissions from a particular noise source. The model accounts for reduction in sound level due to increased distance and geometrical spreading, air absorption, ground attenuation, and acoustical shielding by intervening structures and topography. The model is considered conservative as it represents atmospheric conditions that promote propagation of sound from source to receptor.

#### Railway Analysis

The railway noise impact assessment was conducted using the FRA algorithm using Cadna/A. The model's inputs are outlined in **Section 2.1.2**.

In order to confirm the modelling results of FRA protocol implemented through Cadna/A a comparative analysis was completed for rail traffic noise modelling, in which the results from FRA in Cadna/A were compared against those of STEAM implemented through STAMSON Version 5.04. This comparative analysis is discussed in **Sub-section 2.1.5**.

#### Roadway Analysis

The assessment for roadway impact noise was completed using the TNM, developed by the Federal Highway Administration (FHWA), implemented through Cadna/A. The model inputs used for the TNM algorithm are outlined in **Section 2.1.2**.

In order to confirm the modelling results of TNM protocol implemented through Cadna/A a comparative analysis was completed for road traffic noise modelling, in which the results from TNM in Cadna/A were compared against those of ORNAMENT implemented through STAMSON Version 5.04. This comparative analysis is discussed in **Section 2.1.5**.

### Sensitive Receptor Locations

For the purposes of this study, the Building Evaluation feature was used in Cadna/A to assess the worst-case façade impacts throughout the proposed development. Based on the preliminary site plan for the proposed development, no Outdoor Living Areas (OLAs) have been identified that require assessment of impact due to transportation noise. The private balconies of the proposed development are assumed to be less than 4m in depth, and therefore are not considered OLAs per MECF NPC-300.

### Transportation Noise Impacts – Plane of Window

**Table 8** summarizes the predicted building façade noise levels from rail noise sources at the sensitive receptors within the proposed development.

**Table 8: Combined Road and Rail Noise Prediction Summary Table - Façade Impacts**

Building	Equivalent Sound Level - $L_{eq}^{[1],[2]}$ [dBA]						
	Road Impacts		Railway Impacts		Combined Road and Rail <sup>[3]</sup>		24hr Railway Impacts <sup>[4]</sup>
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	
Building 'A' (McHugh)	62	56	55	56	63	58	N/A
Building 'B' (McHugh)	62	56	61	62	63	62	61
Building 'C' (McHugh)	53	46	56	57	57	57	N/A
Building 'D' (McHugh)	55	48	60	61	61	62	61
Respite Home (McHugh)	58	51	46	47	58	52	N/A
Building 'E' (Leathorne)	62	56	51	52	63	57	N/A
Building 'F' (Leathorne)	63	57	50	51	63	57	N/A
Building 'G' (Leathorne)	64	57	48	50	64	57	N/A
Building 'H' (Leathorne)	64	58	48	49	65	58	N/A
Building 'I' (Leathorne)	65	59	47	48	65	59	N/A

- Notes: [1]  $L_{eq}$  represents maximum predicted impacts along façade.  
 [2] Predicted noise levels that exceed the applicable limits are presented in **bold**.  
 [3] Combined impacts may not be equal to road plus rail, as maxima may be in different locations along the façade.  
 [4] 24hr railway impacts are only assessed at the first row of residences that are within 100 m of the railway.

The predicted transportation sound levels for combined road and rail impacts at the building façades of the proposed development are presented in **Figure 2** and **Figure 3**, for the Banwell site and the Leathorne site, respectively.

## 2.1.4 Noise Control Measures

### Façade Construction Recommendations

Based on the predicted façade sound levels shown in **Table 8**, and the threshold criteria outlined in **Table 2**, a detailed building component design analysis is required for Buildings 'A', 'B', 'C', and 'D'. Additionally, based on the threshold criteria for 24-hour rail noise set in **Table 3**, the south façades of Buildings 'B' and 'D' are to be built to a minimum of brick veneer or masonry equivalent construction (an acoustical equivalent of STC 54). An initial building component analysis is shown in **Table 9**. As detailed floor plans are not yet available, typical unit layouts were assumed. The predicted maximum impacts for road, locomotive, and train car noise were used to assess the required glazing for each building.

**Table 9: Building Component Analysis Using Maximum Impacts**

Building	Maximum Required Glazing (STC)	
	Living/Dining Area	Sleeping Quarters
Building 'A' (McHugh)	25	27
Building 'B' (McHugh)	28	32
Building 'C' (McHugh)	23	26
Building 'D' (McHugh)	27	31

For all other buildings with the proposed development, windows conforming to the Ontario Building Code (OBC) are anticipated to be sufficient to ensure the indoor sound level criteria is met (as outlined in **Table 1**). Windows which meet the structural and energy saving requirements of the OBC typically have STC29 / STC30 ratings.

The above mentioned STC ratings are conservatively calculated and represent the recommended minimum STC ratings for the windows. Windows should be carefully selected to ensure the entire assembly (frame and glazing) meets the specified minimum STC ratings. It is recommended that manufacturer tests and specifications be reviewed by an Acoustical Consultant upon selection.

Sensitive spaces located on corners of buildings, which have multiple façade exposure and potential contribution from multiple sources may require an STC increase of 3. As the design progresses, the

façade and glazing requirements should be reviewed by an Acoustical Consultant, ideally at the Site Plan Approval (SPA) stage, to confirm or update the above recommended STC ratings.

### Ventilation Requirements and Warning Clauses

Based on the predicted façade sound levels shown in **Table 8**, and the threshold criteria outlined in **Table 4**, Buildings 'B' and 'D' will require installation of central air conditioning and a Type D warning clause. The remainder of the proposed development requires a provision for the installation of central air conditioning and Type C warning clause.

Additionally, VIA requires that a warning clause regarding the potential for noise and vibration impacts be applied to all sensitive locations within the 300m of the railway right-of-way.

All warning clauses should be included in agreements that are registered on Title for all Offers of Purchase and Sale, lease/rental agreements, and condominium declarations. The list of applicable warning clauses required for the proposed development are provided in **Appendix C**.

#### 2.1.5 TNM/FTA Protocol Confirmation

In order to demonstrate appropriate implementation of Transportation Noise Model (TNM) through Cadna/A, noise modelling results obtained through the TNM protocol were compared against traffic noise modelling using MECP's ORNAMENT implemented through STAMSON version 5.04. Building G, 6<sup>th</sup> floor, east façade was used for this comparative analysis. The comparison results are presented in **Table 10**.

**Table 10: TNM Protocol in Cadna/A and ORNAMENT Comparison**

Assessment Location	TNM Cadna/A Result	ORNAMENT STAMSON Result	TNM Cadna/A Modelling Parameters	ORNAMENT STAMSON Modelling Parameters
Building 'G', South Façade, 6 <sup>th</sup> floor	64 dBA	64 dBA	Ground Absorption = 0.2	Absorptive Ground Surface

Similarly, noise modeling results obtained through FRA protocol through Cadna/A were compared against rail modelling using MECP's STEAM implemented through STAMSON version 5.04. The comparison results are shown in **Table 11**.

Table 11: FTA/FRA Protocol in Cadna/A and STEAM Comparison

Assessment Location	FTA/FRA Cadna/A Result	STEAM STAMSON Result	FTA/FRA Cadna/A Modelling Parameters	STEAM STAMSON Modelling Parameters
Building 'D', South Façade, 2 <sup>nd</sup> floor	58 dBA	58 dBA	Ground Absorption = 0.6	Absorptive Ground Surface

The results indicate that the predicted noise impacts obtained through TNM and FRA protocols in Cadna/A and those of ORNAMENT and STEAM are equivalent. The receptor locations assessed in this comparative study are presented in **Figure 4**.

The STAMSON model output is provided in **Appendix D**.

## 2.2 Stationary Noise Assessment

A review of the site and surrounding area has been conducted to identify potential stationary sources (e.g., industrial / commercials) that have the potential to impact the proposed sensitive use. A site visit was completed by Dillon staff on March 15<sup>th</sup>, 2023 for the purpose of classifying facilities in proximity to the proposed developments, identifying potential sources of noise, and classifying the acoustic environment.

### 2.2.1 MECP Guideline D-6 Compability between Industrial Facilities

The MECP's land-use compatibility guidelines (D-series) are intended to prevent or minimize the encroachment of sensitive land uses upon industrial/commercial land uses and vice versa, as these two types of land uses are normally incompatible, due to possible adverse effects (e.g., noise) on the sensitive land use. As per the guideline, potential noise impact from commercial / industrial establishments within the potential influence area/or recommended minimum separation distance, as outlined in D-6 (see **Table 12**), should be assessed.

**Table 12: Guideline D-6 Potential Influence Area and Recommended Minimum Separation Distance**

Industrial Classification <sup>[1]</sup>	Area of Influence	Recommended Minimum Separation Distance
Class I	70 m	20 m
Class II	300 m	70 m
Class III	1000 m	300 m

Note: [1] Industrial classification are outlined in Guideline D-6, and presented in **Appendix E**.

### 2.2.2 Facilities

The land use planning guide, *D-6 Compatibility between Industrial Facilities*, was used for the classification of the surrounding industrial facilities and the compatible proximities for the proposed sensitive land use. The criteria for classification of industrial categories are presented in **Appendix E**.

**Table 13** describes the industries that were identified with the potential to have noise impacts on the proposed development.

**Table 13: Facilities with Proximity to Proposed Development**

Facility and Address	Industrial Classification	Description of Operations	Environmental Compliance Approval
Ideas Cabinets and Countertops, 11210 Tecumseh Road E	Class 1	Material cutting, delivery truck movements	No
DonTrans Trucking Facility, 11000 Tecumseh Road E	Class 1	Idling trucks, truck maintenance (pneumatic tools)	No

### 2.2.3 Stationary Noise Criteria and Area Classification

MECP Publication NPC-300 outlines applicable noise criteria for the proposed development associated with surrounding industrial and commercial stationary noise sources. The noise criteria are defined using area classifications (not to be confused with the D-6 industrial classifications), which are based on the receptor's existing acoustical environment. NPC-300 classification are as follows:

- Class 1 – Urban Area;
- Class 2 – Semi-Urban / Semi – Rural;
- Class 3 – Rural Area; and
- Class 4 – Areas of Redevelopment and Infill.

Different noise guideline limits apply to each area classification, as shown below in **Table 14**.

**Table 14: Exclusionary Limits for Stationary Noise Sources**

Assessment Location	Time Period	Exclusionary Sound Level Limit - $L_{eq}$ 1hr			
		Class 1	Class 2	Class 3	Class 4
Plane of window for living area or sleeping quarters	Daytime (07:00 - 19:00)	50 dBA	50 dBA	45 dBA	60 dBA
	Evening (19:00 - 23:00)	50 dBA	50 dBA	40 dBA	60 dBA
	Nighttime (23:00 - 07:00)	45 dBA	45 dBA	40 dBA	55 dBA
Outdoor points of reception	Daytime (07:00 - 19:00)	50 dBA	50 dBA	45 dBA	55 dBA
	Evening (19:00 - 23:00)	50 dBA	45 dBA	40 dBA	55 dBA

During the site visit conducted on March 15<sup>th</sup>, 2023, it was observed that the acoustic environment surrounding the proposed development is dominated by transportation noise and general urban hum during daytime. Based on the nature of the area, the Class 1 urban sound level limits would apply.

#### 2.2.4

#### Stationary Sources

The noise sources associated with the industries identified in **Section 2.2.2** are outlined below in **Table 15**. The facilities and their corresponding location are presented in **Figure 5**.

**Table 15: Stationary Noise Sources**

Noise Source <sup>[1]</sup>	Associated Facility	# of Sources	Source Type
Circular saw cutting concrete	Ideas Cabinets and Countertops	1	Point source, steady
Truck movements	Ideas Cabinets and Countertops	1	Line source, steady
Pneumatic tools	DonTrans Trucking Facility	1	Point source, quasi-steady
Idling truck	DonTrans Trucking Facility	2	Point source, steady

Note: [1] Sound power level and spectrum of noise sources are provided in **Appendix F**.

MECP's publication, *NPC-104 – Sound Level Adjustments*, specifies sound level adjustments (penalties) to be applied to the observed sound level of a source based on its sound quality. NPC-104 specifies that a penalty of +5 dB be applied to any sound that has a pronounced audible tonal quality or cyclical variation, and that a +10 dB penalty be applied to a quasi-steady impulsive sound. "Quasi-steady" is a sequence of impulsive sounds emitted from a source having a time interval of less than 0.5 s, per



MECP's NPC-101 – *Technical Definitions*. Sound level penalties are not accumulated when more than one sound quality applies. Instead, the largest of the applicable penalties shall be used.

The operation of pneumatic tools at the Trucking Depot is assumed to operate as a quasi-steady state impulsive sound. A +10 dB penalty was applied to this noise source.

### 2.2.5 Noise Sensitive Points of Reception

As per the MECP noise guidelines NPC-300, a Point of Reception (POR), as it applies to impact assessments of stationary sources, means any location on a noise sensitive land use where noise from a stationary source is received. Noise sensitive land uses include the following lands:

- Permanent, seasonal, or rental residences;
- Hotels, motels, and campgrounds;
- Schools, universities, libraries, and daycare centres;
- Hospitals and clinics, nursing / retirement homes; and
- Places of worship.

The residential buildings and respite home within the McHugh proposed development were considered noise sensitive receptors. The noise sensitive receptors of the Leathorne site were determined to be outside of the Potential Influence Area of the identified facilities.

### 2.2.6 Predicted Sound Levels - Stationary

The noise analysis was completed using CADNA/A, an outdoor noise propagation model, based on ISO Standard 9613, Part 1: Calculation of the absorption of sound by the atmosphere, 1993 and Part 2: General method of calculation (ISO-9613-2:1996). The model is capable of incorporating various site specific features, such as elevation, berms, absorptive grounds, and barriers to accurately predict noise levels at specific receptors, pertaining to noise emissions from a particular source / sources. The ISO based model accounts for reduction in sound level due to increased distance and geometrical spreading, air absorption, ground attenuation, and acoustical shielding by intervening structures and topography. The model is considered conservative as it represents atmospheric conditions that promote propagation of sound from the source to the receiver.

The following assumptions were incorporated in the noise propagation modelling:

- A global ground absorption coefficient of 0.50, representing reflective grounds between sources and receptors, and 0.2, representing paved areas were incorporated in the noise model;
- A second order reflection was incorporated in the noise model;
- The ground within the study area is considered to be generally flat with the exception of an existing berm located between the McHugh site and the rail right of way; and
- Nearby industries were assumed to only operate during the daytime and evening periods (07:00-19:00).

For the purposes of the stationary assessment, the Building Evaluation feature in Cadna/A was used to determine building façades with the worst-case noise impacts.

Impacts from the stationary noise sources were predicted through noise propagation modelling. The predicted receptor noise levels (at the proposed development site) were compared against the applicable criteria, as specified in NPC-300 (see **Table 14**).

**Table 16** summarizes the predicted building façade daytime noise levels from stationary noise sources from the surrounding industries at the proposed development.

**Table 16: Stationary Noise Impact Summary Table – Surrounding Industries on Proposed Development**

Building	Maximum Façade Leq (1 hour) (dBA) <sup>[1]</sup>	MECP Compliance
Building 'A' (McHugh)	42	Yes
Building 'B' (McHugh)	47	Yes
Building 'C' (McHugh)	48	Yes
Building 'D' (McHugh)	50	Yes
Respite Home (McHugh)	37	Yes

Note: [1] Values in exceedance of MECP limits are shown in **bold**.

The predicted stationary noise impacts from the surrounding industries at the proposed development façades are shown in **Figure 5**.

The predicted impacts from the nearby stationary sources meet the MECP NPC-300 Class 1 exclusionary limits at the proposed development.

## 2.3 Rail Vibration Assessment

The proposed development is located approximately 55 m from the VIA Chatham Subdivision principal mainline right-of-way. As the proposed development is located within the vibration influence area of 75 metres, per VIA, and the Guidelines for New Development in Proximity to Railway Operations (FCM/RAC, 2013), a vibration assessment for the proposed development is required.

### 2.3.1 Rail Vibration Criteria

There are no MECP guidelines with respect to railway vibration and proposed sensitive land-uses. Applicable guidelines for vibration impacts due to railway operations are those published in the *Guidelines for New Development in Proximity to Railway Operations* (FCM/RAC, 2013).

Overall vibration levels from railway activities are recommended not to exceed 0.14 mm/s RMS between 4 Hz and 200 Hz on and above the first floor of all dwellings. This criterion is based on the human

perception of ground-borne vibration, published in the International Standard ISO 2631-2. Vibration levels from railway operations meeting this criterion will generally not be perceptible by the occupants.

### 2.3.2 Rail Vibration Measurements

On March 15<sup>th</sup> and March 16<sup>th</sup>, 2023, Dillon staff visited the site of the proposed Banwell and McHugh development to measure rail vibration levels from the ROW. Measurements were conducted 30 m from the ROW using the Instantel Minimate® Plus seismograph. The vibration measurement location is shown in **Figure 6**. The instrument is capable of measuring vibrations between 4 and 200 Hz within  $\pm 3$  VdB. Measurements were conducted for four passenger train passbys and two freight train passbys between 18:30 on March 15<sup>th</sup> and 11:00 on March 16<sup>th</sup>.

The results of the measurements are shown below in **Table 17**.

**Table 17: Summary of Rail Vibration Measurements**

Date	Time of Passby	Train Type	Max RMS velocity @ 30 m (mm/s)
March 15 <sup>th</sup> , 2023	18:35	Freight	0.124
March 15 <sup>th</sup> , 2023	22:08	Passenger	0.004
March 15 <sup>th</sup> , 2023	23:55	Passenger	0.004
March 16 <sup>th</sup> , 2023	03:11	Freight	0.069
March 16 <sup>th</sup> , 2023	05:55	Passenger	0.004
March 16 <sup>th</sup> , 2023	10:59	Passenger	0.005

### 2.3.3 Rail Vibration Impacts

The maximum measured vertical ground-borne vibration level, 0.124 mm/s RMS, is below the 0.14 mm/s RMS FCM/RAC criterion. As the measurements were completed at 30 metres from the railway right-of-way, and the nearest foundation setback is proposed at approximately 55 m, impacts are expected to be less than what is presented in **Table 17**.

Additionally, further reduction of ground-borne vibration levels are expected due to the coupling-loss of the proposed building foundations, which will result in lower vibration levels within the residential units. As such, no vibration mitigation measures are deemed necessary to meet the applicable criterion.

VIA requires that a warning clause regarding the potential for noise and vibration impacts be applied to all residential locations within 300 metres of their right-of-way.

All warning clauses should be included in agreements that are registered on Title for all Offers of Purchase and Sale, lease/rental agreements, and condominium declarations. The list of applicable warning clause requirements for the proposed development are provided in **Appendix C**.

## 3.0

## Conclusions

Dillon Consulting Limited (Dillon) was retained by 1027458 Ontario Inc. to complete a Noise and Vibration Assessment as requested by the City of Windsor for the proposed mixed use developments located at Banwell Street and McHugh Street. This study has been completed in support of Zoning By-law Amendment and Official Plan Amendment applications for the proposed development.

The noise and vibration assessment focuses on the noise impacts from nearby transportation sources and stationary sources (i.e., nearby industrial operations) on the proposed development and vibration impacts from the nearby railway on the proposed development.

### ***Transportation Noise Assessment***

As outlined in Section 2.1.4, the results of the transportation noise assessment confirm that the noise impacts on the proposed development can be sufficiently controlled by:

- Buildings 'B' and 'D' require an upgraded glazing of STC 32 and 31, respectively, for sleeping quarters;
- Buildings 'B' and 'D' require a brick veneer or acoustical equivalent (STC 54) façade construction;
- Buildings 'B' and 'D' require the installation of central air conditioning with a Type D warning clause; and
- Buildings 'A', 'C', 'E', 'F', 'G', 'H', and 'I' require the provision for the installation of central air conditioning with a Type C warning clause.

### ***Stationary Noise Assessment***

The noise impacts from surrounding commercial and industrial properties on the development were assessed through modelling of stationary sources in Cadna/A using ISO:9613 standards. It was determined that the noise impacts from the surrounding commercial and industrial properties will not exceed MECP requirements.

### ***Rail Vibration Assessment***

The maximum measured vertical ground-borne vibration level, 0.124 mm/s RMS, is below the 0.14 mm/s RMS FCM/RAC criterion. As such, no vibration mitigation measures are deemed necessary to meet the applicable criterion.

VIA requires that a warning clause regarding the potential for noise and vibration impacts be applied to all sensitive receptor locations within 300 metres of their right-of-way.

## 4.0

# Closure

This noise and vibration assessment has been prepared based on the information provided and/or approved by 1027458 Ontario Inc. This report is intended to provide a reasonable review of available information within an agreed work scope, schedule, and budget. This report was prepared by Dillon for the sole benefit of the 1027458 Ontario Inc. The material in the report reflects Dillon's judgement in light of the information available to Dillon at the time of this report preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We trust that the report is to your satisfaction. Please do not hesitate to contact the undersigned if you have any further questions on this report.

Respectfully Submitted:

## DILLON CONSULTING LIMITED



Callum Heggart, EIT



Thom Wright, EIT



Lucas Arnold, P.Eng  
Associate

Attachments    Attachment A: Development Site Plan  
                          Attachment B: Road/Rail Traffic Data  
                          Attachment C: Warning Clauses  
                          Attachment D: Stanson Modelling  
                          Attachment E: D-6 Classification Criteria  
                          Attachment F: Stationary Source Data

# Figures



Scale 1: 8,000

## Figure 1

Project # 22-5144

Mar 2023

## Subject Site and Surrounding Area

McHugh St and Banwell Rd, Windsor, Ontario





Scale 1: 2,000

## Figure 2

Project # 22-5144

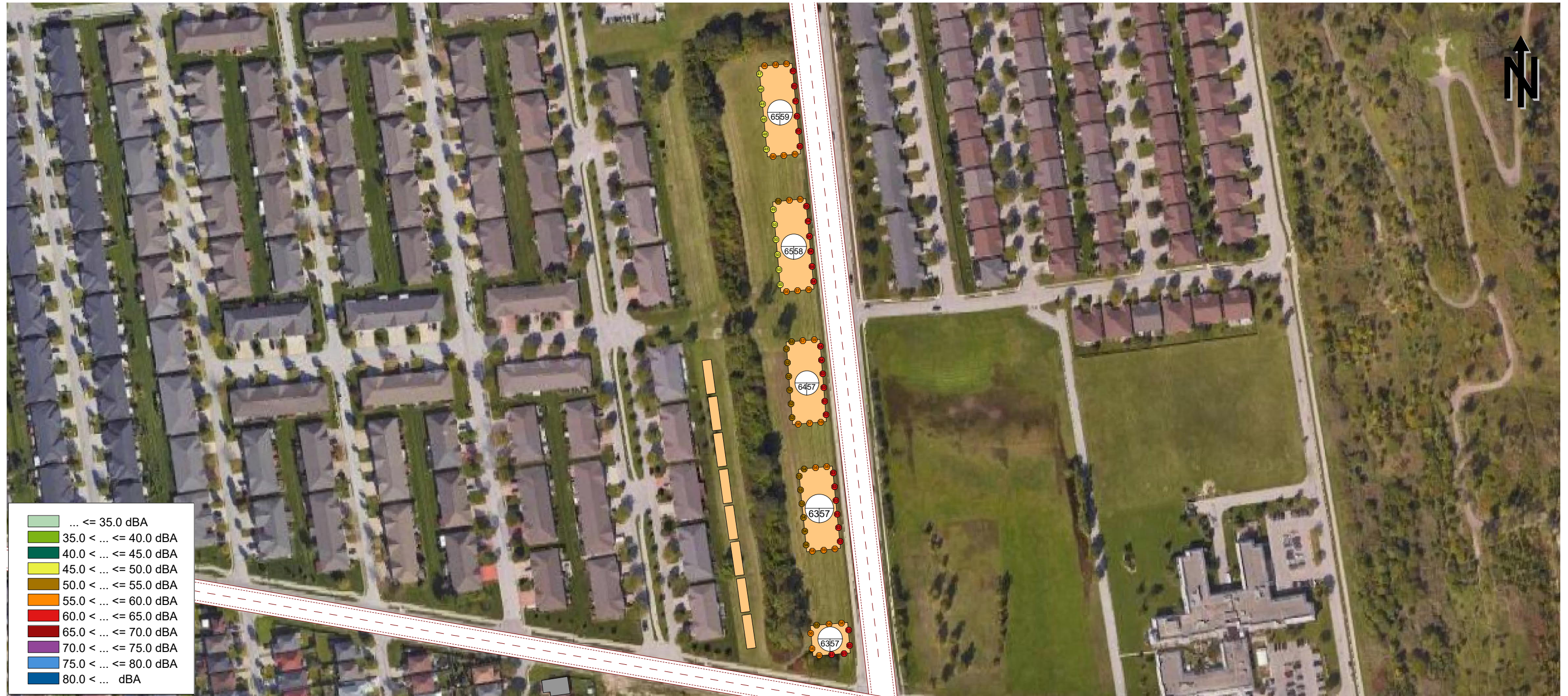
Mar 2023

### Transportation Impacts, McHugh Site Rail and Road - Daytime Plus Max Nighttime

McHugh St and Banwell Rd, Windsor, Ontario







Scale 1: 2,500

## Figure 3

Project # 22-5144

Mar 2023

### Transportation Impacts, Leathorne Site Rail and Road - Daytime Plus Max Nighttime

Leathorne St and Banwell Rd, Windsor, Ontario





Scale 1: 5,000

## Figure 4

Project # 22-5144

Mar 2023

### STAMSON Comparison Calculation Sites

McHugh St and Banwell Rd, Windsor, Ontario





Scale 1: 2,750

## Figure 5

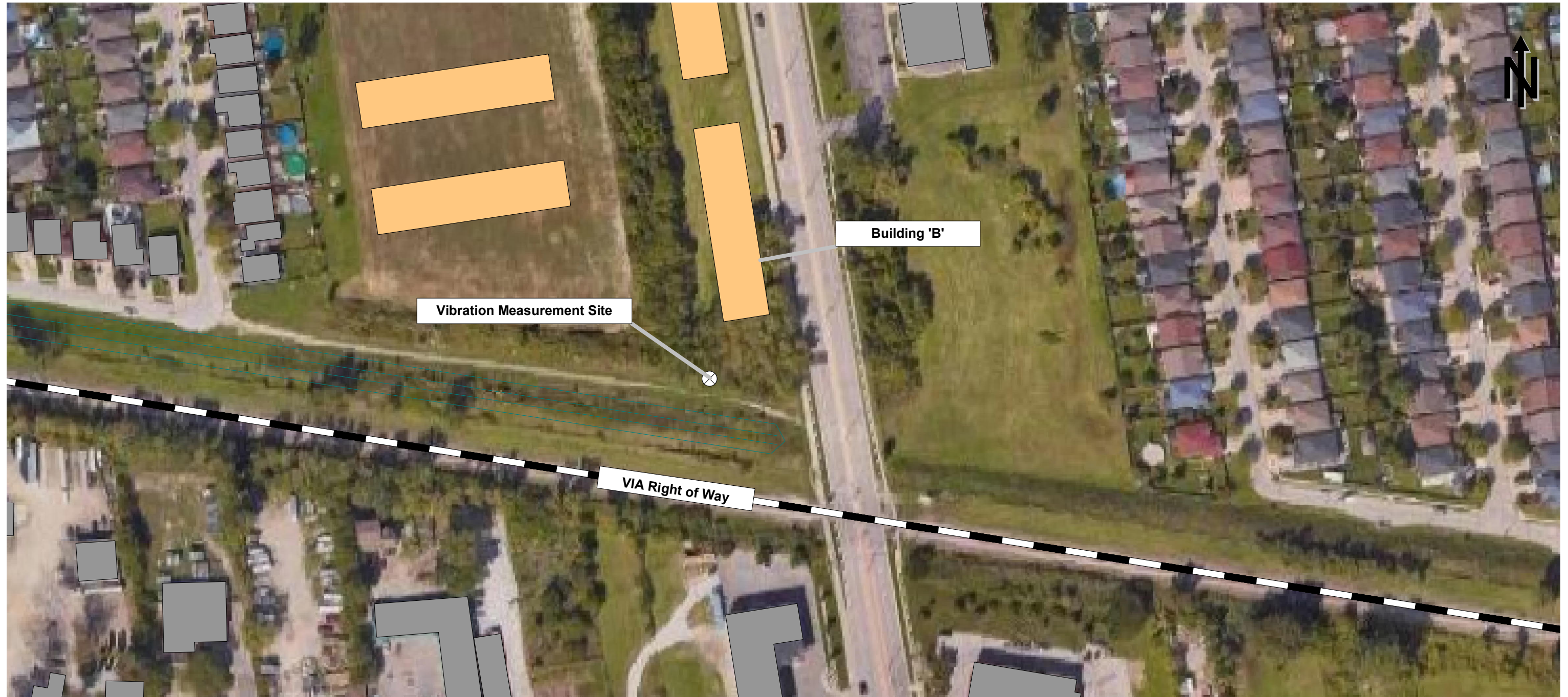
Project # 22-5144

Mar 2023

## Impacts of Stationary Sources McHugh Site

McHugh St and Banwell Rd, Windsor, Ontario





Scale 1: 1,500

## Figure 6

Project # 22-5144

Mar 2023

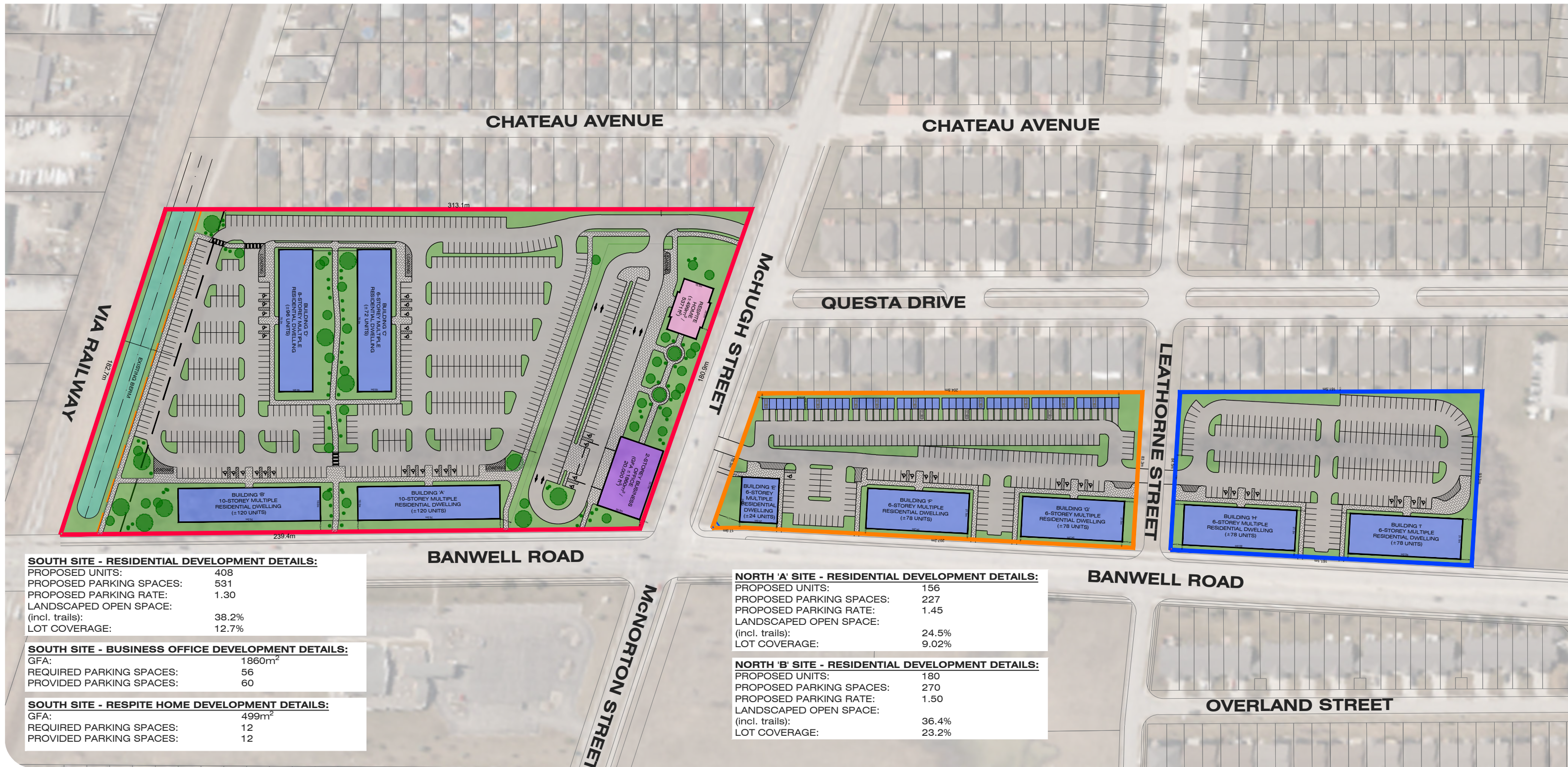
### Location of Vibration Measurements McHugh Site

McHugh St and Banwell Rd, Windsor, Ontario



# Appendix A

## *Development Site Plan*



**SOUTH SITE - RESIDENTIAL DEVELOPMENT DETAILS:**

PROPOSED UNITS:	408
PROPOSED PARKING SPACES:	531
PROPOSED PARKING RATE:	1.30
LANDSCAPED OPEN SPACE: (incl. trails):	38.2%
LOT COVERAGE:	12.7%

**SOUTH SITE - BUSINESS OFFICE DEVELOPMENT DETAILS:**

GFA:	1860m <sup>2</sup>
REQUIRED PARKING SPACES:	56
PROVIDED PARKING SPACES:	60

**SOUTH SITE - RESPITE HOME DEVELOPMENT DETAILS:**

GFA:	499m <sup>2</sup>
REQUIRED PARKING SPACES:	12
PROVIDED PARKING SPACES:	12

**NORTH 'A' SITE - RESIDENTIAL DEVELOPMENT DETAILS:**

PROPOSED UNITS:	156
PROPOSED PARKING SPACES:	227
PROPOSED PARKING RATE:	1.45
LANDSCAPED OPEN SPACE: (incl. trails):	24.5%
LOT COVERAGE:	9.02%

**NORTH 'B' SITE - RESIDENTIAL DEVELOPMENT DETAILS:**

PROPOSED UNITS:	180
PROPOSED PARKING SPACES:	270
PROPOSED PARKING RATE:	1.50
LANDSCAPED OPEN SPACE: (incl. trails):	36.4%
LOT COVERAGE:	23.2%

**1027458 ONTARIO LTD.**  
BANWELL AND McHUGH -  
MIXED USE DEVELOPMENTS

**CONCEPTUAL DEVELOPMENT PLAN**  
FEBRUARY 13, 2023

BANWELL AND McHUGH -  
SOUTH SITE  
(± 5.35 ha / 13.23 ac)

BANWELL AND McHUGH -  
NORTH 'A' SITE  
(± 1.43 ha / 3.54 ac)

BANWELL AND McHUGH -  
NORTH 'B' SITE  
(± 1.66 ha / 4.11 ac)

30m BUFFER FROM  
RAILWAY

EXTENT OF BERM

EXISTING BERM

PROPOSED MULTI-UNIT  
RESIDENTIAL

PROPOSED BUSINESS  
OFFICES

PROPOSED LANDSCAPED  
OPEN SPACE

PROPOSED RESPITE  
HOME

File Location:  
c:\pw working directory\projects 2022\dillon\_32mru\dms63328\22-5144 - banwell  
and mchugh - v7 - 2022.12.13.dwg  
March, 16, 2023 9:55 AM

SOURCE: THE COUNTY OF ESSEX INTERACTIVE MAPPING (2021)

MAP/DRAWING INFORMATION  
THIS DRAWING IS FOR INFORMATION PURPOSES ONLY. ALL  
DIMENSIONS AND BOUNDARY INFORMATION SHOULD BE  
VERIFIED BY AN O.L.S PRIOR TO CONSTRUCTION.

CREATED BY: MRU  
CHECKED BY: TJO  
DESIGNED BY: MRU

SCALE: 1: 2000 (11X17)



PROJECT: 22-5144  
STATUS: DRAFT  
DATE: 02/13/2023

## Appendix B

### *Road/Rail Traffic Data*



65 Front St. West,  
Union Station, Rm G-C-021  
Toronto, Ontario M5J 1E7

REAL ESTATE

**BY EMAIL**

21 February 2023

Mr. Thom Wright  
Dillon Consulting Limited  
235 Yorkland Blvd, Suite 800  
Toronto, Ontario M2J 4Y8

Dear Sir:

**RE: Train Traffic Data – Mile 100.08 VIA’s Chatham Subd. - City of Windsor**

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Further to your request for train traffic information in the vicinity of Banwell Road in the City of Windsor, please find below a summary of typical daily rail traffic.

Train Type	Frequency Day (0700-2300)	Frequency Night (2300-0700)	Max. Cars	Locomotives	Speed (mph)
Passenger	6	1	8	2	80
Freight	1	1	140	4	60
Way Freight	0	0	0	0	0

On site observations and measurements are recommended to capture actual noise and vibration levels from pass-by train operations.

Please note that rail traffic is subject to change due to varying economic and weather conditions, track maintenance work, holiday periods and emergencies. For the purpose of noise and vibration analysis, train volumes should be escalated 2.5% per annum for a 10-year period.

The above chart identifies 7 scheduled passenger trains, which is 1 less than our pre-COVID schedule. Without being able to confirm the return of the deferred train, please use the info in the chart as above in your study. For your info, VIA is in the process of replacing our corridor rail fleet with new equipment starting later this year, however we do not anticipate any schedule changes in the Toronto-Windsor Corridor at this time.


Anti-whistling by-laws are in effect throughout the City of Windsor, however all engines must sound their bells when occupying at-grade road crossings and they may still use their whistles in an emergency or to warn trespassers. It is noted that Clover Ave. and Lesperance Road level crossings are in close proximity to the subject site.

The mainline track at this location consists of continuously welded rail (CWR) while portions of the service track is bolted rail. Equipment loads are not to exceed 268,000 lbs.

**love the way**



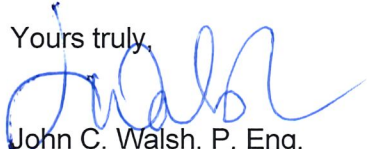




VIA is not in favour of incompatible land uses such as Residential being introduced in close proximity to our busy Chatham Subdivision due to potential safety and environmental conflicts. Development adjacent to our rail corridor is not appropriate without satisfactory noise, vibration and safety mitigation measures as per the attached.

Should you have any questions, please feel free to contact me at 416-956-7669.

Yours truly,



John C. Walsh, P. Eng.  
Senior Property Manager  
Real Estate - Central Region

love the way



## PRINCIPAL MAIN LINE

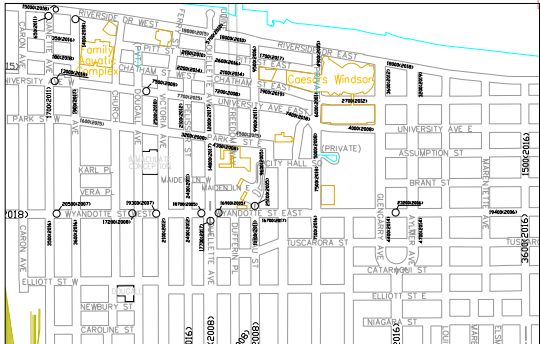


- A. Noise berm, or combination berm and acoustic fence, adjoining and parallel to the railway right-of-way and having returns at the ends:
- (i) Minimum total height 5.5 metres above top-of-rail.
  - (ii) Acoustic fence to be constructed without openings and of a durable material weighing not less than 20 kg. per square metre (4 lb/sq. ft) of surface area.
- Note: The Railway may consider other measures recommended by an approved Noise Consultant satisfactory to the Railway.
- B. Safety setback of dwellings from the railway right-of-way to be a minimum of 30 metres in conjunction with the safety berm noted below. In the absence of a safety berm, we require a dwelling setback of 120 metres.
- C. Ground-borne vibration transmission to be estimated through site testing and evaluation to determine if dwellings within 75 metres of the Railway right-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, +/- 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.
- D. Safety berm adjoining and parallel to the railway right-of-way with returns at the ends, 2.5 metres above grade is required despite none being required to address the Railway's noise concerns.
- E. The following clause should be inserted in all offers to purchase, agreements of sale and purchase or lease and in the title deed or lease of each dwelling; "Warning: VIA Rail Canada Inc. or its assigns or successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the rail facilities on such right-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). VIA will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way."
- F. Any proposed alterations to the existing drainage pattern affecting Railway property must receive prior concurrence from the Railway and be substantiated by a drainage report to the satisfaction of the Railway.
- G. The Developer shall install and maintain at his own expense, a chain link fence of minimum 1.83 metre (6 feet) height along the mutual property line, which shall be maintained by the Owner.
- H. The Owner shall through restrictive covenants to be registered on title and all agreements of purchase and sale or lease provide notice to the public that the safety berm, fencing and vibration isolation measures implemented are not to be tampered with or altered and further that the Owner shall have the sole responsibility for and shall maintain these measures to the satisfaction of VIA Rail.
- I. Pursuant to the Planning Act, the Municipality shall provide this office of the Railway with written notice of the public meeting, by-law and passing of the by-law appropriately zoning the lands hereby proposed for subdivision.
- J. The Owner enter into an Agreement stipulating how VIA Rail's concerns will be resolved and will pay VIA Rail's reasonable costs in preparing and negotiating the agreement.

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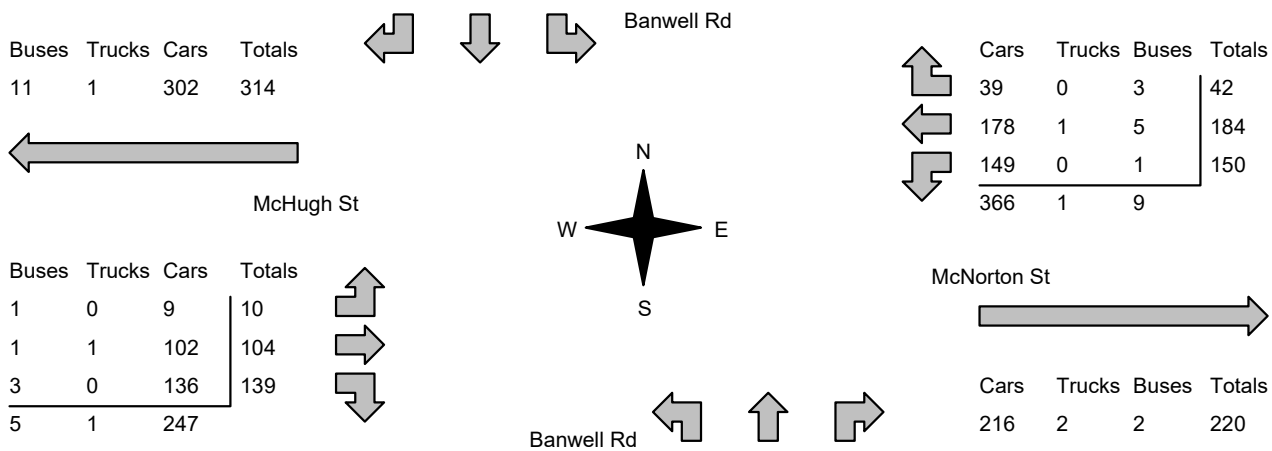





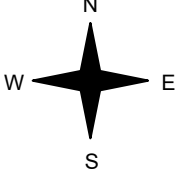



**DOWNTOWN AREA**

2020 AADT MAP

**CITY OF WINDSOR**

A B C D E F G H I J K L M N O P Q R S

<b>Morning Peak Diagram</b>		<b>Specified Period</b> <b>From:</b> 7:00:00 <b>To:</b> 10:00:00	<b>One Hour Peak</b> <b>From:</b> 8:00:00 <b>To:</b> 9:00:00																												
<b>Municipality:</b> Windsor <b>Site #:</b> 2302900003 <b>Intersection:</b> Banwell Rd & McHugh St <b>TFR File #:</b> 1 <b>Count date:</b> 16-Feb-23		<b>Weather conditions:</b>  <b>Person counted:</b> <b>Person prepared:</b> <b>Person checked:</b>																													
<b>** Signalized Intersection **</b>		<b>Major Road:</b> Banwell Rd runs N/S																													
North Leg Total: 680 North Entering: 450 North Peds: 11 Peds Cross: ☒	<table style="width:100%; border-collapse: collapse;"> <tr><td>Buses</td><td>0</td><td>4</td><td>0</td><td>4</td></tr> <tr><td>Trucks</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>Cars</td><td>27</td><td>374</td><td>44</td><td>445</td></tr> <tr><td>Totals</td><td>27</td><td>379</td><td>44</td><td></td></tr> </table>	Buses	0	4	0	4	Trucks	0	1	0	1	Cars	27	374	44	445	Totals	27	379	44		<table style="width:100%; border-collapse: collapse;"> <tr><td>Buses</td><td>6</td></tr> <tr><td>Trucks</td><td>2</td></tr> <tr><td>Cars</td><td>222</td></tr> <tr><td>Totals</td><td>230</td></tr> </table>	Buses	6	Trucks	2	Cars	222	Totals	230	East Leg Total: 596 East Entering: 376 East Peds: 0 Peds Cross: ☒
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<table style="width:100%; border-collapse: collapse;"> <tr><td>Buses</td><td>Trucks</td><td>Cars</td><td>Totals</td></tr> <tr><td>1</td><td>0</td><td>9</td><td>10</td></tr> <tr><td>1</td><td>1</td><td>102</td><td>104</td></tr> <tr><td>3</td><td>0</td><td>136</td><td>139</td></tr> <tr><td>5</td><td>1</td><td>247</td><td></td></tr> </table>	Buses	Trucks	Cars	Totals	1	0	9	10	1	1	102	104	3	0	136	139	5	1	247				<table style="width:100%; border-collapse: collapse;"> <tr><td>Cars</td><td>Trucks</td><td>Buses</td><td>Totals</td></tr> <tr><td>216</td><td>2</td><td>2</td><td>220</td></tr> </table>	Cars	Trucks	Buses	Totals	216	2	2	220
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1	1	102	104																												
3	0	136	139																												
5	1	247																													
Cars	Trucks	Buses	Totals																												
216	2	2	220																												
Peds Cross: ☒ West Peds: 1 West Entering: 253 West Leg Total: 567	<table style="width:100%; border-collapse: collapse;"> <tr><td>Cars</td><td>659</td></tr> <tr><td>Trucks</td><td>1</td></tr> <tr><td>Buses</td><td>8</td></tr> <tr><td>Totals</td><td>668</td></tr> </table>	Cars	659	Trucks	1	Buses	8	Totals	668	<table style="width:100%; border-collapse: collapse;"> <tr><td>Cars</td><td>97</td><td>174</td><td>70</td><td>341</td></tr> <tr><td>Trucks</td><td>0</td><td>2</td><td>1</td><td>3</td></tr> <tr><td>Buses</td><td>6</td><td>2</td><td>1</td><td>9</td></tr> <tr><td>Totals</td><td>103</td><td>178</td><td>72</td><td></td></tr> </table>	Cars	97	174	70	341	Trucks	0	2	1	3	Buses	6	2	1	9	Totals	103	178	72		Peds Cross: ☒ South Peds: 5 South Entering: 353 South Leg Total: 1021
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Trucks	1																														
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Totals	103	178	72																												
<b>Comments</b>																															

<h2>Afternoon Peak Diagram</h2>	<b>Specified Period</b> <b>From:</b> 15:00:00 <b>To:</b> 18:00:00	<b>One Hour Peak</b> <b>From:</b> 16:45:00 <b>To:</b> 17:45:00																																																																																		
<b>Municipality:</b> Windsor <b>Site #:</b> 2302900003 <b>Intersection:</b> Banwell Rd & McHugh St <b>TFR File #:</b> 1 <b>Count date:</b> 16-Feb-23	<b>Weather conditions:</b>  <b>Person counted:</b> <b>Person prepared:</b> <b>Person checked:</b>																																																																																			
<b>** Signalized Intersection **</b>		<b>Major Road:</b> Banwell Rd runs N/S																																																																																		
North Leg Total: 946 North Entering: 401 North Peds: 1 Peds Cross: ☒	<table style="border-collapse: collapse; margin: auto;"> <tr><td>Buses</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Trucks</td><td>0</td><td>1</td><td>1</td><td>2</td></tr> <tr><td>Cars</td><td>22</td><td>314</td><td>63</td><td>399</td></tr> <tr style="border-top: 1px solid black;"><td>Totals</td><td>22</td><td>315</td><td>64</td><td></td></tr> </table>	Buses	0	0	0	0	Trucks	0	1	1	2	Cars	22	314	63	399	Totals	22	315	64		 <table style="border-collapse: collapse; margin: auto;"> <tr><td>Buses</td><td>0</td></tr> <tr><td>Trucks</td><td>1</td></tr> <tr><td>Cars</td><td>544</td></tr> <tr style="border-top: 1px solid black;"><td>Totals</td><td>545</td></tr> </table>	Buses	0	Trucks	1	Cars	544	Totals	545	East Leg Total: 783 East Entering: 330 East Peds: 1 Peds Cross: ☒																																																					
Buses	0	0	0	0																																																																																
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Cars	544																																																																																			
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<table style="border-collapse: collapse;"> <tr><td>Buses</td><td>Trucks</td><td>Cars</td><td>Totals</td></tr> <tr><td>2</td><td>0</td><td>342</td><td>344</td></tr> </table>	Buses	Trucks	Cars	Totals	2	0	342	344	 <p>Banwell Rd</p>	 <table style="border-collapse: collapse; margin: auto;"> <tr><td>Cars</td><td>Trucks</td><td>Buses</td><td>Totals</td></tr> <tr><td>43</td><td>0</td><td>0</td><td>43</td></tr> <tr><td>178</td><td>0</td><td>0</td><td>178</td></tr> <tr><td>109</td><td>0</td><td>0</td><td>109</td></tr> <tr style="border-top: 1px solid black;"><td>330</td><td>0</td><td>0</td><td></td></tr> </table>	Cars	Trucks	Buses	Totals	43	0	0	43	178	0	0	178	109	0	0	109	330	0	0		<table style="border-collapse: collapse;"> <tr><td>Buses</td><td>Trucks</td><td>Cars</td><td>Totals</td></tr> <tr><td>0</td><td>0</td><td>14</td><td>14</td></tr> <tr><td>0</td><td>0</td><td>168</td><td>168</td></tr> <tr><td>0</td><td>0</td><td>114</td><td>114</td></tr> <tr style="border-top: 1px solid black;"><td>0</td><td>0</td><td>296</td><td></td></tr> </table>	Buses	Trucks	Cars	Totals	0	0	14	14	0	0	168	168	0	0	114	114	0	0	296			<p>McNorton St</p> 	<table style="border-collapse: collapse;"> <tr><td>Buses</td><td>Trucks</td><td>Cars</td><td>Totals</td></tr> <tr><td>0</td><td>0</td><td>14</td><td>14</td></tr> <tr><td>0</td><td>0</td><td>168</td><td>168</td></tr> <tr><td>0</td><td>0</td><td>114</td><td>114</td></tr> <tr style="border-top: 1px solid black;"><td>0</td><td>0</td><td>296</td><td></td></tr> </table>	Buses	Trucks	Cars	Totals	0	0	14	14	0	0	168	168	0	0	114	114	0	0	296		 <p>Banwell Rd</p>	<table style="border-collapse: collapse;"> <tr><td>Cars</td><td>Trucks</td><td>Buses</td><td>Totals</td></tr> <tr><td>452</td><td>1</td><td>0</td><td>453</td></tr> </table>	Cars	Trucks	Buses	Totals	452	1	0	453
Buses	Trucks	Cars	Totals																																																																																	
2	0	342	344																																																																																	
Cars	Trucks	Buses	Totals																																																																																	
43	0	0	43																																																																																	
178	0	0	178																																																																																	
109	0	0	109																																																																																	
330	0	0																																																																																		
Buses	Trucks	Cars	Totals																																																																																	
0	0	14	14																																																																																	
0	0	168	168																																																																																	
0	0	114	114																																																																																	
0	0	296																																																																																		
Buses	Trucks	Cars	Totals																																																																																	
0	0	14	14																																																																																	
0	0	168	168																																																																																	
0	0	114	114																																																																																	
0	0	296																																																																																		
Cars	Trucks	Buses	Totals																																																																																	
452	1	0	453																																																																																	
Peds Cross: ☒ West Peds: 1 West Entering: 296 West Leg Total: 640	 <table style="border-collapse: collapse; margin: auto;"> <tr><td>Cars</td><td>537</td></tr> <tr><td>Trucks</td><td>1</td></tr> <tr><td>Buses</td><td>0</td></tr> <tr style="border-top: 1px solid black;"><td>Totals</td><td>538</td></tr> </table>	Cars	537	Trucks	1	Buses	0	Totals	538	<table style="border-collapse: collapse; margin: auto;"> <tr><td>Cars</td><td>142</td><td>487</td><td>221</td><td>850</td></tr> <tr><td>Trucks</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>Buses</td><td>2</td><td>0</td><td>0</td><td>2</td></tr> <tr style="border-top: 1px solid black;"><td>Totals</td><td>144</td><td>488</td><td>221</td><td></td></tr> </table>	Cars	142	487	221	850	Trucks	0	1	0	1	Buses	2	0	0	2	Totals	144	488	221		Peds Cross: ☒ South Peds: 1 South Entering: 853 South Leg Total: 1391																																																					
Cars	537																																																																																			
Trucks	1																																																																																			
Buses	0																																																																																			
Totals	538																																																																																			
Cars	142	487	221	850																																																																																
Trucks	0	1	0	1																																																																																
Buses	2	0	0	2																																																																																
Totals	144	488	221																																																																																	
<h3>Comments</h3>																																																																																				

# Total Count Diagram

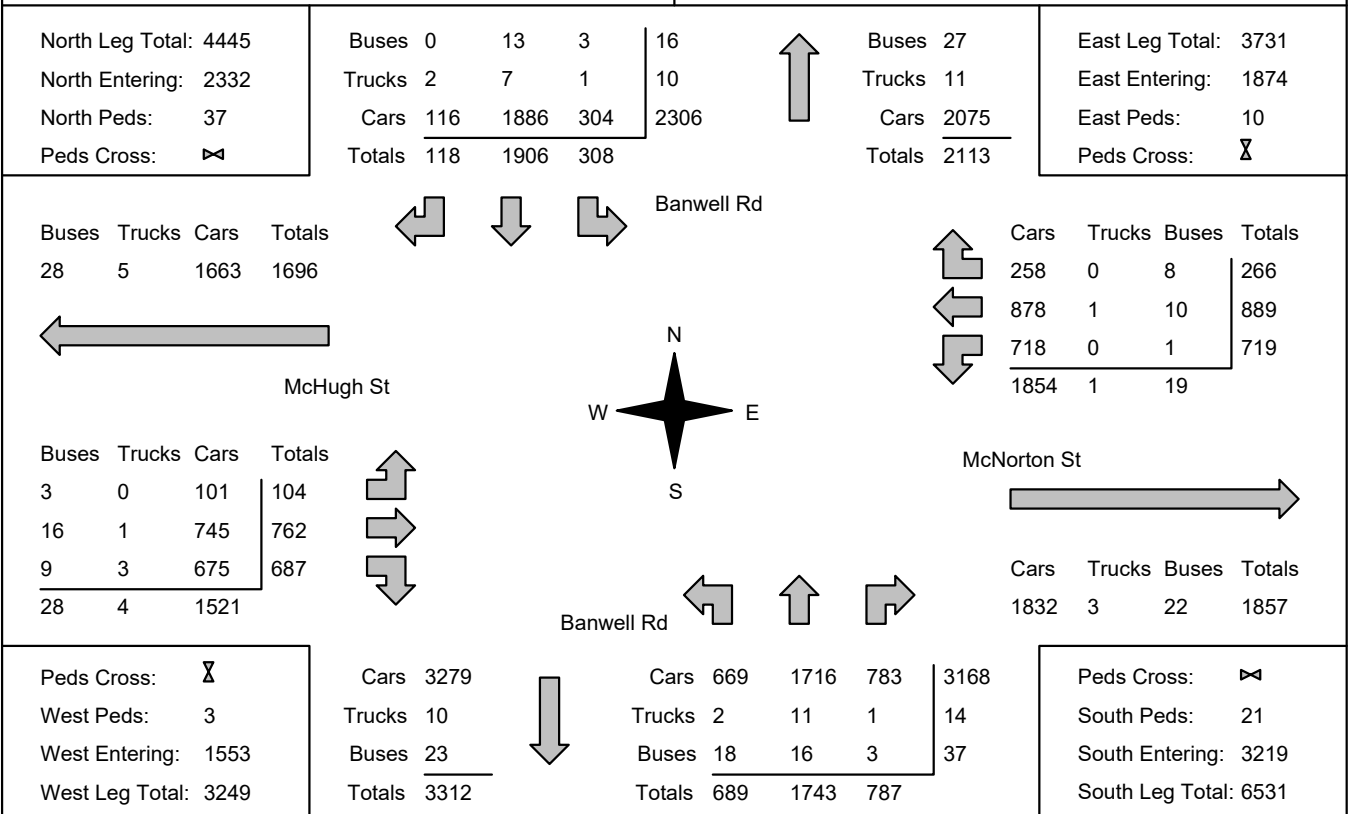
**Municipality:** Windsor  
**Site #:** 2302900003  
**Intersection:** Banwell Rd & McHugh St  
**TFR File #:** 1  
**Count date:** 16-Feb-23

**Weather conditions:**

**Person counted:**  
**Person prepared:**  
**Person checked:**

**\*\* Signalized Intersection \*\***

**Major Road:** Banwell Rd runs N/S



## Comments

# Traffic Count Summary

Intersection: Banwell Rd & McHugh St      Count Date: 16-Feb-23      Municipality: Windsor

<b>North Approach Totals</b>						North/South Total Approaches	<b>South Approach Totals</b>					
Hour Ending	Includes Cars, Trucks, & Buses				Total Peds		Hour Ending	Includes Cars, Trucks, & Buses				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	30	364	16	410	6	607	8:00:00	50	114	33	197	0
9:00:00	44	379	27	450	11	803	9:00:00	103	178	72	353	5
10:00:00	48	246	23	317	6	619	10:00:00	78	152	72	302	1
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	64	297	16	377	10	1114	16:00:00	158	379	200	737	14
17:00:00	60	310	12	382	3	1187	17:00:00	147	454	204	805	1
18:00:00	62	310	24	396	1	1221	18:00:00	153	466	206	825	0
<b>Totals:</b>	<b>308</b>	<b>1906</b>	<b>118</b>	<b>2332</b>	<b>37</b>	<b>5551</b>	<b>S Totals:</b>	<b>689</b>	<b>1743</b>	<b>787</b>	<b>3219</b>	<b>21</b>
<b>East Approach Totals</b>						East/West Total Approaches	<b>West Approach Totals</b>					
Hour Ending	Includes Cars, Trucks, & Buses				Total Peds		Hour Ending	Includes Cars, Trucks, & Buses				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	125	103	37	265	1	460	8:00:00	6	75	114	195	0
9:00:00	150	184	42	376	0	629	9:00:00	10	104	139	253	1
10:00:00	98	89	37	224	3	403	10:00:00	10	80	89	179	1
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	121	160	56	337	4	698	16:00:00	42	186	133	361	0
17:00:00	110	175	47	332	1	619	17:00:00	19	159	109	287	1
18:00:00	115	178	47	340	1	618	18:00:00	17	158	103	278	0
<b>Totals:</b>	<b>719</b>	<b>889</b>	<b>266</b>	<b>1874</b>	<b>10</b>	<b>3427</b>	<b>W Totals:</b>	<b>104</b>	<b>762</b>	<b>687</b>	<b>1553</b>	<b>3</b>
<b>Calculated Values for Traffic Crossing Major Street</b>												
Hours Ending:	7:00	8:00	9:00	10:00		15:00	16:00	17:00	18:00			
Crossing Values:	0	240	360	204		0	373	308	311			



Count Date: 16-Feb-23 Site #: 2302900003

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Buses - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	4	4	50	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	11	7	116	66	2	2	0	0	1	1	0	0	0	0	0	0	0	0	6	6
7:45:00	16	5	229	113	10	8	0	0	2	1	0	0	0	0	0	0	0	0	6	0
8:00:00	30	14	361	132	16	6	0	0	2	0	0	0	0	0	1	1	0	0	6	0
8:15:00	44	14	468	107	20	4	0	0	3	1	0	0	0	0	3	2	0	0	9	3
8:30:00	54	10	545	77	26	6	0	0	3	0	0	0	0	0	4	1	0	0	11	2
8:45:00	62	8	635	90	34	8	0	0	3	0	0	0	0	0	4	0	0	0	16	5
9:00:00	74	12	735	100	43	9	0	0	3	0	0	0	0	0	5	1	0	0	17	1
9:15:00	95	21	805	70	46	3	0	0	3	0	0	0	0	0	8	3	0	0	18	1
9:30:00	103	8	872	67	53	7	0	0	3	0	1	1	0	0	9	1	0	0	18	0
9:45:00	113	10	924	52	60	7	0	0	3	0	1	0	0	0	9	0	0	0	22	4
10:00:00	122	9	977	53	65	5	0	0	3	0	1	0	0	0	9	0	0	0	23	1
10:15:00	122	0	977	0	65	0	0	0	3	0	1	0	0	0	9	0	0	0	23	0
15:00:00	122	0	977	0	65	0	0	0	3	0	1	0	0	0	9	0	0	0	23	0
15:15:00	135	13	1063	86	68	3	0	0	3	0	1	0	0	0	9	0	0	0	29	6
15:30:00	153	18	1128	65	74	6	0	0	3	0	1	0	0	0	9	0	0	0	31	2
15:45:00	169	16	1195	67	77	3	0	0	4	1	1	0	0	0	10	1	0	0	32	1
16:00:00	185	16	1272	77	80	3	0	0	4	0	2	1	1	1	10	0	0	0	33	1
16:15:00	197	12	1348	76	81	1	0	0	5	1	2	0	2	1	13	3	0	0	36	3
16:30:00	207	10	1436	88	84	3	0	0	5	0	2	0	3	1	13	0	0	0	36	0
16:45:00	227	20	1509	73	89	5	0	0	5	0	2	0	3	0	13	0	0	0	36	0
17:00:00	243	16	1578	69	92	3	0	0	5	0	2	0	3	0	13	0	0	0	36	0
17:15:00	261	18	1667	89	95	3	1	1	6	1	2	0	3	0	13	0	0	0	36	0
17:30:00	278	17	1742	75	101	6	1	0	6	0	2	0	3	0	13	0	0	0	37	1
17:45:00	290	12	1823	81	111	10	1	0	6	0	2	0	3	0	13	0	0	0	37	0
18:00:00	304	14	1886	63	116	5	1	0	7	1	2	0	3	0	13	0	0	0	37	0
18:15:00	304	0	1886	0	116	0	1	0	7	0	2	0	3	0	13	0	0	0	37	0
18:15:15	304	0	1886	0	116	0	1	0	7	0	2	0	3	0	13	0	0	0	37	0



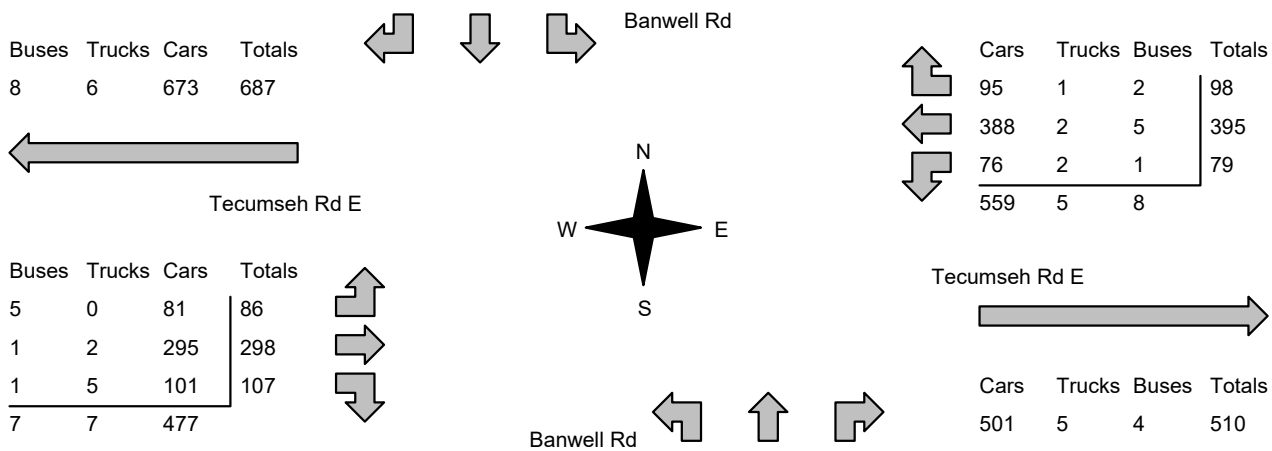



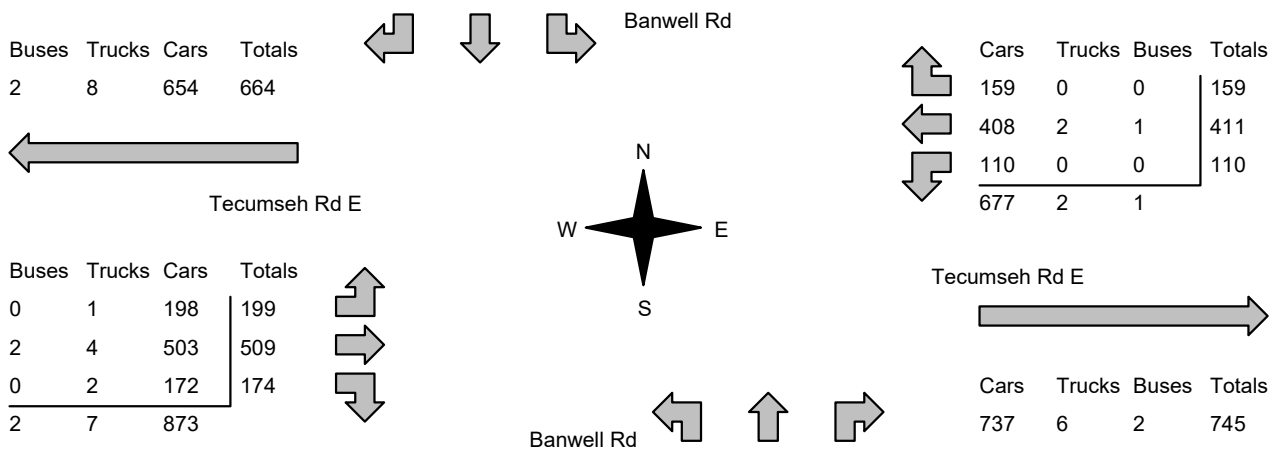





Count Date: 16-Feb-23 Site #: 2302900003

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Buses - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	14	14	19	19	0	0	0	0	0	0	0	0	1	1	0	0	0	0
7:30:00	3	2	27	13	41	22	0	0	0	0	0	0	0	0	1	0	0	0	0	0
7:45:00	6	3	48	21	80	39	0	0	0	0	0	0	0	0	3	2	0	0	0	0
8:00:00	6	0	70	22	114	34	0	0	0	0	0	0	0	0	5	2	0	0	0	0
8:15:00	8	2	88	18	160	46	0	0	0	0	0	0	0	0	6	1	0	0	0	0
8:30:00	8	0	118	30	187	27	0	0	0	0	0	0	0	0	6	0	1	1	0	0
8:45:00	9	1	146	28	218	31	0	0	1	1	0	0	0	0	6	0	1	0	1	1
9:00:00	15	6	172	26	250	32	0	0	1	0	0	0	1	1	6	0	3	2	1	0
9:15:00	18	3	194	22	273	23	0	0	1	0	0	0	1	0	7	1	3	0	1	0
9:30:00	18	0	208	14	297	24	0	0	1	0	0	0	1	0	7	0	3	0	2	1
9:45:00	21	3	235	27	320	23	0	0	1	0	0	0	1	0	7	0	3	0	2	0
10:00:00	25	4	251	16	338	18	0	0	1	0	1	1	1	0	7	0	3	0	2	0
10:15:00	25	0	251	0	338	0	0	0	1	0	1	0	1	0	7	0	3	0	2	0
15:00:00	25	0	251	0	338	0	0	0	1	0	1	0	1	0	7	0	3	0	2	0
15:15:00	40	15	321	70	381	43	0	0	1	0	2	1	2	1	9	2	5	2	2	0
15:30:00	51	11	357	36	408	27	0	0	1	0	2	0	2	0	10	1	6	1	2	0
15:45:00	58	7	396	39	435	27	0	0	1	0	3	1	3	1	13	3	6	0	2	0
16:00:00	65	7	431	35	464	29	0	0	1	0	3	0	3	0	13	0	8	2	2	0
16:15:00	72	7	466	35	494	30	0	0	1	0	3	0	3	0	14	1	9	1	2	0
16:30:00	77	5	512	46	520	26	0	0	1	0	3	0	3	0	15	1	9	0	2	0
16:45:00	82	5	547	35	538	18	0	0	1	0	3	0	3	0	16	1	9	0	2	0
17:00:00	84	2	587	40	572	34	0	0	1	0	3	0	3	0	16	0	9	0	3	1
17:15:00	88	4	629	42	607	35	0	0	1	0	3	0	3	0	16	0	9	0	3	0
17:30:00	93	5	669	40	628	21	0	0	1	0	3	0	3	0	16	0	9	0	3	0
17:45:00	96	3	715	46	652	24	0	0	1	0	3	0	3	0	16	0	9	0	3	0
18:00:00	101	5	745	30	675	23	0	0	1	0	3	0	3	0	16	0	9	0	3	0
18:15:00	101	0	745	0	675	0	0	0	1	0	3	0	3	0	16	0	9	0	3	0
18:15:15	101	0	745	0	675	0	0	0	1	0	3	0	3	0	16	0	9	0	3	0

<b>Morning Peak Diagram</b>		<b>Specified Period</b> <b>From:</b> 7:00:00 <b>To:</b> 10:00:00	<b>One Hour Peak</b> <b>From:</b> 8:00:00 <b>To:</b> 9:00:00																												
<b>Municipality:</b> Windsor <b>Site #:</b> 2302900004 <b>Intersection:</b> Tecumseh Rd E & Banwell Rd <b>TFR File #:</b> 1 <b>Count date:</b> 16-Feb-23		<b>Weather conditions:</b>  <b>Person counted:</b> <b>Person prepared:</b> <b>Person checked:</b>																													
<b>** Signalized Intersection **</b>		<b>Major Road:</b> Tecumseh Rd E runs W/E																													
North Leg Total: 1013 North Entering: 652 North Peds: 2 Peds Cross: ☒	<table style="width:100%; border-collapse: collapse;"> <tr><td>Buses</td><td>2</td><td>3</td><td>3</td><td>8</td></tr> <tr><td>Trucks</td><td>0</td><td>4</td><td>0</td><td>4</td></tr> <tr><td>Cars</td><td>108</td><td>401</td><td>131</td><td>640</td></tr> <tr><td>Totals</td><td>110</td><td>408</td><td>134</td><td></td></tr> </table>	Buses	2	3	3	8	Trucks	0	4	0	4	Cars	108	401	131	640	Totals	110	408	134		<table style="width:100%; border-collapse: collapse;"> <tr><td>Buses</td><td>12</td></tr> <tr><td>Trucks</td><td>3</td></tr> <tr><td>Cars</td><td>346</td></tr> <tr><td>Totals</td><td>361</td></tr> </table>	Buses	12	Trucks	3	Cars	346	Totals	361	East Leg Total: 1082 East Entering: 572 East Peds: 6 Peds Cross: ☒
Buses	2	3	3	8																											
Trucks	0	4	0	4																											
Cars	108	401	131	640																											
Totals	110	408	134																												
Buses	12																														
Trucks	3																														
Cars	346																														
Totals	361																														
 <p style="text-align: center;">Banwell Rd</p> <p style="text-align: center;">Tecumseh Rd E</p> <p style="text-align: center;">N W — S — E</p> <p style="text-align: center;">Banwell Rd</p> <p style="text-align: center;">Tecumseh Rd E</p>																															
Peds Cross: ☒ West Peds: 0 West Entering: 491 West Leg Total: 1178	<table style="width:100%; border-collapse: collapse;"> <tr><td>Cars</td><td>578</td></tr> <tr><td>Trucks</td><td>11</td></tr> <tr><td>Buses</td><td>5</td></tr> <tr><td>Totals</td><td>594</td></tr> </table>	Cars	578	Trucks	11	Buses	5	Totals	594	<table style="width:100%; border-collapse: collapse;"> <tr><td>Cars</td><td>177</td><td>170</td><td>75</td><td>422</td></tr> <tr><td>Trucks</td><td>4</td><td>2</td><td>3</td><td>9</td></tr> <tr><td>Buses</td><td>1</td><td>5</td><td>0</td><td>6</td></tr> <tr><td>Totals</td><td>182</td><td>177</td><td>78</td><td></td></tr> </table>	Cars	177	170	75	422	Trucks	4	2	3	9	Buses	1	5	0	6	Totals	182	177	78		Peds Cross: ☒ South Peds: 3 South Entering: 437 South Leg Total: 1031
Cars	578																														
Trucks	11																														
Buses	5																														
Totals	594																														
Cars	177	170	75	422																											
Trucks	4	2	3	9																											
Buses	1	5	0	6																											
Totals	182	177	78																												
<b>Comments</b>																															

<b>Afternoon Peak Diagram</b>		<b>Specified Period</b> <b>From:</b> 15:00:00 <b>To:</b> 18:00:00	<b>One Hour Peak</b> <b>From:</b> 16:30:00 <b>To:</b> 17:30:00																																								
<b>Municipality:</b> Windsor <b>Site #:</b> 2302900004 <b>Intersection:</b> Tecumseh Rd E & Banwell Rd <b>TFR File #:</b> 1 <b>Count date:</b> 16-Feb-23		<b>Weather conditions:</b>  <b>Person counted:</b> <b>Person prepared:</b> <b>Person checked:</b>																																									
<b>** Signalized Intersection **</b>		<b>Major Road:</b> Tecumseh Rd E runs W/E																																									
North Leg Total: 1388 North Entering: 513 North Peds: 4 Peds Cross: ☒	<table style="width:100%; border-collapse: collapse;"> <tr><td>Buses</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Trucks</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>Cars</td><td>96</td><td>286</td><td>130</td><td>512</td></tr> <tr><td>Totals</td><td>96</td><td>287</td><td>130</td><td></td></tr> </table>	Buses	0	0	0	0	Trucks	0	1	0	1	Cars	96	286	130	512	Totals	96	287	130		 <table style="width:100%; border-collapse: collapse;"> <tr><td>Buses</td><td>2</td></tr> <tr><td>Trucks</td><td>3</td></tr> <tr><td>Cars</td><td>870</td></tr> <tr><td>Totals</td><td>875</td></tr> </table>	Buses	2	Trucks	3	Cars	870	Totals	875	East Leg Total: 1425 East Entering: 680 East Peds: 3 Peds Cross: ☒												
Buses	0	0	0	0																																							
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Buses Trucks Cars Totals 2 8 654 664	<table style="width:100%; border-collapse: collapse;"> <tr><td>Buses</td><td>Trucks</td><td>Cars</td><td>Totals</td></tr> <tr><td>0</td><td>1</td><td>198</td><td>199</td></tr> <tr><td>2</td><td>4</td><td>503</td><td>509</td></tr> <tr><td>0</td><td>2</td><td>172</td><td>174</td></tr> <tr><td>2</td><td>7</td><td>873</td><td></td></tr> </table>	Buses	Trucks	Cars	Totals	0	1	198	199	2	4	503	509	0	2	172	174	2	7	873		<table style="width:100%; border-collapse: collapse;"> <tr><td>Cars</td><td>Trucks</td><td>Buses</td><td>Totals</td></tr> <tr><td>159</td><td>0</td><td>0</td><td>159</td></tr> <tr><td>408</td><td>2</td><td>1</td><td>411</td></tr> <tr><td>110</td><td>0</td><td>0</td><td>110</td></tr> <tr><td>677</td><td>2</td><td>1</td><td></td></tr> </table>	Cars	Trucks	Buses	Totals	159	0	0	159	408	2	1	411	110	0	0	110	677	2	1		Cars Trucks Buses Totals 737 6 2 745
Buses	Trucks	Cars	Totals																																								
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110	0	0	110																																								
677	2	1																																									
Peds Cross: ☒ West Peds: 2 West Entering: 882 West Leg Total: 1546	<table style="width:100%; border-collapse: collapse;"> <tr><td>Cars</td><td>568</td></tr> <tr><td>Trucks</td><td>3</td></tr> <tr><td>Buses</td><td>0</td></tr> <tr><td>Totals</td><td>571</td></tr> </table>	Cars	568	Trucks	3	Buses	0	Totals	571	 <table style="width:100%; border-collapse: collapse;"> <tr><td>Cars</td><td>150</td><td>513</td><td>104</td><td>767</td></tr> <tr><td>Trucks</td><td>6</td><td>2</td><td>2</td><td>10</td></tr> <tr><td>Buses</td><td>1</td><td>2</td><td>0</td><td>3</td></tr> <tr><td>Totals</td><td>157</td><td>517</td><td>106</td><td></td></tr> </table>	Cars	150	513	104	767	Trucks	6	2	2	10	Buses	1	2	0	3	Totals	157	517	106		Peds Cross: ☒ South Peds: 1 South Entering: 780 South Leg Total: 1351												
Cars	568																																										
Trucks	3																																										
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Buses	1	2	0	3																																							
Totals	157	517	106																																								
<b>Comments</b>																																											

# Total Count Diagram

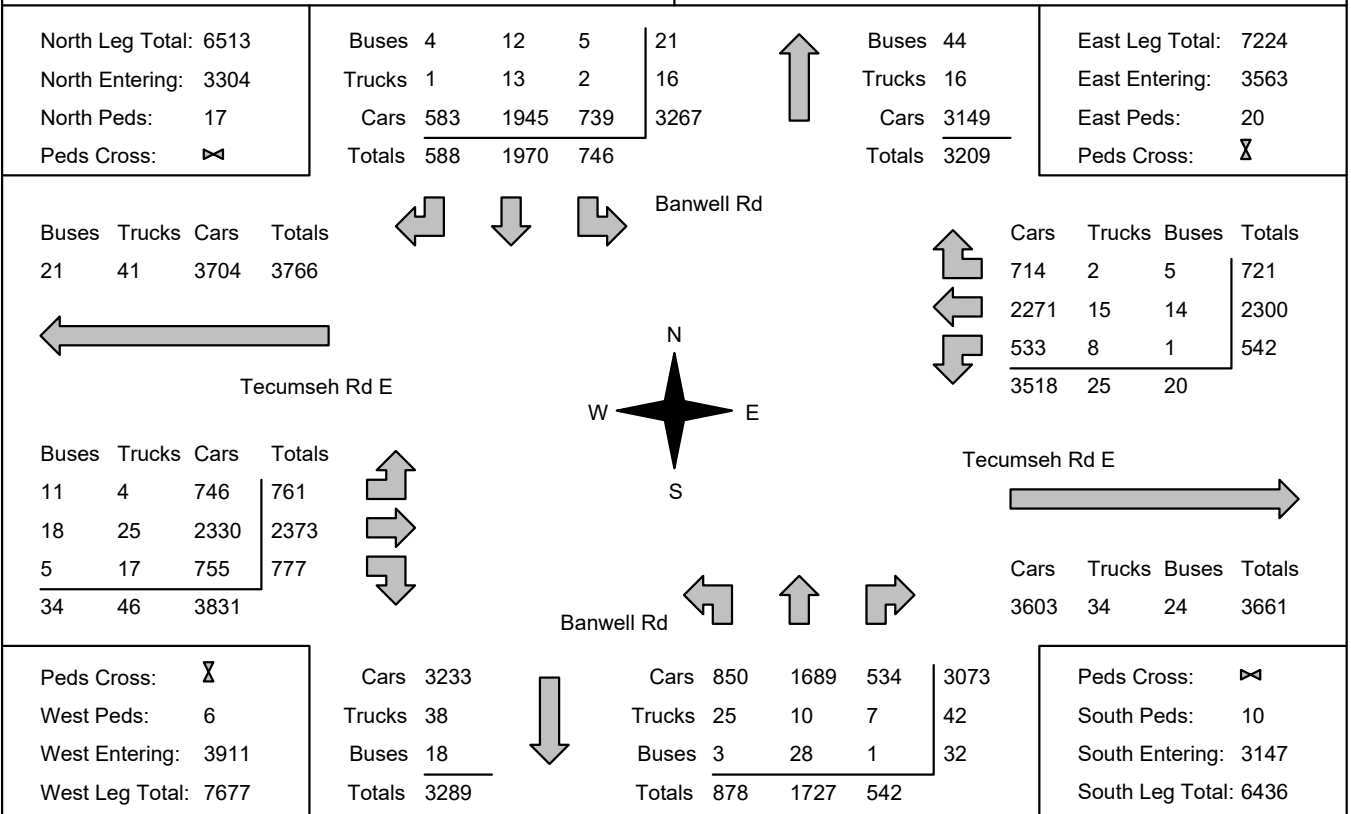
**Municipality:** Windsor  
**Site #:** 2302900004  
**Intersection:** Tecumseh Rd E & Banwell Rd  
**TFR File #:** 1  
**Count date:** 16-Feb-23

**Weather conditions:**

**Person counted:**  
**Person prepared:**  
**Person checked:**

**\*\* Signalized Intersection \*\***

**Major Road:** Tecumseh Rd E runs W/E



## Comments

# Traffic Count Summary

Intersection: Tecumseh Rd E & Banwell Rd      Count Date: 16-Feb-23      Municipality: Windsor

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Buses				Total Peds		Hour Ending	Includes Cars, Trucks, & Buses				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	96	417	82	595	0	868	8:00:00	109	114	50	273	0
9:00:00	134	408	110	652	2	1089	9:00:00	182	177	78	437	3
10:00:00	108	247	80	435	0	792	10:00:00	148	134	75	357	3
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	157	279	107	543	10	1180	16:00:00	140	378	119	637	2
17:00:00	110	331	98	539	3	1251	17:00:00	156	446	110	712	1
18:00:00	141	288	111	540	2	1271	18:00:00	143	478	110	731	1
<b>Totals:</b>	<b>746</b>	<b>1970</b>	<b>588</b>	<b>3304</b>	<b>17</b>	<b>6451</b>	<b>S Totals:</b>	<b>878</b>	<b>1727</b>	<b>542</b>	<b>3147</b>	<b>10</b>
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Buses				Total Peds		Hour Ending	Includes Cars, Trucks, & Buses				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	65	264	53	382	0	684	8:00:00	36	217	49	302	0
9:00:00	79	395	98	572	6	1063	9:00:00	86	298	107	491	0
10:00:00	64	378	89	531	5	1018	10:00:00	78	310	99	487	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	123	413	165	701	4	1641	16:00:00	183	563	194	940	4
17:00:00	109	439	167	715	1	1560	17:00:00	193	483	169	845	1
18:00:00	102	411	149	662	4	1508	18:00:00	185	502	159	846	1
<b>Totals:</b>	<b>542</b>	<b>2300</b>	<b>721</b>	<b>3563</b>	<b>20</b>	<b>7474</b>	<b>W Totals:</b>	<b>761</b>	<b>2373</b>	<b>777</b>	<b>3911</b>	<b>6</b>
<b>Calculated Values for Traffic Crossing Major Street</b>												
Hours Ending:	7:00	8:00	9:00	10:00			15:00	16:00	17:00	18:00		
Crossing Values:	0	622	730	508			0	683	714	767		











# Appendix C

## *Warning Clauses*

# Warning Clauses

Warning clauses should be included in agreements of Offers of Purchase and Sale, lease/rental agreements and condominium declarations.

**Type C:** “This dwelling unit has been designed with the provision for adding central air conditioning at the occupant’s discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment.”

**Type D:** “This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment.”

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

# Appendix D

## *Stamson Modelling*

Filename: banrail.te                            Time Period: 16 hours  
 Description:

Rail data, segment # 1:

```

-----
Train          ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type           !             !(km/h) !/Train!/Train! type !weld
-----+-----+-----+-----+-----+-----
  1. Pass      !   1.0/1.0   ! 128.0 ! 17.0 ! 66.0 !Diesel! Yes
  
```

Data for Segment # 1:

```

-----
Angle1  Angle2      : -90.00 deg   90.00 deg
Wood depth      :           0   (No woods.)
No of house rows :           0
Surface         :           1   (Absorptive ground surface)
Receiver source distance : 78.50 m
Receiver height :    4.50 m
Topography      :           1   (Flat/gentle slope; no barrier)
No Whistle
Reference angle :    0.00
  
```

Rail data, segment # 2:

```

-----
Train          ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type           !             !(km/h) !/Train!/Train! type !weld
-----+-----+-----+-----+-----+-----
  1.           !   1.0/1.0   ! 96.0  !  6.0 !193.0 !Diesel! Yes
  
```

Data for Segment # 2:

```

-----
Angle1  Angle2      : -90.00 deg   90.00 deg
Wood depth      :           0   (No woods.)
No of house rows :           0
Surface         :           1   (Absorptive ground surface)
Receiver source distance : 78.50 m
Receiver height :    4.50 m
Topography      :           1   (Flat/gentle slope; no barrier)
No Whistle
Reference angle :    0.00
  
```

Results segment # 1:

```

-----
LOCOMOTIVE (0.00 + 55.38 + 0.00) = 55.38 dBA
  
```

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	67.30	-10.75	-1.17	0.00	0.00	0.00	55.38

WHEEL (0.00 + 44.28 + 0.00) = 44.28 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.60	57.13	-11.50	-1.35	0.00	0.00	0.00	44.28

Segment Leq : 55.70 dBA

Results segment # 2:

LOCOMOTIVE (0.00 + 53.42 + 0.00) = 53.42 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	65.33	-10.75	-1.17	0.00	0.00	0.00	53.42

WHEEL (0.00 + 46.12 + 0.00) = 46.12 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.60	58.97	-11.50	-1.35	0.00	0.00	0.00	46.12

Segment Leq : 54.16 dBA

Total Leq All Segments: 58.01 dBA

TOTAL Leq FROM ALL SOURCES: 58.01



Filename: banwell.te                    Time Period: 16 hours  
 Description:

Road data, segment # 1: Banwell  
 -----

Car traffic volume : 16491 veh/TimePeriod  
 Medium truck volume : 255 veh/TimePeriod  
 Heavy truck volume : 239 veh/TimePeriod  
 Posted speed limit : 50 km/h  
 Road gradient : 0 %  
 Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Banwell  
 -----

Angle1 Angle2 : -90.00 deg 90.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 0  
 Surface : 1 (Absorptive ground surface)  
 Receiver source distance : 17.00 m  
 Receiver height : 16.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

Results segment # 1: Banwell  
 -----

Source height = 1.09 m

ROAD (0.00 + 64.27 + 0.00) = 64.27 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.22	65.52	0.00	-0.66	-0.59	0.00	0.00	0.00	64.27

Segment Leq : 64.27 dBA

Total Leq All Segments: 64.27 dBA

TOTAL Leq FROM ALL SOURCES:                    64.27

## Appendix E

### *D-6 Classification Criteria*

Category	Outputs	Scale	Process	Operations/Intensity	Possible Examples
Class I	<ul style="list-style-type: none"> <li>• Noise: Sound not audible off property</li> <li>• Dust and/or Odour: Infrequent and not intense</li> <li>• Vibration: No ground borne vibration on plant property</li> </ul>	<ul style="list-style-type: none"> <li>• No outside storage</li> <li>• Small scale plant or scale is irrelevant in relation to all other criteria for this Class</li> </ul>	<ul style="list-style-type: none"> <li>• Self-contained plant or building which produces/stores a packaged product. Low probability of fugitive emissions</li> </ul>	<ul style="list-style-type: none"> <li>• Daytime operations only</li> <li>• Infrequent movement of products and/or heavy trucks</li> </ul>	<ul style="list-style-type: none"> <li>• Electronics manufacturing and repair</li> <li>• Furniture repair and refinishing</li> <li>• Beverages bottling</li> <li>• Auto parts supply</li> <li>• Packaging and crafting services</li> <li>• Distribution of dairy products</li> <li>• Laundry and linen supply</li> </ul>
Class II	<ul style="list-style-type: none"> <li>• Noise: Sound occasionally audible off property</li> <li>• Dust and/or Odour: Frequent and occasionally intense</li> <li>• Vibration: Possible groundborne vibration, but cannot be perceived off property</li> </ul>	<ul style="list-style-type: none"> <li>• Outside storage permitted</li> <li>• Medium level of production allowed</li> </ul>	<ul style="list-style-type: none"> <li>• Open process</li> <li>• Periodic outputs of minor annoyance</li> <li>• Low probability of fugitive emissions</li> </ul>	<ul style="list-style-type: none"> <li>• Shift operations permitted</li> <li>• Frequent movement of products and/or heavy trucks with the majority of movements during daytime hours</li> </ul>	<ul style="list-style-type: none"> <li>• Magazine printing</li> <li>• Paint spray booths</li> <li>• Metal command</li> <li>• Electrical production manufacturing</li> <li>• Manufacturing of dairy products</li> <li>• Dry cleaning services</li> <li>• Feed packing plant</li> </ul>
Class III	<ul style="list-style-type: none"> <li>• Noise: sound frequently audible off property</li> <li>• Dust and/or Odour: Persistent and/or intense</li> <li>• Vibration: Ground-borne vibration can frequently be perceived off property</li> </ul>	<ul style="list-style-type: none"> <li>• Outside storage of raw and finished products</li> <li>• Large production levels</li> </ul>	<ul style="list-style-type: none"> <li>• Open process</li> <li>• Frequent outputs of major annoyances</li> <li>• High probability of fugitive emissions</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous movement of products and employees</li> <li>• Daily shift operations permitted</li> </ul>	<ul style="list-style-type: none"> <li>• Manufacturing of paint and varnish</li> <li>• Organic chemicals manufacturing</li> <li>• Breweries</li> <li>• Solvent recovery plants</li> <li>• Soaps and detergent manufacturing</li> <li>• Manufacturing of resins and costing</li> <li>• Metal manufacturing</li> </ul>

# Appendix F

## *Stacionary Source Data*

Stationary Source	Spectrum Type	Spectrum [dB]									Total Sound Power Level [dBA]
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Circular Saw Cutting Concrete	L <sub>p</sub> (10 m)		85	74	72	70	72	76	82	77	113
Truck Movements	L <sub>w</sub>	112.2	112	110.9	105.9	102.3	100.9	101	96	90.6	107.1
Pneumatic Tools	L <sub>w</sub>	93.6	88.9	93.4	86.8	90.3	89.4	96.6	96.1	95.9	102
Truck Idling	L <sub>w</sub>	99.5	100.8	96.2	92.8	95.3	95.2	92.8	86.6	79.1	99.3

## References

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Ontario Ministry of Environment Publication NPC-300, Environmental Noise Guideline, Stationary and Transportation Sources- Approval and Planning, October 2013.

US FTA Transit Noise and Vibration Impact Assessment Manual, 2018

Guidelines for New Development in Proximity to Railway Operations, Railway Association of Canada and Federation of Canadian Municipalities, May 2013.