

*Appendix A4*  
*Noise and Vibration Technical Report*





**Addendum to Oshawa to  
Bowmanville Rail Service  
Extension  
Environmental Project  
Report: Noise and  
Vibration Technical Report**

**Final**

August 24, 2023

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# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

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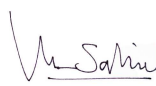
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# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

## **Executive Summary**

Stantec Consulting Ltd. (Stantec) was retained by Metrolinx, an agency of the Province of Ontario, to complete a Noise and Vibration Technical Report in support of the Oshawa to Bowmanville Rail Service Extension Project (the Project), formally referred to as the Oshawa to Bowmanville Rail Service Expansion Project in the 2011 Environmental Project Report (EPR).

A noise and vibration report was completed by AECOM as part of the EPR that was approved in 2011 to expand GO Transit rail services from Oshawa to Bowmanville. Since the completion of the 2011 EPR, Metrolinx has advanced the design of the rail expansion project, including updates to the alignment and infrastructure needs of the project. A new noise and vibration assessment is being undertaken to support an Addendum to the 2011 EPR.

The current Project includes the following elements:

- Tracking and supporting track infrastructure:
  - Proposed new track within the existing GO Lakeshore East Rail Corridor at the western limit of the Project, crossing Highway 401 via the existing General Motors (GM) Spur bridge. A new bridge will be constructed adjacent to the existing GM Spur bridge for the proposed realigned CP Rail track. The new GO track will extend north to the existing CP Rail corridor, ending at Bowmanville Avenue.
  - Retaining walls and grading to support track infrastructure
- Proposed GO station locations in proximity to:
  - Fox Street (B1 Thornton's Corners East)
  - Front Street (B2 Ritson)
  - Courtice Road (B3 Courtice)
  - Bowmanville Avenue (B4 Bowmanville)
- New bridges at the following locations:
  - Highway 401
  - GM Spur
  - Oshawa Creek
  - Wilson Road





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- Farewell Creek
  - Harmony Creek
  - Green Road
- New multi-use crossing (bridge or tunnel, to be determined)
- Front Street (Michael Starr Trail) Bridge replacements at the following locations:
  - Simcoe Street
  - Ritson Road
  - Farewell Street<sup>1</sup>
- Bridge removal at Albert Street
- Bridge expansions at the following locations:
  - Durham College (DC) Oshawa GO (formerly Oshawa GO Station) pedestrian bridge
  - Stevenson Road
  - Park Road
  - Harmony Road
  - Courtice Road
- Widening of at-grade crossings to accommodate GO track(s) at the following locations:
  - Bloor Street
  - Prestonvale Road
  - Private crossing for Dom's Auto
  - Trulls Road
  - Baseline Road (two crossings)
  - Rundle Road

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<sup>1</sup> Multi-use bridge only. Multi-use bridges can be used by pedestrians and cyclists crossing the rail corridor.



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- Holt Road
- Private farm crossing west of Maple Grove Road
- Maple Grove Road

The objective of this noise and vibration addendum is to update the baseline, construction and operation impact from the Project. The following applicable guidelines are considered for this assessment:

- The Ministry of the Environment, Conservation and Parks (MECP) guidance document “*Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning*” Noise Pollution Control (NPC) - 300 (MECP August 2013) for GO station stationary operation noise assessment.
- MECP Publication Noise Pollution Control (NPC) -115 “Model Municipal Noise Control By-law” (MECP August 1978) and NPC -118 “Motorized Conveyances” (MECP August 1982) are the applicable Provincial noise guidelines for construction.
- The Metrolinx Environmental Guide for Noise and Vibration Impact Assessment (Metrolinx 2021) that provides construction noise and vibration limits referenced from the City of Toronto’s By-law 514-2008 (Toronto By-law 514 2008) and the United States Federal Transit Administration (US FTA) Noise and Vibration Impact Assessment Manual (FTA 2018), and operation noise and vibration from the Ministry of Energy and Environment (MOEE)/GO Transit Draft Protocol for Noise and Vibration Assessment (MOEE/GO Protocol 1995).

### **Construction**

Construction is expected 8 hours per day and 5 days per week. Therefore, the receptor-based construction noise assessment was completed for the weekday limits only. Construction of Project components involve several construction activities under multiple phases. Phase specific equipment lists (i.e., equipment types and quantities) were provided by the design team.

The methodology described in Section 4.2 was used to assess Project construction noise impacts. The emission-based noise assessment was also completed for the construction equipment and the sound levels were compared to the applicable MECP NPC-115 and NPC-118 limits. The construction equipment exceeding the MECP limits requires an investigation of additional noise control for the construction phase.

A comparison of equipment sound levels (sound levels from the US FTA manual and FHWA road construction noise model) considered in this study against the MECP limits showed that some of the proposed equipment may exceed these limits. Prior to start of construction, noise emissions of the construction equipment considered for the Project must be reviewed to confirm that they are within the NPC-115 and NPC-118 limits. If the



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limits cannot be met, noise control options should be investigated and implemented to bring them into compliance.

Receptor-based construction noise and vibration impacts for the Project were assessed as per Metrolinx Environmental Guide, by establishing zone of influence (ZOI).

Project construction activities are expected to occur from 08:00 to 17:00 on weekdays; therefore, the noise ZOIs were established using noise exposure limits for weekday construction activities (e.g., 85 dBA, 80 dBA, 75 dBA, 70 dBA) for the land uses (e.g., Industrial, Commercial, Residential, and Institutional) surrounding the Project. In the absence of construction activity/phase specific work areas and equipment locations, the construction noise ZOIs were established based on the Project Footprint.

The results of the assessment indicate that some residential, commercial and institutional land uses fall within the established ZOI for the worst-case noise impact. Scheduling restrictions such as staggering of construction activities as well as mitigation and monitoring are recommended for those areas. The potential residential, commercial and institutional areas impacted by the Project construction are identified in this report. Further, for each construction activity and phase, the assessment provides the minimum setback distances for noise compliance with the applicable noise exposure limits.

Construction vibration impacts were evaluated by establishing vibration ZOI per the applicable vibration criteria provided in the Metrolinx Environmental Guide for structural damage.

The assessment identifies potential areas impacted by the construction vibration and minimum setback distances required for the most impactful construction equipment for vibration compliance. Vibration monitoring is recommended for those areas potentially impacted by construction vibration if the minimum setback distances cannot be maintained.

Additionally, monitoring requirements and best construction practices as per the Metrolinx Environmental Guide are provided in the report appendices. A thorough construction noise and vibration management plan or plans will be needed to address this topic more directly and they should be prepared by the contractor prior to the start of construction.

### **Operation**

Project operation is expected 24 hours per day and 7 days per week, and therefore, operation noise was assessed for daytime and nighttime limits. The methodology described in Section 4.3 was used to assess Project operation noise and vibration impacts.



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Noise and vibration impact from the Project rail operations were assessed by completing pre-project noise modelling and vibration measurements. The MOEE/GO Transit Draft Protocol limits (MOEE/GO Draft Protocol 1995) were used for the rail operation noise and vibration assessment.

Baseline noise and vibration data was collected for the Project between May 3 and June 2, 2021 in support of the operation noise and vibration assessment. Baseline sound levels from six representative noise monitoring locations (NM01 through NM06) were used to validate the noise model considered for this assessment. Baseline vibration data was used to assess operation vibration from the existing Canadian Pacific (CP) Rail corridor. Methodology, instrumentation, and results of the baseline noise and vibration data collection are discussed and reported in Section 5.0 of this report.

Baseline sound data collected along the CP Rail corridor and existing sound levels predicted from the model, indicate that the noise model considered for this assessment is appropriate.

Eighty-nine (89) representative Points of Reception (PORs), including future developments, were chosen within the Study Area for assessing noise impact from rail operations along the corridor. The noise effects due to Project rail operations were compared to the pre-project sound levels at the representative PORs. The analysis of the noise modeling results indicate that predicted effects resulted were above the MOEE/GO Draft Protocol limits at several PORs. Therefore, noise mitigation measures are recommended for Project rail operations in Section 6.4 of this report.

In addition to the PORs considered for the rail operation noise assessment, nine additional PORs were considered for assessing stationary noise impact from stations associated with the GO stations and the layover facility. The GO stations are expected to be developed for mixed use with potential commercial and residential use. At the time of preparing this report, no information was available for GO stations. Therefore, they are not considered as receptors for this assessment. Stantec recommends further detailed studies be conducted once the design of the GO stations is advanced to evaluate compliance with the applicable MECP noise limits.

Stationary noise sources at the GO stations and layover facility were assessed by predicting noise levels at the surrounding receptors and comparing with the applicable MECP limits. The MECP guidance document NPC-300 was considered to evaluate the impact of noise generated by the four GO stations and the layover facility.

GO station and layover facility sound levels were predicted using the methodology described in Section 4.3. The assessment indicates that the sound levels generated by GO station operations are expected to exceed daytime and nighttime limits at PORs in proximity to GO stations B2, B3, and B4 and the layover facility. Noise walls are recommended for these GO stations and the layover facility as discussed in Section 6.4 of this report. Idling locomotives at the layover facility were modeled at the east end of



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the trains due to operational requirements. Idling locomotives at the west end of the trains are expected to cause exceedances at condominiums in proximity to the B4 GO station. Therefore, it is recommended that the locomotives for the trains be kept at the east end of the trains.

MOEE/GO Draft Protocol recommends a desirable objective of a maximum of 0.14 mm/s vibration levels at the receptor locations. As per the Draft Protocol, an evaluation of mitigation is required only if the vibration level exceeds the objective by 25% from the existing or a maximum value of 0.175 mm/s at any existing POR.

The proposed GO tracks are to be located south of the existing CP tracks. The Project vibration impact from rail operations was assessed using measurements from two representative locations along the corridor, for several setback distances. The future setback distances from the proposed GO rail track to the receptors were identified and pre-project measured vibration levels for that setback were used to assess potential vibration impact from the proposed GO rail operations. Based on the measured vibration levels from the existing CP Rail track, a criterion of 0.175 mm/s was considered for assessment of the Project vibration from operations. All new developments are assessed against a vibration criteria limit of 0.14 mm/s.

Vibration levels were assessed and reported in Table 6.7 under Section 6.3. Vibration levels from rail operations are expected to exceed the criteria limits at the receptors (dwellings south of the CP rail) located within 30 m of the centerline of the proposed GO track. Ballast mats are recommended as vibration mitigation for the Project as described in Section 6.4, subject to feasibility.

Stantec recommends that additional noise and vibration monitoring be conducted during the detailed design phase of the Project. These measurements should be collected to confirm that modelled ambient noise levels are a conservative estimate of existing ambient sound levels and that measured vibration levels are also representative of the existing conditions along the project corridor.

Noise and vibration monitoring may be challenging given the varying schedule and composition of the freight movements along the CP rail line.

Stantec also recommends that an additional set of validation measurements be collected after the commissioning of the Project to validate modelled sound levels.



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# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

## **Abbreviations**

CADNA/A	A Noise Modeling Software
CEI	Cost Effectiveness Index
dB	Decibel
dBA	Decibel, A-weighted
DC Oshawa GO	Durham College Oshawa GO
EA	Environmental Assessment
Hz	Hertz
ISO	International Organization for Standardization
Km	Kilometre(s)
L <sub>eq</sub>	Energy Equivalent Sound Level over a period of time
L <sub>eq(16)</sub>	Daytime (07:00-23:00) Energy Equivalent Sound Level
L <sub>eq(8)</sub>	Nighttime (23:00-07:00) Energy Equivalent Sound Level
M	Metre(s)
MECP	Ontario Ministry of the Environment, Conservation and Parks
mm/s	Millimetre(s) per second
MTM	Modified Transverse Mercator
POR	Point of reception
PPV	Peak particle velocity
RMS	Root mean square
TNM	Traffic Noise Model
US FHWA	United States Federal Highway Administration
US FTA	United States Federal Transit Administration
ZOI	Zone of influence



# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

## Glossary

Term	Definition
Ambient sound level or ambient noise	All-encompassing sound that is associated with a given environment, usually a composite of sounds from many sources near and far. Includes noise from all sources other than the sound of interest (in this case, sound that exists prior to improvements).
A-weighting	The weighting network used to account for changes in level sensitivity as a function of frequency. The A-weighting network de-emphasizes the high (i.e., 6.3 kHz and above) and low (i.e., below 1 kHz) frequencies, and emphasizes the frequencies between 1 kHz and 6.3 kHz, in an effort to simulate the relative response of the human ear. See also: frequency weighting.
baseline	The existing acoustical environment or baseline acoustical conditions. See also: existing ambient, pre-project conditions.
decibel (dB)	A logarithmic quantity of any measured physical parameter and commonly used in the measurement of sound. The decibel (dB) provides the possibility of representing a large span of sound levels in a simplified manner. The difference between the sound pressures for virtual silence versus a loud sound is a factor of 1:1,000,000 or more, therefore it is less cumbersome to use a small range of equivalent values: 0 to 130 dB. It is used for both sound pressure level as well as sound power level.



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Term	Definition
decibel, A-weighted (dBA)	A-weighted decibels (dBA). Most common units for expressing sound levels approximating the response of the human ear.
energy equivalent sound level	An energy-average sound level ( $L_{eq}$ ) over a specified period that would have the same sound energy as the actual (i.e., time varying) sound over the same period. It represents the average sound pressure level encountered for the period. The period is often added as a suffix to the label (i.e., $L_{eq(24hr)}$ for the 24-hour equivalent sound level).
existing ambient	All sounds in a given area (i.e., includes all natural sounds as well as all mechanical, electrical and other human-caused sounds). See also: baseline and pre-project conditions.
frequency	The number of times per second that the sine wave of sound repeats itself. It can be expressed in cycles per second, or Hertz (Hz). Frequency equals speed of sound/wavelength.
frequency weighting (A, B, and C Weighting)	<p>A method used to account for changes in sensitivity as a function of frequency. Three standard weighting networks, A, B and C, are used to account for different responses to sound pressure levels.</p> <p>Note: The absence of frequency weighting is referred to as linear response or unweighted response. Most commonly used weighting is A-weighting (see also A-weighting).</p>
Hertz (Hz)	The unit of frequency also expressed as cycles per second.
noise	Unwanted sound.



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<b>Term</b>	<b>Definition</b>
peak particle velocity (vibration)	The peak particle velocity (PPV) is the maximum instantaneous positive or negative peak of the vibration signal. PPV is often used in construction vibration monitoring and assessment since PPV is related to the stresses experienced by buildings during construction.
pre-project conditions	See also: baseline, existing ambient.
point of reception (POR)	A noise-sensitive receptor such as a residence, campground, daycare, school, church, or hospital as defined in Ontario Ministry of the Environment, Conservation and Parks Publication NPC-300.
reference sound level	Reference sound levels for road and rail sources were obtained from ORNAMENT and STEAM and was used in the model to predict noise effects at PORs. The reference sound level produced by rail with specified number of locomotives, number of cars, and train speed at a given distance.
root mean square (vibration)	The root mean square (RMS) of a vibration velocity signal is the square root of the average of the squared velocity of the vibratory signal.
sound level	Generally, sound level refers to the weighted sound pressure level obtained by frequency weighting, usually A-weighted for the purpose of approval in Ontario and expressed in decibels.
sound level meter	An instrument consisting of a microphone, an amplifier, and a data logger and analyzer equipped with frequency-weighting networks that is used to measure sound levels.
sound power level	The total sound energy radiated by a source per unit time. The unit of measurement is the Watt.



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<b>Term</b>	<b>Definition</b>
	The acoustical power radiated from a given sound source as related to a reference power level (i.e., typically 1E-12 watts, or 1 picowatt) and expressed as decibels. A sound power level of 1 watt = 120 decibels relative to a reference level of 1 picowatt.
sound pressure	The root-mean-square of the instantaneous sound pressures during a specified time interval in a stated frequency band.
sound pressure level	Logarithmic ratio of the root-mean-square sound pressure to the sound pressure at the threshold of human hearing (i.e., 20 micropascals).
vibration	Vibration is defined as an oscillatory motion of an element/particle. Because the motion is oscillatory, there is no net movement of the vibrating element/particle and the average of the motion is zero. Rail related vibration is described in terms of the velocity. The velocity represents the instantaneous speed of the element/particle.
weighting	Adjustment of sound level data to reflect receptor sensitivities. A-weighting is used to refer to average human hearing as a function of frequency.



# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Introduction  
August 24, 2023

## **1.0 Introduction**

### **1.1 Project Overview**

Stantec Consulting Ltd. (Stantec) was retained by Metrolinx, an agency of the Province of Ontario, to complete a Noise and Vibration Technical Report for the Oshawa to Bowmanville Rail Service Extension Project (the Project), formally referred to as the Oshawa to Bowmanville Rail Service Expansion Project in the 2011 Environmental Project Report (EPR), located in the City of Oshawa and the Municipality of Clarington within the Region of Durham, Ontario. A noise and vibration report was completed by AECOM as part of the EPR that was approved in 2011 to expand GO Transit rail services from Oshawa to Bowmanville. This Assessment is required to support an Addendum to the Oshawa to Bowmanville Rail Service Extension EPR. The purpose of the Project is to extend GO rail services from the existing Durham College (DC) Oshawa GO Station (formerly Oshawa GO Station) through to Bowmanville.

### **1.2 Background**

All-day rail service currently operates on the Lakeshore East Rail Corridor between Union Station in downtown Toronto and DC Oshawa GO Station. The Lakeshore East Rail Corridor extension from Oshawa to Bowmanville was originally identified as one of 52 rapid transit improvements and expansion projects in the *MoveOntario* 2020 plan (Government of Ontario 2007), Ontario's multi-year \$17.5 billion rapid transit action plan for the Greater Toronto and Hamilton Area (GTHA). More recently, the expansion initiative was supported through the Initial Business Case Update (Metrolinx 2020) and a preferred alignment option was selected.

The Oshawa to Bowmanville Rail Service Extension and Rail Maintenance Facility Environmental Project Report (EPR) was completed in 2011, in accordance with the Transit Project Assessment Process (TPAP) outlined in Ontario Regulation (O. Reg.) 231/08 – Transit Projects and Metrolinx Undertakings, to assess Metrolinx's plan to expand GO Transit rail services from Oshawa to Bowmanville utilizing the CP Rail corridor.

Since the completion of the 2011 EPR, Metrolinx has advanced the design of the rail expansion project, including updates to the alignment and infrastructure needs of the project. As outlined in Section 15 (1) of O. Reg. 231/08, if a proponent wishes to make a change to a transit project that is inconsistent with a completed EPR, an addendum to the EPR must be prepared. In addition, as per Section 16 of O. Reg. 231/08, should a project not commence within 10 years of the Statement of Completion, a review of the project documentation is required. The Statement of Completion for the 2011 EPR is



# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Introduction  
August 24, 2023

dated April 13, 2011, and more than 10 years has lapsed since the filing of this document.

An EPR Addendum Report is being undertaken to document the changes to the transit project based on refinements to the design approach identified in the EPR, and to consider relevant updates to environmental conditions since the completion of the EPR in 2011.

## **1.3 Purpose**

Metrolinx is conducting preliminary planning studies and developing a conceptual design for the Project. Potential environmental effects of the Project are being assessed to meet the requirements of the O. Reg. 231/08 and the Ontario *Environmental Assessment Act*. This Noise and Vibration Assessment is to evaluate the potential effects of noise and vibration generated by the Project construction and operation on sensitive receptors in the vicinity of the Project Footprint.

The objectives of this Technical Report are:

- To determine baseline noise and vibration levels in the Project area through monitoring;
- Assess the potential impacts of noise and vibration generated by construction activities at the sensitive receptors in the vicinity of the Project;
- Assess the potential impacts of noise and vibration generated by operation at the sensitive receptors in the vicinity of the Project;
- Identify areas where potential noise and vibration complaints could arise from construction and operation activities; and,
- Reduce potential complaints from surrounding properties by recommending operational changes to construction activities, proposing noise barriers and/or other noise and vibration mitigation options, proposing noise and vibration monitoring during construction.

The noise and vibration assessment is intended to comply with the applicable criteria during construction and operation of the Project.





# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Project Description  
August 24, 2023

## **2.0 Project Description**

The Project Footprint includes the total area potentially affected by the proposed construction and operational activities. The current Project includes the extension of GO rail service from the DC Oshawa GO to Bowmanville, with four new proposed GO stations. The following Project components are proposed to be located on or adjacent to the rail corridor between DC Oshawa GO and Bowmanville Avenue in the Municipality of Clarington (i.e., GO Subdivision Mile 11.67 in the west to CP Belleville Subdivision Mile 164.8 in the east):

- Tracking and supporting track infrastructure:
  - Proposed new track within the existing GO Lakeshore East Rail Corridor at the western limit of the Project, crossing Highway 401 via the existing General Motors (GM) Spur bridge. A new bridge will be constructed adjacent to the existing GM Spur bridge for the proposed realigned CP Rail track. The new GO track will extend north to the existing CP Rail corridor, ending at Bowmanville Avenue.
  - Retaining walls and grading to support track infrastructure
- Proposed Layover Facility:
  - Proposed layover facility adjacent to the proposed Bowmanville Avenue GO station
- Proposed GO station locations in proximity to:
  - Fox Street (B1 Thornton's Corners East)
  - Front Street (B2 Ritson)
  - Courtice Road (B3 Courtice)
  - Bowmanville Avenue (B4 Bowmanville)
- New bridges at the following locations:
  - Highway 401
  - GM Spur
  - Oshawa Creek
  - Wilson Road



# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Project Description  
August 24, 2023

- Farewell Creek
  - Harmony Creek
  - Green Road
- New multi-use crossing (bridge or tunnel, to be determined):
  - Farewell Street
- Bridge replacements at the following locations:
  - Simcoe Street
  - Ritson Road
  - Farewell Street<sup>2</sup>
- Bridge removal at Albert Street
- Bridge expansions at the following locations:
  - DC Oshawa GO pedestrian bridge
  - Stevenson Road
  - Park Road
  - Harmony Road
  - Courtice Road
- Widening of at-grade crossings to accommodate GO track(s) at the following locations:
  - Bloor Street
  - Prestonvale Road
  - Private crossing for Dom's Auto
  - Trulls Road
  - Baseline Road (two crossings)
  - Rundle Road

---

<sup>2</sup> Multi-use bridge only. Multi-use bridges can be used by pedestrians and cyclists crossing the rail corridor.



# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Project Description  
August 24, 2023

- Holt Road
- Private farm crossing west of Maple Grove Road
- Maple Grove Road

Drawings of the proposed track alignment are provided as Appendix A.

## **2.1 Study Area**

The Study Area is defined as the region where the impacts are assessed and investigated, including areas of potential noise and vibration impacts. The Study Area for this noise and vibration assessment has been identified based on the Project Footprint.

The Project Study Area for the noise impact assessment is defined as per the Metrolinx Environmental Guide for Noise and Vibration Impact Assessment (Metrolinx, 2021), hereafter referred to as the Metrolinx Environmental Guide. The study area defines the region where impacts need to be investigated, including the areas of most-significant impact. The minimum recommended study area for impact assessments is 300 m on either side of rail or roadway for rail projects and 500 m from construction sites or stationary sources in all directions. For the purposes of this assessment, the Study Area has been defined as per the construction requirements.

The Federation of Canadian Municipalities/Railway Association of Canada (FCM/RAC 2013) proximity guideline identifies a 75 m setback as the Zone of Influence (ZOI) to assess the impact of vibration on sensitive receptors. As the 500 m Study Area setback distance established by the Metrolinx Environmental Guide for noise is greater, it will be used for both noise and vibration for this Project.

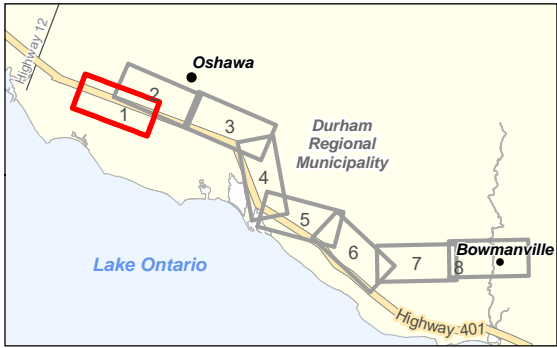
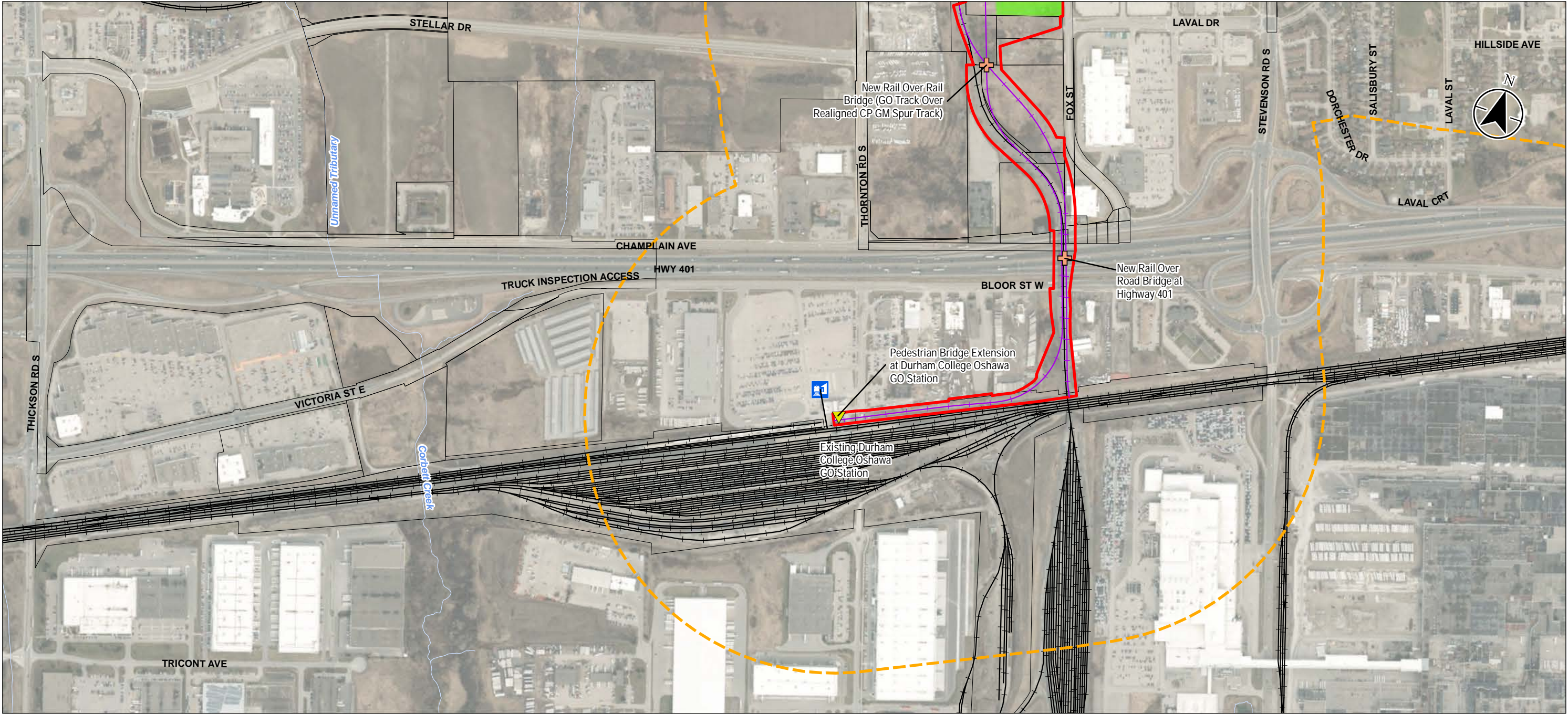
The Study Area is used to describe the pre-project (baseline) conditions in the area from a contextual perspective.

The overall Project Study Area along with the Project Footprint is shown in Figure 2.1.1 through Figure 2.1.8. Drawings showing the location of the proposed GO rail track within the existing rail corridor are provided in Appendix A.





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- Legend**
- Project Footprint
  - Study Area
  - 1 Existing Durham College Oshawa GO Station
  - ▼ Proposed Pedestrian Bridge Extension
  - + Proposed New Bridge
  - Proposed Transit Oriented Community Location
  - +— Existing Railway
  - +— Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary

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Project Location 165011019 REVA  
Regionan Municipality Prepared by BCC on 2023-08-22  
of Durham

Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.

**2.1.1**

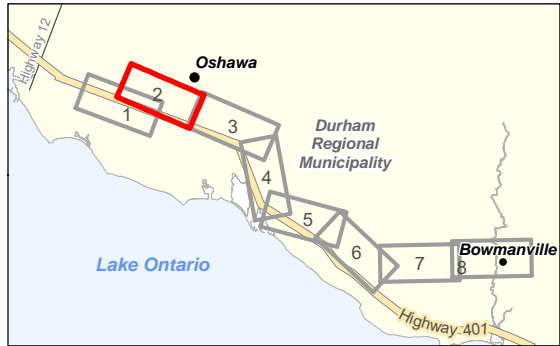
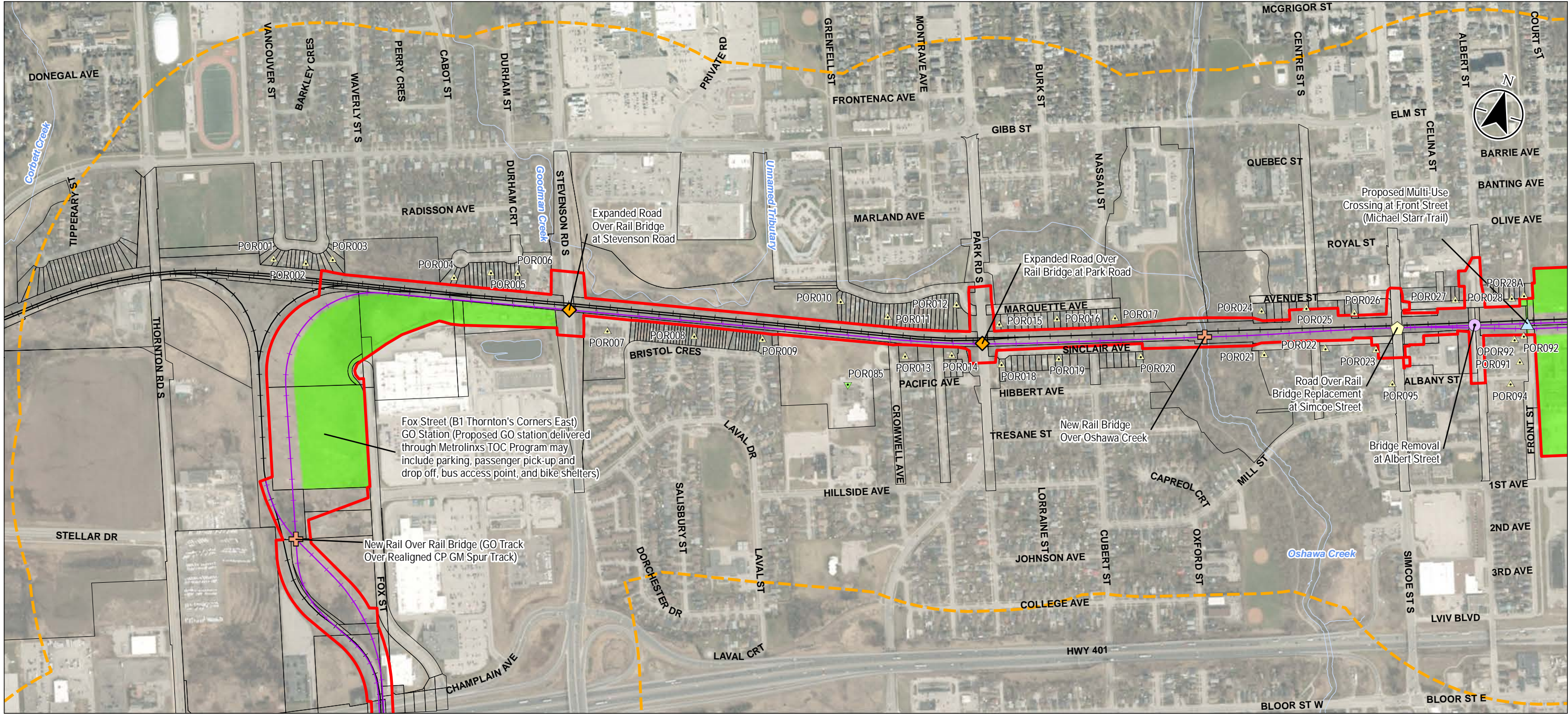
Title

**Project Footprint, Study Area, and  
Representative Receptors**

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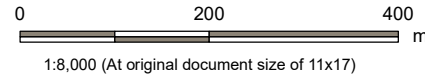
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#### Legend

- Project Footprint
- Study Area
- + Proposed New Bridge
- △ Proposed Bridge Replacement
- Proposed Bridge Removal
- △ Proposed New Multi-Use Grade-Separated Crossing
- ◆ Proposed Bridge Expansion
- Proposed Transit Oriented Community Location
- Existing Railway
- Proposed GO Track(s)
- Watercourse

- Waterbody
- Property Boundary
- △ Representative Receptors
- ▽ Receptor - Construction



Project Location 165011019 REVA  
Region Municipality of Durham Prepared by BCC on 2023-08-22

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Figure No.

**2.1.2**

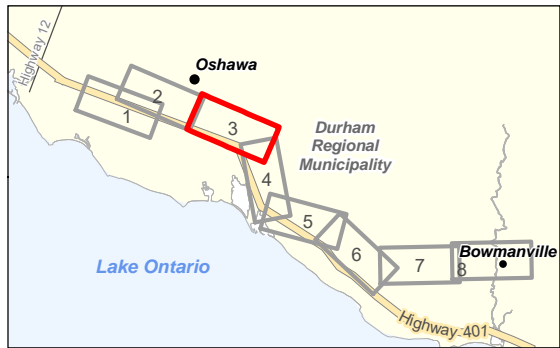
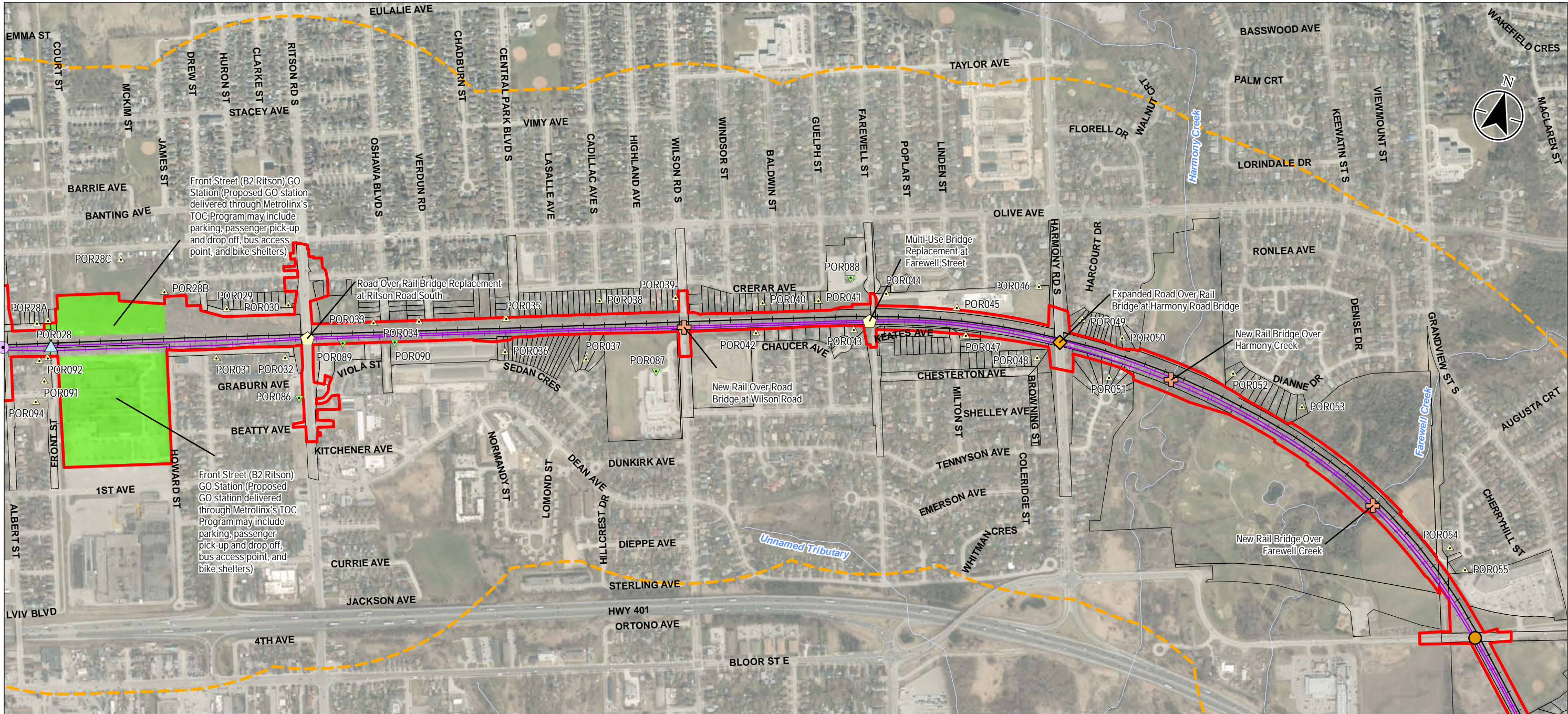
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**Project Footprint, Study Area, and  
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#### Legend

- Project Footprint
- Study Area
- Proposed New Bridge
- Proposed Bridge Replacement
- Proposed Bridge Removal
- Proposed New Multi-Use Grade-Separated Crossing
- Proposed Upgrades to At-Grade Crossing
- Proposed Bridge Expansion
- Proposed Transit Oriented Community Location
- Existing Railway
- Proposed GO Track(s)
- Watercourse
- Waterbody
- Property Boundary
- Representative Receptors
- Receptor - Construction

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EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.

2.1.3

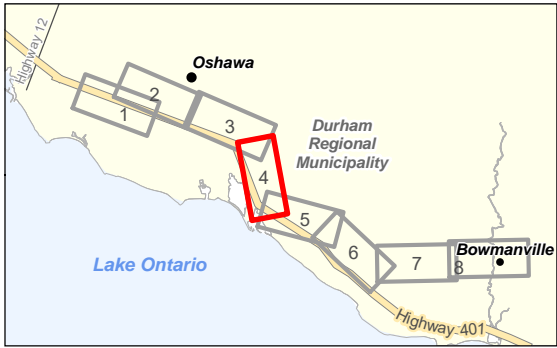
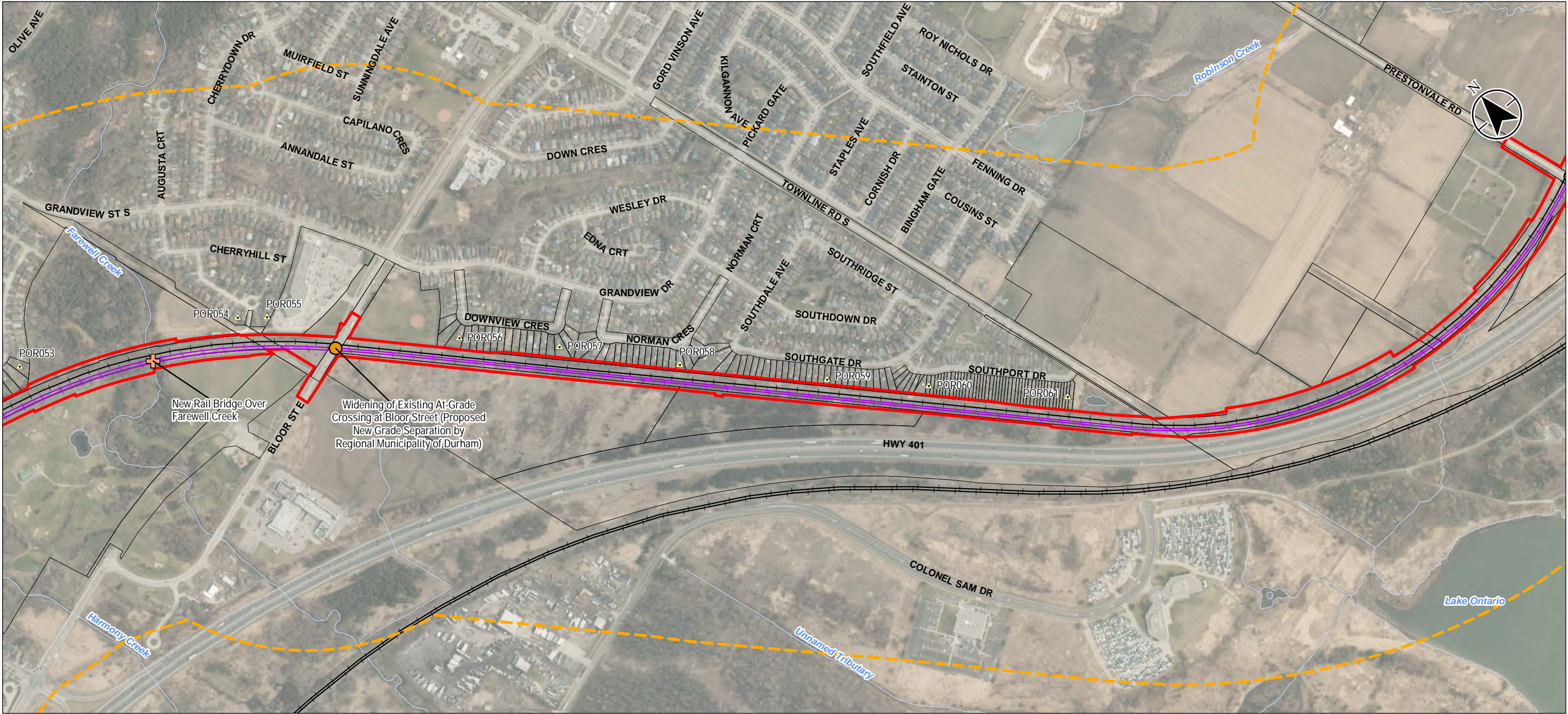
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Project Footprint, Study Area, and  
Representative Receptors

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- Legend**
- Project Footprint
  - Study Area
  - + Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - +— Existing Railway
  - +— Proposed GO Track(s)
  - +— Watercourse
  - +— Waterbody
  - Property Boundary
  - ▲ Representative Receptors

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ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.  
**2.1.4**

Title  
**Project Footprint, Study Area, and  
Representative Receptors**

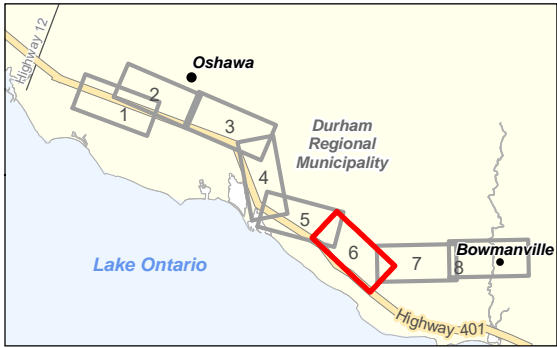
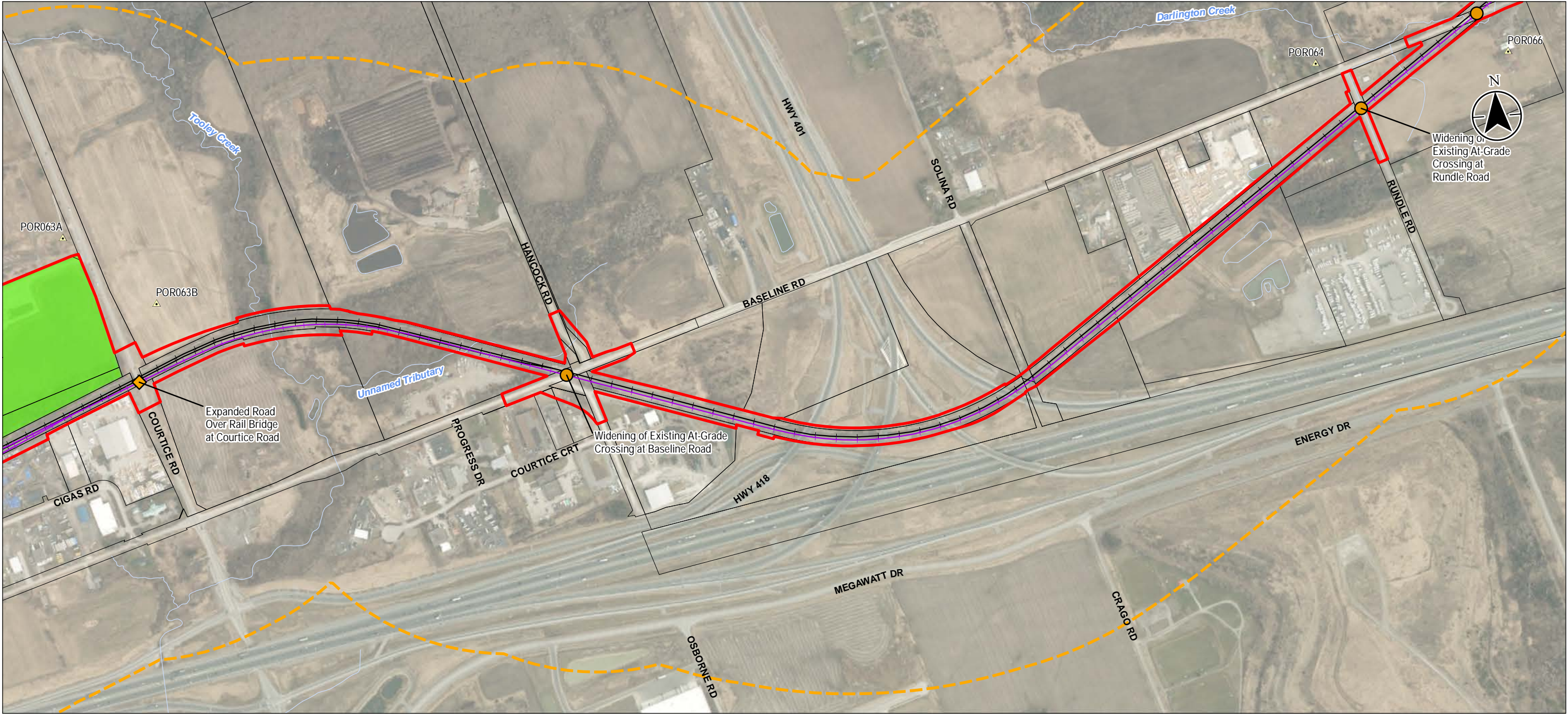
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- Legend**
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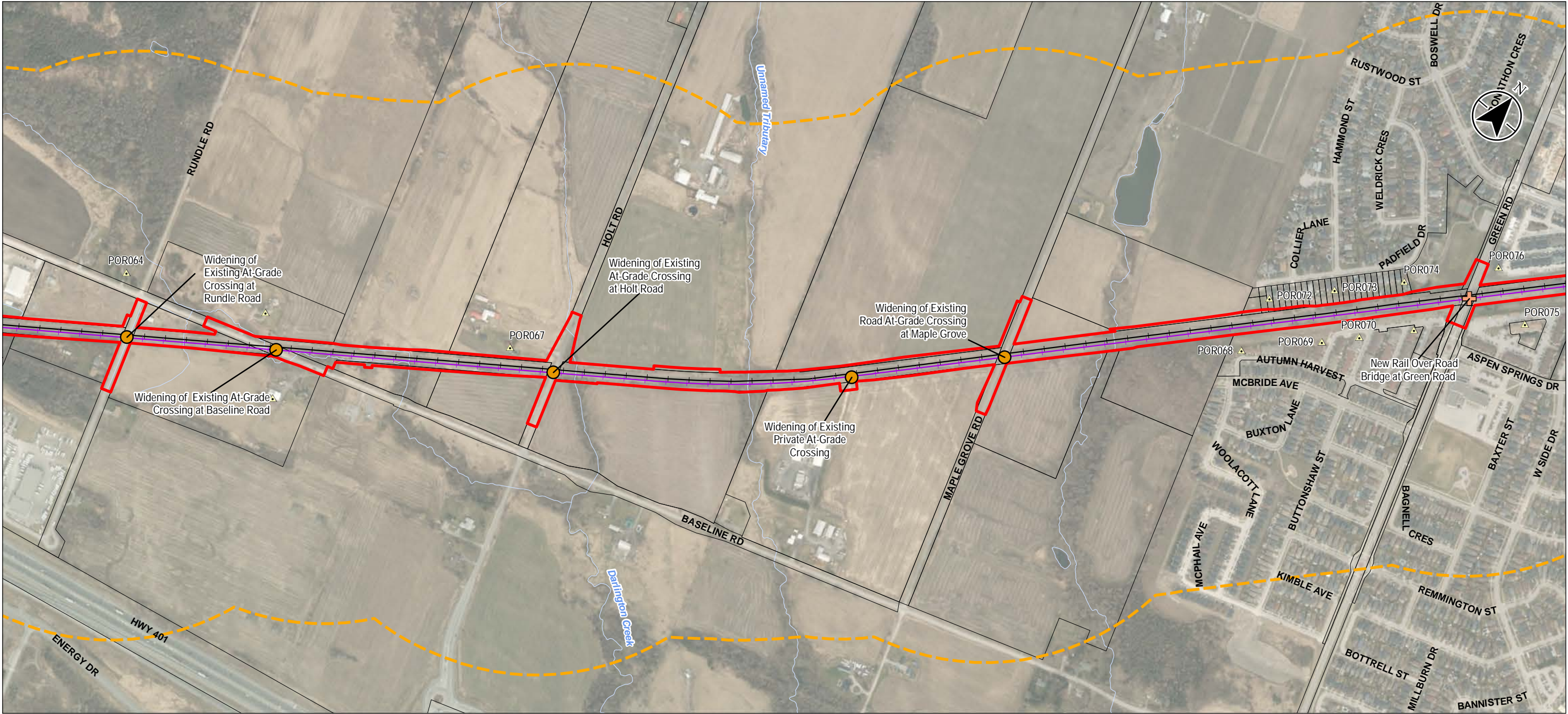
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Title  
**Project Footprint, Study Area, and Representative Receptors**

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- Legend**
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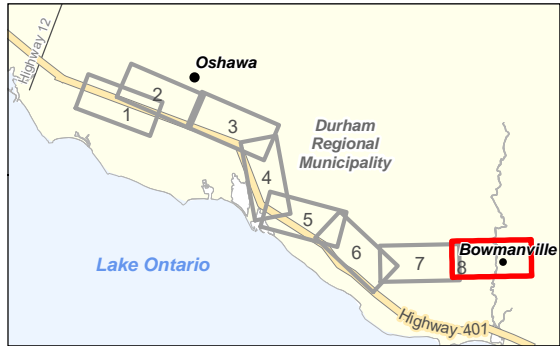
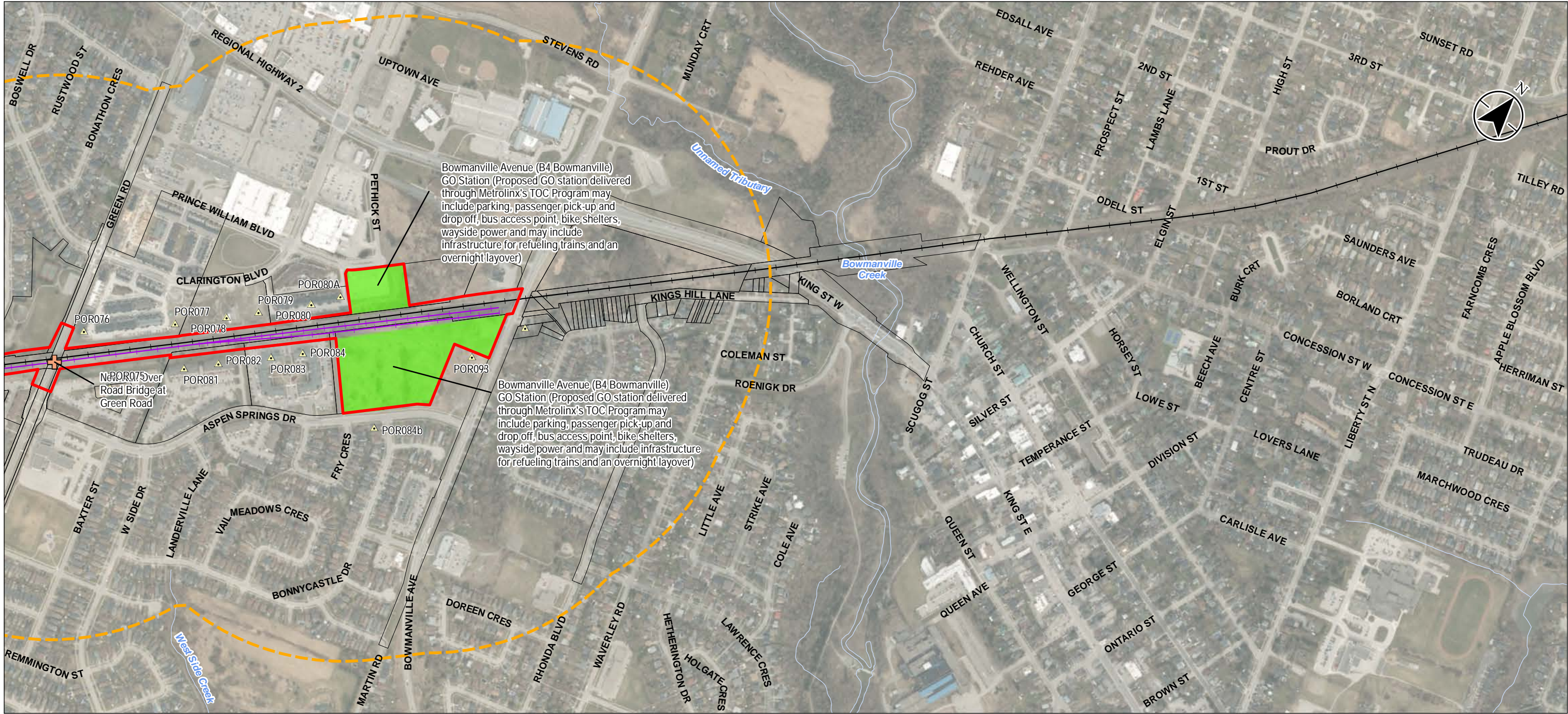
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**2.1.7**

Title  
**Project Footprint, Study Area, and Representative Receptors**

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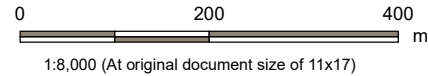


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- Legend**
- Project Footprint
  - Study Area
  - Proposed New Bridge
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  - Existing Railway
  - Proposed GO Track(s)
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  - Waterbody
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Project Location  
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Figure No.

**2.1.8**

Title

**Project Footprint, Study Area, and  
Representative Receptors**

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# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Project Description  
August 24, 2023

## **2.2 Land Use Description**

The area surrounding the Study Area serves diverse purposes. It consists of a mix of varying densities of residential developments, commercial, industrial, transportation, and agricultural land uses. The proposed new GO rail track shares the rail corridor with a main CP Rail track and interfaces with a Canadian National (CN) Railway track directly after the existing DC Oshawa GO Station. The Project initially crosses Highway 401, west of Stevenson Road before turning east and running parallel to Highway 401. The rail corridor passes underneath the Highway 401/418 interchange where it begins to head northeast away from Highway 401.

Residential dwellings are located at various distances from the existing right-of-way (ROW) with the closest being approximately 20 m from the center of the closest track. There are several institutional buildings including schools and churches adjacent to the existing ROW approximately 20 m from the center of the closest track.

The acoustical environment at the western edge of the Study Area between Stevenson Road and Prestonvale Road in Oshawa is dominated by traffic noise generated by the surrounding roadway and the existing rail network. The acoustical environment between Prestonvale Road and Maple Grove Road in the Study Area is a combination of traffic noise generated by the surrounding roadway and rail network as well as farming and light industrial activities. The acoustical environment between Maple Grove Road and Martin Road at the eastern edge of the Study Area is dominated by traffic noise generated by the surrounding roadway and the existing rail network.

Zoning maps for the Study Area are included in Appendix A.



# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Policy and Regulatory Overview  
August 24, 2023

## **3.0 Policy and Regulatory Overview**

The applicable noise and vibration criteria for the Project construction and operation are discussed in detail in this section.

The following categories of noise and vibration sources have been identified as part of the Project:

1. Noise and vibration generated by construction activities
2. Noise and vibration generated by the operation of trains along the Project ROW
3. Noise and vibration generated by the operation of stationary sources including bus service at the GO stations
4. Noise and vibration generated by the proposed layover facility
5. Noise from emergency generator testing and maintenance activities at the GO stations

### **3.1 Construction**

Noise and vibration impact from Project construction is a concern as it may cause annoyance and structural damage. Sections 3.1.1 through 3.1.4 discuss applicable guidelines and noise and vibration limits for the construction phase of the Project.

#### **3.1.1 Federal Context**

As a provincial agency, Metrolinx construction projects are not governed by federal noise guidelines such as Health Canada Noise Guidance (HC 2017). Therefore, other applicable guidance and criteria such as provincial guidelines, municipal by-laws, and Metrolinx criteria are considered for this assessment.

#### **3.1.2 Provincial Context**

The Ministry of the Environment, Conservation and Parks (MECP) Publication Noise Pollution Control (NPC)-115 “Model Municipal Noise Control By-law” (MECP August 1978) and NPC-118 “Motorized Conveyances” (MECP August 1982) are the applicable Provincial noise guidelines for construction of the Project. Both NPC-115 and NPC-118 limit noise emissions from construction equipment in Ontario and are considered the criteria for this assessment. These NPC publications provide sound emission limits for various types of construction equipment. They stipulate noise limits on individual pieces of equipment rather than a site-wide combined performance limits or sound level at nearby receptors. These criteria are summarized in Table 3.1.



# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Policy and Regulatory Overview

August 24, 2023

**Table 3.1: NPC-115 and NPC-118 Noise Emission Limits**

Type of Equipment	Maximum Sound Pressure Level (dBA)
Excavation equipment, bulldozers, loaders, backhoes or other equipment or other equipment capable of being used for a similar application <sup>1</sup>	83 (for Power Rating less than 75 kW) at 15 m
	85 (for Power Rating 75 kW and greater) at 15 m
Pneumatic Pavement Breakers <sup>2</sup>	85 at 7 m
Portable Air Compressors <sup>3</sup>	76 at 7 m
Track Drills <sup>1</sup>	100 at 15 m
Heavy Vehicle with Governed Diesel Engines <sup>3</sup>	95 at 15 m

Notes:

<sup>1</sup> Maximum Sound Level (dBA) determined per Publication NPC-103 - Procedures, Section 6.

<sup>2</sup> Maximum Sound Level (dBA) determined per Publication NPC-103 - Procedures, Section 7.

<sup>3</sup> Maximum Sound Level (dBA) determined per Publication NPC-103 - Procedures, Section 9.

If the sound levels are expected to exceed the limits, noise control options should be investigated and implemented for compliance.

## 3.1.3 Municipal Context

A range of municipal permits and approvals may be required for the Project, particularly pertaining to municipally owned lands and infrastructure. Metrolinx will obtain all required permits and approvals. However, Metrolinx, as a Crown Agency of the Province of Ontario, is exempt from certain municipal processes and requirements. In these instances, Metrolinx, on a voluntary basis, will engage with the municipalities to incorporate municipal requirements as a best practice where practical, and may consult with or seek consensus from permitting agencies on certain project activities in keeping with the requirements as outlined in the by-law or legislation.

Municipal noise by-laws for the City of Oshawa (By-law 112-82) and the Municipality of Clarington (By-law 2007-071) only outline permissible operating times for construction activities. Neither provides criteria noise and vibration limits for construction activities. The permitted hours of operation based on day of the week for the City of Oshawa and Municipality of Clarington are outlined in Table 3.2.

**Table 3.2: Permissible Construction Operating Times**

City/Municipality	Weekday Permitted Hours	Saturday Permitted Hours	Sunday Permitted Hours
Clarington	07:00-21:00	07:00-21:00	10:00-16:00
Oshawa	07:00-19:00	07:00-19:00	07:00-17:00

Note: Any construction activities are forbidden on statutory holidays



# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Policy and Regulatory Overview

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A noise by-law exemption for the Project is not required since Metrolinx is a Crown Agency of Ontario.

## 3.1.4 Metrolinx Context

Metrolinx has construction noise exposure limits, which are referenced in its Environmental Guide. Construction noise is assessed by pre-construction modelling during planning and is crucial to identify noise sensitive areas that need monitoring during the construction phase.

The Metrolinx Environmental Guide proposes receptor-based noise limits for assessing potential noise from construction. The construction noise limits provided in the Metrolinx Environmental Guide are adapted from the US Federal Highway Administration (US FHWA) guidance and they are provided in Table 3.3.

**Table 3.3: Metrolinx Environmental Guide Limits for Construction Noise**

Land Use	$L_{eq}$ (Day, Night) <sup>1,2</sup> Sound Levels (dBA)		$L_{eq}$ (15-minute) Sound Levels (dBA)		$L_{max}$ <sup>3</sup> Sound Levels (dBA)	
	Day	Night	Day	Night	Day	Night
Residential – Weekday	Louder of 75 or Baseline+5	Louder of 65 or Baseline+5	85	75	90	80
Residential – Weekend <sup>4</sup> & Holiday	Louder of 70 or Baseline+5	Louder of 60 or Baseline+5	75	65	90	80
Institutional <sup>5</sup>	Louder of 70 or Baseline+5	Louder of 60 or Baseline+5	75	65	90	80
Commercial	Louder of 80 or Baseline+5	None	None	None	None	None
Industrial	Louder of 85 or Baseline+5	None	None	None	None	None

Notes:

<sup>1</sup>  $L_{eq}$  (day) is the average energy equivalent noise level for 16 hours (7:00 – 23:00), hours adjusted to match Provincial daytime period.

<sup>2</sup>  $L_{eq}$  (night) is the average energy equivalent noise level for 8 hours (23:00 – 07:00), hours adjusted to match Provincial nighttime period.

<sup>3</sup>  $L_{max}$  represents the maximum allowable noise level, typically used for compliance.

<sup>4</sup> The weekend starts at 23:00 on Friday and ends at 07:00 on Monday as per Metrolinx Environmental Guide.

<sup>5</sup> Institutional receptors include schools, universities, child daycare centres, hospitals, old age homes, churches, etc.



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Only weekday limits are applicable for the Project construction as the construction is expected from 8:00 through 17:00 on weekdays. Other metrics, such as  $L_{eq}$  (15 min) and  $L_{max}$  are to be applied only for monitoring during construction.

The Metrolinx Environmental Guide (Metrolinx 2021) includes limits for construction vibration that are based on the City of Toronto's By-law 514-2008, the United States Federal Transit Administration (US FTA) Noise and Vibration Impact Assessment Manual (FTA 2018) and the MOEE/GO Transit Draft Protocol for Noise and Vibration Assessment (MOEE/GO Protocol 1995). The Metrolinx Environmental Guide is intended to reduce potential damage to the structure of buildings and annoyance to the public.

The FTA Manual is a comprehensive railway-specific guidance that is widely used and accepted in North America for railway transit projects. The FTA Manual provides vibration limits for various types of building structures, including heritage buildings.

The MOEE/GO Protocol provides a vibration limit of 0.14 mm/s Root-Mean-Square (RMS) for human perception (annoyance) from ground-borne vibration (GBV). The MOEE/GO protocol's vibration limit is not specifically for construction activities; however, the limit was adopted by the Metrolinx Environmental Guide for construction vibration. The vibration velocity of 0.14 mm/s Root-Mean-Square (RMS) is used for assessing continuous vibration from activities such as tunneling. Vibration limits for structural damage are provided in Peak Particle Velocity (PPV). Vibration criteria for assessing structural damage from construction, as provided in Metrolinx Guide are presented in Table 3.4.

**Table 3.4: Metrolinx Environmental Guide Construction Vibration Limits**

Category	Metric	Frequency (Hz)	Vibration Limit (mm/s)
Construction Vibration Damage Levels	Peak Particle Velocity (PPV)	Less than 4	8
		4 to 10	15
		More than 10	25
Potential Annoyance Vibration Levels	Root Mean Square (RMS)	All frequencies	0.14

The vibration limits provided in Table 3.4 are maximum thresholds, on a frequency basis, not to be exceeded during construction monitoring. In addition to the prohibition limit of vibration in the table above, the Metrolinx Environmental Guide provides vibration limit for buildings or structures that are potentially impacted by vibrations from construction activities. The ZOI vibration limit is PPV (measured or estimated) which is equal to or greater than 5 mm/s regardless of frequency. This construction vibration assessment is based on the vibration ZOI limit of 5 mm/s.





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Stricter criteria of 3 mm/s, as defined by the US FTA, is recommended for fragile heritage buildings, and is used for heritage structures identified within the study area.

## **3.2 Operation**

This section of the report provides details regarding reference documents for determining noise limits during operations of the Project. The operational assessment includes the noise emissions from stationary sources such as operations at the stations as well as from the movement of the trains. Section 3.2.1 through Section 3.2.3 provide the applicable criteria (noise limits) for construction of the Project.

### **3.2.1 Federal & Municipal Context**

As a provincial agency, Metrolinx operations are not governed by federal noise guidelines such as Health Canada Noise Guidance (HC 2017). Operational noise from rail movements and stationary noise sources is not governed by the municipalities.

Therefore, other applicable guidance and criteria such as provincial guidelines and Metrolinx criteria are considered for this assessment.

### **3.2.2 Provincial Context**

MECP NPC-300 Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (MECP August 2013) is applicable for the Project stationary noise sources associated with GO station operations and layover sites. The MECP limits are based on the surrounding land use and classification.

Stationary noise sources are assessed against minimum background sound levels, based on a predictable worst-case scenario. As per NPC-300, the sound level limit is assessed at noise-sensitive Points of Reception (PORs) and expressed in terms of a one-hour equivalent sound level (1-hr  $L_{eq}$ ). The limit is defined as the higher of the applicable exclusion limit or the minimum existing background sound level for that point of reception.

The Project Study Area surrounding the GO stations (stationary noise sources) is defined as Class 1, as per the MECP guidance, which is typical of a major population centre where the background sound level is dominated by the activities of people or “urban hum”.

Applicable sound level limits for stationary sources of noise are presented in Table 3.5. Note that nighttime limits are lower than those for daytime.



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**Table 3.5: MECP Sound Level Limits for Stationary Noise Sources**

Time Period	Exclusion Limit for Class 1 Area (dBA) *	
	Plane of Window to Noise Sensitive Spaces <sup>1</sup>	Outdoor Points of Reception <sup>1</sup>
Daytime (0700-1900)	50 or background	50 or background
Evening (1900-2300)	50 or background	50 or background
Nighttime (2300-0700)	45 or background	n/a

Note:

<sup>1</sup> The plane of window is typically the most exposed upper-storey window to a noise sensitive indoor space, such as a bedroom. The outdoor point of reception is typically an outdoor space intended for the quiet enjoyment of the outdoors, such as a private backyard or shared outdoor amenity (e.g., outdoor barbecue area).

Emergency equipment operating in emergency situations is excluded from compliance with provincial sound level limits. However, planned non-emergency operation (e.g., during testing) must comply with provincial sound level limits. The MECP states that emergency sources are to be assessed separately from non-emergency equipment and are allowed a sound level limit that is 5 dB higher than the associated limit for non-emergency equipment.

Per NPC-300, the sound level limit for the layover facility is assessed at noise-sensitive PORs with a one-hour equivalent sound level (1-hr  $L_{eq}$ ) limit of 55 dBA limit for daytime and nighttime. The NPC-300 criteria of 55 dBA was used for the assessment of noise from the layover facility just east of the Bowmanville GO Station.

MECP recently published the guidelines for prediction methods used for assessing road and rail traffic; Methods to Determine Sound Levels Due to Road and Rail Traffic NPC-306, dated December 2021, and is currently in draft. The draft guideline NPC-306 is to ensure that proponents use up to date noise prediction methods when determining sound levels caused by road and rail traffic. The preferred methods for assessing noise from road and rail are identified in the guidelines. NPC-306 recommends using the following noise models:

- United States Federal Transit Administration (US FTA) method or any software with FTA algorithms for rail noise assessment; and
- the most current version of the United States Federal Highway Administration (FHWA) Traffic Noise Model (TNM) for roads.

These recommended noise models are used for predicting ambient and project noise levels at the receptors.



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## 3.2.3 Metrolinx Context

The Metrolinx Guide recommends the desirable objective for the Project rail noise assessment. The daytime (07:00 - 23:00) sound level ( $L_{eq(16hr)}$ ) produced by the rail corridor should not exceed the higher of the ambient (pre-project) sound level, combined with the sound level from existing rail activity, or 55 dBA, at the modelled receptors as defined in the MOEE/GO Draft Protocol (Draft Protocol 1995). Similarly, the nighttime (23:00 - 07:00) sound level ( $L_{eq(8hr)}$ ) from the rail corridor should not exceed the higher of the ambient sound level, combined with the sound level from existing rail service, or 50 dBA, at the receptors.

It is further stipulated that the Impact Assessment Method shall be based on the Adjusted Noise Impact. The Adjusted Noise Impact is the difference between:

- Pre-project noise, which is the combination of the ambient noise and the existing rail noise (determined based on a combination of measurements and modelling); and
- Project noise, which is the combination of the ambient noise and project rail noise (determined through predictive modelling).

It is further stated that where pre-project noise is less than 55 dBA  $L_{eq}$  during daytime hours or 50 dBA  $L_{eq}$  during nighttime hours for a POR, the pre-project noise shall be taken as 55 dBA  $L_{eq}$  daytime or 50 dBA  $L_{eq}$  nighttime, respectively (referred to herein as 'the Adjusted Pre-Project  $L_{eq}$ '). Metrolinx sound level limits are summarized in Table 3.6.

**Table 3.6: Metrolinx Noise Criteria for Project Rail Operations**

Time Period	Limit
Daytime Adjusted Noise Impact	5 dB relative to the higher of: pre-Project sound levels or 55 dBA
Nighttime Adjusted Noise Impact	5 dB relative to the higher of: pre-Project sound levels or 50 dBA

Based on the MOEE/GO Draft Protocol, noise impacts are to be rated with respect to the objectives and the need for noise mitigation are presented in Table 3.7.

**Table 3.7: Noise Impact Ratings and Mitigation Requirements**

Adjusted Impact Level	Impact Rating	Mitigation Requirements
0 - 2.99 dBA	Insignificant	No Mitigation Required
3 - 4.99 dBA	Noticeable	No Mitigation Required
5 - 9.99 dBA	Significant	Investigation of Mitigation Required
10+ dBA	Very Significant	Investigation of Mitigation Required



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If a 'significant' or 'very significant' impact is predicted at any POR (i.e., a predicted change in sound level of 5 dBA or more), the potential to mitigate the noise effects due to the Project should be evaluated based on administrative, operational, economic, and technical feasibility.

Under MOEE/GO Draft Protocol, the desirable objective of a rail vibration assessment is a maximum of 0.14 mm/s at receptor locations. The Protocol also provides the following vibration criteria limits when assessing vibration at the receptors adjacent to the existing corridors:

- If the current levels exceed 0.14 mm/s at any receptor location, the desirable objective is not to exceed the existing vibration level; and
- If the vibration velocity exceeds the objective by 25% at any point of reception, the requirement to mitigate will be evaluated based on administrative, operational, economic, and technical feasibility.

The vibration impact of a rail project shall be assessed using field measurements of vibration velocities.



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## **4.0 Methodology**

The impact of noise and vibration from construction and operational are assessed separately as required by the applicable guidelines, and the assessment methodology, including identification of PORs for operation assessment, is discussed in this section.

### **4.1 Points of Reception**

#### **4.1.1 Overview**

Properties with noise sensitive land uses such as residential dwellings, hotels, schools, retirements homes or places of worship are considered for the Project operation noise assessment. Construction noise is assessed by establishing a ZOI. The location (within the noise sensitive land parcel) where noise is assessed is defined as a POR. PORs were selected by reviewing land uses within the Study Area and comparing them to POR selection criteria defined by the Metrolinx Environmental Guide and MOEE/GO Draft Protocol for rail operations and by the MECP NPC-300 for the GO station and layover operations. Selected PORs are chosen for the assessment of vibration impact from rail operations.

As stipulated by the Metrolinx Environmental Guide and Draft Protocol, sensitive noise receptors for rail operations are assessed at the plane of window (POW) and outdoor living area (OLA) which is located at 3 m away from the building façade. Sound levels are typically assessed at the highest window of a dwelling. The exception being high rises or condominiums. For residential buildings such as apartment buildings or condominiums consisting of multiple floors, the Metrolinx Environmental Guide stipulates that daytime and nighttime noise impacts must be evaluated at the floor most impacted by the Project noise. For multi-storey buildings the worst-case noise impact is determined via a building noise evaluation and a receptor height is selected based on the worst-case noise impact level. OLAs are assessed at 1.5m above grade in the backyard, side yard, or common amenity area. Noise impact at POWs is assessed during daytime and nighttime hours as applicable and at OLAs is assessed for daytime hours only as they are assumed to be unoccupied during nighttime. Daytime hours are defined as 07:00 - 23:00, and nighttime hours are defined as 23:00 - 07:00.

The noise impact for institutions (e.g., churches, schools, etc.) are assessed at the POW at a height representative of the building's use for daytime hours as they typically operate during daytime hours.



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The receptor location considered for stationary noise assessment of the GO stations as per MECP NPC-300 is given below.

- Receptor location at 4.5 m above ground for the POW PORs for the two storey dwellings (i.e., highest window level); and
- Receptor location at 1.5 m above ground within 30 m of a facade of a dwelling for the Outdoor POR (OPOR) associated with a dwelling.

## 4.1.2 Points of Reception

Representative PORs, including future developments, were chosen within the Study Area for the assessment of noise impact from operations, 89 receptors were selected for the rail corridor assessment and nine additional receptors were selected to evaluate stationary noise sources at GO stations and layover facility with fueling capability. Six additional receptors were selected to evaluate the impact of construction activities. Both POW receptors and OLAs were considered for this assessment. The POW receptors were considered for daytime and nighttime operations, and OLAs were considered for daytime only, as per the guidelines. The representative PORs considered for this assessment are summarized in Table 4.1.

**Table 4.1: Representative Points of Reception**

POR Description	POR ID	MTM Coordinates <sup>1</sup>		Approximate Distance to Nearest Track (m)
		Easting	Northing	
Two Storey Dwelling at 332 Vancouver Crescent	POR001	354111	4860489	31
Two Storey Dwelling at 352 Vancouver Crescent	POR002	354175	4860499	30
Two Storey Dwelling at 368 Vancouver Crescent	POR003	354226	4860521	43
Two Storey Residence at 389 Durham Court	POR004	354471	4860552	30
Two Storey Residence at 363 Durham Court	POR005	354540	4860581	47
Two Storey Residence at 345 Durham Court	POR006	354592	4860595	51
Two Storey Residence at 420 Bristol Crescent	POR007	354797	4860532	33
Two Storey Residence at 372 Bristol Crescent	POR008	354969	4860568	30
Two Storey Residence at 334 Sheffield Court	POR009	355103	4860600	23
Two Storey Residence at 460 Grenfell Street	POR010	355234	4860716	57
Two Storey Residence at 492 Grenfell Street	POR011	355334	4860711	35
Two Storey Residence at 540 Grenfell Street	POR012	355461	4860772	69
Two Storey Residence at 413 Cromwell Avenue	POR013	355389	4860644	30
Two Storey Residence at 431 Montrave Avenue	POR014	355479	4860671	22



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POR Description	POR ID	MTM Coordinates <sup>1</sup>		Approximate Distance to Nearest Track (m)
		Easting	Northing	
Two Storey Residence at 257 Marquette Avenue	POR015	355554	4860757	28
Two Storey Residence at 213 Marquette Avenue	POR016	355663	4860799	36
Two Storey Residence at 181 Marquette Avenue	POR017	355775	4860832	34
Two Storey Residence at 257 Sinclair Avenue	POR018	355581	4860680	40
One Storey Residence at 215 Sinclair Avenue	POR019	355689	4860722	32
One Storey Residence at 167 Sinclair Avenue	POR020	355846	4860771	33
Two Storey Residence at 85 Hall Street	POR021	356085	4860842	38
One Storey Residence at 423 Centre Street South	POR022	356200	4860887	34
Two Storey Residence at 11 Hall Street	POR023	356299	4860912	41
Two Storey Residence at 83 Avenue Street	POR024	356056	4860925	38
Two Storey Residence at 394 Centre Street South	POR025	356141	4860955	41
One Storey Residence at 25 Avenue Street	POR026	356237	4860972	28
Two Storey Residence at 38 Fisher Street	POR027	356426	4861052	47
Two Storey Residence at 74 Fisher Street	POR028	356535	4861086	47
One Storey Residence at 214 George Street	POR028A <sup>2</sup>	356551	4861104	65
One Storey Residence at 258 George Street	POR028B <sup>2</sup>	356790	4861226	69
Two Storey Residence at 419 Drew Street	POR028C <sup>2</sup>	356676	4861268	27
Two Storey Residence at 249 Edward Avenue	POR029	356929	4861229	37
One Storey Residence at 396 Oshawa Boulevard South	POR030	357058	4861274	23
One Storey Residence at 398 Verdun Road	POR031	356937	4861118	23
One Storey Residence at 400 Central Park Boulevard South	POR032	357082	4861159	23
One Storey Residence at 410 Sedan Crescent	POR033	357249	4861286	40
One Storey Residence at 446 Brest Crescent	POR034	357345	4861316	62
One Storey Residence at 485 Crerar Avenue	POR035	357528	4861374	55
One Storey Residence at 541 Crerar Avenue	POR036	357545	4861303	56
One Storey Residence at 603 Crerar Avenue	POR037	357722	4861335	38
One Storey Residence at 641 Crerar Avenue	POR038	357715	4861467	39
Three Storey Residence at 596 Chaucer Avenue	POR039	357875	4861519	16
Three Storey Residence at 424 Austen Court	POR040	358063	4861559	17



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POR Description	POR ID	MTM Coordinates <sup>1</sup>		Approximate Distance to Nearest Track (m)
		Easting	Northing	
One Storey Residence at 393 Farewell Street	POR041	358180	4861597	52
Two Storey Place of Worship at 399 Elmridge Street	POR042	358067	4861491	30
One Storey Residence on Wicklow Court	POR043	358273	4861557	103
Two Storey Residence at 429 Milton Street	POR044	358320	4861653	18
Two Storey Residence at 791 Chesterton Avenue	POR045	358478	4861664	39
Two Storey Residence at 420 Harcourt Drive	POR046	358640	4861758	53
Two Storey Residence at 452 Harcourt Drive	POR047	358514	4861611	38
One Storey Residence at 464 Tennyson Court	POR048	358679	4861606	37
Two Storey Residence at 446 Dianne Drive	POR049	358751	4861714	58
Two Storey Residence at 486 Dianne Drive	POR050	358847	4861698	65
Two Storey Residence at 1094 Saint Andrews Court	POR051	358843	4861607	52
Two Storey Residence at 1082 Street Andrews. Court	POR052	359103	4861690	50
Two Storey Residence at 1094 Saint Andrews Court	POR053	359270	4861658	39
Two Storey Residence at 762 Downview Crescent	POR054	359667	4861448	41
Two Storey Residence at 1113 Norman Crescent	POR055	359712	4861410	30
Two Storey Residence at 924 Southgate Drive	POR056	359980	4861126	29
Two Storey Residence at 984 Southport Drive	POR057	360122	4860982	37
Two Storey Residence at 1074 Southport Drive	POR058	360282	4860796	42
Two Storey Residence at 1018 Prestonvale Road	POR059	360488	4860580	55
Two Storey Residence at 1218 Trulls Road	POR060	360636	4860438	371
One Storey Residence at 2048 Baseline Road West	POR061	360833	4860239	125
One Storey Residence at 2074 Baseline Road West	POR062	361885	4859851	67
Two Storey Residence at 2091 Baseline Road West	POR063	362876	4860736	98
Two Storey Residence at 1108 Holt Road	POR063A <sup>2</sup>	363660	4861006	38
Vacant Lot Receiver	POR063B <sup>2</sup>	363232	4860634	137





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POR Description	POR ID	MTM Coordinates <sup>1</sup>		Approximate Distance to Nearest Track (m)
		Easting	Northing	
Vacant Lot Receiver	POR063C <sup>2</sup>	363838	4860860	137
Two Storey Residence at 34 Autumn Harvest Road	POR064	366203	4861168	46
Two Storey Residence at 34 Dykstra Lane	POR065	366470	4861286	49
Two Storey Residence at 56 Dykstra Lane	POR066	366592	4861163	49
Two Storey Residence at 95 Dykstra Lane	POR067	366892	4861549	49
Two Storey Residence at 187 Padfield Drive	POR068	368026	4862491	44
Two Storey Residence at 143 Padfield Drive	POR069	368139	4862608	45
Two Storey Residence at 95 Padfield Drive	POR070	368190	4862664	44
Four Storey Apartment Building at 128 Aspen Springs Drive	POR071	368266	4862745	65
Future Three Storey Residence at 1423 Green Road	POR072	368002	4862607	48
Future Three Storey Residence at 2 Lord Elgin Lane	POR073	368092	4862705	40
Future Three Storey Residence at 57 Clarington Boulevard	POR074	368188	4862808	40
Future Three Storey Residence at 55 Clarington Boulevard	POR075	368430	4862899	42
Three Storey Residence at 61 Clarington Boulevard	POR076	368316	4862952	45
Three Storey Residence at 94 Aspen Springs Drive	POR077	368447	4863082	45
Three Storey Residence at 90 Aspen Springs Drive	POR078	368522	4863155	43
Four Storey Residence at 84 Aspen Springs Drive	POR079	368564	4863205	39
Four Storey Residence at 80 Aspen Springs Drive	POR080	368632	4863288	35
Two Storey Dwelling at 332 Vancouver Crescent	POR080A <sup>2</sup>	368669	4863340	31
Two Storey Dwelling at 352 Vancouver Crescent	POR081	368519	4863024	30
Two Storey Dwelling at 368 Vancouver Crescent	POR082	368566	4863076	43
Two Storey Residence at 389 Durham Court	POR083	368639	4863153	30
Two Storey Residence at 363 Durham Court	POR084	368683	4863201	47



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POR Description	POR ID	MTM Coordinates <sup>1</sup>		Approximate Distance to Nearest Track (m)
		Easting	Northing	
Single Storey Residence at 1775 Bowmanville Avenue	POR084A <sup>2</sup>	368993	4863528	58
Two Storey Residence at 126 Bonniecastle Drive	POR084B <sup>2</sup>	368890	4863179	199
School at 400 Pacific Avenue	POR085 <sup>3</sup>	355296	4860554	67
Place of Worship at 464 Ritson Road South	POR086 <sup>3</sup>	357139	4861078	102
School at 460 Wilson Road South	POR087 <sup>3</sup>	357881	4861348	132
Place of Worship at 374 Farewell Street	POR088 <sup>3</sup>	358238	4861661	95
Commercial Brewhouse at 439 Ritson Road South	POR089 <sup>3</sup>	357199	4861221	82
Commercial Storage Facility at 421 Storngo Boulevard	POR090 <sup>3</sup>	357309	4861253	7
11 Storey Apartment Residence at 64 Albany Street	POR091	356585	4860966	63
One Storey Residence at 418 Front Street	POR092	356579	4861018	12
25 Storey Apartment Residence at 10 Aspen Springs Drive	POR093	368949	4863414	76
4 Storey Apartment Residence at 63 Albany Street	POR094	356579	4860918	100
5 Storey Apartment Residence at 446 Simcoe Street	POR095	356349	4860855	102

<sup>1</sup> MTM Reference Zone 16T

<sup>2</sup> PORS only applicable to the stationary noise assessment

<sup>3</sup> PORS only applicable to the construction assessment.

PORs are modelled for daytime and nighttime sound levels at representative POW receptors as listed in Table 4.1. OLAs for the corridor operation noise and OPORs for GO station stationary noise assessments are considered where applicable.

GO stations are expected to be developed for mixed use with potential commercial and residential use. At the time of preparing this report, no information was available for GO stations. In the absence of information about the proposed GO stations, they are not considered as receptors in this assessment.

Stantec has reviewed all current development applications submitted to the City of Oshawa, Bowmanville, Courtice, Newcastle, and Newtonville. A list of known developments identified for this assessment is included as Table 4.2 for Oshawa, Table 4.3 for Bowmanville, and Table 4.4 for Courtice. Some developments were not included in this assessment given their large setback distance to the Project.



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Developments included in the assessment are noted in the respective tables. Developments identified in Newcastle and Newtonville are outside of the project area, and therefore are not discussed further in this report.

**Table 4.2: City of Oshawa Proposed Developments**

ID	Street Number	Street Name	Application Type	Notes
1	N/A	Dean Avenue opposite Normandy Street	88 stacked townhouses	130 m south of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences. A closer representative POR has been included in the Study area.
2	N/A	NW Corner Stevenson Road South & Champlain Avenue	Parking lot for the storage of new vehicles	Non noise sensitive land use
3	39	McGrigor Street	33-unit apartment building	600 m north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the Study area.
4	63	Albany Street	6 storey, 99-unit apartment building	112 m south of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences A closer representative POR has been included in this assessment.
5	64	Albany Street	11-storey, 100-unit apartment building	Included in the assessment (POR091)
6	426	Front Street	11-storey, 100-unit apartment building	Part of same development identified as 64 Albany Street. 426 Front Street will be amalgamated with 64 Albany Street considered as POR091 in this assessment
7	135	Bruce Street	Rezoning to permit 2,145 apartments, 96 townhouses & limited commercial uses	600 m north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance Development is located outside of the study area.



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ID	Street Number	Street Name	Application Type	Notes
8	223	Albert Street	New 10-unit apartment building	500 m north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
9	227	Simcoe Street South	New commercial development including an office, retail & soup kitchen	Non noise sensitive land use
10	250	Harmony Road South	212 townhouses	3-storey townhouse development 300m north of the project. A closer representative receptor has been included in the assessment
11	255	Tresane Street	New 4-unit apartment building	Permit for a multi-unit apartment building 200 m south of project. A closer representative receptor has been included in the assessment
12	446	Simcoe Street South	New 50-unit apartment building	5 Storey apartment building approximately 100 m south of the project. A closer representative receptor has been included in the assessment.
13	480, 484, 490, 506	Ritson Road South	40 stacked townhouses	3-storey stacked townhouses approximately 200 m south of project. A closer representative receptor has been included in the assessment
14	485	Normandy Street	50 stacked townhouses	3-storey stacked townhouses approximately 200 m south of project. A closer representative receptor has been included in the assessment
15	505	Simcoe Street South	Create a severed lot to the east, retaining lands with apartment building to the west	No information available. Closer representative PORs are included in the assessment
16	642	Champlain Avenue	New self-storage facility	Non noise sensitive land use
17	883	Thornton Road South	New 40, 877 m <sup>2</sup> warehouse building	Non noise sensitive land use
18	63	Albany Street	New 99-unit apartment building	112 m south of the project corridor. Impact from project estimated to be insignificant due to setback distance. A closer representative POR has been included in this assessment.



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**Table 4.3: Town of Bowmanville Proposed Developments**

ID	Street Number	Street Name	Application Type	Notes
1	-	Brookhill Boulevard Southeast of Boswell Drive and Brookhill Boulevard	88 unit six storey apartment	1 km northwest of Bowmanville Station. Impact from project estimated to be insignificant due to screening from existing residences and setback distance
2	2345	Highway 2	Two 11-storey buildings	550 m northwest of project area. Impact from project estimated to be insignificant due to screening from existing residences and setback distance Development is located outside of the study area.
3	505	Lake Road	Industrial Development	Non noise sensitive use
4	10	Aspen Springs Drive	Two 25-storey buildings	Directly southeast of Bowmanville GO Station. Included as POR093
5	922	Green Road	69 townhouse units	Townhouse development 700 m to the southeast of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance Development is located outside of the study area.
6	2400	Green Road	53 detached, and 36 townhouse units	Development more than 1km northwest of site. Noise impact assumed to be insignificant Development is located outside of the study area.
7	2020	Lambs Road	13 single detached and 9 medium and high density	Development more than 1 km east of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance Development is located outside of the study area.
8	NA	Mearns Avenue and Ireland	5 lots	Development more than 1 km east of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance Development is located outside of the study area.



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ID	Street Number	Street Name	Application Type	Notes
9	46	Stevens Road	10-storey multiunit retirement residence	500 m northwest of right-of-way. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
10	1558	Green Road	3-storey condos	260 m northwest of project corridor. Closer representative PORs are included in the assessment

**Table 4.4: Town of Courtice Proposed Developments**

ID	Street Number	Street Name	Application Type	Notes
1	1588	Bloor Steet	32 semi-detached and 68 townhouses	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
2	1824	Nash Road	six single-detached	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
3	2212	Trulls Road	12 semi-detached and 21 townhouse	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
4	2350	Courtice Road	140 residential detached and semi-detached units	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
5		Bloor Street and Trulls Road	524 residential units including detached and townhouses	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.



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ID	Street Number	Street Name	Application Type	Notes
6		Nash Road and Hancock Road	78 townhouse units	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
7	1668	Nash Road	17 townhouses	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
8		Bloor Street and Hancock Road	318 single detached houses	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
9	3105	Courtice Road	80 residential townhouse units	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance.
10	1440	Gord Vinson Avenue	Unknown	Development 700 m north east of THE PROJECT CORRIDOR. Closer representative receptor included in the assessment. Development is located outside of the study area.
11	3	Lawson Road	28 Townhouse units	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
12	1828	Nash Road	151 residential lots detached and townhouses	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.



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ID	Street Number	Street Name	Application Type	Notes
13	1640	Nash Road	21 townhouses	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.
14	2591	Trulls Road	10 freehold townhouses	Development more than 1 km north of the project corridor. Impact from project estimated to be insignificant due to screening from existing residences and setback distance. Development is located outside of the study area.

Representative PORs considered in the assessment are shown in Figures 2.1.1 through 2.1.8.

### 4.2 Construction Assessment Methodology

Project construction involves construction of the Project components in multiple phases. Each phase will have multiple equipment and various types of equipment. A summary of the Project components, construction phases and equipment considered in this assessment is provided in Table 4.5.





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Table 4.5: Project Components, Construction Phases and Equipment Summary

Project Components for Construction	Construction Phase	Type Construction Equipment and Quantities														
		Asphalt spreader	Backhoe	Ballast regulator	Bobcat	Boom Truck	Caisson auger	Compactor	Concrete Breaker	Concrete pump	Concrete saw	Concrete truck	Crane	Drill	Dump Truck	Dynamic stabilizer
Track and Grading	Track	-	-	2	1	-	-	-	-	-	-	-	1	-	2	1
	Grading	-	2	-	-	-	-	2	-	-	-	4	1	-	4	-
Bridge Replacement	Utility Relocation and Road Closure	-	1	-	1	1	-	1	-	-	-	-	-	-	2	-
	Demolition of Existing Bridge	-	2	-	1	-	-	-	2	-	-	-	1	-	2	-
	Abutment Construction	-	2	-	-	-	-	-	-	1	-	2	-	-	1	-
	Span construction	-	-	-	-	1	-	-	-	1	-	2	-	-	-	-
	Road Reinstatement	1	-	-	-	1	-	1	-	-	-	-	-	-	2	-
	Site Cleanup	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-
New Bridge	Utility Relocation and Road Closure	-	1	-	1	1	-	1	-	-	-	-	-	-	2	-
	Abutment Construction	-	2	-	-	-	-	-	-	1	-	2	-	-	1	-
	Span construction	-	-	-	-	1	-	-	-	1	-	2	-	-	-	-
	Road Reinstatement	1	-	-	-	1	-	1	-	-	-	-	-	-	2	-
	Site Cleanup	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-
Modified Bridge	Removals and Site Preparation	-	1	-	1	-	-	-	1	-	1	-	-	-	2	-
	Abutment Underpinning	-	1	-	-	1	-	-	-	1	-	2	-	1	1	-
	Site Cleanup	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-
Stations/Layover Facility	Clearing	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-
	Parking Construction	1	1	-	-	-	-	1	-	-	-	1	1	-	2	-
	Building/Platform Construction	-	1	-	1	-	1	1	-	-	-	1	1	-	1	-
Crossing Widening	Removals and Reconstruction	-	1	-	1	1	-	1	-	-	1	1	-	-	2	-



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Project Components for Construction	Construction Phase	Type Construction Equipment and Quantities															
		Earth Scraper	Flatbed truck	Front-end loader	Grader	Pavement Roller	Pavement Saw	Pile auger	Pile driver	Rail drill	Rail saw	Speed Swing	Spike machine	Track liner/tamper	Water Truck	Welder	Zoom Boom
Track and Grading	Track	-	1	1	-	-	-	-	-	1	1	1	1	2	1	1	1
	Grading	-	1	2	2	-	-	-	-	-	-	-	-	-	1	-	-
Bridge Replacement	Utility Relocation and Road Closure	-	-	-	-	1	1	-	-	-	-	-	-	-	1	-	-
	Demolition of Existing Bridge	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Abutment Construction	-	1	-	-	-	-	1	1	-	-	-	-	-	1	-	-
	Span construction	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	Road Reinstatement	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-
	Site Cleanup	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
New Bridge	Utility Relocation and Road Closure	-	-	-	-	1	1	-	-	-	-	-	-	-	1	-	-
	Abutment Construction	-	1	-	-	-	-	1	1	-	-	-	-	-	1	-	-
	Span construction	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	Road Reinstatement	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-
	Site Cleanup	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Modified Bridge	Removals and Site Preparation	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Abutment Underpinning	-	1	-	-	-	-	1	1	-	-	-	-	-	1	1	1
	Site Cleanup	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Stations/Layover Facility	Clearing	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Parking Construction	-	1	1	1	2	-	-	-	-	-	-	-	-	1	-	-
	Building/Platform Construction	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1	1
Crossing Widening	Removals and Reconstruction	-	-	-	-	1	1	-	-	-	-	-	-	-	1	-	-



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The activities at the staging and laydown areas such as storing material/equipment and assembly are expected to be lighter than the other construction activities occurring within the Project Footprint, hence expected to be less impactful. All laydown and staging areas for the Project are assumed to be within the Project Footprint, and are therefore, not separately considered further in this assessment.

The construction noise and vibration assessment methodologies are discussed in detail in the following subsections.

## 4.2.1 Construction Noise

Construction noise for the Project is assessed in two methods as required by the guidelines and are discussed below.

1. Emission-based assessment - comparing the reference sound levels for the equipment listed in Table 4.5 against the applicable sound level limits in MECP NPC-115 and NPC-118 (Table 3.1) to identify the need for additional noise control during construction phases.
2. Receptor-based assessment - establishing a construction ZOI for noise based on the noise limit established in Metrolinx Guide to identify surrounding areas that may be impacted during each construction phase and identify mitigation and monitoring requirements.

The US FTA Manual and FHWA Roadway Construction Noise Model User's Guide (FHWA 2006) provide typical construction equipment reference sound levels and they are used in this assessment. Construction equipment reference sound levels used in the assessment are listed in Table 4.6.

**Table 4.6: Construction Equipment Sound Pressure Levels**

Equipment Type	Sound Pressure Level at 15 m (dBA) <sup>1</sup>
Asphalt spreader	85
Backhoe	80
Ballast regulator	82
Bobcat	80
Boom Truck	80
Caisson auger	85
Compactor	82
Concrete Breaker	85
Concrete pump	82
Concrete saw	90



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Equipment Type	Sound Pressure Level at 15 m (dBA) <sup>1</sup>
Concrete truck	85
Crane	83
Drill	85
Dump Truck	84
Dynamic stabilizer	82
Earth Scraper	85
Flatbed truck	84
Front-end loader	80
Grader	85
Pavement Roller	85
Pavement Saw	90
Pile auger	85
Pile driver	101
Rail drill	85
Rail saw	90
Speed Swing	80
Spike machine	80
Track liner/tamper	82
Water Truck	84
Welder	73
Zoom Boom	80

<sup>1</sup> Reference sound pressure levels for the listed equipment were obtained from the US FTA Manual and FHWA Roadway Construction Noise Model User's Guide documents

ZOI for construction noise is defined as the land in or adjacent to a construction site, which is potentially impacted by construction noise equal to or greater than the criteria.

Construction noise ZOI is calculated based on the following geometric spreading calculation as provided in the Metrolinx Environmental Guide, adopted from the US FTA Manual:

$$L_{EQ}(\text{point of reception}) = SPL_{\text{equipment}} - 20 * \log(D_{\text{point of reception}} / D_{\text{ref}}) + 10 * \log(D.C.)$$



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Where:

- $L_{EQ}$  (point of reception) = sound level of the piece of equipment at the point of reception (dBA)
- $SPL_{equipment}$  = sound pressure level of the equipment at a reference distance (usually 15 m)
- $D_{point\ of\ reception}$  = straight line distance from equipment to point of reception (m)
- $D_{ref}$  = reference distance provided in  $SPL_{equipment}$  (m)
- $D.C.$  = fraction of time, or duty cycle, that a piece of equipment usually operates

Construction noise ZOI is calculated for each construction phase based on the type and quantity of construction equipment, and reference sound levels for the equipment. As a conservative approach, it is assumed that the associated construction equipment to be operating simultaneously during the construction period (i.e., weekdays 08:00 - 17:00) with the loudest piece of equipment located at the closest Project boundary to the receptor. The remaining equipment for each phase was evenly distributed conservatively along the Project boundary on either side of the loudest equipment with a minimum 25 m between each piece of equipment.

The duty cycle for each piece of equipment was calculated to account for the fraction of time the equipment is expected to operate during the construction period as well as the fraction of time the equipment is expected to operate at its loudest condition (acoustical usage factor). The acoustical usage factors used in this assessment are taken from the US FHWA Roadway Construction Noise Model User's Guide (RCNM).

A noise barrier that breaks the line-of-sight between the source and receptor will typically provide about 6-8 dB attenuation. A 7 dB reduction is considered to establish ZOI with noise barrier scenario.

## 4.2.2 Construction Vibration

Construction vibration impacts are evaluated by establishing the construction vibration ZOI. Construction vibration ZOIs are calculated based on the applicable vibration limits for building damage as provided in Table 3.4. This assessment considers a vibration limit of 5 mm/s for typical construction (e.g., non-engineered timber and masonry buildings) and 3 mm/s for heritage structures.



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Construction vibration ZOI is calculated based on the following vibration propagation equation as provided in the Metrolinx Environmental Guide, adopted from the US FTA Manual:

$$PPV_{(point\ of\ reception)} = PPV_{(point\ of\ reception)} * (D_{ref} / D_{point\ of\ reception})^{1.5}$$

Where:

- $PPV_{(point\ of\ reception)}$  = the vibration level of the piece of equipment at the point of reception (mm/s)
- $PPV_{(point\ of\ reception)}$  = the vibration level of the piece of equipment at a reference distance (mm/s)
- $D_{ref}$  = the reference distance provided in  $PPV_{ref}$  (m); and
- $D_{point\ of\ reception}$  = the straight-line distance from the equipment to the point of reception (m).

In line with the Metrolinx Environmental Guide, this assessment establishes construction vibration ZOI for the worst-case vibration event for each Project component. In other words, for each construction element, vibration ZOI is established for the equipment expected to generate the highest vibration level. The equipment reference vibration levels as provided in the FTA Manual is used in this assessment to calculate vibration ZOI.

## 4.3 Operational Assessment Methodology

Based on the Metrolinx Environmental Guide, study scenarios are required for both the assessment of noise and vibration generated by heavy rail projects and new sources of stationary sound such as the stations associated with the GO stations. A summary of the required scenarios and assessment criteria are provided in Table 4.7.



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**Table 4.7: Study Scenarios**

Project Component	Assessment Criteria	Study Scenarios	Description
Rail	Change (Sound or Vibration) Per MOEE/GO Draft Protocol	Pre-Project	Sound and vibration levels prior to the undertaking. Represented by the levels of rail activity prior to the project
		Post-Project	Sound and vibration levels after the undertaking. Represented by the maximum level of rail activity enabled by the project (potentially 10 to 20 years in the future).
Stationary sources of sound associated with GO stations	Absolute Limit (Sound only) Per MECP NPC-300	Post-Project	Sound levels after the undertaking. Represented by the maximum level associated with the project GO stations.
Stationary and rail sources associated with Layover site	Absolute Limit (Sound only) Per MECP NPC-300	Post-Project	Sound levels after the undertaking. Represented by the maximum level associated with the project Layover site.
Emergency Power Generators associated with GO stations	Absolute Limit (Sound only) Per MECP NPC-300	Post-Project	Sound levels after the undertaking. Represented by the maximum level associated with the emergency generator testing for the project GO stations.

## 4.3.1 Operation Noise (Rail)

The Metrolinx Environmental Guide recommends assessing both pre-project and post-project operation noise at the receptors for daytime (07:00 - 23:00) and nighttime (23:00 - 07:00) periods in accordance with the MOEE/GO Draft Protocol (Draft Protocol 1995).

The following approach was used to assess the impact of noise generated sources from the proposed rail expansion:

- Identify representative PORs within the Study Area
- Establish pre-project noise levels at the receptors due to existing rails
- Predict post-project noise levels at the receptors from the existing and proposed rails
- Assess the effect of noise based on the impact ratings and determine if noise mitigation is required



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Train idling at the GO stations is included as part of the post-project rail operations. Trains are expected to idle at GO stations for about 90 seconds and at the layover facility for about an hour. Therefore, time-weighting for train idling is included in the assessment.

Train horn and whistle noise at-grade road-rail crossings is included as part of the existing and post-project rail operations. Trains are expected to obey the Transport Canada Canadian Railway Operating Rules (May 2022) which mandate the use of horns and whistles. Horns and whistles have been considered for all at-grade crossings within the Project Footprint. Sound power levels for horn/whistle noise for trains has been assumed to be 96 dBA at 30 meters based on the Transport Canada Locomotives Design Requirements (Part II) Section 11.2.

Current sound levels (baseline) from the existing roads and rail are also calculated to compare with the monitored sound levels at the calibration points to validate the noise model. The daytime and nighttime sound levels at the PORs due to rail activities are calculated using CADNA/A, an acoustic modelling software published by Datakustik GmbH and configured to implement the ISO 9613-2 environmental sound propagation algorithms. CADNA/A implements US FTA methods for rail noise. Road noise from the surrounding roads and highways are modelled with the most current version of the US FHWA Traffic Noise Model (TNM). The predicted levels from rail and road are combined for both Pre-Project and Project scenarios.

The Metrolinx Environmental Guide provides modeling parameters to be used for noise and vibration assessments for rail projects. Train counts for the existing and future rail lines for daytime and nighttime periods, along with the number of locomotives and rail cars for each train type train are summarized in Table 4.8.

**Table 4.8: Modelled Train Data**

Train Type and Description	Number of Trains Daytime (07:00-23:00)	Number of Trains Nighttime (23:00-07:00)	Maximum Train Speed Within Project Footprint (km/hr)
CP Main Line (3 locomotives - 85 cars)	5	4	90
CP Spur Line (1 locomotive - 6 cars)	3	-	90
CP Spur Line (CP - CN connecting line - GM Plant) (1 locomotive - 6 cars)	3	-	40
GO (Proposed) (2 locomotives - 12 cars)	42 <sup>1</sup>	12 <sup>1</sup>	90

<sup>1</sup> Train volumes include both revenue and non-revenue trips





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Annual Average Daily Traffic (AADT) data and commercial vehicle percentages for significant roads in the area were reviewed to establish baseline sound levels. Speed limits used for the analysis were obtained from street view. A summary of the traffic data used for the current year in the assessment is provided in Table 4.9.



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**Table 4.9: Road Traffic Modelling Data for Year 2021<sup>1</sup>**

Segment	Available AADT Year	2021 AADT Estimate	Daytime Volume	Nighttime Volume	Cars (%)	Medium Trucks (%)	Heavy Trucks (%)	Commercial Vehicle (%)	Traffic Speed (km/hr)
<b>Highway 401 Ramps at Stevenson Road South</b>									
Ramp E-N/S (Westbound Off-Ramp)	2019	8,400	7,560	840	82%	7%	11%	18%	60
<b>Stevenson Road South, North of Highway 401</b>									
Between Gibb Street and Laval Drive	2019	33,000	29,700	3,300	86%	5%	9%	14%	60
Between Laval Drive and Highway 401	2019	23,100	20,790	2,310	86%	5%	9%	14%	60
Park Road South, North of Highway 401	2019	12,800	11,520	1,280	98%	1%	1%	2%	60
Simcoe Street South, North of Highway 401	2019	26,300	23,670	2,630	96%	2%	2%	4%	60
<b>Ritson Road South, North of Highway 401</b>									
North of Toronto Avenue	2018	22,000	19,800	2,200	97%	1%	2%	3%	60
South of Toronto Avenue	2018	19,400	17,460	1,940	97%	1%	2%	3%	60
Wilson Road South, North of Highway 401	2019	13,800	12,420	1,380	97%	1%	2%	3%	50
<b>Bloor Street East between Harmony Road South and Townline Road South</b>									
Between Harmony Road South and Grandview S Street	2019	20,500	18,450	2,050	98%	1%	1%	2%	50



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Segment	Available AADT Year	2021 AADT Estimate	Daytime Volume	Nighttime Volume	Cars (%)	Medium Trucks (%)	Heavy Trucks (%)	Commercial Vehicle (%)	Traffic Speed (km/hr)
Between Grandview S Street and Townline Road South	2019	14,800	13,320	1,480	98%	1%	1%	2%	50
Harmony Road South, North of Highway 401	2019	21,400	19,260	2,140	98%	1%	1%	2%	50
Courtice Road North of Highway 401	2019	8,500	7,650	850	79%	8%	13%	21%	80
Highway 401 between Harmony Road South and Courtice Road	2016	108,800	97,920	10,880	89%	4%	7%	11%	100
<b>Highway 401</b>									
Between Waverly Road to Holt Road	2016	99,000	89,100	9,900	90%	4%	6%	10%	100
Between Holt Road to Courtice Road	2016	108,200	97,380	10,820	89%	4%	6%	11%	100
Baseline Road West (west of Courtice Road)	2019	3,100	2,790	310	69%	12%	19%	31%	60
<b>Martin Road south of King Street West</b>									
Between King Street W and Hartwell Avenue	2019	16,300	14,670	1,630	81%	7%	12%	19%	60
Between Hartwell Avenue and Baseline Road West	2019	18,100	16,290	1,810	81%	7%	12%	19%	60



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Segment	Available AADT Year	2021 AADT Estimate	Daytime Volume	Nighttime Volume	Cars (%)	Medium Trucks (%)	Heavy Trucks (%)	Commercial Vehicle (%)	Traffic Speed (km/hr)
<b>King Street West (Regional Highway 2) at Martin Road</b>									
Between Clarington Boulevard and Martin Road	2019	27,200	24,480	2,720	85%	6%	9%	15%	60
West of Clarington Boulevard	2019	24,400	21,960	2,440	85%	6%	9%	15%	60

<sup>1</sup> Traffic data provided by the transportation team and volumes estimated based on a 2% growth rate applied to existing AADT counts for roadways



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Rail squeal noise occurs when the gauge of the track varies, and a train runs over it. The resulting sizing difference generates a grinding and squealing noise which is both a nuisance and a maintenance issue as reduces the lifetime of track. Typically, rail squeal occurs at track curvatures when the radii is less than 305m. As the problem is exacerbated by unpredictable factors such as installation, train types and weight, and track conditions predicting its occurrence is difficult as the phenomenon is extremely complex. Rail squeal noise has been modelled along the curved track segment at the beginning of the project corridor in Oshawa. Passenger train locomotive noise has been modelled at height of 2.5m and passenger cars at a height of 0.3m. A 5 dB penalty has been added to passenger car noise along this segment of track.

Additional parameters used in the noise model include topographical information and ground absorption. Topographical information for the rail corridors was provided by a LiDAR topographical data study. A global ground absorption coefficient of 0.5 was used for the Study Area representing a ground surface that is made up of an even combination of reflective and absorptive surfaces. In addition, a conservative reflection order of 2 was used for modelling. A summary of modelling parameters used in this assessment is provided in Appendix B.

## **4.3.2 Operation Vibration (Rail)**

Under the Metrolinx Environmental Guide and Draft Protocol, potential impacts from rail vibration are assessed using modelling and field measurements. The Root Mean Square (RMS) vibration velocity, measured in units of millimeters per second (mm/s), is defined as the appropriate descriptor for vibration level for assessing annoyance.

The following approach was used to assess the potential vibration impact from rail:

- Identify representative measurement locations in the Study Area
- Conduct ground-borne vibration measurements for a minimum of 3 to 5 train passby events where possible
- Complete an assessment of vibration at the closest receptor and recommend mitigation measures, if necessary

## **4.3.3 Operation Noise (GO Station/Layover Facility Stationary Sources)**

Sound levels are predicted at the receptors using the Cadna/A noise model and assessed with the MECP NPC-300 limits. Daytime, evening, and nighttime sound levels are predicted based on the noise sources operating at the GO stations and layover facility. Daytime hours are defined as 07:00 - 19:00, evening hours are defined as 19:00 - 23:00, and nighttime hours are defined as 23:00 - 07:00.



## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Methodology  
August 24, 2023

Four GO stations are proposed for this Project, and they are located at:

1. Fox Street (B1 - Thornton's Corners East)
2. Front Street (B2 - Ritson)
3. Courtice Road (B3 - Courtice)
4. Bowmanville Avenue (B4 - Bowmanville)

The following stationary noise sources are expected at each GO station:

- Emergency power generator
- Heating, Ventilation and Air-conditioning (HVAC) units
- PA System
- Idling buses
- Bus loop

Bus idling is included near bus shelters within the GO station area. The number of buses considered for this assessment are summarized in Table 4.10. A time-weighting of 3 minutes is considered in the model for bus idling.

**Table 4.10: Modelled GO Station Bus Volumes**

Station ID	Daytime Peak Hour Volume	Nighttime Peak Hour Volume
B1 - Thornton's Corners East	6	3
B2 - Ritson	6	3
B3 - Courtice	6	3
B4 - Bowmanville	6	2

The emergency power generators are modelled separately as required by the guideline for GO stations and layover facility.

HVAC units and passenger announcement systems are modelled at the station platforms. Measured sound levels from typical GO station PA systems were used in the assessment. HVAC units were modelled using representative sound power levels from Stantec's noise database. A time weighting was applied for PA system based on typical operating times observed during site visits to GO stations. A 60 minute daytime hour and 30 minute nighttime hour time weighting was applied to HVAC sources.

Other sources such as exhaust fans and boilers at the GO stations are considered to be insignificant sources of noise as they are typically not audible and quieter than the significant noise sources such as bus loops and idling buses. Idling trains are assessed as part of the rail noise assessment as required by the guidelines.



# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

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An assessment of vibration is not required for the stationary sources as they are insignificant source of vibration and assumed to have negligible impact on nearby sensitive receptors.

The proposed layover facility, including a fueling station, is located just east of the Bowmanville GO Station. Two idling trains with two locomotives on the east end of the trains and an air compressor are modeled as significant noise sources. The layover facility also includes indoor fuel pumps and fuel storage tank exhausts which are considered to be insignificant sources based on their sizes, capacities, and locations. The noise impact of the two emergency generators is assessed separately as required by the NPC-300 guideline.

## **4.4 Monitoring**

Monitoring is recommended to reduce public complaints and for investigating complaints during construction phase of the Project. Metrolinx Environmental Guidance document identifies two types of projects for construction monitoring:

### **Type 1 Projects**

These are projects that are largely localized and “stationary”, and they expose the same receptors to noise for an extended period of time. Examples of Type 1 projects include the construction of grade separation structures (bridges or tunnels), train stations, and rail maintenance facilities, as well as construction staging and laydown sites.

### **Type 2 Projects**

Projects that are geographically “mobile” and do not expose the same receptors to noise for an extended period of time. These types of projects include rail track improvements.

The Bowmanville Rail Service Extension Project includes both Type1 and Type 2 project activities. Monitoring requirements, as recommended in the Metrolinx document are provided in Appendix C.



# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Pre-Project Conditions (Baseline)

August 24, 2023

## 5.0 Pre-Project Conditions (Baseline)

Baseline noise and vibration data was collected for the Project between May 3, 2021 and June 2, 2021. The following subsections discuss methodology, instrumentation, and results of the baseline noise and vibration data collection.

### 5.1 Pre-Project Sound Levels

#### 5.1.1 Measurement Methods

Baseline noise measurements were conducted at six locations representative locations within the Study Area. The baseline monitoring locations are shown in Figures 5.1.1 through 5.1.8. Measurements were completed using Type 1 sound level meters that were field calibrated before and after the measurements). A summary of the monitors, monitoring locations and equipment used is provided in Table 5.1.

**Table 5.1: Monitoring Locations and Instrumentation**

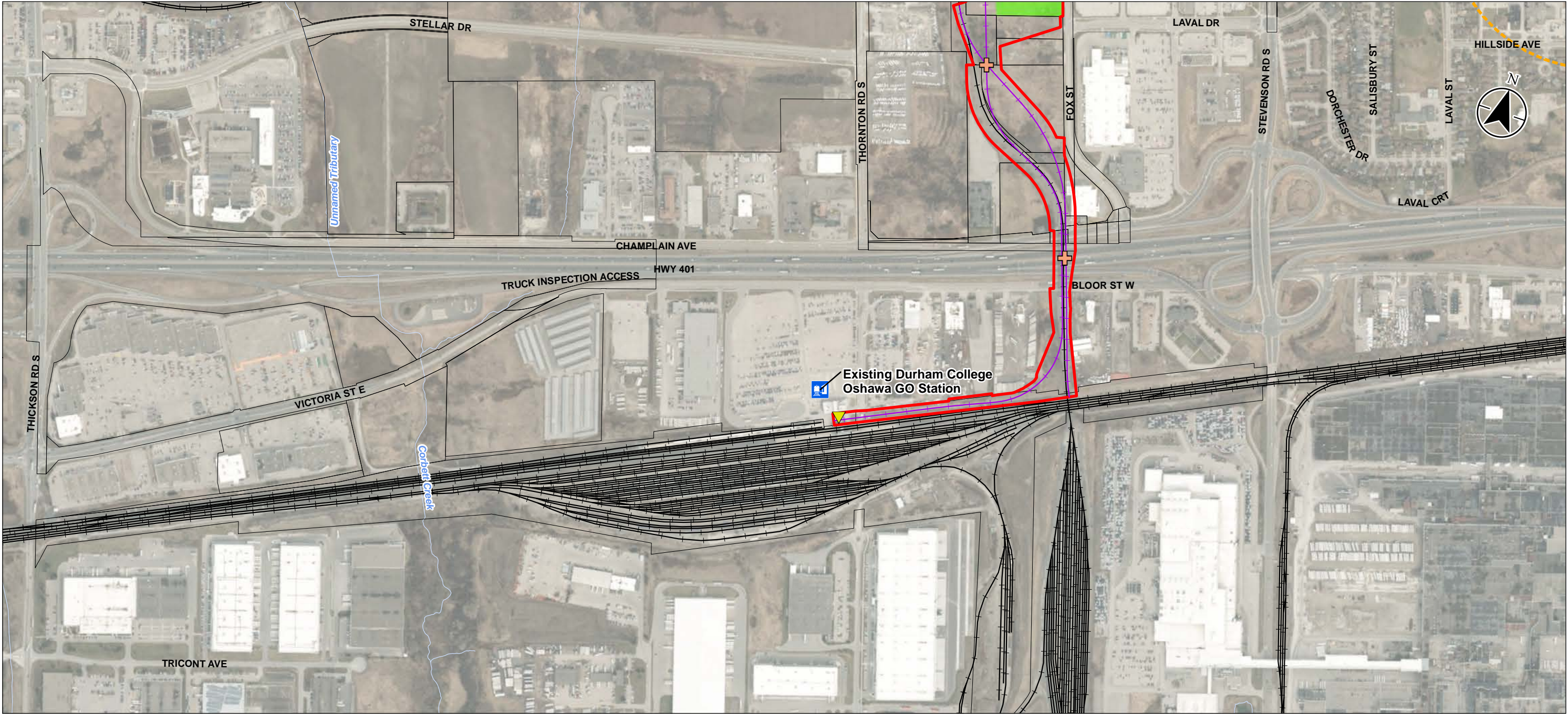
Monitor ID	Description	MTM Coordinates <sup>1</sup>		Monitor Make	Monitor Model	Serial Number
		Easting	Northing			
NM01	Cromwell Avenue South of ROW approximately 4 m above grade	355382	4860622	Larson Davis	LXT	4604
NM02	Keates Avenue South of ROW approximately 4 m above grade	358415	4861593	Larson Davis	LXT	4572
NM03	Southport Road North of ROW approximately 4 m above grade	360899	4860203	Convergence	NSRT-mk3	NSNUNIT3
NM04	Courtice Road North of ROW approximately 4 m above grade	363738	4860888	Convergence	NSRT-mk3	NSNUNIT6
NM05	Holt Road adjacent to South of ROW approximately 4 m above grade	366991	4861542	Convergence	NSRT-mk3	NSNUNIT2
NM06	Bowmanville Carpool Lot North of ROW approximately 4 m above grade	368735	48633397	Convergence	NSRT-mk3	NSNUNITA

<sup>1</sup> MTM Reference Zone 16T





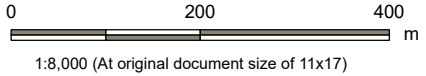
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- Legend**
- Project Footprint
  - Existing Durham College Oshawa GO Station
  - Proposed Pedestrian Bridge Extension
  - Proposed New Bridge
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - C-RAIL-ALGN-CNTR PROP
  - Watercourse
  - Waterbody
  - Property Boundary
  - Noise Monitoring Location 300 m Buffer



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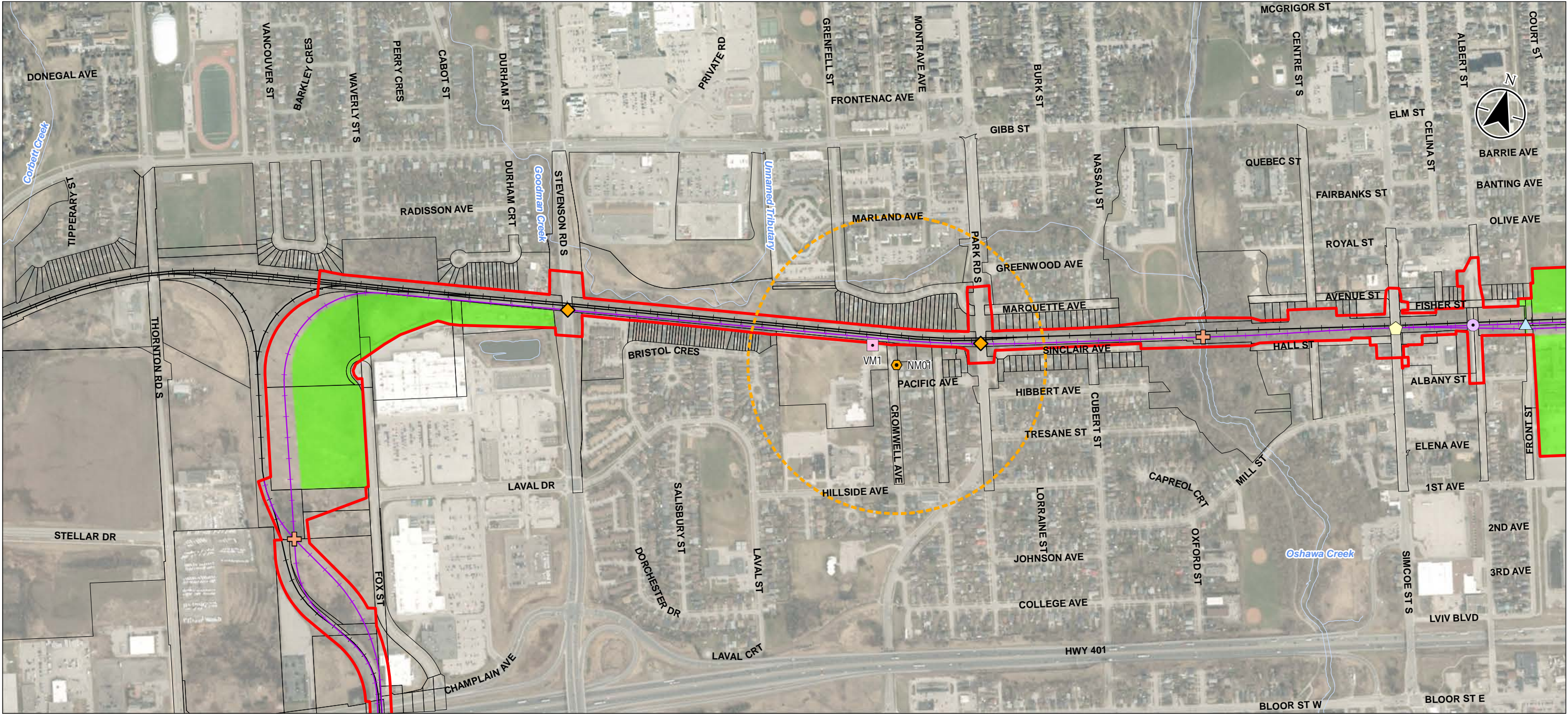
Figure No.  
**5.1.1**

Title  
**Noise and Vibration Monitoring Locations**

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- Legend**
- |  |   |  |  |
|--|---|--|--|
|  | Project Footprint                               |  | Property Boundary                      |
|  | Proposed New Bridge                             |  | Noise Monitoring Location              |
|  | Proposed Bridge Replacement                     |  | Vibration Monitoring Location          |
|  | Proposed Bridge Removal                         |  | Noise Monitoring Location 300 m Buffer |
|  | Proposed New Multi-Use Grade-Separated Crossing |  |  |
|  | Proposed Bridge Expansion                       |  |  |
|  | Proposed Transit Oriented Community Location    |  |  |
|  | Existing Railway                                |  |  |
|  | C-RAIL-ALGN-CNTR PROP                           |  |  |
|  | Watercourse                                     |  |  |
|  | Waterbody                                       |  |  |

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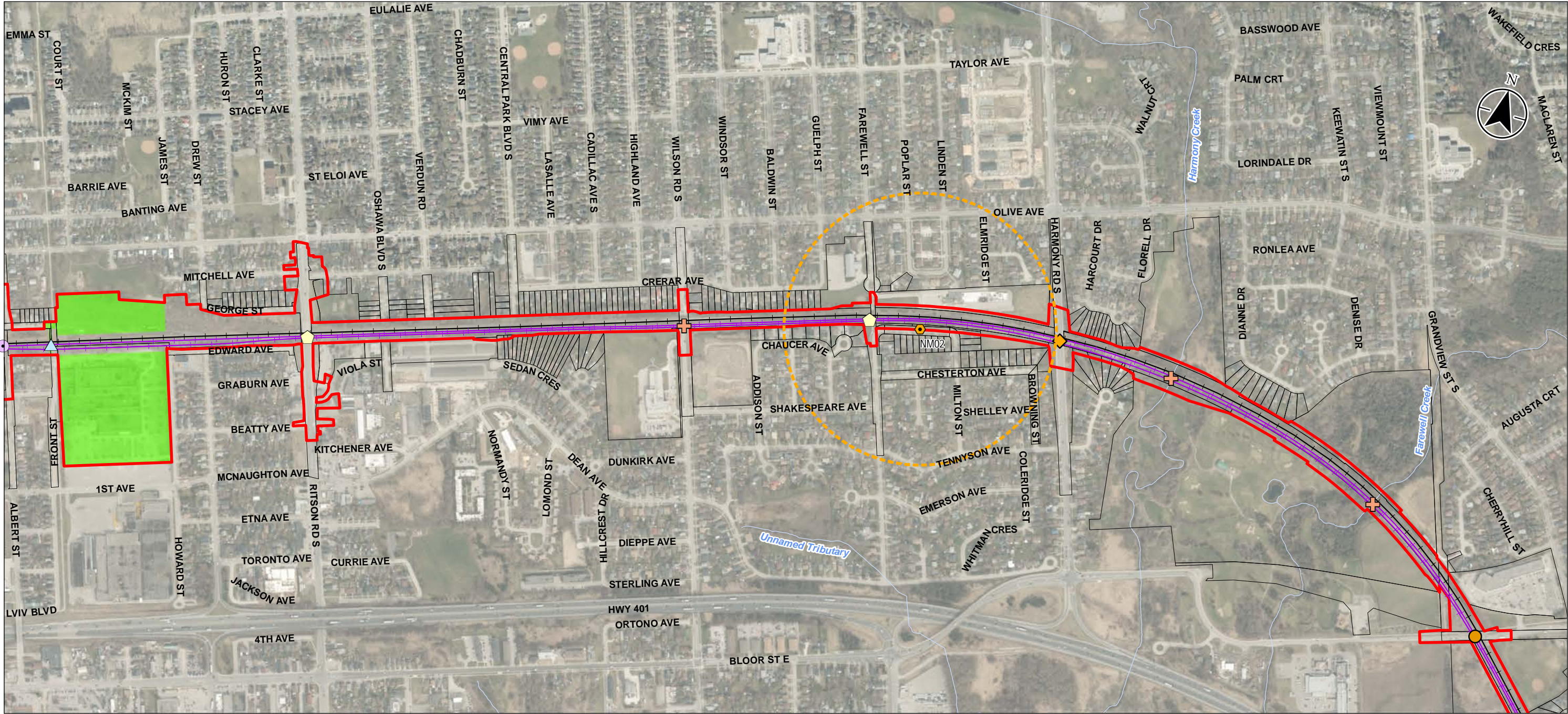
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Title  
**Noise and Vibration Monitoring Locations**

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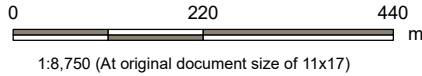


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- Legend**
- Project Footprint
  - + Proposed New Bridge
  - Proposed Bridge Replacement
  - Proposed Bridge Removal
  - ▲ Proposed New Multi-Use Grade-Separated Crossing
  - Proposed Upgrades to At-Grade Crossing
  - ◆ Proposed Bridge Expansion
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - C-RAIL-ALGN-CNTR PROP
  - Waterbody
  - Property Boundary
  - ⬢ Noise Monitoring Location
  - Noise Monitoring Location 300 m Buffer
  - Watercourse



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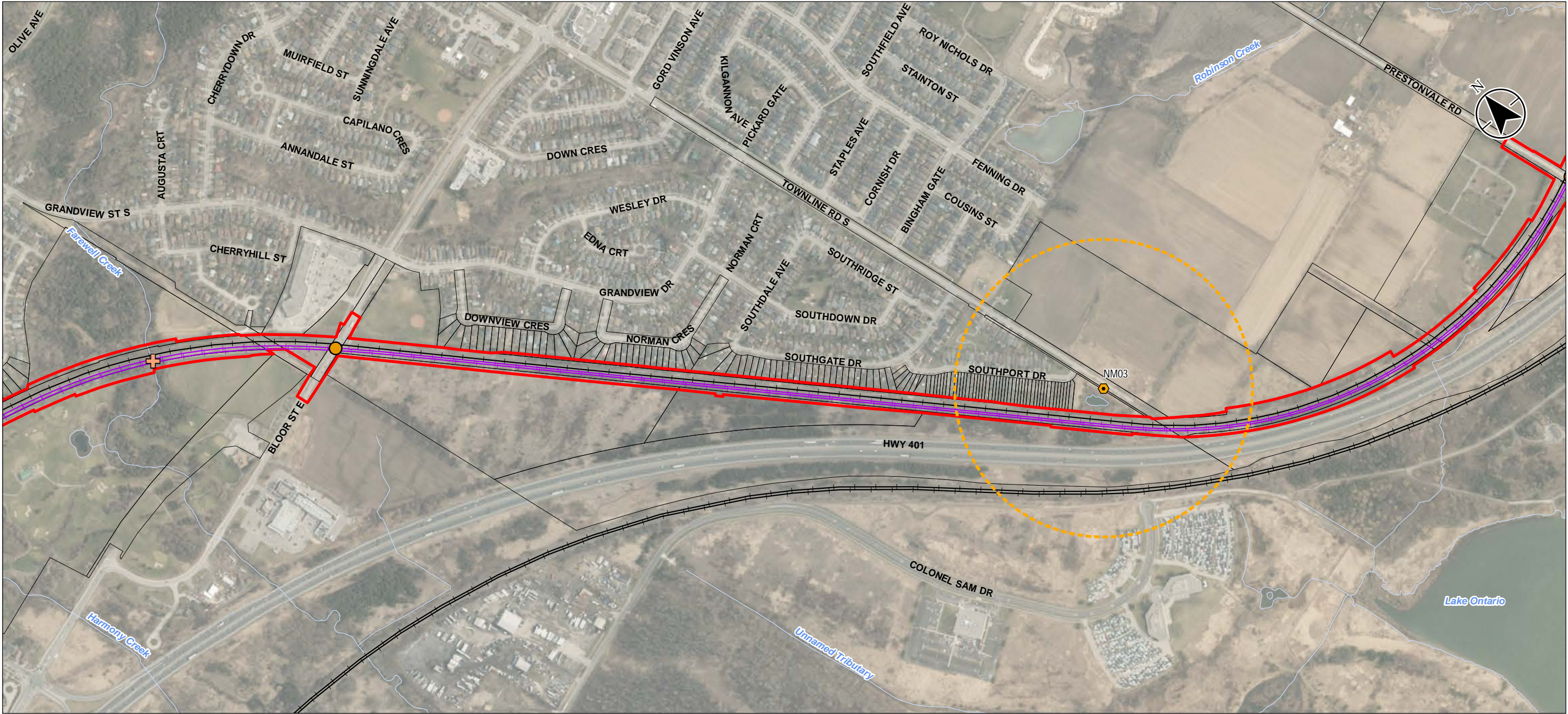
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Figure No.  
**5.1.3**  
Title  
**Noise and Vibration Monitoring Locations**

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- Legend**
- Project Footprint
  - + Proposed New Bridge
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  - Watercourse
  - Waterbody
  - Property Boundary
  - ⬡ Noise Monitoring Location
  - Noise Monitoring Location 300 m Buffer

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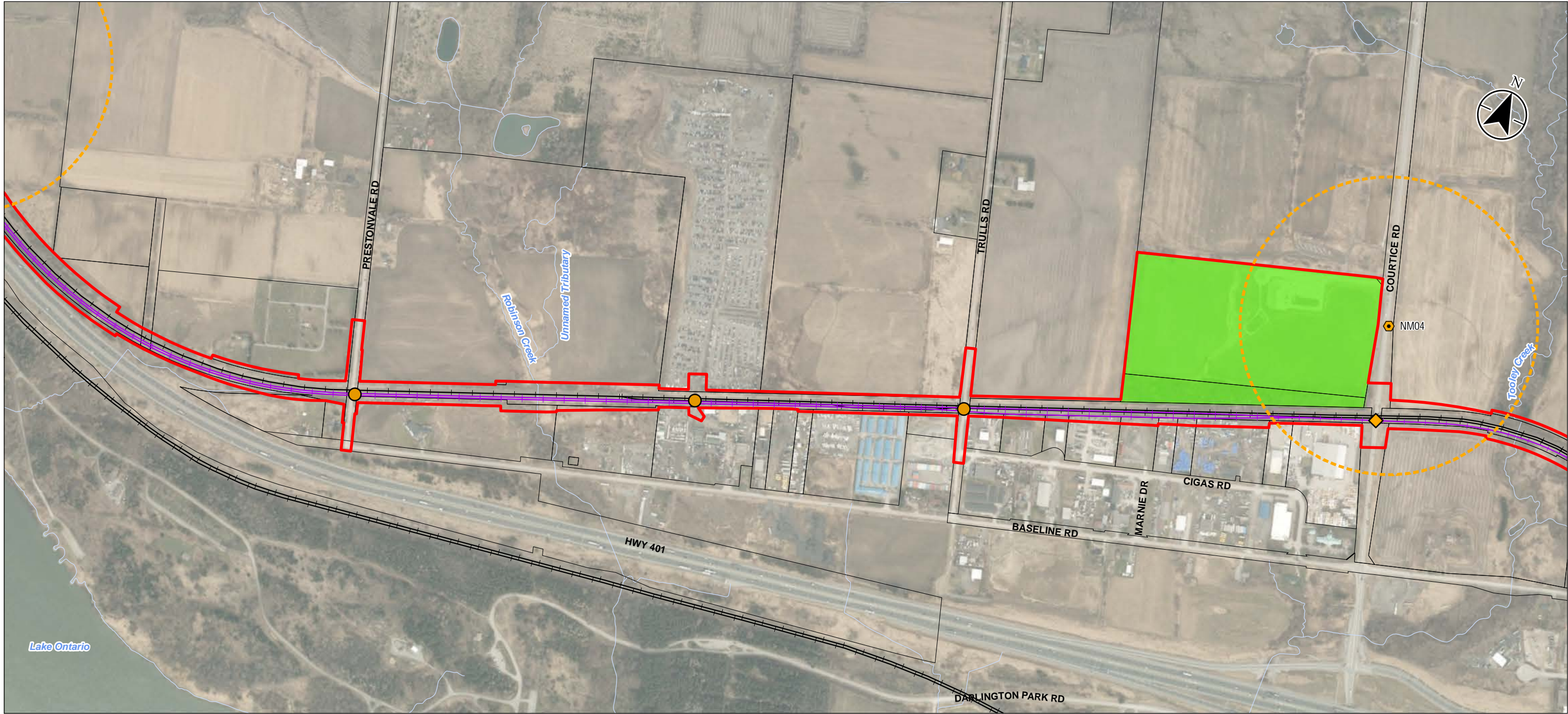
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Title  
**Noise and Vibration Monitoring Locations**

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- Legend**
- Project Footprint
  - Proposed Upgrades to At-Grade Crossing
  - Proposed Bridge Expansion
  - Proposed Transit Oriented Community Location
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  - Waterbody
  - Property Boundary
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  - Noise Monitoring Location 300 m Buffer

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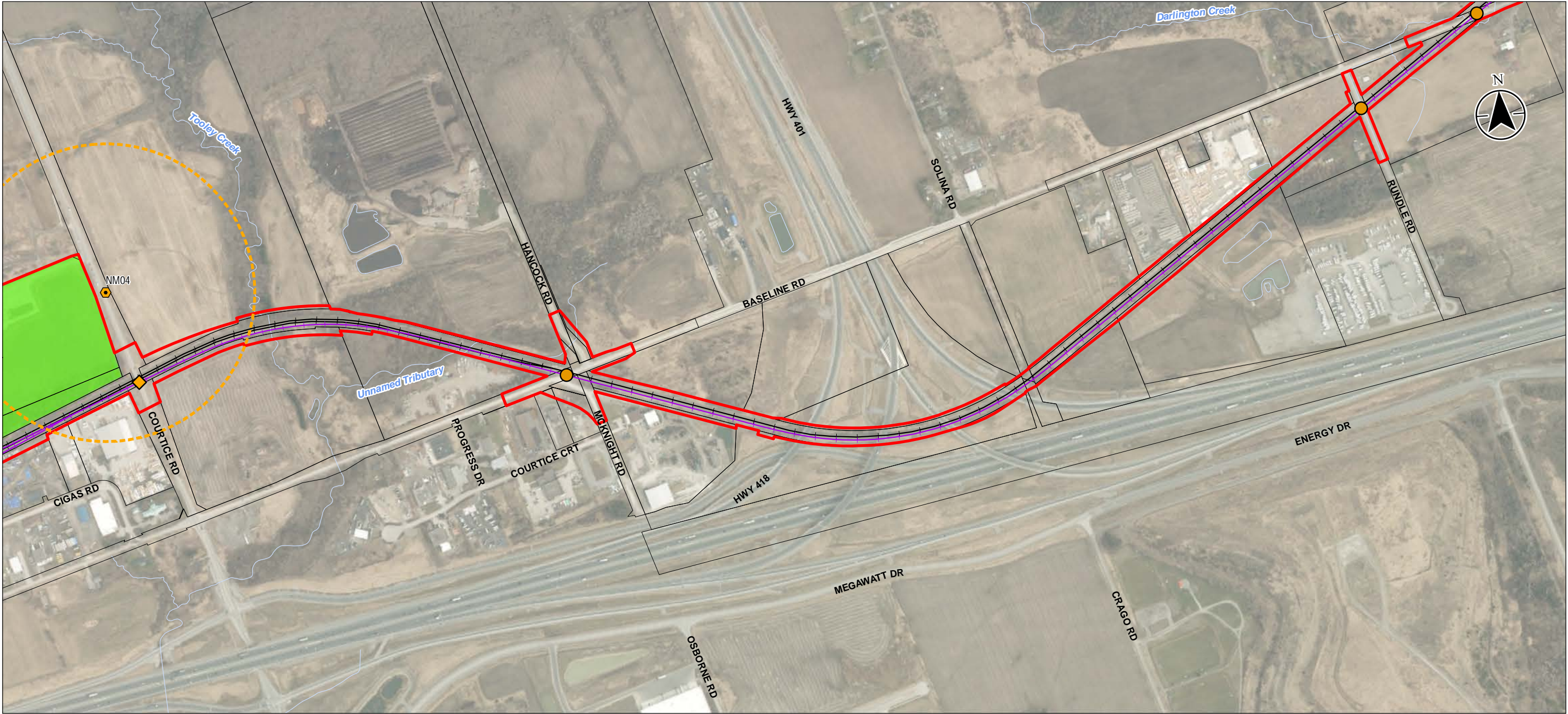
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Figure No.  
**5.1.5**

Title  
**Noise and Vibration Monitoring Locations**

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- Legend**
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  - Waterbody
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  - Noise Monitoring Location
  - Noise Monitoring Location 300 m Buffer



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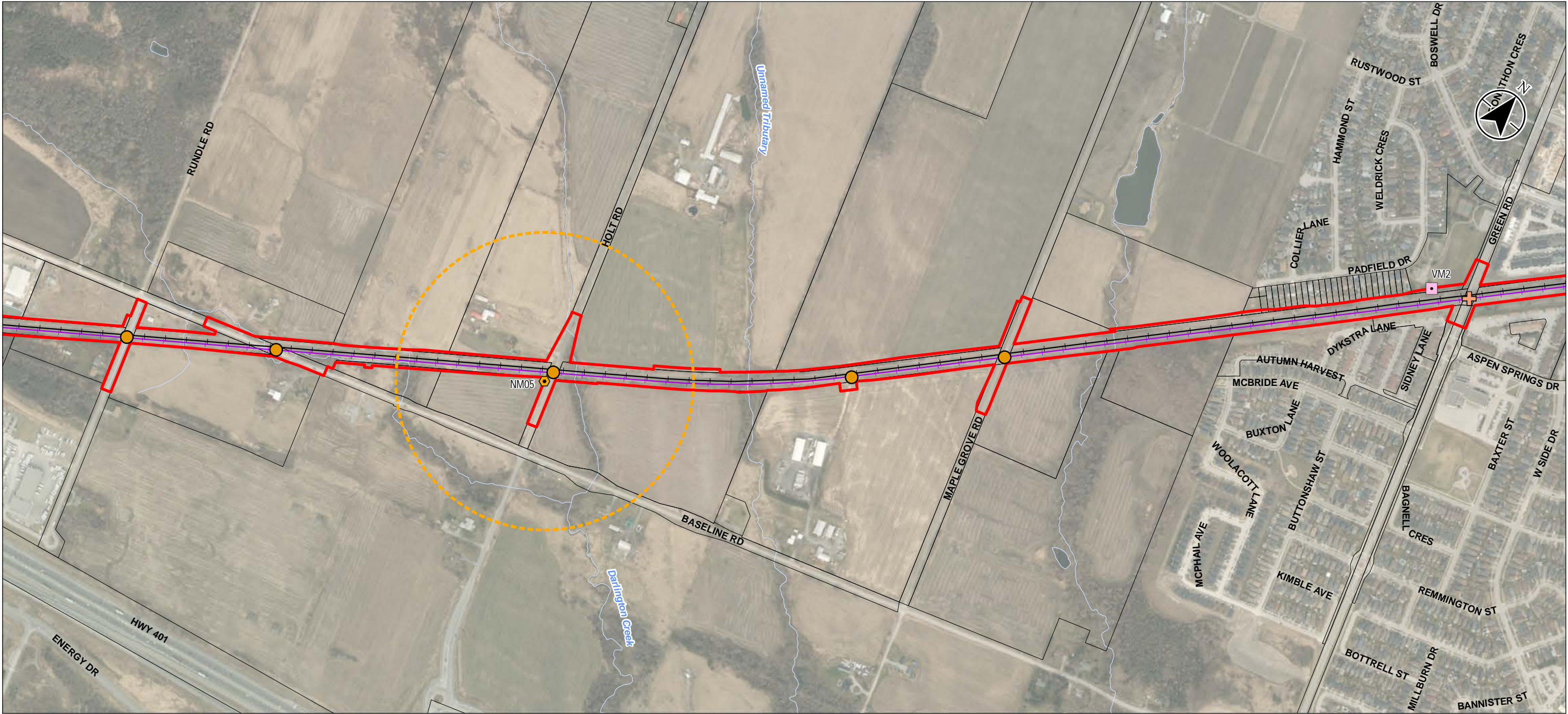
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Figure No.  
**5.1.6**

Title  
**Noise and Vibration Monitoring Locations**



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- Legend**
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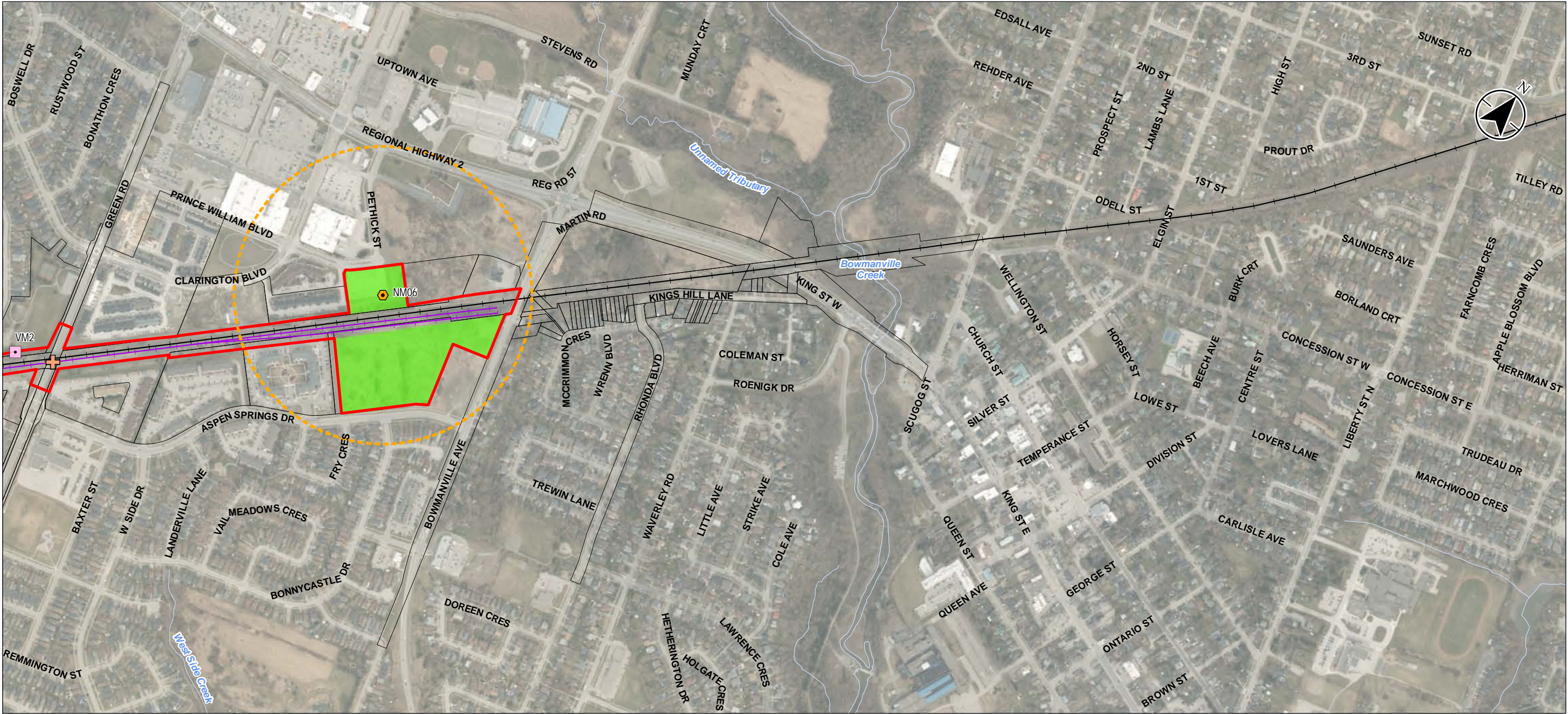
Figure No.  
**5.1.7**

Title  
**Noise and Vibration Monitoring Locations**

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  - Vibration Monitoring Location
  - Noise Monitoring Location 300 m Buffer



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Figure No.  
**5.1.8**

Title  
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# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Pre-Project Conditions (Baseline)

August 24, 2023

## 5.1.2 Baseline Results

Measured sound levels were analyzed to exclude baseline noise data collected during inclement weather conditions, based on the criteria outline in MECP guideline NPC-103 “Procedures”.

Inclement weather included the following conditions:

- Wind speeds greater than 20 km/hr
- Relative humidity greater than 90%
- Periods of precipitation
- Temperature less than -10°C or greater than 50°C

Measured sound levels are presented in Table 5.2. The data presented in this report excludes the baseline noise data collected during inclement weather conditions.

**Table 5.2: Measured Baseline Sound Levels**

Monitor ID	Monitor Location and Description	Measured Daytime Sound Levels (Leq(16)) (dBA)	Measured Nighttime Sound Levels (Leq(8)) (dBA)	Measurement Notes
NM01	Cromwell Avenue South of ROW, approximately 4 m above grade	58	58	Elevated sound levels were due to proximity to Highway 401, other major roadways, and the existing freight line
NM02	Keates Avenue South of ROW, approximately 4 m above grade	61	60	
NM03	Southport Road North of ROW, approximately 4 m above grade	69	67	
NM04	Courtice Road North of ROW, approximately 4 m above grade	75	70	
NM05	Holt Road adjacent to South of ROW, approximately 4 m above grade	69	70	
NM06	Bowmanville Carpool Lot North of ROW, approximately 4 m above grade	60	58	

The sound levels reported in Table 5.2 were used to validate the noise model used for the Project. They are further discussed in the following section.



# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Pre-Project Conditions (Baseline)

August 24, 2023

Hourly sound levels monitored at these locations are presented graphically in Appendix D.

## 5.1.3 Noise Model Validation

This section presents predicted existing sound levels at the monitoring locations and compared with the measured sound levels.

The acoustic model used road and rail traffic data detailed in Section 4.3 to predict existing sound levels. The existing daytime sound level ( $L_{eq(16hr)}$ ) and the nighttime sound level ( $L_{eq(8hr)}$ ) for the six noise monitoring locations were predicted and they are compared with the monitored sound levels in Table 5.3.

**Table 5.3: Sound Level Comparison – Measured Vs Predicted**

Monitor ID	Height (m)	Measured Daytime/ Nighttime Sound Levels (dBA)	Predicted Daytime/ Nighttime Sound Levels (dBA)	Difference in Sound Levels Day/Night (dB)	Rationale
NM01	4	58/58	63/63	5/5	Measured sound levels at NM01 are primarily driven by existing rail traffic noise. The justification behind measured sound levels being lower than predicted levels is likely due to fewer, smaller, and slower trains passing by during monitoring periods.
NM02	4	61/60	66/67	5/7	Measured sound levels at NM02 are primarily driven by existing rail traffic noise. The justification behind measured sound levels being lower than predicted levels is likely due to fewer, smaller, and slower trains passing by during monitoring periods.
NM03 <sup>1</sup>	4	69/67	70/68	1/1	Measured sound levels at NM03 are in reasonable agreement with modelled sound levels. Measured and modelled levels are high; however, this is due to the combined noise impact of consistent highway noise from Highway 401 and rail traffic along the CP corridor.



# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Pre-Project Conditions (Baseline)

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Monitor ID	Height (m)	Measured Daytime/ Nighttime Sound Levels (dBA)	Predicted Daytime/ Nighttime Sound Levels (dBA)	Difference in Sound Levels Day/Night (dB)	Rationale
NM04 <sup>1</sup>	4	75/70	72/66	-3/-4	Measured sound levels at NM04 are above modelled sound levels. The justification behind this difference is due to increased road traffic noise from Trulls Road. During the installation of monitoring equipment at NM04 Stantec staff noticed that vehicle acceleration noise was dominant at this location due to the speed limit increasing from 50 km/hr to 80 km/hr northbound along Trulls Road. TNM modelling for Trulls Road considers steady road traffic noise as there is no intersection nearby the monitoring location.
NM05 <sup>1</sup>	4	69/70	66/67	-3/-3	Measured sound levels at NM05 are above modelled sound levels. The justification behind this difference is due to Holt Road not being included in the TNM road traffic noise model due to insufficient road traffic data. Further, the monitoring location was adjacent to a rail crossing. During the installation of the monitor, Stantec staff observed that noise was generated from vehicles traversing the grade crossing resulting in additional noise impacts.
NM06	4	60/58	63/64	3/6	Measured sound levels at NM01 are primarily driven by existing rail traffic noise. The justification behind measured sound levels being lower than predicted levels is likely due to fewer, smaller, and slower trains passing by during monitoring periods.

<sup>1</sup> Higher sound levels measured from heavy road traffic and vehicle acceleration at this location.



## **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Pre-Project Conditions (Baseline)  
August 24, 2023

Measured daytime and nighttime sound levels at NM01 are 5 dBA lower than the modelled sound levels while that at NM02 are 5-7 dBA lower than modelled sound levels. Based on field observations, this difference may be explained by slower train speeds and lower train volumes than modelled in this assessment. Trains at these locations (NM01 and NM02) were observed to be travelling at speeds of approximately 40-60 km/hr whilst trains were modelled at a maximum speed of 90 km/hr. Other factors such as less road traffic due to the COVID-19 pandemic may have contributed to the sound level difference at NM01 and NM02.

Measured daytime and nighttime sound levels at NM03 are 1 dBA lower than modelled levels. The modelled noise impact is considered within the range of acceptable tolerance.

Measured daytime and nighttime sound levels are approximately 3-4 dBA above modelled levels at NM04. Stantec observed vehicle acceleration noise was high at this location as the traffic speed increases from 50 km/hr to 80 km/hr south of the monitoring location. In addition, NM04 was located adjacent to the roadway that was used by a high volume of medium and heavy trucks.

Measured daytime and nighttime sound levels are 3 dBA above modelled levels at NM05. Road traffic noise from the adjacent roadway was not modelled due to a lack of traffic data. Considering this, the modelled noise impact is considered to be within the range of tolerance.

Measured daytime and nighttime sound levels are 3-6 dBA below modeled levels at NM06. Based on field observations, this difference may be explained by slower train speeds and lower train volumes than modelled.

The predicted sound levels are conservative in comparison with measured sound levels at NM01, NM02, NM03, and NM06. These areas are critical as they are located within the city limits of Oshawa and Bowmanville and are extensively developed areas surrounded by residences. Predicted sound levels at NM04 are below measured levels; however, they are considered acceptable given externalities such as acceleration noise specific to the measurements location as discussed above. Predicted sound levels at NM05 are considered to be in reasonable agreement with measured levels as they are within 3 dBA of measured sound levels and do not consider the impact of the adjacent roadway.

Based on these results, the Project noise model and the procedure followed for this assessment are considered appropriate for the purpose of determining Project sound levels. The modelled inputs, model configuration, and sample calculations are provided in Appendix B.



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Pre-Project Conditions (Baseline)

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## 5.1.4 Pre-Project Sound Levels

The pre-project daytime sound levels ( $L_{eq(16hr)}$ ) and the nighttime sound levels ( $L_{eq(8hr)}$ ) were predicted at the representative receptor locations and are presented in Table 5.4. The predicted levels include sound levels from both road and rail traffic.

**Table 5.4: Pre-Project Sound Levels**

Receptor ID	Receptor Description	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16hr)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8hr)}$
POR001	Two Storey Dwelling at 332 Vancouver Crescent	Façade	65	66
		OLA	67	-
POR002	Two Storey Dwelling at 352 Vancouver Crescent	Façade	66	66
		OLA	67	-
POR003	Two Storey Dwelling at 368 Vancouver Crescent	Façade	63	63
		OLA	65	-
POR004	Two Storey Residence at 389 Durham Court	Façade	66	66
		OLA	67	-
POR005	Two Storey Residence at 363 Durham Court	Façade	64	64
		OLA	65	-
POR006	Two Storey Residence at 345 Durham Court	Façade	65	63
		OLA	66	-
POR007	Two Storey Residence at 420 Bristol Crescent	Façade	66	64
		OLA	67	-
POR008	Two Storey Residence at 372 Bristol Crescent	Façade	65	65
		OLA	66	-
POR009	Two Storey Residence at 334 Sheffield Court	Façade	65	66
		OLA	67	-
POR010	Two Storey Residence at 460 Grenfell Street	Façade	63	63
		OLA	66	-
POR011	Two Storey Residence at 492 Grenfell Street	Façade	65	66
		OLA	66	-
POR012	Two Storey Residence at 540 Grenfell Street	Façade	63	62
		OLA	64	-
POR013	Two Storey Residence at 413 Cromwell Avenue	Façade	65	65
		OLA	66	-



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Receptor ID	Receptor Description	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq}(16hr)$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq}(8hr)$
POR014	Two Storey Residence at 431 Montrave Avenue	Façade	66	66
		OLA	67	-
POR015	Two Storey Residence at 257 Marquette Avenue	Façade	67	67
		OLA	68	-
POR016	Two Storey Residence at 213 Marquette Avenue	Façade	65	66
		OLA	66	-
POR017	Two Storey Residence at 181 Marquette Avenue	Façade	65	66
		OLA	67	-
POR018	Two Storey Residence at 257 Sinclair Avenue	Façade	64	63
		OLA	60	-
POR019	One Storey Residence at 215 Sinclair Avenue	Façade	64	64
		OLA	60	-
POR020	One Storey Residence at 167 Sinclair Avenue	Façade	64	65
		OLA	64	-
POR021	Two Storey Residence at 85 Hall Street	Façade	64	64
		OLA	60	-
POR022	One Storey Residence at 423 Centre Street South	Façade	64	64
		OLA	64	-
POR023	Two Storey Residence at 11 Hall Street	Façade	66	65
		OLA	64	-
POR024	Two Storey Residence at 83 Avenue	Façade	65	65
		OLA	66	-
POR025	Two Storey Residence at 394 Centre Street South	Façade	65	65
		OLA	66	-
POR026	One Storey Residence at 25 Avenue	Façade	67	67
		OLA	69	-
POR027	Two Storey Residence at 38 Fisher Street	Façade	65	64
		OLA	60	-
POR028	Two Storey Residence at 74 Fisher Street	Façade	65	65
		OLA	59	-
POR029	One Storey Residence at 214 George Street	Façade	63	63
		OLA	59	-



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Receptor ID	Receptor Description	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq}(16hr)$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq}(8hr)$
POR030	One Storey Residence at 258 George Street	Façade	65	62
		OLA	64	-
POR031	Two Storey Residence at 419 Drew Street	Façade	65	65
		OLA	65	-
POR032	Two Storey Residence at 249 Edward Avenue	Façade	65	64
		OLA	63	-
POR033	One Storey Residence at 396 Oshawa Boulevard South	Façade	67	68
		OLA	66	-
POR034	One Storey Residence at 398 Verdun Road	Façade	67	68
		OLA	66	-
POR035	One Storey Residence at 400 Central Park Boulevard South	Façade	67	67
		OLA	64	-
POR036	One Storey Residence at 410 Sedan Crescent	Façade	63	64
		OLA	64	-
POR037	One Storey Residence at 446 Brest Crescent	Façade	62	63
		OLA	63	-
POR038	One Storey Residence at 485 Crerar Avenue	Façade	63	63
		OLA	64	-
POR039	One Storey Residence at 541 Crerar Avenue	Façade	65	64
		OLA	66	-
POR040	One Storey Residence at 603 Crerar Avenue	Façade	65	65
		OLA	66	-
POR041	One Storey Residence at 641 Crerar Avenue	Façade	64	64
		OLA	65	-
POR042	Three Storey Residence at 596 Chaucer Avenue	Façade	66	67
		OLA	68	-
POR043	Three Storey Residence at 424 Austen Court	Façade	66	67
		OLA	66	-
POR044	One Storey Residence at 393 Farewell Street	Façade	61	61
		OLA	60	-
POR045	Two Storey Place of Worship at 399 Elmridge Street	Façade	66	66
		OLA	-	-



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Receptor ID	Receptor Description	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq}(16hr)$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq}(8hr)$
POR046	One Storey Residence on Wicklow Court	Façade	61	59
		OLA	63	-
POR047	Two Storey Residence at 429 Milton Street	Façade	66	66
		OLA	67	-
POR048	Two Storey Residence at 791 Chesterton Avenue	Façade	63	63
		OLA	64	-
POR049	Two Storey Residence at 420 Harcourt Drive	Façade	63	62
		OLA	64	-
POR050	Two Storey Residence at 452 Harcourt Drive	Façade	64	65
		OLA	66	-
POR051	One Storey Residence at 464 Tennyson Court	Façade	63	63
		OLA	65	-
POR052	Two Storey Residence at 446 Dianne Drive	Façade	63	63
		OLA	64	-
POR053	Two Storey Residence at 486 Dianne Drive	Façade	62	62
		OLA	63	-
POR054	Two Storey Residence at 1094 Street Andrews Court	Façade	64	64
		OLA	65	-
POR055	Two Storey Residence at 1082 Street Andrews Court	Façade	64	64
		OLA	65	-
POR056	Two Storey Residence at 1094 Street Andrews Court	Façade	66	66
		OLA	67	-
POR057	Two Storey Residence at 762 Downview Crescent	Façade	66	66
		OLA	66	-
POR058	Two Storey Residence at 1113 Norman Crescent	Façade	68	68
		OLA	69	-
POR059	Two Storey Residence at 924 Southgate Drive	Façade	69	70
		OLA	71	-
POR060	Two Storey Residence at 984 Southport Drive	Façade	69	69
		OLA	70	-
POR061	Two Storey Residence at 1074 Southport Drive	Façade	70	70
		OLA	71	-





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Receptor ID	Receptor Description	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq}(16hr)$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq}(8hr)$
POR062	Two Storey Residence at 1018 Prestonvale Road	Façade	70	70
		OLA	71	-
POR063	Two Storey Residence at 1218 Trulls Road	Façade	57	57
		OLA	57	-
POR064	One Storey Residence at 2048 Baseline Road West	Façade	63	61
		OLA	62	-
POR065	One Storey Residence at 2074 Baseline Road West	Façade	63	63
		OLA	64	-
POR066	Two Storey Residence at 2091 Baseline Road West	Façade	62	62
		OLA	63	-
POR067	Two Storey Residence at 1108 Holt Road	Façade	65	65
		OLA	66	-
POR068	Two Storey Residence at 34 Autumn Harvest Road	Façade	60	61
		OLA	59	-
POR069	Two Storey Residence at 34 Dykstra Lane	Façade	61	62
		OLA	62	-
POR070	Two Storey Residence at 56 Dykstra Lane	Façade	61	61
		OLA	61	-
POR071	Two Storey Residence at 95 Dykstra Lane	Façade	60	61
		OLA	58	-
POR072	Two Storey Residence at 187 Padfield Drive	Façade	63	64
		OLA	63	-
POR073	Two Storey Residence at 143 Padfield Drive	Façade	62	63
		OLA	64	-
POR074	Two Storey Residence at 95 Padfield Drive	Façade	62	63
		OLA	63	-
POR075	Four Storey Apartment Building at 128 Aspen Springs Drive	Façade	61	62
		OLA	53	-
POR076	Future Three Storey Residence at 1423 Green Road	Façade	62	63
		OLA	63	-
POR077	Future Three Storey Residence at 2 Lord Elgin Lane	Façade	63	64
		OLA	64	-



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Receptor ID	Receptor Description	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq}(16hr)$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq}(8hr)$
POR078	Future Three Storey Residence at 57 Clarington Boulevard	Façade	64	65
		OLA	64	-
POR079	Future Three Storey Residence at 55 Clarington Boulevard	Façade	63	64
		OLA	64	-
POR080	Three Storey Residence at 61 Clarington Boulevard	Façade	63	64
		OLA	56	-
POR081	Three Storey Residence at 94 Aspen Springs Drive	Façade	62	63
		OLA	64	-
POR082	Three Storey Residence at 90 Aspen Springs Drive	Façade	62	63
		OLA	64	-
POR083	Four Storey Residence at 84 Aspen Springs Drive	Façade	63	64
		OLA	55	-
POR084	Four Storey Residence at 80 Aspen Springs Drive	Façade	63	64
		OLA	56	-
POR091	11 Storey Apartment Residence at 64 Albany Street	Façade	64	65
		OLA	-	-
POR092	One Storey Residence at 418 Front Street	Façade	66	67
		OLA	65	65
POR093	25 Storey Apartment Residence at 10 Aspen Springs Drive	Façade	63	61
		OLA	-	-
POR094	4 Storey Apartment Residence at 63 Albany Street	Façade	63	62
		OLA	-	-
POR095	5 Storey Apartment Residence at 446 Simcoe Street	Façade	62	62
		OLA	-	-

Background sound levels at all PORs within the project area are elevated due to the presence of existing traffic from major roads and rail corridor.

Sample noise calculations are provided in Appendix B.



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Pre-Project Conditions (Baseline)

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## 5.2 Pre-Project Vibration Levels

Baseline vibration measurements were conducted by Stantec at two representative locations within the Study Area between May 25, 2021 and June 2, 2021. The measurement locations were chosen based on the proposed track alignment and they were at the northwest corner of the Cromwell Avenue roundabout in Oshawa (VM01) and southwest corner of Green Park in Bowmanville (VM02). Based on the current CP Rail track alignment, the closest existing receptor to the north of the corridor is approximately 20 m from the centerline and that to the south is approximately 30 m from the centerline. A summary of separation distances from the main CP Rail track to PORs is provided as Table 5.5. The proposed rail corridor tracks are to be installed south of the existing CP Rail track (closer the receptors south of the corridor). Drawings showing the location of the proposed GO rail track within the existing rail corridor are provided in Appendix A.

**Table 5.5: POR Setback Distance to Current Alignment**

Receptor ID	Receptor Description	Approximate Separation Distance (m)
POR001	Two Storey Dwelling on Vancouver Crescent	31
POR002	Two Storey Dwelling on Vancouver Crescent	30
POR003	Two Storey Dwelling on Vancouver Crescent	43
POR004	Two Storey Residence on Durham Court	30
POR005	Two Storey Residence on Durham Court	47
POR006	Two Storey Residence on Durham Court	51
POR007	Two Storey Residence on Bristol Crescent	47
POR008	Two Storey Residence on Bristol Crescent	41
POR009	Two Storey Residence on Bristol Crescent	34
POR010	Two Storey Residence on Grenfell Street	57
POR011	Two Storey Residence on Grenfell Street	35
POR012	Two Storey Residence on Grenfell Street	69
POR013	Two Storey Residence on Cromwell Avenue	41
POR014	Two Storey Residence on Cromwell Avenue	33
POR015	Two Storey Residence on Marquette Avenue	28
POR016	Two Storey Residence on Marquette Avenue	36
POR017	Two Storey Residence on Marquette Avenue	34
POR018	Two Storey Residence on Sinclair Avenue	53
POR019	One Storey Residence on Sinclair Avenue	45



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Receptor ID	Receptor Description	Approximate Separation Distance (m)
POR020	One Storey Residence on Sinclair Avenue	46
POR021	Two Storey Residence on Hall Street	49
POR022	One Storey Residence on Hall Street	42
POR023	Two Storey Residence on Hall Street	48
POR024	Two Storey Residence on Avenue Street	38
POR025	Two Storey Residence on Avenue Street	41
POR026	One Storey Residence on Avenue Street	28
POR027	Two Storey Residence on Fisher Street	47
POR028	Two Storey Residence on Fisher Street	47
POR029	One Storey Residence on George Street	65
POR030	One Storey Residence on George Street	69
POR031	Two Storey Residence on Edward Avenue	43
POR032	Two Storey Residence on Edward Avenue	47
POR033	One Storey Residence on Oshawa Boulevard S	23
POR034	One Storey Residence on Verdun Road	23
POR035	One Storey Residence on Central Park Boulevard	23
POR036	One Storey Residence on Sedan Crescent	50
POR037	One Storey Residence on Brest Crescent	73
POR038	One Storey Residence on Crerar Avenue	55
POR039	One Storey Residence on Crerar Avenue	56
POR040	One Storey Residence on Crerar Avenue	38
POR041	One Storey Residence on Crerar Avenue	39
POR042	Three Storey Residence on Chaucer	28
POR043	Three Storey Residence on Chaucer	28
POR044	One Storey Residence on Elmridge Street	52
POR045	Two Storey Place of Worship on Elmridge Street	30
POR046	One Storey Residence on Wicklow Court	103
POR047	Two Storey Residence on Keates Avenue	29
POR048	Two Storey Residence on Chesterton Avenue	52
POR049	Two Storey Residence on Harcourt Drive	53
POR050	Two Storey Residence on Harcourt Drive	38
POR051	One Storey Residence on Tennyson Court	53
POR052	Two Storey Residence on Dianne Drive	58



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Receptor ID	Receptor Description	Approximate Separation Distance (m)
POR053	Two Storey Residence on Dianne Drive	65
POR054	Two Storey Residence on Street Andrews Court	52
POR055	Two Storey Residence on Street Andrews Court	50
POR056	Two Storey Residence on Downview Crescent	39
POR057	Two Storey Residence on Downview Crescent	41
POR058	Two Storey Residence on Norman Crescent	30
POR059	Two Storey Residence on Southgate Drive	29
POR060	Two Storey Residence on Southport Drive	37
POR061	Two Storey Residence on Southport Drive	42
POR062	Two Storey Residence on Prestonvale Road	66
POR063	Two Storey Residence on Trulls Road	371
POR064	One Storey Residence on Baseline Road W	125
POR065	One Storey Residence on Baseline Road W	67
POR066	Two Storey Residence on Baseline Road W	104
POR067	Two Storey Residence on Holt Road	38
POR068	Two Storey Residence on Autumn Harvest Road	52
POR069	Two Storey Residence on Dykstra Lane	55
POR070	Two Storey Residence on Dykstra Lane	55
POR071	Two Storey Residence on Dykstra Lane	55
POR072	Two Storey Residence on Padfield Drive	44
POR073	Two Storey Residence on Padfield Drive	45
POR074	Two Storey Residence on Padfield Drive	44
POR075	Four Storey Apartment Building on Aspen Springs Drive	71
POR076	Future Three Storey Residence on Lord Elgin Drive	48
POR077	Future Three Storey Residence on Lord Elgin Drive	40
POR078	Future Three Storey Residence on Clarington Boulevard	36
POR079	Future Three Storey Residence on Clarington Boulevard	39
POR080	Three Storey Residence on Clarington Boulevard	45
POR081	Three Storey Residence on Aspen Springs Drive	51
POR082	Three Storey Residence on Aspen Springs Drive	50
POR083	Four Storey Residence on Aspen Springs Drive	52
POR084	Four Storey Residence on Aspen Springs Drive	51
POR091	11 Storey Apartment Residence at 64 Albany Street	63



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Receptor ID	Receptor Description	Approximate Separation Distance (m)
POR092	One Storey Residence at 418 Front Street	12
POR093	25 Storey Apartment Residence at 10 Aspen Springs Drive	76
POR094	4 Storey Apartment Residence at 63 Albany Street	100
POR095	5 Storey Apartment Residence at 446 Simcoe Street	102

### 5.2.1 Measurement Methods

Based on the setbacks with the current and future alignment, measurements were taken at 15 m, 20 m, 25 m, and 30 m from the centerline of the existing CP Rail track. Baseline vibration measurement locations VM01 and VM02 are shown in Figure 5.1.2 and Figure 5.1.8.

The measurements were completed using a Crystal Instruments model CoCo-80X 8 channel Dynamic Signal Analyzer with PCB Piezotronic model 393B12 (PCB 393B31) seismic high sensitivity ICP accelerometers. Each PCB 393B31 accelerometer was connected to an aluminum plate which was fastened into the ground using ground spikes. The CoCo-80X meets the requirements of ISO 8041:2005 and is designed to measure per ISO 2631-1, 2, and 5 and ISO 5349. The PCB model 393B31 accelerometer is a high sensitivity, ceramic ICP® accelerometer with a sensitivity of 10V/g capable of measuring low vibration levels. The measurement system was factory calibrated in the last 12 months.

The ground was prepared by removing the top layer of loose soil. A flat plate was then spiked to the prepared ground surface. The sensors were connected to collected measurements vertical axis as the levels were significantly higher than other directions.

### 5.2.2 Data Analysis

The vibration was measured in acceleration and the data converted to velocity using a time constant of 1 second to provide real-time vibration velocity levels in millimeters per second (mm/s). The maximum observed RMS vibration levels were used as a measure of pre-project vibration levels and are presented in Table 5.6. RMS vibration velocities for each train pass-by are graphically presented in Appendix D.



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**Table 5.6: Measured Vibration Levels**

Passby Event	Monitoring Location	Maximum Measured RMS Vibration (mm/s)			
		15 m Setback	20 m Setback	25 m Setback	30 m Setback
Passby 1	VM1	0.315	0.210	0.174	0.170
Passby 2		0.273	0.189	0.174	0.148
Passby 3		0.151	0.079	0.072	0.063
Passby 4		0.120	0.068	0.119	0.061
Passby 5		0.136	0.095	0.077	0.061
Passby 6	VM2	0.342	0.211	0.189	0.139
Passby 7		0.279	0.188	0.134	0.093
Passby 8		0.366	0.161	0.178	0.121
Passby 9		0.276	0.187	0.138	0.092
Passby 10		0.301	0.177	0.154	0.097
Passby 11		0.269	0.192	0.196	0.121
<b>Maximum Value</b>		<b>0.366</b>	<b>0.211</b>	<b>0.196</b>	<b>0.170</b>

Vibration levels were measured for freight train passbys. Vibration levels generated by freight trains are typically higher than those of typical passenger trains.

Criteria for operation vibration was determined based on the measured vibration levels generated by the existing CP Rail train movements. Based on the measurements, a vibration limit of 0.175 mm/s (RMS) was considered for the Project operation rail vibration assessment for the existing dwellings. All new developments are assessed with a vibration limit of 0.14 mm/s (RMS).



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Potential Effects, Mitigation and Monitoring  
August 24, 2023

## 6.0 Potential Effects, Mitigation and Monitoring

### 6.1 Construction Assessment

Both emission-based and receptor-based noise assessments were completed for the Project construction in accordance with the MECP Publication NPC-115 and NPC-118 and the Metrolinx Environmental Guide. The construction vibration was assessed in accordance with the Metrolinx Environmental Guide and MOEE/GO Draft Protocol.

The results of the construction noise and vibration assessments are discussed in detail in the following subsections.

#### 6.1.1 Construction Noise Assessment

An emission-based noise assessment was completed using the list of construction equipment (Table 4.1) proposed for the Project construction. The construction equipment reference sound levels were compared to the applicable sound level limits outlined in MECP NPC-115 and NPC-118. Reference sound levels for the preliminary list of equipment that considered for this assessment are compared with the NPC-115 and NPC-118 limits and presented in Table 6.1. For equipment that were not listed in the NPC-115 or NPC-118, criteria for acoustically comparable equipment was used.

**Table 6.1: Construction Equipment Noise Emission Assessment**

Equipment	Reference Sound Pressure Level at 15 m (dBA) <sup>1</sup>	NPC-115/NPC-118 Sound Level Limit at 15 m (dBA)	Meets NPC-115/NPC-118 Sound Level? (Yes/No)
Asphalt spreader	85	85	Yes
Backhoe	80	85	Yes
Ballast regulator	82	85	Yes
Bobcat	80	85	Yes
Boom truck	80	85	Yes
Caisson auger	85	100	Yes
Compactor	82	85	Yes
Concrete breaker	85	85	Yes
Concrete pump	82	85	Yes
Concrete saw	90	85	<b>No<sup>2</sup></b>
Concrete truck	85	85	Yes
Crane	83	85	Yes
Drill	85	100	Yes





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Equipment	Reference Sound Pressure Level at 15 m (dBA) <sup>1</sup>	NPC-115/NPC-118 Sound Level Limit at 15 m (dBA)	Meets NPC-115/NPC-118 Sound Level? (Yes/No)
Dump truck	84	85	Yes
Dynamic stabilizer	82	85	Yes
Earth scraper	85	85	Yes
Flatbed truck	84	85	Yes
Front-end loader	80	85	Yes
Grader	85	85	Yes
Pavement roller	85	85	Yes
Pavement saw	90	85	<b>No<sup>2</sup></b>
Pile auger	85	100	Yes
Pile driver	101	100	<b>No<sup>2</sup></b>
Rail drill	85	100	Yes
Rail saw	90	100	Yes
Speed swing	80	85	Yes
Spike machine	80	85	Yes
Track liner/tamper	82	85	Yes
Water truck	84	85	Yes
Welder	73	85	Yes
Zoom boom	80	85	Yes

Notes:

- <sup>1</sup> Reference sound pressure levels for the listed equipment were obtained from the US FTA Manual and FHWA RCNM.
- <sup>2</sup> These equipment units have potential to exceed the applicable MECP limits and precautions/noise control feasibility should be investigated if they are used near sensitive receptors.

The equipment reference sound levels presented in Table 6.1 show that most equipment can be operated in compliance with the MECP limits; however, there is the potential for higher sound levels than the permissible limits for some equipment. Once equipment and construction schedules are finalized, the equipment noise data should be reviewed prior to start of construction to confirm that noise emissions are below the permissible limits. If the sound levels are higher than the limits, noise control options should be explored and implemented for compliance.



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The construction noise ZOI was established as part of the receptor-based construction noise assessment per the Metrolinx Environmental Guide. For each construction phase, ZOI for construction noise was calculated based on the type, quantity and duty cycle of the construction equipment listed in Table 4.5. Construction noise ZOIs were established for the receptor-based Project construction noise exposure limits, as summarized in Table 6.2 (e.g., 85 dBA, 80 dBA, 75 dBA, 70 dBA) that account for the surrounding type of land uses (e.g., Industrial, Commercial, Residential, and Institutional) and expected construction periods (i.e., daytime limits for weekdays).

The construction noise ZOIs calculated for various noise exposure limits for all known Project construction phases are summarized in Table 6.2.

**Table 6.2: Construction Noise ZOI**

Project Components	Construction Phases	ZOI (m)			
		Industrial Receptors (85 dBA)	Commercial Receptors (80 dBA)	Residential Receptors (75 dBA)	Institutional Receptors (70 dBA)
Track and Grading	Grading	13	27	54	104
	Track	9	20	44	88
Bridge Replacement	Utility Relocation and Road Closure	9	17	32	62
	Demolition of Existing Bridge	10	20	41	78
	Abutment Construction	31	56	100	179
	Span construction	4	7	15	33
	Road Re-instatement	9	16	29	56
	Site Cleanup	4	7	13	27
New Bridge	Utility Relocation and Road Closure	9	17	32	62
	Abutment Construction	31	56	100	179
	Span construction	4	7	15	33
	Road Re-instatement	9	16	31	59
	Site Cleanup	4	7	13	27
Modified Bridge	Removals and Site Preparation	9	17	32	61
	Abutment Underpinning	14	26	47	87
	Site Cleanup	4	7	13	27



# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

Project Components	Construction Phases	ZOI (m)			
		Industrial Receptors (85 dBA)	Commercial Receptors (80 dBA)	Residential Receptors (75 dBA)	Institutional Receptors (70 dBA)
Stations	Clearing	7	15	32	64
	Parking Construction	7	13	28	58
	Building/Platform Construction	6	12	23	47
Crossing Widening	Removals and Reconstruction	5	9	19	45

The construction noise ZOIs presented in Table 6.2 are the minimum setback distances relative to the Project components work area required to maintain noise compliance with the applicable noise exposure limits. The setback distances vary depending on the construction phase and noise exposure limits. Generally, the setback distance increases as the noise exposure limit decreases (i.e., noise limit becomes more stringent).

Depending on the construction phase, some of the residential, institutional, and commercial PORs considered in this study are within the established noise ZOI and hence be impacted. A summary of the potentially impacted residential, institutional, and commercial PORs is presented in Table 6.3. No industrial PORs were identified within the applicable noise ZOIs; therefore, no impacts are expected at the surrounding industrial PORs to the Project Footprint.

**Table 6.3: Potentially Impacted PORs from Construction Noise**

Land Use	Impacted PORs
Residential	All residential PORs modelled along the corridor, except POR001, POR028C, POR063, POR066, POR091, POR093, POR094, POR095
Institutional	POR045, and POR085 through POR088
Commercial	POR089 and POR090

The extent of the construction noise ZOI depends on the setback distances presented in Table 6.2 and the actual operating location of the construction equipment within the activity-specific work area. The maximum construction noise ZOI extent results from the equipment operating at the activity-specific work area boundary. In the absence of Project component construction area details, construction noise ZOIs were established relative to the Project Footprint.



## **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Potential Effects, Mitigation and Monitoring  
August 24, 2023

For each construction Project component, the construction noise ZOI varies with the construction phase. The most impactful construction phase is the phase with the largest setback distance (i.e., largest noise ZOI) needed for Project compliance. To show how the noise ZOI changes as a function of the most impactful construction phase from each construction Project component, ZOI maps for the residential noise exposure limit are presented in Figure 6.1.1 through Figure 6.1.8.

Maps identifying the potentially impacted residential, institutional and commercial areas are presented in Figure 6.2.1 through Figure 6.2.8. Noise mitigation is recommended for those areas and are discussed in the mitigation section of this report.

Based on the results of the construction noise assessment, physical noise control and/or limitations on construction activity for compliance are recommended. To assist with planning, the minimum equipment setbacks for compliance, noise mitigation and monitoring are recommended and discussed in Section 6.2.





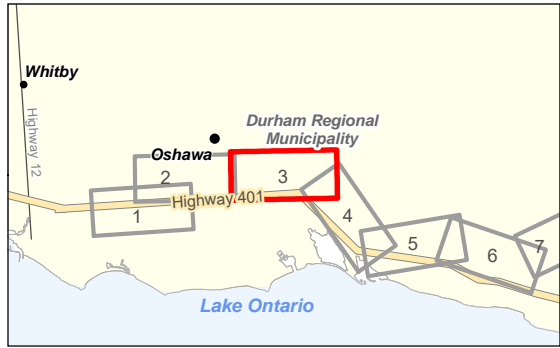
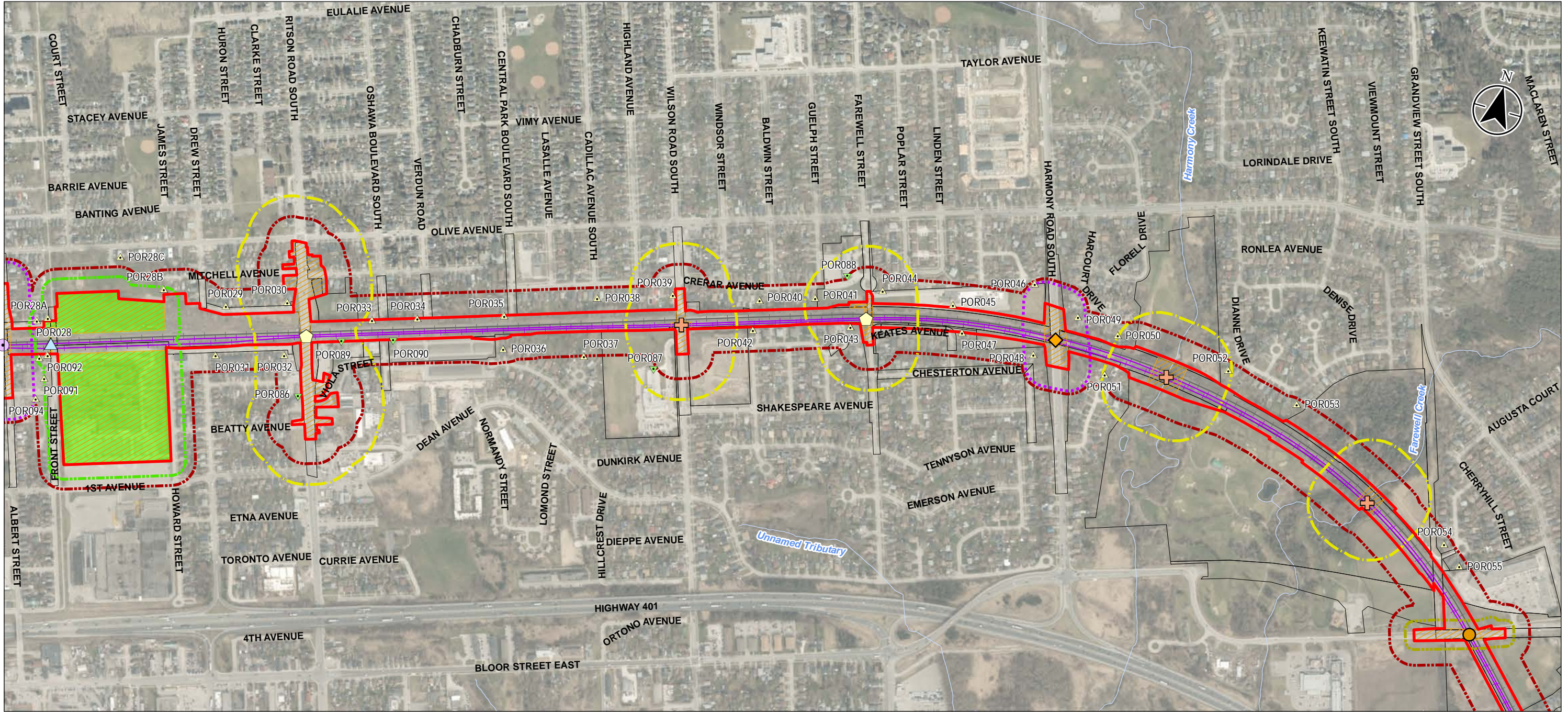








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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Bridge Replacement
  - Proposed Bridge Removal
  - Proposed New Multi-Use Grade-Separated Crossing
  - Proposed Upgrades to At-Grade Crossing
  - Proposed Bridge Expansion
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse

- Waterbody
  - Property Boundary
  - Representative Receptor
  - Receptor - Construction
  - Construction Areas
- Construction Noise Zone of Influence**
- Each Station within the Project Footprint (32 m)
  - Modified Bridge (47 m)
  - Track and Grading (54 m)
  - Crossing Widening (19 m)
  - Bridge Replacement/New Bridge (100 m)

0 220 440 m  
1:8,750 (At original document size of 11x17)



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Figure No.

**6.1.3**

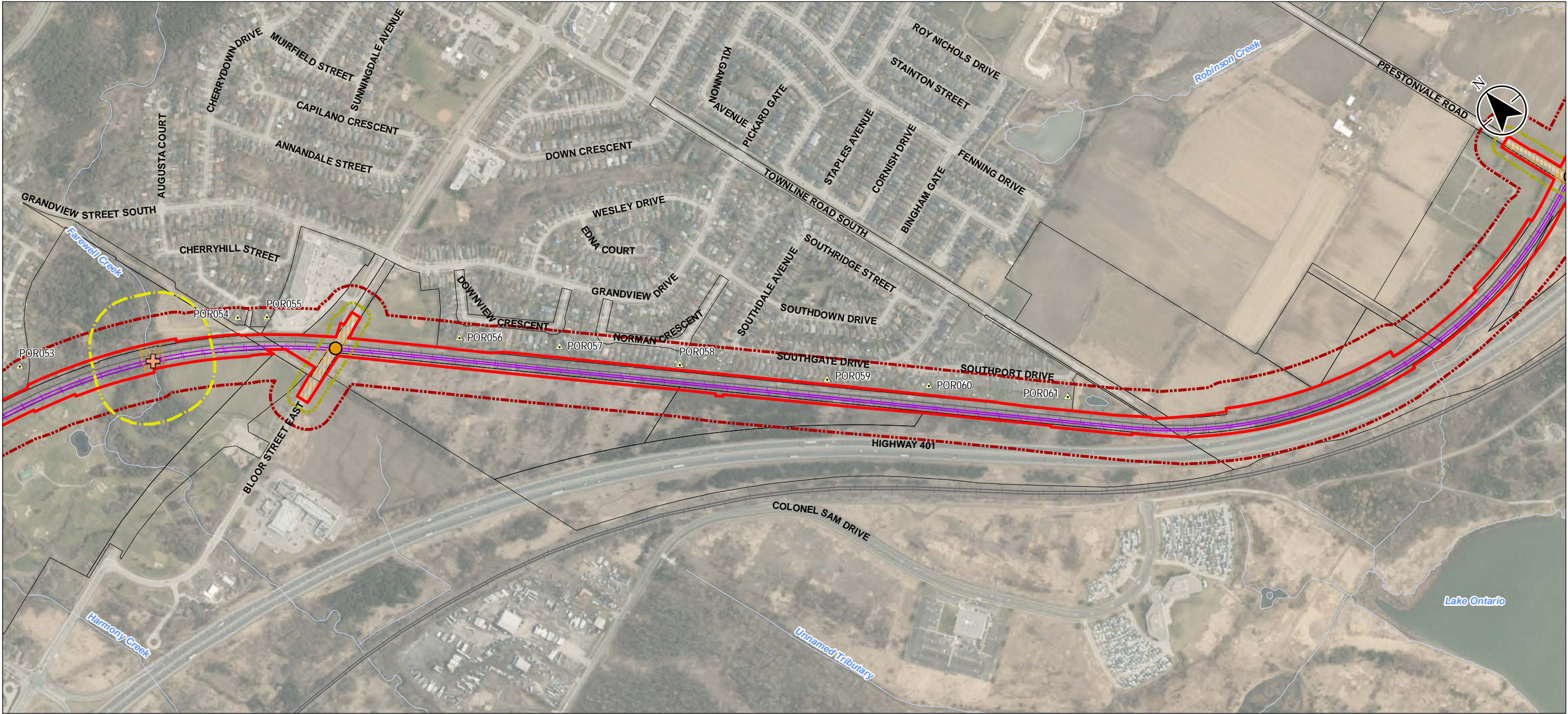
Title

**Construction Noise Zone of Influence for  
Residential Receptors on Weekdays  
During the Daytime (No Barriers)**

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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Representative Receptor
  - Construction Areas
- Construction Noise Zone of Influence**
- Track and Grading (54 m)
  - Crossing Widening (19 m)
  - Bridge Replacement/New Bridge (100 m)



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Figure No.

**6.1.4**

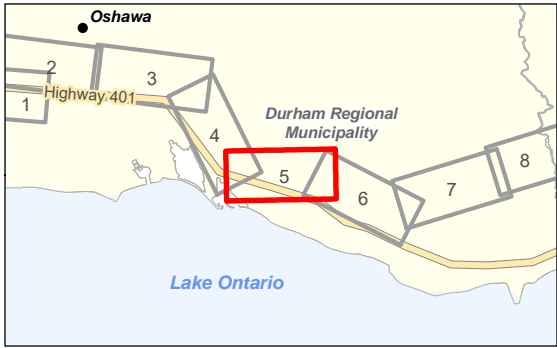
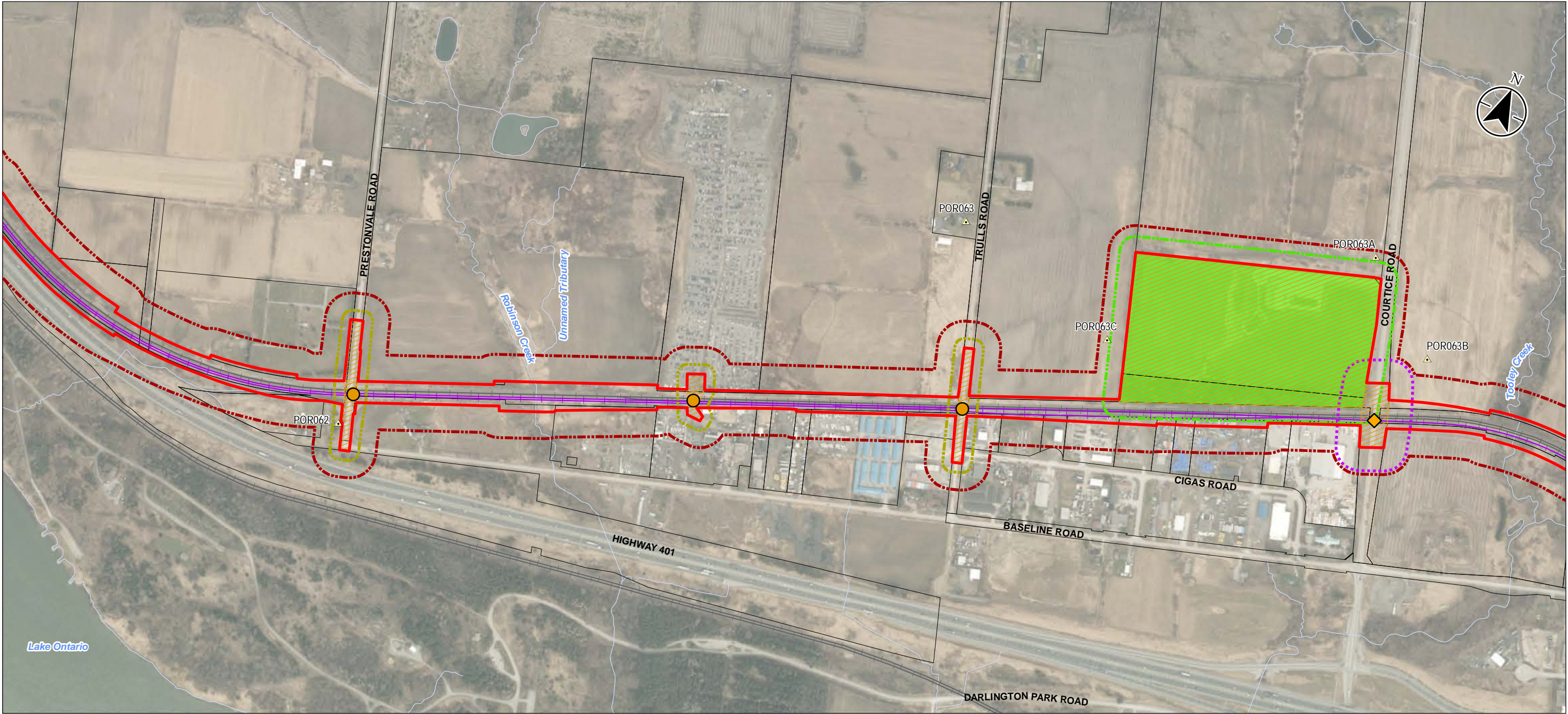
Title

**Construction Noise Zone of Influence for  
Residential Receptors on Weekdays  
During the Daytime (No Barriers)**

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4. Only the most impactful zone of influence for each construction activity is shown in this figure.

- Legend**
- Project Footprint
  - Proposed Upgrades to At-Grade Crossing
  - Proposed Bridge Expansion
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Representative Receptor
  - Construction Areas

- Construction Noise Zone of Influence**
- Each Station within the Project Footprint (32 m)
  - Modified Bridge (47 m)
  - Track and Grading (54 m)
  - Crossing Widening (19 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



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Figure No.

**6.1.5**

Title

**Construction Noise Zone of Influence for  
Residential Receptors on Weekdays  
During the Daytime (No Barriers)**

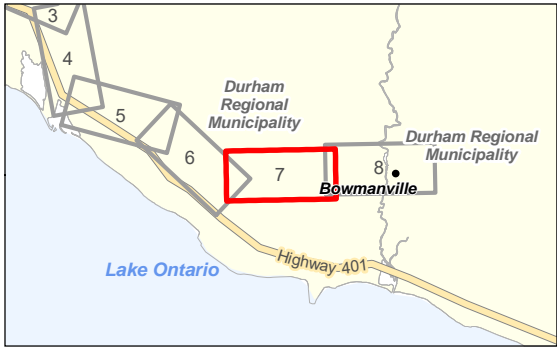
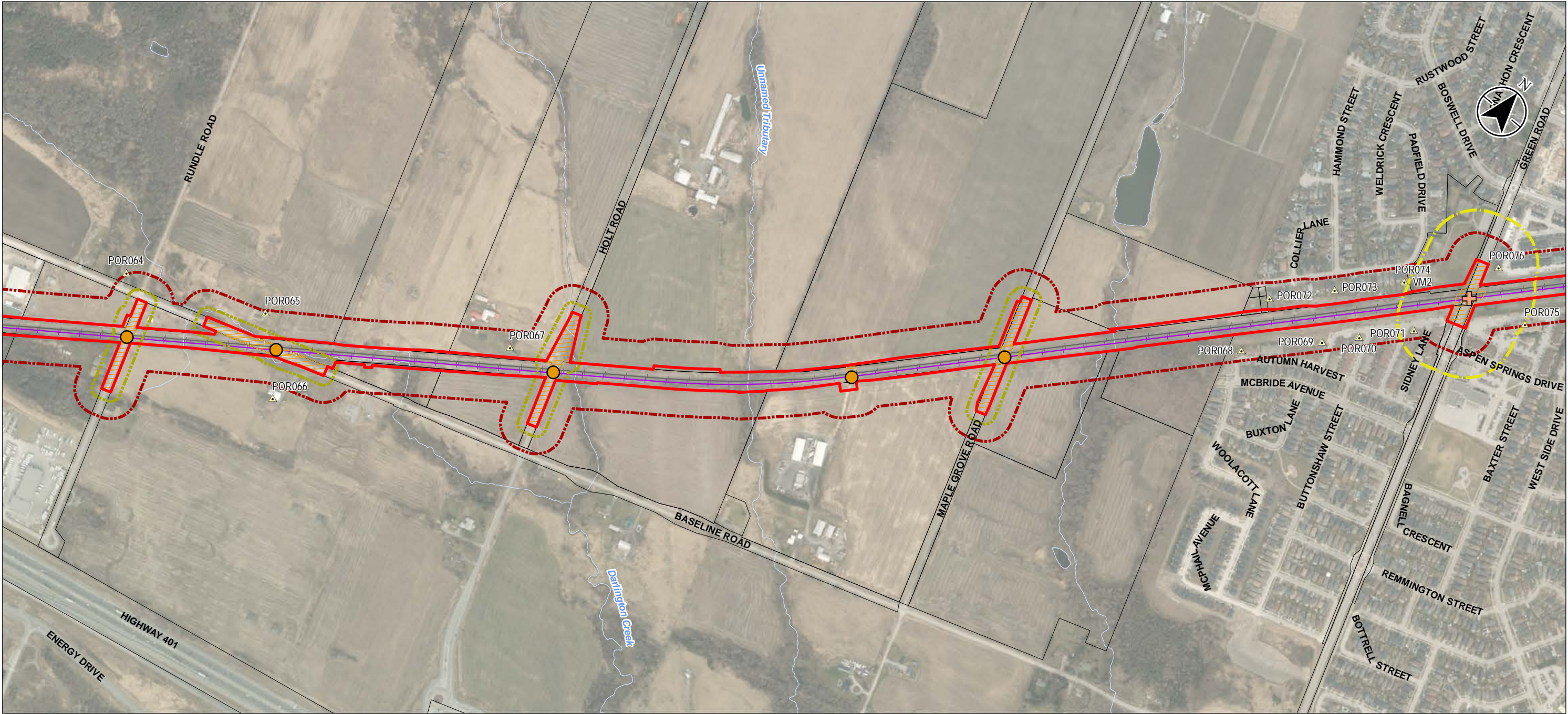
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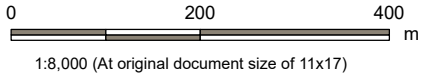
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4. Only the most impactful zone of influence for each construction activity is shown in this figure.

- Legend**
- Project Footprint
  - + Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - ▲ Representative Receptor
  - Construction Areas
- Construction Noise Zone of Influence**
- Track and Grading (54 m)
  - Crossing Widening (19 m)
  - Bridge Replacement/New Bridge (100 m)



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Figure No.  
**6.1.7**

Title  
**Construction Noise Zone of Influence for  
Residential Receptors on Weekdays  
During the Daytime (No Barriers)**

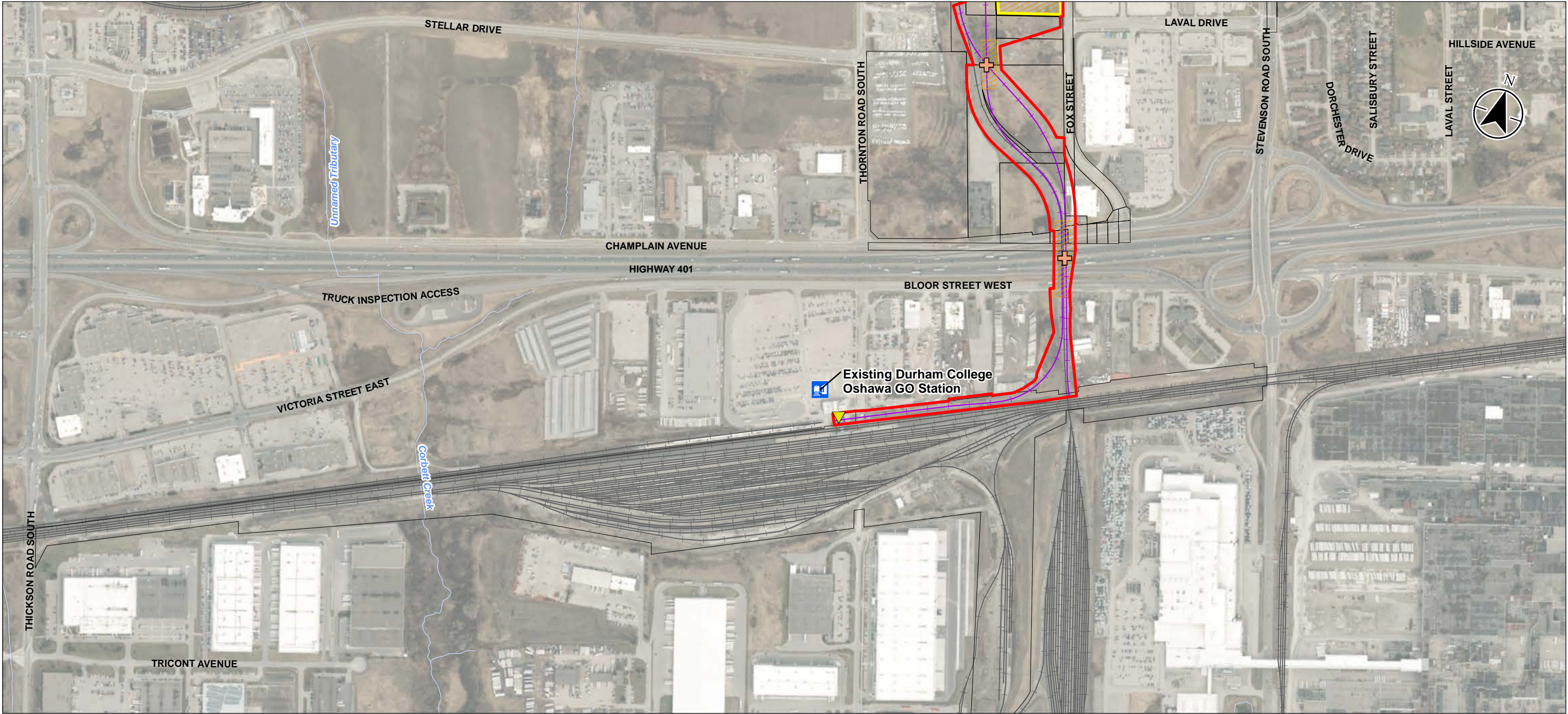
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5. Future developments are excluded for construction impact.

- Legend**
- Project Footprint
  - Existing Durham College Oshawa GO Station
  - Proposed Pedestrian Bridge Extension
  - Proposed New Bridge
  - Proposed GO Station Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Construction Areas

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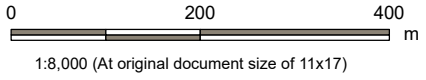


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Figure No.  
**6.2.1**

Title  
**Construction Noise Assessment -  
Potentially Impacted Areas**

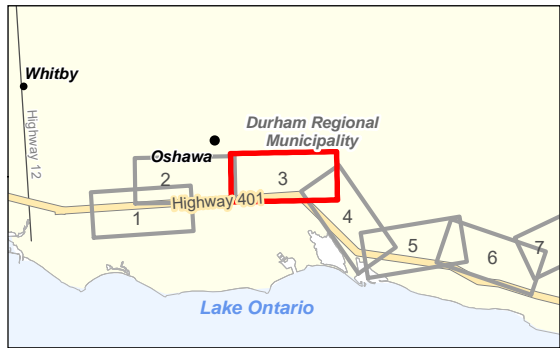
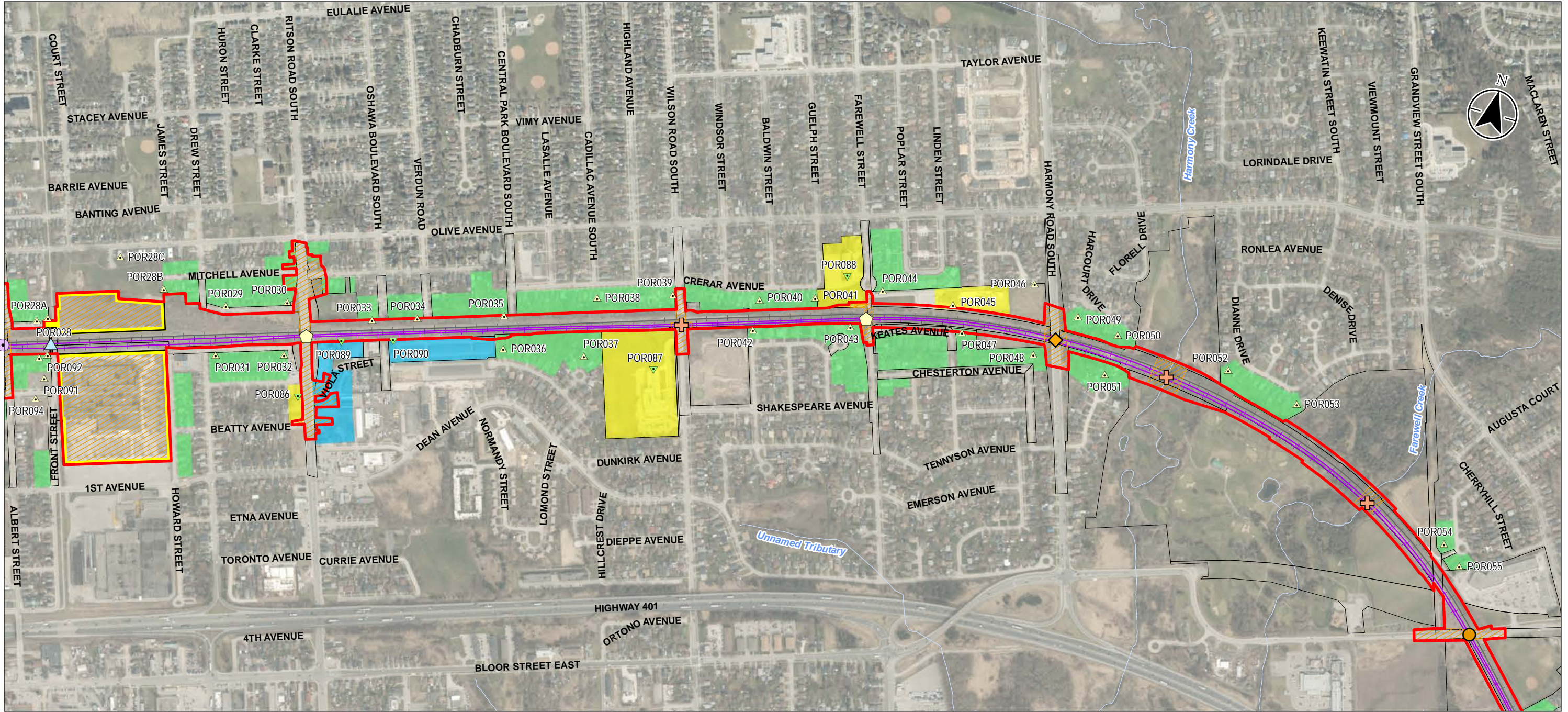








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5. Future developments are excluded for construction impact.

**Legend**

- |   |  |
|---|--|
| Project Footprint                               | Waterbody                                  |
| Proposed New Bridge                             | Property Boundary                          |
| Proposed Bridge Replacement                     | Representative Receptor                    |
| Proposed Bridge Removal                         | Receptor - Construction                    |
| Proposed New Multi-Use Grade-Separated Crossing | Construction Areas                         |
| Proposed Upgrades to At-Grade Crossing          | Potentially Impacted Areas - Residential   |
| Proposed Bridge Expansion                       | Potentially Impacted Areas - Commercial    |
| Proposed GO Station Location                    | Potentially Impacted Areas - Institutional |
| Existing Railway                                |  |
| Proposed GO Track(s)                            |  |
| Watercourse                                     |  |

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Figure No.

**6.2.3**

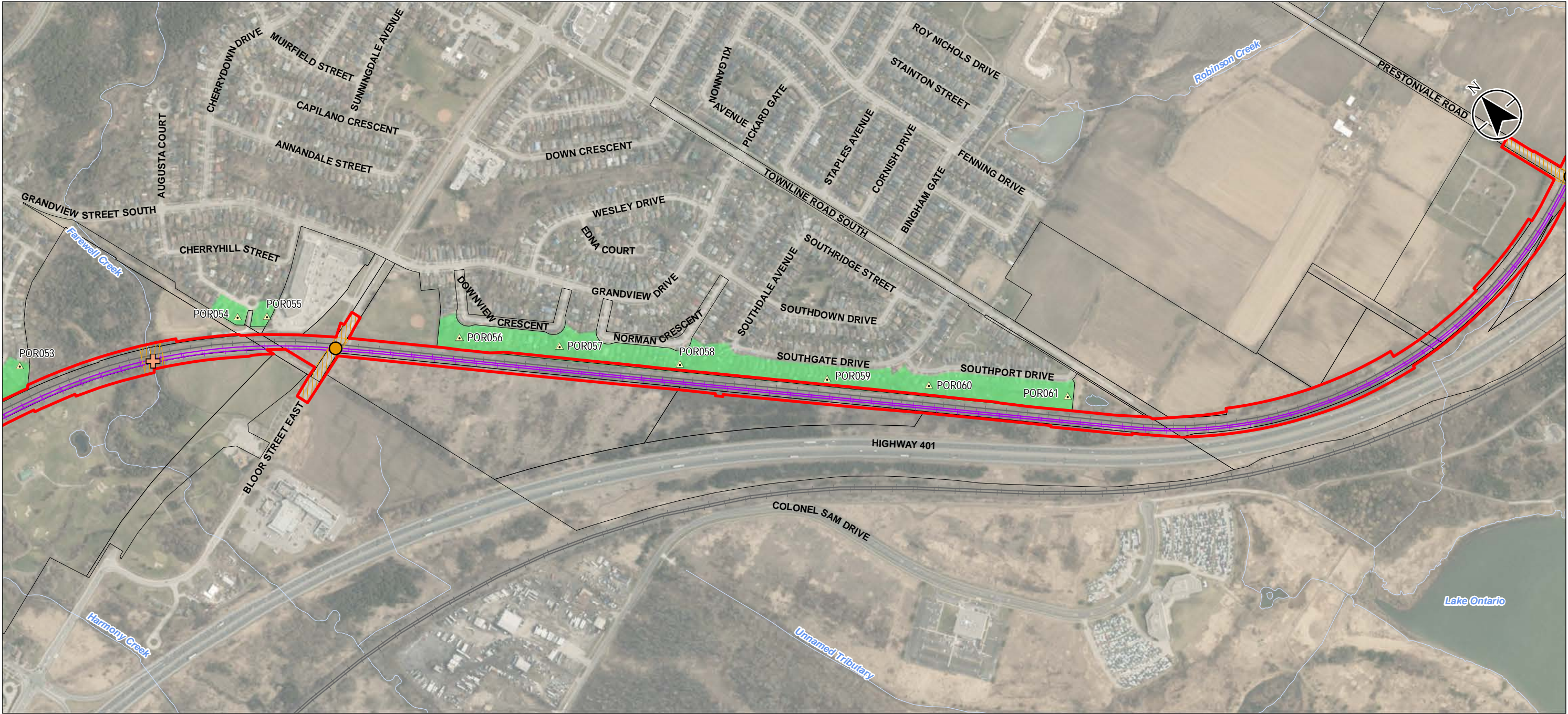
Title

**Construction Noise Assessment -  
Potentially Impacted Areas**

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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Representative Receptor
  - Construction Areas
  - Potentially Impacted Areas - Residential

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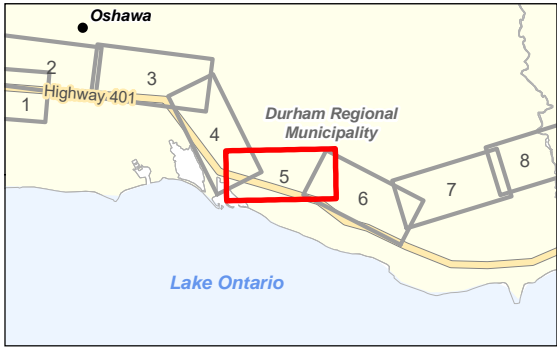
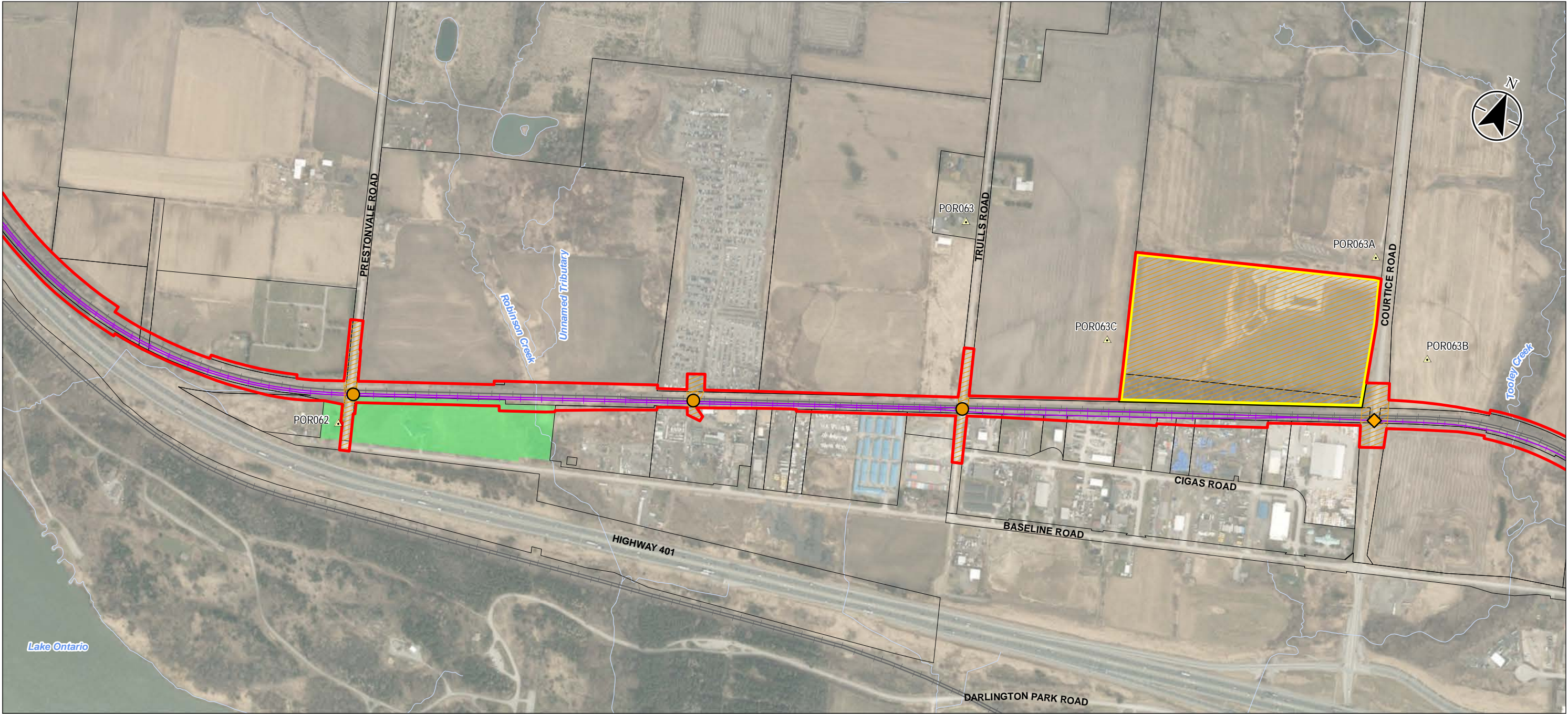
Figure No.  
**6.2.4**

Title  
**Construction Noise Assessment -  
Potentially Impacted Areas**

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4. Only the most impactful zone of influence for each construction activity is shown in this figure.
5. Future developments are excluded for construction impact.

- Legend**
- Project Footprint
  - Proposed Upgrades to At-Grade Crossing
  - Proposed Bridge Expansion
  - Proposed GO Station Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - ▲ Representative Receptor
  - Construction Areas
  - Potentially Impacted Areas - Residential

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Figure No.  
**6.2.5**

Title  
**Construction Noise Assessment -  
Potentially Impacted Areas**

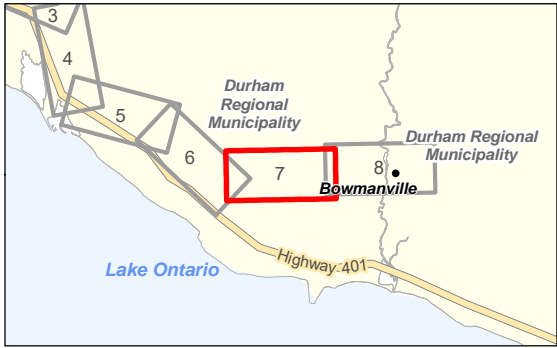
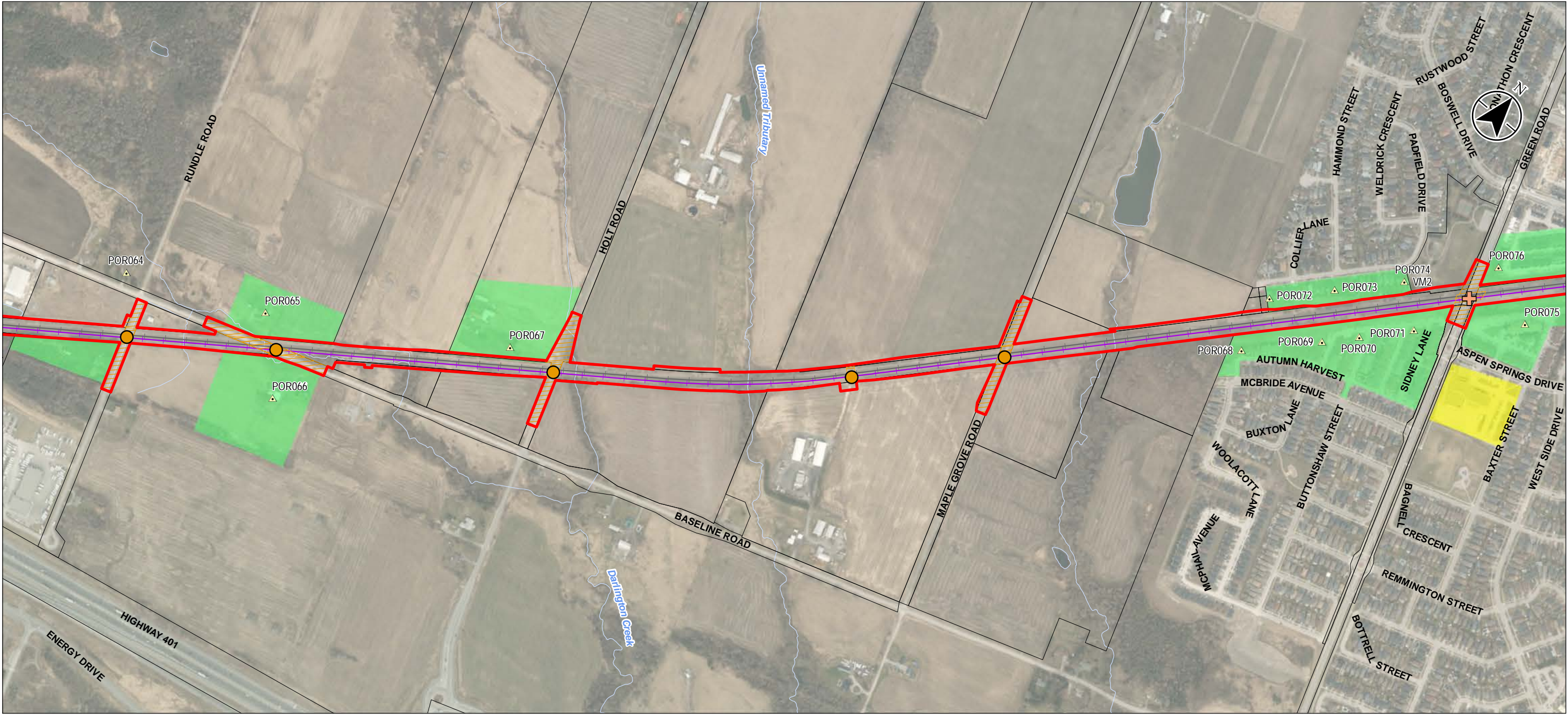
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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Representative Receptor
  - Construction Areas
  - Potentially Impacted Areas - Residential
  - Potentially Impacted Areas - Institutional



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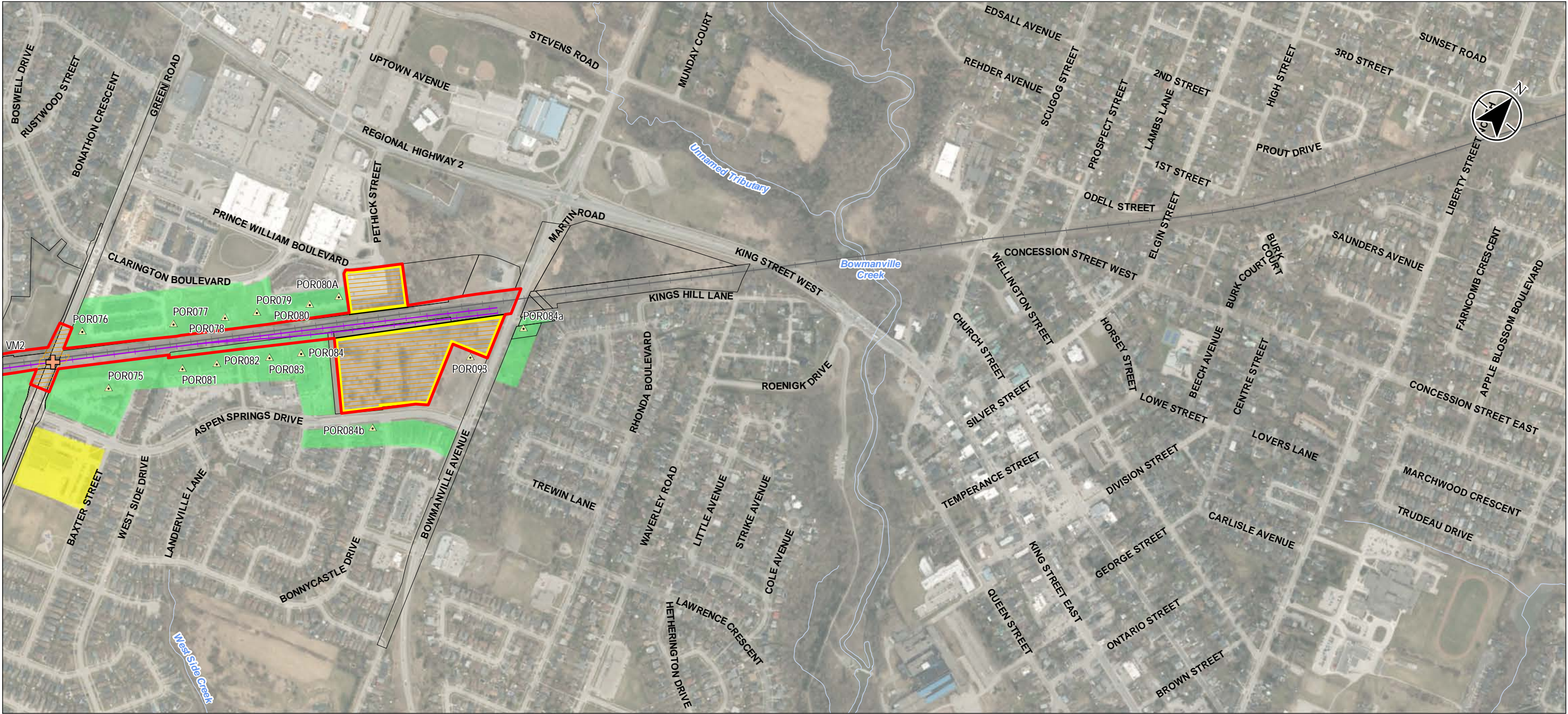
Figure No.: **6.2.7**

Title: **Construction Noise Assessment - Potentially Impacted Areas**

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4. Only the most impactful zone of influence for each construction activity is shown in this figure.
5. Future developments are excluded for construction impact.

- Legend**
- Project Footprint
  - + Proposed New Bridge
  - Proposed GO Station Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - ▲ Representative Receptor
  - Construction Areas
  - Potentially Impacted Areas - Residential
  - Potentially Impacted Areas - Institutional

0 200 400 m  
1:8,000 (At original document size of 11x17)



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Figure No.  
**6.2.8**

Title  
**Construction Noise Assessment -  
Potentially Impacted Areas**

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# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

## 6.1.2 Construction Vibration Assessment

As described in Section 4.2.1, construction vibration ZOIs for 5 mm/s PPVs were established for each piece of equipment for non-engineered timber/masonry buildings (typical buildings). Calculated vibration ZOIs for the most impactful piece of equipment for each construction phase are presented in Table 6.4.

**Table 6.4: Construction Vibration ZOI**

Project Components	Construction Phase	Equipment <sup>1</sup>	Vibration ZOI (m) for Heritage Structures (3 mm/s)	Vibration ZOI (m) for Typical Construction (5 mm/s)
Track and Grading	Grading	Compactor	11	8
	Track	Compactor	11	8
Bridge Replacement	Utility Relocation and Road Closure	Compactor	11	8
	Demolition of Existing Bridge	Backhoe	6	4
	Abutment Construction	Pile driver	24	17
	Span construction	Dump trucks	6	4
	Road Re-instatement	Compactor	11	8
	Site Cleanup	Dump trucks	6	4
New Bridge	Utility Relocation and Road Closure	Compactor	11	8
	Abutment Construction	Pile driver	24	17
	Span construction	Dump trucks	6	4
	Road Re-instatement	Compactor	11	8
	Site Cleanup	Dump trucks	6	4
Modified Bridge	Removals and Site Preparation	Backhoe	6	4
	Abutment Underpinning	Pile driver	24	17
	Site Cleanup	Dump truck	6	4
Stations/Layover Facility	Clearing	Earth Scraper	6	4
	Parking Construction	Compactor	11	8
	Building/Platform Construction	Compactor	11	8



## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring

August 24, 2023

Project Components	Construction Phase	Equipment <sup>1</sup>	Vibration ZOI (m) for Heritage Structures (3 mm/s)	Vibration ZOI (m) for Typical Construction (5 mm/s)
Crossing Widening	Removals and Reconstruction	Compactor	11	8

<sup>1</sup> Represents the most impactful single piece of equipment (i.e., worst-case piece of equipment) for each phase

<sup>2</sup> Non-engineered timber and masonry buildings

Construction vibration ZOIs presented in Figure 6.3.1 through Figure 6.3.16 conservatively represent the areas within which typical buildings may be impacted. This is because the ZOIs were established with the equipment operating along the Project boundary. In the absence of construction details, construction vibration ZOIs were established relative to the Project Footprint.

Construction vibration ZOIs presented in Table 6.4. and in Figure 6.3.1 through Figure 6.3.16, indicate that some PORs identified for the Project are within the established construction vibration ZOI. The PORs identified within the established construction vibration ZOI and thus may be impacted.

Therefore, construction operational changes (e.g., maintaining setback distance and switching to lesser impactful equipment, etc.) are recommended. Construction vibration monitoring is recommended for the structures that are expected to exceed the criteria. Mitigation strategy for construction vibration and monitoring requirements are discussed in Section 6.2.

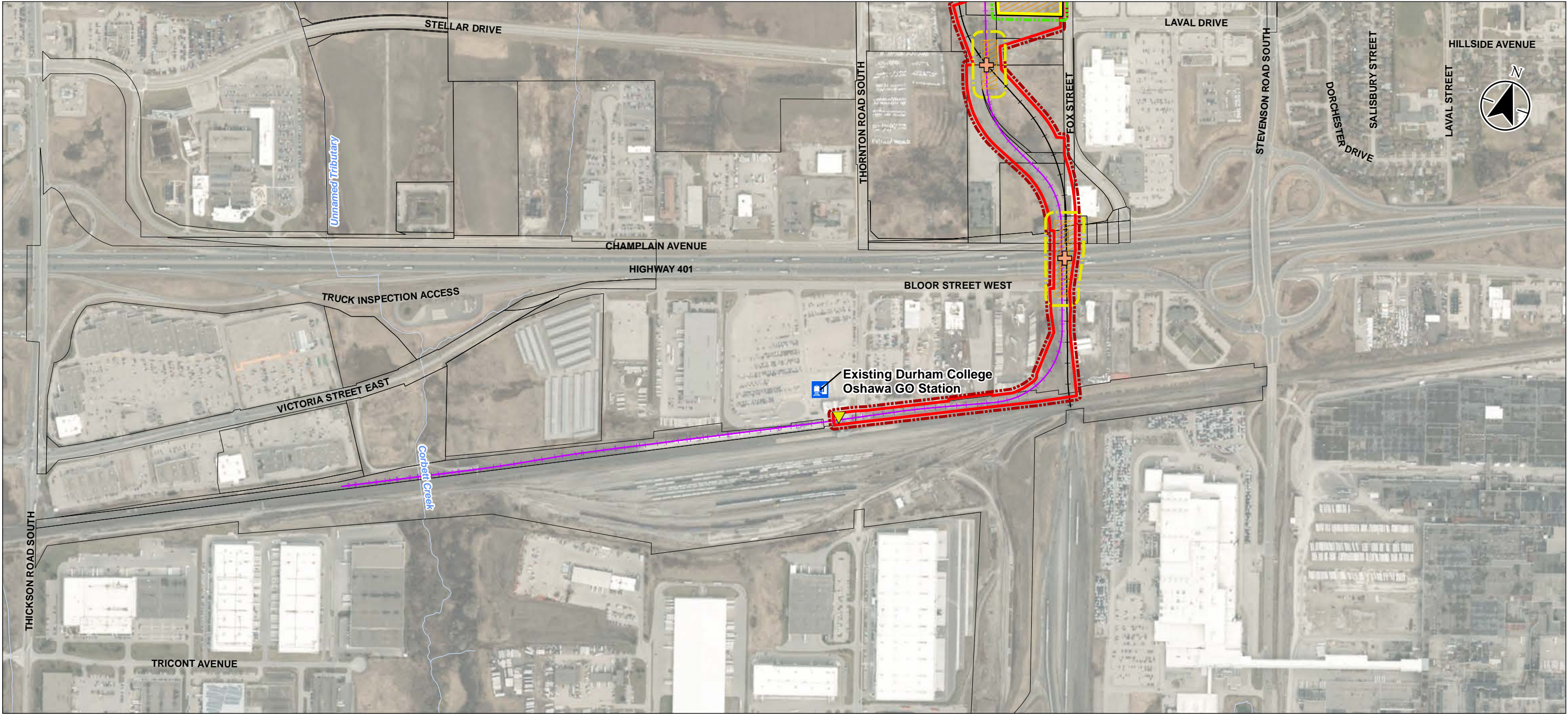
Maps showing the calculated construction vibration ZOIs for the most impactful piece of equipment for each construction activity are shown in Figure 6.3.1 through Figure 6.3.8. Vibration ZOIs for heritage structures are shown in Figure 6.3.9 through Figure 6.3.16.

Maps highlighting areas that have potentially impacted typical buildings are shown in Figure 6.4.1 through Figure 6.4.8.





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4. Only the single worst-case piece of equipment for each construction activity is shown in this figure.

**Legend**

- Project Footprint
- Existing Durham College Oshawa GO Station
- Proposed Pedestrian Bridge Extension
- Proposed New Bridge
- Proposed Transit Oriented Community Location
- Watercourse
- Waterbody
- Property Boundary

**Construction Vibration Zone of Influence**

- Each Station within the Project Footprint (8 m)
- Track and Grading (8 m)

Bridge Replacement/New Bridge (17 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



Project Location 165011019 REVA  
Region Municipality Prepared by BCC on 2023-06-05  
of Durham Technical Review by ## on 2021-##-##

Client/Project  
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EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.

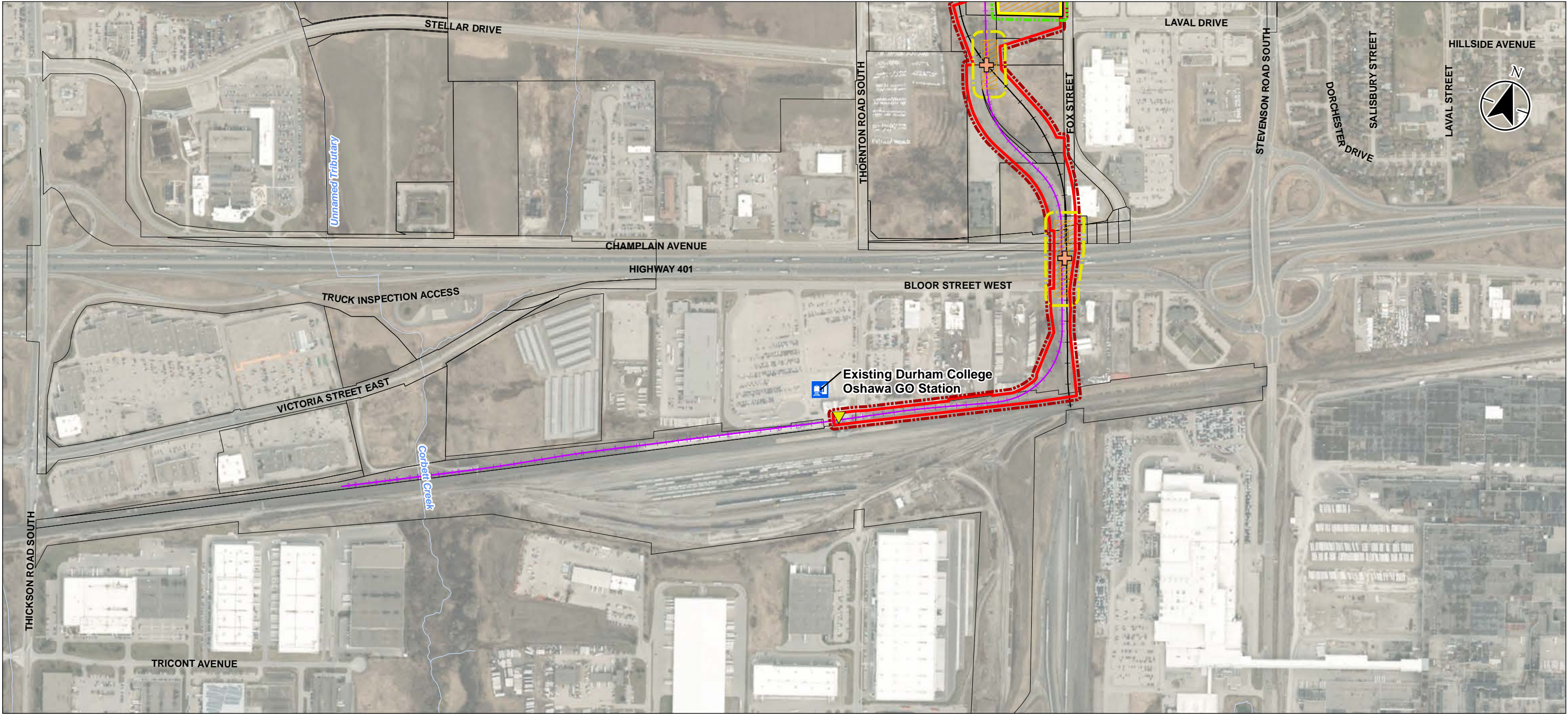
**6.3.1**

Title

**Construction Vibration Zone of Influence  
for 5 mm/s (Typical Construction)**



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**Legend**

- Project Footprint
- Existing Durham College Oshawa GO Station
- Proposed Pedestrian Bridge Extension
- Proposed New Bridge
- Proposed Transit Oriented Community Location
- Watercourse
- Waterbody
- Property Boundary

**Construction Vibration Zone of Influence**

- Each Station within the Project Footprint (8 m)
- Track and Grading (8 m)

Bridge Replacement/New Bridge (17 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



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Figure No.

**6.3.1**

Title

**Construction Vibration Zone of Influence  
for 5 mm/s (Typical Construction)**



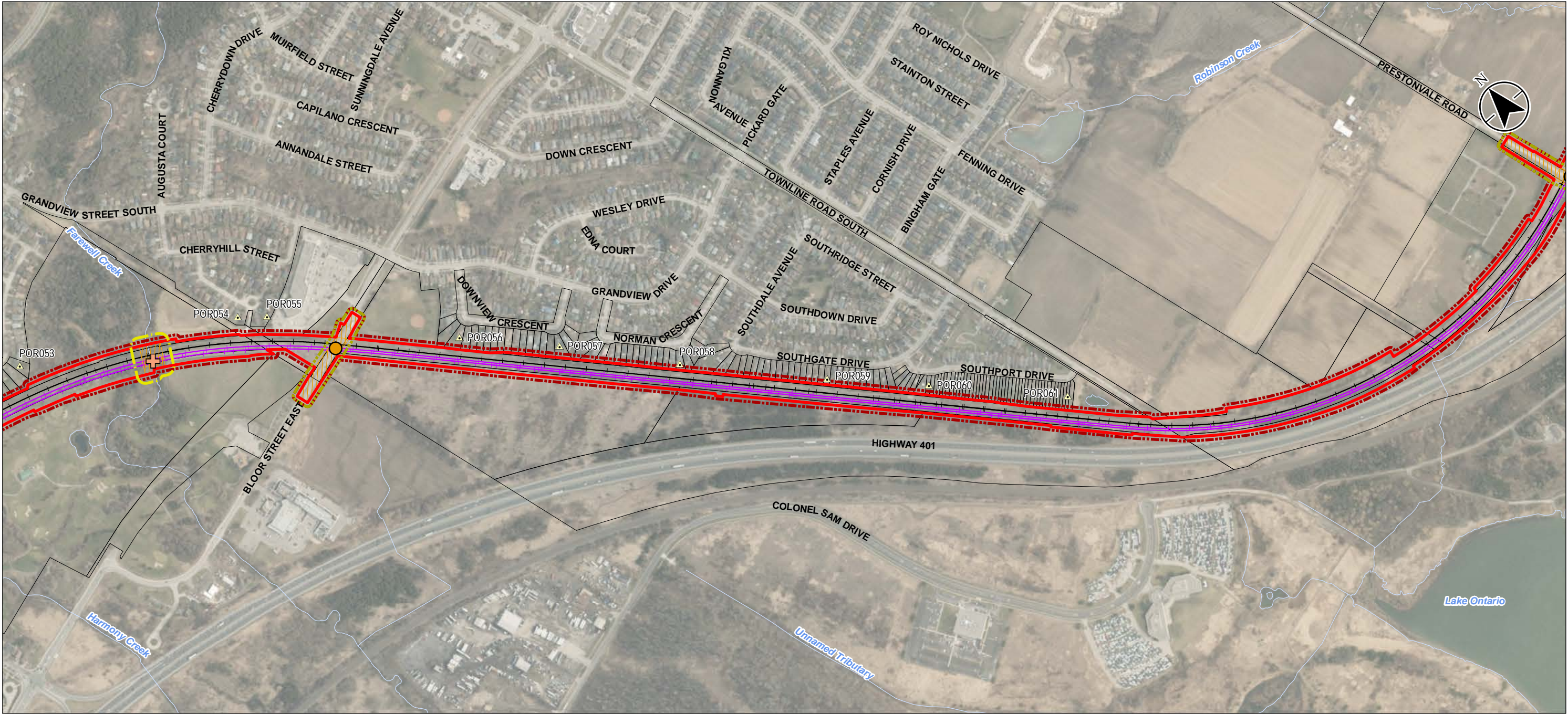








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4. Only the single worst-case piece of equipment for each construction activity is shown in this figure.

- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Watercourse
  - Waterbody
  - Property Boundary
  - Representative Receptor
- Construction Vibration Zone of Influence**
- Track and Grading (8 m)
  - Crossing Widening (8 m)
  - Bridge Replacement/New Bridge (17 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



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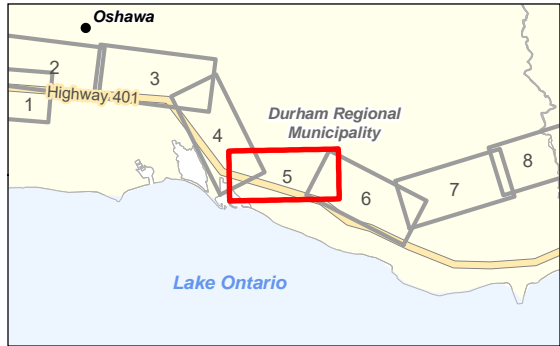
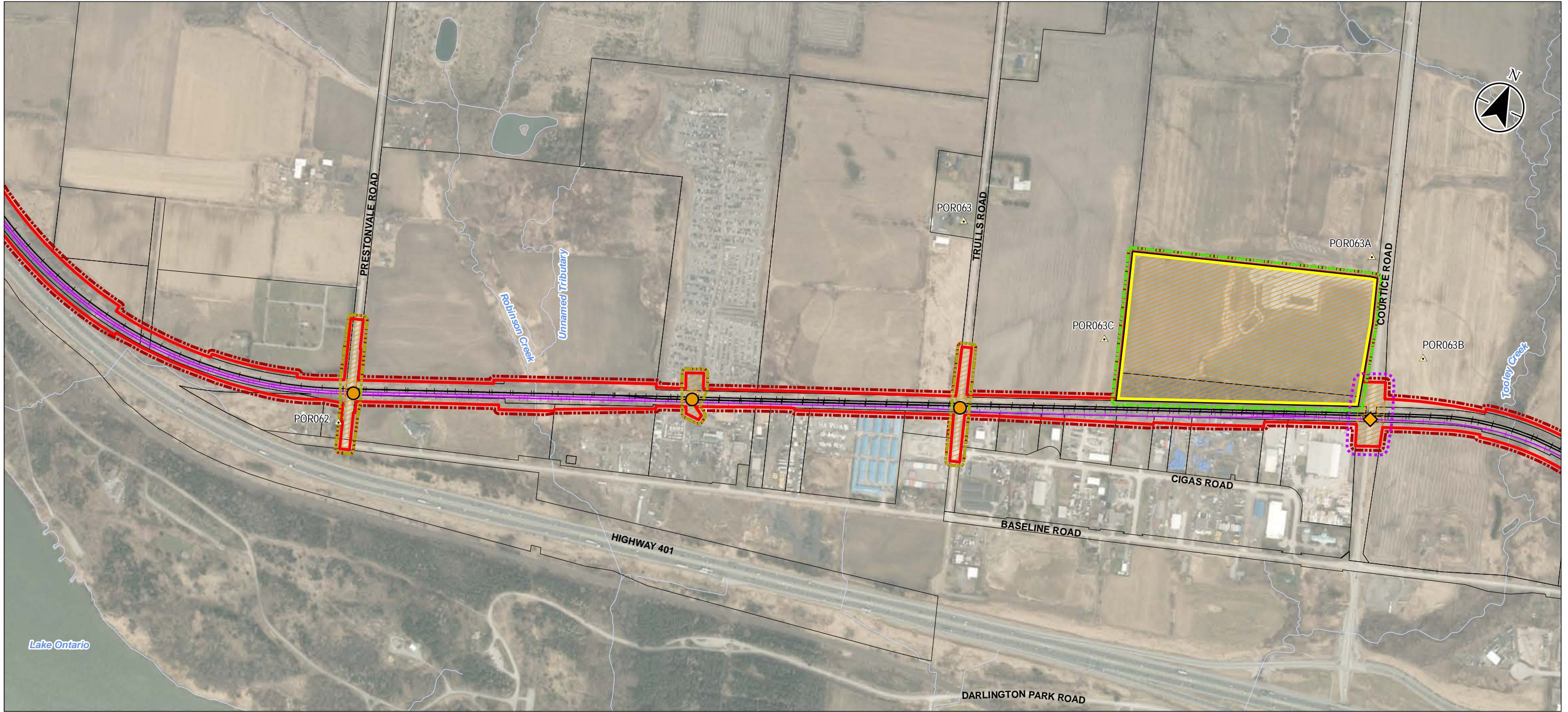
Figure No.  
**6.3.4**

Title  
**Construction Vibration Zone of Influence  
for 5 mm/s (Typical Construction)**

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- Legend**
- Project Footprint
  - Proposed Upgrades to At-Grade Crossing
  - Proposed Bridge Expansion
  - Proposed Transit Oriented Community Location
  - Watercourse
  - Waterbody
  - Property Boundary
  - Representative Receptor
- Construction Vibration Zone of Influence**
- Each Station within the Project Footprint (8 m)
  - Modified Bridge (17 m)

- Track and Grading (8 m)
- Crossing Widening (8 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



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EXTENSION PROJECT  
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Figure No.

6.3.5

Title

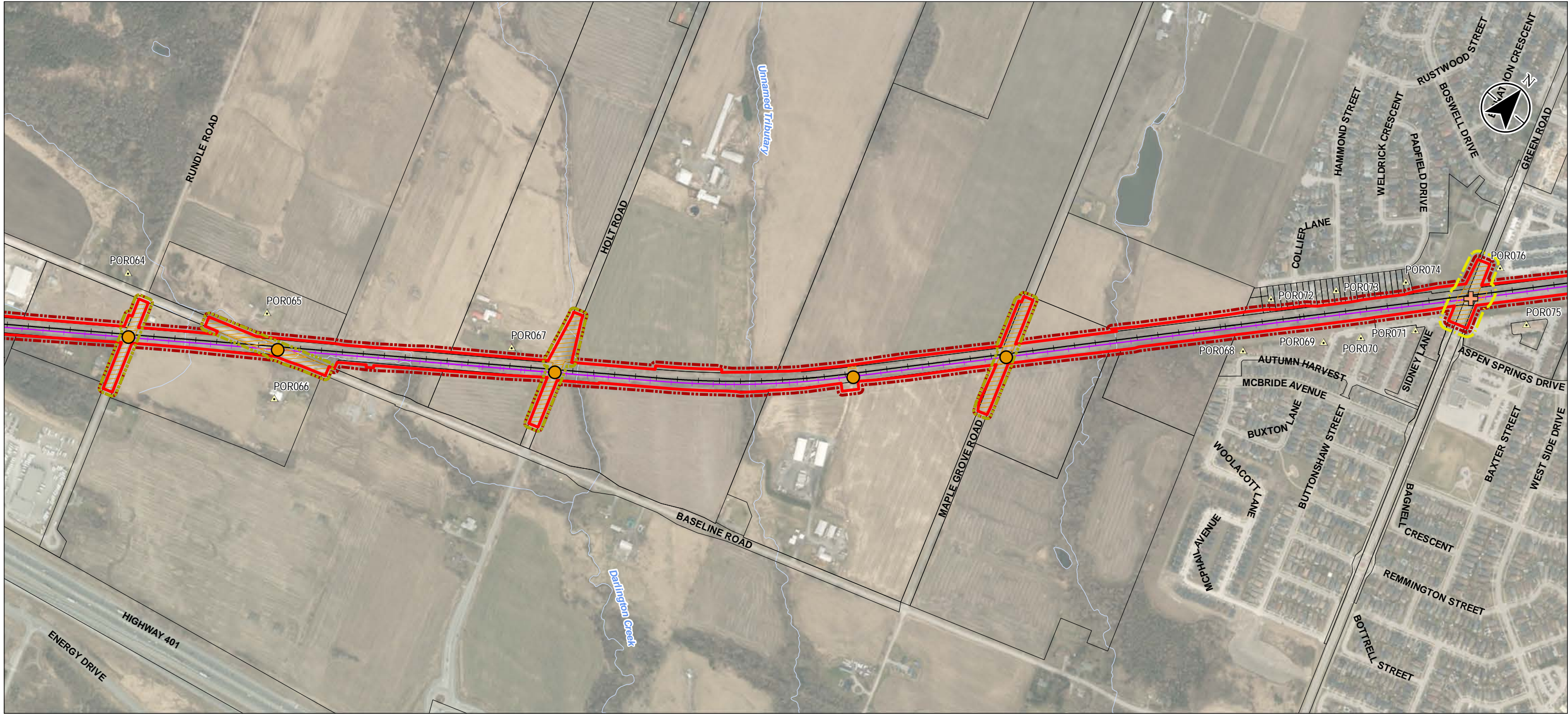
**Construction Vibration Zone of Influence  
for 5 mm/s (Typical Construction)**







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- Legend**
- Project Footprint
  - + Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Watercourse
  - Waterbody
  - Property Boundary
  - ▲ Representative Receptor
- Construction Vibration Zone of Influence**
- Track and Grading (8 m)
  - Crossing Widening (8 m)
  - Bridge Replacement/New Bridge (17 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



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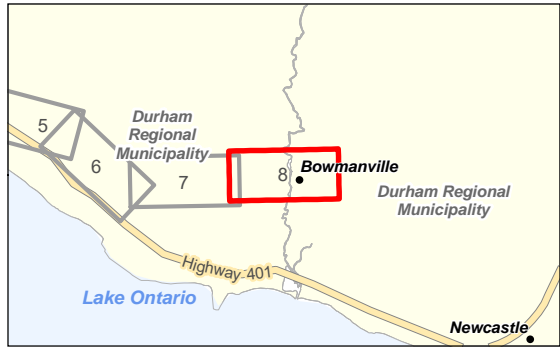
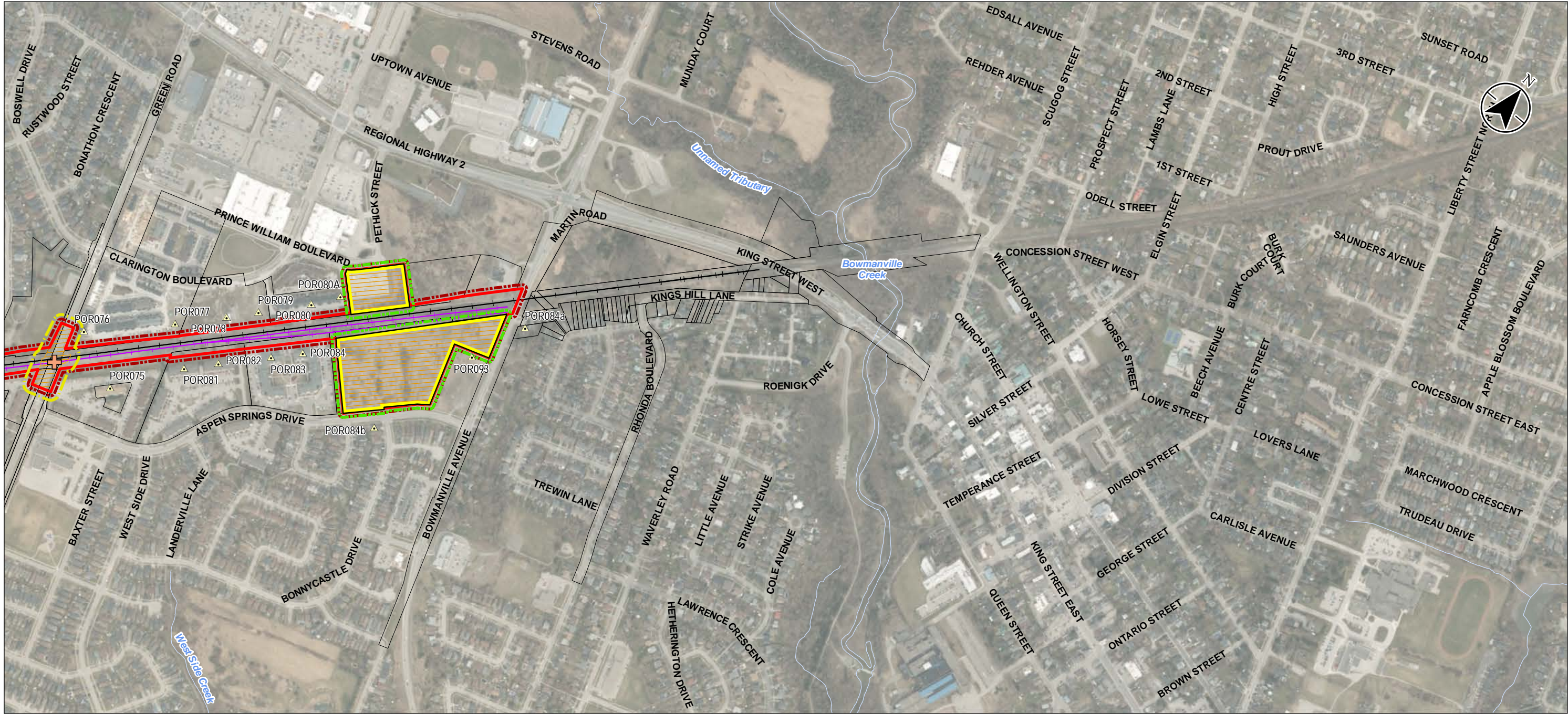
Figure No.  
**6.3.7**

Title  
**Construction Vibration Zone of Influence  
for 5 mm/s (Typical Construction)**

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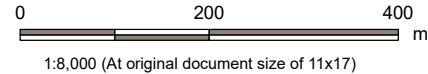


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- Legend**
- Project Footprint
  - + Proposed New Bridge
  - Proposed Transit Oriented Community Location
  - Watercourse
  - Waterbody
  - Property Boundary
  - ▲ Representative Receptor
- Construction Vibration Zone of Influence**
- Each Station within the Project Footprint (8 m)
  - Track and Grading (8 m)
  - Bridge Replacement/New Bridge (17 m)



Project Location  
Region of Durham

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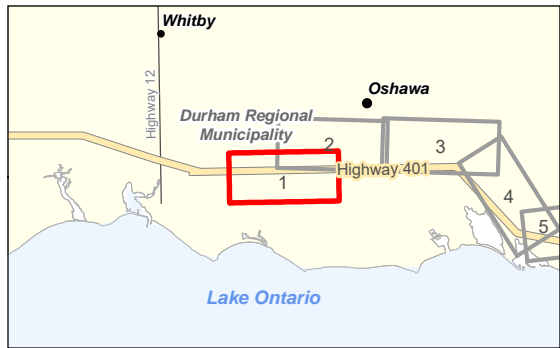
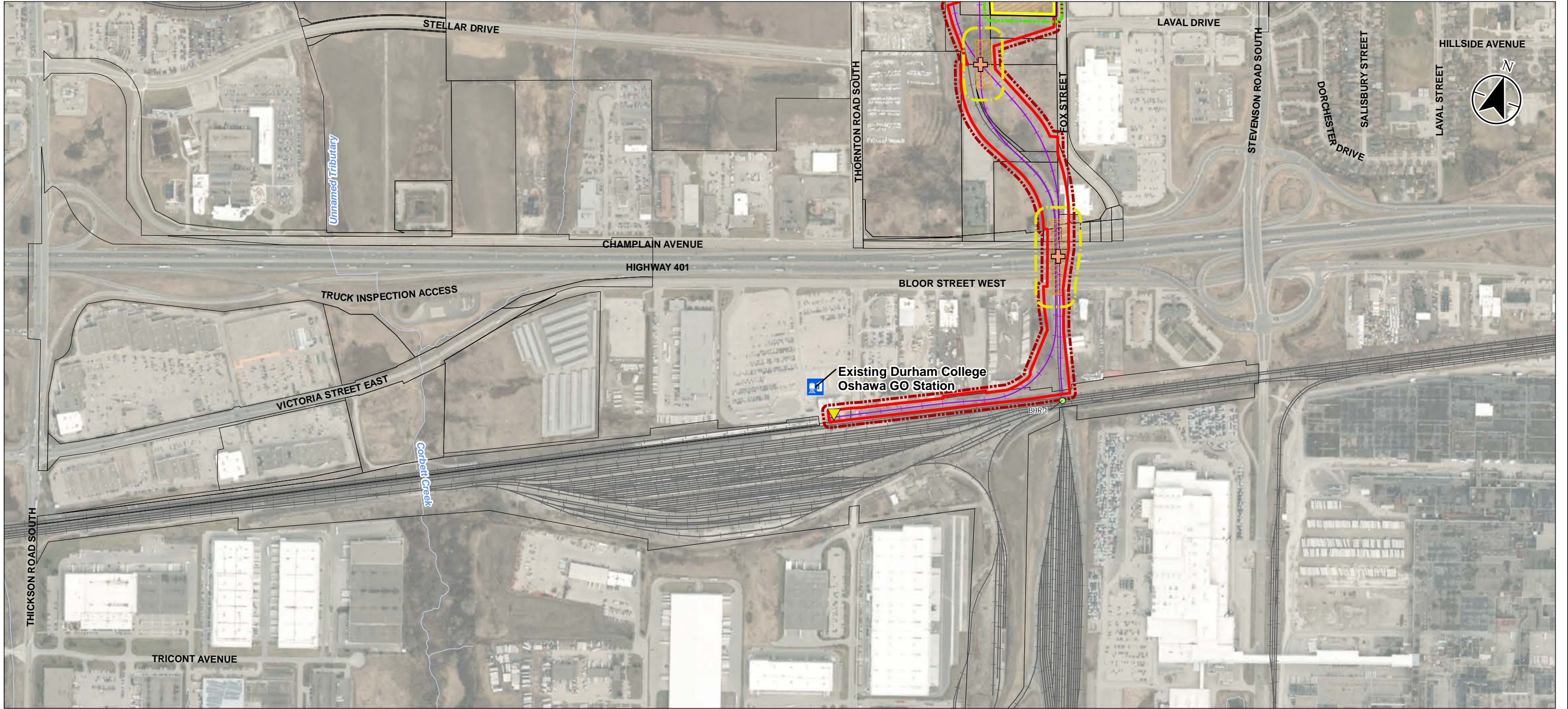
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Figure No.  
**6.3.8**

Title  
**Construction Vibration Zone of Influence  
for 5 mm/s (Typical Construction)**



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4. Only the single worst-case piece of equipment for each construction activity is shown in this figure.

**Legend**

- Project Footprint
- Existing Durham College Oshawa GO Station
- Proposed Pedestrian Bridge Extension
- Proposed New Bridge
- Construction Areas
- Proposed Transit Oriented Community Location
- Existing Railway
- Proposed GO Track(s)
- Watercourse
- Waterbody
- Property Boundary

- Cultural Heritage Resource
- Construction Vibration Zone of Influence**
- Each Station within the Project Footprint (11 m)
- Track and Grading (11 m)
- Bridge Replacement/New Bridge (24 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



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EXTENSION PROJECT  
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Figure No.

**6.3.9**

Title

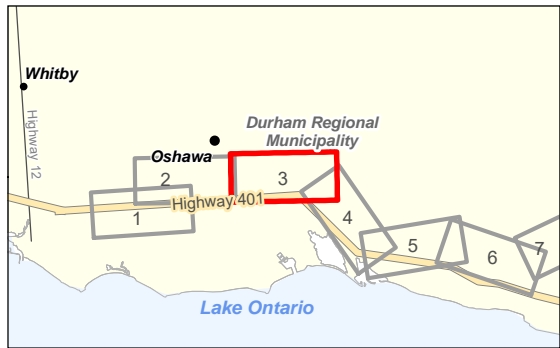
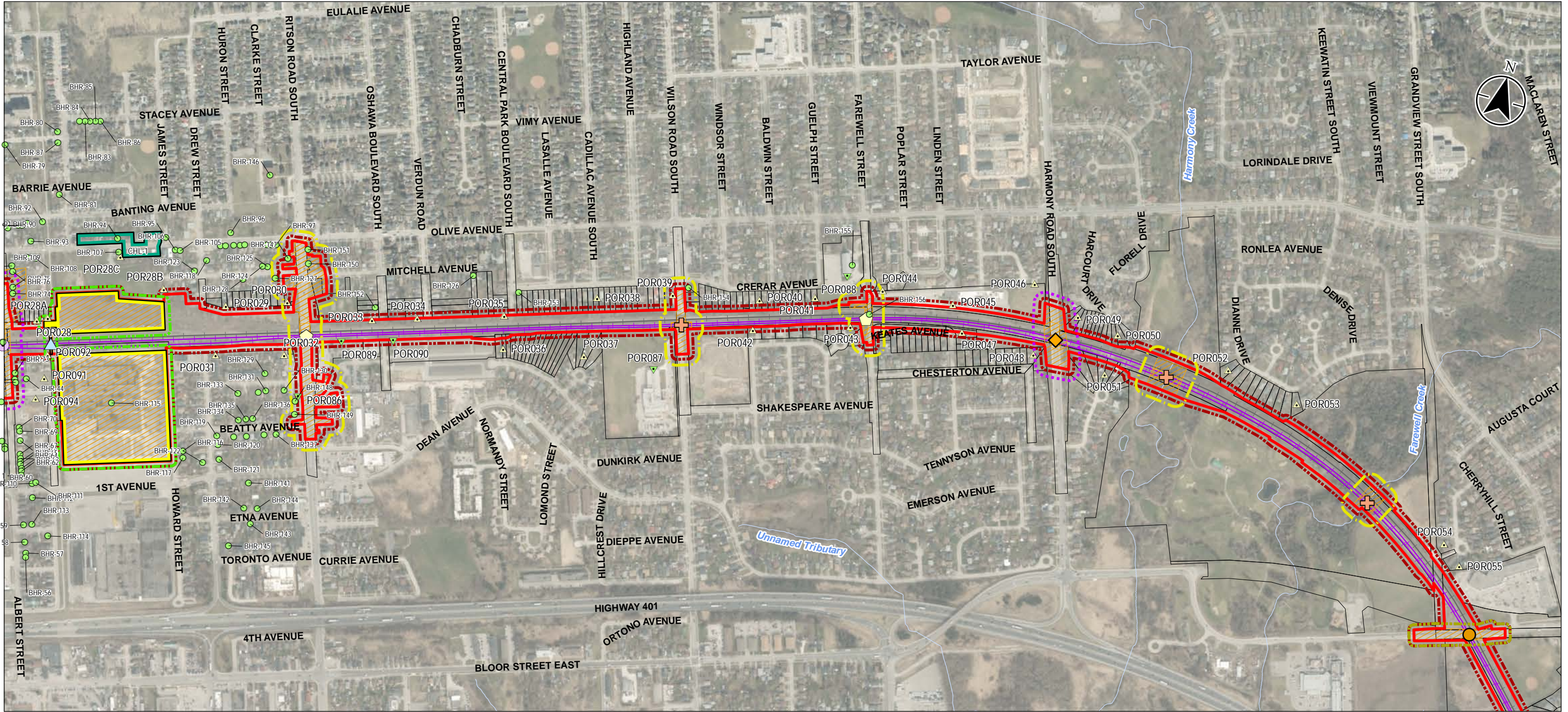
**Construction Vibration Zone of Influence  
for 3 mm/s (Heritage Buildings)**







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4. Only the single worst-case piece of equipment for each construction activity is shown in this figure.

#### Legend

- Project Footprint
- Proposed New Bridge
- Proposed Bridge Replacement
- Proposed Bridge Removal
- Proposed New Multi-Use Grade-Separated Crossing
- Proposed Upgrades to At-Grade Crossing
- Proposed Bridge Expansion
- Construction Areas
- Proposed Transit Oriented Community Location
- Existing Railway
- Proposed GO Track(s)

- Watercourse
- Waterbody
- Property Boundary
- Cultural Heritage Resource
- Cultural Heritage Landscape
- Receptor
- Receptor - Construction

#### Construction Vibration Zone of Influence

- Each Station within the Project Footprint (11 m)
- Modified Bridge (24 m)
- Track and Grading (11 m)

- Crossing Widening (11 m)
- Bridge Replacement/New Bridge (24 m)

0 220 440 m  
1:8,750 (At original document size of 11x17)



Project Location  
Region Municipality  
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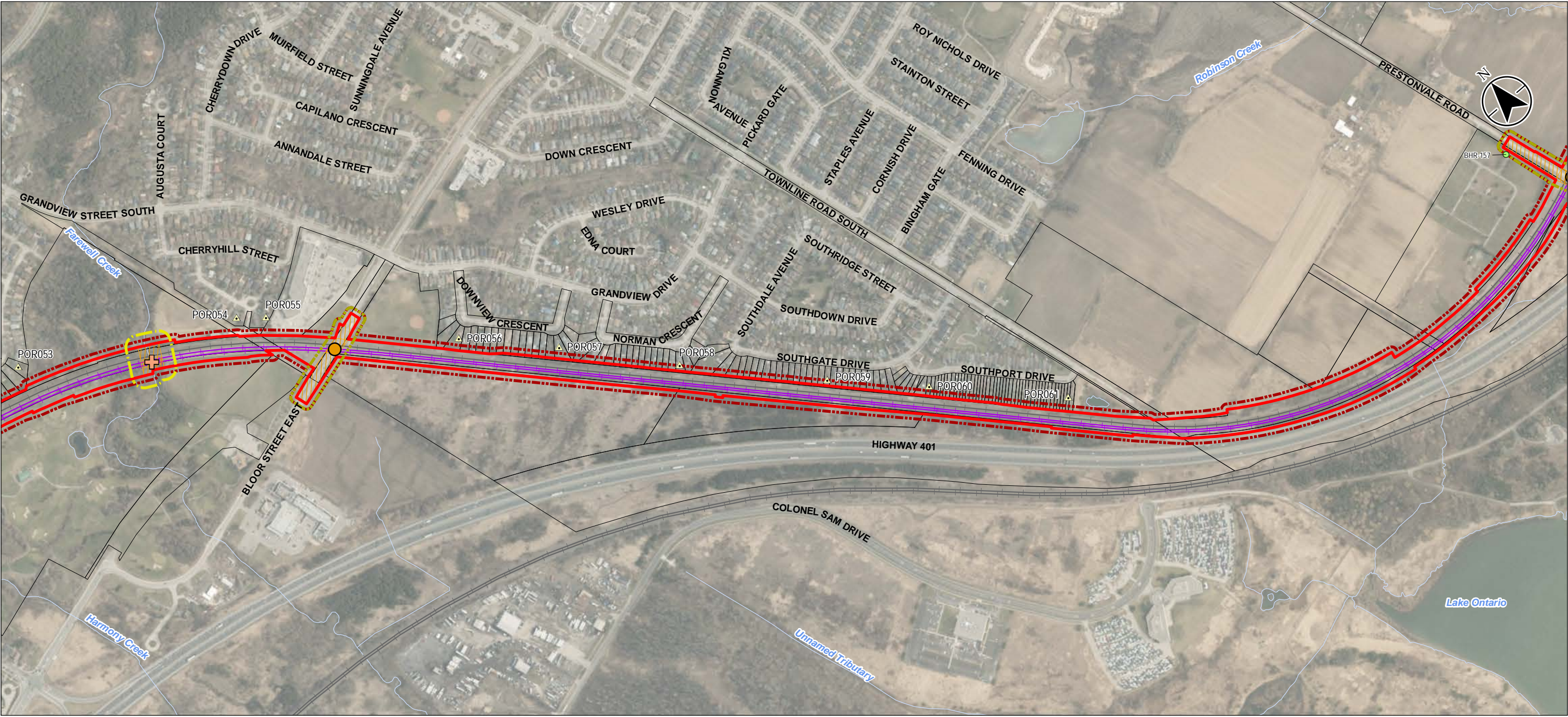
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Figure No.  
**6.3.11**

Title  
**Construction Vibration Zone of Influence  
for 3 mm/s (Heritage Buildings)**

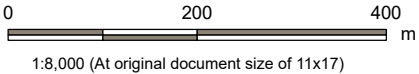


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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Construction Areas
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Cultural Heritage Resource
  - Receptor
- Construction Vibration Zone of Influence**
- Track and Grading (11 m)
  - Crossing Widening (11 m)
  - Bridge Replacement/New Bridge (24 m)



Project Location  
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165011019 REVA  
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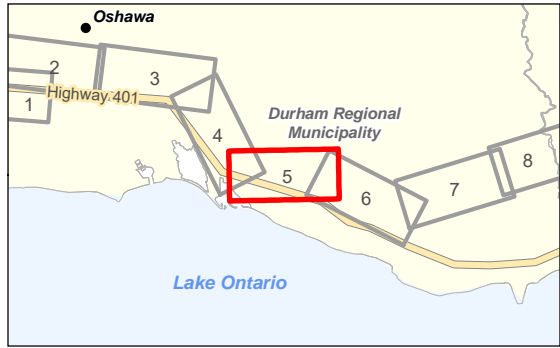
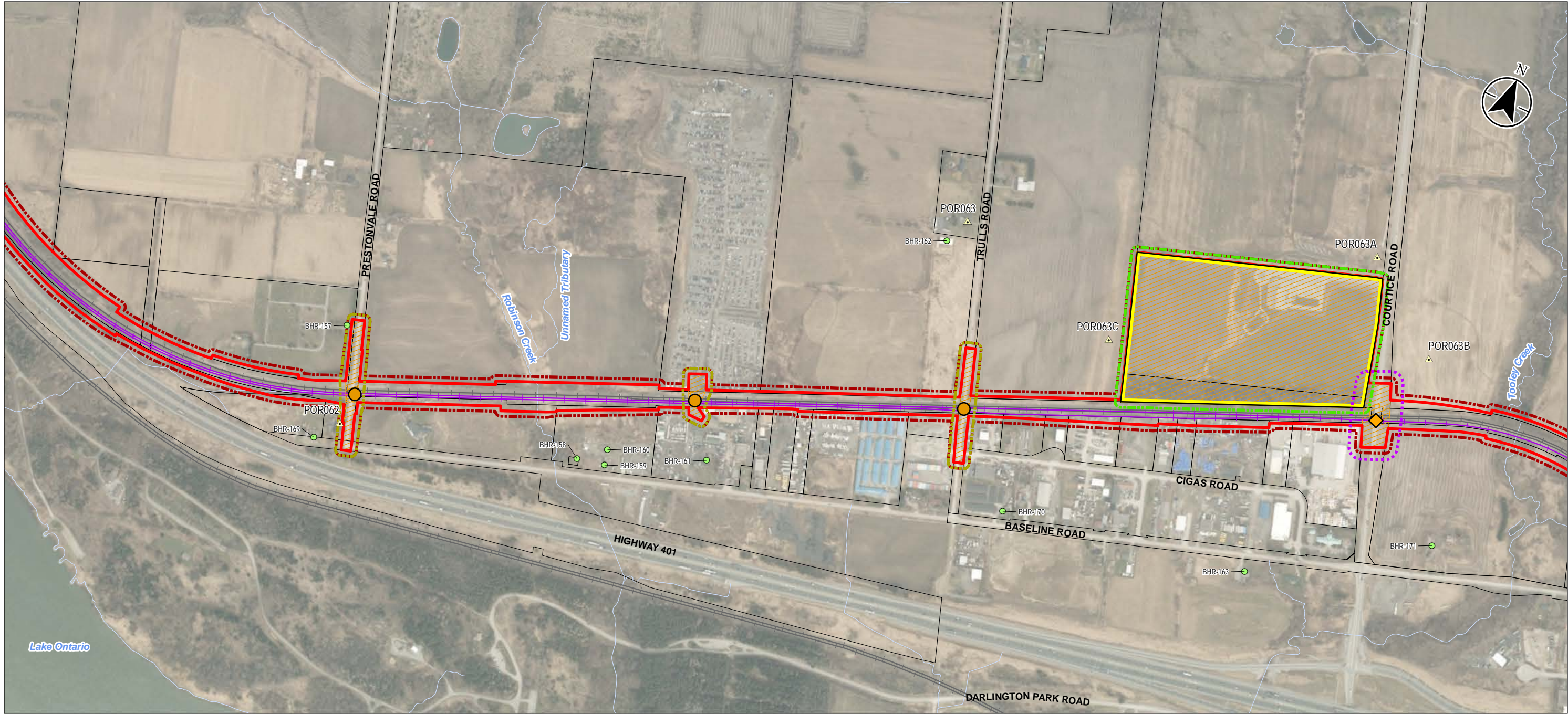
Figure No.  
**6.3.12**

Title  
**Construction Vibration Zone of Influence  
for 3 mm/s (Heritage Buildings)**

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**Legend**

- Project Footprint
- Proposed Upgrades to At-Grade Crossing
- Proposed Bridge Expansion
- Construction Areas
- Proposed Transit Oriented Community Location
- Existing Railway
- Proposed GO Track(s)
- Watercourse
- Waterbody
- Property Boundary
- Cultural Heritage Resource

- Receptor
- Construction Vibration Zone of Influence**
- Each Station within the Project Footprint (11 m)
- Modified Bridge (24 m)
- Track and Grading (11 m)
- Crossing Widening (11 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



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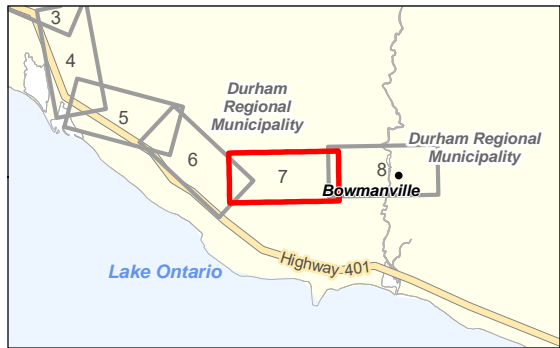
Figure No.  
**6.3.13**  
Title  
**Construction Vibration Zone of Influence  
for 3 mm/s (Heritage Buildings)**







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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Construction Areas
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Cultural Heritage Resource
  - Receptor

- Construction Vibration Zone of Influence**
- Track and Grading (11 m)
  - Crossing Widening (11 m)
  - Bridge Replacement/New Bridge (24 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



Project Location 165011019 REVA  
Region Municipality Prepared by BCC on 2023-06-05  
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EXTENSION PROJECT  
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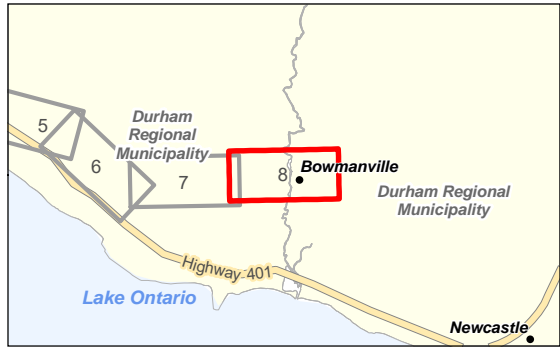
Figure No.  
**6.3.15**

Title  
**Construction Vibration Zone of Influence  
for 3 mm/s (Heritage Buildings)**

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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Construction Areas
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Cultural Heritage Resource
  - Receptor

- Construction Vibration Zone of Influence**
- Each Station within the Project Footprint (11 m)
  - Track and Grading (11 m)
  - Bridge Replacement/New Bridge (24 m)

0 200 400 m  
1:8,000 (At original document size of 11x17)



Project Location 165011019 REVA  
Region of Durham Prepared by BCC on 2023-06-05  
Technical Review by ## on 2021-##-##

Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.  
**6.3.16**

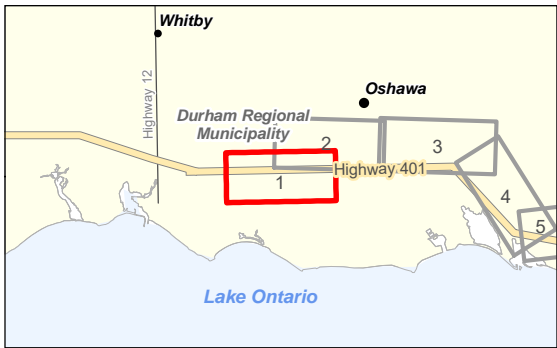
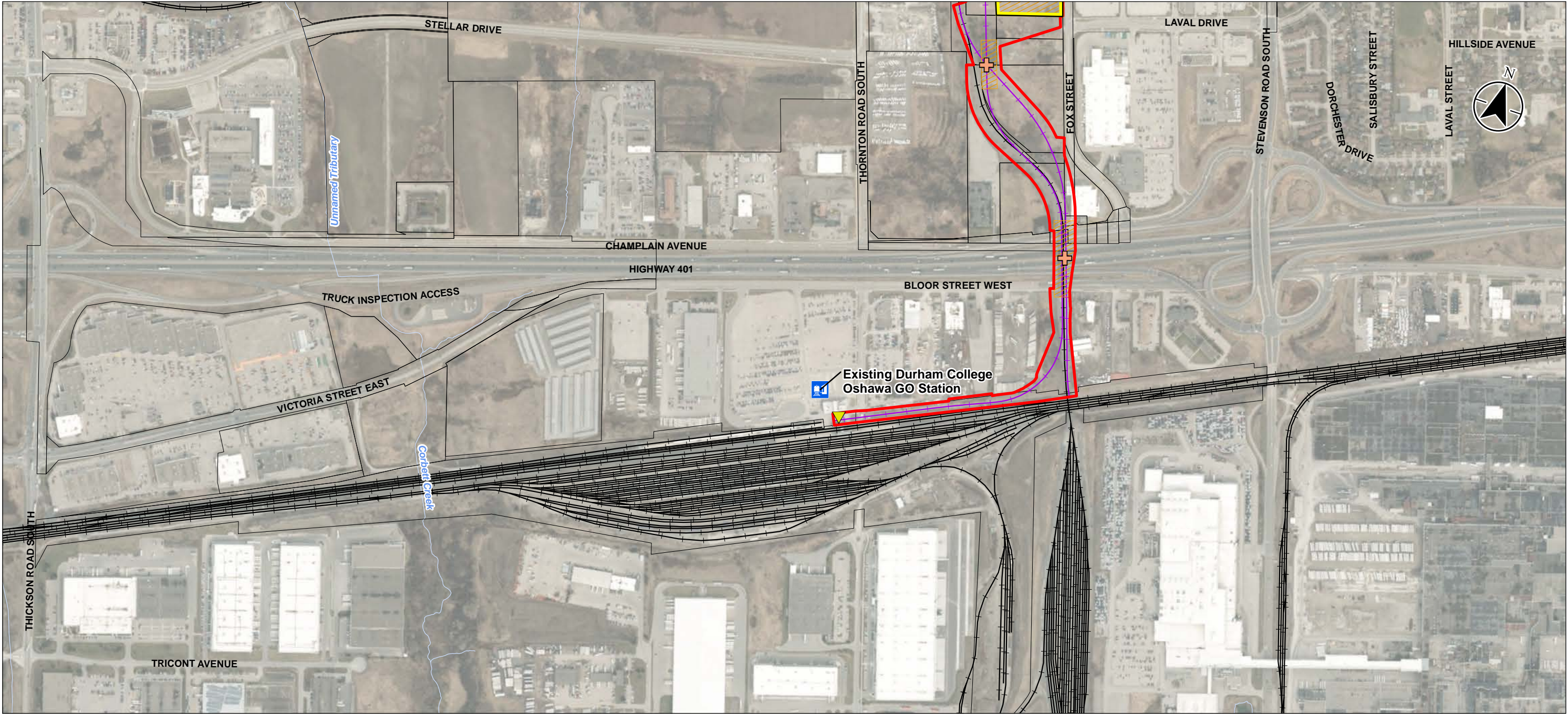
Title  
**Construction Vibration Zone of Influence  
for 3 mm/s (Heritage Buildings)**







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5. Future developments are excluded for construction impact.

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- Legend**
- Project Footprint
  - Existing Durham College Oshawa GO Station
  - Proposed Pedestrian Bridge Extension
  - Proposed New Bridge
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Construction Areas



Project Location 165011019 REVA  
Region Municipality of Durham Prepared by BCC on 2023-06-05  
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EXTENSION PROJECT  
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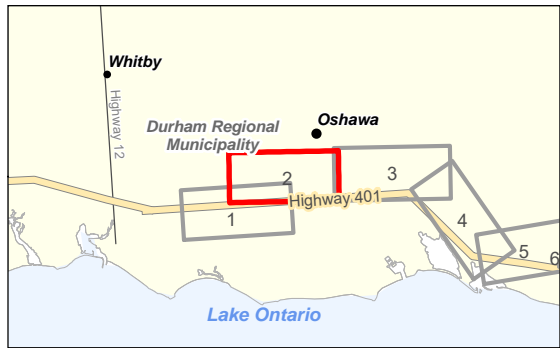
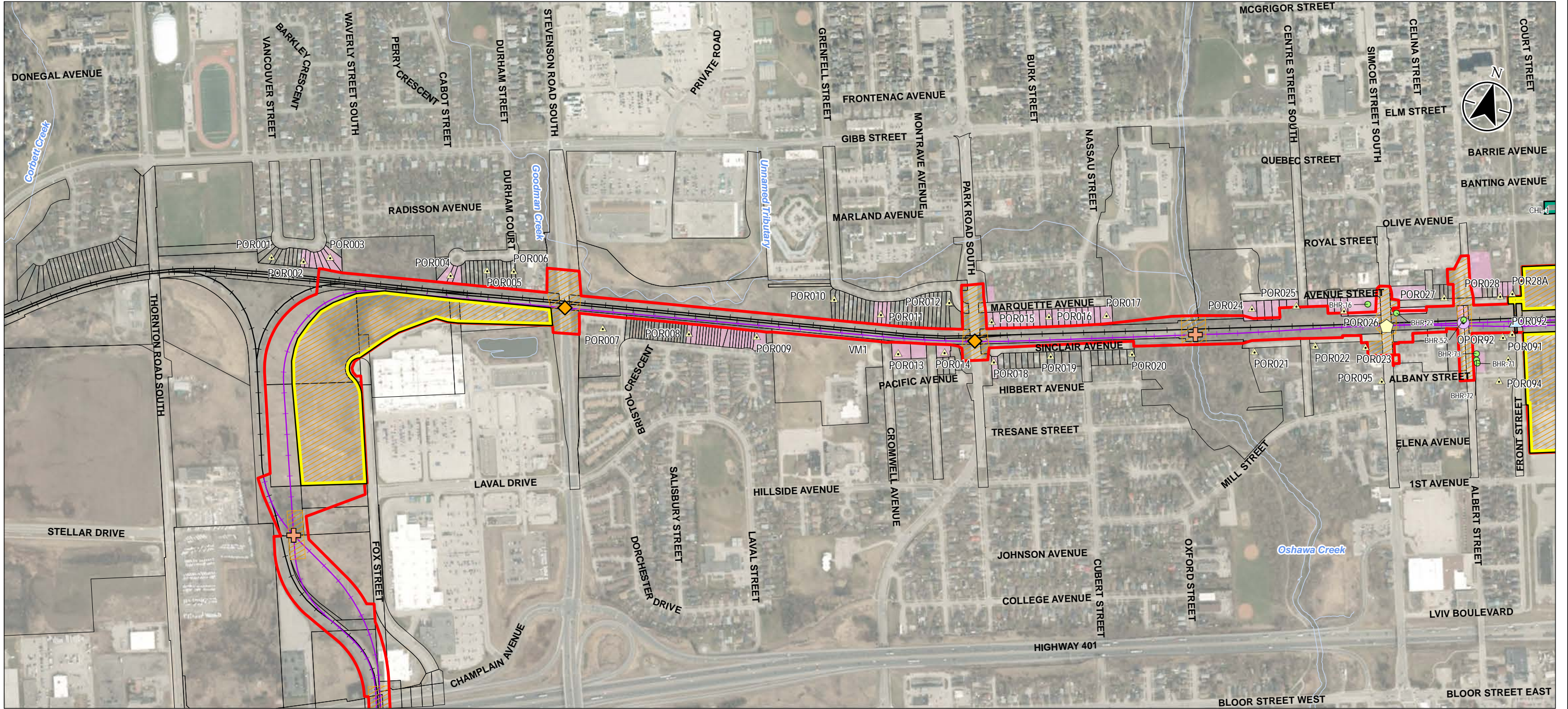
Figure No.  
**6.4.1**

Title  
**Construction Vibration - Potentially Impacted Areas**



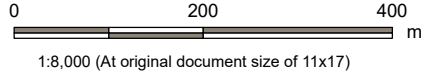


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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Bridge Replacement
  - Proposed Bridge Removal
  - Proposed New Multi-Use Grade-Separated Crossing
  - Proposed Bridge Expansion
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Cultural Heritage Resource
  - Cultural Heritage Landscape
  - Representative Receptor
  - Construction Areas
  - Potentially Impacted Areas



**Stantec**

Project Location: 165011019 REVA  
Region/Municipality: Oshawa  
Prepared by BCC on 2023-06-05  
Technical Review by ## on 2021-##-##

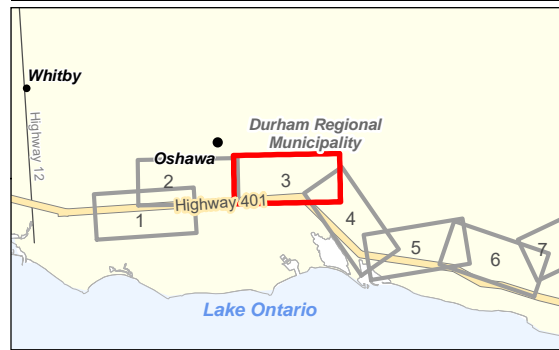
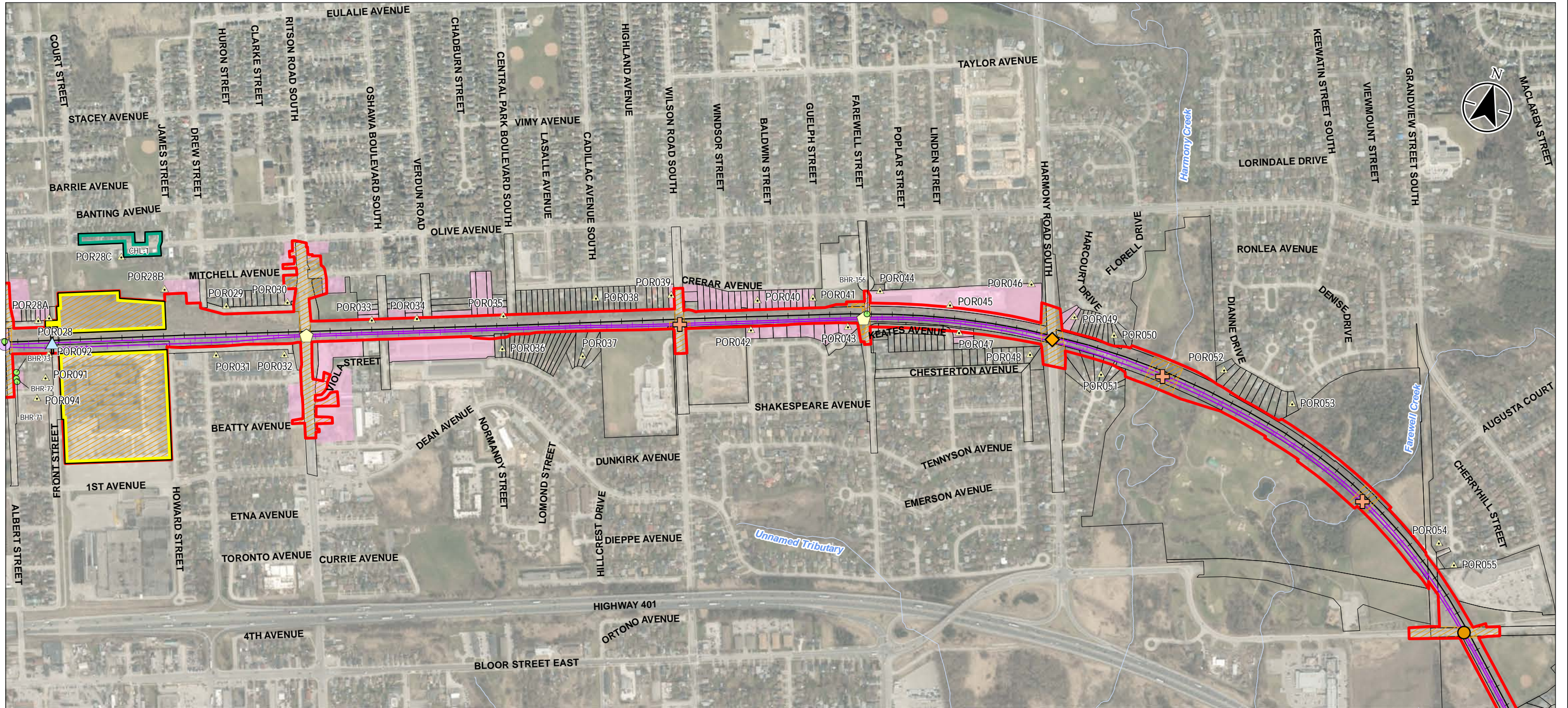
Client/Project: METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.: 6.4.2

Title: Construction Vibration - Potentially Impacted Areas

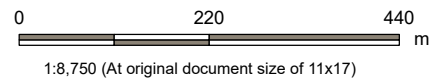


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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Bridge Replacement
  - Proposed Bridge Removal
  - Proposed New Multi-Use Grade-Separated Crossing
  - Proposed Upgrades to At-Grade Crossing
  - Proposed Bridge Expansion
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Cultural Heritage Resource
  - Cultural Heritage Landscape
  - Representative Receptor
  - Construction Areas
  - Potentially Impacted Areas



Project Location  
Region Municipality  
of Durham

165011019 REVA  
Prepared by BCC on 2023-06-05  
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METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.  
**6.4.3**

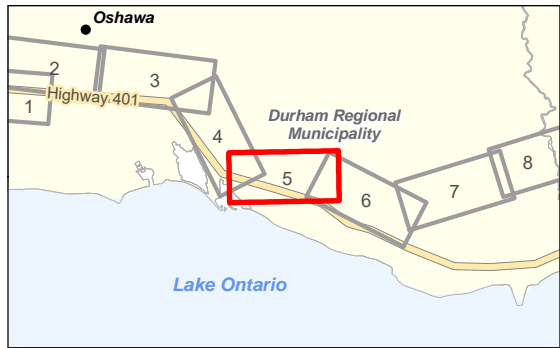
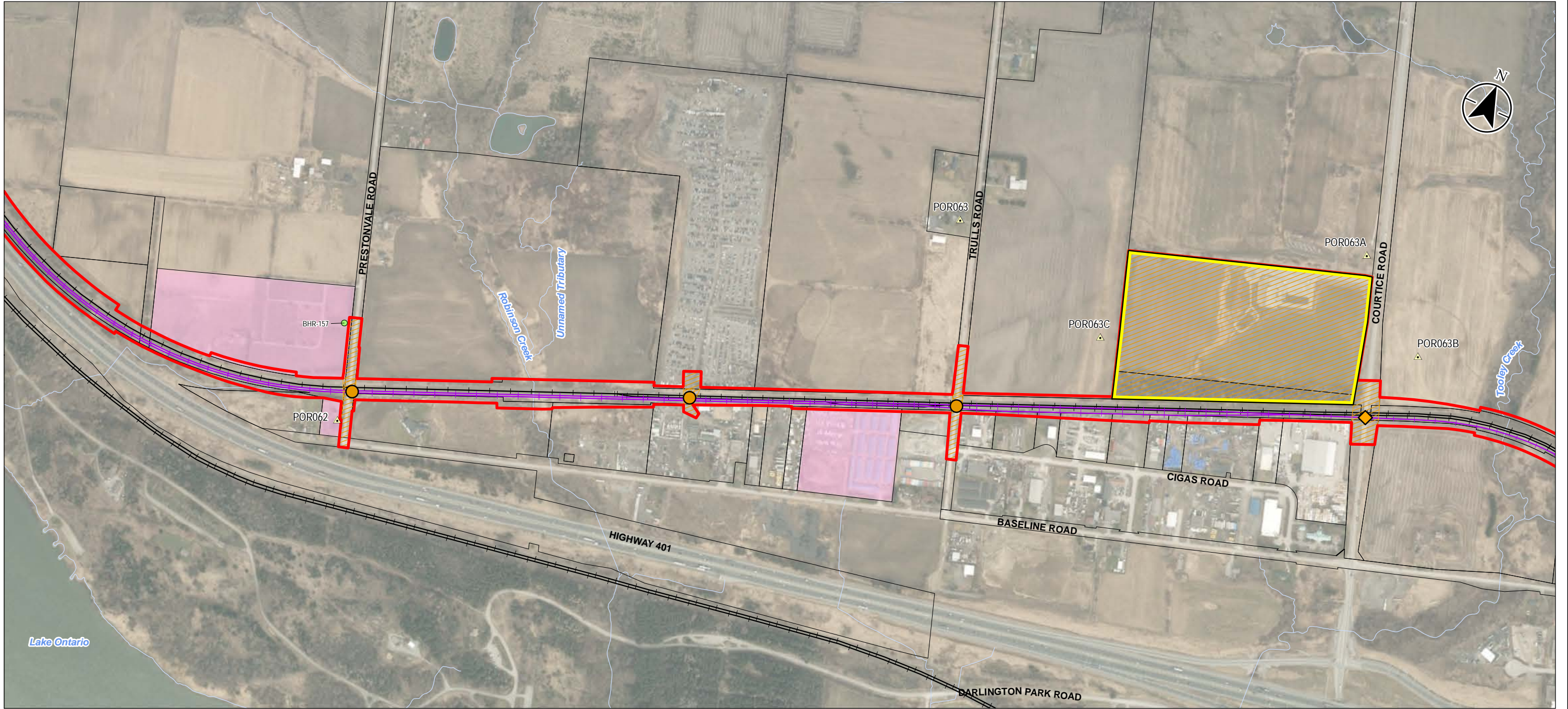
Title  
**Construction Vibration - Potentially  
Impacted Areas**







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**Legend**

- Project Footprint
- Proposed Upgrades to At-Grade Crossing
- ◆ Proposed Bridge Expansion
- Proposed Transit Oriented Community Location
- Existing Railway
- Proposed GO Track(s)
- Watercourse
- Waterbody
- Property Boundary
- Cultural Heritage Resource
- ▲ Representative Receptor
- Construction Areas
- Potentially Impacted Areas

0 200 400 m  
1:8,000 (At original document size of 11x17)



Project Location 165011019 REVA  
Region Municipality of Durham Prepared by BCC on 2023-06-05  
Technical Review by ## on 2021-##-##

Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
EXTENSION PROJECT  
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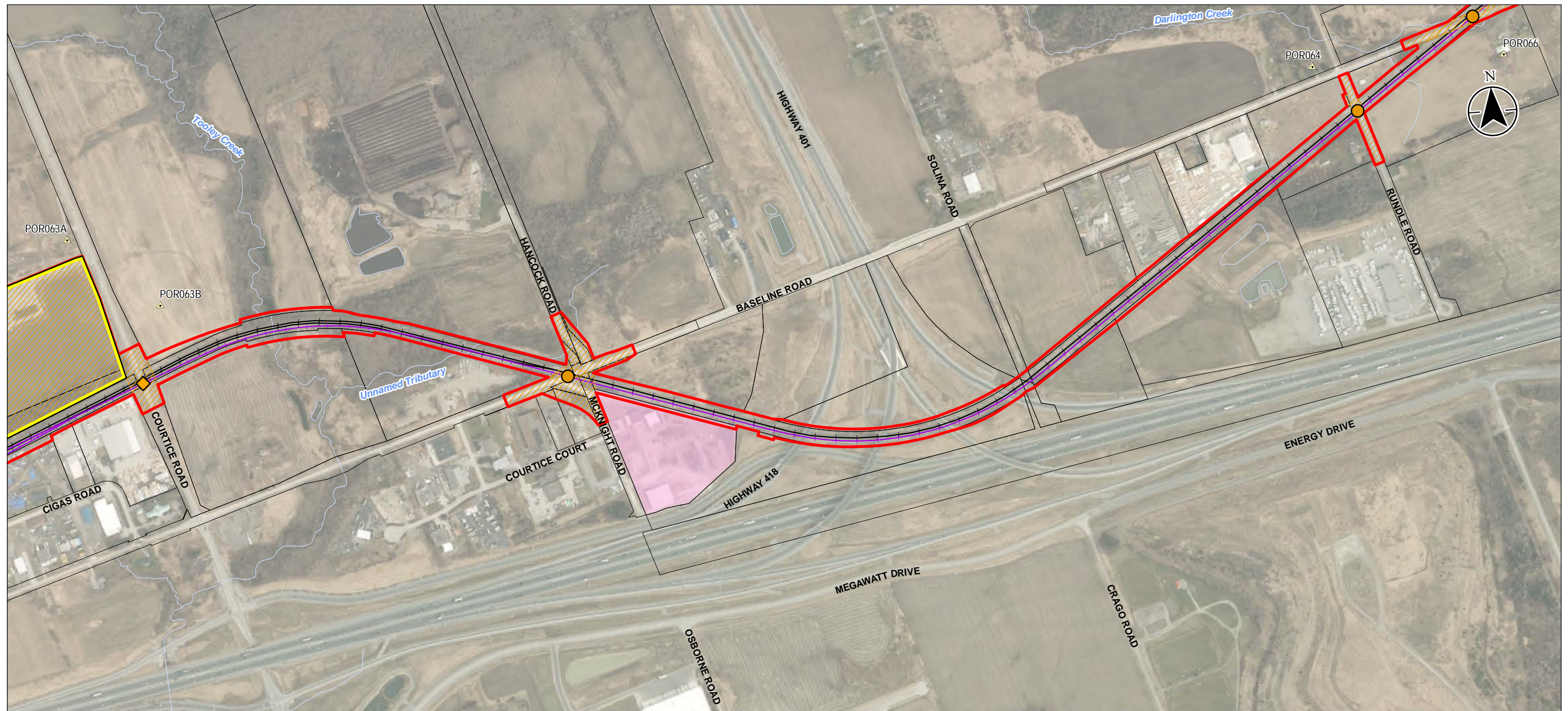
Figure No.













**6.4.5**

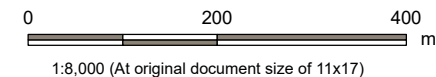
Title

**Construction Vibration - Potentially Impacted Areas**



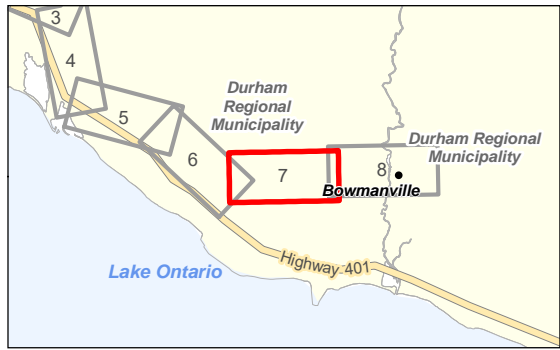


- Legend
-  Project Footprint
  -  Potentially Impacted Areas
  -  Proposed Upgrades to At-Grade Crossing
  -  Proposed Bridge Expansion
  -  Proposed Transit Oriented Community Location
  -  Existing Railway
  -  Proposed GO Track(s)
  -  Watercourse
  -  Waterbody
  -  Property Boundary
  -  Representative Receptor
  -  Construction Areas





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5. Future developments are excluded for construction impact.

- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Upgrades to At-Grade Crossing
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Representative Receptor
  - Construction Areas
  - Potentially Impacted Areas

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EXTENSION PROJECT  
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Figure No.

**6.4.7**

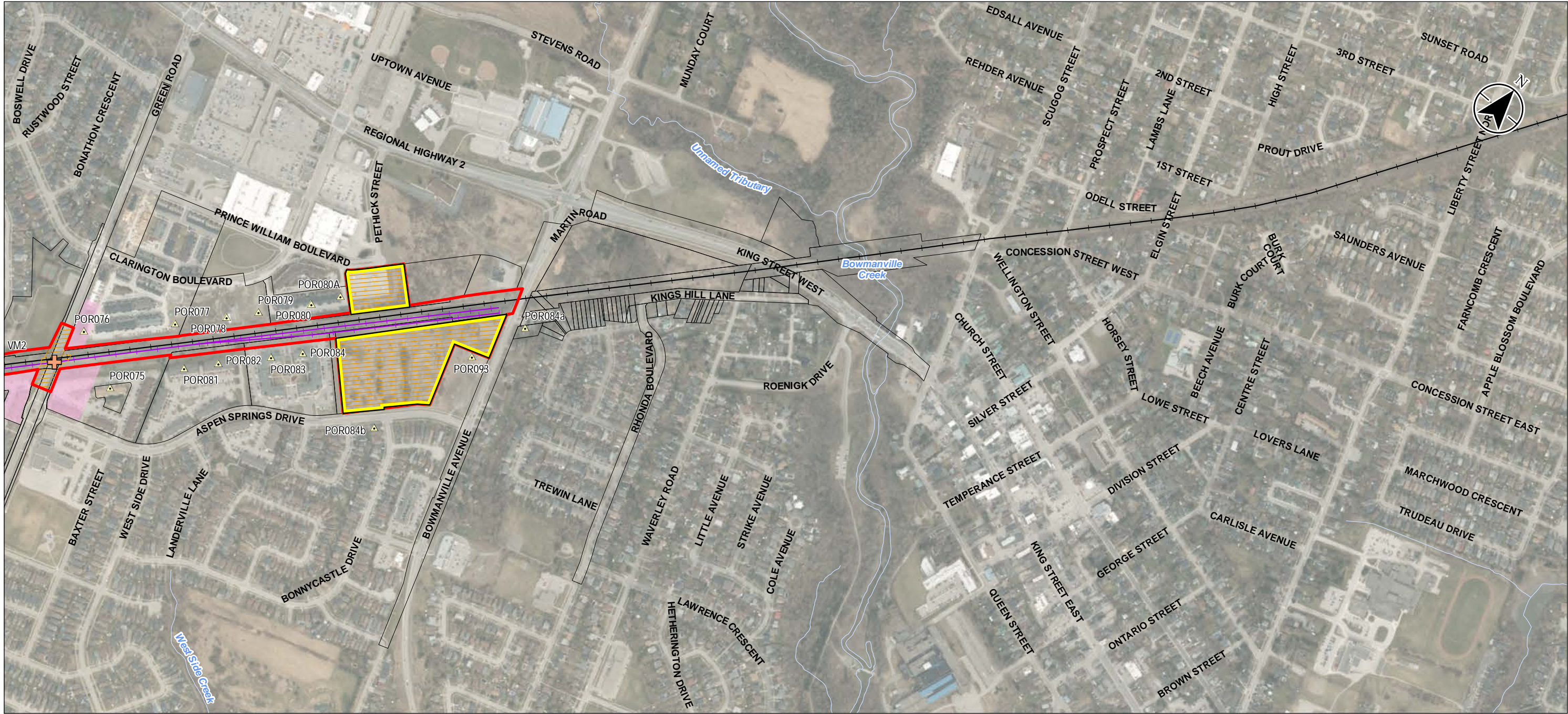
Title

**Construction Vibration - Potentially Impacted Areas**

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- Legend**
- Project Footprint
  - Proposed New Bridge
  - Proposed Transit Oriented Community Location
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Representative Receptor
  - Construction Areas
  - Potentially Impacted Areas

0 200 400 m  
1:8,000 (At original document size of 11x17)



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Client/Project  
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EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.  
**6.4.8**

Title  
**Construction Vibration - Potentially Impacted Areas**



# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Potential Effects, Mitigation and Monitoring  
August 24, 2023

## **6.2 Construction Mitigation and Monitoring**

### **6.2.1 Construction Noise**

Based on the established construction noise ZOI (Table 6.2), some surrounding noise-sensitive areas (in Figure 6.2.1 through Figure 6.2.8) may be impacted by construction noise. The following is a summary of the conceptual mitigation measures that should be considered for construction noise:

1. Noise emissions of the construction equipment should be reviewed during detailed design to confirm that they are within the NPC-115 and NPC-118 limits. If they are expected to exceed the limits, quieter equipment should be considered for the Project. Alternatively, noise control options, such as silencers/mufflers should be investigated and implemented for specific equipment.
2. If the minimum setback distances in Table 6.2 cannot be maintained during the Project construction, temporary noise barriers for construction hoarding should be considered as primary means of construction noise mitigation for the Project. Figure 6.2.1 through Figure 6.2.8 highlight the areas that may be impacted by construction noise in the absence of any noise mitigation.
3. Noise shrouds for piling should be considered for the bridge construction where the receptors are within the ZOI established. Noise shrouds should have a minimum noise reduction of 10 dB. Vibratory/sonic or auger piling may be considered as alternate piling option.
4. Best construction practices for the Project should be followed as summarized in Appendix E.

Where noise barriers are used, the barriers should break line-of-sight between the construction equipment and the receptors, should have a minimum surface density (mass per unit of face area) of 20 kg/m<sup>2</sup> (4 lb/ft<sup>2</sup>) or an acoustic performance of STC 32 (per CSA-Z107.9-00), and be free of gaps and cracks. It is preferable that barriers are absorptive on the construction side.

The minimum setback distances for construction noise compliance with noise barriers for all construction phases considered in this assessment are summarized in Table 6.5. Although the noise barriers reduce the minimum setback distance required for compliance as compared to the no barrier scenario, some PORs may still fall within the noise ZOI depending on the actual construction equipment operating location. Therefore, noise monitoring is recommended for the receptors that exceed the criteria limits after mitigation and to address noise complaints.



# Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

Lastly, a detailed construction noise and vibration management plan should be completed by the Contractor to identify specific mitigation required for each location and to ensure that the noise limits are met for the Project construction. The construction noise and vibration management plan should be based on the actual location of the equipment and the manufacturer's sound levels for the finalized list of equipment.

**Table 6.5: Construction Noise ZOI with Noise Barriers**

Project Component	Construction Phase	ZOI (m)			
		Industrial Receptors (85 dBA)	Commercial Receptors (80 dBA)	Residential Receptors (75 dBA)	Institutional Receptors (70 dBA)
Track and Grading	Grading	6	10	20	41
	Track	4	7	15	32
Bridge Replacement	Utility Relocation and Road Closure	4	7	13	25
	Demolition of Existing Bridge	4	8	15	31
	Abutment Construction	14	25	44	79
	Span construction	2	3	6	11
	Road Reinstatement	4	7	12	23
	Site Cleanup	2	3	6	10
New Bridge	Utility Relocation and Road Closure	4	7	13	25
	Abutment Construction	14	25	44	79
	Span construction	2	3	6	11
	Road Reinstatement	4	7	13	24
	Site Cleanup	2	3	6	10
Modified Bridge	Removals and Site Preparation	4	7	13	25
	Abutment Underpinning	6	11	20	37
	Site Cleanup	2	3	6	10





## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring

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Project Component	Construction Phase	ZOI (m)			
		Industrial Receptors (85 dBA)	Commercial Receptors (80 dBA)	Residential Receptors (75 dBA)	Institutional Receptors (70 dBA)
Stations/Layover Facility	Clearing	3	6	11	24
	Parking Construction	3	6	10	21
	Building/Platform Construction	3	5	9	18
Crossing Widening	Removals and Reconstruction	2	4	7	13

### 6.2.2 Construction Vibration

Based on the established construction vibration ZOIs summarized in Table 6.4, some surrounding heritage and non-engineered timber/masonry buildings (typical buildings) may be impacted by construction vibration.

Some of the PORs identified for the Project falls within the construction vibration ZOI and thus are impacted.

Figure 6.4.1 through Figure 6.4.8 show the PORs identified for the Project and areas that may be impacted by the Project construction vibration if the minimum setback distances cannot be maintained by operational changes. The potential vibration effects from construction equipment can be controlled by increasing the setback distance. Therefore, construction operational changes (e.g., maintaining setback distance, switching to lesser impactful equipment, etc.) and monitoring are recommended. The owners of the properties within the ZOIs should be notified in advance of nearby construction activities commencing.

Figure 6.4.1 through Figure 6.4.8 also serves to identify vibration monitoring areas where there are potentially impacted non-engineered timber/masonry buildings (typical construction) within the vibration ZOI. Mitigation and monitoring measures for construction noise and vibration are also summarized in Appendix F.

### 6.3 Operations Assessment

This section discusses modelling results and provides an indication of the anticipated potential effects associated with Project operations.



## **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Potential Effects, Mitigation and Monitoring  
August 24, 2023

### **6.3.1 Operation Noise Assessment (Rail)**

The Project noise levels from rail operations was predicted at the PORs, using the methodology described in Section 4.3. Predicted Project daytime ( $L_{eq} (16 \text{ hr})$ ) and nighttime ( $L_{eq} (8 \text{ hr})$ ) sound levels at the representative receptors compared with the Pre-Project sound levels as part of this assessment and are presented in Table 6.6. Table 6.6 also shows the Adjusted Daytime and Nighttime noise Impact which is the difference between the Pre-Project and Project sound levels. As per the MOEE/GO Draft Protocol, potential mitigation will be evaluated when the predicted impact is “significant or greater” ( $> 5 \text{ dB}$  increase), as defined in Table 3.7. The mitigation will be evaluated based on administrative, operational, and technical feasibility. If deemed feasible, the mitigation measures shall ensure that the predicted sound level from the GO Transit rail project is as close to or lower than, the rail service objective.





## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

**Table 6.6: Pre-Project vs. Project Sound Levels**

Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR001	Façade	65	66	67	67	2	1	No
	OLA	67	-	69	-	2		No
POR002	Façade	66	66	68	68	3	1	No
	OLA	67	-	70	-	3		No
POR003	Façade	63	63	67	66	5	3	Yes
	OLA	65	-	68	-	4		No
POR004	Façade	66	66	68	67	3	2	No
	OLA	67	-	70	-	3		No
POR005	Façade	64	64	66	65	2	1	No
	OLA	65	-	68	-	3		No
POR006	Façade	65	63	67	65	2	1	No
	OLA	66	-	68	-	2		No
POR007	Façade	66	64	68	66	3	2	No
	OLA	67	-	70	-	3		No
POR008	Façade	65	65	69	67	4	2	No
	OLA	66	-	70	-	4		No
POR009	Façade	65	66	70	68	4	2	No
	OLA	67	-	71	-	4		No



## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
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Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR010	Façade	63	63	65	64	3	1	No
	OLA	66	-	68	-	2		No
POR011	Façade	65	66	68	67	3	1	No
	OLA	66	-	69	-	3		No
POR012	Façade	63	62	65	64	2	1	No
	OLA	64	-	66	-	2		No
POR013	Façade	65	65	68	67	4	2	No
	OLA	66	-	70	-	4		No
POR014	Façade	66	66	70	68	4	2	No
	OLA	67	-	71	-	4		No
POR015	Façade	67	67	69	68	2	1	No
	OLA	68	-	70	-	2		No
POR016	Façade	65	66	67	67	2	1	No
	OLA	66	-	69	-	2		No
POR017	Façade	65	66	68	67	2	1	No
	OLA	67	-	69	-	2		No
POR018	Façade	64	63	67	65	3	2	No
	OLA	60	-	61	-	1		No
POR019	Façade	64	64	68	67	4	2	No
	OLA	60	-	61	-	1		No





## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR020	Façade	64	65	68	67	4	2	No
	OLA	64	-	67	-	3		No
POR021	Façade	64	64	67	66	4	2	No
	OLA	60	-	62	-	2		No
POR022	Façade	64	64	68	66	3	2	No
	OLA	64	-	66	-	3		No
POR023	Façade	66	65	68	66	2	1	No
	OLA	64	-	65	-	1		No
POR024	Façade	65	65	67	67	2	1	No
	OLA	66	-	69	-	2		No
POR025	Façade	65	65	67	66	2	1	No
	OLA	66	-	68	-	2		No
POR026	Façade	67	67	69	68	2	1	No
	OLA	69	-	71	-	2		No
POR027	Façade	65	64	66	65	1	0	No
	OLA	60	-	60	-	0		No
POR028	Façade	65	65	66	65	1	0	No
	OLA	59	-	59	-	0		No
POR029	Façade	63	63	64	64	2	1	No
	OLA	59	-	59	-	0		No



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Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR030	Façade	65	62	66	63	1	1	No
	OLA	64	-	64	-	0		No
POR031	Façade	65	65	68	67	3	1	No
	OLA	65	-	67	-	3		No
POR032	Façade	65	64	68	66	3	2	No
	OLA	63	-	63	-	0		No
POR033	Façade	67	68	70	69	3	1	No
	OLA	66	-	69	-	3		No
POR034	Façade	67	68	70	69	3	1	No
	OLA	66	-	69	-	3		No
POR035	Façade	67	67	70	69	3	1	No
	OLA	64	-	67	-	3		No
POR036	Façade	63	64	67	66	4	2	No
	OLA	64	-	68	-	4		No
POR037	Façade	62	63	66	64	3	2	No
	OLA	63	-	67	-	4		No
POR038	Façade	63	63	65	65	2	1	No
	OLA	64	-	67	-	3		No
POR039	Façade	65	64	67	65	1	1	No
	OLA	66	-	68	-	2		No





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Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR040	Façade	65	65	67	66	3	1	No
	OLA	66	-	69	-	3		No
POR041	Façade	64	64	67	66	3	2	No
	OLA	65	-	69	-	3		No
POR042	Façade	66	67	72	70	6	3	Yes
	OLA	68	-	74	-	6		Yes
POR043	Façade	66	67	71	70	5	3	Yes
	OLA	66	-	71	-	5		Yes
POR044	Façade	61	61	64	63	3	2	No
	OLA	60	-	62	-	3		No
POR045	Façade	66	66	68	67	2	1	No
	OLA	-	-	-	-	-	-	No
POR046	Façade	61	59	62	60	1	1	No
	OLA	63	-	64	-	0		No
POR047	Façade	66	66	69	68	3	2	No
	OLA	67	-	70	-	3		No
POR048	Façade	63	63	66	64	2	1	No
	OLA	64	-	66	-	2		No
POR049	Façade	63	62	64	63	1	1	No
	OLA	64	-	66	-	2		No



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Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR050	Façade	64	65	66	66	2	1	No
	OLA	66	-	67	-	2		No
POR051	Façade	63	63	66	65	2	1	No
	OLA	65	-	67	-	3		No
POR052	Façade	63	63	64	64	2	1	No
	OLA	64	-	66	-	2		No
POR053	Façade	62	62	64	63	2	1	No
	OLA	63	-	65	-	2		No
POR054	Façade	64	64	66	65	2	1	No
	OLA	65	-	67	-	2		No
POR055	Façade	64	64	65	65	2	1	No
	OLA	65	-	67	-	2		No
POR056	Façade	66	66	68	68	2	1	No
	OLA	67	-	69	-	2		No
POR057	Façade	66	66	67	67	1	1	No
	OLA	66	-	68	-	2		No
POR058	Façade	68	68	69	69	1	1	No
	OLA	69	-	70	-	1		No
POR059	Façade	69	70	70	70	1	0	No
	OLA	71	-	71	-	1		No





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Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR060	Façade	69	69	70	70	1	0	No
	OLA	70	-	71	-	1		No
POR061	Façade	70	70	70	70	1	0	No
	OLA	71	-	72	-	1		No
POR062	Façade	70	70	71	71	1	0	No
	OLA	71	-	71	-	1		No
POR063	Façade	57	57	58	58	1	1	No
	OLA	57	-	59	-	1		No
POR064	Façade	63	61	65	63	1	1	No
	OLA	62	-	64	-	2		No
POR065	Façade	63	63	65	65	2	2	No
	OLA	64	-	67	-	3		No
POR066	Façade	62	62	64	63	2	2	No
	OLA	63	-	65	-	2		No
POR067	Façade	65	65	68	67	3	2	No
	OLA	66	-	69	-	3		No
POR068	Façade	60	61	65	64	4	2	No
	OLA	59	-	64	-	4		No
POR069	Façade	61	62	65	64	4	2	No
	OLA	62	-	67	-	4		No



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Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR070	Façade	61	61	65	64	4	2	No
	OLA	61	-	65	-	4		No
POR071	Façade	60	61	64	63	5	2	No
	OLA	58	-	62	-	4		No
POR072	Façade	63	64	66	65	4	2	No
	OLA	63	-	67	-	4		No
POR073	Façade	62	63	66	65	4	2	No
	OLA	64	-	67	-	4		No
POR074	Façade	62	63	66	65	3	2	No
	OLA	63	-	67	-	4		No
POR075	Façade	61	62	65	64	4	2	No
	OLA	53	-	54	-	1		No
POR076	Façade	62	63	66	65	3	2	No
	OLA	63	-	66	-	3		No
POR077	Façade	63	64	67	66	3	2	No
	OLA	64	-	67	-	3		No
POR078	Façade	64	65	66	66	3	1	No
	OLA	64	-	66	-	2		No
POR079	Façade	63	64	66	65	2	1	No
	OLA	64	-	66	-	2		No





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Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Project Nighttime Sound Levels (dBA) $L_{eq(8)}$	Adjusted Daytime Noise Impact (dB) <sup>1</sup>	Adjusted Nighttime Noise Impact (dB) <sup>1</sup>	Mitigation Needed? (Yes or No)
POR080	Façade	63	64	66	65	3	1	No
	OLA	56	-	56	-	0		No
POR081	Façade	62	63	66	65	4	2	No
	OLA	64	-	68	-	4		No
POR082	Façade	62	63	66	65	4	2	No
	OLA	64	-	68	-	4		No
POR083	Façade	63	64	66	65	3	2	No
	OLA	55	-	56	-	1		No
POR084	Façade	63	64	66	65	4	2	No
	OLA	56	-	57	-	1		No
POR091	Façade	64	65	66	65	2	1	No
	OLA	-	-	-	-	-	-	No
POR092	Façade	66	67	69	68	3	1	No
	OLA	65	-	68	-	3		No
POR093	Façade	63	61	64	62	1	1	No
	OLA	-	-	-	-	-	-	No
POR094	Façade	63	62	64	62	1	0	No
	OLA	-	-	-	-	-	-	No
POR095	Façade	62	62	64	63	2	1	No
	OLA	-	-	-	-	-	-	No

<sup>1</sup> Discrepancy in adjusted noise impact is due to sound levels rounded to the nearest whole number



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The assessment of rail corridor indicates that sound levels are expected to increase by 0-6 dB at the receptors. Based on the assessment, the Project has significant impact on five of the surrounding representative receptors (per Table 6.6) for rail operations, and therefore, noise mitigation is recommended. A table detailing the noise impact of the Project operations without ambient noise considered is provided as Appendix B.5.

### **6.3.2 Operations Noise Assessment – Rail Squeal**

Rail squeal noise resulting from the movement of trains around curves is a very complex phenomenon. Track curve radii under 305 m has a potential for wheel squeal noise from rail. No rail under curve radii of 305 m is identified along the corridor, except the one at the current spur line connecting to the CP Rail main line. This curved track is currently used by the CP Rail spur line that connects from the CN to CP Rail main line. A GO station is proposed at this location and trains are expected to stop and/or move at reduced speed at this location. As the trains are moved around the curved tracks, the wheels have potential to produce squeal. A tonal penalty of 5 dB has been included for the curved portions of the track at this location in the assessment. Modelling results presented in Table 6.6 include impact due to squeal. Modeling results indicate that, no receptors are impacted from squeal noise.

### **6.3.3 Operations Noise Assessment – GO Stations and Layover Facility**

Stationary noise sources at the GO stations and layover facility were assessed by predicting noise levels at the surrounding receptors and comparing with the applicable MECP limits. Sound levels were predicted using the methodology described in Section 4.3. The predicted sound levels are reported in Table 6.7.





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**Table 6.7: GO Station/Layover Facility Stationary Noise Assessment**

GO Station/ Layover Facility	Receptor ID	Receptor Location	Daytime Impact (dBA) $L_{eq}(1hr)$	Nighttime Impact (dBA) $L_{eq}(1hr)$	NPC-300 Class 1 Daytime Criteria	NPC-300 Class 1 Nighttime Criteria	Mitigation Needed? (Yes or No)
B1 Station	POR001	POW	38	34	50	45	Yes
		OPOR	39	-	50	-	Yes
	POR002	POW	39	36	50	45	Yes
		OPOR	41	-	50	-	Yes
	POR003	POW	39	37	50	45	Yes
		OPOR	40	-	50	-	Yes
	POR004	POW	45	44	50	45	Yes
		OPOR	46	-	50	-	Yes
B2 Station	POR28A	POW	53	50	50	45	No
		OPOR	53	-	50	-	No
	POR28B	POW	46	44	50	45	Yes
		OPOR	46	-	50	-	Yes
	POR28C	POW	45	43	50	45	Yes
		OPOR	47	-	50	-	Yes
B3 Station	POR063	POW	33	30	50	45	Yes
		OPOR	30	-	50	-	Yes
	POR063A	POW	52	48	50	45	No
		OPOR	54	-	50	-	Yes
	POR063B	POW	45	41	50	45	Yes
		OPOR	-	-	50	-	Yes
	POR063C	POW	N	37	50	45	Yes



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GO Station/ Layover Facility	Receptor ID	Receptor Location	Daytime Impact (dBA) $L_{eq}(1hr)$	Nighttime Impact (dBA) $L_{eq}(1hr)$	NPC-300 Class 1 Daytime Criteria	NPC-300 Class 1 Nighttime Criteria	Mitigation Needed? (Yes or No)
		OPOR	-	-	50	-	Yes
B4 Station	POR080	POW	47	44	50	45	Yes
		OPOR	45	-	50	-	Yes
	POR080A	POW	58	52	50	45	No
		OPOR	45	-	50	-	Yes
	POR093	POW	46	43	50	45	Yes
		OPOR	24	-	50	-	Yes
B4 Layover Facility	POR080 <sup>1</sup>	POW	35	49	55	55	Yes
		OPOR	15	-	55	-	Yes
	POR080A <sup>1</sup>	POW	37	50	55	55	Yes
		OPOR	15	-	55	-	Yes
	POR084 <sup>1</sup>	POW	34	44	55	55	Yes
		OPOR	15	-	55	-	Yes
	POR084A <sup>1</sup>	POW	30	54	55	55	Yes
		OPOR	-	-	55	-	Yes
	POR084B <sup>1</sup>	POW	30	38	55	55	Yes
		OPOR	-	-	55	-	Yes
	POR093	POW	40	59	55	55	No
		OPOR	-	-	55	-	No

<sup>1</sup> Locomotives have been assumed to be at the east end of trains stationed at the layover facility. If locomotives are placed at the west end of trains, predicted sound levels would exceed applicable noise criteria at PORs adjacent to the Bowmanville Avenue (B4 Bowmanville) GO Station





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The assessment indicates that the anticipated sound levels generated by GO station operations at B2, B3, and B4 are above applicable MECP NPC-300 criteria at some of the receptors. The noise impact of the layover facility and fueling operations east of GO Station B4 are above the applicable MECP NPC-300 criteria at the representative receptor east of Bowmanville Avenue. Mitigation is required to achieve compliance with applicable MECP NPC-300 criteria and is discussed under Section 6.4.

### **6.3.4 GO Station and Layover Facility Emergency Generator Testing**

The noise impact of emergency generators at the GO stations and the layover facility during planned non-emergency operation (e.g., during testing) were assessed separately by predicting noise levels at the surrounding receptors and comparing with the applicable MECP limits. Generator sound levels were predicted at the surrounding receptors using the methodology described in Section 4.3. The predicted sound levels are reported in Table 6.8.



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**Table 6.8: GO Station/Layover Facility Emergency Generator Noise Assessment**

GO Station/ Layover Facility	Receptor ID	Receptor Location	Daytime Impact (dBA) $L_{eq}(1hr)$	NPC-300 Class 1 Daytime Criteria <sup>1</sup>	Mitigation Needed? (Yes or No)
B1	POR001	POW	38	55	No
		OPOR	35	55	No
	POR002	POW	38	55	No
		OPOR	38	55	No
	POR003	POW	38	55	No
		OPOR	33	55	No
	POR004	POW	36	55	No
		OPOR	38	55	No
B2	POR28A	POW	43	55	No
		OPOR	43	55	No
	POR28B	POW	50	55	No
		OPOR	52	55	No
	POR28C	POW	44	55	No
		OPOR	47	55	No
B3	POR063	POW	27	55	No
		OPOR	27	55	No
	POR063A	POW	37	55	No
		OPOR	39	55	No





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GO Station/ Layover Facility	Receptor ID	Receptor Location	Daytime Impact (dBA) $L_{eq}(1hr)$	NPC-300 Class 1 Daytime Criteria <sup>1</sup>	Mitigation Needed? (Yes or No)
B4	POR080	POW	48	55	No
		OPOR	25	55	No
	POR080A	POW	51	55	No
		OPOR	25	55	No
	POR084	POW	47	55	No
		OPOR	26	55	No
	POR084A	POW	42	55	No
		OPOR	33	55	No
	POR084B	POW	44	55	No
		OPOR	42	55	No

<sup>1</sup> Criteria for emergency generator testing are 5 dB above the applicable stationary noise criteria per NPC-300. Emergency generator testing is expected during daytime hours only.

Predicted sound levels are within the MECP limits and no additional mitigation is required for the emergency generators at the GO stations and layover facility.



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### **6.3.5 Operations Vibration Assessment (Rail)**

The Project vibration impact from rail operations was assessed using the field measurements conducted at two representative locations for several setback distances for the pre-project conditions as summarized in Table 5.6. The setback distances from the proposed GO rail track were identified and conservatively matched to setback distances from measured levels to assess future potential vibration impact from the proposed GO rail operations. The future vibration levels at the receptors are reported in Table 6.9.

Table 6.9 indicates that they are expected to exceed the limit at the receptors within 30 m from the centerline of the proposed GO track. Vibration level as high as 0.37 mm/s is expected at the dwellings represented by PORs 42, 43 and 47. Other locations where vibration limits expected to exceed are the dwellings that represented by PORs 009, 014, and 031. Vibration mitigation is discussed in the following section.





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**Table 6.9: Future Vibration Levels at Receptors Based on Vibration Measurements**

Receptor ID <sup>1</sup>	Receptor Description	Approximate Separation Distance (m)	Anticipated RMS Vibration Levels (mm/s)	Vibration Criteria (mm/sec)	Exceeds Criteria (Yes or No?)
POR007	Two Storey Residence on Bristol Cres.	33	<0.170	0.175	No
POR008	Two Storey Residence on Bristol Cres.	30	<0.170	0.175	No
POR009	Two Storey Residence on Bristol Cres.	23	0.211	0.175	Yes
POR013	Two Storey Residence on Cromwell Ave.	30	<0.170	0.175	No
POR014	Two Storey Residence on Cromwell Ave.	22	0.211	0.175	Yes
POR018	Two Storey Residence on Sinclair Ave.	40	<0.170	0.175	No
POR019	One Storey Residence on Sinclair Ave.	32	<0.170	0.175	No
POR020	One Storey Residence on Sinclair Ave.	34	<0.170	0.175	No
POR021	Two Storey Residence on Hall St.	38	<0.170	0.175	No
POR022	One Storey Residence on Hall St.	34	<0.170	0.175	No
POR023	Two Storey Residence on Hall St.	41	<0.170	0.175	No
POR031	Two Storey Residence on Edward Ave.	27	0.196	0.175	Yes
POR032	Two Storey Residence on Edward Ave.	37	<0.170	0.175	No
POR036	One Storey Residence on Sedan Cres.	40	<0.170	0.175	No
POR037	One Storey Residence on Brest Cres.	62	<0.170	0.175	No
POR042	Three Storey Residence on Chaucer	16	0.366	0.175	Yes
POR043	Three Storey Residence on Chaucer	17	0.366	0.175	Yes
POR047	Two Storey Residence on Keates Ave.	18	0.366	0.175	Yes



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Receptor ID <sup>1</sup>	Receptor Description	Approximate Separation Distance (m)	Anticipated RMS Vibration Levels (mm/s)	Vibration Criteria (mm/sec)	Exceeds Criteria (Yes or No?)
POR048	Two Storey Residence on Chesterton Ave.	39	<0.170	0.175	No
POR051	One Storey Residence on Tennyson Ct.	37	<0.170	0.175	No
POR062	Two Storey Residence on Prestonvale Rd.	55	<0.170	0.175	No
POR065	One Storey Residence on Baseline Rd. W.	73	<0.170	0.175	No
POR068	Two Storey Residence on Autumn Harvest Rd.	46	<0.170	0.175	No
POR069	Two Storey Residence on Dykstra Ln.	49	<0.170	0.175	No
POR070	Two Storey Residence on Dykstra Ln.	49	<0.170	0.175	No
POR071	Two Storey Residence on Dykstra Ln.	49	<0.170	0.175	No
POR075	Four Storey Apartment Building on Aspen Springs	65	<0.170	0.175	No
POR081	Three Storey Residence on Aspen Springs	45	<0.170	0.175	No
POR082	Three Storey Residence on Aspen Springs	43	<0.170	0.175	No
POR083	Four Storey Residence on Aspen Springs D	39	<0.170	0.175	No
POR084	Four Storey Residence on Aspen Springs D	35	<0.170	0.175	No

<sup>1</sup> Only receptors south of the proposed GO rail tracks have been considered as the new tracks are added to the south of the existing CP tracks. Receptors north of the proposed GO rail tracks are in closer proximity to the existing CP rail line and is farther away from the proposed GO track. Therefore, lesser vibration impact than that from the existing CP rail line is expected.





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## 6.4 Operation Mitigation

Mitigation for the rail corridor, GO stations and layover facility is required to achieve compliance with applicable Draft Protocol and MECP NPC-300 noise limits. Predicted sound levels from GO station operations are expected to exceed the applicable limits at the receptors surrounding B2, B3, and B4 GO stations. Noise walls are recommended for these GO stations for compliance. Noise barriers recommend for the Project operations are summarized in Table 6.10. Mitigated sound levels are presented in Table 6.12 for rail operations and Table 6.13 for GO station stationary operations.

Mitigated noise contours for stationary noise sources (GO stations) are presented on Figures 6.5.1 through 6.5.8.

A summary of noise barriers for the mitigation of GO station, layover facility and rail operations is provided in Table 6.10 and are shown in Figure set 6.7.

**Table 6.10: Noise Barrier Summary**

Barrier ID	Height (m)	Length (m)	Barrier Start Point (MTM Zone 10)		Barrier Endpoint (MTM Zone 10)	
			Easting	Northing	Easting	Northing
NB_A <sup>1</sup>	5	78	356607	4861068	356568	4861152
NB_B <sup>2</sup>	5	325	357994	4861481	358306	4861581
NB_C <sup>1</sup>	5	76	363691	4860979	363619	4860956
NB_D <sup>1</sup>	5	86	368647	4863383	368710	4863324
NB_E <sup>3</sup>	5	33	368942	4863518	368948	4863547
NB_F	5	176	354088	4860469	354259	4860496

<sup>1</sup> Noise barriers required for GO stations

<sup>2</sup> North surface of barrier to be acoustically absorptive finish

<sup>3</sup> Noise barrier required for the layover facility

Operation vibration from rail is expected to exceed applicable criteria at the dwellings represented by PORs 009, 014, 031, 042, 043 and 047. Ballast mats are recommended to mitigate the impact of operational vibration. The area identified for vibration mitigation (ballast mat) are shown in Figure set 6.7.

The following mitigation measures are recommended for the Project operations:

- Install the noise barriers listed in Table 6.10 to address operation noise impacts. Noise barriers are shown in Figure set 6.7.



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- Curved portions of the track at GO Station B1 should be designed and lubricated tracks at the curve as part of general track maintenance to minimize or eliminate rail squeal noise.
- Ballast mats are recommended for the dwellings represented by PORs 009, 014, 031, 032, 042, 043 and 047 to address operation vibration impact. The area identified for mitigation are shown in Figure set 6.7.

With the recommended noise barriers in place, GO station and layover facility stationary noise and future operational noise from rail activities at the surrounding receptors are expected to meet the applicable noise limits, with the exception of POR093 as discussed below

The noise barriers listed in Table 6.10 are considered technically feasible as they achieve a minimum reduction of 5 dB at representative receptors along the ROW. Barriers shall be installed on Metrolinx-owned land, where possible. Public consultations shall be held with the public to include considerations such as aesthetics and interference with sunlight. Barriers shall be installed so as to not obstruct line-of-sight of train engineers, allow for ROW maintenance, not obstruct pedestrian bridges or roadway crossings, allow for trackside and roadside equipment operation, and not create a safety hazard.

The economic feasibility of the barriers listed in Table 6.10 has been evaluated using the barrier cost effectiveness index (CEI). The CEI is defined as the cost per benefitted receptor and per dB of minimum noise reduction (\$\$/BR/dBNR). A summary of the CEI for each barrier is summarized in Table 6.11.

**Table 6.11: Barrier Cost Effectiveness Summary**

Barrier ID	Receptors Impacted	Length (m)	Estimated Unit Barrier Cost \$/m <sup>2</sup>	Surface area (m <sup>2</sup> )	Total Cost	Average Noise Reduction (dB) <sup>2</sup>	CEI (BR/dBNR)
NB_A <sup>1</sup>	-	78	\$600	390	\$234,000	-	-
NB_B	9	284	\$600	1,420	\$852,000	5	\$18,933
NB_C <sup>1</sup>	-	76	\$600	380	\$228,000	-	-
NB_D <sup>1</sup>	-	86	\$600	430	\$258,000	-	-
NB_E <sup>1</sup>	-	33	\$600	165	99,000	-	-
NB_F	14	176	\$600	880	\$528,000	5	\$7,542

<sup>1</sup> Noise barriers required for GO stations and layover facility are not subject to CEI analysis

<sup>2</sup> Based on worst case daytime noise impact levels and mitigated daytime levels





## **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

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Mitigation to reduce operational noise generated by layover activities at POR093 is not feasible given the proposed development is a 25-storey high-rise building overlooking the proposed layover yard. It is expected that this has been taken into account during the land use planning and approval process for this development.

Ballast mat will provide approximately 10 dB reduction in vibration levels. Mitigated vibration from rail operations is expected to be within the MOEE/GO Draft Protocol limits.

Mitigation requirements for Project operation noise and vibration are also summarized in Appendix F.

### **6.5 Recommendations**

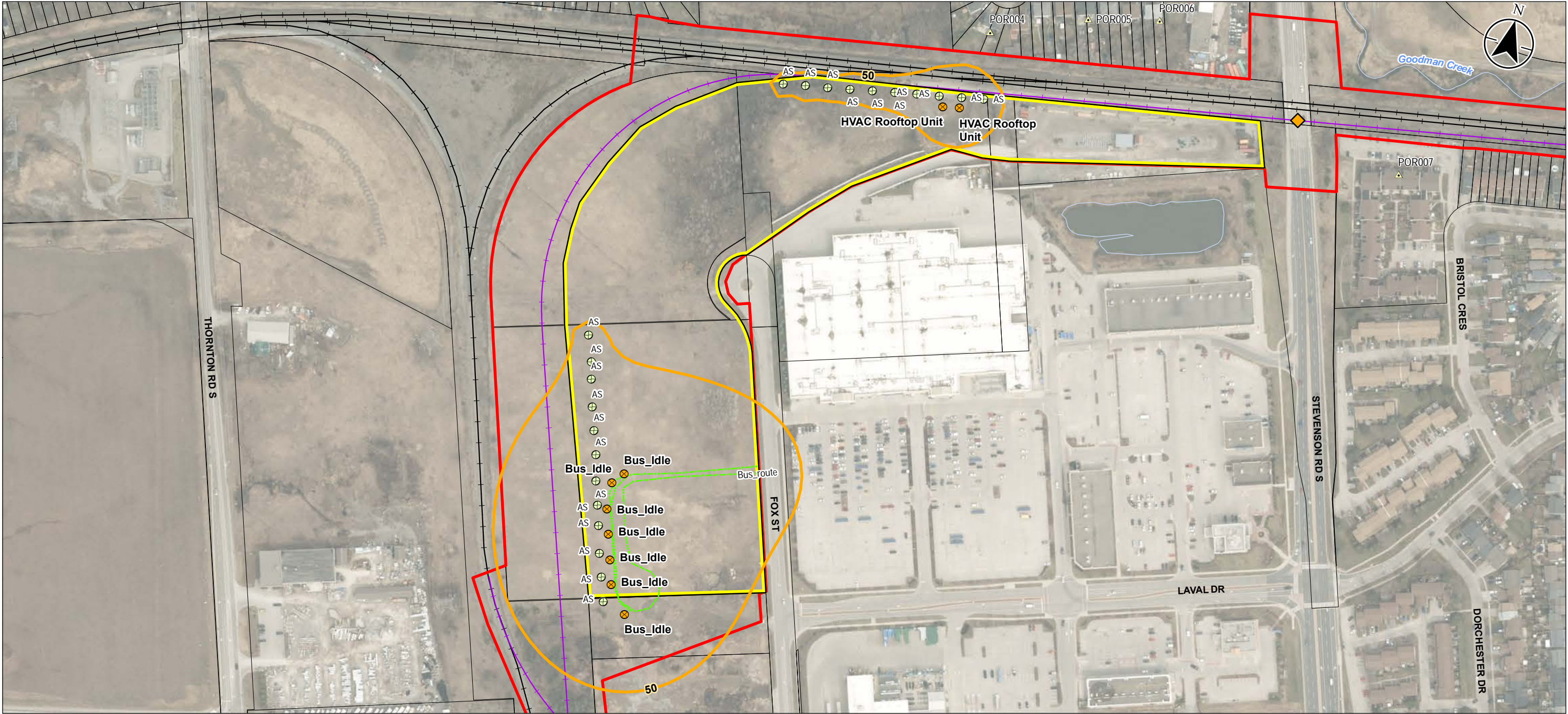
Stantec recommends that additional noise and vibration monitoring be conducted during the detailed design phase of the Project. These measurements should be collected to confirm that modelled ambient noise levels are a conservative estimate of existing ambient sound levels and that measured vibration levels are also representative of the existing conditions along the project corridor.

Noise and vibration monitoring may be challenging given the varying schedule and composition of the freight movements along the CP rail line.

Stantec also recommends that an additional set of validation measurements be collected after the commissioning of the Project to validate modelled sound levels.

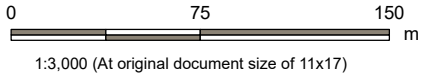


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- Project Footprint
  - Proposed Bridge Expansion
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Representative Receptor
  - Point Source
  - Announcement Speaker Point Source
  - Daytime Mitigated Stationary Noise Impact Contour Plot – 4.5 m AG
  - Line Source



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Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
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ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.

**6.5.1**

Title

**TOC – Daytime Mitigated Stationary Noise  
Impact Contour Plot – 4.5 m AG**

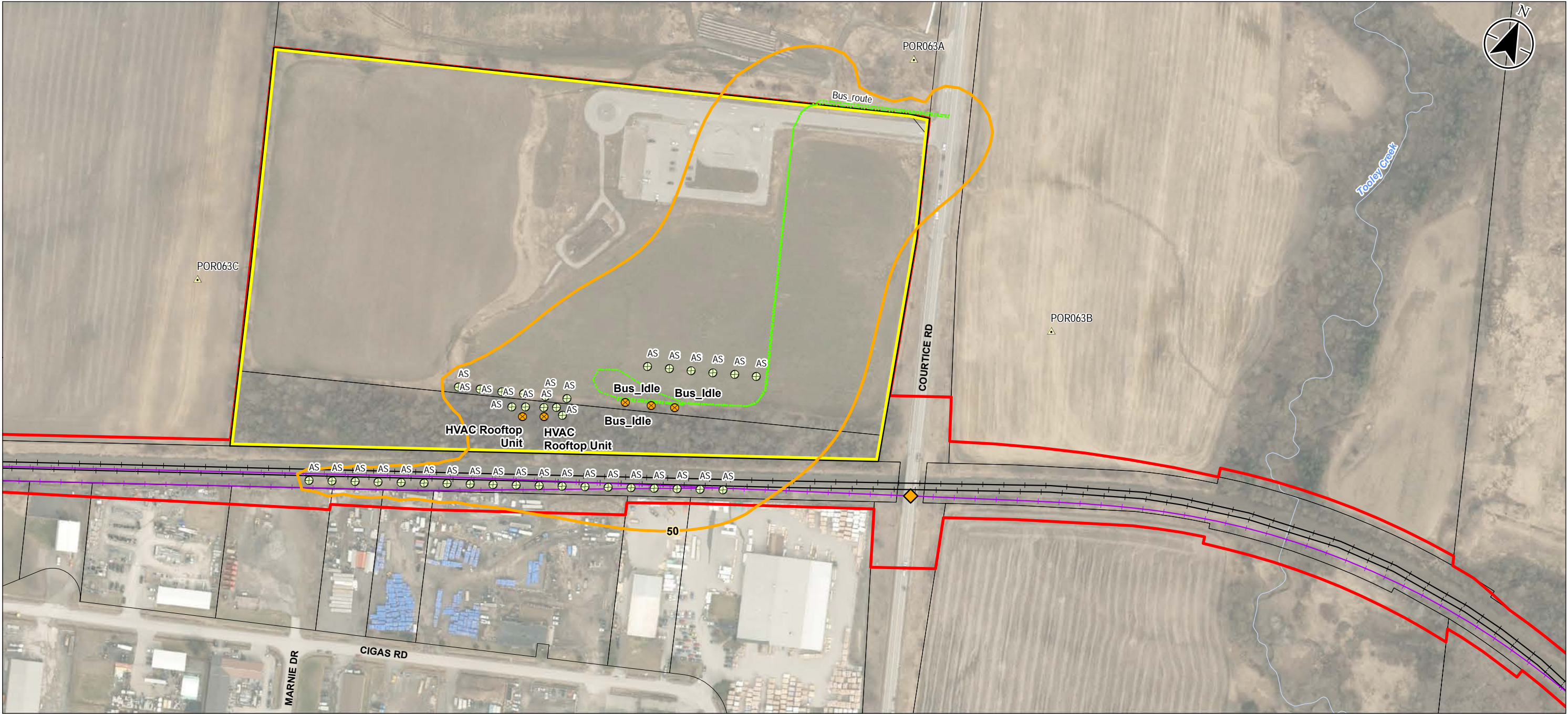
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  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Representative Receptor
  - Point Source
  - Announcement Speaker Point Source
  - Daytime Mitigated Stationary Noise Impact Contour Plot – 4.5 m AG
  - Line Source

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Figure No.

6.5.3

Title

**TOC – Daytime Mitigated Stationary Noise  
Impact Contour Plot – 4.5 m AG**

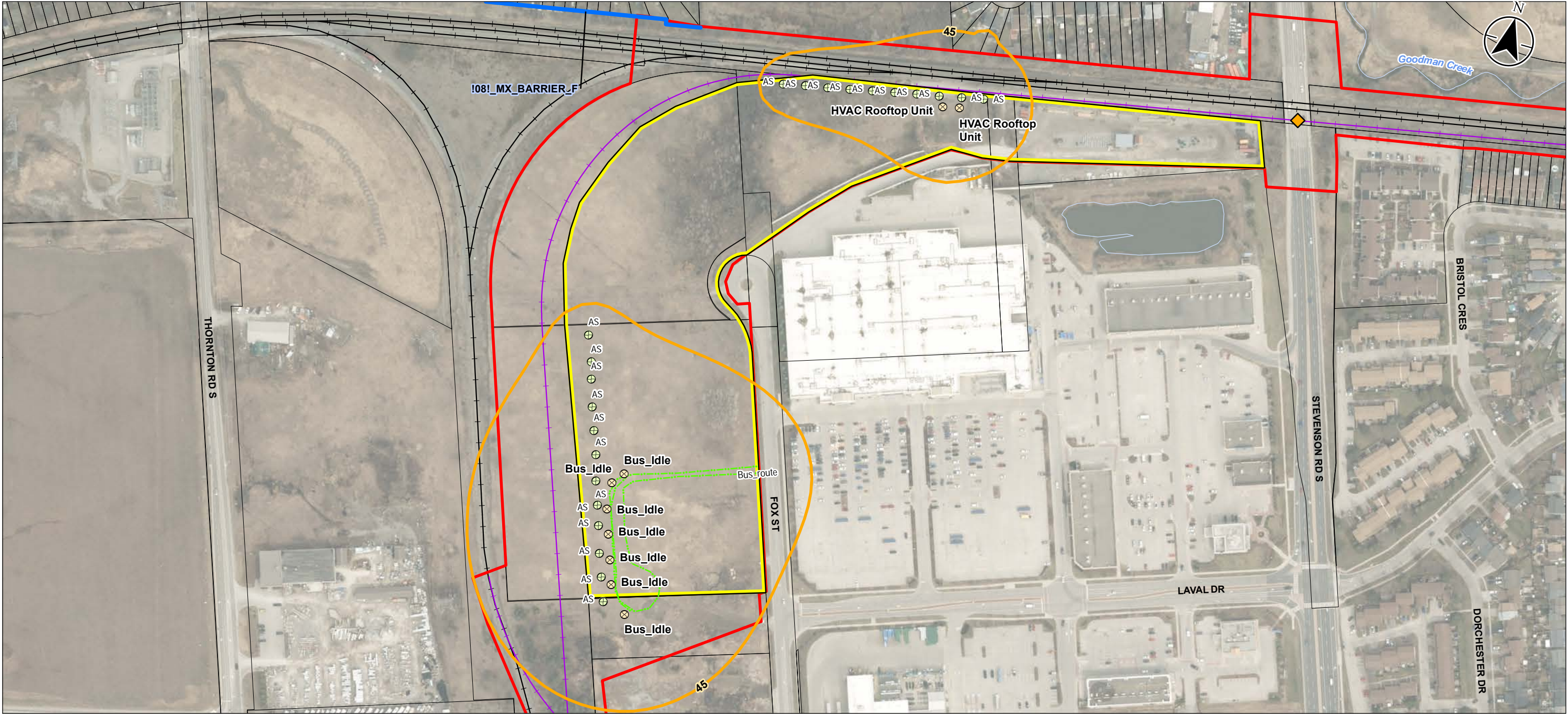
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- Legend**
- Project Footprint
  - Proposed Bridge Expansion
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  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Point Source
  - Announcement Speaker Point Source
  - Recommended Noise Walls
  - Nighttime Mitigated Stationary Noise Impact Contour Plot - 4.5 m AG
  - Line Source

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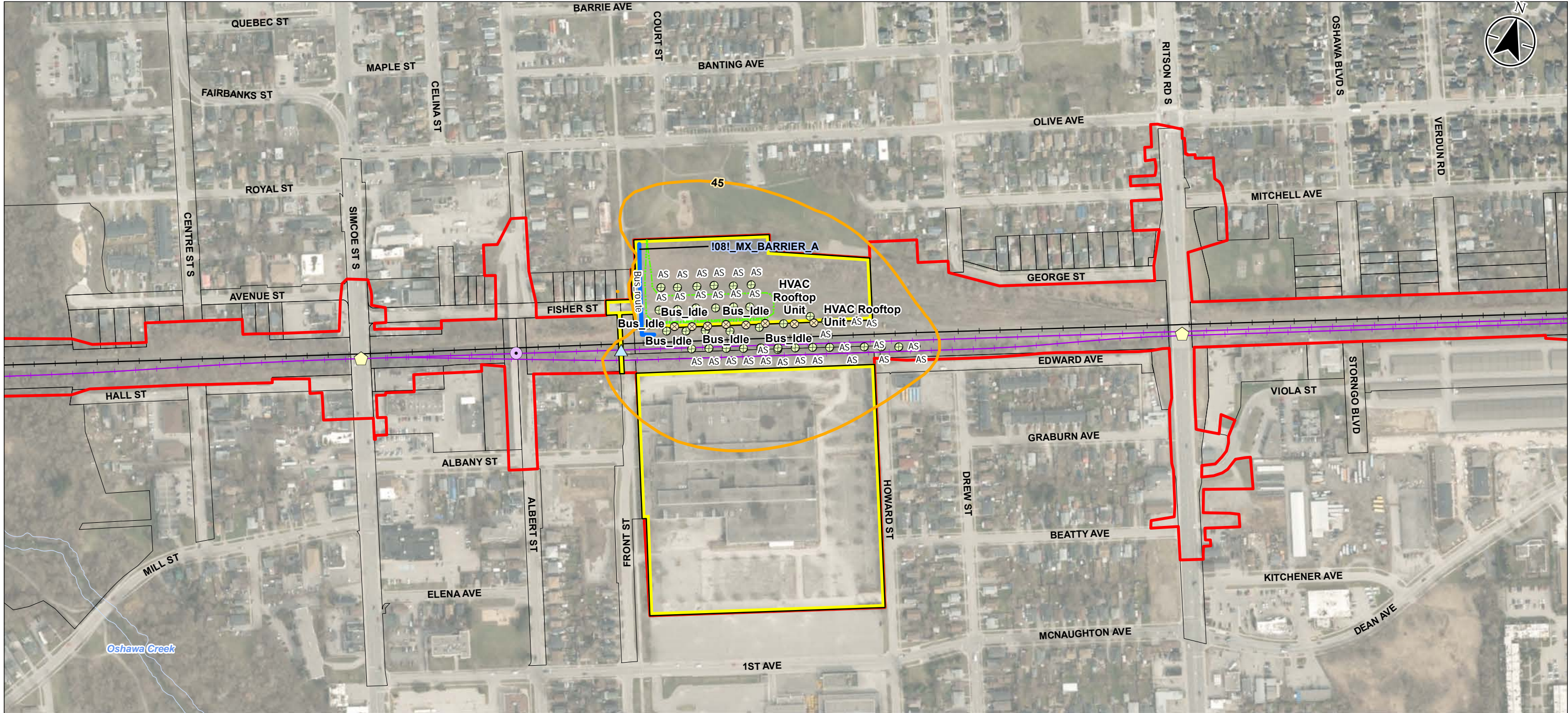
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**6.5.5**

Title  
**TOC – Nighttime Mitigated Stationary  
Noise Impact Contour Plot – 4.5 m AG**

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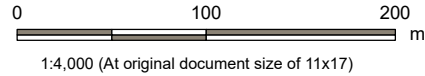


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  - Proposed Bridge Removal
  - Proposed New Multi-Use Grade-Separated Crossing
  - Existing Railway
  - Proposed GO Track(s)
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  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Point Source
  - Announcement Speaker Point Source
  - Recommended Noise Walls
  - Nighttime Mitigated Stationary Noise Impact Contour Plot – 4.5 m AG
  - Line Source



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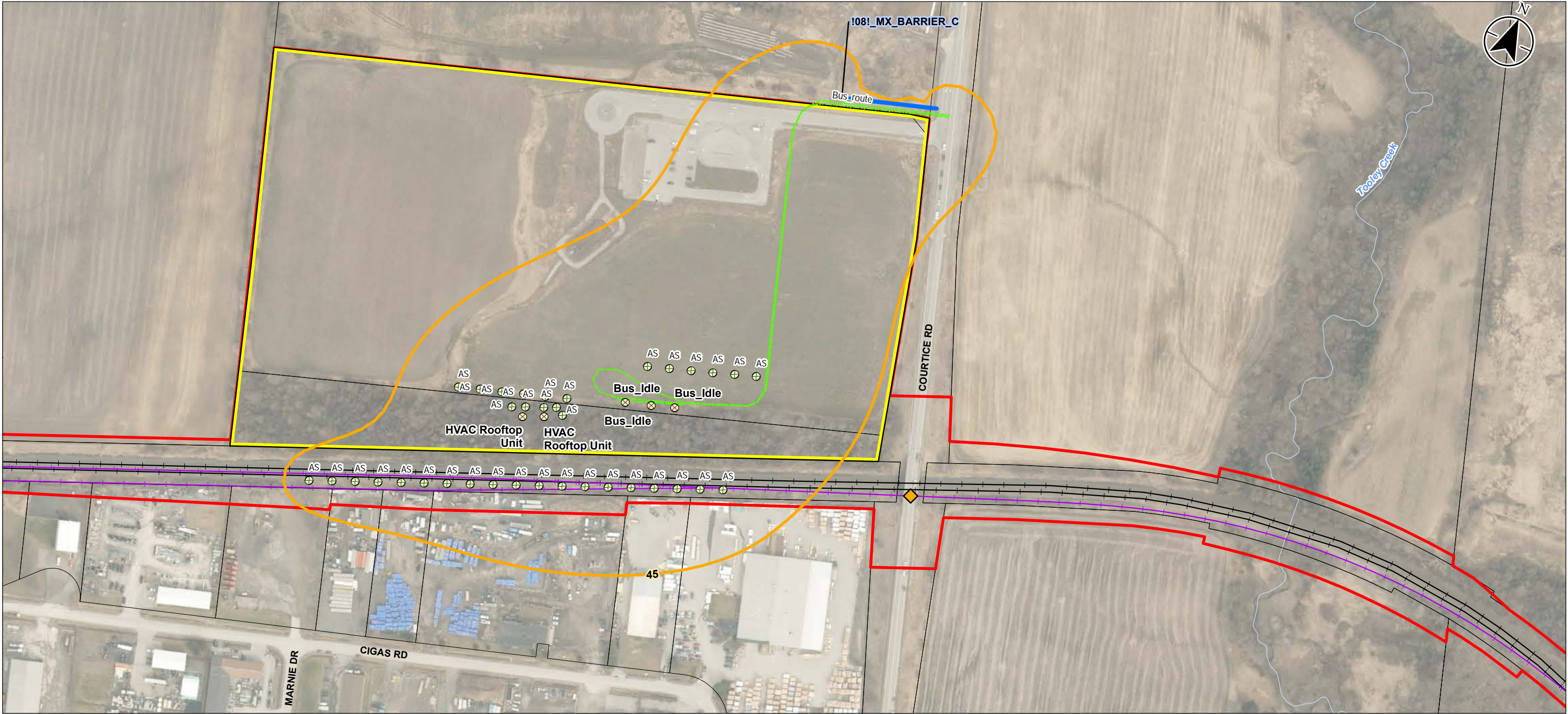
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Title  
**TOC – Nighttime Mitigated Stationary  
Noise Impact Contour Plot – 4.5 m AG**

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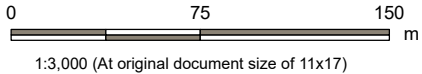


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  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Point Source
  - Announcement Speaker Point Source
  - Recommended Noise Walls
  - Nighttime Mitigated Stationary Noise Impact Contour Plot - 4.5 m AG
  - Line Source



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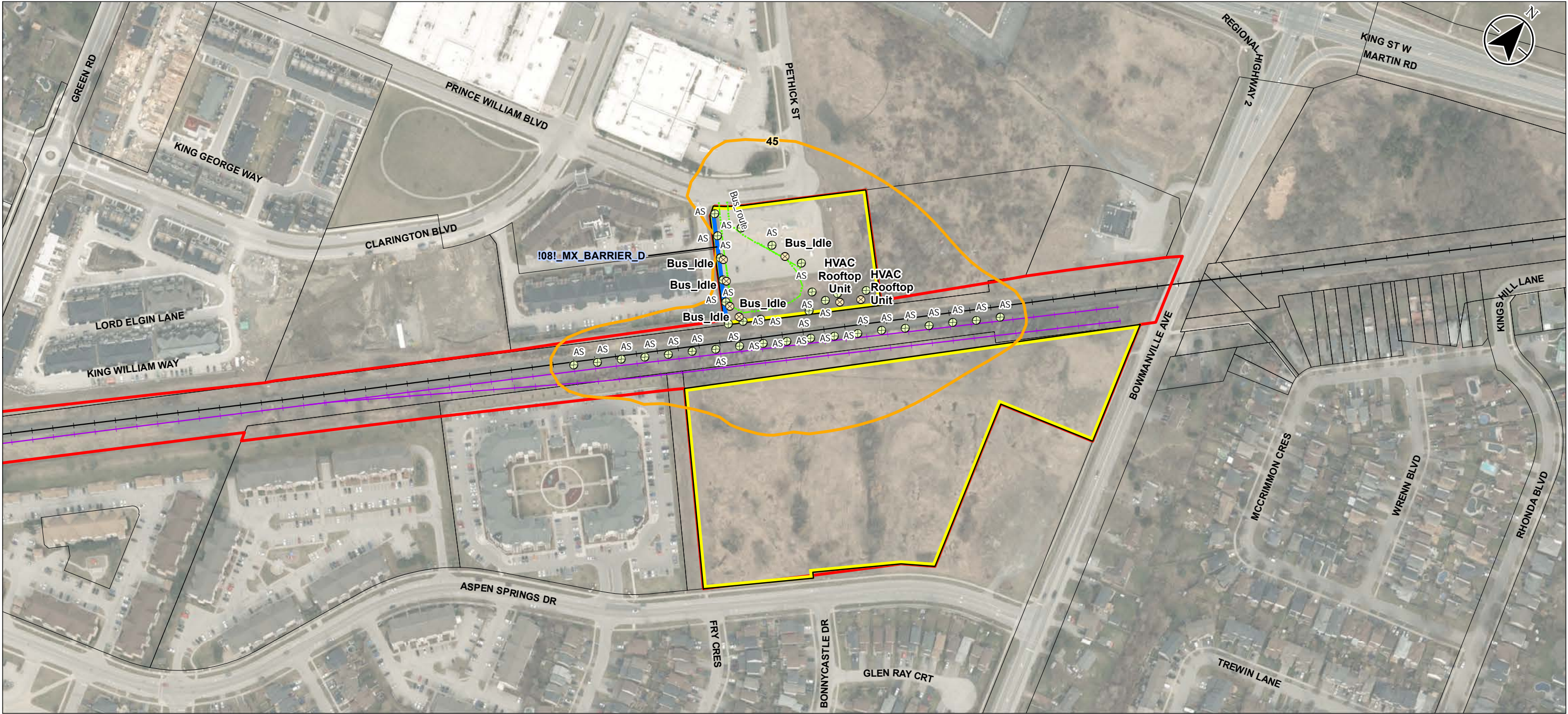
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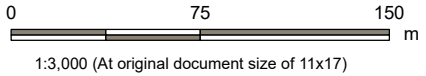


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- Legend**
- Project Footprint
  - Existing Railway
  - Proposed GO Track(s)
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Point Source
  - Announcement Speaker Point Source
  - Recommended Noise Walls
  - Nighttime Mitigated Stationary Noise Impact Contour Plot – 4.5 m AG
  - Line Source



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Figure No.  
**6.5.8**

Title  
**TOC – Nighttime Mitigated Stationary  
Noise Impact Contour Plot – 4.5 m AG**

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- Legend**
- Project Footprint
  - Existing Railway
  - Proposed GO Track(s)
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Point Source
  - Announcement Speaker Point Source
  - Recommended Noise Walls
  - Layover Facility – Daytime Mitigated Stationary Noise Impact Contour Plot

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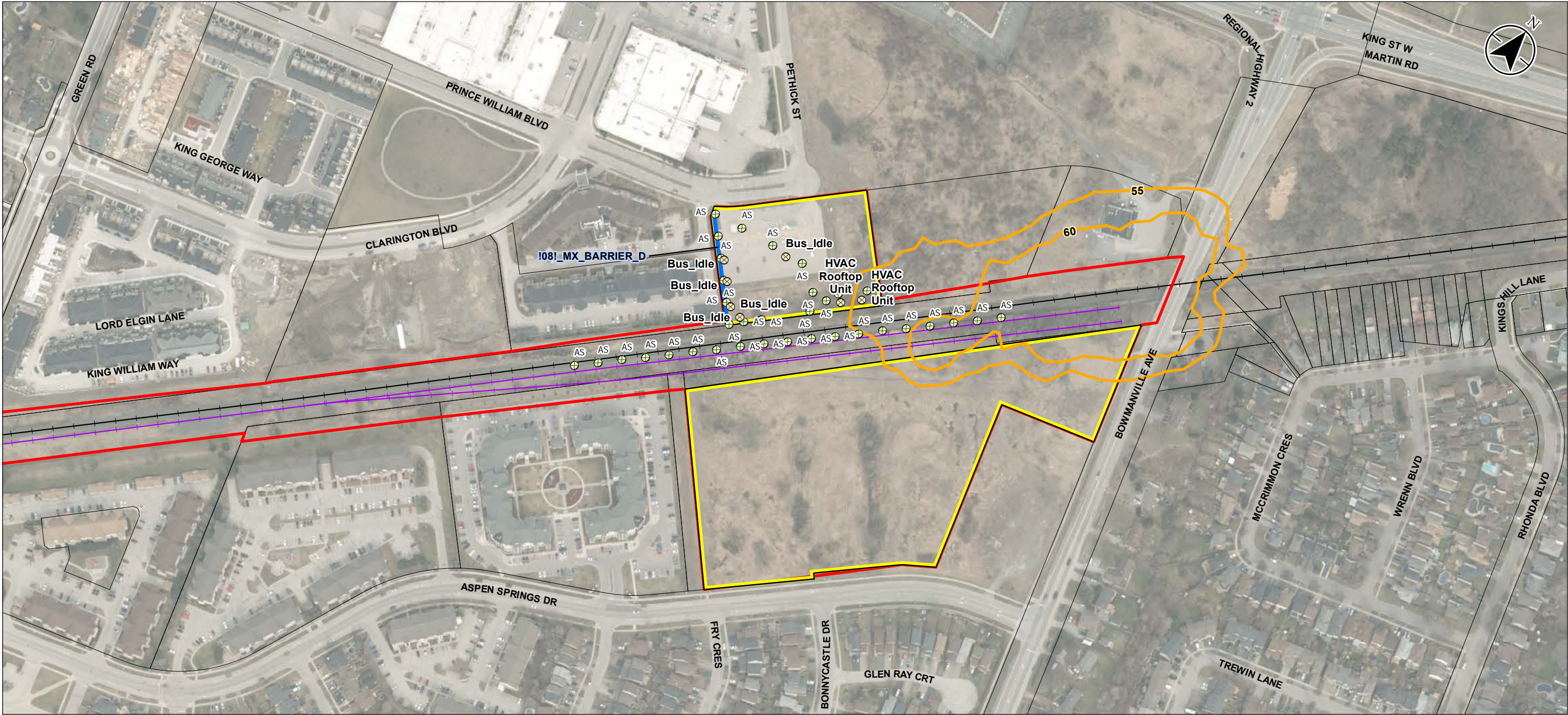
Figure No.  
**6.5.9**

Title  
**Layover Facility – Daytime Mitigated  
Stationary Noise Impact Contour Plot – 4.5  
m AG**

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- Legend**
- Project Footprint
  - Existing Railway
  - Proposed GO Track(s)
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Point Source
  - Recommended Noise Walls
  - Layover Facility – Nighttime Mitigated Stationary Noise Impact Contour

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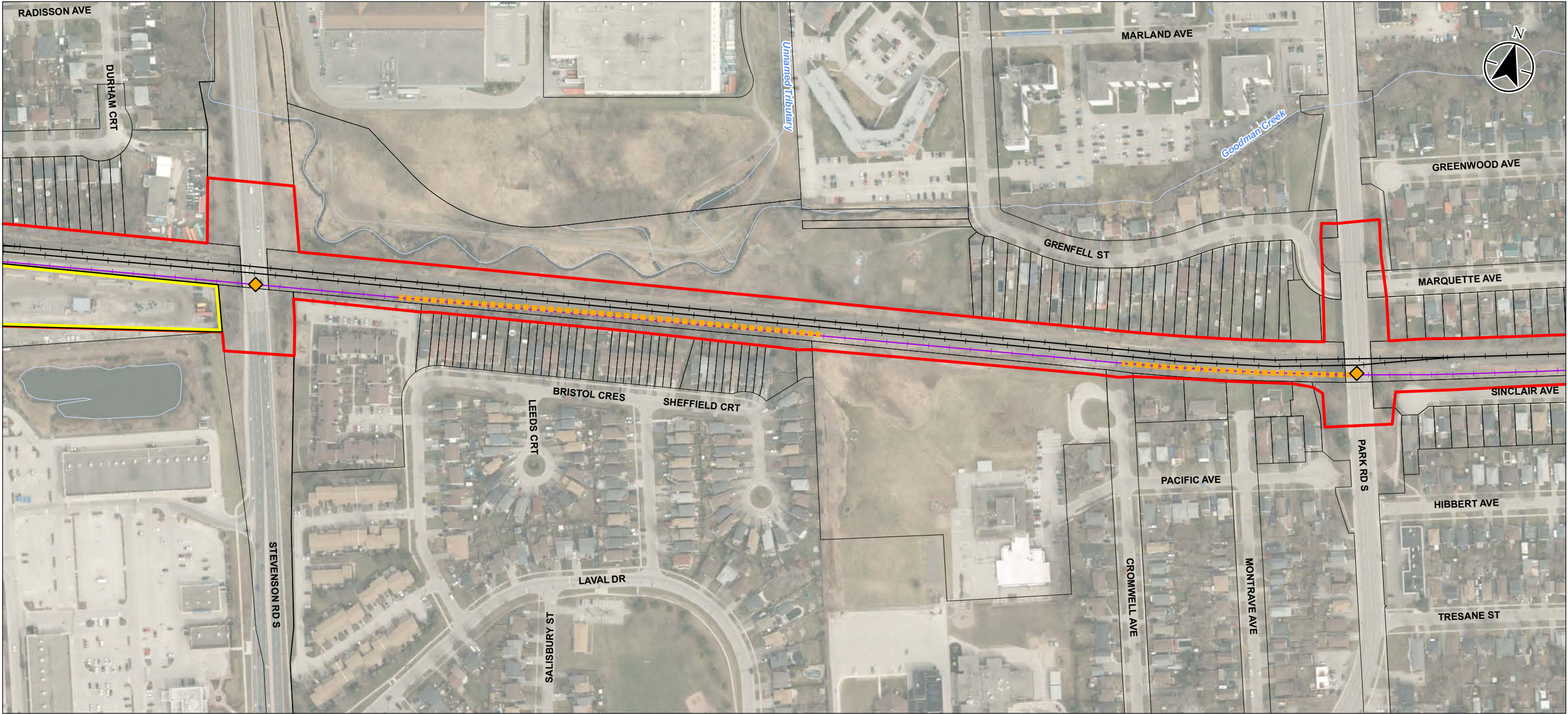
Figure No.  
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Title  
**Layover Facility – Nighttime Mitigated  
Stationary Noise Impact Contour Plot – 4.5  
m AG**

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- Project Footprint
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  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Track Section Requiring Ballast Mats

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Figure No.

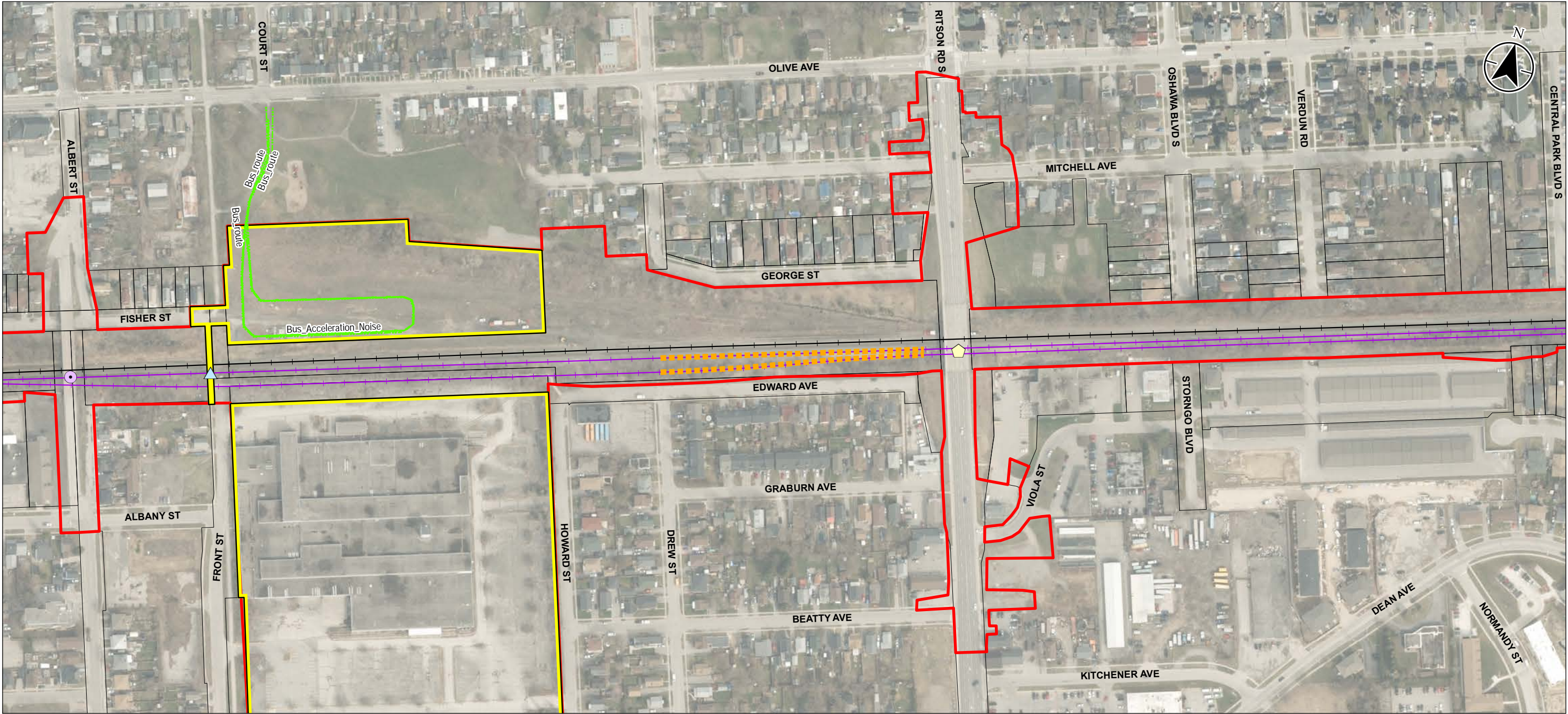
**6.6.1**

Title  
**Vibration Mitigation – Track Section  
Requiring Ballast Mats**

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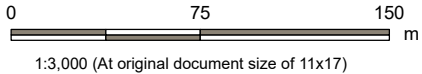
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  - Track Section Requiring Ballast Mats



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Figure No.

**6.6.2**

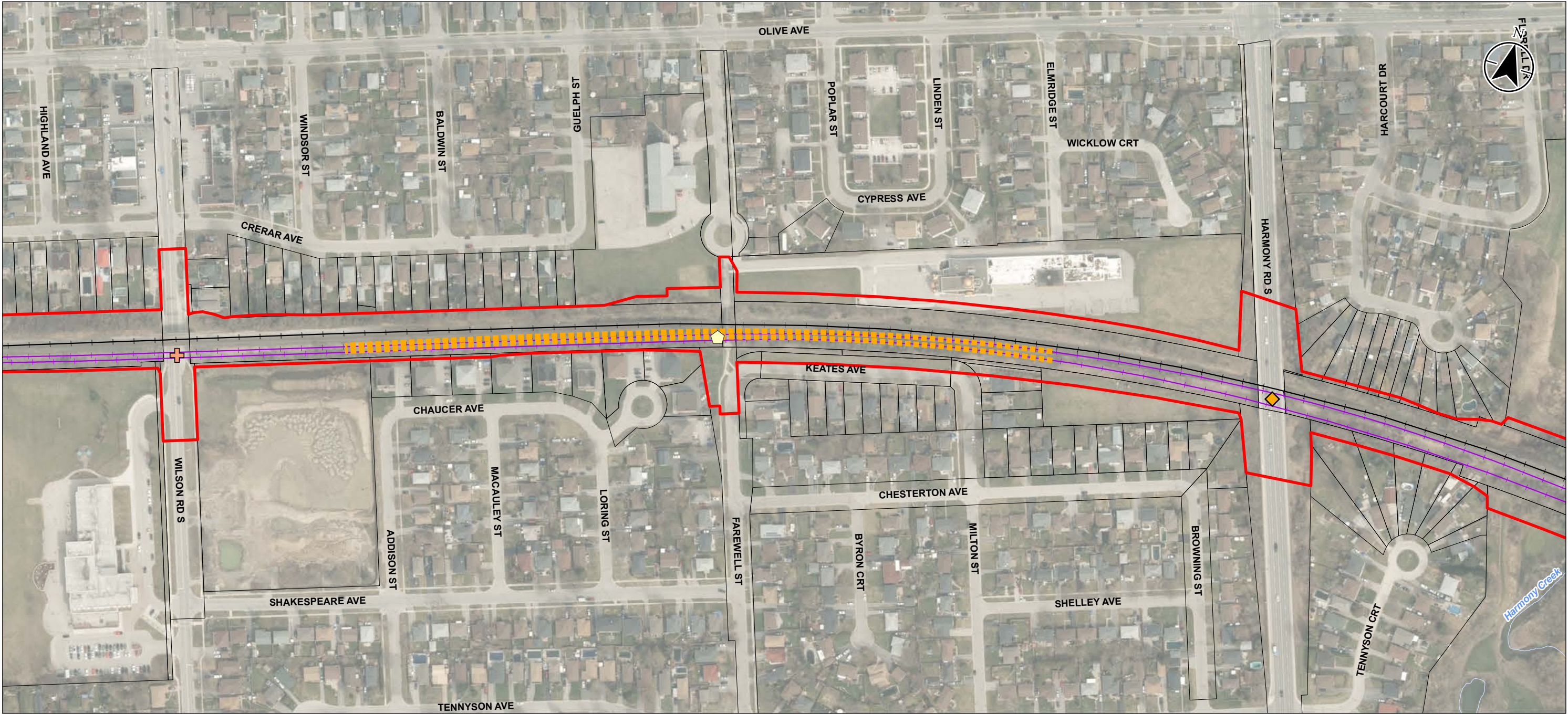
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**Vibration Mitigation – Track Section  
Requiring Ballast Mats**

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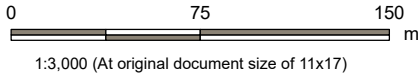


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- Project Footprint
  - Proposed New Bridge
  - Proposed Bridge Replacement
  - Proposed Bridge Expansion
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Track Section Requiring Ballast Mats



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Figure No.

**6.6.3**

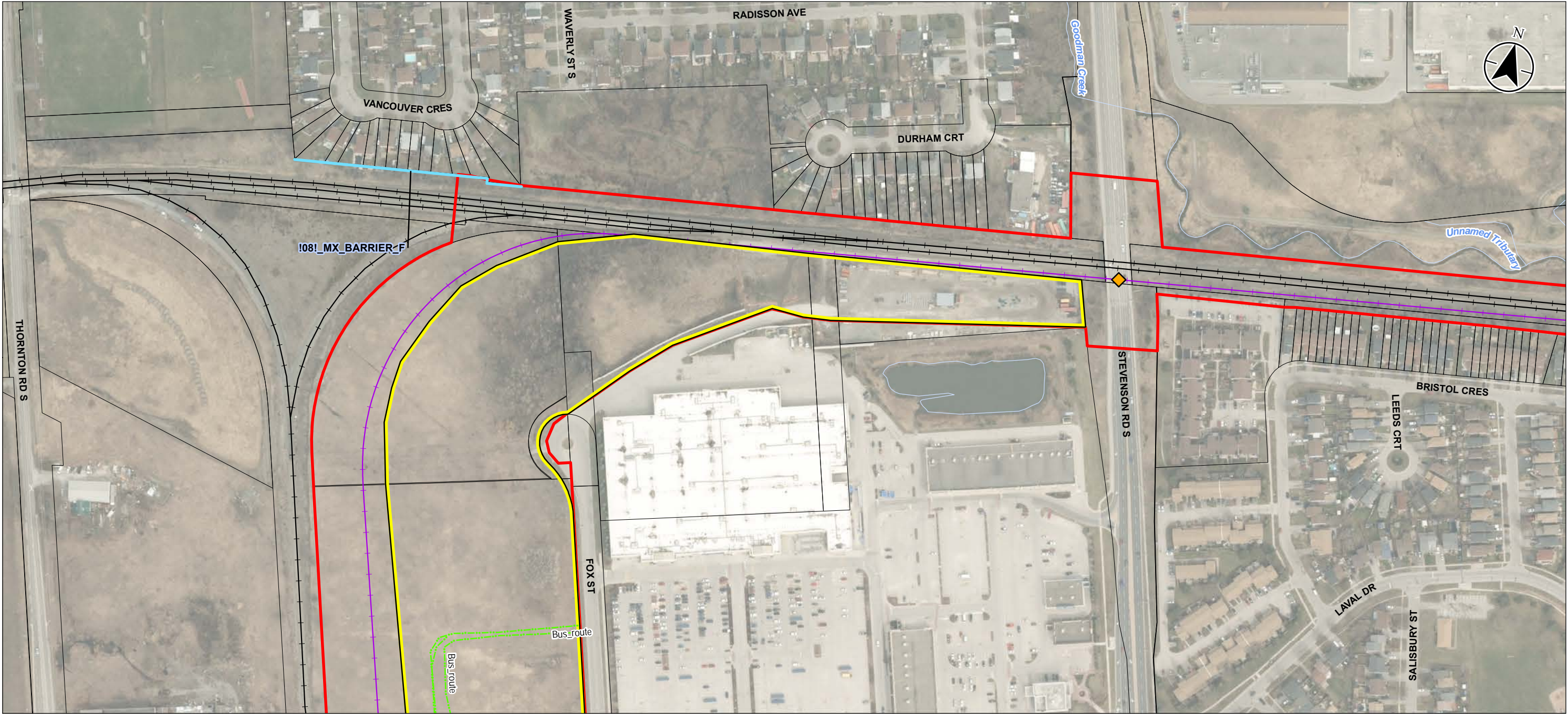
Title

**Vibration Mitigation – Track Section  
Requiring Ballast Mats**

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- Legend**
- Project Footprint
  - ◆ Proposed Bridge Expansion
  - +—+—+— Existing Railway
  - — — — Proposed GO Track(s)
  - ~~~~~ Watercourse
  - Waterbody
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - — — — Recommended Noise Walls
  - .-.-.- Line Source

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Figure No.  
**6.7.1**

Title  
**Operational Noise Mitigation – Noise Wall Locations**

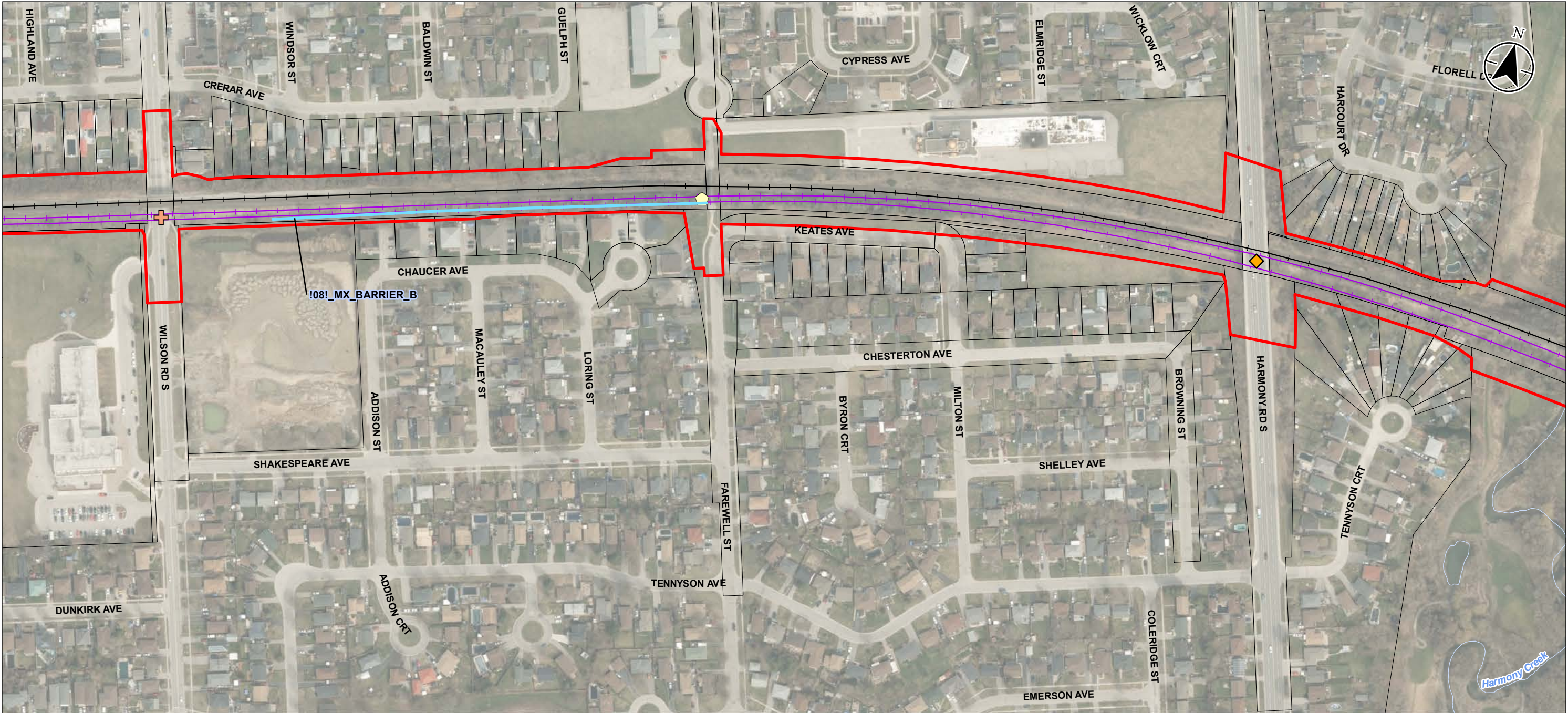
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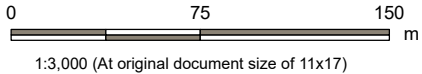


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- Notes**
1. Coordinate System: NAD 1983 CSRS MTM 10
  2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
  3. Orthoimagery © First Base Solutions, 2023. Imagery Date, 2022.

- Legend**
- Project Footprint
  - + Proposed New Bridge
  - Proposed Bridge Replacement
  - Proposed Bridge Expansion
  - + Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Recommended Noise Walls



Project Location  
Region Municipality  
of Durham

165011019 REVA  
Prepared by BCC on 2023-06-05

Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.

**6.7.3**

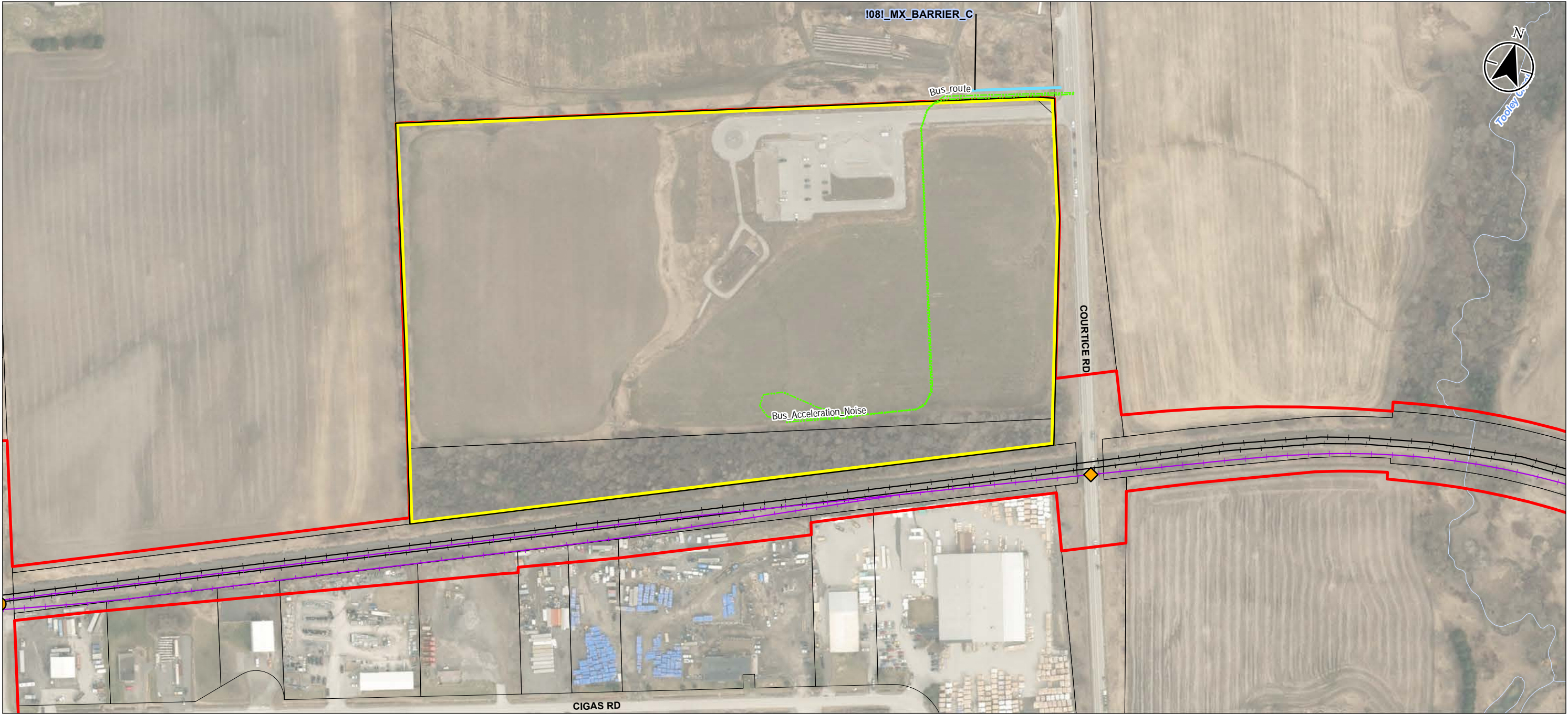
Title

**Operational Noise Mitigation – Noise Wall  
Locations**

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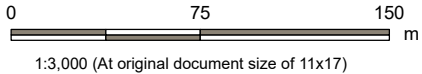


\\ad215-rplsa\01\work\_group\0165011019 - Bowmanville\02 - Amendment2 - Assignment11 - data\figs\cad\figs\env\env\report\_figures\20230223\_Noise\_Report\165011019\_NR\_Fig06.7\_BannerWall.mxd      Revised: 2023-06-05 By: bowmpar



**Notes**  
1. Coordinate System: NAD 1983 CSRS MTM 10  
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.  
3. Orthoimagery © First Base Solutions, 2023. Imagery Date, 2022.

- Legend**
- Project Footprint
  - Proposed Upgrades to At-Grade Crossing
  - Proposed Bridge Expansion
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Waterbody
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Recommended Noise Walls
  - Line Source



Project Location: Region of Durham  
165011019 REVA  
Prepared by BCC on 2023-06-05

Client/Project: METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

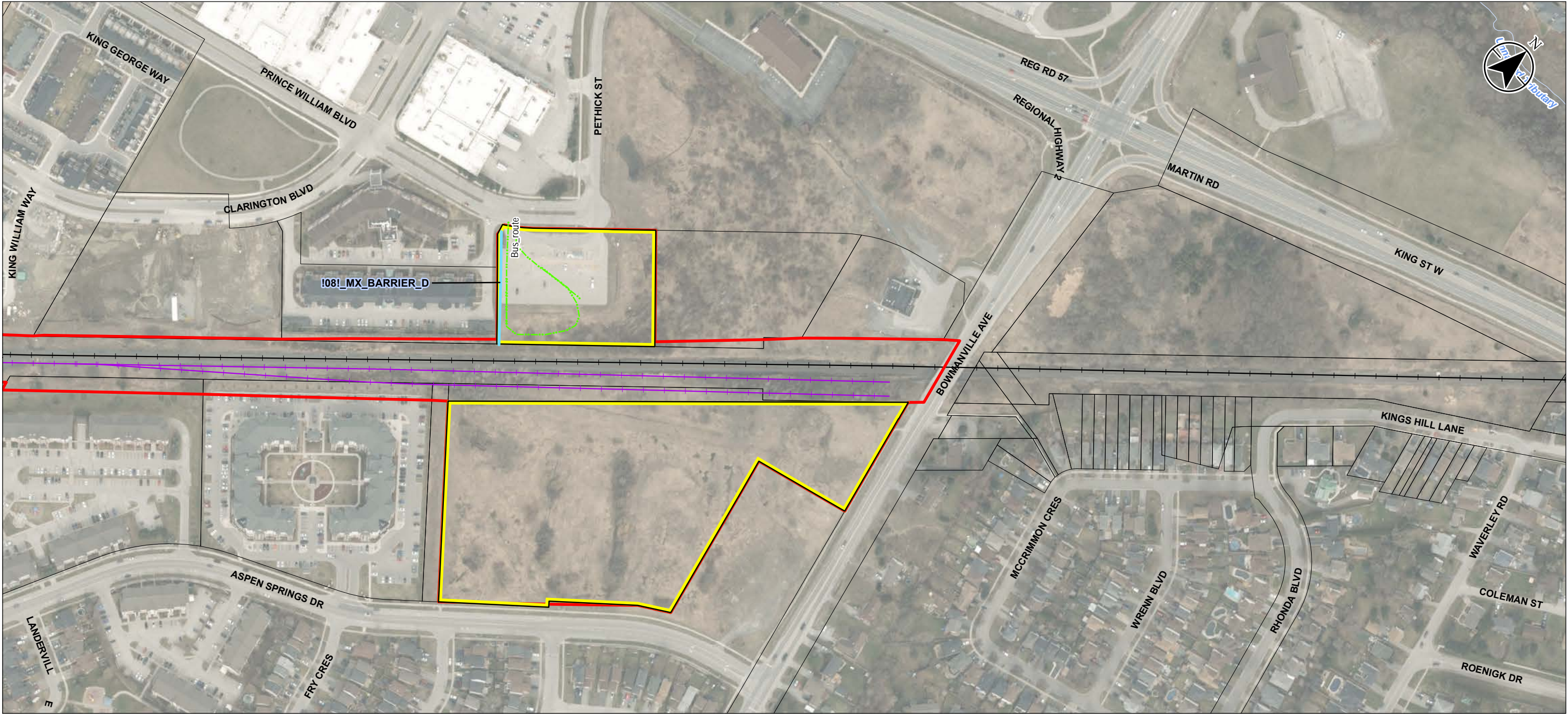
Figure No.: **6.7.4**

Title: **Operational Noise Mitigation – Noise Wall Locations**

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- Legend**
- Project Footprint
  - Existing Railway
  - Proposed GO Track(s)
  - Watercourse
  - Property Boundary
  - Proposed Transit Oriented Community Location
  - Recommended Noise Walls
  - Line Source

**Notes**

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- Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
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Project Location  
Region of Durham  
165011019 REVA  
Prepared by BCC on 2023-06-05

Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL SERVICE  
EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.  
**6.7.5**

Title  
**Operational Noise Mitigation – Noise Wall Locations**

0 75 150 m  
1:3,000 (At original document size of 11x17)

## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

**Table 6.12: Mitigated Rail Operational Noise Levels**

Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR001	Façade	65	66	60	60	-5	-6
	OLA	67	-	60	60	-7	-
POR002	Façade	66	66	64	62	-2	-5
	OLA	67	-	60	59	-8	-
POR003	Façade	63	63	65	63	2	0
	OLA	65	-	64	63	-1	-
POR004	Façade	66	66	68	67	3	1
	OLA	67	-	70	69	3	-
POR005	Façade	64	64	66	65	2	1
	OLA	65	-	68	67	3	-
POR006	Façade	65	63	67	65	2	1
	OLA	66	-	68	66	2	-
POR007	Façade	66	64	68	66	3	2
	OLA	67	-	70	68	3	-
POR008	Façade	65	65	69	67	4	2
	OLA	66	-	70	69	4	-
POR009	Façade	65	66	70	68	4	2
	OLA	67	-	71	69	4	-
POR010	Façade	63	63	65	64	3	1
	OLA	66	-	68	68	2	-





## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR011	Façade	65	66	68	67	3	1
	OLA	66	-	69	68	3	-
POR012	Façade	63	62	65	64	2	1
	OLA	64	-	66	65	2	-
POR013	Façade	65	65	68	67	4	2
	OLA	66	-	70	69	4	-
POR014	Façade	66	66	70	68	4	2
	OLA	67	-	71	70	4	-
POR015	Façade	67	67	69	68	2	1
	OLA	68	-	70	69	2	-
POR016	Façade	65	66	67	67	2	1
	OLA	66	-	69	68	2	-
POR017	Façade	65	66	68	67	2	1
	OLA	67	-	69	#N/A	2	-
POR018	Façade	64	63	67	65	3	2
	OLA	60	-	61	60	1	-
POR019	Façade	64	64	68	67	4	2
	OLA	60	-	61	59	1	-
POR020	Façade	64	65	68	67	4	2
	OLA	64	-	67	66	3	-



## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring

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Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR021	Façade	64	64	67	66	4	2
	OLA	60	-	62	61	2	-
POR022	Façade	64	64	68	66	3	2
	OLA	64	-	66	65	3	-
POR023	Façade	66	65	68	66	2	1
	OLA	64	-	65	62	1	-
POR024	Façade	65	65	67	67	2	1
	OLA	66	-	69	68	2	-
POR025	Façade	65	65	67	66	2	1
	OLA	66	-	68	68	2	-
POR026	Façade	67	67	69	68	2	1
	OLA	69	-	71	70	2	-
POR027	Façade	65	64	66	65	1	0
	OLA	60	-	60	58	0	-
POR028	Façade	65	65	66	65	1	0
	OLA	59	-	59	58	0	-
POR029	Façade	63	63	64	64	2	1
	OLA	59	-	59	58	0	-
POR030	Façade	65	62	66	63	1	1
	OLA	64	-	64	60	0	-





## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring

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Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR031	Façade	65	65	68	67	3	1
	OLA	65	-	67	66	3	-
POR032	Façade	65	64	68	66	3	2
	OLA	63	-	63	60	0	-
POR033	Façade	67	68	70	69	3	1
	OLA	66	-	69	68	3	-
POR034	Façade	67	68	70	69	3	1
	OLA	66	-	69	68	3	-
POR035	Façade	67	67	70	69	3	1
	OLA	64	-	67	66	3	-
POR036	Façade	63	64	67	66	4	2
	OLA	64	-	68	67	4	-
POR037	Façade	62	63	66	64	3	2
	OLA	63	-	67	66	4	-
POR038	Façade	63	63	65	65	2	1
	OLA	64	-	67	66	3	-
POR039	Façade	65	64	67	65	2	1
	OLA	66	-	68	66	2	-
POR040	Façade	65	65	68	67	4	2
	OLA	66	-	70	69	4	-



## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR041	Façade	64	64	68	67	4	3
	OLA	65	-	70	69	4	-
POR042	Façade	66	67	70	68	3	1
	OLA	68	-	68	65	0	-
POR043	Façade	66	67	70	69	4	2
	OLA	66	-	66	64	1	-
POR044	Façade	61	61	64	63	3	2
	OLA	60	-	62	61	3	-
POR045	Façade	66	66	68	67	2	1
	OLA	-	-	-	-	-	-
POR046	Façade	61	59	62	60	1	1
	OLA	63	-	64	60	0	-
POR047	Façade	66	66	69	68	3	2
	OLA	67	-	70	69	3	-
POR048	Façade	63	63	66	64	2	1
	OLA	64	-	66	65	2	-
POR049	Façade	63	62	64	63	1	1
	OLA	64	-	66	65	2	-
POR050	Façade	64	65	66	66	2	1
	OLA	66	-	67	67	2	-





## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring

August 24, 2023

Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR051	Façade	63	63	66	65	2	1
	OLA	65	-	67	66	3	-
POR052	Façade	63	63	64	64	2	1
	OLA	64	-	66	66	2	-
POR053	Façade	62	62	64	63	2	1
	OLA	63	-	65	65	2	-
POR054	Façade	64	64	66	65	2	1
	OLA	65	-	67	67	2	-
POR055	Façade	64	64	65	65	2	1
	OLA	65	-	67	67	2	-
POR056	Façade	66	66	68	68	2	1
	OLA	67	-	69	69	2	-
POR057	Façade	66	66	67	67	1	1
	OLA	66	-	68	67	2	-
POR058	Façade	68	68	69	69	1	1
	OLA	69	-	70	70	1	-
POR059	Façade	69	70	70	70	1	0
	OLA	71	-	71	71	1	-
POR060	Façade	69	69	70	70	1	0
	OLA	70	-	71	71	1	-



## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR061	Façade	70	70	70	70	1	0
	OLA	71	-	72	71	1	-
POR062	Façade	70	70	71	71	1	0
	OLA	71	-	71	71	1	-
POR063	Façade	57	57	58	58	1	1
	OLA	57	-	59	58	1	-
POR064	Façade	63	61	65	63	1	1
	OLA	62	-	64	63	2	-
POR065	Façade	63	63	65	65	2	2
	OLA	64	-	67	66	3	-
POR066	Façade	62	62	64	63	2	2
	OLA	63	-	65	64	2	-
POR067	Façade	65	65	68	67	3	2
	OLA	66	-	69	69	3	-
POR068	Façade	60	61	65	64	4	2
	OLA	59	-	64	62	4	-
POR069	Façade	61	62	65	64	4	2
	OLA	62	-	67	65	4	-
POR070	Façade	61	61	65	64	4	2
	OLA	61	-	65	64	4	-





## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring

August 24, 2023

Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR071	Façade	60	61	64	63	5	2
	OLA	58	-	62	61	4	-
POR072	Façade	63	64	66	65	4	2
	OLA	63	-	67	66	4	-
POR073	Façade	62	63	66	65	4	2
	OLA	64	-	67	67	4	-
POR074	Façade	62	63	66	65	3	2
	OLA	63	-	67	66	4	-
POR075	Façade	61	62	65	64	4	2
	OLA	53	-	54	52	1	-
POR076	Façade	62	63	66	65	3	2
	OLA	63	-	66	66	3	-
POR077	Façade	63	64	67	66	3	2
	OLA	64	-	67	66	3	-
POR078	Façade	64	65	66	66	3	1
	OLA	64	-	66	66	2	-
POR079	Façade	63	64	66	65	2	1
	OLA	64	-	66	66	2	-
POR080 <sup>2</sup>	Façade	63	64	66	65	3	1
	OLA	56	-	56	53	0	-



## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring

August 24, 2023

Receptor ID	Receptor Location	Project Daytime Sound Levels (dBA) Leq(16)	Project Nighttime Sound Levels (dBA) Leq(8)	Mitigated Project Daytime Sound Levels (dBA) Leq(16)	Mitigated Project Nighttime Sound Levels (dBA) Leq(8)	Daytime Noise Reduction (dB) <sup>1</sup>	Nighttime Noise Reduction (dB) <sup>1</sup>
POR081	Façade	62	63	66	65	4	2
	OLA	64	-	68	67	4	-
POR082	Façade	62	63	66	65	4	2
	OLA	64	-	68	67	4	-
POR083	Façade	63	64	66	65	3	2
	OLA	55	-	56	53	1	-
POR084	Façade	63	64	66	65	4	2
	OLA	56	-	57	54	1	-
POR091	Façade	64	65	66	65	2	1
	OLA	-	-	-	-	-	-
POR092	Façade	66	67	69	68	3	1
	OLA	65	65	68	67	3	2
POR093	Façade	63	61	64	62	1	1
	OLA	-	-	-	-	-	-
POR094	Façade	63	62	64	62	1	0
	OLA	-	-	-	-	-	-
POR095	Façade	62	62	64	63	2	1
	OLA	-	-	-	-	-	-

<sup>1</sup> Discrepancy in noise reduction is due to sound levels rounded to the nearest whole number

<sup>2</sup> Noise mitigation is unfeasible due to the height of the POR and proximity to the right-of-way





## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

**Table 6.13: Mitigated GO Station/Layover Facility Sound Levels**

GO Station/ Layover Facility	Receptor ID	Receptor Location	Daytime Impact (dBA) $L_{eq}(1hr)$	Nighttime Impact (dBA) $L_{eq}(1hr)$	NPC-300 Class 1 Daytime Criteria (dBA) $L_{eq}(1hr)$	NPC-300 Class 1 Nighttime Criteria (dBA) $L_{eq}(1hr)$	Mitigation Needed? (Yes or No)
B1 Station	POR001	Façade	33	29	50	45	No
		OLA	31	-	50	-	No
	POR002	Façade	35	33	50	45	No
		OLA	33	-	50	-	No
	POR003	Façade	38	36	50	45	No
		OLA	37	-	50	-	No
	POR004	Façade	45	44	50	45	No
		OLA	46	-	50	-	No
B2 Station	POR28A	Façade	43	39	50	45	No
		OLA	43	-	50	-	No
	POR28B	Façade	46	44	50	45	No
		OLA	47	-	50	-	No
	POR28C	Façade	46	43	50	45	No
		OLA	48	-	50	-	No
B3 Station	POR063	Façade	32	29	50	45	No
		OLA	29	-	50	-	No
	POR063A	Façade	45	41	50	45	No
		OLA	46	-	50	-	No
	POR063B	Façade	46	42	50	45	No
		OLA	-	-	50	-	No



## Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report

Potential Effects, Mitigation and Monitoring  
August 24, 2023

GO Station/ Layover Facility	Receptor ID	Receptor Location	Daytime Impact (dBA) $L_{eq}(1hr)$	Nighttime Impact (dBA) $L_{eq}(1hr)$	NPC-300 Class 1 Daytime Criteria (dBA) $L_{eq}(1hr)$	NPC-300 Class 1 Nighttime Criteria (dBA) $L_{eq}(1hr)$	Mitigation Needed? (Yes or No)
B4 Station	POR063C	Façade	40	37	50	45	No
		OLA	-	-	50	-	No
	POR080	Façade	43	42	50	45	No
		OLA	35	-	50	-	No
	POR080A	Façade	48	44	50	45	No
		OLA	35	-	50	-	No
	POR084	Façade	43	42	50	45	No
		OLA	23	-	50	-	No
	OLA093	Façade	42	39	50	45	No
		OLA	-	-	50	-	No
B4 Layover Facility	POR080	Façade	37	49	55	55	No
	POR080A	OLA	40	51	55	55	No
	POR084	Façade	36	48	55	55	No
	POR084a	OLA	32	52	55	55	No
	POR084b	Façade	32	43	55	55	No
		OLA	32	-	55	-	No
	POR093	Façade	40	59	55	55	Yes
		OLA	-	-	55	-	No





# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

Conclusions  
August 24, 2023

## **7.0 Conclusions**

Stantec was retained by Metrolinx to complete a Noise and Vibration Technical Report for the Project to support an Addendum to the Oshawa to Bowmanville Rail Service Extension EPR. The addendum is required to account for modifications to the Project which are inconsistent with the 2011 EPR. The Project will include expansion of approximately 21-kilometre (km) of rail corridor from Oshawa to Bowmanville, four proposed GO station locations, a layover facility with fueling capability, bridges, at-grade crossing widenings, and modifications to structures and utilities in order to facilitate the Project.

The emission-based noise assessment was completed for the construction equipment and the sound levels were compared to the MECP NPC-115 and NPC-118 limits. The construction equipment exceeding the MECP limits requires an investigation of additional noise control for the construction phase. Prior to start of construction, noise emissions of the construction equipment considered for the Project should be reviewed to confirm that they are within the NPC-115 and NPC-118 limits. If the limits cannot be met, noise control options should be investigated and implemented to bring them into compliance.

Receptor-based construction noise and vibration impacts for the Project were assessed with Metrolinx Environmental Guide criteria by establishing a ZOI. Project construction activities are expected to occur from 08:00 to 17:00 on weekdays; therefore, the noise ZOIs were established using the noise exposure limits for weekday construction during daytime only (e.g., 85 dBA, 80 dBA, 75 dBA, 70 dBA) for the applicable surrounding types of land uses (e.g., Industrial, Commercial, Residential, and Institutional). In the absence of construction activity/phase specific work areas, the noise ZOIs were established based on the Project Footprint.

The results of the construction noise assessment indicate that some residential, commercial and institutional land uses fall within the established ZOI. The potential residential, commercial and institutional areas impacted by the Project construction are identified in this report. Further, for each phase, the assessment provides the minimum setback distances for noise compliance with the applicable noise exposure limits. Noise wall in place of construction hoarding and construction operational changes are recommended for the areas impacted by construction noise. Construction noise monitoring is recommended for the areas where sound levels are expected to exceed after mitigation.



## **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

### Conclusions

August 24, 2023

Construction vibration impacts were evaluated by establishing vibration ZOI per the applicable vibration criteria provided in the Metrolinx Environmental Guide for structural damage. The assessment identifies potential areas impacted by the construction vibration and minimum setback distances required for the most impactful construction equipment for vibration compliance. Vibration monitoring is recommended for those areas potentially impacted by construction vibration if the minimum setback distances cannot be maintained.

Noise and vibration impact from the Project rail operations were assessed by completing pre-Project noise modelling and vibration measurements. The noise effects due to Project rail operations were predicted at 89 representative PORs and compared to the pre-project sound levels, as required by the guidelines. The analysis of the noise modeling results indicate that predicted effects resulted were above the MOEE/GO Draft Protocol limits at several PORs. Therefore, noise mitigation measures are recommended (Section 6.4) at two locations for Project rail operations.

In addition to the PORs considered for the corridor noise assessment, nine additional PORs were considered for assessing stationary noise impact from stations associated with the GO stations. GO stations are expected to be developed for mixed use with potential commercial and residential use. At the time of preparing this report, no information was available for GO stations. Therefore, they are not considered as receptors in this assessment. Stantec recommends further detailed studies be conducted once the design of the GO stations is advanced to evaluate compliance with the applicable MECP noise limits.

Stationary noise sources at the GO stations were assessed by predicting noise levels at the surrounding receptors and comparing with the applicable MECP limits. The assessment indicates that the sound levels generated by GO stations and layover facility operations are expected to exceed daytime and nighttime limits at some of the PORs in the area surrounding GO Station B2, B3 and B4, and the layover facility. As a result, noise walls are recommended for these GO stations and the layover facility (Section 6.4). Idling locomotives for the layover facility were modeled at the east end of trains stationed at the layover facility. If the locomotives are relocated to the west end of trains, sound levels at the PORs adjacent to the B4 GO Station are expected to exceed applicable criteria. It is recommended that the locomotives stationed at the layover facility be kept at the east end of the trains.





## **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

### Conclusions

August 24, 2023

The Project vibration impact from rail operations was assessed using measurements from two representative locations along the corridor. The future setback distances from the proposed GO rail track to the receptors were identified and pre-project measured vibration levels for that setback were used to assess potential vibration impact from the proposed GO rail operations. Based on the measured vibration levels from the existing CP Rail track, a criterion of 0.175 mm/s was considered for assessment of the Project vibration from operations at the existing PORs. A criterion of 0.14 mm/s was considered for the operation vibration assessment of the new developments.

Vibration levels are expected to be higher than the criteria limits at the receptors (dwellings) located within 30 m from the centerline of the proposed GO track. Ballast mats are recommended, subject to feasibility, as vibration mitigation for Project (Section 6.4).



# **Addendum to Oshawa to Bowmanville Rail Service Extension Environmental Project Report: Noise and Vibration Technical Report**

References

August 24, 2023

## **8.0 References**

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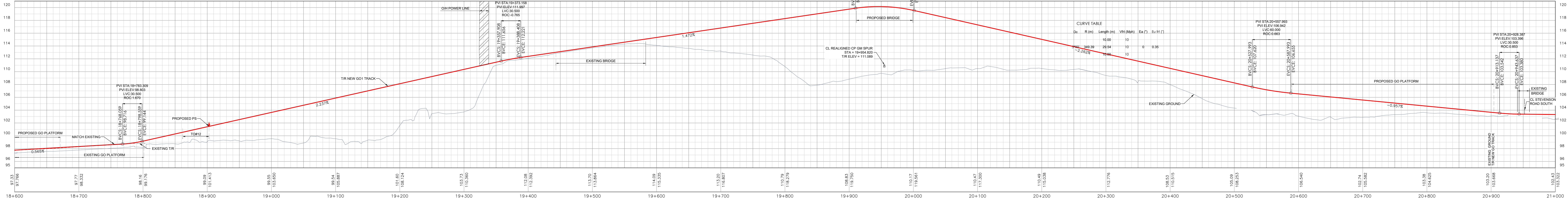
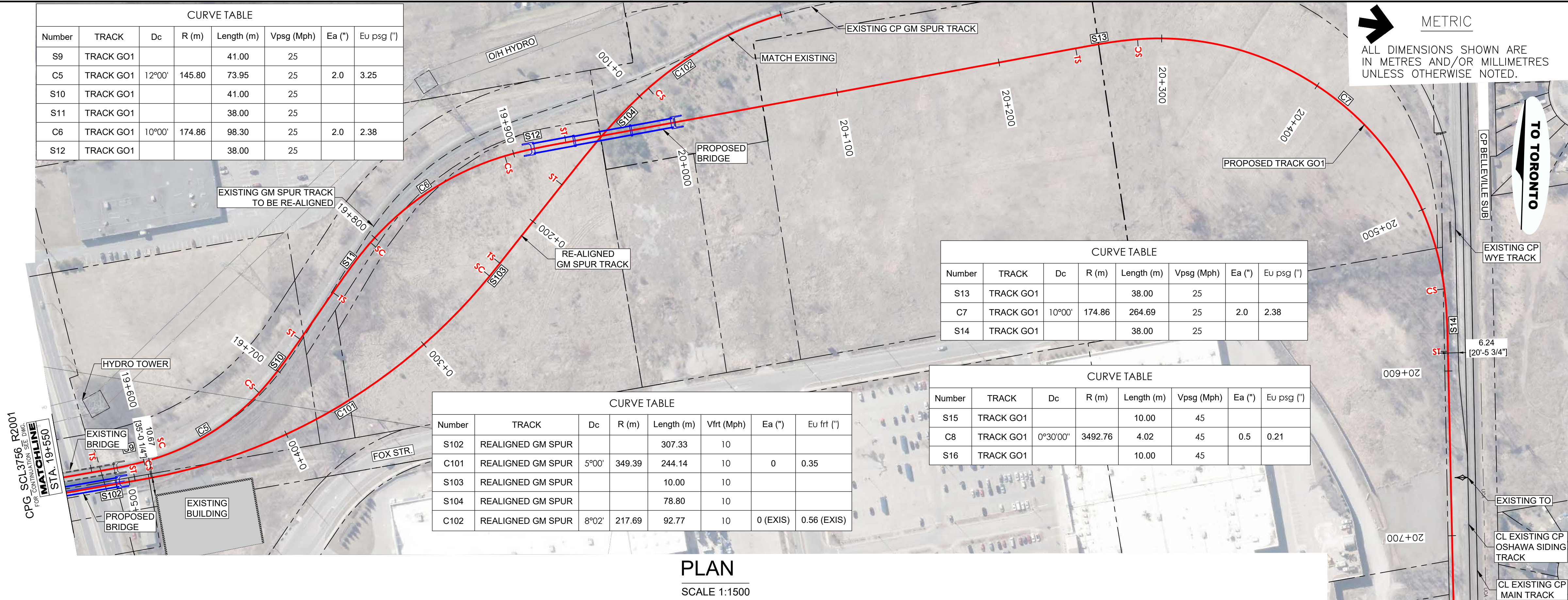
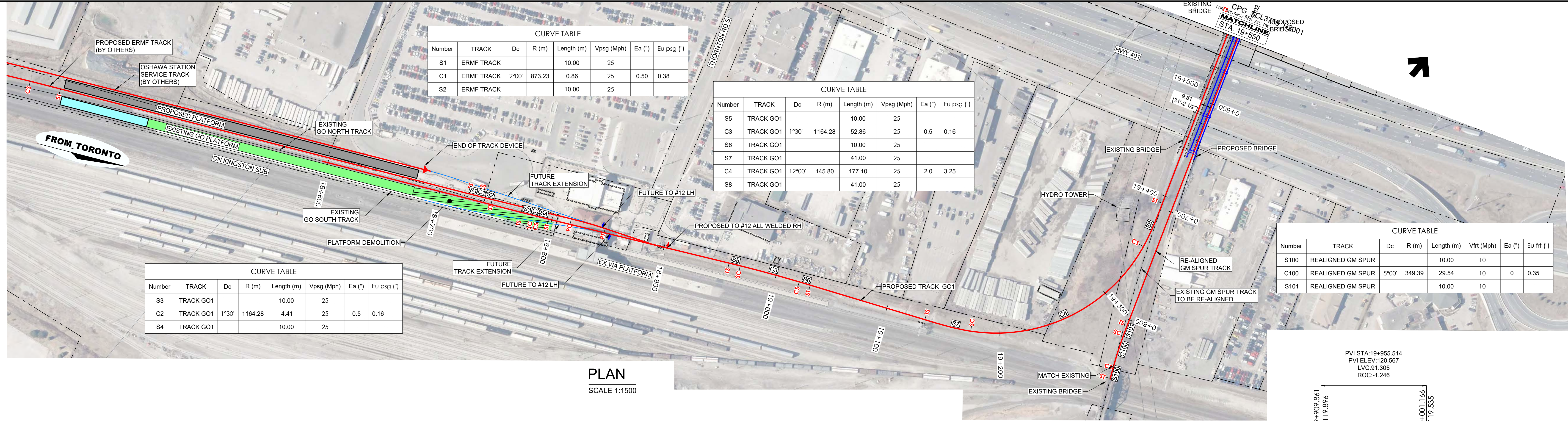


# **Appendix A**

## **Project Drawings and Zoning Map**







**LEGEND**

- |   |                            |                               |
|---|----------------------------|-------------------------------|
| CL PROPOSED TRACK                         | OVERHEAD HYDRO             | UNDERGROUND FIBRE OPTIC CABLE |
| CL EXISTING TRACK                         | PROPERTY LINE              | UNDERGROUND ELECTRICAL        |
| CL FUTURE TRACK                           | STORM SEWER                | NATURAL GAS                   |
| CL EXISTING TRACK TO BE REMOVED/REALIGNED | SANITARY SEWER             | WATER                         |
| EXISTING TURNOUT/PS                       | UNDERGROUND BELL TELEPHONE | EXISTING BRIDGE               |
| PROPOSED TURNOUT PS                       | UNDERGROUND CABLE TV       | PROPOSED BRIDGE               |
| FUTURE TURNOUT PS                         |                            |                               |

**ABBREVIATION**

- |      |                                |     |                         |
|------|--------------------------------|-----|-------------------------|
| BVCS | BEGIN VERTICAL CURVE           | PS  | POINT OF SWITCH         |
| PVI  | POINT OF VERTICAL INTERSECTION | RH  | RIGHT HAND              |
| CL   | CENTRE LINE                    | ROC | RATE OF CHANGE ON CURVE |
| EVCS | END VERTICAL CURVE STATION     | STA | STATION                 |
| EX   | EXISTING                       | TO  | TURNOUT                 |
| LH   | LEFT HAND                      | T/R | TOP OF RAIL             |
| LVC  | LENGTH OF VERTICAL CURVE       |     |                         |
| ML   | MAINLINE                       |     |                         |

**REFERENCE DRAWINGS**

DWG NO.	TITLE

**ISSUE**

NO.	DATE	ISSUED FOR
F	22/04/13	ISSUED FOR APPENDIX A
E	21/06/04	ISSUED FOR PRELIMINARY DESIGN
D	20/09/18	ISSUED FOR CONCEPTUAL DESIGN
C	20/08/26	ISSUED FOR CONCEPTUAL DESIGN
B	20/08/14	ISSUED FOR CONCEPTUAL DESIGN
A	20/01/31	ISSUED FOR PRELIMINARY DESIGN

**REVISIONS**

REV.	DATE

**DRAWN BY:**

JG	21/06/04
EG	21/06/04

**DESIGNED BY:**

JG	21/06/04
EG	21/06/04

**SCALE: 1:1500 FULL SIZE ONLY**

0 15 75m	0 1.5 7.5m



METROLINX PROJECT NO. 126701

**BOWMANVILLE RAIL EXPANSION**

**PROPOSED GO TRACKAGE**

PLAN & TRACK GO1 PROFILE

STA 18+600 TO STA 21+000

CONTRACT NO. RQ0-2017-CLE-010

DWG. NO. CPG\_SCL3756\_R2001

REV. 0

SHEET

**NOT FOR CONSTRUCTION**





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**METROLINX**

**Stantec**

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# BOWMANVILLE RAIL EXPANSION

## PROPOSED GO TRACKAGE

PLAN & TRACK G01 PROFILE  
STA 21+000 TO STA 22+800

CONTRACT NO. RQQ-2017-CLE-010	DWG. NO. CPG_SCL3756_R2002	REV. 0	SHEET
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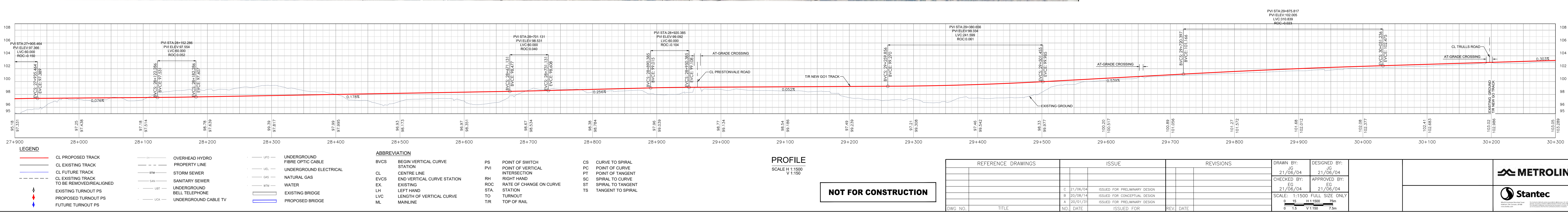




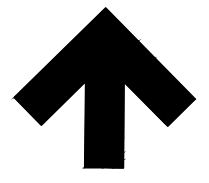































CS	CURVE TO SPIRAL
PC	POINT OF CURVE
PT	POINT OF TANGENT
SC	SPIRAL TO CURVE
ST	SPIRAL TO TANGENT
TS	TANGENT TO SPIRAL

BOWMANVILLE RAIL EXPANSION			
PROPOSED GO TRACKAGE			
PLAN & TRACK G01 PROFILE			
STA 30+300 TO STA 32+500			
CONTRACT NO. RQQ-2017-CLE-010	DWG. NO. CPG_SCL3756_R2006	REV. 0	SHEET







	CL PROPOSED TRACK		OVERHEAD HYDRO		UFD	UNDERGROUND FIBRE OPTIC CABLE
	CL EXISTING TRACK		PROPERTY LINE		UEL	UNDERGROUND ELECTRIC
	CL FUTURE TRACK		STORM SEWER		GAS	NATURAL GAS
	CL EXISTING TRACK TO BE REMOVED/REALIGNED		SANITARY SEWER		WTM	WATER
	EXISTING TURNOUT PS		UNDERGROUND BELL TELEPHONE			EXISTING BRIDGE
	PROPOSED TURNOUT PS		UNDERGROUND CABLE TV			PROPOSED BRIDGE
	FUTURE TURNOUT PS					

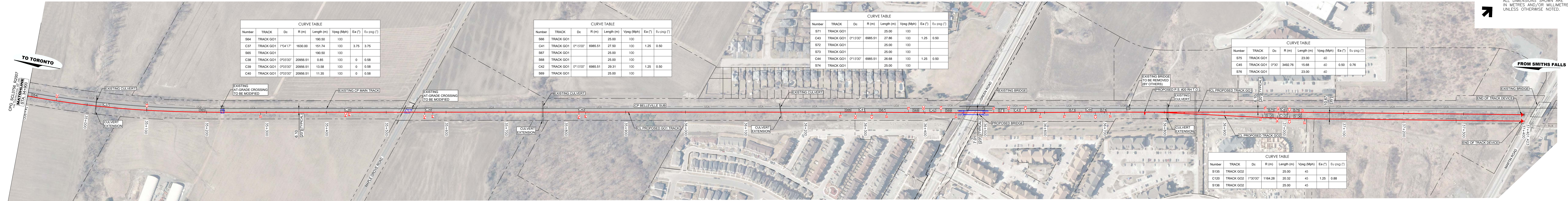
BVCS	BEGIN VERTICAL CURVE STATION	PS	POINT OF SWITCH
CL	CENTRE LINE	PVI	POINT OF VERTICAL INTERSECTION
EVCS	END VERTICAL CURVE STATION	RH	RIGHT HAND
EX.	EXISTING	ROC	RATE OF CHANGE ON CURVE
LH	LEFT HAND	STA.	STATION
LVC	LENGTH OF VERTICAL CURVE	TO	TURNOUT
ML	MAINLINE	T/R	TOP OF RAIL

CS	CURVE TO SPIRAL
PC	POINT OF CURVE
PT	POINT OF TANGENT
SC	SPIRAL TO CURVE
ST	SPIRAL TO TANGENT
TS	TANGENT TO SPIRAL

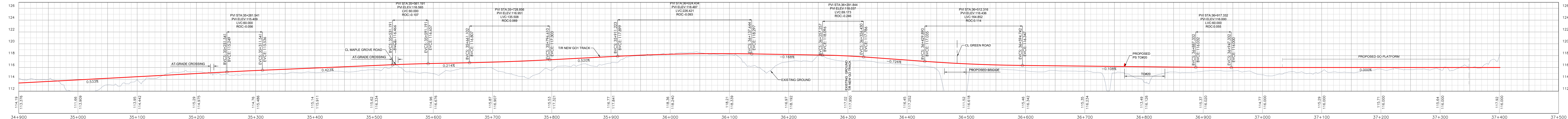
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REFERENCE DRAWINGS		ISSUE		REVISIONS		DRAWN BY: JG 21/06/04 CHECKED BY: EG 21/06/04		DESIGNED BY: JG 21/06/04 APPROVED BY: EG 21/06/04				 <b>METROLINX</b>		<b>BOWMANVILLE RAIL EXPANSION</b> PROPOSED GO TRACKAGE PLAN & TRACK G01 PROFILE STA 32+500 TO STA 34+900			
												 <b>Stantec</b>		CONTRACT NO. R00-2017-CLE-010 DWG. NO. CPG_SCL3756-R2007 REV. 0 SHEET			
DWG. NO.		TITLE		NO.		DATE		ISSUED FOR		REV.		DATE					
				C		21/06/04		ISSUED FOR PRELIMINARY DESIGN									
				B		20/08/14		ISSUED FOR CONCEPTUAL DESIGN									
				A		20/01/31		ISSUED FOR PRELIMINARY DESIGN									





PLAN  
SCALE 1:1500



PROFILE  
SCALE H 1:1500  
V 1:150

LEGEND

CL PROPOSED TRACK		OVERHEAD HYDRO		UFO	UNDERGROUND FIBRE OPTIC CABLE
CL EXISTING TRACK		PROPERTY LINE		UEL	UNDERGROUND EL
CL FUTURE TRACK		STORM SEWER		GAS	NATURAL GAS
CL EXISTING TRACK TO BE REMOVED/REALIGNED		SANITARY SEWER		WTM	WATER
EXISTING TURNOUT PS		UNDERGROUND BELL TELEPHONE			EXISTING BRIDGE
PROPOSED TURNOUT PS		UNDERGROUND CABLE TV			PROPOSED BRIDGE
FUTURE TURNOUT PS					

### ABBREVIATION

BVCS	BEGIN VERTICAL CURVE STATION
CL	CENTRE LINE
EVCS	END VERTICAL CURVE STATION
EX.	EXISTING
LH	LEFT HAND
LVC	LENGTH OF VERTICAL CURVE
ML	MAINLINE



PS

PVI	POINT OF VERTICAL INTERSECTION
RH	RIGHT HAND
ROC	RATE OF CHANGE ON CURVE
STA.	STATION
TO	TURNOUT
T/R	TOP OF RAIL

CS

PC	POINT OF CURVE
PT	POINT OF TANGENT
SC	SPIRAL TO CURVE
ST	SPIRAL TO TANGENT
TS	TANGENT TO SPIRAL

**NOT FOR CONSTRUCTION**

REFERENCE DRAWINGS		ISSUE		REVISIONS		DRAWN BY: JG 21/06/04		DESIGNED BY: JG 21/06/04		 <b>METROLINX</b>		<b>BOWMANVILLE RAIL EXPANSION</b> PROPOSED GO TRACKAGE PLAN & TRACK G01 PROFILE STA 34+900 TO STA 37+401.50								
						CHECKED BY: EG 21/06/04		APPROVED BY: EG 21/06/04												
		D 22/04/13		ISSUED FOR APPENDIX A						 <b>Stantec</b> <small>100 Wellington Street West, Suite 1000 Toronto, Ontario M5X 1C4 Canada Tel: 416.593.8200 Fax: 416.593.8201 Email: info@stantec.com</small>		CONTRACT NO. R00-2017-CL-010			DWG. NO. CPG_SCL3756_R2008			REV. 0 SHEET		
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		A 20/01/13		ISSUED FOR PRELIMINARY DESIGN																
DWG. NO.	TITLE	NO.	DATE	ISSUED FOR	REV.	DATE														



## Section 3: Zones and Zone Symbols

### 3.1 Establishment of Zones

3.1.1 For the purposes of this By-law and the maps contained in Schedule “A” hereto, the following zones are established and may be referred to by class, symbol or name:

(a) **Class: Residential**

<u>Symbol</u>	<u>Name</u>
R1	R1 Residential Zone
R2	R2 Residential Zone
R3	R3 Residential Zone
R4	R4 Residential Zone
R5	R5 Residential Zone
R6	R6 Residential Zone
R7	R7 Residential Zone
R8	R8 Residential Zone

(b) **Class: Office**

<u>Symbol</u>	<u>Name</u>
SO	Specialized Office Zone
OC	Office Conversion Zone

(c) **Class: Commercial**

<u>Symbol</u>	<u>Name</u>
CBD	Central Business District Zone
PCC	Planned Commercial Centre Zone
PSC	Planned Strip Commercial Zone
SPC	Special Purpose Commercial Zone
CC	Convenience Commercial Zone
SSC	Automobile Service Station Zone
HMC	Hamlet Commercial Zone
HBC	Harbour Commercial Zone

(d) **Class: Institutional**

<u>Symbol</u>	<u>Name</u>
CIN	Community Institutional Zone
MIN	Major Institutional Zone



(e) **Class: Open Space**

<u>Symbol</u>	<u>Name</u>
OS	Open Space Zone
OSU	Urban Open Space Zone
OSR	Rural Open Space Zone
OSP	Park Open Space Zone
OSH	Hazard Lands Open Space Zone
OSE	Environmentally Sensitive Open Space Zone
OSW	Waterfront Open Space Zone
OSB	Open Space Buffer Zone
OS-ORM	Oak Ridges Moraine Open Space Zone

**(38-2006, 138-2008)**

(f) **Class: Industrial**

<u>Symbol</u>	<u>Name</u>
PI	Prestige Industrial Zone
SI	Select Industrial Zone
GI	General Industrial Zone
SPI	Special Industrial Zone
HI	Hamlet Industrial Zone

(g) **Class: Other**

<u>Symbol</u>	<u>Name</u>
AG	Agricultural Zone
AP	Airport Zone
UT	Utilities Zone
MA	Mineral Aggregate Zone
CE	Cemetery Zone
UR	Urban Reserve Zone
EU	Existing Use Zone
SW	Special Waterfront Zone
AG-ORM	Oak Ridges Moraine Agricultural Zone

**(62-2000, 38-2006)**

(h) **Class: Regulatory**

<u>Symbol</u>	<u>Name</u>
D	Density
F	Lot Frontage
I	Floor Space Index
L	Lot Area
T	Height
Y	Front Yard Depth
R	Rear Yard Depth
DB	Density Block
C	Lot Coverage

**(4-1998)**

(i) **Class: Mixed Use**

**(106-2006, OMB PL060815)**

<u>Symbol</u>	<u>Name</u>
MU	Mixed Use Zone

### **3.2 Zone Variations and Special Conditions**

- 3.2.1 The term “zone variations” is used to describe the subdivisions of the zones established by Subsection 3.1. For example, the R6 Residential Zone has zone variations which include R6-A, R6-B, R6-C and R6-D. Each zone variation has different regulations applicable to the permitted uses within that zone or the uses permitted in each zone variation are different. Table 11.2 sets out the regulations for each R6 zone variation. The word “zone” includes each of the zone variations within the zone.
- 3.2.2 A “special condition” permits additional uses or further restricts the use of specific property in various zones and zone variations or provides regulations applicable to uses permitted at specific locations that differ from the regulations applicable to the standard zones or zone variations. An example is the R6-C(1) Zone established under Article 11.3.1.

### **3.3 Regulatory Zones**

#### **3.3.1 Explanation**

- 3.3.1(1) The T, I, D, F, L, Y, R, DB and C regulatory zones provide individual regulations with respect to height (T), floor space index (I), density (D), minimum lot frontage (F), minimum lot area (L), minimum front yard depth (Y), minimum rear yard depth (R), density in blocks in a registered plan of subdivision (DB) and maximum lot coverage (C). These regulatory zones are used in conjunction with one or more use zones. The regulatory zones take precedence over any applicable maximum height, maximum floor space index, maximum density, minimum lot frontage, minimum lot area, minimum front yard depth, minimum rear yard depth and maximum lot coverage regulations set out in the relevant use zone.

**(4-1998)**

#### **3.3.2 T – HEIGHT**

- 3.3.2(1) The maximum height of main buildings and main structures permitted on any lot is determined by the HEIGHT regulatory zone. If no height regulatory zone is noted on the zoning maps, the height regulations of the applicable use zone apply.
- 3.3.2(2) Each T - HEIGHT regulatory zone permits a maximum building height expressed in “metres”, indicated by the number following the letter T on the zoning maps attached to this By-law.



**3.3.3 I – FLOOR SPACE INDEX**

- 3.3.3(1) The maximum floor space index permitted on any lot is determined by the FLOOR SPACE INDEX regulatory zone. If no floor space index zone is noted on the zoning maps, the floor space index regulations of the applicable use zone apply.
- 3.3.3(2) Each I - Floor Space Index regulatory zone permits a maximum floor space index, indicated by the number following the letter I on the zoning maps attached to this By-law.

**3.3.4 D – DENSITY**

- 3.3.4(1) The maximum number of dwelling units permitted on any lot is determined by the DENSITY regulatory zone. If no density zone is noted on the zoning maps, the density regulations of the applicable use zone apply.
- 3.3.4(2) Each D - Density regulatory zone permits a maximum number of dwelling units per hectare, indicated by the number following the letter D on the maps attached to this By-law.

**3.3.5 F – FRONTAGE**

- 3.3.5(1) The minimum lot frontage of any lot is determined by the LOT FRONTAGE regulatory zone. If no lot frontage is noted on the zoning maps, the frontage regulations of the applicable use zone apply.
- 3.3.5(2) Each F - Frontage regulatory zone requires the minimum lot frontage expressed in metres (m), indicated by the number following the letter F on the zoning maps attached to this By-law.

**3.3.6 L – LOT AREA**

- 3.3.6(1) The minimum lot area of any lot is determined by the LOT AREA regulatory zone. If no minimum lot area is noted on the zoning maps, the lot area regulations of the applicable use zone apply.
- 3.3.6(2) Each L - Lot Area regulatory zone requires the minimum lot area expressed in square metres (m<sup>2</sup>), indicated by the number following the letter L on the zoning maps attached to this By-law. **(58-1996)**

**3.3.7 Y – FRONT YARD DEPTH**

- 3.3.7(1) The minimum front yard depth requirement of any lot is determined by the FRONT YARD DEPTH regulatory zone. If no front yard depth zone is noted on the zoning maps, the front yard depth regulations of the applicable use zone apply.

- 3.3.7(2) Each Y - Front Yard Depth regulatory zone requires the minimum front yard depth expressed in metres (m), indicated by the number following the letter Y on the zoning maps attached to this By-law.

**3.3.8 R – REAR YARD DEPTH**

- 3.3.8(1) The minimum rear yard depth requirement of any lot is determined by the REAR YARD DEPTH regulatory zone. If no rear yard depth zone is noted on the zoning maps, the rear yard depth regulations of the applicable use zone apply.

- 3.3.8(2) Each R - Rear Yard Depth regulatory zone requires the minimum rear yard depth expressed in metres (m), indicated by the number following the letter R on the zoning maps attached to this By-law.

**3.3.9 DB – DENSITY IN BLOCKS IN A REGISTERED PLAN OF SUBDIVISION**

- 3.3.9(1) The maximum density requirement in any block in a registered plan of subdivision can be determined by the DENSITY BLOCK regulatory zone. If no density block zone is noted on the zoning maps, the density regulations of the applicable use zone apply.

- 3.3.9(2) Each DB - Density Block regulatory zone permits a maximum number of dwelling units per hectare in the applicable block within a registered plan of subdivision, indicated by the number following the letters DB on the maps attached to this By-law.

**3.3.10 C – LOT COVERAGE (4-1998)**

- 3.3.10(1) The maximum lot coverage of any lot is determined by the LOT COVERAGE regulatory zone. If no lot coverage regulatory zone is noted on the zoning maps, the lot coverage regulations of the applicable use zone apply.

- 3.3.10(2) Each C – Lot Coverage regulatory zone permits a maximum lot coverage expressed in a percentage of the lot area indicated by the number following the letter C on the zoning maps attached to this By-law.

**3.3.11 DBR – DENSITY BLOCK RANGE IN BLOCKS IN A REGISTERED PLAN OF SUBDIVISION (119-2018)**

- 3.3.11(1) The density block range (minimum density to maximum density requirement) in any block in a registered plan of subdivision can be determined by the DENSITY BLOCK RANGE regulatory zone. If no density block range zone is noted on the zoning maps, the density regulations of the applicable use zone apply.



- 3.3.11(2) Each DBR - Density Block Range regulatory zone permits a minimum and maximum number of dwelling units per hectare in the applicable block within a registered plan of subdivision, indicated by the number following the letters DBR on the maps attached to this By-law.

### **3.4 Schedules and Tables**

- 3.4.1 All Schedules and Tables attached to this By-law form part of the By-law except as may be noted elsewhere in this By-law.

### **3.5 Holding “h” Zones**

#### **3.5.1 Use of “h” Symbol**

- 3.5.1(1) Where the symbol “h” appears on a zoning map as a suffix to a zone, a zone variation or a compound zone applying to certain lands, notwithstanding the provisions of that zone unless this By-law has been amended to remove the “h” symbol, those lands shall not be developed or used except in compliance with the provisions of the applicable zone for existing uses, or for such other uses set out in the relevant Holding Zone Provisions of Article 3.5.2. The relevant Holding Zone Provisions are denoted by the number immediately following the symbol “h” on the zoning map.

#### **3.5.2 Holding Zone Provisions**

- 3.5.2(1) **h-1 Zone (west of Stevenson Road South, north of Champlain Avenue) (102-2005)**

Purpose: To ensure that:

- (a) An appropriate site plan agreement is executed with the City which addresses such matters as:
  - (i) Approval for driveway access all to the satisfaction of the MTO and the Region;
  - (ii) Agreement in principle for mutual access/egress to Champlain Avenue through the lands to the west and any other access/egress through adjacent lands to the north to the City’s satisfaction, by way of registered access easements;
  - (iii) Agreement in principle for storm servicing acceptance points, the provision of stormwater quality and quantity control on the adjacent lands and registered servicing easements with the adjacent owner for both the major and minor storm flows generated from the subject site. The approved overall scheme for stormwater management as prepared for the Champlain East Sector shall form the basis

of any agreement for site servicing and necessary easements;

- (iv) Agreement in principle for the proposed site grading adjacent to the abutting lands and approval in writing from MTO and the Region for the proposed site grading adjacent to Stevenson Road South and Champlain Avenue;
- (v) Preparation of a comprehensive stormwater management report and site servicing brief. The proposal shall comply with City's policies and by-laws with regard to stormwater management and also the approved overall scheme for stormwater management for the Champlain East Sector. Additionally, the report shall have regard for previous studies/reports already done for the abutting lands north and west of the subject site. The report must address all of the water resource issues identified below:
  - Water quality and quantity control;
  - Overland flow routes including lands external to the site;
  - A physical storm sewer outfall for the site;
  - Erosion and sedimentation control for the site;
- (vi) Noise mitigation to the City's satisfaction; and
- (vii) Building siting and landscaping to the City's satisfaction.

Permitted Interim Uses:

- (a) All uses permitted in an UR Zone.

3.5.2(2) **h-2 Zone (certain lands located adjacent to Branch 6 of the Harmony Creek immediately south of Highway 401 and Bloor Street East and east of Farewell Street above the 1:100 year storm floodline under future development conditions) (OMB Z950159)**

Purpose: To ensure that:

- (a) Engineering and environmental studies shall be prepared to the satisfaction of the Central Lake Ontario Conservation Authority and the City to address floodplain and stormwater management issues and any potential environmental impacts of the proposed development on the Harmony Creek and Second Marsh;
- (b) Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and transportation services to serve the development; and
- (c) An appropriate site plan agreement shall be executed.



Permitted Interim Uses:

- (a) All uses permitted in an OSE Zone.

3.5.2(3) **h-3 Zone (south of Taunton Road East, west of Langley Circle) (17-2021)**

Purpose: To ensure that:

- (a) Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and transportation services and facilities to serve this development and included in a subdivision agreement which is executed.
- (b) Verification is provided to the satisfaction of the City and Region which indicates the soils of the subject site are suitable for the proposed use. A Record of Site Condition acknowledged by the Ministry of the Environment, Conservation and Parks shall be required if required by the Region's Site Contamination Protocol.
- (c) Noise mitigation to the satisfaction of the City and Region.
- (d) Dust and odour mitigation to the satisfaction of the City and Region.
- (e) An archaeological assessment is completed to the satisfaction of the Ministry of Heritage, Sport, Tourism and Culture Industries.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law, provided that for those lands where an "h-74" holding symbol also applies, the "h-79" holding symbol is removed.
- (c) All permitted interim uses under the "h-81" holding symbol, for those lands where the "h-81" holding symbol applies.

3.5.2(4) **h-4 Zone (671 Bloor Street East) (71-1997)**

Purpose: To ensure that:

- (a) The City is advised, in writing, by the Central Lake Ontario Conservation Authority (CLOCA) that the owner has addressed CLOCA's concerns on the installation of a backflow prevention device; and
- (b) The City has granted site plan approval for an apartment building.

Permitted Interim Uses:

- (a) All uses permitted in a R2 Zone. **(82-1998, 44-1999)**



3.5.2(5) **h-5 Zone (McKim Street and James Street, north of Stacey Avenue)**  
**(71-1996)**

Purpose: To ensure that:

- (a) A servicing agreement is executed with the City;
- (b) Verification is provided to the satisfaction of the City and the Ministry of Environment, Conservation and Parks which indicates that the soils of the subject site are suitable for the proposed residential development; and
- (c) A noise study is prepared to the satisfaction of the City and the Canadian National Railway.

Permitted Interim Uses:

- (a) All existing uses.

3.5.2(6) **h-6 Zone (918 to 926 Simcoe Street North)**

Purpose: To ensure that:

- (a) A fence and certain rear yard landscape improvements are installed and completed to the satisfaction of the City of Oshawa.

Permitted Interim Uses:

- (a) All uses permitted in a R1-A Zone.

3.5.2(7) **h-7 Zone (63 Albany Street)** **(124-2019)**

Purpose: To ensure that:

- (a) For any apartment building having more than 65 apartments or more than 4 storeys in height:
  - (i) An appropriate site plan agreement is executed with the City;
  - (ii) Appropriate arrangements shall be made for the provision of adequate water, sanitary, storm, foundation drainage and transportation services to the development to the satisfaction of the City; and,
  - (iii) Noise and vibration mitigation to the satisfaction of the City and Region.

Permitted Interim Uses:

- (a) All existing uses.
- (b) All uses permitted in a R2 Zone.
- (c) All uses permitted in a R3-A.F5.5 Zone.



- (d) An apartment building permitted under the R6-B(2) Zone and any variances thereto specific to the subject site, in accordance with the Site Plan Approval obtained pursuant to file SPA-2017-21 and any registered site plan agreement(s) associated therewith.

**3.5.2(8) h-8 Zone (southeast Quadrant of Taunton Road East and Clearbrook Drive) (17-2021)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City which addresses such matters as landscaping, fencing and lighting.
- (b) A noise study is completed to the satisfaction of the City.
- (c) Dust and odour mitigation to the satisfaction of the City and Region.
- (d) Cross access easements are granted to lands to the east known municipally as 679, 695, 725, 737, 741, 745 and 757 Taunton Road East to the satisfaction of the City and Region.
- (e) The building design(s) is compatible with the operation of the Oshawa Executive Airport.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.

**3.5.2(9) h-9 Zone (southern portion of 135 Bruce Street) (66-1996)**

Purpose: To ensure that:

- (a) A subdivision agreement is executed with the City;
- (b) Verification is provided to the satisfaction of the City and the Ministry of Environment, Conservation and Parks which indicates that the soils of the subject site are suitable for the proposed residential development; and
- (c) A noise study for the entire site and a vibration study for all building envelopes within 75.0m of the railway right-of-way, are prepared to the satisfaction of the City and CN.

Permitted Interim Uses:

- (a) All existing uses.



3.5.2(10)      **h-10 Zone (721 King Street West)**      **(25-2006)**

Purpose:      To ensure that:

- (a)      The City has granted site plan approval for an apartment building.

Permitted Interim Uses:

- (a)      All uses permitted in a R2 Zone.

3.5.2(11)      **h-11 Zone (133 Ritson Road North)**      **(56-2020)**

Purpose:      To ensure that:

- (a)      Site plan approval is obtained from the City that addresses such matters as landscaping, fencing and lighting levels;
- (b)      Arrangements have been made to the satisfaction of the Region of Durham and the City on any necessary transportation improvements (e.g. driveway entrance design and related road improvements);
- (c)      A noise study is completed to the satisfaction of the City;
- (d)      A vibration study is completed to the satisfaction of the City to review the impact of the construction of the proposed development on adjacent buildings, and any necessary mitigation measures are implemented in the site plan agreement;
- (e)      Sufficient lands are conveyed to the City at no cost to accommodate an appropriate termination and 0.3m reserve for the cul-de-sac for Colborne Street East at the southeast corner of the site to the satisfaction of the Commissioner of Development Services;
- (f)      Stormwater management matters are addressed to the satisfaction of the City, Region of Durham and Central Lake Ontario Conservation Authority;
- (g)      Any necessary cross-access easements are created in favour of the lands to the north to the satisfaction of the City; and,
- (h)      A Record of Site Condition acknowledged by the Ministry of the Environment, Conservation and Parks is provided to the satisfaction of the City and the Region of Durham, indicating that the site is suitable for residential development in accordance with the appropriate Provincial guidelines/criteria.

Permitted Interim Uses:

- (a)      All existing uses.



3.5.2(12)     **h-12 Zone (2029-2043 Simcoe Street North)**     **(58-2011)**

Purpose:     To ensure that:

- (a)     Site plan approval is obtained from the City;
- (b)     Appropriate arrangements shall be made for the provision of adequate water, sanitary, storm, foundation drainage and transportation services to the development to the satisfaction of the City and Region;
- (c)     Driveway access to the satisfaction of the City and Region;
- (d)     Noise mitigation to the City's satisfaction; and
- (e)     Any necessary cross-access easements are created to the satisfaction of the City.

**(89-2014)**

Permitted Interim Uses:

- (a)     Any single detached dwelling existing as of April 11, 2011 on a lot existing as of April 11, 2011. The regulations in Table 6.2 and the relevant provisions of this By-law applicable to the R1-C Zone shall apply to such use, including any expansion to the dwelling.
- (b)     Notwithstanding the definition of a "Lodging House" in Section 2, to the contrary, a lodging house with a maximum of 5 lodging units in an existing single detached dwelling as of July 1, 2012. The regulations in Table 12.2 and the relevant provisions of this By-law applicable to a lodging house in a R7-A Zone shall apply to such use.

**(45-2012, 89-2014)**

3.5.2(13)     **h-13 Zone (part of the former Gifford Farm located within 40.0m of the Lake Ontario Shoreline)**     **(OMB Z960129)**

Purpose:     To ensure that:

- (a)     A study shall be completed to the satisfaction of the City of Oshawa that indicates that:
  - (iv)     Policy 3.1.3 of the Provincial Policy Statement, 1996 regarding lands subject to erosion hazards is met;
  - (v)     Development will not have an adverse impact on the ecological function of the shoreline area; and
  - (vi)     Development will not significantly interfere with the view of Lake Ontario from the crest of the Gifford Hill; and
- (b)     An appropriate site plan agreement is executed with the City.

Permitted Interim Uses:

- (a)     All uses permitted in a UR Zone.



3.5.2(14)     **h-14 Zone (various locations)**     **(50-1997, OMB PL020751)**

Purpose:     To ensure that:

- (a)     Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and transportation services and facilities to serve this development and included in a subdivision agreement which is executed.     **(39-2004)**

Permitted Interim Uses:

- (a)     All uses permitted in a UR Zone.
- (b)     Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.

3.5.2(15)     **h-15 Zone (west of Thornton Road South, north and south of the future Consumers Drive extension)**     **(79-2009)**

Purpose:     To ensure that:

- (a)     Development of these lands does not proceed until the alignment of the Consumers Drive extension has been finalized to the satisfaction of the City of Oshawa and the Region of Durham; and
- (b)     Suitable arrangements have been made with the Region for the acquisition of the land required from the subject site for the extension of Consumers Drive.

Permitted Interim Uses:

- (a)     All existing uses.

3.5.2(16)     **h-16 Zone (north of Shankel Road, west of Townline Road North)**     **(12-2018)**

Purpose:     To ensure that:

- (a)     An appropriate subdivision agreement is executed with the City which addresses such matters as:
  - (i)     Appropriate arrangements are made for the provision of adequate sanitary, water, storm and transportation services and facilities to serve this development;
  - (ii)     Any conveyance/easement necessary for the stormwater management pond, outfall and pipe and access to the pond/pipe/outfall;
  - (iii)     Appropriate arrangements with respect to the installation of traffic signals at the Shankel Road and Townline Road North intersection to be paid for by the owner;



- (iv) The necessary arrangements to implement the proposed improvements to the pick-up/drop-off area for the College Park Elementary School;
- (v) Noise mitigation to the satisfaction of the City including off-site stationary noise mitigation related to the woodworking shop at Kingsway College.
- (vi) A Record of Site Condition (RSC) acknowledged by the Ministry of the Environment, Conservation and Parks, has been provided to the satisfaction of the City, indicating that the soils of the site are suitable for residential development.

Permitted Interim Uses:

- (a) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.

3.5.2(17)      **h-17 Zone (west side of Fox Street)**      **(54-2008)**

Purpose:      To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Appropriate arrangements are made for the provision of adequate sanitary, water, storm and transportation services to serve this development to the satisfaction of the City and the Region of Durham;
- (c) Appropriate engineering and environmental studies are prepared to address any potential environmental impacts of the proposed development to the satisfaction of the City;
- (d) Written confirmation is received from GO Transit that the proposed development is acceptable;
- (e) A market study is prepared to the satisfaction of the City to ensure the additional medical office/clinic floor space mentioned in Sentence 19.3.12(7) will not have a negative impact on the Oshawa Main Central Area;      **(112-2011, 92-2016)**
- (f) An archaeological study is completed to the satisfaction of the Ministry of Tourism, Culture and Sport;      **(92-2016)**
- (g) A vibration study is completed to the satisfaction of the City, if necessary;      **(92-2016)**
- (h) The environmental condition of the site is suitable for the proposed uses to the satisfaction of the City and Region; and      **(92-2016)**
- (i) Upon completion of an Environmental Assessment to determine the final road alignment the owner conveys to the City or Region any lands required for the future east west Type "C" Arterial road to connect Thornton Road North to Laval Drive.      **(69-2019)**



Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

3.5.2(18) **h-18 Zone (southwest Quadrant of Taunton Road East and Clearbrook Drive) (17-2021)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City which addresses such matters as building siting, landscaping, fencing and lighting.
- (b) Appropriate arrangements are made for municipal servicing, including stormwater management matters;
- (c) A noise study is completed regarding noise from the proposed development and implementation of noise mitigation from existing abutting industrial and commercial facilities for existing and planned residential lands to the east, to the satisfaction of the City.
- (d) Satisfactory arrangements are made with the City and Region on any transportation improvements.
- (e) An odour study is completed for any restaurant use.
- (f) All waste storage shall be located within an enclosed building or a partially in-ground waste storage bin.
- (g) The building design(s) is compatible with the operation of the Oshawa Executive Airport.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.
- (c) All permitted interim uses under the “h-81” holding symbol.

3.5.2(19) **h-19 Zone (northwest corner of Taunton Road West and Thornton Road North) (74-2008)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Appropriate arrangements are made for the provision of adequate sanitary, water, storm and transportation services to serve this development to the satisfaction of the City and the Region of Durham; and



- (c) Appropriate engineering and environmental studies are prepared to address any potential environmental impacts of the proposed development to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in the SPC-A/SSC-C(1) Zones within existing buildings and structures and uses permitted in the UR Zone.

3.5.2(20) **h-20 Zone (west of Harmony Road North, south of Taunton Road East) (4-1998)**

Purpose: To ensure that:

- (a) Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and transportation services and facilities to serve this development and included in a subdivision agreement which is executed and registered.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.

3.5.2(21) **h-21 Zone (southwest of Bruce Street and Drew Street) (32-2006)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

3.5.2(22) **h-22 Zone (south of Taunton Road East, west of Harmony Road North) (23-2005)**

Purpose: To ensure that:

- (a) An appropriate site plan agreement or subdivision agreement is executed with the City.

Permitted Interim Uses:

- (a) All existing R1-A uses as of February 28, 2005. Minor enlargements to existing single detached dwellings may be permitted in compliance with Article 38.2.2 of this By-law. Any minor enlargement shall comply with the R1-A regulations.



3.5.2(23)      **h-23 Zone (various locations)**      **(136-2008)**

Purpose:      To ensure that:

- (a)      Site plan approval is granted by the City;
- (b)      Appropriate arrangements are made for servicing, including storm water management;
- (c)      An archaeological study is completed to the satisfaction of the City, if necessary;
- (d)      An environmental study is completed, if necessary, to the satisfaction of the Central Lake Ontario Conservation Authority and the City since a portion of the subject site is located within 120.0m of a Provincially Significant Wetland located north and south of Taunton Road West within the Goodman Creek valley;
- (e)      The site design is compatible with the operation of the Oshawa Airport; and
- (f)      Verification has been provided to the satisfaction of the City that the site is suitable for the proposed uses in accordance with the relevant Provincial guidelines in effect immediately prior to the issuance of any building permit or use of the site. A Record of Site Condition, if necessary, must be submitted to the Ministry of the Environment, Conservation and Parks.

Permitted Interim Uses:

- (a)      All uses permitted in the UR Zone.

3.5.2(24)      **h-24 Zone (135 Bruce Street)**      **(117-2018)**

Purpose: To ensure that:

- (a)      Site plan approval is obtained from the City that addresses such matters as landscaping, fencing and lighting levels;
- (b)      Appropriate arrangements are made for municipal servicing, including sanitary/water and stormwater management matters to the satisfaction of the City and the Region; and
- (c)      A new Record of Site Condition acknowledged by the Ministry of the Environment, Conservation and Parks, is provided to the satisfaction of the City and the Region, indicating that the site is suitable for residential development in accordance with the appropriate Provincial guidelines/criteria.

Permitted Interim Uses:

- (a)      All uses permitted in an UR Zone.



- (b) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.

3.5.2(25) **h-25 Zone (5055 Simcoe Street North)**

Purpose: To ensure that:

- (a) A site plan agreement is executed with the City; and
- (b) A Record of Site Condition (RSC) acknowledged by the Ministry of the Environment, Conservation and Parks, has been provided to the satisfaction of the City, indicating that the soils of the site are suitable for commercial development in accordance with the Provincial guidelines in effect immediately prior to the issuance of a building permit.

Permitted Interim Uses:

- (a) All AG-ORM uses. **(38-2006)**

3.5.2(26) **h-26 Zone (south of King Street West and east of Thornton Road South)** **(63-2011)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City for any apartment building or block townhouse which addresses such matters as:
  - (i) Appropriate arrangements are made for the provision of adequate water, sanitary, storm, foundation drainage, and transportation services to the development to the satisfaction of the City and Region;
  - (ii) A traffic impact study is prepared, as necessary, to the satisfaction of the City and Region;
  - (iii) Driveway access is in a location to the satisfaction of the City and Region; and
  - (iv) Noise mitigation is addressed to the City's satisfaction.

Permitted Interim Uses:

- (a) All uses permitted in a R2 Zone.
- (b) Notwithstanding the definition of a "Lodging House" in Section 2, to the contrary, a lodging house with a maximum of 5 lodging units in an existing single detached dwelling as of July 1, 2012. The regulations in Table 12.2 and the relevant provisions of this By-law applicable to a lodging house in a R7-A Zone shall apply to such use. **(45-2012)**



3.5.2(27) **h-27 Zone (185 Hillcroft Street)** **(95-2014)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City that addresses such matters as landscaping, fencing, lighting levels and the removal of asphalt on the City lands immediately south of the site and replacing it with sod;
- (b) A noise study is completed to the satisfaction of the City;
- (c) Appropriate arrangements are made for municipal servicing, including sanitary/water and stormwater management matters, to the satisfaction of the City and the Region; and
- (d) A Record of Site Condition, acknowledged by the Ministry of the Environment, Conservation and Parks, has been provided to the satisfaction of the City, indicating that the site is suitable for residential development in accordance with the appropriate Provincial guidelines.

Permitted Interim Uses:

- (a) All legally existing uses as of June 23, 2014.

3.5.2(28) **h-28 Zone (southeast corner of Ritson Road South and King Street East)** **(72-1999)**

Purpose: To ensure that:

- (a) Verification has been provided to the satisfaction of the City that the soils of the subject site are suitable for residential development in accordance with the relevant Provincial guidelines in effect immediately prior to the issuance of a building permit for a single detached dwelling.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) A parking lot in accordance with the relevant provisions of this By-law pertaining to the R1-C(7) Zone provided a site plan agreement has been executed with the City for the parking lot.

3.5.2(29) **h-29 Zone (1827 Thornton Road North)** **(70-2018)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City that addresses such matters as building siting, landscaping, fencing, lighting levels and



any necessary easements for overland flow and maintenance access are created to the satisfaction of the City;

- (b) A noise study is completed to the satisfaction of the City;
- (c) An archaeological assessment is completed to the satisfaction of the Ministry of Tourism, Culture and Sport;
- (d) Appropriate arrangements are made for the provision of adequate water, sanitary, foundation drainage and transportation services including driveway access to the development at no cost to and to the satisfaction of the City and Region; and
- (e) Appropriate arrangements shall be made for the management of stormwater at no cost to the City and to the satisfaction of the City, Region and CLOCA.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

**3.5.2(30) h-30 Zone (various locations) (119-2018, 69-2020)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City; and
- (b) Urban design guidelines are prepared to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

**3.5.2(31) h-31 Zone (671-723 Conlin Road East) (62-2012)**

Purpose: To ensure that:

- (a) Site plan or subdivision approval is obtained from the City that addresses such matters as landscaping, fencing and lighting;
- (b) A traffic impact study is completed to the satisfaction of the City;
- (c) A noise study regarding noise from Conlin Road East is completed to the satisfaction of the City;
- (d) An archaeological assessment is completed to the satisfaction of the Ministry of Tourism, Culture and Sport;
- (e) Storm water management and environmental matters are addressed to the satisfaction of the City and the Central Lake Ontario Conservation Authority;
- (f) The Oshawa Creek valley lands/floodplain and related environmental buffer are conveyed to the City at no cost and in a physical condition acceptable to the City;



- (g) A Record of Site Condition acknowledged by the Ministry of Environment, Conservation and Parks, as may be required, to the satisfaction of the City indicating that the soils of the site are suitable for residential development in accordance with the appropriate Provincial guidelines;
- (h) Adequate municipal water and sanitary services are provided to the satisfaction of the Region of Durham;
- (i) Tree and vegetation preservation is implemented to the satisfaction of the City and the Central Lake Ontario Conservation Authority;
- (j) A parking plan for any street townhouses shall be provided to the City's satisfaction which may lead to a restriction on the number of street townhouses. Also street townhouses will not be permitted with direct frontage on Conlin Road East;
- (k) An Urban Design Study is prepared to the satisfaction of the City showing, amongst other matters, how any development addresses Conlin Road East and how any development can be integrated with development on the subject lands and adjacent lands to the east.

Permitted Interim Uses:

- (a) Any single detached dwelling existing as of June 25, 2012 on a lot existing as of June 25, 2012. The regulations in Table 6.2 and the relevant provisions of this By-law applicable to the R1-A Zone shall apply to such use, including any expansion to the dwelling.

3.5.2(32) **h-32 Zone (north side of King Street West, west of Goodman Creek)** **(62-2000)**

Purpose: To ensure that:

- (a) Floodplain hazard issues are addressed to the satisfaction of the City and the Central Lake Ontario Conservation Authority.

Permitted Interim Uses:

- (a) All existing uses.
- (b) All uses permitted in an OSH Zone.

3.5.2(33) **h-33 Zone (370 Conant Street)** **(66-2001)**

Purpose: To ensure that:

- (a) An appropriate site plan agreement is executed with the City.

Permitted Interim Uses:

- (a) A Works Yard operated by the City.



3.5.2(34) **h-34 Zone (former Montgomery Road Allowance, north of Bloor Street East) (45-2012)**

Purpose: To ensure that:

- (a) Verification has been provided to the satisfaction of the City that the site is suitable for the proposed uses in accordance with the relevant Provincial guidelines in effect immediately prior to the issuance of any building permit or residential use of the site. A Record of Site Condition must be submitted to the Ministry of the Environment, Conservation and Parks.

Permitted Interim Uses:

- (a) All uses permitted in the EU Zone.

3.5.2(35) **h-35 Zone (Bloor Street West and Champlain Avenue) (39-2004)**

Purpose: To ensure that:

- (a) A Traffic Impact Study is undertaken to the City's and Region's satisfaction, and the development of retail warehouse space is phased.

Permitted Interim Uses:

- (a) All existing uses;
- (b) All SI-C uses on the lands also zoned SI-C along the north side of Champlain Avenue and along the south side of Bloor Street West; and
- (c) All SI-A and GI uses on the lands also zoned SI-A/GI located on the south side of the future Consumers Drive extension, west of Thornton Road South.

and provided that the maximum gross floor area of retail warehouses does not exceed:

- (i) 4,646m<sup>2</sup> until January 1, 2006
- (ii) 13,940m<sup>2</sup> until January 1, 2011

in the entire areas zoned SPC-A(6) and SPC-A(7). (79-2009)

3.5.2(36) **h-36 Zone (northwest corner of Hospital Court and Simcoe Street North) (47-2002)**

Purpose: To ensure that:

- (a) A site plan agreement is executed with the City.



Permitted Interim Uses:

- (a) All lawfully existing uses as of April 29, 2002.

3.5.2(37) **h-37 Zone (southeast corner of Adelaide Avenue East and Ritson Road North) (127-2013 – OMB PL140074)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City that addresses such matters as landscaping, fencing, lighting levels, hours for refuse pickup and hours for loading and unloading;
- (b) Satisfactory arrangements are made with the Region of Durham and City on any transportation improvements (e.g. driveway entrance design and related road improvements);
- (c) A noise study is completed to the satisfaction of the City;
- (d) Sufficient lands are conveyed to the City at no cost to accommodate an appropriate termination and 0.3m reserve for Elgin Street East at the southeast corner of the site to the satisfaction of the Commissioner of Development Services;
- (e) Stormwater management matters are addressed to the satisfaction of the City, Region of Durham and Central Lake Ontario Conservation Authority; and
- (f) Any necessary cross-access easements are created in favour of the lands to the south to the satisfaction of the City.

Permitted Interim Uses:

- (a) All legally existing uses as of December 16, 2013.

3.5.2(38) **h-38 Zone (east of Simcoe Street North and north of Britannia Avenue) (83-2012)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.



3.5.2(39) **h-39 Zone (north side of Taunton Road West, east and west of Stevenson Road North) (6-2008)**

Purpose: To ensure that:

- (a) Appropriate provisions have been made for municipal servicing, including stormwater management issues, and transportation facilities and services; and
- (b) Site plan approval is obtained from the City.

Permitted Interim Uses:

- (a) All existing uses in accordance with the EU Zone.

3.5.2(40) **h-40 Zone (southeast corner of Taunton Road East and Harmony Road North) (57-2005)**

Purpose: To ensure that:

- (a) An appropriate site plan agreement is executed with the City which addresses such matters as:
  - (i) Noise mitigation to the City's satisfaction;
  - (ii) Building siting to the City's satisfaction;
  - (iii) Driveway access to the Region's satisfaction;
  - (iv) A stormwater management study, as necessary, to the City's and CLOCA's satisfaction; and
  - (v) The following site design matters for any Oil and lubrication centre:
    - The building will be located in the centre of the southerly 0.4ha of the site with the drive-through doors oriented in an east-west manner;
    - Fascia signage will only be permitted on the north and west face of the building;
    - Any proposed pylon sign will be located at the common driveway entrance from Harmony Road North;
    - The driveway entrance from Harmony Road North as constructed for the car wash, convenience store and fuel bar will be maintained as the only access to the subject site from Harmony Road North;
    - All refuse/recyclable storage is to be internal to the building;
    - Parking for any Oil and lubrication centre is to be located north of the southerly limit of the main building;



- Landscaping strips shall be provided having a minimum width of 8.5m from the east lot line and 6.0m from the south lot line and 6.0m abutting Harmony Road North. Coniferous planting shall be provided in the south-east area of the site, and said landscaping strip shall be greater in this area;
- A minimum 1.8m high acoustic fence shall be constructed along the south property line; and
- Noise mitigation measures, as appropriate, related to the use of air tools.

Permitted Interim Uses:

- (a) A car wash, fuel bar, and convenience store are permitted on the northerly 0.8ha.
- (b) All uses permitted in a UR Zone are permitted on the southerly 0.4ha. **(57-2005)**

3.5.2(41) **h-41 Zone (southeast corner of Taunton Road East and Grandview Street North) (OMB PL020751)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.

3.5.2(42) **h-42 Zone (1226 King Street East) (73-2014)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City and that the site plan agreement contain provisions requiring the owner to convey Part 5, Plan 40R-14385 as valleyland and an appropriate access easement from King Street East to the valley land to the City's satisfaction and at no cost and in a condition acceptable to the City.

Permitted Interim Uses:

- (a) All uses permitted in an EU Zone.



3.5.2(43) **h-43 Zone (southwest corner of Conlin Road East and Townline Road North) (21-2012)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City.
- (b) Written confirmation is received from Trans-Canada Pipeline and Enbridge Pipeline that the proposed development is acceptable.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

3.5.2(44) **h-44 Zone (northwest of Stevenson Road South and Champlain Avenue) (2-2004)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and transportation services to serve this development to the satisfaction of the City and the Region of Durham;
- (c) Appropriate arrangements are made for the acquisition and development of the east-west collector road designated in the Oshawa Official Plan to the satisfaction of the City of Oshawa;
- (d) Appropriate engineering and environmental studies are prepared that address any potential environmental impacts of the proposed development to the satisfaction of the City;
- (e) Written confirmation is received from the Ministry of Transportation that the proposed development is acceptable;
- (f) Written confirmation is received from GO Transit that the proposed development is acceptable;
- (g) Written confirmation is received from Oshawa PUC Networks Inc. that suitable arrangements have been made for access to its storage yard; and
- (h) Written confirmation is received from Canadian Pacific Railways that suitable arrangements have been made for access.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.



3.5.2(45) **h-45 Zone (Certain lands north and south of Winchester Road East and east of Bridle Road) (73-2014)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and transportation services to serve the development; and
- (c) Upon completion of an Environmental Assessment to determine the final road alignment the owner conveys to the City any lands required for the future north south Collector Road to connect Windfields Farm Drive West to Winchester Road West. **(69-2019)**

Permitted Interim Uses:

- (a) All uses permitted in an EU Zone.

3.5.2(46) **h-46 Zone (1464 Thornton Road North) (64-2012)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City including appropriate fencing, landscaping and lighting;
- (b) Appropriate arrangements are made for municipal servicing, including stormwater management matters;
- (c) A Record of Site Condition, acknowledged by the Ministry of the Environment, Conservation and Parks, has been provided to the satisfaction of the City, indicating that the soils of the site are suitable for industrial/commercial development in accordance with the appropriate Provincial guidelines;
- (d) All of the requirements of Central Lake Ontario Conservation Authority are satisfied;
- (e) A noise study is completed to the satisfaction of the City;
- (f) Land use compatibility with respect to the Oshawa Municipal Airport is achieved through such matters as the location and design of the refuse enclosures (e.g. all refuse enclosures will be wildlife/bird proof);
- (g) Opportunities for appropriate cross access easements are provided.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

3.5.2(47) **h-47 Zone (north side of Bloor Street East, east of Harmony Road South and west of the Harmony Creek) (126-2004)**

Purpose: To ensure that:

- (a) An appropriate site plan agreement shall be executed with the City;
- (b) A traffic impact study is completed to the satisfaction of the City and Region;
- (c) A noise study is completed to the satisfaction of the City;
- (d) An up-dated cut and fill analysis is completed to the satisfaction of the Central Lake Ontario Conservation Authority;
- (e) A stormwater management report is completed to the satisfaction of the City and the Central Lake Ontario Conservation Authority;
- (f) An archaeological assessment is completed to the satisfaction of the Ministry of Tourism, Culture and Sport;
- (g) An odour study is completed to the satisfaction of the City; and,
- (h) An illumination study is completed to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in an OSH Zone.

3.5.2(48) **h-48 Zone (east and west side of Simcoe Street North, south of Conlin Road and southeast corner of Simcoe Street North and Conlin Road East) (106-2006, OMB PL060815)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Appropriate arrangements shall be made for the provision of adequate water, sanitary, storm, foundation drainage, and transportation services to the development to the satisfaction of the City and Region;
- (c) Driveway access to the satisfaction of the City and Region;
- (d) Noise mitigation to the City's satisfaction;
- (e) Any necessary cross-access easements are created to the satisfaction of the City.

Permitted Interim Uses:

- (a) All lawfully existing uses in existing buildings as of July 17, 2006.
- (b) Notwithstanding the definition of a "Lodging House" in Section 2, to the contrary, a lodging house with a maximum of 5 lodging units in an existing single detached dwelling as of July 1, 2012. The



regulations in Table 12.2 and the relevant provisions of this By-law applicable to a lodging house in a R7-A Zone shall apply to such use. **(45-2012)**

- (c) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law. **(118-2018)**

3.5.2(49) **h-49 Zone (east side of Simcoe Street North, south of Taylorwood Road) (106-2006, OMB PL060815)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Appropriate arrangements shall be made for the provision of adequate water, sanitary, storm, foundation drainage, and transportation services to the development to the satisfaction of the City and Region;
- (c) Driveway access to the satisfaction of the City and Region;
- (d) Noise mitigation to the City's satisfaction; and
- (e) Any necessary cross-access easements are created to the satisfaction of the City.

Permitted Interim Uses:

- (a) Any single detached dwelling existing as of July 17, 2006 on a lot existing as of July 17, 2006. The regulations in Table 6.2 and the relevant provisions of this By-law applicable to the R1-C Zone shall apply to such use, including any expansion to the dwelling.
- (b) Notwithstanding the definition of a "Lodging House" in Section 2, to the contrary, a lodging house with a maximum of 5 lodging units in an existing single detached dwelling as of July 1, 2012. The regulations in Table 12.2 and the relevant provisions of this By-law applicable to a lodging house in a R7-A Zone shall apply to such use. **(45-2012, 89-2014)**

3.5.2(50) **h-50 Zone (1600 Simcoe Street North) (106-2006, OMB PL060815)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City for an apartment building; and
- (b) The automobile repair garage use is terminated prior to the development of an apartment building.

### Permitted Interim Uses:

- (a) An automobile repair garage and two flats in the building existing as of July 17, 2006 or in a replacement building on the building footprint existing as of July 17, 2006. In addition, a maximum of two used vehicles comprised of automobiles, vans or passenger trucks can be displayed for sale as an accessory use to an automobile repair garage.

**3.5.2(51) h-51 Zone (155 First Avenue) (123-2014)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City for both 144 and 155 First Avenue.
- (b) Satisfactory arrangements are made with the Region of Durham, Ministry of Transportation and the City on any transportation improvements (e.g. road widening, driveway entrance design, potential traffic signals, safe pedestrian crossing and related road improvements).
- (c) Stormwater management matters are addressed to the satisfaction of the City and the Central Lake Ontario Conservation Authority;  
and
- (d) The environmental condition of the site is suitable for the proposed flea market use to the satisfaction of the City and Region of Durham.

### Permitted Interim Uses:

- (a) All uses permitted in a GI Zone and professional offices.

3.5.2(52) **h-52 Zone (north side of Harbour Road, east of Simcoe Street South)**  
(27-2007)

Purpose: To ensure that:

- (a) An appropriate site plan agreement or subdivision agreement, where applicable, is executed with the City.
- (b) Verification has been provided to the satisfaction of the City and the Region, in the form of a Record of Site Condition acknowledged by the Ministry of the Environment, Conservation and Parks, that the soils of the subject site are suitable for development in accordance with the relevant Provincial guidelines in effect immediately prior to the issuance of a building permit;
- (c) A stormwater management study is prepared to the satisfaction of the City and the Central Lake Ontario Conservation Authority;



- (d) Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and foundation drainage services to serve this development to the satisfaction of the City and Region; and,
- (e) An archaeological assessment is completed to the satisfaction of the Ministry of Tourism, Culture and Sport for lands within 300.0m of a waterway or waters within the Oshawa Harbour.

Permitted Interim Uses:

- (a) All lawfully existing uses as of April 10, 2007 subject to Articles 38.2.2, 38.2.3, 38.2.4 and 38.2.5.
- (b) Outdoor recreational uses without buildings or structures.

3.5.2(53) **h-53 Zone (north of Harbour Road, east of Simcoe Street South and Nelson Street) (27-2007)**

Purpose: To ensure that:

- (a) A development plan and related urban design guidelines are prepared to the satisfaction of the City showing public or private roads, lotting patterns, mix and variety of dwelling unit types, building heights, building, parking area and amenity area footprints for the entire area subject to “h-53”.
- (b) A transportation study that meets the requirements of the Municipal Class Environmental Assessment process, is completed to the satisfaction of the City showing a public or private road pattern, including addressing emergency access, for the entire area subject to “h-53”. Appropriate arrangements in the form of a plan of subdivision and subdivision agreement shall be made to the satisfaction of the City to implement any public roads identified in the transportation study. Appropriate arrangements to the City’s satisfaction shall be made to implement any private roads identified in the approved transportation study, including provision of any required cross-access easements. Notwithstanding the foregoing, implementation of the public or private road pattern may be phased, provided the City is satisfied that appropriate arrangements and agreements are in place to ensure adequate access, including provision for emergency access, is available for adjacent properties subject to the “h-53”.
- (c) Environmental studies are undertaken and appropriate arrangements are made with the City, in the form of a subdivision or other agreement, to address the mitigation of noise, odour and vibration for the area subject to “h-53”. The development of the area and the removal of the “h” may be phased provided that the City is satisfied appropriate arrangements and agreements are in place to ensure development of adjacent lands is not compromised.

- (d) Verification has been provided to the satisfaction of the City and the Central Lake Ontario Conservation Authority and appropriate arrangements have been made to implement any required mitigation to ensure that there will be no negative impacts from development or site alteration on the Provincially Significant Oshawa Creek Wetland Complex, as per policy 2.1.3 and 2.1.6 of the Provincial Policy Statement, 2005.

Permitted Interim Uses:

- (a) All lawfully existing uses as of April 10, 2007 subject to Articles 38.2.2, 38.2.3, 38.2.4 and 38.2.5.
- (b) Outdoor recreational uses without buildings or structures.

3.5.2(54) **h-54 Zone (south of Wellington Avenue East, west of Nelson Street)  
(27-2007)**

Purpose: To ensure that:

- (a) Environmental studies are undertaken and appropriate arrangements are made with the City, in the form of a subdivision or other agreement, to address the mitigation of noise, odour and vibration.

Permitted Interim Uses:

- (a) All lawfully existing uses as of April 10, 2007 subject to Articles 38.2.2, 38.2.3, 38.2.4 and 38.2.5.
- (b) Outdoor recreational uses without buildings or structures.

3.5.2(55) **h-55 Zone (lands south of Winchester Road, east and west of Simcoe Street North)  
(84-2012)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City that addresses such matters as landscaping, fencing, lighting and compliance with the approved Urban Design Guidelines;
- (b) The site plan is generally consistent with the overall long term intent of the Region of Durham's Transit Oriented Development Guidelines to the satisfaction of the Region;
- (c) Driveway access to the satisfaction of the City and the Region;
- (d) Noise mitigation to the satisfaction of the City and the Region; and
- (e) Urban Design Guidelines are prepared to the satisfaction of the City and the Region.



Permitted Interim Uses:

- (a) All uses permitted in the UR Zone.

3.5.2(56) **h-56 Zone (lands south of Winchester Road, west of Simcoe Street North) (84-2012)**

Purpose: To ensure that:

- (a) Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and transportation services and facilities to serve this development and included in a subdivision agreement which is executed.
- (b) A Master Environmental Servicing Plan is completed to the satisfaction of the City, the Region of Durham and the Central Lake Ontario Conservation Authority.

Permitted Interim Uses:

- (a) All uses permitted in the UR Zone.

3.5.2(57) **h-57 Zone (lands south of Winchester Road, east and west of Simcoe Street North) (84-2012)**

Purpose: To ensure that:

- (a) A Retail Market Study and peer review is completed to the City's and Region of Durham's satisfaction for any additional gross leasable floor area above 120,770m<sup>2</sup> and the development of gross leasable floor area is phased.

Permitted Interim Uses:

- (a) Any PCC-A(4) use with a maximum of 120,770m<sup>2</sup> of gross leasable floor area provided the "h-14", "h-55" and "h-56" holding symbols are removed.

3.5.2(58) **h-58 Zone (71 Bruce Street) (86-2015)**

Purpose: To ensure that:

- (a) Verification has been provided to the satisfaction of the City that the site is suitable for the proposed uses in accordance with the relevant Provincial guidelines in effect immediately prior to the issuance of any building permit or residential use of the site. A Record of Site Condition must be submitted to the Ministry of the Environment, Conservation and Parks.

Permitted interim Uses:

- (a) All uses permitted in the UR(1) Zone.

3.5.2(59)     **h-59 Zone (360 Simcoe Street North)**     **(68-2013)**

Purpose:     To ensure that:

- (a) Site Plan approval is obtained from the City;
- (b) Appropriate arrangements are made for the provision of adequate sanitary, water and storm services, including foundation drainage, to serve this development to the satisfaction of the City and the Region of Durham;
- (c) A noise study is completed to the satisfaction of the City and any recommendations are implemented through a site plan agreement;
- (d) Any easements from the City required for stormwater management, servicing or fencing on the City-owned reserve are conveyed; and
- (e) A 0.3m reserve along the north property boundary is conveyed to the City.

Permitted Interim Uses:

- (a) All uses permitted in a R1-C Zone.

3.5.2(60)     **h-60 Zone (north side of Taunton Road West, east and west of Stevenson Road North)**     **(68-2013)**

Purpose:     To ensure that:

- (a) Site Plan approval is obtained from the City for a retail store;
- (b) A transportation impact study is prepared to the satisfaction of the Region of Durham and the City; and
- (c) A retail impact study is prepared to the satisfaction of the City in accordance with Subsection 2.4.5.17 of the Oshawa Official Plan.

Permitted Interim Uses:

- (a) Any use permitted in a compound zone on the property subject to any holding provisions.



3.5.2(61) **h-61 Zone (64 Park Road North and 284 Buena Vista Avenue)** **(61-2016)**

Purpose: To ensure that:

- (a) The City is advised, in writing, by the Region of Durham that the owner has conveyed a corner sight triangle road widening to the satisfaction of the Region of Durham.

Permitted Interim Uses:

- (a) A dwelling unit on the second floor of the existing building and all uses permitted in the OC-B(4) Zone in the balance of the existing main building.

3.5.2(62) **h-62 Zone (north of Britannia Avenue West, west of Windfields Farm Drive)** **(87-2018)**

Purpose: To ensure that:

- (a) Site Plan approval is obtained from the City which addresses such matters as stormwater management, noise mitigation, building siting and appropriate landscaping and fencing to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.

3.5.2(63) **h-63 Zone (24 Beatrice Street West)** **(43-2016)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City that addresses such matters as landscaping, fencing and lighting levels;
- (b) A noise study is completed to the satisfaction of the City;
- (c) Any necessary cross access easements are created to the satisfaction of the City;
- (d) Appropriate arrangements are made for the provision of adequate water, sanitary, foundation drainage and transportation services including driveway access to the development at no cost to and to the satisfaction of the City and Region;
- (e) Appropriate arrangements shall be made for the management of stormwater at no cost to the City and to the satisfaction of the City and Region;

- (f) A qualified person under the Environmental Protection Act and related regulations verifies, to the satisfaction of the City and Region, that the site is suitable for the proposed use. A Record of Site Condition acknowledged by the Ministry of Environment, Conservation and Parks shall only be required if required by the Region's Site Contamination Protocol.

Permitted Interim Uses:

- (a) All uses permitted in an R2 Zone.

3.5.2(64) **h-64 Zone (3151 Wilson Road North) (43-2018)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City including provisions for adequate septic system, storm water management and firefighting services.
- (b) A hydrological/well water supply report is prepared to the satisfaction of the City demonstrating that the well for the property has sufficient capacity to accommodate an agri-tourism and will not adversely impact neighbouring wells;
- (c) That any necessary Environmental Site Assessment (ESA) and, if required by the ESA report, a Record of Site Condition acknowledged by the Ministry of the Environment, Conservation and Parks, are submitted to the satisfaction of the City regarding the conversion of the former barn into hotel rooms.

Permitted Interim Uses:

- (a) All uses permitted in an AG-A Zone.

3.5.2(65) **h-65 Zone (east of Bridle Road, south of Winchester Road East) (72-2018)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City that addresses such matters as lighting, landscaping and fencing, including appropriate provisions related to golf course compatibility; and
- (b) A noise study is completed to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.



3.5.2(66) **h-66 Zone (450-464 Taunton Road West and 620 Taunton Road West) (72-2019, 10-2020)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Appropriate provisions have been made for municipal servicing, including stormwater management issues, and transportation facilities and services;
- (c) An environmental impact study is completed to the satisfaction of the Central Lake Ontario Conservation Authority, the Region and the City;
- (d) An archaeological assessment is completed to the satisfaction of the Ministry of Tourism, Culture and Sport;
- (e) Any necessary cross-access easements to the west and east are created to the satisfaction of the City; and,
- (f) A copy of the Region's Site Screening Questionnaire and any other additional supporting information in accordance with the Region's Site Contamination Protocol is provided to the satisfaction of the Region.

Permitted Interim Uses:

- (a) All existing uses in accordance with the EU Zone.

3.5.2(67) **h-67 Zone (Southwest corner of King Street West and Cabot Street) (69-2019)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) A Flood Study, including hydraulics and balanced cut and fill analysis, is prepared and completed to the satisfaction of the City and CLOCA;
- (c) An appropriate Vegetative Compensation Plan for the removal of any Natural Heritage Features on the property, is prepared to the satisfaction of the City and CLOCA; and
- (d) A constraint map and an Environmental Impact Study demonstrating all proposed development from any environmental features and/or flood and erosion hazards and their appropriate buffers are prepared, to the satisfaction of the City and CLOCA.

Permitted Interim Uses:

- (a) All uses permitted in a R2 Zone.

3.5.2(68) **h-68 Zone (east of Harmony Road North, north of Conlin Road East) (122-2018)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Urban Design Guidelines are prepared to the satisfaction of the City; and
- (c) Any necessary cross-access easements on Block 47 in favour of the lands to the north are created to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

3.5.2(69) **h-69 Zone (east of Harmony Road North, north of Conlin Road East) (122-2018)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City;
- (b) Urban Design Guidelines are prepared to the satisfaction of the City; and
- (c) Any necessary cross-access easements on Block 46 in favour of the lands to the south and east are created to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

3.5.2(70) **h-70 Zone [Not in use] (123-2020)**

3.5.2(71) **h-71 Zone (certain lands north of Taunton Road West, east of the Oshawa-Whitby boundary, south of Highway 407 East and west of the Oshawa Creek) (58-2019)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City that addresses such matters as a stormwater management plan using the results of the Master Stormwater Management Plan Study for the Northwood Business Park prepared by Greck and Associates Limited dated August 2016 as a resource to the satisfaction of the City and the Central Lake Ontario Conservation Authority;
- (b) Appropriate arrangements are made for the provision of adequate sanitary, water and storm services to the satisfaction of the City, the



Region of Durham and the Central Lake Ontario Conservation Authority; and

- (c) Appropriate engineering and environmental impact studies are undertaken to address any potential environmental impacts on the natural heritage system to the satisfaction of the City and the Central Lake Ontario Conservation Authority.

Permitted Interim Uses.

- (a) All uses permitted in a UR Zone;
- (b) [Not in use].
- (c) [Not in use].
- (d) Contracting Yard provided that there is a maximum of one building with a maximum gross floor area of 200 square metres (2,153 sq. ft.), processed under site plan control, which may be by way of a Letter of Undertaking. **(74-2021)**
- (e) Recreational Vehicle Storage provided that there is a maximum of one building with a maximum gross floor area of 200 square metres (2,153 sq. ft.), processed under site plan control, which may be by way of a Letter of Undertaking. **(74-2021)**

3.5.2(72) **h-72 Zone (certain lands north of Conlin Road West, east and west of Thornton Road North) **(58-2019)****

Purpose: To ensure that:

- (a) Appropriate arrangements are made with the City for the acquisition of the land required from the subject site for construction of the Britannia Avenue West extension to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Contracting Yard provided that there is a maximum of one building with a maximum gross floor area of 200 square metres (2,153 sq. ft.), processed under site plan control, which may be by way of a Letter of Undertaking. **(74-2021)**
- (c) Recreational Vehicle Storage provided that there is a maximum of one building with a maximum gross floor area of 200 square metres (2,153 sq. ft.), processed under site plan control, which may be by way of a Letter of Undertaking. **(74-2021)**

3.5.2(73) **h-73 Zone (certain lands north of Taunton Road West, east and west of Thornton Road North) (58-2019)**

Purpose: To ensure that:

- (a) Appropriate arrangements are made with the City for the acquisition of lands required from the subject lands for construction of the east-west Type "C" Arterial Road between Stevenson Road North and the Oshawa-Whitby boundary north of the Trans-Northern Pipeline and that a Municipal Class Environmental Assessment is undertaken to determine the alignment of the Type "C" Arterial Road to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.
- (b) Contracting Yard provided that there is a maximum of one building with a maximum gross floor area of 200 square metres (2,153 sq. ft.), processed under site plan control, which may be by way of a Letter of Undertaking. **(74-2021)**
- (c) Recreational Vehicle Storage provided that there is a maximum of one building with a maximum gross floor area of 200 square metres (2,153 sq. ft.), processed under site plan control, which may be by way of a Letter of Undertaking. **(74-2021)**

3.5.2(74) **h-74 Zone (1410 Stevenson Road North) (58-2019)**

Purpose: To ensure that:

- (a) Site Plan approval is obtained from the City for a Place of Worship;
- (b) Appropriate arrangements are made with the City for the acquisition of the land required from the subject site for construction of the Britannia Avenue West extension to the satisfaction of the City; and
- (c) Appropriate arrangements are made with the City for the acquisition of lands required from the subject lands for construction of the east-west Type "C" Arterial Road between Stevenson Road North and the Oshawa-Whitby boundary north of the Trans-Northern Pipeline and that a Municipal Class Environmental Assessment is undertaken to determine the alignment of the Type "C" Arterial Road to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone
- (b) Church



3.5.2(75)      **h-75 Zone (1680 Stevenson Road North)**      **(58-2019)**

Purpose:      To ensure that:

- (a)      A land division Committee application LD-2019-11 is completed.

Permitted Interim Uses:

- (a)      A severance of the lands in accordance with Land Division Committee application A-2019-11.

3.5.2(76)      **h-76 Zone (various locations)**      **(69-2019)**

Purpose:      To ensure that:

- (a)      Site plan approval is obtained from the City; and
- (b)      For those lands abutting the Oshawa Creek a constraint map and/or studies demonstrating all proposed development is setback from any environmental features and/or hazard and their appropriate buffers, are prepared and completed to the satisfaction of the City and CLOCA.

Permitted Interim Uses:

- (a)      All uses permitted in a R1-C Zone.

3.5.2(77)      **h-77 Zone (various locations)**      **(69-2019)**

Purpose:      To ensure that:

- (a)      Site plan approval is obtained from the City; and
- (b)      For those lands abutting the Oshawa Creek a constraint map and/or studies demonstrating all proposed development is setback from any environmental features and/or hazard and their appropriate buffers, are prepared and completed to the satisfaction of the City and CLOCA.

Permitted Interim Uses:

- (a)      All uses permitted in a R2 Zone.

3.5.2(78)      **h-78 Zone (various locations)**      **(69-2019)**

Purpose:      To ensure that:

- (a)      Site plan approval is obtained from the City.

Permitted Interim Uses:

- (a) All uses permitted in a R1-C/OC-A Zone.

3.5.2(79) **h-79 Zone (north of Grand Ridge Avenue, west of Langley Circle)  
(17-2021)**

Purpose: To ensure that:

- (a) Appropriate studies are completed in accordance with Ministry of the Environment, Conservation and Parks guidelines to the satisfaction of the City and Region demonstrating that mitigation measures are no longer required on lands subject to this Holding Zone to provide land use compatibility between nearby industrial and commercial land uses and the residential lands to the east and south.
- (b) Site plan approval is obtained from the City for any block townhouses, which addresses such matters as landscaping, fencing and lighting.
- (c) For any block townhouses, any necessary cross-access easements are created to the satisfaction of the City.

Permitted Interim Uses:

- (a) All uses permitted in a UR Zone.

3.5.2(80) **h-80 Zone (North of Grand Ridge Avenue, west of Langley Circle)  
(17-2021)**

Purpose: To ensure that:

- (a) Site plan approval is obtained from the City which addresses such matters as landscaping, fencing and lighting.
- (b) A noise study is completed to the satisfaction of the City.
- (c) Dust and odour mitigation to the satisfaction of the City and Region.
- (d) Any cross-access easements are created in favour of the lands to the southeast to the satisfaction of the City.

Permitted Interim Uses:

- (d) All uses permitted in a UR Zone.
- (e) Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.



3.5.2(81) **h-81 Zone (Southwest quadrant of Taunton Road East and Clearbrook Drive)** (17-2021)

Purpose: To ensure that:

- (a) Appropriate studies are completed in accordance with Ministry of the Environment, Conservation and Parks guidelines to the satisfaction of the City and Region demonstrating that mitigation measures are no longer required on lands subject to this Holding Zone to provide land use compatibility between nearby industrial and commercial land uses and the residential lands to the east.
- (b) Site plan approval is obtained from the City which addresses such matters as building siting, landscaping, fencing and lighting.
- (c) Appropriate arrangements shall be made for the provision of adequate water, sanitary, storm, foundation drainage and transportation services to the development to the satisfaction of the City and Region.
- (d) An odour study is completed for any restaurant use.
- (e) Noise mitigation to the City's satisfaction.
- (f) All waste storage shall be located within an enclosed building or a partially in-ground waste storage bin.
- (g) The building design(s) is compatible with the operation of the Oshawa Executive Airport.

Permitted Interim Uses:

- (a) All uses permitted in a PCC-D Zone except for the following:
  - (i) Adult secondary school
  - (ii) Apartment building
  - (iii) Back-to-back townhouse
  - (iv) Block townhouse
  - (v) Church
  - (vi) Commercial school
  - (vii) Day care centre
  - (viii) Flat
  - (ix) Funeral home
  - (x) Hotel
  - (xi) Long Term Care Facility
  - (xii) Museum
  - (xiii) Nursing home
  - (xiv) Private school
  - (xv) Retirement home.
- (b) All permitted interim uses under the "h-18" holding symbol.

3.5.2(82)     **h-82 Zone (64 Albany Street and 426 Front Street)**     **(117-2021)**

Purpose:     To ensure that:

- (a)     An appropriate site plan agreement is executed with the City;
- (b)     Appropriate arrangements shall be made for the provision of adequate water, sanitary, storm, foundation drainage and transportation services to the development to the satisfaction of the City and the Regional Municipality of Durham; and
- (c)     Noise and vibration issues have been mitigated to the satisfaction of the City.

Permitted Interim Uses:

- (a)     All existing uses permitted as of the date of this By-law.
- (b)     A temporary sales office for the sale of units within the proposed building in accordance with the provisions of Subsection 4.13 of this By-law.

3.5.2(83)     **h-83 Zone (south of the future Beatrice Street East connection and east of Harmony Road North)**     **(76-2021)**

Purpose:     To ensure that:

- (a)     Appropriate site plan and subdivision agreements are executed with the City.
- (b)     Appropriate arrangements shall be made for the provision of adequate sanitary, water, storm and transportation services and facilities to serve this development and included in a subdivision or site plan agreement which is executed.
- (c)     Appropriate arrangements are made with the City for the acquisition of the land required from the subject site for the construction of the future Beatrice Street East connection to the satisfaction of the City.

Permitted Interim Uses:

- (a)     All existing uses legally permitted as of the date of this By-law.
- (b)     Model homes and a temporary sales office in accordance with the provisions of Subsection 4.13 of this By-law.

**3.6             Compound Zones**

- 3.6.1     Notwithstanding any other provision of this By-law, where two or more zoning symbols divided by an oblique line ("/") are shown on the zoning maps as applying to a lot, or as compounded by a Special Condition, that



lot may be used for any use permitted in any one of the zones included in the compound zone symbol, or for any combination of uses permitted in any of the zones included in the compound zone symbol, subject to compliance with the provisions of Articles 3.6.2 and 3.6.3.

- 3.6.2 The provisions prescribed in this By-law for the selected zone in the compound zone symbol in which the use is permitted shall be complied with in the development of the lands. When a combination of uses from two or more zones are to be developed on a lot, the zone provisions applicable to each use shall be complied with.
- 3.6.3 The parking facilities and loading spaces required by this By-law for each of the uses included in the development of the lands, whether for a single use or a combination of uses, shall be provided.

### **3.7 Multiple Zones**

- 3.7.1 Where a lot is divided into two or more zones, each such portion of the lot shall be considered a separate lot for the purposes of this By-law and shall be used in accordance with the provisions of this By-law which are applicable to the zone wherein such portion of the said lot is located.
- 3.7.2 Notwithstanding Article 3.7.1 to the contrary, where a use or uses are permitted by the zones applying to two or more portions of the lot, those portions shall be considered to constitute a single lot as defined herein and the most restrictive zone provisions pertaining to such use or uses in all the pertinent zones shall apply to the whole lot, except as provided in Article 3.7.3.
- 3.7.3 Notwithstanding Article 3.7.2, any building erected or to be erected on a lot, which is divided into separate CBD-A and CBD-B zones, and which building will be partially located in each zone, shall be subject to the regulations set out in Table 16.2 for CBD-A zones, except that not more than twenty-five percent (25%) of the gross floor area or 90m<sup>2</sup>, whichever is the greater, of that portion of the first storey, excluding basements, of the building located in the CBD-B Zone shall be designated or used as retail store floor space.

### **3.8 Determining Zone Boundaries**

- 3.8.1 The extent and boundaries of all zones are set out on the maps comprising Schedule "A" to this By-law.
- 3.8.2 Boundaries of zones shall be determined wherever possible to be concurrent with the following:
- (a) The lot line of any lot, except where the lot line is a street line then the boundary is the centreline of the street;

- (b) The centreline of a lane, railway right-of-way, transmission line, pipeline or watercourse;
- (c) When running substantially parallel to a street line, where the distance from the street line is not indicated and the circumstances described in clauses (a) and (b) do not pertain, the boundary is parallel to the street line and the distance therefrom shall be determined according to the scale shown on the zoning map;
- (d) The more restrictive of either the regulatory flood line, as determined by the Central Lake Ontario Conservation Authority, or the top of a bank of a valley and, where the top of bank is or becomes the more restrictive, the boundary shall move with any change in such top of bank. **(66-1998, 60-2005)**

3.8.3 Notwithstanding Articles 3.8.1 and 3.8.2 to the contrary, the western boundary of the OSE Zone affecting the area commonly referred to as the Second Marsh and located south of Colonel Sam Drive and north of the Harbour Road Extension is located 60m west of the applicable regulatory floodline on the west side of the Second Marsh, as determined by the Central Lake Ontario Conservation Authority. In the area south of the Harbour Road Extension, the western boundary of the OSE Zone is the applicable regulatory floodline on the west side of the Second Marsh as described above. **(OMB Z960129, 68-2013)**

3.8.4 Notwithstanding Articles 3.8.1 or 3.8.2 to the contrary, the northern boundary of the OSW Zone affecting the area generally located along the Lake Ontario Waterfront between Park Road South and Cedar Street shall be the 100 year erosion setback limit as determined by the Central Lake Ontario Conservation Authority.

3.8.5 Notwithstanding Articles 3.8.1 or 3.8.2 to the contrary, the boundaries of the OSH Zone along the Goodman Creek between King Street West and Stevenson Road South and between Lots 13 and 14, Concession 1, and Nassau Street shall be located 5.0m from the centreline of the Goodman Creek on both sides of the creek. **(43-1998)**

3.8.6 In the event that a street or lane which forms the boundary is closed or partially closed, the boundary between such zones shall remain as the former centreline of the closed street or lane as of the date of passage of this By-law.

3.8.7 Where uncertainty exists as to the location of a zone boundary on Schedule "A" hereto or a Schedule to any amendment to this By-law, reference shall be made to the Schedules at the original scales as contained in the Office of the Clerk.

3.8.8 Notwithstanding Articles 3.8.1 and 3.8.2 to the contrary, the boundaries of the lands zoned SI-C south of Bloor Street East, east of the existing west property line, north of Branch No. 6 of the Harmony Creek and west of



Branch No. 1 of the Harmony Creek shall be interpreted as being the 1:100 year storm floodline under future development conditions as determined by the Central Lake Ontario Conservation Authority such that the lands zoned SI-C are above the 1:100 year storm floodline under future development conditions. **(OMB Z950159, 39-2004)**

- 3.8.9 Notwithstanding Articles 3.8.1 and 3.8.2 to the contrary, the easterly boundary of the lands zoned SI-C south of Bloor Street East, east of Farewell Street, north of the CN Rail mainline and west of Branch No. 6 of the Harmony Creek, shall be interpreted as being the 1:100 year storm floodline under future development conditions as determined by the Central Lake Ontario Conservation Authority, such that the lands zoned SI-C are above the 100 year storm floodline under future development conditions **(OMB Z950159, 39-2004)**
- 3.8.10 Notwithstanding Articles 3.8.1 and 3.8.2 to the contrary, the most easterly boundary of the lands zoned PCC-A(3) shall be interpreted as being 7.5m west of the top of bank of the Harmony Creek Valley as determined by the City. **(73-2003, 55-2006, OMB Z050045)**
- 3.8.11 Notwithstanding Articles 3.8.1 and 3.8.2 to the contrary, the easterly most boundary of the lands zoned SPC-A north of Bloor Street East, west of the Harmony Creek, shall be concurrent with the easterly limit of Part 2 on Plan 40R-23001. **(126-2004)**
- 3.8.12 Notwithstanding Articles 3.8.1 or 3.8.2 to the contrary, the boundaries of the OS-ORM Zone shall be interpreted as being 30.0m beyond the edge of the Natural Heritage Feature or Hydrologically Sensitive Feature and incorporates the Minimum Vegetation Protection Zone required by the Oak Ridges Moraine Conservation Plan. **(38-2006)**
- 3.8.13 Notwithstanding any Article in Subsection 3.8 to the contrary, the boundaries of the SPC-A(9) Zone for the former Fox Street road allowance on the west side of Fox Street, north of Champlain Avenue shall be interpreted as being the western limit of the former Fox Street road allowance rather than the centreline of the road allowance. **(42-2017)**
- 3.8.14 Notwithstanding any Article in Subsection 3.8 to the contrary, the boundaries of the OSE(1) Zone affecting the area commonly referred to as the Northwood Business Park and generally located north of Taunton Road West, east of the Oshawa-Whitby boundary, south of Highway 407 East and west of the Oshawa Creek may be adjusted following the preparation of either or both of an Environmental Impact Study or Engineering Study to the satisfaction of the City and the Central Lake Ontario Conservation Authority. **(58-2019)**

### **3.9 Map Details**

- 3.9.1 Any street, address, or other names, notes, property boundaries or physical features shown on the maps are for reference purposes only and do not form part of this By-law. This information may be amended from time to time without a statutory by-law amendment.
- 3.9.2 Any accretions to any land subject to this By-law shall be deemed to be subject to this By-law with respect to the respective zone or zones as shown on the zoning maps to which such accretions immediately abut.

### **3.10 Hazard Lands**

- 3.10.1 The map comprising Schedules “B”, “B-1” and “B-2” is for information purposes only and does not form part of this By-law. This information is intended to assist property owners in knowing if their lands are affected by Hazard Lands as shown in the Oshawa Official Plan and thus likely subject to the provisions of the Conservation Authorities Act. The lands so shaded which lie within Hazard Lands may be subject to flooding and at a minimum may require floodproofing or safe access before any development or redevelopment may occur. Approvals pursuant to the Conservation Authorities Act may be required. Schedules “B”, “B-1” and “B-2” may be amended from time to time without a statutory by-law amendment.

### **3.11 Waste Disposal Assessment Areas**

- 3.11.1 Waste Disposal Assessment Areas are symbolically shown on Schedule “C”. The map comprising Schedule “C” is for information purposes only and does not form part of this By-law. These areas symbolically indicate the general location of certain former waste disposal areas and their possible areas of influence. Prior to any development or redevelopment near the former waste disposal areas, approval from the Ministry of the Environment, Conservation and Parks may be required. Schedule “C” may be amended from time to time without a statutory by-law amendment.

### **3.12 Temporary Use Zones (160-2005)**

#### **3.12.1 Use of “TEMP” Symbol**

- 3.12.1(1) Where the symbol “TEMP” appears on a zoning map as a suffix to a zone, a zone variation or a compound zone applying to certain lands, notwithstanding the provisions of that zone, one or more additional uses are permitted on the land as set out in Article 3.12.2 until the permission granted by the site specific Temporary Use by-law expires. The relevant Temporary Use Zone Provisions are denoted by the number immediately following the symbol “TEMP” on the zoning map.



**3.12.2 Temporary Use Zone Provisions (160-2005)**

**3.12.2(1) TEMP-1 Zone (1399 Simcoe Street North)  
(31-2007, 80-2009, 10-2013, 86-2015, 69-2019, 74-2001)**

Notwithstanding any other provision of this By-law to the contrary, in any R6-C "Temp-1" Zone, a temporary automobile sales and service establishment for used vehicles shall be permitted until April 10, 2024.

**3.12.2(2) TEMP-2 Zone (382 Simcoe Street North) (110-2016)**

(a) Notwithstanding any other provision of this By-law to the contrary, in any R1-C "TEMP-2" Zone, as shown on Schedule "A", a temporary administrative office for the Lakeridge Health Foundation shall be permitted in the main building lawfully existing on November 28, 2016 provided site plan approval has been obtained from the City. The temporary administrative office shall only be permitted until November 28, 2024. **(69-2019, 74-2021)**

(b) Notwithstanding any other provision of this By-law to the contrary, a minimum of four (4) parking spaces shall be required for an administrative office in a R1-C "TEMP-2" Zone.

(c) In any R1-C "TEMP-2" Zone, as shown on Schedule "A" to this By-law, the following definition shall apply:

**"ADMINISTRATIVE OFFICE"** means a building in which one or more persons are employed in the management of the Lakeridge Health Foundation and such activities shall only include budgeting, accounting, event planning, donor communication, and donor meetings.

**3.12.2(3) TEMP-3 Zone [Not in use] (73-2014)**

**3.13 Oak Ridges Moraine Conservation Plan (38-2006)**

3.13.1 Key Natural Heritage Features and Hydrologically Sensitive Features, as identified by the Oak Ridges Moraine Conservation Plan, plus a 120.0m Area of Influence, are shown on Schedule "E". Minimum Vegetation Protection Zones within the Area of Influence are also shown on Schedule "E". Schedule "E" is provided for information purposes only and does not form part of this By-law. Lands identified on Schedule "E" are subject to the Oak Ridges Moraine Conservation Plan policies requiring a natural heritage evaluation and/or hydrological evaluation to be completed to the City's satisfaction prior to development.

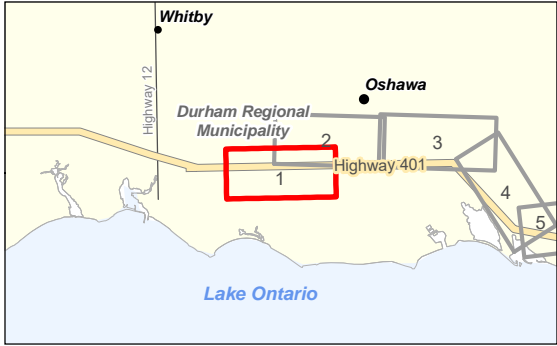
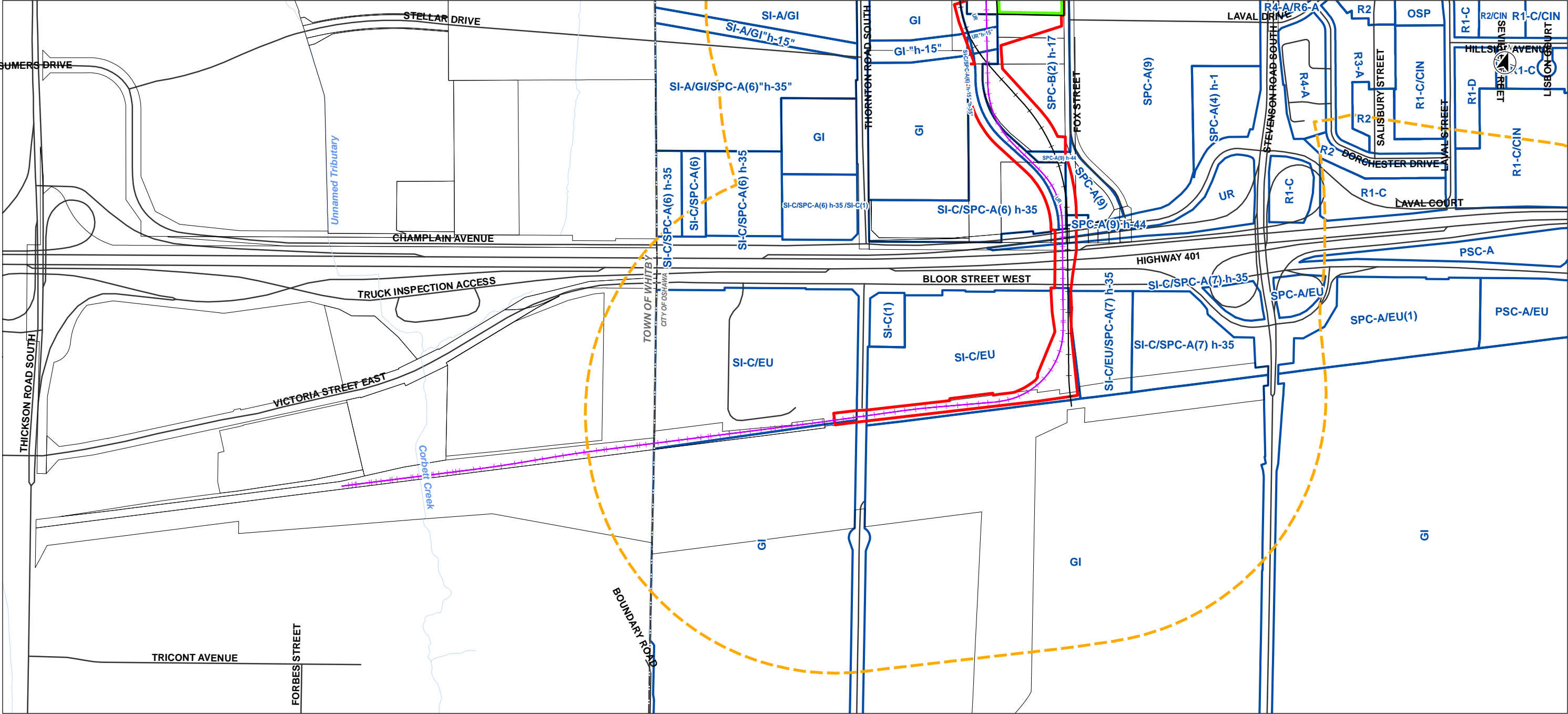
3.13.2 Key Natural Heritage Features on the Oak Ridges Moraine shall include wetlands, significant portions of the habitat of endangered, rare and threatened species, fish habitat, areas of natural and scientific interest (life

science), significant valleylands, significant woodlots, significant wildlife habitat, and sand barrens, savannahs and tallgrass prairies.

- 3.13.3 Hydrologically Sensitive Features on the Oak Ridges Moraine shall include permanent and intermittent streams, wetlands, kettle lakes and seepage areas and springs.

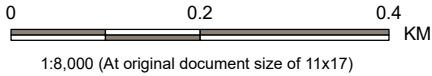


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**Notes**  
1. Coordinate System: NAD 1983 CSRS MTM 10  
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.  
3. Zoning layer source City of Oshawa, Open Data Licence Agreement 2021.

- Legend**
- Project Footprint
  - Proposed Transit Oriented Community Location
  - Study Area (500 m Buffer)
  - Proposed Tracks
  - Existing Railway
  - Watercourse
  - Property Boundary
  - Municipal Boundary, Lower
  - Zoning Categories (City of Oshawa)



Project Location: 165011019 REVA  
Region Municipality of Durham  
Prepared by BCC on 2023-06-05

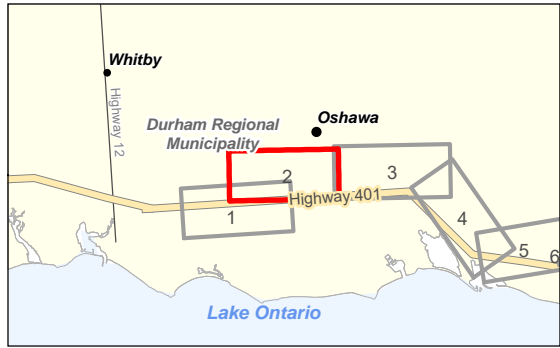
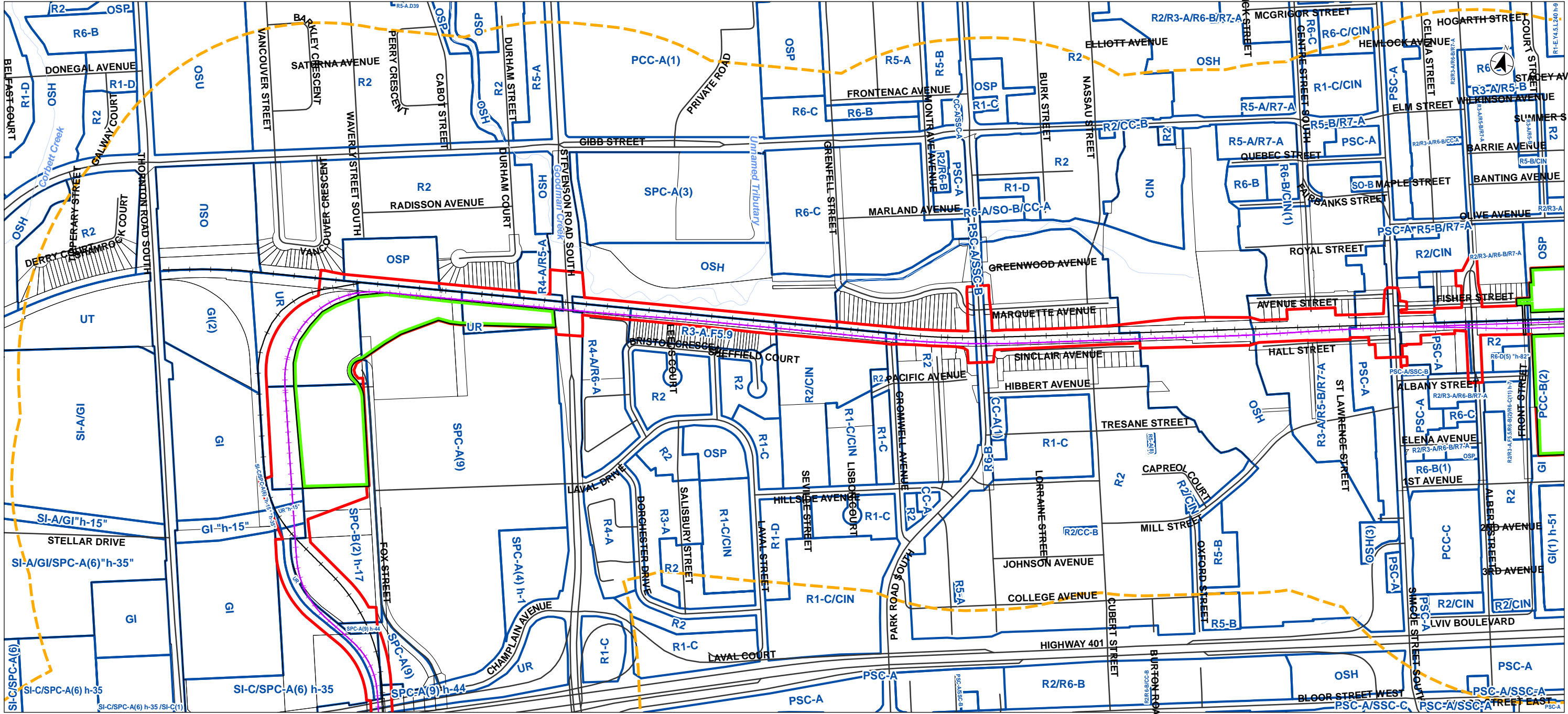
Client/Project: METROLINX, OSHAWA TO BOWMANVILLE RAIL  
SERVICE EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.: **A.1.1**

Title: **City of Oshawa Zoning Categories**

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Project Location 165011019 REVA  
Region Municipality of Durham Prepared by BCC on 2023-06-05

Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL  
SERVICE EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.

**A.1.2**

Title

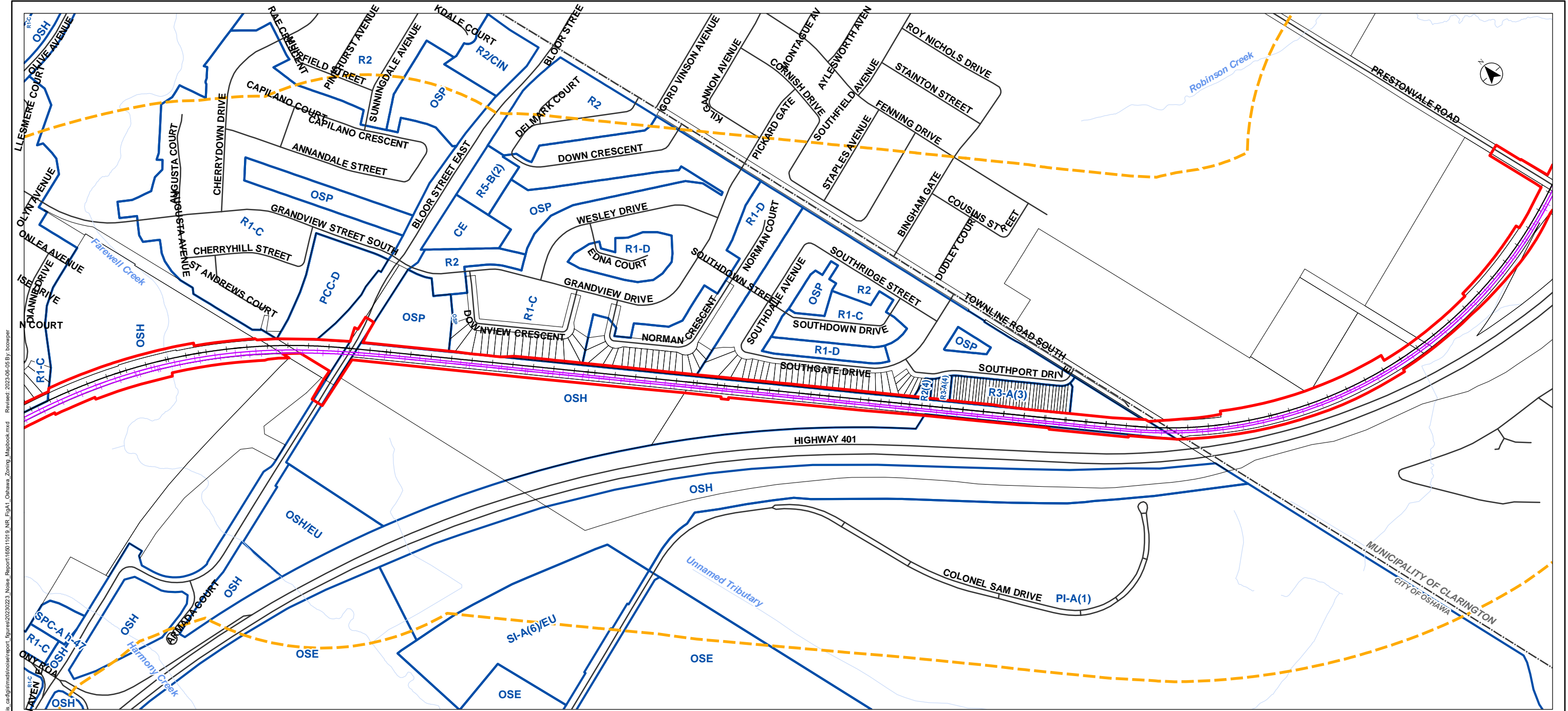
**City of Oshawa Zoning Categories**

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KM  
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- Legend
- Project Footprint
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  - Property Boundary
  - Municipal Boundary, Lower
  - Zoning Categories (City of Oshawa)

Notes

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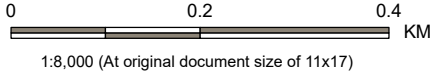


Project Location  
Region of Durham  
165011019 REVA  
Prepared by BCC on 2023-06-05

Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL  
SERVICE EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.  
**A.1.4**

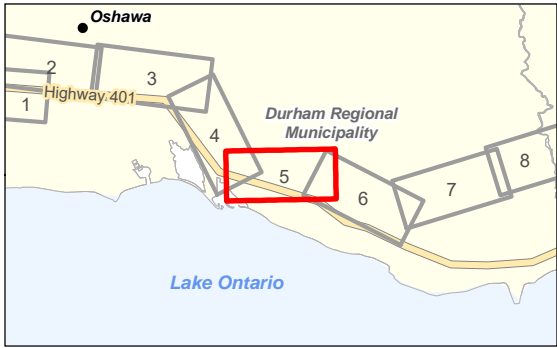
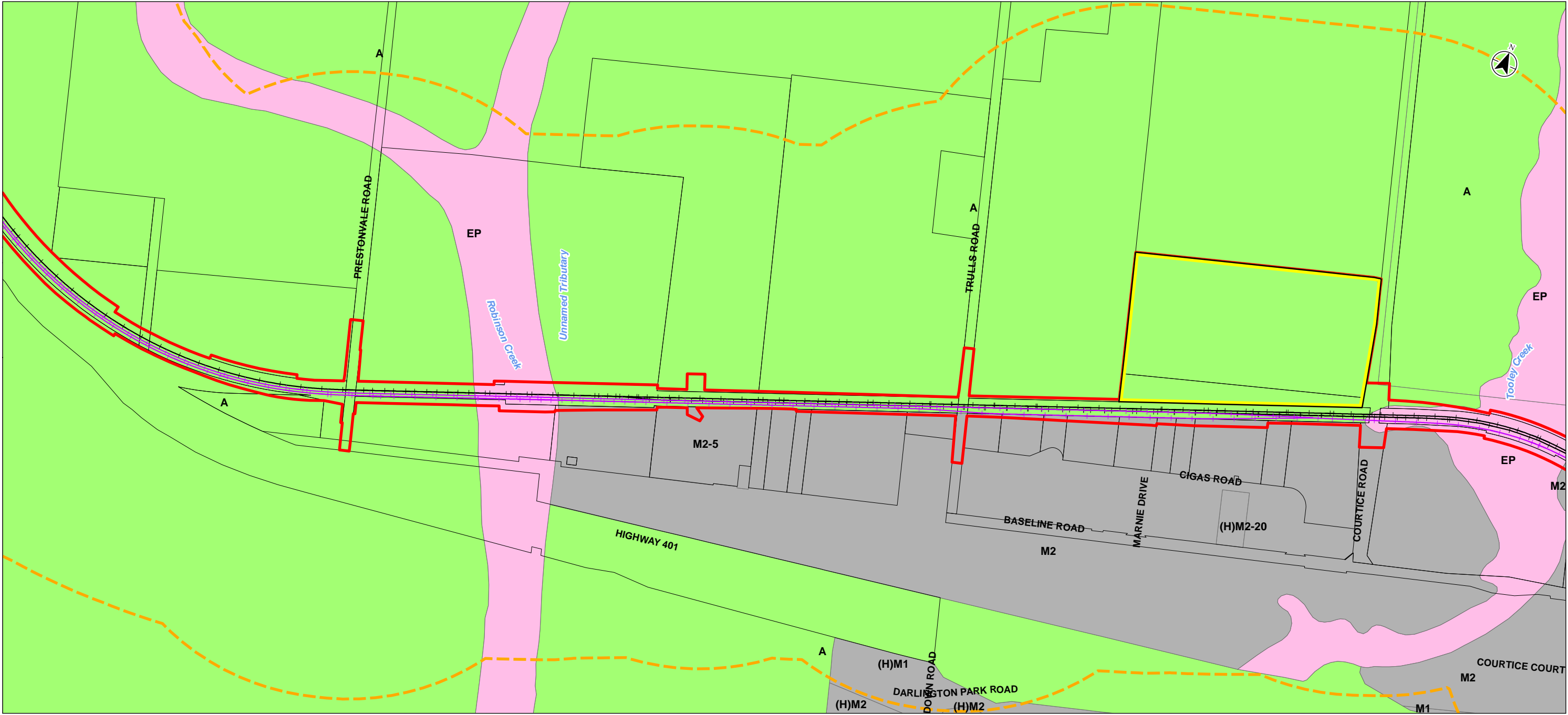
Title  
**City of Oshawa Zoning Categories**







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  - Watercourse
  - Property Boundary
  - Municipal Boundary, Lower
- Zoning and Landuse (City of Clarington)**
- Agriculture
  - Environmental Protection

Industrial

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1:8,000 (At original document size of 11x17)



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SERVICE EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.  
**A.2.2**

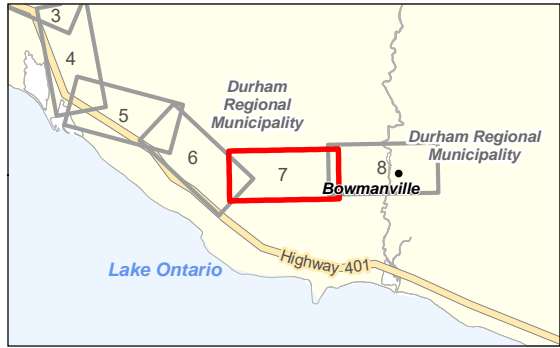
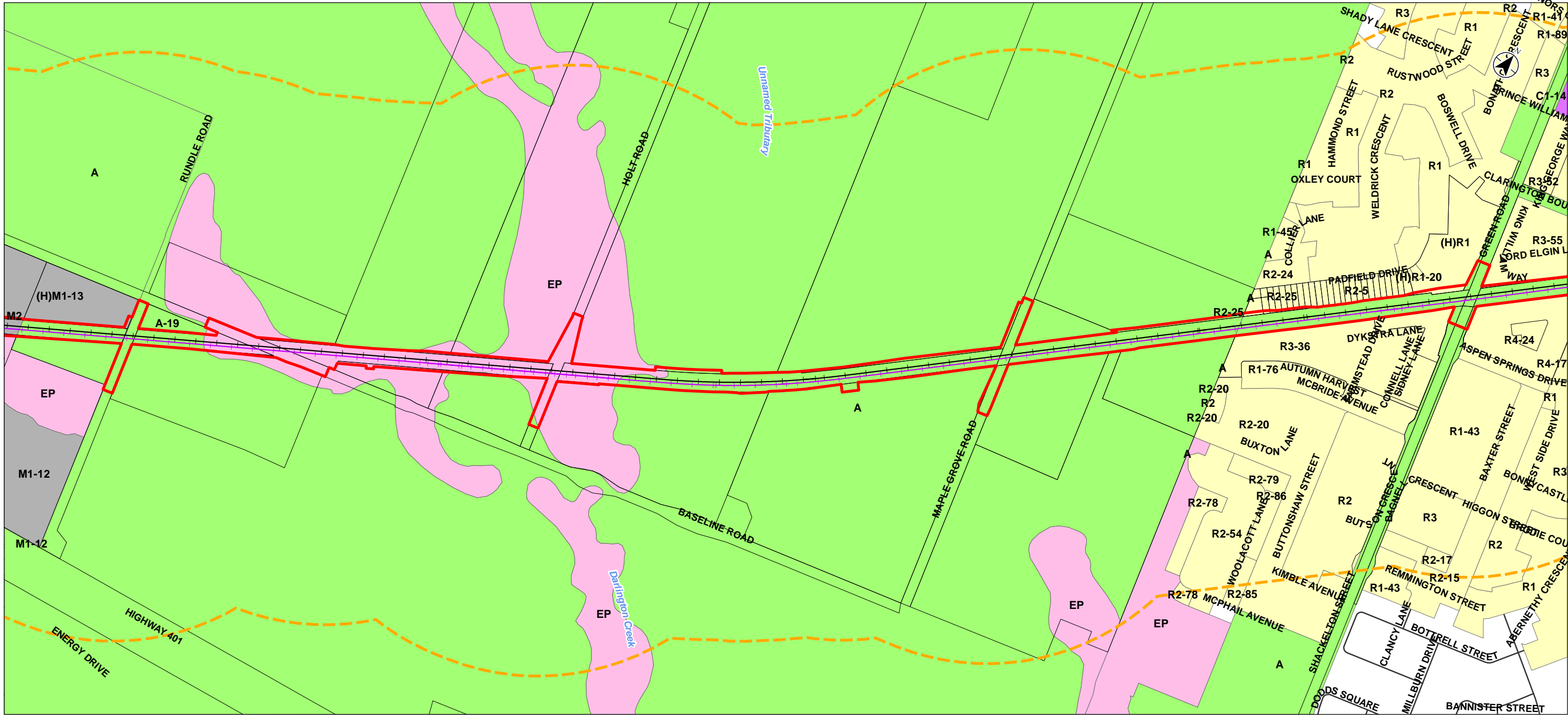
Title  
**City of Clarington Zoning and Land Use Categories**

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  - Property Boundary
  - Municipal Boundary, Lower
- Zoning and Landuse (City of Clarington)**
- Agriculture
  - Commercial
  - Environmental Protection
  - Industrial
  - Residential

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1:8,000 (At original document size of 11x17) KM



Project Location 165011019 REVA  
Region of Durham Municipality Prepared by BCC on 2023-06-05

Client/Project  
METROLINX, OSHAWA TO BOWMANVILLE RAIL  
SERVICE EXTENSION PROJECT  
ENVIRONMENTAL PROJECT REPORT ADDENDUM

Figure No.  
**A.2.4**

Title  
**City of Clarington Zoning and Land Use Categories**

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## **Appendix B**

### **Sample Noise Calculations and Modelling Inputs**





## Appendix B.1 - Key Acoustic Modelling Parameters and Sample Calculations

Modelling parameters used to calculate the pre-project and project daytime and nighttime noise impacts are summarized in Table 1.

**Table 1 Key Acoustic Model Parameters**

Parameter	Value	Rationale
Ground Absorption	0.5	Accounts for mostly acoustically reflective surfaces (pavement and hard packed ground) within the Facility property boundary and the industrial area to the south and mostly acoustically absorptive (i.e., grass) surfaces between Facility and representative point of reception.
Temperature	10°C	Ontario standard conditions
Relative Humidity	70%	Ontario standard conditions
Max. Order of Reflection	2	Accounts for building reflections

## **Appendix B.2 - FTA Cadna Rail Sample Calculations**



## Receiver

Name: Two Storey Residence on Cromwell Ave.

ID: !00!POR013

X: 355388.72 m

Y: 4860644.04 m

Z: 108.21 m

Railway, FTA/FRA, Name: "CN\_EXISTING\_TRACKS\_LOCO", ID: "!0500!BMV\_PROPOSED\_TRACKS00002\_LOCO"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Lw dB(A)	Ageo (dB)	Aangle (dB)	Agr (dB)	Ashield (dB)	RL (dB)	Lr dB(A)
10309	355334.34	4860672.15	105.38	0	D	62.1	3.9	10.3	1.3	0.0	0.0	46.6
10319	355306.06	4860667.02	105.35	0	D	62.1	3.9	13.2	1.2	0.0	0.0	43.7
10329	355263.66	4860659.33	105.32	0	D	62.1	3.9	13.4	1.2	0.0	0.0	43.5
10339	355207.11	4860649.08	105.28	0	D	62.1	3.9	16.7	1.1	0.0	0.0	40.3
10348	355150.57	4860638.83	105.23	0	D	62.1	3.9	19.1	1.1	0.0	0.0	38.0
10359	355065.76	4860623.45	105.16	0	D	62.1	3.9	18.7	1.1	0.0	0.0	38.4
10368	354952.67	4860602.95	105.08	0	D	62.1	3.9	21.4	1.0	0.0	0.0	35.7
10377	355314.27	4860668.51	105.36	1	D	62.1	8.8	14.1	2.5	0.0	2.0	34.6
10399	355196.77	4860647.21	105.27	1	D	62.1	11.0	17.7	2.7	0.0	2.0	28.7
10700	355429.34	4860690.44	106.09	0	D	62.1	4.0	11.2	1.3	0.0	0.0	45.6
10711	355412.01	4860687.07	105.94	0	D	62.1	4.0	12.3	1.3	0.0	0.0	44.6
10723	355400.46	4860684.82	105.84	0	D	62.1	4.0	11.1	1.3	0.0	0.0	45.8
10734	355388.91	4860682.58	105.74	0	D	62.1	4.0	10.2	1.3	0.0	0.0	46.6
10744	355377.35	4860680.33	105.64	0	D	62.1	4.0	10.1	1.3	0.0	0.0	46.7
10754	355365.80	4860678.08	105.54	0	D	62.1	4.0	10.8	1.3	0.0	0.0	46.1
10766	355354.25	4860675.83	105.44	0	D	62.1	4.0	11.9	1.3	0.0	0.0	45.0
11246	355476.18	4860701.43	106.17	0	D	62.1	3.6	16.1	1.2	0.0	0.0	41.3
11258	355452.66	4860695.60	106.18	0	D	62.1	3.6	13.9	1.2	0.0	0.0	43.4
11385	355943.14	4860849.28	106.17	0	D	62.1	2.7	23.5	0.9	1.0	0.0	34.0
11395	355781.76	4860798.17	106.10	0	D	62.1	2.7	20.5	0.9	0.0	0.0	38.0
11669	355578.66	4860730.92	106.19	0	D	62.1	2.7	16.7	0.9	0.0	0.0	41.7
11681	355542.45	4860719.98	106.20	1	D	62.1	10.5	19.9	2.7	0.0	2.0	27.0
11692	355553.90	4860723.44	106.20	1	D	62.1	10.6	19.9	2.8	0.0	2.0	26.9
11703	355510.01	4860710.59	106.18	0	D	62.1	3.1	16.1	1.0	0.0	0.0	41.8
12094	355663.16	4860758.81	106.11	0	D	62.1	-0.3	23.8	0.1	0.0	0.0	38.5
12105	355671.05	4860761.68	106.10	1	D	62.1	8.0	24.6	2.3	0.0	2.0	25.2
12313	354498.93	4860522.16	105.65	0	D	62.1	3.8	22.1	1.1	0.0	0.0	35.0
12393	354796.92	4860575.19	105.58	0	D	62.1	3.6	21.8	1.0	0.0	0.0	35.7

Railway, FTA/FRA, Name: "BMV\_PROPOSED\_TRACKS\_LOCO\_A", ID: "!06!BMV\_PROPOSED\_TRACKS00001\_LOCO\_A"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Lw dB(A)	Ageo (dB)	Aangle (dB)	Agr (dB)	Ashield (dB)	RL (dB)	Lr dB(A)
10409	355358.43	4860669.00	106.03	0	D	67.3	3.0	12.0	1.0	0.0	0.0	51.4
10418	355368.38	4860670.90	106.12	0	D	67.3	3.0	10.7	1.0	0.0	0.0	52.7
10428	355378.32	4860672.79	106.21	0	D	67.3	3.0	9.9	1.0	0.0	0.0	53.5
10439	355388.27	4860674.69	106.30	0	D	67.3	3.0	9.9	1.0	0.0	0.0	53.5
10451	355358.43	4860669.00	108.77	0	D	67.3	3.0	12.0	1.2	0.0	0.0	51.2
10463	355368.38	4860670.90	108.86	0	D	67.3	3.0	10.7	1.2	0.0	0.0	52.5
10472	355378.32	4860672.79	108.95	0	D	67.3	3.0	9.9	1.2	0.0	0.0	53.3
10482	355388.27	4860674.69	109.05	0	D	67.3	3.0	9.9	1.2	0.0	0.0	53.3
10539	355398.05	4860676.64	106.35	0	D	67.3	3.0	10.9	1.0	0.0	0.0	52.5
10549	355407.68	4860678.65	106.36	0	D	67.3	3.0	12.2	1.0	0.0	0.0	51.2
10560	355422.12	4860681.66	106.36	0	D	67.3	3.0	11.2	1.0	0.0	0.0	52.2
10593	355398.05	4860676.64	109.10	0	D	67.3	2.9	10.9	1.2	0.0	0.0	52.3
10603	355407.68	4860678.65	109.10	0	D	67.3	2.9	12.2	1.2	0.0	0.0	51.0
10613	355422.12	4860681.66	109.10	0	D	67.3	2.9	11.2	1.2	0.0	0.0	51.9
10625	355323.57	4860662.66	105.47	0	D	67.3	2.9	13.7	1.0	0.0	0.0	49.7
10636	355343.49	4860666.25	105.81	0	D	67.3	2.9	11.1	1.0	0.0	0.0	52.3
10647	355317.44	4860661.55	105.37	1	D	67.3	9.1	18.0	2.6	0.0	2.0	35.7
10657	355323.57	4860662.66	108.21	0	D	67.3	2.9	13.7	1.2	0.0	0.0	49.5
10668	355343.49	4860666.25	108.55	0	D	67.3	2.9	11.1	1.2	0.0	0.0	52.1
10679	355314.91	4860661.09	108.07	1	D	67.3	9.1	22.7	2.5	0.0	2.0	31.0

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "I06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
10690	355318.75	4860661.79	108.13	1	D	67.3	9.1	19.7	2.5	0.0	2.0	33.9
10876	355441.32	4860685.86	106.36	0	D	67.3	2.8	13.9	1.0	0.0	0.0	49.7
10888	355460.48	4860690.24	106.34	0	D	67.3	2.8	16.0	1.0	0.0	0.0	47.6
10898	355441.32	4860685.86	109.10	0	D	67.3	2.8	13.9	1.2	0.0	0.0	49.4
10908	355460.48	4860690.24	109.09	0	D	67.3	2.8	16.0	1.2	0.0	0.0	47.3
10920	355276.42	4860654.20	104.83	0	D	67.3	2.9	17.2	1.0	0.0	0.0	46.2
10929	355301.21	4860658.64	105.15	0	D	67.3	2.9	15.1	1.0	0.0	0.0	48.3
10941	355307.78	4860659.81	105.23	1	D	67.3	9.1	16.4	2.6	0.0	2.0	37.2
10953	355276.42	4860654.20	107.58	0	D	67.3	2.9	17.2	1.2	0.0	0.0	46.0
10963	355301.21	4860658.64	107.89	0	D	67.3	2.9	15.1	1.2	0.0	0.0	48.1
10975	355307.78	4860659.81	107.97	1	D	67.3	9.1	16.4	2.5	0.0	2.0	37.2
11031	355189.97	4860638.73	104.20	0	D	67.3	2.9	19.1	0.9	0.0	0.0	44.3
11042	355239.34	4860647.57	104.52	0	D	67.3	2.9	16.6	0.9	0.0	0.0	46.9
11054	355192.20	4860639.13	104.22	1	D	67.3	11.1	17.7	2.9	0.0	2.0	33.5
11066	355189.97	4860638.73	106.94	0	D	67.3	2.9	19.1	1.1	0.0	0.0	44.2
11077	355239.34	4860647.57	107.26	0	D	67.3	2.9	16.6	1.1	0.0	0.0	46.7
11145	355489.13	4860697.16	106.34	0	D	67.3	2.6	15.6	0.9	0.0	0.0	48.3
11156	355489.13	4860697.16	109.08	0	D	67.3	2.5	15.6	1.1	0.0	0.0	48.0
11178	355053.65	4860614.34	104.40	0	D	67.3	2.9	21.9	0.8	0.0	0.0	41.7
11189	355128.07	4860627.66	104.16	0	D	67.3	2.9	19.6	0.9	0.0	0.0	43.9
11222	355053.65	4860614.34	107.14	0	D	67.3	2.9	21.9	1.0	0.0	0.0	41.5
11234	355128.07	4860627.66	106.90	0	D	67.3	2.9	19.7	1.1	0.0	0.0	43.7
11329	355527.18	4860706.98	106.36	0	D	67.3	2.1	18.6	0.8	0.0	0.0	45.8
11341	355527.18	4860706.98	109.10	0	D	67.3	2.1	18.6	1.0	0.0	0.0	45.5
11646	355562.39	4860716.76	106.38	0	D	67.3	1.6	21.8	0.6	0.0	0.0	43.4
11657	355562.39	4860716.76	109.12	0	D	67.3	1.5	21.8	0.9	0.0	0.0	43.1
12453	355003.30	4860605.32	104.51	0	D	67.3	3.0	27.7	0.9	0.0	0.0	35.8
12463	355003.30	4860605.32	107.25	0	D	67.3	2.9	27.7	1.0	0.0	0.0	35.7
12520	354977.03	4860600.55	104.51	0	D	67.3	3.2	28.0	0.9	0.0	0.0	35.2
12543	354977.03	4860600.55	107.26	0	D	67.3	3.2	28.0	1.0	0.0	0.0	35.0
12604	354878.22	4860581.36	104.96	0	D	67.3	4.0	27.5	1.1	0.0	0.0	34.7
12615	354878.22	4860581.36	107.70	0	D	67.3	4.0	27.6	1.2	0.0	0.0	34.5
12626	354935.93	4860592.78	104.59	0	D	67.3	3.8	28.3	1.1	0.0	0.0	34.2
12636	354935.93	4860592.78	107.34	0	D	67.3	3.8	28.3	1.2	0.0	0.0	34.1
12694	354909.73	4860587.63	104.72	0	D	67.3	4.0	28.5	1.1	0.0	0.0	33.7
12706	354909.73	4860587.63	107.46	0	D	67.3	4.0	28.5	1.2	0.0	0.0	33.6
12997	354956.47	4860596.73	104.55	0	D	67.3	3.5	30.6	1.0	0.0	0.0	32.3
13017	354956.47	4860596.73	107.29	0	D	67.3	3.5	30.6	1.1	0.0	0.0	32.1

Railway, FTA/FRA, Name: "BMV_Existing_Main_Line_LOCO", ID: "I0500!BMV_EXISTING TRACKS00001_LOCO"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
10494	355336.86	4860676.36	105.08	0	D	67.0	4.3	11.8	1.4	0.0	0.0	49.6
10504	355318.36	4860673.06	105.02	0	D	67.0	4.3	13.7	1.4	0.0	0.0	47.7
10516	355290.62	4860668.11	104.94	0	D	67.0	4.3	13.1	1.3	0.0	0.0	48.3
10527	355315.63	4860672.57	105.02	1	D	67.0	8.7	14.1	2.5	0.0	2.0	39.7
10572	355375.63	4860683.36	105.82	0	D	67.0	4.3	8.3	1.4	0.0	0.0	53.1
10582	355355.95	4860679.79	105.35	0	D	67.0	4.3	9.5	1.4	0.0	0.0	51.8
10777	355395.29	4860687.01	106.10	0	D	67.0	4.3	8.6	1.4	0.0	0.0	52.7
10789	355336.86	4860676.36	107.82	0	D	62.8	4.3	11.8	1.5	0.0	0.0	45.2
10801	355318.36	4860673.06	107.77	0	D	62.8	4.3	13.7	1.5	0.0	0.0	43.3
10812	355290.62	4860668.11	107.68	0	D	62.8	4.3	13.1	1.5	0.0	0.0	43.9
10823	355315.63	4860672.57	107.76	1	D	62.8	8.7	14.1	2.5	0.0	2.0	35.5
10832	355375.63	4860683.36	108.57	0	D	62.8	4.3	8.3	1.5	0.0	0.0	48.7
10844	355355.95	4860679.79	108.09	0	D	62.8	4.3	9.5	1.5	0.0	0.0	47.4
10855	355414.92	4860690.89	106.15	0	D	67.0	4.3	10.4	1.4	0.0	0.0	51.0
10865	355438.78	4860696.05	106.12	0	D	67.0	4.2	11.4	1.3	0.0	0.0	50.1
10987	355238.07	4860658.73	104.38	0	D	67.0	4.3	13.8	1.3	0.0	0.0	47.6
10999	355205.82	4860652.98	103.91	1	D	67.0	10.9	24.2	2.9	0.0	2.0	27.0
11009	355395.29	4860687.01	108.85	0	D	62.8	4.3	8.6	1.5	0.0	0.0	48.4
11020	355466.84	4860702.67	106.09	0	D	67.0	4.0	14.3	1.3	0.0	0.0	47.5
11089	355170.95	4860646.72	103.96	0	D	67.0	4.3	17.2	1.3	0.0	0.0	44.2
11100	355104.79	4860634.83	104.13	0	D	67.0	4.3	19.5	1.2	0.0	0.0	41.9



Railway, FTA/FRA, Name: "BMV_Existing_Main_Line_LOCO", ID: "I0500!BMV_EXISTING TRACKS00001_LOCO"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
11111	355197.59	4860651.50	103.90	1	D	67.0	10.9	18.8	2.9	0.0	2.0	32.4
11123	355414.92	4860690.89	108.89	0	D	62.8	4.3	10.4	1.5	0.0	0.0	46.6
11134	355438.78	4860696.05	108.86	0	D	62.8	4.2	11.4	1.5	0.0	0.0	45.7
11167	355494.75	4860709.93	106.06	0	D	67.0	3.7	16.7	1.2	0.0	0.0	45.4
11199	355238.07	4860658.73	107.12	0	D	62.8	4.3	13.8	1.5	0.0	0.0	43.2
11269	355466.84	4860702.67	108.83	0	D	62.8	4.0	14.3	1.5	0.0	0.0	43.1
11281	355170.95	4860646.72	106.71	0	D	62.8	4.3	17.2	1.4	0.0	0.0	39.9
11293	355104.79	4860634.83	106.87	0	D	62.8	4.3	19.6	1.4	0.0	0.0	37.6
11317	355195.36	4860651.10	106.64	1	D	62.8	10.9	20.7	2.8	0.0	2.0	26.4
11353	355010.01	4860617.80	104.52	0	D	67.0	4.3	19.3	1.2	0.0	0.0	42.3
11365	354817.08	4860583.26	105.42	0	D	67.0	4.3	19.9	1.1	0.0	0.0	41.7
11541	355687.85	4860769.27	106.05	0	D	67.0	2.9	21.3	1.0	0.0	0.0	41.9
11553	355662.60	4860761.32	106.05	1	D	67.0	7.2	24.6	2.1	0.0	2.0	31.1
11565	355593.00	4860739.50	106.06	0	D	67.0	3.1	20.9	1.0	0.0	0.0	42.1
11601	355494.75	4860709.93	108.81	0	D	62.8	3.7	16.7	1.4	0.0	0.0	41.0
11613	355516.34	4860715.97	106.07	0	D	67.0	3.4	21.0	1.1	0.0	0.0	41.5
11624	355560.40	4860729.40	106.07	0	D	67.0	3.1	21.6	1.0	0.0	0.0	41.4
11635	355551.20	4860726.55	106.09	1	D	67.0	10.5	22.2	2.8	0.0	2.0	29.6
11715	355631.04	4860751.38	106.05	0	D	67.0	2.9	22.9	1.0	0.0	0.0	40.2
11768	355529.99	4860720.02	106.13	0	D	67.0	3.2	23.1	1.1	0.0	0.0	39.7
11779	355534.33	4860721.34	106.14	1	D	67.0	10.4	24.8	2.7	0.0	2.0	27.2
11789	355010.01	4860617.80	107.26	0	D	62.8	4.3	19.3	1.3	0.0	0.0	37.9
11799	355541.94	4860723.68	106.12	0	D	67.0	3.1	23.8	1.0	0.0	0.0	39.1
11808	355539.47	4860722.92	106.13	1	D	67.0	10.4	21.6	2.7	0.0	2.0	30.3
11830	354817.08	4860583.26	108.16	0	D	62.8	4.3	20.0	1.2	0.0	0.0	37.4
11840	355793.20	4860802.45	105.06	0	D	67.0	2.9	24.5	1.1	0.0	0.0	38.6
11941	355687.85	4860769.27	108.79	0	D	62.8	2.9	21.3	1.2	0.0	0.0	37.4
11950	355662.60	4860761.32	108.79	1	D	62.8	7.2	24.6	2.2	0.0	2.0	26.8
11959	355593.00	4860739.50	108.80	0	D	62.8	3.0	20.9	1.2	0.0	0.0	37.6
11970	355516.34	4860715.97	108.82	0	D	62.8	3.4	21.0	1.3	0.0	0.0	37.1
11989	355560.40	4860729.40	108.81	0	D	62.8	3.0	21.6	1.3	0.0	0.0	37.0
12010	354629.52	4860549.74	105.69	0	D	67.0	4.3	25.2	1.2	0.0	0.0	36.4
12029	355743.92	4860786.93	106.05	0	D	67.0	2.9	26.3	1.0	0.0	0.0	36.8
12051	355852.66	4860821.18	103.75	0	D	67.0	2.9	26.6	1.1	0.0	0.0	36.4
12062	355631.04	4860751.38	108.80	0	D	62.8	2.9	23.0	1.2	0.0	0.0	35.8
12140	355529.99	4860720.02	108.87	0	D	62.8	3.2	23.1	1.3	0.0	0.0	35.3
12153	354495.60	4860525.80	105.25	0	D	67.0	4.3	26.6	1.2	0.0	0.0	34.9
12228	354328.62	4860495.99	105.11	0	D	67.0	4.3	26.9	1.3	0.0	0.0	34.7
12240	355541.94	4860723.68	108.86	0	D	62.8	3.1	23.8	1.3	0.0	0.0	34.6
12264	355793.20	4860802.45	107.81	0	D	62.8	2.9	24.4	1.3	0.0	0.0	34.3
12276	355944.36	4860850.05	103.29	0	D	67.0	2.9	28.6	1.1	6.4	0.0	28.0
12381	355900.07	4860836.11	103.41	0	D	67.0	2.9	28.7	1.1	0.0	0.0	34.3
12405	356035.07	4860878.68	104.18	0	D	67.0	2.9	28.5	0.9	9.2	0.0	25.6
12418	354142.78	4860463.43	106.05	0	D	67.0	3.4	28.4	1.0	0.0	0.0	34.2
12509	354629.52	4860549.74	108.43	0	D	62.8	4.3	25.2	1.3	0.0	0.0	32.1
12531	355743.92	4860786.93	108.80	0	D	62.8	2.9	26.3	1.2	0.0	0.0	32.4
12567	355852.66	4860821.18	106.50	0	D	62.8	2.9	26.5	1.4	0.0	0.0	32.0
12718	354495.60	4860525.80	108.00	0	D	62.8	4.3	26.6	1.4	0.0	0.0	30.6
12787	354328.62	4860495.99	107.86	0	D	62.8	4.2	26.9	1.4	0.0	0.0	30.3
12883	355944.36	4860850.05	106.03	0	D	62.8	2.9	28.6	1.3	0.6	0.0	29.4
12918	355900.07	4860836.11	106.15	0	D	62.8	2.9	28.8	1.4	0.0	0.0	29.8
12944	356035.07	4860878.68	106.92	0	D	62.8	2.9	28.6	1.2	4.0	0.0	26.1
12955	354942.99	4860605.76	104.82	0	D	67.0	4.4	31.5	1.2	0.0	0.0	30.1
12966	354142.78	4860463.43	108.79	0	D	62.8	3.4	28.5	1.2	0.0	0.0	29.7
13203	354009.67	4860437.29	104.71	0	D	67.0	9.8	26.8	2.7	1.4	0.0	26.3
13298	355986.80	4860863.44	106.16	0	D	62.8	2.8	30.4	1.3	3.3	0.0	25.1
13898	354942.99	4860605.76	107.56	0	D	62.8	4.3	31.5	1.2	0.0	0.0	25.7

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "I06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
11577	355748.52	4860775.08	105.53	0	D	67.3	0.1	22.7	0.2	11.2	0.0	33.1
11589	355748.52	4860775.08	108.28	0	D	67.3	0.0	22.6	0.6	0.5	0.0	43.5

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
12040	355865.26	4860812.27	106.13	0	D	67.3	0.3	26.3	0.7	13.7	0.0	26.4
13443	356092.08	4860885.21	107.42	0	D	67.3	-10.6	37.6	-1.4	14.0	0.0	27.6

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
11727	355603.28	4860728.92	106.39	0	D	67.3	0.8	23.5	0.4	0.0	0.0	42.6
11737	355603.28	4860728.92	109.13	0	D	67.3	0.7	23.5	0.7	0.0	0.0	42.3
11747	355649.26	4860743.37	106.39	0	D	67.3	0.1	24.5	0.2	0.0	0.0	42.6
11757	355649.26	4860743.37	109.13	0	D	67.3	0.0	24.5	0.6	0.0	0.0	42.2
12647	355581.27	4860722.20	106.39	0	D	67.3	1.6	30.5	0.6	0.0	0.0	34.6
12658	355581.27	4860722.20	109.13	0	D	67.3	1.5	30.5	0.9	0.0	0.0	34.3

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
11851	354516.54	4860514.54	106.01	0	D	67.3	2.7	24.1	0.8	0.0	0.0	39.7
11903	354516.54	4860514.54	108.76	0	D	67.3	2.7	24.1	1.0	0.0	0.0	39.5
13094	354760.23	4860558.45	104.98	0	D	67.3	2.7	31.8	0.8	0.0	0.0	32.0
13124	354760.23	4860558.45	107.72	0	D	67.3	2.7	31.9	1.0	0.0	0.0	31.7
13236	354733.95	4860553.73	105.55	0	D	67.3	2.3	32.0	0.7	0.0	0.0	32.3
13255	354733.95	4860553.73	108.29	0	D	67.3	2.3	32.2	0.9	0.0	0.0	31.9
13330	354783.87	4860562.81	104.58	0	D	67.3	3.3	32.0	1.0	0.0	0.0	31.1
13339	354783.87	4860562.81	107.33	0	D	67.3	3.2	32.1	1.2	0.0	0.0	30.8
13909	354713.37	4860550.07	106.09	0	D	67.3	2.2	34.8	0.7	0.0	0.0	29.7
13918	354713.37	4860550.07	108.83	0	D	67.3	2.2	35.0	0.9	0.0	0.0	29.2
13952	354698.40	4860547.42	106.31	0	D	67.3	2.2	35.9	0.7	0.0	0.0	28.5
13973	354698.40	4860547.42	109.05	0	D	67.3	2.2	36.0	0.9	0.0	0.0	28.3
14157	354683.96	4860544.86	106.28	0	D	67.3	2.3	36.4	0.7	0.0	0.0	27.9
14191	354683.96	4860544.86	109.02	0	D	67.3	2.3	36.3	0.9	0.0	0.0	27.8
15741	354797.14	4860565.33	104.36	0	D	67.3	3.7	37.1	1.1	0.0	0.0	25.4
15764	354797.14	4860565.33	107.10	0	D	67.3	3.7	37.2	1.3	0.0	0.0	25.1

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
13214	354810.25	4860567.88	104.64	0	D	67.3	3.7	31.2	1.1	0.0	0.0	31.3
13225	354810.25	4860567.88	107.38	0	D	67.3	3.7	31.1	1.2	0.0	0.0	31.3
13495	354827.65	4860571.29	105.13	0	D	67.3	4.0	32.5	1.1	0.0	0.0	29.8
13505	354827.65	4860571.29	107.87	0	D	67.3	4.0	32.4	1.2	0.0	0.0	29.7

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
13453	354853.29	4860576.39	105.15	0	D	67.3	4.0	32.5	1.1	0.0	0.0	29.7
13474	354853.29	4860576.39	107.90	0	D	67.3	4.0	32.5	1.2	0.0	0.0	29.6
13581	354840.74	4860573.89	105.25	0	D	67.3	4.0	33.1	1.1	0.0	0.0	29.2
13603	354840.74	4860573.89	107.99	0	D	67.3	4.0	33.1	1.2	0.0	0.0	29.0



## Receiver

Name: OLA013

ID: !0100!OLA013

X: 355388.79 m

Y: 4860647.14 m

Z: 105.11 m

Railway, FTA/FRA, Name: "CN\_EXISTING\_TRACKS\_LOCO", ID: "!0500!BMV\_PROPOSED\_TRACKS00002\_LOCO"

Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
80097	355334.34	4860672.15	105.38	0	D	62.1	3.5	10.4	1.3	0.0	0.0	46.8
80108	355306.06	4860667.02	105.35	0	D	62.1	3.5	13.5	1.3	0.0	0.0	43.7
80119	355263.66	4860659.33	105.32	0	D	62.1	3.5	13.8	1.3	0.0	0.0	43.5
80131	355207.11	4860649.08	105.28	0	D	62.1	3.5	17.1	1.2	0.0	0.0	40.2
80141	355150.57	4860638.83	105.23	0	D	62.1	3.5	19.5	1.2	0.0	0.0	37.9
80153	355065.76	4860623.45	105.16	0	D	62.1	3.5	19.1	1.2	0.0	0.0	38.3
80163	354952.67	4860602.95	105.08	0	D	62.1	3.5	21.8	1.1	0.0	0.0	35.6
80175	355313.05	4860668.29	105.36	1	D	62.1	8.7	14.1	2.9	0.0	2.0	34.4
80187	355340.11	4860673.19	105.38	1	D	62.1	4.2	12.1	1.6	0.0	2.0	42.2
80198	355323.38	4860670.16	105.37	1	D	62.1	4.2	13.8	1.6	0.0	2.0	40.4
80210	355298.29	4860665.61	105.35	1	D	62.1	4.2	13.1	1.5	0.0	2.0	41.2
80221	355314.53	4860668.56	105.36	2	D	62.1	9.0	14.3	3.0	0.0	4.0	31.9
80233	355197.73	4860647.38	105.27	2	D	62.1	11.0	17.8	3.3	0.0	4.0	26.0
80256	355195.04	4860646.89	105.27	1	D	62.1	10.9	17.8	3.2	0.0	2.0	28.2
80802	355429.34	4860690.44	106.09	0	D	62.1	3.6	11.2	1.4	0.0	0.0	45.9
80813	355412.01	4860687.07	105.94	0	D	62.1	3.6	12.1	1.4	0.0	0.0	45.0
80823	355400.46	4860684.82	105.84	0	D	62.1	3.6	10.8	1.4	0.0	0.0	46.3
80833	355388.91	4860682.58	105.74	0	D	62.1	3.6	9.9	1.4	0.0	0.0	47.3
80843	355377.35	4860680.33	105.64	0	D	62.1	3.6	9.8	1.4	0.0	0.0	47.3
80852	355365.80	4860678.08	105.54	0	D	62.1	3.6	10.6	1.4	0.0	0.0	46.6
80864	355354.25	4860675.83	105.44	0	D	62.1	3.6	11.9	1.4	0.0	0.0	45.3
80873	355426.39	4860689.87	106.07	1	D	62.1	4.3	10.9	1.6	0.0	2.0	43.3
80885	355409.69	4860686.62	105.92	1	D	62.1	4.3	12.1	1.6	0.0	2.0	42.0
80895	355398.56	4860684.45	105.82	1	D	62.1	4.3	11.2	1.6	0.0	2.0	43.0
80906	355387.43	4860682.29	105.73	1	D	62.1	4.3	10.6	1.6	0.0	2.0	43.6
80918	355376.30	4860680.12	105.63	1	D	62.1	4.3	10.7	1.6	0.0	2.0	43.6
80929	355365.17	4860677.96	105.53	1	D	62.1	4.3	11.3	1.6	0.0	2.0	42.9
80940	355354.04	4860675.79	105.44	1	D	62.1	4.3	12.3	1.6	0.0	2.0	41.9
81649	355476.18	4860701.43	106.17	0	D	62.1	3.2	16.3	1.3	0.0	0.0	41.3
81661	355452.66	4860695.60	106.18	0	D	62.1	3.2	14.1	1.3	0.0	0.0	43.5
81852	355943.14	4860849.28	106.17	0	D	62.1	2.2	24.0	0.9	1.8	0.0	33.2
81864	355781.76	4860798.17	106.10	0	D	62.1	2.2	21.0	0.9	0.0	0.0	38.0
82199	355578.66	4860730.92	106.19	0	D	62.1	2.2	17.2	0.9	0.0	0.0	41.8
82233	355543.85	4860720.40	106.20	1	D	62.1	10.4	19.8	3.2	0.0	2.0	26.6
82245	355555.41	4860723.89	106.20	1	D	62.1	10.5	19.9	3.2	0.0	2.0	26.5
82256	355510.01	4860710.59	106.18	0	D	62.1	2.6	16.5	1.1	0.0	0.0	41.9
82691	355663.16	4860758.81	106.11	0	D	62.1	-1.4	24.8	-0.2	0.0	0.0	38.9
82991	354498.93	4860522.16	105.65	0	D	62.1	3.4	22.5	1.2	0.0	0.0	35.0
83041	354796.92	4860575.19	105.58	0	D	62.1	3.2	22.2	1.1	0.0	0.0	35.6

Railway, FTA/FRA, Name: "BMV\_PROPOSED\_TRACKS\_LOCO\_A", ID: "!06!BMV\_PROPOSED\_TRACKS00001\_LOCO\_A"

Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
80266	355358.43	4860669.00	106.03	0	D	67.3	2.5	12.0	1.0	0.0	0.0	51.8
80277	355368.38	4860670.90	106.12	0	D	67.3	2.5	10.5	1.0	0.0	0.0	53.3
80287	355378.32	4860672.79	106.21	0	D	67.3	2.5	9.5	1.0	0.0	0.0	54.4
80299	355388.27	4860674.69	106.30	0	D	67.3	2.5	9.4	1.0	0.0	0.0	54.4
80310	355358.43	4860669.00	106.03	1	D	67.3	3.4	12.2	1.3	0.0	2.0	48.5
80320	355368.38	4860670.90	106.12	1	D	67.3	3.4	11.1	1.3	0.0	2.0	49.6
80330	355378.32	4860672.79	106.21	1	D	67.3	3.4	10.3	1.3	0.0	2.0	50.4
80341	355388.27	4860674.69	106.30	1	D	67.3	3.4	10.2	1.3	0.0	2.0	50.5
80353	355358.43	4860669.00	108.77	0	D	67.3	2.5	12.0	1.3	0.0	0.0	51.4

Railway, FTA/FRA, Name: "BMV\_PROPOSED TRACKS\_LOCO\_A", ID: "I06!BMV\_PROPOSED TRACKS00001\_LOCO\_A"

Nr.	X	Y	Z	Ref.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
80364	355368.38	4860670.90	108.86	0	D	67.3	2.6	10.5	1.3	0.0	0.0	52.9
80374	355378.32	4860672.79	108.95	0	D	67.3	2.6	9.5	1.3	0.0	0.0	53.9
80382	355388.27	4860674.69	109.05	0	D	67.3	2.6	9.5	1.3	0.0	0.0	54.0
80394	355358.43	4860669.00	108.77	1	D	67.3	3.4	12.2	1.5	0.0	2.0	48.1
80405	355368.38	4860670.90	108.86	1	D	67.3	3.4	11.1	1.5	0.0	2.0	49.3
80417	355378.32	4860672.79	108.95	1	D	67.3	3.4	10.3	1.5	0.0	2.0	50.0
80427	355388.27	4860674.69	109.05	1	D	67.3	3.4	10.2	1.6	0.0	2.0	50.1
80437	355398.05	4860676.64	106.35	0	D	67.3	2.5	10.5	1.0	0.0	0.0	53.3
80448	355407.68	4860678.65	106.36	0	D	67.3	2.5	12.0	1.0	0.0	0.0	51.8
80458	355422.12	4860681.66	106.36	0	D	67.3	2.5	11.2	1.0	0.0	0.0	52.6
80469	355397.75	4860676.58	106.35	1	D	67.3	3.4	11.3	1.3	0.0	2.0	49.4
80478	355406.76	4860678.46	106.35	1	D	67.3	3.4	12.3	1.3	0.0	2.0	48.4
80489	355420.27	4860681.28	106.36	1	D	67.3	3.4	11.0	1.3	0.0	2.0	49.7
80500	355398.05	4860676.64	109.10	0	D	67.3	2.5	10.6	1.3	0.0	0.0	52.9
80508	355407.68	4860678.65	109.10	0	D	67.3	2.5	12.0	1.3	0.0	0.0	51.4
80518	355422.12	4860681.66	109.10	0	D	67.3	2.5	11.2	1.3	0.0	0.0	52.2
80527	355397.75	4860676.58	109.10	1	D	67.3	3.4	11.3	1.6	0.0	2.0	49.1
80537	355406.76	4860678.46	109.10	1	D	67.3	3.4	12.3	1.6	0.0	2.0	48.0
80548	355420.27	4860681.28	109.10	1	D	67.3	3.4	11.0	1.6	0.0	2.0	49.3
80692	355323.57	4860662.66	105.47	0	D	67.3	2.5	14.1	1.0	0.0	0.0	49.8
80700	355343.49	4860666.25	105.81	0	D	67.3	2.5	11.3	1.0	0.0	0.0	52.5
80709	355316.77	4860661.43	105.36	1	D	67.3	9.0	18.8	3.0	0.0	2.0	34.6
80719	355323.57	4860662.66	105.47	1	D	67.3	3.3	13.6	1.3	0.0	2.0	47.1
80730	355343.49	4860666.25	105.81	1	D	67.3	3.3	11.2	1.3	0.0	2.0	49.5
80738	355317.53	4860661.56	105.37	2	D	67.3	9.2	18.0	3.1	0.0	4.0	33.1
80747	355323.57	4860662.66	108.21	0	D	67.3	2.5	14.0	1.3	0.0	0.0	49.5
80757	355343.49	4860666.25	108.55	0	D	67.3	2.5	11.3	1.3	0.0	0.0	52.2
80766	355316.77	4860661.43	108.10	1	D	67.3	9.0	18.8	3.0	0.0	2.0	34.5
80774	355323.57	4860662.66	108.21	1	D	67.3	3.4	13.6	1.6	0.0	2.0	46.8
80783	355343.49	4860666.25	108.55	1	D	67.3	3.4	11.2	1.5	0.0	2.0	49.2
80793	355317.53	4860661.56	108.11	2	D	67.3	9.2	18.0	3.1	0.0	4.0	33.0
81163	355441.32	4860685.86	106.36	0	D	67.3	2.3	14.1	1.0	0.0	0.0	49.9
81171	355460.48	4860690.24	106.34	0	D	67.3	2.3	16.3	1.0	0.0	0.0	47.7
81181	355441.32	4860685.86	109.10	0	D	67.3	2.4	14.1	1.3	0.0	0.0	49.6
81192	355460.48	4860690.24	109.09	0	D	67.3	2.4	16.2	1.3	0.0	0.0	47.4
81202	355276.42	4860654.20	104.83	0	D	67.3	2.4	17.7	1.0	0.0	0.0	46.2
81213	355301.21	4860658.64	105.15	0	D	67.3	2.4	15.5	1.0	0.0	0.0	48.4
81223	355306.98	4860659.67	105.22	1	D	67.3	9.0	15.9	3.0	0.0	2.0	37.4
81235	355307.56	4860659.77	105.23	1	D	67.3	3.3	17.5	1.3	0.0	2.0	43.2
81247	355307.99	4860659.85	105.23	2	D	67.3	9.2	16.7	3.1	0.0	4.0	34.4
81258	355276.42	4860654.20	107.58	0	D	67.3	2.5	17.6	1.3	0.0	0.0	45.9
81267	355301.21	4860658.64	107.89	0	D	67.3	2.5	15.5	1.3	0.0	0.0	48.0
81278	355306.98	4860659.67	107.96	1	D	67.3	9.0	15.9	3.0	0.0	2.0	37.4
81290	355307.56	4860659.77	107.97	1	D	67.3	3.3	17.5	1.5	0.0	2.0	42.9
81302	355307.99	4860659.85	107.97	2	D	67.3	9.2	16.7	3.1	0.0	4.0	34.3
81393	355189.97	4860638.73	104.20	0	D	67.3	2.4	19.6	0.9	0.0	0.0	44.3
81404	355239.34	4860647.57	104.52	0	D	67.3	2.4	17.1	1.0	0.0	0.0	46.9
81414	355193.27	4860639.32	104.22	2	D	67.3	11.2	17.8	3.5	0.0	4.0	30.9
81425	355190.26	4860638.78	104.20	1	D	67.3	11.1	17.8	3.4	0.0	2.0	33.0
81436	355189.97	4860638.73	106.94	0	D	67.3	2.5	19.6	1.2	0.0	0.0	44.1
81448	355239.34	4860647.57	107.26	0	D	67.3	2.5	17.0	1.3	0.0	0.0	46.6
81459	355193.27	4860639.32	106.97	2	D	67.3	11.2	17.8	3.4	0.0	4.0	30.9
81469	355190.26	4860638.78	106.95	1	D	67.3	11.1	17.8	3.4	0.0	2.0	33.1
81569	355489.13	4860697.16	106.34	0	D	67.3	2.0	16.0	0.9	0.0	0.0	48.4
81579	355489.13	4860697.16	109.08	0	D	67.3	2.1	16.0	1.2	0.0	0.0	48.0
81672	355053.65	4860614.34	104.40	0	D	67.3	2.4	22.4	0.9	0.0	0.0	41.6
81682	355128.07	4860627.66	104.16	0	D	67.3	2.4	20.2	0.9	0.0	0.0	43.8
81693	355053.65	4860614.34	107.14	0	D	67.3	2.5	22.4	1.1	0.0	0.0	41.3
81704	355128.07	4860627.66	106.90	0	D	67.3	2.5	20.2	1.2	0.0	0.0	43.5
81772	355527.18	4860706.98	106.36	0	D	67.3	1.6	19.1	0.7	0.0	0.0	45.9
81794	355527.18	4860706.98	109.10	0	D	67.3	1.7	19.0	1.1	0.0	0.0	45.5
82177	355562.39	4860716.76	106.38	0	D	67.3	0.9	22.3	0.5	0.0	0.0	43.6
82188	355562.39	4860716.76	109.12	0	D	67.3	1.0	22.3	0.9	0.0	0.0	43.1



Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
83100	355003.30	4860605.32	104.51	0	D	67.3	2.5	28.2	0.9	0.0	0.0	35.8
83112	355003.30	4860605.32	107.25	0	D	67.3	2.5	28.1	1.1	0.0	0.0	35.5
83181	354977.03	4860600.55	104.51	0	D	67.3	2.7	28.5	1.0	0.0	0.0	35.2
83205	354977.03	4860600.55	107.26	0	D	67.3	2.7	28.5	1.2	0.0	0.0	34.9
83273	354878.22	4860581.36	104.96	0	D	67.3	3.6	27.9	1.2	0.0	0.0	34.5
83285	354878.22	4860581.36	107.70	0	D	67.3	3.7	28.0	1.4	0.0	0.0	34.3
83295	354935.93	4860592.78	104.59	0	D	67.3	3.4	28.7	1.1	0.0	0.0	34.1
83307	354935.93	4860592.78	107.34	0	D	67.3	3.4	28.7	1.3	0.0	0.0	33.9
83365	354909.73	4860587.63	104.72	0	D	67.3	3.6	28.9	1.2	0.0	0.0	33.6
83376	354909.73	4860587.63	107.46	0	D	67.3	3.6	28.9	1.4	0.0	0.0	33.3
83666	354956.47	4860596.73	104.55	0	D	67.3	3.1	31.1	1.0	0.0	0.0	32.2
83690	354956.47	4860596.73	107.29	0	D	67.3	3.1	31.1	1.3	0.0	0.0	31.9

Railway, FTA/FRA, Name: "BMV_Existing_Main_Line_LOCO", ID: "!0500!BMV_EXISTING TRACKS00001_LOCO"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
80557	355380.55	4860684.25	105.94	0	D	67.0	4.0	10.8	1.5	0.0	0.0	50.8
80565	355370.71	4860682.47	105.71	0	D	67.0	4.0	11.2	1.5	0.0	0.0	50.4
80575	355355.95	4860679.79	105.35	0	D	67.0	4.0	9.5	1.5	0.0	0.0	52.1
80586	355380.55	4860684.25	105.94	1	D	67.0	4.6	11.4	1.7	0.0	2.0	47.3
80597	355370.71	4860682.47	105.71	1	D	67.0	4.6	11.7	1.7	0.0	2.0	47.0
80606	355355.95	4860679.79	105.35	1	D	67.0	4.6	9.8	1.7	0.0	2.0	49.0
80614	355336.86	4860676.36	105.08	0	D	67.0	4.0	11.9	1.5	0.0	0.0	49.7
80624	355318.36	4860673.06	105.02	0	D	67.0	4.0	13.9	1.5	0.0	0.0	47.7
80633	355290.62	4860668.11	104.94	0	D	67.0	4.0	13.3	1.5	0.0	0.0	48.3
80643	355314.53	4860672.38	105.01	1	D	67.0	8.6	14.1	2.9	0.0	2.0	39.5
80653	355336.86	4860676.36	105.08	1	D	67.0	4.6	11.9	1.7	0.0	2.0	46.8
80662	355318.36	4860673.06	105.02	1	D	67.0	4.6	13.7	1.7	0.0	2.0	45.1
80671	355290.62	4860668.11	104.94	1	D	67.0	4.6	13.0	1.7	0.0	2.0	45.8
80681	355315.86	4860672.61	105.02	2	D	67.0	8.8	14.3	3.0	0.0	4.0	37.0
80951	355395.29	4860687.01	106.10	0	D	67.0	4.0	8.3	1.5	0.0	0.0	53.3
80961	355395.29	4860687.01	106.10	1	D	67.0	4.6	8.8	1.7	0.0	2.0	49.9
80972	355380.55	4860684.25	108.69	0	D	62.8	4.0	10.8	1.7	0.0	0.0	46.3
80984	355370.71	4860682.47	108.45	0	D	62.8	4.0	11.2	1.7	0.0	0.0	45.9
80995	355355.95	4860679.79	108.09	0	D	62.8	4.0	9.5	1.7	0.0	0.0	47.6
81005	355380.55	4860684.25	108.69	1	D	62.8	4.6	11.4	1.9	0.0	2.0	42.9
81016	355370.71	4860682.47	108.45	1	D	62.8	4.6	11.7	1.9	0.0	2.0	42.5
81027	355355.95	4860679.79	108.09	1	D	62.8	4.6	9.8	1.9	0.0	2.0	44.5
81038	355336.86	4860676.36	107.82	0	D	62.8	4.0	11.9	1.7	0.0	0.0	45.2
81049	355318.36	4860673.06	107.77	0	D	62.8	4.0	13.9	1.7	0.0	0.0	43.2
81060	355290.62	4860668.11	107.68	0	D	62.8	4.0	13.3	1.7	0.0	0.0	43.8
81070	355314.53	4860672.38	107.76	1	D	62.8	8.6	14.1	3.0	0.0	2.0	35.2
81081	355336.86	4860676.36	107.82	1	D	62.8	4.6	11.9	1.9	0.0	2.0	42.4
81091	355318.36	4860673.06	107.77	1	D	62.8	4.6	13.7	1.9	0.0	2.0	40.6
81102	355290.62	4860668.11	107.68	1	D	62.8	4.6	13.0	1.9	0.0	2.0	41.3
81112	355315.86	4860672.61	107.76	2	D	62.8	8.8	14.3	3.0	0.0	4.0	32.7
81123	355414.92	4860690.89	106.15	0	D	67.0	3.9	10.3	1.5	0.0	0.0	51.3
81132	355414.92	4860690.89	106.15	1	D	67.0	4.6	10.4	1.7	0.0	2.0	48.4
81143	355438.78	4860696.05	106.12	0	D	67.0	3.8	11.5	1.5	0.0	0.0	50.3
81153	355433.30	4860694.82	106.13	1	D	67.0	4.5	12.9	1.7	0.0	2.0	46.0
81314	355395.29	4860687.01	108.85	0	D	62.8	4.0	8.4	1.7	0.0	0.0	48.7
81325	355395.29	4860687.01	108.85	1	D	62.8	4.6	8.8	1.9	0.0	2.0	45.5
81336	355238.07	4860658.73	104.38	0	D	67.0	4.0	14.2	1.5	0.0	0.0	47.5
81347	355271.59	4860664.72	104.87	1	D	67.0	4.6	29.9	1.7	0.0	2.0	28.9
81359	355206.25	4860653.06	103.91	2	D	67.0	11.0	23.3	3.5	0.0	4.0	25.3
81382	355466.84	4860702.67	106.09	0	D	67.0	3.6	14.5	1.4	0.0	0.0	47.6
81481	355170.95	4860646.72	103.96	0	D	67.0	4.0	17.5	1.4	0.0	0.0	44.1
81492	355104.79	4860634.83	104.13	0	D	67.0	4.0	19.9	1.4	0.0	0.0	41.8
81504	355198.06	4860651.59	103.89	2	D	67.0	11.0	19.2	3.5	0.0	4.0	29.4
81515	355196.77	4860651.36	103.90	1	D	67.0	10.8	18.4	3.4	0.0	2.0	32.4
81525	355414.92	4860690.89	108.89	0	D	62.8	3.9	10.3	1.7	0.0	0.0	46.8
81536	355414.92	4860690.89	108.89	1	D	62.8	4.6	10.4	1.9	0.0	2.0	43.9
81546	355438.78	4860696.05	108.86	0	D	62.8	3.9	11.5	1.7	0.0	0.0	45.8

Railway, FTA/FRA, Name: "BMV_Existing_Main_Line_LOCO", ID: "I0500!BMV_EXISTING TRACKS00001_LOCO"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
81558	355433.30	4860694.82	108.88	1	D	62.8	4.5	12.9	1.9	0.0	2.0	41.5
81590	355494.75	4860709.93	106.06	0	D	67.0	3.3	17.0	1.3	0.0	0.0	45.4
81602	355238.07	4860658.73	107.12	0	D	62.8	4.0	14.1	1.7	0.0	0.0	43.0
81716	355466.84	4860702.67	108.83	0	D	62.8	3.6	14.4	1.7	0.0	0.0	43.0
81728	355170.95	4860646.72	106.71	0	D	62.8	4.0	17.5	1.6	0.0	0.0	39.6
81738	355104.79	4860634.83	106.87	0	D	62.8	4.0	19.9	1.6	0.0	0.0	37.3
81749	355198.06	4860651.59	106.64	2	D	62.8	11.0	19.2	3.4	0.0	4.0	25.2
81760	355196.77	4860651.36	106.64	1	D	62.8	10.8	18.4	3.4	0.0	2.0	28.2
81816	355010.01	4860617.80	104.52	0	D	67.0	4.0	19.6	1.3	0.0	0.0	42.1
81828	354817.08	4860583.26	105.42	0	D	67.0	3.9	20.3	1.3	0.0	0.0	41.6
82064	355687.85	4860769.27	106.05	0	D	67.0	2.4	21.7	1.0	0.0	0.0	41.9
82076	355667.99	4860763.02	106.05	1	D	67.0	7.0	24.8	2.4	0.0	2.0	30.8
82088	355593.00	4860739.50	106.06	0	D	67.0	2.6	21.3	1.1	0.0	0.0	42.1
82121	355494.75	4860709.93	108.81	0	D	62.8	3.3	17.0	1.6	0.0	0.0	40.9
82132	355516.34	4860715.97	106.07	0	D	67.0	3.0	21.3	1.2	0.0	0.0	41.5
82143	355560.40	4860729.40	106.07	0	D	67.0	2.6	21.9	1.1	0.0	0.0	41.4
82166	355551.94	4860726.78	106.08	1	D	67.0	10.4	21.3	3.2	0.0	2.0	30.1
82268	355631.04	4860751.38	106.05	0	D	67.0	2.4	23.4	1.0	0.0	0.0	40.2
82322	355529.99	4860720.02	106.13	0	D	67.0	2.8	23.4	1.1	0.0	0.0	39.7
82334	355533.09	4860720.96	106.14	2	D	67.0	10.4	22.3	3.3	0.0	4.0	27.1
82359	355010.01	4860617.80	107.26	0	D	62.8	4.0	19.7	1.5	0.0	0.0	37.6
82371	355541.94	4860723.68	106.12	0	D	67.0	2.6	24.2	1.1	0.0	0.0	39.1
82382	355538.17	4860722.52	106.13	2	D	67.0	10.5	23.5	3.3	0.0	4.0	25.8
82394	355544.45	4860724.46	106.11	2	D	67.0	10.6	21.7	3.3	0.0	4.0	27.4
82405	355540.16	4860723.13	106.13	1	D	67.0	10.3	20.8	3.2	0.0	2.0	30.7
82426	354817.08	4860583.26	108.16	0	D	62.8	3.9	20.3	1.4	0.0	0.0	37.1
82438	355793.20	4860802.45	105.06	0	D	67.0	2.4	24.7	1.1	0.0	0.0	38.9
82524	355687.85	4860769.27	108.79	0	D	62.8	2.5	21.7	1.3	0.0	0.0	37.3
82535	355667.99	4860763.02	108.79	1	D	62.8	7.0	24.8	2.6	0.0	2.0	26.4
82546	355593.00	4860739.50	108.80	0	D	62.8	2.6	21.2	1.4	0.0	0.0	37.6
82557	355516.34	4860715.97	108.82	0	D	62.8	3.0	21.3	1.5	0.0	0.0	37.0
82566	355560.40	4860729.40	108.81	0	D	62.8	2.6	21.9	1.4	0.0	0.0	36.9
82590	355551.94	4860726.78	108.83	1	D	62.8	10.4	21.3	3.2	0.0	2.0	25.9
82626	354629.52	4860549.74	105.69	0	D	67.0	3.9	25.5	1.3	0.0	0.0	36.3
82638	355743.92	4860786.93	106.05	0	D	67.0	2.4	26.8	1.0	0.0	0.0	36.8
82669	355852.66	4860821.18	103.75	0	D	67.0	2.4	27.0	1.1	3.0	0.0	33.6
82680	355631.04	4860751.38	108.80	0	D	62.8	2.5	23.3	1.3	0.0	0.0	35.7
82755	355529.99	4860720.02	108.87	0	D	62.8	2.8	23.4	1.4	0.0	0.0	35.2
82784	354495.60	4860525.80	105.25	0	D	67.0	3.9	26.9	1.4	0.0	0.0	34.8
82859	354328.62	4860495.99	105.11	0	D	67.0	3.9	27.2	1.4	0.0	0.0	34.5
82870	355541.94	4860723.68	108.86	0	D	62.8	2.7	24.2	1.4	0.0	0.0	34.6
82901	355540.16	4860723.13	108.87	1	D	62.8	10.3	20.8	3.2	0.0	2.0	26.5
82924	355793.20	4860802.45	107.81	0	D	62.8	2.4	24.5	1.4	0.0	0.0	34.5
82934	355944.36	4860850.05	103.29	0	D	67.0	2.4	29.1	1.0	8.7	0.0	25.8
82967	355900.07	4860836.11	103.41	0	D	67.0	2.4	29.2	1.1	6.6	0.0	27.8
83065	354142.78	4860463.43	106.05	0	D	67.0	3.0	28.9	1.1	0.0	0.0	34.1
83158	354629.52	4860549.74	108.43	0	D	62.8	4.0	25.4	1.5	0.0	0.0	31.9
83170	355743.92	4860786.93	108.80	0	D	62.8	2.5	26.7	1.3	0.0	0.0	32.3
83240	355852.66	4860821.18	106.50	0	D	62.8	2.4	26.9	1.5	0.0	0.0	32.0
83386	354495.60	4860525.80	108.00	0	D	62.8	3.9	26.9	1.6	0.0	0.0	30.4
83453	354328.62	4860495.99	107.86	0	D	62.8	3.9	27.2	1.6	0.0	0.0	30.1
83546	355944.36	4860850.05	106.03	0	D	62.8	2.4	29.1	1.4	1.9	0.0	28.0
83570	355900.07	4860836.11	106.15	0	D	62.8	2.4	29.2	1.4	0.1	0.0	29.6
83619	354942.99	4860605.76	104.82	0	D	67.0	4.0	31.8	1.3	0.0	0.0	29.9
83631	354142.78	4860463.43	108.79	0	D	62.8	3.0	29.0	1.3	0.0	0.0	29.4
83877	354009.67	4860437.29	104.71	0	D	67.0	9.8	26.8	3.1	1.8	0.0	25.5
84623	354942.99	4860605.76	107.56	0	D	62.8	4.0	31.8	1.5	0.0	0.0	25.5

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "I06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
82098	355748.52	4860775.08	105.53	0	D	67.3	-0.9	23.4	-0.0	12.8	0.0	32.1
82109	355748.52	4860775.08	108.28	0	D	67.3	-0.8	23.0	0.5	1.3	0.0	43.3



Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
82650	355865.26	4860812.27	103.39	0	D	67.3	-0.5	26.7	0.1	15.0	0.0	26.1
82658	355865.26	4860812.27	106.13	0	D	67.3	-0.6	26.3	0.5	15.0	0.0	26.1
84090	356066.34	4860876.45	104.21	0	D	67.3	-10.0	35.8	-2.2	15.0	0.0	28.8
84103	356066.34	4860876.45	106.95	0	D	67.3	-8.4	36.6	-1.3	14.4	0.0	25.9
84351	356227.65	4860932.21	106.86	0	D	67.3	-7.1	34.6	-1.4	15.0	0.0	26.3

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
82278	355603.28	4860728.92	106.39	0	D	67.3	-0.0	24.3	0.2	0.0	0.0	42.8
82289	355603.28	4860728.92	109.13	0	D	67.3	0.1	24.1	0.7	0.0	0.0	42.4
82300	355649.26	4860743.37	106.39	0	D	67.3	-0.9	25.4	-0.0	0.0	0.0	42.9
82311	355649.26	4860743.37	109.13	0	D	67.3	-0.7	25.2	0.5	0.0	0.0	42.3
83318	355581.27	4860722.20	106.39	0	D	67.3	0.9	31.1	0.5	0.0	0.0	34.8
83330	355581.27	4860722.20	109.13	0	D	67.3	1.0	31.0	0.9	0.0	0.0	34.3

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
82448	354516.54	4860514.54	106.01	0	D	67.3	2.2	24.6	0.8	0.0	0.0	39.7
82487	354516.54	4860514.54	108.76	0	D	67.3	2.2	24.5	1.1	0.0	0.0	39.4
83776	354760.23	4860558.45	104.98	0	D	67.3	2.2	32.4	0.8	0.0	0.0	31.9
83821	354760.23	4860558.45	107.72	0	D	67.3	2.2	32.5	1.1	0.0	0.0	31.4
83937	354733.95	4860553.73	105.55	0	D	67.3	1.7	32.6	0.7	0.0	0.0	32.3
83969	354733.95	4860553.73	108.29	0	D	67.3	1.8	32.9	1.0	0.0	0.0	31.7
84029	354783.87	4860562.81	104.58	0	D	67.3	2.8	32.5	1.0	0.0	0.0	31.0
84040	354783.87	4860562.81	107.33	0	D	67.3	2.8	32.6	1.3	0.0	0.0	30.6
84635	354713.37	4860550.07	106.09	0	D	67.3	1.6	35.4	0.7	0.0	0.0	29.6
84646	354713.37	4860550.07	108.83	0	D	67.3	1.7	35.7	1.0	0.0	0.0	29.0
84691	354698.40	4860547.42	106.31	0	D	67.3	1.6	36.5	0.7	0.0	0.0	28.5
84702	354698.40	4860547.42	109.05	0	D	67.3	1.7	36.5	0.9	0.0	0.0	28.1
84931	354683.96	4860544.86	106.28	0	D	67.3	1.8	36.8	0.7	0.0	0.0	28.1
84967	354683.96	4860544.86	109.02	0	D	67.3	1.8	36.6	1.0	0.0	0.0	27.9
86463	354797.14	4860565.33	104.36	0	D	67.3	3.3	37.6	1.2	0.0	0.0	25.3

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A_SQUEAL", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
82602	354250.49	4860116.94	110.91	0	D	72.3	19.1	12.1	5.2	0.0	0.0	35.9
82614	354250.49	4860116.94	113.65	0	D	72.3	19.1	12.1	4.8	0.0	0.0	36.3
83798	354442.07	4859803.11	112.90	0	D	72.3	18.9	20.9	4.8	0.0	0.0	27.8
83832	354442.07	4859803.11	115.65	0	D	72.3	18.9	20.9	4.3	0.0	0.0	28.2
83865	354297.20	4859984.69	110.90	0	D	72.3	19.1	20.8	5.5	0.0	0.0	26.9
83889	354297.20	4859984.69	113.65	0	D	72.3	19.1	20.8	5.1	0.0	0.0	27.3
84268	354310.63	4859946.68	113.40	0	D	72.3	19.1	22.7	5.2	0.0	0.0	25.3
84280	354466.85	4859790.95	113.17	0	D	72.3	18.9	23.1	4.7	0.0	0.0	25.6
84304	354466.85	4859790.95	115.92	0	D	72.3	18.9	23.1	4.3	0.0	0.0	26.0
84364	354206.41	4860241.99	110.91	0	D	72.3	19.1	23.2	5.0	0.0	0.0	25.1
84397	354206.41	4860241.99	113.65	0	D	72.3	19.1	23.2	4.5	0.0	0.0	25.5
84420	354417.96	4859814.90	112.90	0	D	72.3	18.9	23.6	4.8	0.0	0.0	25.0
84452	354417.96	4859814.90	115.65	0	D	72.3	18.9	23.6	4.4	0.0	0.0	25.5

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
83251	354250.69	4860117.34	112.81	0	D	67.3	19.1	12.1	4.7	0.0	0.0	31.5
83261	354250.69	4860117.34	115.55	0	D	67.3	19.1	12.1	4.2	0.0	0.0	31.9

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
83901	354810.25	4860567.88	104.64	0	D	67.3	3.3	31.4	1.2	0.0	0.0	31.5
83925	354810.25	4860567.88	107.38	0	D	67.3	3.3	31.2	1.4	0.0	0.0	31.4

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
84199	354827.65	4860571.29	105.13	0	D	67.3	3.6	32.7	1.2	0.0	0.0	29.8
84211	354827.65	4860571.29	107.87	0	D	67.3	3.6	32.6	1.4	0.0	0.0	29.7

Railway, FTA/FRA, Name: "BMV_PROPOSED TRACKS_LOCO_A", ID: "!06!BMV_PROPOSED TRACKS00001_LOCO_A"												
Nr.	X	Y	Z	Refl.	DEN	Lw	Ageo	Aangle	Agr	Ashield	RL	Lr
	(m)	(m)	(m)			dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
84165	354853.29	4860576.39	105.15	0	D	67.3	3.6	32.9	1.2	0.0	0.0	29.6
84188	354853.29	4860576.39	107.90	0	D	67.3	3.7	32.9	1.4	0.0	0.0	29.3
84292	354840.74	4860573.89	105.25	0	D	67.3	3.6	33.5	1.2	0.0	0.0	29.1
84316	354840.74	4860573.89	107.99	0	D	67.3	3.6	33.5	1.4	0.0	0.0	28.8



## **Appendix B.3 - Stationary Noise Cadna Sample Calculations**

## Receiver

Name: Two Storey Residence on Mitchell Ave

ID: !00!POR28B

X: 356786.69 m

Y: 4861227.81 m

Z: 104.50 m

Line Source, ISO 9613, Name: "Bus\_route", ID: "!03!LS02"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahours (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
4901	356676.60	4861130.26	101.43	0	D	A	72.3	17.7	0.0	0.0	0.0	54.4	0.7	-0.3	0.0	0.0	0.0	0.0	0.0	35.3
4912	356625.07	4861114.23	101.52	0	D	A	72.3	16.9	0.0	0.0	0.0	56.9	0.9	-0.3	0.0	0.0	0.0	0.0	0.0	31.7
4923	356629.27	4861115.54	101.51	1	D	A	72.3	17.6	0.0	0.0	0.0	60.1	1.2	-0.5	0.0	0.0	0.0	0.0	10.0	19.2
4934	356678.53	4861130.86	101.42	1	D	A	72.3	17.4	0.0	0.0	0.0	61.5	1.4	-0.6	0.0	0.0	0.0	0.0	10.3	17.1
4946	356630.95	4861088.42	102.23	0	D	A	72.3	17.6	0.0	0.0	0.0	57.4	0.9	-0.4	0.0	0.0	0.0	0.0	0.0	32.0
4957	356685.13	4861105.91	102.10	0	D	A	72.3	17.6	0.0	0.0	0.0	55.0	0.7	-0.3	0.0	0.0	0.0	0.0	0.0	34.5
4968	356619.02	4861084.57	102.26	1	D	A	72.3	15.0	0.0	0.0	0.0	59.8	1.2	-0.6	0.0	0.0	0.0	0.0	3.9	23.1
4979	356663.88	4861099.05	102.15	1	D	A	72.3	18.0	0.0	0.0	0.0	61.1	1.3	-0.6	0.0	0.0	0.0	0.0	10.2	18.3
5381	356715.87	4861127.17	101.69	0	D	A	72.3	10.9	0.0	0.0	0.0	52.8	0.6	-0.4	0.0	0.0	0.0	0.0	0.0	30.3
5393	356579.11	4861138.53	101.79	0	D	A	72.3	16.0	0.0	0.0	0.0	58.1	1.0	-0.2	0.0	0.0	0.0	0.0	0.0	29.5
5405	356579.59	4861136.38	101.80	1	D	A	72.3	15.5	0.0	0.0	0.0	58.6	1.0	-0.3	0.0	0.0	0.0	0.0	2.5	26.0
5441	356581.54	4861141.65	101.64	0	D	A	72.3	15.5	0.0	0.0	0.0	57.9	1.0	-0.2	0.0	0.0	0.0	0.0	0.0	29.1
5453	356582.41	4861139.63	101.62	1	D	A	72.3	14.9	0.0	0.0	0.0	58.7	1.0	-0.3	0.0	0.0	0.0	0.0	2.8	25.0
5465	356589.01	4861102.07	102.04	0	D	A	72.3	15.6	0.0	0.0	0.0	58.4	1.0	-0.4	0.0	0.0	0.0	0.0	0.0	28.9
5477	356586.36	4861110.22	101.94	1	D	A	72.3	11.4	0.0	0.0	0.0	58.7	1.0	-0.4	0.0	0.0	0.0	0.0	2.5	21.9
5489	356590.73	4861096.80	102.10	1	D	A	72.3	11.6	0.0	0.0	0.0	58.8	1.1	-0.5	0.0	0.0	0.0	0.0	2.5	22.1
5500	356593.78	4861087.43	102.22	1	D	A	72.3	7.1	0.0	0.0	0.0	58.9	1.1	-0.5	0.0	0.0	0.0	0.0	2.5	17.5
6097	356714.81	4861117.90	101.91	0	D	A	72.3	9.2	0.0	0.0	0.0	53.4	0.6	-0.4	0.0	0.0	0.0	0.0	0.0	27.9
6394	356708.05	4861138.70	101.42	0	D	A	72.3	8.1	0.0	0.0	0.0	52.5	0.6	-0.4	0.0	0.0	0.0	0.0	0.0	27.8
6405	356712.82	4861135.79	101.53	0	D	A	72.3	7.8	0.0	0.0	0.0	52.4	0.6	-0.4	0.0	0.0	0.0	0.0	0.0	27.5
6512	356590.73	4861119.42	101.59	0	D	A	72.3	11.1	0.0	0.0	0.0	58.0	1.0	-0.3	0.0	0.0	0.0	0.0	0.0	24.8
6524	356592.22	4861115.39	101.65	1	D	A	72.3	6.4	0.0	0.0	0.0	58.9	1.1	-0.4	0.0	0.0	0.0	0.0	2.8	16.4
6536	356590.00	4861121.41	101.56	1	D	A	72.3	9.4	0.0	0.0	0.0	58.9	1.1	-0.4	0.0	0.0	0.0	0.0	2.8	19.4
6585	356597.36	4861110.15	101.62	0	D	A	72.3	10.3	0.0	0.0	0.0	58.0	1.0	-0.4	0.0	0.0	0.0	0.0	0.0	24.1
6597	356597.36	4861110.15	101.62	1	D	A	72.3	10.3	0.0	0.0	0.0	59.1	1.1	-0.4	0.0	0.0	0.0	0.0	2.8	20.1
6646	356596.39	4861083.94	102.26	0	D	A	72.3	6.2	0.0	0.0	0.0	58.6	1.0	-0.5	0.0	0.0	0.0	0.0	0.0	19.5
6658	356601.03	4861081.29	102.28	0	D	A	72.3	8.1	0.0	0.0	0.0	58.5	1.0	-0.5	0.0	0.0	0.0	0.0	0.0	21.5
6670	356599.21	4861082.33	102.27	1	D	A	72.3	10.3	0.0	0.0	0.0	59.1	1.1	-0.6	0.0	0.0	0.0	0.0	2.8	20.1

Point Source, ISO 9613, Name: "HVAC Rooftop Unit", ID: "!07!NS41"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahours (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5334	356759.35	4861122.56	104.00	0	D	A	90.0	0.0	0.0	0.0	0.0	51.7	0.5	-1.2	0.0	0.0	0.0	0.0	0.0	38.9

Point Source, ISO 9613, Name: "HVAC Rooftop Unit", ID: "!07!NS40"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahours (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5346	356740.67	4861116.60	104.00	0	D	A	90.0	0.0	0.0	0.0	0.0	52.6	0.6	-1.2	0.0	0.0	0.0	0.0	0.0	38.0

Point Source, ISO 9613, Name: "Bus\_Idle", ID: "!03!NS37"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahours (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5357	356712.23	4861108.94	102.09	0	D	A	102.5	0.0	-13.0	0.0	0.0	53.9	1.0	-0.6	0.0	0.0	0.0	0.0	0.0	35.1

Point Source, ISO 9613, Name: "Bus\_Idle", ID: "!03!NS36"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahours (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5369	356693.89	4861102.56	102.10	0	D	A	102.5	0.0	-13.0	0.0	0.0	54.9	1.1	-0.6	0.0	0.0	0.0	0.0	0.0	34.1

Point Source, ISO 9613, Name: "Bus\_Idle", ID: "!03!NS04"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahours (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5417	356670.24	4861095.65	102.14	0	D	A	102.5	0.0	-13.0	0.0	0.0	55.9	1.2	-0.6	0.0	0.0	0.0	0.0	0.0	32.9



Point Source, ISO 9613, Name: "Bus_Idle", ID: "!03!NS04"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5429	356670.24	4861095.65	102.14	1	D	A	102.5	0.0	-13.0	0.0	0.0	61.3	1.8	-1.0	0.0	0.0	0.0	0.0	8.2	19.2

Point Source, ISO 9613, Name: "Bus_Idle", ID: "!03!NS05"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)
5738	356656.88	4861091.24	101.65	0	D	A	102.5	0.0	-13.0	0.0	0.0	56.5	1.3	-0.6	0.0	0.0	0.0	0.0	0.0	32.3
5750	356656.88	4861091.24	101.65	1	D	A	102.5	0.0	-13.0	0.0	0.0	60.9	1.8	-1.0	0.0	0.0	0.0	0.0	8.1	19.7

Line Source, ISO 9613, Name: "Bus_Acceleration_Noise", ID: "!03!LS06"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5762	356637.29	4861089.31	101.83	0	D	A	90.0	17.1	-25.1	0.0	0.0	57.2	1.3	-0.7	0.0	0.0	0.0	0.0	0.0	24.3
5774	356686.15	4861104.84	102.00	0	D	A	90.0	17.1	-25.1	0.0	0.0	55.0	1.1	-0.6	0.0	0.0	0.0	0.0	0.0	26.5

Point Source, ISO 9613, Name: "Bus_Idle", ID: "!03!NS06"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)
6076	356641.95	4861086.50	101.50	0	D	A	102.5	0.0	-13.0	0.0	0.0	57.1	1.3	-0.7	0.0	0.0	0.0	0.0	0.0	31.7
6087	356641.95	4861086.50	101.50	1	D	A	102.5	0.0	-13.0	0.0	0.0	60.5	1.7	-1.0	0.0	0.0	0.0	0.0	8.0	20.3

Point Source, ISO 9613, Name: "Bus_Idle", ID: "!03!NS07"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)
6108	356625.02	4861081.56	101.50	0	D	A	102.5	0.0	-13.0	0.0	0.0	57.8	1.4	-0.8	0.0	0.0	0.0	0.0	0.0	31.1
6119	356625.02	4861081.56	101.50	1	D	A	102.5	0.0	-13.0	0.0	0.0	60.0	1.7	-1.0	0.0	0.0	0.0	0.0	4.5	24.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "!03!SPK065"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6417	356800.44	4861136.38	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	50.3	0.8	-1.5	0.0	0.0	0.0	0.0	0.0	30.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "!03!SPK064"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6429	356785.93	4861131.65	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	50.7	0.8	-1.5	0.0	0.0	0.0	0.0	0.0	29.9

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK063"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6441	356770.15	4861127.55	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	51.1	0.8	-1.5	0.0	0.0	0.0	0.0	0.0	29.4

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "!03!SPK062"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6452	356753.77	4861128.23	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	51.4	0.8	-1.5	0.0	0.0	0.0	0.0	0.0	29.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "!03!SPK031"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6464	356830.48	4861119.99	102.26	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.3	0.9	-1.5	0.0	0.0	0.0	0.0	0.0	28.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "!03!SPK030"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6476	356813.97	4861114.56	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.3	0.9	-1.5	0.0	0.0	0.0	0.0	0.0	28.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "!03!SPK032"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6488	356847.00	4861125.42	101.59	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.5	0.9	-1.5	0.0	0.0	0.0	0.0	0.0	27.9

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK029"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6500	356797.45	4861109.13	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.5	0.9	-1.5	0.0	0.0	0.0	0.0	0.0	27.9

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK033"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6549	356863.51	4861130.85	101.98	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.8	1.0	-1.5	0.0	0.0	0.0	0.0	0.0	27.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK028"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6561	356780.94	4861103.70	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.9	1.0	-1.5	0.0	0.0	0.0	0.0	0.0	27.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK061"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6573	356729.77	4861113.98	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.1	1.0	-1.5	0.0	0.0	0.0	0.0	0.0	27.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK054"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6610	356688.13	4861142.69	102.62	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.3	1.0	-1.4	0.0	0.0	0.0	0.0	0.0	27.0

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK034"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6622	356880.03	4861136.28	102.31	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.3	1.0	-1.5	0.0	0.0	0.0	0.0	0.0	27.0

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK027"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6634	356764.43	4861098.28	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.4	1.0	-1.5	0.0	0.0	0.0	0.0	0.0	27.0

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK035"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6682	356896.54	4861141.71	102.33	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.9	1.1	-1.5	0.0	0.0	0.0	0.0	0.0	26.4

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK026"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6694	356747.91	4861092.85	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.9	1.1	-1.5	0.0	0.0	0.0	0.0	0.0	26.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK044"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6705	356692.55	4861121.24	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.1	1.1	-1.5	0.0	0.0	0.0	0.0	0.0	26.2

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK053"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6716	356670.78	4861137.01	102.53	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.4	1.1	-1.3	0.0	0.0	0.0	0.0	0.0	25.8

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK060"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6738	356707.38	4861103.57	103.79	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.4	1.1	-1.5	0.0	0.0	0.0	0.0	0.0	25.9

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK036"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6749	356913.05	4861147.14	102.34	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.5	1.1	-1.5	0.0	0.0	0.0	0.0	0.0	25.7



Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK025"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6769	356731.40	4861087.42	103.04	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.6	1.2	-1.5	0.0	0.0	0.0	0.0	0.0	25.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK046"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6781	356676.78	4861116.51	102.94	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.9	1.2	-1.5	0.0	0.0	0.0	0.0	0.0	25.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK037"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6805	356929.57	4861152.57	102.37	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.2	1.2	-1.5	0.0	0.0	0.0	0.0	0.0	25.0

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK052"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6817	356652.17	4861131.96	102.57	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.4	1.2	-1.4	0.0	0.0	0.0	0.0	0.0	24.7

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK059"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6841	356683.72	4861095.69	103.90	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.5	1.3	-1.5	0.0	0.0	0.0	0.0	0.0	24.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK048"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6865	356659.74	4861110.51	102.89	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.8	1.3	-1.4	0.0	0.0	0.0	0.0	0.0	24.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK038"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6888	356946.08	4861158.00	102.68	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.8	1.3	-1.5	0.0	0.0	0.0	0.0	0.0	24.2
6900	356946.08	4861158.00	102.68	1	D	A	90.7	0.0	-10.8	0.0	0.0	58.1	1.6	-1.5	0.0	0.0	0.0	0.0	2.5	19.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK051"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6912	356635.77	4861126.60	102.65	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.2	1.3	-1.4	0.0	0.0	0.0	0.0	0.0	23.7

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK058"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6936	356662.90	4861088.43	103.78	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.4	1.4	-1.5	0.0	0.0	0.0	0.0	0.0	23.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK039"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6960	356962.60	4861163.43	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.5	1.4	-1.5	0.0	0.0	0.0	0.0	0.0	23.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK047"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6977	356640.50	4861105.15	102.93	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.6	1.4	-1.4	0.0	0.0	0.0	0.0	0.0	23.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK050"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7026	356617.16	4861120.29	102.83	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.1	1.5	-1.3	0.0	0.0	0.0	0.0	0.0	22.7
7038	356617.16	4861120.29	102.83	1	D	A	90.7	0.0	-10.8	0.0	0.0	59.8	1.9	-1.5	0.0	0.0	0.0	0.0	2.6	17.2

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK040"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7050	356979.11	4861168.86	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.1	1.5	-1.5	0.0	0.0	0.0	0.0	0.0	22.8

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK057"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7062	356644.60	4861083.07	103.02	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.1	1.5	-1.5	0.0	0.0	0.0	0.0	0.0	22.7

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK045"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7085	356623.15	4861098.84	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.4	1.5	-1.4	0.0	0.0	0.0	0.0	0.0	22.4
7108	356623.15	4861098.84	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	59.9	1.9	-1.6	0.0	0.0	0.0	0.0	2.6	17.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK041"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7152	356995.63	4861174.29	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.7	1.5	-1.5	0.0	0.0	0.0	0.0	0.0	22.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK049"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7163	356601.07	4861115.88	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.7	1.6	-1.3	0.0	0.0	0.0	0.0	0.0	21.9
7174	356601.07	4861115.88	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	59.2	1.8	-1.5	0.0	0.0	0.0	0.0	2.5	17.8

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK056"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7185	356626.94	4861077.71	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.8	1.6	-1.4	0.0	0.0	0.0	0.0	0.0	22.0
7196	356626.94	4861077.71	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	60.0	1.9	-1.7	0.0	0.0	0.0	0.0	2.6	17.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK043"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7206	356605.49	4861093.16	103.31	0	D	A	90.7	0.0	-10.8	0.0	0.0	58.1	1.6	-1.4	0.0	0.0	0.0	0.0	0.0	21.6
7236	356605.49	4861093.16	103.31	1	D	A	90.7	0.0	-10.8	0.0	0.0	59.3	1.8	-1.6	0.0	0.0	0.0	0.0	2.1	18.2

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK042"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7256	357012.14	4861179.72	103.15	0	D	A	90.7	0.0	-10.8	0.0	0.0	58.3	1.6	-1.5	0.0	0.0	0.0	0.0	0.0	21.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK055"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7264	356609.59	4861073.29	103.49	0	D	A	90.7	0.0	-10.8	0.0	0.0	58.4	1.7	-1.5	0.0	0.0	0.0	0.0	0.0	21.3



## Receiver

Name: OLA028B

ID: !0100!OLA028B

X: 356789.77 m

Y: 4861225.69 m

Z: 101.50 m

Line Source, ISO 9613, Name: "Bus\_route", ID: "!03!LS02"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5248	356678.10	4861130.72	101.42	0	D	A	72.3	17.5	0.0	0.0	0.0	54.3	0.7	-0.4	0.0	0.0	0.0	0.0	0.0	35.2
5260	356626.56	4861114.69	101.52	0	D	A	72.3	17.2	0.0	0.0	0.0	56.9	0.9	-0.5	0.0	0.0	0.0	0.0	0.0	32.2
5271	356632.10	4861116.42	101.51	1	D	A	72.3	18.0	0.0	0.0	0.0	60.3	1.2	-0.5	0.0	0.0	0.0	0.0	9.4	19.9
5284	356681.02	4861131.63	101.42	1	D	A	72.3	17.0	0.0	0.0	0.0	61.6	1.4	-0.4	0.0	0.0	0.0	0.0	9.7	17.0
5297	356630.95	4861088.42	102.23	0	D	A	72.3	17.6	0.0	0.0	0.0	57.4	0.9	-0.6	0.0	0.0	0.0	0.0	0.0	32.1
5309	356685.13	4861105.91	102.10	0	D	A	72.3	17.6	0.0	0.0	0.0	55.0	0.7	-0.5	0.0	0.0	0.0	0.0	0.0	34.6
5321	356621.24	4861085.29	102.25	1	D	A	72.3	15.6	0.0	0.0	0.0	59.9	1.2	-0.5	0.0	0.0	0.0	0.0	3.6	23.8
5333	356670.39	4861101.15	102.14	1	D	A	72.3	18.2	0.0	0.0	0.0	61.3	1.3	-0.5	0.0	0.0	0.0	0.0	9.7	18.8
5466	356715.87	4861127.17	101.69	0	D	A	72.3	10.9	0.0	0.0	0.0	52.8	0.6	-0.3	0.0	0.0	0.0	0.0	0.0	30.2
5478	356579.11	4861138.53	101.79	0	D	A	72.3	16.0	0.0	0.0	0.0	58.2	1.0	-0.3	0.0	0.0	0.0	0.0	0.0	29.5
5490	356579.58	4861136.43	101.80	1	D	A	72.3	15.5	0.0	0.0	0.0	58.6	1.0	-0.3	0.0	0.0	0.0	0.0	2.7	25.8
5526	356581.54	4861141.65	101.64	0	D	A	72.3	15.5	0.0	0.0	0.0	58.0	1.0	-0.3	0.0	0.0	0.0	0.0	0.0	29.1
5538	356582.39	4861139.68	101.62	1	D	A	72.3	14.9	0.0	0.0	0.0	58.8	1.0	-0.3	0.0	0.0	0.0	0.0	2.9	24.8
5550	356589.01	4861102.07	102.04	0	D	A	72.3	15.6	0.0	0.0	0.0	58.4	1.0	-0.5	0.0	0.0	0.0	0.0	0.0	28.9
5562	356586.26	4861110.52	101.93	1	D	A	72.3	11.2	0.0	0.0	0.0	58.8	1.0	-0.4	0.0	0.0	0.0	0.0	2.7	21.5
5574	356590.53	4861097.41	102.10	1	D	A	72.3	11.6	0.0	0.0	0.0	58.9	1.1	-0.5	0.0	0.0	0.0	0.0	2.7	21.8
5586	356593.66	4861087.78	102.22	1	D	A	72.3	7.7	0.0	0.0	0.0	59.0	1.1	-0.5	0.0	0.0	0.0	0.0	2.7	17.8
5815	356714.81	4861117.90	101.91	0	D	A	72.3	9.2	0.0	0.0	0.0	53.4	0.6	-0.4	0.0	0.0	0.0	0.0	0.0	27.9
5851	356708.05	4861138.70	101.42	0	D	A	72.3	8.1	0.0	0.0	0.0	52.5	0.6	-0.3	0.0	0.0	0.0	0.0	0.0	27.7
5887	356712.82	4861135.79	101.53	0	D	A	72.3	7.8	0.0	0.0	0.0	52.5	0.6	-0.3	0.0	0.0	0.0	0.0	0.0	27.4
6237	356590.73	4861119.42	101.59	0	D	A	72.3	11.1	0.0	0.0	0.0	58.1	1.0	-0.4	0.0	0.0	0.0	0.0	0.0	24.8
6248	356592.19	4861115.48	101.65	1	D	A	72.3	6.6	0.0	0.0	0.0	59.0	1.1	-0.4	0.0	0.0	0.0	0.0	2.9	16.4
6259	356589.97	4861121.49	101.56	1	D	A	72.3	9.3	0.0	0.0	0.0	58.9	1.1	-0.4	0.0	0.0	0.0	0.0	2.9	19.2
6387	356597.36	4861110.15	101.62	0	D	A	72.3	10.3	0.0	0.0	0.0	58.0	1.0	-0.5	0.0	0.0	0.0	0.0	0.0	24.1
6399	356597.36	4861110.15	101.62	1	D	A	72.3	10.3	0.0	0.0	0.0	59.1	1.1	-0.4	0.0	0.0	0.0	0.0	2.9	20.0
6447	356596.46	4861083.90	102.26	0	D	A	72.3	6.4	0.0	0.0	0.0	58.6	1.0	-0.5	0.0	0.0	0.0	0.0	0.0	19.6
6459	356601.09	4861081.25	102.28	0	D	A	72.3	8.0	0.0	0.0	0.0	58.5	1.0	-0.6	0.0	0.0	0.0	0.0	0.0	21.4
6471	356599.21	4861082.33	102.27	1	D	A	72.3	10.3	0.0	0.0	0.0	59.2	1.1	-0.5	0.0	0.0	0.0	0.0	2.9	20.0

Point Source, ISO 9613, Name: "HVAC Rooftop Unit", ID: "!07!NS41"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5394	356759.35	4861122.56	104.00	0	D	A	90.0	0.0	0.0	0.0	0.0	51.6	0.5	-0.5	0.0	0.0	0.0	0.0	0.0	38.3
5406	356759.35	4861122.56	104.00	1	D	A	90.0	0.0	0.0	0.0	0.0	52.0	0.6	-0.5	0.0	0.0	0.0	0.0	2.7	35.1

Point Source, ISO 9613, Name: "HVAC Rooftop Unit", ID: "!07!NS40"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5418	356740.67	4861116.60	104.00	0	D	A	90.0	0.0	0.0	0.0	0.0	52.6	0.6	-0.4	0.0	0.0	0.0	0.0	0.0	37.2
5430	356740.67	4861116.60	104.00	1	D	A	90.0	0.0	0.0	0.0	0.0	52.9	0.6	-0.4	0.0	0.0	0.0	0.0	2.7	34.2

Point Source, ISO 9613, Name: "Bus\_Idle", ID: "!03!NS37"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5442	356712.23	4861108.94	102.09	0	D	A	102.5	0.0	-13.0	0.0	0.0	53.9	1.0	-0.9	0.0	0.0	0.0	0.0	0.0	35.4

Point Source, ISO 9613, Name: "Bus\_Idle", ID: "!03!NS36"

Nr.	X (m)	Y (m)	Z (m)	Refl.	DEN	Freq. (Hz)	Lw dB(A)	l/a dB	Optime dB	K0 (dB)	Di (dB)	Adiv (dB)	Aatm (dB)	Agr (dB)	Afol (dB)	Ahous (dB)	Abar (dB)	Cmet (dB)	RL (dB)	Lr dB(A)
5454	356693.89	4861102.56	102.10	0	D	A	102.5	0.0	-13.0	0.0	0.0	54.9	1.1	-1.0	0.0	0.0	0.0	0.0	0.0	34.5

Point Source, ISO 9613, Name: "Bus_Idle", ID: "I03!NS04"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5502	356670.24	4861095.65	102.14	0	D	A	102.5	0.0	-13.0	0.0	0.0	55.9	1.2	-1.1	0.0	0.0	0.0	0.0	0.0	33.4
5514	356670.24	4861095.65	102.14	1	D	A	102.5	0.0	-13.0	0.0	0.0	61.3	1.8	-1.2	0.0	0.0	0.0	0.0	7.9	19.6

Point Source, ISO 9613, Name: "Bus_Idle", ID: "I03!NS05"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5682	356656.88	4861091.24	101.65	0	D	A	102.5	0.0	-13.0	0.0	0.0	56.5	1.3	-1.1	0.0	0.0	0.0	0.0	0.0	32.8
5694	356656.88	4861091.24	101.65	1	D	A	102.5	0.0	-13.0	0.0	0.0	60.9	1.8	-1.2	0.0	0.0	0.0	0.0	7.8	20.1

Line Source, ISO 9613, Name: "Bus_Acceleration_Noise", ID: "I03!LS06"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5706	356637.29	4861089.31	101.83	0	D	A	90.0	17.1	-25.1	0.0	0.0	57.2	1.3	-1.1	0.0	0.0	0.0	0.0	0.0	24.6
5718	356686.15	4861104.84	102.00	0	D	A	90.0	17.1	-25.1	0.0	0.0	55.0	1.1	-1.0	0.0	0.0	0.0	0.0	0.0	26.9

Point Source, ISO 9613, Name: "Bus_Idle", ID: "I03!NS06"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5791	356641.95	4861086.50	101.50	0	D	A	102.5	0.0	-13.0	0.0	0.0	57.2	1.3	-1.1	0.0	0.0	0.0	0.0	0.0	32.1
5803	356641.95	4861086.50	101.50	1	D	A	102.5	0.0	-13.0	0.0	0.0	60.5	1.7	-1.2	0.0	0.0	0.0	0.0	7.7	20.7

Point Source, ISO 9613, Name: "Bus_Idle", ID: "I03!NS07"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5827	356625.02	4861081.56	101.50	0	D	A	102.5	0.0	-13.0	0.0	0.0	57.8	1.4	-1.2	0.0	0.0	0.0	0.0	0.0	31.4
5839	356625.02	4861081.56	101.50	1	D	A	102.5	0.0	-13.0	0.0	0.0	60.0	1.7	-1.2	0.0	0.0	0.0	0.0	4.4	24.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK065"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5863	356800.44	4861136.38	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	50.1	0.7	-1.2	0.0	0.0	0.0	0.0	0.0	30.2
5875	356800.44	4861136.38	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	50.6	0.8	-1.1	0.0	0.0	0.0	0.0	2.1	27.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK064"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5899	356785.93	4861131.65	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	50.5	0.8	-1.1	0.0	0.0	0.0	0.0	0.0	29.8
5911	356785.93	4861131.65	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	51.0	0.8	-1.1	0.0	0.0	0.0	0.0	2.1	27.2

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK063"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5922	356770.15	4861127.55	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	51.0	0.8	-1.1	0.0	0.0	0.0	0.0	0.0	29.2
5934	356770.15	4861127.55	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	51.5	0.8	-1.1	0.0	0.0	0.0	0.0	2.1	26.7

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK062"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
5946	356753.77	4861128.23	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	51.3	0.8	-1.1	0.0	0.0	0.0	0.0	0.0	28.9
5958	356753.77	4861128.23	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	51.7	0.9	-1.1	0.0	0.0	0.0	0.0	2.1	26.4

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK031"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6154	356830.48	4861119.99	102.26	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.1	0.9	-1.1	0.0	0.0	0.0	0.0	0.0	28.0
6164	356830.48	4861119.99	102.26	1	D	A	90.7	0.0	-10.8	0.0	0.0	52.5	0.9	-1.1	0.0	0.0	0.0	0.0	2.1	25.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK030"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6174	356813.97	4861114.56	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.1	0.9	-1.1	0.0	0.0	0.0	0.0	0.0	28.0
6184	356813.97	4861114.56	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	52.6	0.9	-1.1	0.0	0.0	0.0	0.0	2.1	25.4



Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK032"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6194	356847.00	4861125.42	101.59	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.2	0.9	-1.1	0.0	0.0	0.0	0.0	0.0	27.9
6204	356847.00	4861125.42	101.59	1	D	A	90.7	0.0	-10.8	0.0	0.0	52.7	1.0	-1.1	0.0	0.0	0.0	0.0	2.1	25.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK029"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6215	356797.45	4861109.13	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.4	0.9	-1.1	0.0	0.0	0.0	0.0	0.0	27.7
6226	356797.45	4861109.13	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	52.8	1.0	-1.1	0.0	0.0	0.0	0.0	2.1	25.2

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK033"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6271	356863.51	4861130.85	101.98	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.6	0.9	-1.1	0.0	0.0	0.0	0.0	0.0	27.5
6301	356863.51	4861130.85	101.98	1	D	A	90.7	0.0	-10.8	0.0	0.0	53.0	1.0	-1.1	0.0	0.0	0.0	0.0	2.1	25.0

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK028"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6311	356780.94	4861103.70	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	52.7	1.0	-1.1	0.0	0.0	0.0	0.0	0.0	27.3
6322	356780.94	4861103.70	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	53.1	1.0	-1.1	0.0	0.0	0.0	0.0	2.1	24.8

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK061"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6333	356729.77	4861113.98	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.1	1.0	-1.1	0.0	0.0	0.0	0.0	0.0	26.9

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK034"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6344	356880.03	4861136.28	102.31	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.1	1.0	-1.1	0.0	0.0	0.0	0.0	0.0	26.9
6355	356880.03	4861136.28	102.31	1	D	A	90.7	0.0	-10.8	0.0	0.0	53.4	1.0	-1.1	0.0	0.0	0.0	0.0	2.1	24.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK027"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6365	356764.43	4861098.28	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.3	1.0	-1.1	0.0	0.0	0.0	0.0	0.0	26.7
6376	356764.43	4861098.28	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	53.6	1.0	-1.1	0.0	0.0	0.0	0.0	2.1	24.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK054"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6413	356688.13	4861142.69	102.62	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.4	1.0	-1.1	0.0	0.0	0.0	0.0	0.0	26.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK035"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6424	356896.54	4861141.71	102.33	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.7	1.1	-1.1	0.0	0.0	0.0	0.0	0.0	26.3
6435	356896.54	4861141.71	102.33	1	D	A	90.7	0.0	-10.8	0.0	0.0	54.0	1.1	-1.2	0.0	0.0	0.0	0.0	2.1	23.9

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK026"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6483	356747.91	4861092.85	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	53.9	1.1	-1.1	0.0	0.0	0.0	0.0	0.0	26.1
6495	356747.91	4861092.85	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	54.2	1.1	-1.2	0.0	0.0	0.0	0.0	2.1	23.7

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK044"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6507	356692.55	4861121.24	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.1	1.1	-1.2	0.0	0.0	0.0	0.0	0.0	25.9

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK036"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6519	356913.05	4861147.14	102.34	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.3	1.1	-1.2	0.0	0.0	0.0	0.0	0.0	25.7

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK036"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6531	356913.05	4861147.14	102.34	1	D	A	90.7	0.0	-10.8	0.0	0.0	54.6	1.2	-1.2	0.0	0.0	0.0	0.0	2.1	23.4

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK060"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6543	356707.38	4861103.57	103.79	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.4	1.1	-1.2	0.0	0.0	0.0	0.0	0.0	25.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK053"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6555	356670.78	4861137.01	102.53	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.4	1.1	-1.2	0.0	0.0	0.0	0.0	0.0	25.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK025"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6579	356731.40	4861087.42	103.04	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.5	1.1	-1.2	0.0	0.0	0.0	0.0	0.0	25.5
6591	356731.40	4861087.42	103.04	1	D	A	90.7	0.0	-10.8	0.0	0.0	54.8	1.2	-1.3	0.0	0.0	0.0	0.0	2.1	23.2

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK046"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6602	356676.78	4861116.51	102.94	0	D	A	90.7	0.0	-10.8	0.0	0.0	54.9	1.2	-1.3	0.0	0.0	0.0	0.0	0.0	25.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK037"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6626	356929.57	4861152.57	102.37	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.0	1.2	-1.3	0.0	0.0	0.0	0.0	0.0	25.0
6638	356929.57	4861152.57	102.37	1	D	A	90.7	0.0	-10.8	0.0	0.0	55.2	1.2	-1.3	0.0	0.0	0.0	0.0	2.1	22.8

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK052"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6650	356652.17	4861131.96	102.57	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.4	1.2	-1.3	0.0	0.0	0.0	0.0	0.0	24.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK059"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6674	356683.72	4861095.69	103.90	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.5	1.3	-1.4	0.0	0.0	0.0	0.0	0.0	24.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK038"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6698	356946.08	4861158.00	102.68	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.6	1.3	-1.4	0.0	0.0	0.0	0.0	0.0	24.4
6709	356946.08	4861158.00	102.68	1	D	A	90.7	0.0	-10.8	0.0	0.0	55.8	1.3	-1.4	0.0	0.0	0.0	0.0	2.1	22.1
6720	356946.08	4861158.00	102.68	2	D	A	90.7	0.0	-10.8	0.0	0.0	58.2	1.6	-1.7	0.0	0.0	0.0	0.0	4.4	17.4
6731	356946.08	4861158.00	102.68	1	D	A	90.7	0.0	-10.8	0.0	0.0	58.0	1.6	-1.6	0.0	0.0	0.0	0.0	2.3	19.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK048"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6742	356659.74	4861110.51	102.89	0	D	A	90.7	0.0	-10.8	0.0	0.0	55.8	1.3	-1.4	0.0	0.0	0.0	0.0	0.0	24.2

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK051"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6764	356635.77	4861126.60	102.65	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.3	1.4	-1.3	0.0	0.0	0.0	0.0	0.0	23.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK039"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6788	356962.60	4861163.43	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.3	1.4	-1.5	0.0	0.0	0.0	0.0	0.0	23.7
6800	356962.60	4861163.43	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	56.5	1.4	-1.5	0.0	0.0	0.0	0.0	2.1	21.5



Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK058"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6812	356662.90	4861088.43	103.78	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.4	1.4	-1.5	0.0	0.0	0.0	0.0	0.0	23.6

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK047"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6836	356640.50	4861105.15	102.93	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.7	1.4	-1.5	0.0	0.0	0.0	0.0	0.0	23.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK040"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6884	356979.11	4861168.86	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	56.9	1.4	-1.5	0.0	0.0	0.0	0.0	0.0	23.1
6895	356979.11	4861168.86	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	57.1	1.5	-1.6	0.0	0.0	0.0	0.0	2.1	20.9

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK050"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6907	356617.16	4861120.29	102.83	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.1	1.5	-1.4	0.0	0.0	0.0	0.0	0.0	22.7
6919	356617.16	4861120.29	102.83	1	D	A	90.7	0.0	-10.8	0.0	0.0	59.8	1.9	-1.6	0.0	0.0	0.0	0.0	2.4	17.5
6931	356617.16	4861120.29	102.83	1	D	A	90.7	0.0	-10.8	0.0	0.0	59.8	1.9	-1.6	0.0	0.0	0.0	0.0	2.4	17.5

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK057"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6943	356644.60	4861083.07	103.02	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.2	1.5	-1.6	0.0	0.0	0.0	0.0	0.0	22.8

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK045"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
6967	356623.15	4861098.84	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.4	1.5	-1.6	0.0	0.0	0.0	0.0	0.0	22.5
6991	356623.15	4861098.84	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	60.0	1.9	-1.7	0.0	0.0	0.0	0.0	2.4	17.4

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK041"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7040	356995.63	4861174.29	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.5	1.5	-1.6	0.0	0.0	0.0	0.0	0.0	22.4
7052	356995.63	4861174.29	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	57.7	1.5	-1.6	0.0	0.0	0.0	0.0	2.1	20.2

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK049"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7064	356601.07	4861115.88	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.8	1.6	-1.5	0.0	0.0	0.0	0.0	0.0	22.0
7076	356601.07	4861115.88	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	59.3	1.8	-1.6	0.0	0.0	0.0	0.0	2.4	18.1

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK056"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7087	356626.94	4861077.71	103.00	0	D	A	90.7	0.0	-10.8	0.0	0.0	57.8	1.6	-1.6	0.0	0.0	0.0	0.0	0.0	22.1
7098	356626.94	4861077.71	103.00	1	D	A	90.7	0.0	-10.8	0.0	0.0	60.1	1.9	-1.8	0.0	0.0	0.0	0.0	2.4	17.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK043"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7110	356605.49	4861093.16	103.31	0	D	A	90.7	0.0	-10.8	0.0	0.0	58.1	1.6	-1.6	0.0	0.0	0.0	0.0	0.0	21.8
7143	356605.49	4861093.16	103.31	1	D	A	90.7	0.0	-10.8	0.0	0.0	59.4	1.8	-1.7	0.0	0.0	0.0	0.0	2.1	18.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK042"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7164	357012.14	4861179.72	103.15	0	D	A	90.7	0.0	-10.8	0.0	0.0	58.1	1.6	-1.7	0.0	0.0	0.0	0.0	0.0	21.8
7175	357012.14	4861179.72	103.15	1	D	A	90.7	0.0	-10.8	0.0	0.0	58.2	1.6	-1.7	0.0	0.0	0.0	0.0	2.3	19.3

Point Source, ISO 9613, Name: "Announcement Speaker", ID: "I03!SPK055"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	I/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
7186	356609.59	4861073.29	103.49	0	D	A	90.7	0.0	-10.8	0.0	0.0	58.5	1.7	-1.7	0.0	0.0	0.0	0.0	0.0	21.5



## **Appendix B.4 - TNM Road Noise Sample Calculations**

## REPORT:

## INPUT ROADWAYS

TNM VERSION:

3.1.7970.37608

REPORT DATE:

27 February 2023

CALCULATED WITH:

3.1.7970.37608

CALCULATION DATE:

2/24/2023 11:58:34 AM

CASE:

BMV

ORGANIZATION:

ANALYSIS BY:

saarnold

PROJECT/CONTRACT:

Roadway Name	Roadway Notes	Road Segment		Coordinates (pavement)			Width	Point Notes	Road Segment		
		Start Point							Road Category	Pavement Type	On Structure
		Name	Number								
		X	Y	Z	[m]	[m]	[m]				
Stevenson Rd		Point-0	2	670000.80	4862177.00	0.00	11.25		Mainline	Average	No
		Point-1	3	670505.70	4860774.00	0.00	11.25		Mainline	Average	No
		Point-3	4	670626.00	4860389.00	0.00	11.25		Mainline	Average	No
Park Rd		Point-6	6	671171.20	4860788.00	0.00	15.00		Mainline	Average	No
		Point-7	7	671276.50	4860986.00	0.00	15.00		Mainline	Average	No
		Point-9	8	671273.40	4861103.00	0.00	15.00		Mainline	Average	No
		Point-11	9	670793.90	4862445.00	0.00	15.00		Mainline	Average	No
Simcoe Street		Point-12	10	671595.40	4862662.00	0.00	15.00		Mainline	Average	No
		Point-13	11	672199.50	4860981.00	0.00	15.00		Mainline	Average	No
Ritson Rd		Point-14	12	672342.40	4862984.00	0.00	15.00		Mainline	Average	No
		Point-15	13	672985.90	4861251.00	0.00	15.00		Mainline	Average	No
Wilson Rd		Point-16	14	673174.10	4863225.00	0.00	15.00		Mainline	Average	No
		Point-17	15	673770.60	4861519.00	0.00	15.00		Mainline	Average	No
Harmony Rd		Point-18	16	673939.90	4863486.00	0.00	15.00		Mainline	Average	No
		Point-19	17	674553.90	4861773.00	0.00	15.00		Mainline	Average	No
Bloor St		Point-20	18	674581.00	4861794.00	0.00	7.50		Mainline	Average	No
		Point-21	19	674806.60	4861873.00	0.00	7.50		Mainline	Average	No



Roadway Name	Roadway Notes	Road Segment		Coordinates (pavement)			Width	Point Notes	Road Segment		
		Start Point							Road	Pavement	On
		Name	Number	X	Y	Z	Category		Type	Structure	
				[m]	[m]	[m]	[m]				
Bloor St		Point-23	20	674843.10	4861798.00	0.00	7.50		Mainline	Average	No
		Point-25	21	674889.10	4861754.00	0.00	7.50		Mainline	Average	No
		Point-27	22	674958.40	4861739.00	0.00	7.50		Mainline	Average	No
		Point-29	23	675638.40	4861984.00	0.00	7.50		Mainline	Average	No
		Point-31	24	675785.30	4862039.00	0.00	7.50		Mainline	Average	No
		Point-33	25	676165.90	4862128.00	0.00	7.50		Mainline	Average	No
		Point-35	26	676589.40	4862284.00	0.00	7.50		Mainline	Average	No
		Point-37	27	677075.00	4862187.00	0.00	7.50		Mainline	Average	No
Baseline Rd		Point-38	28	677606.80	4860489.00	0.00	7.50		Mainline	Average	No
		Point-39	29	683785.50	4862528.00	0.00	7.50		Mainline	Average	No
Courtice Rd		Point-40	30	678959.90	4862897.00	0.00	7.50		Mainline	Average	No
		Point-41	31	679564.50	4861142.00	0.00	7.50		Mainline	Average	No
Martin Rd		Point-42	32	684526.60	4864531.00	0.00	3.66		Mainline	Average	No
		Point-43	33	684756.10	4863844.00	0.00	3.66		Mainline	Average	No
		Point-45	34	684857.10	4863685.00	0.00	3.66		Mainline	Average	No
		Point-47	35	684987.60	4863582.00	0.00	3.66		Mainline	Average	No
		Point-49	36	685190.70	4863474.00	0.00	3.66		Mainline	Average	No
		Point-51	37	685300.10	4863385.00	0.00	3.66		Mainline	Average	No
		Point-53	38	685528.90	4862851.00	0.00	3.66		Mainline	Average	No
King St		Point-64	45	681732.70	4864678.00	0.00	15.00		Mainline	Average	No
		Point-65	46	683296.40	4864374.00	0.00	15.00		Mainline	Average	No
		Point-67	47	683514.30	4864349.00	0.00	15.00		Mainline	Average	No
		Point-69	48	683703.60	4864364.00	0.00	15.00		Mainline	Average	No
		Point-71	49	684067.80	4864412.00	0.00	15.00		Mainline	Average	No
		Point-73	50	684504.50	4864582.00	0.00	15.00		Mainline	Average	No

Roadway Name	Roadway Notes	Road Segment		Coordinates (pavement)			Width	Point Notes	Road Segment		
		Start Point							Road Category	Pavement Type	On Structure
		Name	Number								
		X	Y	Z	[m]	[m]	[m]				
King St		Point-75	51	684882.70	4864748.00	0.00	15.00		Mainline	Average	No
		Point-77	52	685312.40	4864797.00	0.00	15.00		Mainline	Average	No
		Point-79	53	686240.50	4864535.00	0.00	15.00		Mainline	Average	No
Highway401E		Point-117	0	685555.60	4862761.00	0.00	11.25		Mainline	Average	No
		Point-115	1	684452.60	4861982.00	0.00	11.25		Mainline	Average	No
		Point-113	5	684228.80	4861844.00	0.00	11.25		Mainline	Average	No
		Point-111	39	683921.30	4861737.00	0.00	11.25		Mainline	Average	No
		Point-109	40	679667.20	4860854.00	0.00	11.25		Mainline	Average	No
		Point-107	41	677841.90	4860471.00	0.00	11.25		Mainline	Average	No
		Point-105	42	677532.80	4860418.00	0.00	11.25		Mainline	Average	No
		Point-103	43	677197.40	4860442.00	0.00	11.25		Mainline	Average	No
		Point-101	44	676930.20	4860502.00	0.00	11.25		Mainline	Average	No
		Point-99	54	676650.10	4860653.00	0.00	11.25		Mainline	Average	No
		Point-97	55	676433.30	4860829.00	0.00	11.25		Mainline	Average	No
		Point-95	56	676059.00	4861151.00	0.00	11.25		Mainline	Average	No
		Point-93	57	675772.70	4861345.00	0.00	11.25		Mainline	Average	No
		Point-91	58	675317.30	4861541.00	0.00	11.25		Mainline	Average	No
		Point-89	59	674959.80	4861624.00	0.00	11.25		Mainline	Average	No
		Point-87	60	674610.60	4861651.00	0.00	11.25		Mainline	Average	No
		Point-85	61	674268.10	4861626.00	0.00	11.25		Mainline	Average	No
		Point-83	62	673781.60	4861495.00	0.00	11.25		Mainline	Average	No
		Point-81	63	671169.20	4860599.00	0.00	11.25		Mainline	Average	No
		Point-80	64	669889.60	4860043.00	0.00	11.25		Mainline	Average	No
Highway401W		Point-35	65	669904.20	4860013.00	0.00	11.25		Mainline	Average	No
		Point-33	66	671180.10	4860578.00	0.00	11.25		Mainline	Average	No



Roadway Name	Roadway Notes	Road Segment		Coordinates (pavement)			Width	Point Notes	Road Segment		
		Start Point							Road Category	Pavement Type	On Structure
		Name	Number	X	Y	Z	[m]				
Highway401W		Point-31	67	673785.70	4861471.00	0.00	11.25		Mainline	Average	No
		Point-29	68	674273.90	4861601.00	0.00	11.25		Mainline	Average	No
		Point-27	69	674616.40	4861627.00	0.00	11.25		Mainline	Average	No
		Point-25	70	674955.30	4861598.00	0.00	11.25		Mainline	Average	No
		Point-23	71	675311.10	4861515.00	0.00	11.25		Mainline	Average	No
		Point-21	72	675761.30	4861317.00	0.00	11.25		Mainline	Average	No
		Point-19	73	676047.40	4861130.00	0.00	11.25		Mainline	Average	No
		Point-17	74	676411.30	4860812.00	0.00	11.25		Mainline	Average	No
		Point-15	75	676642.00	4860634.00	0.00	11.25		Mainline	Average	No
		Point-13	76	676916.80	4860485.00	0.00	11.25		Mainline	Average	No
		Point-11	77	677196.40	4860418.00	0.00	11.25		Mainline	Average	No
		Point-9	78	677535.10	4860395.00	0.00	11.25		Mainline	Average	No
		Point-7	79	679672.90	4860832.00	0.00	11.25		Mainline	Average	No
		Point-5	80	683932.30	4861710.00	0.00	11.25		Mainline	Average	No
		Point-3	81	684237.90	4861825.00	0.00	11.25		Mainline	Average	No
		Point-1	82	684491.60	4861946.00	0.00	11.25		Mainline	Average	No
		Point-0	83	685559.60	4862740.00	0.00	11.25		Mainline	Average	No

## REPORT:

**Results: Sound Levels - No Barrier Objects**

TNM VERSION

3.1.7970.37608

REPORT DATE:

27 February 2023

CALCULATED WITH:

3.1.7970.37608

CALCULATION DATE:

2/24/2023 11:58:34 AM

CASE:

BMV

ORGANIZATION:

saarnold

UNITS:

Metric

ANALYSIS BY:

saarnold

DEFAULT GROUND TYPE:

HardSoil

PROJECT/CONTRACT

ATMOSPHERICS:

20°C, 50%

Average pavement type shall be used unless a state

PAVEMENT TYPE(S) USED:

Average

highway agency substantiates the use of a different

type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing  LAeq						
				LAeq		Increase over Existing		Type  of  Impact	
					Absolute		Relative		
			Calc.	Criterion	Calc.	Criterion			
			dBA	dBA	dBA	dBA	dBA		
POR001	0	0	---	54.4	0.0	---	---	Sound Level	
POR002	0	0	---	54.8	0.0	---	---	Sound Level	
POR003	0	0	---	55.3	0.0	---	---	Sound Level	
POR004	0	0	---	58.2	0.0	---	---	Sound Level	
POR005	0	0	---	59.9	0.0	---	---	Sound Level	
POR006	0	0	---	61.7	0.0	---	---	Sound Level	
POR007	0	0	---	63.3	0.0	---	---	Sound Level	
POR008	0	0	---	59.0	0.0	---	---	Sound Level	
POR009	0	0	---	58.4	0.0	---	---	Sound Level	
POR010	0	0	---	57.6	0.0	---	---	Sound Level	
POR011	0	0	---	58.2	0.0	---	---	Sound Level	
POR012	0	0	---	60.2	0.0	---	---	Sound Level	
POR013	0	0	---	59.0	0.0	---	---	Sound Level	
POR014	0	0	---	60.2	0.0	---	---	Sound Level	
POR015	0	0	---	62.0	0.0	---	---	Sound Level	



## REPORT:

## Results: Sound Levels - No Barrier Objects

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ANALYSIS BY:

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PROJECT/CONTRACT

ATMOSPHERICS:

20°C, 50%

Average pavement type shall be used unless a state

PAVEMENT TYPE(S) USED:

Average

highway agency substantiates the use of a different  
type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing LAeq  dBA	LAeq		Increase over Existing		Type of Impact	
				Calc.	Absolute	Calc.	Relative		
					Criterion		Criterion		
					dBA		dBA		
POR016	0	0	---	58.4	0.0	---	---	Sound Level	
POR017	0	0	---	58.1	0.0	---	---	Sound Level	
POR018	0	0	---	62.2	0.0	---	---	Sound Level	
POR019	0	0	---	60.1	0.0	---	---	Sound Level	
POR020	0	0	---	59.6	0.0	---	---	Sound Level	
POR021	0	0	---	59.3	0.0	---	---	Sound Level	
POR022	0	0	---	60.8	0.0	---	---	Sound Level	
POR023	0	0	---	63.4	0.0	---	---	Sound Level	
POR024	0	0	---	58.4	0.0	---	---	Sound Level	
POR025	0	0	---	59.1	0.0	---	---	Sound Level	
POR027	0	0	---	60.0	0.0	---	---	Sound Level	
POR028	0	0	---	58.6	0.0	---	---	Sound Level	
POR028A	0	0	---	59.2	0.0	---	---	Sound Level	
POR028C	0	0	---	57.0	0.0	---	---	Sound Level	
POR028B	0	0	---	58.4	0.0	---	---	Sound Level	

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## Results: Sound Levels - No Barrier Objects

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ATMOSPHERICS:

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Average pavement type shall be used unless a state

PAVEMENT TYPE(S) USED:

Average

highway agency substantiates the use of a different

type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing  LAeq  dBA						
				LAeq		Increase over Existing		Type of Impact	
					Absolute		Relative		
				Calc.	Criterion	Calc.	Criterion		
				dBA	dBA	dBA	dBA		
POR029	0	0	---	59.4	0.0	---	---	Sound Level	
POR030	0	0	---	64.0	0.0	---	---	Sound Level	
POR031	0	0	---	59.5	0.0	---	---	Sound Level	
POR032	0	0	---	62.6	0.0	---	---	Sound Level	
POR033	0	0	---	59.9	0.0	---	---	Sound Level	
POR034	0	0	---	59.3	0.0	---	---	Sound Level	
POR035	0	0	---	59.0	0.0	---	---	Sound Level	
POR036	0	0	---	59.8	0.0	---	---	Sound Level	
POR037	0	0	---	60.1	0.0	---	---	Sound Level	
POR038	0	0	---	58.8	0.0	---	---	Sound Level	
POR039	0	0	---	63.2	0.0	---	---	Sound Level	
POR040	0	0	---	58.8	0.0	---	---	Sound Level	
POR041	0	0	---	58.4	0.0	---	---	Sound Level	
POR042	0	0	---	58.9	0.0	---	---	Sound Level	
POR043	0	0	---	58.3	0.0	---	---	Sound Level	



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**Results: Sound Levels - No Barrier Objects**

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PAVEMENT TYPE(S) USED:

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highway agency substantiates the use of a different  
type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing  LAeq						
				LAeq		Increase over Existing		Type  of  Impact	
					Absolute		Relative		
			Calc.	Criterion	Calc.	Criterion			
			dBA	dBA	dBA	dBA	dBA		
POR044	0	0	---	58.1	0.0	---	---	Sound Level	
POR045	0	0	---	58.4	0.0	---	---	Sound Level	
POR046	0	0	---	61.2	0.0	---	---	Sound Level	
POR047	0	0	---	58.4	0.0	---	---	Sound Level	
POR048	0	0	---	60.7	0.0	---	---	Sound Level	
POR049	0	0	---	60.3	0.0	---	---	Sound Level	
POR050	0	0	---	57.9	0.0	---	---	Sound Level	
POR051	0	0	---	60.1	0.0	---	---	Sound Level	
POR052	0	0	---	57.3	0.0	---	---	Sound Level	
POR053	0	0	---	57.4	0.0	---	---	Sound Level	
POR054	0	0	---	59.6	0.0	---	---	Sound Level	
POR055	0	0	---	59.9	0.0	---	---	Sound Level	
POR056	0	0	---	62.7	0.0	---	---	Sound Level	
POR057	0	0	---	64.2	0.0	---	---	Sound Level	
POR058	0	0	---	66.6	0.0	---	---	Sound Level	

## REPORT:

**Results: Sound Levels - No Barrier Objects**

TNM VERSION

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ATMOSPHERICS:

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Average pavement type shall be used unless a state

PAVEMENT TYPE(S) USED:

Average

highway agency substantiates the use of a different

type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing  LAeq						
				LAeq		Increase over Existing		Type  of  Impact	
					Absolute		Relative		
			Calc.	Criterion	Calc.	Criterion			
			dBA	dBA	dBA	dBA	dBA		
POR059	0	0	---	69.1	0.0	---	---	Sound Level	
POR060	0	0	---	69.7	0.0	---	---	Sound Level	
POR061	0	0	---	70.7	0.0	---	---	Sound Level	
POR062	0	0	---	71.4	0.0	---	---	Sound Level	
POR063	0	0	---	56.6	0.0	---	---	Sound Level	
POR063A	0	0	---	65.9	0.0	---	---	Sound Level	
POR064	0	0	---	63.0	0.0	---	---	Sound Level	
POR065	0	0	---	60.6	0.0	---	---	Sound Level	
POR066	0	0	---	60.7	0.0	---	---	Sound Level	
POR067	0	0	---	56.8	0.0	---	---	Sound Level	
POR068	0	0	---	52.7	0.0	---	---	Sound Level	
POR069	0	0	---	52.5	0.0	---	---	Sound Level	
POR070	0	0	---	52.4	0.0	---	---	Sound Level	
POR071	0	0	---	52.5	0.0	---	---	Sound Level	
POR072	0	0	---	52.3	0.0	---	---	Sound Level	



## REPORT:

**Results: Sound Levels - No Barrier Objects**

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PROJECT/CONTRACT

ATMOSPHERICS:

20°C, 50%

Average pavement type shall be used unless a state

PAVEMENT TYPE(S) USED:

Average

highway agency substantiates the use of a different

type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing  LAeq						
				LAeq		Increase over Existing		Type  of  Impact	
					Absolute		Relative		
			Calc.	Criterion	Calc.	Criterion			
			dBA	dBA	dBA	dBA	dBA		
POR073	0	0	---	52.2	0.0	---	---	Sound Level	
POR074	0	0	---	52.3	0.0	---	---	Sound Level	
POR075	0	0	---	52.3	0.0	---	---	Sound Level	
POR076	0	0	---	52.3	0.0	---	---	Sound Level	
POR077	0	0	---	53.0	0.0	---	---	Sound Level	
POR078	0	0	---	53.4	0.0	---	---	Sound Level	
POR079	0	0	---	54.2	0.0	---	---	Sound Level	
POR080	0	0	---	54.8	0.0	---	---	Sound Level	
POR080A	0	0	---	55.6	0.0	---	---	Sound Level	
POR081	0	0	---	52.9	0.0	---	---	Sound Level	
POR082	0	0	---	53.3	0.0	---	---	Sound Level	
POR083	0	0	---	54.0	0.0	---	---	Sound Level	
POR084	0	0	---	54.5	0.0	---	---	Sound Level	
POR084A	0	0	---	66.5	0.0	---	---	Sound Level	
POR084B	0	0	---	57.1	0.0	---	---	Sound Level	

## REPORT:

## Results: Sound Levels - No Barrier Objects

TNM VERSION

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saarnold

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ATMOSPHERICS:

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Average pavement type shall be used unless a state

PAVEMENT TYPE(S) USED:

Average

highway agency substantiates the use of a different  
type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing LAeq  dBA						
				LAeq		Increase over Existing		Type of Impact	
				Calc.	Absolute Criterion	Calc.	Relative Criterion		
				dBA	dBA	dBA	dBA		
POR091	0	0	---	61.5	0.0	---	---	Sound Level	
POR092	0	0	---	60.0	0.0	---	---	Sound Level	
OLA01	0	0	---	55.2	0.0	---	---	Sound Level	
OLA03	0	0	---	56.1	0.0	---	---	Sound Level	
OLA04	0	0	---	58.9	0.0	---	---	Sound Level	
OLA05	0	0	---	60.5	0.0	---	---	Sound Level	
OLA06	0	0	---	62.3	0.0	---	---	Sound Level	
OLA07	0	0	---	64.6	0.0	---	---	Sound Level	
OLA08	0	0	---	59.7	0.0	---	---	Sound Level	
OLA09	0	0	---	59.1	0.0	---	---	Sound Level	
OLA10	0	0	---	58.5	0.0	---	---	Sound Level	
OLA11	0	0	---	58.9	0.0	---	---	Sound Level	
OLA12	0	0	---	60.7	0.0	---	---	Sound Level	
OLA13	0	0	---	59.5	0.0	---	---	Sound Level	
OLA14	0	0	---	60.7	0.0	---	---	Sound Level	



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Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing LAeq  dBA						
				LAeq		Increase over Existing		Type of Impact	
				Calc.	Absolute Criterion	Calc.	Relative Criterion		
				dBA	dBA	dBA	dBA		
OLA15	0	0	---	62.3	0.0	---	---	Sound Level	
OLA16	0	0	---	59.2	0.0	---	---	Sound Level	
OLA17	0	0	---	58.9	0.0	---	---	Sound Level	
OLA18	0	0	---	61.1	0.0	---	---	Sound Level	
OLA19	0	0	---	60.4	0.0	---	---	Sound Level	
OLA20	0	0	---	59.8	0.0	---	---	Sound Level	
OLA21	0	0	---	60.2	0.0	---	---	Sound Level	
OLA22	0	0	---	61.0	0.0	---	---	Sound Level	
OLA23	0	0	---	64.0	0.0	---	---	Sound Level	
OLA24	0	0	---	59.3	0.0	---	---	Sound Level	
OLA25	0	0	---	59.8	0.0	---	---	Sound Level	
OLA26	0	0	---	61.6	0.0	---	---	Sound Level	
OLA27	0	0	---	60.4	0.0	---	---	Sound Level	
OLA28	0	0	---	59.2	0.0	---	---	Sound Level	
OLA28A	0	0	---	59.1	0.0	---	---	Sound Level	

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type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing LAeq						
				LAeq		Increase over Existing		Type of Impact	
					Absolute		Relative		
			Calc.	Criterion	Calc.	Criterion			
			dBA	dBA	dBA	dBA	dBA		
OLA28B	0	0	---	58.5	0.0	---	---	Sound Level	
OLA28C	0	0	---	57.8	0.0	---	---	Sound Level	
OLA29	0	0	---	59.2	0.0	---	---	Sound Level	
OLA30	0	0	---	63.9	0.0	---	---	Sound Level	
OLA31	0	0	---	60.4	0.0	---	---	Sound Level	
OLA32	0	0	---	63.3	0.0	---	---	Sound Level	
OLA33	0	0	---	60.1	0.0	---	---	Sound Level	
OLA34	0	0	---	59.3	0.0	---	---	Sound Level	
OLA35	0	0	---	58.9	0.0	---	---	Sound Level	
OLA36	0	0	---	59.6	0.0	---	---	Sound Level	
OLA37	0	0	---	59.9	0.0	---	---	Sound Level	
OLA38	0	0	---	58.9	0.0	---	---	Sound Level	
OLA39	0	0	---	63.4	0.0	---	---	Sound Level	
OLA40	0	0	---	58.9	0.0	---	---	Sound Level	
OLA41	0	0	---	58.5	0.0	---	---	Sound Level	



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Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing LAeq  dBA						
				LAeq		Increase over Existing		Type of Impact	
				Calc.	Absolute Criterion	Calc.	Relative Criterion		
				dBA	dBA	dBA	dBA		
OLA42	0	0	---	59.5	0.0	---	---	Sound Level	
OLA43	0	0	---	59.0	0.0	---	---	Sound Level	
OLA44	0	0	---	58.0	0.0	---	---	Sound Level	
OLAY46	0	0	---	63.3	0.0	---	---	Sound Level	
OLAY47	0	0	---	59.3	0.0	---	---	Sound Level	
OLA48	0	0	---	61.2	0.0	---	---	Sound Level	
OLA49	0	0	---	61.1	0.0	---	---	Sound Level	
OLA50	0	0	---	58.6	0.0	---	---	Sound Level	
OLA51	0	0	---	59.9	0.0	---	---	Sound Level	
OLA52	0	0	---	58.2	0.0	---	---	Sound Level	
OLA53	0	0	---	58.3	0.0	---	---	Sound Level	
OLA54	0	0	---	60.3	0.0	---	---	Sound Level	
OLA55	0	0	---	60.7	0.0	---	---	Sound Level	
OLA56	0	0	---	63.5	0.0	---	---	Sound Level	
OLA57	0	0	---	65.0	0.0	---	---	Sound Level	

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Receiver				Modeled Traffic Noise Levels				
Name	No.	Nb. R.R.	Existing LAeq  dBA					Type of Impact
				LAeq		Increase over Existing		
				Calc.	Absolute Criterion	Calc.	Relative Criterion	
				dBA	dBA	dBA	dBA	
OLA58	0	0	---	67.2	0.0	---	---	Sound Level
OLAY59	0	0	---	69.8	0.0	---	---	Sound Level
OLAY60	0	0	---	70.4	0.0	---	---	Sound Level
OLAY61	0	0	---	71.5	0.0	---	---	Sound Level
OLA62	0	0	---	71.9	0.0	---	---	Sound Level
OLA63	0	0	---	57.5	0.0	---	---	Sound Level
OLA63A	0	0	---	65.6	0.0	---	---	Sound Level
OLA64	0	0	---	61.2	0.0	---	---	Sound Level
OLA65	0	0	---	59.8	0.0	---	---	Sound Level
OLA66	0	0	---	61.6	0.0	---	---	Sound Level
OLA67	0	0	---	57.3	0.0	---	---	Sound Level
OLA68	0	0	---	53.3	0.0	---	---	Sound Level
OLA69	0	0	---	53.2	0.0	---	---	Sound Level
OLA70	0	0	---	53.1	0.0	---	---	Sound Level
OLA71	0	0	---	53.2	0.0	---	---	Sound Level



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CALCULATED WITH:

3.1.7970.37608

CALCULATION DATE:

2/24/2023 11:58:34 AM

CASE:

BMV

ORGANIZATION:

UNITS:

Metric

ANALYSIS BY:

saarnold

DEFAULT GROUND TYPE:

HardSoil

PROJECT/CONTRACT

ATMOSPHERICS:

20°C, 50%

Average pavement type shall be used unless a state

PAVEMENT TYPE(S) USED:

Average

highway agency substantiates the use of a different  
type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing LAeq  dBA						
				LAeq		Increase over Existing		Type of Impact	
				Calc.	Absolute Criterion	Calc.	Relative Criterion		
				dBA	dBA	dBA	dBA		
OLA72	0	0	---	53.0	0.0	---	---	Sound Level	
OLA73	0	0	---	52.9	0.0	---	---	Sound Level	
OLA74	0	0	---	53.0	0.0	---	---	Sound Level	
OLA75	0	0	---	53.5	0.0	---	---	Sound Level	
OLA76	0	0	---	53.5	0.0	---	---	Sound Level	
OLA77	0	0	---	53.7	0.0	---	---	Sound Level	
OLA78	0	0	---	54.3	0.0	---	---	Sound Level	
OLA79	0	0	---	54.7	0.0	---	---	Sound Level	
OLA80	0	0	---	55.6	0.0	---	---	Sound Level	
OLA80A	0	0	---	56.0	0.0	---	---	Sound Level	
OLA81	0	0	---	53.9	0.0	---	---	Sound Level	
OLA82	0	0	---	53.9	0.0	---	---	Sound Level	
OLA83	0	0	---	54.9	0.0	---	---	Sound Level	
OLA84	0	0	---	55.3	0.0	---	---	Sound Level	
OLA84B	0	0	---	58.1	0.0	---	---	Sound Level	

## REPORT:

## Results: Sound Levels - No Barrier Objects

TNM VERSION

3.1.7970.37608

REPORT DATE:

27 February 2023

CALCULATED WITH:

3.1.7970.37608

CALCULATION DATE:

2/24/2023 11:58:34 AM

CASE:

BMV

ORGANIZATION:

UNITS:

Metric

ANALYSIS BY:

saarnold

DEFAULT GROUND TYPE:

HardSoil

PROJECT/CONTRACT

ATMOSPHERICS:

20°C, 50%

Average pavement type shall be used unless a state

PAVEMENT TYPE(S) USED:

Average

highway agency substantiates the use of a different  
type with approval FHWA.

Receiver				Modeled Traffic Noise Levels					
Name	No.	Nb. R.R.	Existing LAeq  dBA						
				LAeq		Increase over Existing		Type of Impact	
				Calc.	Absolute Criterion	Calc.	Relative Criterion		
				dBA	dBA	dBA	dBA		
OLA84A	0	0	---	72.1	0.0	---	---	Sound Level	
OLA91	0	0	---	60.5	0.0	---	---	Sound Level	
OLA92	0	0	---	60.0	0.0	---	---	Sound Level	
POR093	0	0	---	60.8	0.0	---	---	Sound Level	
OLA93	0	0	---	63.2	0.0	---	---	Sound Level	
POR026	0	0	---	61.5	0.0	---	---	Sound Level	
CAL1	0	0	---	59.3	0.0	---	---	Sound Level	
CAL2	0	0	---	58.3	0.0	---	---	Sound Level	
CAL3	0	0	---	69.4	0.0	---	---	Sound Level	
CAL4	0	0	---	72.2	0.0	---	---	Sound Level	
CAL5	0	0	---	57.2	0.0	---	---	Sound Level	
CAL6	0	0	---	56.6	0.0	---	---	Sound Level	
OLA02	0	0	---	55.6	0.0	---	---	Sound Level	
POR094	0	0	---	61.7	0.0	---	---	Sound Level	
POR095	0	0	---	60.8	0.0	---	---	Sound Level	



**Appendix B.5 - Project Noise Impact Only - Ambient Excluded**

Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$
POR001	Façade	64	65
	OLA	66	-
POR002	Façade	64	66
	OLA	66	-
POR003	Façade	61	62
	OLA	64	-
POR004	Façade	65	66
	OLA	66	-
POR005	Façade	62	63
	OLA	64	-
POR006	Façade	62	62
	OLA	63	-
POR007	Façade	62	63
	OLA	64	-
POR008	Façade	64	64
	OLA	65	-
POR009	Façade	65	65
	OLA	66	-
POR010	Façade	62	62
	OLA	65	-
POR011	Façade	64	65
	OLA	66	-
POR012	Façade	60	61
	OLA	62	-
POR013	Façade	64	64
	OLA	65	-
POR014	Façade	65	65
	OLA	66	-
POR015	Façade	66	66
	OLA	67	-
POR016	Façade	64	65
	OLA	66	-

Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$
POR017	Façade	65	65
	OLA	66	-
POR018	Façade	61	62
	OLA	51	-
POR019	Façade	63	64
	OLA	51	-
POR020	Façade	63	64
	OLA	62	-
POR021	Façade	63	63
	OLA	55	-
POR022	Façade	62	63
	OLA	60	-
POR023	Façade	62	63
	OLA	54	-
POR024	Façade	64	65
	OLA	66	-
POR025	Façade	63	64
	OLA	65	-
POR026	Façade	65	66
	OLA	67	-
POR027	Façade	62	63
	OLA	51	-
POR028	Façade	63	63
	OLA	50	-
POR029	Façade	61	61
	OLA	51	-
POR030	Façade	59	60
	OLA	52	-
POR031	Façade	63	64
	OLA	62	-
POR032	Façade	62	63
	OLA	50	-
POR033	Façade	67	67
	OLA	65	-



Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$
POR034	Façade	67	67
	OLA	66	-
POR035	Façade	66	67
	OLA	63	-
POR036	Façade	61	62
	OLA	63	-
POR037	Façade	60	61
	OLA	62	-
POR038	Façade	62	62
	OLA	63	-
POR039	Façade	62	62
	OLA	63	-
POR040	Façade	64	64
	OLA	65	-
POR041	Façade	63	64
	OLA	65	-
POR042	Façade	66	67
	OLA	67	-
POR043	Façade	66	66
	OLA	65	-
POR044	Façade	59	60
	OLA	57	-
POR045	Façade	65	66
	OLA	51	-
POR046	Façade	54	54
	OLA	52	-
POR047	Façade	65	66
	OLA	67	-
POR048	Façade	61	62
	OLA	62	-
POR049	Façade	60	61
	OLA	62	-
POR050	Façade	64	64
	OLA	65	-

Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$
POR051	Façade	62	62
	OLA	63	-
POR052	Façade	62	62
	OLA	64	-
POR053	Façade	60	61
	OLA	62	-
POR054	Façade	62	62
	OLA	64	-
POR055	Façade	61	62
	OLA	63	-
POR056	Façade	64	64
	OLA	65	-
POR057	Façade	63	64
	OLA	63	-
POR058	Façade	65	66
	OLA	67	-
POR059	Façade	65	66
	OLA	67	-
POR060	Façade	64	65
	OLA	66	-
POR061	Façade	63	64
	OLA	65	-
POR062	Façade	61	62
	OLA	62	-
POR063	Façade	50	51
	OLA	50	-
POR064	Façade	55	57
	OLA	57	-
POR065	Façade	59	61
	OLA	61	-
POR066	Façade	57	58
	OLA	57	-
POR067	Façade	63	64
	OLA	65	-



Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$
POR068	Façade	60	61
	OLA	58	-
POR069	Façade	60	62
	OLA	62	-
POR070	Façade	60	61
	OLA	61	-
POR071	Façade	59	60
	OLA	57	-
POR072	Façade	62	63
	OLA	63	-
POR073	Façade	62	63
	OLA	64	-
POR074	Façade	62	63
	OLA	63	-
POR075	Façade	60	62
	OLA	44	-
POR076	Façade	62	63
	OLA	63	-
POR077	Façade	63	64
	OLA	63	-
POR078	Façade	63	64
	OLA	64	-
POR079	Façade	63	64
	OLA	63	-
POR080	Façade	62	64
	OLA	47	-
POR081	Façade	62	63
	OLA	63	-
POR082	Façade	62	63
	OLA	63	-
POR083	Façade	62	63
	OLA	48	-
POR084	Façade	62	64
	OLA	48	-

Receptor ID	Receptor Location	Pre-Project Daytime Sound Levels (dBA) $L_{eq(16)}$	Pre-Project Nighttime Sound Levels (dBA) $L_{eq(8)}$
POR091	Façade	62	62
	OLA	-	-
POR092	Façade	65	66
	OLA	63	-
POR03	Façade	59	60
	OLA	-	-
POR094	Façade	58	58
	OLA	-	-
POR095	Façade	58	59
	OLA	-	-



## **Appendix C**

### **Metrolinx Monitoring Requirements**



## **Monitoring Requirements for Metrolinx Projects**

In areas where it is predicted that the noise and vibration limits may be exceeded after mitigation, a noise and/or vibration monitoring is required. Monitoring may also be warranted when:

- Construction duration is over a month;
- Construction includes pile driving;
- Nighttime construction is anticipated; or
- The anticipated community response to the construction is negative.

### **Monitoring Type**

Table below outlines the type of monitoring that is required under various conditions based on the project location, duration, presence of night-time activity, and receptor proximity. The monitoring types include:

- Type 1: Monitoring continuously throughout the project.
- Type 2: Monitoring during most impactful phases of the project only.
- Type 3: Monitoring in response to complaints only.

### **Required Noise and Vibration Monitoring**

<b>Project Parameters</b>		<b>Type</b>
Project Location	Urban	1
	Suburban	2
	Rural	3
Project Duration	Over 12 months	1
	1 to 12 months	2
	Less than 1 month	3
Nighttime Activity	Major (constant, high intensity sources with frequent elevated sounds)	1
	Intermediate (occasional events, moderate sources)	2
	Minor (infrequent events or continuous minor sources)	3
Receptor Location *	Within zone of influence	1
	Near zone of influence	2
	Far from zone of influence	3

Note: \* The zone of influence covers the area where, without mitigation, receptors could experience noise and vibration levels that exceed the criteria at anytime. Where a project triggers more than one type of monitoring, the more stringent type will apply.

In general, the type of monitoring shall be dictated by the parameter that calls for the most stringent type of monitoring. For instance, if the location of the project is urban, then Type 1 monitoring will be implemented irrespective of the other project parameters. Similarly, if the location of the project is suburban but the project involves major night-time activity, then Type 1 monitoring will be preferred. Given the large variability within each parameter, it is understood that this simple strategy may not be appropriate for all projects. More often than not, the project



team will be called upon to apply its professional judgement to select the most appropriate type of monitoring.

## **Implementation**

Noise and vibration monitoring should be conducted at the closest point of reception to the construction. If multiple points of reception are in close proximity to the construction, monitoring may need to occur at multiple locations to characterize variable noise and vibration impacts in the community.

Prior to construction, noise and vibration monitoring should be completed to determine the baseline levels and to help inform future attribution of elevated noise and vibration levels to construction or the ambient environment.

Monitoring must be conducted using equipment capable of satisfying the requirements of MECP NPC-103 and other applicable MECP guidance and be overseen by a qualified acoustical engineer. The noise and vibration monitoring system must output the relevant metrics considered for the construction assessment (i.e.  $L_{MAX}$ ,  $L_{EQ}$ ).

If noise or vibration levels above the relevant limits are measured and attributed to the construction activities, the monitoring engineer will notify Metrolinx and take action to adjust operations at the offending source to ameliorate the potential excess. If necessary, additional measurements will be conducted to determine and rectify the source of the exceedance.

### **Noise:**

Noise monitoring is deemed to be an effective tool for enforcing noise exposure limits, avoiding legitimate public complaints, and investigating complaints. It is, however, a relatively demanding task that may need to be tailored to the type of the project. To this end, two types of projects are identified:

#### Type 1 Projects:

These are projects that are largely localized and “stationary”, and they expose the same receptors to noise for an extended period of time. Examples of Type 1 projects include the construction of grade separation structures (bridges or tunnels), train stations, and rail maintenance facilities, as well as construction staging and laydown sites.

#### Type 2 Projects:

Projects that are geographically “mobile” and do not expose the same receptors to noise for an extended period of time. These include linear projects such as construction related to rail electrification and rail track or signaling improvements.

The following noise monitoring requirements are recommended for the two types of projects:

#### Noise Monitoring in Type 1 Projects:

Project Co shall monitor continuously each geographically distinct, active construction site with one monitor located strategically to capture the highest noise exposure level based on planned construction activities and the number, geographic distribution and proximity of noise sensitive receptors. The location of the monitor shall be adjusted in response to

changes in construction activity to continue to capture the highest noise exposure level. The microphone of the monitor will be placed at 1.5 – 4.5 m above the ground level depending on the receptor height.

#### Noise Monitoring in Type 2 Projects:

Project Co shall not need to monitor noise continuously during these projects unless one of the following two conditions applies:

- a) any of the processes and equipment Project Co plans to use for over 15 minutes during the daytime / nighttime has a noise emission level exceeding 85 / 75 dBA, whichever is applicable. Noise emission levels are noise levels measured at 15 m from the process or equipment, operating at maximum rate and/or power setting

or

- b) any of the noise sensitive receptors is located less than 50 m from any boundary of the construction, staging or laydown site.

In projects that require noise monitoring, each work crew shall employ one portable noise monitor, which shall be located at or close to the boundary of the work site and at a location that will capture the highest noise exposure level. This location will usually be one as close as possible to the nearest unshielded noise sensitive receptor. The work crew will reposition the monitor as soon as the location of the work changes. The microphone of the monitor will be placed at 1.5 – 4.5 m above the ground level depending on the receptor height.

#### Noise Monitoring Provisions Common to Type 1 and 2 Projects

Project Co shall employ Type 1 or Class 1 integrating sound level meters meeting the IEC Standard 60651, 60804 or 61672. Each meter shall be calibrated within one week prior to its initial use and once per month thereafter. The frequency weighting of the meter will be set to “A” and the speed of response to “fast”.

The output of each noise meter will be continuously stored in the “cloud” and made simultaneously available to the designated Metrolinx office. The output data will contain, for each day, the maxima level recorded, each 15-minute average, and each 16-hour daytime (7:00 – 23:00) and each 8-hour night-time average.

Project Co shall submit monthly summary reports to MX for each monitoring location. The reports shall include but not be limited to the number and duration of any incident during which any of the MX noise exposure limits were exceeded, the probable cause of each exceedance, the incident-specific measure(s) implemented, and the resulting mitigated noise levels.

The noise monitors should be calibrated by independent certification lab within 2 years of measurements and should be field calibrated with a portable precision acoustic calibrator.

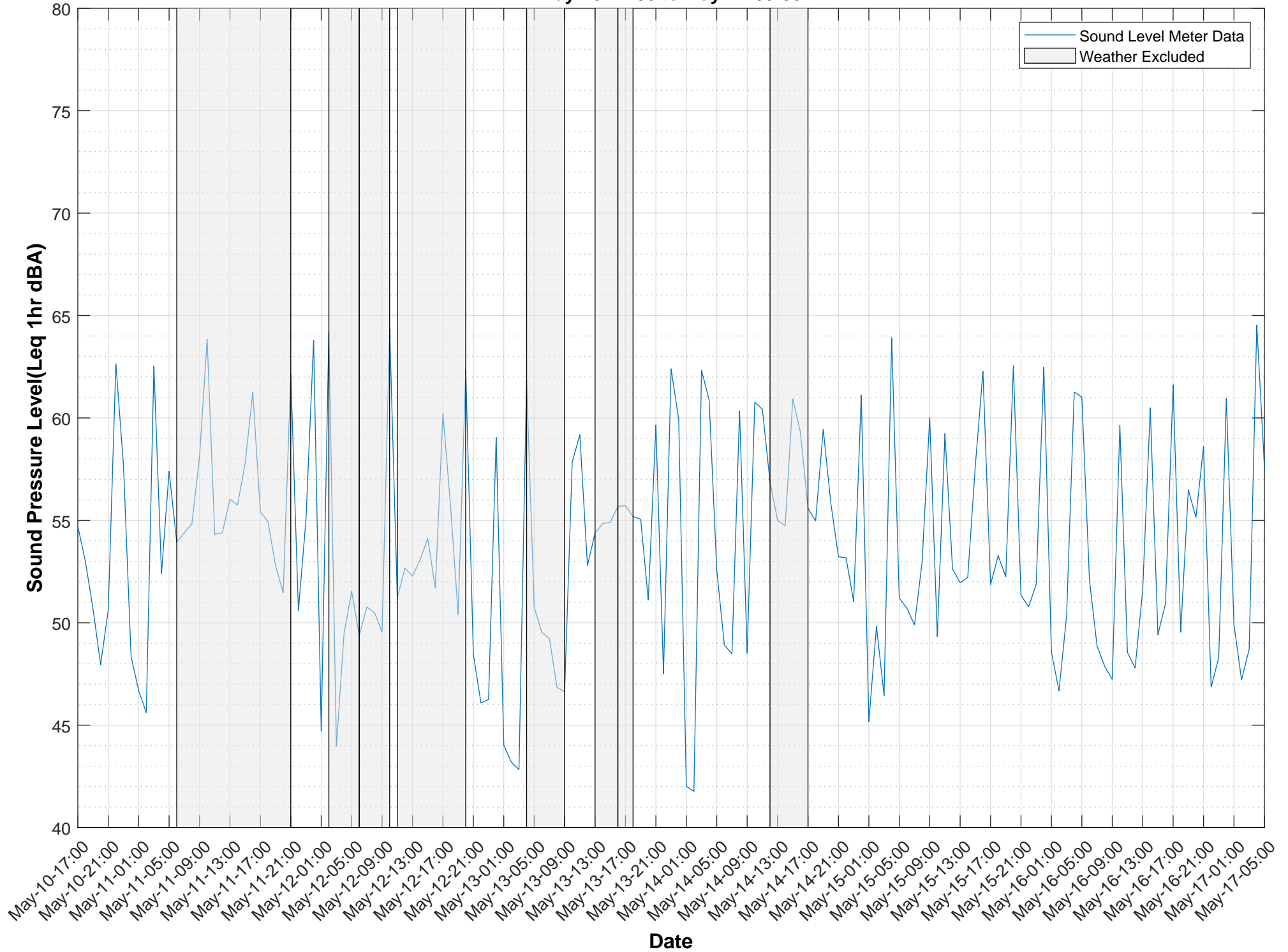


# **Appendix D**

## **Baseline Noise and Vibration Monitoring Data**

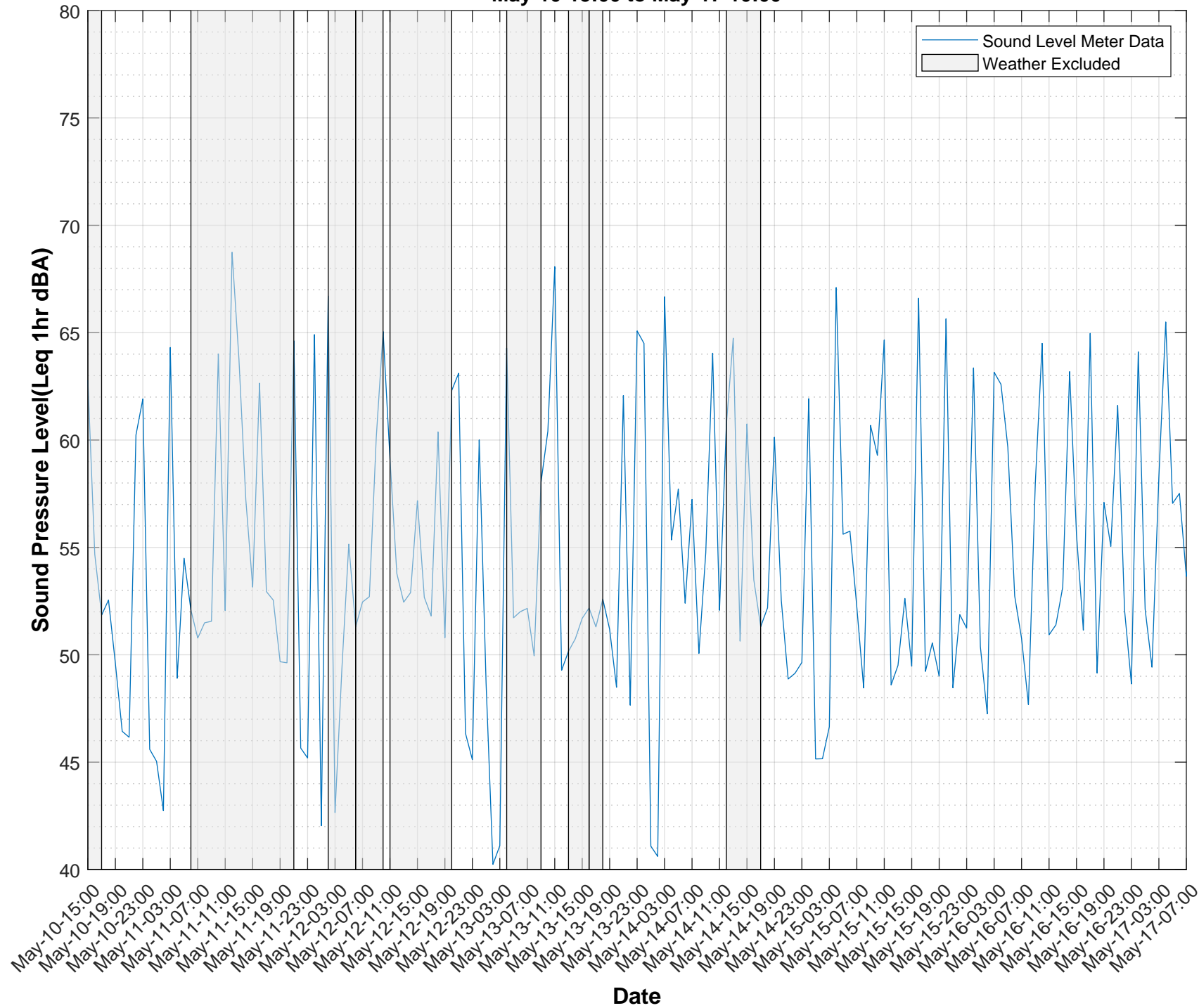


NM01  
May-10-17:00 to May-17-09:00

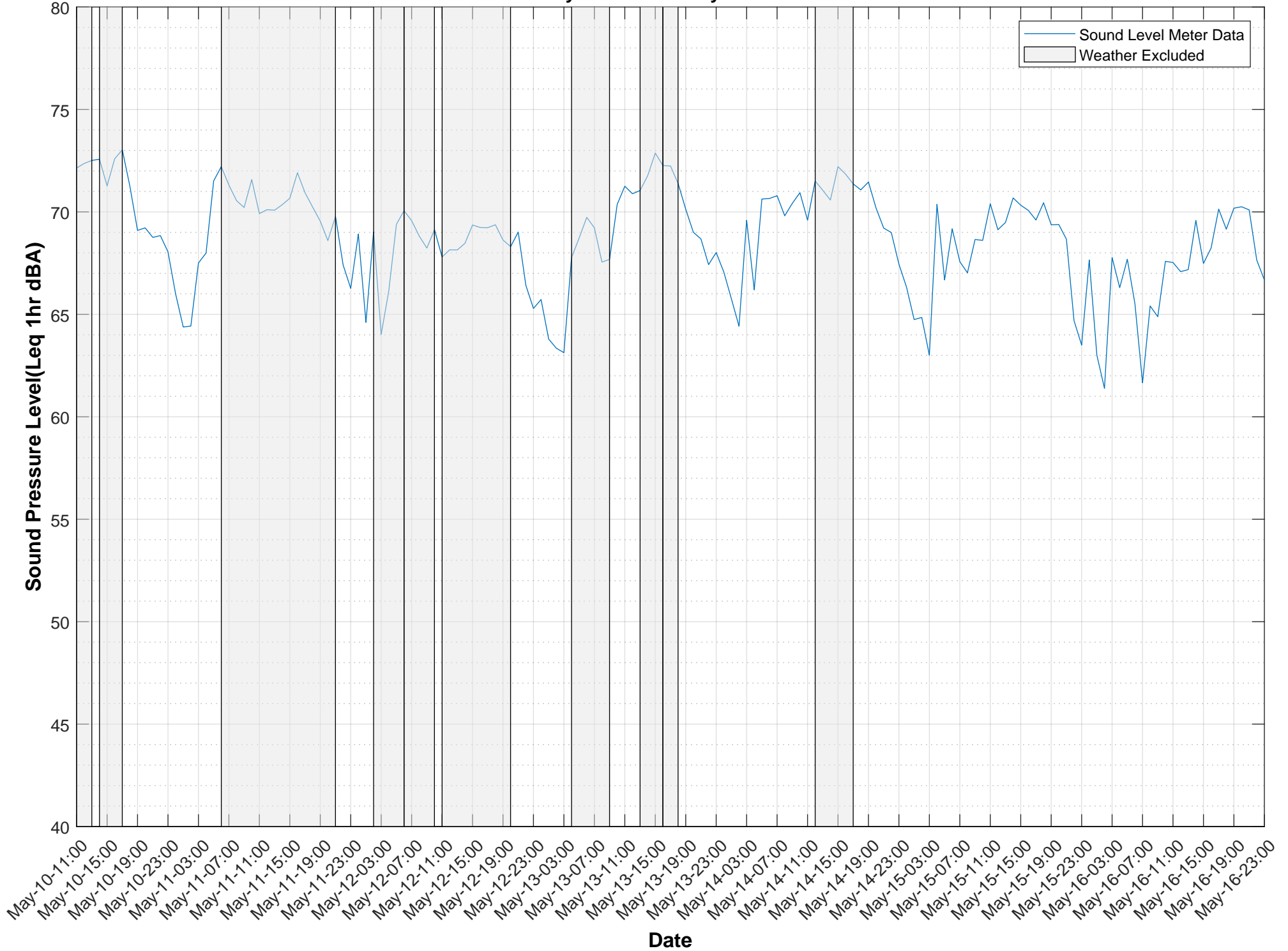




NM02  
May-10-15:00 to May-17-10:00

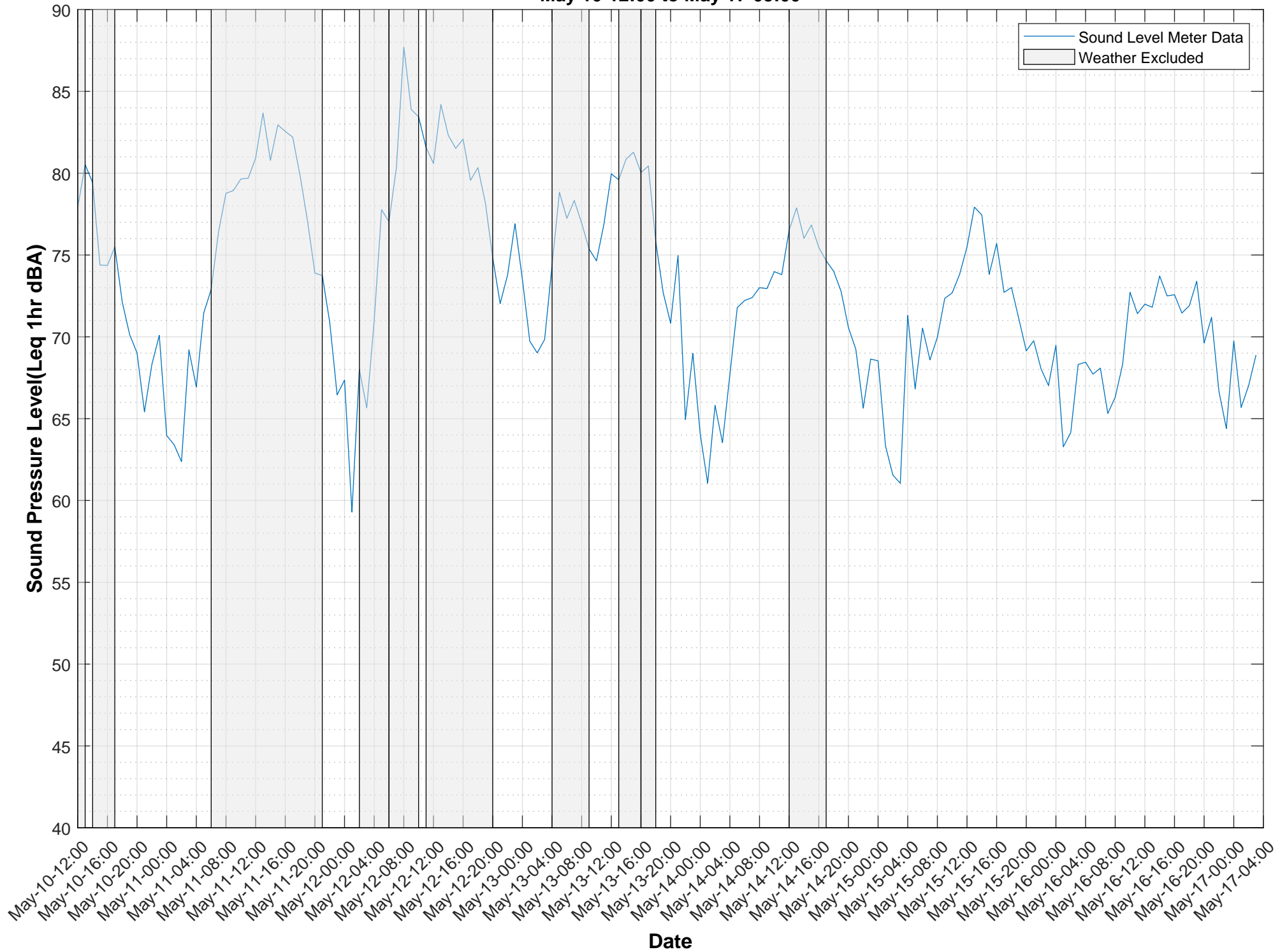


**NM03 Southport**  
**May 10-13:00 to May 17-23:00**

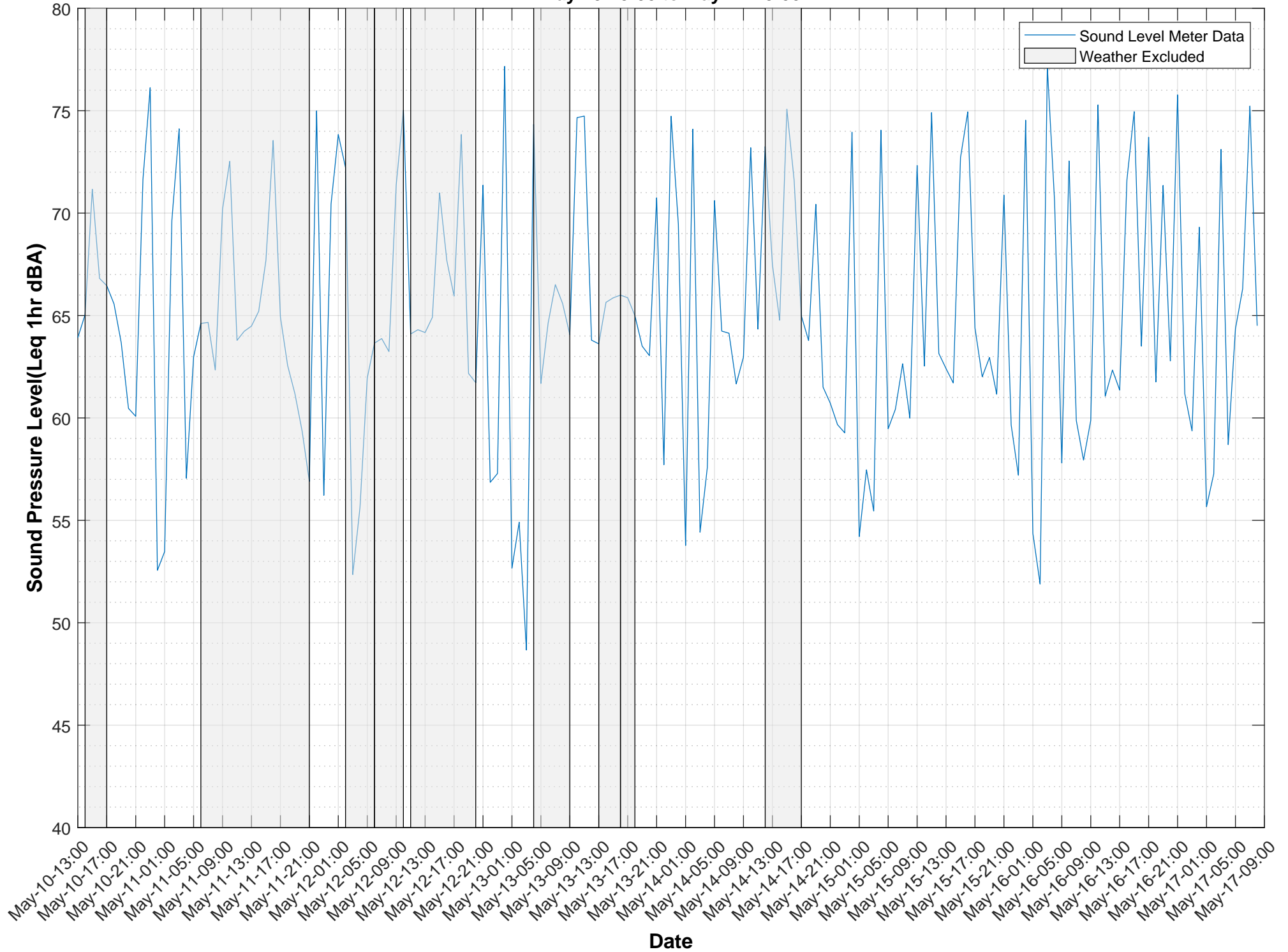




**NM04 Courtice GO**  
**May 10-12:00 to May 17-05:00**

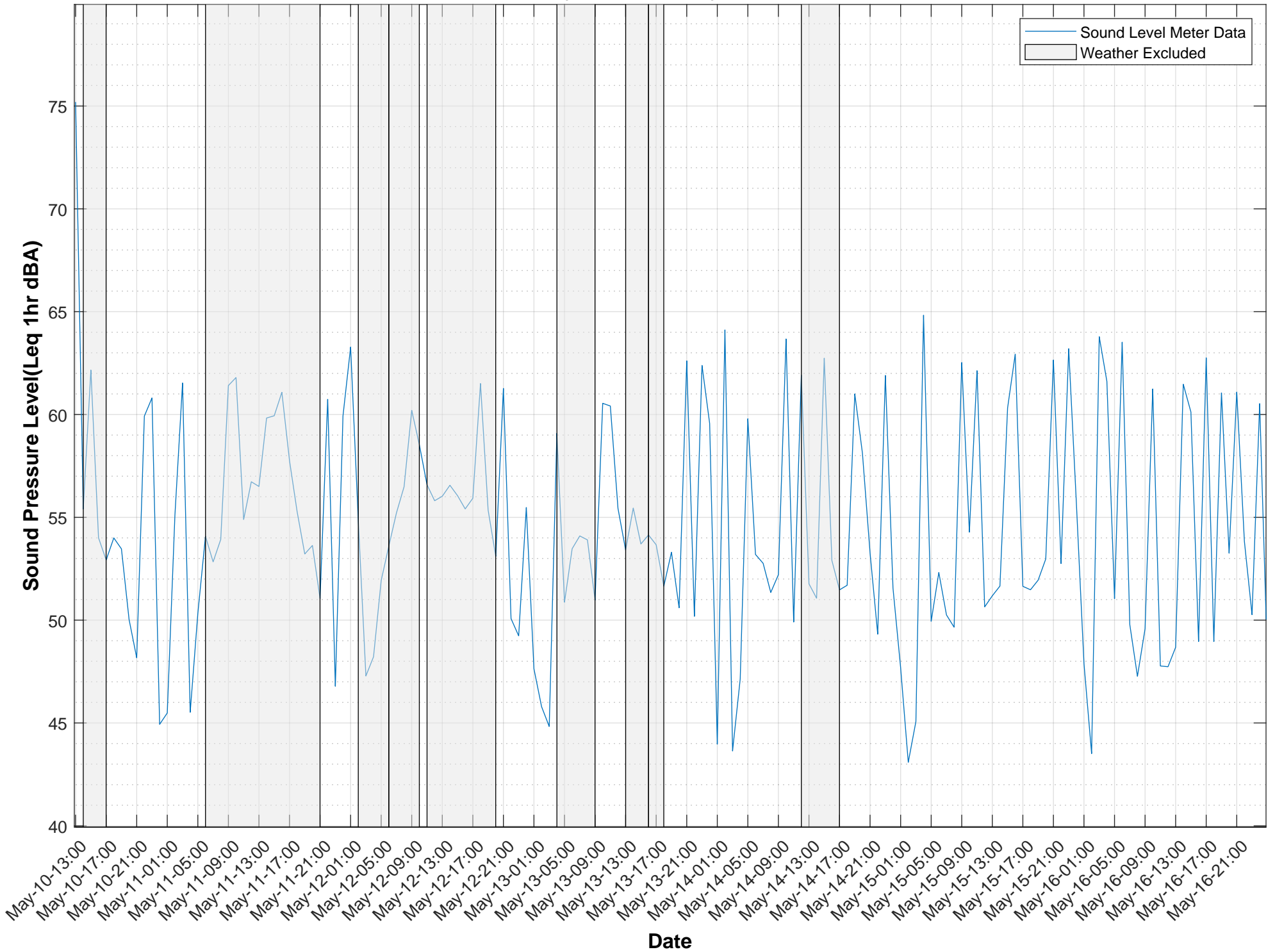


**NM05 Holt Road**  
**May 10-13:00 to May 17-10:00**



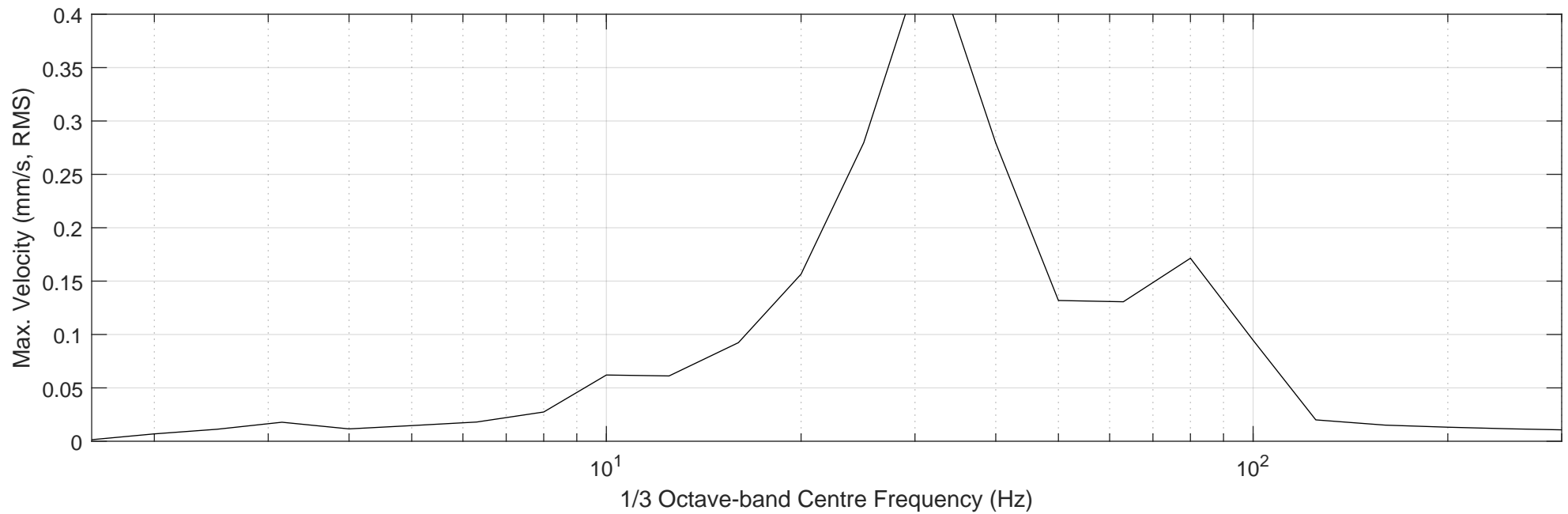
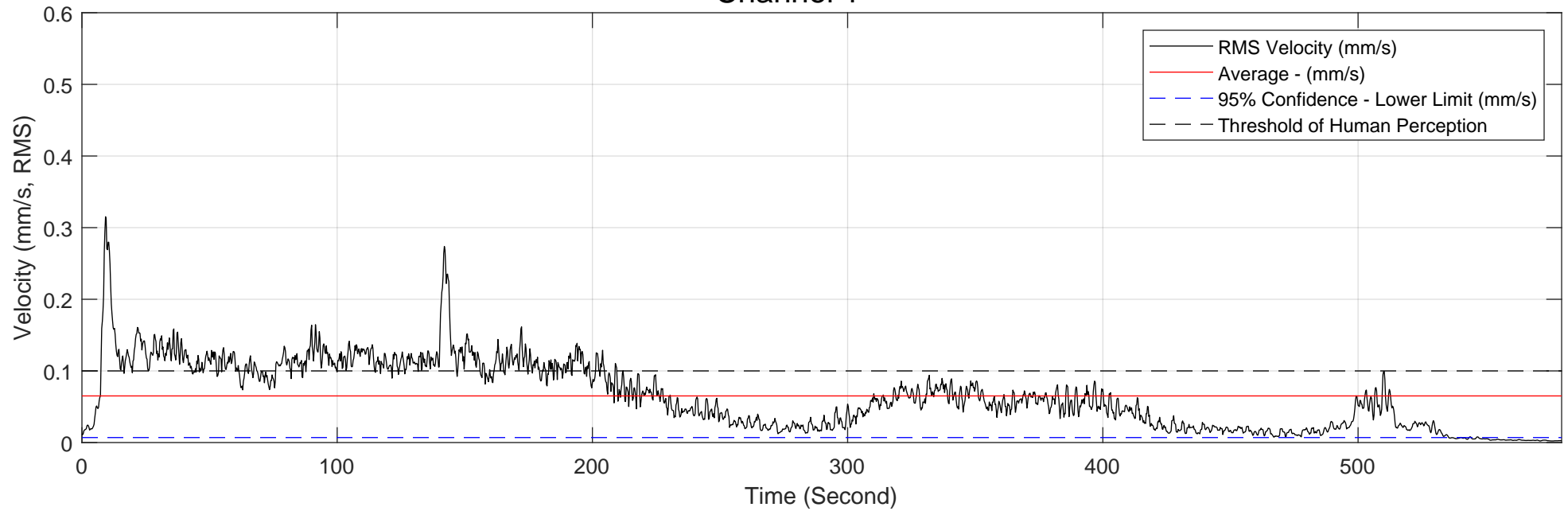


**NM06 Bowmanville Carpool Lot**  
**May 10-13:00 to May 17-04:00**



# Vibration Measurement Data - Passby1

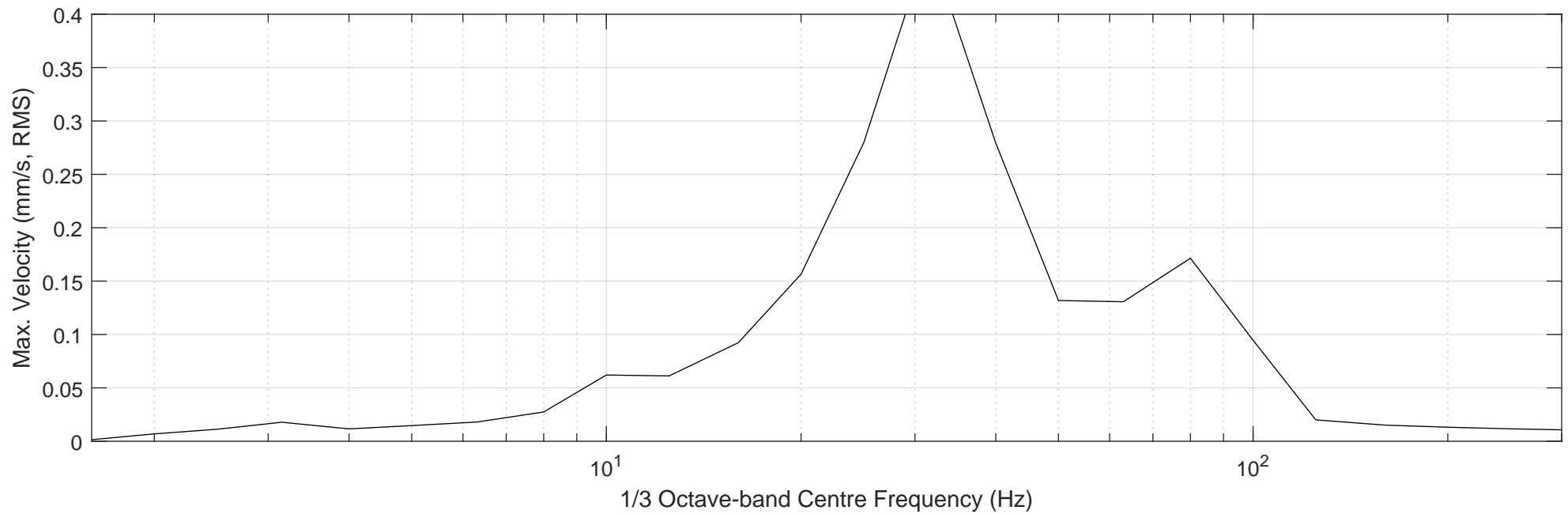
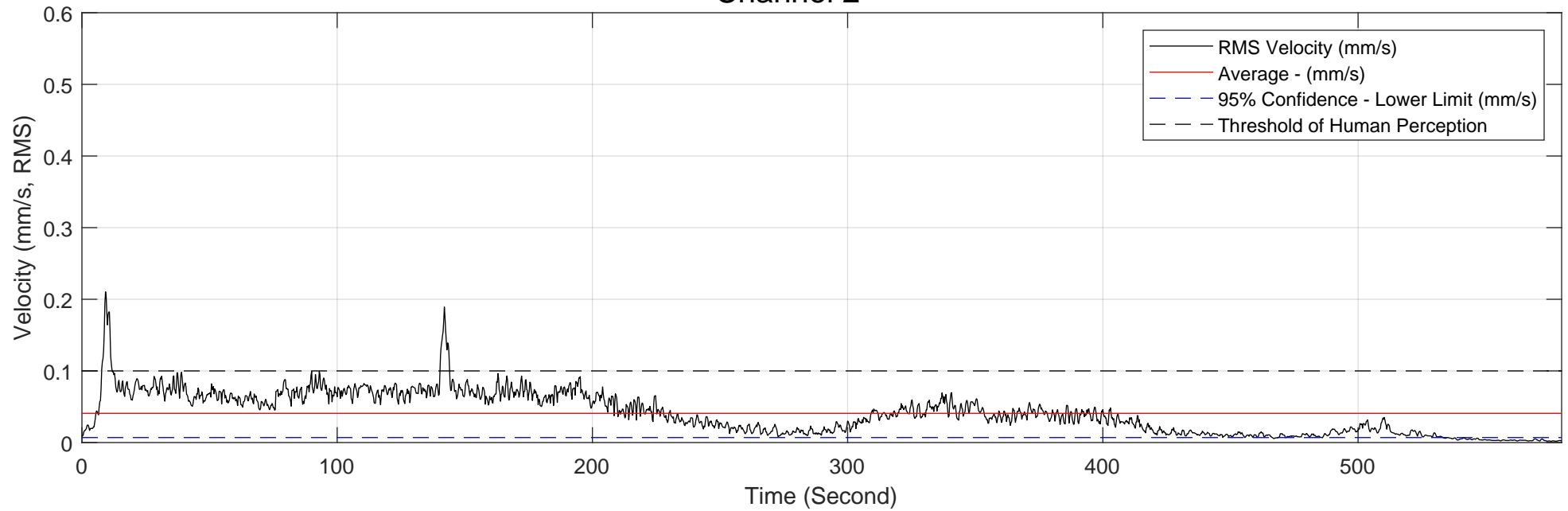
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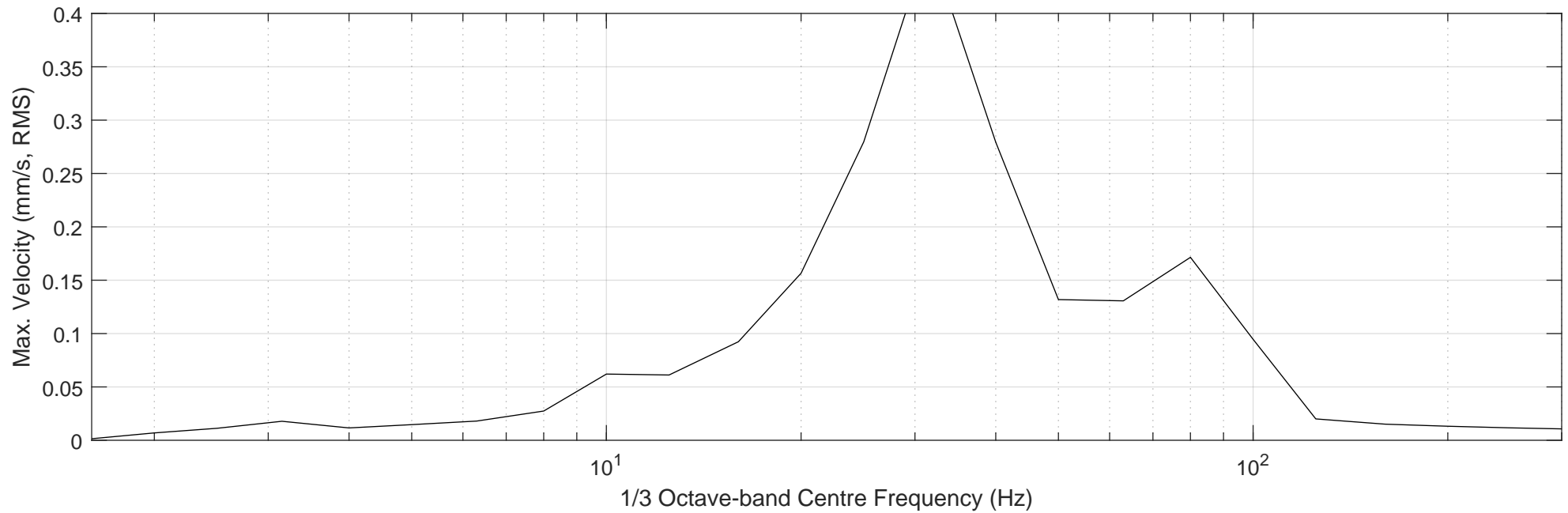
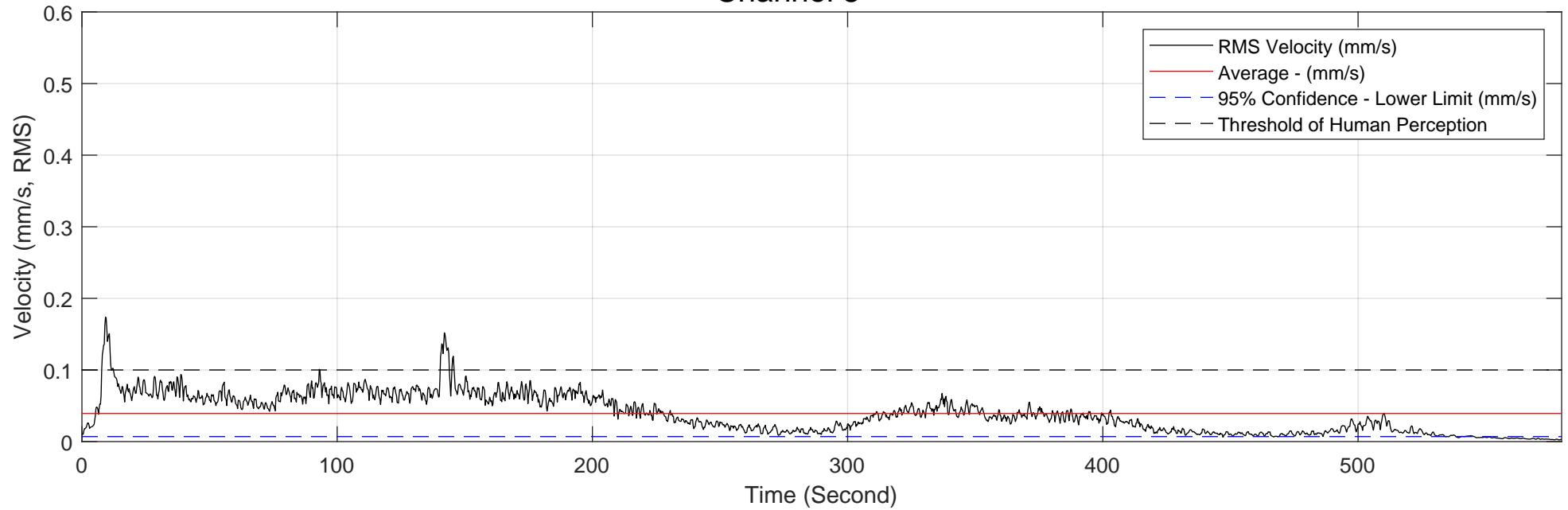
# Vibration Measurement Data - Passby1

## Channel 2



# Vibration Measurement Data - Passby1

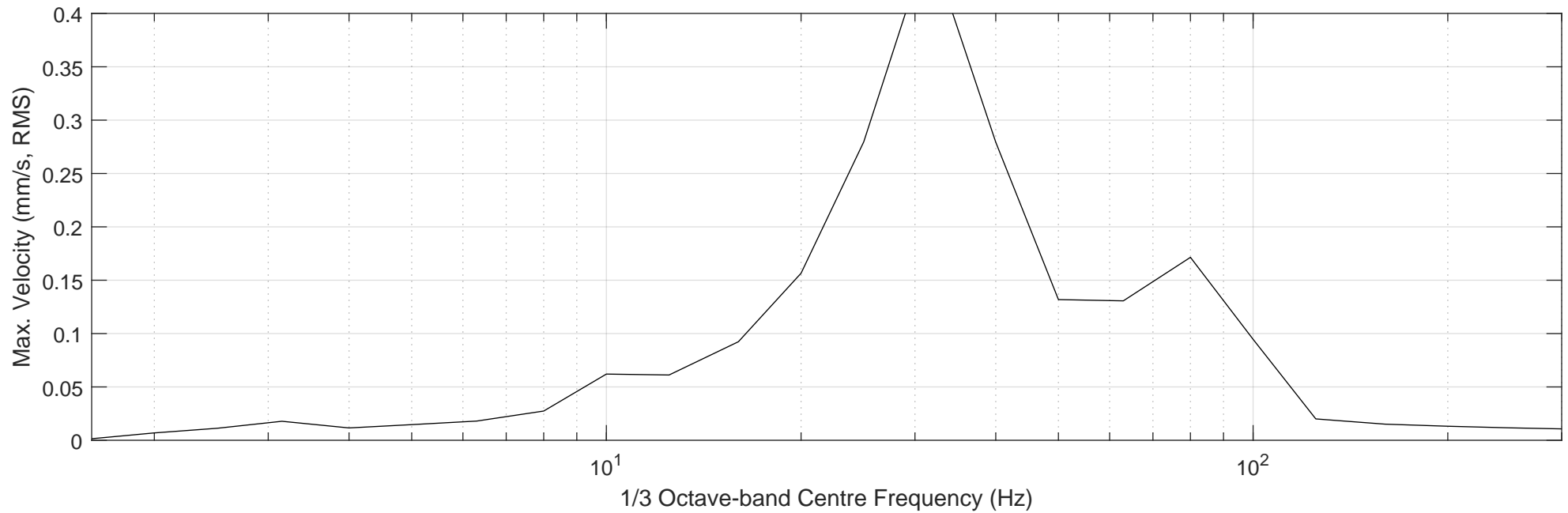
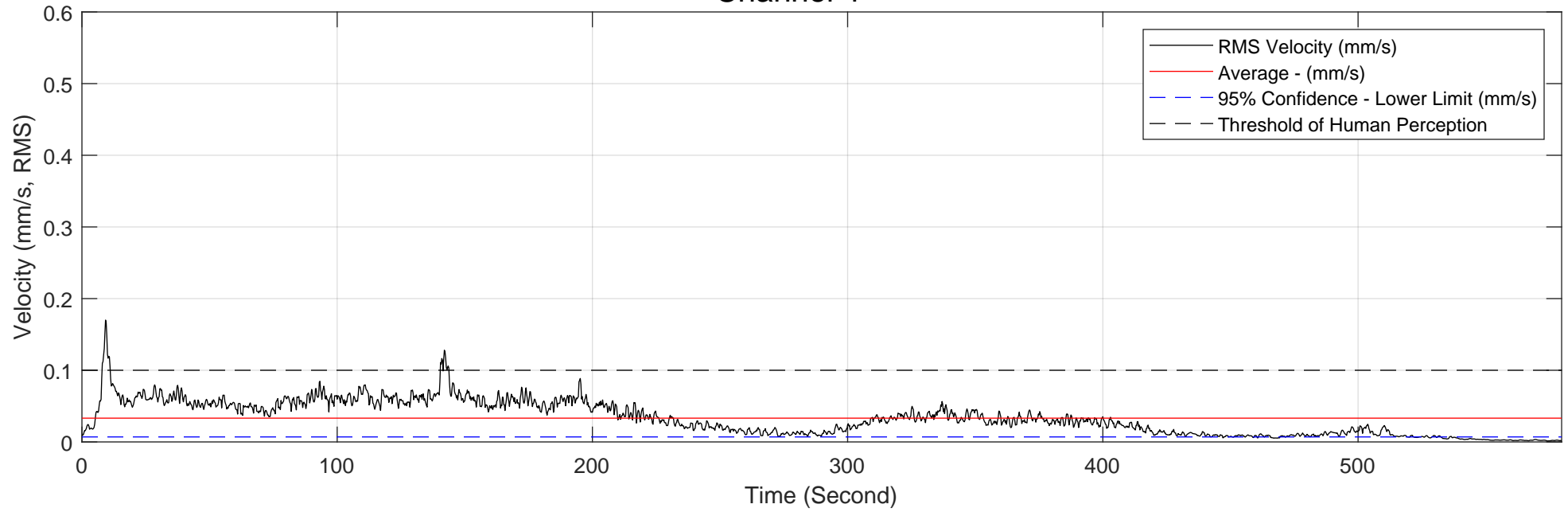
## Channel 3





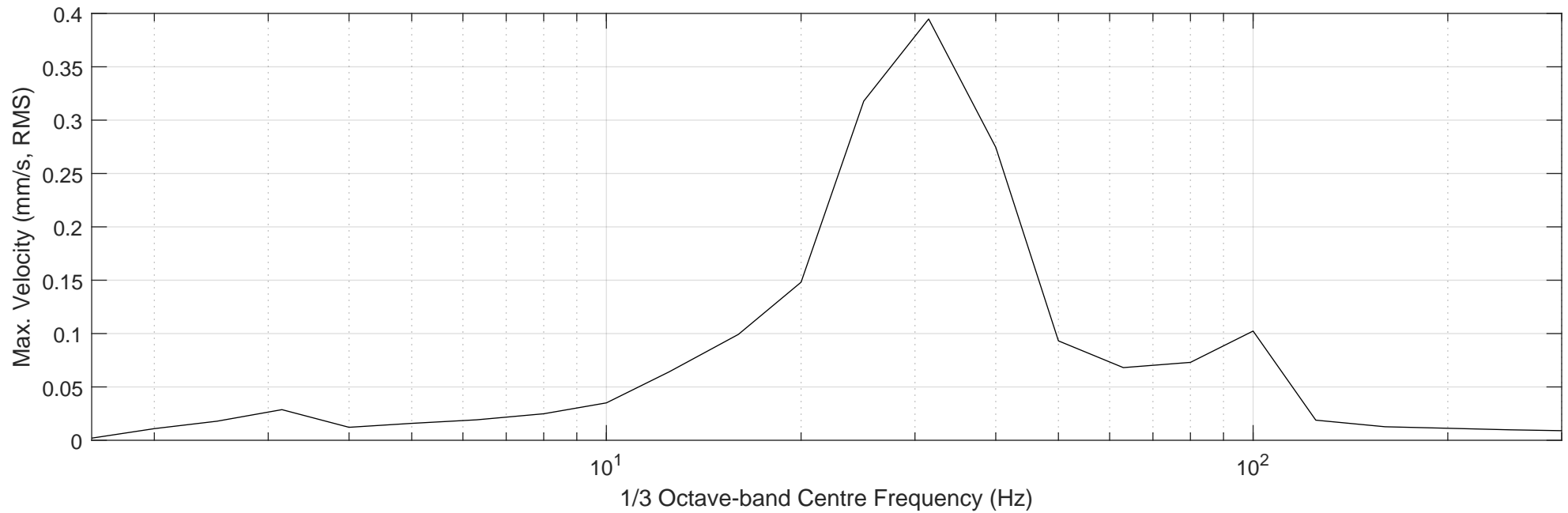
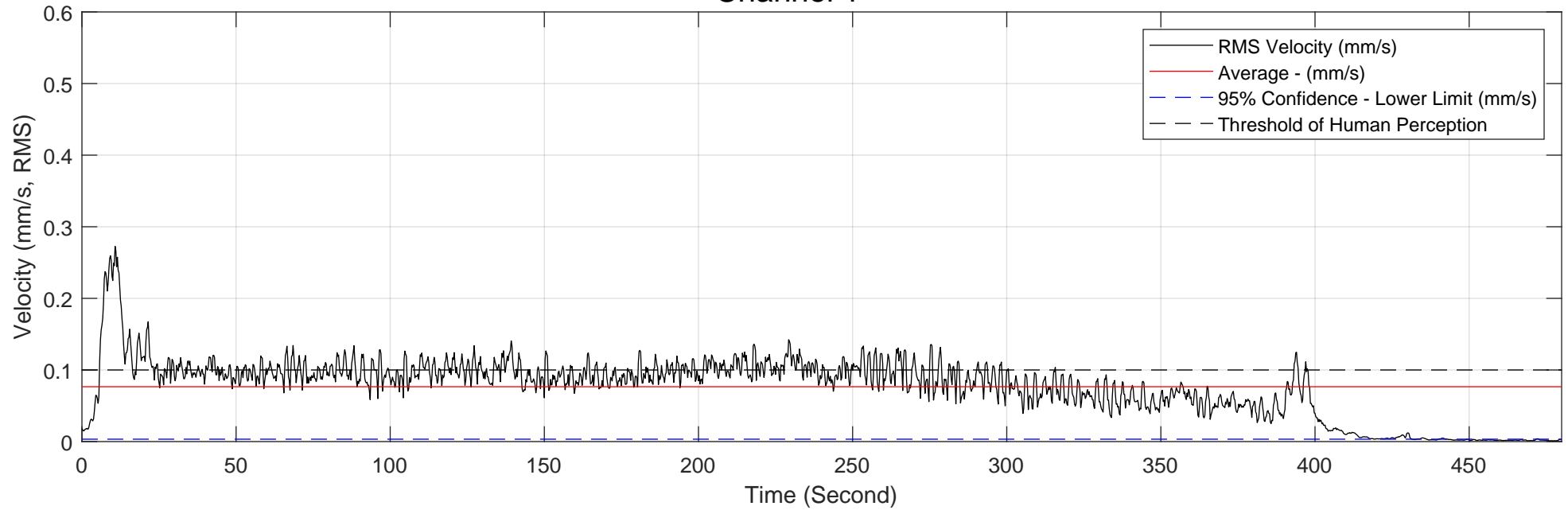
# Vibration Measurement Data - Passby1

## Channel 4



# Vibration Measurement Data - Passby2

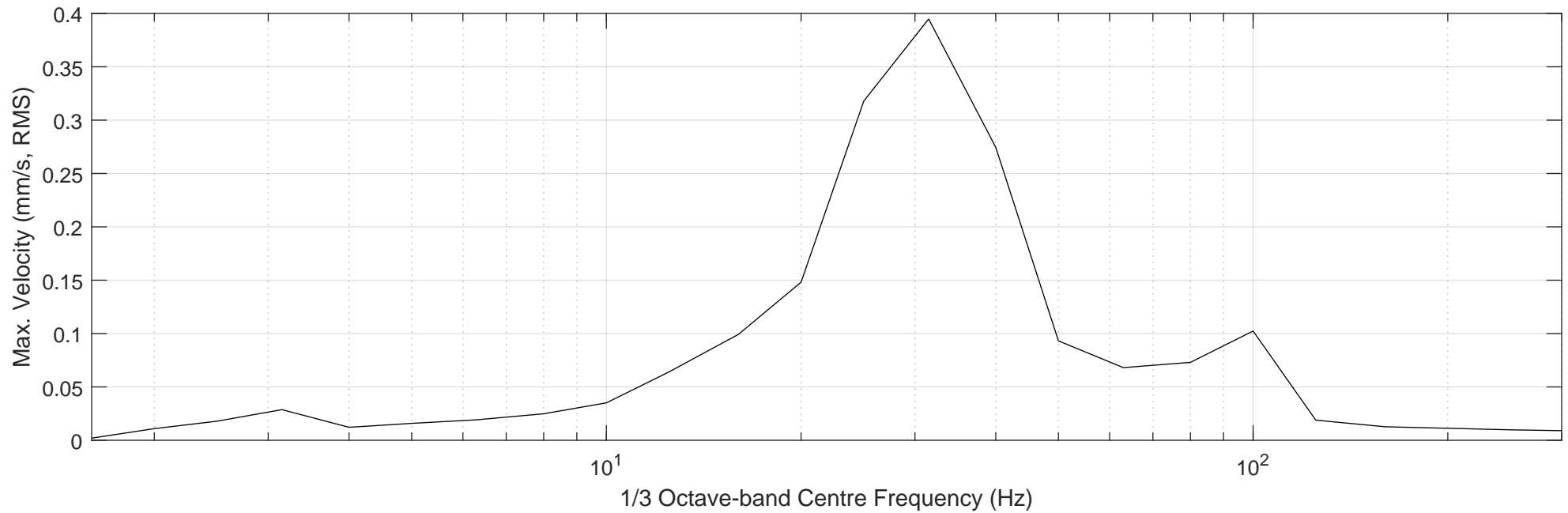
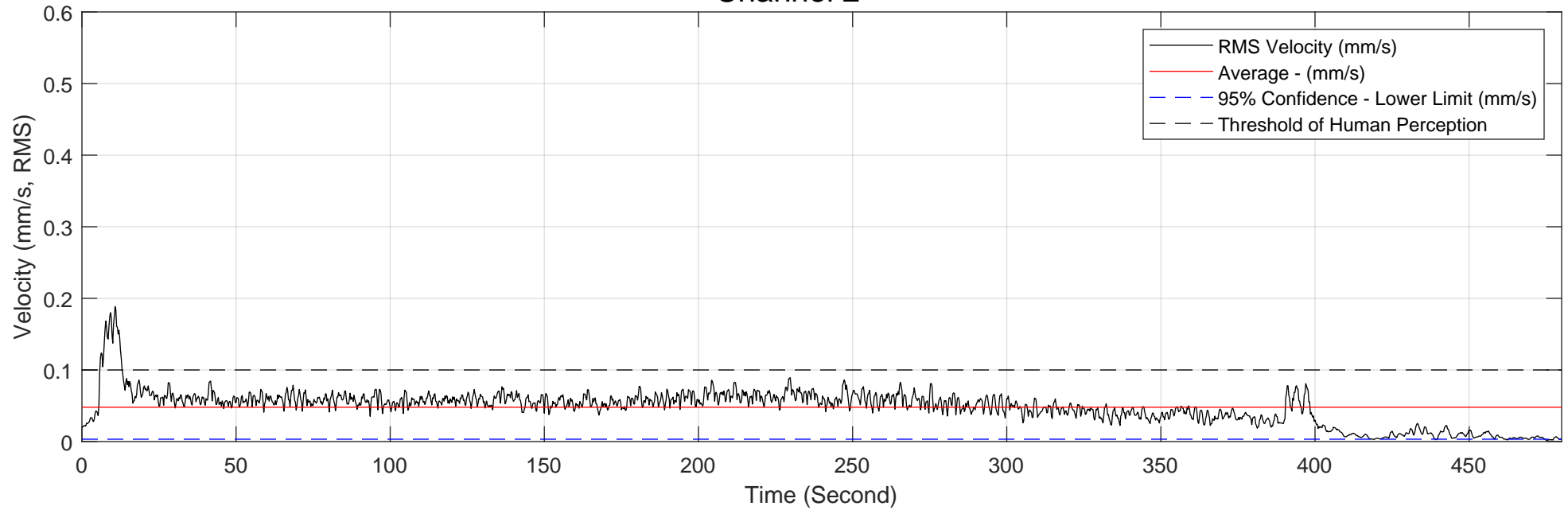
## Channel 1





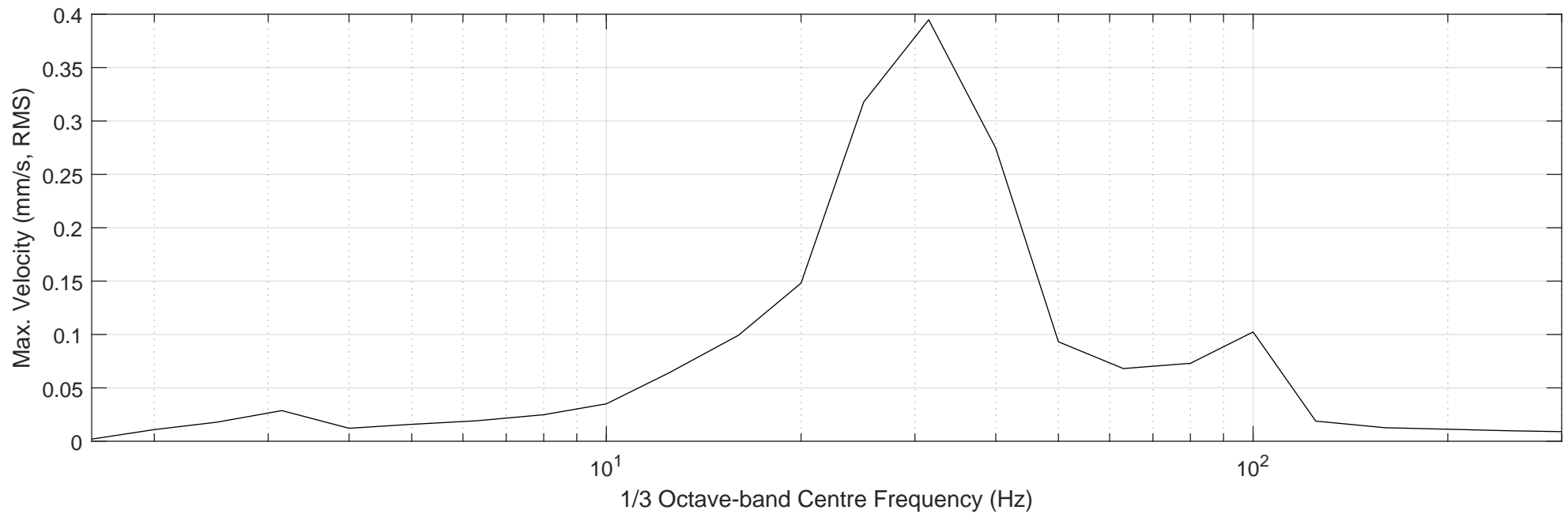
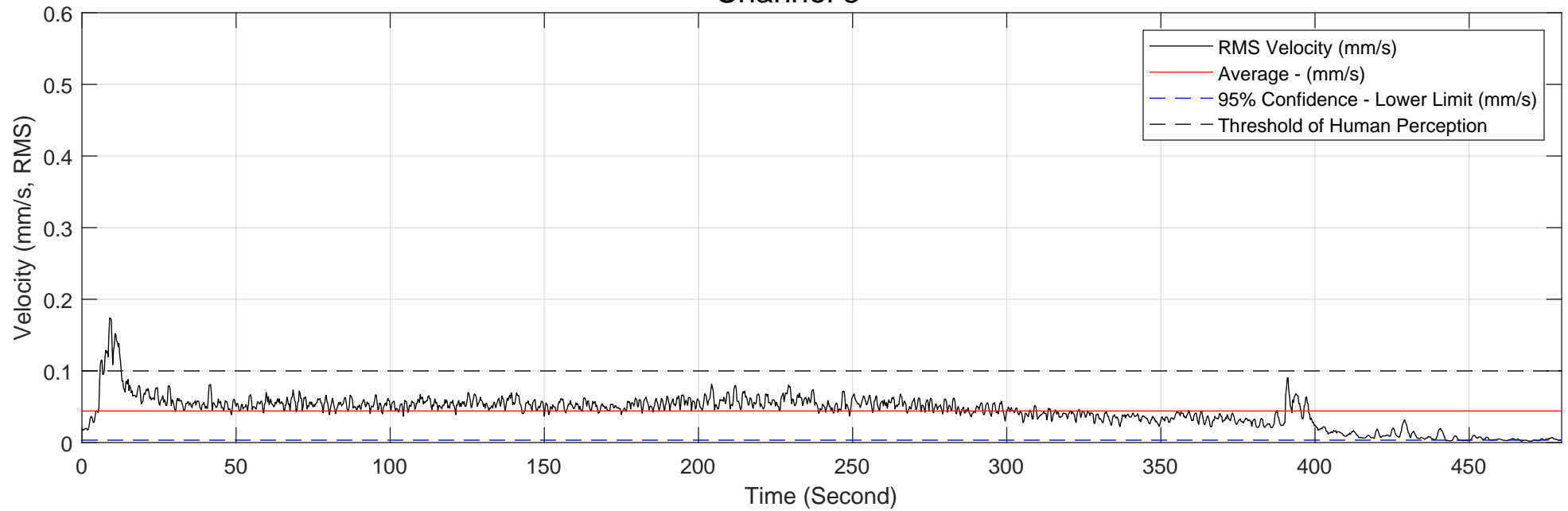
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## Channel 2



# Vibration Measurement Data - Passby2

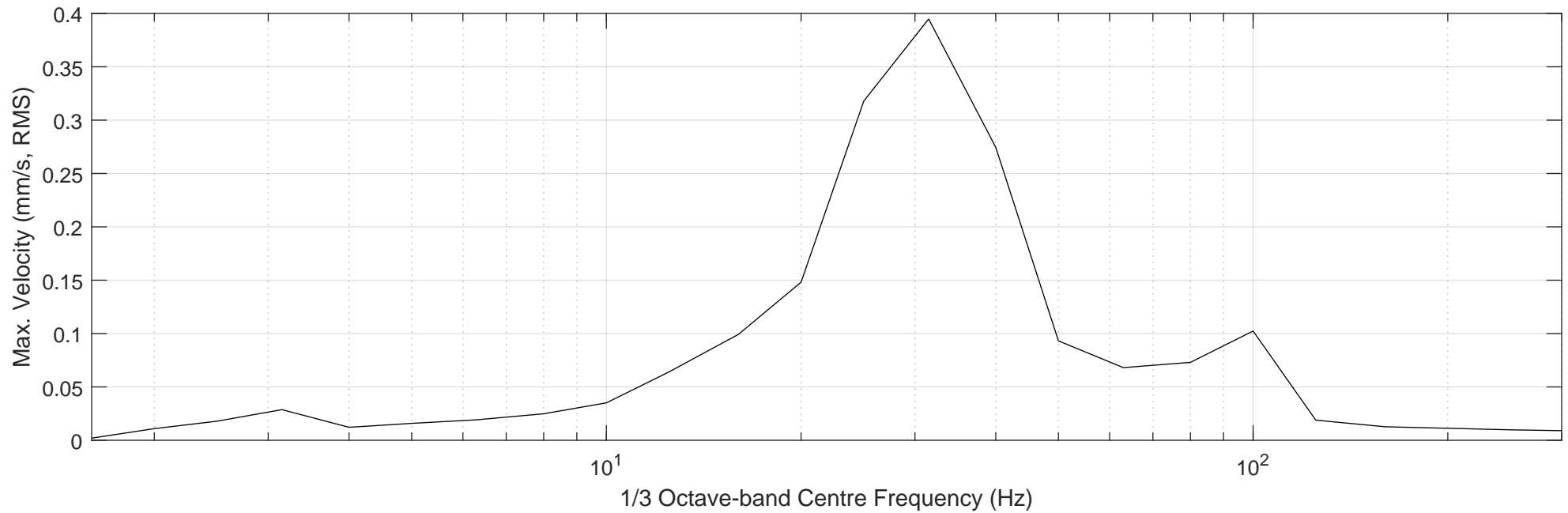
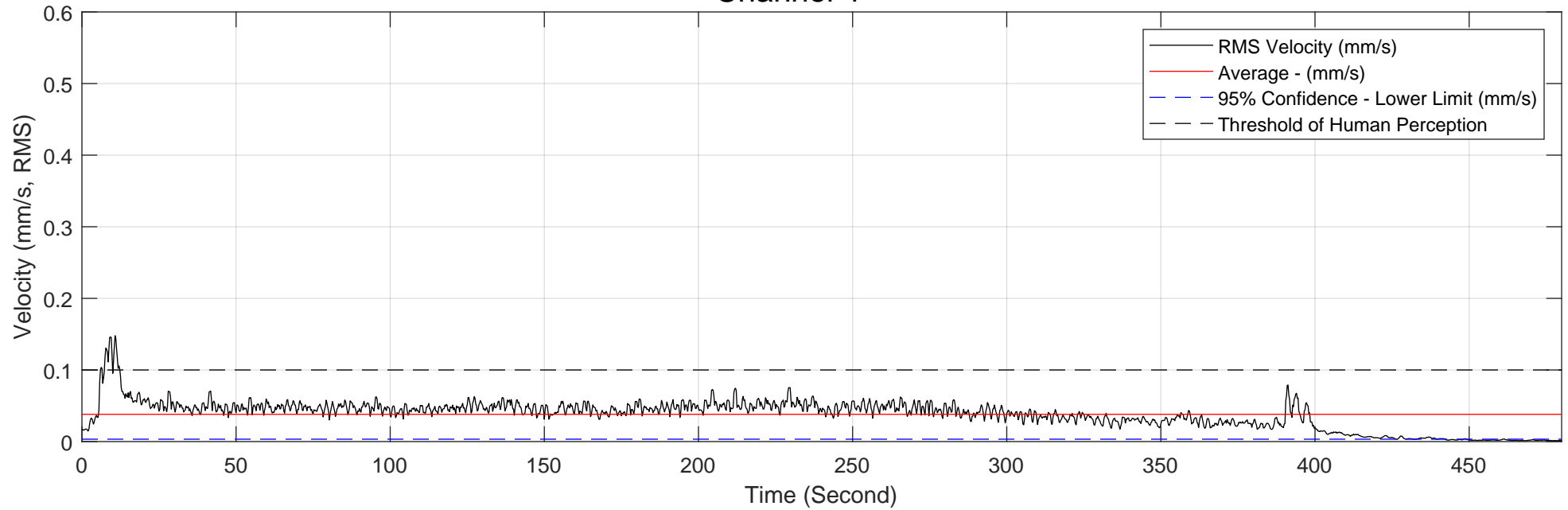
## Channel 3





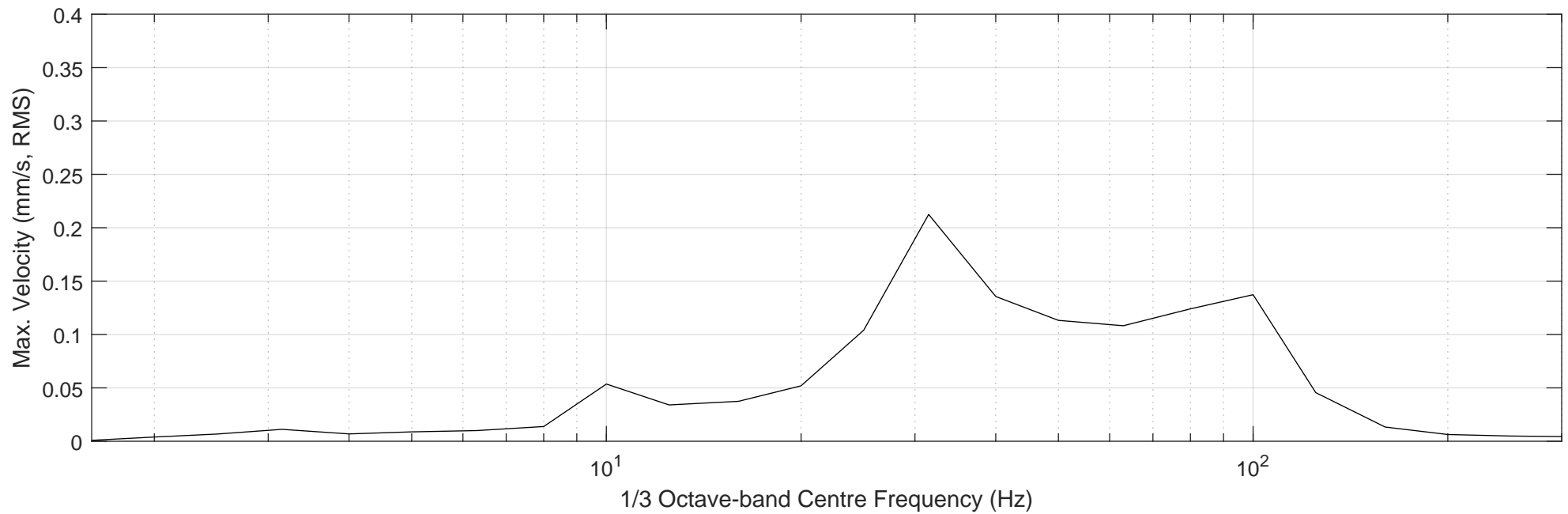
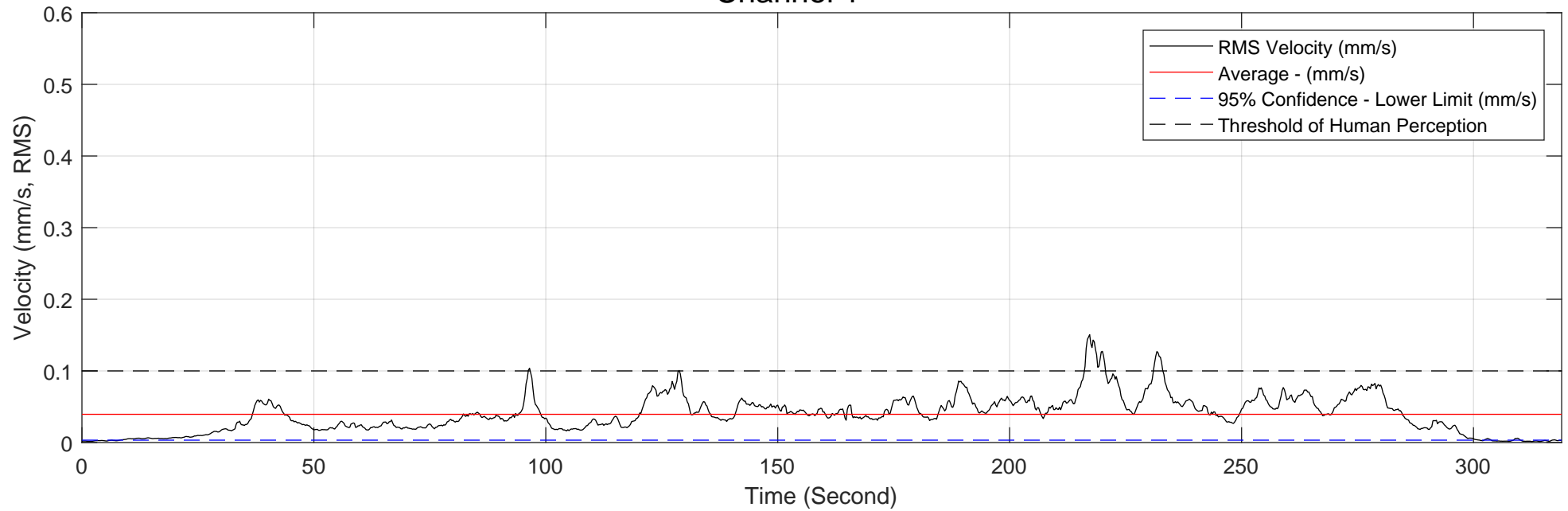
# Vibration Measurement Data - Passby2

## Channel 4



# Vibration Measurement Data - Passby3

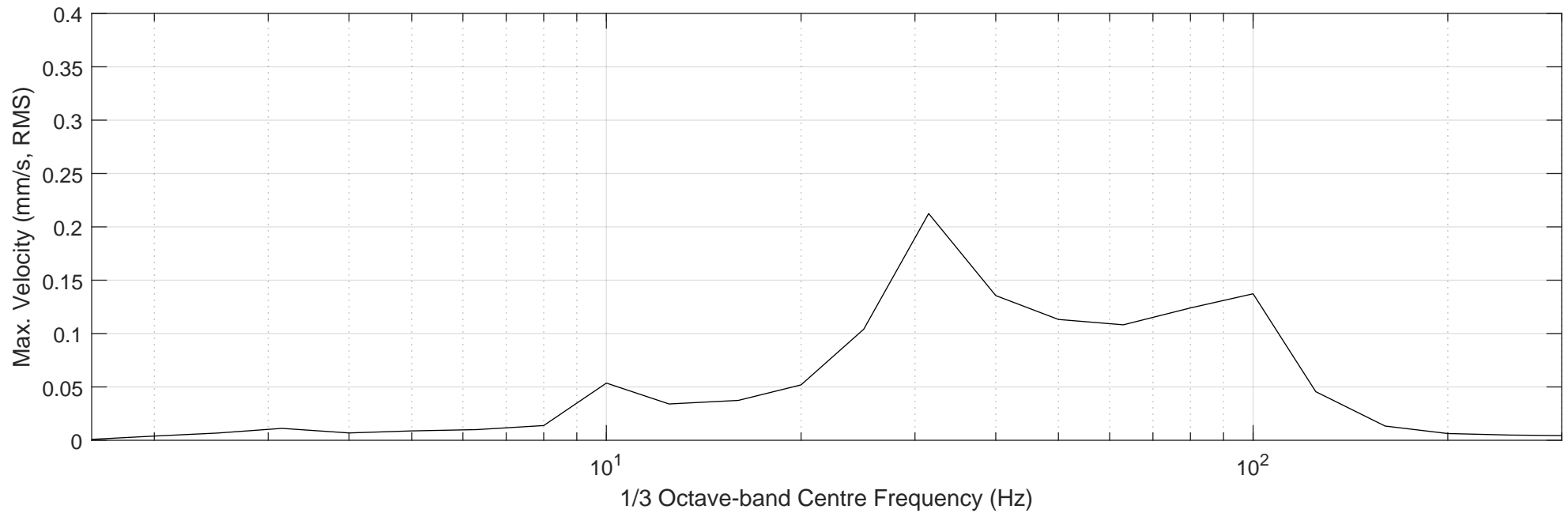
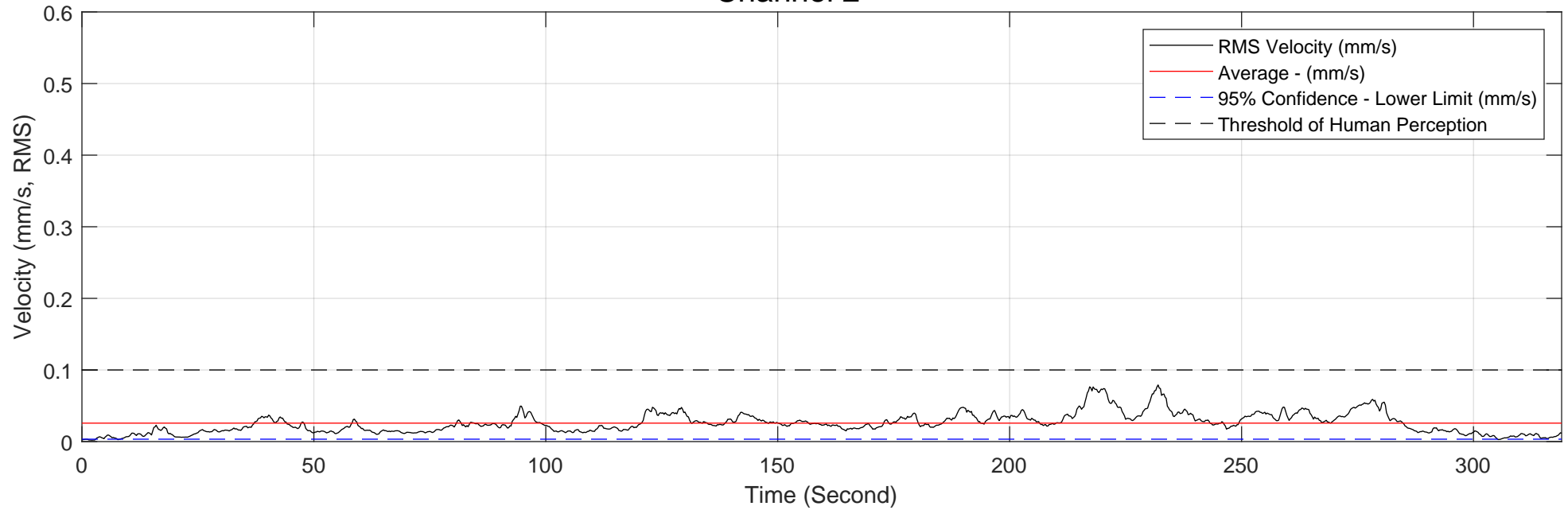
## Channel 1





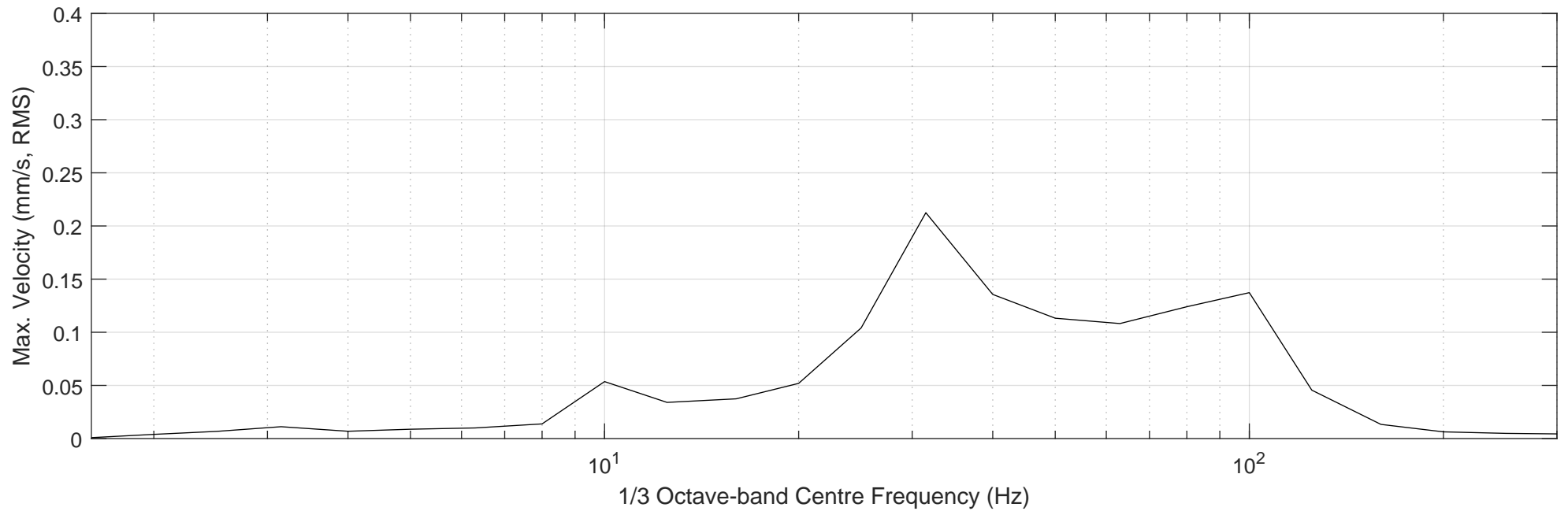
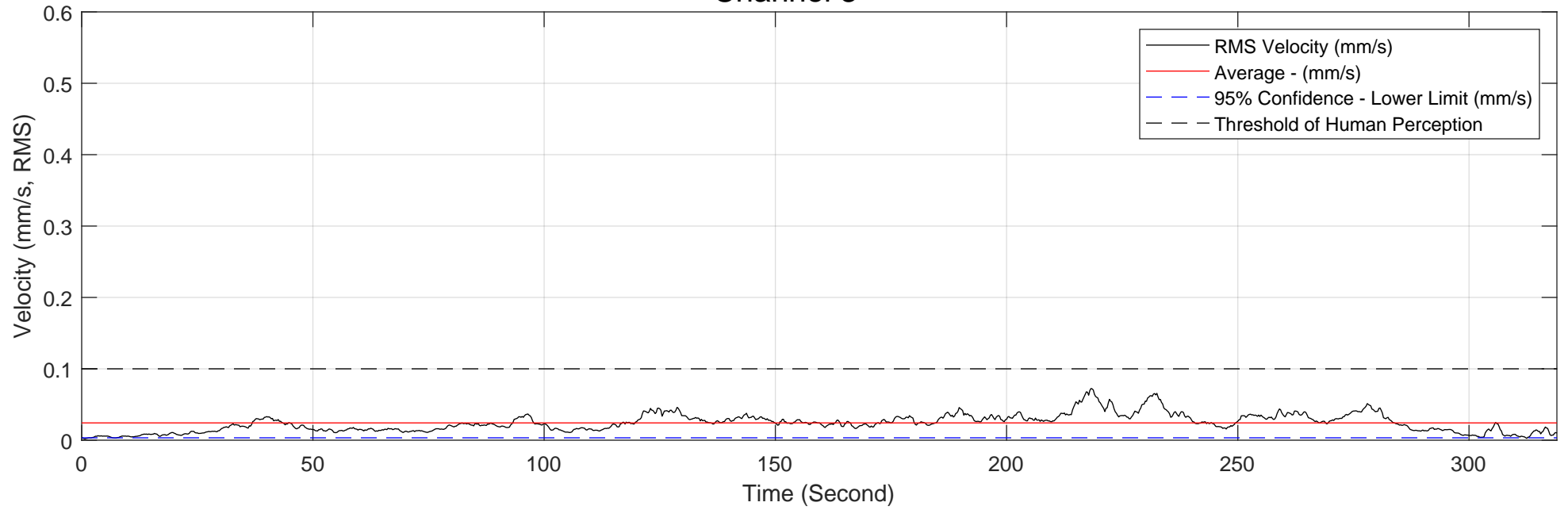
# Vibration Measurement Data - Passby3

## Channel 2



# Vibration Measurement Data - Passby3

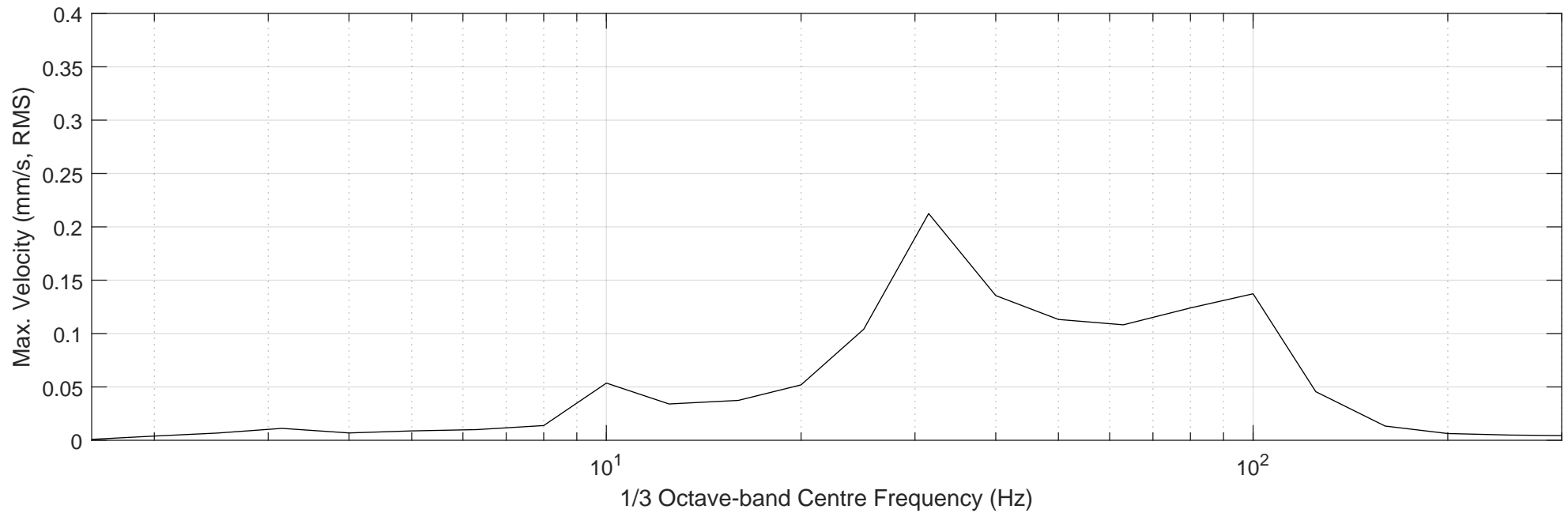
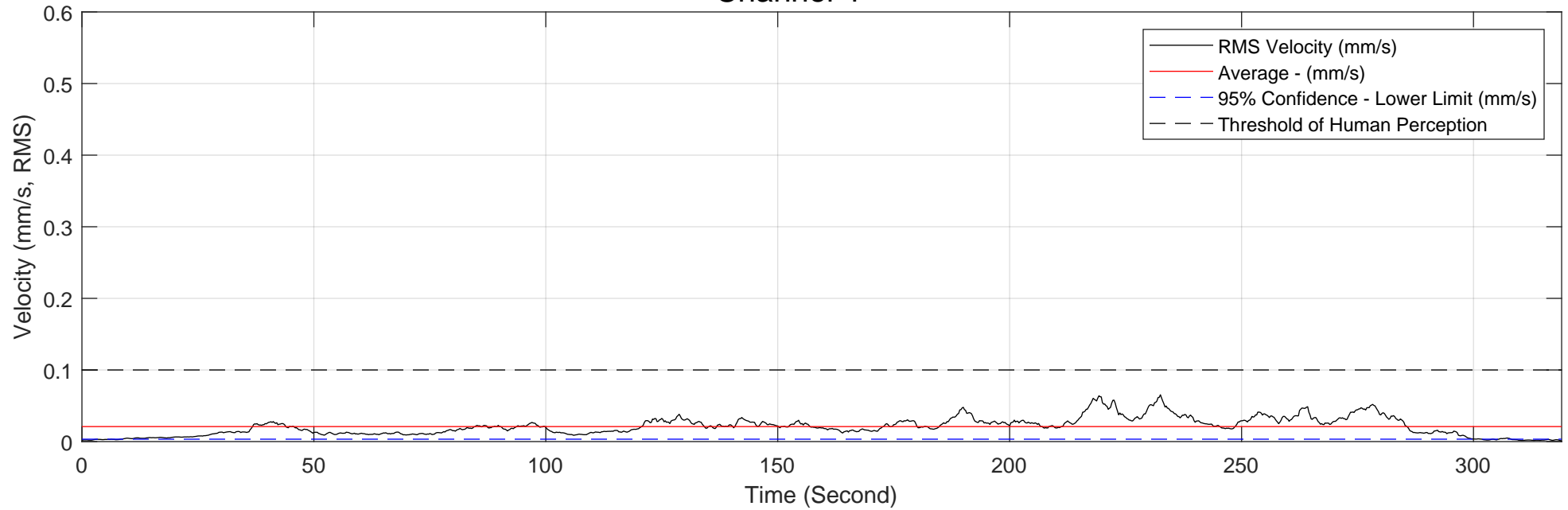
## Channel 3





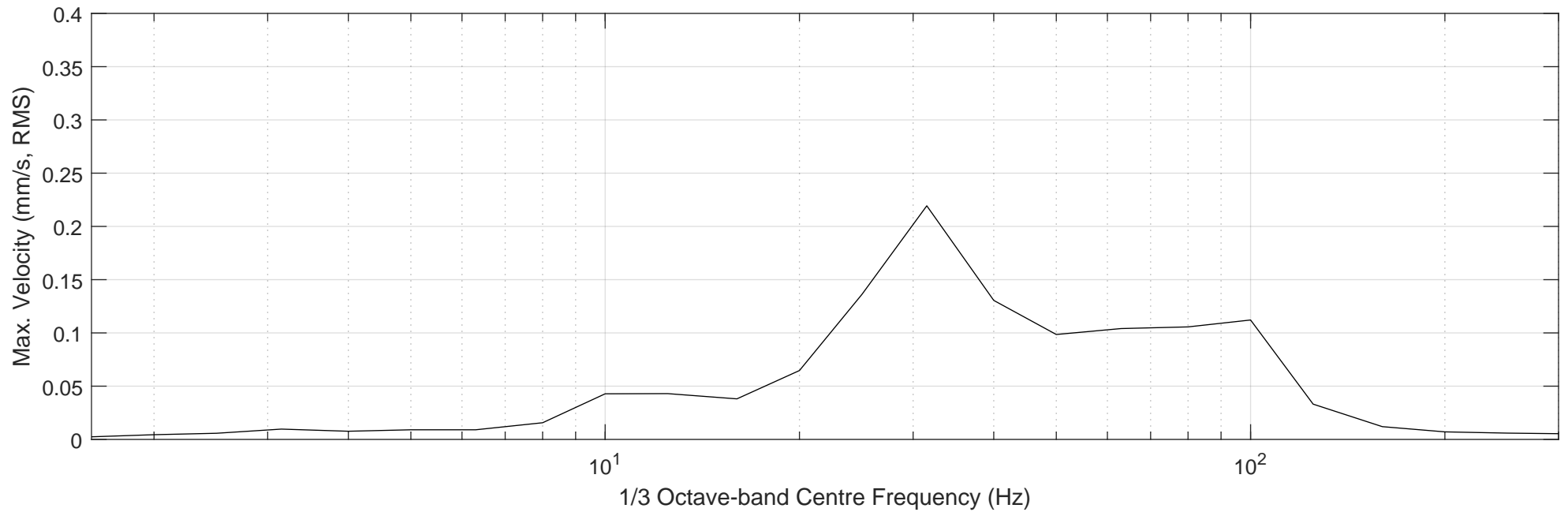
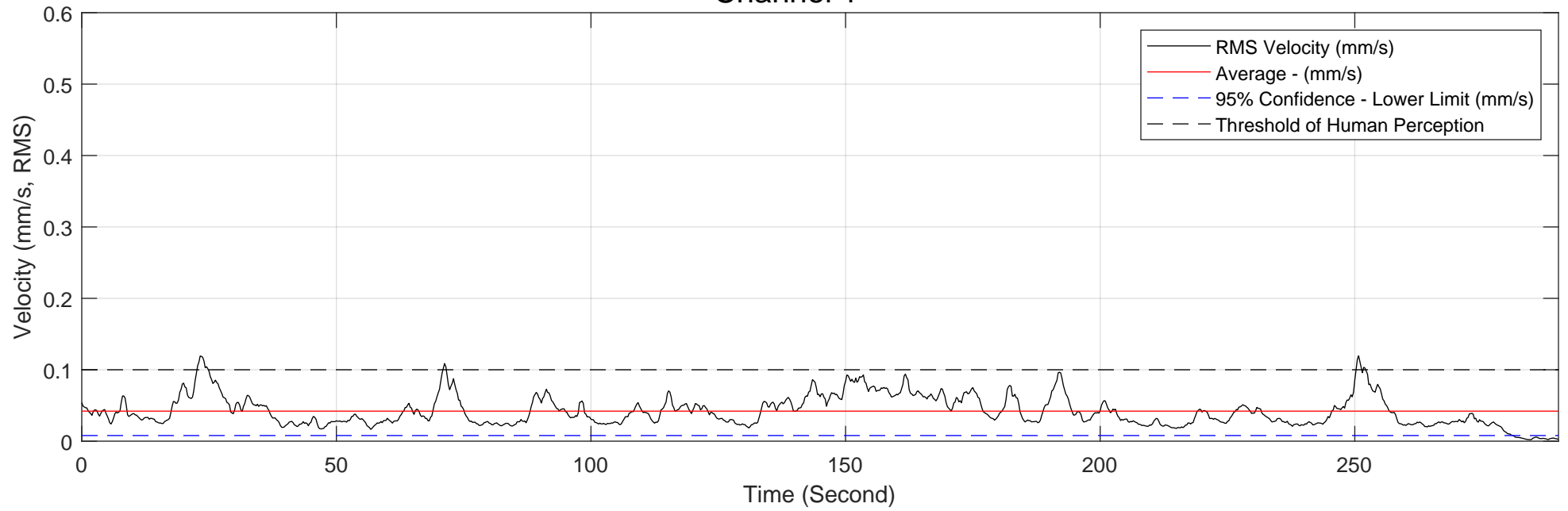
# Vibration Measurement Data - Passby3

## Channel 4



# Vibration Measurement Data - Passby4

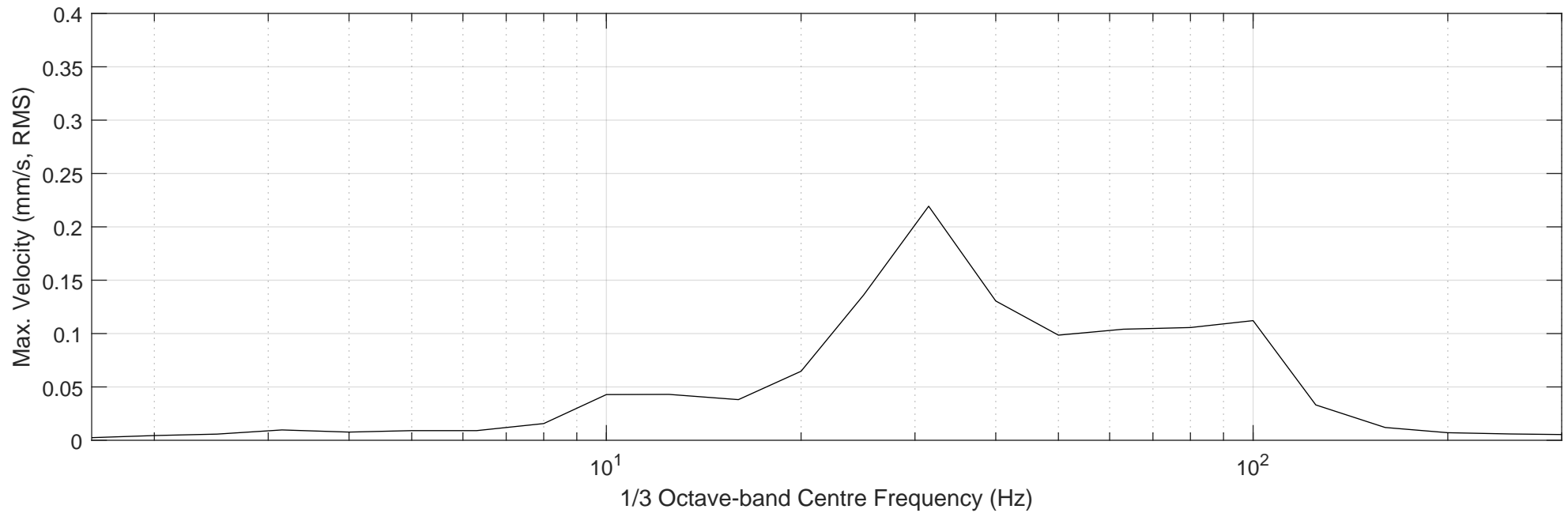
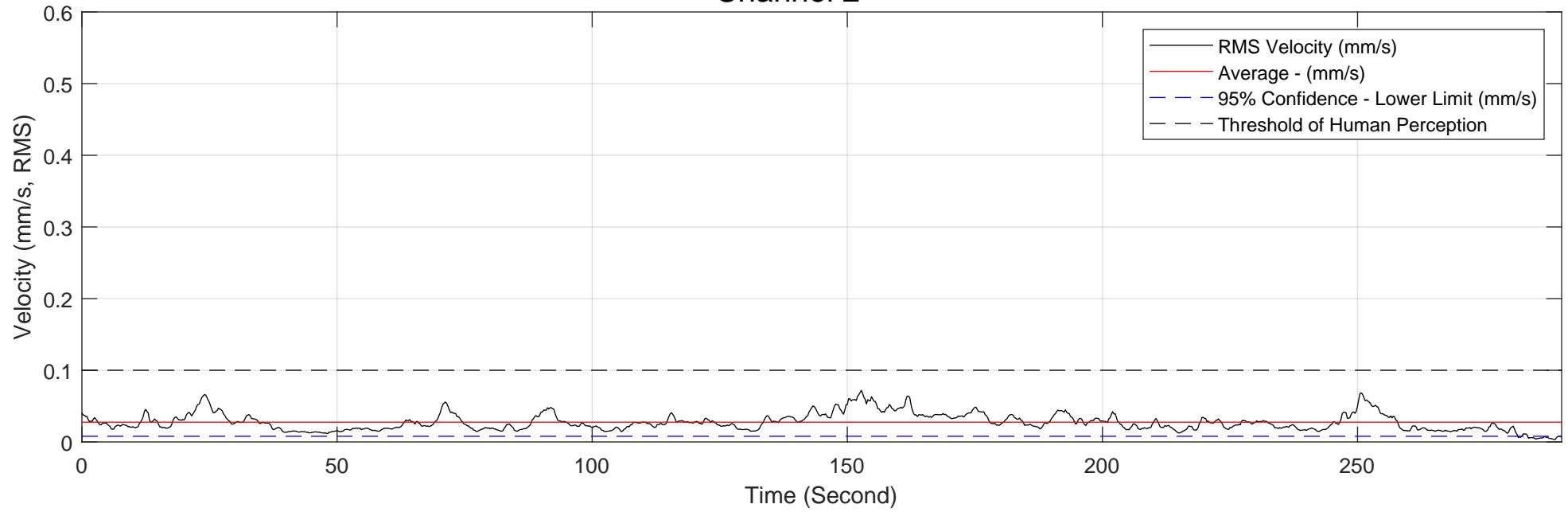
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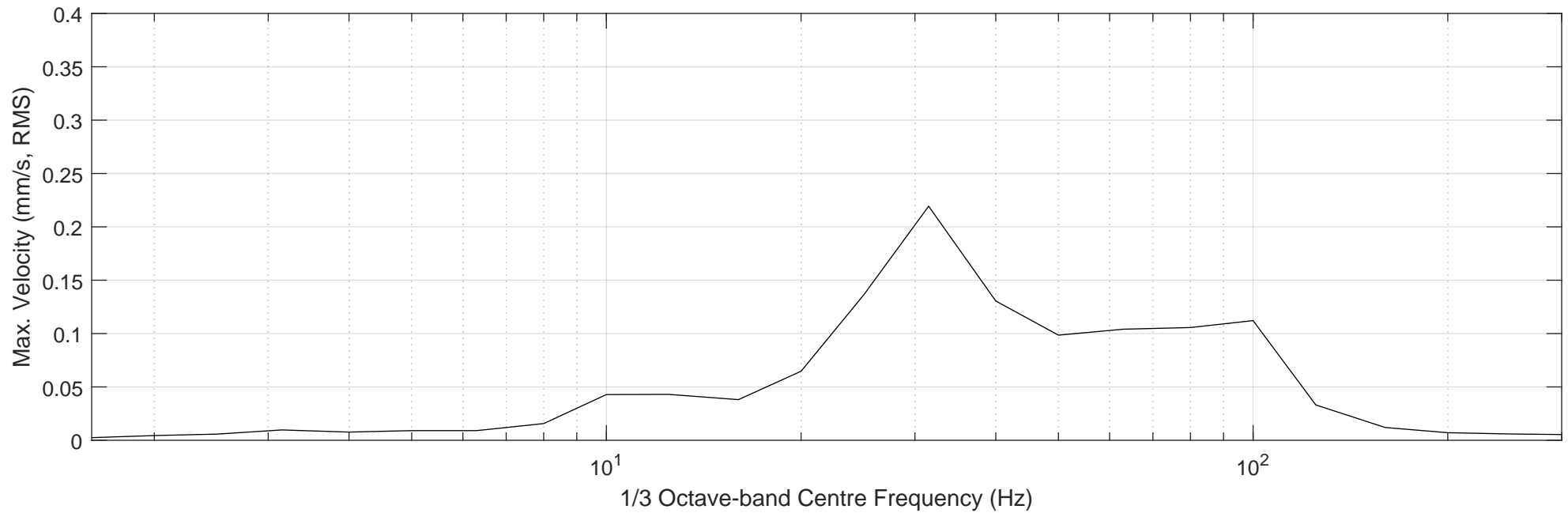
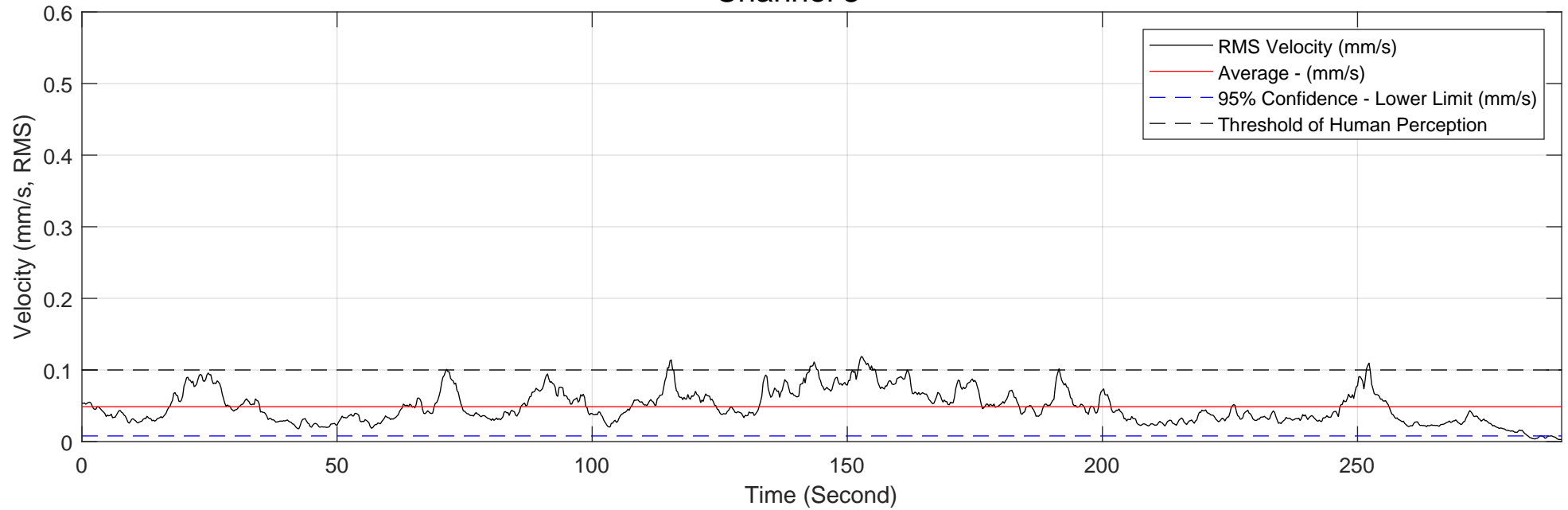
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## Channel 2



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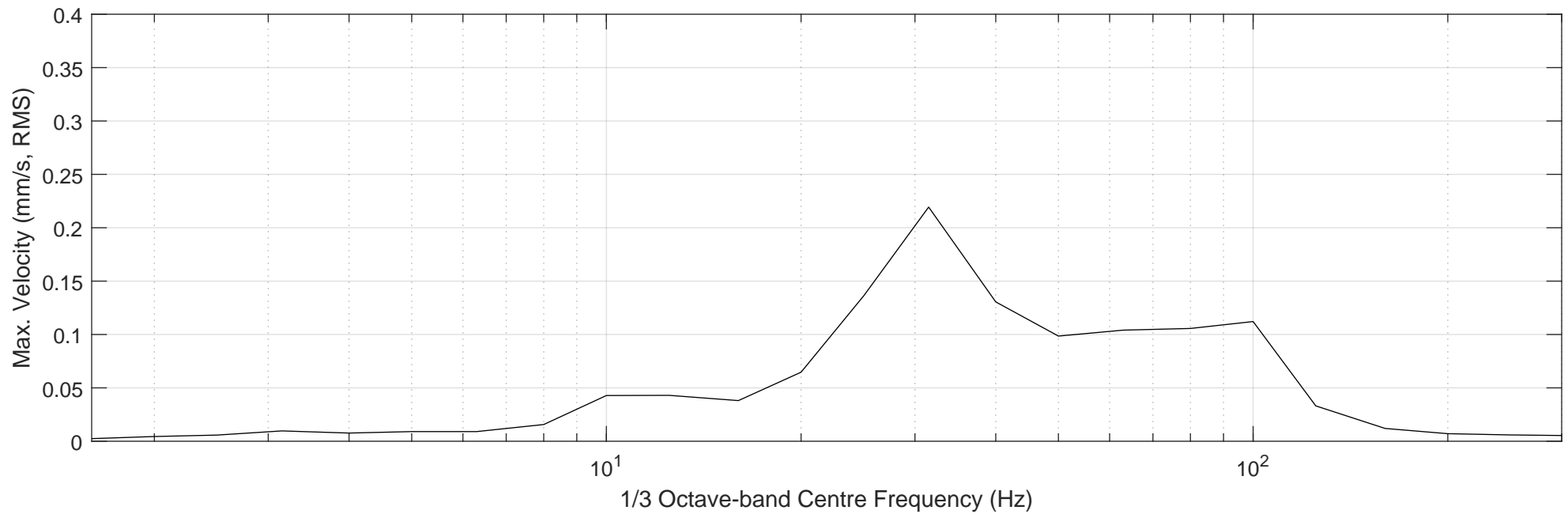
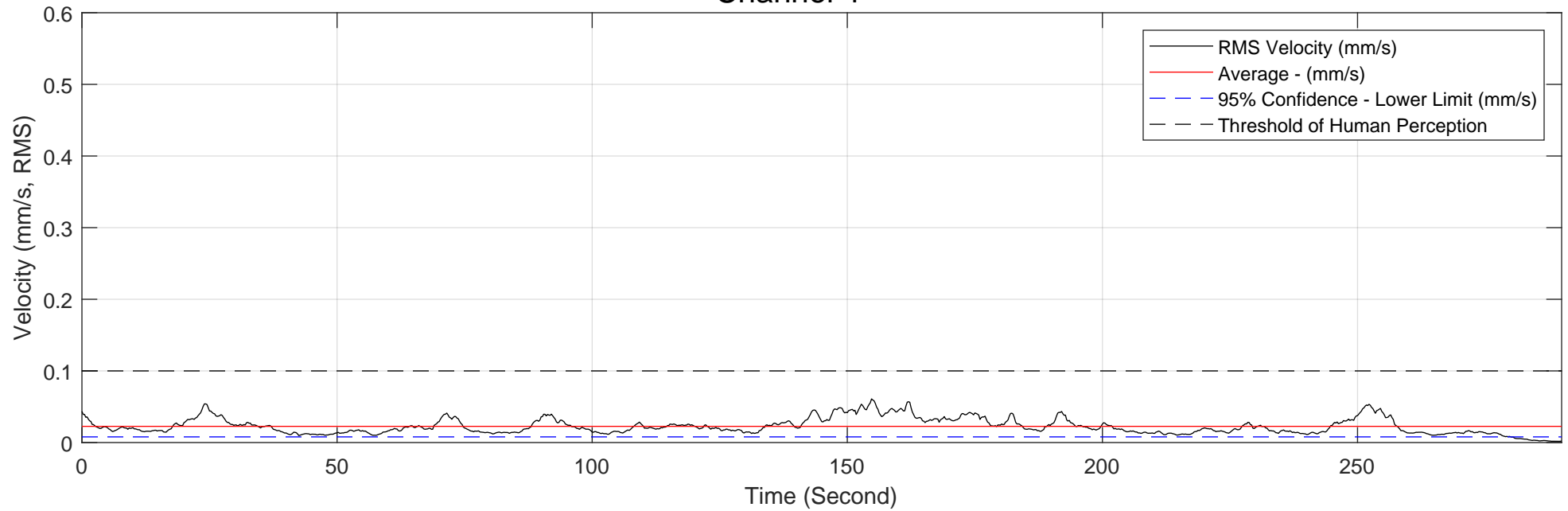
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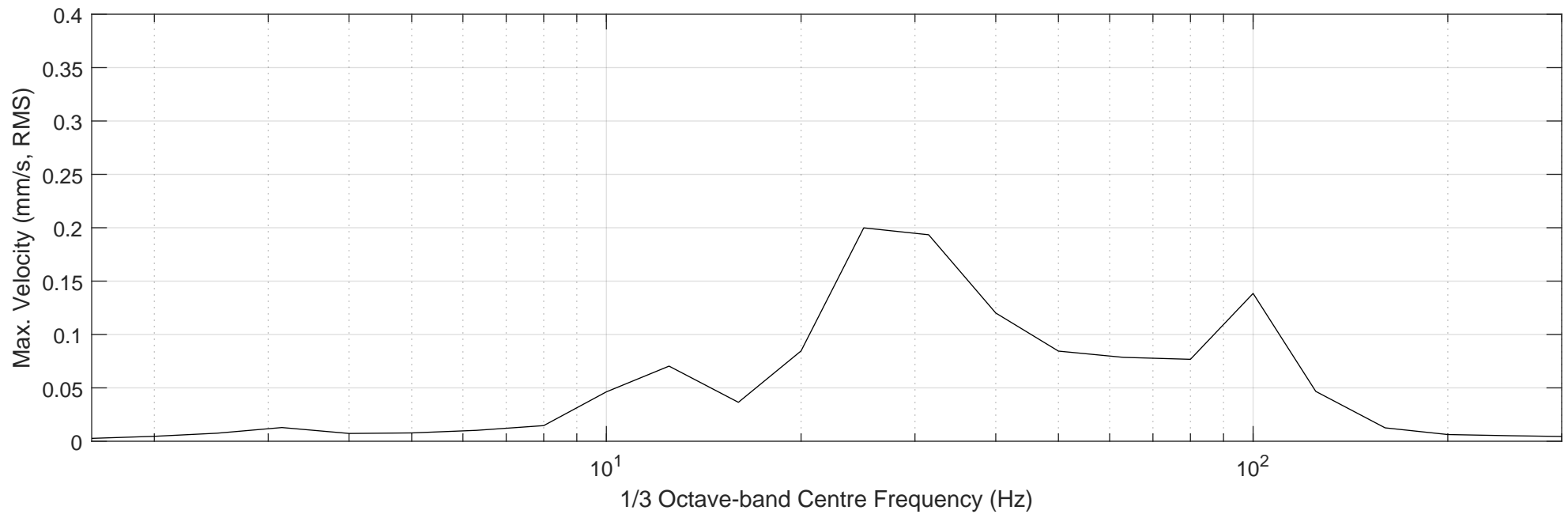
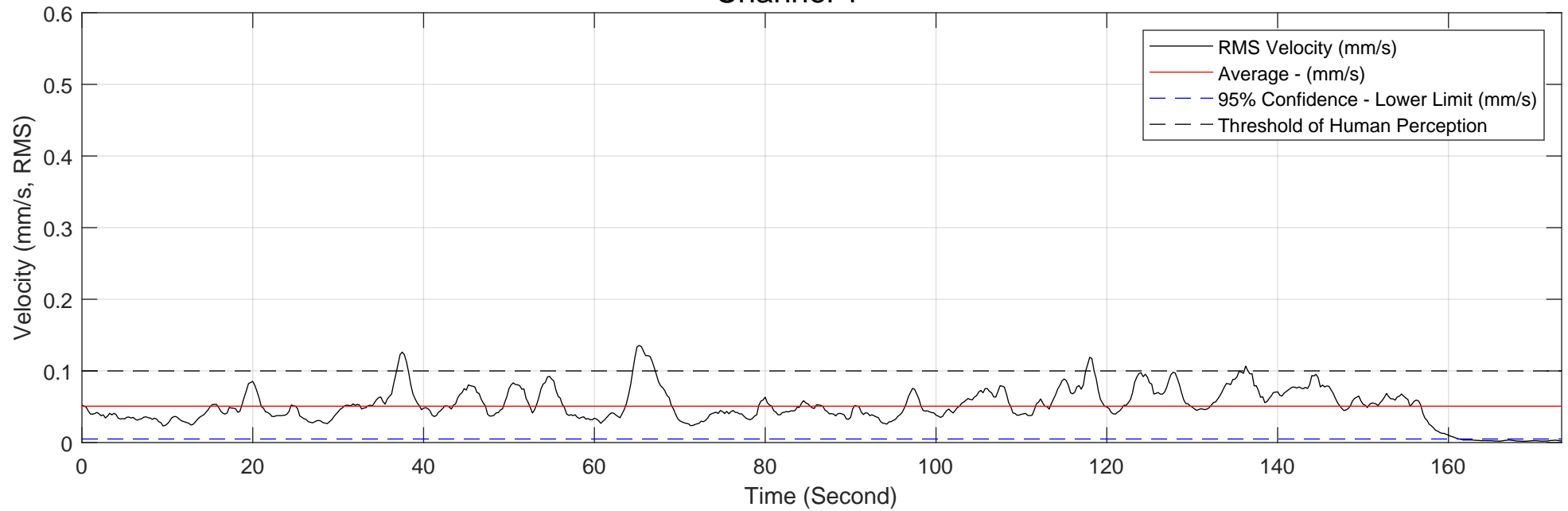
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## Channel 4



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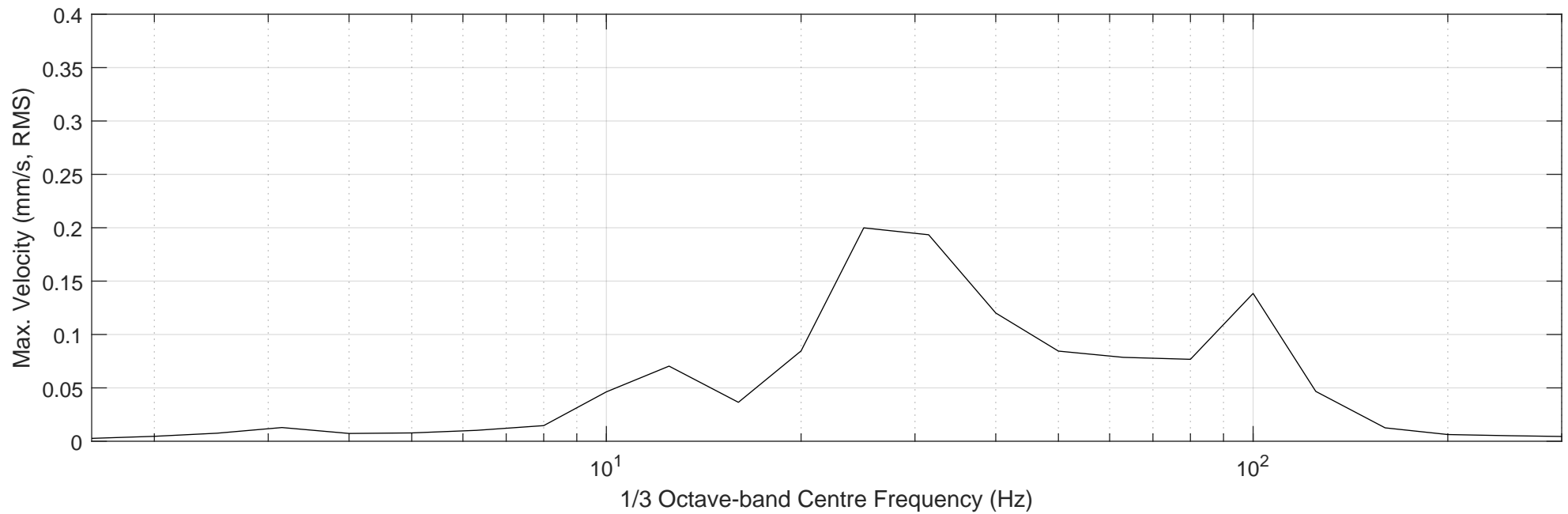
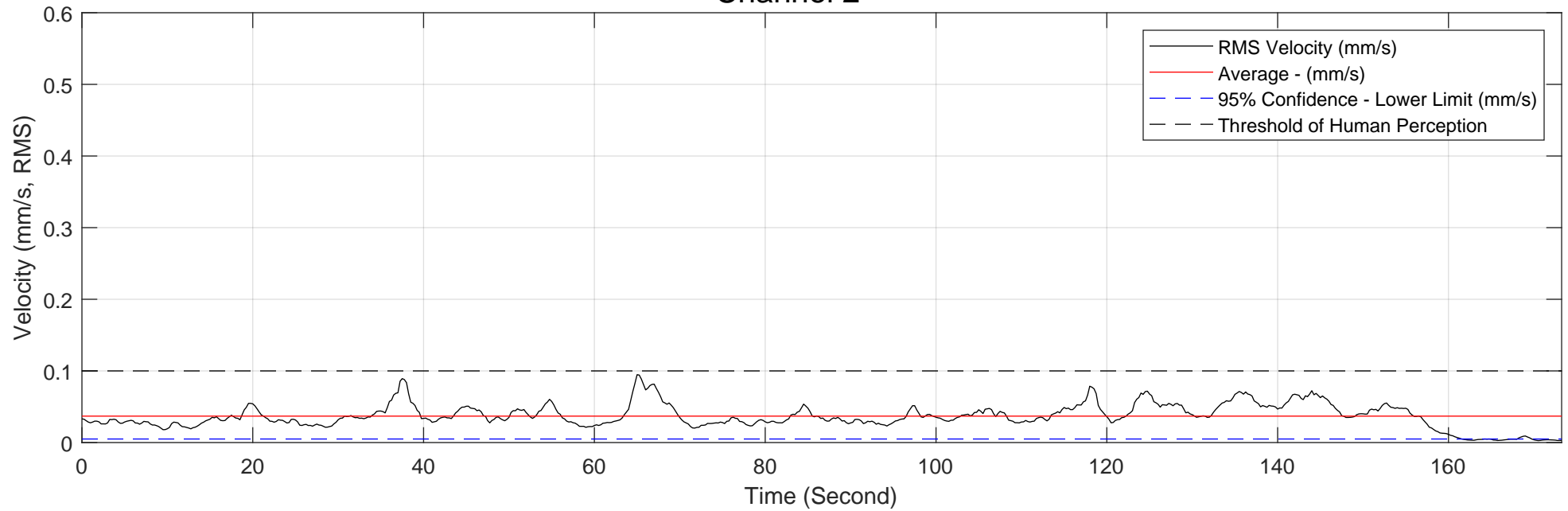
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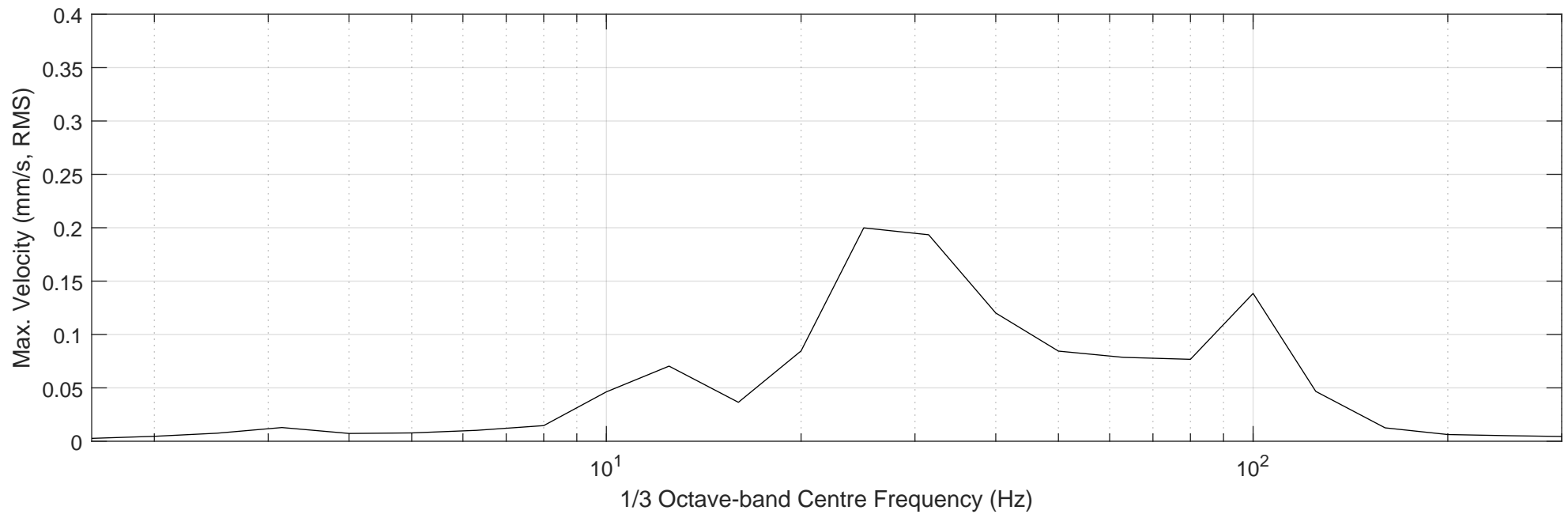
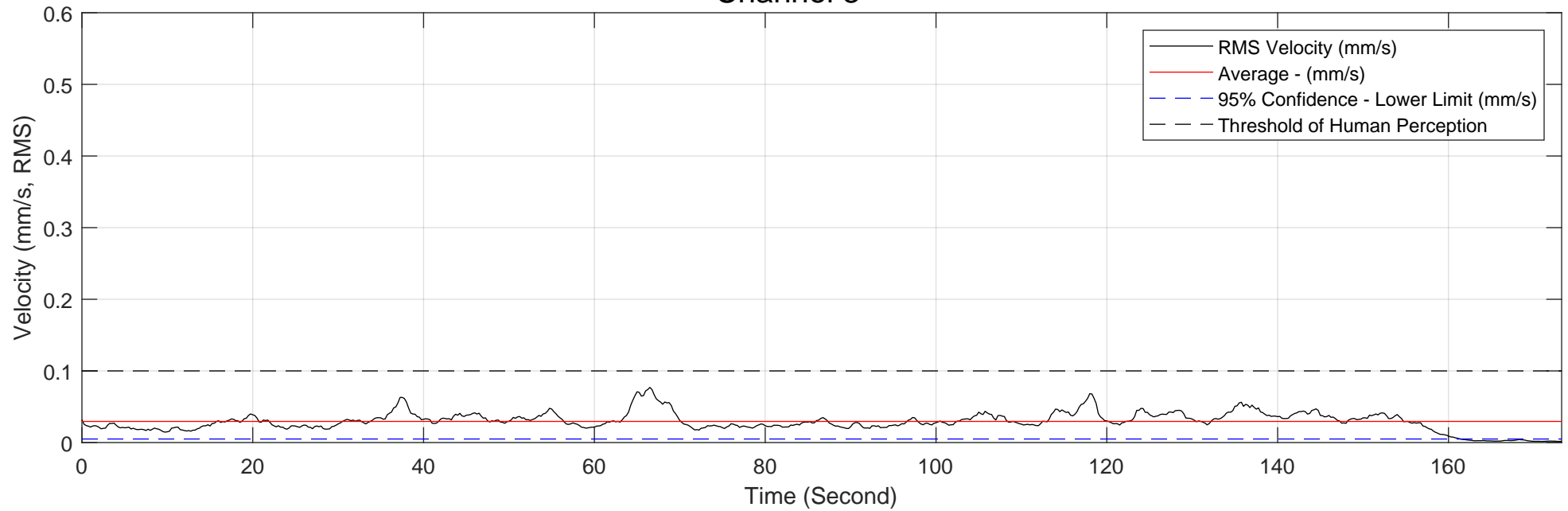
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## Channel 2



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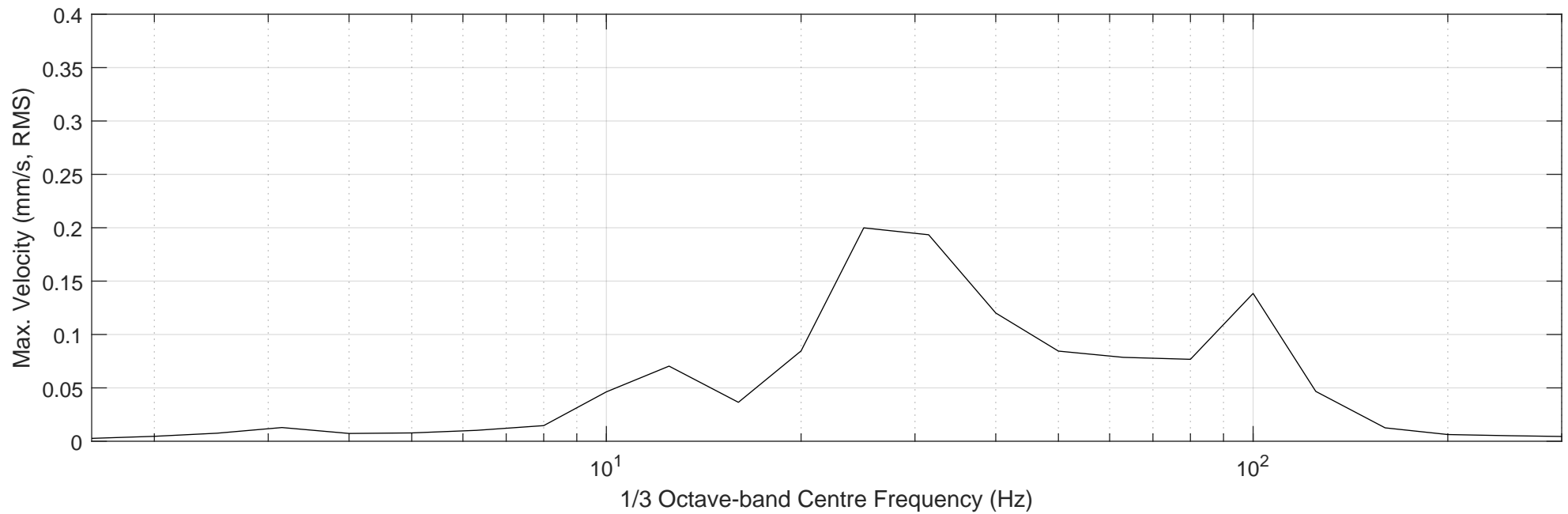
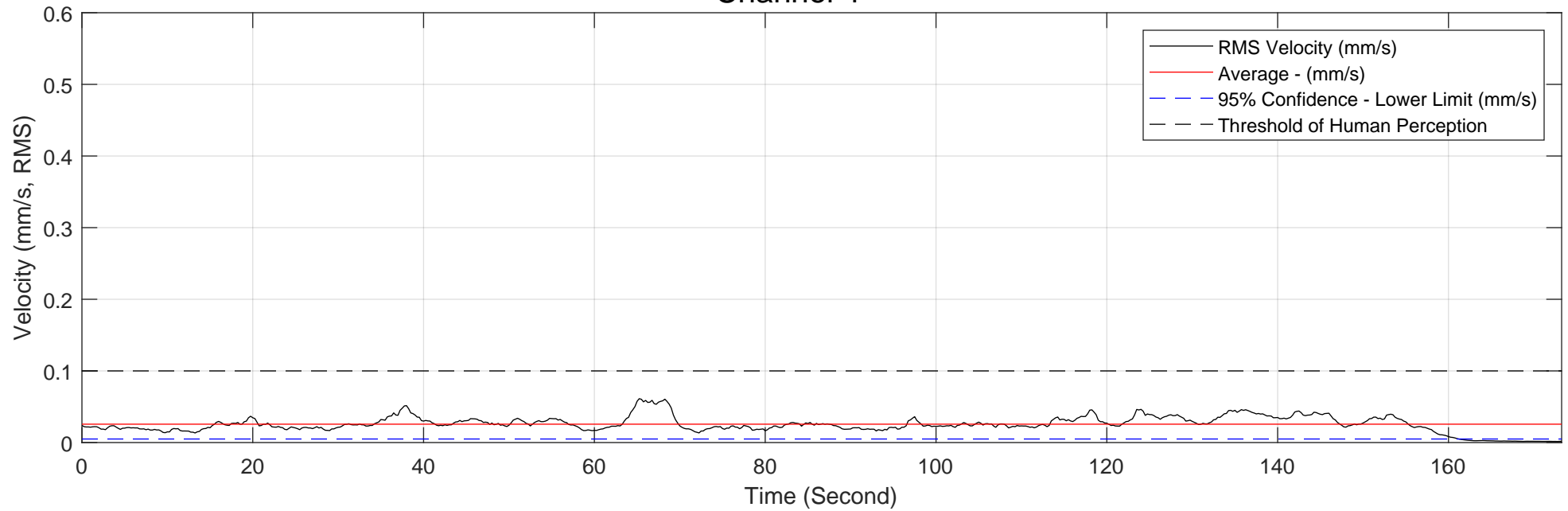
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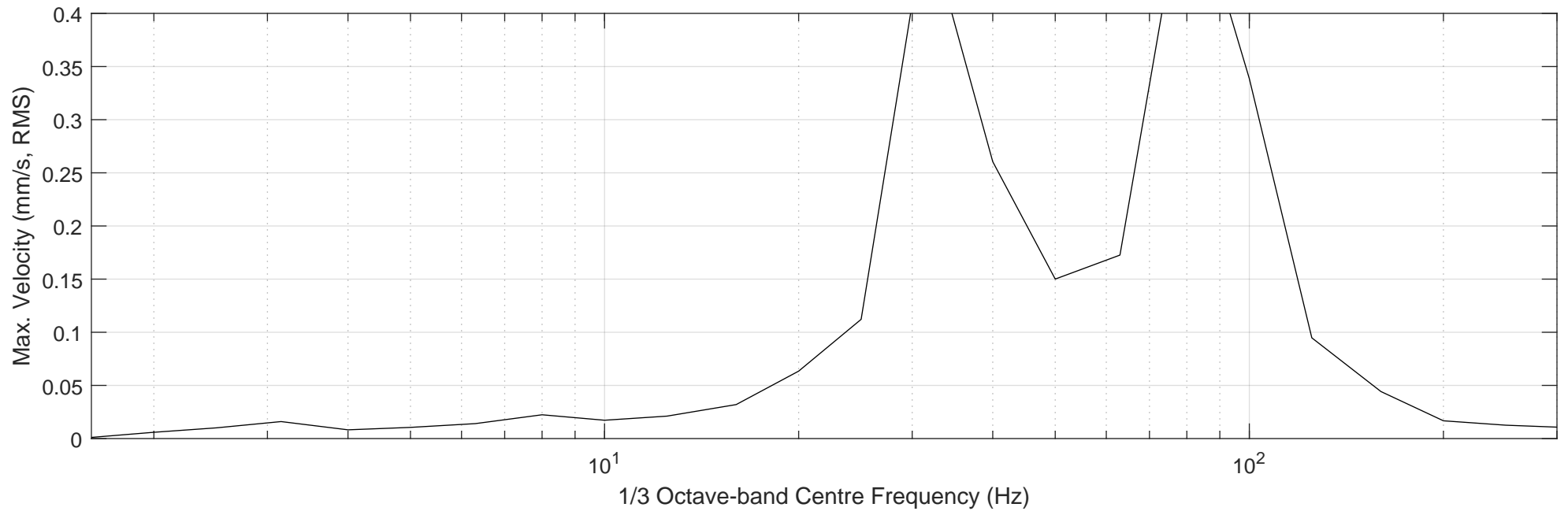
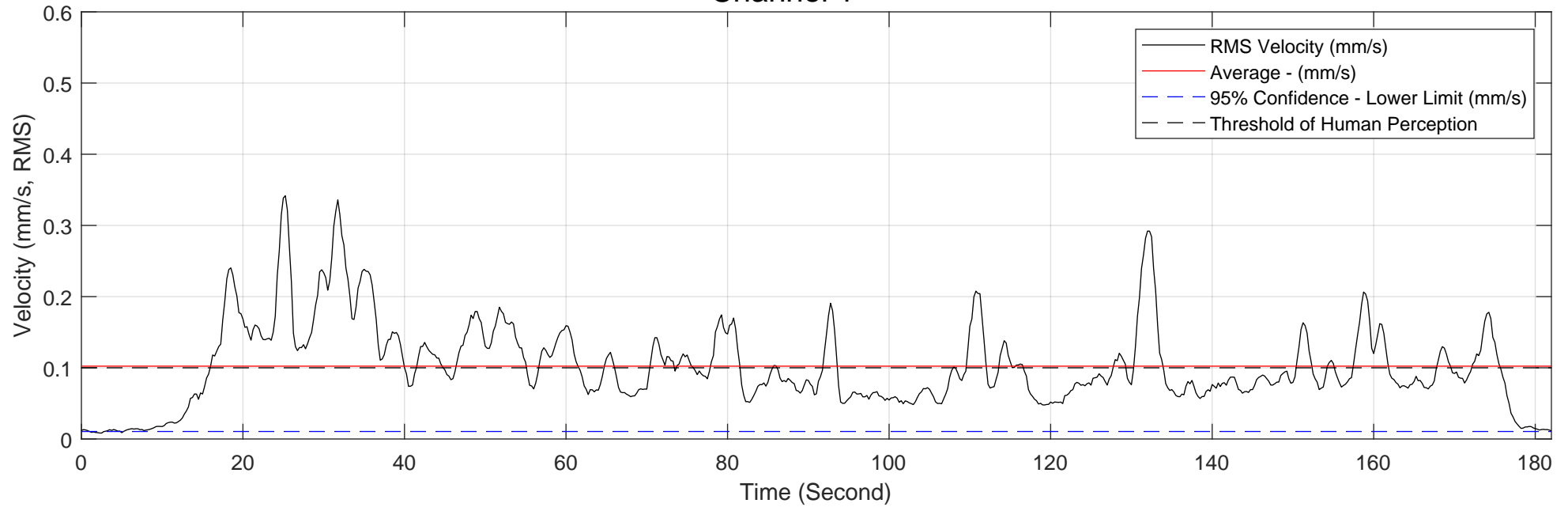
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## Channel 4



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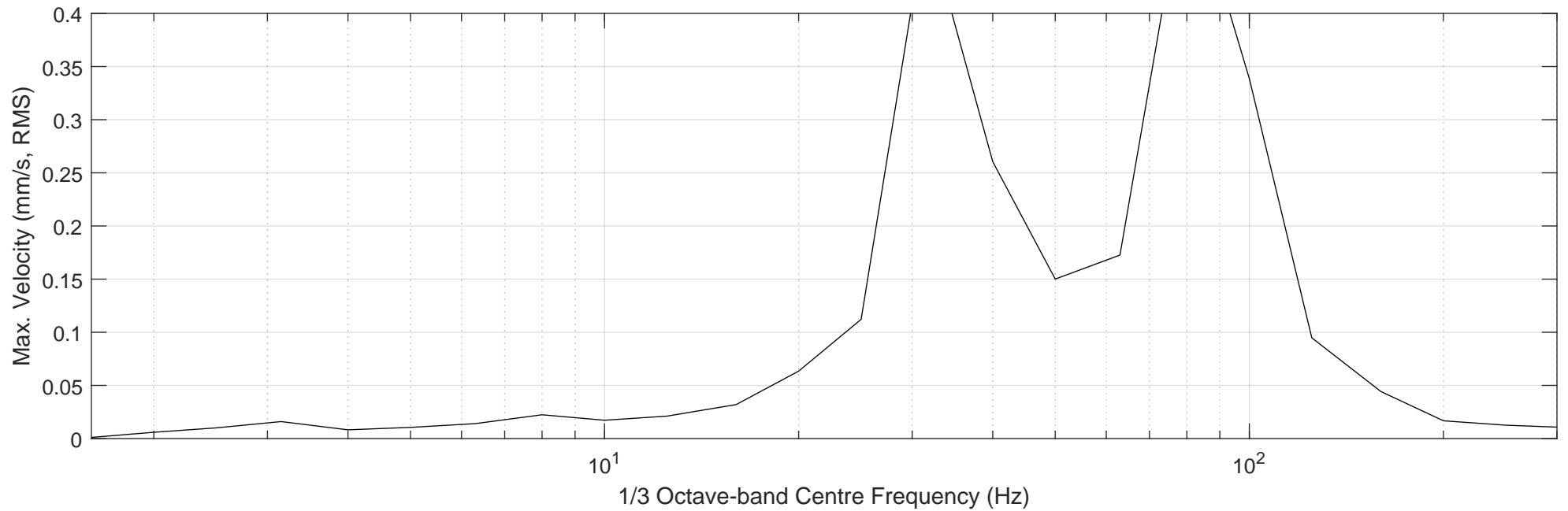
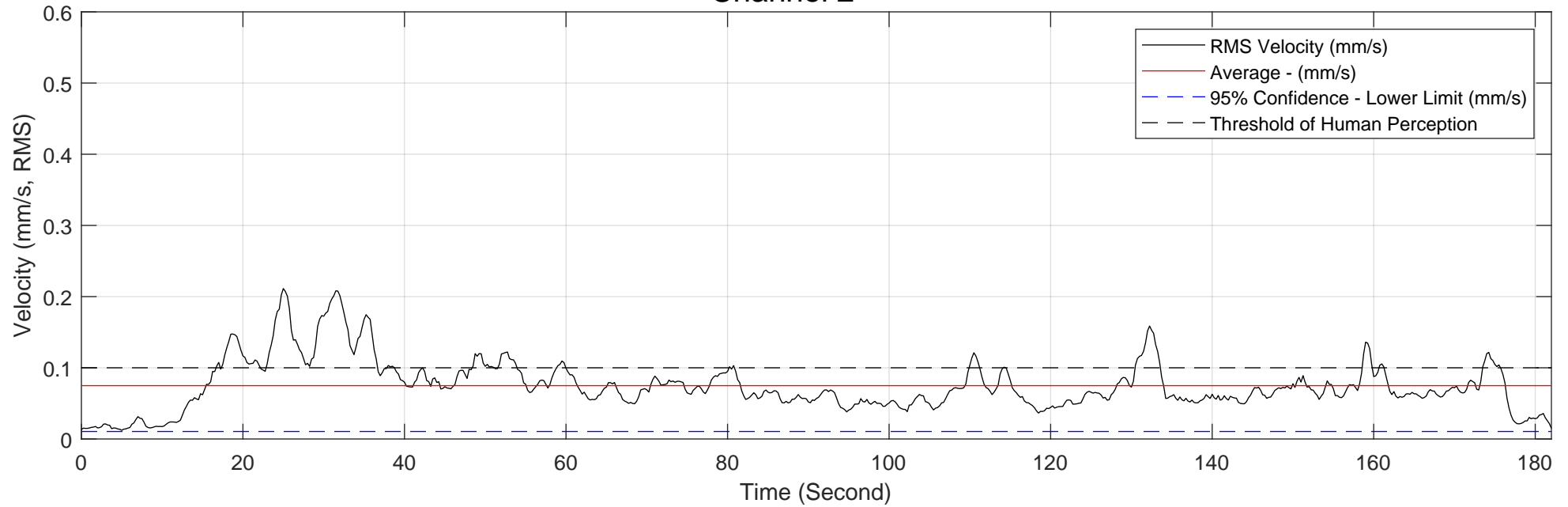
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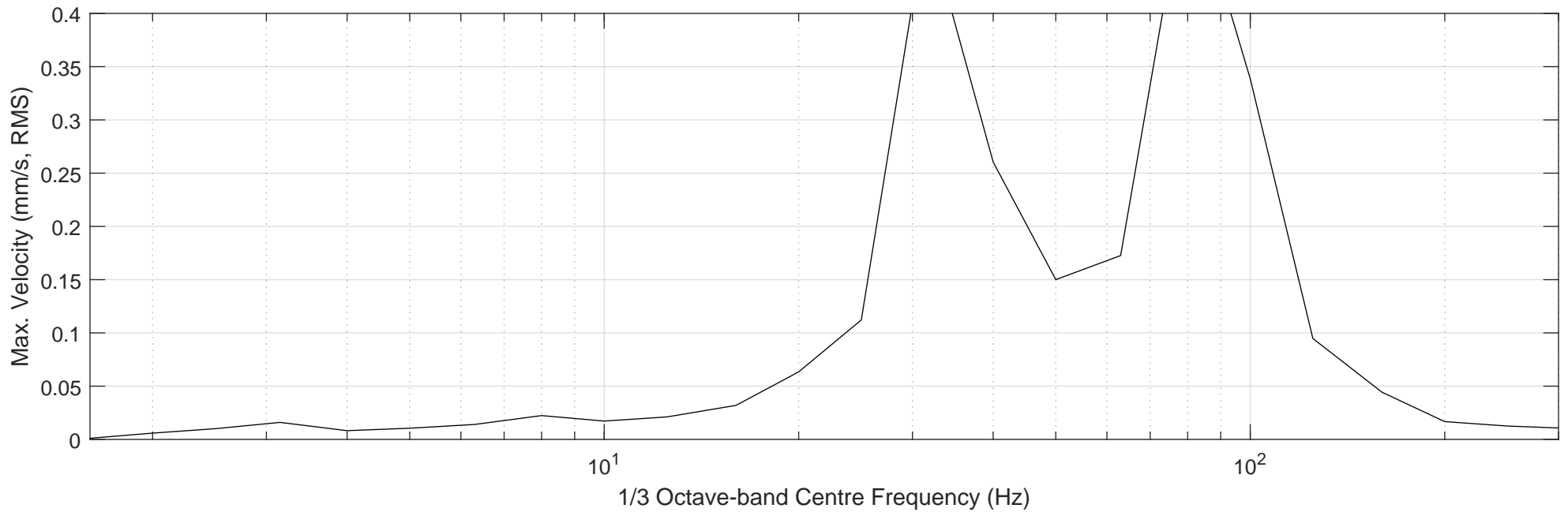
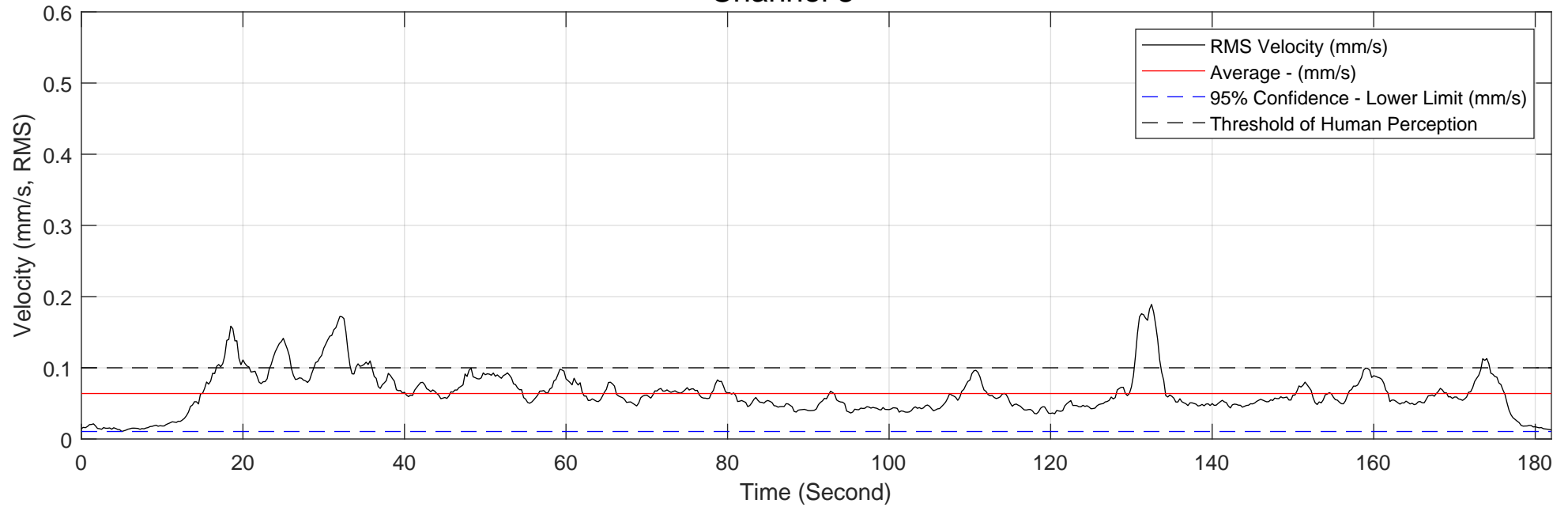
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## Channel 2



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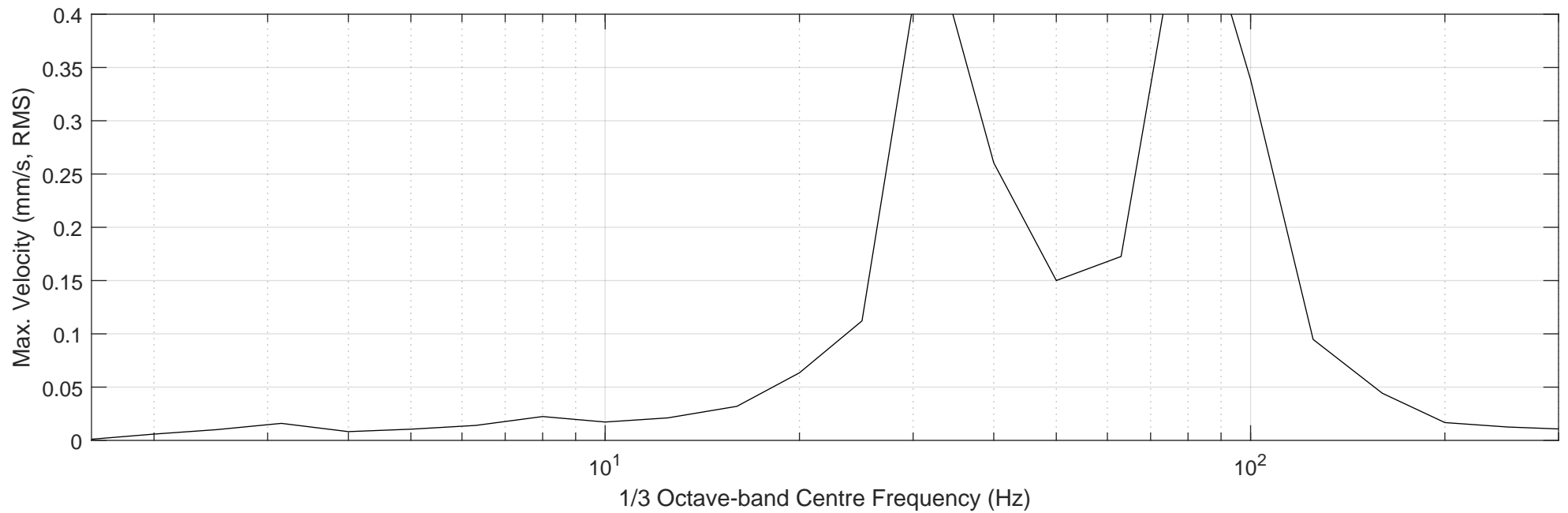
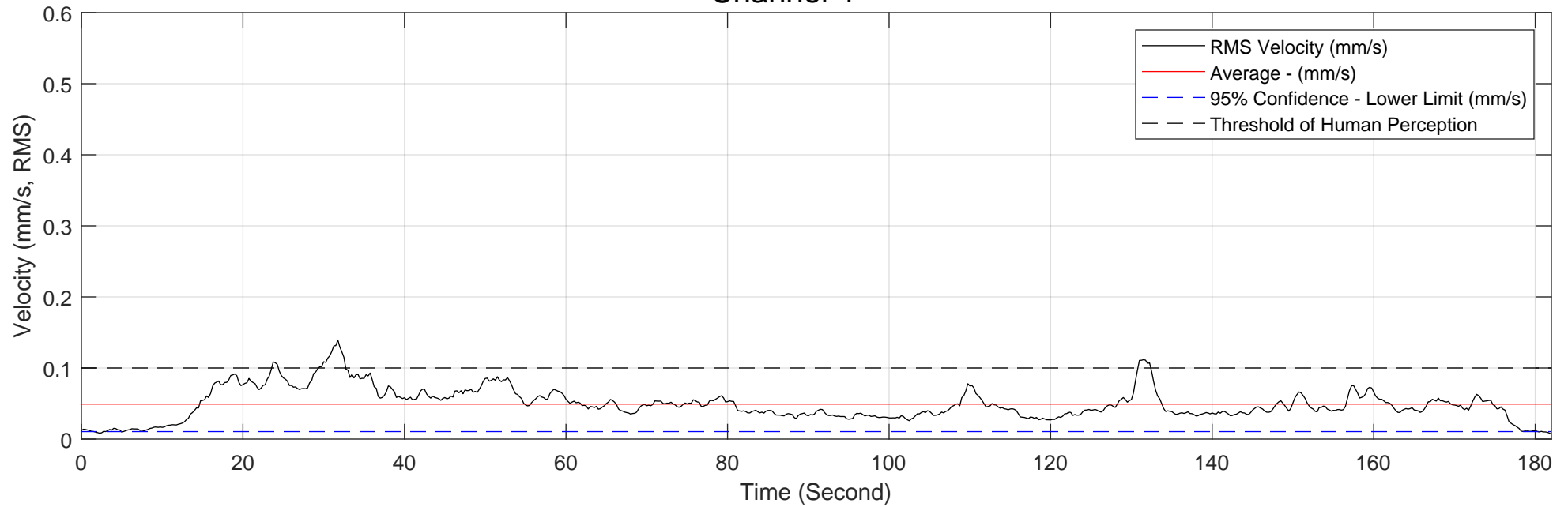
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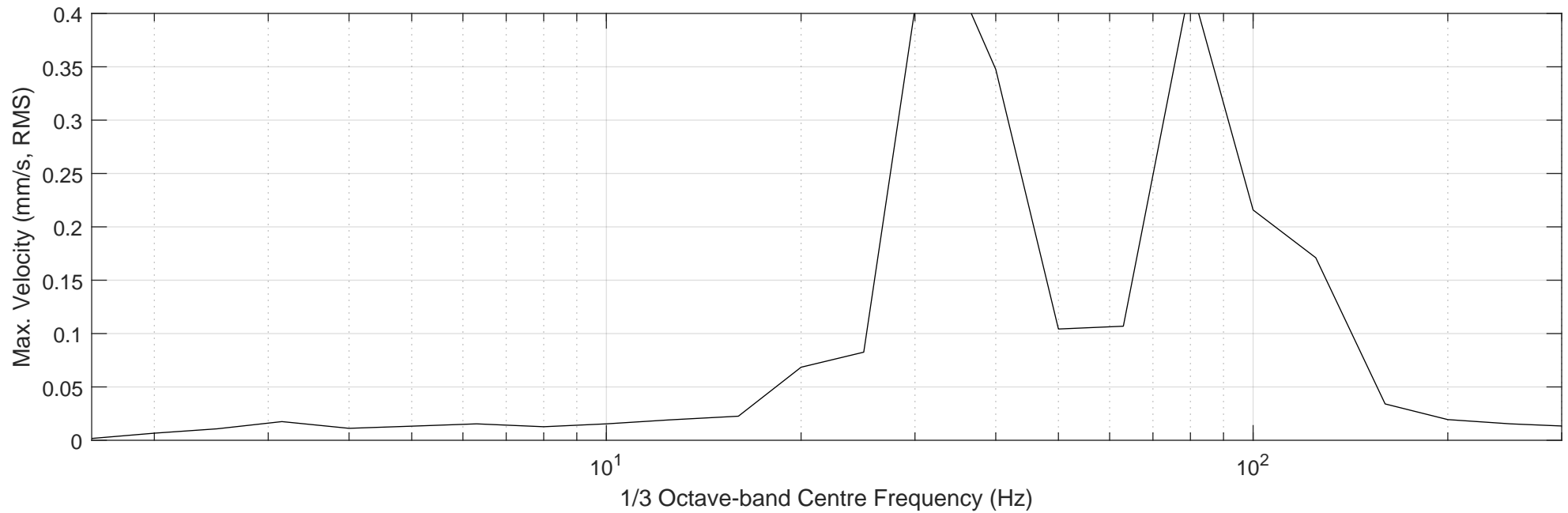
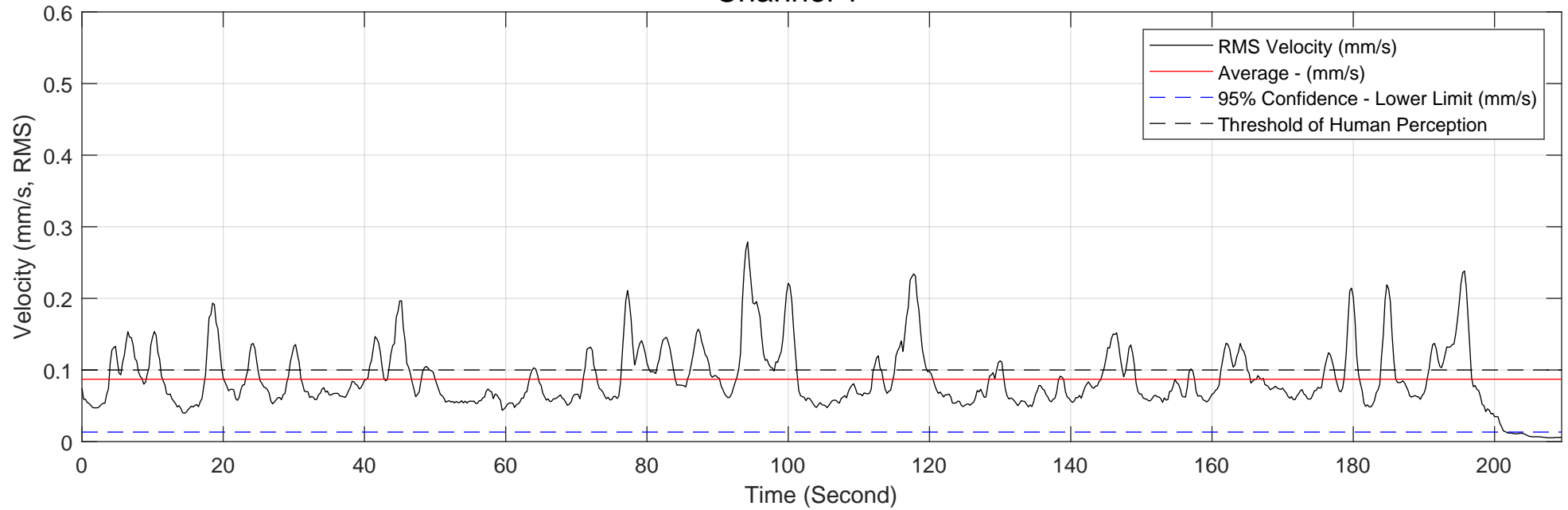
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## Channel 4



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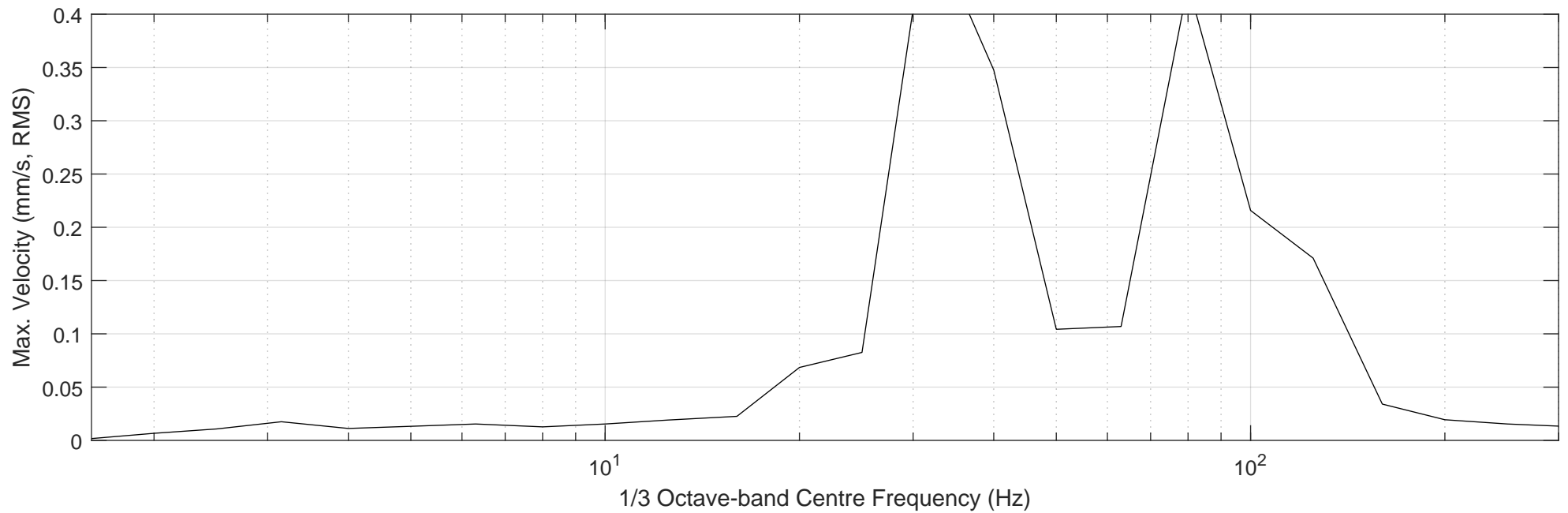
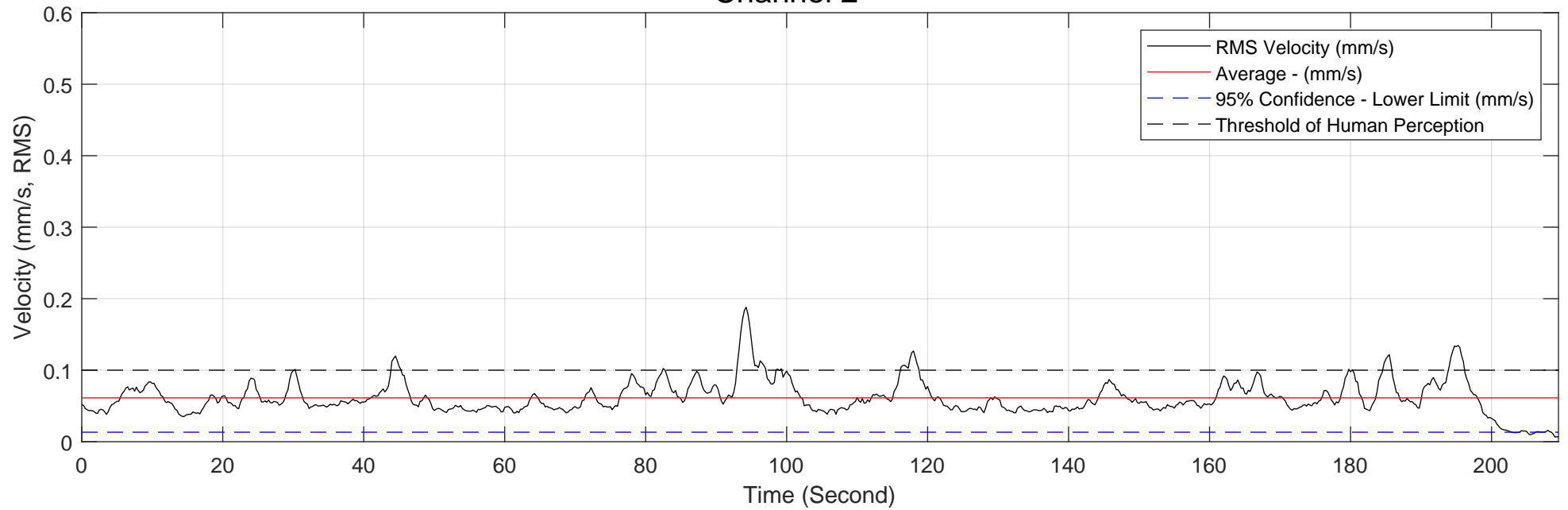
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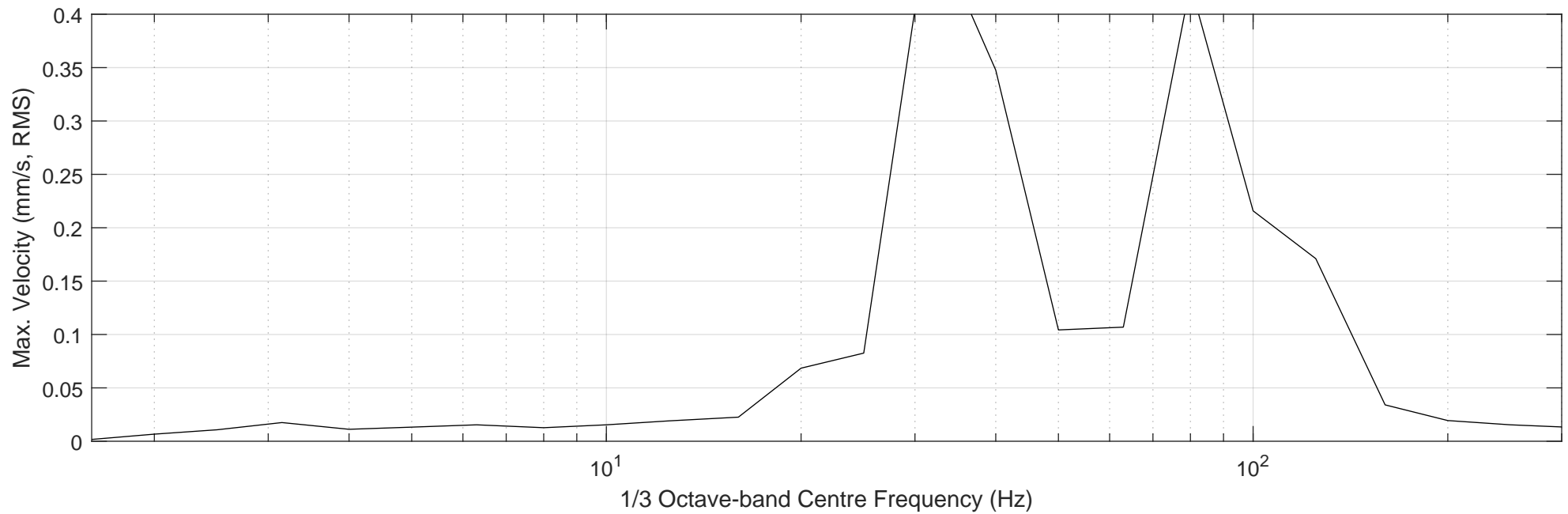
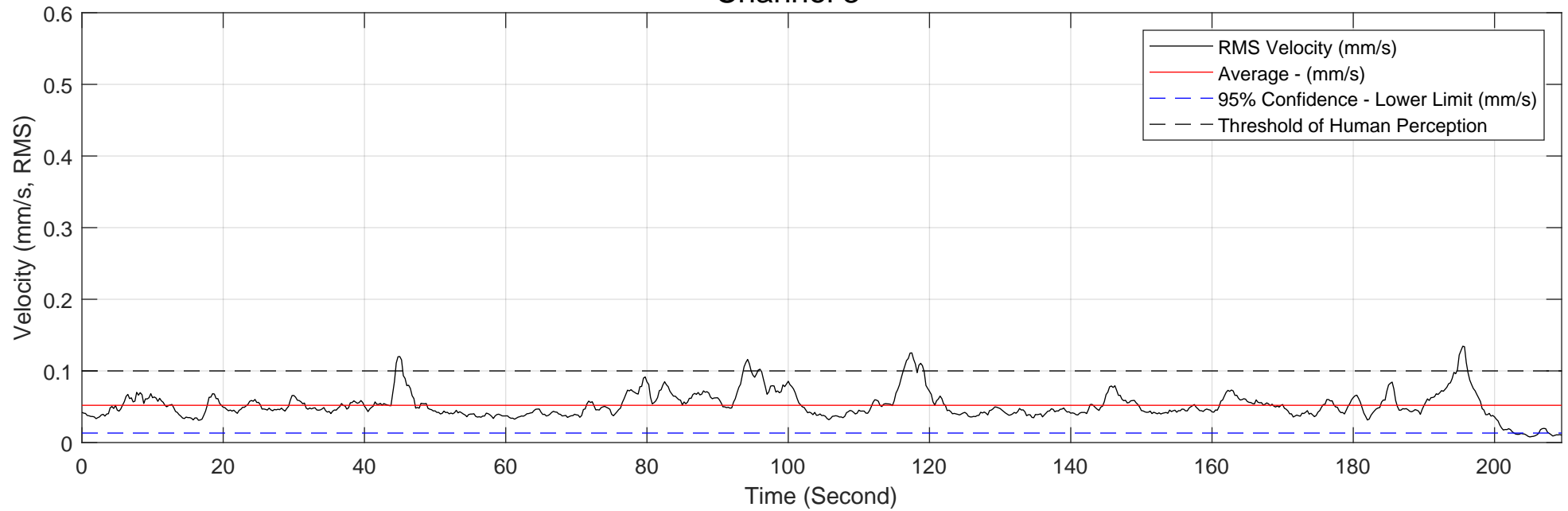
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## Channel 2



# Vibration Measurement Data - Passby7

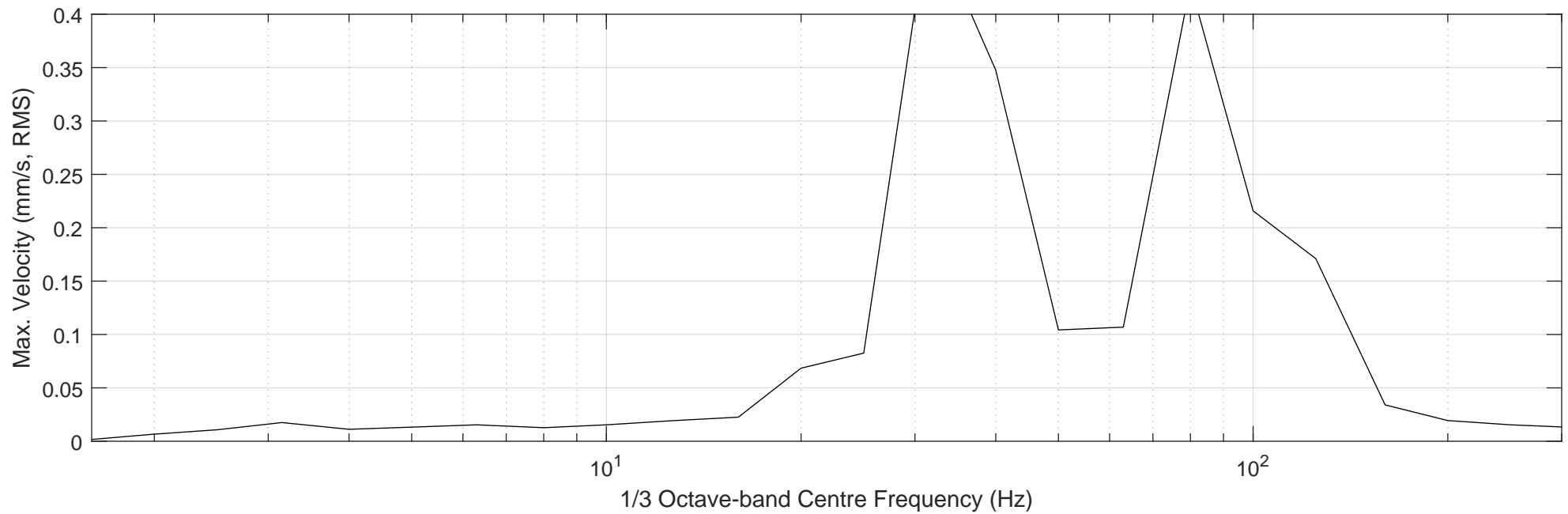
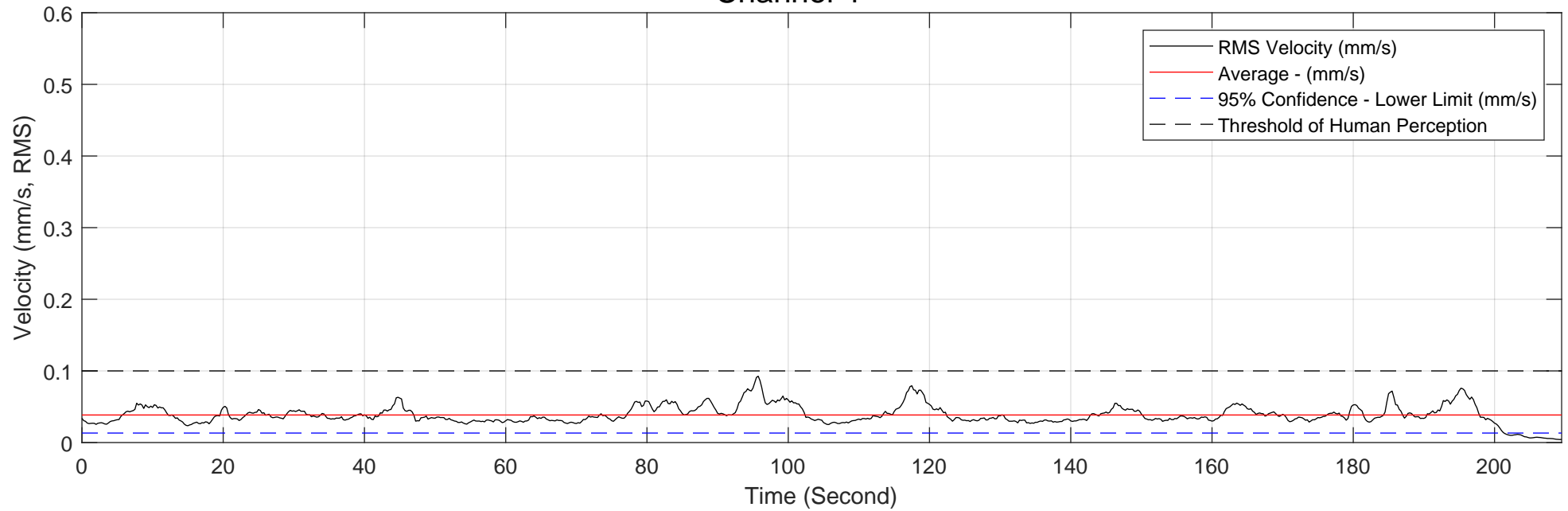
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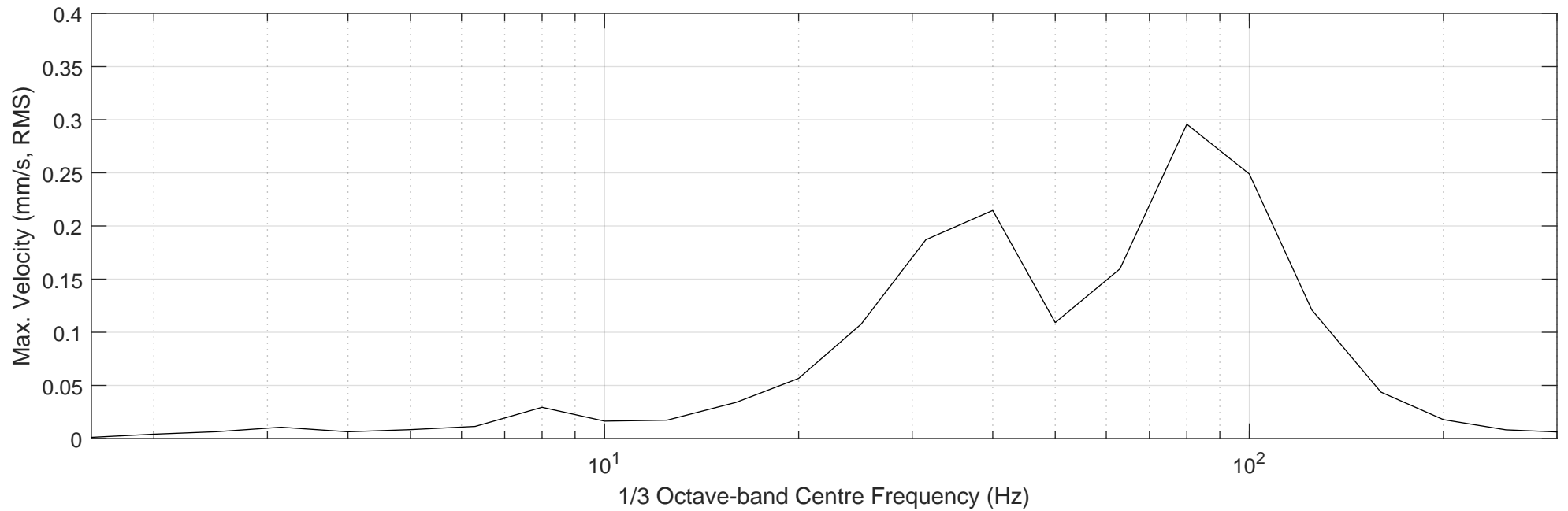
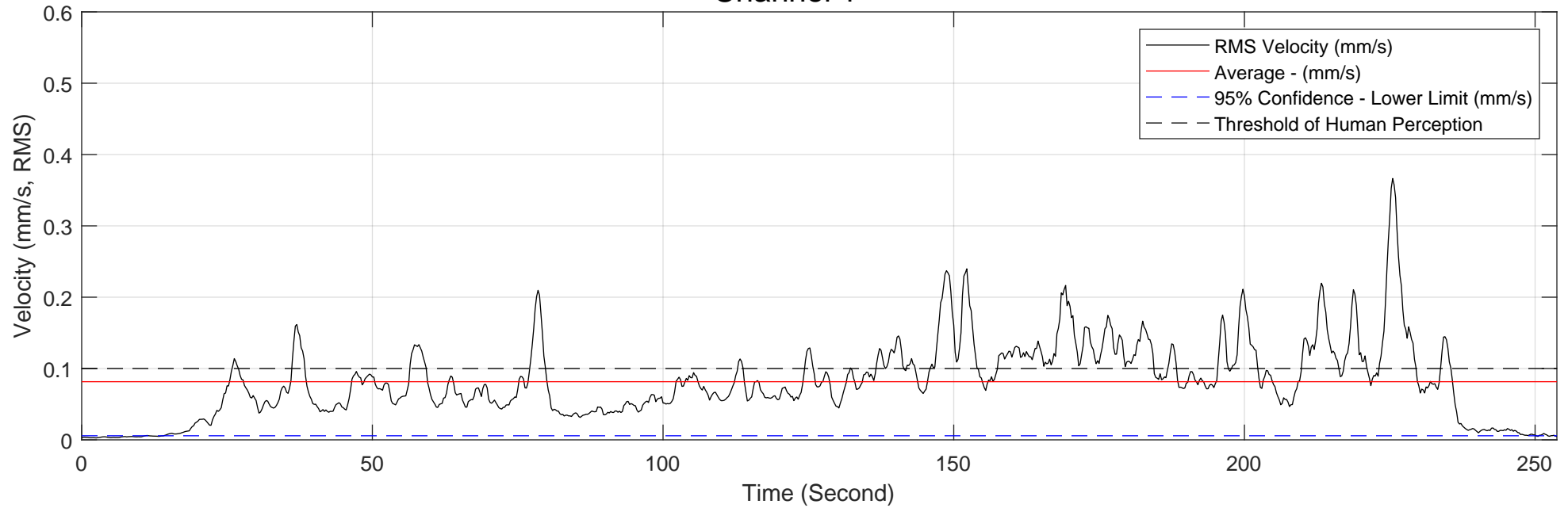
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## Channel 4



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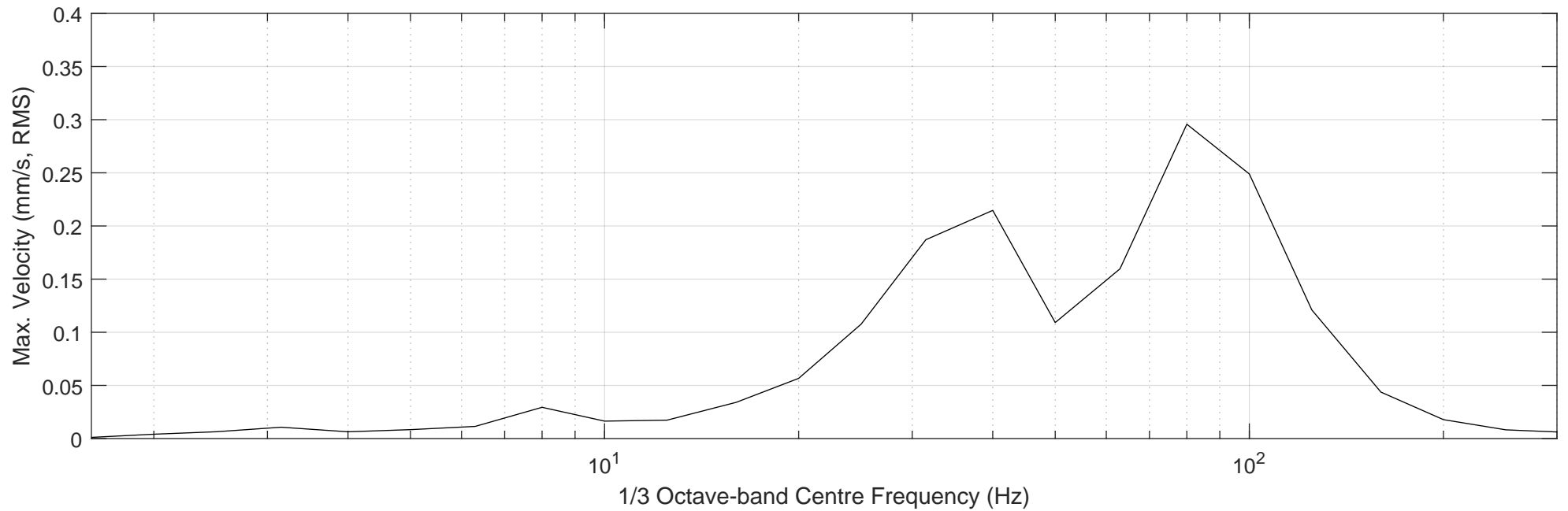
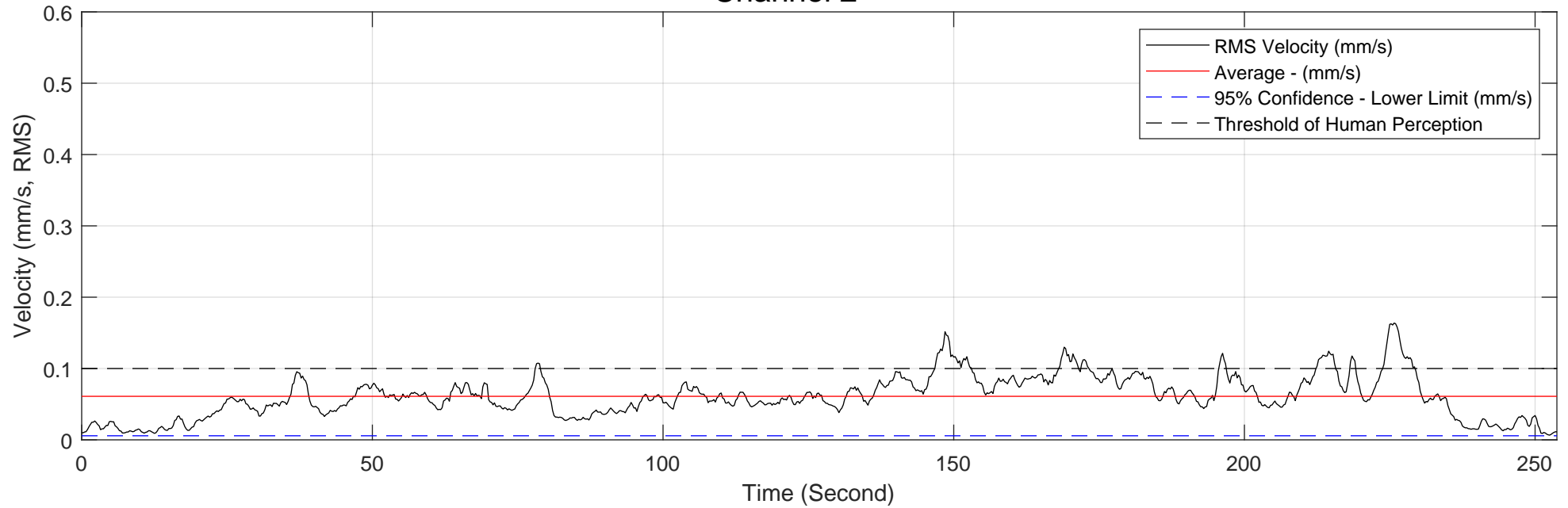
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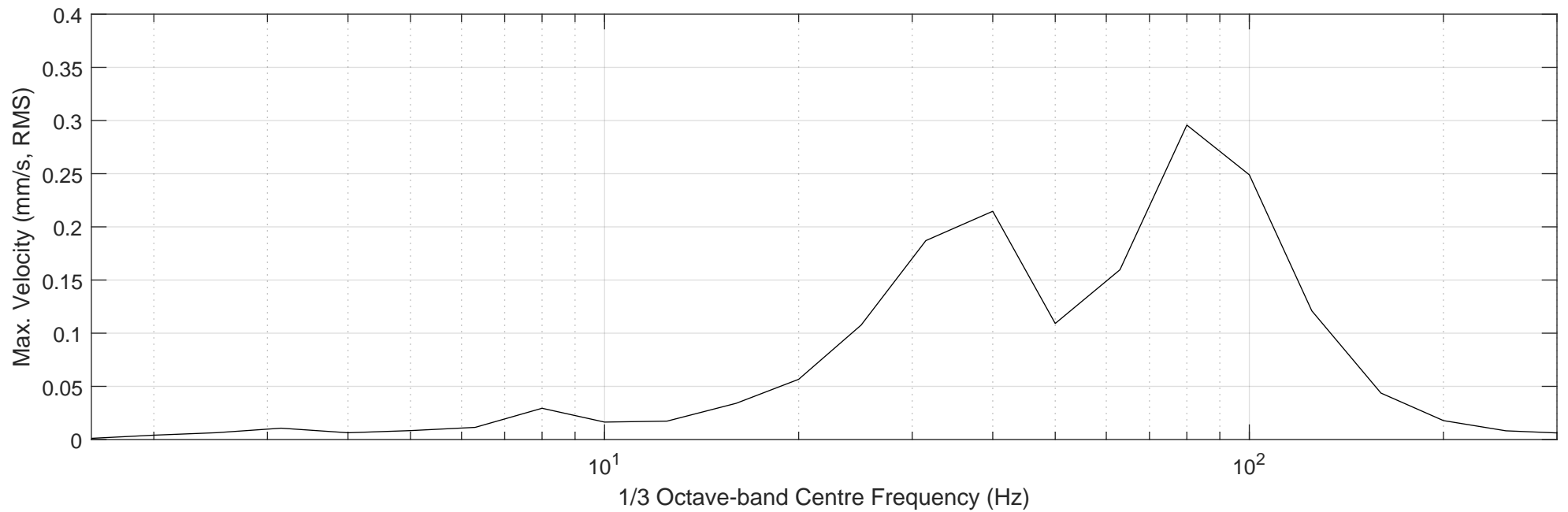
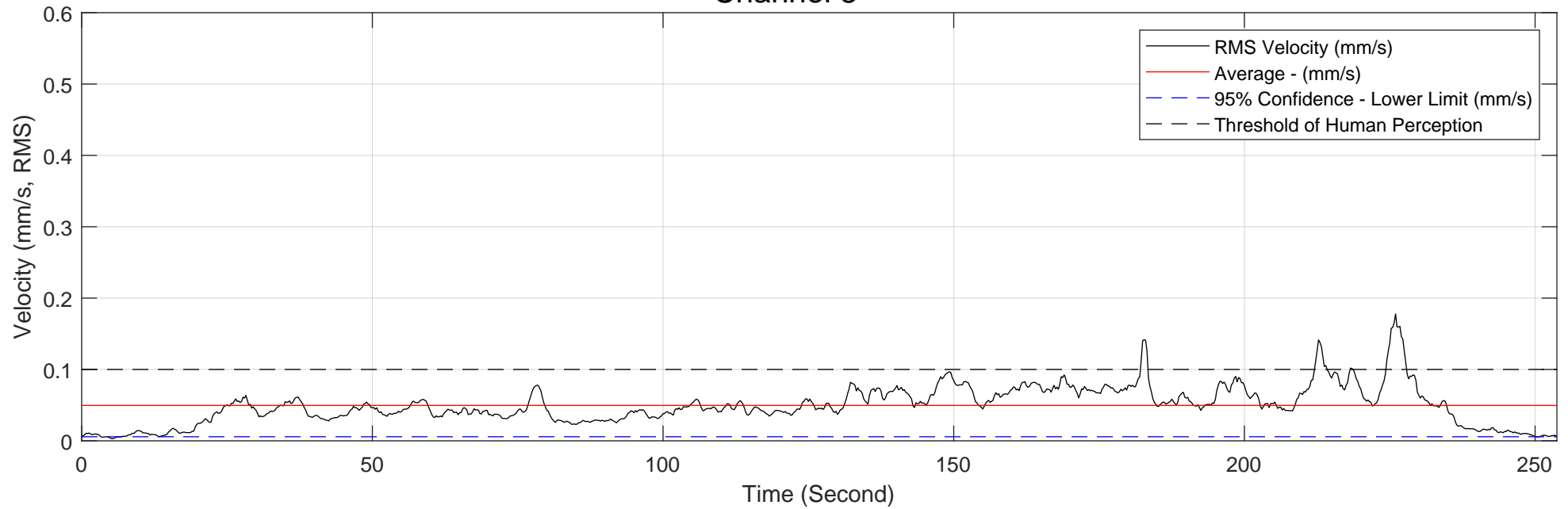
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## Channel 2



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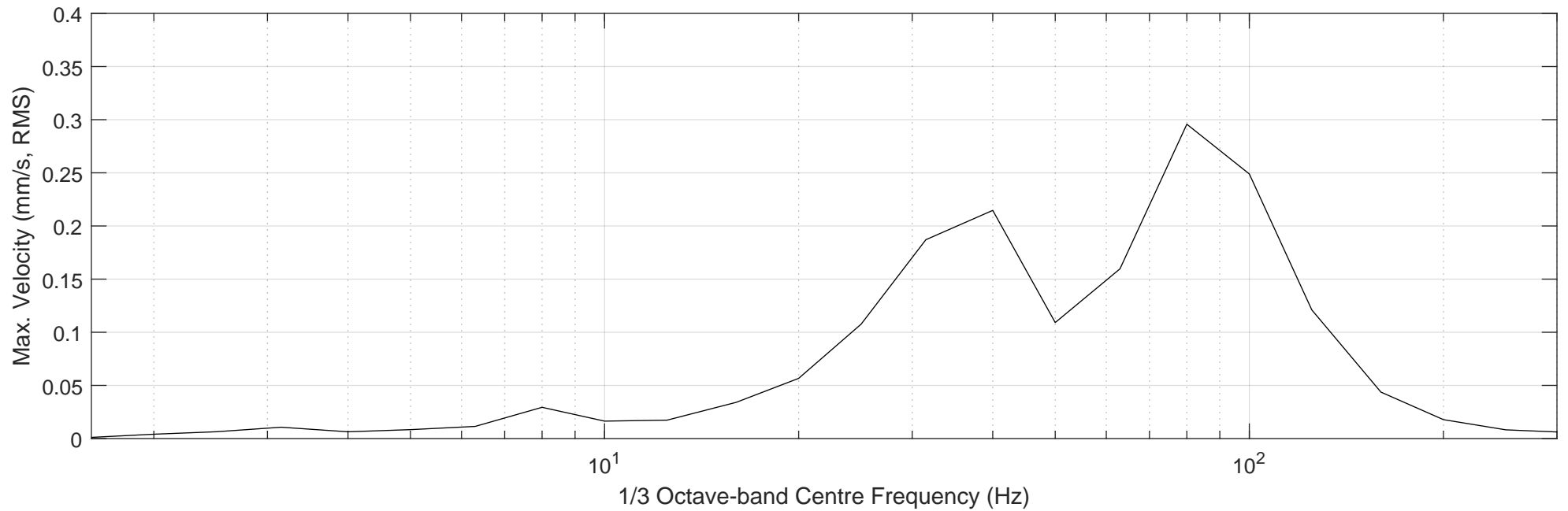
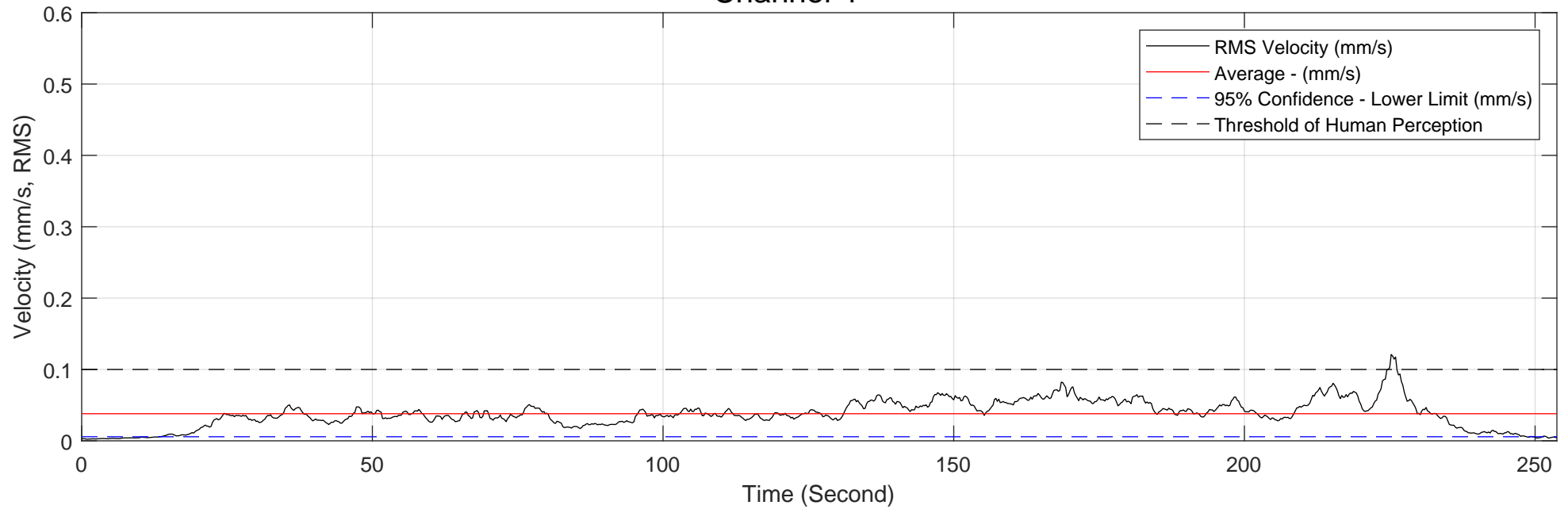
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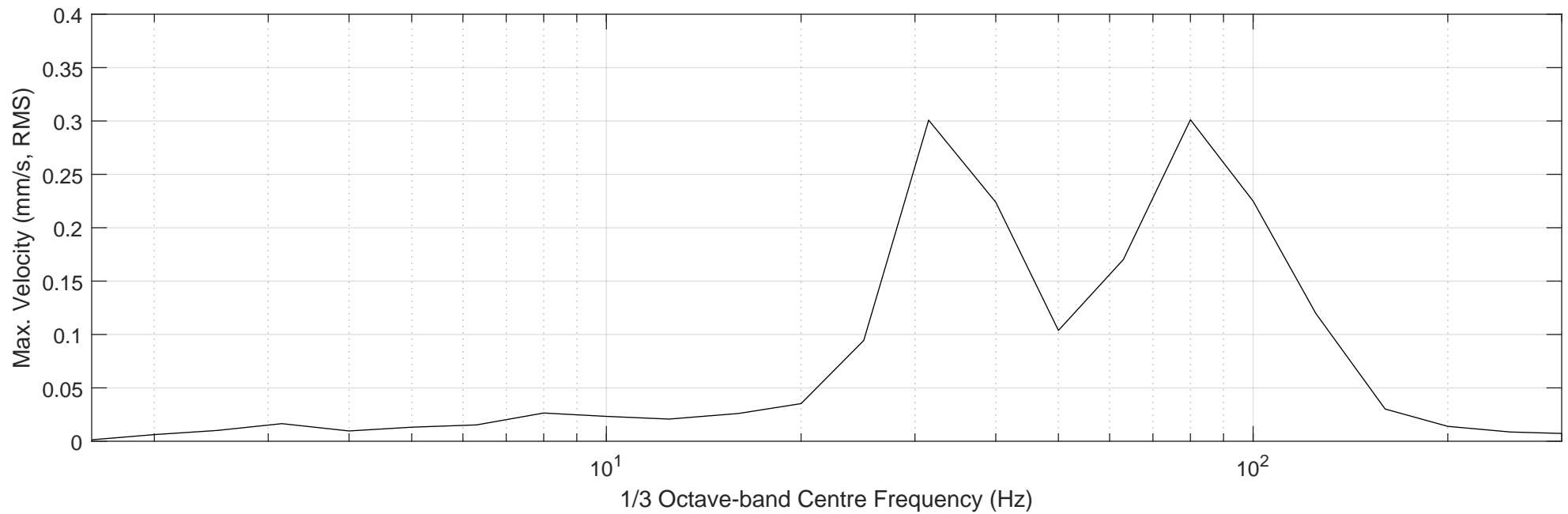
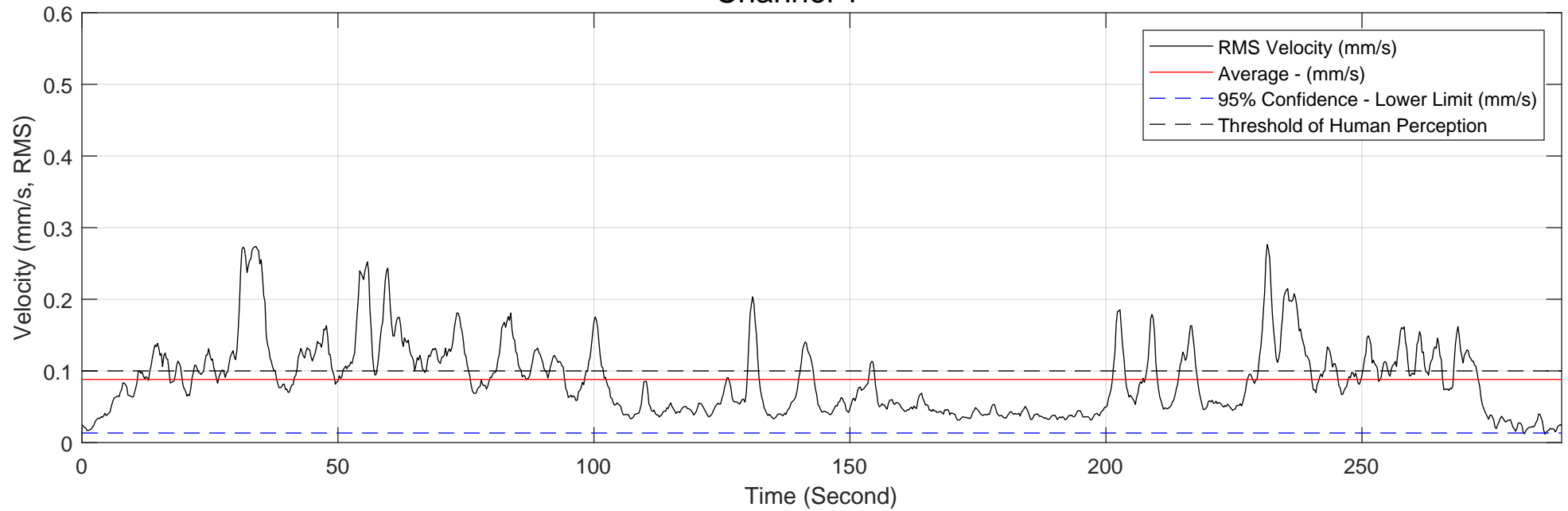
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## Channel 4



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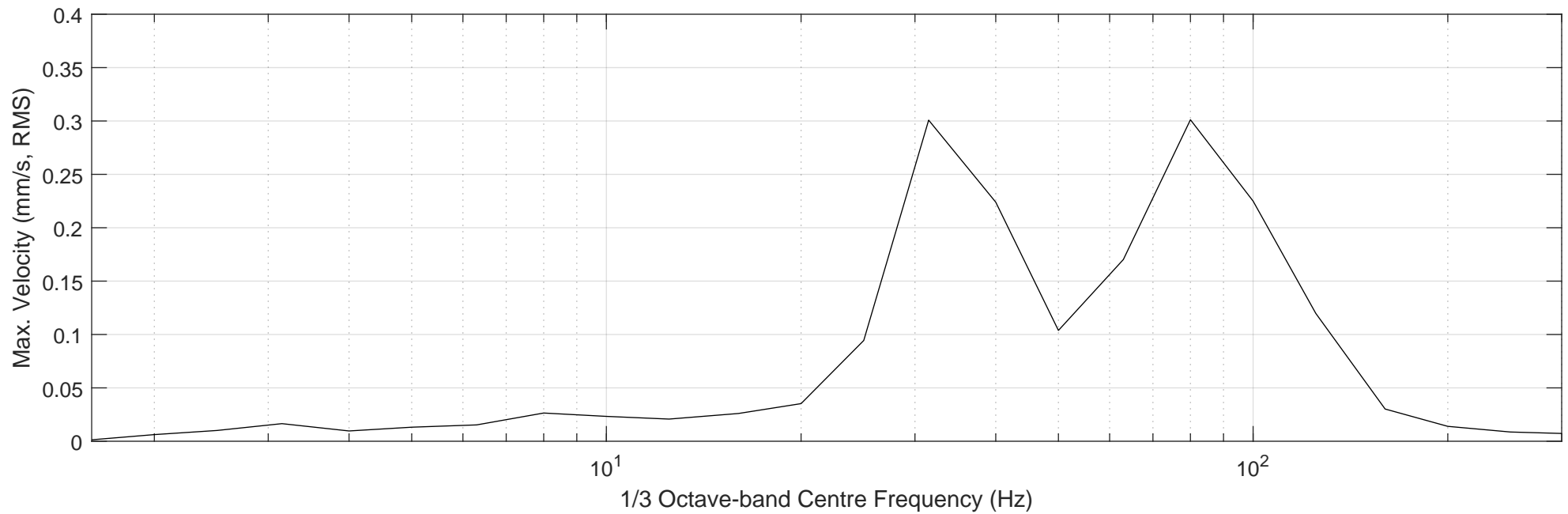
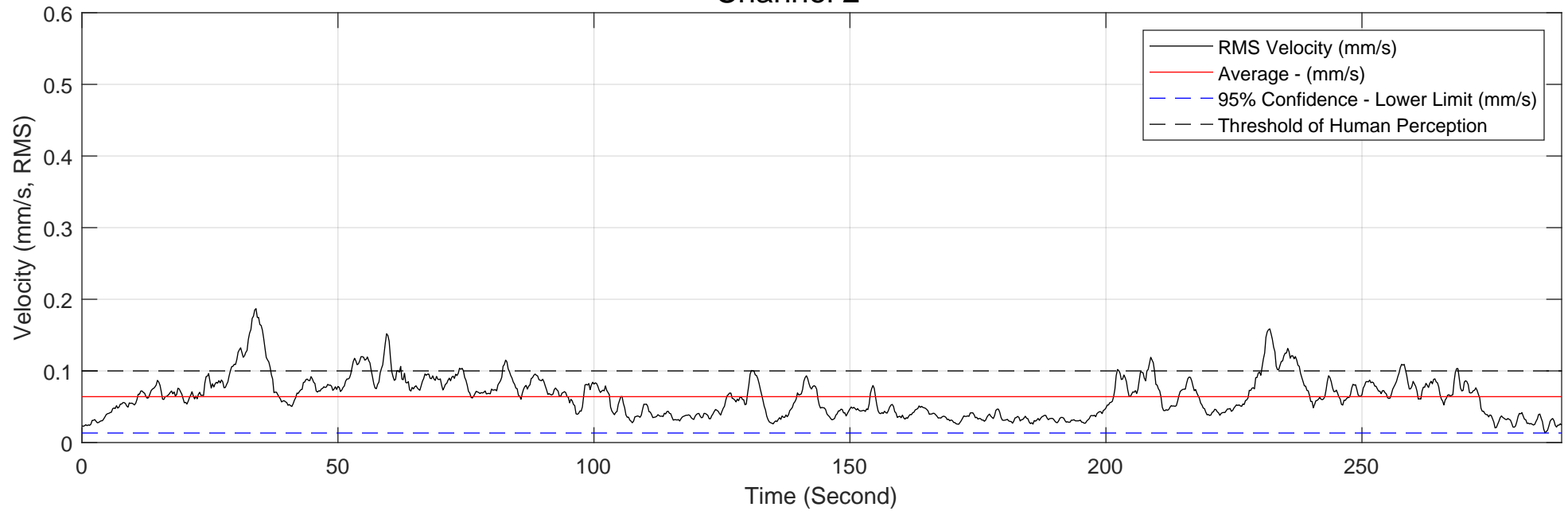
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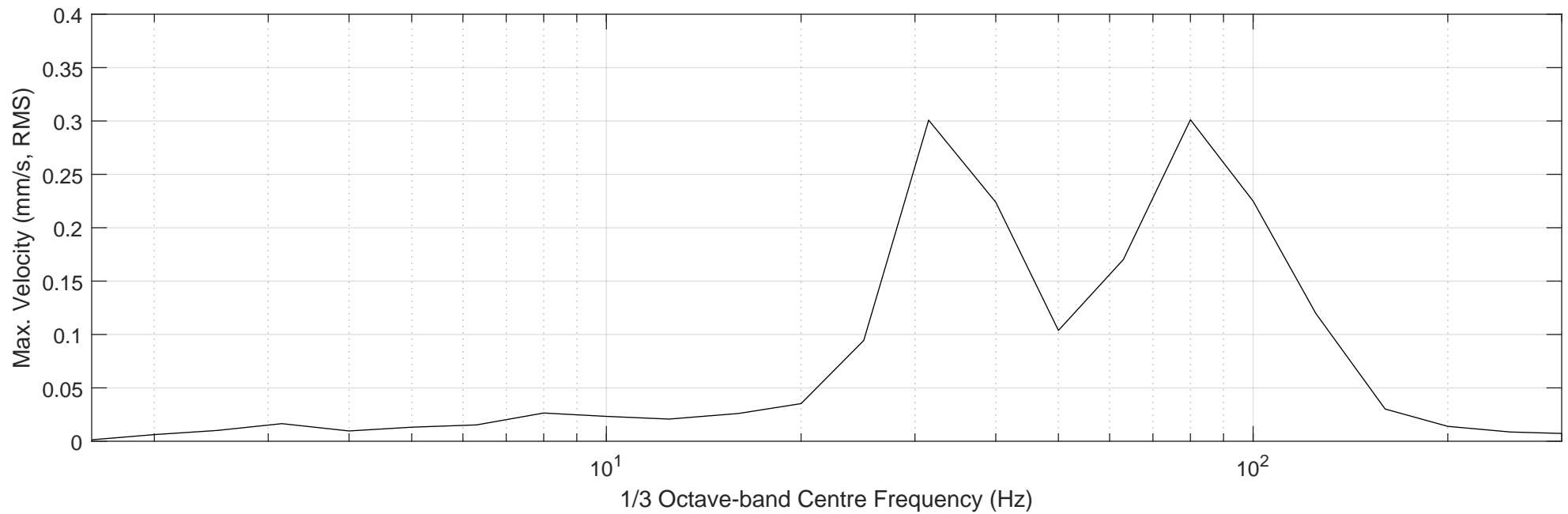
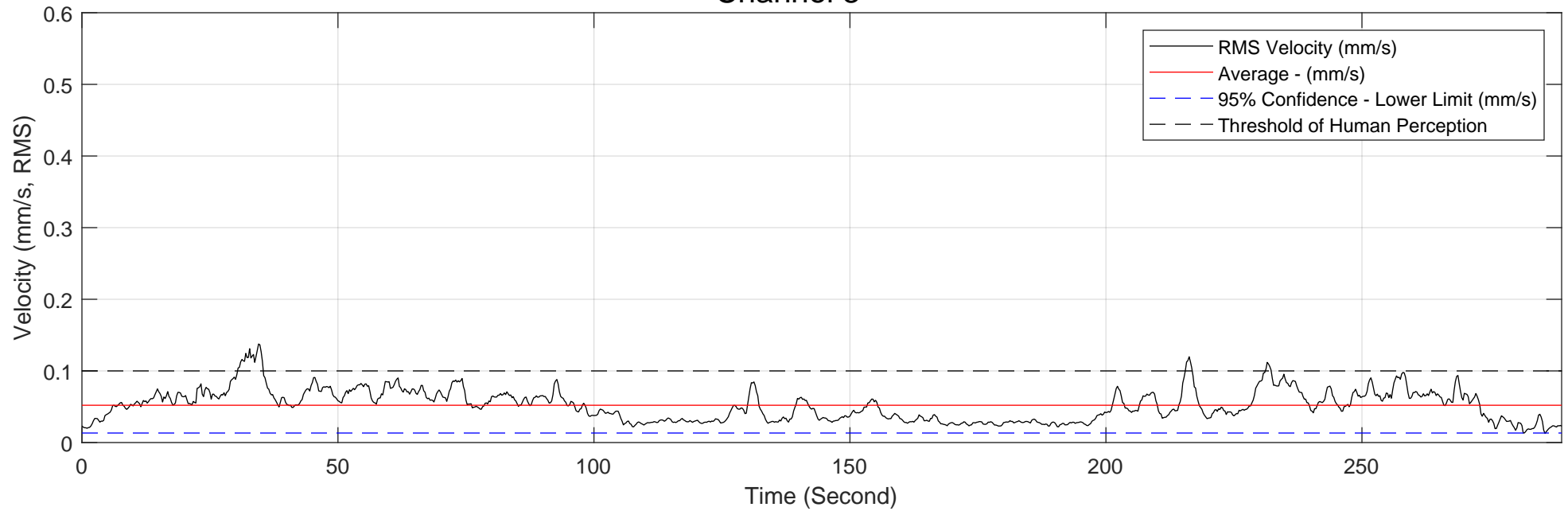
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## Channel 2



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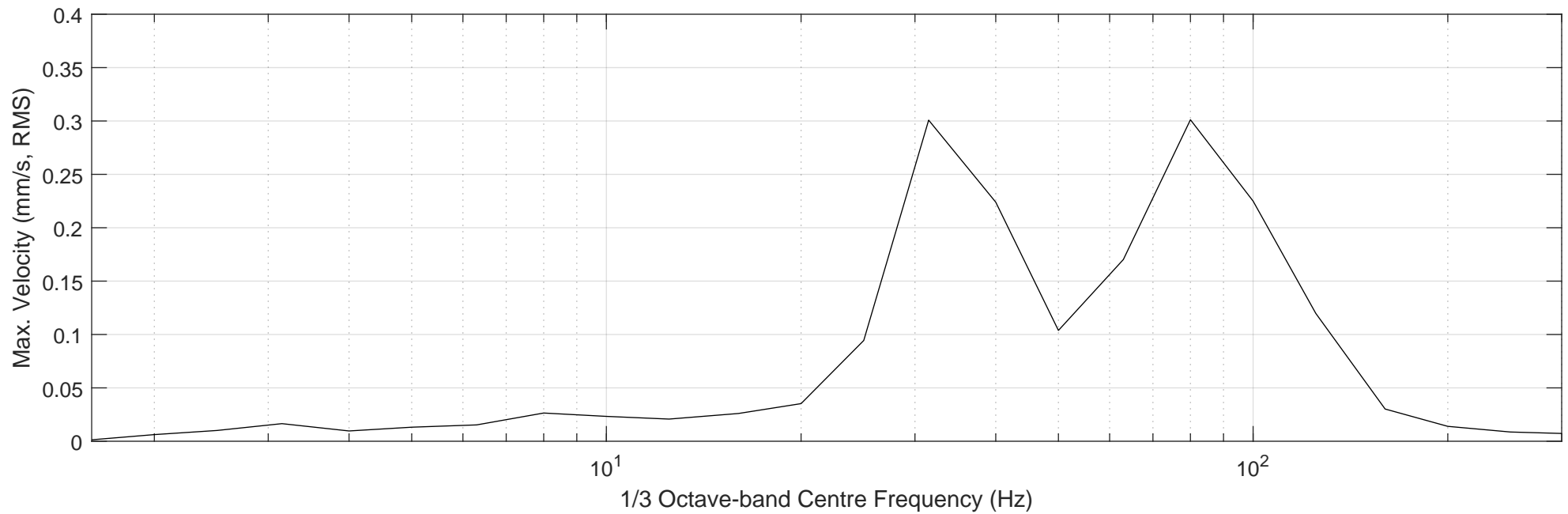
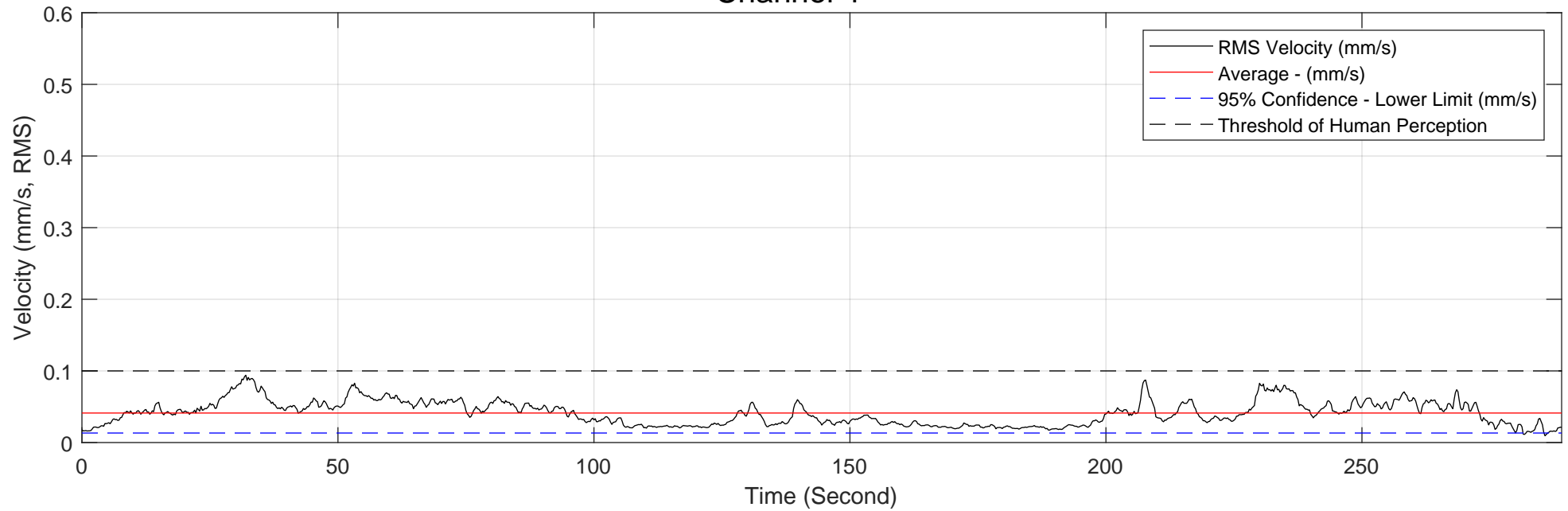
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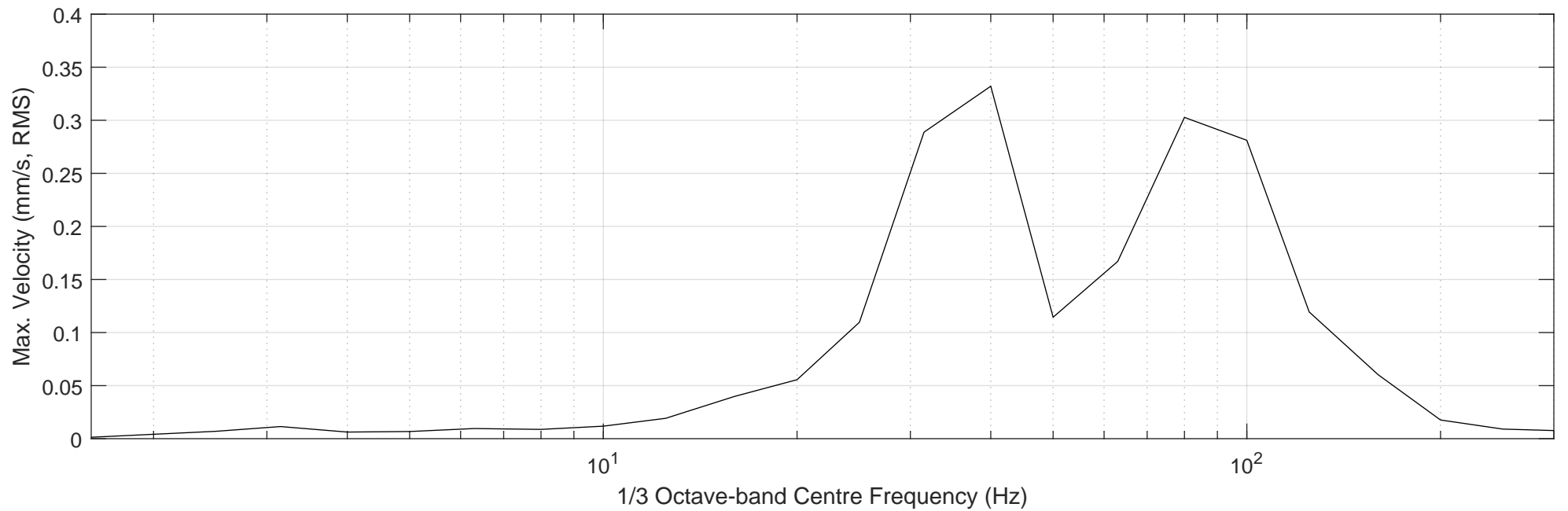
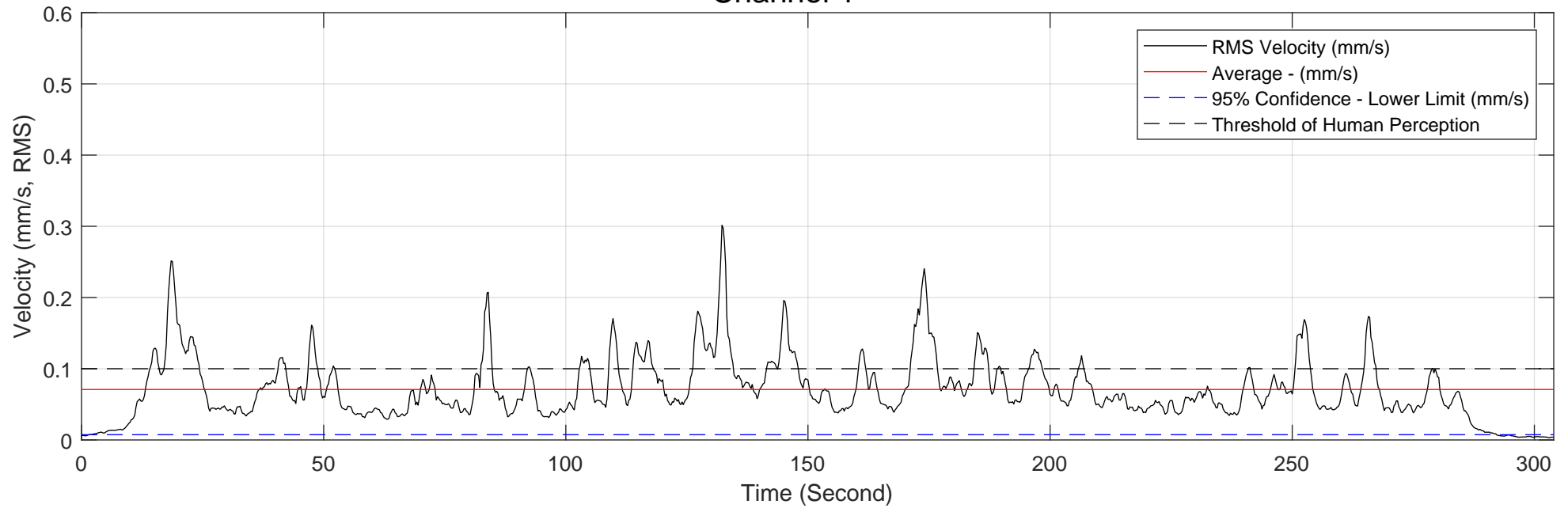
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## Channel 4



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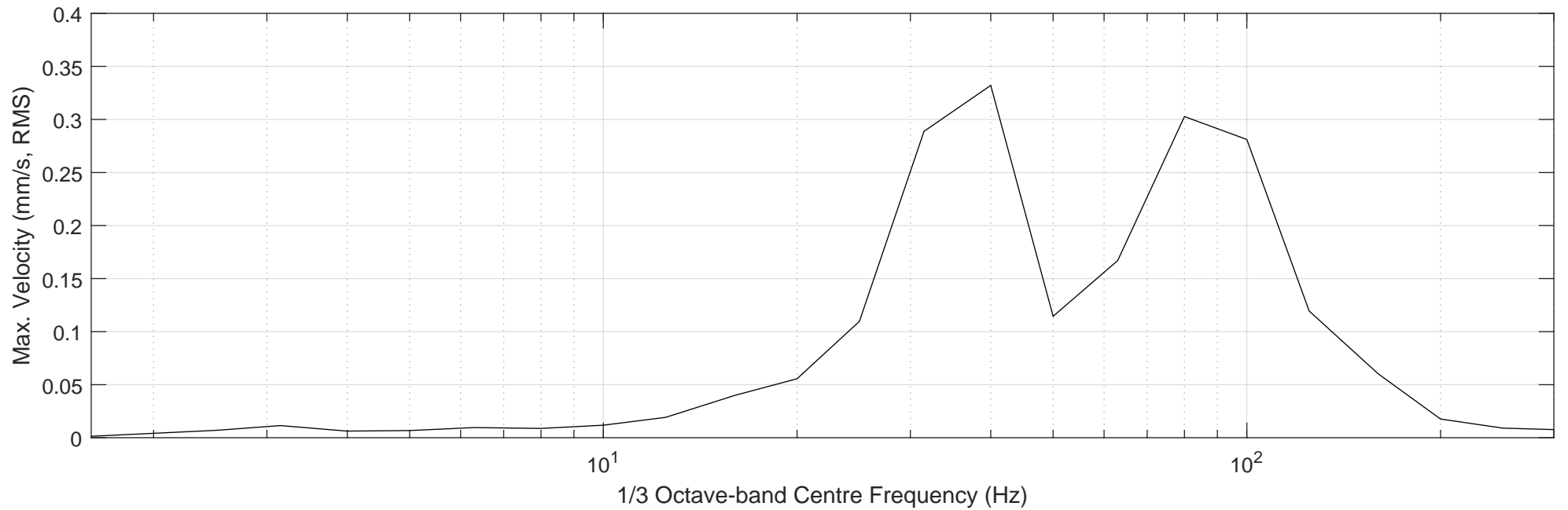
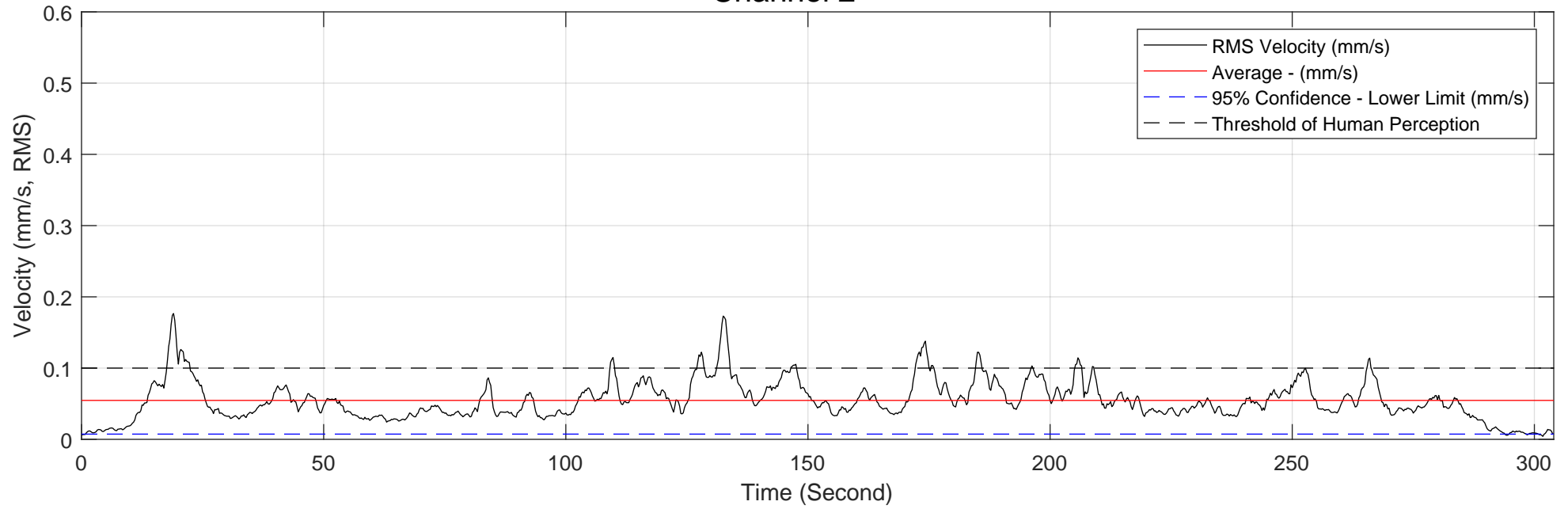
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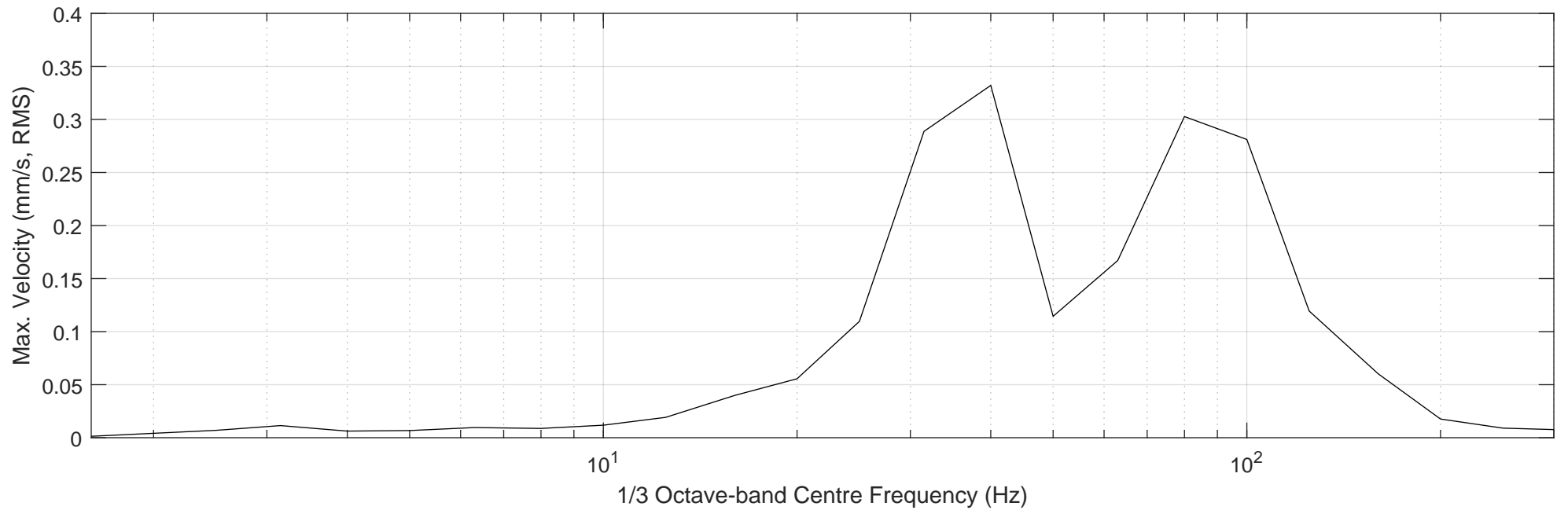
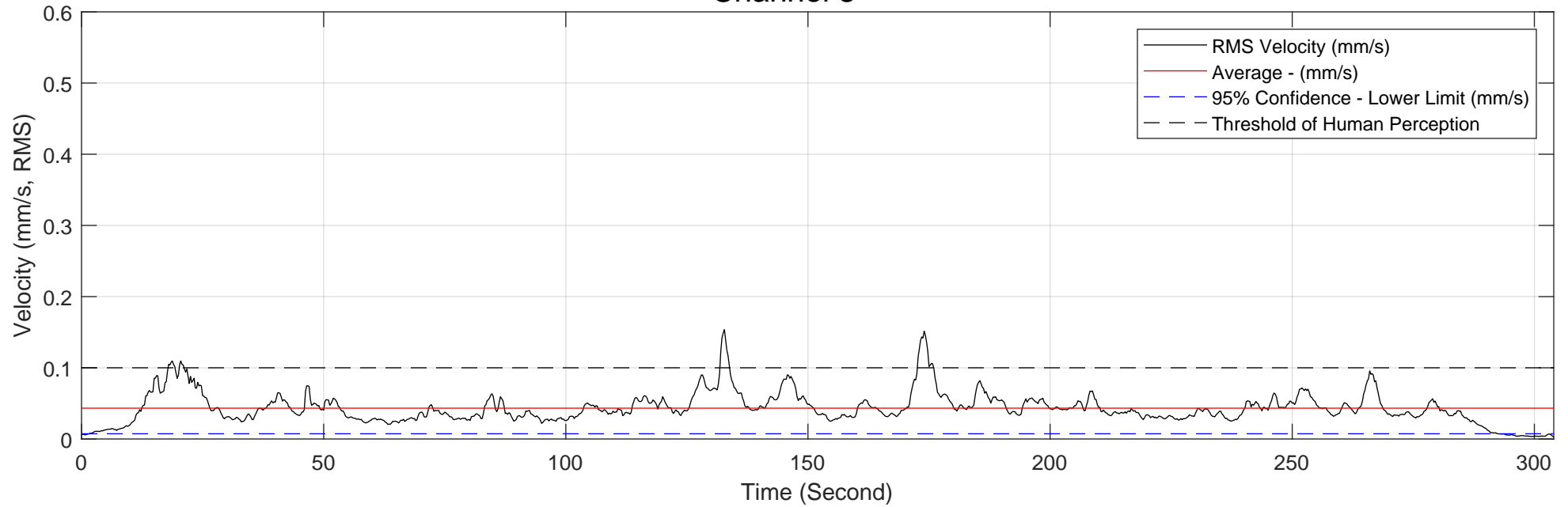
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## Channel 2



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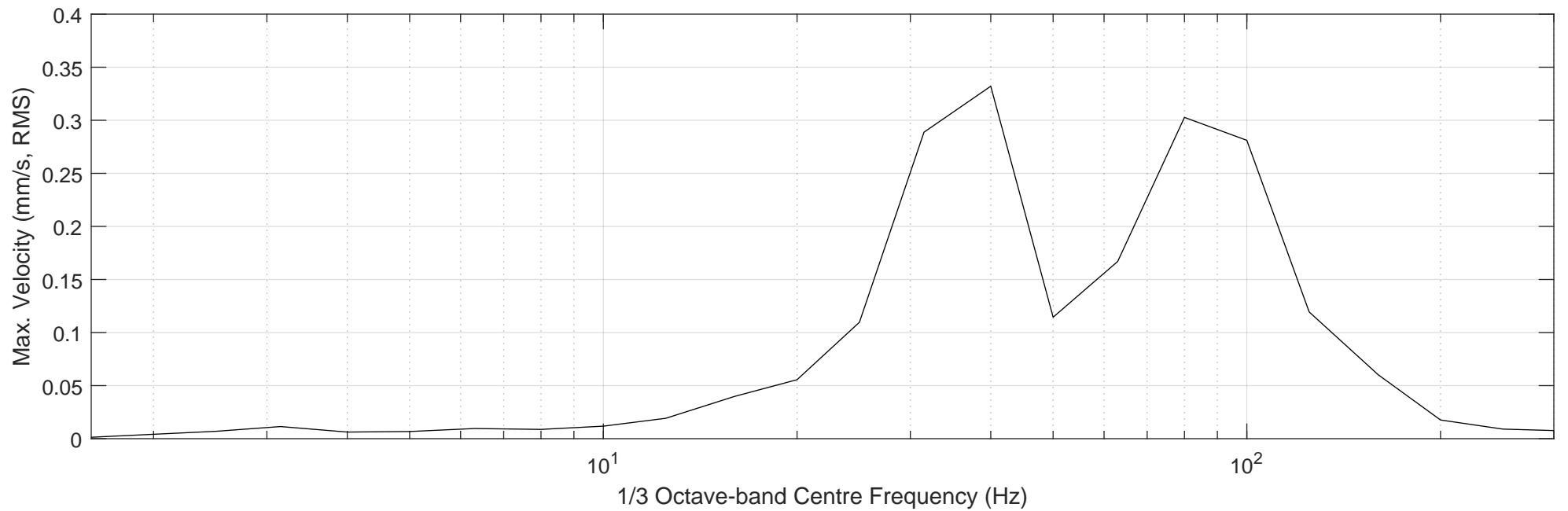
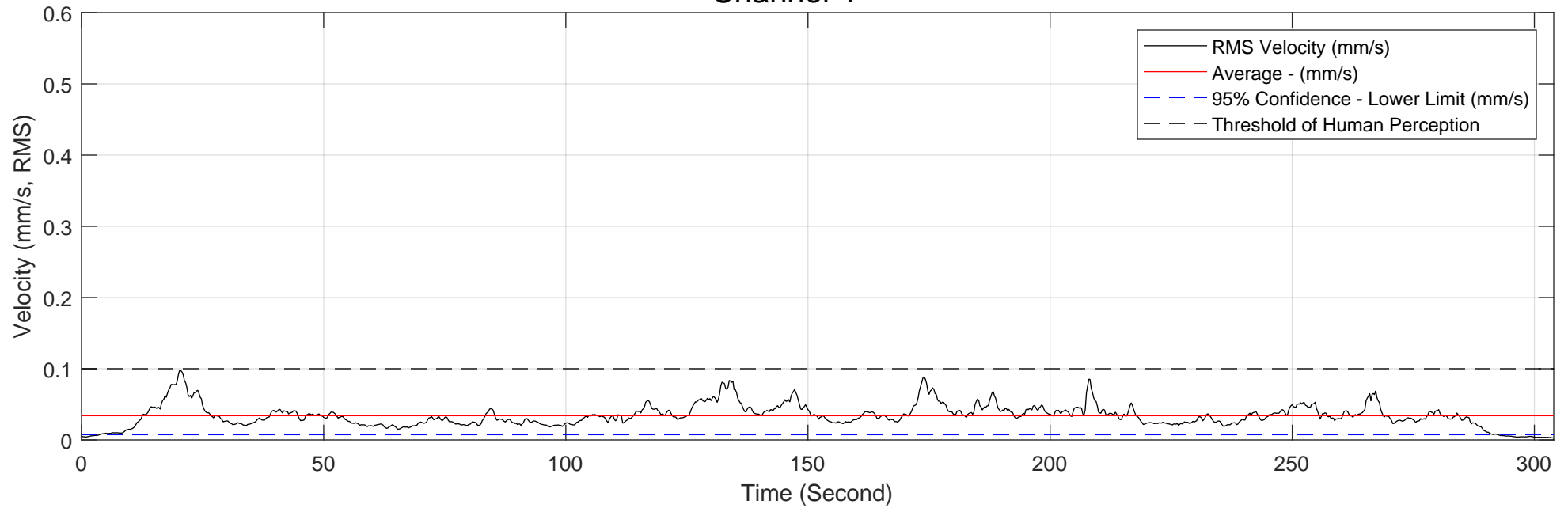
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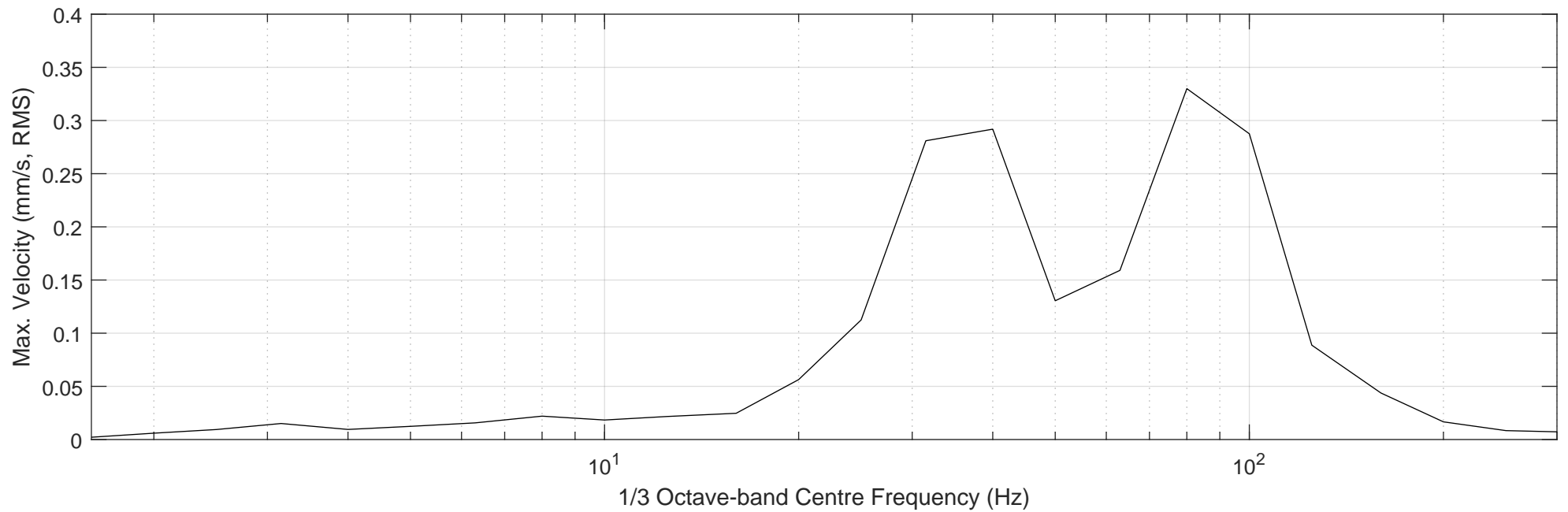
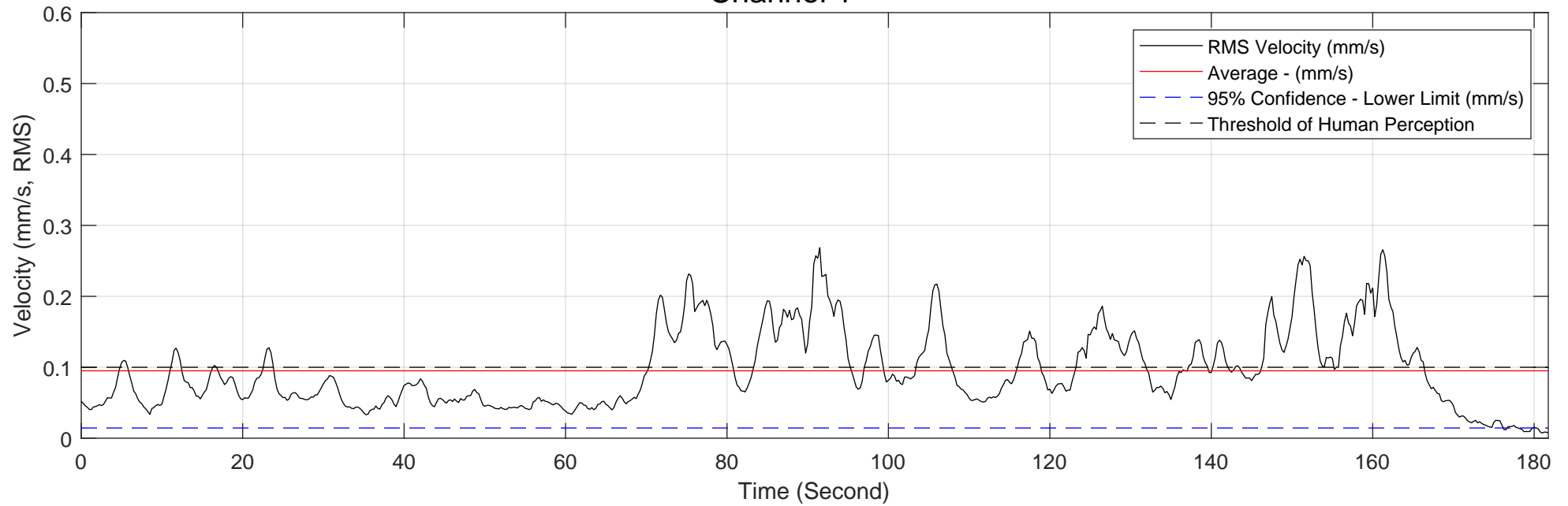
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## Channel 4



# Vibration Measurement Data - Passby11

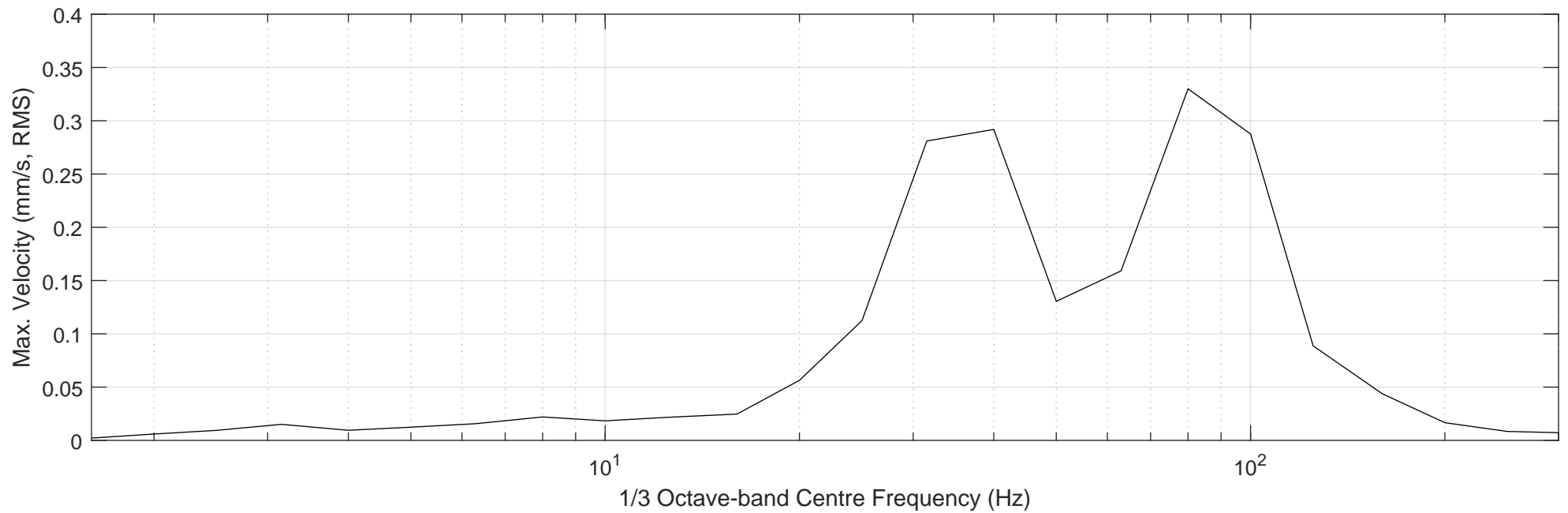
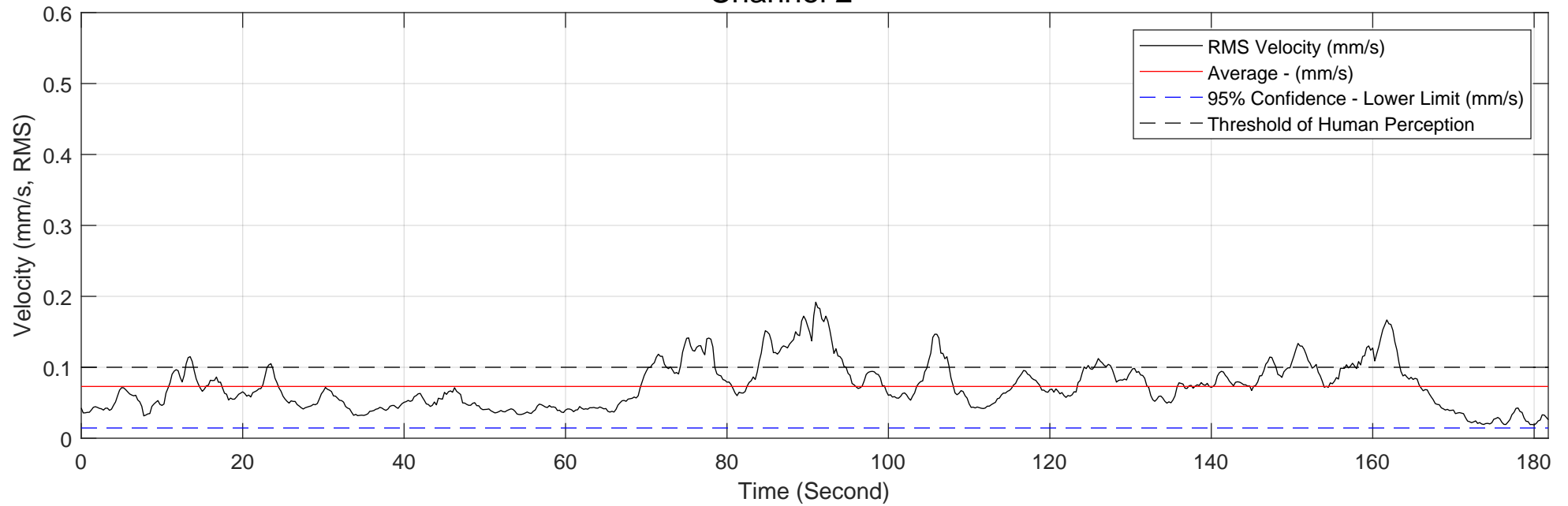
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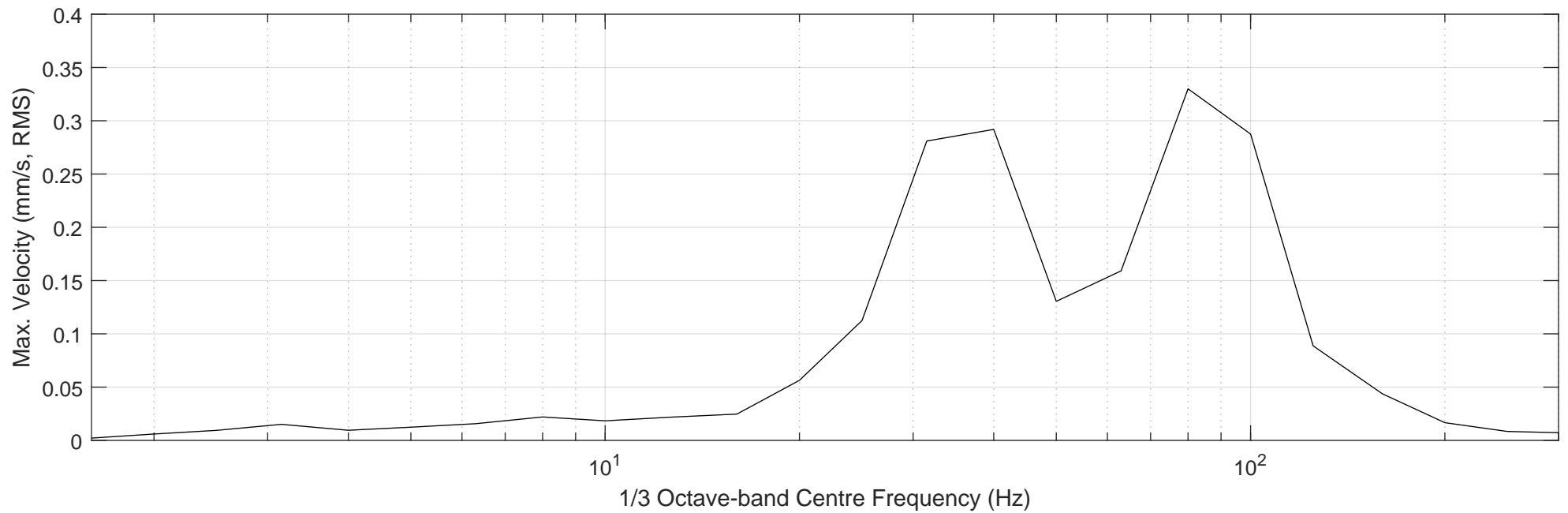
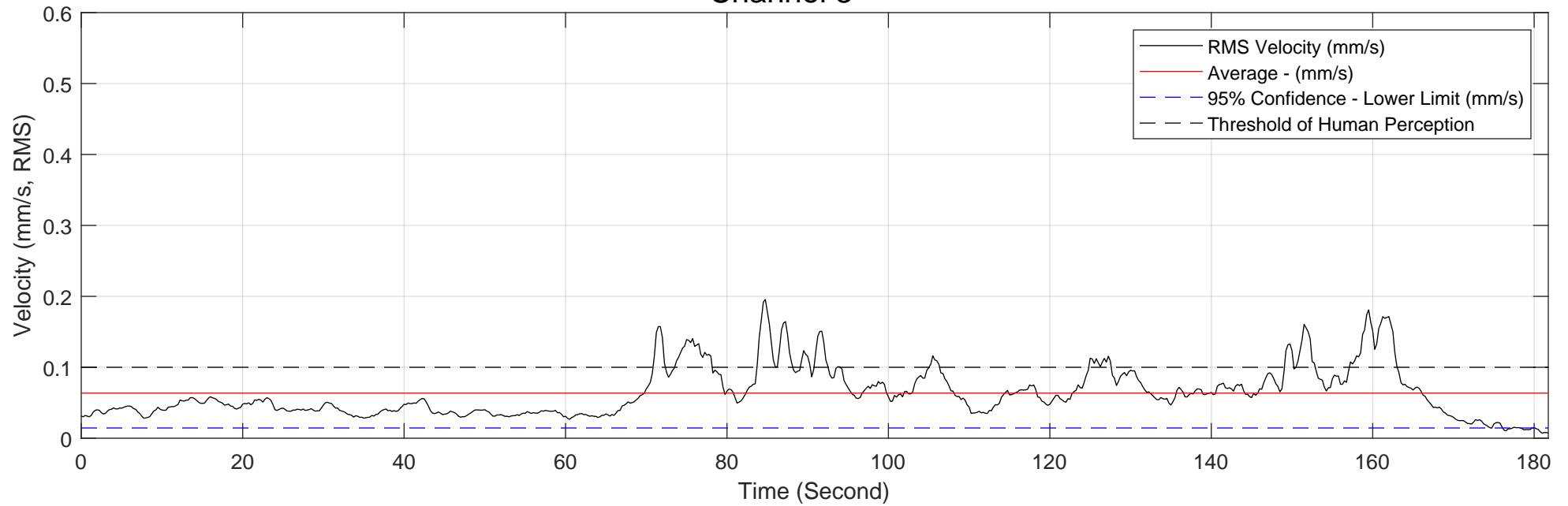
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## Channel 2



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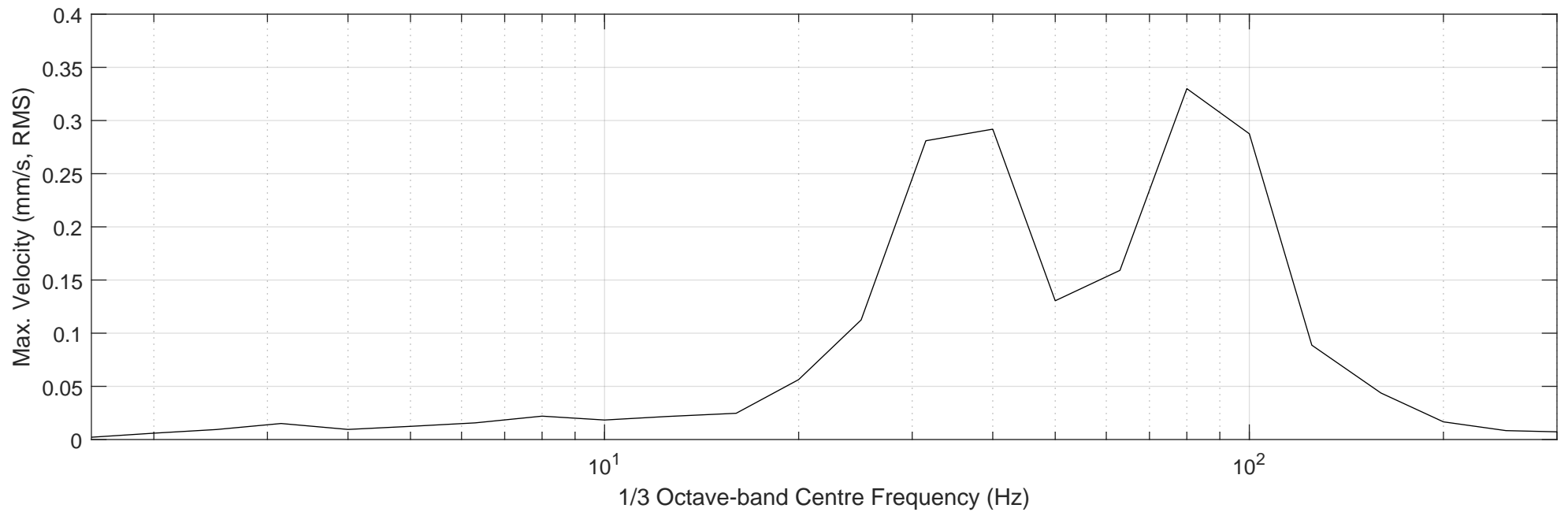
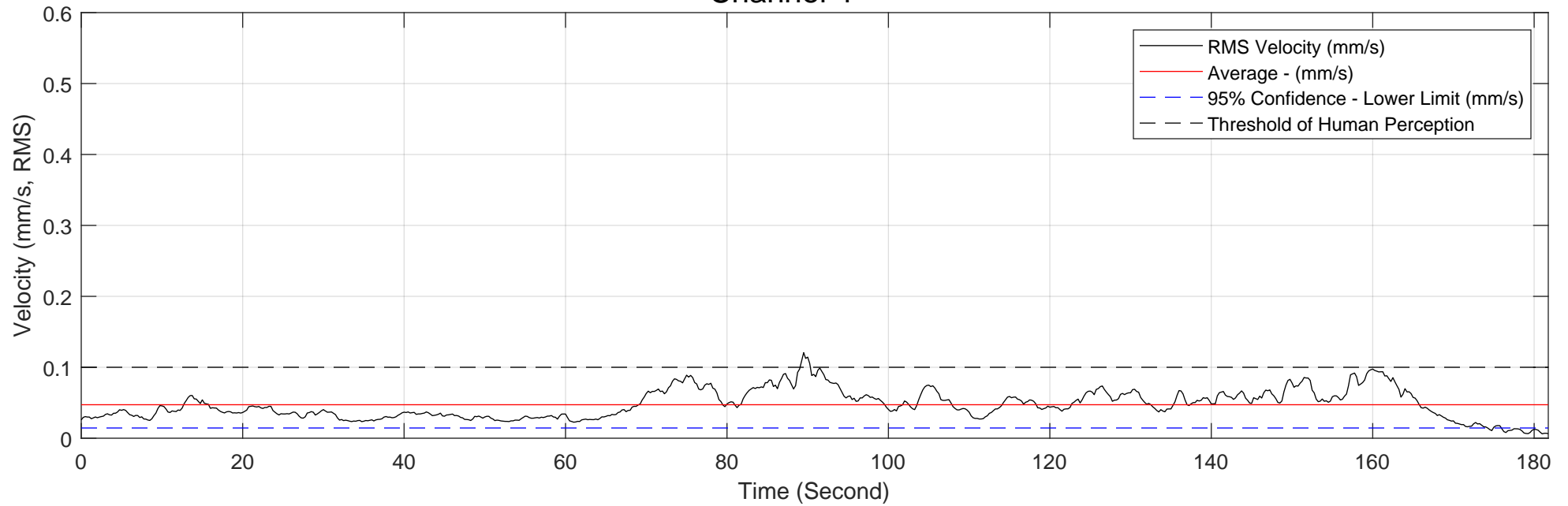
## Channel 3





# Vibration Measurement Data - Passby11

## Channel 4



# **Appendix E**

## **Metrolinx Construction Best Practices**





### **Best Construction Practices for Noise and Vibration Control**

The application of best practices is perhaps the easiest and cheapest way to control noise. These practices are numerous to discuss one by one. They are summarized below:

1. Adopt working hours to restrict noisy activities (such as demolition or pile driving) to regular working hours of the week.
2. Arrange delivery times to suit the area – in general, daytime for residential areas and nighttime for commercial areas.
3. Plan deliveries and vehicle movements so that vehicles are not waiting or queuing on public roads. If waiting and queuing is unavoidable then engines should be turned off.
4. Plan site layout to ensure that reversing is kept to a minimum and, where practicable, eliminated altogether.
5. Where reversing is required, use broadband reverse sirens/alarms or, where it is safe to do so, disengage all sirens and alarms and use flag-men.
6. Locate noisy plant and equipment as far away as possible from sensitive receptors and orient it judiciously.
7. Use plant and equipment only in tasks for which they are designed.
8. Use equipment with the lowest noise and vibration emission levels.
9. Use equipment powered by electricity rather than diesel engines.
10. Minimize the use of diesel electric generators and use mains electricity where available.
11. Shut down or throttle down to a minimum all plant and equipment between works.
12. Fit all plant and equipment with appropriate mufflers and silencers of the type recommended by the manufacturer.
13. Reduce the need for noisy assembly practices; e.g., by fabricating off site.
14. Rather than breaking in-situ, remove larger sections and break them either in an area away from sensitive receptors or off-site.
15. Locate the site access points and the construction vehicle routes as far away as possible from sensitive receptors.
16. Keep haul roads well maintained.
17. Avoid steep gradients on internal haul routes.
18. During weekends and nights, stockpile material within the site such that it can be removed during normal working hours.

19. Where site space is limited and volume of vehicles attending the site is high, seek vehicle holding location(s) to use with just-in-time delivery systems.
20. Minimise the drop height into hoppers, trucks and other plant/equipment.
21. Choose the working method with the lowest N&V impacts; e.g.,
- in demolition work, avoid the use of percussive demolition techniques, use hydraulic shears instead of hydraulic impact breakers;
  - when breaking payments, use methods other than pneumatic breakers and drills, including chemical splitters and falling weight breakers; and
  - when excavating hard material, use rotary drills and bursters actuated by hydraulic or electrical power.
22. Adopt the following hierarchy of groundwork/piling methods:
- Pressed-in methods, e.g. hydraulic jacking
  - Auger / bored piling
  - Diaphragm walling
  - Vibratory piling
  - Driven piling
23. Use vibratory equipment in a mode that minimizes the incident vibration at nearby receptors; e.g., by using smaller equipment, turning off the mechanical vibration on vibratory rollers and conducting more passes, engaging concentric weights only when running at speed.
24. Avoid sound traps that amplify noise.
25. Maximize the screen effect of buildings and temporary stockpiles.
26. Minimize opening and closing of site access gates through good co-ordination of deliveries and vehicle movements.



# **Appendix F**

## **Mitigation and Monitoring Measures**



**POTENTIAL EFFECTS, MITIGATION MEASURES AND MONITORING - NOISE AND VIBRATION**

Environmental Component	Potential Effect	Mitigation Measure(s)	Monitoring
<b>Operational Noise (Trains)</b>	Environmental noise may cause disturbance and/or annoyance. Project noise from operations may be a concern for the receptors within the Study Area	<p>Predicted sound levels from Project rail operations are above the MOEE/GO Draft Protocol limits at several sensitive points-of-reception. Therefore, noise mitigation measures are recommended for Project rail and GO Station operation. Trains are expected to stop and/or move at a reduced speed station associated with B1 Thornton’s Corners East GO Station. Curved portion of the track at this location should be designed and maintained with track lubrication to minimize or eliminate squeal noise from curved rail.</p> <p>Noise barriers are recommended to mitigate the noise impact of rail corridor operations as shown in Figure set 6-7. A summary of noise barriers is provided in Table 6-10.</p>	Noise monitoring is not required for Project operations.
<b>Construction Noise</b>	<p>Environmental noise may cause disturbance and/or annoyance. The severity of the noise effects resulting from construction projects varies, depending on:</p> <ul style="list-style-type: none"><li>• Scale, location and complexity of the project</li><li>• Construction methods, processes and equipment deployed</li><li>• Total duration of construction near sensitive noise receptors</li><li>• Construction activity periods (days, hours, time period)</li><li>• Number and proximity of noise-sensitive sites to construction area(s)</li></ul>	<p>Assessment results indicate that few of the construction equipment emission sound levels exceed the MECP limits. The equipment exceeding the MECP limits would require an investigation of additional noise control for the construction phase. Prior to commencement of construction, develop and submit a detailed Construction Noise Management Plan base on the actual equipment sound levels and their locations.</p> <p>The Construction Noise Management Plan shall:</p> <ul style="list-style-type: none"><li>• Document and commit to all measures to be taken for meeting the noise exposure limits documented in the Metrolinx Guide for Noise and Vibration Assessment (2019) at every directly exposed sensitive receptor and throughout the entire project.</li><li>• Determine the Zone of Influence for construction related noise based on the noise exposure limits outlined in the Metrolinx Guide for Noise and Vibration Assessment (2019) and taking into consideration the construction site, staging and laydown sites and hauling routes, each stage of the construction (including demolition), the overall construction schedule along with the schedule of each major component and associated major construction processes and equipment usage.</li><li>• Identify all sensitive receptors that fall within the Zone of Influence for construction related noise. Mitigation measures will be proposed for these sensitive receptors, and the effects of the proposed mitigation measures will then be evaluated using noise modelling. If results of the modelling indicate that any sensitive receptors still remain within the Zone of Influence for construction related noise, then the following shall apply:<ul style="list-style-type: none"><li>✓ Additional mitigation such as noise wall in place of construction hoarding and construction operational changes are recommended and subsequently modelled until the sensitive receptor does not fall within the Zone of Influence; or</li><li>✓ If mitigation strategies are not viable, receptor-based mitigation will be proposed.</li></ul></li></ul>	<p>The Construction Noise Management Plan shall incorporate the following requirements related to monitoring of noise and noise related complaints:</p> <ul style="list-style-type: none"><li>• Monitor noise where the Construction Noise Management Plan indicates that noise exposure limits may be exceeded. At these locations, monitor noise continuously at each geographically distinct, active construction site with one monitor located strategically to capture the highest exposure level based on planned construction activities and the number, geographic distribution and proximity of noise sensitive receptors. Develop weekly reports describing the monitoring conducted and summarizing the data collected for the reporting period. The reports will include but not be limited to the number and duration of any incident during which any of the noise exposure limits documented in the Metrolinx Guide for Noise and Vibration Assessment (2019) were exceeded, the probable cause of each exceedance, the incident-specific measure(s) implemented, the resulting mitigated noise levels and the complaints investigation procedure.</li><li>• Establish a Communications Protocol and a Complaints Protocol to respond to issues that develop during construction.</li></ul>
<b>Operational Vibration (Trains)</b>	Vibration can cause disturbance and/or annoyance.	Operation vibration levels are expected to be higher than the criteria limits at the receptors (dwellings) located within 30 m from the centerline of the proposed GO track (PORs 007, 009, 13, 14, 31, 32, 42, 43 and 47). To mitigate operational vibration impacts, ballast mats are recommended for the dwellings represented by PORs 007, 009, 13, 14, 31, 32, 42, 43 and 47. The area identified area shown in Figures 10-1 through 10-4.	Vibration monitoring is not required for Project operations.
<b>Construction Vibration</b>	Exposure to vibration may result in public annoyance and complaints. Vibration may also cause damage to buildings and other structures.	<p>Construction vibration ZOI is established for the equipment expected to generate the highest vibration level for each construction phase. Based on the established construction vibration ZOIs (Table 6 4), some of the heritage and non-engineered timber/masonry buildings (typical buildings) fall within the ZOIs, hence impacted by construction vibration.</p> <p>The potential vibration effects from construction equipment can be controlled by increasing the setback distance. Therefore, construction operational changes (e.g., maintaining setback distance and switching to lesser impactful equipment, etc.) are recommended. The owners of the properties within the ZOIs should be notified at least a week (preferably earlier) before commencing any nearby construction activities.</p> <p>Develop and implement a detailed Construction Vibration Management Plan for Metrolinx review and approval with minimum requirements outlined below:</p> <ul style="list-style-type: none"><li>• Complete a detailed construction related vibration assessment prior to the commencement of construction that includes assessment of the vibration ZOI.</li></ul>	<p>The Construction Vibration Management Plan shall incorporate the following requirements related to monitoring of vibration and vibration related complaints:</p> <ul style="list-style-type: none"><li>• Monitor vibration continuously at structures where the Construction Vibration Management Plan indicates that structures are deemed to be within the ZOI for construction related vibration or at additional structures as requested by Metrolinx.</li><li>• The type of Vibration Monitoring Program that is established is based on the vibration ZOI, the project location, duration, presence of nighttime activity, and receptor proximity. The monitoring types include:<ul style="list-style-type: none"><li>✓ Type 1: Monitoring continuously throughout the project (for receptors within the ZOI).</li></ul></li></ul>



Environmental Component	Potential Effect	Mitigation Measure(s)	Monitoring
		<ul style="list-style-type: none"><li>• Complete pre-construction condition surveys for properties within the vibration ZOI of the planned work prior to beginning of any work.</li><li>• Identify any heritage structures and other sensitive structures, buildings or infrastructure vulnerable to vibration damage, assess requirements and, if necessary, develop mitigation measures.</li><li>• Identify buildings, where vibration sensitive activities such as sound recording or medical image processing take place, assess requirements and, if necessary, develop mitigation measures.</li><li>• Select construction/maintenance methods and equipment with the least vibration impacts.</li><li>• In the presence of persistent complaints and subject to the results of a field investigation, identify alternative vibration control measures, where reasonably available.</li></ul>	<ul style="list-style-type: none"><li>✓ Type 2: Monitoring during most impactful phases of the project only (for receptors outside of the ZOI Influence but within 50 m of the boundary of the construction site).</li><li>✓ Type 3: Monitoring in response to complaints only (for receptors outside of the ZOI and beyond 50 m of the boundary of the construction site).</li><li>• Establish a Communications Protocol and a Complaints Protocol to respond to issues that develop during construction.</li></ul>