NOISE AND VIBRATION IMPACT ASSESSMENT

Durham Scarborough Bus Rapid Transit (DSBRT)

December 2021

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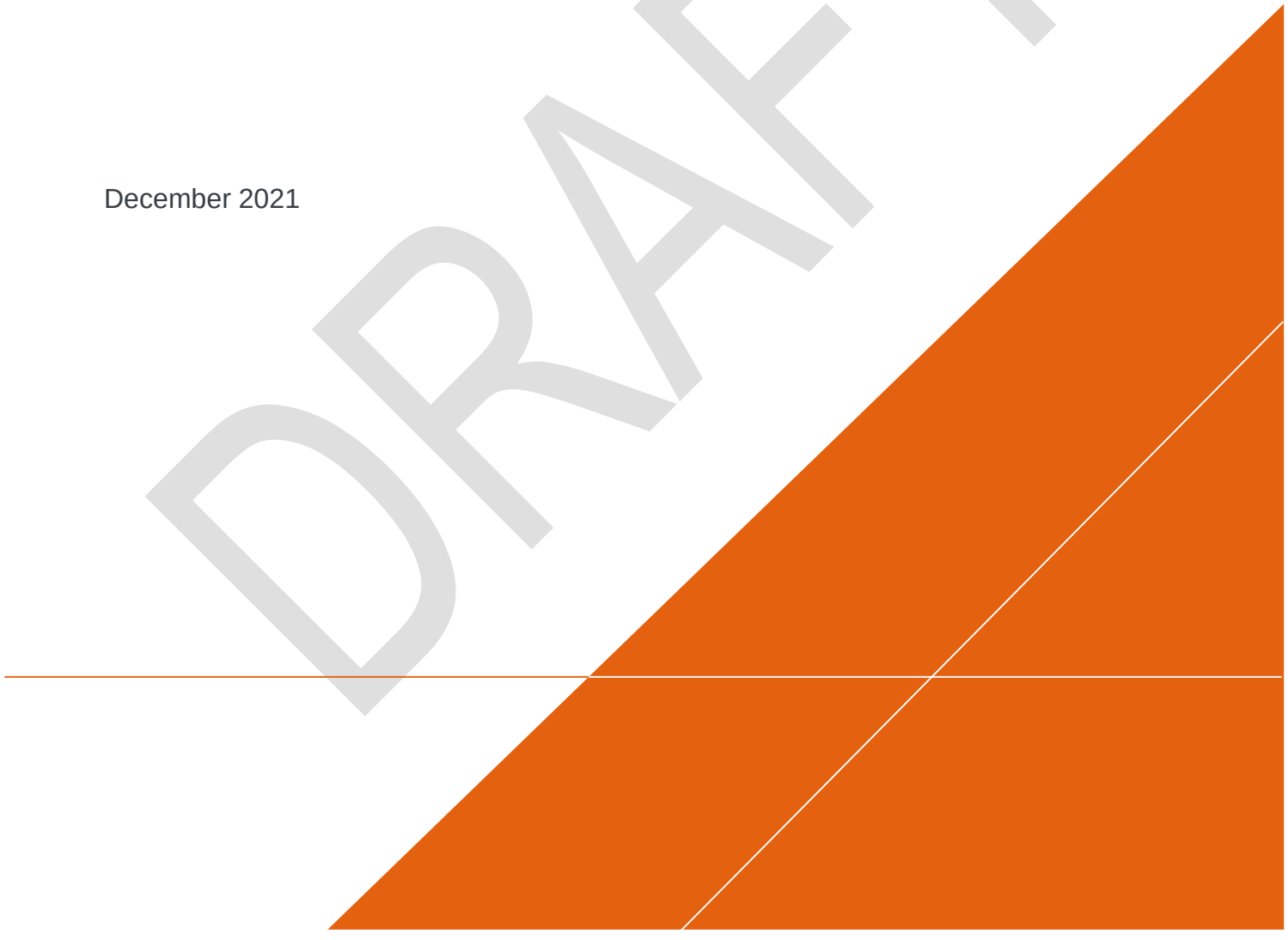

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Durham Scarborough Bus Rapid Transit (DSBRT)

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DRAFT

CONTENTS

ACRONYMS AND ABBREVIATIONS AC-1

EXECUTIVE SUMMARY ES-1

1.0 INTRODUCTION 1-1

1.1 Project Description 1-1

2.0 STUDY AREA DESCRIPTION 2-1

3.0 ASSESSMENT CRITERIA 3-1

3.1 Construction Noise 3-1

3.1.1 MECP NPC Guidelines (MECP, 2013) 3-2

3.1.2 City of Pickering Noise By-law 6834/08 (City of Pickering, 2008) 3-3

3.1.3 Town of Ajax Noise By-law 38-2017 (Town of Ajax, 2017) 3-3

3.1.4 Town of Whitby Noise By-law 6917-14 (Town of Whitby, 2014) 3-4

3.1.5 City of Oshawa Noise By-law 112-82 (City of Oshawa, 1982) 3-4

3.1.6 City of Toronto – Toronto Municipal Code Chapter 591-Noise (City of Toronto, 2020) 3-4

3.2 Operational Noise 3-5

3.3 Construction Vibration 3-7

3.3.1 City of Toronto: By-law No. 514-2008 – Construction Vibrations 3-7

3.4 Summary of Assessment Criteria 3-8

4.0 METHODOLOGY 4-1

4.1 Existing Condition 4-1

4.1.1 Baseline Noise Level 4-1

4.1.2 Baseline Vibration Level 4-3

4.1.3 Existing Noise Barriers 4-5

4.2 Identification of NSAs (Noise Receivers) 4-6

4.3 Description of Assessment Scenarios 4-6

4.3.1 Future No-Build (Year 2041) 4-7

4.3.2 Future Build (Year 2041) 4-22

4.4 Noise Modelling 4-23

4.4.1 Noise from Construction 4-23

4.4.2 Noise from Transportation Sources 4-25

DRAFT

4.4.2.1 ORNAMENT/STAMSON 4-25
4.4.2.2 FHWA TNM 2.5 4-26
4.5 Vibration Modelling 4-27
4.5.1 Vibration from Construction 4-27
5.0 NOISE IMPACT ASSESSMENT 5-1
5.1 Construction Noise 5-1
5.1.1 Potential Impacts 5-1
5.1.2 Mitigation Measures and Monitoring 5-4
5.2 Operational Noise 5-5
5.2.1 Impact Assessment 5-5
5.2.2 Assessment of Noise Control 5-6
6.0 VIBRATION IMPACT ASSESSMENT 6-1
6.1 Construction Vibration 6-1
6.1.1 Potential Impacts 6-1
6.1.2 Mitigation Measures and Monitoring 6-2
6.2 Operational Vibration 6-3
7.0 CONCLUSIONS AND RECOMMENDATIONS 7-1
7.1 Conclusions 7-1
7.2 Recommendations 7-1
7.2.1 Noise Assessment Recommendations 7-1
7.2.1.1 Construction Noise 7-1
7.2.1.2 Operational Noise 7-2
7.2.2 Vibration Assessment Recommendations 7-4
7.2.2.1 Construction Vibration 7-4
7.2.2.2 Operational Vibration 7-4
8.0 REFERENCES 8-1

DRAFT

APPENDICES

APPENDIX A: NOISE ASSESSMENT FIGURES (EXISTING AND REVIEWED NOISE BARRIERS)

APPENDIX B: NOISE ASSESSMENT FIGURES (EXISTING AND PROPOSED NOISE BARRIERS)

APPENDIX C: DURHAM REGION NOISE GUIDELINE

APPENDIX D: NOISE BY-LAWS

APPENDIX E: DEVELOPMENT APPLICATIONS SITE PLANS

APPENDIX F: ONTARIO GEOLOGY SURVEY

APPENDIX G: STAMSON SAMPLE CALCULATION

APPENDIX H: TRAFFIC DATA

APPENDIX I: CONSTRUCTION NOISE ZONE OF INFLUENCE

APPENDIX J: CONSTRUCTION VIBRATION ZONE OF INFLUENCE

APPENDIX K: EXISTING NOISE BARRIERS INVENTORY

DRAFT

TABLES

Table ES-1 Noise Impacts, Mitigation Measures, and Monitoring Activities ES-4
Table ES-2 Vibration Impacts, Mitigation Measures, and Monitoring Activities ES-5
Table 3-1 Detailed Analysis Construction Noise Criteria (FTA, 2018) 3-2
Table 3-2 MECP NPC-115 Construction Equipment Sound Level Limits 3-2
Table 3-3 MTO Noise Assessment Criteria 3-6
Table 3-4 Durham Region Noise Assessment Criteria 3-6
Table 3-5 MECP NPC-207 Impulse Vibration Limits 3-7
Table 3-6 Construction Vibration Damage Criteria 3-7
Table 3-7 City of Toronto Prohibited Construction Vibrations (By-law 514-2008) 3-8
Table 3-8 Summary of Noise Assessment Criteria 3-9
Table 3-9 Summary of Vibration Assessment Criteria 3-10
Table 4-1 List of Locations for Conducting Baseline Noise Monitoring 4-2
Table 4-2 List of Locations for Conducting Baseline Vibration Monitoring 4-4
Table 4-3 Existing Noise Wall Information 4-5
Table 4-4 Summary of NSAs 4-7
Table 4-5 Construction Equipment Noise Emission Levels 4-24
Table 4-6 TNM 2.5 vs STAMSON Sample Comparison 4-26
Table 5-1 List of Construction Equipment 5-1
Table 5-2 Zone of Influence (ZOI) for Construction Activities 5-2
Table 5-3 List of Buildings Requiring Noise Monitoring During Construction Activities ... 5-2
Table 5-4 Noise Impacts (First Row Receivers) 5-7
Table 5-5 Noise Impacts (First Row Receivers) with Noise Mitigation 5-14
Table 6-1 Minimum Setback Distances for Construction Equipment (FTA, 2018) 6-1
Table 6-2 List of Buildings Requiring Vibration Monitoring During Bridge and Culvert Construction Activities (i.e., Pile Driving) 6-2
Table 7-1 Noise Impacts, Mitigation Measures, and Monitoring Activities 7-3
Table 7-2 Vibration Impacts, Mitigation Measures, and Monitoring Activities 7-5

FIGURES

Figure 1-1 Durham-Scarborough Bus Rapid Transit Corridor 1-2
Figure 2-1 Study Area Limit within Durham Region and City of Toronto 2-2

DRAFT

ACRONYMS AND ABBREVIATIONS

dBA	A-weighted decibels
DSBRT	Durham Scarborough Bus Rapid Transit
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GBV	Ground-Borne Vibration
Hz	Hertz
km/hr	Kilometres per hour
L_{eq}	Energy equivalent sound level
MECP	Ontario Ministry of the Environment, Conservation and Parks
MES	Most Exposed Side
mm/s	Millimetres per second
mph	Miles per hour
MTO	Ontario Ministry of Transportation
NSA	Noise Sensitive Area
NVIA	Noise and Vibration Impact Assessment
OLA	Outdoor Living Area
POR	Point of Reception
PPV	Peak Particle Velocity
RMS	Root Mean Square
ROW	Right-of-Way
TNM	Traffic Noise Model
TPAP	Transit Project Assessment Process
VdB	Vibration Decibels
ZOI	Zone of Influence

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EXECUTIVE SUMMARY

In 2018, Metrolinx completed the Durham-Scarborough Bus Rapid Transit (DSBRT) Initial Business Case. The study recommended a preferred Bus Rapid Transit (BRT) alignment between Downtown Oshawa (in Durham Region) and Scarborough Centre (in the City of Toronto). The DSBRT project (the "Project") has now advanced to the Preliminary Design Business Case and Environmental Assessment/Transit Project Assessment Process (TPAP) phase in accordance with the Metrolinx Business Case Framework, for capital investment projects. IBI Group and Parsons Corporation (Parsons) are managing the project on behalf of Metrolinx and Durham Region, the co-proponents of the Project.

The Project proposes approximately 36 kilometres of dedicated transit infrastructure, connecting downtown Oshawa, Whitby, Ajax, Pickering and Scarborough. This project builds on the existing PULSE service and will provide more dedicated transit infrastructure along Highway 2 and Ellesmere Road to connect to Scarborough Centre. The corridor has varied traffic, land use conditions and constraints. With rapid growth in the past decade, and an expectation for this growth to continue into the future, travel demand along the corridor will continue to increase and higher capacity transit will be needed to link communities and employment on both sides of the Toronto-Durham boundary. Transit infrastructure will include a range of design solutions in different segments of the corridor. The preliminary design concept includes segments with buses operating with transit priority measures, and segments with dedicated curbside or centre-median transit lanes. The design concept varies by segment based on available space, travel demand, and land use context.

Arcadis Canada Inc. was retained by Parsons on behalf of Metrolinx, to complete this Noise and Vibration Impact Assessment (NVIA) in support of the TPAP, as prescribed in *Ontario Regulation 213/08 Transit Projects and Metrolinx Undertakings*, for the Project. This NVIA focuses on the assessment of potential noise and vibration impacts as a result of the DSBRT project and recommend mitigation measures and monitoring activities to reduce the impacts. Such impacts from construction and operation of DSBRT were discussed in the current NVIA. The NVIA methodology involved identifying the locations of Noise Sensitive Areas (NSAs) and Vibration Sensitive Areas along the route and selecting points of reception (POR) that are representative of each of these locations.

Noise levels during construction of Bus Stops and Runningways (i.e., BRT lanes through the corridor) caused by construction activities were predicted using the methodology explained in U.S Federal Transit Administration (FTA) Manual (FTA, 2018).

Construction vibration was assessed according to the methodology explained in U.S. FTA Manual (FTA, 2018). Specifically, Zones of Influence (ZOI) and the affected buildings were identified for bridge and culvert construction activities which use equipment that produce hight vibration levels such as Pile Driving.

DRAFT

The Noise Assessment scenarios were developed to estimate future sound levels associated with the Project. The difference in noise levels predicted between the future scenario that assumes the Project does not proceed (i.e., the Future No-Build, where no changes are assumed to current configurations and only traffic volumes are projected) and the future scenario where the Project does proceed (i.e., Future Build) is an indication of the impact of the Project. Traffic noise modelling of these scenarios was completed using U.S. Federal Highway Administration (FHWA) Traffic Noise Model (TNM 2.5 in CadnaA) (FHWA, 1998) as part of the CadnaA computer software and compared to the adopted assessment criteria.

In addition, potential noise and vibration impacts from construction were considered and assessed as described in this report.

Construction Noise

A total of thirty-nine (39) Representative Noise Sensitive Receivers that require monitoring during construction activities were identified as presented in Table 5-3 and in construction noise Zone of Influence in Appendix I.

Construction Vibration

Construction vibration Zone of Influence (ZOI) for bridge and culvert works using Pile Drivers that are producing high vibration levels during operation are generated and presented in Appendix J. Accordingly, the buildings presented in Table 6-2 were identified to be affected by such construction activities and will require vibration monitoring during construction of bridge and culverts to appropriately identify and mitigate any exceedances. For other construction activities, setback distances have been calculated for typical construction equipment in Table 6-1.

Operational Noise

A number of noise barriers were investigated to be constructed within the road Right of Way (ROW) as they will provide sufficient noise reduction as per the Ontario Ministry of Transportation (MTO) Environmental Guide for Noise (MTO, 2008 Version 1.1) and Durham Region Noise Policy (The Regional Municipality of Durham, 2012).

Noise barrier recommendations at receiver locations are identified in Table 5-5. The technical, economic, and administrative feasibility of implementing noise barriers in the locations identified in Table 5-5 will be reviewed in accordance with MTO's Environmental Guide for Noise (MTO, 2008 Version 1.1) during the detailed design phase. The locations for implementing the noise barriers in Toronto and Durham will be confirmed through discussions with the respective municipalities.

Installation of recommended noise barriers will mitigate impacts and reduce the predicted sound levels at receiver locations in compliance with MTO (MTO, 2008 Version 1.1) and Durham Region guidelines for noise (The Regional Municipality of Durham, 2012). The noise barriers should be constructed of a durable material having a minimum surface area density of 20 kg/m^2 (4 lb/ft^2) and

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be in a continuous line without openings or gaps. Barrier material and design shall meet standards acceptable to the Durham Region, MTO and Ministry of the Environment, Conservation and Parks (MECP) for noise barriers.

The Project does not include bus garages for the DSBRT; therefore, such facilities were not considered in this NVIA. If in the future, any plans for bus garages are considered, a detailed noise and vibration impact study may be required.

Operational Vibration

No vibration impacts from operation of BRT projects are anticipated according to Metrolinx guidelines (Metrolinx Environmental Guide for Noise and Vibration Impact Assessment, 2019; updated 2021) and from experience with other similar BRT projects in Ontario. Ground-borne vibration from rubber-tired transit projects (e.g., BRT) are negligible and unlikely to be of concern.

Summary of Impacts, Mitigations, and Monitoring Activities

Summary of noise and vibration impact, mitigation solutions, and monitoring activities are listed in Table ES-1 and Table ES-2, respectively.

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Table ES-1 Noise Impacts, Mitigation Measures, and Monitoring Activities

Noise Component	Potential Impacts	Mitigation Measures	Monitoring Activities
Construction Noise	• 39 locations (i.e., noise sensitive receivers) as listed in Appendix I could potentially be impacted by construction noise. • The severity of construction noise at the identified locations of concerns are mainly dependent on: o The number and type of equipment being simultaneously used. o The duration construction equipment will be utilized during the day (i.e., usage factor). o To be conservative, the current report assumes all relevant construction equipment are working simultaneously and are fully utilized (i.e., usage factor of 1) during the construction period.	• A Noise and Vibration Management Plan (NVMP) during Detail Design is to be prepared prior to construction. NVMP will include specific mitigation measures related to laydown areas (once they are determined). • Temporary noise mitigation measures shall be investigated and necessary noise mitigation measures in the form of physical noise barriers, mufflers on equipment, etc. shall be implemented if monitoring results show noise levels during construction activities exceed the criteria. • Limit construction work to the time periods allowed by the municipalities' noise By-laws, as summarized in Section 3.1. • Should there be a need to complete work outside of the hours allowed in the applicable noise By-laws, the Contractor is to seek any required exemptions and permits directly from the applicable jurisdiction, in advance of any work performed outside of the allowable time periods. If an exemption cannot be obtained, then construction will proceed in accordance with the requirements of the noise By-laws. • The Contractor is expected to comply with all applicable requirements of the contract and local noise By-laws. Enforcement of noise control By-laws is the responsibility of the Municipality for all work. • Contracts shall include explicit indication that all construction equipment used on the project is to meet the sound level criteria from NPC-115 and NPC-118, and be well maintained and operating with effective muffling devices that are in good working order. • The separation distance between construction staging areas and nearby sensitive receivers is to be maximized to the extent possible to reduce noise impacts. • Any temporary roads for construction vehicle access are to be well maintained and free of pot-holes and ruts to avoid excessive noise from heavy vehicles travelling on uneven surfaces. • Should any complaints be reported from the public due to construction noise, the Owner will be notified, and the incident will be investigated. A complaints protocol is to be established for receiving, investigating and addressing construction noise complaints from the public, including a plan for how the public is to be notified of their options for logging a complaint.	• Noise level monitoring shall be undertaken at identified Representative Noise Sensitive Receivers to appropriately identify and mitigate any exceedances for noise levels to comply with construction noise criteria set in Table 3-8. • Noise levels shall be monitored to verify mitigation measures(s) effectiveness, if any. • In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration will be given to the technical, administrative and economic feasibility of the various alternatives. • A noise complaint will trigger an investigation to verify whether the noise mitigation has been implemented, including verification of construction equipment sound levels per NPC-115 and NPC-118.
Operational Noise	• 17 PORs as listed in Table 5-5 were identified to be affected because of DSBRT operational noise.	• Noise barriers were investigated to be constructed within ROW of the 17 identified PORs. • Noise barrier heights range between 2.0 m to 3.0 m and were investigated to be constructed in accordance with the instruction provided under section 7.2.1.2.	• The effectiveness of the proposed noise barriers in reducing sound levels below the assessment criteria has been confirmed via the CadnaA modelling. The mitigation effectiveness could also be confirmed via field measurements.

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Table ES-2 Vibration Impacts, Mitigation Measures, and Monitoring Activities

Vibration Component	Potential Impacts	Mitigation Measures	Monitoring Activities
Construction Vibration	• Seven (7) buildings as listed in Table 6-2 could potentially be impacted (i.e., possible structural damage) by the construction vibration (i.e., during bridge and culvert work). • The construction vibration could cause annoyance and trigger complaint from the communities.	• A Noise and Vibration Management Plan (NVMP) during Detail Design is to be prepared prior to construction. NVMP will include specific mitigation measures related to laydown areas (once they are determined). • For work that is to occur outside of regular hours, the Contractor will be responsible for identifying the implications of the vibration generated, and to make construction work plans available for review by the Stakeholders. • Construction equipment with potential to cause off-site vibrations will be operated as far away from vibration-sensitive sites as possible. • Where possible, activities that have potential to cause off-site vibrations will be phased such that as few as possible are occurring simultaneously. • Update Zone of Influence mapping and predictions based upon refined site staging, equipment, construction areas, and building locations prior to the commencement of construction. • Contractor shall be responsible for any damage caused by construction vibration. • Operate construction equipment on lower vibration settings, where possible. • Construction activities that have potential to cause off-site vibration during the night-time hours will be avoided. • A complaints protocol is to be established for this Project for receiving, investigating and addressing construction vibration complaints received from the public. • The Contract documents shall contain a provision that any initial vibration complaint will trigger verification that any general vibration control measures agreed to are in effect. • In the presence of persistent vibration complaints, Metrolinx and its Contractor shall consider implementing a measurement program to evaluate the vibration impacts. • In the presence of persistent complaints and subject to the results of a field investigation, alternative vibration control measures may be required, where reasonably available.	• Pre-construction consultation with property owners. • Pre-construction measurement of the background vibration within the ZOI according to the applicable By-laws (e.g., City of Toronto By-law No. 514-2008 (City of Toronto, 2008)). • Contractor shall be responsible for pre-construction inspection (e.g., photography of building foundation) of the impacted buildings inside the ZOI according to the applicable By-laws. • A monitoring program to measure vibration levels during construction activities (close to the affected buildings) shall be developed and implemented to appropriately identify and mitigate any exceedances and be in compliance with City of Toronto By-law No. 514-2008 (City of Toronto, 2008), and applicable vibration criteria listed in Table 3-9 to identify the need for mitigation measures if required. • Monitoring will be undertaken to verify mitigation measure(s) effectiveness.
Operational Vibration	• No impacts are anticipated due to the nature of BRT (rubber-tired transit) projects.	• Not Applicable	• Not Applicable

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1.0 INTRODUCTION

1.1 Project Description

In 2018, Metrolinx completed the Durham-Scarborough Bus Rapid Transit (DSBRT) Initial Business Case. The study recommended a preferred Bus Rapid Transit (BRT) alignment between Downtown Oshawa (in Durham Region) and Scarborough Centre (in the City of Toronto). The DSBRT project (the "Project") has now advanced to the Preliminary Design Business Case and Environmental Assessment/Transit Project Assessment Process (TPAP) phase in accordance with the Metrolinx Business Case Framework, for capital investment projects. IBI Group and Parsons Corporation (Parsons) are managing the project on behalf of Metrolinx and Durham Region, the co-proponents of the Project.

The Project proposes approximately 36 kilometres of dedicated transit infrastructure, connecting downtown Oshawa, Whitby, Ajax, Pickering and Scarborough. This project builds on the existing PULSE service and will provide more dedicated transit infrastructure along Highway 2 and Ellesmere Road to connect to Scarborough Centre. The corridor has varied traffic, land use conditions and constraints. With rapid growth in the past decade, and an expectation for this growth to continue into the future, travel demand along the corridor will continue to increase and higher capacity transit will be needed to link communities and employment on both sides of the Toronto-Durham boundary. Transit infrastructure will include a range of design solutions in different segments of the corridor. The preliminary design concept includes segments with buses operating with transit priority measures, and segments with dedicated curbside or centre-median transit lanes. The design concept varies by segment based on available space, travel demand, and land use context.

Arcadis Canada Inc. was retained by Parsons on behalf of Metrolinx, to complete this Noise and Vibration Impact Assessment (NVIA) in support of the TPAP, as prescribed in *Ontario Regulation 213/08 Transit Projects and Metrolinx Undertakings*, for the Project. This NVIA focuses on the potential BRT impacts from the future DSBRT project.

The DSBRT Corridor is shown in Figure 1-1.

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Figure 1-1 Durham-Scarborough Bus Rapid Transit Corridor



Transportation projects in high density areas have the potential to impact the existing sound environment, and also introduce a potential source of vibration particularly when new transit infrastructure is proposed. This NVIA assesses not only the noise and vibration impacts associated with the use of the new transit alignment, but also the impact of the proposed changes to the elevations in local areas required to accommodate the new infrastructure. The following potential impacts are addressed in this NVIA study:

- noise and vibration during construction of the DSBRT; and
- noise impacts at existing and proposed sensitive locations from buses operating on the proposed DSBRT corridor, inclusive of local topography.

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2.0 STUDY AREA DESCRIPTION

The Highway 2 Bus Rapid Transit corridor is a crucial transportation corridor connecting people through the Durham Region and Scarborough. The corridor has varied traffic, land use conditions and constraints. With rapid growth in the past decade and an expectation for this growth to continue into the future, demand for travel along the corridor will continue to increase and a higher capacity form of transit will be needed to link communities and employment on both sides of the Scarborough Durham boundary. The DSBRT project proposes approximately 36 kilometres of dedicated transit infrastructure, connecting downtown Oshawa, Whitby, Ajax, Pickering and Scarborough. This proposed Project builds on the existing PULSE service and will provide more dedicated transit infrastructure along Highway 2 and Ellesmere Road to connect to Scarborough Centre. The corridor will improve connections between TTC, DRT and GO Transit services, allowing transit riders to get where they are going faster than before. The study area including the proposed DSBRT infrastructure alignment is presented in Figure 1-1 and Figure 2-1.

The study area for this NVIA is 300 metres (m) on either side of the corridor which runs east along Ellesmere Road and Highway 2 from Scarborough Centre to Downtown Oshawa. The study area limit (i.e., 300 m on either side of the roadway) is in accordance to the Metrolinx guidelines (Metrolinx Environmental Guide for Noise and Vibration Impact Assessment, 2019; updated 2021). It represents the distance over which the sound level due to DSBRT project would not be perceptible and overall sound level is dominated by ambient noise level.

The Project does not include bus garages for the DSBRT; therefore, such facilities were not considered in this NVIA. If in the future, any plans for bus garages are considered, a detailed noise and vibration impact study may be required.

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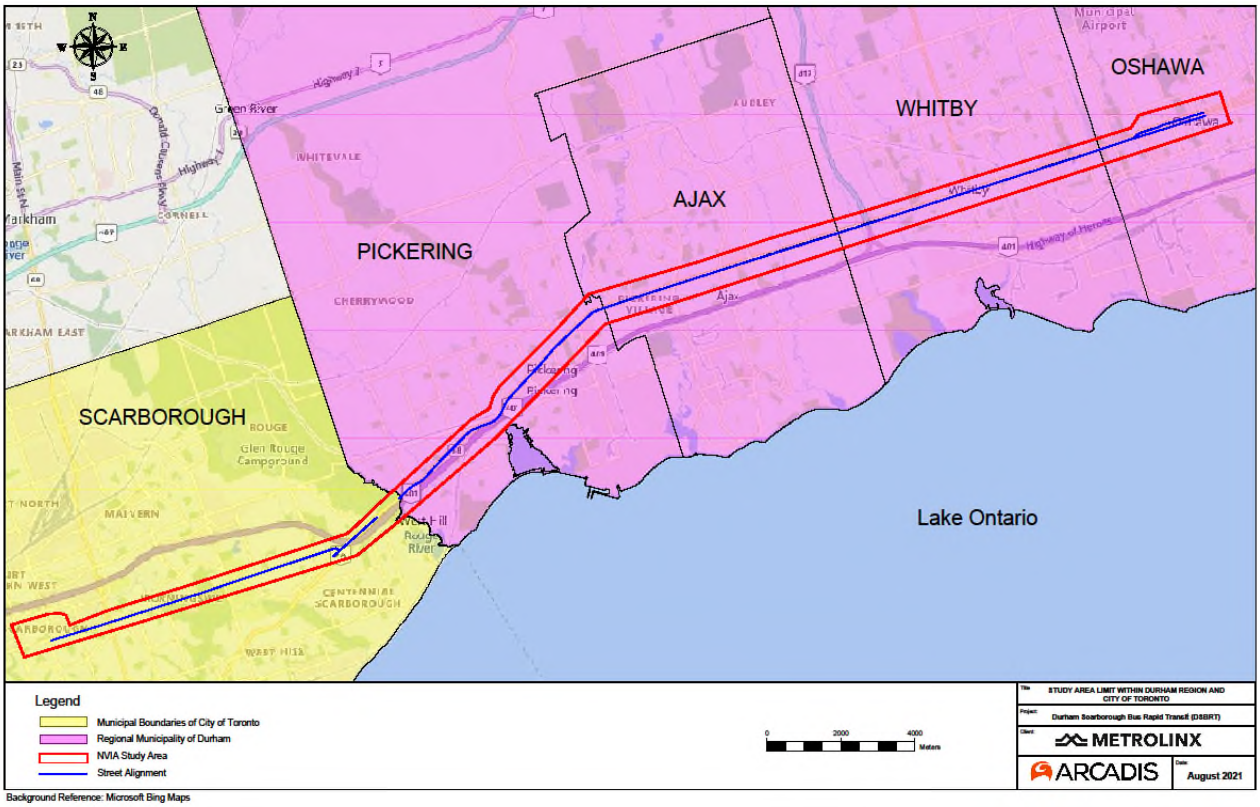
Figure 2-1 Study Area Limit within Durham Region and City of Toronto



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3.0 ASSESSMENT CRITERIA

The following sections summarize the assessment criteria that have been applied in the evaluation of potential noise and vibration impacts related to the Project. The Metrolinx Noise Guide (Metrolinx Environmental Guide for Noise and Vibration Impact Assessment, 2019; updated 2021) follows the MTO Environmental Guide for Noise (MTO, 2008 Version 1.1) for BRT projects, with the exception for construction noise where the municipalities noise By-laws will apply. The operational noise assessment was conducted in accordance with the MTO guidelines as part of the Publication *Environmental Guide for Noise* where the assessment methodology and impact assessment criteria are established (MTO, 2008 Version 1.1).

A major part of the study area falls under the jurisdiction of the Regional Municipality of Durham, therefore, the Durham Region's guidelines (The Regional Municipality of Durham, 2012) are also referenced and used specifically in the areas within the Region of Durham as it is more stringent than the MTO guidelines (MTO, 2008 Version 1.1). The City of Toronto's noise guidelines (City of Toronto, 2020) are also used, as Scarborough is within the City of Toronto.

Relevant information from the Toronto Municipal Code (City of Toronto, 2010) Chapter 591 and Municipalities' Noise By-law are also summarized with regard to construction activities in Sections 3.1.2 to 3.1.6. Where no assessment guidance had been developed by the MTO for a potential project effect, relevant guidelines from the Ontario Ministry of the Environment, Conservation and Parks (MECP, 2013) were applied as appropriate.

No impacts are anticipated from operational vibration due to negligible ground-borne vibration associated with operating rubber-tired transit (i.e., BRT). This conclusion is consistent with Metrolinx guidelines (Metrolinx Environmental Guide for Noise and Vibration Impact Assessment, 2019; updated 2021). The construction vibration should comply with MECP Publication NPC-207 and City of Toronto By-law No. 514-2008 (City of Toronto, 2008) that are summarized in Section 3.3. The applicable guidelines for construction vibration are set to avoid damage to buildings as well as to protect community against potential annoyance caused by construction.

3.1 Construction Noise

Construction noise level can be predicted provided the construction equipment during each phase of construction is known. U.S. FTA (FTA, 2018) provides a list of construction equipment and reference sound level at a reference distance from the source. It also describes a procedure to estimate the sound level from the equipment used during a construction activity at a certain distance from the construction.

According to U.S. FTA (FTA, 2018), the detailed construction noise assessment was conducted by comparing the overall predicted sound level caused by all equipment used during each phase of a construction to the criteria as shown in Table 3-1 below.

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Table 3-1 Detailed Analysis Construction Noise Criteria (FTA, 2018)

Land Use	Leq. Equipment (8-hr), dBA	
	Day	Night
Residential	80	70

The MTO *Environmental Guide for Noise* (MTO, 2008 Version 1.1) outlines that construction must be conducted in a manner that minimizes noise and abides by the municipal noise By-law. A procedure by which to address noise complaints must be in place as part of the contract documents. Such procedures involve responding to persistent noise complaints by completing sound testing to appropriately identify and mitigate any exceedances so that the construction equipment operating sound levels are within those recommended by the MECP. The following sections summarize MECP construction equipment guideline limits (MECP, 2013), and relevant requirements of the applicable municipalities with regards to construction noise. Copies of municipal Noise By-laws are provided in Appendix D.

3.1.1 MECP NPC Guidelines (MECP, 2013)

Construction activities are not considered to be "stationary sources" by the MECP (per the definition of Stationary Source in Part A of Publication NPC-300) and are therefore not required to meet the sound level limits outlined in Publication NPC-300 (MECP, 2013). The MECP does not currently prescribe sound level limits for the cumulative impact of construction operations. In Publication NPC-115 (Ontario Ministry of the Environment, 1977a), the MECP has instead outlined a series of equipment-specific sound level limits that must be met by individual pieces of construction equipment, depending on the location of use and date of manufacture (Ontario Ministry of the Environment, 1977a). The sound level limits for construction equipment manufactured after January 1, 1981 are summarized in Table 3-2.

Table 3-2 MECP NPC-115 Construction Equipment Sound Level Limits

Equipment	Standard	Measurement Distance (m)	Maximum Sound Level (dBA)
Excavator, Dozer, Loader, Backhoe, Other	Quiet Zone*	15	Power Rating <75 kW: 83 dBA Power Rating >75 kW: 85 dBA
	Residential Zone**		Power Rating <75 kW: 83 dBA Power Rating >75 kW: 85 dBA
Pneumatic Pavement Breaker	Quiet Zone	7	85 dBA
	Residential Zone		85 dBA
Portable Air Compressor	Quiet Zone	7	70 dBA
	Residential Zone		76 dBA
Tracked Drills	Quiet Zone	15	100 dBA
	Residential Zone		100 dBA

*Note: * "Quiet Zone" means those areas of the City where quiet is of particular importance.*
*** The purpose of the Residential (R) zone is to provide areas for a variety of residential building types, including detached houses, semi-detached houses, townhouses, duplexes, triplexes, fourplexes and apartment buildings (City of Toronto Zoning By-law 569-2013).*

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In addition, any heavy vehicle (motorized conveyance with a gross weight >4,500 kg) with a diesel engine that is associated with a construction activity would be subject to the sound level limits prescribed in MECP Publication NPC-118 (Ontario Ministry of the Environment, 1977b). For vehicles manufactured after 1979, the maximum allowable sound level is 95 dBA at a distance of 15 m.

3.1.2 City of Pickering Noise By-law 6834/08 (City of Pickering, 2008)

The City of Pickering Noise By-law 6834/08 (City of Pickering, 2008) is intended to prohibit and regulate noise in the City of Pickering. Schedule 2 of the By-law identifies type of activities prohibited by time. Schedule 2 prohibits operation of construction equipment from 7:00 p.m. to 7:00 a.m. weekdays, and all day on Sundays, Saturdays and holidays. Part II of the By-law identifies Exemption Requests as:

1) Any person may request an exemption to permit the operation of construction equipment during the period of time prohibited by Schedule 2. All such requests shall be submitted in writing to the City Clerk and shall,
    a) identify and describe in detail the construction activity that the applicant wishes to have exempted;
    b) set out the time(s) and location(s) for which the exemption is being sought;
    c) state the name, address, telephone numbers and facsimile numbers of the applicant;
    d) set out the reasons why an exemption should be granted; and
    e) be signed by the applicant who shall be certifying the accuracy and truth of the contents of the application.

3.1.3 Town of Ajax Noise By-law 38-2017 (Town of Ajax, 2017)

The Town of Ajax Noise By-law 38/2017 (Town of Ajax, 2017) is intended to prohibit and regulate noise in the Town of Ajax. The By-law section 3, General Provisions states that no person shall cause or permit noise from any construction on statutory holidays or between the hours of 8:00 p.m. one day to 7:00 a.m. the following day, Monday to Friday, and 7:00 p.m. on Friday to 9:00 a.m. on Saturday, and 5:00 p.m. on Saturday to 7:00 a.m. on Monday. The By-law Section 5 Exemption Requests clarifies any person may request an exemption to permit construction during the periods of time prohibited in Section 3. All such requests shall be made in writing to the Manager and shall:

(a) Identify and describe the construction activity that the applicant wishes to have exempted;

(b) Set out the time(s) and location(s) for which the exemption is being sought;

(c) State the name, address and telephone numbers of the applicant; and

(d) Set out the reasons why an exemption should be granted.

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3.1.4 Town of Whitby Noise By-law 6917-14 (Town of Whitby, 2014)

The Town of Whitby Noise By-law 6917-14 (Town of Whitby, 2014) is intended to prohibit and regulate noise in the Town of Whitby. The By-law Schedule 2 prohibits the operation of heavy equipment in connection with construction or demolition, automotive repair or material handling 8:00 p.m. to 7:00 a.m. (any time on Sundays and statutory holidays) for Residential and Parks Areas as well as Commercial, Industrial, and Agricultural Areas, as defined in the Town's Official Plan. The By-law exempts any reasonable noise resulting from the operation of a business activity provided that such noise is part of the normal operation of the business and provided that the business is operating in compliance with the Town's Zoning By-laws and all other applicable laws.

3.1.5 City of Oshawa Noise By-law 112-82 (City of Oshawa, 1982)

The City of Oshawa Noise By-law 112-82 (City of Oshawa, 1982) prohibits noises likely to disturb the inhabitants of the City of Oshawa. The By-law shall not apply to prevent:

- Any sound made by Construction between the hours of seven o'clock in the forenoon (7:00 a.m.) and seven o'clock in the evening (7:00 p.m.) on any day that is not a Holiday. (1-2005).
- Any sound made by Construction between the hours of nine o'clock in the forenoon (9:00 a.m.) and five o'clock in the afternoon (5:00 p.m.) on any Sunday. (110-2013).

3.1.6 City of Toronto – Toronto Municipal Code Chapter 591-Noise (City of Toronto, 2020)

The Toronto Municipal Code Chapter 591-Noise (City of Toronto, 2020) outlines a number of requirements pertaining to the operation of construction activities and stationary sources. With regard to construction, Section 591-2.3 outlines the following specific prohibitions: No person shall emit or cause or permit the emission of sound resulting from any operation of construction equipment or any construction, if it is clearly audible at a POR: From 7 p.m. to 7 a.m. the next day, except until 9 a.m. on Saturdays; and all day on Sundays and statutory holidays.

It should be noted that the Municipal Code does include prohibitions with regard to stationary sources. The requirement is that the limits in MECP publication NPC-205 be observed (NPC-205 was the stationary source noise assessment guidance document in place prior to the release of NPC-300. It is assumed that the City of Toronto would accept compliance with NPC-300).

MECP does not set out receptor-based noise level limits. Municipal Construction noise in the City of Toronto is typically addressed using City of Toronto Noise By-law 591 (City of Toronto, 2020). However, as the Project qualifies as "Government Work" as per By-law 519 (exempt from By-law requirements), the Project is exempt from the City of Toronto's Noise By-law.

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3.2 Operational Noise

As stated in the earlier section, the MTO noise guide (MTO, 2008 Version 1.1) was followed in Toronto and Durham policy was followed in Durham as their policy is more stringent than MTO's. The MTO has summarized its requirements for the assessment of noise impacts from projects in the *Environmental Guide for Noise* (MTO, 2008 Version 1.1) and the *Environmental Reference for Highway Design*. In addition to outlining requirements for the assessment documentation and qualifications of the assessors, these documents present the accepted procedures for identifying noise sensitive points of reception, assessing and determining the significance of potential noise impacts at these locations, and evaluating the need for noise control measures, where necessary.

In addition, Durham Region has a policy titled *Implementation Guidelines for the Installation and Maintenance of Noise Attenuation Barriers with Regional Road Expansion Projects* (Regional Municipality of Durham, 2012) whereby it is expected that noise mitigation will be considered for new construction or expansion of a regional road, when predicted noise levels at existing dwelling unit exceed 60 dBA or exceed 55 dBA and the difference between existing and projected noise levels is five (5) dBA or more. In addition, the maximum barrier wall height to be constructed by the Region shall be 3.0 m above existing or finished property line grade elevations. Higher sound barriers maybe accepted subject to site specific condition. The minimum recommended barrier height shall be 2.2 m above grade elevations. For aesthetic reasons, the maximum sound barrier height relative to road crown elevation shall not exceed 5.0 m.

Since the MTO (MTO, 2008 Version 1.1) and Durham Region's noise guidelines (The Regional Municipality of Durham, 2012) specifically apply to the backyard outdoor living areas (OLA), analysis for this criterion will consider existing noise levels compared to future predicted noise levels in the backyards of the representative noise receivers.

The criteria for the assessment of noise impacts are applied at NSAs, which are to be identified at the outset of the assessment. NSAs generally include residential land uses, educational facilities, hospitals and commercial properties with overnight accommodations (i.e., hotels, motels, campgrounds). NSAs must have an associated OLA to qualify for inclusion in the noise assessment by MTO standards. An OLA is a ground-level space adjacent to the building on an NSA that accommodates outdoor living activities. The impact assessment is completed at the most exposed side (MES) of the unit with respect to the project, regardless of where the OLA is located. If an assessment of mitigation is required, then the point of reception (POR) is to be moved to the OLA if these locations differ. The locations of the PORs are illustrated in both Appendix A and Appendix B.

The MTO procedures require that future sound levels (10 years after construction) at the identified NSAs be predicted both with and without the Project on a 16-hour energy equivalent basis for highways other than freeways as well as arterial roadways. However, the noise assessment will be based on forecasted Year 2041 traffic volumes. The interim scenario for Year 2031 is not part of this report. The difference between these sound levels provides an estimation of the degree to which the Project would be expected to increase sound levels at the NSAs compared to the case in which the Project does not proceed. These increments, as well as the predicted future

DRAFT

sound levels at the NSAs, are used to assess whether there are likely to be any adverse noise effects associated with the Project using the assessment criteria summarized in Table 3-3 (MTO, 2008 Version 1.1) and Table 3-4 (Regional Municipality of Durham, 2012).

Table 3-3 MTO Noise Assessment Criteria

MTO	Mitigation Effort Required
< 5 dBA change/ AND < 65 dBA	None
≥ 5 dBA change/ OR ≥ 65 dBA	• Investigate noise control measures on right-of-way; • Introduce noise control measures within right-of-way and mitigate to ambient levels if technically, economically and administratively feasible; • Noise control measures, where introduced, should achieve a minimum of 5 dBA attenuation over first row receivers[1].
Notes: 1- First Row Receivers: means those adjacent receivers where noise level differences are imperceptible (within 3 dBA) from the receiver experiencing the highest noise levels (MTO, 2008 Version 1.1).	

Table 3-4 Durham Region Noise Assessment Criteria

Durham Region	Mitigation Effort Required
< 5 dBA change AND < 55 dBA OR ≤ 60 dBA	None
≥ 5 dBA change AND >55 dBA; OR > 60 dBA	• Investigate noise control measures on right-of-way; • Introduce noise control measures within right-of-way and mitigate to ambient if technically, economically and administratively feasible; • Noise control measures, where introduced, should achieve a minimum of 6 dBA attenuation over first row receivers.

To comply with MTO assessment procedures, all predictions must be completed using calculation methods that are approved by the MTO and MECP. These include the MECP traffic noise prediction method ORNAMENT for simple geographical settings, and the United States Federal Highway Administration (FHWA) TNM 2.5 (FHWA, 1998) in CadnaA model for more complex scenarios where changes in topography and grade separated roads are involved. The TNM 2.5 as part of the CadnaA computer software was used for this noise assessment.

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3.3 Construction Vibration

In NPC-207 of the Ontario Model Municipal By-law (Ontario Ministry of the Environment, 1983), the MECP recommends limits for only impulse vibration, which may be applicable to some construction activities such as pile driving. Other types of construction equipment have potential to be sources of non-impulsive vibration, such as vibratory compaction. Therefore, construction vibration limits from the U.S. FTA are also considered (FTA, 2018).

Construction vibrations are generally assessed in terms of PPV rather than root mean square (RMS) levels. It is because public concerns are generally related more to the potential for building damage than perceptibility during construction (FTA, 2018). The MECP outlines the limits presented in Table 3-5 for impulse vibration. The limits vary depending on the frequency of occurrence.

Table 3-5 MECP NPC-207 Impulse Vibration Limits

Time Required to Observe 20 Impulses (minutes)	Limit on the Average Peak Vibration Velocity (mm/s)	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
20 minutes or less	0.30	0.30
Less or equal to 60 minutes but more than 20 minutes	0.60	0.30
Less or equal to 120 minutes but more than 60 minutes	1.00	0.30
120 minutes	10.00	0.30

The U.S. FTA provides a series of criteria that vary depending on details of the building that is receiving the vibration, and are set to protect against building damage (FTA, 2018). These criteria are summarized in Table 3-6. As a conservative measure, the vibration analysis in this assessment utilized the Category III. Non-engineered timber and masonry buildings criteria of 5.1 mm/s.

Table 3-6 Construction Vibration Damage Criteria

Building Category	PPV (mm/s)
I. Reinforced concrete, steel, or timber (no plaster)	12.7
II. Engineered concrete and masonry (no plaster)	7.6
III. Non-engineered timber and masonry buildings	5.1
IV. Buildings extremely susceptible to vibration damage	3.0

3.3.1 City of Toronto: By-law No. 514-2008 – Construction Vibrations

In 2008, the City of Toronto enacted a By-law (City of Toronto, 2008) that addresses vibration from construction activities. In general, the By-law provides a stepped approach to identifying whether vibration is a potential concern for the proposed construction activity, and how the

potential vibration concerns are to be addressed. The By-law provides vibration limits that are not to be exceeded by any construction activity. These limits are summarized in Table 3-7.

Table 3-7 City of Toronto Prohibited Construction Vibrations (By-law 514-2008)

Frequency of Vibration (Hz)	Vibration Peak Particle Velocity (PPV) (mm/sec)
Less than 4	8
4 to 10	15
More than 10	25

This By-law requires an applicant for a construction permit to complete a Vibration Control Form, on which the nature of the construction activity is identified. The form identifies specific construction activities for which vibration would be anticipated to be an issue (e.g., blasting), but also includes a general entry: "*any other construction activity or method that has the potential to cause vibrations which may impact on buildings or structures outside of the construction site that is the subject of the permit application*". If any of the noted activities on the Vibration Control Form are identified as applicable to the permit application, then a Professional Engineer must be engaged to prepare supporting documentation outlining a zone of influence for the source(s) of vibration, and specifically identify whether the zone of influence extends beyond the property boundaries of the construction site.

If a *zone of influence* is found to extend beyond the construction site boundary, a pre-construction consultation and monitoring program is required. This involves consultation with the public, including all property owners and occupants within the *zone of influence*, to advise on the possibility of construction vibrations, and also involves the preparation of a detailed vibration report from a Professional Engineer. This report must summarize the consultation process, as well as detail the results of pre-construction measurements and pre-construction building inspections, identify mitigation measures, and outline a construction monitoring program.

Where a pre-construction plan is required, there is also a requirement to complete a public communications and complaints protocol. This is intended to inform the public of the construction schedule in advance, provide means by which to contact the applicant (i.e., to lodge a complaint), and outline a procedure by which to address complaints.

3.4 Summary of Assessment Criteria

The noise and vibration assessment criteria that have been adopted for each aspect of the Project is summarized in Table 3-8 and Table 3-9, respectively.

DRAFT

Table 3-8 Summary of Noise Assessment Criteria

Component	Protocol	Criteria	Mitigation
Operational Noise	MTO (MTO, 2008 Version 1.1)	Future ambient noise levels without the influence of the proposed improvement	To be considered when criteria is exceeded by more than 5 dB, or when sound levels increase are equal or greater to than 65 dBA
	Durham Region (The Regional Municipality of Durham, 2012)	Predicted noise levels at existing dwelling and approved development application	To be considered when the criteria is exceeded 60 dBA or exceeded 55 dBA and the difference between existing and projected noise levels is 5 dBA or more
Construction Noise	NPC-115	See Table 3-2	
	City of Pickering Noise By-Law (City of Pickering, 2008)	• Activities Prohibited by Time: Operation of Construction Equipment 7:00 p.m. to 7:00 a.m. (all day on Sundays and statutory holidays) • Exemptions permitted.	Adhere to By-law requirements
	City of Oshawa Noise By-law (City of Oshawa, 1982)	• Permits any sound made by Construction between the hours of 7:00 am and 7:00 pm on any day that is not a Holiday. • Permits any sound made by Construction between the hours of 9:00 am and 5:00 pm on any Sunday.	Adhere to By-law requirements
	City of Toronto Municipal Code and Noise By-law(City of Toronto, 2020)	• Quiet zone or Residential Area Prohibitions: between 19:00 and 07:00 hours on weekday, or 09:00 hours on Saturdays, and all day Sunday and statutory holidays. • Compliance with NPC-205 (now NPC-300) (MECP, 2013). • Requirements for Construction Vibrations. • Exemptions permitted.	Adhere to By-law requirements
	Town of Whitby Noise Control By-law (Town of Whitby, 2014)	• Residential and Parks Area Prohibition: between 8:00 p.m. and 07:00 a.m. all day Sundays and statutory holidays. • Commercial, Institutional Prohibition: between 8:00 p.m. and 07:00 a.m. all day Sundays and statutory holidays. • Exemptions permitted.	Adhere to By-law requirements

	Town of Ajax Noise Control By-law (Town of Ajax, 2017)	• Prohibits noise from any construction on:
		  - statutory holidays;
		  - Between the hours of 8:00 p.m. one day to 7:00 a.m. the following day Monday to Friday;
		  - 7:00 p.m. on Friday to 9:00 a.m. on Saturday; and 5:00 p.m. on Saturday to 7:00 a.m. on Monday.
		  - Exemptions permitted.
			Adhere to By-law requirements

DRAFT

Table 3-9 Summary of Vibration Assessment Criteria

Component	Protocol	Criteria	Mitigation
Operational Vibration	N/A[1]	Not Applicable	Not Applicable
Construction Vibration	MECP NPC-207	Impulse Vibration Limits	Adhere to limits stated in Table 3-5
	FTA (FTA, 2018)	Building damage	Adhere to limits stated in Table 3-6
	City of Toronto By-law 514-2008 (City of Toronto, 2008)	Frequency-based vibration limits	Adhere to limits stated in Table 3-7

Notes:

1- N/A: Not Applicable. No vibration impacts from operation of BRT projects are anticipated according to Metrolinx guidelines (Metrolinx Environmental Guide for Noise and Vibration Impact Assessment, 2019; updated 2021)

DRAFT

4.0 METHODOLOGY

The noise assessment was conducted on the most exposed side of each receiver, as per MECP and MTO guidelines (MTO, 2008 Version 1.1). If the predicted noise levels at the MES receiver are either more than 5 dB greater than the "Future No-Build" scenario or if the general level predicted is over 65 dBA, then additional analysis is to be completed at the OLA, typically in the backyard.

Durham Region provides guidelines for noise assessment (The Regional Municipality of Durham, 2012) to be conducted at the OLA (the backyard), and requires mitigation consideration if the predicted increase in the sound level is equal or greater than 5 dB than the "Future No-Build" scenario and greater than 55 dBA, or the predicted noise level is over 60 dBA.

In this noise assessment, noise sources from the proposed BRT and vehicular traffic were both considered in evaluating the noise levels at the receivers identified in Table 4-4. The primary source is the noise caused by rubber-tires and pavement interaction when buses are in motion (Bus Passby). Moreover, the engine and exhaust noise from Diesel engine buses also contribute to the overall noise levels at the nearest receiver locations. It is assumed that DSBRT buses are Diesel engine for a conservative assessment.

In accordance to FTA, if the roadway is fairly smooth, the vibration from rubber-tired traffic is rarely perceptible. No operational vibration impacts are anticipated due to the nature of BRT (rubber-tired) transit projects since the rubber-tires and smooth pavement surface does not generate ground-borne vibration and therefore, is not further assessed.

4.1 Existing Condition

As part of the Project, baseline noise and vibration levels are being collected and will be included in the report once the field work is completed. Field noise measurements will be used to validate the CadnaA model which was used to estimate baseline noise levels at Representative Noise Sensitive Receivers. Baseline vibration levels are also established by collecting vibration measurement at Representative Vibration Sensitive Receivers. This section discusses the procedures that was used to conduct baseline noise and vibration measurements as well as the existing noise wall inventory throughout the corridor.

4.1.1 Baseline Noise Level

As listed in Table 4-1, fifteen (15) locations were identified on publicly owned lands to conduct noise monitoring over a 24-hr period. As it was mentioned, the intent is to confirm the accuracy of the noise modelling by comparing the field noise measurements against those obtained through noise modelling using U.S. Federal Highway Administration's (FHWA) Traffic Noise Model (TNM 2.5) module of CadnaA software for sound level predictions (FHWA, 1998).

DRAFT

Table 4-1 List of Locations for Conducting Baseline Noise Monitoring

Receiver ID	Location	Address	Building Type
1	Centennial Recreation Center Scarborough	1967 Ellesmere Rd, Scarborough, ON M1H 2W5	Recreational
2	Metropolitan Toronto & Region Conservation Authority, Botany Hill Dog Park	325 Orton Park Rd #283, Scarborough, ON M1G 3T4	Recreational
3	The Corporation of the City of Scarborough Highland Creek Park	3500 Ellesmere Rd, Scarborough, ON M1C 1H5	Recreational
4	Her Majesty the Queen in Right of Canada	7298 Kingston Road, Scarborough	Vacant land
5	The Corporation of the City of Pickering Steeple Hill Park	Pickering, ON, L1V 0C3	Recreational
6	The Corporation of the City of Pickering Green space close to 1230 Kingston Rd	Pickering, ON L1V 1B4	Vacant land
7	The Corporation of the Town of Ajax Green space	close to intersection of the Kingston Rd and Westney Rd S	Vacant land
8	Regional Municipality of Durham Green space	close to intersection of the Kingston Rd and Durham 41	Vacant land
9	Regional Municipality of Durham Green space	space close to 1610 Dundas St W, Whitby, ON, L1P 1Y8	Vacant land
10	The Corporation of the Town of Whitby D'Hillier Park	128 Raglan St, Whitby, ON, L1N 2S9	Recreational
11	The Corporation of the Town of Whitby	69 Garden St, Whitby, ON, L1N 9E7	Vacant land
12	The Corporation of the City of Oshawa	close 1003 Dundas St E, Whitby, ON, L1N 2K4	Vacant land
13	Her Majesty the Queen in Right of Canada	close to 1507 Dundas Street East, Whitby	Vacant land
14	The Corporation of the City of Oshawa	close 847 King St W, Oshawa, ON, L1J 2L4	Vacant land
15	The Corporation of the City of Oshawa	50 Centre St S, Oshawa, ON, L1H 3Z7	Commercial

DRAFT

The equivalent sound level (Leq) were collected using a Larson Davis 831 System inclusive of a Class 1 Precision Sound Level Meter (SLM), Model 831, and a ½ inch free field microphone with a PRM831 pre-amplifier. The use of the sound level meters, battery checks, calibration, microphone orientation and timing occurred in accordance with the manufacturer specifications. The sound level measurements will be in compliance with MECP Publication NPC-103.

The modelling was completed using the Federal Highway Administration's (FHWA) Traffic Noise Model (TNM 2.5 in CadnaA) (FHWA, 1998) which is a software application for the modelling of highway traffic noise impacts. The TNM 2.5 is a component of the Computer Aided Noise Abatement (CadnaA) computer noise modelling software.

Traffic Movement Count (TMC) was conducted simultaneously during baseline noise measurements for a 24-hr period to ensure the traffic that is modelled in the software represent the same vehicular traffic condition.

The TNM 2.5 model was then be updated for the fifteen (15) monitoring locations to reflect the traffic data collected as well as receptor heights including ground elevations. Any shielding effect from nearby structures was also inputted into the model by introducing buildings heights and locations.

The difference between the measured and predicted sound levels should be within 3 dB in order to calibrate and/or verify the modelling vs. monitoring results.

4.1.2 Baseline Vibration Level

Baseline vibration levels were established by 24-hr measurement of vibration levels at nineteen (19) representative vibration sensitive locations as listed in Table 4-2. In selecting representative vibration sensitive receivers, cultural heritage buildings and/or medical buildings hosting vibration sensitive equipment (e.g., X-Ray) were given priority over other types of buildings. The baseline vibration levels can be used to evaluate the variation in vibration levels of selected buildings during construction and operation. Vibration levels were measured as close as possible to the building's foundations but within public ROW, due to COVID-19 constraints during this time.

The Multi-Channel Dynamic Signal Analyzer (DSA), Model CoCo-90x by Crystal Instruments was set to read the Root Mean Square (rms) vibration levels in every one third octave band for the range 0.1 Hz to 1000 Hz at an integration time of one second during the baseline monitoring.

DRAFT

Table 4-2 List of Locations for Conducting Baseline Vibration Monitoring

Receiver ID	Location	Address	Type of Building
1	House/Residential Unit	34 Pendle Hill Ct, Toronto, ON, M1H 2L9	Residential
2	Townhouse owned by City of Toronto close to Scarborough Health Network - Centenary hospital	2867 Ellesmere Rd, Scarborough, ON M1E 4B9	Residential
3	House/Residential Unit	397 Morrish Rd, Scarborough, ON, M1C 1E9	Residential
4	Known BHR - Part IV Designation (By-law #21790)	726 Meadowvale Rd Scarborough, ON, M1C 1T2	Residential / Cultural Heritage Site
5	Known CHL - Part IV Designation (By-law #19127)	6540-6550 Kingston Rd, Scarborough, ON, M1C 1L4	Residential / Cultural Heritage Site
6	House/Residential Unit	575 Steeple Hill, Pickering, ON, L1V 7G3	Residential
7	St. Mary St. John The Beloved Coptic Orthodox Church	980 Kingston Rd Pickering, ON, L1V 1B2	Commercial
8	My Health Centre - Pickering - Ultrasound, X-ray	1105 Kingston Rd Pickering, ON, L1V 1B5	Medical/Lab
9	BROCK & KINGSTON HOLDINGS INC. Known BHR - Part IV Designation (By-law #2570/87)	1970 Brock Rd, Pickering, ON, L1V1Y3	Commercial/ Cultural Heritage Site
10	Smile line Orthodontics & Kids Dentistry Known CHL - Part V Designation (By-law #102-2013)	03 Old Kingston Rd, Ajax, ON L1T 3A6	Commercial / Medical/ Cultural Heritage Site
11	Health Movement Pilates Known BHR - Part IV Designation (By-law #116-82)	592 Kingston Rd W, Ajax, ON, L1T 3A2	Commercial / Cultural Heritage Site
12	Sunshine Learning Centre Inc. Known BHR - Part IV Designation (By-law #67-2001)	504 Kingston Rd W, Ajax, ON, L1T 3A3	Commercial / Cultural Heritage Site
13	House/Residential Unit	51 Chalmers Cres, Ajax, ON, L1S 6A1	Residential
14	Known BHR - Part IV Designation (By-law #148-92; #125-2009)	365 Kingston Rd E, Ajax, ON	Commercial / Cultural Heritage Site
15	House/Residential Unit	114 Raglan St, Whitby, ON, L1N 2S9	Residential
16	Known BHR - Part IV Designation (By-law #1813-85)	132 Dundas St W, Whitby, ON	Commercial / Cultural Heritage Site
17	House/Residential Unit	991 Dundas St E, Whitby, ON, L1N 2K1	Residential
18	Bluewater Park Apartment	101 Kathleen St, Whitby, ON, L1N 6P8	Residential
19	House/Residential Unit	36 Fernhill Blvd, Oshawa, ON, L1J 5H9	Residential

DRAFT

4.1.3 Existing Noise Barriers

There are several existing noise barriers identified throughout the corridor and the locations are illustrated in Appendix A (or Appendix B) and the inventory is listed in Appendix K. Condition (i.e., being in good structural condition), seamlessness (not having any gap in their constructions), and review of the inventory of the previous reports were the criteria in identifying existing noise barriers as per MECP *Publication NPC-300* (MECP, 2013). In most instances, the height of the existing noise barriers were assumed to be 2.0 m in the noise assessment, except where different heights are noted.

A summary of the existing noise barriers information such as locations, lengths, and heights are listed in Table 4-3. Further details are provided in Appendix K. It is recommended that the survey and review of the existing noise barriers information should be completed at the Detailed Design stage to update the information based on the most recent condition of the noise walls at that time.

Table 4-3 Existing Noise Wall Information

Noise Barrier Location (Closest Receiver ID)	Noise Barrier Height (m)	Noise Barrier Length (m)
OLA15	1.0	45
OLA21	1.5	34
OLA21a	1.5	27
OLA21b	1.5	14
OLA24a-d	2.0	217
OLA25	2.0	245
OLA26a	2.0	36
OLA27	2.0	194
OLA29	2.0	92[1]
OLA32a	2.0	32
OLA33	2.0	141[1]
OLA34	2.0	211
OLA34b	2.0	211
OLA34c	2.0	187
OLA34d-f	2.0	109
OLA35b	2.0	28
OLA36a	2.0	68
OLA36b	2.0	73
OLA38a	2.0	40
OLA39	2.0	45
OLA39a	2.0	37
OLA40	2.0	463
OLA41	2.0	53[1]
OLA41a	2.0	59
OLA45	2.0	227
OLA45a-d	2.0	227
OLA45e	2.0	32
OLA46	2.0	60
OLA55	2.0	227

Notes:
1- The entire length of the noise wall has been mentioned in the table. However, in our modeling only the effective portion of the noise wall length has been included. Effective length of the noise wall is a length extending the noise wall beyond which would not alter the sound level results.

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4.2 Identification of NSAs (Noise Receivers)

Existing NSAs were identified using recent aerial photography, and confirmed through site visit by Arcadis staff dated September 30, 2020. Noise receivers are generally identified using the acronym POR. Noise impacts at PORs may be calculated at the OLA and/or in the plane of window of the noise sensitive space. PORs have been selected to represent the worst-case noise impacts. Key points of reception (POR) were identified to represent groups of NSAs with similar exposure to the DSBRT project. As per MECP and MTO guidance, noise impacts are generally assessed in the OLA of a noise sensitive land-use. Per MTO's Noise Guide, this includes private homes, townhouses, apartment buildings with OLAs, hospitals and nursing homes.

The noise receivers are summarized in Table 4-4 and the locations are illustrated in Appendix A (or Appendix B). For each NSA, the side of the building that is most exposed to the DSBRT was assessed. In cases where the most exposed side is on the same side as the OLA, the OLA was selected as the POR of choice.

Furthermore, shallow apartment balconies, churches, cemeteries, parks and picnic areas that are not part of NSA, commercial and industrial land uses are not considered NSAs.

Land-use zoning was reviewed for the study area, and it was concluded that at the time of this report, there were three approved development applications and were further analysed as part of this project. However, it should be noted that there were only two available site plans from these approved development applications. Based on the review of the available plans, the OLA at both 1744 & 1750 Ellesmere Road and 3300 Ellesmere Road is fully shielded by the building structure and therefore, further analysis was not performed. The development application at 550 Bond Street West was not available at the time this study was conducted, therefore, future assessment should be undertaken once the plans are available. Copies of the available site plans are shown in Appendix E.

Noise mitigation measures were assessed as per MTO's Noise Guide by assessing the most exposed sides for each POR first. If the MES receiver was not the same as the OLA, the receiver was then re-assessed at the actual OLA location.

4.3 Description of Assessment Scenarios

The potential noise and vibration impacts associated with the Project were assessed by predicting noise and vibration conditions at the nearest NSAs under two operating scenarios: future conditions (Year 2041) assuming that the project *does not* proceed (Future No-Build), and future conditions (Year 2041) assuming that the project *does* proceed (Future Build). Each of these scenarios are described in more detail in the following sections. Existing condition scenario was also assessed due to Durham Region's policies requiring comparison between Existing and "Future Build" scenarios for assessment of mitigation requirements.

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4.3.1 Future No-Build (Year 2041)

In order to assess the impacts associated with full operations on the DSBRT for the future horizon year of 2041, conditions must first be established for the same year in the absence of the DSBRT. This scenario, termed the Future No-Build or future ambient scenario, provides a baseline condition for assessing the potential impacts associated with the Project. Projected traffic volumes for the Future No-Build scenario were provided by Parsons and modelled in the same manner as the existing traffic scenario (discussed in Section 4.4.2) to describe a future ambient condition at the NSAs. This represents the future condition that the NSAs would otherwise be exposed to if the Project were not to proceed, accounting only for traffic increases associated with population growth and no changes to existing transportation infrastructure.

Table 4-4 provides a summary of the NSAs within the study area. Fifty-Seven (57) PORs were identified to represent the worst-case scenario locations. However, there are also additional subsets to the identified PORs throughout the entire corridor as part of this assessment. The locations of these PORs as well as the existing noise barriers are illustrated in both Appendix A and Appendix B.

Table 4-4 Summary of NSAs

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR1	MES01	Toronto	Residential-House	68 Parkington Cres, Toronto, M1H 2V1	MTO
	OLA01	Toronto	Residential-House	68 Parkington Cres, Toronto, M1H 2V1	MTO
	OLA01a	Toronto	Residential-House	24 Earlthorpe Cres, Toronto, M1H 2P9	MTO
	OLA01b	Toronto	Residential-House	38 Earlthorpe Cres, Toronto, M1H 2P9	MTO
	OLA01c	Toronto	Residential-Apartment Building with OLA's	68 Grangeway Ave, Scarborough, M1H 0A1	MTO
POR2	OLA02	Toronto	Residential-House	48 Sunderland Cres, Toronto, M1H 2V3	MTO
	OLA02a	Toronto	Residential-House	36 Sunderland Cres, Toronto, M1H 2V3	MTO
	OLA02b	Toronto	Residential-House	24 Sunderland Cres, Toronto, M1H 2V3	MTO
	OLA02c	Toronto	Residential-House	18 Sunderland Cres, Toronto, M1H 2V3	MTO
	OLA02d	Toronto	Residential-House	12 Sunderland Cres, Toronto, M1H 2V3	MTO

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR3	OLA03	Toronto	Residential-House	32 Pendle Hill Crt, Toronto, M1H 2L9	MTO
	OLA03a	Toronto	Residential-House	38 Pendle Hill Crt, Toronto, M1H 2L9	MTO
	OLA03b	Toronto	Residential-House	46 Pendle Hill Crt, Toronto, M1H 2L9	MTO
	OLA03c	Toronto	Residential-House	54 Pendle Hill Crt, Toronto, M1H 2L9	MTO
POR4	MES04	Toronto	Residential-Town House	#Unit 11,2055 Ellesmere Rd, Scarborough, M1H 2W6	MTO
	OLA04	Toronto	Residential-Town House	#Unit 11,2055 Ellesmere Rd, Scarborough, M1H 2W7	MTO
POR5	MES05	Toronto	Residential-House	34 Gander Dr, Toronto, M1G 2W1	MTO
	OLA05	Toronto	Residential-House	34 Gander Dr, Toronto, M1G 2W1	MTO
	OLA05a	Toronto	Residential-House	58 Clementine Sq, Scarborough, M1G 2V7	MTO
	OLA05b	Toronto	Residential-House	52 Clementine Sq, Toronto, M1G 2V7	MTO
	OLA05c	Toronto	Residential-House	46 Clementine Sq, Toronto, M1G 2V7	MTO
	OLA05d	Toronto	Residential-House	40 Clementine Sq, Scarborough, M1G 2V7	MTO
	OLA05e	Toronto	Residential-House	34 Clementine Sq, Scarborough, M1G 2V7	MTO
	OLA05f	Toronto	Residential-House	20 Mafeking Cres, Toronto, M1G 2W8	MTO
	OLA05g	Toronto	Residential-House	24 Mafeking Cres, Toronto, M1G 2W8	MTO
	OLA05h	Toronto	Residential-House	32 Mafeking Cres, Toronto, M1G 2W8	MTO
	OLA05i	Toronto	Residential-House	16 Mafeking Cres, Toronto, M1G 2W8	MTO

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR6	OLA06	Toronto	Educational Facility	2300 Ellesmere Rd, Scarborough, M1G 3M7	MTO
	OLA06a	Toronto	Residential-House	15 Portico Dr, Toronto, M1G 3R4	MTO
	OLA06b	Toronto	Residential-House	2 Helicon Gate, Toronto, M1G 3R8	MTO
	OLA06c	Toronto	Residential-House	31 Portico Dr, Toronto, M1G 3R5	MTO
	OLA06d	Toronto	Residential-House	37 Portico Dr, Toronto, M1G 3R5	MTO
	OLA06e	Toronto	Residential-House	51 Portico Dr, Toronto, M1G 3R5	MTO
	OLA6f	Toronto	Residential-House	59 Portico Dr, Toronto, M1G 3R5	MTO
	OLA6g	Toronto	Residential-House	67 Portico Dr, Toronto, M1G 3R5	MTO
POR7	OLA07	Toronto	Residential-Town House	371 Orton Park Rd, Scarborough, M1G 3V1	MTO
	OLA07a	Toronto	Residential-Town House	371 Orton Park Rd, Scarborough, M1G 3V1	MTO
	OLA07b	Toronto	Residential-Town House	371 Orton Park Rd, Scarborough, M1G 3V1	MTO
POR8	OLA08	Toronto	Residential-House	39 Trailridge Cres, Scarborough, M1E 4C4	MTO
	OLA08a	Toronto	Residential-House	39 Trailridge Cres, Scarborough, M1E 4C4	MTO
	OLA08b	Toronto	Residential-House	42 Purpledusk Trail, Toronto, M1E 4C8	MTO
	OLA08c	Toronto	Residential-House	50 Purpledusk Trail, Toronto, M1E 4C8	MTO
	OLA08d	Toronto	Residential-House	54 Purpledusk Trail, Toronto, M1E 4C8	MTO
	OLA08e	Toronto	Residential-House	60 Purpledusk Trail, Toronto, M1E 4C8	MTO
	OLA08f	Toronto	Residential-House	51 Trailridge Cres, Scarborough, M1E 4S9	MTO

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR9	OLA09	Toronto	Residential-Town House	Townhouse owned by City of Toronto close to Scarborough Health Network - Centenary hospital located at 2867 Ellesmere Rd, Scarborough, ON M1E 4B9	MTO
POR10	OLA10_Day Care	Toronto	Day Care	1255 Military Trail, Toronto (ON), M1C 1A3, Canada	MTO
	OLA10a	Toronto	Residential-House	Residential at 1255 Military Trail, Toronto (ON), M1C 1A3, Canada	MTO
	OLA10b	Toronto	Residential-House	Residential at 1255 Military Trail, Toronto (ON), M1C 1A3, Canada	MTO
POR11	MES11	Toronto	Residential-House	1 Mirrow Crt, Scarborough, M1C 4Y7	MTO
	OLA11	Toronto	Residential-House	1 Mirrow Crt, Scarborough, M1C 4Y7	MTO
	MES11a	Toronto	Residential-House	2 Mirrow Crt, Toronto, M1C 4Y7	MTO
	OLA11a	Toronto	Residential-House	2 Mirrow Crt, Toronto, M1C 4Y7	MTO
	MES11b	Toronto	Residential-House	3321 Ellesmere Rd, Toronto, M1C 1H1	MTO
	OLA11b	Toronto	Residential-House	3321 Ellesmere Rd, Toronto, M1C 1H1	MTO
	MES11c	Toronto	Residential-House	75 Conlins Road, Scarborough	MTO
	OLA11c	Toronto	Residential-House	75 Conlins Road, Scarborough	MTO
	MES11d	Toronto	Residential-House	3433 Ellesmere Rd, Toronto, M1C 1H2	MTO
	OLA11d	Toronto	Residential-House	3433 Ellesmere Rd, Toronto, M1C 1H2	MTO
	MES11e	Toronto	Residential-House	70 Gladys Rd, Toronto, M1C 1C6	MTO
	OLA11e	Toronto	Residential-House	70 Gladys Rd, Toronto, M1C 1C6	MTO
	MES11f	Toronto	Residential-House	3473 Ellesmere Rd, Toronto, M1C 1H4	MTO

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR11	OLA11f	Toronto	Residential-House	3473 Ellesmere Rd, Toronto, M1C 1H4	MTO
	MES11g	Toronto	Residential-House	100 Bobmar Rd, Toronto, M1C 1C9	MTO
	OLA11g	Toronto	Residential-House	100 Bobmar Rd, Toronto, M1C 1C9	MTO
	MES11h	Toronto	Residential-House	103 Bobmar Rd, Toronto, M1C 1C8	MTO
	OLA11h	Toronto	Residential-House	103 Bobmar Rd, Toronto, M1C 1C8	MTO
	MES11i	Toronto	Residential-House	3515 Ellesmere Rd, Toronto, M1C 1H5	MTO
	OLA11i	Toronto	Residential-House	3515 Ellesmere Rd, Toronto, M1C 1H5	MTO
	MES11m	Toronto	Residential-House	112 Watson St, Toronto, M1C 1E3	MTO
POR12	MES12	Toronto	Residential-House	2 Calthorpe Ave, Scarborough, M1C 3V6	MTO
	OLA12	Toronto	Residential-House	2 Calthorpe Ave, Scarborough, M1C 3V6	MTO
	OLA12a	Toronto	Residential-House	3346 Ellesmere Rd, Toronto, M1C 1G9	MTO
	OLA12b	Toronto	Residential-House	148 Conlins Rd, Toronto, M1C 1C5	MTO
	MES12c	Toronto	Residential-House	149 Conlins Rd, Toronto, M1C 1C4	MTO
	OLA12c	Toronto	Residential-House	149 Conlins Rd, Toronto, M1C 1C4	MTO
	MES12d	Toronto	Residential-House	3446 Ellesmere Rd, Scarborough, M1C 1H3	MTO
	OLA12d	Toronto	Residential-House	3446 Ellesmere Rd, Scarborough, M1C 1H3	MTO
	MES12e	Toronto	Residential-House	3450 Ellesmere Rd, Scarborough, M1C 1H3	MTO
	OLA12e	Toronto	Residential-House	3450 Ellesmere Rd, Scarborough, M1C 1H3	MTO
	MES12f	Toronto	Residential-House	1 Calthorpe Ave, Scarborough, M1C 3S3	MTO
	OLA12f	Toronto	Residential-House	1 Calthorpe Ave, Scarborough, M1C 3S3	MTO

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR12	MES12g	Toronto	Residential-House	2 Spall Crt, Toronto, M1C 0B2	MTO
	OLA12g	Toronto	Residential-House	2 Spall Crt, Toronto, M1C 0B2	MTO
	MES12h	Toronto	Residential-House	3526 Ellesmere Rd, Toronto, M1C 3Z2	MTO
	OLA12h	Toronto	Residential-House	3526 Ellesmere Rd, Toronto, M1C3Z2	MTO
	OLA12i	Toronto	Residential-House	1 Spall Crt, Toronto, M1C 0B1	MTO
POR13	MES13	Toronto	Residential-House	107 Watson St, Toronto, M1C 1E2	MTO
	OLA13	Toronto	Residential-House	107 Watson St, Toronto, M1C 1E2	MTO
	MES13a	Toronto	Residential-House	3601 Ellesmere Rd, Scarborough, M1C 4Y6	MTO
	OLA13a	Toronto	Residential-House	3601 Ellesmere Rd, Scarborough, M1C 4Y6	MTO
	MES13b	Toronto	Residential-House	3607 Ellesmere Rd, Toronto, M1C 4Y6	MTO
	OLA13b	Toronto	Residential-House	3607 Ellesmere Rd, Toronto, M1C 4Y6	MTO
	MES13c	Toronto	Residential-House	3677 Ellesmere Rd, Scarborough, M1C 1H7	MTO
	OLA13c	Toronto	Residential-House	3677 Ellesmere Rd, Scarborough, M1C 1H7	MTO
	MES13d	Toronto	Residential-House	3685 Ellesmere Rd, Scarborough, M1C 1H7	MTO
	OLA13d	Toronto	Residential-House	3685 Ellesmere Rd, Scarborough, M1C 1H7	MTO
	MES13e	Toronto	Residential-House	3691 Ellesmere Rd, Scarborough, M1C 1H7	MTO
	OLA13e	Toronto	Residential-House	3691 Ellesmere Rd, Scarborough, M1C 1H7	MTO
POR14	MES14	Toronto	Residential-House	2 Scarboro Ave, Toronto, M1C 3Z4	MTO
	OLA14	Toronto	Residential-House	2 Scarboro Ave, Toronto, M1C 3Z4	MTO
	MES14a	Toronto	Residential-House	3692 Ellesmere Rd, Scarborough, M1C 1H6	MTO

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR14	OLA14a	Toronto	Residential-House	3692 Ellesmere Rd, Scarborough, M1C 1H6	MTO
	MES14b	Toronto	Residential-House	3700 Ellesmere Rd, Scarborough, M1C 1H6	MTO
	OLA14b	Toronto	Residential-House	3700 Ellesmere Rd, Scarborough, M1C 1H6	MTO
	MES14c	Toronto	Residential-House	3706 Ellesmere Rd, Toronto, M1C 1H6	MTO
	OLA14c	Toronto	Residential-House	3706 Ellesmere Rd, Toronto, M1C 1H6	MTO
	MES14d	Toronto	Residential-House	3760 Ellesmere Rd, Scarborough, M1C 1H9	MTO
	OLA14d	Toronto	Residential-House	3760 Ellesmere Rd, Scarborough, M1C 1H9	MTO
	MES14e	Toronto	Residential-House	3766 Ellesmere Rd, Scarborough, M1C 1H9	MTO
	OLA14e	Toronto	Residential-House	3766 Ellesmere Rd, Scarborough, M1C 1H9	MTO
	MES14f	Toronto	Residential-House	3772 Ellesmere Rd, Scarborough, M1C 1H9	MTO
	OLA14f	Toronto	Residential-House	3772 Ellesmere Rd, Scarborough, M1C 1H9	MTO
POR15	MES15	Toronto	Residential-House	588 Meadowvale Rd, Scarborough, M1C 4Y4	MTO
	OLA15	Toronto	Residential-House	588 Meadowvale Rd, Scarborough, M1C 4Y4	MTO
	MES15a	Toronto	Residential-House	3791 Ellesmere Rd, Scarborough, M1C 1H8	MTO
	OLA15a	Toronto	Residential-House	3791 Ellesmere Rd, Scarborough, M1C 1H8	MTO
	MES15b	Toronto	Residential-House	3785 Ellesmere Rd, Toronto, M1C 1H8	MTO
	OLA15a	Toronto	Residential-House	3785 Ellesmere Rd, Toronto, M1C1H8	MTO
	MES15c	Toronto	Residential-House	3777 Ellesmere Rd, Toronto, M1C1H8	MTO
	OLA15c	Toronto	Residential-House	3777 Ellesmere Rd, Toronto, M1C 1H8	MTO
	MES15d	Toronto	Residential-House	3769 Ellesmere Rd, Scarborough, M1C 1H8	MTO

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR15	OLA15d	Toronto	Residential-House	3769 Ellesmere Rd, Scarborough, M1C 1H8	MTO
	MES15e	Toronto	Residential-House	3761 Ellesmere Rd, Toronto, M1C 1H8	MTO
	OLA15e	Toronto	Residential-House	3761 Ellesmere Rd, Toronto, M1C 1H8	MTO
POR16	OLA16	Toronto	Residential - Heritage Known BHR	3864 Ellesmere Rd, Toronto, M1C 1J1	MTO
POR17	MES17	Toronto	Residential-House	4083 Ellesmere Rd, Toronto, M1C 1J3	MTO
	OLA17	Toronto	Residential-House	4083 Ellesmere Rd, Toronto, M1C 1J3	MTO
POR18	MES18	Pickering	Residential - Heritage Known CHL	1310 Altona Rd, Pickering, L1V 1L8	Durham
	OLA18	Pickering	Residential - Heritage Known CHL	1310 Altona Rd, Pickering, L1V 1L8	Durham
POR19	MES19	Pickering	Residential-House	1003 Riverview Cres, Pickering, L1V 4M5	Durham
	OLA19	Pickering	Residential-House	1003 Riverview Cres, Pickering, L1V 4M5	Durham
POR20	MES20	Pickering	Co-operative Apartment	400 Kingston Rd, Pickering, L1V 6S1	Durham
	OLA20	Pickering	Co-operative Apartment	400 Kingston Rd, Pickering, L1V 6S1	Durham
	OLA20a	Pickering	Co-operative Apartment	440 Kingston Rd, Pickering, L1V 1A4	Durham
POR21	MES21	Pickering	Residential-Townhouse	575 Steeple Hill, Pickering, L1V 7E4	Durham
	OLA21	Pickering	Residential-Townhouse	575 Steeple Hill, Pickering, L1V 7E4	Durham
	MES21a	Pickering	Residential-Townhouse	575 Steeple Hill, Pickering, L1V 7E4	Durham
	OLA21a	Pickering	Residential-Townhouse	575 Steeple Hill, Pickering, L1V 7E4	Durham
	OLA21b	Pickering	Residential-Townhouse	575 Steeple Hill, Pickering, L1V 7E4	Durham

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR22	MES22	Pickering	Residential-House	770 Kingston Rd, Pickering, L1V 1A8	Durham
	OLA22	Pickering	Residential-House	770 Kingston Rd, Pickering, L1V 1A8	Durham
	MES22a	Pickering	Residential-House	770 Kingston Rd, Pickering, L1V 1A8	Durham
	OLA22a	Pickering	Residential-House	770 Kingston Rd, Pickering, L1V 1A8	Durham
POR23	OLA23	Pickering	Residential-House	1723 Dunchurch St, Pickering, L1V 1T9	Durham
	OLA23a	Pickering	Residential-House	1047 Dunbarton Rd, Pickering, L1V 1H1	Durham
	OLA23b	Pickering	Residential-House	1087 Dunbarton Rd, Pickering, L1V 1H1	Durham
	OLA23c	Pickering	Residential-House	1089 Dunbarton Rd, Pickering, L1V 1H1	Durham
POR24	OLA24	Pickering	Residential-Townhouse	1735 Walnut Lane, Pickering, L1V 6Z8	Durham
	OLA24a	Pickering	Residential-Townhouse	1132 Glen Eden Crt, Pickering, L1V 6N8	Durham
	OLA24b	Pickering	Residential-Townhouse	1138 Glen Eden Crt, Pickering, L1V 6N8	Durham
	OLA24c	Pickering	Residential-Townhouse	1135 Glen Eden Crt, Pickering, L1V 6N8	Durham
	OLA24d	Pickering	Residential-Townhouse	1117 Glen Eden Crt, Pickering, L1V 6N8	Durham
POR25	OLA25	Pickering	Residential-House	1228 Charlotte Cir, Pickering, L1V 3P8	Durham
POR26	OLA26	Pickering	Condo apartment with OLA's	1200 The Esplanade N, Pickering, L1V 6V3	Durham
	OLA26a	Pickering	Condo apartment with OLA's	1880 Valley Farm Rd, Pickering, L1V 6B	Durham
	MES26b	Pickering	Condo apartment with OLA's	1880 Glengrove Rd, Pickering, ON L1V 7K1	Durham
	OLA26b	Pickering	Condo apartment with OLA's	1880 Glengrove Rd, Pickering, ON L1V 7K1	Durham
	MES26c	Pickering	Condo apartment with OLA's	1360 Glenanna Rd, Pickering, L1V 2T5	Durham
	OLA26c	Pickering	Condo apartment with OLA's	1360 Glenanna Rd, Pickering, L1V 2T5	Durham

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR27	OLA27	Pickering	Residential-Townhouse	1945 Denmar Rd, Pickering, L1V 3E2	Durham
	OLA27a	Pickering	Residential-Townhouse	1643 Jaywin Cir, Pickering, L1V 2W3	Durham
	OLA27b	Pickering	Residential-Townhouse	1629 Jaywin Cir, Pickering, L1V 2W3	Durham
	OLA27c	Pickering	Residential-Townhouse	1621 Jaywin Cir, Pickering, L1V 2W3	Durham
	OLA27d	Pickering	Residential-Townhouse	1617 Jaywin Cir, Pickering, L1V 2W3	Durham
	OLA27e	Pickering	Residential-Townhouse	1580 Kingston Rd, Pickering, L1V 6M6	Durham
POR28	OLA28	Pickering	Residential-House	1778 Bainbridge Dr, Pickering, L1V 6L8	Durham
POR29	OLA29	Pickering	Residential-Townhouse	1867 Kingston Rd, Pickering, L1V 6Z4	Durham
POR30	MES30	Ajax	Saint George's Anglican Church	77 Randall Dr, Ajax, L1S 6L4	Durham
	OLA30	Ajax	Saint George's Anglican Church	77 Randall Dr, Ajax, L1S 6L4	Durham
	OLA30a	Ajax	EDUKids Child Care Centres St Georges Daycare	77 Randall Dr, Ajax, L1S 6L4	Durham
POR31	MES31	Ajax	Heritage Known BHR-Health Movement Pilates-Massage	592 Kingston Rd W, Ajax, L1T 3A2	Durham
	OLA31	Ajax	Heritage Known BHR-Health Movement Pilates-Massage	592 Kingston Rd W, Ajax, L1T 3A2	Durham

DRAFT

Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR32	MES32	Ajax	Heritage Known BHR-Health Movement Pilates-Massage	504 Kingston Rd W, Ajax, L1T 3A3	Durham
	OLA32	Ajax	Heritage Known BHR-Sunshine Learning Centre Inc.	504 Kingston Rd W, Ajax, L1T 3A3	Durham
	OLA32a	Ajax	Heritage Known BHR-Sunshine Learning Centre Inc.	10 Hewison Crt, Ajax, L1T 3X7	Durham
POR33	OLA33	Ajax	Residential-House	1 Hewison Crt, Ajax, L1T 3X7	Durham
	OLA33a	Ajax	Residential-House	2 Pinoak Rd, Ajax, L1T 2X8	Durham
	OLA33b	Ajax	Residential-House	1 Pinoak Rd, Ajax, L1T 2X7	Durham
POR34	OLA34	Ajax	Residential-House	36 Fearn Cres, Ajax, L1S 5L6	Durham
	OLA34a	Ajax	Residential-House	4 Fearn Cres, Ajax, L1S 5L9	Durham
	OLA34b	Ajax	Residential-House	36 Fearn Cres, Ajax, L1S 5L6	Durham
	OLA34c	Ajax	Residential-House	44 Fearn Cres, Ajax, L1S 5L5	Durham
	OLA34d	Ajax	Residential-House	1 Rotherglen Rd N, Ajax, L1T 1N7	Durham
	OLA34e	Ajax	Residential-House	16 Cummings Crt, Ajax, L1T 1N6	Durham
	OLA34f	Ajax	Residential-House	20 Cummings Crt, Ajax, L1T 1N6	Durham

DRAFT

Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR35	MES35	Ajax	Residential-House	33 Woodward Cres, Ajax	Durham
	OLA35	Ajax	Residential-House	33 Woodward Cres, Ajax	Durham
	MES35a	Ajax	Residential-House	2 Ritchie Ave, Ajax, L1S 7T1	Durham
	MES35b	Ajax	Residential-House	36 Woodward Cres, Ajax, L1S 5T4	Durham
	OLA35b	Ajax	Residential-House	36 Woodward Cres, Ajax, L1S 5T4	Durham
	OLA35c	Ajax	Residential-House	10 Patterson Cres, Ajax, L1S 6R1	Durham
	OLA35a	Ajax	Residential-House	2 Ritchie Ave, Ajax, L1S 7T1	Durham
	OLA35d	Ajax	Residential-House	34 Patterson Cres, Ajax, L1S 6P9	Durham
	OLA35e	Ajax	Residential-House	58 Patterson Cres, Ajax, L1S 6P4	Durham
	OLA35f	Ajax	Residential-House	68 Patterson Cres, Ajax, L1S 6P3	Durham
	OLA35g	Ajax	Residential-House	72 Patterson Cres, Ajax, L1S 6P3	Durham
POR36	MES36	Ajax	Residential-House	51 Arnold Estate Lane, Ajax, L1S 7L6	Durham
	OLA36	Ajax	Residential-House	51 Arnold Estate Lane, Ajax, L1S 7L6	Durham
	MES36a	Ajax	Residential-House	45 Ventura Lane, Ajax, L1T 0C4	Durham
	OLA36a	Ajax	Residential-House	45 Ventura Lane, Ajax, L1T 0C4	Durham
	MES36b	Ajax	Residential-House	47 Ventura Lane, Ajax, L1T 0C3	Durham
	OLA36b	Ajax	Residential-House	47 Ventura Lane, Ajax, L1T 0C3	Durham
POR37	MES37	Ajax	Residential-House	57 Trawley Cres, Ajax, L1S 5X9	Durham
	OLA37	Ajax	Residential-House	57 Trawley Cres, Ajax, L1S 5X9	Durham

DRAFT

Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR38	MES38	Ajax	Residential-House	51 Chalmers Cres, Ajax, L1S 6A1	Durham
	OLA38	Ajax	Residential-House	51 Chalmers Cres, Ajax, L1S 6A1	Durham
	MES38a	Ajax	Residential-House	49 Chalmers Cres, Ajax, L1S 6A1	Durham
	OLA38a	Ajax	Residential-House	49 Chalmers Cres, Ajax, L1S 6A1	Durham
POR39	MES39	Ajax	Residential-House	38 Gilmour Dr, Ajax, L1S 5J5	Durham
	OLA39	Ajax	Residential-House	38 Gilmour Dr, Ajax, L1S 5J5	Durham
	MES39a	Ajax	Residential-House	68 Longstaff Dr, Ajax, L1S 5J6	Durham
	OLA39a	Ajax	Residential-House	68 Longstaff Dr, Ajax, L1S 5J6	Durham
	MES39b	Ajax	Residential-House	41 Gilmour Dr, Ajax, L1S 5J4	Durham
	OLA39b	Ajax	Residential-House	41 Gilmour Dr, Ajax, L1S 5J4	Durham
POR40	OLA40	Ajax	Residential-House	16 Tams Dr, Ajax, L1Z 1A3	Durham
POR41	MES41	Ajax	Heritage Known BHR-Daycare	365 Kingston Rd E, Ajax, L1Z 1W3	Durham
	OLA41	Ajax	Heritage Known BHR-Daycare	365 Kingston Rd E, Ajax, L1Z 1W3	Durham
	MES41a	Ajax	Residential-House	1 Wicks Dr, Ajax, L1Z 1C4	Durham
	OLA41a	Ajax	Residential-House	1 Wicks Dr, Ajax, L1Z 1C4	Durham
	MES41b	Ajax	Residential-House	50 Alexander's Crossing, Ajax, ON L1Z 2E6	Durham
	OLA41b	Ajax	Residential-House	50 Alexander's Crossing, Ajax, ON L1Z 2E6	Durham

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR42	MES42	Ajax	Residential-House	744 Kingston Rd E, Ajax, L1Z 1V8	Durham
	OLA42	Ajax	Residential-House	744 Kingston Rd E, Ajax, L1Z 1V8	Durham
POR43	MES43	Ajax	Residential-House	1610 Dundas St W, Whitby, L1P 1Y8	Durham
	OLA43	Whitby	Residential-House	1610 Dundas St W, Whitby, L1P 1Y8	Durham
POR44	MES44	Whitby	Residential-House	1180 Dundas St W, Whitby, L1P 1Y5	Durham
	OLA44	Whitby	Residential-House	1180 Dundas St W, Whitby, L1P 1Y5	Durham
POR45	OLA45	Whitby	Residential-House	24 Bluebell Cres, Whitby, L1P 1L1	Durham
	OLA45a	Whitby	Residential-House	20 Bluebell Cres, Whitby, L1P 1L1	Durham
	OLA45b	Whitby	Residential-House	16 Bluebell Cres, Whitby, L1P 1L2	Durham
	OLA45c	Whitby	Residential-House	12 Bluebell Cres, Whitby, L1P 1K7	Durham
	OLA45d	Whitby	Residential-House	4 Bluebell Cres, Whitby, L1P 1K7	Durham
	MES45e	Whitby	Residential-House	1 Fothergill Crt, Whitby, L1P 1K8	Durham
	OLA45e	Whitby	Residential-House	1 Fothergill Crt, Whitby, L1P 1K8	Durham
POR46	MES46	Whitby	Residential-House	114 Raglan St, Whitby, L1N 2S9	Durham
	OLA46	Whitby	Residential-House	114 Raglan St, Whitby, L1N 2S9	Durham
	OLA46a	Whitby	Residential-House	116 Raglan St, Whitby, L1N 2S9	Durham
POR47	MES47	Whitby	Residential-House	99 Bell Dr, Whitby, L1N 2T1	Durham
	OLA47	Whitby	Residential-House	99 Bell Dr, Whitby, L1N 2T1	Durham
POR48	MES48	Whitby	Residential-House	506 Dundas St W, Whitby, L1N 2M9	Durham
	OLA48	Whitby	Residential-House	506 Dundas St W, Whitby, L1N 2M9	Durham

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Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR49	MES49	Whitby	Residential-House	501 Dundas St E, Whitby, L1N 2J5	Durham
	OLA49	Whitby	Residential-House	501 Dundas St E, Whitby, L1N 2J5	Durham
POR50	MES50	Whitby	Residential-House	991 Dundas St E, Whitby, L1N 2K1	Durham
	OLA50	Whitby	Residential-House	991 Dundas St E, Whitby, L1N 2K1	Durham
	OLA50a	Whitby	Residential-House	105 Dovedale Dr, Whitby, L1N 1Z7	Durham
POR51	MES51	Whitby	Residential-House	1535 Dundas St E, Whitby, L1N 2K6	Durham
	OLA51	Whitby	Residential-House	1535 Dundas St E, Whitby, L1N 2K6	Durham
POR52	OLA52	Whitby	Residential-Apartment Building with OLA's	101 Kathleen St, Whitby, L1N 6P8	Durham
POR53	OLA53	Whitby	Residential-House	17 Burdge Crt, Whitby, L1N 9L1	Durham
	MES53a	Whitby	Residential-House	11 Falcon Crt, Whitby, L1N 6V5	Durham
	MES53b	Whitby	Residential-House	1923 Dundas St E, Whitby, L1N 2L5	Durham
	OLA53a	Whitby	Residential-House	11 Falcon Crt, Whitby, L1N 6V5	Durham
	OLA53b	Whitby	Residential-House	1923 Dundas St E, Whitby, L1N 2L5	Durham
	OLA53c	Whitby	Residential-House	909 King St W, Oshawa, L1J 2L4	Durham
	OLA53d	Oshawa	Residential-House	14 Burdge Crt, Whitby, L1N 9L1	Durham
	OLA53e	Oshawa	Residential-House	8 Falcon Crt, Whitby, L1N 6V5	Durham
POR54	OLA54	Oshawa	Residential-House	10 Waverly St S, Oshawa, L1J 5T7	Durham
POR55	OLA55	Oshawa	Residential-House	717 Featherwood Crt, Oshawa, L1J 8H1	Durham

DRAFT

Table 4-4 Summary of NSAs (Continued)

ID	OLA/MES ID	Municipality	Type of Unit	Address	Applicable Criteria
POR56	MES56	Oshawa	Residential-House	36 Fernhill Blvd, Oshawa, L1J 5H9	Durham
	OLA56	Oshawa	Residential-House	36 Fernhill Blvd, Oshawa, L1J 5H9	Durham
	MES56a	Oshawa	Residential-House	522 Bond St W, Oshawa, L1J 2M4	Durham
	OLA56a	Oshawa	Residential-House	522 Bond St W, Oshawa, L1J 2M4	Durham
	MES56b	Oshawa	Residential-House	510 Bond St W, Oshawa, L1J 2M4	Durham
	OLA56b	Oshawa	Residential-House	510 Bond St W, Oshawa, L1J 2M4	Durham
	MES56c	Oshawa	Residential-House	39 Harris Ave, Oshawa, L1J 5K6	Durham
	OLA56c	Oshawa	Residential-House	39 Harris Ave, Oshawa, L1J 5K6	Durham
	MES56d	Oshawa	Residential-House	36 Rosehill Blvd, Oshawa, L1J 5G7	Durham
	OLA56d	Oshawa	Residential-House	36 Rosehill Blvd, Oshawa, L1J 5G7	Durham
	MES56e	Oshawa	Residential-House	424 Bond St W, Oshawa, L1J 6G3	Durham
	OLA56e	Oshawa	Residential-House	424 Bond St W, Oshawa, L1J 6G3	Durham
POR57	OLA57	Oshawa	Residential-House	345 Buena Vista Ave, Oshawa, L1J 2M6	Durham
	MES57a	Oshawa	Residential-House	39 Park Rd N, Oshawa, L1J 4K8	Durham
	OLA57a	Oshawa	Residential-House	39 Park Rd N, Oshawa, L1J 4K8	Durham

4.3.2 Future Build (Year 2041)

The Future Build scenario represents future conditions in the same year as the Future No-Build year, but inclusive of the DSBRT. The traffic data for Future Build scenario indicates that 20 buses per hour per direction will be using the dedicated ROW, resulting in fewer cars utilizing the roadways. The BRT will operate 12 buses per hour per direction (5 minute service), and that the additional 8 buses per hour per direction is to account for additional local bus service or future BRT growth for a conservative assessment. A copy of the traffic data used in the assessment is provided in Appendix H.

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Projected noise levels at the NSAs in the Future Build scenario were estimated through predictive modelling (discussed in Section 4.4.2), in the same manner as for the Future No-Build scenario. Modelling of the Future Build scenario accounts for any changes to roadway elevations, number of lanes, and alignment that will be required to accommodate the DSBRT, and also accounts for the planned vertical profile of the DSBRT. To account for the effects of surface construction materials, the DSBRT was modelled with an asphalt surface.

4.4 Noise Modelling

4.4.1 Noise from Construction

As noted in Section 3.1, the overall noise level of all equipment in a construction activity should be compared with the criteria noted in Table 3-2. In order to calculate the overall noise level due to construction activities at a sensitive receiver, individual equipment noise level should be calculated according to the equation shown below (FTA, 2018).

$$L_{eq} = L_{emission} + 10\log(Adj_{Usage}) - 20\log\left(\frac{D}{50}\right) - 10Glog(\frac{D}{50})$$

Where:

$L_{emission}$ = noise emission level of the particular piece of equipment at the reference distance of 50 ft, dBA;

Adj_{Usage} = usage factor to account for the fraction of time that the equipment is in use over the specified time period;

D = distance from equipment to receiver in feet; and

G = a constant that accounts for topography and ground effects.

The reference construction equipment emission levels $L_{eqmission}$ is provided in FTA (FTA, 2018) for a list of construction equipment as shown in Table 4-5. Other parameters in the equation above can be adjusted to tailor the calculation for specific construction activities.

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Table 4-5 Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level 50 ft from Source, dBA
Air Compressor	80
Backhoe	80
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Dozer	85
Generator	82
Grader	85
Jack Hammer	88
Large Bulldozer	85
Loader	80
Loaded Truck	84
Paver	85
Pneumatic Tool	85
Pump	77
Roller	85
Vibratory Roller	85
Saw	76
Scarifier	83
Scraper	85
Shovel	82
Truck	84

Note: Sound emission levels for vibratory roller, large bulldozer, and loaded truck were not available in the FTA (FTA, 2018). Hence, their sound emission levels were assumed to be equal to the most similar equipment such as roller, dozer, and truck, respectively.

DRAFT

In addition to above, as noted in Section 3.1.1, the sound level limits recommended by the MECP for construction noise have been developed on a per-unit basis rather than a cumulative basis. As such, noise level of individual pieces of construction equipment shall be in compliance with the NPC-115 and NPC-118 limits. It is assumed that the construction contractor will ensure that all equipment meets the applicable NPC-115 and NPC-118 limits.

4.4.2 Noise from Transportation Sources

The sound level predictions completed in support of transportation noise assessment is completed using either the MECP ORNAMENT calculation method, or the TNM 2.5 (FTA, 2018). For scenarios with complex geometry, such as roads featuring grade separations or below grade sections, irregular topography or complex horizontal alignments, the more rigorous TNM 2.5 model may be used. The TNM 2.5 model is based on algorithms from the U.S. FHWA (FHWA, 1998). The TNM 2.5 version is implemented in the CadnaA software and therefore was used for this noise assessment. As per MTO's Noise Guide requirements, for arterial roadways, all sound levels were assessed as L_{eq} (16-hour) at a height of 1.5 m above ground at the most exposed side, or OLA of each identified NSA.

4.4.2.1 ORNAMENT/STAMSON

Sound levels in ORNAMENT are calculated based on the specific exposure of a given POR to the road(s) under assessment. As the road source geometry is considered from the specific point of view of the receiver, only one receiver may be modelled at a time and the results are applicable only to that receiver and those with a reasonably similar exposure to the road.

The ORNAMENT method is summarized in a Technical Document prepared in 1989 (Ontario Ministry of the Environment, 1989) and is based on reference sound level data for three classes of vehicles: cars, medium trucks (inclusive of buses) and heavy trucks. A series of adjustments are then applied to the reference data based on site-specific variables, including the actual volume of each vehicle type, the speed of travel, distance between the road and receiver, road length and pavement type, road gradient, intervening ground surface, and obstacles to noise propagation (i.e., barriers, houses, dense foliage). Accuracy decreases significantly beyond 200 m of the noise source, and the method does not work for distances greater than 500 m. Prediction accuracy is further reduced in cases with irregular terrain, such as parts of this study area.

As noted earlier, the ORNAMENT method is the basis for the STAMSON computer program, which was used for calculations for a representative receiver for two NSA for comparison with TNM 2.5 results. NSAs are located within complex terrains with a combination of natural, or engineered safety and acoustic controls, such as berms and acoustic fences. The receivers selected below have relatively simple terrain geometry, considering the overall complexity of the study area, and can be modelled using STAMSON with the least amount of adjustments made by the software. This also allows for a relatively direct comparison. Other receivers are either well beyond the confidence range of STAMSON, or are subject to a number of terrain changes between the source and receiver, which cannot be easily modelled using STAMSON. Furthermore, the selected receivers are considered representative for a good number of the PORs within the NSAs as they share similar exposures to all road segments in terms of angle and distance. Based on aerial photography and site observations, the surrounding ground surface was set to absorptive. Vehicles were assumed to be operating at the posted speed limit, per MECP procedures outlined in the ORNAMENT Technical Document (Ontario Ministry of the

DRAFT

Environment, 1989). Table 4-6 documents the results of the comparison between TNM 2.5 and STAMSON. A sample STAMSON calculation is provided in Appendix G.

Table 4-6 TNM 2.5 vs STAMSON Sample Comparison

ID	Sound Level Prediction (dBA)		Sound Level Difference (dBA)
	TNM	STAMSON	
POR1	66.0	67.4	+1.4
POR12	61.7	63.6	+1.9

STAMSON results are slightly higher than TNM 2.5 results for the PORs shown in Table 4-6. However, this difference is likely to be imperceptible to humans. In these cases, TNM 2.5 can handle the complex terrain, the benefits from interfering structures, such as berms and residential acoustical fences, varying ground absorptions, and number of reflections, better than STAMSON. In all cases, the differences in sound levels are below the 3 dBA threshold of perception.

4.4.2.2 FHWA TNM 2.5

TNM version 2.5 was developed by the FHWA for the assessment and analysis of highway traffic noise, and to assist in the design of noise barriers for highway projects and is the successor to MTO's approved model for complex terrain, TNM 2.5. The model utilizes 1/3-octave band reference sound level data for several vehicle types operating on a variety of pavement surfaces. Test cases are checked against real-world noise measurements to ensure the accuracy of the model. The vehicle types that may be modelled include automobiles, medium trucks, heavy trucks, buses and motorcycles. In this program, the user plots the road alignment and sensitive receiver locations of interest and assigns the traffic mix to each plotted road segment as appropriate. The model accounts for the speed of each vehicle type, the pavement surface type, the separation distance between the road and receiver, as well as the effect of intervening distance, ground type, topography and absorption of sound by the atmosphere. TNM 2.5 allows for the simultaneous calculation of multiple receiver points in a single run, as opposed to ORNAMENT, for which each run is receiver specific.

TNM version 2.5 was applied in the assessment of traffic noise impacts for the receivers in this assessment due to the size of the study area corridor. However, the results of select receivers within each NSA were compared to results obtained using ORNAMENT in Table 4-6.

The road infrastructure for both Future Build and Future No-Build scenarios were modelled in TNM 2.5 based on roadway plan and profile drawings and topographical contour plots. The traffic volumes of the various vehicle types were input into the model based on the projected future traffic data with and without the Project, and speeds were assigned based on the posted speed

limits of the associated roads. The selected representative receivers discussed in Section 4.2 were modelled and assigned a height of 1.5 m. It was assumed that the vehicles travel on an average pavement type and that the surrounding area is set to absorptive.

4.5 Vibration Modelling

4.5.1 Vibration from Construction

The operation of construction equipment may result in perceptible ground vibrations in the vicinity of the construction site. As construction activities and equipment such as Pile Driving (impact) for culverts and bridges are required and are considered as construction activities that produce high level of vibrations, the potential for vibration impacts has been assessed on a setback basis by typical equipment type. Measurement data from literature have been used in conjunction with the construction vibration criteria in Section 3.3 to define the minimum separation distance required for each type of construction equipment that may be used in construction.

The U.S. FTA has compiled vibration measurement data for various sources from literature and summarized each source in terms of a reference PPV vibration level (in/sec) at a distance of 25 ft (FTA, 2018). The following equation is provided to extrapolate the reference level to further distances.

$$PPV_{equip} = PPV_{ref}\left(\frac{25}{D}\right)^{1.5}$$

Where:

PPV_{equip} = peak particle velocity of the equipment in in/sec of the equipment, adjusted for distance;

PPV_{ref} = reference vibration level in in/sec at 25 ft from the equipment; and

D = the distance from the equipment to the receiver (ft).

The above equation was rearranged to solve for D with the PPV_{equip} variable being set to the applicable criteria value from Section 3.3. The solution to the resulting equation provides the minimum distance required between each type of equipment and the receiver to achieve the applicable criteria. The results of the construction vibration impact assessment are discussed in Section 6.1.

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5.0 NOISE IMPACT ASSESSMENT

5.1 Construction Noise

5.1.1 Potential Impacts

Construction activities for the DSBRT includes construction of Bus Stops and Runningways (i.e., BRT lanes throughout the corridor). An assessment of construction noise is required to identify potential noise monitoring locations as well as providing recommendations and applicable mitigation measures. Table 5-1 indicates the different equipment used in the construction of Bus Stops and Runningways along with their associated sound levels, respectively.

Table 5-1 List of Construction Equipment

Construction Equipment	Construction Activity			
	Bus Stop-Removal Construction	Bus Stop-New Construction	Runningway-Removal Construction	Runningway-New Construction
Air Compressor	-[1]	×[2]	-	-
Backhoe	×	-	×	-
Compactor	-	×	-	×
Concrete Mixer	-	×	-	×
Concrete pump	-	×	-	×
Concrete vibrator	-	×	-	×
Dozer	-	×	-	×
Generator	×	-	×	×
Grader	-	×	-	-
Jack Hammer	×	-	-	-
Large Bulldozer	-	×	-	×
Loader	-	-	-	×
Loaded Truck	×	-	×	-
Paver	-	-	-	×
Pneumatic Tool	-	×	-	-
Pump	-	×	-	-
Roller	-	-	-	×
Saw	×	-	-	-
Scarifier	×	-	-	-
Scraper	-	×	-	×
Shovel	-	×	-	×
Truck	×	-	×	-
Vibratory Roller	-	-	-	×

Notes:
1- "-" indicate the specified equipment is not used during the considered construction activity.
2- "x" indicate the specified equipment is used during the considered construction activity.

The noise generated during a construction activity (e.g., Bus Stop, or Runningway) is calculated using equation presented in Section 4.4.1. Usage factor (Adj_{Usage}) and ground effect are assumed to be 1, and 0, respectively, in order to calculate conservative values for equipment sound levels.

To define the Zone of Influence (ZOI) boundary or setback distances for a specific construction activity, the distance at which the overall sound level of construction equipment is predicted to be the same as the assessment criteria noted in Table 3-1 of Section 3.1 are calculated. Consequently, the ZOI for construction of Bus Stop and Runningway are shown in Table 5-2. Construction noise level monitoring is required for the most sensitive receivers/buildings (i.e., closest buildings to the construction area) falling inside the construction ZOI. The measured construction noise levels should comply with noise level limits summarized in Table 3-8. The list of 39 representative buildings that fall in the ZOI and require noise monitoring during construction activities are presented in Table 5-3. Zone of Influence (ZOI) plans including thirty-nine (39) identified Representative Noise Sensitive Receivers requiring sound level monitoring for daytime construction are shown in Appendix I. The ZOI for daytime construction of BRT lanes to provide an example of a runningway ZOI is illustrated in Appendix I. The other runningways ZOIs were not shown since they would not alter the selection of Representative Noise Sensitive Receivers.

Table 5-2 Zone of Influence (ZOI) for Construction Activities

Construction Activity	Combined Sound level Prohibited Limits (dBA) at Setback distance or boundary of ZOI		Zone of Influence (ZOI) or Setback Distance (m)	
	Day	Night	Day	Night
Bus Stop - Removal Construction	80	70	61.5	195
Bus Stop - New Construction	80	70	77	245
Runningway - Removal Construction	80	70	42	133
Runningway - New Construction	80	70	85	277

Table 5-3 List of Buildings Requiring Noise Monitoring During Construction Activities

Receiver ID	Building Type	Address
1	Residential-House	67 Parkington Cres, Toronto, M1H 2T9
2	Residential-House	34 Pendle Hill Crt, Toronto, M1H 2L9
3	Residential-Town House	#Unit 11,2055 Ellesmere Rd, Scarborough, M1H 2W6
4	Residential-Town House	33 Gander Dr, Toronto, M1G 2W3
5	Residential-Town House	371 Orton Park Rd, Scarborough, M1G 3V1
6	Residential-Town House	Townhouse owned by City of Toronto close to Scarborough Health Network - Centenary hospital 2867 Ellesmere Rd, Scarborough, ON M1E 4B9

Table 5-3 List of Buildings Requiring Noise Monitoring During Construction Activities (Continued)

Receiver ID	Building Type	Address
7	Day Care	Day Care-1255 Military Trail, Toronto (ON), M1C 1A3, Canada
8	Residential-House	148 Conlins Rd, Toronto, M1C 1C5
9	Residential-House	107 Watson St, Toronto, M1C 1E2
10	Residential - Heritage Known BHR	3864 Ellesmere Rd, Toronto, M1C 1J1
11	Residential-House	4083 Ellesmere Rd, Toronto, M1C 1J3
12		341 Kingston Rd, Pickering, L1V 1A1
13	Residential-Townhouse	575 Steeple Hill, Pickering, L1V 7E4
14	Residential-House	770 Kingston Rd, Pickering, L1V 1A8
15	Residential-House	878 Kingston Rd, Pickering, L1V 1A8
16	Residential-House	1723 Dunchurch St, Pickering, L1V 1T9
17	Commercial-Medical centre (LifeLab)	1735 Walnut Lane, Pickering, L1V 6Z8
18	Residential-House	1230 Charlotte Cir, Pickering, L1V 3P8
19	Residential-House	1360 Glenanna Rd, Pickering, L1V 2T5
20	Residential-House	1945 Denmar Rd, Pickering, L1V 3E2
21	Residential-House	1874 Kingston Rd, Pickering, L1V 1C8
22	Residential-House	592 Kingston Rd W, Ajax, L1T 3A2
23	Residential-House	10 Fearn Cres, Ajax, L1S 5L6
24	Residential-House	36 Woodward Cres, Ajax, L1S 5T4
25	Residential-House	30 Tams Dr, Ajax, L1Z 1A2
26	Residential-House	1 Galea Dr, Ajax, L1Z 0J7
27	Residential-House	1610 Dundas St W, Whitby, L1P 1Y8
28	Residential-House	1180 Dundas St W, Whitby, L1P 1Y5
29	Residential-House	22 Bluebell Cres, Whitby, L1P 1L1
30	Residential-House	723 Dundas Street West, Whitby
31	Residential-House	506 Dundas St W, Whitby, L1N 2M9
32	Vacant land	604 Dundas Street East, Whitby
33	Residential-House	991 Dundas St E, Whitby, L1N 2K1
34	Residential-House	1535 Dundas St E, Whitby, L1N 2K6
35	Residential-Apartment Building with OLA's	101 Kathleen St, Whitby, L1N 6P8
36	Residential-House	787 King St W, Oshawa, L1J 2L2
37	Residential-House	717 Featherwood Crt, Oshawa, L1J 8H1
38	Residential-House	36 Fernhill Blvd, Oshawa, L1J 5H9
39	Residential-Apartment	44 Bond St W, Oshawa, L1G 6R2

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In addition, as noted in Section 3.1, the sound level limits recommended by the MECP for construction noise have been developed on a per-unit basis rather than a cumulative basis. As such, noise levels of individual pieces of construction equipment shall be in compliance with the NPC-115 and NPC-118 limits. It is assumed that the equipment supplier will ensure that all equipment meets the applicable NPC-115 and NPC-118 limits.

5.1.2 Mitigation Measures and Monitoring

The implementation of the following measures will help to monitor and mitigate potential noise impacts during construction:

- A Noise and Vibration Management Plan (NVMP) to be prepared prior to construction. NVMP will include specific mitigation measures related to laydown areas (once they are determined).
- Noise level monitoring shall be undertaken at identified Representative Noise Sensitive Receivers to appropriately identify and mitigate any exceedances for noise levels to comply with construction noise criteria set in Table 3-8.
- Temporary noise mitigation measures shall be investigated and necessary noise mitigation measures in the form of physical noise barriers, mufflers on equipment, etc. shall be implemented if monitoring results show noise levels during construction activities exceed the criteria.
- Noise levels shall be monitored to verify mitigation measures(s) effectiveness, if any. Limit construction work to the time periods allowed by the municipalities' noise By-laws, as summarized in Section 3.1.
- Should there be a need to complete work outside of the hours allowed in the applicable noise By-laws, the Contractor is to seek any required exemptions and permits directly from the applicable jurisdiction, in advance of any work performed outside of the allowable time periods. If an exemption cannot be obtained, then construction will proceed in accordance with the requirements of the noise By-laws.
- The Contractor is expected to comply with all applicable requirements of the contract and local noise By-laws. Enforcement of noise control By-laws is the responsibility of the Municipality for all work.
- Contracts shall include explicit indication that all construction equipment used on the project is to meet the sound level criteria from NPC-115 and NPC-118, and be well maintained and operating with effective muffling devices that are in good working order.
- The separation distance between construction staging areas and nearby sensitive receivers is to be maximized to the extent possible to reduce noise impacts.
- Any temporary roads for construction vehicle access are to be well maintained and free of pot-holes and ruts to avoid excessive noise from heavy vehicles travelling on uneven surfaces.

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- Should any complaints be reported from the public due to construction noise, the Owner will be notified, and the incident will be investigated. A complaints protocol is to be established for receiving, investigating and addressing construction noise complaints from the public, including a plan for how the public is to be notified of their options for logging a complaint.
- A noise complaint will trigger an investigation to verify whether the noise mitigation has been implemented, including verification of construction equipment sound levels per NPC-115 and NPC-118.
- In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration will be given to the technical, administrative and economic feasibility of the various alternatives.

5.2 Operational Noise

5.2.1 Impact Assessment

The noise modelling of the transportation sources was completed using TNM version 2.5 and the results are summarized in Table 5-4. This assessment includes all existing noise barriers (berms and fences) constructed as part of subdivision plan approvals, as well as any naturally occurring berms and embankments. The sound level predictions as a result of DSBRT operations indicate that some of the Future Build sound levels are projected to be above the MTO absolute sound level threshold of 65 dBA at the representative receiver locations where MTO Noise Guide applies. However, the incremental impacts are below the MTO threshold of +5 dBA at all locations within the study area.

Similarly, the sound level predictions as a result of DSBRT operations indicate that some of the Future Build sound levels are projected to be above the Durham Region absolute sound level threshold of 60 dBA at the representative receiver locations within the Durham Region boundaries. However, the incremental impacts are below the Durham Region threshold of +5 dBA at most locations within the study area except for three PORs (i.e., POR23, POR45, and POR46). The noticeable incremental impacts were caused either due to demolishing existing noise walls for road expansion purposes at the affected receivers (i.e., POR45 and POR46) or new road alignment/profile which brings the traffic noticeably closer to the receiver (i.e., POR23).

Very little variability in impact is expected between the receivers due to the similarities in exposure conditions. For a number of receivers, the noise impacts are predicted to marginally decrease as buses that are currently travelling along Ellesmere Road and Highway 2 are expected to shift operations to the dedicated ROW in median, thus moving them farther away and resulting in less audible operations. However, in certain areas the DSBRT dedicated ROW shifts closer to the edge of the ROW and therefore may have a potential noise impact at the nearest noise sensitive areas.

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Bus stations are not expected to have associated garages, or layover, or overnight stationary activities and as such were not treated as stationary noise sources. Stations were not assessed against NPC-300 as significant stationary noise sources are not expected to be present at the stations within this study area.

Where the predicted Future Build sound level at the POR is above the MTO or Durham Region's threshold of 65 dBA or 60 dBA, respectively, an assessment of noise mitigation was completed. A copy of the reviewed noise barriers (i.e., the barriers that were introduced in the model for the purpose of evaluating the noise mitigation effectiveness) along with the existing noise barriers is attached in Appendix A.

5.2.2 Assessment of Noise Control

The noise impact due to the proposed DSBRT within the study area is assessed. The primary sources of noise are the vehicular traffic along Ellesmere Road and Highway 2, and major arterial roads carrying traffic. By comparison, the DSBRT will represent only a fraction of the total road traffic and would not be a significant contributor to overall traffic volumes.

As shown in Table 5-4, there are a large number of POR locations where the predicted Future Build sound levels are in exceedance of the MTO Noise Guide or Durham Region's Noise Policy, depending on the POR locations. Therefore, review and investigation of new noise barriers were conducted at the OLA locations where there is an exceedance. To be consistent with Durham Region's Noise Policy, a maximum height of 3.0 m high noise barrier was modelled along the proposed road ROW near the OLA receivers where the sound levels are predicted to be above the applicable criteria.

As shown in Table 5-5, at some POR locations, the reviewed noise barrier will not provide 5 dBA or 6 dBA sound level reduction and therefore it is not recommended that a noise barrier be built at these locations. However, at some POR locations, a 2.0 m to 3.0 m higher noise barrier is predicted to provide a minimum of 5 dBA or 6 dBA sound level reduction.

A series of noise barrier heights ranging between 2.0 to 3.0 m high along the fenceline of residences were investigated to be constructed within the road ROW to mitigate the sound levels within the NSAs meet the applicable criteria within this study area. The technical, economic, and administrative feasibility of implementing noise barriers in the locations identified in Table 5-5 will be reviewed in accordance with MTO's Environmental Guide for Noise (MTO, 2008 Version 1.1) during detailed design. The locations for implementing the noise barriers in Toronto and Durham will be confirmed through discussions with the respective municipalities. A copy of the plan illustrating the investigated noise barriers that provide efficient sound level reduction (5 dBA (Toronto Municipality) and 6 dBA (Durham Region)) for the associated PORs is provided in Appendix B.

Table 5-4 Noise Impacts (First Row Receivers)

POR ID	OLA/MES ID	Existing Sound Level (dBA)	Sound Level Predictions (dBA)		Change due to Undertaking (dBA)	Applicable Criteria	Mitigation Review Required (Y/N)?
			Future No-Build (2041)	Future Build (2041)			
POR1	MES01	65.7	66.0	**67.3**[1]	1.3	MTO	N/A[2]
	OLA01	62.9	63.2	64.0	0.8	MTO	N[3]
	OLA01a	63.6	63.9	64.6	0.7	MTO	Y
	OLA01b	63.5	63.8	64.8	1.0	MTO	Y
	OLA01c	53.7	53.9	55.0	1.1	MTO	N
POR2	OLA02	64.1	64.4	**65.2**	0.8	MTO	Y
	OLA02a	63.6	63.9	64.5	0.6	MTO	N
	OLA02b	64.4	64.7	**65.3**	0.6	MTO	Y
	OLA02c	64.3	64.6	**65.2**	0.6	MTO	Y
	OLA02d	63.3	63.6	64.5	0.9	MTO	N
POR3	OLA03	64.3	64.5	**65.8**	1.3	MTO	Y
	OLA03a	63.4	63.6	64.8	1.2	MTO	Y
	OLA03b	63.4	63.6	64.5	0.9	MTO	N
	OLA03c	61.0	61.2	62.2	1.0	MTO	N
POR4	MES04	64.3	64.4	**65.7**	1.3	MTO	N/A
	OLA04	52.8	53.0	53.0	0.0	MTO	N
POR5	MES05	66.0	66.4	**68.8**	2.4	MTO	N/A
	OLA05	63.6	64.0	**65.5**	1.5	MTO	Y
	OLA05a	65.0	65.4	**67.0**	1.6	MTO	Y
	OLA05b	64.7	65.1	**66.2**	1.1	MTO	Y
	OLA05c	64.8	65.2	**66.3**	1.1	MTO	Y
	OLA05d	65.3	65.7	**66.7**	1.0	MTO	Y
	OLA05e	64.4	64.9	**65.6**	0.7	MTO	Y
	OLA05f	64.1	64.5	**66.9**	2.4	MTO	Y
	OLA05g	63.7	64.1	**66.6**	2.5	MTO	Y
	OLA05h	63.7	64.2	**66.7**	2.5	MTO	Y
	OLA05i	61.7	62.2	63.9	1.7	MTO	N
POR6	OLA06	63.1	63.5	64.5	1.0	MTO	N
	OLA06a	62.8	63.2	64.8	1.6	MTO	Y
	OLA06b	64.0	64.4	**65.6**	1.2	MTO	Y
	OLA06c	63.0	63.4	64.6	1.2	MTO	Y
	OLA06d	63.8	64.3	**65.4**	1.1	MTO	Y
	OLA06e	63.6	64.1	**65.0**	0.9	MTO	Y
	OLA06f	60.0	60.5	61.4	0.9	MTO	N
	OLA06g	58.1	58.5	59.6	1.1	MTO	N
POR7	OLA07	62.0	62.5	62.8	0.3	MTO	N
	OLA07a	55.4	55.9	56.9	1.0	MTO	N
	OLA07b	60.5	61.0	61.2	0.2	MTO	N

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Table 5-4 Noise Impacts (First Row Receivers) (Continued)

POR ID	OLA/MES ID	Existing Sound Level (dBA)	Sound Level Predictions (dBA)		Change due to Undertaking (dBA)	Applicable Criteria	Mitigation Review Required (Y/N)?
			Future No-Build (2041)	Future Build (2041)			
POR8	OLA08	62.2	62.8	63.5	0.7	MTO	N
	OLA08a	58.1	58.6	59.8	1.2	MTO	N
	OLA08b	45.2	45.8	46.2	0.4	MTO	N
	OLA08c	52.2	52.7	53.7	1.0	MTO	N
	OLA08d	49.3	49.8	50.7	0.9	MTO	N
	OLA08e	47.7	48.2	48.4	0.2	MTO	N
	OLA08f	58.9	59.4	60.0	0.6	MTO	N
POR9	OLA09	63.8	64.4	**65.9**	1.5	MTO	Y
	OLA09a	64.2	64.8	**65.9**	1.1	MTO	Y
	OLA09b	64.3	64.9	**65.8**	0.9	MTO	Y
POR10	OLA10_Day Care	58.4	59.4	59.7	0.3	MTO	N
	OLA10a	53.7	54.6	55.1	0.5	MTO	N
	OLA10b	45.6	46.3	47.0	0.7	MTO	N
POR11*	MES11	61.2	62.3	**65.3**	3.0	MTO	N/A
	MES11a	61.3	62.4	64.7	2.3	MTO	N/A
	MES11b	59.9	61.0	62.6	1.6	MTO	N
	MES11c	60.2	61.3	63.6	2.3	MTO	N
	MES11d	60.1	61.2	63.2	2.0	MTO	N
	MES11e	60.7	61.8	63.8	2.0	MTO	N
	MES11f	57.4	58.5	59.9	1.4	MTO	N
	MES11g	60.8	61.9	63.7	1.8	MTO	N
	MES11h	60.5	61.6	63.3	1.7	MTO	N
	MES11i	59.2	60.3	61.7	1.4	MTO	N
	MES11M	60.8	61.9	63.7	1.8	MTO	N
	OLA11	58.1	59.2	60.7	1.5	MTO	N
	OLA11a	57.4	58.5	60.1	1.6	MTO	N
	OLA11b	51.6	52.6	53.5	0.9	MTO	N
	OLA11c	43.1	44.1	45.2	1.1	MTO	N
	OLA11d	43.3	44.4	45.4	1.0	MTO	N
	OLA11e	56.7	57.8	59.4	1.6	MTO	N
	OLA11f	40.0	41.0	41.2	0.2	MTO	N
	OLA11g	40.3	41.4	42.8	1.4	MTO	N
	OLA11h	46.3	47.4	48.9	1.5	MTO	N
	OLA11i	40.6	41.8	43.4	1.6	MTO	N
POR12	MES12	60.7	61.7	63.4	1.7	MTO	N
	MES12c	60.6	61.6	63.8	2.2	MTO	N
	MES12d	60.5	61.5	63.2	1.7	MTO	N
	MES12e	60.7	61.7	63.4	1.7	MTO	N
	MES12f	59.6	60.6	61.9	1.3	MTO	N
	MES12g	59.2	60.2	61.5	1.3	MTO	N
	MES12h	60.3	61.3	63.0	1.7	MTO	N

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Table 5-4 Noise Impacts (First Row Receivers) (Continued)

POR ID	OLA/MES ID	Existing Sound Level (dBA)	Sound Level Predictions (dBA)		Change due to Undertaking (dBA)	MTO/ Region of Durham	Mitigation Review Required (Y/N)?
			Future No-Build (2041)	Future Build (2041)			
POR12	OLA12	57.1	58.1	59.6	1.5	MTO	N
	OLA12a	46.9	47.9	48.8	0.9	MTO	N
	OLA12b	58.0	59.0	60.6	1.6	MTO	N
	OLA12c	57.9	58.9	60.6	1.7	MTO	N
	OLA12d	45.3	46.3	47.9	1.6	MTO	N
	OLA12e	38.6	39.6	40.9	1.3	MTO	N
	OLA12f	56.3	57.3	58.3	1.0	MTO	N
	OLA12g	56.4	57.5	58.7	1.2	MTO	N
	OLA12h	57.2	58.2	59.6	1.4	MTO	N
	OLA12i	57.0	58.1	59.6	1.5	MTO	N
POR13	MES13	60.3	61.4	**66.3**	4.9	MTO	N/A
	MES13a	59.9	61.0	64.0	3.0	MTO	N
	MES13b	60.0	61.2	63.2	2.0	MTO	N
	MES13c	58.1	59.5	61.6	2.1	MTO	N
	MES13d	58.5	59.9	62.1	2.2	MTO	N
	MES13e	58.6	60.0	62.2	2.2	MTO	N
	OLA13	55.6	56.8	60.2	3.4	MTO	N
	OLA13a	45.0	46.1	47.5	1.4	MTO	N
	OLA13b	45.2	46.6	48.4	1.8	MTO	N
	OLA13c	49.2	50.4	51.8	1.4	MTO	N
	OLA13d	45.6	46.9	48.3	1.4	MTO	N
	OLA13e	45.9	47.3	49.6	2.3	MTO	N
POR14	MES14	58.8	60.2	62.2	2.0	MTO	N
	MES14a	59.3	60.7	62.5	1.8	MTO	N
	MES14b	59.0	60.5	62.3	1.8	MTO	N
	MES14c	59.0	60.4	62.3	1.9	MTO	N
	MES14d	58.6	60.0	61.9	1.9	MTO	N
	MES14e	58.5	59.9	61.8	1.9	MTO	N
	MES14f	58.7	60.1	62.2	2.1	MTO	N
	OLA14	56.0	57.4	59.1	1.7	MTO	N
	OLA14a	48.5	49.8	51.4	1.6	MTO	N
	OLA14b	42.3	43.6	45.2	1.6	MTO	N
	OLA14c	43.6	45.0	47.4	2.4	MTO	N
	OLA14d	45.7	47.0	48.7	1.7	MTO	N
	OLA14e	37.6	38.5	38.8	0.3	MTO	N
	OLA14f	48.1	49.3	51.3	2.0	MTO	N

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Table 5-4 Noise Impacts (First Row Receivers) (Continued)

POR ID	OLA/MES ID	Existing Sound Level (dBA)	Sound Level Predictions (dBA)		Change due to Undertaking (dBA)	MTO/ Region of Durham	Mitigation Review Required (Y/N)?
			Future No-Build (2041)	Future Build (2041)			
POR15	MES15	59.9	61.1	62.9	1.8	MTO	N
	MES15a	57.8	59.3	62.1	2.8	MTO	N
	MES15b	58.5	59.9	62.2	2.3	MTO	N
	MES15c	58.7	60.1	62.8	2.7	MTO	N
	MES15d	58.3	59.8	62.2	2.4	MTO	N
	MES15e	58.2	59.7	62.0	2.3	MTO	N
	OLA15	58.5	59.8	61.2	1.4	MTO	N
	OLA15a	46.4	47.2	47.4	0.2	MTO	N
	OLA15b	43.3	44.4	45.9	1.5	MTO	N
	OLA15c	42.1	43.2	44.6	1.4	MTO	N
	OLA15d	44.8	46.1	47.7	1.6	MTO	N
	OLA15e	44.7	46.1	47.8	1.7	MTO	N
POR16	OLA16	60.6	61.6	62.8	1.2	MTO	N
POR17	MES17	62.5	63.1	62.3	-0.8	MTO	N
	OLA17	57.9	58.5	57.2	-1.3	MTO	N
POR18	MES18	66.0	66.4	**63.1**	-3.3	Durham	N/A
	OLA18	57.6	57.9	53.9	-4.0	Durham	N
POR19	MES19	62.6	63.0	59.5	-3.5	Durham	N
	OLA19	58.7	59.1	55.0	-4.1	Durham	N
POR20	MES20	60.1	60.6	**62.9**	2.3	Durham	N/A
	OLA20	44.7	45.2	45.0	-0.2	Durham	N
	OLA20a	57.9	58.3	59.7	1.4	Durham	N
POR21	MES21	64.2	64.8	**66.6**	1.8	Durham	N/A
	MES21a	63.6	64.1	**66.2**	2.1	Durham	N/A
	OLA21	56.8	57.3	59.0	1.7	Durham	N
	OLA21a	55.9	56.5	59.4	2.9	Durham	N
	OLA21b	59.3	59.9	**63.1**	3.2	Durham	Y
POR22	MES22	61.5	62.4	**63.5**	1.1	Durham	N/A
	MES22a	57.6	58.5	59.8	1.3	Durham	N
	OLA22	55.8	56.8	57.8	1.0	Durham	N
	OLA22a	43.1	44.0	43.5	-0.5	Durham	N
POR23	OLA23	57.1	58.0	**63.4**	5.4	Durham	Y
	OLA23a	53.8	54.8	57.3	2.5	Durham	N
	OLA23b	58.2	59.1	**60.2**	1.1	Durham	Y
	OLA23c	60.1	61.1	**61.6**	0.5	Durham	Y
POR24	OLA24	64.1	64.7	**66.4**	1.7	Durham	Y
	OLA24a	48.6	49.3	51.1	1.8	Durham	N
	OLA24b	54.5	55.2	57.2	2.0	Durham	N
	OLA24c	53.3	54.0	55.9	1.9	Durham	N
	OLA24d	51.0	51.6	53.3	1.7	Durham	N

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Table 5-4 Noise Impacts (First Row Receivers) (Continued)

POR ID	OLA/MES ID	Existing Sound Level (dBA)	Sound Level Predictions (dBA)		Change due to Undertaking (dBA)	MTO/ Region of Durham	Mitigation Review Required (Y/N)?
			Future No-Build (2041)	Future Build (2041)			
POR25	OLA25	56.3	56.9	57.6	0.7	Durham	N
POR26	MES26b	67.3	67.7	**69.7**	2.0	Durham	N/A
	MES26c	63.1	63.6	**64.6**	1.0	Durham	N/A
	OLA26	58.0	58.5	59.1	0.6	Durham	N
	OLA26a	60.4	60.9	**61.5**	0.6	Durham	Y
	OLA26b	53.4	53.9	55.2	1.3	Durham	N
	OLA26c	62.2	62.6	**63.7**	1.1	Durham	Y
POR27	OLA27	55.5	56.0	56.8	0.8	Durham	N
	OLA27a	63.0	63.5	**64.5**	1.0	Durham	Y
	OLA27b	63.4	63.8	**64.9**	1.1	Durham	Y
	OLA27c	62.2	62.7	**63.4**	0.7	Durham	Y
	OLA27d	59.9	60.4	59.2	-1.2	Durham	N
	OLA27e	62.3	62.7	**63.9**	1.2	Durham	Y
POR28	OLA28	64.0	64.2	**65.0**	0.8	Durham	Y
POR29	OLA29	52.8	53.1	54.1	1.0	Durham	N
POR30	MES30	61.6	61.8	**62.7**	0.9	Durham	N/A
	OLA30	51.0	51.3	52.7	1.4	Durham	N
	OLA30a	53.8	54.1	55.2	1.1	Durham	N
POR31	MES31	66.2	66.5	**67.4**	0.9	Durham	N/A
	OLA31	52.5	52.9	54.5	1.6	Durham	N
POR32	MES32	66.0	66.4	**68.7**	2.3	Durham	N/A
	OLA32	57.9	58.3	59.7	1.4	Durham	N
	OLA32a	53.7	54.1	56.0	1.9	Durham	N
POR33	OLA33	54.0	54.4	55.9	1.5	Durham	N
	OLA33a	56.7	57.1	59.2	2.1	Durham	N
	OLA33b	58.2	58.5	59.8	1.3	Durham	N
POR34	OLA34	53.3	53.7	54.8	1.1	Durham	N
	OLA34a	56.6	57.0	58.2	1.2	Durham	N
	OLA34b	54.4	54.7	55.8	1.1	Durham	N
	OLA34c	53.7	54.1	54.5	0.4	Durham	N
	OLA34d	54.1	54.5	55.7	1.2	Durham	N
	OLA34e	49.2	49.6	51.0	1.4	Durham	N
	OLA34f	55.5	55.9	57.1	1.2	Durham	N
POR35	MES35	63.9	64.1	**65.0**	0.9	Durham	N/A
	MES35a	61.9	62.1	**63.1**	1.0	Durham	N/A
	MES35b	63.5	63.7	**64.7**	1.0	Durham	N/A
	OLA35	60.1	60.3	**61.4**	1.1	Durham	Y
	OLA35a	57.6	57.8	58.4	0.6	Durham	N

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Table 5-4 Noise Impacts (First Row Receivers) (Continued)

POR ID	OLA/MES ID	Existing Sound Level (dBA)	Sound Level Predictions (dBA)		Change due to Undertaking (dBA)	MTO/ Region of Durham	Mitigation Review Required (Y/N)?
			Future No-Build (2041)	Future Build (2041)			
POR35	OLA35b	53.7	53.9	54.4	0.5	Durham	N
	OLA35c	58.6	58.8	59.4	0.6	Durham	N
	OLA35d	57.9	58.2	58.4	0.2	Durham	N
	OLA35e	57.9	58.2	58.5	0.3	Durham	N
	OLA35f	58.2	58.5	58.7	0.2	Durham	N
	OLA35g	54.4	54.7	55.2	0.5	Durham	N
POR36	MES36	64.8	65.0	**66.0**	1.0	Durham	N/A
	MES36a	56.4	56.7	57.7	1.0	Durham	N
	MES36b	55.6	55.8	56.3	0.5	Durham	N
	OLA36	60.8	61.0	**61.8**	0.8	Durham	Y
	OLA36a	54.2	54.5	55.9	1.4	Durham	N
	OLA36b	57.5	57.8	57.9	0.1	Durham	N
POR37	MES37	64.6	64.8	**66.5**	1.7	Durham	N/A
	OLA37	62.2	62.4	**63.7**	1.3	Durham	Y
POR38	MES38	65.2	65.4	**66.8**	1.4	Durham	N/A
	MES38a	59.7	59.9	**61.2**	1.3	Durham	N/A
	OLA38	63.0	63.3	**64.5**	1.2	Durham	Y
	OLA38a	53.5	53.8	54.4	0.6	Durham	N
POR39	MES39	60.6	60.8	**60.7**	-0.1	Durham	N/A
	MES39a	55.4	55.6	56.6	1.0	Durham	N
	MES39b	63.8	64.0	**64.9**	0.9	Durham	N/A
	OLA39	55.8	56.1	54.8	-1.3	Durham	N
	OLA39a	54.2	54.4	54.7	0.3	Durham	N
	OLA39b	61.4	61.6	**62.3**	0.7	Durham	Y
POR40	OLA40	55.9	56.2	57.2	1.0	Durham	N
POR41	MES41	67.0	67.2	**64.9**	-2.3	Durham	N/A
	MES41a	54.7	54.9	55.4	0.5	Durham	N
	MES41b	62.4	62.7	**63.9**	1.2	Durham	N/A
	OLA41	53.1	53.3	54.1	0.8	Durham	N
	OLA41a	55.0	55.2	55.8	0.6	Durham	N
	OLA41b	52.2	52.4	53.4	1.0	Durham	N
POR42	MES42	65.9	66.1	**67.4**	1.3	Durham	N/A
	OLA42	57.7	58.0	58.7	0.7	Durham	N
POR43	MES43	67.5	68.1	**68.8**	0.7	Durham	N/A
	OLA43	64.1	64.7	**65.4**	0.7	Durham	Y
POR44	MES44	64.3	64.9	**66.6**	1.7	Durham	N/A
	OLA44	53.2	53.7	54.1	0.4	Durham	N
POR45	MES45e	54.6	55.3	**63.0**	7.7	Durham	N/A
	OLA45	53.5	54.0	**63.2**	9.2	Durham	Y
	OLA45a	52.7	53.3	**62.5**	9.2	Durham	Y
	OLA45b	52.2	52.8	**62.2**	9.4	Durham	Y
	OLA45c	52.4	53.0	**62.1**	9.1	Durham	Y
	OLA45d	53.7	54.2	**61.9**	7.7	Durham	Y
	OLA45e	54.9	55.5	**61.5**	6.0	Durham	Y
POR46	MES46	55.4	54.8	**65.1**	10.3	Durham	N/A
	OLA46	52.5	52.2	**60.9**	8.7	Durham	Y
	OLA46a	54.4	54.7	57.1	2.4	Durham	N

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Table 5-4 Noise Impacts (First Row Receivers) (Continued)

POR ID	OLA/MES ID	Existing Sound Level (dBA)	Sound Level Predictions (dBA)		Change due to Undertaking (dBA)	MTO/ Region of Durham	Mitigation Review Required (Y/N)?
			Future No-Build (2041)	Future Build (2041)			
POR47	MES47	65.1	64.8	**66.6**	1.8	Durham	N/A
	OLA47	61.1	60.8	**62.2**	1.4	Durham	Y
POR48	MES48	61.4	61.7	**63.4**	1.7	Durham	N/A
	OLA48	58.9	59.1	**61.1**	2.0	Durham	Y
POR49	MES49	61.7	62.0	**64.6**	2.6	Durham	N/A
	OLA49	53.6	53.8	55.1	1.3	Durham	N
POR50	MES50	63.5	63.8	**66.4**	2.6	Durham	N/A
	OLA50	53.1	53.4	55.0	1.6	Durham	N
	OLA50a	58.2	58.5	60.0	1.5	Durham	N
POR51	MES51	60.5	60.7	59.9	-0.8	Durham	N
	OLA51	52.5	52.8	52.9	0.1	Durham	N
POR52	OLA52	55.3	55.5	57.8	2.3	Durham	N
POR53	MES53a	57.7	57.9	60.0	2.1	Durham	N
	MES53b	59.7	58.4	**62.4**	4.0	Durham	N/A
	OLA53	60.0	60.1	**62.4**	2.3	Durham	Y
	OLA53a	56.1	56.3	58.4	2.1	Durham	N
	OLA53b	53.9	52.5	55.5	3.0	Durham	N
	OLA53c	58.5	58.8	**61.5**	2.7	Durham	Y
	OLA53d	57.6	57.1	**60.2**	3.1	Durham	Y
	OLA53e	57.2	57.4	59.2	1.8	Durham	N
POR54	OLA54	62.3	62.6	**62.5**	-0.1	Durham	Y
POR55	OLA55	53.2	53.4	51.5	-1.9	Durham	N
POR56	MES56	61.0	61.2	**62.2**	1.0	Durham	N/A
	MES56a	60.3	60.5	**61.6**	1.1	Durham	N/A
	MES56b	61.7	61.9	**62.6**	0.7	Durham	N/A
	MES56c	60.7	60.9	**61.8**	0.9	Durham	N/A
	MES56d	61.9	62.1	**62.1**	0.0	Durham	N/A
	MES56e	60.0	60.3	**60.8**	0.5	Durham	N/A
	OLA56	56.0	56.2	57.1	0.9	Durham	N
	OLA56a	50.3	50.4	48.4	-2.0	Durham	N
	OLA56b	57.4	57.7	58.4	0.7	Durham	N
	OLA56c	56.2	56.5	57.4	0.9	Durham	N
	OLA56d	51.1	51.3	52.1	0.8	Durham	N
	OLA56e	50.0	50.2	51.1	0.9	Durham	N
POR57	MES57a	62.0	62.4	**62.3**	-0.1	Durham	N/A
	OLA57	57.6	57.8	59.4	1.6	Durham	N
	OLA57a	50.4	50.8	51.1	0.3	Durham	N

Notes: 1. Sound level values shown by bold text are indicating they are in exceedance of the assessment criteria.

2. N/A means Not Applicable, as noise barrier investigations at the MES receivers are not required, where the OLA receiver location is different than the MES receiver location.
3. N means No, the investigation of the noise barrier is not required as the sound level at the receiver is below the applicable criteria.

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Table 5-5 Noise Impacts (First Row Receivers) with Noise Mitigation

POR ID	OLA/MES ID	Future Build Sound Level Predictions (dBA)		Noise Barrier Reduction (dBA)	Technically Feasible (Y/N)?
		Without Noise Barrier	With Noise Barrier		
POR1	OLA01	64.0	57.4	-6.6	Y
	OLA01a	64.6	60.8	-3.8	N
	OLA01b	64.8	57.4	-7.4	Y
POR2	OLA02	65.2	62.1	-3.1	N
	OLA02a	64.5	60.8	-3.7	N
	OLA02b	65.3	57.9	-7.4	Y
	OLA02c	65.2	57.0	-8.2	Y
	OLA02d	64.5	57.3	-7.2	Y
POR3	OLA03	65.8	62.5	-3.3	N
	OLA03a	64.8	59.2	-5.6	Y
	OLA03b	64.5	61.0	-3.5	N
	OLA03c	62.2	61.6	-0.6	N
POR5	OLA05	65.5	55.9	-9.6	Y
	OLA05a	67.0	57.2	-9.8	Y
	OLA05b	66.2	57.7	-8.5	Y
	OLA05c	66.3	57.6	-8.7	Y
	OLA05d	66.7	57.6	-9.1	Y
	OLA05e	65.6	60.3	-5.3	Y
	OLA05f	66.9	56.5	-10.4	Y
	OLA05g	66.6	55.9	-10.7	Y
	OLA05h	66.7	55.5	-11.2	Y
	OLA05i	63.9	57.4	-6.5	Y
POR6	OLA06a	64.8	58.1	-6.7	Y
	OLA06b	65.6	59.6	-6.0	Y
	OLA06c	64.6	55.9	-8.7	Y
	OLA06d	65.4	54.4	-11.0	Y
	OLA06e	65.0	60.5	-4.5	N
	OLA06f	61.4	61.1	-0.3	N
	OLA06g	59.6	59.4	-0.2	N
POR9	OLA09	65.9	60.5	-5.4	Y
	OLA09a	65.9	57.5	-8.4	Y
	OLA09b	65.8	60.3	-5.5	Y

DRAFT

Table 5-5 Noise Impacts (First Row Receivers) with Noise Mitigation (Continued)

POR ID	OLA/MES ID	Future Build Sound Level Predictions (dBA)		Noise Barrier Reduction (dBA)	Technically Feasible (Y/N)?
		Without Noise Barrier	With Noise Barrier		
POR21	OLA21a	59.4	57.2	-2.2	N
	OLA21b	63.1	59.5	-3.6	N
POR23	OLA23	63.4	54.9	-8.5	Y
	OLA23a	57.3	52.4	-4.9	N
	OLA23b	60.2	52.8	-7.4	Y
	OLA23c	61.6	55.5	-6.1	Y
POR24	OLA24	66.4	66.0	-0.4	N
POR26	OLA26a	61.5	56.0	-5.5	N
	OLA26c	63.7	62.6	-1.1	N
POR27	OLA27a	64.5	57.0	-7.5	Y
	OLA27b	64.9	57.2	-7.7	Y
	OLA27c	63.4	60.0	-3.4	N
	OLA27d	59.2	58.0	-1.2	N
	OLA27e	63.9	60.6	-3.3	N
POR28	OLA28	65.0	61.4	-3.6	N
POR35	OLA35	61.4	51.8	-9.6	Y
POR36	OLA36	61.8	54.7	-7.1	Y
POR37	OLA37	63.7	57.5	-6.2	Y
POR38	OLA38	64.5	57.7	-6.8	Y
POR39	OLA39b	62.3	56.3	-6.0	Y
POR43	OLA43	65.4	60.4	-5.0	N
POR45	OLA45	63.2	54.4	-8.8	Y
	OLA45a	62.5	53.6	-8.9	Y
	OLA45b	62.2	53.2	-9.0	Y
	OLA45c	62.1	53.8	-8.3	Y
	OLA45d	61.9	55.9	-6.0	Y
	OLA45e[1]	61.5	56.6	-4.9	N
POR46	OLA46	60.9	53.3	-7.6	Y
POR47	OLA47	62.2	59.3	-2.9	N
POR48	OLA48	61.1	58.5	-2.6	N
POR53	OLA53	62.4	54.2	-8.2	Y
	OLA53c	61.5	55.3	-6.2	Y
	OLA53d	60.2	57.1	-3.1	N
POR54	OLA54	62.5	56.6	-5.9	Y

Notes: 1. At OLA45e, noise barrier return along the rear private property line of the lot was investigated. It was confirmed that if the mentioned portion of the barrier is built, the implementation of the whole barrier will result in more than 6 dBA sound reduction. Therefore, this modification to the barrier is recommended to be investigated during detailed design stage since this dwelling is equipped with an existing noise wall.

DRAFT

6.0 VIBRATION IMPACT ASSESSMENT

6.1 Construction Vibration

6.1.1 Potential Impacts

Construction activities can cause vibration impacts (i.e., structural damage) depending on the type of equipment being used. FTA (FTA, 2018) provides the vibration levels of typical construction equipment at a specified distance of 25 ft from the equipment which are shown in Table 6-1. In order to operate individual equipment without exceeding the threshold of vibration level that can cause structural damages on buildings, setback distances (the distance that ensures the operation of construction equipment would meet the vibration criteria) are calculated based on the procedure (Equation 7-2) explained in the US FTA (FTA, 2018) and also described in Section 4.5.1 of the report. The results of the assessment for typical construction equipment are provided in Table 6-1.

Table 6-1 Minimum Setback Distances for Construction Equipment (FTA, 2018)

Equipment Type	PPV_{ref} (at 25ft)		Criteria	Minimum Separation Distance
	(in/s)	(mm/s)	(mm/s)	(m)
Pile Driver (impact)	1.52 / 0.64	38.6 / 16.4	5.1	30 / 17
Pile Driver (sonic)	0.73 / 0.17	18.6 / 4.3	5.1	18 / 7
Vibratory Roller	0.210	5.3	5.1	8
Small Bulldozer	0.003	0.1	5.1	1
Large Bulldozer	0.089	2.3	5.1	4
Loaded Trucks	0.076	1.9	5.1	4
Jackhammer	0.035	0.9	5.1	2

Note: Vibration levels and minimum separation distances for a large bulldozer is also representative for each of the three equipment (grader, front end loader, and excavator) as per confirmation with FTA staff.

As noted in Section 3.3, the vibration analysis in this assessment utilized the Category III. Non-engineered timber and masonry buildings damage criteria of 5.1 mm/s as a conservative measure.

As shown in Table 6-1, pile drivers are to be operated at larger distance from buildings due to their relatively higher operating vibration levels. Bridge and culvert construction activities require the use of pile drivers. Therefore, as an example, the setback distances depicted in the form of Zone of Influences (ZOI) are presented for such construction activities. The locations where the bridge and culvert works are planned have been shown in Appendix J. Accordingly, ZOIs were identified based on the required setback distance calculated for the pile driver (impact) activities given in the Table 6-1. ZOI are shown as circles of 30 m radius in the Appendix J accordingly. The buildings shown in Table 6-2 are anticipated to fall within the identified ZOI, hence vibration monitoring

DRAFT

during Pile Driving is required to appropriately identify and mitigate any exceedances of the vibration damage criteria of 5.1 mm/sec to avoid any damage to the building structures within the ZOI.

Table 6-2 List of Buildings Requiring Vibration Monitoring During Bridge and Culvert Construction Activities (i.e., Pile Driving)

Building Name	Building Address
Gas Station	951 Dundas Street W, Whitby, ON
Autoshop/Service	701 Dundas Street E, Whitby, ON
Residential buildings	105 Dovedale Drive, Whitby, ON
Car dealer ship	140 Bond Street W and Arena Street, Oshawa, ON
Public parking	110 King Street W, Oshawa, ON
Car wash	116 Bond Street W, Oshawa, ON
Commercial buildings	145 King Street W, Oshawa, ON

6.1.2 Mitigation Measures and Monitoring

The buildings that were listed in Table 6-2 are the potential impacted locations due to construction vibration. The implementation of the following measures will help to monitor and mitigate potential vibration impacts during construction:

- A Noise and Vibration Management Plan (NVMP) to be prepared prior to construction. NVMP will include specific mitigation measures related to laydown areas (once they are determined).
- Pre-construction consultation with property owners.
- Pre-construction measurement of the background vibration within the ZOI according to the applicable By-laws (e.g., City of Toronto By-law No. 514-2008 (City of Toronto, 2008)).
- Contractor shall be responsible for pre-construction inspection (e.g., photography of building foundation) of the impacted buildings inside the ZOI according to the applicable By-laws.
- Contractor shall be responsible for any damage caused by construction vibration.
- A monitoring program to measure vibration during construction activities (close to the affected buildings) will be developed and implemented to appropriately identify and mitigate to be in compliance with City of Toronto By-law No. 514-2008 (City of Toronto, 2008), and applicable vibration criteria listed in Table 3-9 to identify the need for mitigation measures if required.
- Monitoring will be undertaken to verify mitigation measure(s) effectiveness.
- For work that is to occur outside of regular hours, the Contractor will be responsible for identifying the implications of the vibration generated, and to make construction work plans

DRAFT

available for review and coordinate with appropriate municipalities/region and MTO as required near MTO right-of-way.

- Construction equipment with potential to cause off-site vibrations should be operated as far away from vibration-sensitive sites as possible.
- Where possible, activities that have potential to cause off-site vibrations should be phased such that as few as possible are occurring simultaneously.
- Construction activities that have potential to cause off-site vibration during the night-time hours should be avoided.
- A complaints protocol is to be established for this Project for receiving, investigating and addressing construction vibration complaints received from the public.
- The Contract documents shall contain a provision that any initial vibration complaint will trigger verification that any general vibration control measures agreed to are in effect.
- In the presence of persistent vibration complaints, the Metrolinx and its Contractor shall consider implementing a measurement program to evaluate the vibration impacts.
- In the presence of persistent complaints and subject to the results of a field investigation, alternative vibration control measures may be required, where reasonably available. In selecting appropriate vibration control measures, consideration will be given to the technical, administrative and economic feasibility of the various alternatives.

6.2 Operational Vibration

There are no quantitative limits or methods of assessment for the assessment of vibration during project operation defined in the Metrolinx Guide or in other provincial and federal guidelines. However, the U.S. Federal Transit Administration publication Transit Noise and Vibration Impact Assessment Manual (2018) notes that “Because the rubber tires and suspension systems on buses provide vibration isolation, it is unusual for buses to cause ground-borne vibration or noise problems.” In addition, within the context of environmental assessments in the province of Ontario, vibration impact assessments for rubber-tired vehicle projects has historically not been completed. In consideration of the above, a quantitative vibration assessment from operation of the Bus Rapid Transit was not completed.

With respect to ground-borne vibration or noise problems, it is uncommon for rubber-tired vehicles to be a source of concern. The US Federal Transit Administration notes that “For most issues with bus-related vibration, such as rattling of windows, the cause is almost always airborne noise and directly related to running surface conditions such as potholes, bumps, expansion joined, or other discontinuities in the road surface (usually resolved by smoothing the discontinuities).” The quality of the road surface condition upon commencement of operation is not controlled by the project or its design. Rather, the condition will be dependent on the quality of workmanship of the contractor. Finally, ongoing maintenance of the road surface would be within the purview of Durham Region and City of Toronto.

DRAFT

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

The NVIA for the DSBRT included an assessment of the following potential impacts at existing and proposed future sensitive locations:

- noise and vibration considerations during construction of the Project; and
- noise impacts at existing and proposed sensitive locations from buses operating on the proposed DSBRT corridor, inclusive of local topography.

The following key conclusions may be drawn from the assessment:

- Construction noise is anticipated to be impacting adjacent dwellings; hence, representative noise sensitive receivers were identified for monitoring;
- Construction vibration (from bridge and culvert work) is anticipated to impact a few buildings that will require vibration monitoring during construction;
- The sound level predictions as a result of DSBRT operations indicate that the Future Build sound levels are predicted to be above the MTO absolute sound level threshold of 65 dBA at some of the representative receiver locations where the MTO Noise Guide applies. However, the incremental impacts are below the MTO threshold of +5 dBA at all locations within the study area; and
- The sound level predictions as a result of DSBRT operations indicate that some of the Future Build sound levels are predicted to be above the Durham Region absolute sound level threshold of 60 dBA at the representative receiver locations within the Durham Region boundaries. However, the incremental impacts are below the Durham Region threshold of +5 dBA at most locations within the study area except for three PORs (i.e., POR23, POR45, and POR46). The noticeable incremental impacts were caused either due to planned demolition of existing noise walls for road expansion purposes at the affected receivers (i.e., POR45 and POR46) or new road alignment/profile which brings the traffic noticeably closer to the receiver (i.e., POR23).

7.2 Recommendations

7.2.1 Noise Assessment Recommendations

7.2.1.1 Construction Noise

Based on the ZOIs identified for Bus Stop and Runningway construction activities in Appendix I, a total of thirty-nine (39) Representative Noise Sensitive Receivers were identified for noise monitoring during construction activities and are presented in Appendix I and Table 5-3. If during noise monitoring it was determined that the sound levels due to the construction activities exceed

DRAFT

the criteria, temporary mitigation measures will be investigated and may be implemented as described in Section 5.1.2.

The noise By-laws for the associated jurisdictions include time and place prohibitions on construction activities and require all construction equipment to comply with NPC-115 and NPC-118.

A Noise and Vibration Management Plan (NVMP) to be prepared prior to construction. NVMP will include specific mitigation measures related to laydown areas (once they are determined).

7.2.1.2 Operational Noise

A number of noise barriers as shown in Table 5-5 were investigated to be constructed within the road ROW as these barriers provide sufficient noise reduction as per MTO Noise Guide and/or Durham Region Noise Policy. Please note that MTO noise guideline (MTO, 2008 Version 1.1) is used for evaluating the noise barriers investigated in City of Toronto (i.e., the noise barriers near R1, R2, R5, and R6).

Installation of these noise barriers will mitigate the predicted sound levels at these receiver locations to be in compliance with MTO (MTO, 2008 Version 1.1) (for the receivers located in the City of Toronto) and Durham Region guidelines for noise (The Regional Municipality of Durham, 2012).

The noise barriers should be constructed of a durable material having a minimum surface area density of 20 kg/m^2 (4 lb/ft^2) and be in a continuous line without openings or gaps. Barrier material and design shall meet standards acceptable to the Durham Region, MTO and Ministry of the Environment, Conservation and Parks (MECP) for noise barriers. The technical, economic, and administrative feasibility of implementing noise barriers in the locations identified in Table 5-5 will be reviewed in accordance with MTO's Environmental Guide for Noise (MTO, 2008 Version 1.1) during the detailed design phase. The locations for implementing the noise barriers in Toronto and Durham will be confirmed through discussions with the respective municipalities.

This Project does not currently include bus garages for DSBRT. Therefore, such facilities were not considered in this NVIA; if in the future any plans are considered, a detailed noise and vibration impact study may be required.

A summary of impacts, mitigation measures, and monitoring activities for construction and operational noise is listed in Table 7-1.

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Table 7-1 Noise Impacts, Mitigation Measures, and Monitoring Activities

Noise Component	Potential Impacts	Mitigation Measures	Monitoring Activities
Construction Noise	• 39 locations (i.e., noise sensitive receivers) as listed in Appendix I could potentially be impacted by construction noise. • The severity of construction noise at the identified locations of concerns are mainly dependent on: o The number and type of equipment being simultaneously used. o The duration construction equipment will be utilized during the day (i.e., usage factor). o To be conservative, the current report assumes all relevant construction equipment are working simultaneously and are fully utilized (i.e., usage factor of 1) during the construction period.	• A Noise and Vibration Management Plan (NVMP) during Detail Design is to be prepared prior to construction. NVMP will include specific mitigation measures related to laydown areas (once they are determined). • Temporary noise mitigation measures shall be investigated and necessary noise mitigation measures in the form of physical noise barriers, mufflers on equipment, etc. shall be implemented if monitoring results show noise levels during construction activities exceed the criteria. • Limit construction work to the time periods allowed by the municipalities' noise By-laws, as summarized in Section 3.1. • Should there be a need to complete work outside of the hours allowed in the applicable noise By-laws, the Contractor is to seek any required exemptions and permits directly from the applicable jurisdiction, in advance of any work performed outside of the allowable time periods. If an exemption cannot be obtained, then construction will proceed in accordance with the requirements of the noise By-laws. • The Contractor is expected to comply with all applicable requirements of the contract and local noise By-laws. Enforcement of noise control By-laws is the responsibility of the Municipality for all work. • Contracts shall include explicit indication that all construction equipment used on the project is to meet the sound level criteria from NPC-115 and NPC-118, and be well maintained and operating with effective muffling devices that are in good working order. • The separation distance between construction staging areas and nearby sensitive receivers is to be maximized to the extent possible to reduce noise impacts. • Any temporary roads for construction vehicle access are to be well maintained and free of pot-holes and ruts to avoid excessive noise from heavy vehicles travelling on uneven surfaces. • Should any complaints be reported from the public due to construction noise, the Owner will be notified, and the incident will be investigated. A complaints protocol is to be established for receiving, investigating and addressing construction noise complaints from the public, including a plan for how the public is to be notified of their options for logging a complaint.	• Noise level monitoring shall be undertaken at identified Representative Noise Sensitive Receivers to appropriately identify and mitigate any exceedances for noise levels to comply with construction noise criteria set in Table 3-8. • Noise levels shall be monitored to verify mitigation measures(s) effectiveness, if any. • In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration will be given to the technical, administrative and economic feasibility of the various alternatives. • A noise complaint will trigger an investigation to verify whether the noise mitigation has been implemented, including verification of construction equipment sound levels per NPC-115 and NPC-118.
Operational Noise	• 17 PORs as listed in Table 5-5 were identified to be affected because of DSBRT operational noise.	• Noise barriers were investigated to be constructed within ROW of the 17 identified PORs. • Noise barrier heights range between 2.0 m to 3.0 m were investigated to be constructed in accordance with the instruction provided under Section 7.2.1.2.	• The effectiveness of the proposed noise barriers in reducing sound levels below the assessment criteria has been confirmed via the CadnaA modelling. The mitigation effectiveness could also be confirmed via field measurements.

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7.2.2 Vibration Assessment Recommendations

7.2.2.1 Construction Vibration

As shown in Table 6-2, the buildings identified are anticipated to fall within ZOI determined for bridge and culvert works and therefore, vibration monitoring during construction is recommended. The vibration monitoring will appropriately identify and mitigate the vibration levels due to construction activities from Pile Driving to not exceed the vibration damage criteria and therefore, buildings within ZOI will not be damaged (cosmetic and structurally). A summary of impacts, mitigation measures, and monitoring activities for construction vibration is listed in Table 7-2. If the vibration levels do exceed the criteria, the construction has to be seized immediately and other forms of mitigation measures will be recommended (refer to Table 7-2 for list of construction impacts, mitigation, and monitoring activities). Once the construction details are further defined, any additional vibration monitoring requirements must be added as part of the NVIA report recommendations.

A Noise and Vibration Management Plan (NVMP) to be prepared prior to construction. NVMP will include specific mitigation measures related to laydown areas (once they are determined).

7.2.2.2 Operational Vibration

No vibration impacts from BRT projects are anticipated according to Metrolinx guidelines (Metrolinx Environmental Guide for Noise and Vibration Impact Assessment, 2019; updated 2021). Ground-borne vibration from rubber-tired transit projects (e.g., BRT) are negligible and unlikely to be of concern.

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Table 7-2 Vibration Impacts, Mitigation Measures, and Monitoring Activities

Vibration Component	Potential Impacts	Mitigation Measures	Monitoring Activities
Construction Vibration	• Seven (7) buildings as listed in Table 6-2 could potentially be impacted (i.e., possible structural damage) by the construction vibration (i.e., during bridge and culvert work). • The construction vibration could cause annoyance and trigger complaint from the communities.	• A Noise and Vibration Management Plan (NVMP) during Detail Design is to be prepared prior to construction. NVMP will include specific mitigation measures related to laydown areas (once they are determined). • For work that is to occur outside of regular hours, the Contractor will be responsible for identifying the implications of the vibration generated, and to make construction work plans available for review by the Stakeholders. • Construction equipment with potential to cause off-site vibrations will be operated as far away from vibration-sensitive sites as possible. • Where possible, activities that have potential to cause off-site vibrations will be phased such that as few as possible are occurring simultaneously. • Update Zone of Influence mapping and predictions based upon refined site staging, equipment, construction areas, and building locations prior to the commencement of construction. • Contractor shall be responsible for any damage caused by construction vibration. • Operate construction equipment on lower vibration settings, where possible. • Construction activities that have potential to cause off-site vibration during the night-time hours will be avoided. • A complaints protocol is to be established for this Project for receiving, investigating and addressing construction vibration complaints received from the public. • The Contract documents shall contain a provision that any initial vibration complaint will trigger verification that any general vibration control measures agreed to are in effect. • In the presence of persistent vibration complaints, the Metrolinx and its Contractor shall consider implementing a measurement program to evaluate the vibration impacts. • In the presence of persistent complaints and subject to the results of a field investigation, alternative vibration control measures may be required, where reasonably available.	• Pre-construction consultation with property owners. • Pre-construction measurement of the background vibration within the ZOI according to the applicable By-laws (e.g., City of Toronto By-law No. 514-2008 (City of Toronto, 2008)). • Contractor shall be responsible for pre-construction inspection (e.g., photography of building foundation) of the impacted buildings inside the ZOI according to the applicable By-laws. • A monitoring program to measure vibration levels during construction activities (close to the affected buildings) shall be developed and implemented to appropriately identify and mitigate any exceedances and be in compliance with City of Toronto By-law No. 514-2008 (City of Toronto, 2008), and applicable vibration criteria listed in Table 3-9 to identify the need for mitigation measures if required. • Monitoring will be undertaken to verify mitigation measure(s) effectiveness.
Operational Vibration	• No impacts are anticipated due to the nature of BRT (rubber-tired transit) projects.	• Not Applicable	• Not Applicable

DRAFT

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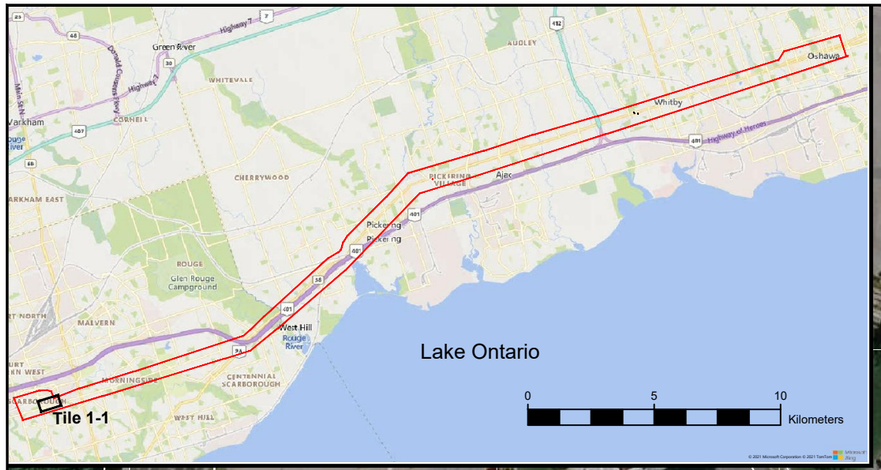
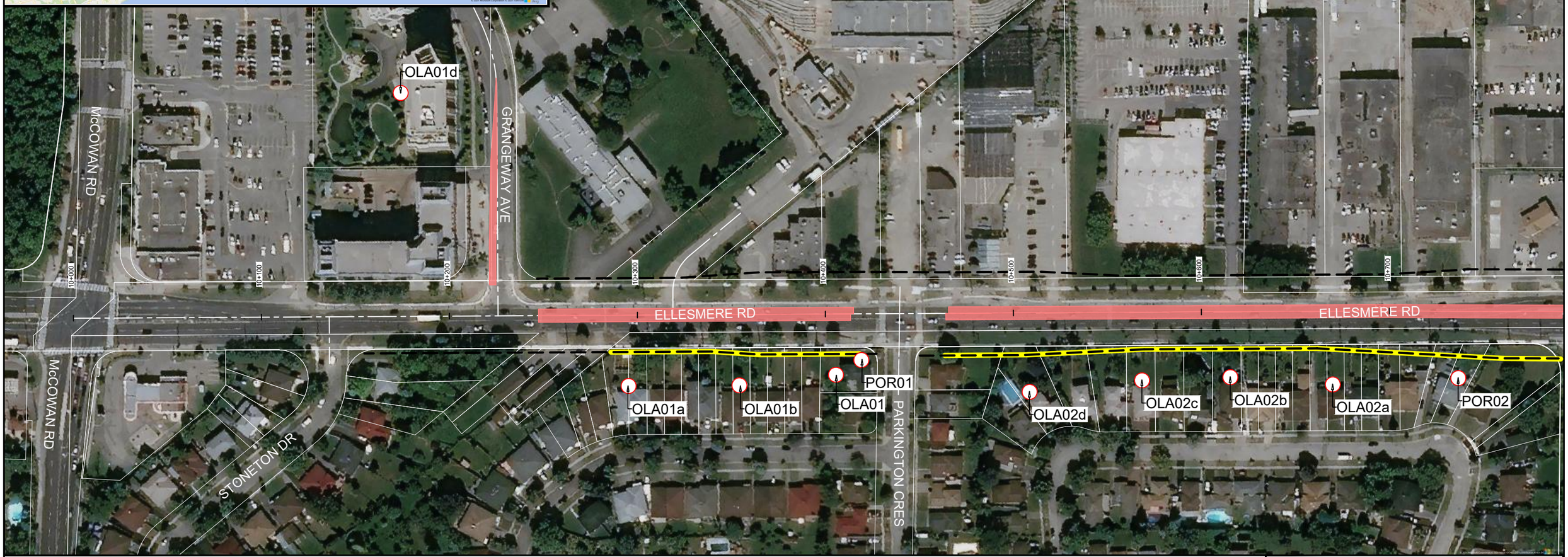
DRAFT

APPENDIX A: NOISE ASSESSMENT FIGURES (Existing and Reviewed Noise Barriers)

DRAFT





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- Project Footprint
- Proposed Right of Way

Noise Walls

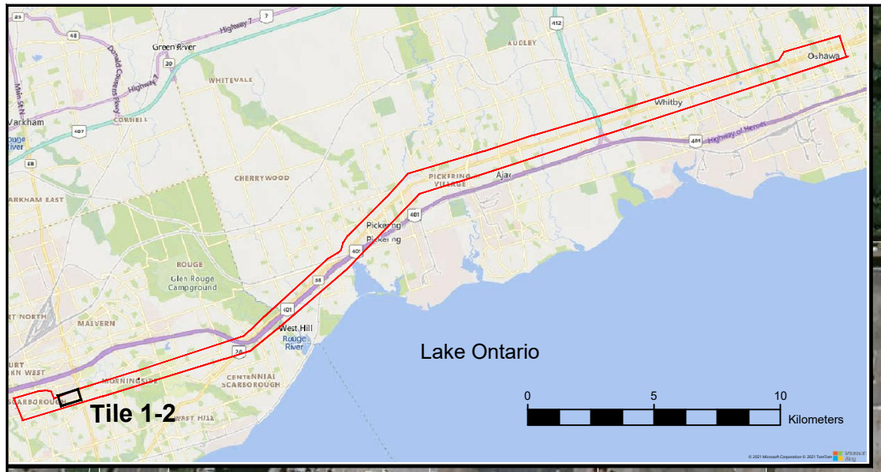
- Existing Noise Walls
- Reviewed Noise Walls

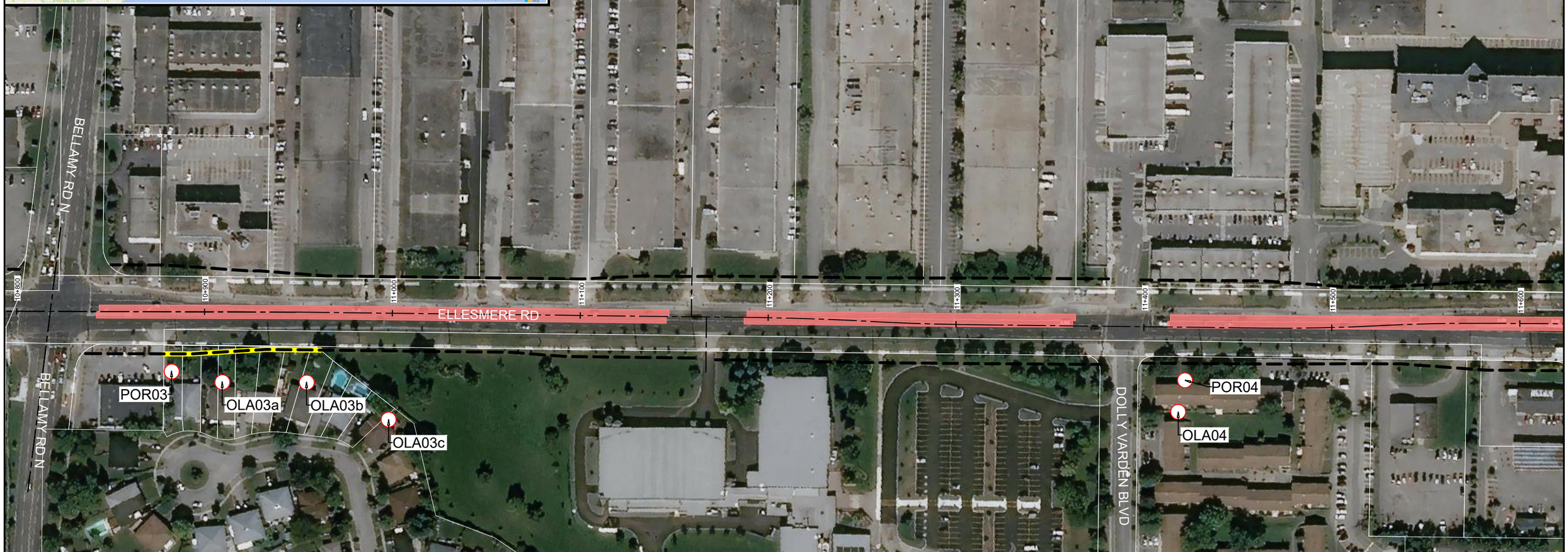
Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-1
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

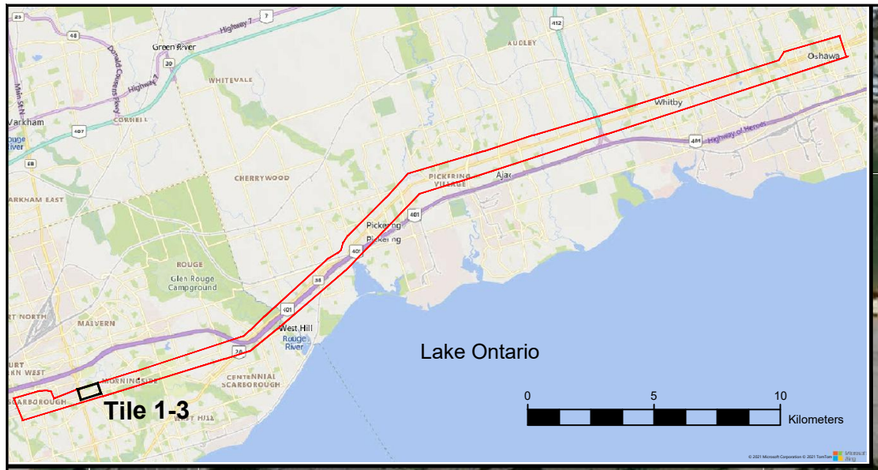
Noise Walls

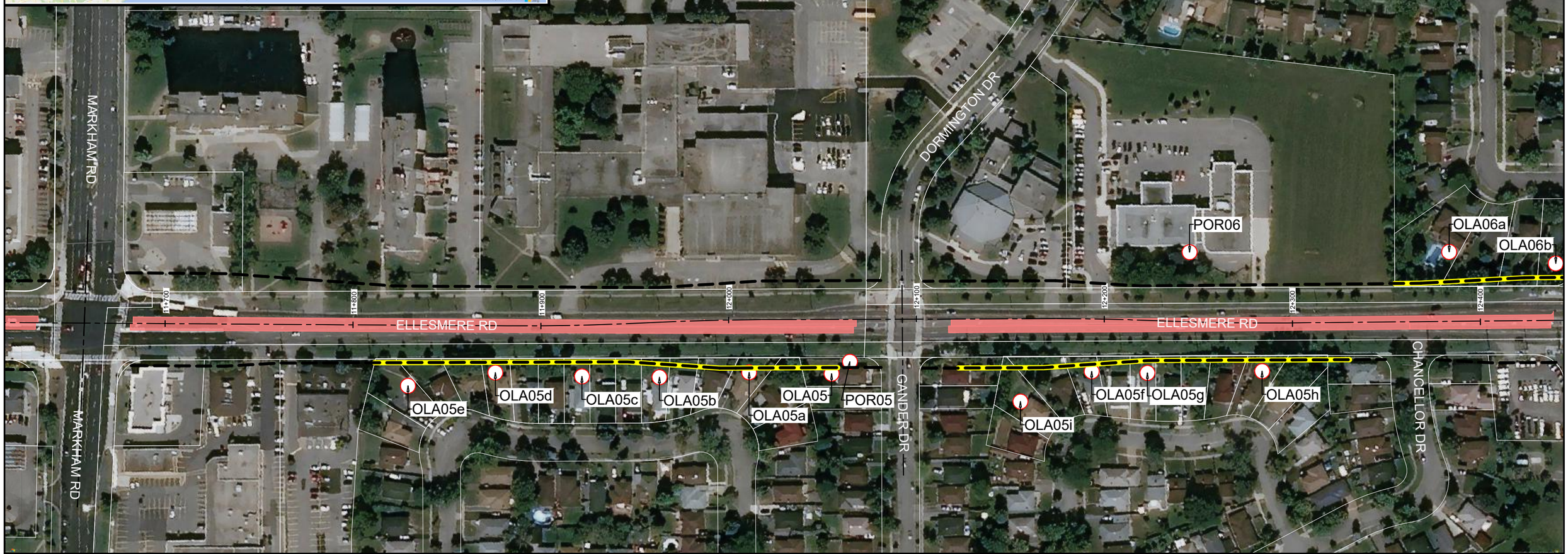
- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-2
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title: **FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-3**

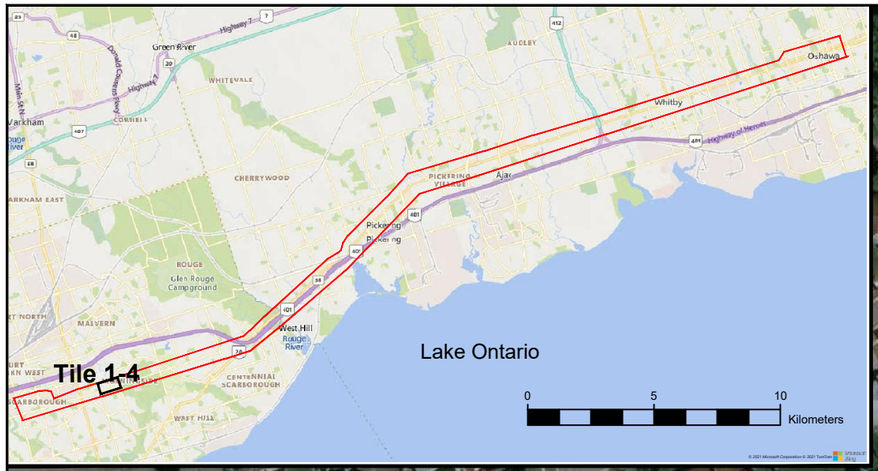
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

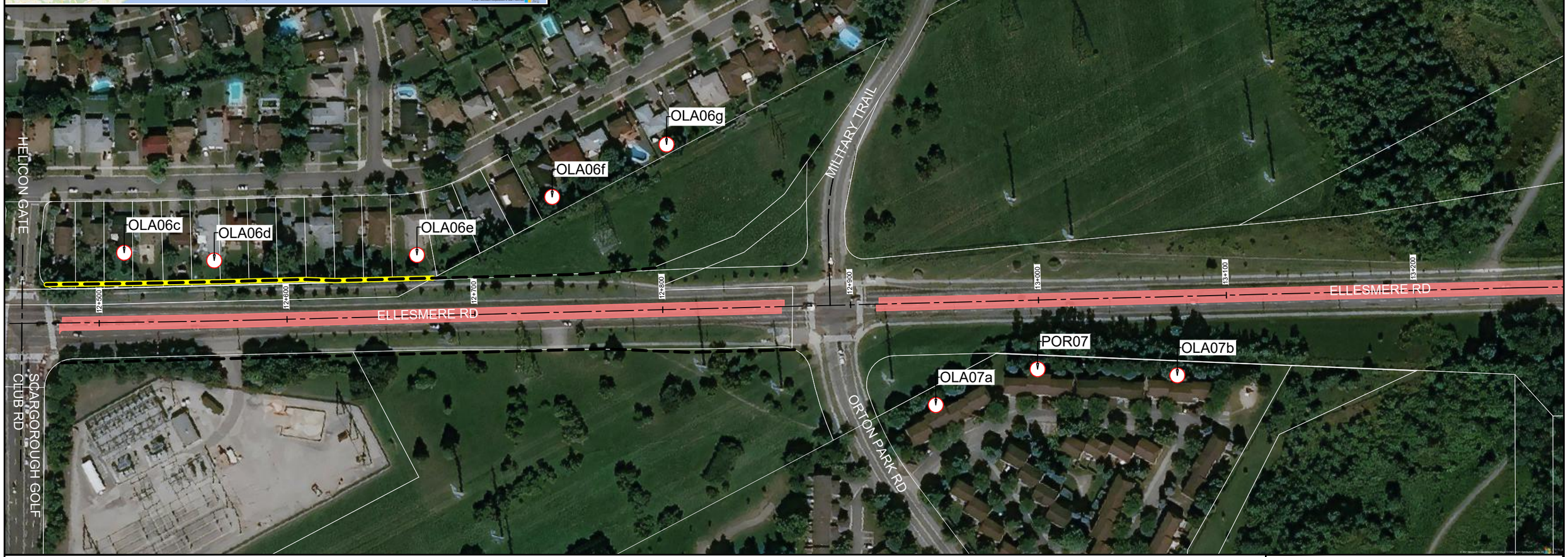
Client: METROLINX

ARCADIS

Date: **August 2021**

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

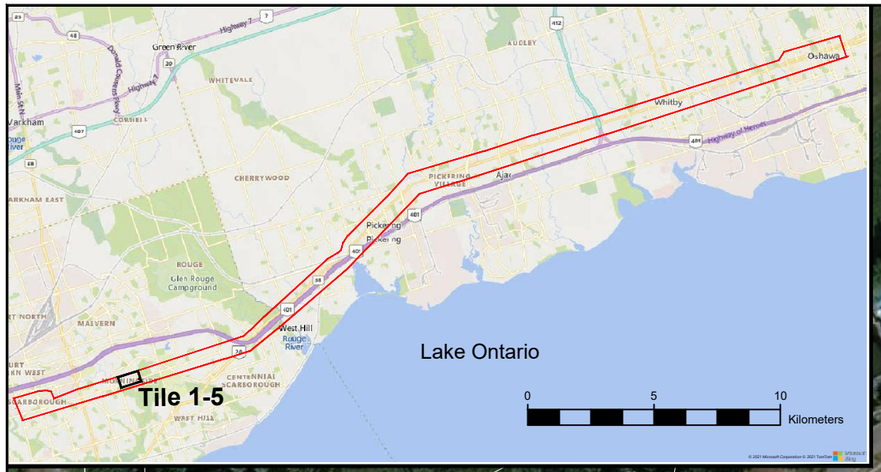
- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-4
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

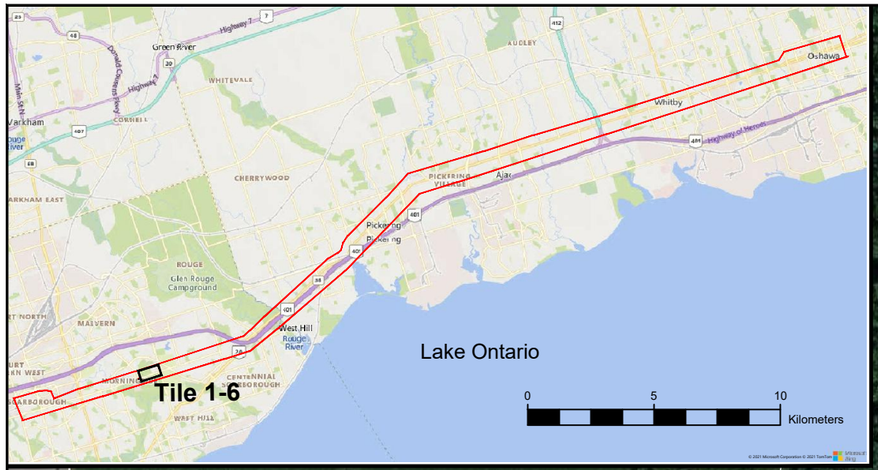
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-5
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

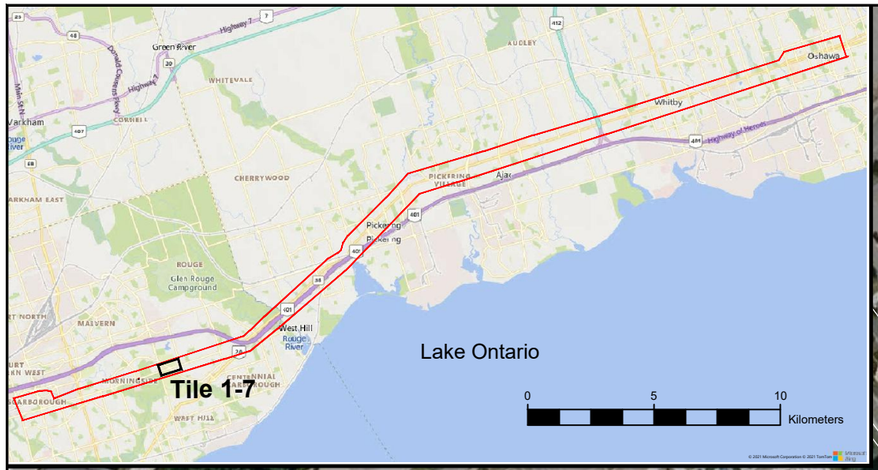
- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-6
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



MILITARY TRAIL

REALIGNED MILITARY TRAIL (BY OTHERS)

ELLESMERE RD

15+000
15+100
15+200
15+300
15+400
15+500
15+600
15+700

OLA12a
OLA12b
MES11b
MES11a
POR11
OLA11a
OLA11
OLA11b
MIRROW CT
CONLINS RD
POR10_Day Care
OLA10a
OLA10b

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

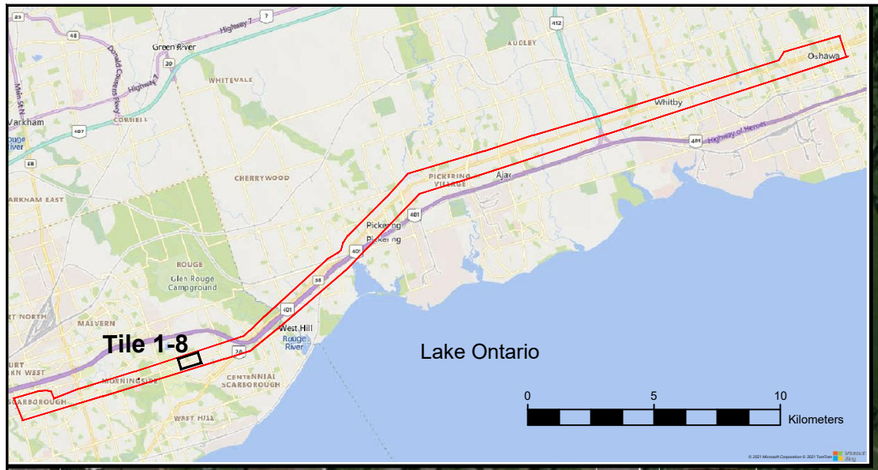
Noise Walls

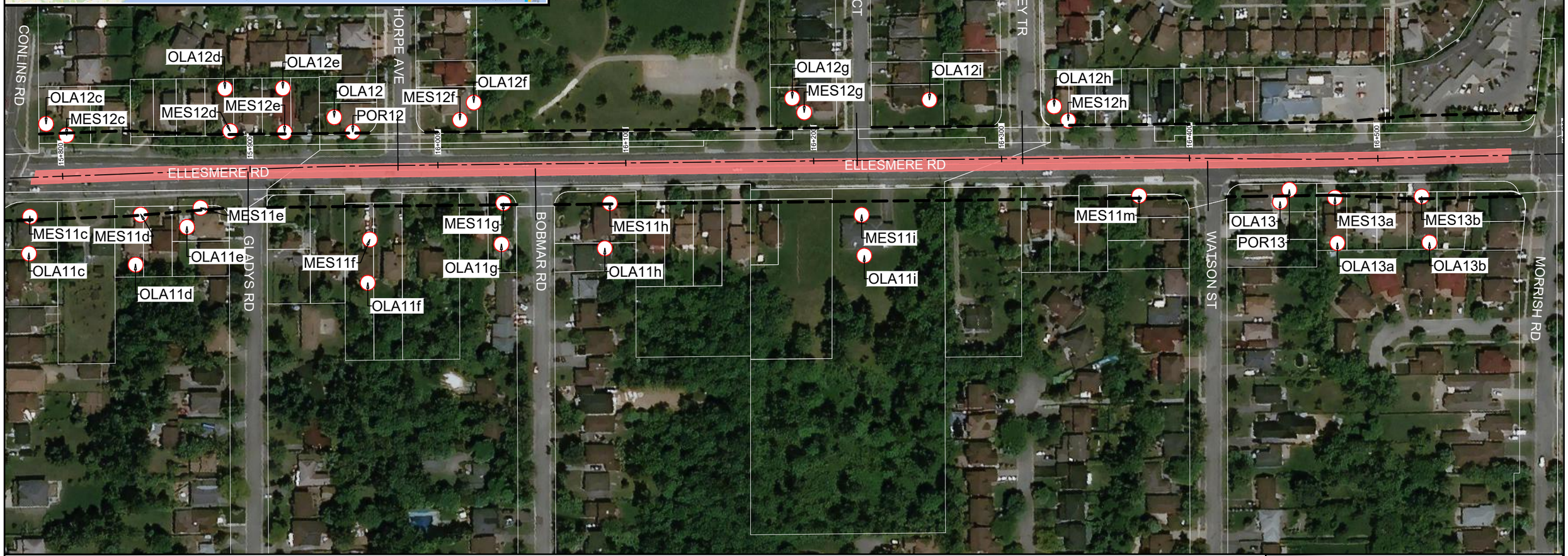
- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-7
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

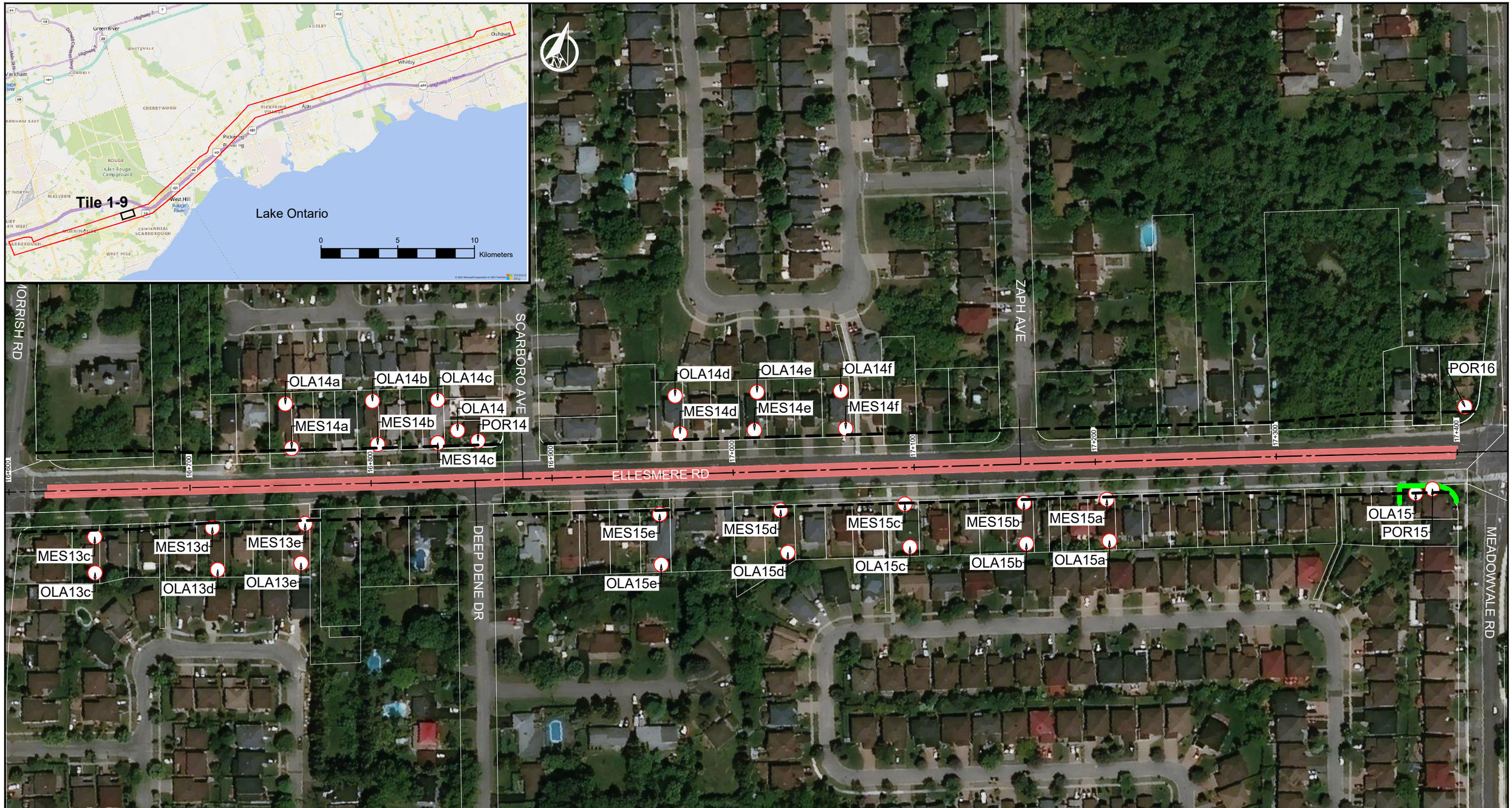
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-8
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

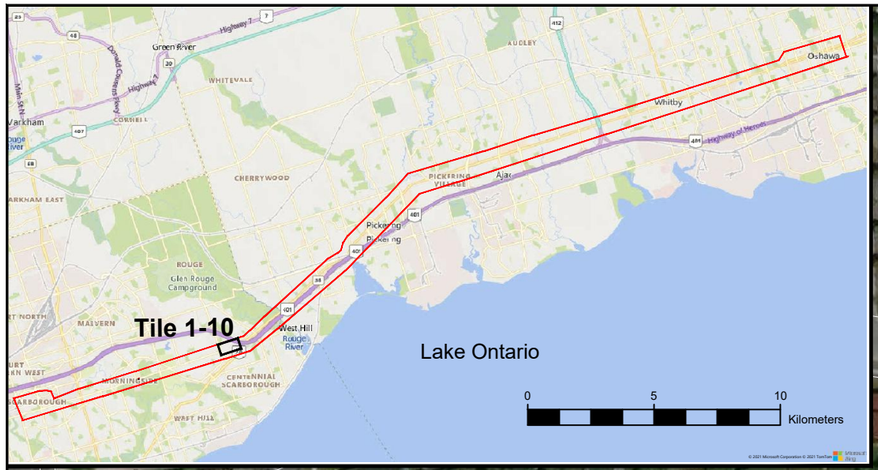
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-9
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



MEADOWVALE RD

MUIRBANK BLVD.

HWY 401 W-S RAMP

ELLESMERE RD

ELLESMERE RD

KINGSTON RD

POR17

OLA17

17+500
17+600
17+700
17+800
17+900
18+000
18+100
18+200
18+300
18+400
18+500
18+600

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

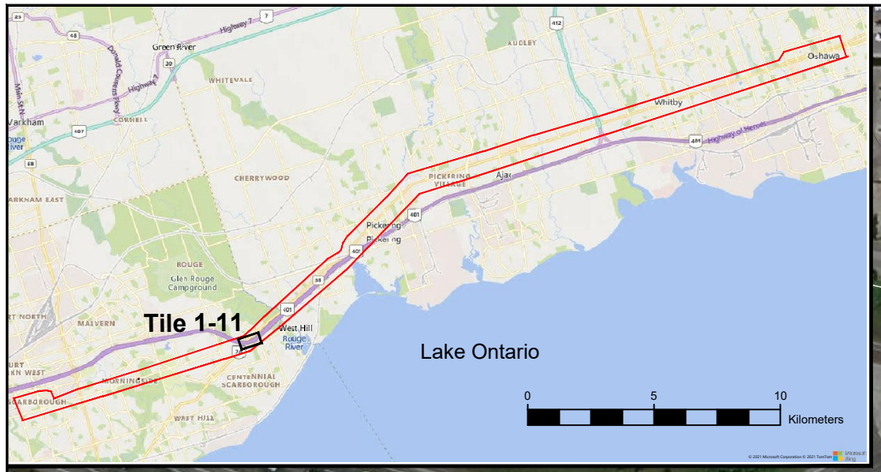
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-10
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

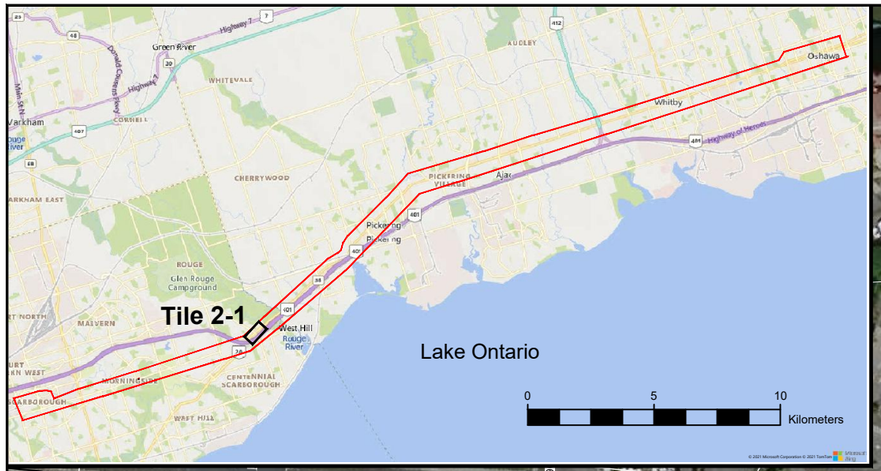
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 1-11
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

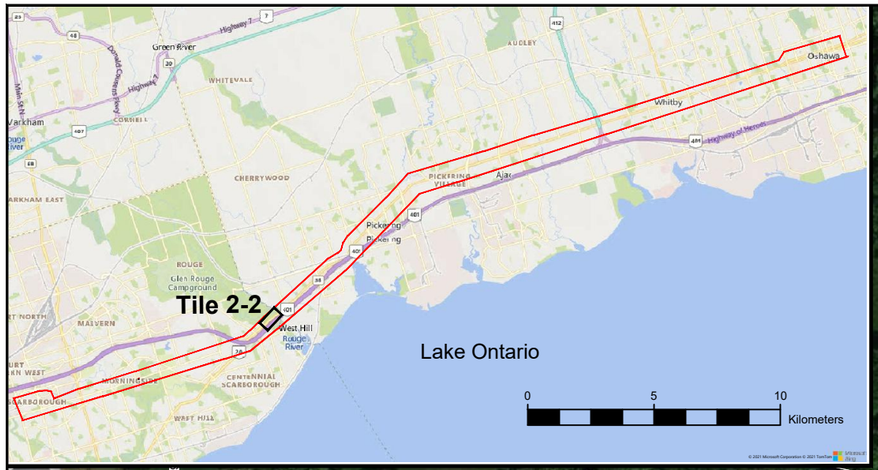
- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-1
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

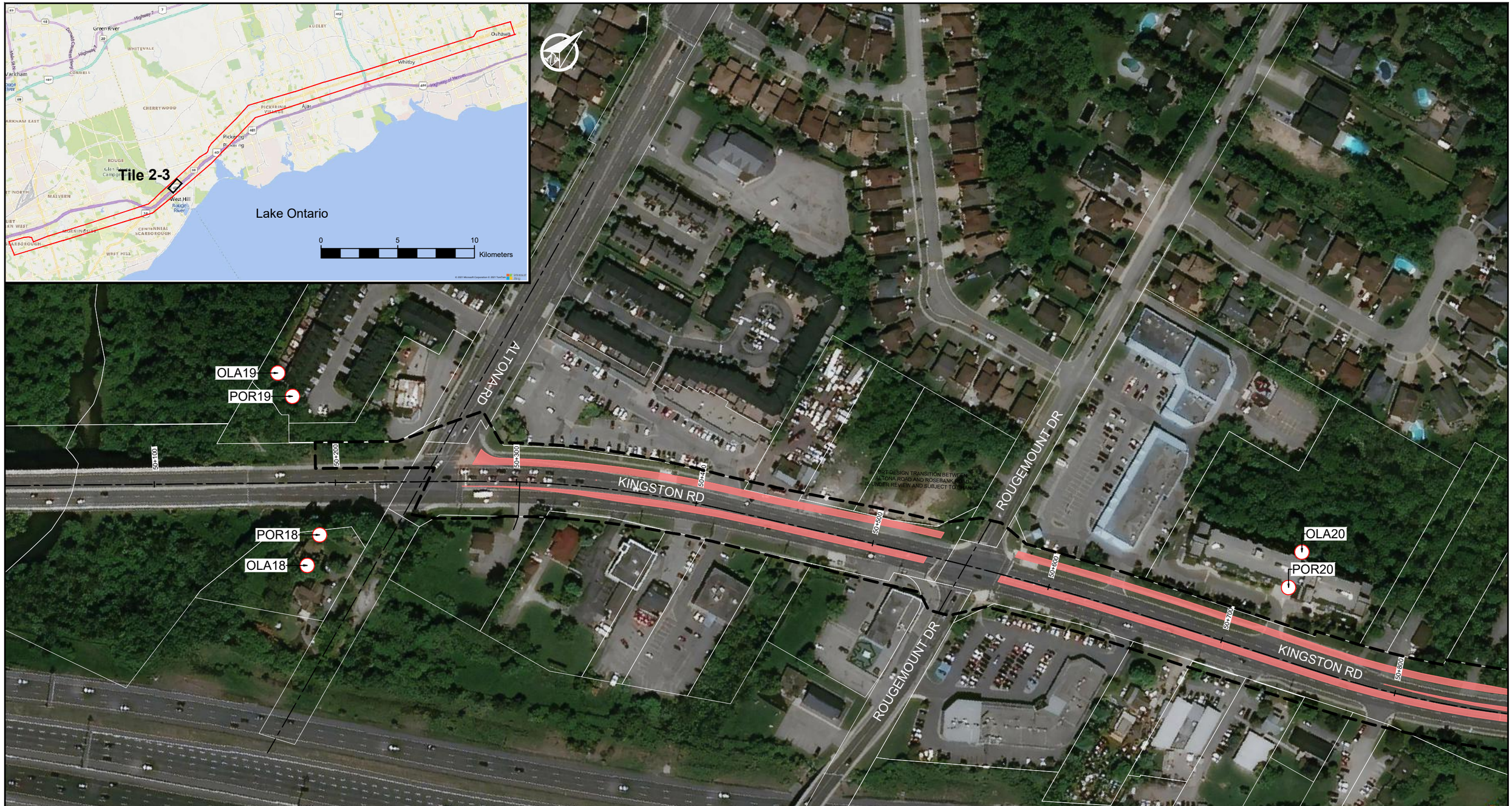
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-2
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

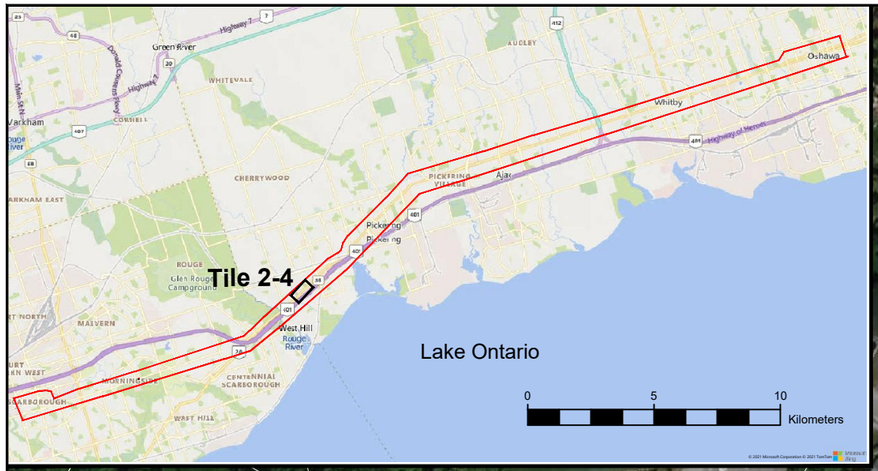
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-3
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



ROSEBANK RD

OLA20a

OLA21b

POR21

OLA21a

OLA21

MES21a

50+900

51+000

51+100

51+200

51+300

51+400

51+500

51+600

KINGSTON RD

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

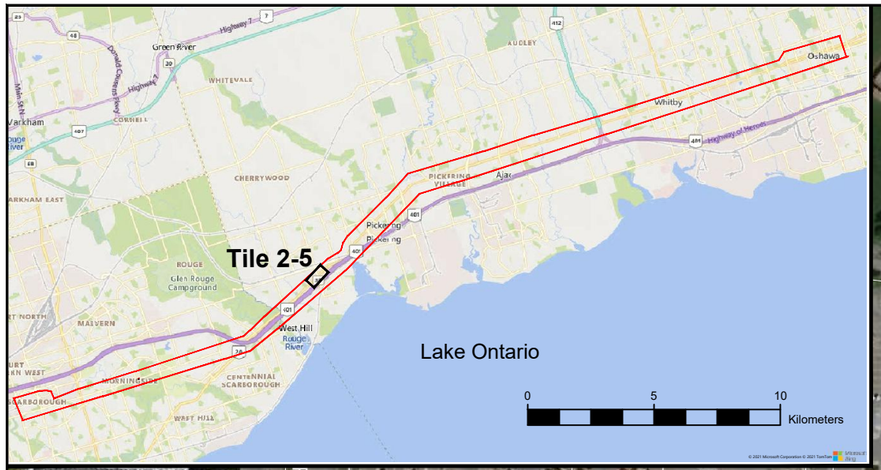
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-4
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

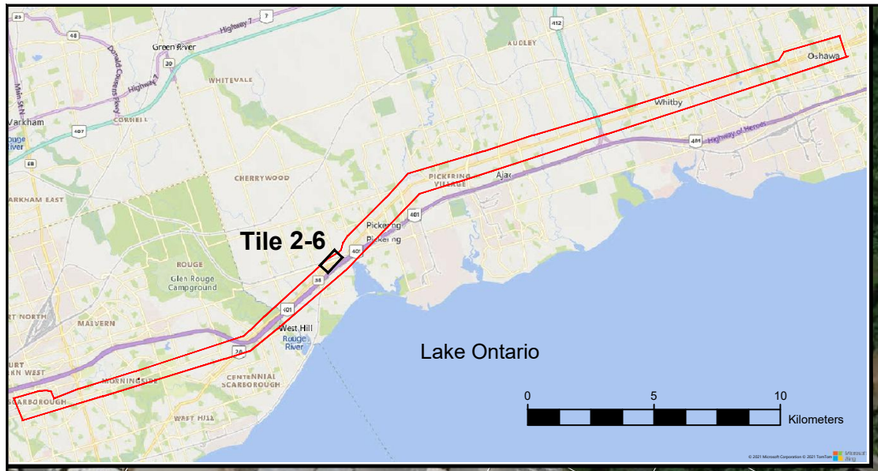
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-5
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

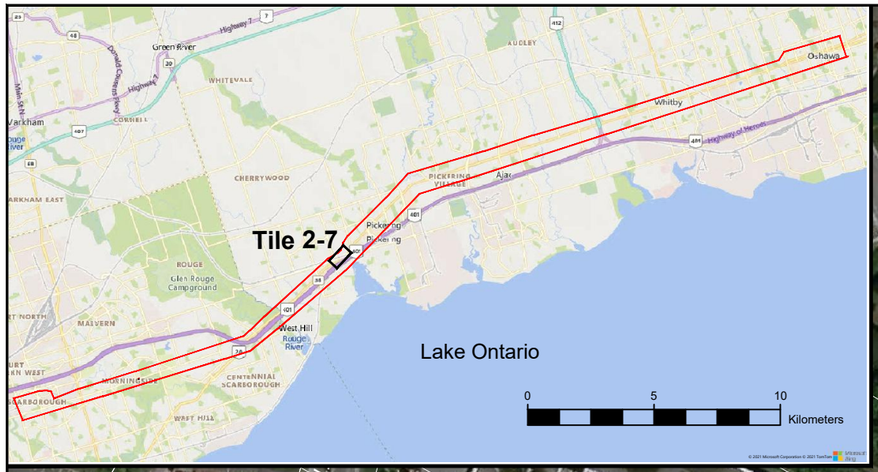
- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-6
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

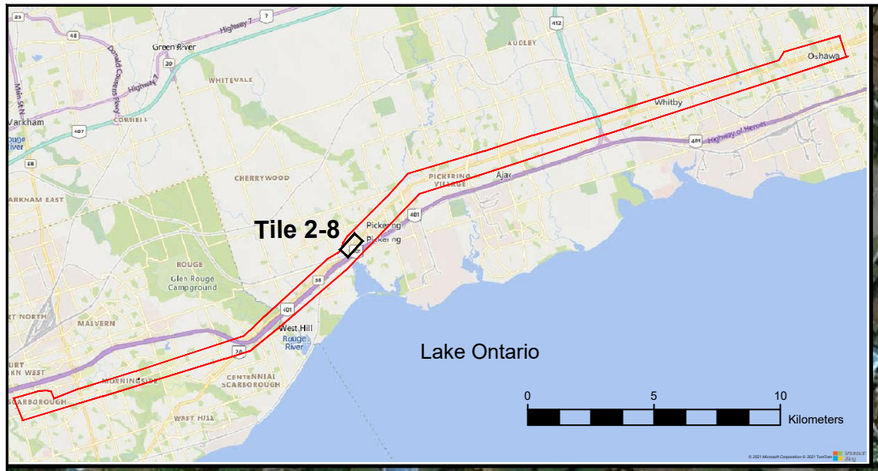
- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-7
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

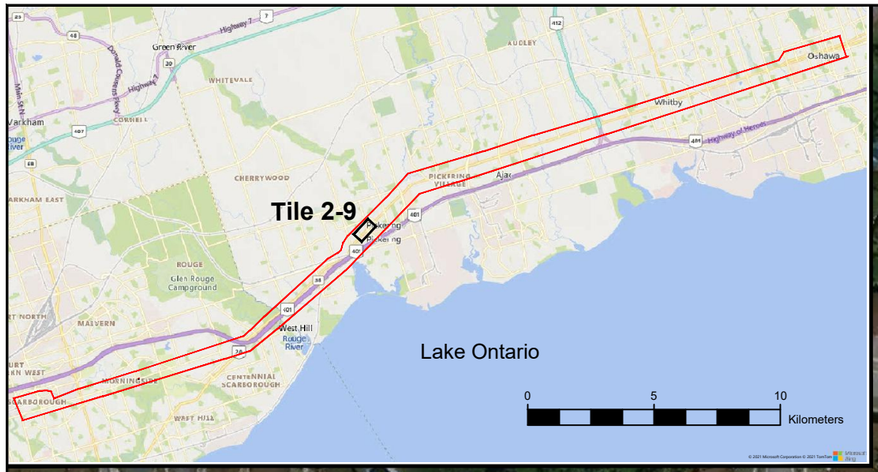
- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-8
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

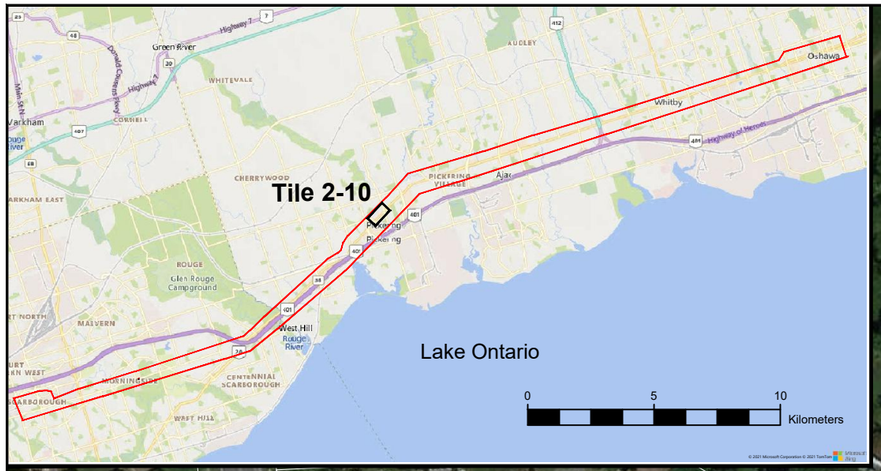
- Existing Noise Walls
- Reviewed Noise Walls

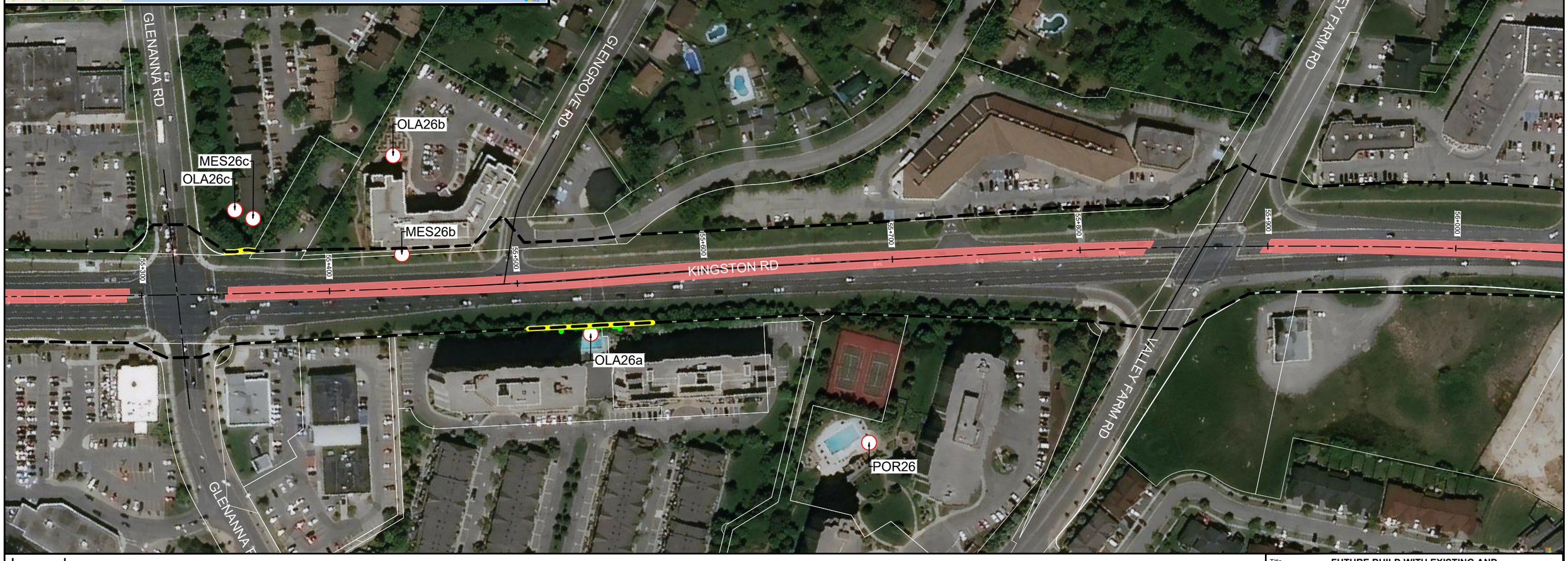
Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-9
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

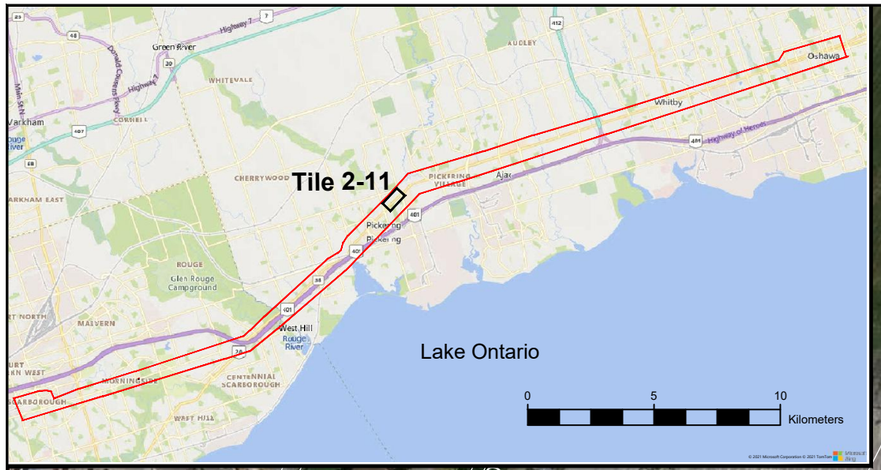
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-10
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

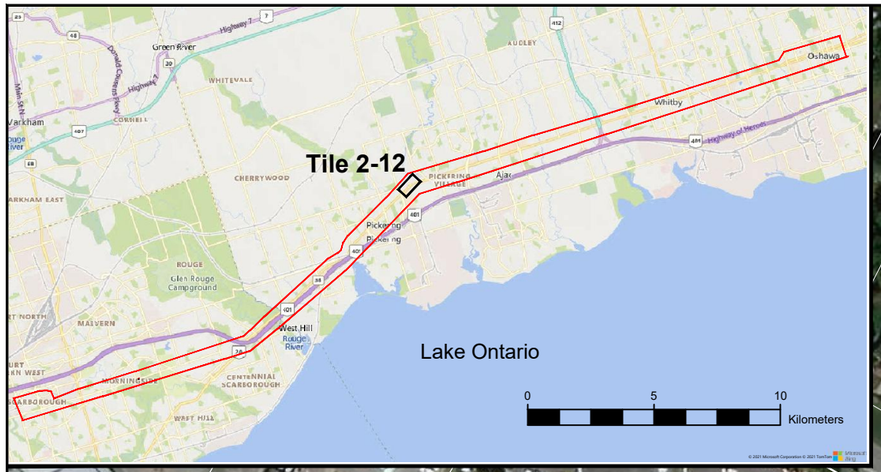
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-11
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

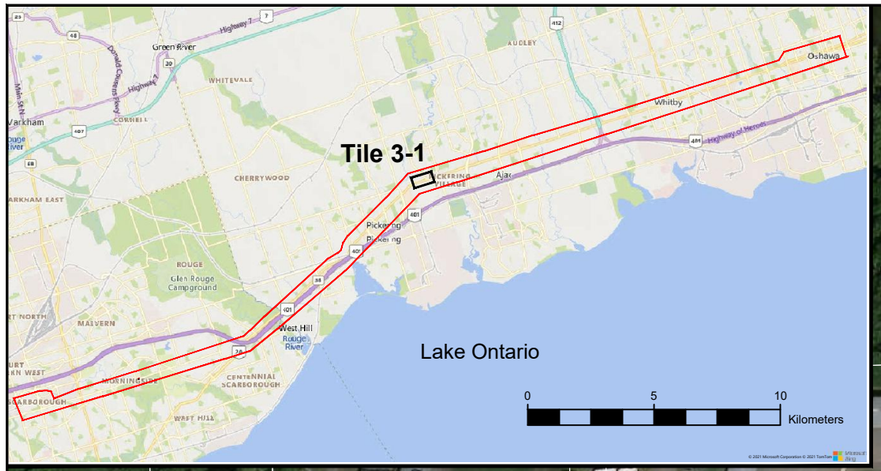
- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 2-12
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



DUFFINS CREEK B-03
ELIZABETH ST
WINDSOR DR
SHERWOOD RD W
OLD KINGSTON RD
LINTON AVE
KINGSTON RD
NOTION RD
POR29
POR30
OLA30
OLA30a

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

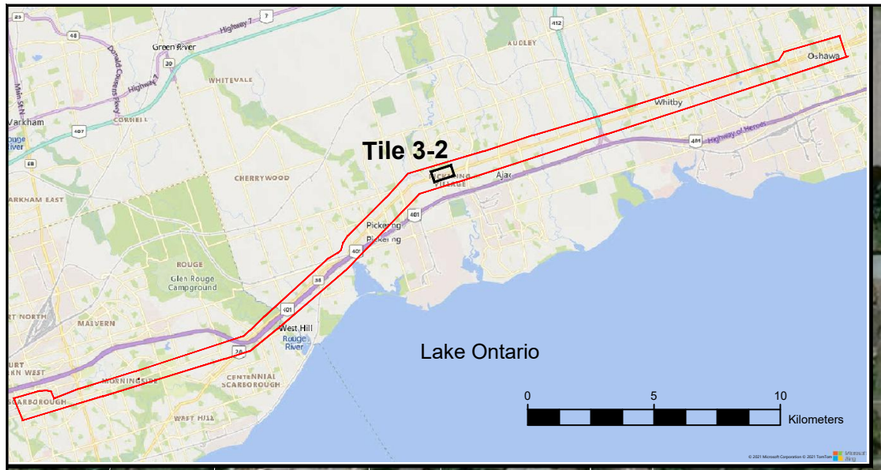
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-1
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

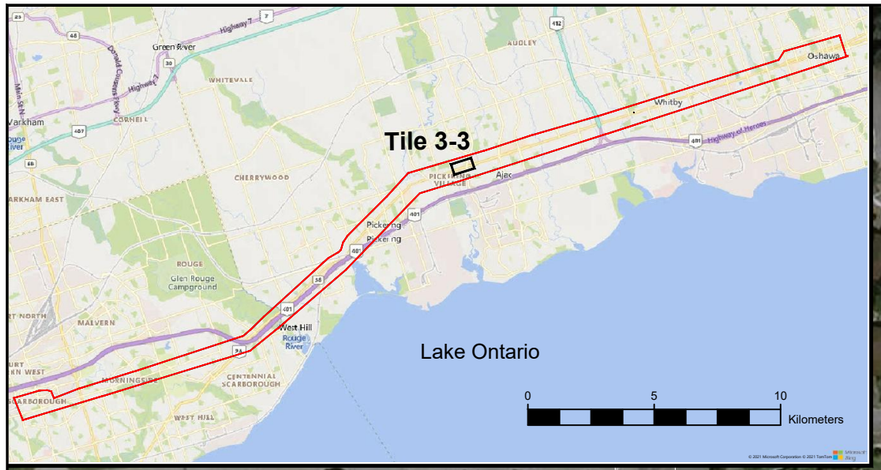
Meters

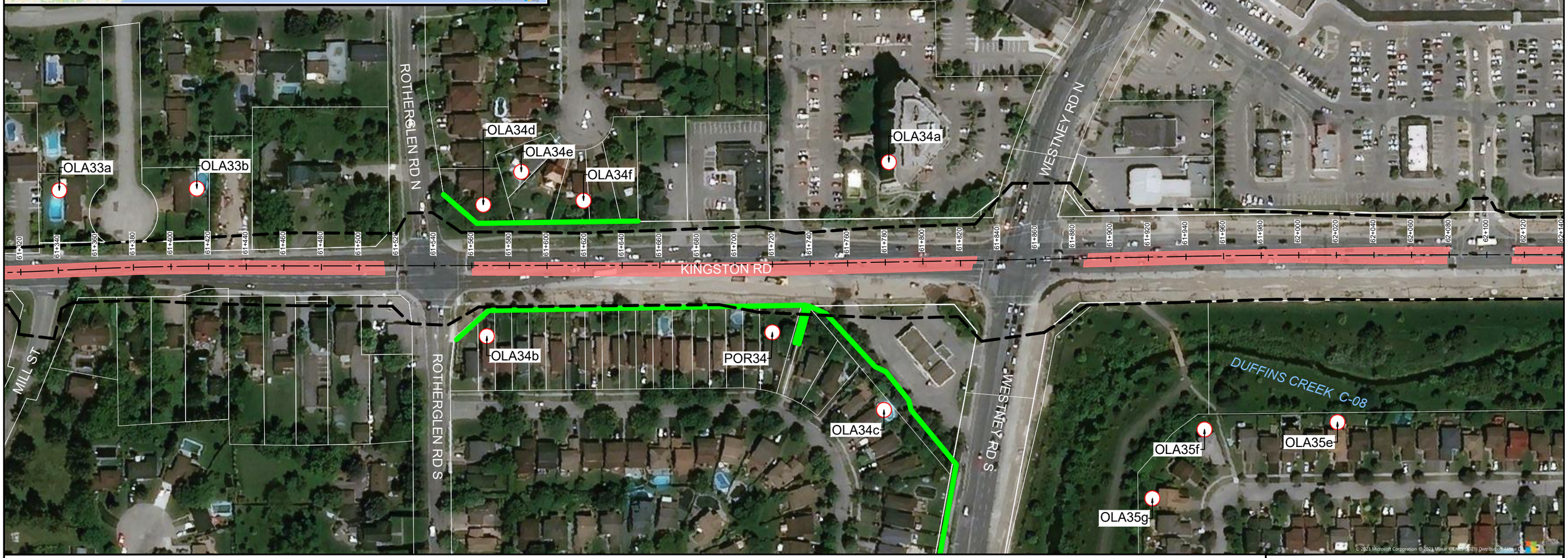
50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-2
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

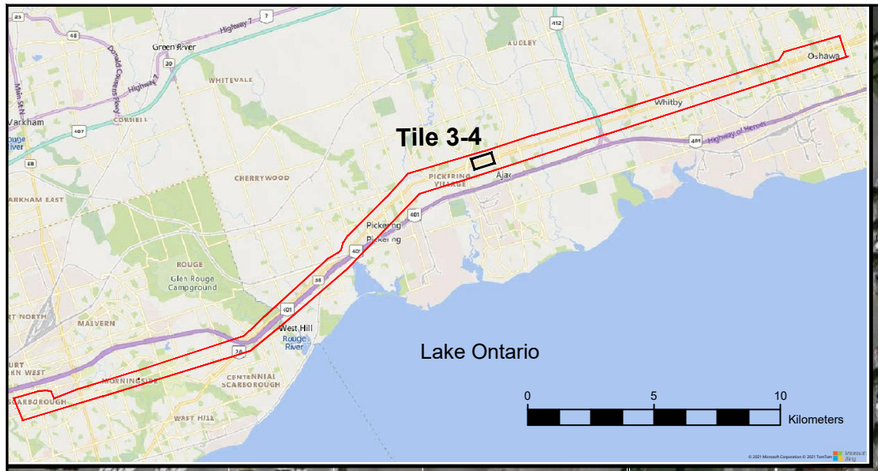
- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

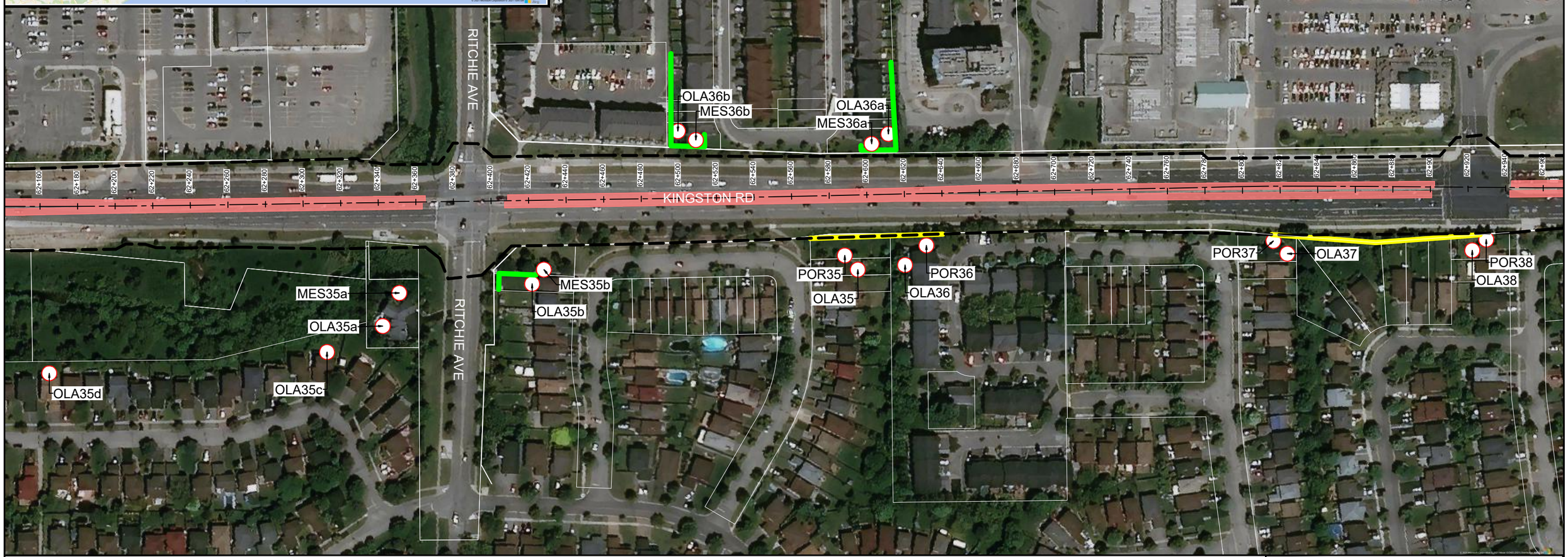
Noise Walls
- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-3
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

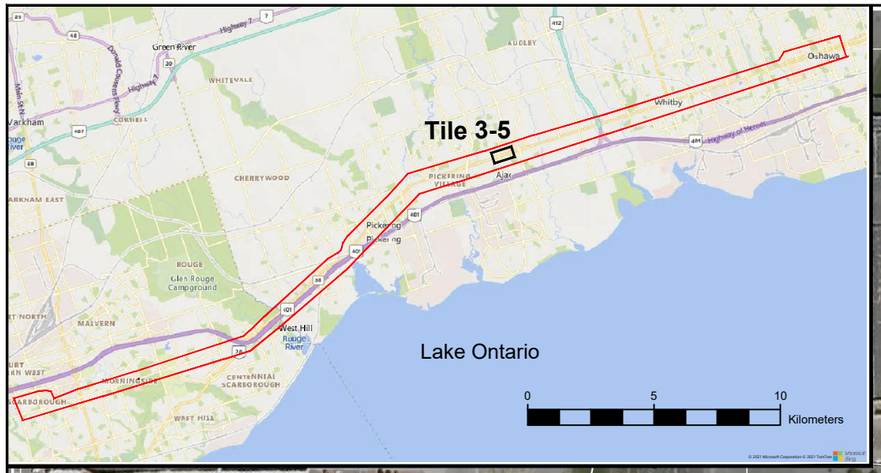
Meters

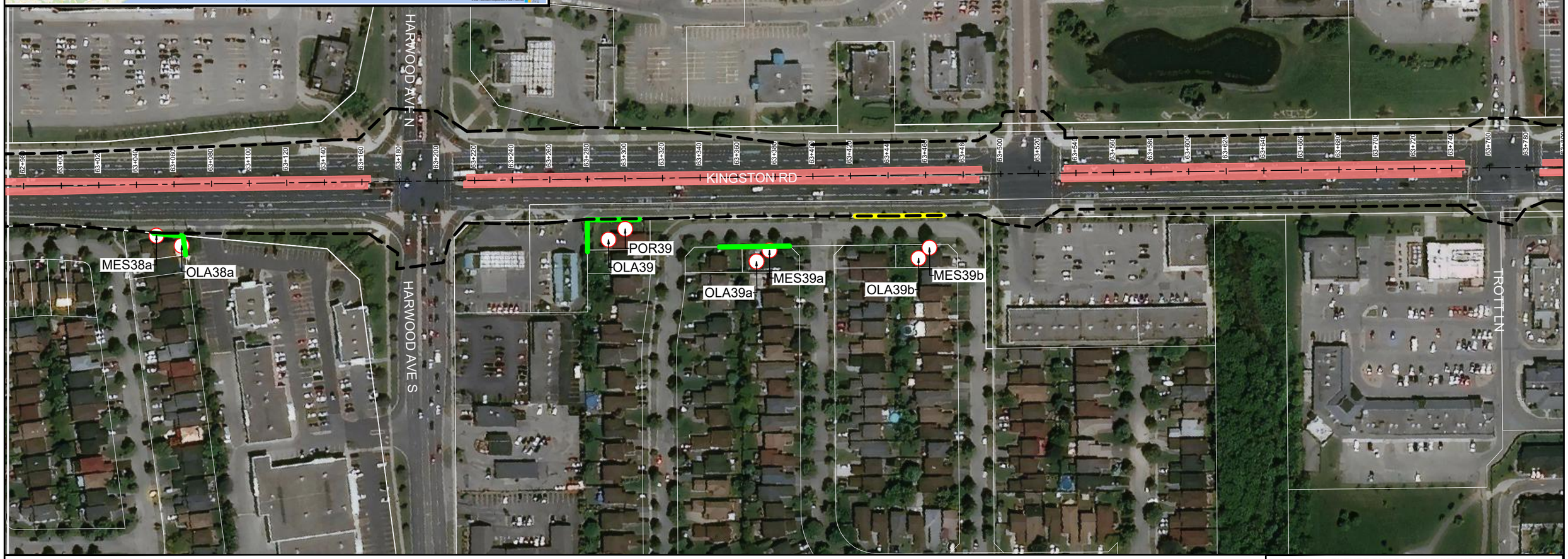
50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-4
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

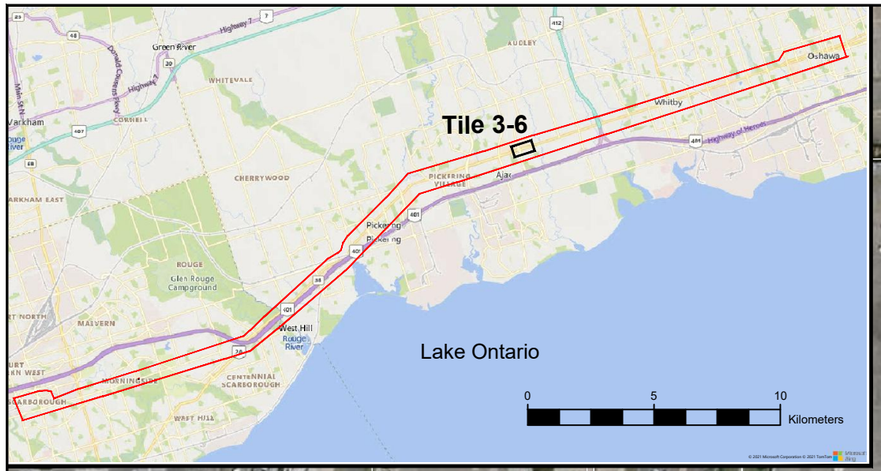
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-5
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



KINGSTON RD

SALEM RD

WICKS DR

POR40

MES41a

OLA41a

63+920 63+940 63+960 63+980 64+000 64+020 64+040 64+060 64+080 64+100 64+120 64+140 64+160 64+180 64+200 64+220 64+240 64+260 64+280 64+300 64+320 64+340 64+360 64+380 64+400 64+420 64+440 64+460 64+480 64+500 64+520 64+540 64+560 64+580 64+600 64+620

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

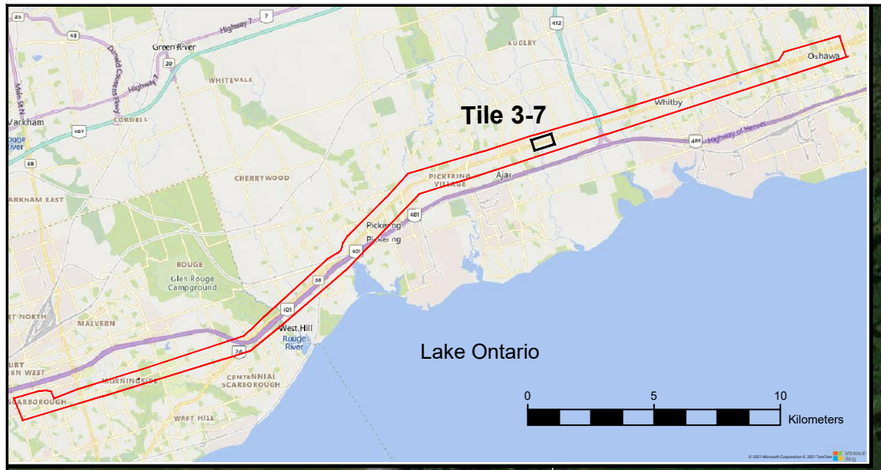
Noise Walls
- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-6
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title: **FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-7**

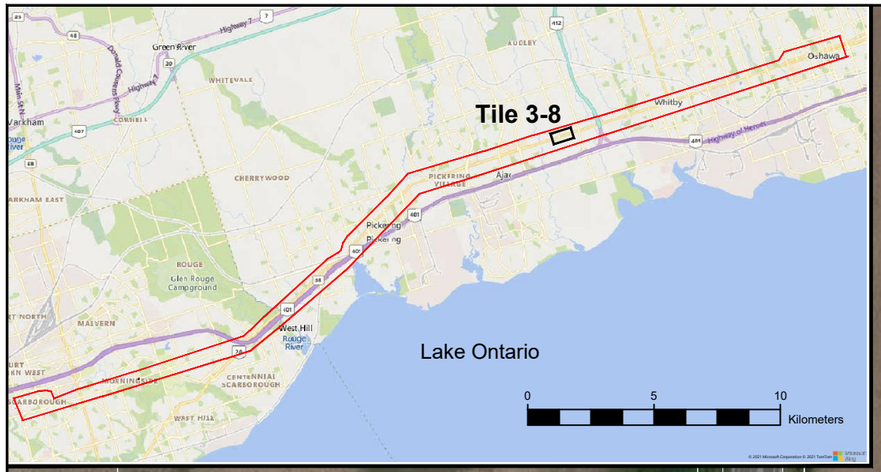
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **August 2021**

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

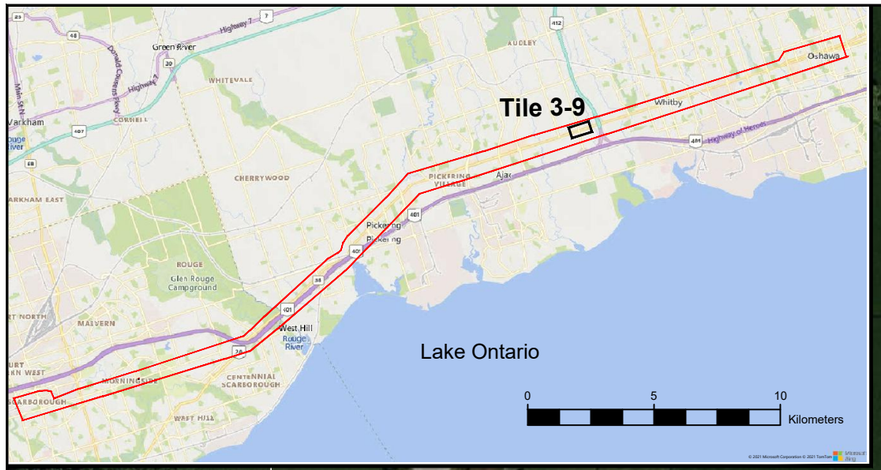
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-8
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

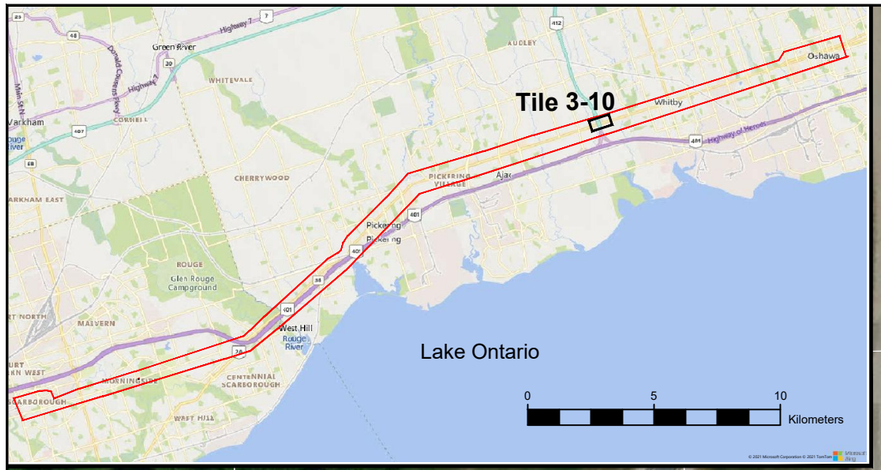
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-9
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

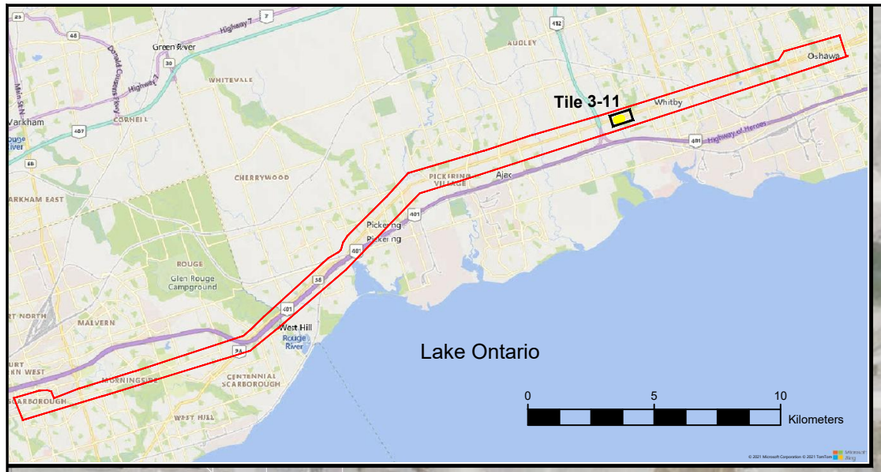
- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-10
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- Project Footprint
- Proposed Right of Way

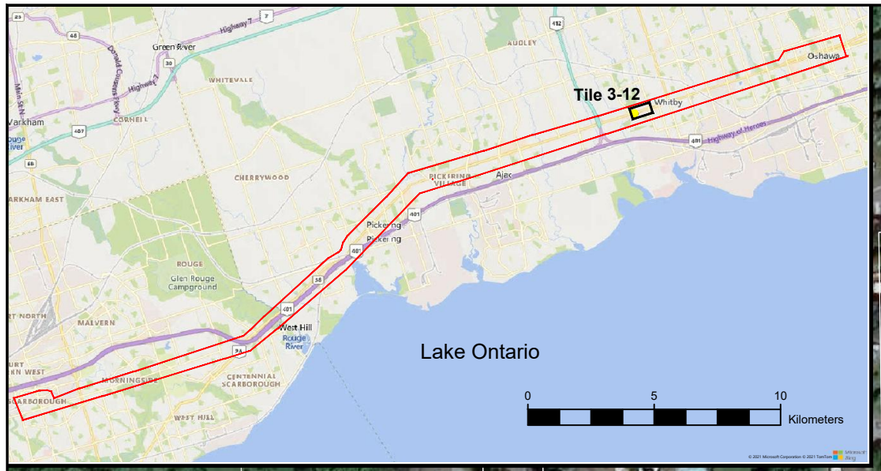
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls
- Existing Noise Walls to Be Removed Due to New Right of Way

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-11
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- Project Footprint
- Proposed Right of Way
- Official Plan Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls
- Existing Noise Walls to Be Removed Due to New Right of Way

Meters
50 0 50 100
1:2000

Title: **FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-12**

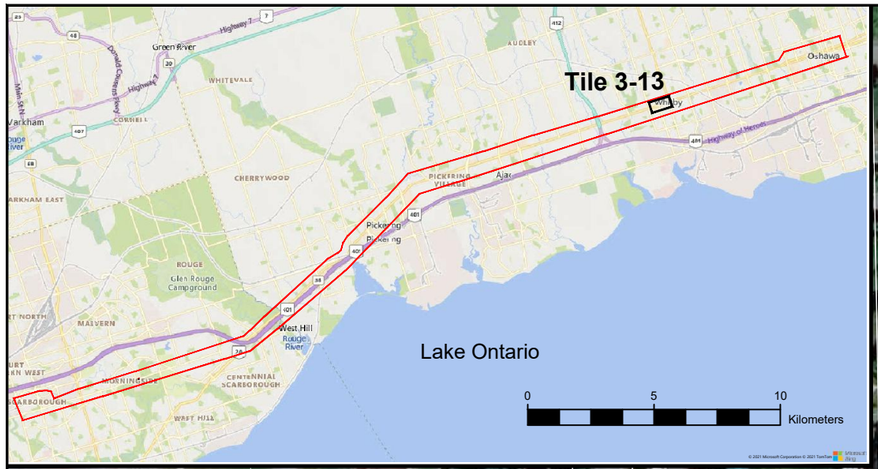
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **August 2021**

Background Reference: Microsoft Bing Maps





Legend

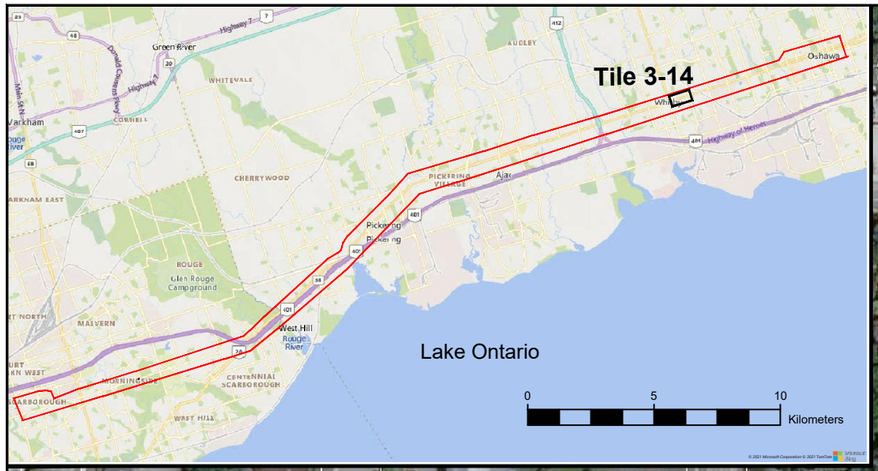
- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls
- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-13
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Background Reference: Microsoft Bing Maps

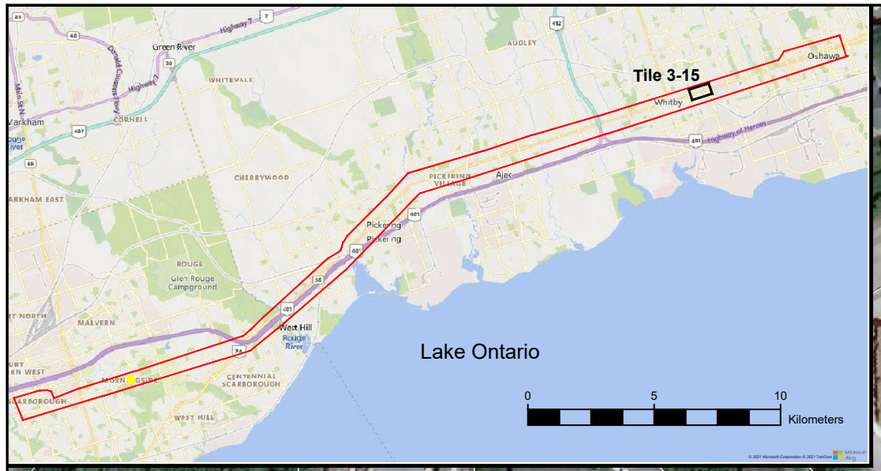
Title: **FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-14**

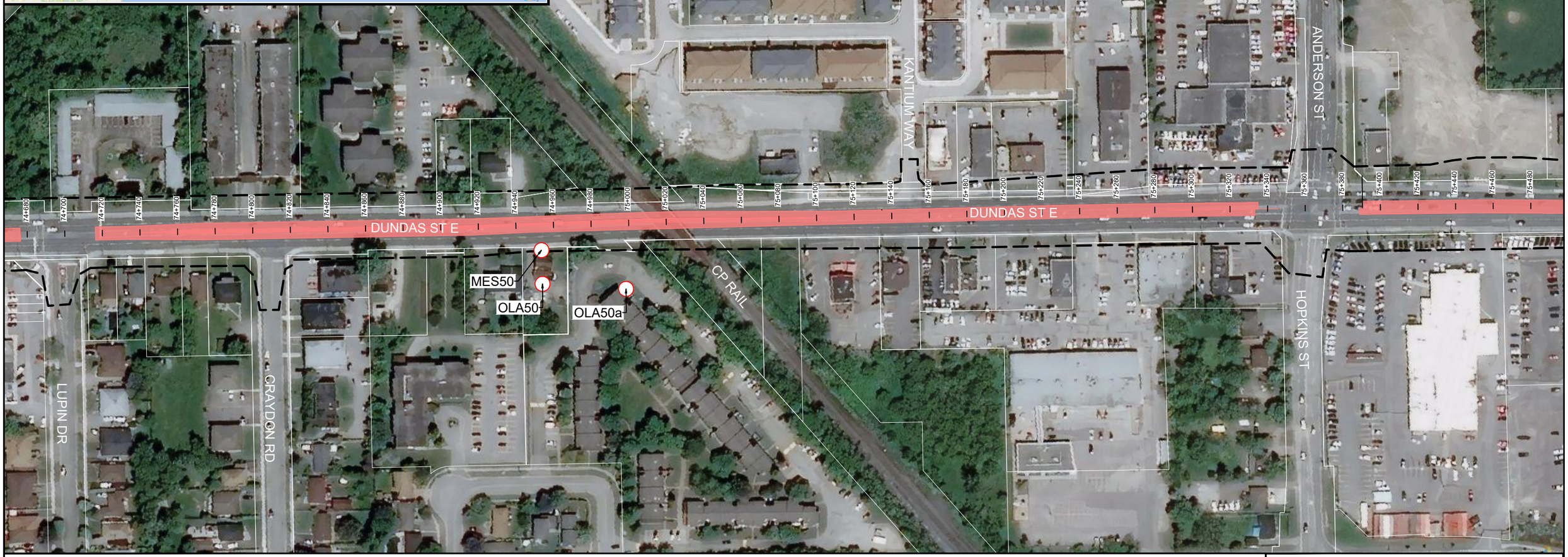
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **August 2021**





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- Project Footprint
- Proposed Right of Way

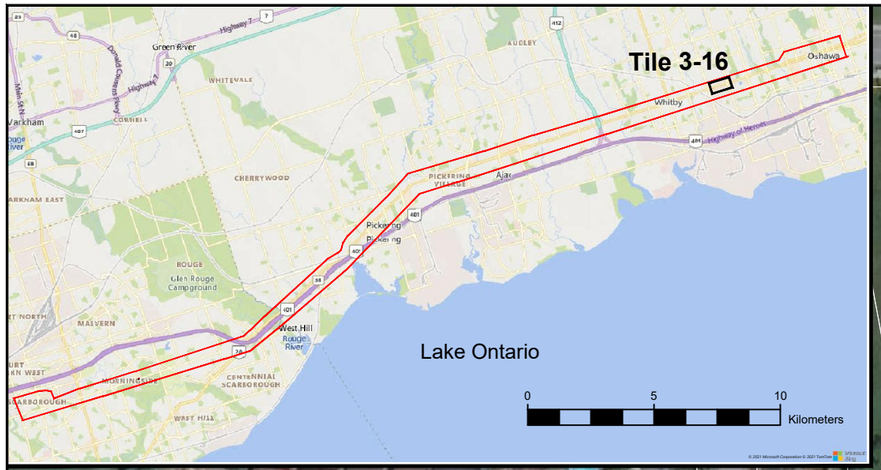
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-15
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

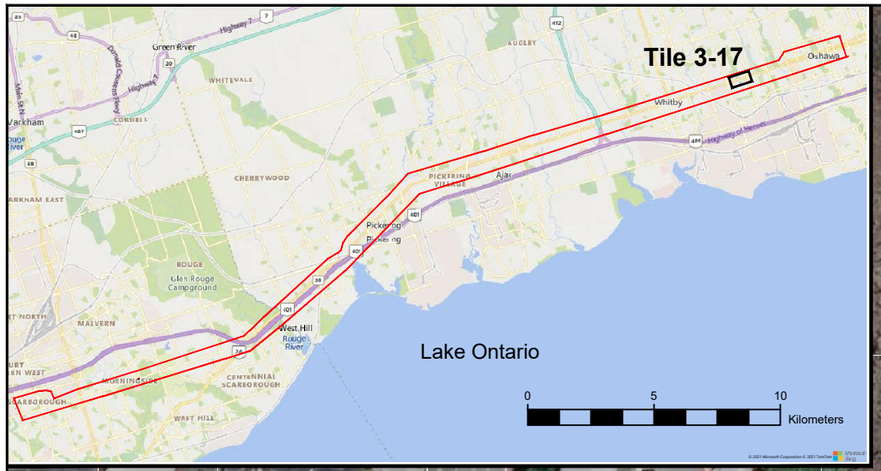
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-16
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

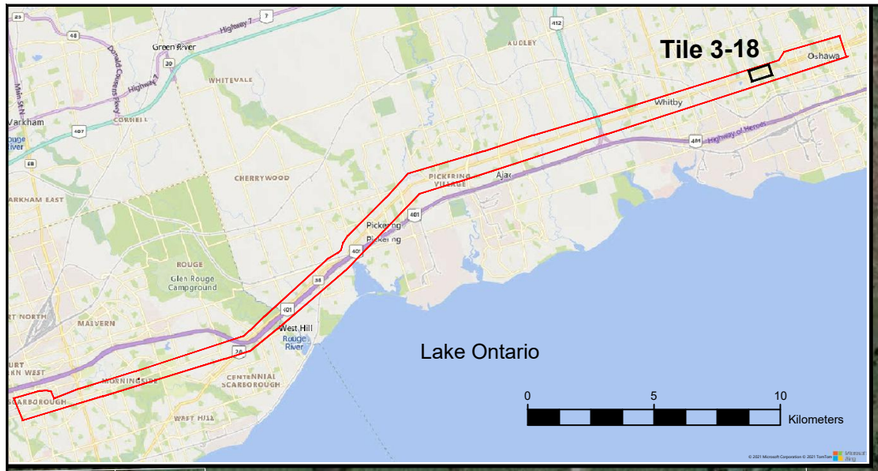
Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-17
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

Meters: 50 0 50 100

1:2000

Title: **FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-18**

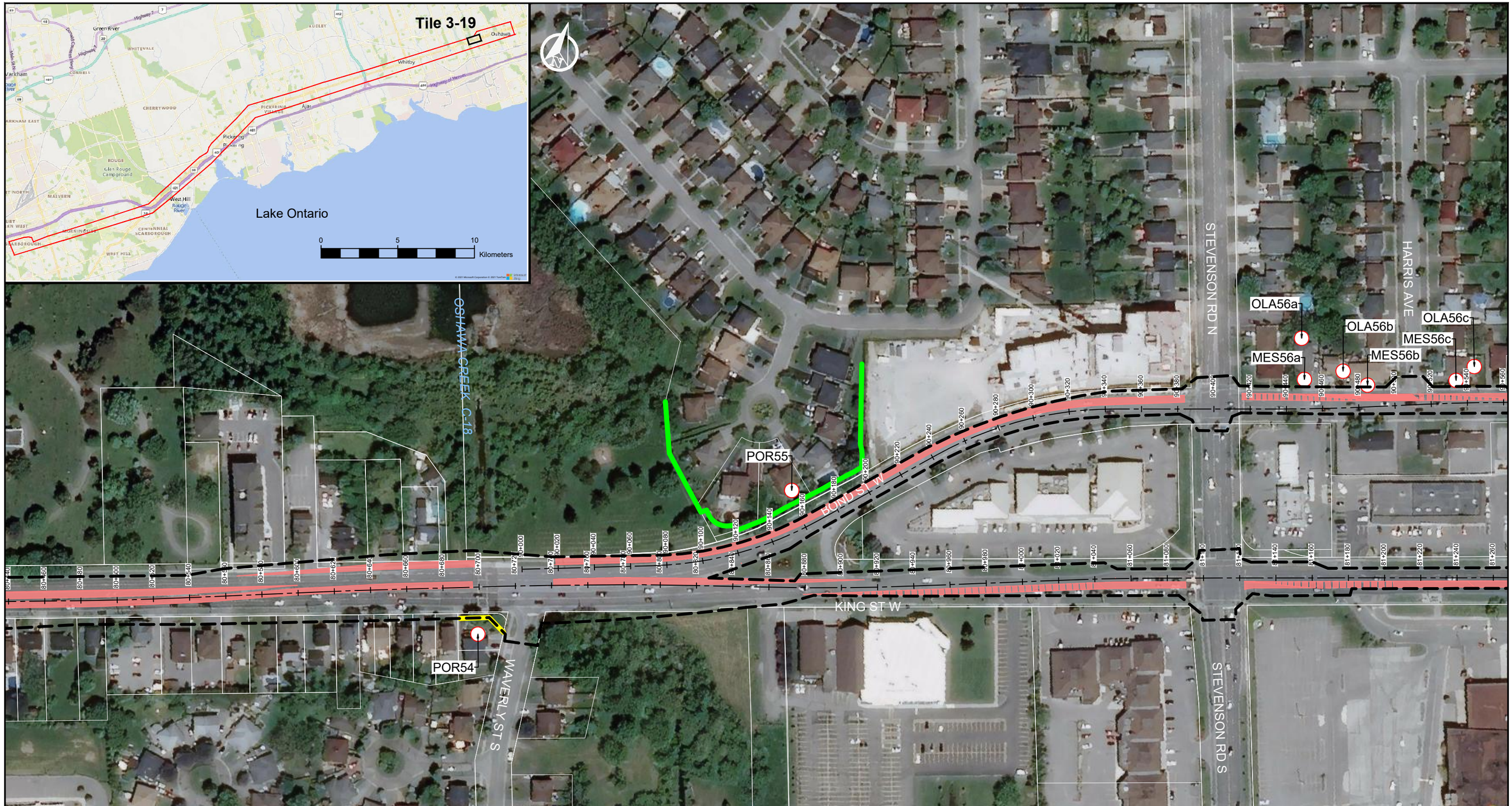
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **August 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

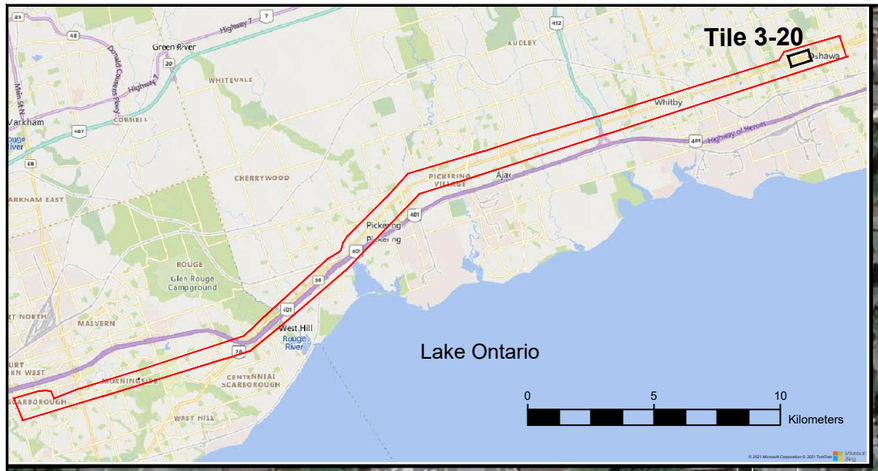
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-19
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

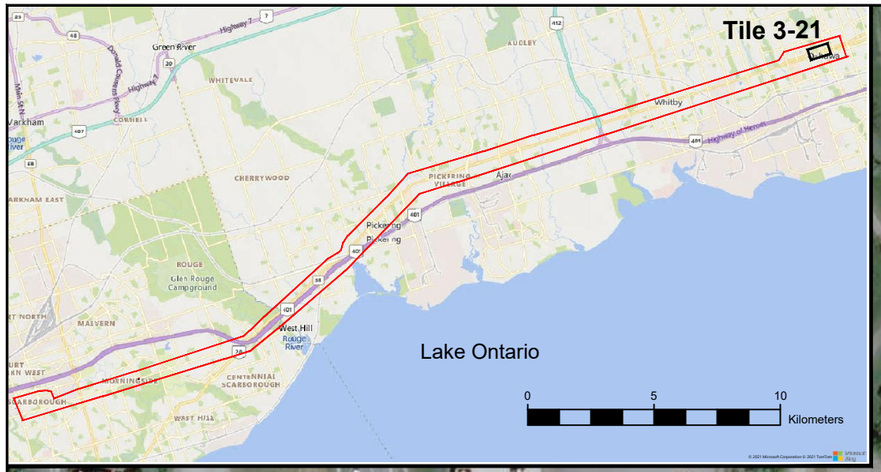
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-20
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Reviewed Noise Walls

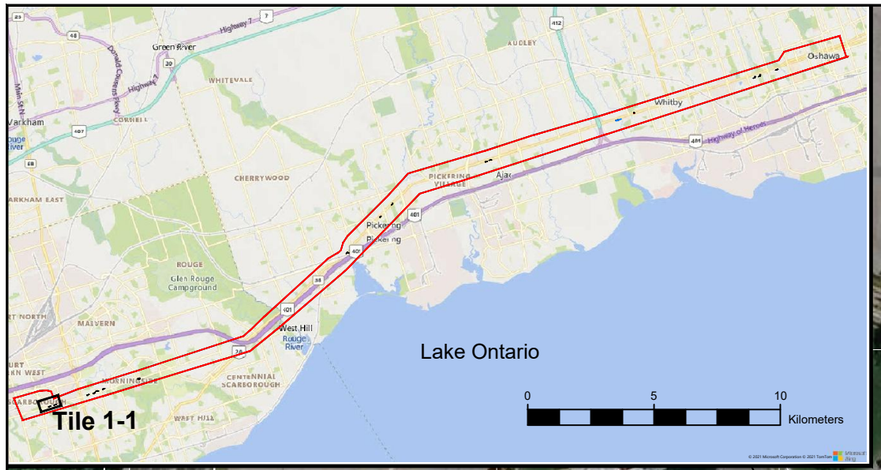
Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND REVIEWED NOISE WALLS - TILE 3-21
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: August 2021

Background Reference: Microsoft Bing Maps

APPENDIX B: NOISE ASSESSMENT FIGURES (Existing and Proposed Noise Barriers)

DRAFT



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

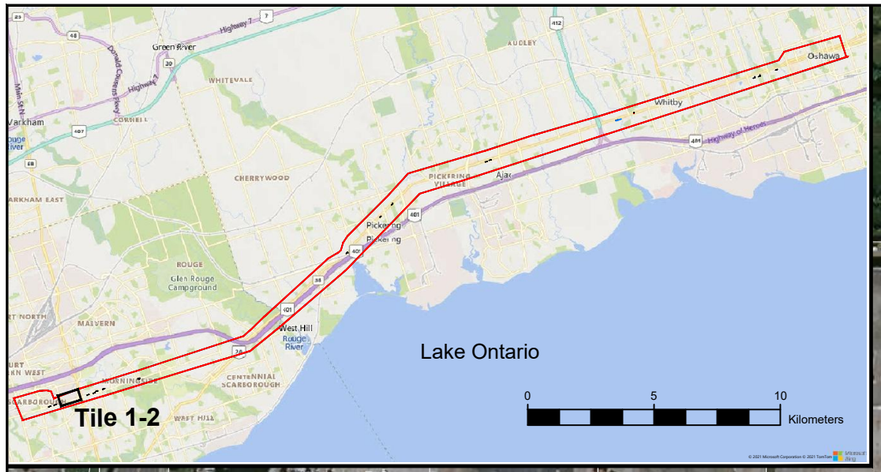
Noise Walls

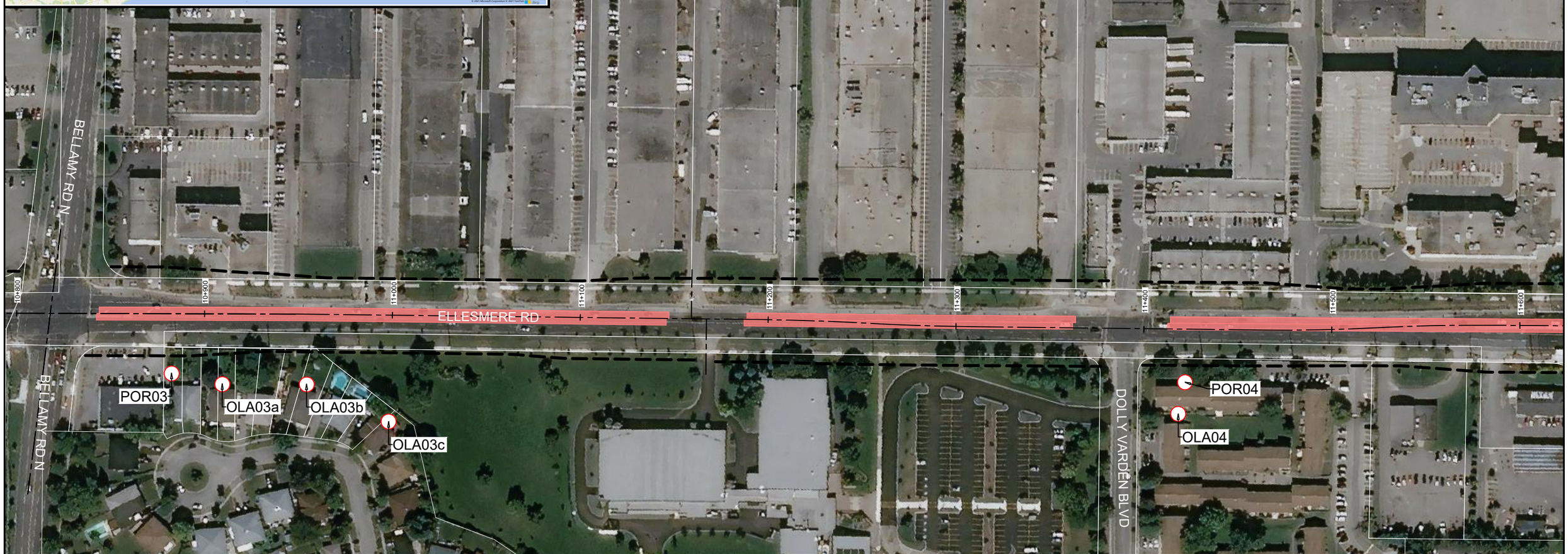
- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-1
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

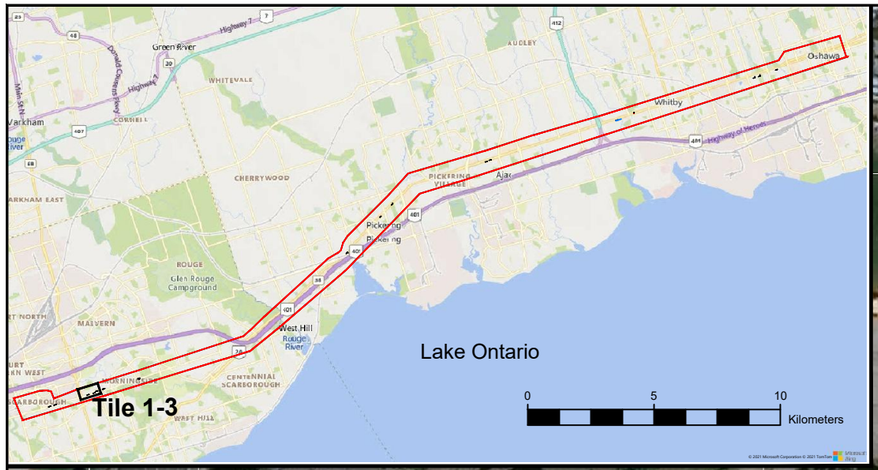
Noise Walls

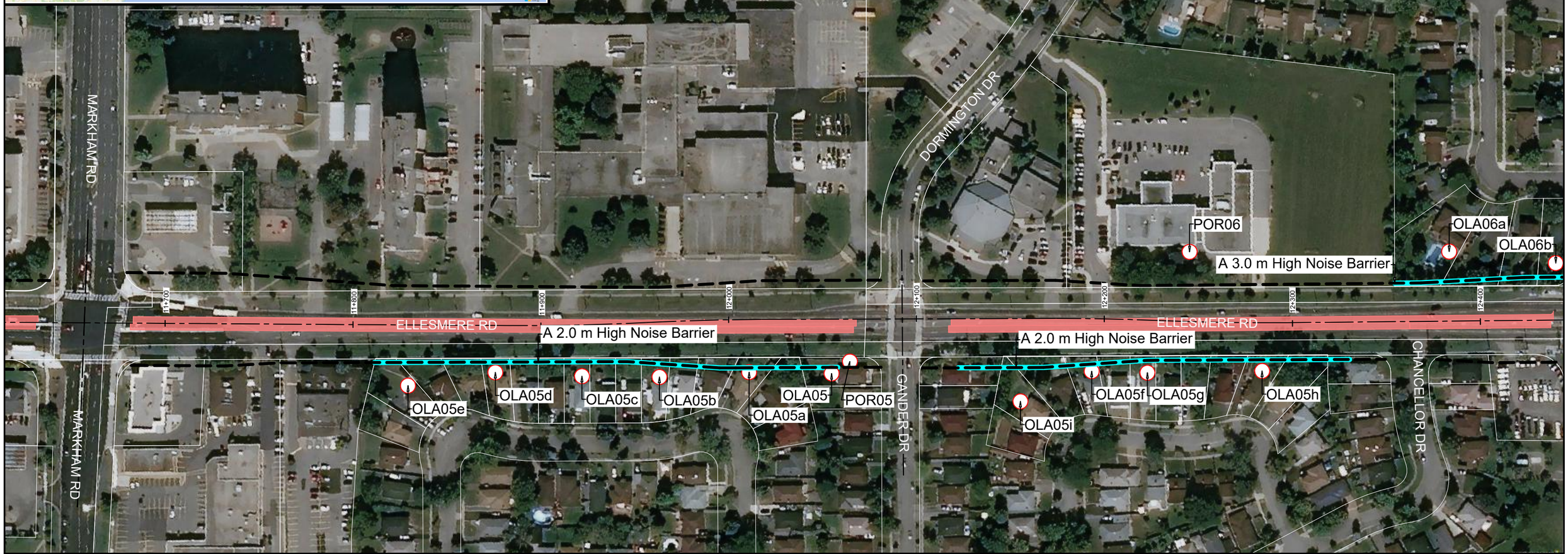
- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-2
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

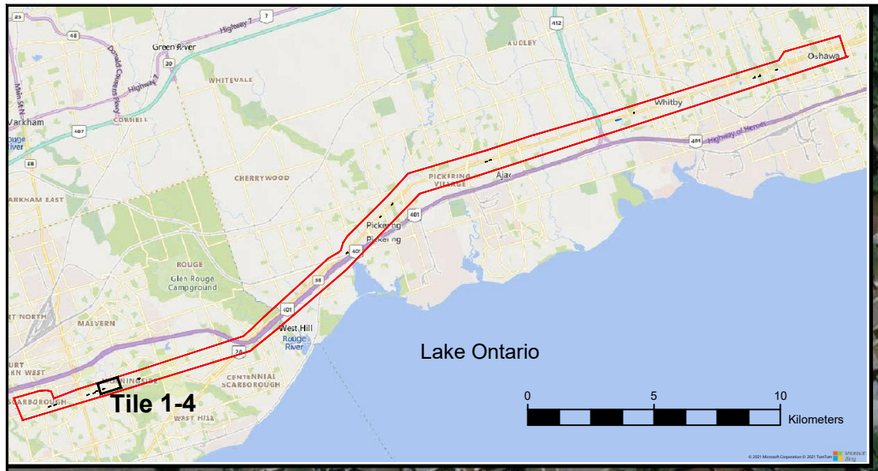
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-3
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

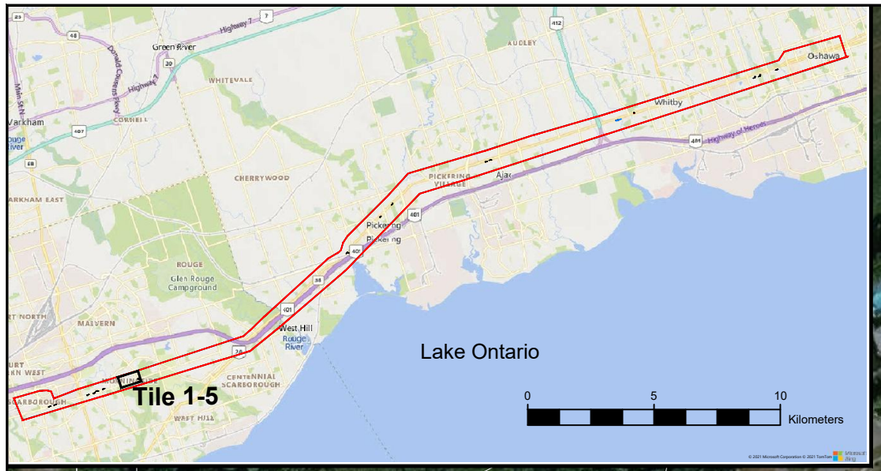
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-4
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

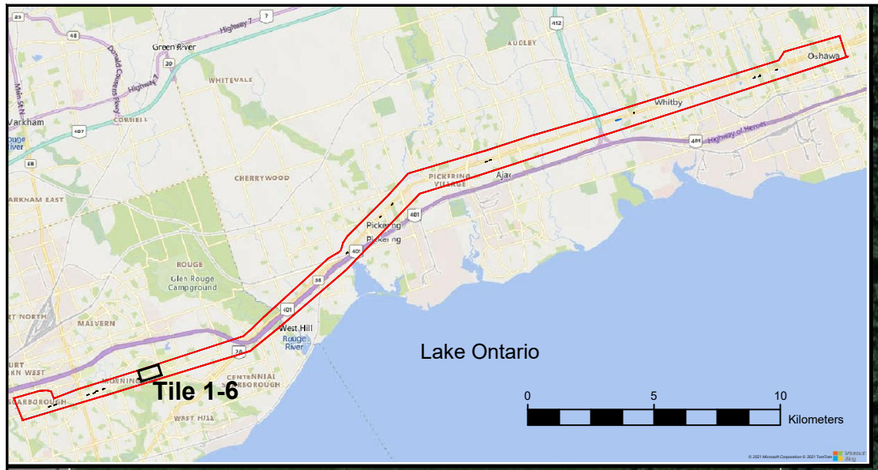
Meters

50 0 50 100

1:2000.005

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-5
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

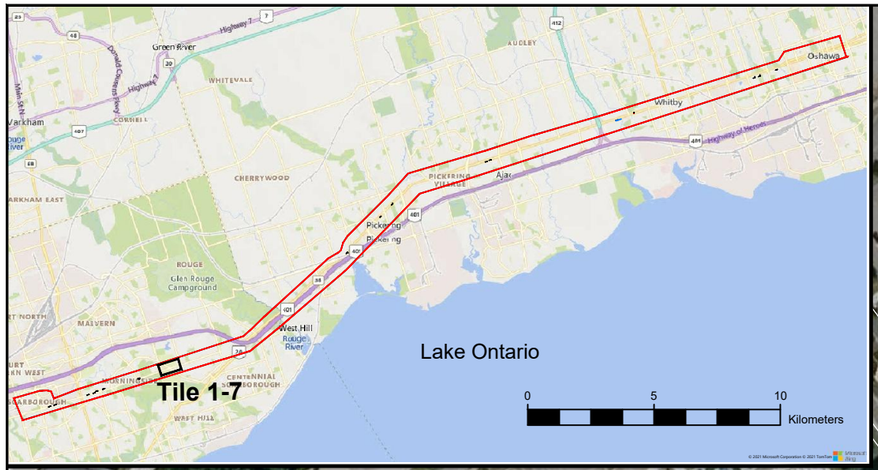
- Existing Noise Walls
- Proposed Noise Walls

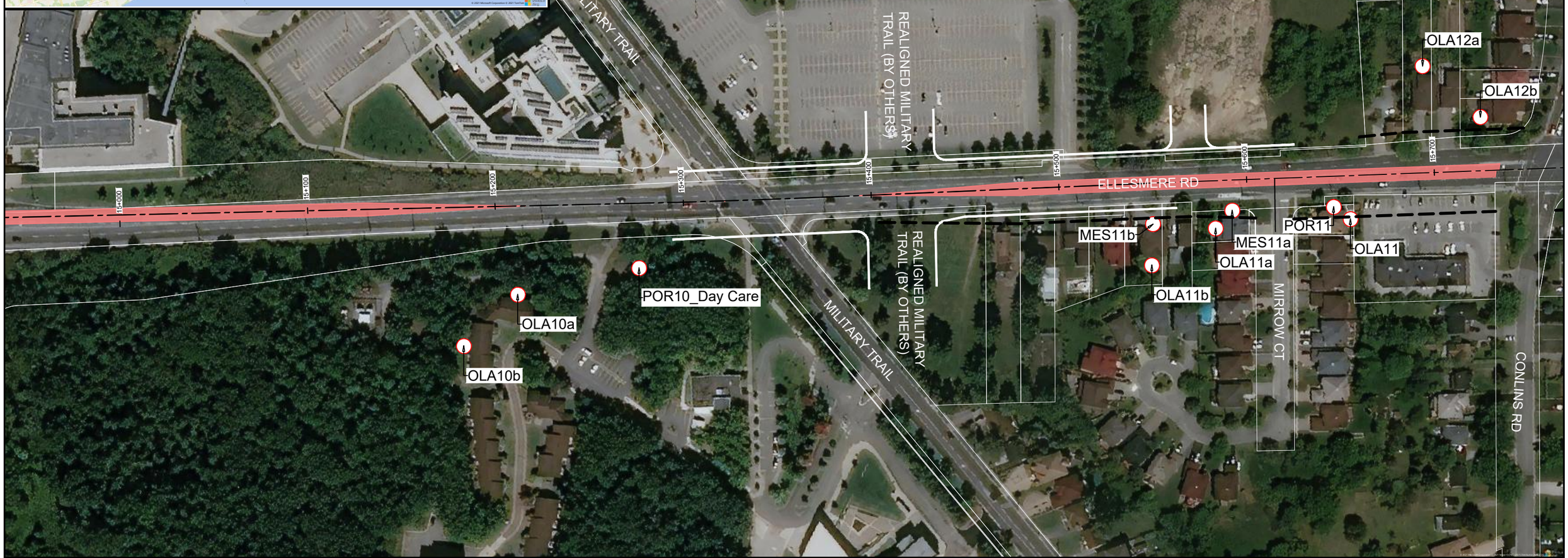
Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-6
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

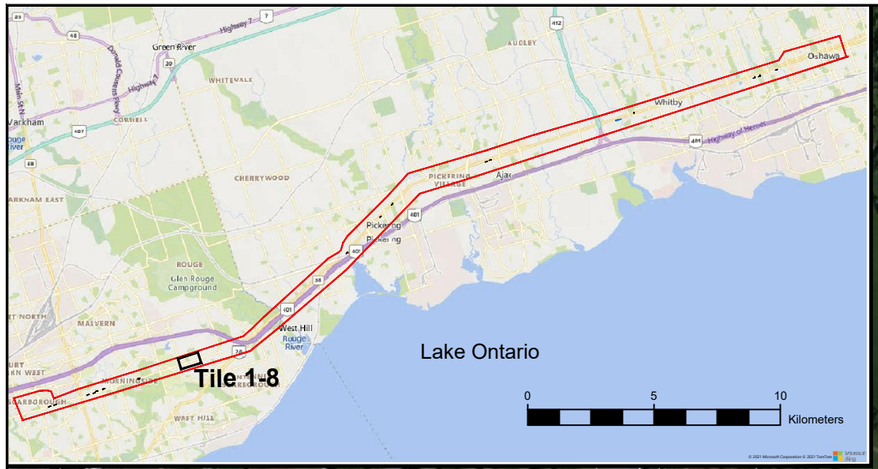
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-7
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Meters

50 0 50 100

1:2000

Title: **FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-8**

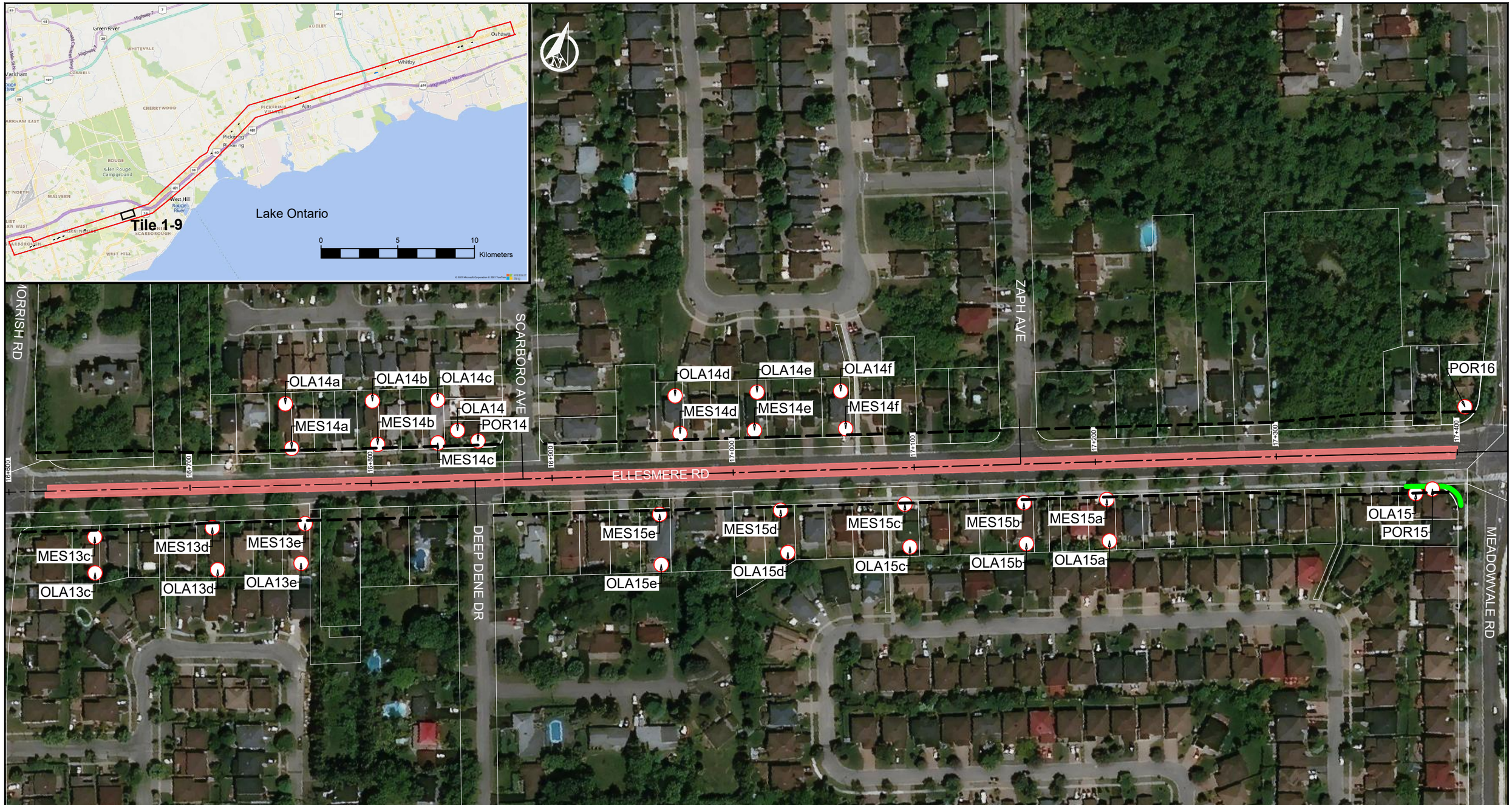
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **December 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

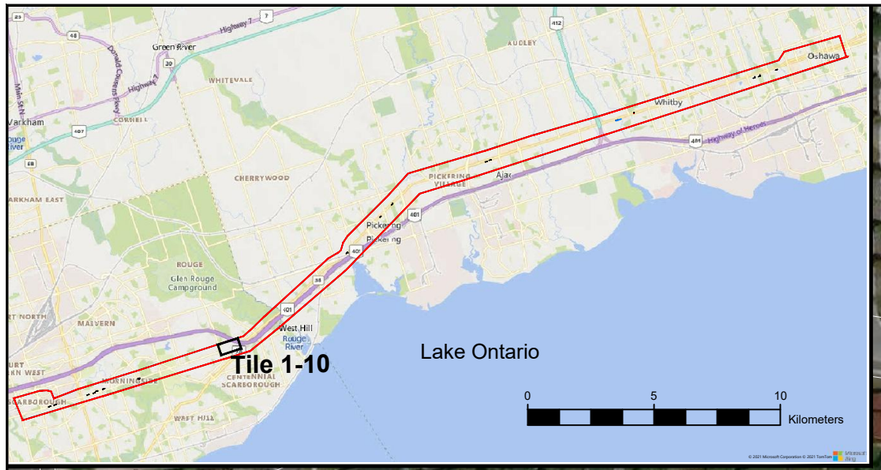
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-9
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

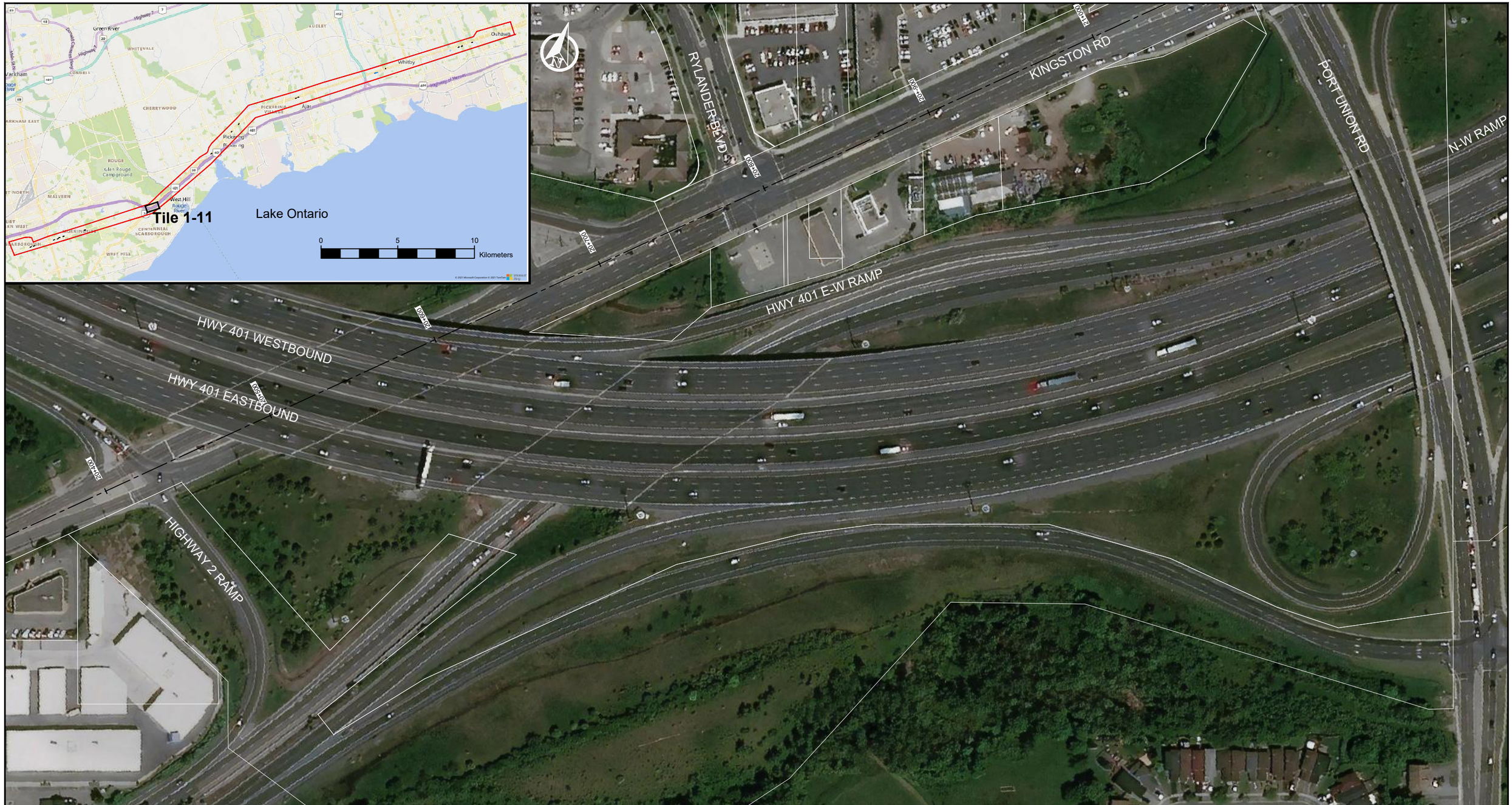
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-10
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

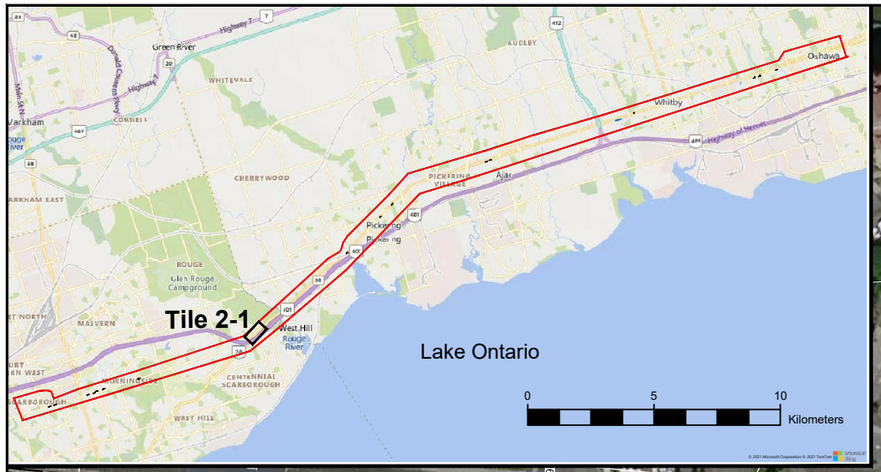
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 1-11
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

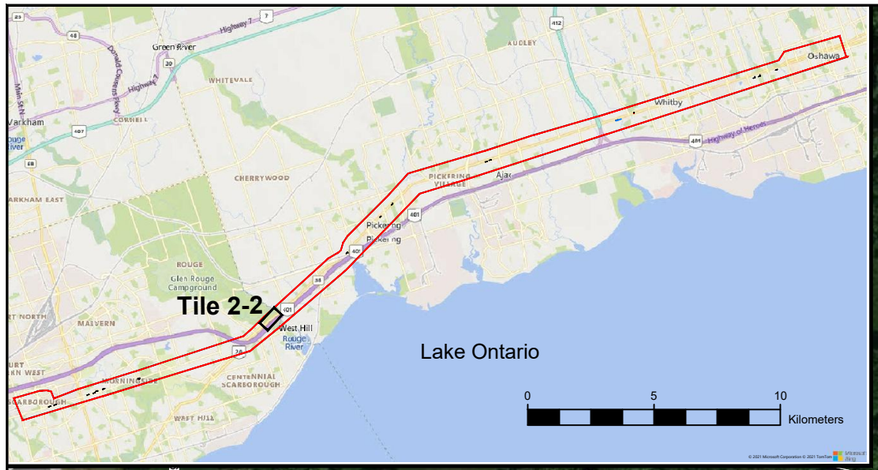
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-1
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

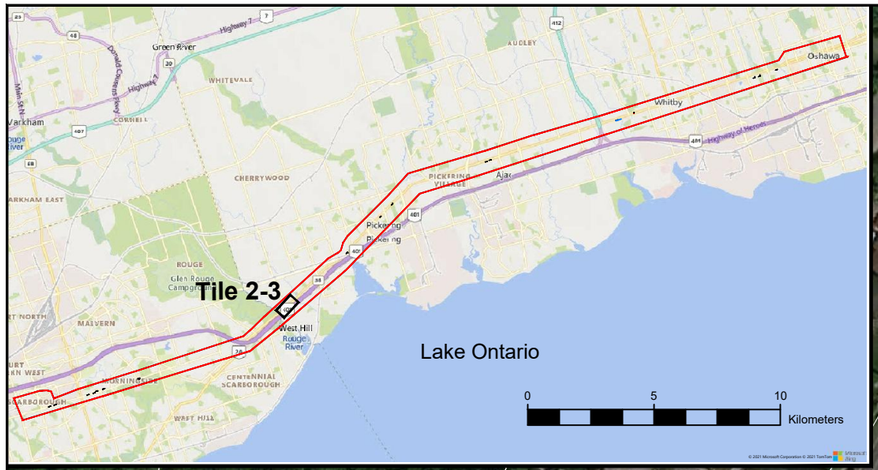
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-2
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

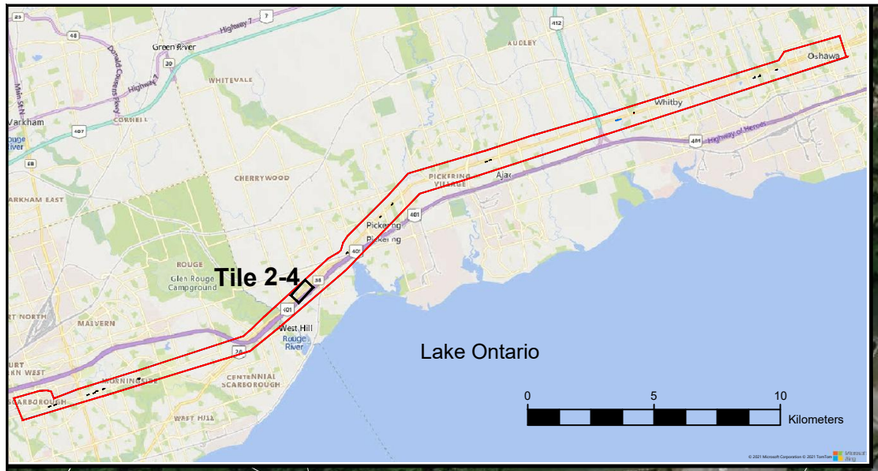
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-3
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



ROSEBANK RD

OLA20a

OLA21b

POR21

OLA21a

OLA21

MES21a

50+900

51+000

51+100

51+200

51+300

51+400

51+500

51+600

KINGSTON RD

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

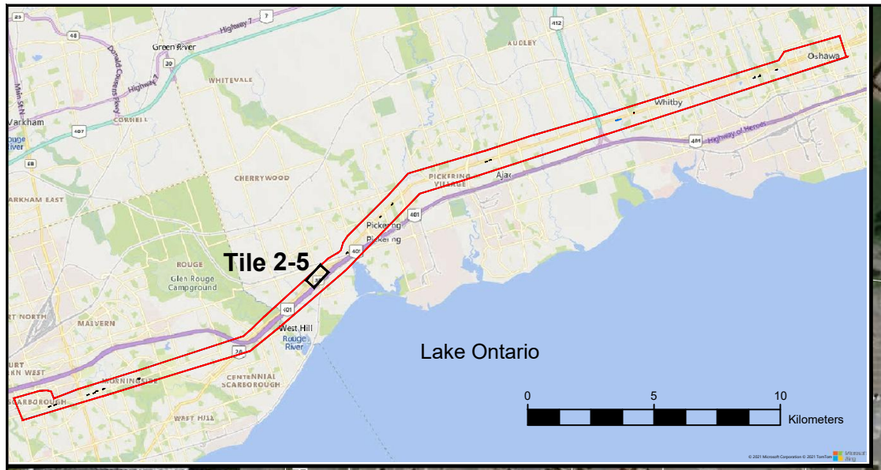
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-4
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

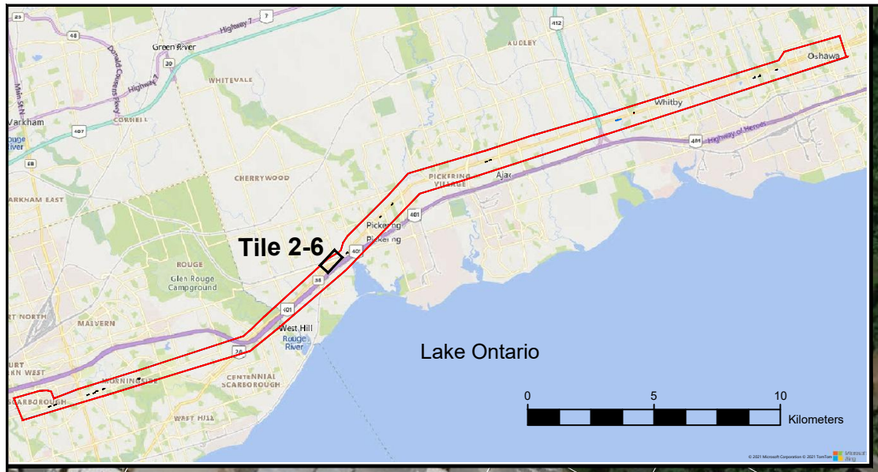
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-5
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

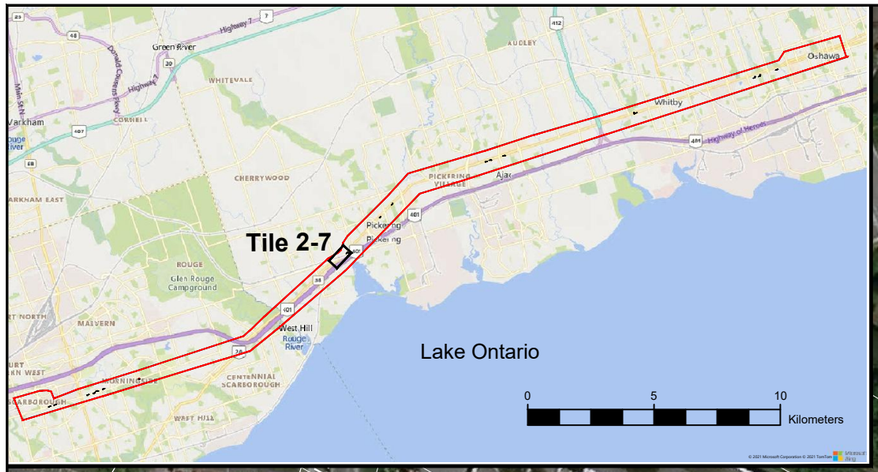
- Existing Noise Walls
- Proposed Noise Walls

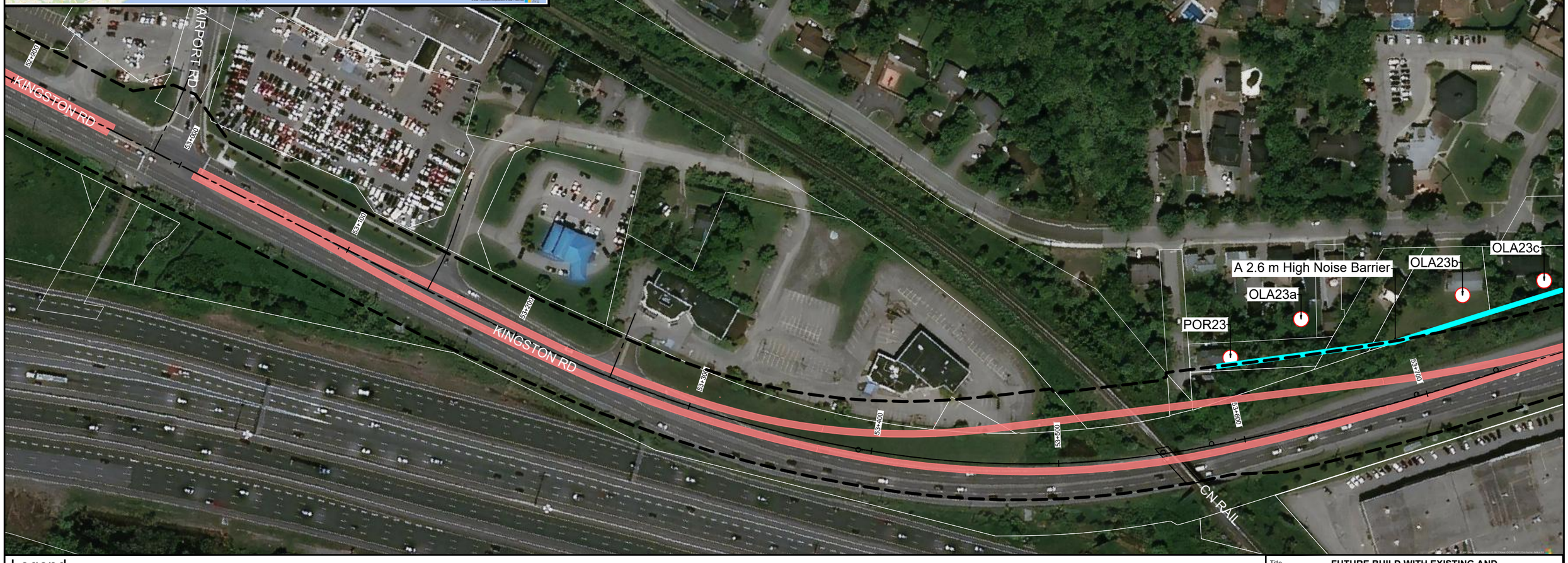
Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-6
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

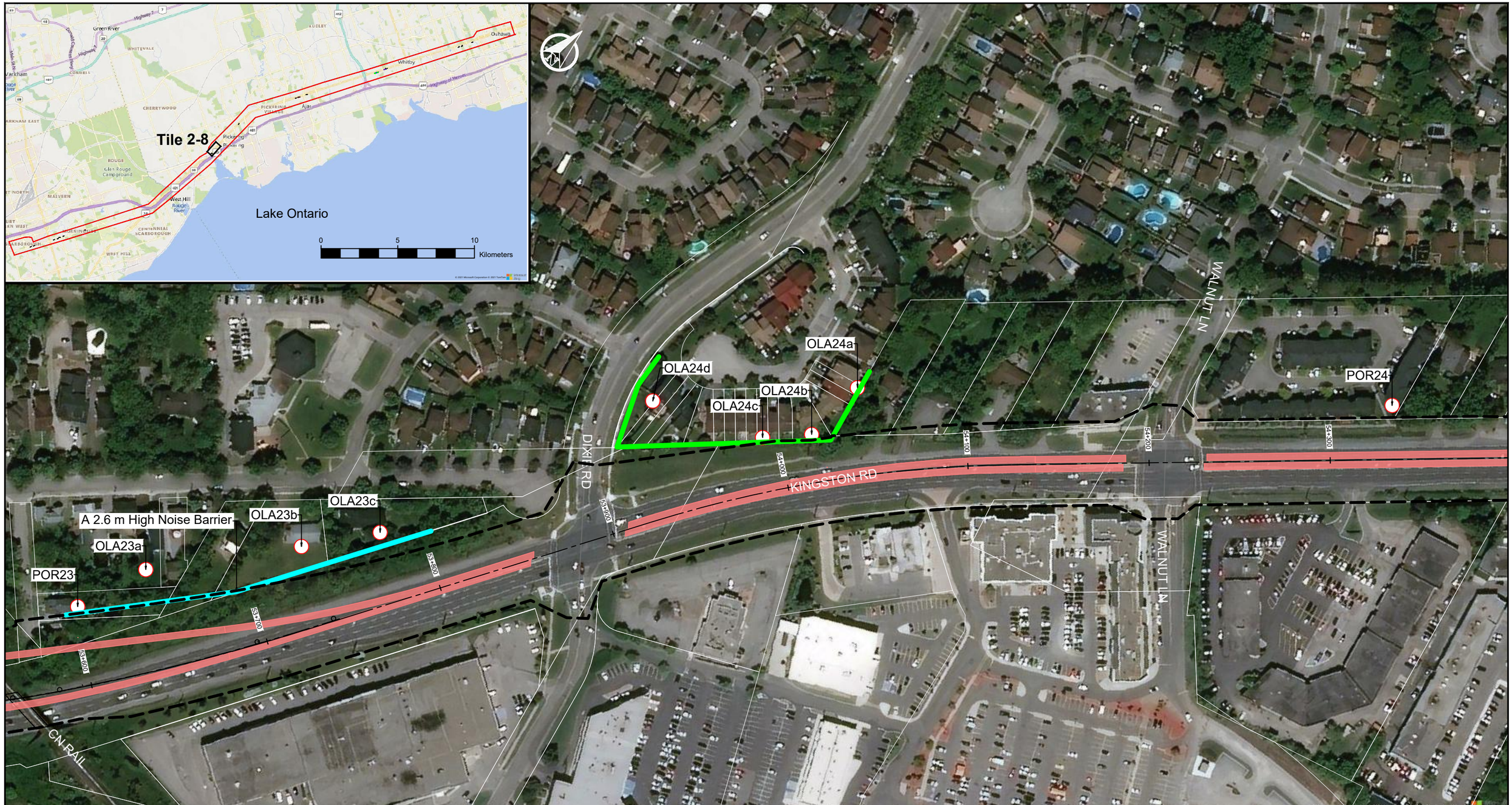
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-7
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

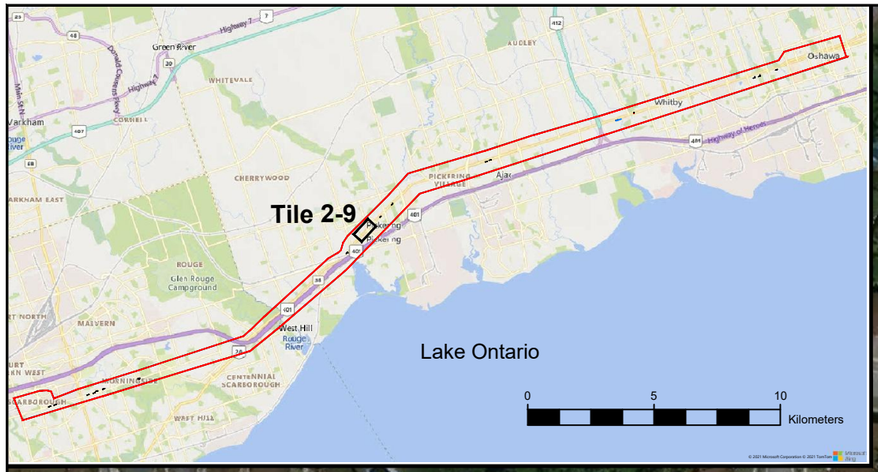
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-8
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

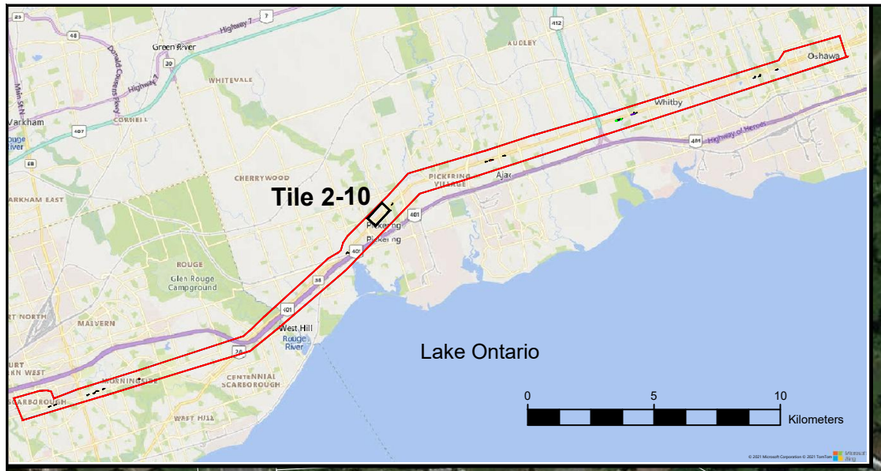
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-9
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

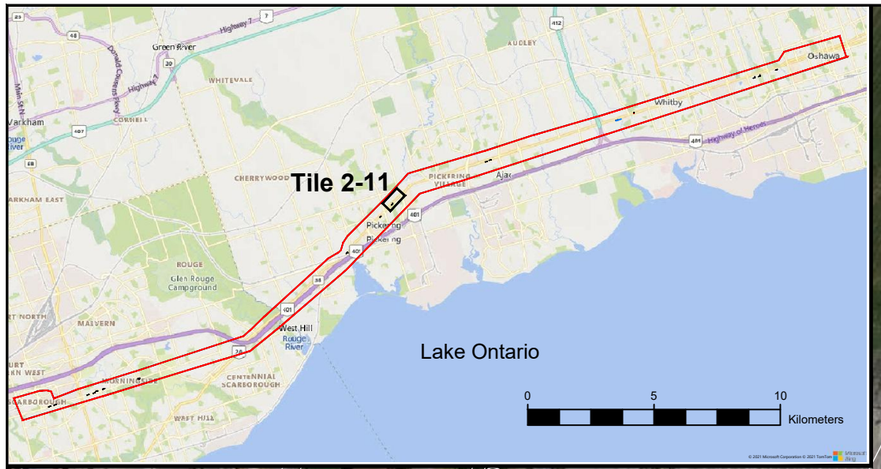
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-10
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title: **FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-11**

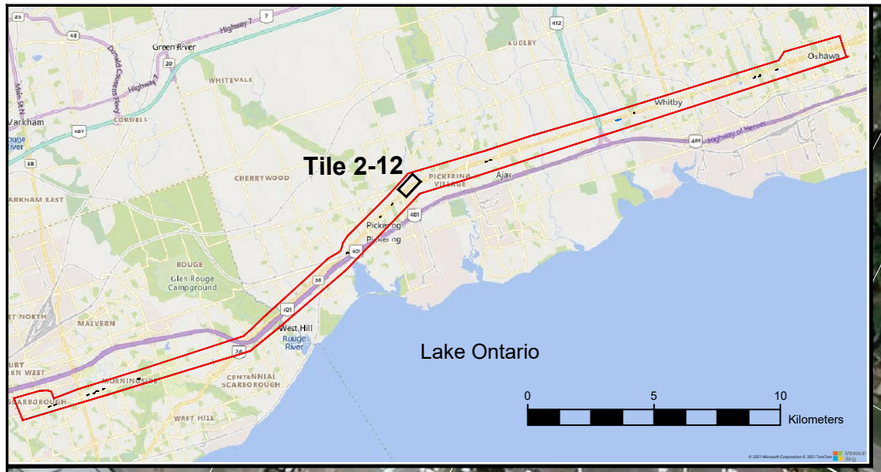
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **December 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

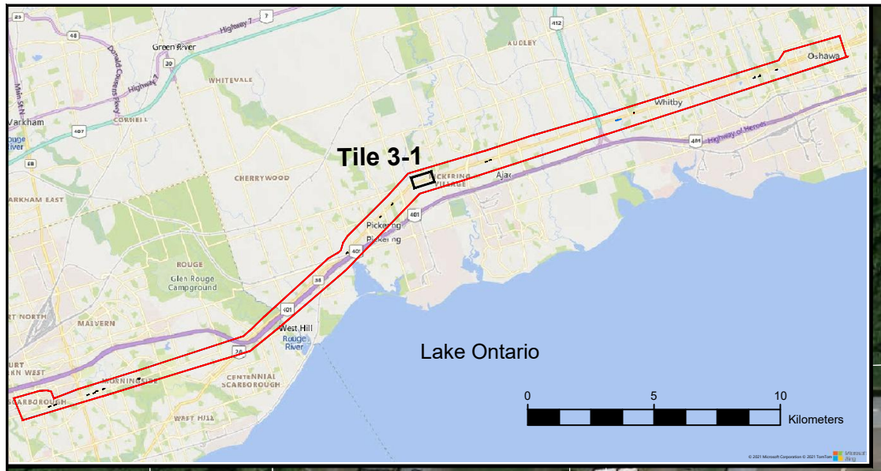
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 2-12
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

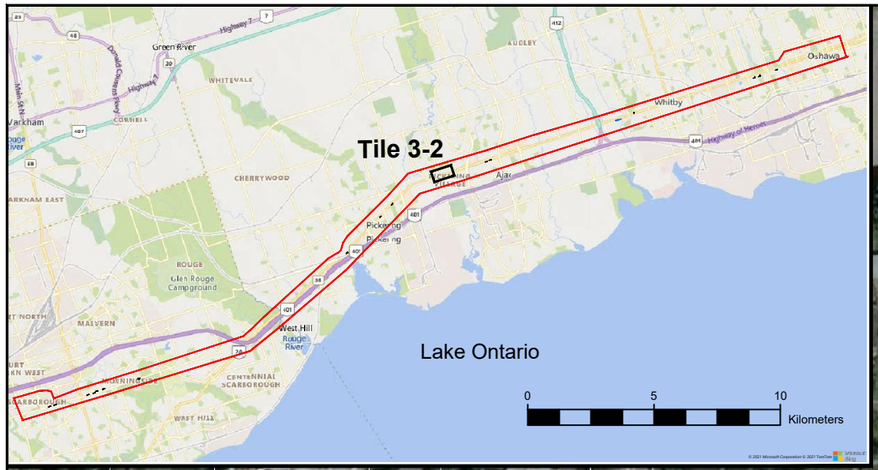
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-1
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

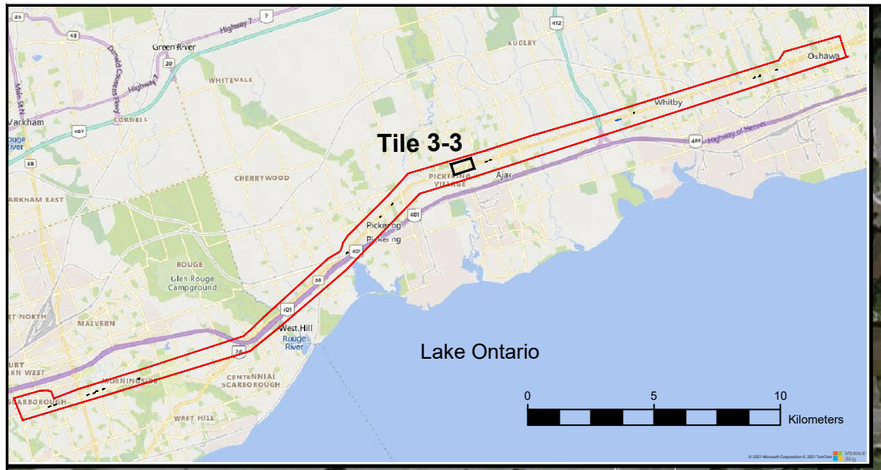
Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-2
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

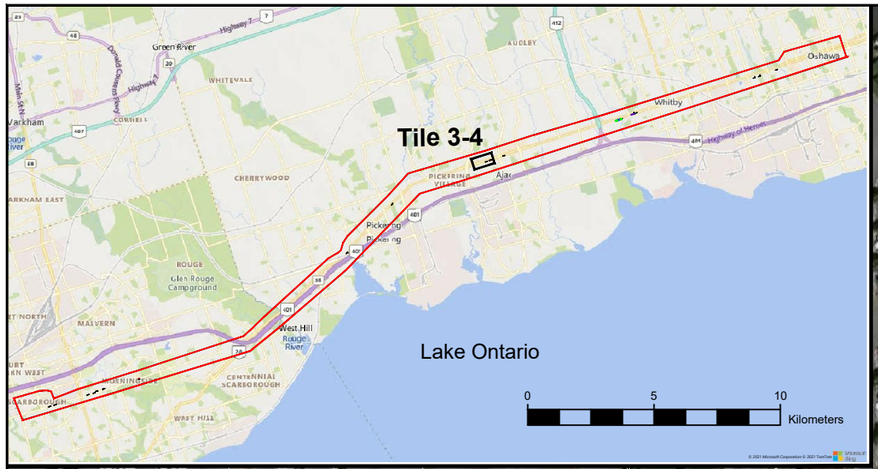
- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls
- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-3
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



RITCHIE AVE

KINGSTON RD

OLA36b
MES36b
OLA36a
MES36a

A 2.2 m High Noise Barrier

A 2.6 m High Noise Barrier

POR35
OLA35
POR36
OLA36
POR37
OLA37
POR38
OLA38
MES35b
OLA35b
MES35a
OLA35a
OLA35c
OLA35d

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

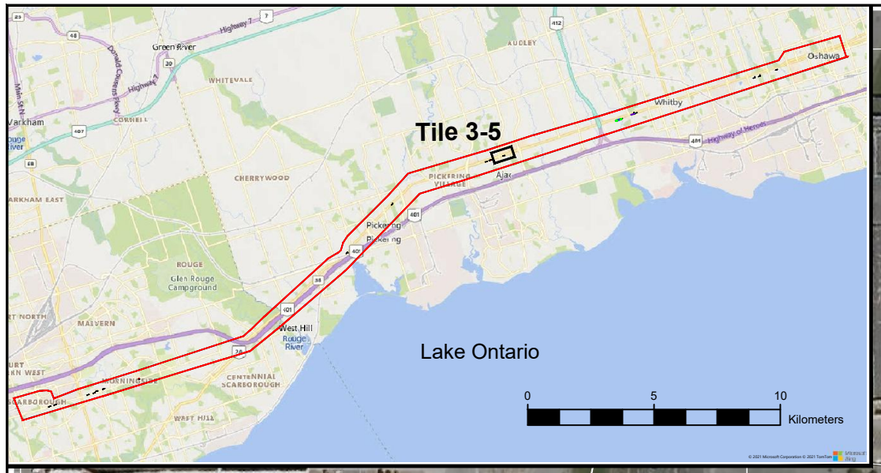
Noise Walls
- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-4
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title: **FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-5**

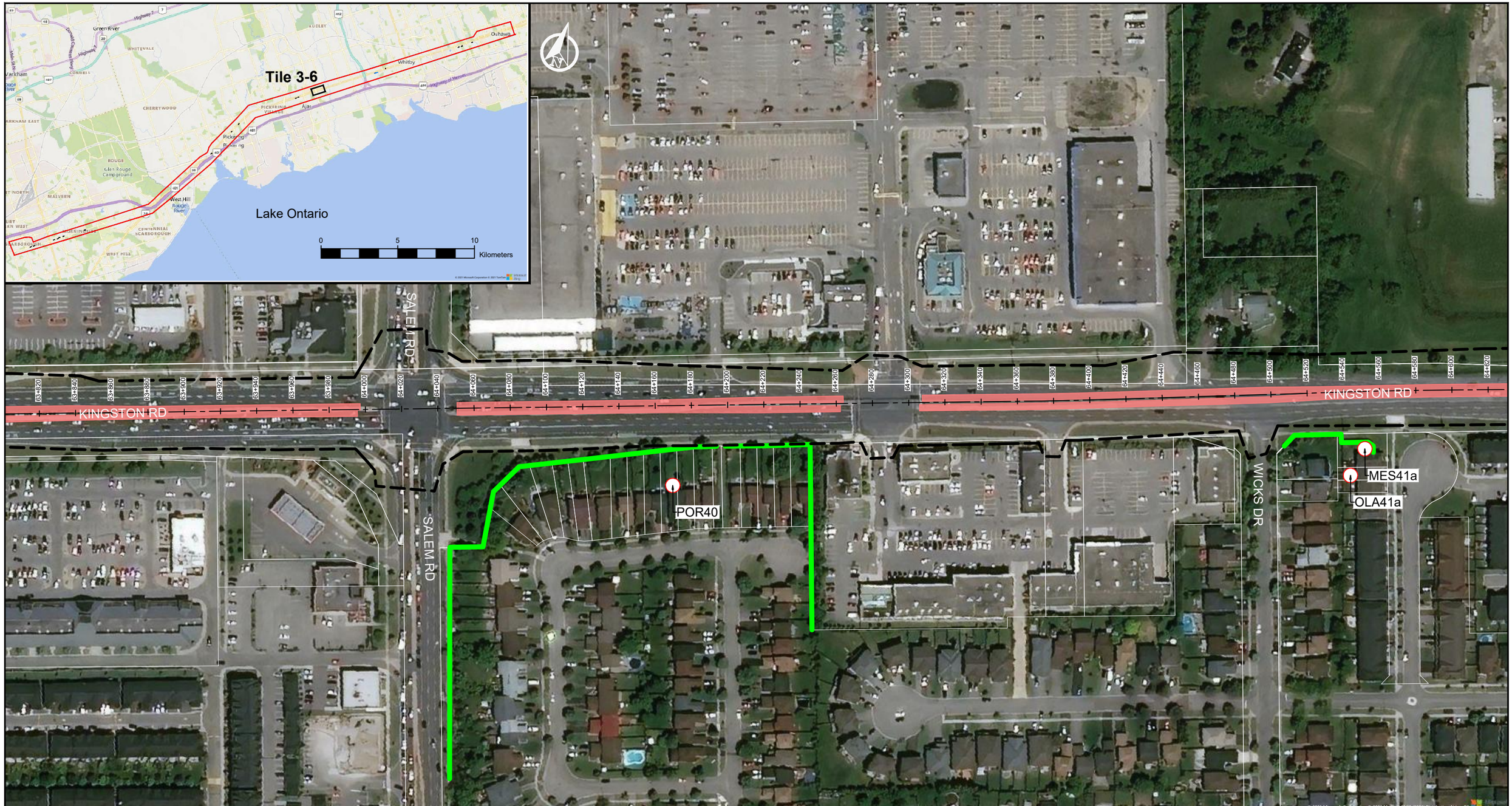
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **December 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

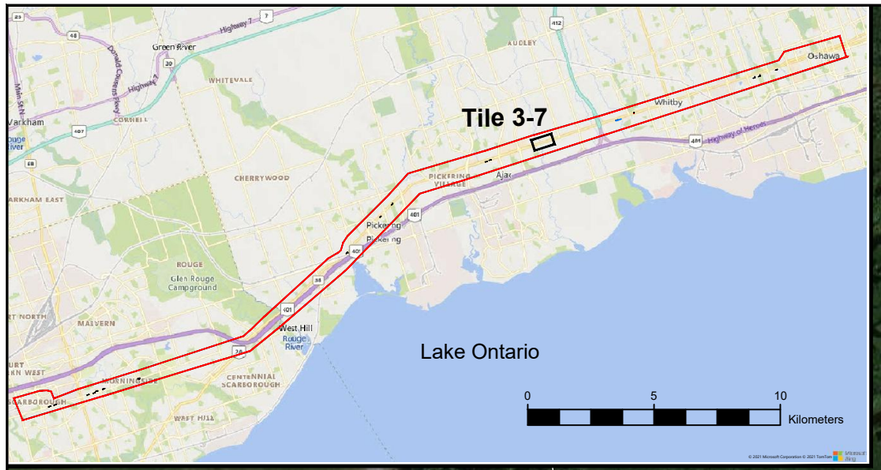
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-6
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



OLA41b

MES41b

CARRUTHERS CREEK
B-04

ALEXANDER'S CROSSING

64+240 64+260 64+280 64+300 64+320 64+340 64+360 64+380 64+400 64+420 64+440 64+460 64+480 64+500 64+520 64+540 64+560 64+580 64+600 64+620 64+640 64+660 64+680 64+700 64+720 64+740 64+760 64+780 64+800 64+820 64+840 64+860 64+880 64+900 64+920 64+940 64+960 64+980 65+000 65+020 65+040 65+060 65+080 65+100 65+120 65+140 65+160 65+180 65+200 65+220 65+240 65+260 65+280 65+300 65+320 65+340 65+360 65+380 65+400 65+420 65+440

KINGSTON RD

POR41

OLA41

GALEA DR

FUTURE ACCESS

FUTURE ACCESS (BY OTHERS)

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls
- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100

1:2000

Title: **FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-7**

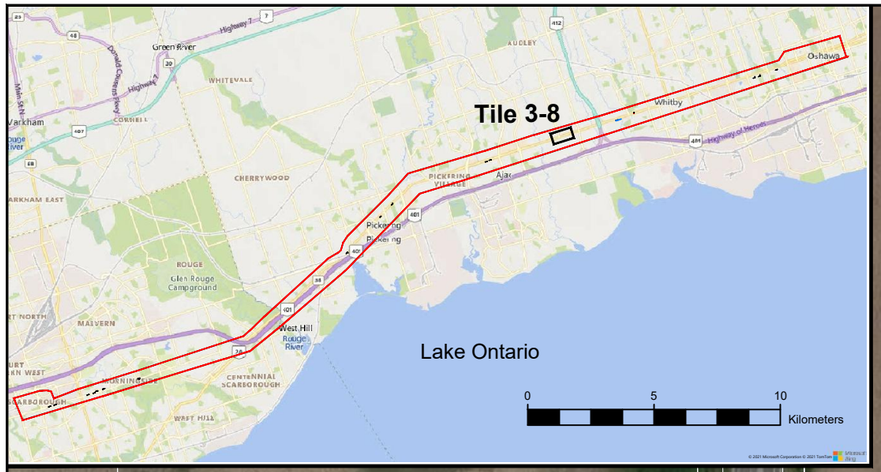
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

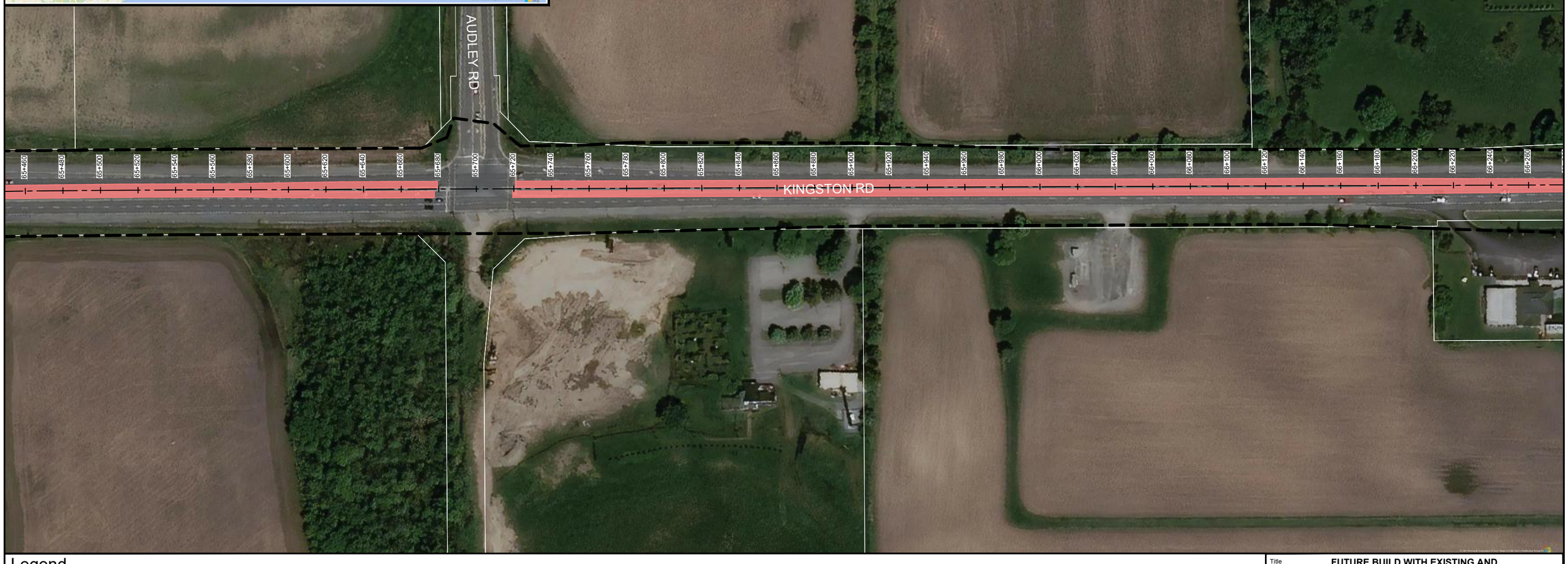
Client: METROLINX

ARCADIS

Date: **December 2021**

Background Reference: Microsoft Bing Maps





Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

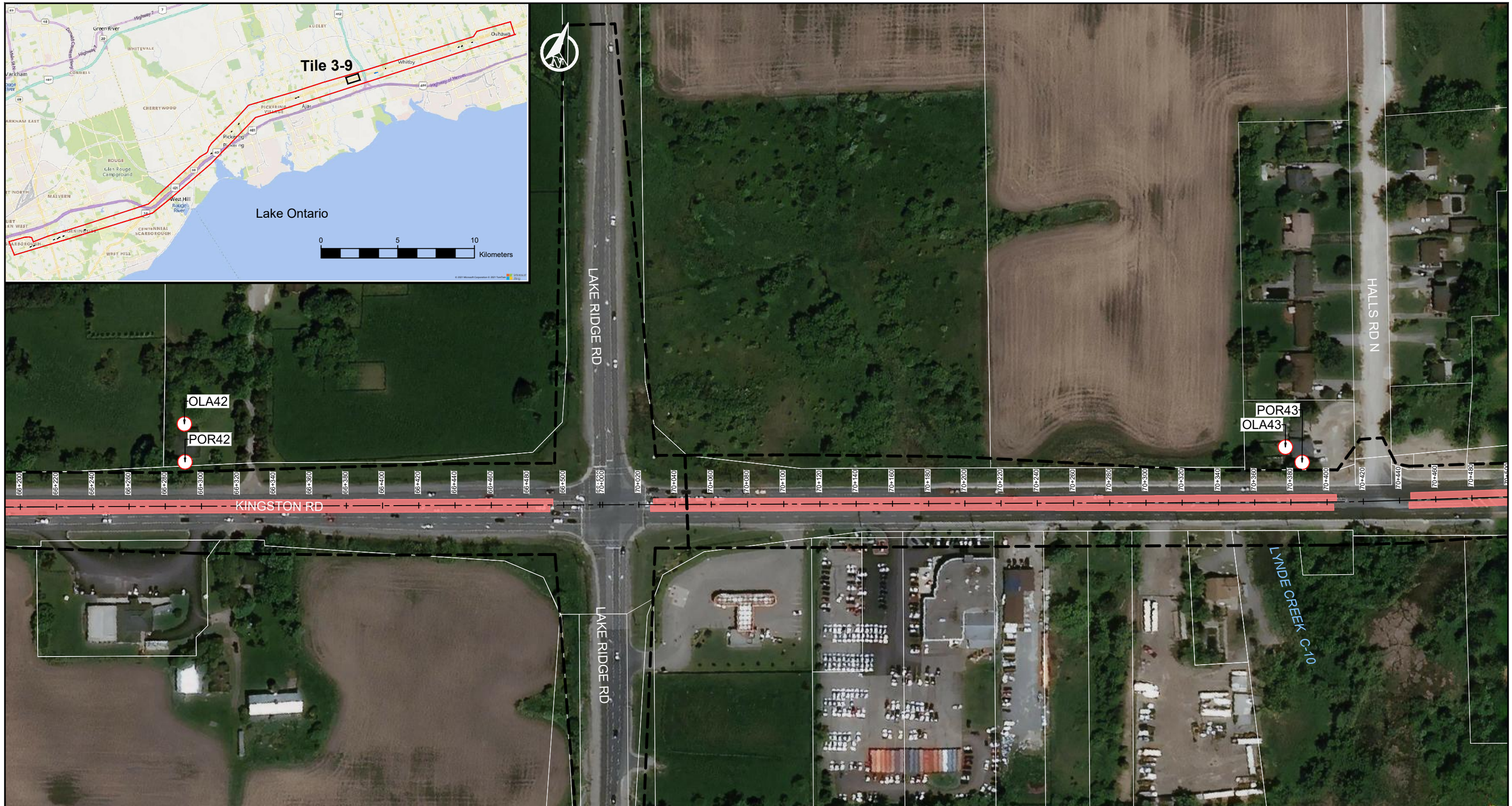
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-8
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

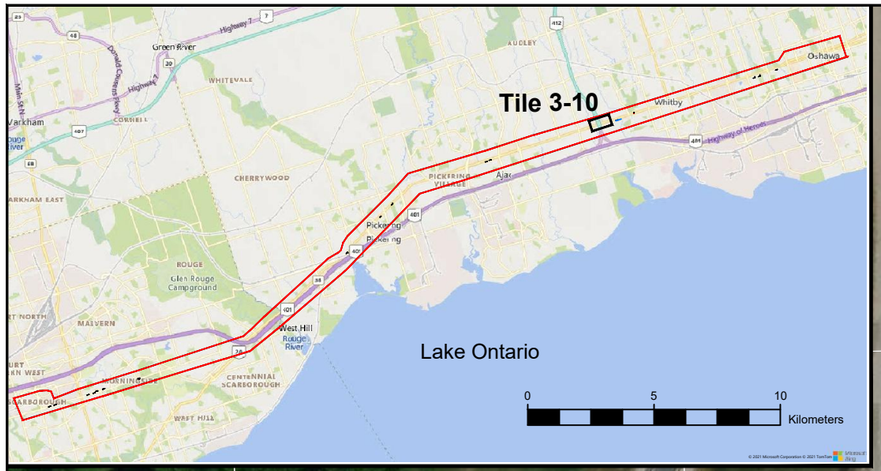
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-9
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

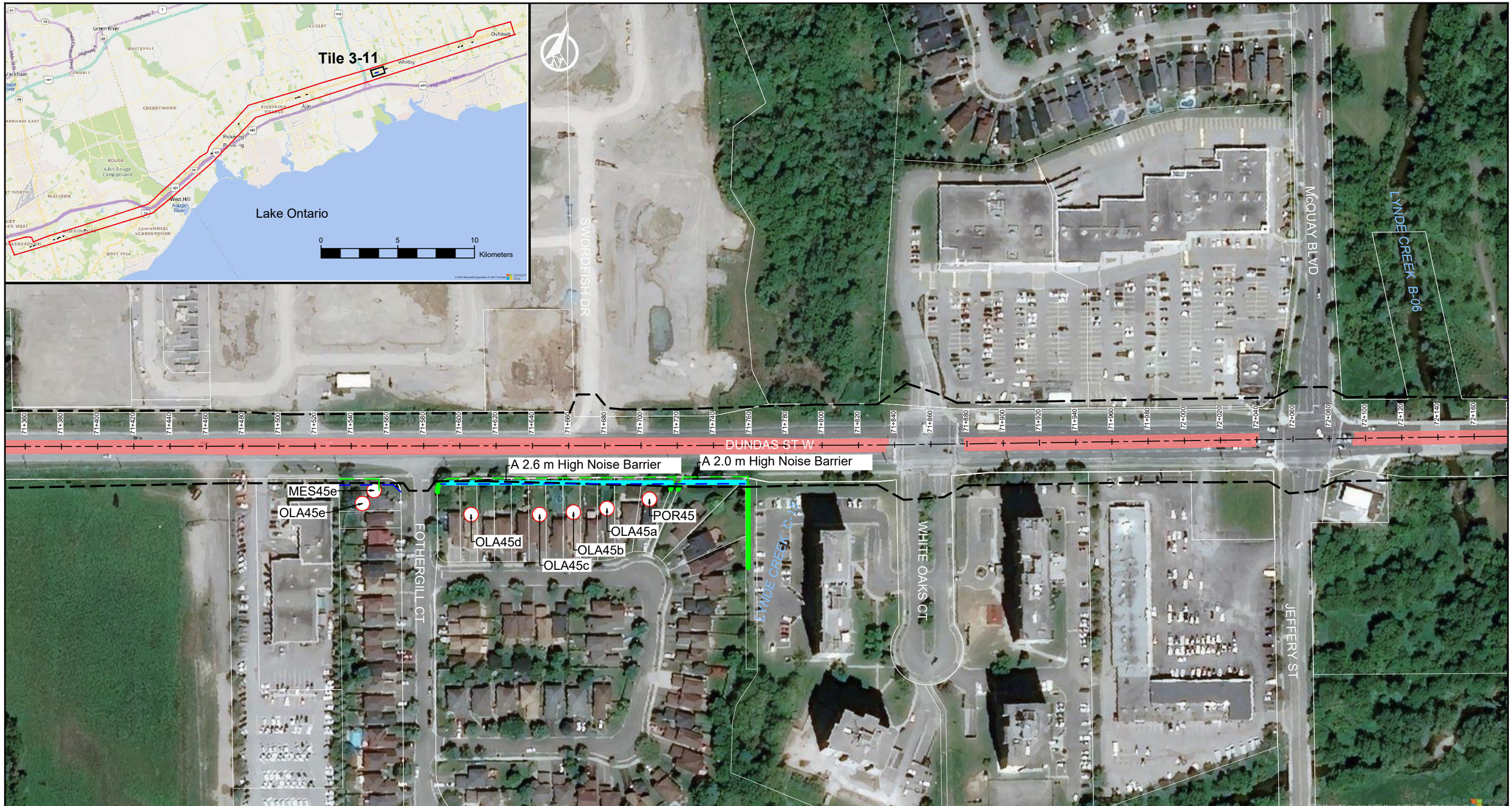
Noise Walls
- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-10
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Proposed Property Line

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls
- Existing Noise Walls to Be Removed Due to New Right of Way

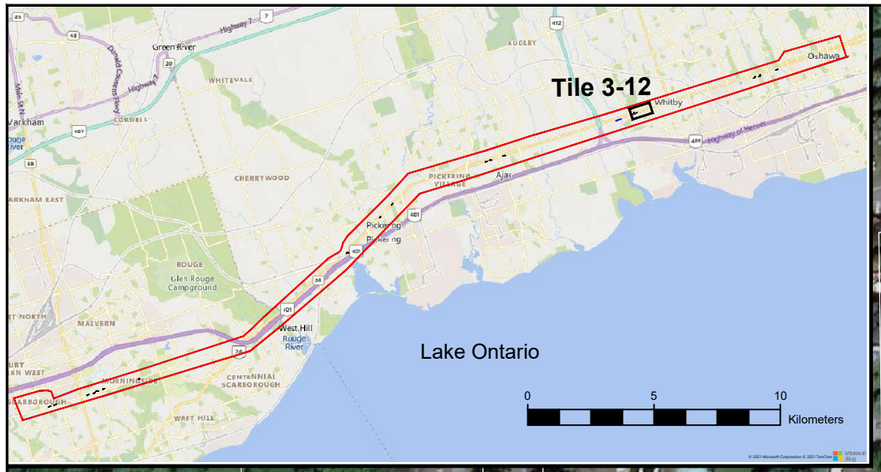
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-11
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Official Plan Right of Way

Noise Walls

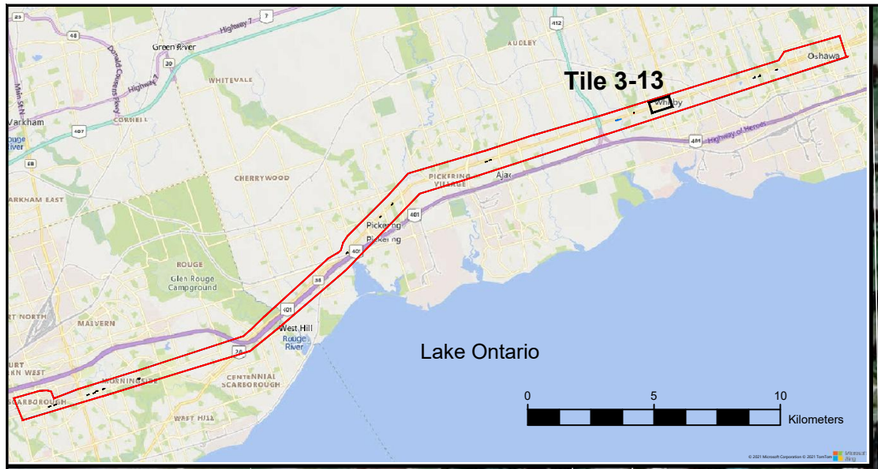
- Existing Noise Walls
- Proposed Noise Walls
- Existing Noise Wall to Be Removed Due to New Right of Way

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-12
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
	ARCADIS
Date:	December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

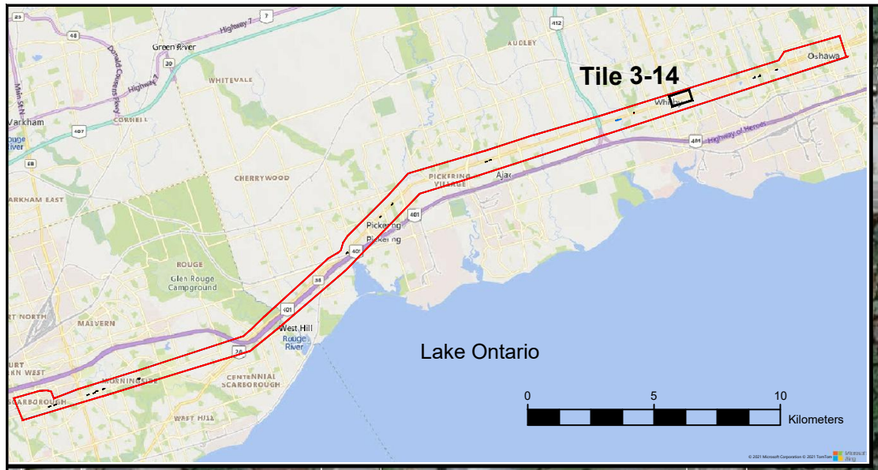
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-13
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

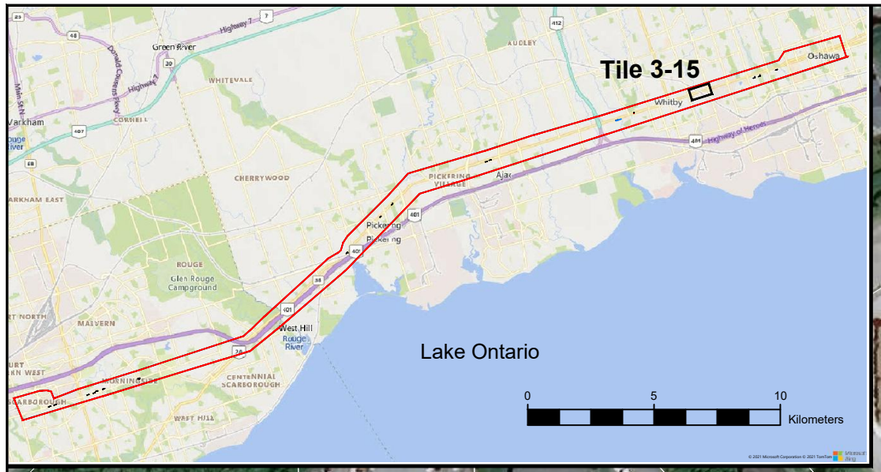
- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-14
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
	ARCADIS
Date:	December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

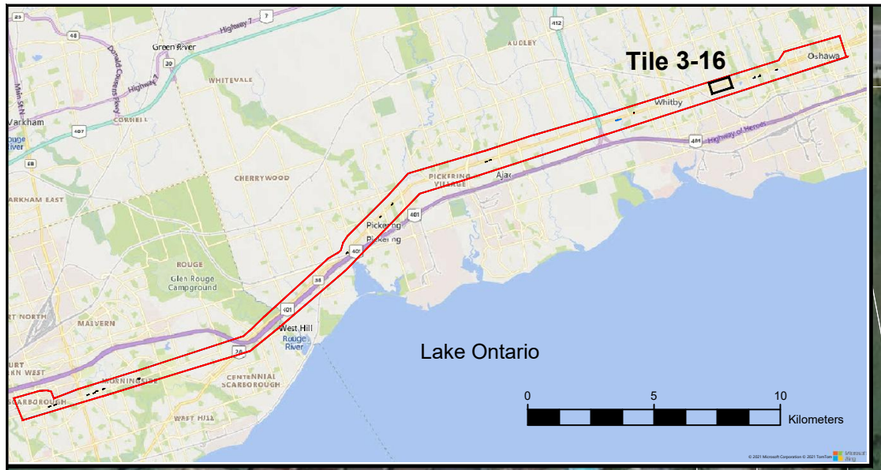
- Existing Noise Walls
- Proposed Noise Walls

Meters: 50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-15
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

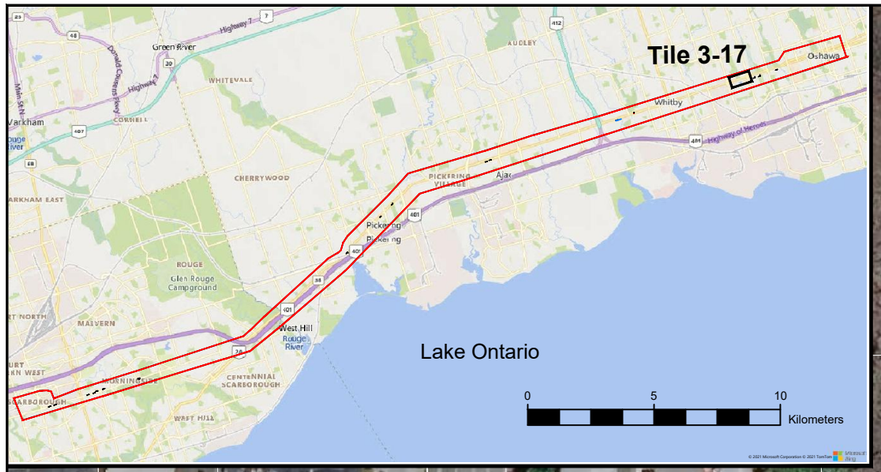
Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-16
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title: **FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-17**

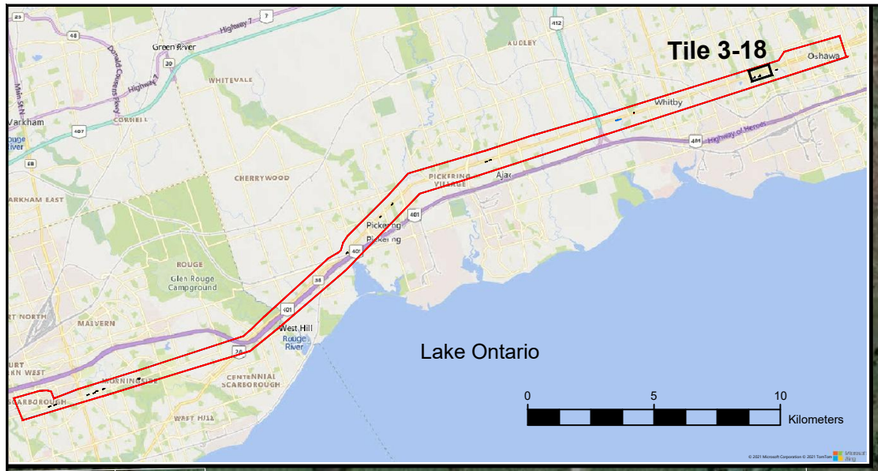
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **December 2021**

Background Reference: Microsoft Bing Maps



CORBETT CREEK C-17

THORNTON RD N

THORNTON RD S

POWELL RD

DUNDAS ST E

KING ST W

KING ST W

77+160 77+180 77+200 77+220 77+240 77+260 77+280 77+300 77+320 77+340 77+360 77+380 77+400 77+420 77+440 77+460 77+480 77+500 77+520 77+540 80+000 80+020 80+040 80+060 80+080 80+100 80+120 80+140 80+160 80+180 80+200 80+220 80+240 80+260 80+280 80+300 80+320 80+340 80+360 80+380 80+400 80+420

OLA53b

MES53b

OLA53d

POR53

OLA53e

MES53a

OLA53a

A 2.2 m High Noise Barrier

OLA53c

A 3.0 m High Noise Barrier

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

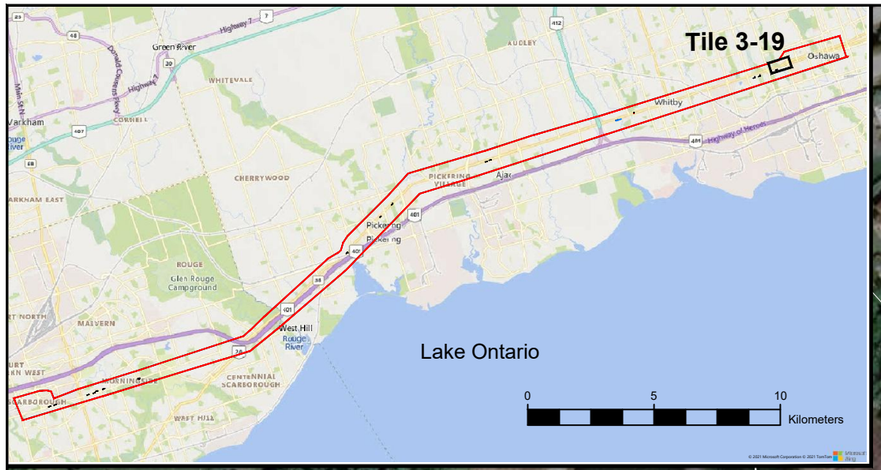
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-18
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



OSHAWA CREEK C-18

POR55

BOND ST W

KING ST W

A 2.2 m High Noise Barrier

POR54

WAVERLY ST S

STEVENSON RD N

STEVENSON RD S

HARRIS AVE

OLA56a

OLA56b

OLA56c

MES56a

MES56b

MES56c

Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

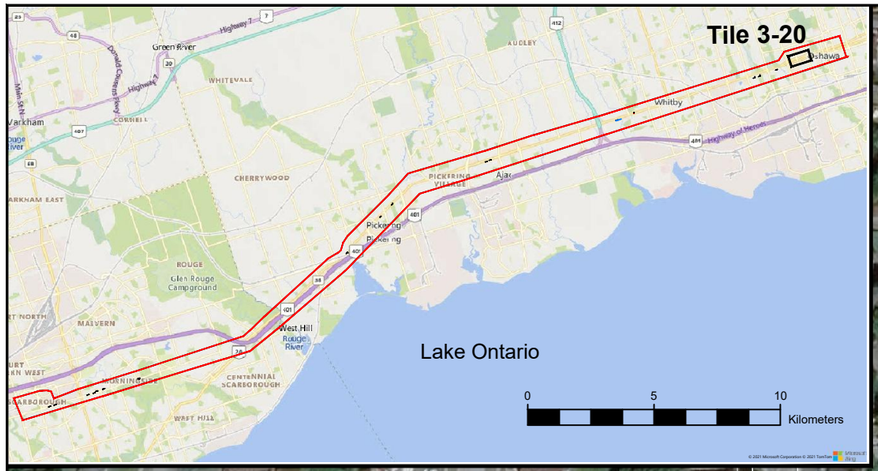
Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-19
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

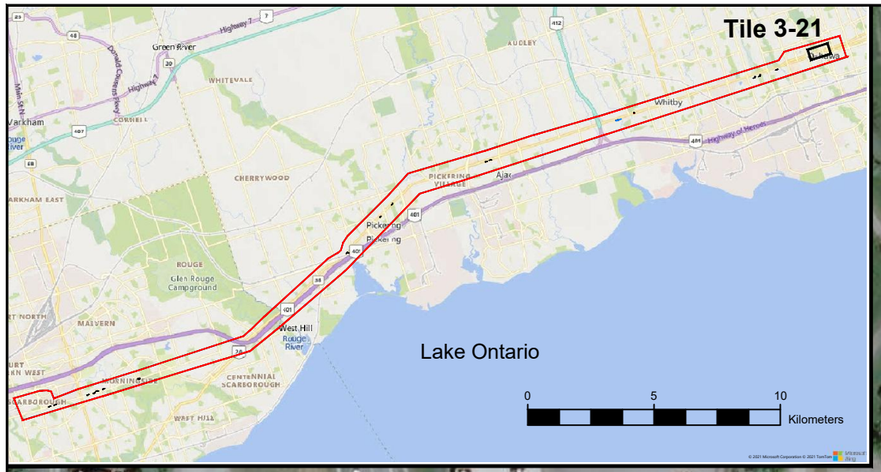
Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Meters
50 0 50 100
1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-20
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Noise Walls

- Existing Noise Walls
- Proposed Noise Walls

Meters

50 0 50 100

1:2000

Title	FUTURE BUILD WITH EXISTING AND PROPOSED NOISE WALLS - TILE 3-21
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: December 2021

Background Reference: Microsoft Bing Maps

APPENDIX C: DURHAM REGION NOISE GUIDELINE

DRAFT

The Regional Municipality of Durham

Implementation Guidelines for the Installation and Maintenance of Noise Attenuation Barriers with Regional Road Expansion Projects

Table of Contents

1. Introduction 2
2. Noise Assessment Study Report Requirements 3
3. Technical Procedures 4
4. Interpretations 10
5. Guidelines for Design and Construction of Noise Barriers 11
6. Implementation and Maintenance 13
7. Definitions 13

Appendix A – Works Committee Report 2012-W-83 (June 13, 2012)
Appendix B – Summary Table Examples

1. Introduction

1.1 Scope

In 2012, The Regional Municipality of Durham Council approved a Noise Attenuation Policy for Regional Road Expansion Projects which is described in Works Committee Report 2012-W-83 (refer to Appendix A). To complement the Works Committee Report, this supplemental document is intended to provide additional technical details and implementation guidelines for the approved Noise Policy.

Capital Works projects of Region of Durham roadways may include the expansion (i.e. widening to add additional travel lanes) and or construction of new (including significantly realigned) roads. Such projects are designed and constructed to meet the requirements of the Ontario Environmental Assessment Act (EAA) and are generally being carried out in accordance with the Municipal Class EA Process, which is an approved process under the EAA. As part of an EA process, a Noise Assessment Study is carried out where a Region of Durham roadway project is undertaken adjacent to existing noise sensitive receptors or adjacent to approved, but not constructed, new noise-sensitive developments.

Where required, a noise assessment is to be carried out in conformity with the Region of Durham Guidelines for the Installation and Maintenance of Noise Attenuation Barriers and the Ministry of the Environment/Ministry of Transportation (MOE-MTO) Noise Protocol. The details and implementation procedures of the Region of Durham Guidelines are outlined in this document.

The Region of Durham or its consultant carrying out the EA study on its behalf is responsible for considering the potential noise impacts from the Region of Durham road undertaking and identifying the need for noise mitigation if deemed necessary. The determination of potential noise impacts including the justification for whether or not noise mitigation is provided must be documented in a Noise Assessment Report, which is usually included as an appendix in the EA Report for the road undertaking.

1.2 Application

The guideline applies to Capital Works projects of Region of Durham roadways for expansion (i.e. widening to add additional travel lanes) and construction of new (including significantly re-aligned) roads. It is not the intent of the Policy nor the guidelines presented herein to apply to retrofit situations (no current project) or projects that are not either expansion or new/realignments of existing Regional Roads. As a result, intersection improvements or rehabilitation projects would not trigger the application of this policy

Implementation of this Policy in connection with roads that are under the jurisdiction of the Province or an Area Municipality is not subject to the provisions of this Policy for Regional Road Expansion Projects[1].

In all cases where a Region of Durham capital road works is undertaken, such work will also be undertaken in conformity with the noise assessment and mitigation provisions under the Environmental Assessment Act (EAA).

[1] The noise due to Provincial and Area Municipal roadways, however may be included as part of the overall ambient noise at noise-sensitive receptor(s) if any of such sources contribute to the overall noise at the receptor(s).

The Region of Durham will review and consider the application of noise abatement measures for outdoor living areas only, where warranted, based on the consideration of the technical, economic, and administrative feasibility of the evaluated measures. The homeowner or the owner of other noise-sensitive land uses will be responsible for building noise abatement measures relating to indoor noise controls or for any noise controls off the Region of Durham's right-of-way.

1.3 General Information on Noise Control Measures for Capital Works Projects

The following is general information to assist all concerned parties with dealing with general technical information for the control of roadway transportation noise. One or more of the following may be suitable for consideration depending on the case and project constraints.

For new construction and widening of facilities within the Regional right-of-way, there are a number of potential geometric and physical noise control alternatives available, including:

- Selection or alternation of a horizontal alignment
- Depressed or elevated corridor profiles
- The use of earth berms
- A combination of berms with walls on top
- Traffic demand management practices
- Reduction or establishment of suitable vehicle speed limits
- The use of prefabricated noise barrier walls/systems
- Any combination of the above

2. Noise Assessment Study Report Requirements

The Noise Assessment Study Reports submitted to the Region of Durham for road undertakings adjacent to noise sensitive areas are to be stamped by a Professional Engineer (in Ontario) with roadway noise assessment experience and should include:

2.1 Introduction

- purpose of EA Study
- location/overview of Region of Durham road undertaking
- purpose of noise assessment study – preliminary or detailed

2.2 Background

Review of adjacent Noise Sensitive Areas (NSA) to determine:

- the construction date for the residential development
- if a Noise Study Report for the development was prepared
- if there was consideration of the proposed Region of Durham road undertaking
- if there are any Warning Clauses on title
- if there are any noise attenuation measures provided to mitigate traffic noise from the Region of Durham roadway

2.3 Methodology

- summary of MOE and Region of Durham noise criteria
- summary of measuring noise levels (e.g. background/overview regarding the

subject of noise to provide an understanding for those who may not be familiar)

2.4 Noise Sensitive Areas

- overview of Noise Sensitive Areas within the study limits (include details, such as number of adjacent houses, nature of the Noise Sensitive Areas (rural or urban), and location of the Outdoor Living Areas (OLAs)
- exhibit(s) illustrating the location of the Noise Sensitive Areas and their OLAs including dimensions

2.5 Noise Analysis

- The assumptions used in the Noise Study to calculate noise levels (traffic data, posted speed, number of lanes, etc.)
- noise prediction method (i.e. to follow MOE's ORNAMENT model)
- a table and a concise summary of projected noise levels for Outdoor Living Areas at appropriate receiver locations (shown on plan) before and after noise mitigation
- identification of the need for noise attenuation measures, such as noise barriers, as required by unit/block

2.6 Noise Mitigation Requirements (if proposed)

If a barrier is proposed for noise attenuation:

- economic, planning and engineering justification for the use of a wall or berm
- barrier heights table
- typical and worst-case cross-sections, at an appropriate vertical and horizontal scale, which clearly show the barrier, the noise source, the noise receiver, and property limits
- cross-sections must clearly show that the proposed noise wall satisfies the fact that the line-of-sight from the road source to the receptor is interrupted

3. Technical Procedures

3.1 Receptor Selection

- A minimum of every 3rd dwelling in a row of single-family dwellings or at least 1 unit from each townhouse block that are parallel to the subject roadway should be assessed.
- The dwellings may include: Flanking lots with the OLA exposed to the subject roadway adjacent to the Regional ROW; lots backing onto the subject roadway and with the OLA exposed to the roadway adjacent to the Regional ROW.
- Lots located at a greater distance from the ROW (where the property line of the residential dwelling is not common with the ROW) should be considered if the lot's OLA has exposure to the subject roadway and is adjacent to the flanking lot.

3.2 Data Required for Sound Level Predictions

At the outset of a capital works project, the acoustic consultant should assemble the following data from various sources including the Region of Durham and the Area Municipal offices:

a. Traffic Data of the subject roadway: The traffic data should be separated into sections depending on the change in AADT at each intersection. If the roadway is proposed to have a future BRT/LRT lane, then the traffic data for the BRT/LRT should be provided in a separate table and separated from the road traffic data.

b. Road data for two time periods: Current and Future (Mature State of Development) to include: ROW width, number of lanes, roadway gradient, AADT, medium truck %, heavy truck %, posted speed limit (km/h), %Day/%Night traffic split, and directional split % NB/%SB.

c. High resolution aerial photos of the study area to aid in identifying the locations of any existing barriers and the applicable Outdoor Living Areas.

d. Drawings showing the existing and future alignment and centre line of the subject roadway.

e. Existing and future typical cross sections at 100m (maximum) intervals (if available).

f. Existing and future road profiles at the centerline and the centerline of each direction (or lane, if available).

g. Up-to-date ground elevations (contours and/or spot elevations) at the existing centre line of the road every 10m in increments of 0.5m or less (or as available depending on the stage of the roadway assessment).

h. Spot elevations at the backyards (OLAs) of the selected receptor locations and at the property line/right-of-way (ROW) every 20m.

i. If spot elevations are unavailable to be taken, then a contour map or other drawing with a maximum resolution of 1m (preferably 0.5m or better) of the study area should be provided to the acoustic consultant.

j. Inventory of existing fences:

- Height (ground and top elevation)
- Condition(state of repair)
- Location (exact alignment)
- Level of noise attenuation
  (i) Density
  (ii) Assessment of gaps
- Material (wood, concrete, brick, composite, etc)

k. Any noise studies for existing / future subdivisions or site plans within the study area for detailed review by the Acoustic Consultant and reporting on discrepancies with their data.

- During the process of preparing a Noise Assessment Study for a roadway expansion project, the Acoustic Consultant must obtain information from the respective planning and development department(s) in the area municipality and the Region of Durham on future noise-sensitive development applications in

proximity to the proposed Regional Road and/or transportation project undertaking for further assessment. The information shall include: copies of the relevant plans, status of approvals by the approval authorities, existing or proposed grade elevations of the proposed development and copies of noise study reports that may have been submitted by the proponent to the approval authorities

- The Acoustical Consultant shall review all relevant information in these documents for noise and their recommended noise control measures. The results of this review shall be compared with the relevant technical details related to noise assessment of the subject undertaking and differences or inconsistencies should be noted and reported to the Region of Durham, if any. The Region shall be advised of any discrepancies in the resulting sound levels and the extent of noise mitigation for both the development side and the subject undertaking.

l. Drawing(s) showing the land use plans within the study area.

3.3 Analysis of the Results

The current state of the selected receptor locations will generally fall under one of the following categories:

- Category A: The OLA of the selected receptor is currently protected by a sound barrier that is in a **good state of repair** for acoustic purposes (no gaps, cracks, or holes) and provides a minimum estimated 6dB reduction in the noise impact due to the subject roadway.

  Should these existing barriers be in a good condition and not needing repairs, the study should then conclude that these locations warranted an investigation if the applicable sound level criteria have been exceeded, but barrier upgrades should not be considered.

- Category B: The OLA of the selected receptor is currently protected by a sound barrier that is in a **poor state of repair** for acoustic purposes (existence of gaps or inadequate height) and provides less than a 6dB reduction in the noise impact due to the subject roadway. Should predictions/calculations indicate that the applicable sound level criteria have been exceeded, barrier upgrades should then be considered.

- Category C: The OLA of the selected receptor is currently not acoustically protected, i.e. there is only a privacy fence (many gaps or inadequate surface density) or no structure at all. Should the prediction calculations indicate that the applicable sound level criteria have been exceeded, noise mitigation in the form of sound barriers should then be considered and any existing privacy fences be replaced with a sound barrier.

- Category D: The OLA of the selected receptor is located away from the ROW, i.e. the ROW and property line are not adjacent to one another. Noise mitigation should not be considered in this case.

Should the analysis indicates that an investigation into noise mitigation is warranted at a selected receptor and the barrier is located on private lands that are not contiguous with a Region's right-of-way, then the construction of sound barriers at this location should not be considered. The only exception to this will be continuation of a property line sound barrier on the Region's right-of-way and where a flanking sound barrier is warranted on private lands.

In cases where a proposed sound barrier would prove to be ineffective if constructed only on the ROW (e.g. corner lots), the barrier should turn/flank and cover the extent that is necessary to reflect that of the calculation. For corner lots, the “daylight triangle” should be taken into account and adhered to, if available.

3.4 Establishment of the Sound Levels

The daytime sound levels Leq should be established using prediction models acceptable to the Region. Actual field measurements may be used subject to the Region's prior approval, to deal with situations that may not be feasible to predict such as: unusual traffic patterns or the presence of high percentages of vehicle classifications, traffic or roadway parameters that are outside of the limitations of the prediction model, downtown core areas, presence of large reflecting buildings in dense urban areas, highly irregular topography and the presence of complex geometrics for sound level prediction purposes, or the lack/unavailability of traffic data. Actual field measurements, if deemed necessary, are to be performed in accordance with the MOE procedures and generally accepted acoustic and traffic engineering principles.

3.5 Road Traffic Sound Level Predictions

a. Road traffic noise shall be predicted using the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), a computerized version of ORNAMENT like STAMSON, or by using updated procedures by the MOE.

b. The noise study report shall detail information on all required adjustments to the model, where applicable.

c. Where there is more than one roadway noise source, the calculation of the combined sound levels is required.

d. When predicting the sound levels due to Regional roads, the following points shall be adhered to in the analysis and assessment:

- Curved road sections, roads with varying grade elevations, roadways with four or more lanes, and roads with sound barriers are to be assessed on the basis of multiple segments that suitably represent the existing condition.

- Where existing sound barriers are involved in the analysis, calculations shall be performed at locations not exceeding three (3) lots and/or dwellings when undertaking a detailed design assignment.

- Accurate grade elevations at the receptors, barrier base elevations and road elevations shall be secured and included in the study (for preliminary assessments, the use of ground contours in +/- 0.50m may suffice, however, for detailed design assignments, reliance should be made on actual survey elevations (at or near the OLA, at 10m increments along the Regional property

line and at 10m along the road centre line elevations)).

- The majority of barrier segments, where sound barriers are involved, should be in the acoustic "shadow zone". The use of acoustic "bright zones" is not acceptable, except for the remote segments.

e. Where heavy truck percentages exceed 5% of the total traffic volume and where sound barrier(s) are warranted, additional and supplementary analysis shall be included in the study by separating the analysis of each vehicle class prior to combining the sound levels of all vehicle categories.

f. All receptors that may have an outdoor noise sensitive land use component are to be identified and addressed in the study.

g. Where the receptors are outfitted with existing sound barrier(s), the study shall address the sound levels with such barrier(s). The general condition of the barrier that affects their acoustic performance shall be included in the noise study together with appropriate conclusions and recommendations.

h. For Bus Rapid Transit (BRT) projects, bus movements between stations to be modeled using the ORNAMENT model based on knowledge of the applicable future bus movements by the Region, the specific BRT lanes as well as all other relevant parameters discussed above (It is highly recommended that the source height for buses be increased up to 3m high).

i. details.

The input data and the various assumptions used shall be clearly documented in the report.

3.6 Summary Tables of the Results

Examples of recommended summary tables of the results are located in **Appendix B**.

Table 1: Roadway Environmental Noise Impact Assessment should include the following (all levels to be Leq(16hr) dBA):

- Receptor Code (to be selected by the Consultant)
- Receptor Name
- Predicted existing/ambient sound levels
- Predicted Mature State of development sound levels
- Predictions include effect of existing barrier? (Y/N); i.e. whether or not the prediction calculation at the selected receptor location included the effect of the noise mitigation due to an existing barrier
- Difference between mature state and existing sound levels (dB)
- Subjective Significance/Impact Assessment due to the *change*
- Comparison with Applicable Criteria
  - (i) Are the predicted sound levels (existing or future) greater than 55dBA and the *change* from existing to future is greater than or equal to 5dB, or
  - (ii) Are the predicted sound levels (existing or future) greater than Leq(16hr) 60dBA?

- MOE Classification of the study area and the Baseline Leq(16hr) for urban and rural areas, if any
- Consideration for Mitigation (Y/N)?
    (i) Whether or not the sound levels at the selected receptor have exceeded the applicable criteria and noise mitigation should be considered
- Condition, height, and form of existing barriers
    (i) Conditions: No barrier, privacy fence, poor sound barrier, good sound barrier:
        1. **No barrier**: the selected receptor location does not currently have any structure present along the property line
        2. **Privacy fence**: the selected receptor location currently has a privacy-type fence along the property line, but provides minimal or no noise mitigation
        3. **Poor sound barrier**: the selected receptor location currently has a sound barrier, but is deficient in terms of minimum density requirements, poor maintenance/state of repair, or is generally acoustically ineffective (does not provide a minimum 6dB reduction in noise)
        4. **Good sound barrier**: Meets minimum density requirements, is in a good state of repair, no gaps, and is acoustically effective (provides a minimum 6dB reduction in noise)
- Notes - Of importance would be to note the reason why a receptor location will not be considered for noise mitigation if an investigation was warranted (applicable criteria exceeded)

Table 2: Summary of Predicted Sound Levels with Varying Barrier Heights should reflect the OLAs where mitigation is considered and alternative heights and achieved reductions. The table should include the following (all levels to be Leq(16hr) dBA):

- Receptor Code
- Condition and height of the existing barrier/fence, if any
- Predicted Future Sound Level with existing barrier, if any
- Predicted Future Sound Level without existing barrier, if any
- The predicted sound level at the future/mature state with barrier heights ranging from 2.2m to 3.0m in 0.2m increments
- In general, the calculations should include predicted sound barrier heights alternatives to achieve a minimum 6dB sound level reduction with a maximum barrier height of 3.0m (occasionally, the Region may require barrier height calculations to be shown higher than 3.0m to establish the feasibility of noise controls).

Table 3: Summary of Barrier Details Recommended for Consideration should reflect the OLAs where mitigation should be considered and installation of the barriers at these locations are feasible. The table should include the following:

- Receptor Code
- Recommended barrier height
- Receptor and all relevant elevations to qualify a barrier installation (base elevation, height, and top of barrier elevations)

4. Interpretations

Minimum Number of Dwellings to Be Protected: There is no minimum number for the dwellings to be considered for assessment and noise control purposes and reference should be made to the definition of Outdoor Living Area. However, a cost-benefit analysis will be considered in the Region when dealing with estate lots or sparsely situated dwellings along Regional Roads requiring sound barriers in accordance with the technical assessment procedures presented in this guideline.

Noise-Sensitive Land Uses: Are defined as existing and/or municipally approved residential and institutional land uses which may have an outdoor living area component that may be adversely impacted by transportation noise. The uses include residential developments, seasonal residential developments, an educational facility, a day nursery, nursing/retirement homes, a hospital, a health care facility, a shelter for emergency housing, a community centre, a place of worship[2], or a detention centre.

Outdoor Living Area (OLA): Is a ground-based[3] outdoor living area associated with a noise-sensitive land use as defined herein that is not enclosed where the enjoyment of the outdoor environment is important. Such areas may include:

- A ground-based backyard, a municipally approved front yard as a substitute OLA
- Ground-based common outdoor living areas associated within high-rise multi-unit buildings, such as apartments or condominiums allocated for recreation purposes outside.

For the purposes of noise impact assessment in an OLA, the point of assessment is typically:

- 3 metres from the building façade;
- 1.5 metres above grade or floor level; and
- Aligned approximately with the midpoint of the subject façade.

In general, the point of assessment in the OLA is a point used for prediction of the sound levels.

The noise impact assessment at an OLA excludes the effect of sound reflection from the façade.

Interpretation of the Applicable Sound Level Criteria

- Impact assessment, based on the June 13, 2012 Durham Region Policy, references Leq(16hr) 55 dBA as the *existing* (also referred to as ambient) sound level for estimating the difference between the *projected* and *existing* sound levels (the difference is sometimes referred to as the *change* or *excess*). In the urban areas[4] of the Region, as designated in Regional or local municipal Official Plans, the lowest or minimum *existing* sound level for impact assessment purposes is Leq(16hr) 55 dBA in accordance with the MOE and MTO guidelines.

[2] Not located in commercially or industrially zoned lands.
[3] Elevated areas, such as balconies, decks, terraces and the like areas/structures above ground level are not accepted as Outdoor Living Areas.
[4] For other non-urban areas, such as designated rural areas, the Region of Durham shall be consulted on site specific application.

- Assessment of the existing/ambient sound levels shall be based on the most current AADT and road traffic parameters at the time of the noise assessment while assessment of the future sound levels shall be based on the projected AADT and road traffic parameters corresponding to the mature state of development.

- Notwithstanding the municipal land use planning classifications, if there is no existing Regional Roadway or there are no other roads nearby the receptor of concern, the following baseline sound levels will be assumed as the existing/background sound levels for the following land use classifications:
  (i) Urban Area: Leq(16hr) 55 dBA
  (ii) Rural Area[5]: Leq(16hr) 45 dBA

  In all cases, the assumed background sound level must be reviewed with the Region of Durham for confirmation.

- The significance of a noise impact, referred to herein as the 'change' or 'excess', will be quantified by comparing the future sound levels due to the proposed undertaking with the higher of Leq(16hr) 55 dBA and/or the established existing background/ambient sound level at the receptor of concern.

5. Guidelines for Design and Construction of Noise Barriers

The purpose of constructing a noise barrier is to reduce the sound levels as much as it is technically, economically, and administratively feasible towards the Region's established sound level objectives in outdoor living areas of noise sensitive land uses.

5.1 Noise Barrier Provisions and Requirements

a. For a noise barrier to be deemed acoustically effective by the Region, the technical analysis and assessment by the Acoustic Consultant must confirm that it is predicted to provide a minimum 6dBA reduction. The Acoustic Consultant will be required to provide alternate barrier height predictions. In all cases, all noise barriers must provide effective attenuation to road traffic noise by interrupting the line-of-sight, with an adequate margin of safety, from the receiver to the source, i.e. all predictions to show acoustic shadow zones for most of the "segmented line source" calculations.

b. Noise barrier walls will typically be permitted along the property line at the extreme outer edge of Durham Region's ultimate right-of-way. The Region may alter the grades or construct base berms where property permits in lieu of sound barriers.

c. Noise barriers will not typically be constructed on private property. Should it be determined that a barrier to be constructed will require a flanking portion on private property to adequately protect an OLA, the Region should consider the use of easements to be registered on title to accommodate the construction of such barrier. The maintenance of a flanking barrier will be the responsibility of the Region and the owner will be required to not tamper with the installation, unless alternative arrangements have been agreed.

[5] The only sounds in such areas are natural sounds.

d. The Region may construct noise barriers on flanking end(s) on Area Municipality lands if deemed necessary for acoustic effectiveness of barrier terminations.

e. The maximum barrier wall height to be constructed by the Region shall be 3m above existing or finished property line grade elevations. Higher sound barriers may be accepted subject to site specific conditions. The minimum recommended barrier height shall be 2.2m above grade elevations. For aesthetic reasons, the maximum sound barrier height relative to road crown elevation shall not exceed 5.0m.

f. The proposed height, location, and design of a sound barrier to achieve the Region objectives should be reviewed with the benefiting area residents and other concerned parties. Close consultation with all the stakeholders is recommended where the use of a higher sound barrier than the above objectives may not result in meeting the sound level objectives of this policy.

g. The noise barrier should be constructed of a durable material having a minimum 20kg/m2 (4 lb/sq.ft.) of surface area density and be in a continuous line without openings or gaps. Barrier material and design shall meet standards acceptable to the Region of Durham for noise barriers.

h. Where a noise barrier is warranted, it must be continuous across contiguous residential properties without breaks or discontinuities. The use of private gates is not accepted. The use of access to public transit or a public park between two properties will be allowed with the design of an acoustic access opening.

i. To protect the outermost properties of a residential development, the best practice is to extend the two noise barrier ends along the Regional ROW. In some cases, returns alongside lot lines (flanking ends) may be allowed with special provisions and approvals by the Region and the Area Municipality to ensure effectiveness of a sound barrier.

j. If a Regional road construction project is deferred for 5 or more years following the Class EA from its original construction date, the Region may require re-examination of the sound levels and the impact assessment findings prior to construction if traffic volumes are expected to be different from those used in the original analysis.

k. Noise barriers will not be proposed along wide and major arterial roads adjoining larger estate residential properties where the houses are generally setback much further away from the Regional Road since there is no effective mechanism for noise mitigation (noise walls of reasonable heights may not be acoustically effective).

l. The Region reserves the right to not construct a sound barrier if it is not technically or economically feasible to construct for reasons such as unfavourable topography or grade elevations necessitating high sound barriers, predicted barrier attenuation less than 6dB, presence of significant utilities, interference with drainage patterns or the presence of trees and plant life that must be preserved.

m. The Region will not upgrade, demolish to rebuild, or reconstruct an existing privately owned noise barrier wall along its property line if such barrier is deemed by the Acoustic Consultant to be acoustically effective and in good state of repair. Attempts

by private owners to remove, damage or allow the existing noise barrier to fall into a state of disrepair in order to qualify for new noise barriers as part of a capital project will be denied and these owners will be required to reinstate the noise barrier through enforcement of municipal property standards bylaws.

6. Implementation and Maintenance

The Region will be responsible for maintenance of the sound barrier while the road is under its jurisdiction and the sound barrier is located within the Regional right-of-way, except as noted elsewhere.

7. Definitions

AADT (Annual Average Daily Traffic) Parameters: are defined as the average twenty-four hour, two-way traffic volumes for the period January 1st to December 31st as well as the corresponding traffic speed, percentages of cars, medium trucks, and heavy trucks.

Aesthetics: Methods of providing visual relief and appealing characteristics to planned noise barriers through the application of landscaping designs and aesthetic treatment in accordance with the Region of Durham and the Area Municipality standards.

Mature State of Development AADT (Annual Average Daily Traffic) Parameters: Defined as the average twenty-four hour, two-way traffic volumes predicted for the period from January 1st to December 31st, which corresponds to the future build-out of development as designated in the Regional Official Plan. This is based on the ultimate population, employment and traffic forecasts (2031) as well as the expected corresponding traffic speed, percentages of cars, medium trucks and heavy trucks.

Noise control measure: A physical structure or feature which can be used to achieve compatibility for the specific noise-sensitive receptor with respect to noise from the transportation corridor of concern.

Noise barrier: means a wall, berm, wall/berm combination or similar structure used as a noise control measure, and high enough to break the line-of-sight between the source (vehicular traffic) and the receptor. The term noise barrier is used interchangeably with acoustic barrier or simply a barrier

The minimum surface density (face weight) is 20 kg/m2 and the barrier should be structurally sound, appropriately designed to withstand wind and snow load, and constructed without cracks or surface gaps. Any gaps under the barrier that are necessary for drainage purposes should be minimized and localized, so that the acoustical performance of the barrier is maintained.

Source of Road Transportation Noise: is the combined sound levels due to the movement of transportation vehicles on the Region of Durham transportation corridors and it includes the movement of all types of vehicles allowed to travel on a public highway such as passenger cars, trucks, buses and Bus Rapid Transit (BRT) vehicles,. Highly intrusive short duration noise caused by a source such as an aircraft flyover or a train pass-by is normally excluded from the determination of the road transportation sound levels.

Existing/Ambient Sound Levels: are the sound levels that exist/prevail as produced by road transportation sources. For the purposes of roadway noise assessments, the existing/ambient sound level is expressed in terms of the 16-Hour Equivalent Sound Level in dBA (Leq(16hr), dBA

or Leq(day), dBA). The existing/ambient sound level is determined by means of prediction models acceptable to the MOE or by other acceptable methods/measurements that conform to the MOE and/or the Region of Durham procedures, unless a background sound level is established and reported in this document. In general, the existing sound level is the higher of: a) the established ambient due to AADT traffic parameters corresponding to the noise assessment date, or b) the assigned background sound level.

dBA: means the A-weighted sound pressure level.

Leq(16hr) or Leq(day), dBA: means the A-weighted sound level of a steady source of sound that is logarithmically averaged to carry the same total energy in the 16 hour daytime time period from 07:00 to 23:00 hours as a representation of the actually observed fluctuating sound.

Noise/Sound Barrier System: refers to the noise barrier as a system which includes the panels, posts, foundation, methods of design and construction details, finish and all other components as approved by the Region.

A-weighted decibel, dBA: A nationally and internationally standardized frequency weighting applied to the sound level (measured in decibels, dB) spectrum to approximate the sensitivity of the human hearing mechanism as a function of frequency (pitch).

Acoustic “Shadow Zone” (and Acoustic “Bright Zone”): Acoustic “Shadow Zone” is the area behind a sound barrier with no direct line-of-sight from the receptor to the source where the sound wave may diffract (bend) around the barrier. The Acoustic “Bright Zone” is the area around a sound barrier with direct line-of-sight from the receptor to the source.

Acoustical Consultant: is a Professional Engineer (P.Eng.), licensed by the Professional Engineers of Ontario (PEO) to practice in the Province of Ontario with demonstrated experience in the field of roadway acoustics and noise control as partly defined by the PEO professional practice Guidelines for Professional Engineers Providing Acoustical Engineering Services in Land-Use Planning.

A-Weighted sound level: A sound pressure level indicated by a measurement system that includes an A-weighted network. The resulting value is in decibels and commonly labelled “dBA”.

APPENDIX D: NOISE BY-LAWS

DRAFT

THE CORPORATION OF THE TOWN OF AJAX

BY-LAW NUMBER 38-2017

A By-law to prohibit and regulate noise

WHEREAS the Municipal Act, 2001, S.O. 2001, c 25, as amended, authorizes a Municipality to pass a by-law to prohibit and regulate noise;

NOW THEREFORE, the Council of The Corporation of the Town of Ajax enacts as follows:

1. SHORT TITLE

1.1 This By-law may be cited as the Noise By-law.

2. DEFINITIONS

2.1 In this By-law:

(a) "construction" includes any earth moving, land clearing, excavating, construction, demolition, alteration, repair to any property, including a building, and shall include the delivery or movement of any equipment or materials intended for use in construction.

(b) "Council" means council of the Town.

(c) "Manager" means the Manager of By-law Services or their designate.

(d) "noise" means sound or vibration that is of such volume, level or nature that it is unusual and likely to disturb the inhabitants of the Town.

(e) "Officer" means a Municipal Law Enforcement Officer appointed by the Town or a Police Officer.

(f) "person" includes a corporation.

(g) "residential renovation" includes any construction by a property owner on their own property, and shall not include any construction by a person hired by the property owner.

(h) "Town" means The Corporation of the Town of Ajax.

(i) "waste" means any discarded or unwanted material including, but not limited to, garbage, recyclable material, debris, compostable material, excrement, ashes, packing material, cans, bottles, mechanical equipment, cardboard, grass clippings, tree branches, or leaves.

(j) "waste container" means a receptacle manufactured for the containment of waste that is capable of being emptied by a fork lift truck or a packer truck or a similar vehicle.

3. GENERAL PROVISONS

3.1 No person shall cause or permit the emission of any noise if the noise is audible at the point of reception.

3.2 No person shall cause or permit noise from any construction on Statutory Holidays or between the hours of 8:00 p.m. one day to 7:00 a.m. the following day, Monday to Friday, and 7:00 p.m. on Friday to 9:00 a.m. on Saturday, and 5:00 p.m. on Saturday to 7:00 a.m. on Monday.

3.3 No person shall cause or permit noise for any residential renovation between the hours of 9:00 p.m. to 7:00 a.m. Monday to Saturday, and between 8:00 p.m. Saturday to 9:00 a.m. on Sunday, and 8:00 p.m. on Sunday and 7:00 a.m. on Monday.

3.4 No person shall empty or collect or permit to be emptied or collected any waste from any waste container from any property adjacent to any residentially zoned area, in accordance with the Town's Zoning By-law, between 11:00 p.m. and 7:00 a.m. of the following day.

4. GENERAL EXEMPTIONS

4.1 This By-law shall not apply to a person who causes or permits the emission of noise in connection with any of the activities listed in Schedule "A".

5. EXEMPTION REQUESTS

5.1 Any person may request an exemption to permit construction during the periods of time prohibited in Section 3.2. All such requests shall be made in writing to the Manager and shall:

(a) Identify and describe the construction activity that the applicant wishes to have exempted;

(b) Set out the time (s) and location(s) for which the exemption is being sought;

(c) State the name, address and telephone numbers of the applicant; and,

(d) Set out the reasons why an exemption should be granted.

5.2 The Manager may grant or refuse to grant any exemption request, and may impose any conditions as he or she determines to be appropriate.

6. ENFORCEMENT

6.1 An Officer may, at a reasonable time, enter upon any property for the purpose of carrying out an inspection to determine whether or not the provisions of this By-law have been complied with.

6.2 No person shall prevent, hinder or interfere or attempt to prevent, hinder or interfere with an inspection undertaken by an Officer.

6.3 Every person who contravenes any provision of this By-law is guilty of an offence and upon conviction is liable to a fine pursuant to the provisions of the Provincial Offences Act, R.S.O. 1990, c.P33, as amended.

6.4 If a Court of competent jurisdiction should declare any section or part of a section of this By-law to be invalid, such section or part of a section shall not be construed as having persuaded or influenced Council to pass the remainder of this By-law, and it is hereby declared that the remainder of the By-law be valid and shall remain in force.

6.5 Nothing in this By-law prevents any individual from privately initiating a charge for an alleged offence.

7. REPEAL

7.1 By-law # 105-2013 is hereby repealed.

Read a first and second time this
Fifteenth, day of May, 2017

Read a third time and passed this,
Fifteenth, day of May, 2017

Mayor

D-Clerk

SCHEDULE "A"

TO BY-LAW NUMBER # 38-2017

EXEMPTED ACTIVITIES

1. Any event undertaken by the Town or any special event, provided the necessary approvals have been obtained from the Town.

2. Any emergency work undertaken for the immediate health, safety or welfare of the inhabitants of the Town or for the preservation, protection or restoration of property.

3. Any emergency work being carried out by the Town, The Regional Municipality of Durham or an electrical, gas, cable or telephone utility company.

4. Any sound originated from or caused by, the operation of farm equipment or machinery for cultivating, seeding, crop maintenance or harvesting on any lands designated as an agricultural use.

5. Necessary municipal operations carried out in the interest of public necessity and convenience, including but not limited to, snow clearing and street cleaning, undertaken by or on behalf of the Town.

6. Any snow removal which is essential for the effective operation of a business, residential condominium or school.

THE CORPORATION OF THE CITY OF PICKERING

BY-LAW NO.6834/08

A by-law to prohibit and regulate noise

WHEREAS section 129 of the *Municipal Act, 2001* provides that a local municipality may prohibit and regulate noise.

NOW THEREFORE BE IT RESOLVED THAT the Council of The Corporation of the City of Pickering enacts as follows:

PART I - INTERPRETATION

Definitions

1. In this by-law,

"City" means The Corporation of the City of Pickering or the geographical area of the City, as the context requires;

"City Clerk" means the Clerk of the City or a designate;

"construction" includes erection, alteration, repair, dismantling, demolition, structural maintenance, land clearing, earth moving, grading, excavating, the laying of pipe and conduit whether above or below ground level, street and highway building, application of concrete, equipment installation and alteration and the structural installation of construction components and materials in any form or for any purpose;

"construction equipment" means any equipment, tool or device designed or capable of use in construction or material handling, including pile drivers, bulldozers, tractors, excavators, trenchers, cranes, derricks, loaders, scrapers, pavers, generators, off highway haulers or trucks, ditchers, compactors and rollers, pumps, concrete mixers and graders;

"highway" has the same meaning as in subsection 1(1) of the *Highway Traffic Act* and includes unopened and unassumed road allowances;

"motor vehicle" has the same meaning as in subsection 1(1) of the *Highway Traffic Act* and includes a motorized snow vehicle;

"parks area" means any land owned or operated by the City or the Toronto Region Conservation Authority for park or recreational purposes;

"person" includes a corporation and the heirs, executors, administrators or other legal representatives of a person to whom the context can apply according to law;

"point of reception" means any geographic location at which noise can be heard other than the premises from which the noise originates;

"special event" includes a demonstration, parade, sports event, festival, carnival and other similar events; and

"statutory holiday" means any day designated as a holiday in the *Retail Business Holidays Act.*

References

2. In this by-law, reference to any Act or by-law is reference to that Act or by-law as it is amended or re-enacted from time to time.

3. Unless otherwise specified, references in this by-law to sections and Schedules are to sections and Schedules in this by-law.

Word Usage

4. This by-law shall be read with all changes in gender or number as the context may require.

5. A grammatical variation of a word or expression defined has a corresponding meaning.

Schedules

6. The following Schedules are attached to and form part of this by-law:

Schedule 1 – PROHIBITED ACTIVITIES
Schedule 2 – ACTIVITIES PROHIBITED BY TIME
Schedule 3 – EXEMPTED ACTIVITIES

Severability

7. Each section of this by-law is an independent section, and the holding of any section or part of any section of this by-law to be void or ineffective for any reason shall not be deemed to affect the validity of any other section or parts of sections of this by-law.

PART II – REGULATIONS

General Prohibitions

8. No person shall cause or permit the emission of any noise resulting from any of the activities listed in Schedule 1 if the noise is audible at a point of reception.

Restrictions by Time and Place

9. No person shall cause or permit the emission of any noise resulting from any of the activities listed in Schedule 2 during the prohibited period of time listed opposite such activities if the noise is audible at a point of reception.

General Exemptions

10. This by-law shall not apply to a person who causes or permits the emission of noise in connection with any of the activities listed in Schedule 3.

Exemption Requests

11. (1) Any person may request an exemption to permit the operation of construction equipment during the period of time prohibited by Schedule 2. All such requests shall be submitted in writing to the City Clerk and shall,

(a) identify and describe in detail the construction activity that the applicant wishes to have exempted;

(b) set out the time(s) and location(s) for which the exemption is being sought;

(c) state the name, address, telephone numbers and facsimile numbers of the applicant;

(d) set out the reasons why an exemption should be granted; and

(e) be signed by the applicant who shall certifying the accuracy and truth of the contents of the application.

(2) The City Clerk may grant or refuse to grant any exemption request, and may impose any conditions as he or she determines to be appropriate.

(3) Where an exemption is granted, breach of any condition of the exemption shall render the exemption null and void.

PART III – ENFORCEMENT

Inspections

12. A municipal law enforcement officer appointed by the City to enforce municipal by-laws may, at any reasonable time, enter upon any property for the purpose of carrying out an inspection to determine whether or not the provisions of this by-law have been complied with.

13. No person shall prevent, hinder or interfere or attempt to prevent, hinder or interfere with an inspection undertaken by an officer.

Offences and Penalties

14. Every person who contravenes any provision of this by-law is guilty of an offence and upon conviction is liable to a fine pursuant to the provisions of the *Provincial Offences Act*.

15. No person shall make a false or intentionally misleading recital of fact, statement or representation in any exemption request.

PART IV – GENERAL

Repeal

16. By-law No. 3821 is repealed.

Short Title

17. This by-law may be cited as the "Noise Control By-law".

Effective Date

18. This by-law comes into effect on the date of its passing.

BY-LAW read a first, second and third time and finally passed this 19th day of February, 2008.

David Ryan, Mayor

Debi A. Wilcox, City Clerk

SCHEDULE 1

TO BY-LAW NO. 6834/08

PROHIBITED ACTIVITIES

1. Operation of any electronic device or group of connected electronic devices incorporating one or more speakers and intended for the production, reproduction or amplification of sound (including car stereos) at such a volume that it is audible from the interior of a residence or business whose occupant has made every reasonable attempt to mitigate the reception of the noise.

2. Operation of any electronic device or group of connected electronic devices incorporating one or more speakers and intended for the production, reproduction or amplification of sound (including car stereos) in a park area at a volume that a reasonable person would, in all of the circumstances, consider to be excessive, intrusive or disturbing.

3. Persistent yelling, shouting, hooting, whistling or singing at such a volume that it is audible from the interior of a residence or business whose occupant has made every reasonable attempt to mitigate the reception of the noise.

4. Excessive and unnecessary revving of a motor vehicle engine.

5. Operation of a motor vehicle is such a manner that the tires squeal.

6. Operation of a motor vehicle horn or other warning device except where required or authorized by law or in the interest of good safety practices.

7. Operation of a motor vehicle other than on a highway or other place where its operation is permitted by law.

8. Persistent barking, calling, howling, whining or crying at frequent or lengthy intervals by any domestic pet or any other animal kept or used for any purpose other than agriculture.

9. All selling or advertising by shouting or amplified sound.

SCHEDULE 2

TO BY-LAW NO. 6834/08

ACTIVITIES PROHIBITED BY TIME

	Type of Activity	Prohibited Periods of Time
1	Operation of any electronic device or group of connected electronic devices incorporating one or more speakers or other electro-mechanical transducers, and intended for the production, reproduction or amplification of sound (including car stereos).	9:00 PM to 7:00 AM
2	Persistent yelling, shouting, hooting, whistling or singing.	9:00 PM to 7:00 AM
3	Operation of construction equipment.	7:00 PM to 7:00 AM (all day on Sundays & statutory holidays)
4	Operation of any powered or non-powered tools for domestic purposes or automotive repair including augers, air compressors, and pneumatic or hydraulic tools.	9:00 PM to 7:00 AM
5	Operation of a combustion engine that is used in a toy or model or replica.	9:00 PM to 7:00 AM
6	Operation of any equipment or machinery used for yard maintenance that is run by electricity or gasoline, including lawn mowers, leaf blowers, chain saws, hedge trimmers, whipper snippers and pressure washers.	9:00 PM to 7:00 AM
7	Operation of snow blowers.	9:00 PM to 6:00 AM
8	Operation of solid waste bulk lift or refuse compacting equipment.	10:00 PM to 6:00 AM

SCHEDULE 3

TO BY-LAW NO. 6834/08

EXEMPTED ACTIVITIES

1. The use in a reasonable manner of an apparatus or mechanism for the amplification of the human voice or of music in a park area or recreational area provided that the permission of the City has been obtained.

2. Any special event provided that the necessary permissions or approvals have been obtained from the City and the Durham Regional Police Service.

3. Any emergency work undertaken for the immediate health, safety or welfare of the inhabitants of the City or for the preservation, protection or restoration of property.

4. Any emergency work being carried out by the City, The Regional Municipality of Durham, any electric utility company, any natural gas utility company, or any telephone utility company.

5. The ringing of school bells or the sounding of a public address system on a property owned by the Durham District School Board, the Durham Catholic District School Board or a recognized private school.

6. The sounding of bells or chimes on a property operated as a church or a place of worship, or on any property owned or operated by the City.

7. Any sound originating from, or caused by, the operation of farm equipment or machinery for cultivating, seeding, crop maintenance or harvesting purposes on any lands designated as an agricultural area.

8. Any fireworks display authorized by the City in accordance with Fireworks By-law No. 6783/07.

9. Necessary municipal operations carried out in the interest of public necessity and convenience, including but not limited to snow clearing, street cleaning and garbage collection, undertaken by or on behalf of the City.

10. Any snow removal which is essential for the effective operation of a business.

As Amended by By-laws 1-2005,110-2013 and 91-2020
By-law 112-82
of The Corporation of the City of Oshawa

being a by-law to prohibit noises likely to disturb the inhabitants of the City of Oshawa and to repeal by-law number 3827, as amended by by-law number 67-69.

Be it enacted and it is hereby enacted as a by-law of The Corporation of the City of Oshawa by the Council thereof as follows:

1. No person shall in the City of Oshawa ring any bell, blow any horn, shout or make any unusual noise or noise likely to disturb the inhabitants of the City of Oshawa.

1.1. No Owner shall emit, cause or permit the emission from the Owner's Property of noise likely to disturb the inhabitants of the City of Oshawa. (1-2005)

2. Without limiting the generality of sections 1 and 1.1 of this by-law, the following noises are hereby deemed to be noises likely to disturb the inhabitants of the City of Oshawa: (1-2005)

   a) the ringing of bells, blowing of horns or sounding of sirens on any motor vehicle except to the extent that such ringing, blowing or sounding is required by law or by the requirement of safety;

   b) the sound or noise from or created by a radio or phonograph, or any musical or sound-producing instrument of whatsoever kind when such radio or phonograph or instrument is played or operated in such manner or with such volume as to annoy or disturb the peace, quiet, comfort or repose of any individual in any dwelling house, apartment house, hotel or other type of residence outside the premises where the instrument is being played.

   c) the grating, grinding or rattling noise or sound caused by a condition of disrepair or maladjustment of any motor vehicle, motorcycle, or other vehicle whatsoever or part or accessory thereof;

   d) the blowing of any steam or air whistle attached to or used in connection with any stationary boiler or other machine or mechanism, except for the purpose of giving notice to workmen of the time to commence or cease work or as a warning of danger.

   e) the noise made by power lawn mowers, outboard motors or similar power motors.

   f) the noise made by the discharge into the open air of the exhaust of any steam engine, stationary internal combustion engine, motor vehicle or motorcycle except through a muffler or other device which effectively prevents loud or explosive noises.

   g) any noise which may be heard beyond the lot upon which it is made at sufficient volume to disturb persons beyond such lot.

3. Notwithstanding the other provisions of this by-law, this by-law shall not apply to prevent:

   a) the use in a reasonable manner of any apparatus or mechanism for the amplification of the human voice or of music in a public place within the limits of the Corporation if the operator of such amplifying device holds a licence for the purpose and the operation is carried on within the terms of section 272 of the Consolidated By-laws of the City of Oshawa, 1940.

   b) any military or other band or any parade, operating under written permission first obtained from the Board of Commissioners of Police.

   c) any vehicle of the police or fire department or any ambulance or any public service or emergency vehicle while answering a call.

   d) any sound arising from the operation of any railway which operates under The Railway Act of Canada or from any plant or work in connection with any such railway.

e) the sounding of church bells or carillons.

f) the making by any person upon his own property of noise which is reasonable and necessary for his enjoyment and use of such property provided that such noise is not audible at a distance of twenty-five feet from the limit of such property and provided in addition that such noise does not interfere with the enjoyment of any adjoining property owner.

g) any sound made by Construction between the hours of seven o'clock in the forenoon (7:00 am) and seven o'clock in the evening (7:00 pm) on any day that is not a Holiday. (1-2005)

h) any sound made by Construction between the hours of nine o'clock in the forenoon (9:00 am) and five o'clock in the afternoon (5:00 pm) on any Sunday. (110-2013)

3.1. In this By-law, the following terms have the meanings indicated:

a) "Construction" means lawful erection, alteration, repair, dismantling, demolition, structural maintenance, land clearing, earth moving, grading, excavating, laying of pipe and conduit (whether above or below ground level), street and highway building, application of concrete, equipment installation and alteration, and structural installation of construction components and materials, in any form or for any purpose.

b) "Holiday" means New Year's Day, Good Friday, Victoria Day, Canada Day, Labour Day, Thanksgiving Day, Christmas and Boxing Day. (110-2013)

c) "Owner" includes, in respect of a Property,

i) each person shown by the records in the Registry Office or the Land Titles Office for the Land Registry Division of Durham to be the owner at law of the Property;

ii) each person from time to time managing any part of the Property or receiving the rent, fees, or any other compensation paid by or on behalf of any person from time to time occupying or entitled to occupy any part of the Property; and

iii) each lessee of any part of the Property.

d) "Property" means a parcel of land which is shown as a lot or block on a registered plan of subdivision or described in a single transfer/deed of land of legal effect registered in the Land Registry Office or the Land Titles Office for the Land Registry Division of Durham and includes any part of a building, structure, mobile building or mobile structure on the Property. (1-2005)

4. Every person who makes or cause to be made any noise prohibited by this by-law and every person who contravenes any provision of this by-law shall be guilty of an offence and liable upon conviction to a penalty of no more than $5,000.00 exclusive of costs for each offence. (1-2005)

4.1. Administrative Penalty Process By-law 63-2013 applies to each administrative penalty issued pursuant to this By-law. (110-2013)

4.2. Tiered and Escalating Penalties: Each person who contravenes any provision of this By-law shall, upon issuance of a Penalty Notice in accordance with Administrative Penalty Process By-law 63-2013, be liable to pay to the City an administrative penalty. If a person receives a Penalty Notice in accordance with the City's Administrative Penalty Process By-law for a contravention of the Noise By-law, as amended, and the person has not received a Penalty Notice for a subsequent contravention of the Noise By-law, as amended within one (1) calendar year or less, the person shall be liable to pay to the City a tier one (1) administrative penalty amount for that contravention in the amount of $125. If a person receives an additional Penalty Notice for a subsequent contravention of the Noise By-law, as amended within one (1) calendar year or less from the date of the Penalty Notice containing a tier one (1) administrative penalty amount, the person shall be liable to pay to the City a tier two (2) administrative penalty amount for that subsequent contravention in the amount of $225. If the person receives a subsequent Penalty Notice for a further contravention of the Noise By-law, as amended law within one (1) calendar year or less from the date of the Penalty Notice containing a tier two

(2) administrative penalty amount, the person shall be liable to pay to the City a tier three (3) administrative penalty amount for that contravention in the amount of $325. If the person receives further Penalty Notice(s) for continued contravention(s) of the Noise By-law, as amended within one (1) calendar year or less from the date of the Penalty Notice containing a tier three (3) administrative penalty amount, the person shall continue to be liable to pay to the City a tier three (3) administrative penalty amount for that offence in the amount of $325. (91-2020)

5. By-laws number 3827 and 67-69 of the City of Oshawa are hereby repealed.

By-law read a first, second and third time and finally passed this fourth day of October, 1982.

2013 11 05

Chapter 591

NOISE

ARTICLE 1
Definitions

§ 591-1.1. Definitions.

ARTICLE 2
Prohibitions

§ 591-2.1. Amplified sound.

§ 591-2.2. Animals.

§ 591-2.3. Construction.

§ 591-2.4. Loading and unloading.

§ 591-2.5. Motor vehicles.

§ 591-2.6. Power devices.

§ 591-2.7. Religious ceremony in a place of worship.

§ 591-2.8. Stationary sources and residential air conditioners.

§ 591-2.9. Unreasonable and persistent noise.

§ 591-2.10. Most restrictive provision applies.

ARTICLE 3
Exemptions

§ 591-3.1. Safety and government work.

§ 591-3.2. Exemption permits.

ARTICLE 4
Offences, Entry to Inspect, Orders, Remedial Action and Transition

§ 591-4.1. Offences.

§ 591-4.2. Entry to inspect.

§ 591-4.3. Orders to comply.

§ 591-4.4. Remedial action.

§ 591-4.5. Transition.

ARTICLE 5
Railway Whistles

§ 591-5.1. Definitions.

§ 591-5.2. Prohibited locations.

[History: Adopted by the Council of the City of Toronto 2019-06-19 by By-law 878-2019[1]. Amendments noted where applicable.]

General References

Fees and charges - See Ch. 441.
Idling of vehicles and boats – See Ch. 517.
Noise in parks - See Ch. 608.
Railway Safety Act - See R.S. 1985, c. 32 (4th Supp.).

ARTICLE 1
Definitions

§ 591-1.1. Definitions.

As used in this chapter, the following terms shall have the meanings indicated:

AMBIENT SOUND LEVEL - The sound level that is present in the environment, produced by sound sources other than the source under assessment.

AMPLIFIED SOUND - Sound made by any electronic device or a group of connected electronic devices incorporating one or more loudspeakers or other electro mechanical transducers, and intended for the production, reproduction or amplification of sound.

CONSTRUCTION - Includes erection, alteration, repair, dismantling, demolition, structural maintenance, land clearing, earth-moving, grading, excavating, the laying of pipe and conduit whether above or below ground level, street and highway building, application of concrete, equipment installation and alteration and the structural installation of construction components and materials in any form or for any purpose, and includes any work in connection with these activities.

CONSTRUCTION EQUIPMENT - Any equipment or device designed and intended for use in construction, or material handling, including hand tools, power tools, air compressors, pile drivers, pneumatic or hydraulic tools, bulldozers, tractors, excavators, trenchers, cranes, derricks,

[1] **Editor's Note: By-law 878-2019 replaced Chapter 591, Noise in its entirety. By-law 878-2019 and this new Chapter comes into force October 1, 2019.**

loaders, scrapers, pavers, generators, off-highway haulers or trucks, ditchers, compactors and rollers, pumps, concrete mixers, graders, and any other material-handling equipment.

CONTINUOUS POURING OF CONCRETE - Slip-forming, deck pour or pre-pour operations that cannot be interrupted once the operations have started.

CONVEYANCE - Includes a vehicle and any other device employed to transport a person or persons or goods from place to place, but does not include any such device or vehicle if operated within the premises of a person.

dB(A) - The sound level in decibels obtained when using a sound level meter with the A-weighting.

dB(C) - The sound level in decibels obtained when using a sound level meter with the C-weighting.

EXECUTIVE DIRECTOR - The Executive Director of Municipal Licensing and Standards or their designate or successor.

GOVERNMENT WORK - Construction, rehabilitation or maintenance work conducted by the City, the Province of Ontario, the Government of Canada and any of its agencies or agents including the operation of motor vehicles and equipment actually engaged in the work.

HIGHWAY - includes a common and public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct or trestle, any part of which is intended for or used by the general public for the passage of vehicles and includes the area between the lateral property lines of a highway.

LARGE CRANE WORK - The erection and dismantling of a crane or any other crane work that a road closure for the work to be started and finished.

Leq - The energy equivalent sound level or the continuous sound level that would result in the same total sound energy being produced over a given period of time.

LIVING AREA - Any area that includes the premises of a dwelling or a workplace.

MOTORCYCLE - Means a self-propelled vehicle having a seat or saddle for the use of the driver and designed to travel on not more than three wheels in contact with the ground, and includes a motor scooter, but does not include a motor assisted bicycle.

MOTOR VEHICLE - Includes an automobile, a motorcycle, a motor assisted bicycle and any other vehicle propelled or driven otherwise than by muscular power, but does not include a street car or other motor vehicle running only upon rails, a power-assisted bicycle, a motorized snow vehicle, a traction engine, a farm tractor, a self-propelled implement of husbandry or a road-building machine.

NOISE - A sound that a person finds disturbing to their peace, rest, enjoyment, comfort or convenience.

NOISE MITIGATION PLAN - A plan as required and approved by the Executive Director that addresses the mitigation of sound not in compliance with the requirements of this chapter from planned events or activities.

PERSISTENT NOISE - Any noise that is continuously heard for a period of ten minutes or more or intermittently over a period of one hour or more.

PLACE OF WORSHIP - A building dedicated to religious worship, including a church, synagogue, temple, mosque, monastery or convent.

POINT OF RECEPTION - Any location on the premises of a person where sound originating from other than those premises is received. The following locations are points of reception:

(1) An outdoor area that is:

(a) near the façade of a building, at a height of 1.5 metres above ground, typically in backyards, front yards, terraces or patios; or

(b) on a balcony or elevated terrace (for example, a rooftop) provided is not enclosed; or

(2) An indoor area that is inside a building with windows and doors closed.

POWER DEVICE - Any equipment driven otherwise than by muscular power used in the servicing, maintenance or repair of lawns, including chainsaws, lawn mowers, leaf blowers, grass trimmers or any other similar equipment. A power device does not include equipment used to remove snow or ice.

PROPERTY - A building or structure or part of a building or structure, including the lands appurtenant thereto and all mobile homes, mobile buildings or mobile structures and vacant land.

SOUND LEVEL METER - An instrument that measures levels of sound as approved for use by the Executive Director.

STATIONARY SOURCE - A source of sound which does not normally move from place to place, including the premises of a person as one stationary source, unless the dominant source of sound on those premises is construction or a conveyance.

UNREASONABLE NOISE - Any noise that would disturb the peace, rest, enjoyment, comfort or convenience of a reasonable person in the circumstances. Unreasonable noise does not include commonplace household or workplace sounds such as sound from furniture being moved, children playing or people engaging in conversation.

ARTICLE 2
Prohibitions

§ 591-2.1. Amplified sound.

A. No person shall emit or cause or permit the emission of continuous amplified sound, measured with a sound level meter at a point of reception in an outdoor living area:

(1) That has a sound level (expressed in terms of Leq for a ten-minute period) exceeding 50 dB(A) or 65 dB(C) from 11 p.m. to 7 a.m. or 55 dB(A) or 70 dB(C) from 7 a.m. to 11 p.m.; or

(2) Where the ambient sound level at a point of reception exceeds the maximum sound level permitted under Subsection A(1), that has a sound level (expressed in terms of Leq for a ten-minute period) equal to or exceeding the ambient sound level.

B. If, during the course of an investigation, a By-law Enforcement Officer determines it is not reasonable to measure from a point of reception in an outdoor living area, then no person shall emit or cause or permit the emission of continuous amplified sound, measured with a sound level meter at a point of reception in an indoor living area:

(1) That has a sound level (expressed in terms of Leq for a ten-minute period), exceeding 45 dB(A) or 60 dB(C) from 11 p.m. to 7 a.m. or 50 dB(A) or 65 dB(C) from 7 a.m. to 11 p.m.; or

(2) Where the ambient sound level at a point of reception exceeds the maximum sound level permitted under Subsection B(1), that has a sound level (expressed in terms of Leq for a ten-minute period) equal to or exceeding the ambient sound level.

§ 591-2.2. Animals.

No person shall cause or permit persistent noise, including barking, calling or whining or other similar persistent noise, to be made by any animal kept or used for any purpose.

§ 591-2.3. Construction.

No person shall emit or cause or permit the emission of sound resulting from any operation of construction equipment or any construction that is clearly audible at a point of reception:

(1) from 7 p.m. to 7 a.m. the next day, except until 9 a.m. on Saturdays; and

(2) all day on Sundays and statutory holidays.

§ 591-2.4. Loading and unloading.

No person shall emit or cause or permit the emission of sound resulting from loading, unloading, delivering, packing, unpacking, and otherwise handling any containers, products or materials from 11 p.m. to 7 a.m. the next day, except until 9 a.m. on Saturdays, Sundays and statutory holidays. **[Amended 2019-07-18 by By-law 1102-2019]**

§ 591-2.5. Motor vehicles.

A. No person shall emit or cause or permit the emission of sound resulting from unnecessary motor vehicle noise, such as the sounding of a horn, revving of an engine, squealing of tires, banging, clanking or any like sound that is clearly audible at a point of reception.

B. No person shall emit or cause or permit the emission of sound resulting from the repairing, rebuilding, modifying or testing of a vehicle if the sound is clearly audible at a point of reception from 9 p.m. until 7 a.m. the next day, except until 9 a.m. on Saturdays, Sundays and statutory holidays.

C. No person shall emit or cause or permit the emission of sound from a motorcycle, if the motorcycle emits any sound exceeding 92 dB(A) from the exhaust outlet as measured at 50 cm, while the motorcycle engine is at idle.

§ 591-2.6. Power devices.

A. No person shall emit or cause or permit the emission of sound from a power device from 7 p.m. until 7 a.m. the next day, except until 9 a.m. on Saturdays, Sundays and statutory holidays.

B. Subsection A does not apply to a power device used to maintain a golf course or public park.

§ 591-2.7. Religious ceremony in a place of worship.

No person shall make, cause or permit the emission of sound that disturbs a religious ceremony in a place of worship.

§ 591-2.8. Stationary sources and residential air conditioners.

A. No person shall cause or permit the emission of sound from a stationary source or residential air conditioner that, when measured with a sound level meter a point of reception, has a sound level (expressed in terms of Leq for a one-hour period) exceeding 50 dB(A) or the applicable sound level limit prescribed in provincial noise pollution control guidelines.

B. Subsection A does not apply to the emission of sound from a stationary source that is in compliance with a provincial environmental compliance approval.

§ 591-2.9. Unreasonable and persistent noise.

A. No person shall make, cause or permit noise, at any time, that is unreasonable noise and persistent noise.

B. Subsection A only applies to sound or noise that is not described in § 591-2.1 through § 591-2.8.

C. Despite Subsection B, an exemption permit may be required under § 591-3.2., at the discretion of the Executive Director, if the Executive Director determines that there is unreasonable and persistent noise during otherwise permitted hours as described in § 591-2.1 through § 591-2.8.

§ 591-2.10. Most restrictive provision applies.

Where a source of sound is subject to more than one provision of this article, the most restrictive provision applies.

ARTICLE 3
Exemptions

§ 591-3.1. Safety and government work.

Despite any other provision of this chapter, it shall be lawful to emit or cause or permit the emission of sound from:

A. Bells or sirens required for the purposes of public safety including sirens when operated by Police Services, Fire and Paramedic Services, or bells or whistles operated by rail or transit services;

B. Measures undertaken for the immediate health, safety or welfare of persons under emergency circumstances;

C. Measures undertaken as a result of an emergency requiring immediate action for the construction, preservation, restoration or demolition of any highway; or

D. Government work.

§ 591-3.2. Exemption permits.

A. Any person may apply for an exemption permit from a noise prohibition or noise limitation provision in this chapter, in connection with one or more events or activities, by filing with the Executive Director the following:

(1) An application in the form prescribed by the Executive Director;

(2) The non-refundable application fee set out in Chapter 441, Fees and Charges; and

(3) Any information relevant to the application as requested by and to the satisfaction of the Executive Director including:

(a) Reasons supporting an exemption permit;

(b) A noise mitigation plan;

(c) A statement certified by a professional engineer or acoustical consultant for any sounds that are not technically or operationally feasible to control.

B. Upon receipt of an application under Subsection A, the Executive Director shall give written notice to the Councillor of any ward where each event or activity is to be held and, where each event or activity is to be held on a boundary street between wards, to the Councillors of the adjoining wards.

C. The Executive Director shall issue an exemption permit if all of the following conditions have been met:

(1) All of the Councillors notified under Subsection B have either:

(a) Not responded within 14 days of the notice; or

(b) Responded indicating that they have no objection to the application being approved.

(2) The applicant has complied, to the satisfaction of the Executive Director, with the last exemption permit, if any, issued to them.

(3) The applicant has provided the following:

(a) The applicant's name, address, and telephone number;

(b) The date, time and location of each event or activity for which the exemption permit is sought and, where applicable, the number of people expected to attend;

(c) The purpose for which the exemption permit is required;

(d) The description of any sound equipment or construction equipment to be used;

(e) The name, address and telephone number of at least one contact person who will supervise each event or activity; and

(f) A written undertaking that one or more contact persons responsible for supervising each event or activity will be on-site during the entire event or activity to ensure compliance with the terms and conditions of the exemption permit.

(4) The applicant has paid all required fees.

D. An exemption permit shall be subject to the following conditions:

(1) A notice of the exemption permit shall be posted in a visible location where each event or activity will occur 7 days prior to the event or activity. This condition may be altered or waived by the Executive Director;

(2) If required by the Executive Director, the event or activity shall comply with a noise mitigation plan;

(3) If required by the Executive Director, the sound levels resulting from each event or activity shall be monitored by City staff with the applicant paying the charges for this monitoring as set out in Chapter 441, Fees and Charges;

(4) The sound emitted from any equipment shall not exceed a sound level (expressed in terms of Leq for a ten-minute period) of 85 dBA when measured 20 metres from the source;

(5) Where the sound level exceeds 85 dBA, the applicant shall comply with any request made by a police officer or a By-law Enforcement Officer with respect to the volume of sound from the equipment to ensure compliance with Subsection D(2);

(6) No sound equipment or construction equipment other than the equipment approved under the exemption permit shall be used by the applicant;

(7) Each event or activity shall be restricted to the approved location; and

(8) The permission granted shall be for the date and times for each event or activity as set out in the exemption permit.

E. Appeal.

(1) Where the Executive Director refuses to grant an exemption permit under this subsection, the applicant shall be notified in writing and advised that they may appeal the Executive Director's decision to the community council which has jurisdiction for the location of each proposed event or activity by filing an appeal within 21 days of the date of the notice, along with the applicable fee as set out in

Chapter 441, Fees and Charges, with the City Clerk at the address shown on the notice.

(2) Notice of hearing shall be sent to all residents within 100 metres of the location where each event or activity is proposed to be held as shown on the last revised assessment rolls and at the applicant's expense.

(3) Where the location of each proposed event or activity under appeal falls on the boundary street of more than one community council, each affected community council shall provide its recommendations to Council for its consideration of the appeal under this Subsection.

(4) Council, or the community council under delegated authority, may issue or refuse an exemption permit.

(5) If the community council under delegated authority or Council issues an exemption permit, the exemption permit is subject to the conditions set out in Subsection D, unless the community council under delegated authority or Council provides otherwise, and to any other conditions respecting health, safety and nuisance as the community council under delegated authority or Council considers advisable.

F. Where an application for an exemption permit is made for continuous concrete pouring or large crane work, only Subsections A, B, C(2), (3) and (4), G and H apply and the Executive Director may issue the exemption permit subject to the conditions in Subsections D(1), (2), (7) and the conditions that:

(a) The permission granted shall be for the date and times for each event or activity as set out in the exemption permit with overnight events or activities discouraged; and

(b) Notice for continuous concrete pouring and large crane work shall be distributed to those within a 120 metre radius of the activity at least 7 days prior to such event or activity.

G. Despite anything contained in § 591-3.2., where an application for an exemption permit is made by the City or any of its agencies, boards or commissions:

(1) The application shall be submitted directly to the Executive Director by the City department, agency, board or commission seeking the exemption permit.

(2) The fees in Chapter 441, Fees and Charges, do not apply.

(3) Subsections C(3)(e) and (f) do not apply.

H. The Executive Director may revoke an exemption permit, with or without notice, if there is non-compliance any of the exemption permit's conditions.

ARTICLE 4
Offences, Entry to Inspect, Orders, Remedial Action and Transition

§ 591-4.1. Offences.

A. Every person who contravenes any provision of this chapter is guilty of an offence and on conviction is liable to a fine of no more than $100,000.

B. Every person who fails to comply with an exemption permit issued or an order made under this chapter, is guilty of an offence and on conviction is liable to a fine of no more than $100,000.

C. In addition to a fine or fines provided for in this subsection every person who gains an economic advantage from contravening this chapter shall be liable to a special fine in an amount equal to the fair market value of the economic advantage obtained from the non-compliance.

D. In addition to offences referred to in Subsections A, B and C every person is guilty of an offence under this chapter who:

(1) Hinders or obstructs or attempts to hinder or obstruct any person exercising a power or performing a duty under this chapter;

(2) Neglects or refuses to produce or provide any information or thing to any person acting pursuant to an order made under section 378 of the City of Toronto Act, 2006;

(3) Knowingly makes, participates in, assents to or acquiesces in the provision of false information in a statement, affidavit, application or other document prepared, submitted or filed under this chapter.

E. Where a corporation contravenes any provision of this chapter, every director or officer who concurs in such contravention is guilty of an offence and on conviction is liable to a fine of no more than $100,000.

F. Where a corporation fails to comply with an exemption permit issued or an order made under this chapter, every director or officer who concurs in such contravention is guilty of an offence and on conviction is liable to a fine of no more than $100,000. **[Amended 2020-12-18 by By-law 1129-2020]**

G. Each offence is designated as a continuing offence and is subject to, for each day or part of a day that the offence continues a maximum fine of no more than $10,000. The total of all of the daily fines imposed for each offence may exceed $100,000.

§ 591-4.2. Entry to inspect.

A. In accordance with section 376 of the City of Toronto Act, 2006, a By-Law Enforcement Officer may enter upon land within the City at any reasonable time for the purpose of carrying out inspections to determine whether the following are being complied with:

(1) This chapter; or

(2) A notice or order issued in accordance with this chapter.

B. For the purposes of an inspection under Subsection A, a By-law Enforcement Officer may:

(1) Require, for inspection, the production of documents or things relevant to the inspection;

(2) Inspect and remove documents or things relevant to the inspection for the purpose of making copies or extracts of them;

(3) Require information from any person concerning a matter related to the inspection;

(4) Be accompanied by such person or persons as the By-law Enforcement Officer determines is necessary if such person or persons possesses special or expert knowledge related to the purpose of the inspection; and

(5) Make examinations or take tests, samples or photographs necessary for the purposes of the inspection.

§ 591-4.3. Orders to comply.

A. A By-law Enforcement Officer who finds a contravention of this chapter may make one or more orders requiring discontinuance of the contravening activity or to do work to correct the contravention under section 384 or 385 of the City of Toronto Act, 2006.

B. The order may be served personally on the person to whom it is directed or by registered mail to the last known address of that person, in which case it shall be deemed to have been given on the third day after it is mailed.

C. If there is evidence that the occupant of the land is not the registered property owner, the notice shall be served on both the registered property owner and the occupant of the land.

D. If the address of the registered property owner is unknown, the City is unable to effect service on the registered property owner or occupant of the land under Subsection B or the delay necessary to give an order would result in circumstances that endanger the

health or safety of any person or similarly serious consequences, a placard stating the terms of the order and placed in a conspicuous place upon land on or near the property shall be deemed to be sufficient notice to the registered property owner or the occupant of the land.

§ 591-4.4. Remedial action.

If a person fails to comply with an order to do work to correct a contravention under this chapter, the Executive Director, or persons acting upon their instructions, may enter the lands at any reasonable time for the purposes of doing the things described in the order at the person's expense.

§ 591-4.5. Transition.

A. The provisions of this chapter do not apply to exemption permits granted before October 1, 2019 provided that the holder of such permits continue to comply with the conditions of their original permits and that such permits are not revoked, terminated and do not expire.

B. All prosecutions and other enforcement processes commenced under this chapter which have not been completed on October 1, 2019 shall be completed as if the chapter had not been amended on that date.

ARTICLE 5
Railway Whistles

§ 591-5.1. Definitions.

As used in this article, the following abbreviations and terms shall have the meanings indicated:

CN - Canadian National Railway.

CP - Canadian Pacific Railway.

GO - Go Transit.

§ 591-5.2. Prohibited locations.

The use of the whistle on any railway equipment in respect of the highway crossings described in the following table is prohibited, except as otherwise provided in section 23.1 of the Railway Safety Act, R.S. 1985, c. 32 (4th Supp.):

No.	Railway	Subdivision, Branch or other Trackage	Mileage	Street Name
A.	Go	Uxbridge Subdivision	55.73	Sheppard Avenue East in the vicinity of the Agincourt Go Station
B.	Go	Uxbridge Subdivision	55.44	Marilyn Avenue in the vicinity of the Agincourt Go Station
C.	Go	Uxbridge Subdivision	60.19	Danforth Road west of Midland Avenue
D.	Go	Uxbridge Subdivision	59.96	Corvette Avenue pedestrian crossing mile 59.96 Uxbridge Subdivision

Authority: Planning and Growth Committee Item 15.6,
adopted as amended, by City of Toronto Council on May 26 and 27, 2008
Enacted by Council: May 27, 2008

CITY OF TORONTO

BY-LAW No. 514-2008

To amend City of Toronto Municipal Code Chapter 363, Building Construction and Demolition, with respect to regulation of vibrations from construction activity.

The Council of the City of Toronto HEREBY ENACTS as follows:

1. Chapter 363, Building Construction and Demolition, of The City of Toronto Municipal Code, is amended as follows:

A. By adding the following:

§ 363-3.6. Construction vibrations.

A. Definitions.

As used in this section, the following terms shall have the meanings indicated:

CONSTRUCTION EQUIPMENT — Any equipment or device designed for use in construction, or material handling including, but not limited to, air compressors, pile drivers, pneumatic or hydraulic tools, bulldozers or trucks, tractors, excavators, trenchers, cranes, derricks, loaders, scrapers, pavers, generators, ditchers, compactors and rollers, pumps, concrete mixers, graders, or other material handling equipment.

CONSTRUCTION VIBRATION — Vibration occurring as a result of the operation of construction equipment during construction.

FREQUENCY OF VIBRATION — The rate of oscillation that occurs in one second, measured in hertz where 1 hertz equals 1 cycle per second;

PEAK PARTICLE VELOCITY — The maximum rate of change with respect to time of the particle displacement, measured on the ground, and velocity amplitudes are given in units of millimeters per second from zero to peak amplitude;

VIBRATION CONTROL FORM — The form prescribed by the Chief Building Official to provide information regarding construction vibration to accompany an application for a permit;

ZONE OF INFLUENCE — The area of land within or adjacent to a construction site, including any buildings or structures, that potentially may be impacted by vibrations emanating from a construction activity where the peak particle velocity measured at the point of reception is equal to or greater than 5 mm/sec at any frequency or such greater area where specific site conditions are identified by the professional engineer in a study contemplated in Subsection C3(a).

B. Table 1.0 "Prohibited Construction Vibrations".

(1) No person shall carry on a construction activity resulting in construction vibrations that exceed the levels set out in Table 1.0 "Prohibited Construction Vibrations:

Table 1.0 "Prohibited Construction Vibrations"	
Frequency of Vibration (hertz)	Vibration Peak Particle Velocity (mm/sec)
Less than 4	8
4 to 10	15
More than 10	25

(2) Where the professional engineer has submitted a report under Subsection D and identified lower levels than set out in Table 1.0 above, then levels exceeding those in the report shall be the prohibited construction vibrations.

C. Vibration control form.

(1) In addition to the other requirements of this article, an applicant for a permit for construction, including demolition, shall submit as part of the permit application a vibration control form that provides the following information and is accompanied by plans and other documents set out below.

(2) The vibration control form shall identify whether the construction activity will include blasting, deep foundations, drilled caisson, large scale soil compaction or construction within the water table, or any other construction activity or method that has the potential to cause vibrations which may impact on buildings or structures outside of the construction site that is the subject of the permit application.

(3) If construction activities as described in Subsection B(1) are identified, the vibration control form shall also include the following:

(a) A preliminary study, including a plan showing the construction site and adjacent land and buildings, prepared by a professional engineer that identifies the zone of influence of vibrations and whether the zone of influence will extend beyond the legal boundaries of the construction site that is the subject of the permit application.

(b) The existence within the zone of influence of any buildings that have been designated under the *Ontario Heritage Act*; and

(c) A general review commitment certificate and letter of undertaking in a form acceptable to the Chief Building Official.

(4) In determining the zone of influence for the construction the professional engineer shall consider the following:

(a) Soil conditions of the construction site and adjacent land;

(b) Weather conditions that will exist at the time of construction that may result in construction vibrations;

(c) Whether the proposed construction will be above or below the water table;

(d) The presence of heritage designated or listed properties and sensitive structures or buildings or infrastructure;

(e) The precise location of the source of vibration;

(f) Any unique site conditions;

(g) Whether it would be prudent, in the circumstances, to have a zone of influence that is larger than would result if the analysis had only been restricted to the predicted peak particle velocity values set out in Column 1 of the Table in Subsection B; and

(h) Such further matters identified by the professional engineer which may be relevant to identifying the zone of influence in a specific situation.

(5) After the issuance of a building permit, if a construction activity that was not identified in a vibration control form is proposed or commenced, the applicant shall comply with the requirements the Section, where in the opinion of the Chief Building Official the construction activity may contribute to vibrations.

D. Pre-construction consultation and monitoring program.

If a zone of influence will extend beyond the legal boundaries of the construction site that is the subject of the permit application, the applicant shall:

(1) Carry out a public pre-construction consultation with all property owners and occupants within the zone of influence advising of the possibility of construction vibrations and the provisions of this section;

(2) As part of an application for a permit provide a report from a professional engineer addressing the following matters:

(a) A summary of the pre-construction consultations between the applicant and the owners and occupants of properties within the zone of influence, including comments provided to the applicant by the owners and occupants during the consultations;

(b) Pre-construction measurements of background vibrations within the zone of influence;

(c) Pre-construction inspection of adjacent buildings and structures within the zone of influence to identify existing cracks in walls, floors and exterior cladding of the first two storeys above grade and interior finishes of all storeys below grade in sufficient detail to facilitate comparison of pre-construction and post-construction condition;

(d) Where it is not possible to gain access for a pre-construction inspection, statements of the efforts made to gain access;

(e) Identification of mitigation measures to reduce the impacts of construction related vibrations within the zone of influence; and

(f) A monitoring program to measure variances in the vibration levels before and during construction activities which shall be verified by a professional engineer, and shall include:

[1] The number and location of seismographs to be used;

[2] The sampling frequency;

[3] The result transmittal protocol;

[4] Ambient vibration levels;

[5] A public communications protocol;

[6] A complaints protocol during construction; and

[7] Procedures for construction method alteration to address the occurrence of excessive vibrations.

(3) The mitigation measures and monitoring program required under Subsection D(2)(e) and (f) shall be implemented so that construction activities do not exceed maximum frequency based limits for peak particle velocity as set out in Subsection B or such lower levels as may be identified by the professional engineer as being prudent taking into consideration site specific conditions.

(4) The monitoring program shall include no less than one on-site seismograph that is to be operated continuously to record the vibration frequency and peak particle velocity for construction vibrations at all times construction activities identified in subsection C(2).

E. Monitoring of vibrations during construction.

The applicant shall monitor the vibration levels and report on the monitoring as follows:

(1) The applicant shall monitor vibration levels during construction in accordance with the monitoring program submitted with the application for a permit under Subsection D(2)(f).

(2) Where in the opinion of the professional engineer it is prudent to do so monitoring shall be based to detect levels below those set out in the Table in Subsection B.

(3) The applicant shall submit a copy in writing of all vibration measurements recorded as part of the monitoring program to the building inspector assigned to the project at the end of each work day, or as requested by the building inspector.

(4) Construction activity shall not be carried on when it will result in vibration measurements that exceed the prohibited construction vibration levels set out in Subsection B.

F. Public communications and complaint protocol.

The applicant shall, in addition to the preconstruction survey required in Subsection C provide for the following public communications and complaints protocols:

(1) At least one week before the commencement of construction activity that may cause vibrations the applicant shall notify the ward Councillor and owners and occupants of properties within the zone of influence of the scheduled construction activity.

(2) The notice required under Subsection F(1), shall include the following:

(a) An explanation of the proposed construction activity and its potential to produce vibrations;

(b) A statement of the levels of construction vibration that are prohibited in this Section;

(c) The address of the construction site where the construction activity will occur;

(d) The date and time that the work will occur;

(e) The name, address, telephone number, and other contact information through which a person affected by vibrations may contact the applicant and the person carrying out the construction activity for the applicant; and

(f) Contact information for Toronto Building staff assigned to the project.

(3) In the event that the applicant receives a complaint or is otherwise notified of a complaint about vibrations from the construction activity, the applicant shall cause the professional engineer monitoring the project to immediately perform vibration measurement at the complainant's location during activities representative of the offending operation and to provide to the complainant and to the building inspector assigned to the project a copy of the measurement results including an interpretation by the professional engineer of the possible impacts such construction vibrations might have on the building or structure of the complainant; and

(4) In the event that the measurements at the complainant's location exceed the limits set out in Subsection B, all construction activity generating the vibrations shall immediately cease and not resume until mitigation measures are implemented to reduce the vibration levels so that they are below the limits set out Subsection B.

2. This by-law comes into force on the day that is 60 days after it is passed.

ENACTED AND PASSED this 27th day of May, A.D. 2008.

GLORIA LINDSAY LUBY,
Deputy Speaker

ULLI S. WATKISS
City Clerk

(Corporate Seal)

Town of Whitby
By-law # 6917-14

Noise By-law

Being a By-law to prohibit and regulate noise within the Town of Whitby.

Whereas Section 129 of the Municipal Act provides that a local municipality may prohibit and regulate noise;

And Whereas the Council of the Town of Whitby considers the prohibition and regulation of noise within the Town to be in the interest of the community;

Now therefore, the Council of The Corporation of the Town of Whitby hereby enacts as follows:

1. Definitions

1.1. "agricultural area" means an area designated as such in the Town of Whitby Zoning By-laws and includes an identified non-conforming use;

1.2. "commercial area" means an area designated as such in the Town of Whitby Zoning By-laws and includes an identified non-conforming use;

1.3. "construction" includes the erection, alteration, repair, dismantling, demolition or structural maintenance of buildings, land clearing, earth moving, grading, excavating, laying of pipe and conduit whether above or below ground level, street and highway building, application of concrete, equipment installation and alteration and the structural installation of construction components and materials in any form or for any purpose, and includes any work in connection therewith;

1.4. "conveyance" means any type of device designed or capable for use as a means of physically transporting persons from one place to another;

1.5. "exhaust muffling device" means a muffler in good working order and in constant operation to prevent excessive or unusual noise from a motor vehicle;

1.6. "heavy equipment" means any equipment, tool or device designed or capable of use in construction or demolition, automotive repair or material handling, including but not limited to air compressors, pile drivers, pneumatic or hydraulic tools, bulldozers, tractors, excavators, trenchers, cranes, derricks, loaders, scrapers, pavers, generators, off highway haulers or trucks, ditchers, compactors and rollers, pumps, concrete mixers, graders, or other material handling equipment;

1.7. "highway" includes a common and public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct or trestle designed and intended for use or used by the general public for the passage of vehicles and includes a road allowance and/or right of way;

1.8. "industrial area" means an area designated as such in the Town of Whitby Zoning By-laws and includes an identified non-conforming use;

1.9. "inhabitants" means those people normally residing or working within the Town, which includes any temporary resident or occupier of a premises within the Town;

1.10. "motor vehicle" includes an automobile, motorcycle and any other vehicle propelled or driven otherwise than by muscular power, but does not include the cars of electric or steam railways, or other motor vehicle running only upon rails, traction engines, farm tractors, self-propelled implements of husbandry or road building machines within the meaning of the Highway Traffic Act;

1.11. "non-conforming" means a use which does not comply with the provisions of the Town's Zoning By-laws for the zone in which such use is located as of the date of passing of the Town's Zoning By-laws;

1.12. "parks area" includes playgrounds, sports fields, memorial squares, gardens, waters, marinas, boat launches, and any other area or areas owned and used by the Town for active or passive recreational purposes or for any other purpose ancillary thereto;

1.13. "point of reception" means any point on the premises of a person where noise, originating from other than those premises, is received;

1.14. "officer" means a municipal law enforcement officer appointed by the Town to enforce the provisions of this by-law or a police officer who is a member of the Durham Regional Police Service;

1.15. "Region" means the Region of Durham;

1.16. "residential area" means an area designated as such in the Town of Whitby Zoning By-laws and includes an identified non-conforming use;

1.17. "special event" includes a demonstration, parade, sports event, festival, carnival and other like events;

1.18. "statutory holiday" means any holiday designated a holiday in the Retail Business Holidays Act; and

1.19. "Town" means The Corporation of the Town of Whitby or the territorial jurisdiction of the Town of Whitby as the context requires.

2. Interpretation

2.1. Unless otherwise specified, references in this by-law to sections, subsections, clauses and schedules are references to sections, subsections, clauses and schedules in this by-law.

2.2. If a court of competent jurisdiction declares any section, or any part of any section of this by-law to be invalid, or to be of no force and effect, it is the intention of the Town that every other provision of the by-law be applied and enforced in accordance with its terms to the extent possible according to law.

2.3. References in this by-law to any statute or statutory provision include references to that statute or statutory provision as it may from time to time be amended, extended or re-enacted.

2.4. This by-law shall be read with all changes in gender or number as the context requires.

3. Regulation

3.1. No person shall cause or permit to be caused any noise audible at a point of reception listed in "Schedule 1 – Prohibited Noise".

3.2. No person shall cause or permit to be caused any noise audible at a point of reception listed in "Schedule 2 – Prohibited Noise by Time and Place" where the noise occurs during the prohibited times specified in the schedule.

3.3. Notwithstanding any other provision in this by-law, a person may cause or permit to be caused any noise audible at a point of reception provided the noise is in connection with any of the activities listed in "Schedule 3 – Exempted Noise".

3.4. Notwithstanding any other provision in this by-law, a person may cause or permit to be caused any noise audible at a point of reception in connection with legitimate emergency measures for the protection of the immediate health, safety or welfare of the inhabitants of the Town or for the preservation or protection of property.

Delegation of Authority for Infrastructure Works

3.5. The Commissioner of Public Works is delegated the authority to approve noise by-law exemptions for construction works undertaken by the Town of Whitby, Region of Durham and/or Ministry of Transportation (with the exception of Highway 407 related activities), subject to the following general guidelines;

3.5.1. if possible, work outside the limits of this by-law will be avoided,

3.5.2. if possible, evening work within 400 meters of residential dwelling will be avoided,

3.5.3. if possible, Sunday work will be avoided, however if Sunday work is required, work will be limited to between 8:00 a.m. and 5:00 p.m., whenever possible, and

3.5.4. no evening work will be permitted on holiday weekends.

4. General

4.1. The activities listed in "Schedule 1 – Prohibited Noise" are deemed to be noises which are likely to disturb the inhabitants of the Town if audible at a point of reception.

4.2. The activities listed in "Schedule 2 – Prohibited Noise by Time and Place" are deemed to be noises which are likely to disturb the inhabitants of the Town if the noise occurs within the identified times specified in the schedule and are audible at a point of reception.

4.3. The activities listed in "Schedule 3 – Exempted Noise" are deemed to be noises which are considered to be reasonable or necessary in consideration of the circumstances and are exempted from the provisions of this by-law.

5. Schedule(s)

5.1. Schedule 1 – Prohibited Noise

5.2. Schedule 2 – Prohibited Noise by Time and Place

5.3. Schedule 3 – Exempted Noise

6. Enforcement and Penalties

6.1. The provisions of this by-law may be enforced by an officer.

6.2. Every person who contravenes any provision of this by-law is guilty of an offence and upon conviction is liable to a penalty as provided by the *Municipal Act*.

7. Short Title

7.1. This by-law may be cited as the Noise By-law.

8. Repeal of Existing By-law

8.1. By-law No. 292-70, being a by-law to regulated noises calculated to disturb the inhabitants of the Town of Whitby, is repealed.

8.2. By-law No. 531-77, being a by-law to amend By-law No. 292-70, is repealed.

8.3. By-law No. 891-79, being a by-law to amend By-law No. 292-70, is repealed.

8.4. By-law No. 6862-14, being a by-law to amend By-law No. 292-70, is repealed.

9. Effective Date

9.1. This by-law shall come into force and effect on the day of its passage.

By-law read and passed this 8th day of September, 2014.



Patricia Perkins, Mayor

Debi A. Wilcox, Town Clerk

Schedule 1 – Prohibited Noise

1. The operation of any electronic device or group of connected electronic devices incorporating one or more speakers and intended for the production, reproduction or amplification of sound at such a volume that it is audible from the interior of a residence or business whose occupant has made every reasonable attempt to mitigate the reception of the noise.

2. Shouting, screaming, yelling, singing or the playing of instruments at such a volume that it is audible from the interior of a residence or business whose occupant has made every reasonable attempt to mitigate the reception of the noise.

3. Racing of any motorized conveyance other than in a racing event regulated by law or in a facility for racing motorized conveyances that is not otherwise prohibited by law.

4. The excessive and unnecessary revving of any engine.

5. The operation of a motor vehicle in such a manner that the tires squeal.

6. The operation of any motor vehicle without an exhaust muffling device in good working order.

7. The operation of a motor vehicle or motor vehicle with a trailer which results in banging, clanking, squealing or other like sounds due to an unsecured or improperly secured load or inadequate maintenance of the vehicle or trailer.

8. The operation of a horn or other warning device except where required and authorized by law or in the interest of good safety practices.

9. The operation of a stereo or other electronic device designed to amplify sound in a motor vehicle at such a volume that the sound is clearly audible from the outside of the motor vehicle.

Schedule 2 – Prohibited Noise by Time and Place

Type of Noise	Prohibited Times	
	Residential and Parks Area	Commercial, Industrial, Agricultural Area
1. The operation of any auditory signaling device, including but not limited to the ringing of bells or gongs and the blowing of horns or sirens or whistles, except wind chimes, or the production, reproduction or amplification of any similar sounds by electronic means except where required or authorized by law.	9:00 PM to 7:00 AM	9:00 PM to 7:00 AM
2. The operation of any electronic device or group of connected electronic devices incorporating one or more speakers or other electro-mechanical transducers, and intended for the production, reproduction or amplification of sound.	9:00 PM to 7:00 AM (prohibited at any time in a parks area, except in accordance with Schedule 3 to this by-law)	9:00 PM to 7:00 AM
3. All selling or advertising by shouting or amplified sound.	Prohibited at any time	9:00 PM to 7:00 AM
4. Loading, unloading, delivering, packing, unpacking, or otherwise handling any containers, products, materials or refuse whatsoever, unless necessary for the maintenance of essential services.	9:00 PM to 7:00 AM	9:00 PM to 7:00 AM (permitted at any time in an industrial area)
5. The operation of heavy equipment in connection with construction or demolition, automotive repair or material handling.	8:00 PM to 7:00 AM (prohibited at any time on Sundays and statutory holidays)	8:00 PM to 7:00 AM (prohibited at any time on Sundays and statutory holidays)

Schedule 2 (continued) – Prohibited Noise by Time and Place

Type of Noise	Prohibited Times	
	Residential and Parks Area	Commercial, Industrial, Agricultural Area
6. The operation of any motorized conveyance other than on a highway or other place where its operation is permitted by all applicable legislation.	Prohibited at any time	Generally prohibited at any time (9:00 PM to 7:00 AM in permitted locations pursuant to the Town's Zoning By-laws)
7. The operation of a combustion engine which is used in a toy or model or replica, which is not a vehicle.	9:00 PM to 7:00 AM	9:00 PM to 7:00 AM
8. The operation of any powered or non-powered tool for domestic purposes.	9:00 PM to 7:00 AM	9:00 PM to 7:00 AM
9. The operation of any lawn mower, trimmer or similar device.	9:00 PM to 7:00 AM	9:00 PM to 7:00 AM
10. The operation of any snow thrower, snow blower or similar device.	10:00 PM to 6:00 AM	10:00 PM to 6:00 AM
11. The operation of solid waste bulk lift or refuse compacting equipment.	9:00 PM to 7:00 AM	9:00 PM to 7:00 AM
12. Yelling, whistling, singing, speaking or the playing of instruments at such a volume that it is audible off of the property from which it originates at any point of reception.	9:00 PM to 7:00 AM	9:00 PM to 7:00 AM

Schedule 3 – Exempted Noise

1. The use in a reasonable manner of an apparatus or mechanism for the amplification of the human voice or of music in a public park or recreational area provided that a permit from the Town has first been obtained.

2. Any parade, provided that permission to hold the parade has been obtained from the Durham Regional Police Services and that a permit has been issued by the Town, and that there is compliance with all applicable laws.

3. Any special event held by the Town.

4. Any emergency work being carried out by the Town, the Regional Municipality of Durham, the Ministry of Transportation, any electric utility company; natural gas or telephone utility.

5. The ringing of school bells or the sounding of a public address system on a property owned by the Durham District School Board or the Durham Catholic District School Board or a recognized private school.

6. The sounding of bells or chimes or the use of an apparatus or mechanism for the amplification of the human voice or of music for the purpose of a call to prayer on a property operated as a church or a place of worship.

7. Any noise originating from, or caused by, the operation of farm equipment or machinery for cultivating, seeding, crop maintenance or harvesting purposes on any lands designated as an agricultural area.

8. Any noise originating from, or caused by, the operation of aircraft or aircraft movements which are regulated by the Federal government.

9. Any noise originating from, or caused by, the operation of trains or track maintenance including train whistles, provided a stand-alone by-law prohibiting the same does not exist.

10. Any fireworks display authorized or permitted by the Town and in compliance with all applicable legislation including the Fireworks By-law.

11. Necessary operations carried out in the interest of public necessity and convenience, including but not limited to snow clearing, street cleaning and garbage collection, undertaken by or on behalf of the Town or the Region.

12. Any snow removal activities which are essential for the effective operation of a business.

Schedule 3 (continued) – Exempted Noise

13. Any reasonable noise resulting from the operation of a business activity provided that such noise is part of the normal operation of the business and provided that the business is operating in compliance with the Town's Zoning By-laws and all other applicable laws.

APPENDIX E: DEVELOPMENT APPLICATIONS SITE PLANS

DRAFT

WATERMAIN NOTES:

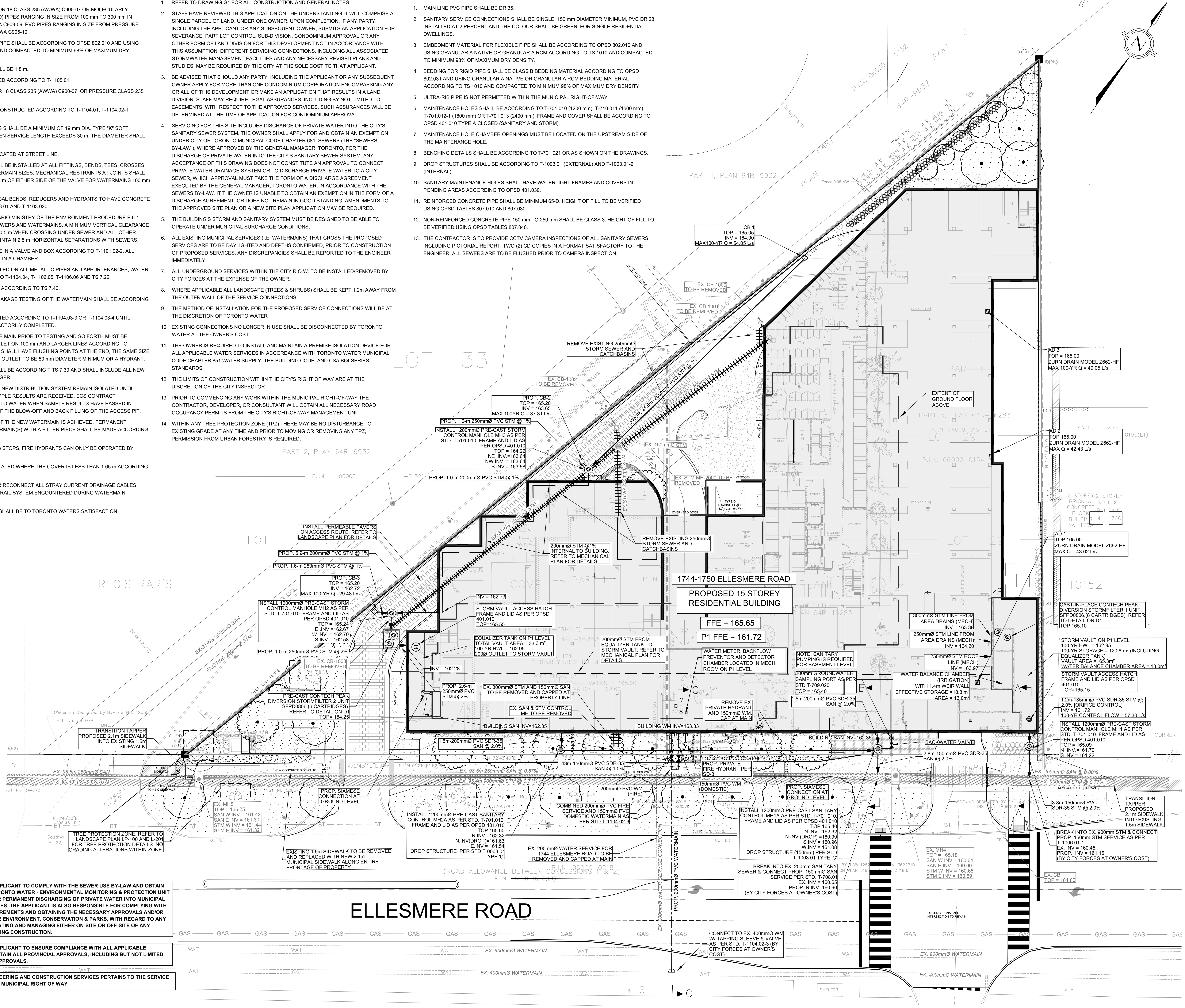
1. PVC WATERMAINS SHALL BE MINIMUM DR 18 CLASS 235 (AWWA) C900-07 OR MOLECULARLY ORIENTED POLYVINYL CHLORIDE (PVCO) PIPES RANGING IN SIZE FROM 100 mm TO 300 mm IN DIAMETER PRESSURE CLASS 235 AWWA C909-09. PVC PIPES RANGINS IN SIZE FROM PRESSURE RATING 235, DR 18, ACCORDING TO AWWA C905-10
2. EMBEDMENT MATERIAL FOR FLEXIBLE PIPE SHALL BE ACCORDING TO OPSD 802.010 AND USING GRANULAR A ACCORDING TO TS 1010 AND COMPACTED TO MINIMUM 98% OF MAXIMUM DRY DENSITY.
3. MINIMUM COVER ON WATERMAINS SHALL BE 1.8 m.
4. ALL HYDRANTS SHALL BE CONSTRUCTED ACCORDING TO T-1105.01.
5. HYDRANT LEADS SHALL BE MINIMUM DR 18 CLASS 235 (AWWA) C900-07 OR PRESSURE CLASS 235 AWWA C909-09.
6. ALL SERVICE CONNECTION SHALL BE CONSTRUCTED ACCORDING TO T-1104.01, T-1104.02-1, T-1104.02-3, T-1105.02-1 AND T-1105.02-2.
7. SINGLE WATER SERVICE CONNECTIONS SHALL BE A MINIMUM OF 19 mm DIA. TYPE "K" SOFT COPPER ACCORDING TO T-1104.01. WHEN SERVICE LENGTH EXCEEDS 30 m, THE DIAMETER SHALL BE 25 mm DIA.
8. ALL CURB AND VALVE BOXES TO BE LOCATED AT STREET LINE.
9. MECHANICAL TRUST RESTRAINTS SHALL BE INSTALLED AT ALL FITTINGS, BENDS, TEES, CROSSES, REDUCERS AND VALVES FOR ALL WATERMAIN SIZES. MECHANICAL RESTRAINTS AT JOINTS SHALL BE INSTALLED AT EVERY PIPE JOINT 6.1 m OF EITHER SIDE OF THE VALVE FOR WATERMAINS 100 mm DIAMETER OR LARGER.
10. ALL TEES, PLUGS, HORIZONTAL, VERTICAL BENDS, REDUCERS AND HYDRANTS TO HAVE CONCRETE THRUST BLOCKS ACCORDING TO T-1103.01 AND T-1103.020.
11. WATERMAINS MUST FOLLOW THE ONTARIO MINISTRY OF THE ENVIRONMENT PROCEDURE F-6-1 THAT GOVERN THE SEPARATION OF SEWERS AND WATERMAINS. A MINIMUM VERTICAL CLEARANCE OF 0.30 m WHEN CROSSING OVER AND 0.5 m WHEN CROSSING UNDER SEWER AND ALL OTHER UTILITIES IS REQUIRED. MUST ALSO MAINTAIN 2.5 m HORIZONTAL SEPARATIONS WITH SEWERS.
12. ALL VALVES LESS THAN 400 mm WILL BE IN A VALVE AND BOX ACCORDING TO T-1101.02-2. ALL VALVES 400 mm AND LARGER SHALL BE IN A CHAMBER.
13. SACRIFICIAL ANODES SHALL BE INSTALLED ON ALL METALLIC PIPES AND APPURTENANCES, WATER SERVICES AND FITTINGS ACCORDING TO T-1104.04, T-1106.05, T-1106.06 AND TS 7.22.
14. TRACER WIRE INSTALLATION SHALL BE ACCORDING TO TS 7.40.
15. HYDROSTATIC PRESSURE TEST AND LEAKAGE TESTING OF THE WATERMAIN SHALL BE ACCORDING TO TS 441.
16. THE NEW WATERMAIN SHALL BE ISOLATED ACCORDING TO T-1104.03-3 OR T-1104.03-4 UNTIL BACTERIOLOGICAL TESTS ARE SATISFACTORILY COMPLETED.
17. PROVISIONS FOR FLUSHING THE WATER MAIN PRIOR TO TESTING AND SO FORTH MUST BE PROVIDED WITH AT LEAST A 50 mm OUTLET ON 100 mm AND LARGER LINES ACCORDING TO T-1104.03-1. COPPER WATER SERVICES SHALL HAVE FLUSHING POINTS AT THE END, THE SAME SIZE AS THE LINE. ON FIRE LINES, FLUSHING OUTLET TO BE 50 mm DIAMETER MINIMUM OR A HYDRANT.
18. DISINFECTION OF THE WATERMAIN SHALL BE ACCORDING T TS 7.30 AND SHALL INCLUDE ALL NEW WATER SERVICES 100 mm DIA AND LARGER.
19. TORONTO WATER REQUIRES THAT THE NEW DISTRIBUTION SYSTEM REMAIN ISOLATED UNTIL SATISFACTORY BACTERIOLOGICAL SAMPLE RESULTS ARE RECEIVED. ECS CONTRACT ADMINISTRATOR SHALL NOTIFY TORONTO WATER WHEN SAMPLE RESULTS HAVE PASSED IN ORDER TO PROCEED WITH REMOVAL OF THE BLOW-OFF AND BACK FILLING OF THE ACCESS PIT.
20. AFTER SATISFACTORY DISINFECTION OF THE NEW WATERMAIN IS ACHIEVED, PERMANENT CONNECTIONS TO THE EXISTING WATERMAIN(S) WITH A FILTER PIECE SHALL BE MADE ACCORDING TO TS 7.70.
21. CITY IN-SERVICE WATER VALVES, CURB STOPS, FIRE HYDRANTS CAN ONLY BE OPERATED BY TORONTO WATER STAFF.
22. ALL NEW WATERMAINS SHALL BE INSULATED WHERE THE COVER IS LESS THAN 1.65 m ACCORDING TO T-708.01-4.
23. THE CONTRACTOR SHALL CONNECT OR RECONNECT ALL STRAY CURRENT DRAINAGE CABLES CONNECTED TO THE TTC ELECTRIFIED RAIL SYSTEM ENCOUNTERED DURING WATERMAIN CONSTRUCTION.
24. THE LOCATION OF THE WATER METER SHALL BE TO TORONTO WATERS SATISFACTION

GENERAL NOTES:

1. REFER TO DRAWING G1 FOR ALL CONSTRUCTION AND GENERAL NOTES.
2. STAFF HAVE REVIEWED THIS APPLICATION ON THE UNDERSTANDING IT WILL COMPRISE A SINGLE PARCEL OF LAND, UNDER ONE OWNER, UPON COMPLETION. IF ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, SUBMITS AN APPLICATION FOR SEVERANCE, PART LOT CONTROL, SUB-DIVISION, CONDOMINIUM APPROVAL OR ANY OTHER FORM OF LAND DIVISION FOR THIS DEVELOPMENT NOT IN ACCORDANCE WITH THIS ASSUMPTION, DIFFERENT SERVICING CONNECTIONS, INCLUDING ALL ASSOCIATED STORMWATER MANAGEMENT FACILITIES AND ANY NECESSARY REVISED PLANS AND STUDIES, MAY BE REQUIRED BY THE CITY AT THE SOLE COST TO THAT APPLICANT.
3. BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, STAFF MAY REQUIRE LEGAL ASSURANCES, INCLUDING BY NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPROVED SERVICES. SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL.
4. SERVICING FOR THIS SITE INCLUDES DISCHARGE OF PRIVATE WATER INTO THE CITY'S SANITARY SEWER SYSTEM. THE OWNER SHALL APPLY FOR AND OBTAIN AN EXEMPTION UNDER CITY OF TORONTO MUNICIPAL CODE CHAPTER 681, SEWERS (THE "SEWERS BY-LAW"), WHERE APPROVED BY THE GENERAL MANAGER, TORONTO, FOR THE DISCHARGE OF PRIVATE WATER INTO THE CITY'S SANITARY SEWER SYSTEM. ANY ACCEPTANCE OF THIS DRAWING DOES NOT CONSTITUTE AN APPROVAL TO CONNECT PRIVATE WATER DRAINAGE SYSTEM OR TO DISCHARGE PRIVATE WATER TO A CITY SEWER, WHICH APPROVAL MUST TAKE THE FORM OF A DISCHARGE AGREEMENT EXECUTED BY THE GENERAL MANAGER, TORONTO WATER, IN ACCORDANCE WITH THE SEWERS BY-LAW. IT THE OWNER IS UNABLE TO OBTAIN AN EXEMPTION IN THE FORM OF A DISCHARGE AGREEMENT, OR DOES NOT REMAIN IN GOOD STANDING, AMENDMENTS TO THE APPROVED SITE PLAN OR A NEW SITE PLAN APPLICATION MAY BE REQUIRED.
5. THE BUILDING'S STORM AND SANITARY SYSTEM MUST BE DESIGNED TO BE ABLE TO OPERATE UNDER MUNICIPAL SURCHARGE CONDITIONS.
6. ALL EXISTING MUNICIPAL SERVICES (I.E. WATERMAINS) THAT CROSS THE PROPOSED SERVICES ARE TO BE DAYLIGHTED AND DEPTHS CONFIRMED, PRIOR TO CONSTRUCTION OF PROPOSED SERVICES. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
7. ALL UNDERGROUND SERVICES WITHIN THE CITY R.O.W. TO BE INSTALLED/REMOVED BY CITY FORCES AT THE EXPENSE OF THE OWNER.
8. WHERE APPLICABLE ALL LANDSCAPE (TREES & SHRUBS) SHALL BE KEPT 1.2m AWAY FROM THE OUTER WALL OF THE SERVICE CONNECTIONS.
9. THE METHOD OF INSTALLATION FOR THE PROPOSED SERVICE CONNECTIONS WILL BE AT THE DISCRETION OF TORONTO WATER
10. EXISTING CONNECTIONS NO LONGER IN USE SHALL BE DISCONNECTED BY TORONTO WATER AT THE OWNER'S COST
11. THE OWNER IS REQUIRED TO INSTALL AND MAINTAIN A PREMISE ISOLATION DEVICE FOR ALL APPLICABLE WATER SERVICES IN ACCORDANCE WITH TORONTO WATER MUNICIPAL CODE CHAPTER 851 WATER SUPPLY, THE BUILDING CODE, AND CSA B64 SERIES STANDARDS
12. THE LIMITS OF CONSTRUCTION WITHIN THE CITY'S RIGHT OF WAY ARE AT THE DISCRETION OF THE CITY INSPECTOR
13. PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL RIGHT-OF-WAY THE CONTRACTOR, DEVELOPER, OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT-OF-WAY MANAGEMENT UNIT
14. WITHIN ANY TREE PROTECTION ZONE (TPZ) THERE MAY BE NO DISTURBANCE TO EXISTING GRADE AT ANY TIME AND PRIOR TO MOVING OR REMOVING ANY TPZ, PERMISSION FROM URBAN FORESTRY IS REQUIRED.

SANITARY AND STORM SEWER NOTES:

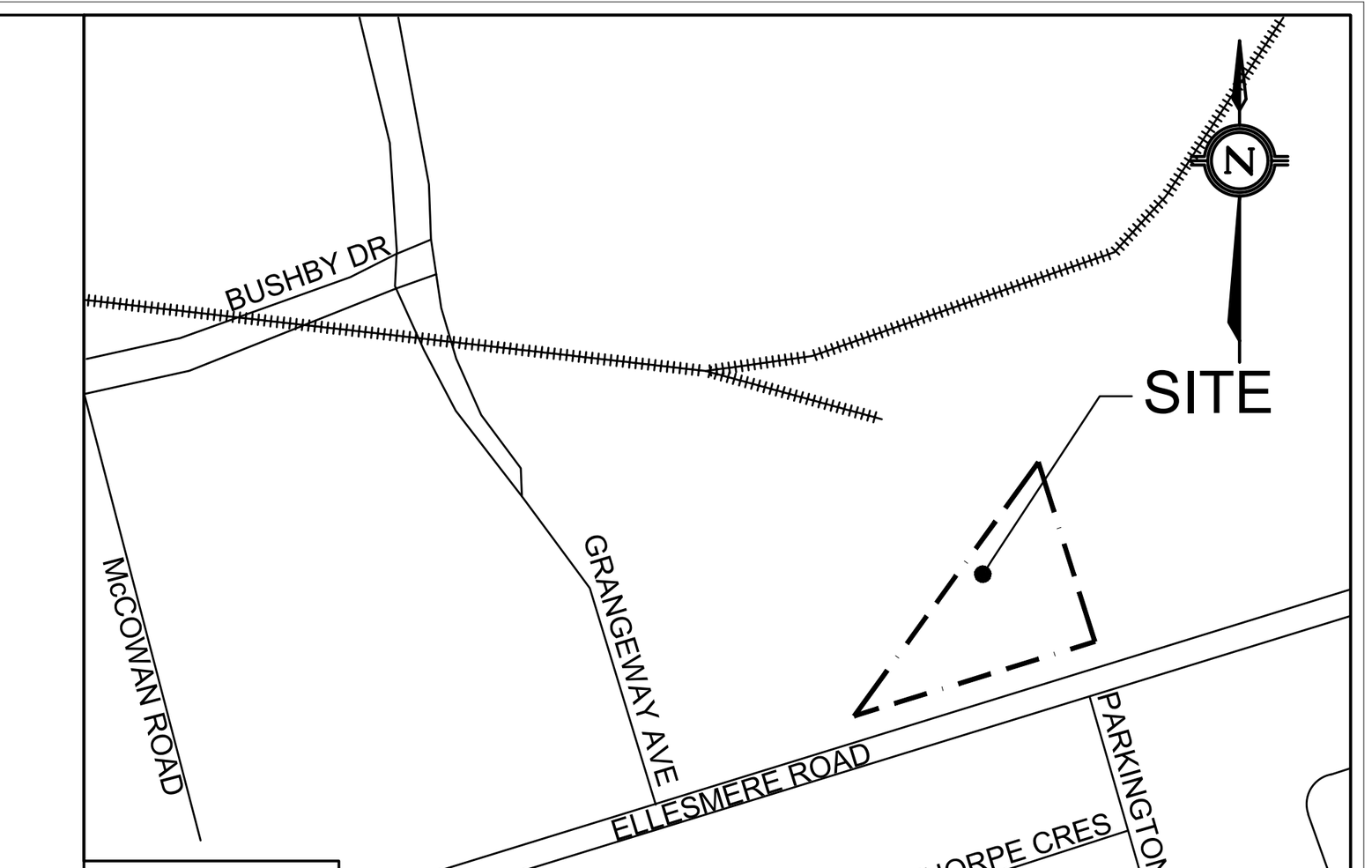
1. MAIN LINE PVC PIPE SHALL BE DR 35.
2. SANITARY SERVICE CONNECTIONS SHALL BE SINGLE, 150 mm DIAMETER MINIMUM, PVC DR 28 INSTALLED AT 2 PERCENT AND THE COLOUR SHALL BE GREEN, FOR SINGLE RESIDENTIAL DWELLINGS.
3. EMBEDMENT MATERIAL FOR FLEXIBLE PIPE SHALL BE ACCORDING TO OPSD 802.010 AND USING GRANULAR A NATIVE OR GRANULAR A RCM ACCORDING TO TS 1010 AND COMPACTED TO MINIMUM 98% OF MAXIMUM DRY DENSITY.
4. BEDDING FOR RIGID PIPE SHALL BE CLASS B BEDDING MATERIAL ACCORDING TO OPSD 802.031 AND USING GRANULAR A NATIVE OR GRANULAR A RCM BEDDING MATERIAL ACCORDING TO TS 1010 AND COMPACTED TO MINIMUM 98% OF MAXIMUM DRY DENSITY.
5. ULTRA-RIB PIPE IS NOT PERMITTED WITHIN THE MUNICIPAL RIGHT-OF-WAY.
6. MAINTENANCE HOLES SHALL BE ACCORDING TO T-701.010 (1200 mm), T-710.011 (1500 mm), T-701.012-1 (1800 mm) OR T-701.013 (2400 mm). FRAME AND COVER SHALL BE ACCORDING TO OPSD 401.010 TYPE A CLOSED (SANITARY AND STORM).
7. MAINTENANCE HOLE CHAMBER OPENINGS MUST BE LOCATED ON THE UPSTREAM SIDE OF THE MAINTENANCE HOLE.
8. BENCHING DETAILS SHALL BE ACCORDING TO T-701.021 OR AS SHOWN ON THE DRAWINGS.
9. DROP STRUCTURES SHALL BE ACCORDING TO T-1003.01 (EXTERNAL) AND T-1003.01-2 (INTERNAL)
10. SANITARY MAINTENANCE HOLES SHALL HAVE WATERTIGHT FRAMES AND COVERS IN PONDING AREAS ACCORDING TO OPSD 401.030.
11. REINFORCED CONCRETE PIPE SHALL BE MINIMUM 65-D. HEIGHT OF FILL TO BE VERIFIED USING OPSD TABLES 807.010 AND 807.030.
12. NON-REINFORCED CONCRETE PIPE 150 mm TO 250 mm SHALL BE CLASS 3. HEIGHT OF FILL TO BE VERIFIED USING OPSD TABLES 807.040.
13. THE CONTRACTOR IS TO PROVIDE CCTV CAMERA INSPECTIONS OF ALL SANITARY SEWERS, INCLUDING PICTORIAL REPORT, TWO (2) CD COPIES IN A FORMAT SATISFACTORY TO THE ENGINEER. ALL SEWERS ARE TO BE FLUSHED PRIOR TO CAMERA INSPECTION.



IT IS THE RESPONSIBILITY OF THE APPLICANT TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS/PERMITS FROM TORONTO WATER - ENVIRONMENTAL MONITORING & PROTECTION UNIT FOR ANY PROPOSED TEMPORARY OR PERMANENT DISCHARGING OF PRIVATE WATER INTO MUNICIPAL SEWER SYSTEMS AND WATERCOURSES. THE APPLICANT IS ALSO RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING THE NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF THE ENVIRONMENT, CONSERVATION & PARKS, WITH REGARD TO ANY PROPOSED DEWATERING AND MITIGATING AND MANAGING EITHER ON-SITE OR OFF-SITE OF ANY PRIVATE WATER ENCOUNTERED DURING CONSTRUCTION.

IT IS THE RESPONSIBILITY OF THE APPLICANT TO ENSURE COMPLIANCE WITH ALL APPLICABLE PROVINCIAL STANDARDS AND TO OBTAIN ALL PROVINCIAL APPROVALS, INCLUDING BUT NOT LIMITED TO ENVIRONMENTAL COMPLIANCE APPROVALS.

THE SIGNED ACCEPTANCE BY ENGINEERING AND CONSTRUCTION SERVICES PERTAINS TO THE SERVICE CONNECTIONS LOCATED WITHIN THE MUNICIPAL RIGHT OF WAY



KEY PLAN
SCALE: N.T.S.

LEGEND:

- PROPERTY BOUNDARY
- EXTENTS OF GROUND FLOOR
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED WATERMAIN
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING WATERMAIN
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED AREA DRAIN
- EXISTING COMBINED MANHOLE
- EXISTING CATCHBASIN
- VB PROPOSED VALVE & BOX
- PROPOSED FIRE HYDRANT
- M DOMESTIC WATER METER
- EXISTING FIRE HYDRANT
- TAPPING SLEEVE AND VALVE
- PIPE REMOVAL
- PERMEABLE PAVERS

TORONTO ENGINEERING AND CONSTRUCTION SERVICES DIVISION

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS.THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

MANAGER, DEVELOPMENT ENGINEERING DATE:

SITE PLAN
PREPARED BY: CLIMANS GREEN LIANG (CLG) ARCHITECTS INC.
DATE: OCTOBER 2020

TOPOGRAPHIC & LEGAL
PREPARED BY:PAUL KIDD SURVEYING LTD.
TOPO DATE: FEBRUARY 3RD, 2010

BENCHMARK NOTES
ELEVATIONS SHOWN ON THIS PLAN ARE GEODETIC AND ARE REFERRED TO THE CITY OF TORONTO BENCH MARK NO. MT132, LOCATED AT 1760 ELLESMERE ROAD, 0.15 WEST OF THE SOUTHWEST CORNER, 0.24 ABOVE THE SIDEWALK, HAVING AN ELEVATION OF 165.312 METRES.

Notes
1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

No.	Issue / Revision	Date	Auth.
5	REISSUED FOR SITE PLAN APPROVAL	05/18/2017	JM
6	REISSUED FOR SITE PLAN APPROVAL	06/20/2018	MC
7	REISSUED FOR SITE PLAN APPROVAL	10/19/2018	JG
8	REISSUED FOR SITE PLAN APPROVAL	08/15/2019	JG
9	REISSUED FOR SITE PLAN APPROVAL	09/23/2020	JG
10	ADDENDUM TO SPA SUBMISSION NO.9	11/06/2020	JG

LICENSED PROFESSIONAL ENGINEER
M. T. COLERIDGE
100011229
11/06/2020
PROVINCE OF ONTARIO

BURNSIDE

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1465 Pickering Parkway
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web www.rjburnside.com

Client
GREENWIN CORP.
19 LESMILL ROAD
TORONTO, ON
M3B 2T3

Drawing Title
AFFORDABLE RENTAL HOUSING DEVELOPMENT
1744 & 1750 ELLESMERE ROAD
TORONTO, ON

SERVICING PLAN

Drawn	Checked	Designed	Checked	Date	Drawing No.
JG	MC	JG	MC	17/12/12	S1
Project No. PEB018910		SPA File No. 10 242510 ESC 38 SA		Revision No.	
Scale 1:250		0 5.0 10.0 15.0m			

File: \\montv\Shared Work Areas\PEB018910 Ellesmere\Civil\2_Production\DWG\018910 S1.dwg Date Plotted: November 5, 2020 - 1:53 PM
Plotted by:JGordon Paper size: ARCH D (24.00 X 36.00 Inches) Plot table: Rjb Full Scale-pickering 2013.ctb

CONSTRUCTION NOTES:

1. ALL MATERIAL FOR SEWER, FORCEMAIN, WATERMAIN, HYDRANTS AND APPURTENANCES, SHALL BE ACCORDING TO CITY OF TORONTO MATERIAL/MANUFACTURE SPECIFICATIONS AS REQUIRED BY CHAPTER 6, MATERIAL SPECIFICATIONS FROM DESIGN CRITERIA FOR SEWERS AND WATERMAINS MANUAL.
2. UTILITY SEPARATION SHALL BE ACCORDING TO APPENDIX D OF THE CITY OF TORONTO DESIGN CRITERIA FOR SEWERS AND WATERMAINS MANUAL.
3. SERVICE CONNECTIONS AND UTILITY CUTS MADE IN ROAD PAVEMENTS SHALL BE BACKFILLED WITH UNSHRINKABLE FILL ACCORDING TO TS4.60.
4. ALL EXISTING UTILITIES SHOWN ON DRAWINGS (PLAN AND PROFILE) ARE FOR REFERENCE PURPOSES ONLY. THE CONTRACTOR SHALL SATISFY THEMSELVES AS TO THE ACTUAL LOCATION AND DEPTH OF ANY UTILITY AND SHALL BE LIABLE FOR ALL OR ANY DAMAGE.
5. ANY DISCREPANCIES BETWEEN SITE CONDITIONS AND CONSTRUCTION DRAWINGS MUST BE REPORTED TO THE CITY PRIOR TO COMMENCEMENT OF CONSTRUCTION AND APPROPRIATE ACTION TAKEN TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR.
6. ALL SURVEY STAKE LAYOUT POINTS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE LAYOUT SHALL BE IMMEDIATELY REPORTED TO THE CITY.
7. ATTENTION IS DESIRED TO THE POSSIBILITY OF EXISTING PRIVATE SPRINKLERS AND LIGHTING SYSTEMS WITHIN THE RIGHT-OF-WAY, WHICH ARE NOT SHOWN ON THE PLANS. LOCATING, WORKING AROUND AND PROTECTING THESE SYSTEMS SHALL BE COMPLETED AT NO EXTRA COST TO THE CITY.
8. AT ALL LOCATIONS WHERE THE PROPOSED WATERMAIN CROSSES UNDER OR ABOVE THE EXISTING SEWERS, OR UTILITIES, GRANULAR A BEDDING MATERIAL IS TO EXTEND FROM THE LOWER PIPE TO THE UPPER PIPE. GRANULAR A IS TO BE COMPACTED TO MINIMUM 98% OF MAXIMUM DRY DENSITY.
9. CONTRACTOR TO PROVIDE ADEQUATE SUPPORT DURING CONSTRUCTION BETWEEN THE NEW WATERMAIN AND EXISTING GAS MAINS. MAINTAIN 300 mm MINIMUM VERTICAL CLEARANCES BETWEEN THE NEW WATERMAIN AND EXISTING GAS MAINS LESS THAN 300 mm IN DIAMETER. MAINTAIN 600 mm MINIMUM VERTICAL CLEARANCE BETWEEN THE NEW WATERMAIN AND EXISTING GAS MAINS EQUAL TO OR GREATER THAN 300 mm IN DIAMETER.
10. ALL EXISTING WATERMAINS AND SEWER PIPES LARGER THAN 300 mm DIAMETER SHALL BE SUPPORTED ACCORDING TO TORONTO T-1007.01-4.
11. ALL DIMENSIONS ARE EXPRESSED IN METERS (m) AND PIPE SIZES ARE EXPRESSED IN MILLIMETERS (mm) UNLESS OTHERWISE NOTED.
12. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.
13. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.
14. RELOCATION OF ALL EXISTING UTILITIES THAT CONFLICT WITH THE PROPOSED SIDEWALK AND ENTRANCE IS TO BE COMPLETED AT THE DEVELOPER'S EXPENSE AND SUBJECT TO APPROVAL BY THE GOVERNING AGENCIES.
15. WITHIN ANY TREE PROTECTION ZONE (TPZ) THERE MAY BE NO DISTURBANCE TO EXISTING GRADE AT ANY TIME AND PRIOR TO MOVING OR REMOVING ANY TPZ, PERMISSION FROM URBAN FORESTRY IS REQUIRED.

GRADING NOTES

1. ALL AREA GRADING AND RESULTING DRAINAGE PATTERNS SHALL NOT ADVERSELY AFFECT ADJACENT LANDS.
2. THE STORM DRAINAGE SHALL BE SELF CONTAINED WITHIN THE SUBJECT PROPERTY UNTIL IT CAN BE DISCHARGED, REUSED, INFILTRATED AND/OR EVAPOTRANSPIRED IN A MANNER ACCEPTABLE TO THE CITY.
3. NO ALTERATIONS TO EXISTING BOUNDARY ELEVATIONS OR ADJACENT LANDS SHALL BE UNDERTAKEN UNLESS WRITTEN AGREEMENT WITH THE ADJACENT PROPERTY OWNER IS OBTAINED AND SUBMITTED IN A FORMAT ACCEPTABLE TO THE CITY.
4. RETAINING WALLS SHALL BE CONSTRUCTED ENTIRELY ON THE UPPER PROPERTY SO THAT TIE BACKS (IF REQUIRED) DO NOT CROSS PROPERTY BOUNDARIES.
5. MAXIMUM PONDING DEPTH 0.3M.
6. PROPOSED SPOT ELEVATIONS SHOWN ARE ON ASPHALT, LANDSCAPE OR CONCRETE AREAS. UNLESS OTHERWISE NOTED TOP OF CURB ELEVATIONS ARE 0.15M ABOVE ASPHALT ELEVATIONS EXCEPT AT CURB DEPRESSIONS AND WHEEL CHAIR RAMPS.

ROAD RECONSTRUCTION:

1. RECONSTRUCTION OF DRIVEWAY ENTRANCES SHALL BE ACCORDING TO T-310.050-8. (REV 3 SEP 2018)
2. LIMITS OF SIDEWALK / CURB RECONSTRUCTION ARE APPROXIMATE, ACTUAL LIMITS ARE TO BE CONFIRMED IN THE FIELD BY THE CONTRACT ADMINISTRATOR.
3. CHAINAGE IS ESTABLISHED FROM THE CENTERLINE OF CONSTRUCTION AND GUTTER GRADES ARE CALCULATED ALONG THE GUTTER LINE.
4. HEIGHT OF CURB FACES MAY VARY ALONG LENGTH OF GUTTER, AS SHOWN ON PROFILE OR TO BE CONFIRMED IN THE FIELD.
5. ADJUST ALL STRUCTURES (MAINTENANCE HOLES, CATCH BASINS, ETC.) TO SUIT NEW DESIGN ELEVATIONS INCLUDING BREAKING DOWN AND REMOVAL OF PORTION OF TOP OF STRUCTURES TO ALLOW THE MINIMUM 150 mm ADJUSTMENTS.
6. ALL CURB SHALL BE CONSTRUCTED WITH A LEDGE AT THE BACK OF THE CURB TO FACILITATE FUTURE SIDEWALK CONSTRUCTION.
7. FULL DEPTH SAW-CUTS ARE REQUIRED AT CONSTRUCTION LIMITS OF EXISTING CURB, SIDEWALK AND PAVEMENT UNLESS OTHERWISE NOTED.
8. SAW CUT EXISTING PAVEMENT, SIDE WALK, CURB, GUTTER, DRIVEWAYS, WALKWAYS, ETC. AT CONSTRUCTION LIMITS TO PROVIDE A CLEAN JOINT FOR THE PROPOSED WORK.
9. CONSTRUCT PEDESTRIAN SIDEWALK RAMPS WITH TACTILE WALKING SURFACE INDICATOR ACCORDING TO T-310.030-7, T-310.030-8, T-310.030-9, T310.030-10 AND T-310.030-11.
10. EXISTING ENTRANCES RAMPS TO BE RE-INSTALLED. VEHICULAR SIDEWALK RAMP SHALL BE ACCORDING TO T-310.050-1.
11. ADJUSTMENT OF APPROACHES, WALKWAYS, AND STEPS MAY BE REQUIRED. LIMITS ARE TO BE DETERMINED IN THE FIELD BY THE CONTRACT ADMINISTRATOR.
12. EXISTING ASPHALT THICKNESS MAY VARY, TAPER TO MATCH EXISTING AT CONSTRUCTION LIMITS (MINIMUM 2.0 m).
13. MINIMUM DRIVEWAY AND ROAD PAVEMENT STRUCTURE THICKNESSES TO BE AS PER 2018 CITY OF TORONTO SUPERPAVE REQUIREMENTS.

ENTRANCE DRIVE
- 40mm SP9.5B
- 60mm SP19.0B
- 150mm GRANULAR A
- 150mm GRANULAR B

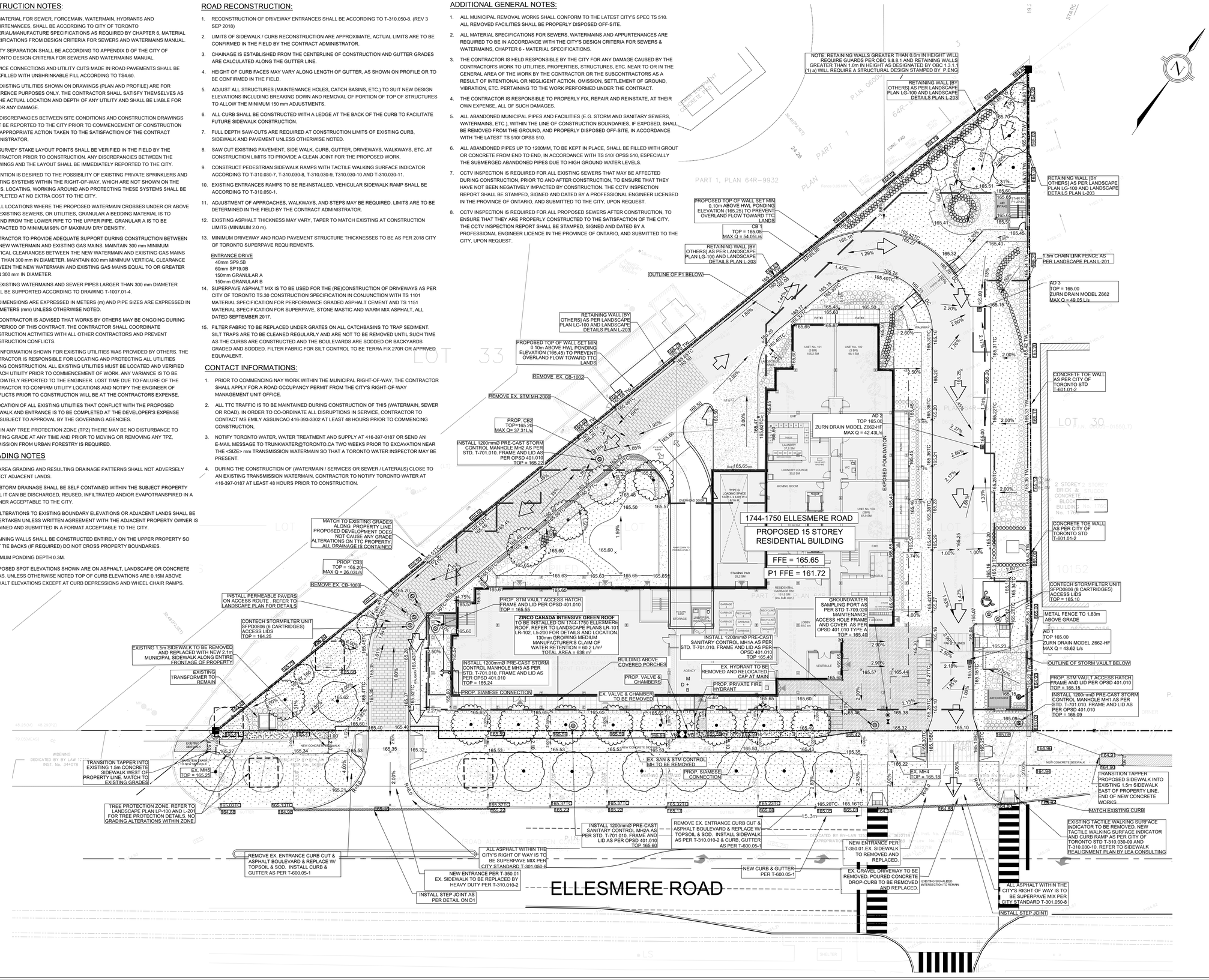
14. SUPERPAVE ASPHALT MIX IS TO BE USED FOR THE (RE)CONSTRUCTION OF DRIVEWAYS AS PER CITY OF TORONTO TS.30 CONSTRUCTION SPECIFICATION IN CONJUNCTION WITH TS 1101 MATERIAL SPECIFICATION FOR PERFORMANCE GRADED ASPHALT CEMENT AND TS 1151 MATERIAL SPECIFICATION FOR SUPERPAVE, STONE MASTIC AND WARM MIX ASPHALT, ALL DATED SEPTEMBER 2017.
15. FILTER FABRIC TO BE REPLACED UNDER GRATES ON ALL CATCHBASINS TO TRAP SEDIMENT. SILT TRAPS ARE TO BE CLEANED REGULARLY AND ARE NOT TO BE REMOVED UNTIL SUCH TIME AS THE CURBS ARE CONSTRUCTED AND THE BOULEVARDS ARE SODDED OR BACKYARDS GRADED AND SODDED. FILTER FABRIC FOR SILT CONTROL TO BE TERRA FIX 270R OR APPRVED EQUIVALENT.

CONTACT INFORMATIONS:

1. PRIOR TO COMMENCING NAY WORK WITHIN THE MUNICIPAL RIGHT-OF-WAY, THE CONTRACTOR SHALL APPLY FOR A ROAD OCCUPANCY PERMIT FROM THE CITY'S RIGHT-OF-WAY MANAGEMENT UNIT OFFICE.
2. ALL TTC TRAFFIC IS TO BE MAINTAINED DURING CONSTRUCTION OF THIS (WATERMAIN, SEWER OR ROAD). IN ORDER TO CO-ORDINATE ALL DISRUPTIONS IN SERVICE, CONTRACTOR TO CONTACT MS EMILY ASSUNCAO 416-393-3302 AT LEAST 48 HOURS PRIOR TO COMMENCING CONSTRUCTION,
3. NOTIFY TORONTO WATER, WATER TREATMENT AND SUPPLY AT 416-397-0187 OR SEND AN E-MAIL MESSAGE TO TRUNKWATER@TORONTO.CA TWO WEEKS PRIOR TO EXCAVATION NEAR THE <SIZE> mm TRANSMISSION WATERMAIN SO THAT A TORONTO WATER INSPECTOR MAY BE PRESENT.
4. DURING THE CONSTRUCTION OF (WATERMAIN / SERVICES OR SEWER / LATERALS) CLOSE TO AN EXISTING TRANSMISSION WATERMAIN, CONTRACTOR TO NOTIFY TORONTO WATER AT 416-397-0187 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

ADDITIONAL GENERAL NOTES:

1. ALL MUNICIPAL REMOVAL WORKS SHALL CONFORM TO THE LATEST CITY'S SPEC TS 510. ALL REMOVED FACILITIES SHALL BE PROPERLY DISPOSED OFF-SITE.
2. ALL MATERIAL SPECIFICATIONS FOR SEWERS, WATERMAINS AND APPURTENANCES ARE REQUIRED TO BE IN ACCORDANCE WITH THE CITY'S DESIGN CRITERIA FOR SEWERS & WATERMAINS, CHAPTER 6 - MATERIAL SPECIFICATIONS.
3. THE CONTRACTOR IS HELD RESPONSIBLE BY THE CITY FOR ANY DAMAGE CAUSED BY THE CONTRACTOR'S WORK TO UTILITIES, PROPERTIES, STRUCTURES, ETC. NEAR TO OR IN THE GENERAL AREA OF THE WORK BY THE CONTRACTOR OR THE SUBCONTRACTORS AS A RESULT OF INTENTIONAL OR NEGLIGENT ACTION, OMISSION, SETTLEMENT OF GROUND, VIBRATION, ETC. PERTAINING TO THE WORK PERFORMED UNDER THE CONTRACT.
4. THE CONTRACTOR IS RESPONSIBLE TO PROPERLY FIX, REPAIR AND REINSTATE, AT THEIR OWN EXPENSE, ALL OF SUCH DAMAGES.
5. ALL ABANDONED MUNICIPAL PIPES AND FACILITIES (E.G. STORM AND SANITARY SEWERS, WATERMAINS, ETC.), WITHIN THE LINE OF CONSTRUCTION BOUNDARIES, IF EXPOSED, SHALL BE REMOVED FROM THE GROUND, AND PROPERLY DISPOSED OFF-SITE, IN ACCORDANCE WITH THE LATEST TS 510/ OPSS 510.
6. ALL ABANDONED PIPES UP TO 1200MM, TO BE KEPT IN PLACE, SHALL BE FILLED WITH GROUT OR CONCRETE FROM END TO END, IN ACCORDANCE WITH TS 510/ OPSS 510, ESPECIALLY THE SUBMERGED ABANDONED PIPES DUE TO HIGH GROUND WATER LEVELS.
7. CCTV INSPECTION IS REQUIRED FOR ALL EXISTING SEWERS THAT MAY BE AFFECTED DURING CONSTRUCTION, PRIOR TO AND AFTER CONSTRUCTION, TO ENSURE THAT THEY HAVE NOT BEEN NEGATIVELY IMPACTED BY CONSTRUCTION. THE CCTV INSPECTION REPORT SHALL BE STAMPED, SIGNED AND DATED BY A PROFESSIONAL ENGINEER LICENSED IN THE PROVINCE OF ONTARIO, AND SUBMITTED TO THE CITY, UPON REQUEST.
8. CCTV INSPECTION IS REQUIRED FOR ALL PROPOSED SEWERS AFTER CONSTRUCTION, TO ENSURE THAT THEY ARE PROPERLY CONSTRUCTED TO THE SATISFACTION OF THE CITY. THE CCTV INSPECTION REPORT SHALL BE STAMPED, SIGNED AND DATED BY A PROFESSIONAL ENGINEER LICENCE IN THE PROVINCE OF ONTARIO, AND SUBMITTED TO THE CITY, UPON REQUEST.


NOTE: RETAINING WALLS GREATER THAN 0.6m IN HEIGHT WILL REQUIRE GUARDS PER OBC 9.8.8.1 AND RETAINING WALLS GREATER THAN 1.0m IN HEIGHT AS DESIGNATED BY OBC 1.3.1.1 (1) a) WILL REQUIRE A STRUCTURAL DESIGN STAMPED BY P.ENG
RETAINING WALL [BY OTHERS] AS PER LANDSCAPE PLAN LG-100 AND LANDSCAPE DETAILS PLAN L-203
RETAINING WALL [BY OTHERS] AS PER LANDSCAPE PLAN LG-100 AND LANDSCAPE DETAILS PLAN L-203
1.5m CHAIN LINK FENCE AS PER LANDSCAPE PLAN L-201
AD 3 TOP = 165.00 ZURN DRAIN MODEL Z662 MAX Q = 49.05 L/s
AD 2 TOP 165.00 ZURN DRAIN MODEL Z662-HF MAX Q = 42.43L/s
CONCRETE TOE WALL AS PER CITY OF TORONTO STD T-601.01-2
CONTECH STORMFILTER UNIT SFPD0806 (6 CARTRIDGES) ACCESS LIDS TOP = 165.10
METAL FENCE TO 1.83m ABOVE GRADE
AD 1 TOP 165.00 ZURN DRAIN MODEL Z662-HF MAX Q = 43.62 L/s
OUTLINE OF STORM VAULT BELOW
PROP. STM VAULT ACCESS HATCH FRAME AND LID PER OPSD 401.010 TOP = 165.15
INSTALL 1200mmØ PRE-CAST STORM CONTROL MANHOLE MH1 AS PER STD. T-701.010. FRAME AND LID AS PER OPSD 401.010 TOP = 165.09
PROPOSED TOP OF WALL SET MIN 0.10m ABOVE HWL PONDING ELEVATION (165.25) TO PREVENT OVERLAND FLOW TOWARD TTC LANDS
CB 1 TOP = 165.05 MAX Q = 54.05L/s
RETAINING WALL [BY OTHERS] AS PER LANDSCAPE PLAN LG-100 AND LANDSCAPE DETAILS PLAN L-203
OUTLINE OF P1 BELOW
RETAINING WALL [BY OTHERS] AS PER LANDSCAPE PLAN LG-100 AND LANDSCAPE DETAILS PLAN L-203
PROPOSED TOP OF WALL SET MIN 0.10m ABOVE HWL PONDING ELEVATION (165.45) TO PREVENT OVERLAND FLOW TOWARD TTC LANDS
REMOVE EX. CB-1002
REMOVE EX. STM MH-2000
PROP. CB2 TOP=165.20 MAX Q = 37.31L/s
INSTALL 1200mmØ PRE-CAST STORM CONTROL MANHOLE MH2 AS PER STD. T-701.010. FRAME AND LID AS PER OPSD 401.010 TOP = 165.22
MATCH TO EXISTING GRADES ALONG PROPERTY LINE. PROPOSED DEVELOPMENT DOES NOT CAUSE ANY GRADE ALTERATIONS ON TTC PROPERTY. ALL DRAINAGE IS CONTAINED
PROP. CB3 TOP = 165.20 MAX Q = 26.03L/s
REMOVE EX. CB-1003
INSTALL PERMEABLE PAVERS ON ACCESS ROUTE. REFER TO LANDSCAPE PLAN FOR DETAILS
CONTECH STORMFILTER UNIT SFPD0806 (6 CARTRIDGES) ACCESS LIDS TOP = 164.25
EXISTING 1.5m SIDEWALK TO BE REMOVED AND REPLACED WITH NEW 2.1m MUNICIPAL SIDEWALK ALONG ENTIRE FRONTAGE OF PROPERTY
EXISTING TRANSFORMER TO REMAIN
TRANSITION TAPPER INTO EXISTING 1.5m CONCRETE SIDEWALK WEST OF PROPERTY LINE. MATCH TO EXISTING GRADES
EX. MH5 TOP = 165.23
TREE PROTECTION ZONE. REFER TO LANDSCAPE PLAN LP-100 AND L-201 FOR TREE PROTECTION DETAILS. NO GRADING ALTERATIONS WITHIN ZONE
PROP. STM VAULT ACCESS HATCH FRAME AND LID PER OPSD 401.010 TOP = 165.55
ZINCO CANADA INTENSIVE GREEN ROOF TO BE INSTALLED ON 1744-1750 ELLESMERE ROOF. REFER TO LANDSCAPE PLANS LR-101, LR-102, L5-200 FOR DETAILS AND LOCATION. 130mm GROWING MEDIUM MANUFACTURER'S CLAIM OF WATER RETENTION = 60.2 L/m² TOTAL AREA = 638 m²
INSTALL 1200mmØ PRE-CAST STORM CONTROL MANHOLE MH3 AS PER STD. T-701.010. FRAME AND LID AS PER OPSD 401.010 TOP = 165.24
PROP. SIAMESE CONNECTION
BUILDING ABOVE COVERED PORCHES
PROP. VALVE & CHAMBERS
EX. VALVE & CHAMBER TO BE REMOVED
PROP. PRIVATE FIRE HYDRANT
EX. HYDRANT TO BE REMOVED AND RELOCATED CAP AT MAIN
INSTALL 1200mmØ PRE-CAST SANITARY CONTROL MH1A AS PER STD. T-701.010. FRAME AND LID AS PER OPSD 401.010 TOP 165.40
GROUNDWATER SAMPLING PORT AS PER STD T-709.020 MAINTENANCE ACCESS HOLE FRAME AND COVER AS PER OPSD 401.010 TYPE A TOP = 165.40
EX. SAN & STM CONTROL MH TO BE REMOVED
PROP. SIAMESE CONNECTION
EX. MH4 TOP = 165.18
TRANSITION TAPPER PROPOSED SIDEWALK INTO EXISTING 1.5m SIDEWALK EAST OF PROPERTY LINE. END OF NEW CONCRETE WORKS
MATCH EXISTING CURB
EXISTING TACTILE WALKING SURFACE INDICATOR TO BE REMOVED. NEW TACTILE WALKING SURFACE INDICATOR AND CURB RAMP AS PER CITY OF TORONTO STD T-310.030-09 AND T-310.030-10. REFER TO SIDEWALK REALIGNMENT PLAN BY LEA CONSULTING
INSTALL 1200mmØ PRE-CAST SANITARY CONTROL MH2A AS PER STD. T-701.010. FRAME AND LID AS PER OPSD 401.010 TOP 165.60
REMOVE EX. ENTRANCE CURB CUT & ASPHALT BOULEVARD & REPLACE W/ TOPSOIL & SOD. INSTALL SIDEWALK AS PER T-310.010-2 & CURB, GUTTER AS PER T-600.05-1
ALL ASPHALT WITHIN THE CITY'S RIGHT OF WAY IS TO BE SUPERPAVE MIX PER CITY STANDARD T-301.050-8
NEW ENTRANCE PER T-350.01 EX. SIDEWALK TO REMOVED AND REPLACED.
NEW CURB & GUTTER PER T-600.05-1
EX. GRAVEL DRIVEWAY TO BE REMOVED. POURED CONCRETE DROP-CURB TO BE REMOVED AND REPLACED.
EXISTING SIGNALIZED INTERSECTION TO REMAIN
REMOVE EX. ENTRANCE CURB CUT & ASPHALT BOULEVARD & REPLACE W/ TOPSOIL & SOD. INSTALL CURB & GUTTER AS PER T-600.05-1
NEW ENTRANCE PER T-350.01 EX. SIDEWALK TO BE REPLACED BY HEAVY DUTY PER T-310.010-2
INSTALL STEP JOINT AS PER DETAIL ON D1
ALL ASPHALT WITHIN THE CITY'S RIGHT OF WAY IS TO BE SUPERPAVE MIX PER CITY STANDARD T-301.050-8
INSTALL STEP JOINT
ELLESMERE ROAD
1744-1750 ELLESMERE ROAD
PROPOSED 15 STOREY RESIDENTIAL BUILDING
FFE = 165.65
P1 FFE = 161.72
EXPOSED FOUNDATION
2 STOREY BRICK & STUCCO CONCRETE BLOCK BUILDING No. 1744
2 STOREY BRICK & STUCCO CONCRETE BLOCK BUILDING No. 1750
PART 1, PLAN 64R–9932
LOT 33
LOT 30
PLAN 64R-9932
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PART 3, PLAN 64R-9932
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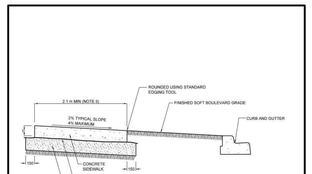
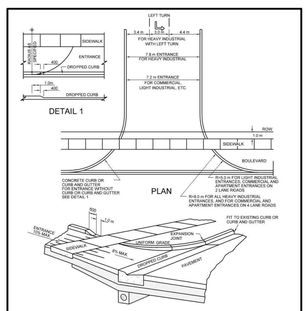


NOTES:

1. FOR CONCRETE SIDEWALK ABUTTING CURB OR CURB AND GUTTER REFER TO T-600.05-1 AND T-600.11-1.
2. SIDEWALK THICKNESS 150 mm EXCEPT ACROSS COMMERCIAL, INDUSTRIAL AND HIGH DENSITY RESIDENTIAL DRIVEWAY WHERE THICKNESS SHALL BE 180 mm.
3. L = THICKNESS OF SIDEWALK.
4. JOINTS SHALL BE ACCORDING TO T-310.010-1.
5. ON LOCAL CONC THE MINIMUM SIDEWALK WIDTH CAN BE REDUCED TO 1.8 m, EXCEPT FOR NEW DEVELOPMENTS. SIDEWALK WIDTH IS TO THE TORONTO GREEN STANDARDS AND GSPS.

All dimensions are in millimetres unless otherwise shown.

ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 3	NOV 2016
CONCRETE SIDEWALK WITH BOULEVARD	T-310.010-2	
	NTS	SHEET 1

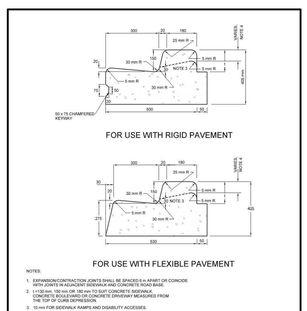


NOTES:

1. MINIMUM DIMENSIONS ARE INDICATED. MAXIMUM DIMENSIONS AS PER OWNER REQUIREMENTS.
2. PAVEMENT AND BOULEVARD STRUCTURE AT ENTRANCES SHALL BE CONSTRUCTED ACCORDING TO T-310.050-1 AND T-310.050-2.

All dimensions are in millimetres unless otherwise shown.

ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 1	NOV 2014
URBAN ENTRANCES	T-350.01	
	NTS	SHEET 1

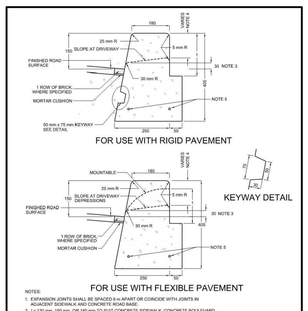


NOTES:

1. EXPANSION/CONTRACTION JOINTS SHALL BE SPACED 6 m APART OR COINCIDE WITH JOINTS IN ADJACENT SIDEWALK AND CONCRETE CURB BASE.
2. I =150 mm, 150 mm OR 180 mm TO SUIT CONCRETE SIDEWALK.
3. 10 mm FOR SIDEWALK RAMPS AND DISABILITY ACCESSES.
4. 10 mm FOR SIDEWALK RAMPS AND DISABILITY ACCESSES.
5. ENTRANCE TERMINATION ACCORDING TO DRAWING T-350.01. DROP CURB AT ENTRANCE, TYP. 10-150 mm, DEPENDS ON SITE CONDITION AS SPECIFIED.
6. D 13-18 REINFORCING BARS FOR INDUSTRIAL DRIVEWAYS; 30 mm CONCRETE COVER. TO BE EXTENDED 600 mm BEYOND WIDTH OF DRIVEWAY ON EACH END.

All dimensions are in millimetres unless otherwise shown.

ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 3	NOV 2014
CONCRETE CURB AND GUTTER	T-600.05-1	
	NTS	SHEET 1

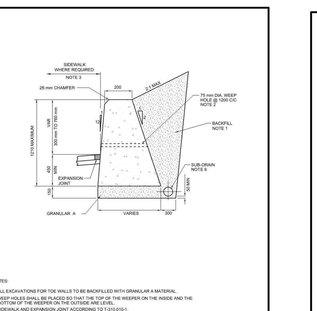


NOTES:

1. EXPANSION JOINTS SHALL BE SPACED 6 m APART OR COINCIDE WITH JOINTS IN ADJACENT SIDEWALK AND CONCRETE ROAD BASE.
2. I =150 mm, 150 mm OR 180 mm TO SUIT CONCRETE SIDEWALK OR CONCRETE DRIVEWAY MEASURED FROM THE TOP OF CURB DEPRESSION.
3. 10 mm FOR SIDEWALK RAMPS AND DISABILITY ACCESSES.
4. ENTRANCE TERMINATION ACCORDING TO DRAWING T-350.01. DROP CURB AT ENTRANCE, TYP 70-100 mm, DEPENDS ON SITE CONDITION AS SPECIFIED.
5. D 13-18 REINFORCING BARS FOR INDUSTRIAL AND COMMERCIAL DRIVEWAYS; 50 mm CONCRETE COVER, TO BE EXTENDED 600 mm BEYOND WIDTH OF DRIVEWAY ON EACH END.

All dimensions are in millimetres unless otherwise shown.

ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 2	NOV 2014
CONCRETE CURB	T-600.11-1	
	NTS	SHEET 1

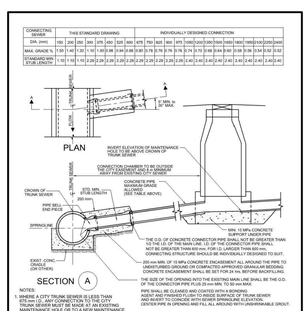


NOTES:

1. ALL EXCAVATIONS FOR TOE WALLS TO BE BACKFILLED WITH GRANULAR A MATERIAL.
2. WEEP HOLES SHALL BE PLACED ISO THAT THE TOP OF THE WEEPHOLE ON THE INSIDE AND THE BOTTOM OF THE WEEPHOLE ON THE OUTSIDE.
3. SIDEWALK AND EXPANSION JOINT ACCORDING TO T-310.010-1.
4. MAXIMUM LENGTH OF TOE WALL SECTIONS TO BE 6.0 m, 10 mm FLEXCELL (OR EQUIVALENT) EXPANSION JOINT MATERIAL TO BE PLACED BETWEEN ADJACENT SECTIONS.
5. CONCRETE STRENGTH AT 28 DAYS, 32 MPa.
6. PERFORATED PIPE SUB DRAIN 100 mm DIA. WITH PERFORATIONS DOWN TO BE USED ONLY AS SHOWN ON PLANS OR AS SPECIFIED.

All dimensions are in millimetres unless otherwise shown.

ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 1	NOV 2014
CONCRETE TOE WALLS	T-601.01-2	
	NTS	SHEET 1

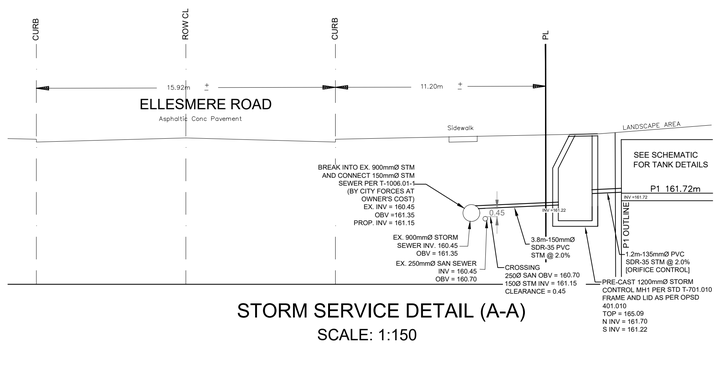


NOTES:

1. WHERE A CITY TRUNK SEWER IS LESS THAN 675 mm I.D., ANY CONNECTION TO THE CITY TRUNK SEWER MUST BE MADE AT AN EXISTING MAINTENANCE HOLE OR BY THE INSTALLATION OF A HOLE TO BE CONSTRUCTED BY THE CITY SEWERS.
2. INSPECTOR SHALL BE PRESENT DURING BREAK-IN TO CONFIRM THE ALIGNMENT OF CONNECTING SEWER.
3. WHERE A CITY TRUNK SEWER IS GREATER THAN OR EQUAL TO A 675 mm I.D. SEWER, THE CITY SEWERS SHALL BE CONTACTED PRIOR TO EXCAVATION TO DETERMINE WHETHER THE CONNECTION CAN BE MADE TO AN EXISTING MAINTENANCE HOLE PRIOR TO CONSIDERING A PIPE TO PIPE CONNECTION.
4. MAINTENANCE HOLES TO BE RE-BENCH TO SUIT.

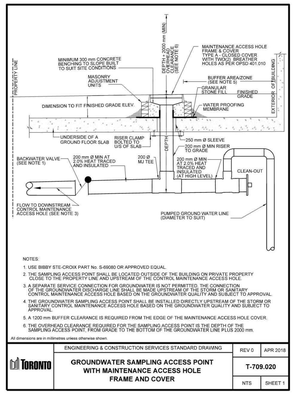
All dimensions are in millimetres unless otherwise shown.

ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 2	SEP 2017
TYPICAL CONNECTION TO CITY TRUNK SEWER 675 mm I.D. OR LARGER FROM CONCRETE TO CONCRETE	T-1006.01-1	
	NTS	SHEET 1



STORM SERVICE DETAIL (A-A)

SCALE: 1:150

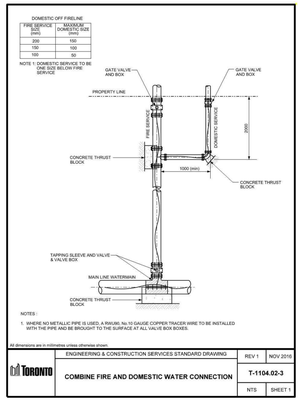


NOTES:

1. USE BMBP STE CROX PART No. S-6980 OR APPROVED EQUAL
2. THE GROUNDWATER SAMPLING ACCESS POINT SHALL BE OUTSIDE OF THE BUILDING ON PRIVATE PROPERTY CLOSE TO THE PROPERTY LINE AND UPSTREAM OF THE COATING MAINTENANCE ACCESS HOLE.
3. A SEPARATE SERVICE CONNECTION FOR GROUNDWATER IS NOT PERMITTED. THE CONNECTION OF THE GROUNDWATER DISCHARGE LINE SHALL BE MADE DOWNSTREAM OF THE SAMPLING ACCESS POINT AND ONLY AFTER APPROVAL OF THE GROUNDWATER QUALITY AND QUANTITY BY THE CITY.
4. THE GROUNDWATER SAMPLING ACCESS POINT SHALL BE INSTALLED DIRECTLY UPSTREAM OF THE STORM OR SANITARY CONTROL MAINTENANCE ACCESS HOLE BASED ON THE GROUNDWATER QUALITY AND SUBJECT TO APPROVAL.
5. A 1200 mm BUFFER CLEARANCE IS REQUIRED FROM THE EDGE OF THE MAINTENANCE ACCESS HOLE COVER.
6. THE OVERHEAD CLEARANCE REQUIRED FOR THE SAMPLING ACCESS POINT IS THE DEPTH OF THE SAMPLING ACCESS POINT, FROM GRADE TO THE BOTTOM OF THE GROUNDWATER LINE PLUS 200 mm.

All dimensions are in millimetres unless otherwise shown.

ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 0	APR 2018
GROUNDWATER SAMPLING ACCESS POINT WITH MAINTENANCE ACCESS HOLE FRAME AND COVER	T-709.020	
	NTS	SHEET 1

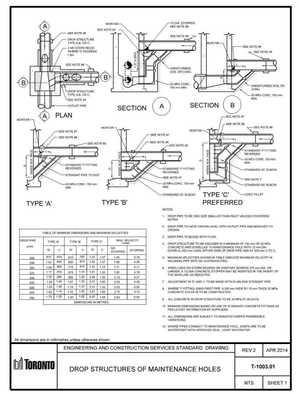


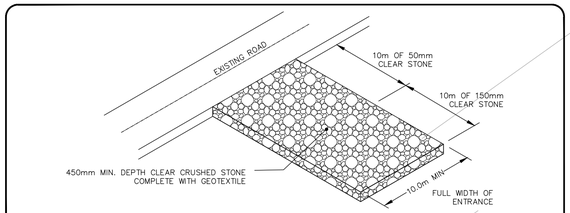
NOTES:

1. WHERE NO METALLIC PIPE IS USED, A RW/UBC No.10 GAUGE COPPER TRACER WIRE TO BE INSTALLED WITH THE PIPE AND BE BROUGHT TO THE SURFACE AT ALL VALVE BOX BOXES.

All dimensions are in millimetres unless otherwise shown.

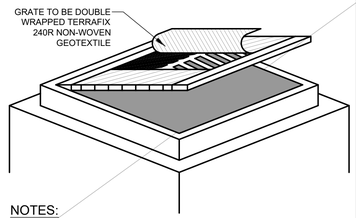
ENGINEERING & CONSTRUCTION SERVICES STANDARD DRAWING	REV 1	NOV 2018
COMBINE FIRE AND DOMESTIC WATER CONNECTION	T-1104.02-3	
	NTS	SHEET 1





MUD MAT - CONSTRUCTION ACCESS

SCALE: N.T.S.



NOTES:

- TO BE USED UNDER APPROPRIATE DRAINAGE CIRCUMSTANCES, BETWEEN APRIL AND DECEMBER.
- WOVEN GEOTEXTILE TO HAVE A MINIMUM EQUIVALENT OPENING SIZE OF 0.15mm AND A MAXIMUM EQUIVALENT OPENING SIZE OF 0.25mm.
- WOVEN GEOTEXTILE TO BE PLACED PERIODICALLY WHEN ACCUMULATED SEDIMENTS INTERFERES WITH DRAINAGE.
- CLEAR STONE TO BE PLACE ON TOP OF WRAPPED CATCHBASIN TO PROTECT GEOTEXTILE FROM LARGE OBJECTS.

INLET SEDIMENT CONTROL

N.T.S.

GENERAL NOTES

1. ALL WORK TO CONFORM TO THE LATEST CITY OF TORONTO STANDARD DRAWINGS AND SPECIFICATIONS AS WELL AS THE LATEST ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS.
2. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CURRENT "OCCUPATIONAL HEALTH AND SAFETY ACT". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
3. ALL TEMPORARY TRAFFIC CONTROL AND SIGNAGE DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT ONTARIO TRAFFIC MANUAL BOOK 7 TEMPORARY CONDITIONS FIELD EDITION.
4. ALL TRENCHES WITHIN EXISTING RIGHT OF WAY SHALL BE BACKFILLED WITH UNSHRINKABLE FILL.
5. THE CONTRACTOR SHALL RECTIFY ALL DISTURBED AREAS TO THE ORIGINAL CONDITION OR BETTER AND TO THE SATISFACTION OF THE EXECUTIVE DIRECTOR OF TECHNICAL SERVICES.
6. PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL RIGHT OF WAY, THE CONTRACTOR OR DEVELOPER OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT-OF-WAY MANAGEMENT SECTION. CONTACT 416-394-8422.
7. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION AND HE SHALL REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER (DETAILS ARE NOT TO BE SCALED FROM THE DRAWINGS).
8. ALL CONSTRUCTION SIGNING MUST CONFORM TO THE M.T.O. MANUAL "UNIFORM TRAFFIC CONTROL DEVICES" LATEST EDITION.
9. REFERENCE TO STANDARD DRAWINGS SHALL MEAN THE STANDARD DRAWINGS OF THE CITY OF TORONTO UNLESS NOTED OTHERWISE AND THESE SHALL BE THE REVISION IN EFFECT AS OF THE DATE OF THE CITY'S APPROVAL OF THE CONSTRUCTION DRAWINGS.
10. ALL SILT CONTROL DEVICES SHALL BE MAINTAINED IN GOOD CONDITION UNTIL ALL SODDING HAS BEEN COMPLETED FOR THE DEVELOPMENT. SILT FROM THE SITE SHALL BE DISPOSED OF AS PER THE DIRECTION OF THE ENGINEER.
11. TEMPORARY REPAIRS TO UTILITY CUTS WILL BE AS PER MUNICIPAL CONSENT REQUIREMENTS, APPENDIX D, TEMPORARY REPAIRS TO UTILITY CUTS.

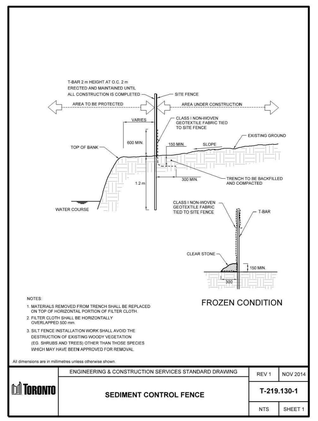
EROSION &SEDIMENT CONTROL NOTES:

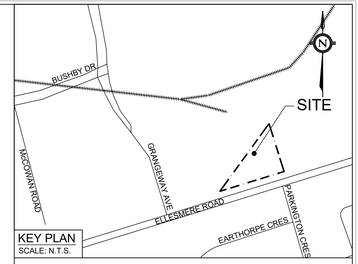
1. ALL SEDIMENT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
2. ALL NEW AND EXISTING CATCHBASINS AND CATCHBASIN MANHOLES ON-SITE OR IN ADJACENT STREETS SHALL HAVE THE UNDERSIDE OF THE GRATE COVERED WITH TERRAFIX 240R NON-WOVEN GEOTEXTILE DURING CONSTRUCTION AND SHALL BE MONITORED ON A WEEKLY BASIS DURING CONSTRUCTION AND REPLACED AS NEEDED. CONTRACTOR SHALL REGULARLY CLEAN SEDIMENT AND DEBRIS FROM THESE GEOTEXTILE PIECES. CONTRACTOR SHALL DISPOSE WITH THESE PIECES AT THE END OF CONSTRUCTION OR AS DIRECTED BY THE ENGINEER.
3. CONTRACTOR SHALL MAINTAIN ADJACENT STREETS AND PROPERTIES FREE OF DUST, MUD, AND OTHER REFUSE THROUGHOUT DURATION OF CONSTRUCTION. ANY CLEANING OF ADJACENT AREAS DURING CONSTRUCTION SHALL BE PAID BY THE CONTRACTOR.
4. ALL SEDIMENT AND EROSION CONTROL WORKS WILL BE INSPECTED AFTER EACH RAINFALL, AND REPAIRED / MAINTAINED TO THE SATISFACTION OF THE CITY ENGINEERS.
5. SEDIMENT CONTROL FENCES SHALL BE INSTALLED AND MAINTAINED AS REQUIRED TO PREVENT SEDIMENT FROM FLOWING ONTO THE ADJACENT LANDS.
6. HOARDING OR SNOW FENCING SHALL BE ERECTED AND MAINTAINED PRIOR TO ANY GRADING OR CONSTRUCTION AND SHALL REMAIN IN PLACE AND IN GOOD REPAIR THROUGHOUT THE CONSTRUCTION AND GRADING PHASE.
7. FILTER FABRIC SHALL BE PLACED UNDER ALL STREET CATCHBASINS GRATES. SILT TRAPS ARE TO BE CLEANED REGULARLY AND ARE NOT TO BE REMOVED UNTIL CURBS ARE CONSTRUCTED AND BOULEVARDS AND BACKYARDS ARE GRADED AND SODDED. FILTER FABRIC USED FOR SEDIMENT CONTROL SHALL BE TERRA FIX 240R AN APPROVED EQUIVALENT.
8. MUD TRACKING AND DUST MUST BE CONTROLLED ON ALL ROADWAYS TO THE SATISFACTION OF THE CITY.

SEDIMENT CONTROL INSTRUCTIONS:

1. THE CONTRACTOR SHALL MAINTAIN A SUPPLY OF SEDIMENT FENCE, CLEAR STONE AND FILTER FABRIC ON SITE FOR EMERGENCY USE. SEDIMENT FENCE WILL BE INSTALLED BEFORE THE COMMENCEMENT OF ANY CONSTRUCTION WORKS.
2. SITE INSPECTOR SHALL VERIFY THAT THE SEDIMENTATION CONTROLS ARE INTACT ON WEEKLY BASIS AND AFTER ALL RAINFALL EVENTS. DEFICIENCIES SHALL BE REPORTED TO THE CONTRACTOR AND REPAIRED IMMEDIATELY.
3. MONTHLY INSPECTION REPORTS SHALL BE PREPARED BY THE INSPECTOR.
4. UPON IMPLEMENTATION OF EROSION SEDIMENT CONTROL THE CONTRACTOR IS TO CONFIRM WITH THE INSPECTOR THAT THE CONTROLS ARE OPERATING TO THEIR SATISFACTION. ADDITIONAL MEASURES MAY BE REQUIRED AT THE RECOMMENDATIONS OF THE ENGINEER AND/OR INSPECTOR.
5. POSITIVE DRAINAGE TO THE SEDIMENT BASINS SHALL BE MAINTAINED DURING CONSTRUCTION.

PRIOR TO ANY PROPOSED AREA DRAINS BEING CONNECTED TO THE MUNICIPAL SEWER SYSTEM, THEY MUST BE CONNECTED THROUGH THE PROPOSED CONTECH OIL/GRIT SEPARATOR UNIT AS PER S1 SERVICING PLAN AND FUNCTIONAL SERVICING REPORT DATED NOVEMBER 2019.





KEY PLAN

SCALE: N.T.S.

LEGEND:

- PROPERTY BOUNDARY
- SILT FENCE
- EXCAVATION AREA
- +165.43 EXISTING TOPOGRAPHIC ELEVATIONS
- EXISTING TOPOGRAPHIC INFORMATION
- EXISTING COMBINED SEWER MANHOLE
- EXISTING CATCHBASIN
- INLET SEDIMENT CONTROL DEVICE
- OVERLAND FLOW ROUTE

TORONTO ENGINEERING AND CONSTRUCTION SERVICES DIVISION

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS.THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

MANAGER, DEVELOPMENT ENGINEERING DATE:

SITE PLAN
PREPARED BY: CLIMANS GREEN LIANG (CLG) ARCHITECTS INC.
DATE: OCTOBER 2020

TOPOGRAPHIC & LEGAL
PREPARED BY:PAUL KIDD SURVEYING LTD.
TOPO DATE: FEBRUARY 3RD, 2010

BENCHMARK NOTES
ELEVATIONS SHOWN ON THIS PLAN ARE GEODETIC AND ARE REFERRED TO THE CITY OF TORONTO BENCH MARK NO. MT132, LOCATED AT 1760 ELLESMERE ROAD, 0.15 WEST OF THE SOUTHWEST CORNER, 0.24 ABOVE THE SIDEWALK, HAVING AN ELEVATION OF 165.312 METRES.

Notes

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2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

No.	Issue / Revision	Date	Auth.
5	REISSUED FOR SITE PLAN APPROVAL	05/18/2017	JM
6	REISSUED FOR SITE PLAN APPROVAL	06/20/2018	MC
7	REISSUED FOR SITE PLAN APPROVAL	10/19/2018	JG
8	REISSUED FOR SITE PLAN APPROVAL	08/15/2019	JG
9	REISSUED FOR SITE PLAN APPROVAL	09/23/2020	JG
10	ADDENDUM TO SPA SUBMISSION NO.9	11/06/2020	JG

LICENSED PROFESSIONAL ENGINEER
M.T. COLERIDGE
100011229
11/06/2020
PROVINCE OF ONTARIO

BURNSIDE

R.J. Burnside & Associates Limited
1465 Pickering Parkway
Pickering, Ontario, L1V 7G7
Telephone: (905) 420-5777
Fax: (905) 420-5247
web www.rjburnside.com

Client
GREENWIN CORP.
19 LESMILL ROAD
TORONTO, ON
M3B 2T3

Drawing Title
AFFORDABLE RENTAL HOUSING DEVELOPMENT
1744 & 1750 ELLESMERE ROAD
TORONTO, ON
EROSION & SEDIMENT CONTROL AND SHORT-TERM DEWATERING PLAN

Drawn	Checked	Designed	Checked	Date	Drawing No.
JG	MC	JG	MC	17/12/12	
Project No.		SPA File No.		Revision No.	
PEB018910		10 242510 ESC 38 SA			ESC1
Scale	0 5.0 10.0 15.0m				
1:250					

File: \\toronto\Shared Work Areas\PEB\18910 Ellesmere\Civil\2_Production\DWG\18910 ESC1.dwg Date Plotted: November 5, 2020 - 1:05 PM

Plotted by:JGordon Paper size: ARCH D (24.00 X 36.00 Inches) Plot table: Rjb Full Scale-pickering 2013.ctb

APPENDIX F: ONTARIO GEOLOGY SURVEY

DRAFT

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MARGINAL NOTES

INTRODUCTION

This Quaternary geological map presents the distribution and sequence of recent and glacial deposits in the Metropolitan Toronto and surrounding areas. The colours and patterns on the map depict the type of sediment on the ground surface. The profiles provide the local sequence of sedimentary layers; the legend lists all of the deposits, generally from oldest (at the bottom) to youngest (at the top). The legend is organized by origin of deposit (rivers, lakes, and ice); some units are therefore not listed chronologically and footnotes provide time terms for those exceptions.

BEDROCK GEOLOGY

The bedrock consists of shale, interbedded dolomitic siltstone, and minor limestone, which were deposited in shallow seas about 450 million years ago. These beds, named the Georgian Bay Formation, are approximately 250 m thick and dip to the southeast at about 5 m/km. Following long periods of additional sedimentation and erosion, the ancient Laurentian River and its tributaries cut several deep, poorly-defined bedrock valleys trending northwest-southeast across the area (see cross-sections). They have an important influence on drift thickness and groundwater distribution in the Toronto area.

TOPOGRAPHY

The landscape of Toronto and the surrounding territory features two gently sloping surfaces divided by a prominent shore-bluff formed by glacial Lake Iroquois. South of this shore-bluff, the old lake bottom is almost level. North of the Iroquois bluff, the surface is a gently undulating till plain that gradually rises towards the north until it meets the Oak Ridges Moraine. This till plain includes several oval hills oriented southeast/northwest. These drumlins indicate that glacial ice moved out of the Lake Ontario basin towards the northwest. Lake-bottom sediments did not cover these drumlins below the Iroquois bluff in the southeast portion of the area.

Dissecting these two sloping plains are large river valleys which, in part, mirror the pregacial river valleys out in the bedrock surface. These large valleys (of the Humber, Don, and Rouge rivers) were not totally formed by present-day river discharge. Major erosion occurred during the drainage of a series of late-glacial lakes.

QUATERNARY GEOLOGY

The early studies and formal stratigraphy of the glacial and recent deposits in the Toronto area are summarized by Karrow (1969). The basic sequence of deposits, representing three main glacial and three nonglacial periods, was known over 100 years ago. The Toronto sequence is famous across North America because of the well-preserved record of fossil-rich deposits indicating both warm-climate and cool-climate conditions. The warm-climate interglacial beds (Don Formation: 5c, 6c) indicate temperate climates, up to 3°C (average) warmer than present. The cool-climate interglacial beds (Scarborough Formation: 5b, 6b) indicate conditions possibly 5°C cooler than present. Detailed studies of these fossiliferous beds and adjacent glacial deposits have revealed an intricate story of the events and climates over the past 200 000 years in the Toronto area. The following description traces this history sequentially.

QUATERNARY HISTORY

York Till: The oldest exposed glacial deposits in the Toronto area are known as the York Till (unit 2d; see reference section, sections 1 and 2). It is a dense clayey to sand till that has incorporated much of the underlying Georgian Bay Formation, upon which it usually rests. This till is widespread, commonly being found in excavations in downtown Toronto. York Till underlies the interglacial Don beds and represents a glaciation (Illinoian Stage) predating the other tills (Wisconsinan Stage) in the Toronto region, about 200 000 years ago.

Don Formation: Following the deposition of York Till, climates warmed dramatically, to about 3°C warmer than present day climate. The warm-climate fossils are contained in deltaic deposits of clay, sand, and gravel (units 5c, 6c), representing the oldest in a series of lakes (Table 1) to affect the Toronto area. This lake, called Lake Coleman, stood 20 m (65 feet) or more above Lake Ontario (75 m, 246 feet). Its deltaic deposits cover about 65 km², with up to 10 m of sediment. The Don beds are also commonly encountered in downtown excavations.

TABLE 1 SUMMARY OF LAKES IN THE TORONTO AREA.

Lake	Elevation[1] m (feet) a.s.l.	Age years B.P.[2]	Deposits
Lake Ontario	75 (246)	present	Toronto Islands, beaches
Admiralty	~0	> 10 000	no deposits
Lake Iroquois	130 (425)	12 500 - 12 000	spits, sand, silt
Peel ponds	183+ (600+)	13 000 - 12 500	sand, silt
Thorncliffe lakes	130+ (425+)	50 000 - 22 000	Thorncliffe Formation
low lake stage	<69 (<255)	75 000	Pottery Road Formation
Lake Scarborough	122 (400)	~ 90 000	Scarborough Formation
Lake Coleman	95 (310)	> 125 000	Don Formation

1. All lake levels (where appropriate) are measured approximately from their position at the Don Valley Brickyards.
2. B.P. – Before present.

Examples of important fossil remains include Black Locust (a tree which presently grows far to the south of Toronto), insects, bison, and large fresh-water clams, which are key indicators of these beds. The warm-climate Don beds lie between the deposits of two major glacial episodes and have been correlated to the Sangamonian Interglacial, judged to be older than 125 000 years.

Scarborough Formation: Another old lake, Lake Scarborough deposited deltaic sediments (units 5b, 6b) up to 50 m thick at an elevation reaching 47 m (154 feet) above Lake Ontario. This high lake level was created by advancing glacial ice blocking drainage down the St. Lawrence River. In contrast to the underlying Don beds, the Scarborough beds contain fossils (plant fragments, pollen, and shells) that indicate cool-climate (boreal) conditions, about 5°C cooler than present. These deposits cover about 195 km² and they are prominently displayed along the Scarborough bluffs (see reference section 3). Here, the deltaic deposits consist of a lower clay member and an upper sand member, a situation that leads to excessive seepage of groundwater and piping at the sand/clay boundary. The Scarborough Formation, about 90 000 years old, represents the earliest Wisconsinan age deposits in the Toronto area.

Pottery Road Formation: Lake levels in the Toronto area fell to an unknown level (less than 69 m, 225 feet) following Lake Scarborough. Rivers flowing into this low stage out valleys that were partially filled with sand and gravel. These deposits (unit 12c) are well exposed at the Don Valley brickyard. The Pottery Road Formation is early Wisconsinan in age, based on its correlation with deposits at St. Pierre, Quebec, dated about 75 000 years B.P.

Sunnybrook Till: As glacier ice returned to the Toronto area it moved out of the Lake Ontario basin incorporating pre-existing deposits, especially Lake Scarborough clays. This ice then deposited a clay-rich till known as the Sunnybrook Till (unit 2c) about 70 000 years B.P. This close relationship to the Scarborough Formation and the widespread extent of such a uniform till sheet allows it to be an important marker bed throughout the area.

Thorncliffe Formation: Fluctuating lake beds created by nearby oscillations of the glacier resulted (mainly) in the deposition of lake deposits (units 5a, 6a): stratified sands, silt, and varved clay. In the Scarborough region, two tills, the Seminary (unit 2b) and the Meadowcliffe (unit 2a) interrupt this complex lake sequence. Fossil remains from these deposits indicate cool-climate conditions similar to the Scarborough Formation lake beds. Radiocarbon dating, however, shows the Thorncliffe Formation to date from roughly 22 000 to 50 000 years B.P. (Middle Wisconsinan).

Young Tills: Once again the glaciers returned, depositing younger tills (late Wisconsinan time) in the Toronto area. Included in this group (unit 3) are several tills, the extent of which is not known in detail. Generally, dense sandy tills (Leaside, 3c, and Wentworth, 3c) underlie the clayey silt to silty tills (Halton, 3b, and Wildfield, 3a) and together cover most of the present land surface. These tills were deposited between 22 000 and 13 000 years ago.

Eskers and Kames: During this latest glacial episode, silt, sand, and gravel were deposited in subglacial channels and crevasses to form the esker and kame deposits (unit 4) of the Brampton esker and the Oak Ridges Moraine near Maple. Both of these deposits are overlain by the Halton Till (3b) of this glacial substage.

Peel ponds: As the last ice sheet melted away, it ponded meltwaters that drained towards the Ontario basin. This created extensive shallow lakes over large areas of Peel and adjacent counties. The lake deposits (units 7 and 8)[1], termed the Peel ponds, consist of a thin covering of sand, silt, and minor clay.

As waters fell to lower levels, the major river valleys of the Toronto region were eroded and lateral terraces (unit 12)[1] were graded to these levels, including those of glacial Lake Iroquois.

Lake Iroquois: Lake levels stabilized while the water in the Ontario basin drained via the Hudson River at Rome, New York. This stable stage formed the prominent shoreline features of glacial Lake Iroquois between 12 500 and 12 000 years B.P. Westward moving lake currents built sandy, pebbly spits or islands (unit 11), which are similar to the present Toronto Islands. A well-marked shoreline, including bluffs up to 15 m high, was established across the centre of the City of Toronto, south of St. Clair Avenue. In Toronto, the elevations for this shoreline range from 53 m (174 feet) in the east, to 61 m (200 feet) in the west, above Lake Ontario. This is due to warping of the land-surface following glaciation. Additional Lake Iroquois deposits include a general covering of sand (unit 10) below the shoreline, to a silty bottom cover (unit 9) in the eastern extent of the lake plain.

Recent deposits: Due to extensive valley erosion during late-glacial and recent times, modern river deposits (unit 13) are spread over very wide floodplains of the modern rivers. Sediment supply to Lake Ontario by those rivers and by bluff erosion at the Scarborough bluffs has formed spits, creating the present Toronto Islands. Considerable fill (unit 15) has been added to the islands and waterfront since about 1910, especially for such new projects as Harbourfront, Ashbridge's Bay, and Bluffer's Park.

[1] Due to the scale and availability of the mapping all of these deposits may not be shown.

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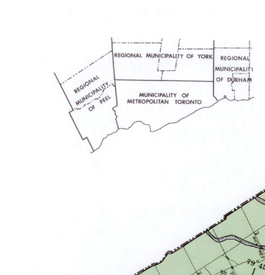
*Contains additional earlier references.



INDEX MAP

The following references were the source of most of the surface geology. The areas of these maps are shown on the index map. They are at a larger scale and will generally provide the user with more detailed information for particular areas. All have been published by the Ontario Department (or Division) of Mines.

1. Coleman (1933): The Pleistocene of the Toronto Region; ODM Map 41g, Scale 1:63 360.
2. Hewitt (1968a): Industrial minerals of the Markham-Newmarket area; ODM Map 2124, Scale 1:63 360.
3. Hewitt (1968b): Industrial mineral resources of the Brampton area; ODM Map 2178, Scale 1:63 360.
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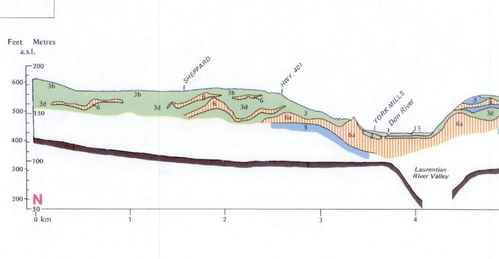
5. Karrow (1970): Pleistocene geology of the Thornhill area; ODM Preliminary Map P. 244, Scale 1:25 000.
6. Watt (1957): Pleistocene geology of the Township of North York; ODM Map 1955-6, Scale 1:31 680.
7. Watt (1968): Pleistocene geology of Etobicoke; ODM Map 2111, Scale 1:31 680.
8. White (1973): Quaternary geology of Bolton; ODM Map 2275, Scale 1:63 360.

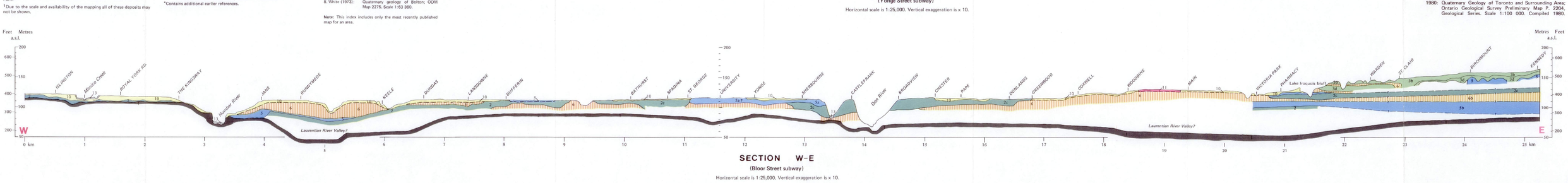
Note: This index includes only the most recently published map for an area.

PURPOSE OF THE MAP

Quaternary geology involves the events and deposits of glacial and recent times: elements that have shaped the landscape and soil strata of the Toronto region. The purpose of this map, then, is to summarize existing information concerning the Quaternary (and bedrock) geology of this region. This map serves as an introduction to further geological and geotechnical studies in the Toronto area. Therefore, the expected users include the general public, students, and earth-science professionals. This is part of a series of publications that will outline the urban geology, including engineering aspects, of the Toronto area.

This publication is composed of several elements. The geological map (scale 1:100 000) is supplemented by north-south and west-east cross-sections (scale 1:25 000) drawn along the subway routes. The detailed geology of well-cored locations is presented as reference sections. More specific information is available from the individual maps (see index map) and the bibliography.





Ministry of Natural Resources
Ontario
Hon. James A. C. Auld, Minister
Dr. J. K. Reynolds, Deputy Minister

ONTARIO GEOLOGICAL SURVEY
PRELIMINARY MAP P. 2204
GEOLOGICAL SERIES

QUATERNARY GEOLOGY
TORONTO AND SURROUNDING AREA
SOUTHERN ONTARIO

Scale: 1:100,000

Miles 1 0 1 2 3 4 Miles
Kilometres 1 0 2 4 6 Kilometres

NTS References: 30M/11, 12E, 13E, 14

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LEGEND

CENOZOIC ERA — QUATERNARY PERIOD — RECENT

RECENT DEPOSITS

15 Man-made deposits: *fill.*
14 Lake Ontario beach and nearshore deposits: *sand, silt.*
13 Modern river deposits: *sand, silt, minor gravel and organic material.*

PLEISTOCENE

ICE-AGE DEPOSITS

RIVER DEPOSITS

12 Older river deposits[a]: *sand, gravel in terrace remnants.*

GLACIAL LAKE DEPOSITS

11 Lake Iroquois[b], beach or bar deposits: *gravel, sand.*
10 Lake Iroquois, shallow-water deposits: *sand, silty sand.*
9 Lake Iroquois, deeper-water deposits: *silt, clay.*
8 Peel ponds; shallow-water deposits: *sand.*
7 Peel ponds; deeper-water deposits: *silt, clay.*
6 Older lakes[c]: shallow-water deposits: *sand* (Formations: 6a, Thorncliffe; 6b, Scarborough; 6c, Don).
5 Older lakes; deeper-water deposits: *silt, clay.* (Formations: 5a, Thorncliffe; 5b, Scarborough; 5c, Don).

GLACIAL ICE DEPOSITS

4 Ice-contact deposits: *sand, gravel, silt in eskers and organic ridges.*
3 Young tills[b]: *clayey silt till* (Wildfield, 3a; Halton, 3b) *and sandy silt till* (Wentworth, 3c; Leaside, 3d).
2 Older till[c]: *silty clay to silt till* (Meadowcliffe, 2a; Seminary, 2b; Sunnybrook, 2c) *to clayey sand till* (York, 2d).

PALEOZOIC ERA — ORDOVICIAN PERIOD

BEDROCK

Shale, interbedded siltstone, and minor limestone, (Georgian Bay Formation).

Notes:
a. Multiple age: 12a, deposited at levels lower than Lake Iroquois; 12b, Pottery Road Formation; 12c, pre-Wisconsinan?
b. Late Wisconsinan.
c. Middle Wisconsinan and older.

SYMBOLS

Geological boundary, approximate.
Geological boundary, assumed.
Lake Iroquois shoreline.
Drumlin (line indicates direction of ice movement).
Small bedrock outcrop.
W E Location of cross-section.

CROSS-SECTIONS AND REFERENCE SECTIONS

In order to expand the general information illustrated on the Quaternary map, two types of profiles have been added to the map. First, generalized cross-sections located along the existing subway routes show the depth and variation of the sediments to bedrock. Section W–E, the Bloor Street subway line, illustrates the thicker, more complex sediments located in Scarborough relative to the thin deposits in Etobicoke. Section N–S, the Yonge Street subway line, shows thick sediment patterns north of the Lake Iroquois shoreline and thinner deposits on the lake plain to the south.

Second, three reference sections are included as examples of the detailed geological information that provides the basis for extending the Quaternary stratigraphy in the Toronto area. The formal Quaternary stratigraphic names have been added to these sections for the interested reader.

The reference sections are modified from: 1. Terasmae (1960); 2. Karrow and Morgan 1975; 3. Karrow 1967. The subway profiles were supplied by J. Wong of the Toronto Transit Commission with additional data from Watt (1954, 1957, and 1968).

SOURCES OF INFORMATION

Geology compiled (1980) from published maps (see index map). Additional data were made available by the following:
H. G. Golder Associates Ltd.
Metropolitan Toronto Works Department
Toronto Transit Commission
Ministry of Transportation and Communications (Ontario)
Ontario Hydro
City of Toronto Public Works Department
Metropolitan Toronto and Region Conservation Authority
City of Toronto Planning Board
John Westgate, unpublished data

Drafting by D. C. Roumbanis and Lorraine Farrell.
Design by D. R. Sharpe and Raimonds Balgalvis.
Base-map supplied by the Public Works Department, City of Toronto.
Metric Conversion Factor: 1 foot = 0.3048 m
This map is published with the permission of E. G. Pye, Director, Ontario Geological Survey.
Issued 1980

Information from this publication may be quoted if credit is given. It is recommended that reference to this map be made in the following form:

Sharpe, D. R.
1980: Quaternary Geology of Toronto and Surrounding Area; Ontario Geological Survey Preliminary Map P. 2204, Geological Series, Scale 1:100 000. Compiled 1980.

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APPENDIX G: STAMSON SAMPLE CALCULATION

DRAFT

STAMSON 5.0 NORMAL REPORT Date: 28-04-2021 21:16:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: MES1.te Time Period: 16 hours
Description: MES 1-DSBRT

Road data, segment # 1: EB

Car traffic volume : 14768 veh/TimePeriod
Medium truck volume : 266 veh/TimePeriod
Heavy truck volume : 487 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: EB

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 18.50 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: WB

Car traffic volume : 16272 veh/TimePeriod
Medium truck volume : 293 veh/TimePeriod
Heavy truck volume : 456 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: WB

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 27.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Results segment # 1: EB

Source height = 1.33 m

ROAD (0.00 + 65.57 + 0.00) = 65.57 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	68.54	0.00	-1.51	-1.46	0.00	0.00	0.00	65.57

Segment Leq : 65.57 dBA

↟

Results segment # 2: WB

Source height = 1.28 m

ROAD (0.00 + 62.88 + 0.00) = 62.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	68.58	0.00	-4.24	-1.46	0.00	0.00	0.00	62.88

Segment Leq : 62.88 dBA

Total Leq All Segments: 67.44 dBA

↟

TOTAL Leq FROM ALL SOURCES: 67.44

↟
↟

STAMSON 5.0 NORMAL REPORT Date: 28-04-2021 21:29:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: MES12.te Time Period: 16 hours
Description: MES 12-DSBRT

Road data, segment # 1: EB

Car traffic volume : 5952 veh/TimePeriod
Medium truck volume : 107 veh/TimePeriod
Heavy truck volume : 196 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: EB

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 24.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Road data, segment # 2: WB

Car traffic volume : 8944 veh/TimePeriod
Medium truck volume : 161 veh/TimePeriod
Heavy truck volume : 250 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: WB

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 16.50 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

↑
Results segment # 1: EB

Source height = 1.33 m

ROAD (0.00 + 58.18 + 0.00) = 58.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	63.02	0.00	-3.39	-1.46	0.00	0.00	0.00	58.18

Segment Leq : 58.18 dBA

↟

Results segment # 2: WB

Source height = 1.28 m

ROAD (0.00 + 62.22 + 0.00) = 62.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	64.37	0.00	-0.69	-1.46	0.00	0.00	0.00	62.22

Segment Leq : 62.22 dBA

Total Leq All Segments: 63.66 dBA

↟

TOTAL Leq FROM ALL SOURCES: 63.66

↟

↟

APPENDIX H: TRAFFIC DATA

DRAFT

Road	Section			Year	Posted	24 Hour															
	ID	From	TO		Speed	Total(Main roads)*		Cars[1]		Medium Trucks[2]		Heavy Trucks[3]		Total(Segment Road)		Cars[1]		Medium Trucks[2]		Heavy Trucks[3]	
					(km/hr)	EB	WB	EB	WB	EB	WB	EB	WB	NB	SB	NB	SB	NB	SB	NB	SB
Ellesmere Rd	Segment 1	McCowan Rd	Bellamy Rd N	2019	60	15314	16974	14533	16193	276	306	505	475	-	-	-	-	-		-	-
		McCowan Rd				-	-	-	-	-		-	-	10175	15885	9595	15234	Combined w// heavy		580	651
	Segment 2	Bellamy Rd N	Markham Rd	2019	60	13635	14510	12940	13843	245	261	450	406	-	-	-	-	-		-	-
		Bellamy Rd N				-	-	-	-	-		-	-	6835	5725	6780	5668	Combined w// heavy		55	57
		Dolly Varden Blvd				-	-	-	-	-		-	-	1590	435	1549	419	Combined w// heavy		41	16
	Segment 3	Markham Rd	Scarborough Golf Club Rd	2019	60	12711	15958	12063	15224	229	287	419	447	-	-	-	-	-		-	-
		Markham Rd				-	-	-	-	-		-	-	10385	11915	9938	11415	Combined w// heavy		447	500
	Segment 4	Scarborough Golf Club Rd	ORTON Park Rd	2019	60	12028	13898	11414	13259	217	250	397	389	-	-	-	-	-		-	-
		Scarborough Golf Club Rd				-	-	-	-	-		-	-	3625	535	3549	522	Combined w// heavy		76	13
	Segment 5	ORTON Park Rd	Morningside Ave	2019	60	9639	12176	9147	11616	174	219	318	341	-	-	-	-	-		-	-
		ORTON Park Rd				-	-	-	-	-		-	-	2455	315	2403	307	Combined w// heavy		52	8
		Neilson Rd												3105	5780	3040	5635	Combined w// heavy		65	145
	Segment 6	Morningside Ave	Military Trail	2019	50	6332	7842	6009	7481	114	141	209	220	-	-	-	-	-		-	-
		Morningside Ave				-	-	-	-	-		-	-	7755	8065	7677	8000	Combined w// heavy		78	65
	Segment 7	Military Trail	Morrish Rd	2019	50	4819	8136	4573	7762	87	146	159	228	-	-	-	-	-		-	-
		Military Trail				-	-	-	-	-		-	-	5725	4270	5668	4236	Combined w// heavy		57	34
		Conlins Rd				-	-	-	-	-		-	-	830	2275	818	2264	Combined w// heavy		12	11
	Segment 8	Morrish Rd	Meadowvale Rd	2019	50	3881	5165	3683	4927	70	93	128	145	-	-	-	-	-		-	-
		Morrish Rd				-	-	-	-	-		-	-	930	1175	925	1162	Combined w// heavy		5	13
	Segment 9	Meadowvale Rd	Hwy 401	2019	50	4991	6476	4616	6159	190	149	185	168	-	-	-	-	-		-	-
		Meadowvale Rd				-	-	-	-	-		-	-	1775	5480	1766	5420	Combined w// heavy		9	60
		Kingston Rd				-	-	-	-	-		-	-	0	1640	0	1622	Combined w// heavy		0	18
		Hwy 401 EB Off-ramp				-	-	-	-	-		-	-	0	7745	0	7528	Combined w// heavy		0	217
	Segment 10	Sheppard Ave E/Port Union Rd	Altona Rd	2019	60	17173	24272	15885	23083	653	558	635	631	-	-	-	-	-		-	-
		Sheppard Ave E/Port Union Rd				-	-	-	-	-		-	-	6825	5025	6770	4950	Combined w// heavy		55	75
		Hwy 401 WB Off-ramp		2019	60	-	-	-	-	-		-	-	4540	0	4436	0	Combined w// heavy		104	0
Kingston Rd	Segment 1	Rougemount Dr	Rosebank Rd	2018	60	9824	11174	9490	10805	128	150	206	219	-	-	-	-	-		-	-
		Rougemount Dr				-	-	-	-	-		-	-	4015	1540	3967	1514	Combined w// heavy		48	26
	Segment 2	Rosebank Rd	Regional Rd 38/Whites Rd N	2018	60	10302	10696	9941	10365	138	135	222	197	-	-	-	-	-		-	-
		Rosebank Rd				-	-	-	-	-		-	-	120	1650	111	1619	Combined w// heavy		9	31
		Steeple Hill				-	-	-	-	-		-	-	760	2475	752	2450	Combined w// heavy		8	25
	Segment 3	Regional Rd 38/Whites Rd N	Fairport Rd	2018	60	12403	8595	12105	8320	114	112	183	163	-	-	-	-	-		-	-
		Regional Rd 38/Whites Rd N				-	-	-	-	-		-	-	14665	9920	14313	9652	Combined w// heavy		352	268
		Delta Bvld				-	-	-	-	-		-	-	1630	2070	1389	1882	Combined w// heavy		241	188
		Hwy 401 WB Ramp				-	-	-	-	-		-	-	7865	0	7708	0	Combined w// heavy		157	0
	Segment 4	Fairport Rd	Dixie Rd	2018	60	12085	8913	11735	8815	135	40	216	58	-	-	-	-	-		-	-
		Fairport Rd				-	-	-	-	-		-	-	0	4695	0	4653	Combined w// heavy		0	42
	Segment 5	Dixie Rd	Regional Rd 29	2018	60	18568	14083	18345	13576	86	206	137	301	-	-	-	-	-		-	-
		Dixie Rd				-	-	-	-	-		-	-	1650	3295	1638	3249	Combined w// heavy		12	46
		Walnut Lane				-	-	-	-	-		-	-	1455	720	1446	713	Combined w// heavy		9	7
	Segment 6	Regional Rd 29	Valley Farm Rd	2018	60	18149	15081	17477	14554	258	215	414	313	-	-	-	-	-		-	-
		Regional Rd 29				-	-	-	-	-		-	-	11415	8235	11073	8095	Combined w// heavy		342	140
		Glenanna Rd				-	-	-	-	-		-	-	3405	3705	3361	3616	Combined w// heavy		44	89
	Segment 7	Valley Farm Rd	Brock Rd	2018	60	18069	14737	17581	14236	187	204	301	297	-	-	-	-	-		-	-
		Valley Farm Rd				-	-	-	-	-		-	-	2465	2460	2435	2433	Combined w// heavy		30	27
		Denmar/Guild Rd				-	-	-	-	-		-	-	450	555	440	542	Combined w// heavy		10	13
	Segment 8	Brock Rd	Notion Rd	2018	60	18698	14108	18156	13699	208	166	334	243	-	-	-	-	-		-	-
		Brock Rd				-	-	-	-	-		-	-	14490	15095	13722	14235	Combined w// heavy		768	860
		Bainbridge Rd				-	-	-	-	-		-	-	2295	275	2205	275	Combined w// heavy		90	0
	Segment 9	Notion Rd	Regional Rd 24	2018	50	23077	21261	22292	20623	301	259	483	378	-	-	-	-	-		-	-
		Notion Rd				-	-	-	-	-		-	-	3265	95	3066	81	Combined w// heavy		199	14
		Elizabeth St				-	-	-	-	-		-	-	0	4915	0	4836	Combined w// heavy		0	79
	Segment 10	Regional Rd 24	Regional Rd 31	2018	50	17175	14604	16729	14195	171	166	275	243	-	-	-	-	-		-	-
		Regional Rd 24				-	-	-	-	-		-	-	5020	7155	4859	6919	Combined w// heavy		161	236
		Rotherglen Rd				-	-	-	-	-		-	-	1270	3150	1233	3115	Combined w// heavy		37	35
	Segment 11	Regional Rd 31	Regional Rd 44	2018	60	16632	15147	16117	14738	198	166	318	243	-	-	-	-	-		-	-
		Regional Rd 31				-	-	-	-	-		-	-	11435	12665	11149	12336	Combined w// heavy		286	329
		Westney Plaza				-	-	-	-	-		-	-	0	3275	0	3262	Combined w// heavy		0	13
		Ritchie Ave / Chapman Dr				-	-	-	-	-		-	-	2410	2365	2333	2289	Combined w// heavy		77	76
		Bestbuy Plaza				-	-	-	-	-		-	-	0	1605	0	1581	Combined w// heavy		0	24
	Segment 12	Regional Rd 44	Durham 41	2018	60	18001	17245	17605	16831	152	168	244	246	-	-	-	-	-		-	-
		Regional Rd 44				-	-	-	-	-		-	-	11110	11865	10932	11640	Combined w// heavy		178	225
		Durham East Center				-	-	-	-	-		-	-	520	1400	516	1390	Combined w// heavy		4	10
		Costco Entrance				-	-	-	-	-		-	-	1825	2630	1809	2619	Combined w// heavy		16	11
	Segment 13	Durham 41	Regional Rd 23	2018	70	14060	10943	13722	10703	130	98	208	143	-	-	-	-	-		-	-
		Durham 41				-	-	-	-	-		-	-	13545	11775	13220	11516	Combined w// heavy		325	259
		First Professional				-	-	-	-	-		-	-	715	3265	708	3213	Combined w// heavy		7	52
		Alexander's Crossing				-	-	-	-	-		-	-	0	1265	0	1257	Combined w// heavy		0	8
		Audley Rd				-	-	-	-	-		-	-	0	3750	0	3713	Combined w// heavy		0	38
	Segment1	Regional Rd 23	Hwy 412 NB	2018	70	13707	14142	13461	13788	95	144	152	210	-	-	-	-	-		-	-
		Regional Rd 23				-	-	-	-	-		-	-	8350	7610	8049	7336	Combined w// heavy		301	274
		Halls Rd				-	-	-	-	-		-	-	0	120	0	114	Combined w// heavy		0	6
		Hwy 412 SB				-	-	-	-	-		-	-	0	540	0	518	Combined w// heavy		0	22
	Segment2	Hwy 412 NB	McQuay/Jeffery St	2018	50	13364	14485	12989	14080	144	165	230	241	-	-	-	-	-		-	-
		Hwy 412 NB				-	-	-	-	-		-	-	0	0	0	0	Combined w// heavy		0	0
		Des Newman Bvld				-	-	-	-	-		-	-	0	0	0	0	Combined w// heavy		0	0
		White Oaks				-	-	-	-	-		-	-	940	975	904	970	Combined w// heavy		36	5

Road	Section			Year	Posted	24 Hour															
	ID	From	TO		Speed	Total(Main roads)*		Cars[1]		Medium Trucks[2]		Heavy Trucks[3]		Total(Segment Road)		Cars[1]		Medium Trucks[2]		Heavy Trucks[3]	
					(km/hr)	EB	WB	EB	WB	EB	WB	EB	WB	NB	SB	NB	SB	NB	SB	NB	SB
Durham Regional Hwy 2 / Dundas St W	Segment3	McQuay/Jeffery st	Cochrane St/Annes St	2018	50	13934	13915	13571	13567	139	141	223	206	-	-	-	-	-		-	-
		McQuay/Jeffery st				-	-	-	-	-		-	-	1965	4410	1900	4339	Combined w// heavy		65	71
	Segment3	Cochrane St/Annes St	Brock St S	2018	50	14921	12928	14757	12579	63	142	101	207	-	-	-	-	-		-	-
		Cochrane St/Annes St				-	-	-	-	-		-	-	2685	4210	2631	4130	Combined w// heavy		54	80
		Euclid/Henry St				-	-	-	-	-		-	-	4410	3100	4344	3088	Combined w// heavy		66	12
	Segment4	Brock St S	Garden St	2018	50	13306	14543	12934	14136	143	166	230	242	-	-	-	-	-		-	-
		Brock St S				-	-	-	-	-		-	-	4705	6290	4503	6095	Combined w// heavy		202	195
		Athol St				-	-	-	-	-		-	-	560	0	549	0	Combined w// heavy		11	0
		Ash St				-	-	-	-	-		-	-	155	230	155	224	Combined w// heavy		0	6
		Hickory St				-	-	-	-	-		-	-	905	525	895	521	Combined w// heavy		10	4
	Segment5	Garden St	Regional Rd 36	2018	50	9456	9125	9182	8851	105	111	169	162	-	-	-	-	-		-	-
		Garden St				-	-	-	-	-		-	-	5715	7920	5549	7754	Combined w// heavy		166	166
		Lupin Dr				-	-	-	-	-		-	-	865	0	818	0	Combined w// heavy		47	0
	Segment6	Regional Rd 36	Regional Rd 26/Thickson Rd	2018	50	9723	9511	9450	9312	105	81	168	118	-	-	-	-	-		-	-
		Regional Rd 36				-	-	-	-	-		-	-	5205	7190	5023	6960	Combined w// heavy		182	230
		Glen Hill Dr				-	-	-	-	-		-	-	2355	1430	2310	1403	Combined w// heavy		45	27
	Segment7	Regional Rd 26/Thickson Rd	Garrard Rd/Kandawood Rd	2018	50	10474	10398	10191	10210	109	76	174	111	-	-	-	-	-		-	-
		Regional Rd 26/Thickson Rd				-	-	-	-	-		-	-	12390	12180	11721	11571	Combined w// heavy		669	609
		Kathleen St				-	-	-	-	-		-	-	90	815	84	800	Combined w// heavy		6	15
		Kandalwood Plaza				-	-	-	-	-		-	-	365	0	363	0	Combined w// heavy		2	0
	Segment8	Garrard Rd/Kandawood Rd	Regional Rd 52/Thornton Rd	2018	50	9876	11108	9679	10908	76	81	122	119	-	-	-	-	-		-	-
		Garrard Rd/Kandawood Rd				-	-	-	-	-		-	-	3940	4175	3885	4121	Combined w// heavy		55	54
	Segment9	Regional Rd 52/Thornton Rd	Stevenson Rs S/ Regional Rd 53	2018	50	19304	0	18976	0	126	0	202	0	-	-	-	-	-		-	-
		Thornton Road				-	-	-	-	-		-	-	4820	9310	4709	9180	Combined w// heavy		111	130
Bond St W	Segment1	Stevenson Rs S/ Regional Rd 53	Park Road	2018	50	0	8195	0	8023	0	70	0	102	-	-	-	-	-		-	-
		Stevenson Rs S/ Regional Rd 53				-	-	-	-	-		-	-	7745	9290	7652	9141	Combined w// heavy		93	149
		Gibbons St				-	-	-	-	-		-	-	1980	2445	1962	2430	Combined w// heavy		18	15
	Segment2	Park Road	Simcoe St N	2018	50	0	10304	0	9964	0	138	0	202	-	-	-	-	-		-	-
		Park Road				-	-	-	-	-		-	-	5510	5035	5405	4965	Combined w// heavy		105	70
		Arena St				-	-	-	-	-		-	-	0	225	0	224	Combined w// heavy		0	1
		McMillan Dr				-	-	-	-	-		-	-	2430	2110	2401	2089	Combined w// heavy		29	21
		Center St				-	-	-	-	-		-	-	0	6740	0	6511	Combined w// heavy		0	229
		Simcoe				-	-	-	-	-		-	-	9145	0	8788	0	Combined w// heavy		357	0
King St W	Segment1	Stevenson Rs S/ Regional Rd 53	Park Road	2018	50	8195	0	8195	0	63	0	164	0	-	-	-	-	-		-	-
		Stevenson Rs S/ Regional Rd 53				-	-	-	-	-		-	-	9875	10280	9717	10095	Combined w// heavy		158	185
		Gibbons St				-	-	-	-	-		-	-	2120	3100	2105	3085	Combined w// heavy		15	16
	Segment2	Park Road	Simcoe St N	2018	50	10304	0	10304	0	99	0	258	0	-	-	-	-	-		-	-
		Park Road				-	-	-	-	-		-	-	6270	6130	6138	6020	Combined w// heavy		132	110
		Midtown Dr				-	-	-	-	-		-	-	1585	0	1545	0	Combined w// heavy		40	0
		McMillan Dr				-	-	-	-	-		-	-	665	945	663	936	Combined w// heavy		2	9
		Center St				-	-	-	-	-		-	-	0	7670	0	7333	Combined w// heavy		0	337
		Simcoe				-	-	-	-	-		-	-	9185	0	8873	0	Combined w// heavy		312	0

*Note:
EB and WB traffic volume are for the main roads(Ellesmere Rd, Kingston Rd, Durham Regional Hwy 2/Dundas St W, Bond St W)

Road	Section			Year	Posted Speed (km/hr)
	ID	From	TO		
Ellesmere Rd	Segment 1	McCowan Rd	Bellamy Rd N	2041	60
		McCowan Rd			
	Segment 2	Bellamy Rd N	Markham Rd	2041	60
		Bellamy Rd N			
		Dolly Varden Blvd			
	Segment 3	Markham Rd	Scarborough Golf Club Rd	2041	60
		Markham Rd			
	Segment 4	Scarborough Golf Club Rd	ORTON Park Rd	2041	60
		Scarborough Golf Club Rd			
	Segment 5	ORTON Park Rd	Morningside Ave	2041	60
		ORTON Park Rd			
		Neilson Rd			
	Segment 6	Morningside Ave	Military Trail	2041	50
		Morningside Ave			
	Segment 7	Military Trail	Morrish Rd	2041	50
		Military Trail			
		Conlins Rd			
	Segment 8	Morrish Rd	Meadowvale Rd	2041	50
		Morrish Rd			
	Segment 9	Meadowvale Rd	Hwy 401	2041	50
		Meadowvale Rd			
		Kingston Rd			
		Hwy 401 EB Off-ramp			
	Segment 10	Sheppard Ave E/Port Union Rd	Altona Rd	2041	60
		Sheppard Ave E/Port Union Rd			
		Hwy 401 WB Off-ramp			
	Segment 1	Rougmount Dr	Rosebank Rd	2041	60
		Rougmount Dr			
	Segment 2	Rosebank Rd	Regional Rd 38/Whites Rd N	2041	60
		Rosebank Rd			
		Steeple Hill			
	Segment 3	Regional Rd 38/Whites Rd N	Fairport Rd	2041	60
		Regional Rd 38/Whites Rd N			
		Delta Bvld			
		Hwy 401 WB Ramp			
	Segment 4	Fairport Rd	Dixie Rd	2041	60
		Fairport Rd			
	Segment 5	Dixie Rd	Regional Rd 29	2041	60

		Dixie Rd			
		Walnut Lane			
	Segment 6	Regional Rd 29	Valley Farm Rd	2041	60
		Regional Rd 29			
		Glenanna Rd			
	Segment 7	Valley Farm Rd	Brock Rd	2041	60
		Valley Farm Rd			
		Denmar/Guild Rd			
	Segment 8	Brock Rd	Notion Rd	2041	60
Kingston Rd		Brock Rd			
		Bainbridge Rd			
	Segment 9	Notion Rd	Regional Rd 24	2041	50
		Notion Rd			
		Elizabeth St			
	Segment 10	Regional Rd 24	Regional Rd 31	2041	50
		Regional Rd 24			
		Rotherglen Rd			
	Segment 11	Regional Rd 31	Regional Rd 44	2041	60
		Regional Rd 31			
		Westney Plaza			
		Ritchie Ave			
		Bestbuy Plaza			
	Segment 12	Regional Rd 44	Durham 41	2041	60
		Regional Rd 44			
		Durham East Center			
		Costco Entrance			
	Segment 13	Durham 41	Regional Rd 23	2041	70
		Durham 41			
		First Professional			
		Alexander's Crossing			
		Audley Rd			
	Segment1	Regional Rd 23	Hwy 412 NB	2041	70
		Regional Rd 23			
		Halls Rd			
		Hwy 412 SB			
	Segment2	Hwy 412 NB	McQuay/Jeffery St	2041	50
		Hwy 412 NB			
		Des Newman Bvld			
		White Oaks			
	Segment3	McQuay/Jeffery st	Cochrane St/Annes St	2041	50
		McQuay/Jeffery st			
	Segment3	Cochrane St/Annes St	Brock St S	2041	50
		Cochrane St/Annes St			

		Euclid/Henry St			
	Segment4	Brock St S	Garden St	2041	50
		Brock St S			
		Athol St			
		Ash St			
		Hickory St			
	Segment5	Garden St	Regional Rd 36	2041	50
		Garden St			
		Lupin Dr			
	Segment6	Regional Rd 36	Regional Rd 26/Thickson Rd	2041	50
		Regional Rd 36			
		Glen Hill Dr			
	Segment7	Regional Rd 26/Thickson Rd	Garrard Rd/Kandawood Rd	2041	50
		Regional Rd 26/Thickson Rd			
		Kathleen St			
		Kandalwood Plaza			
	Segment8	Garrard Rd/Kandawood Rd	Regional Rd 52/Thornton Rd	2041	50
		Garrard Rd/Kandawood Rd			
	Segment9	Regional Rd 52/Thornton Rd	Stevenson Rs S/ Regional Rd 53	2041	50
		Thornton Road			
	Segment1	Stevenson Rs S/ Regional Rd 53	Park Road	2041	50
		Stevenson Rs S/ Regional Rd 53			
		Gibbons St			
	Segment2	Park Road	Simcoe St N	2041	50
		Park Road			
		Arena St			
		McMillan Dr			
		Center St			
		Simcoe			
	Segment1	Stevenson Rs S/ Regional Rd 53	Park Road	2041	50
		Stevenson Rs S/ Regional Rd 53			
		Gibbons St			
	Segment2	Park Road	Simcoe St N	2041	50
		Park Road			
		Midtown Dr			
		McMillan Dr			
		Center St			
		Simcoe			

Durham Regional Hwy 2 / Dundas St W

Bond St W

King St W

*Note:
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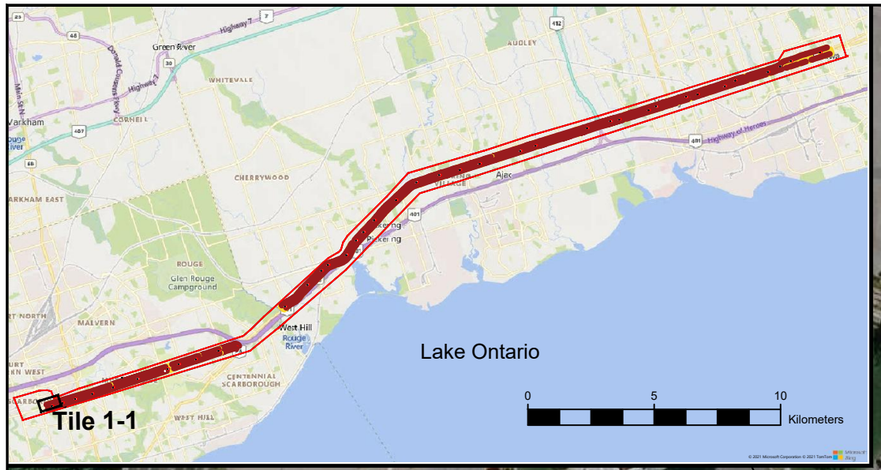
Road	Section				
	ID	From	TO	Year	Posted Speed (km/hr)
Ellesmere Rd	Segment 1	McCowan Rd	Bellamy Rd N	2041	60
		McCowan Rd			
	Segment 2	Bellamy Rd N	Markham Rd	2041	60
		Bellamy Rd N			
		Dolly Varden Blvd			
	Segment 3	Markham Rd	Scarborough Golf Club Rd	2041	60
		Markham Rd			
	Segment 4	Scarborough Golf Club Rd	ORTON Park Rd	2041	60
		Scarborough Golf Club Rd			
	Segment 5	ORTON Park Rd	Morningside Ave	2041	60
		ORTON Park Rd			
		Neilson Rd			
	Segment 6	Morningside Ave	Military Trail	2041	50
		Morningside Ave			
	Segment 7	Military Trail	Morrish Rd	2041	50
		Military Trail			
		Conlins Rd			
	Segment 8	Morrish Rd	Meadowvale Rd	2041	50
		Morrish Rd			
	Segment 9	Meadowvale Rd	Hwy 401	2041	50
		Meadowvale Rd			
		Kingston Rd			
		Hwy 401 EB Off-ramp			
	Segment 10	Sheppard Ave E/Port Union Rd	Altona Rd	2041	60
		Sheppard Ave E/Port Union Rd			
		Hwy 401 WB Off-ramp			
Kingston Rd	Segment 1	Rougmount Dr	Rosebank Rd	2041	60
		Rougmount Dr			
	Segment 2	Rosebank Rd	Regional Rd 38/Whites Rd N	2041	60
		Rosebank Rd			
		Steeple Hill			
	Segment 3	Regional Rd 38/Whites Rd N	Fairport Rd	2041	60
		Regional Rd 38/Whites Rd N			
		Delta Bvld			
		Hwy 401 WB Ramp			
	Segment 4	Fairport Rd	Dixie Rd	2041	60
		Fairport Rd			
	Segment 5	Dixie Rd	Regional Rd 29	2041	60
		Dixie Rd			
		Walnut Lane			
	Segment 6	Regional Rd 29	Valley Farm Rd	2041	60
		Regional Rd 29			
		Glenanna Rd			
	Segment 7	Valley Farm Rd	Brock Rd	2041	60
		Valley Farm Rd			
		Denmar/Guild Rd			
	Segment 8	Brock Rd	Notion Rd	2041	60
		Brock Rd			
		Bainbridge Rd			
	Segment 9	Notion Rd	Regional Rd 24	2041	50
		Notion Rd			
		Elizabeth St			
	Segment 10	Regional Rd 24	Regional Rd 31	2041	50
		Regional Rd 24			
		Rotherglen Rd			
	Segment 11	Regional Rd 31	Regional Rd 44	2041	60
		Regional Rd 31			
		Westney Plaza			
		Ritchie Ave			
		Bestbuy Plaza			
	Segment 12	Regional Rd 44	Durham 41	2041	60
		Regional Rd 44			
		Durham East Center			
		Costco Entrance			

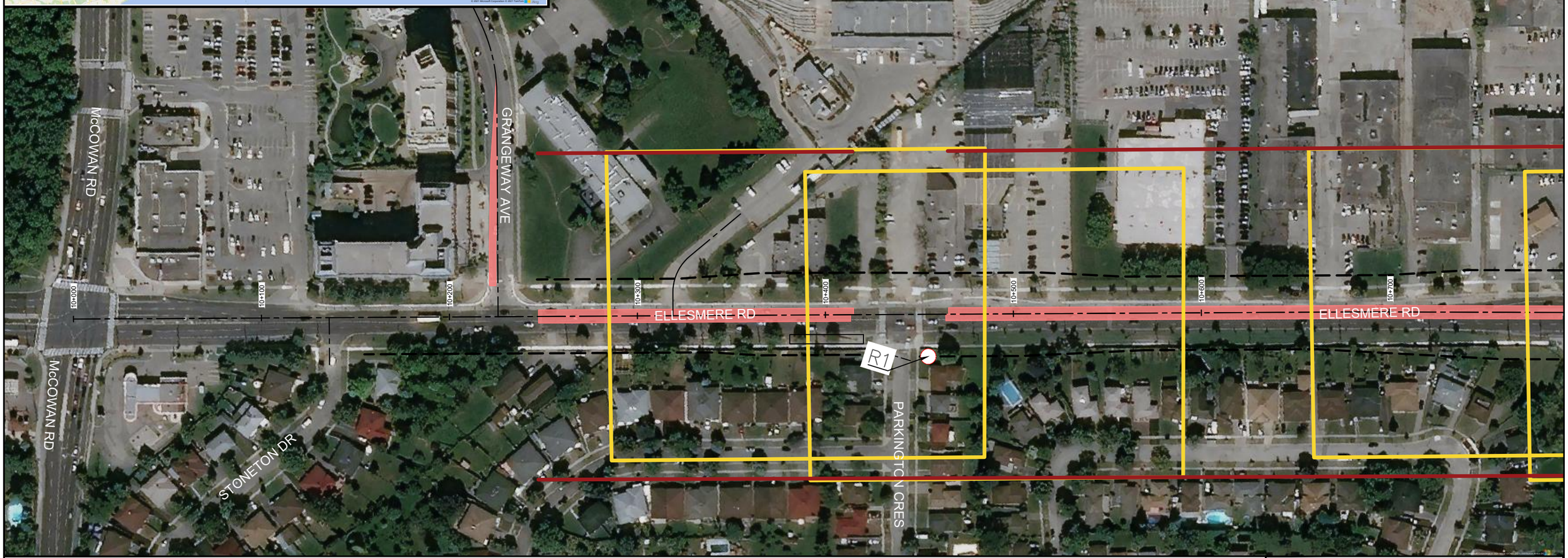
	Segment 13	Durham 41	Regional Rd 23	2041	70
		Durham 41			
		First Professional			
		Alexander's Crossing			
		Audley Rd			
Durham Regional Hwy 2 / Dundas St W	Segment1	Regional Rd 23	Hwy 412 NB	2041	70
		Regional Rd 23			
		Halls Rd			
		Hwy 412 SB			
	Segment2	Hwy 412 NB	McQuay/Jeffery St	2041	50
		Hwy 412 NB			
		Des Newman Bvld			
		White Oaks			
	Segment3	McQuay/Jeffery st	Cochrane St/Annes St	2041	50
		McQuay/Jeffery st			
	Segment3	Cochrane St/Annes St	Brock St S	2041	50
		Cochrane St/Annes St			
		Euclid/Henry St			
	Segment4	Brock St S	Garden St	2041	50
		Brock St S			
		Athol St			
		Ash St			
		Hickory St			
	Segment5	Garden St	Regional Rd 36	2041	50
		Garden St			
		Lupin Dr			
	Segment6	Regional Rd 36	Regional Rd 26/Thickson Rd	2041	50
		Regional Rd 36			
		Glen Hill Dr			
	Segment7	Regional Rd 26/Thickson Rd	Garrard Rd/Kandawood Rd	2041	50
		Regional Rd 26/Thickson Rd			
		Kathleen St			
		Kandalwood Plaza			
	Segment8	Garrard Rd/Kandawood Rd	Regional Rd 52/Thornton Rd	2041	50
		Garrard Rd/Kandawood Rd			
	Segment9	Regional Rd 52/Thornton Rd	Stevenson Rs S/ Regional Rd 53	2041	50
		Thornton Road			
Bond St W	Segment1	Stevenson Rs S/ Regional Rd 53	Park Road	2041	50
		Stevenson Rs S/ Regional Rd 53			
		Gibbons St			
	Segment2	Park Road	Simcoe St N	2041	50
		Park Road			
		Arena St			
		McMillan Dr			
		Center St			
		Simcoe			
King St W	Segment1	Stevenson Rs S/ Regional Rd 53	Park Road	2041	50
		Stevenson Rs S/ Regional Rd 53			
		Gibbons St			
	Segment2	Park Road	Simcoe St N	2041	50
		Park Road			
		Midtown Dr			
		McMillan Dr			
		Center St			
		Simcoe			

*Note:
EB and WB traffic volume are for the main roads(Ellesmere Rd, Kingston Rd, Durham Regional Hwy 2/Dundas St W, Bond St W)

APPENDIX I: CONSTRUCTION NOISE ZONE OF INFLUENCE

DRAFT





Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters: 50 0 50 100

1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-1**

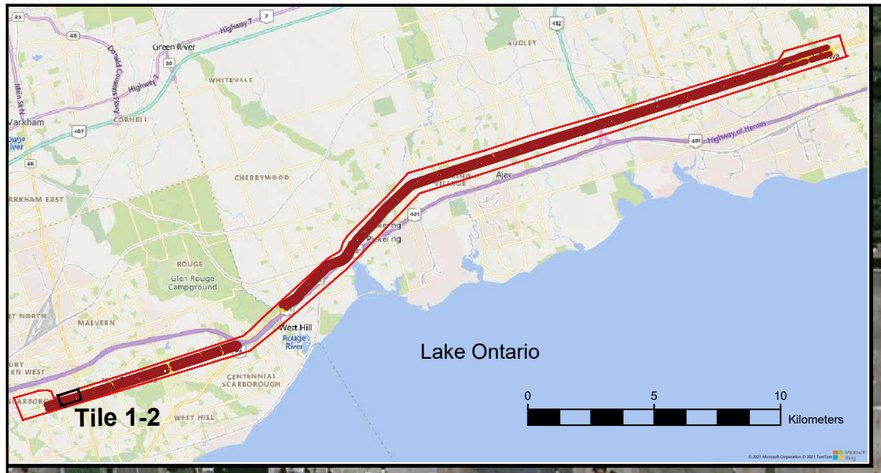
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



BELLAMY RD N

ELLESMERE RD

DOLLY VARDEN BLVD

R2

R3

10+800 10+900 11+000 11+100 11+200 11+300 11+400 11+500 11+600

Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title: CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-2

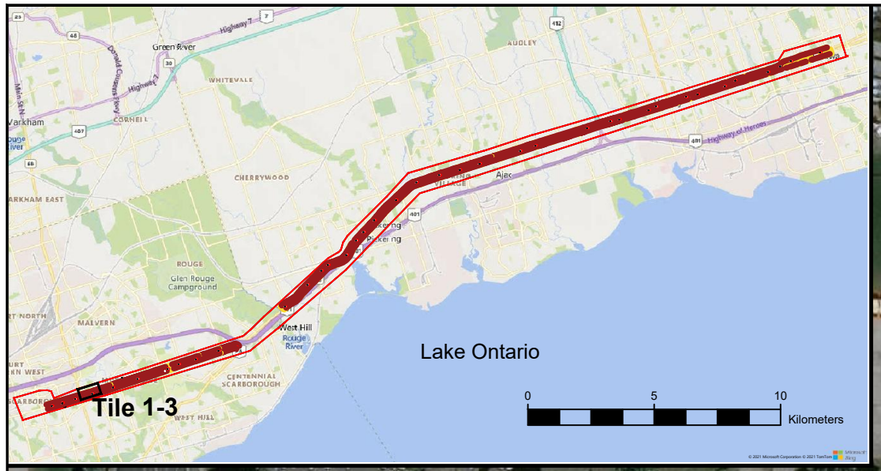
Project: Durham Scarborough Bus Rapid Transit (DSBRT)

Client: METROLINX

ARCADIS

Date: June 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title: CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-3

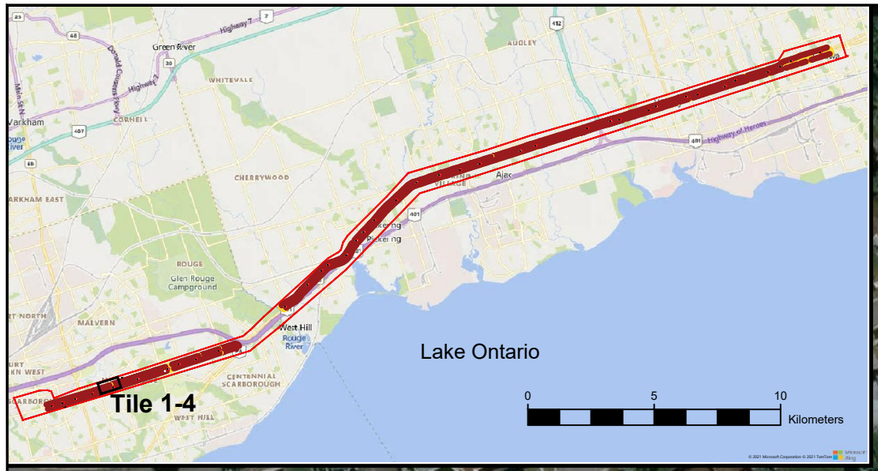
Project: Durham Scarborough Bus Rapid Transit (DSBRT)

Client: METROLINX

ARCADIS

Date: June 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-4**

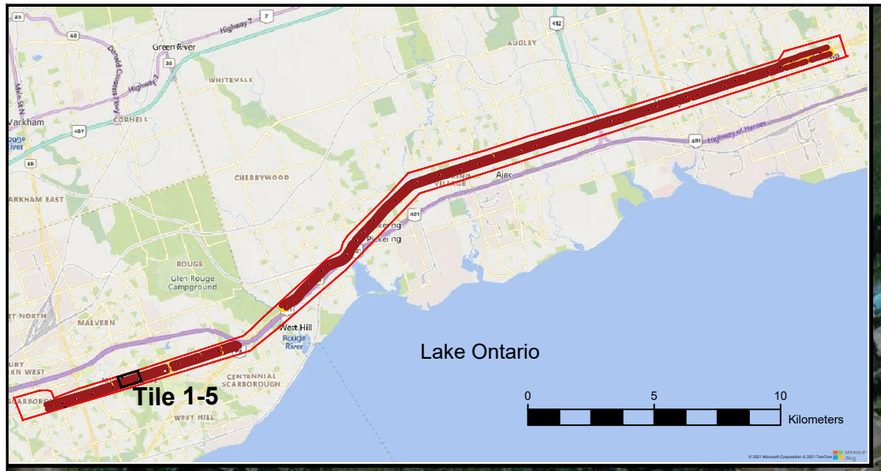
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-5**

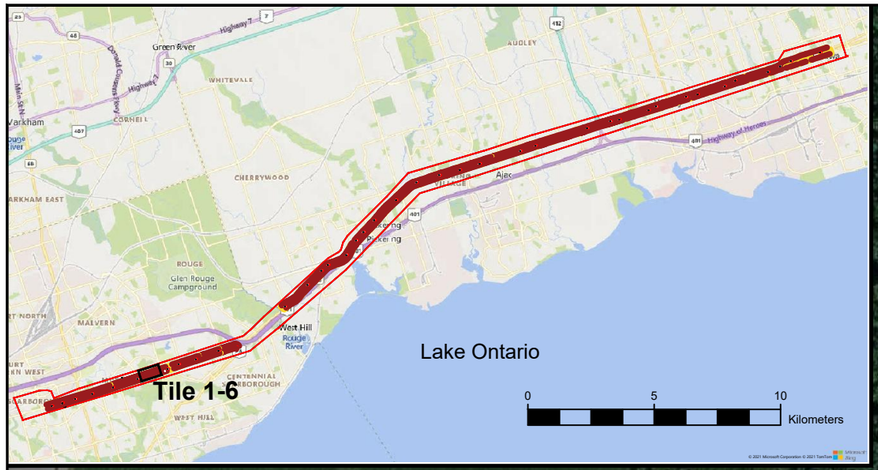
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-6**

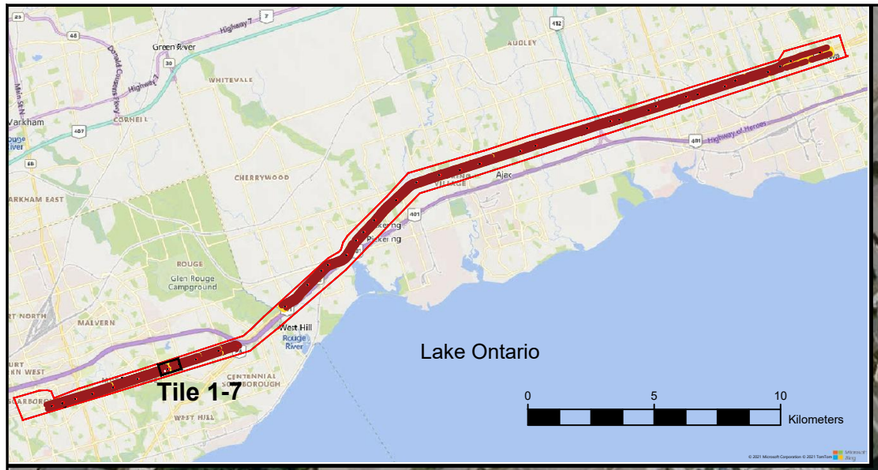
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-7**

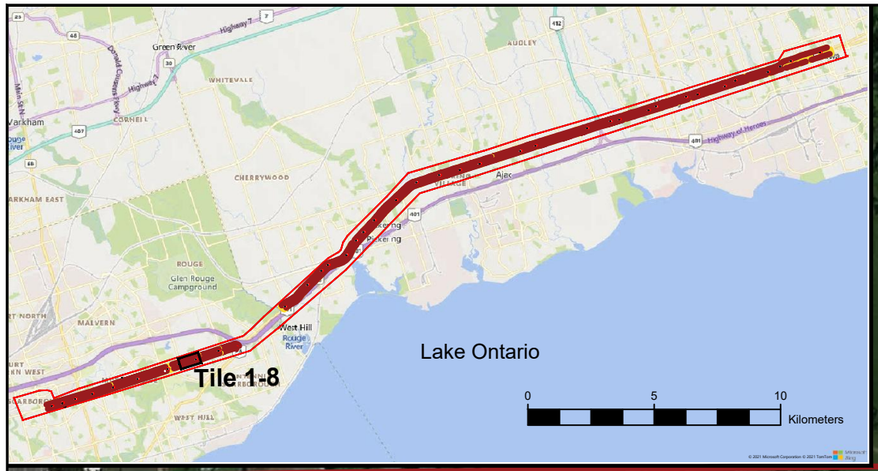
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-8**

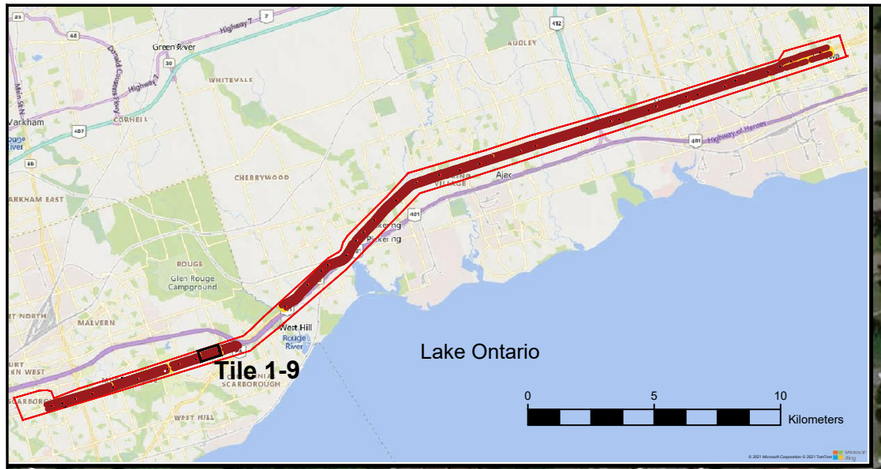
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-9**

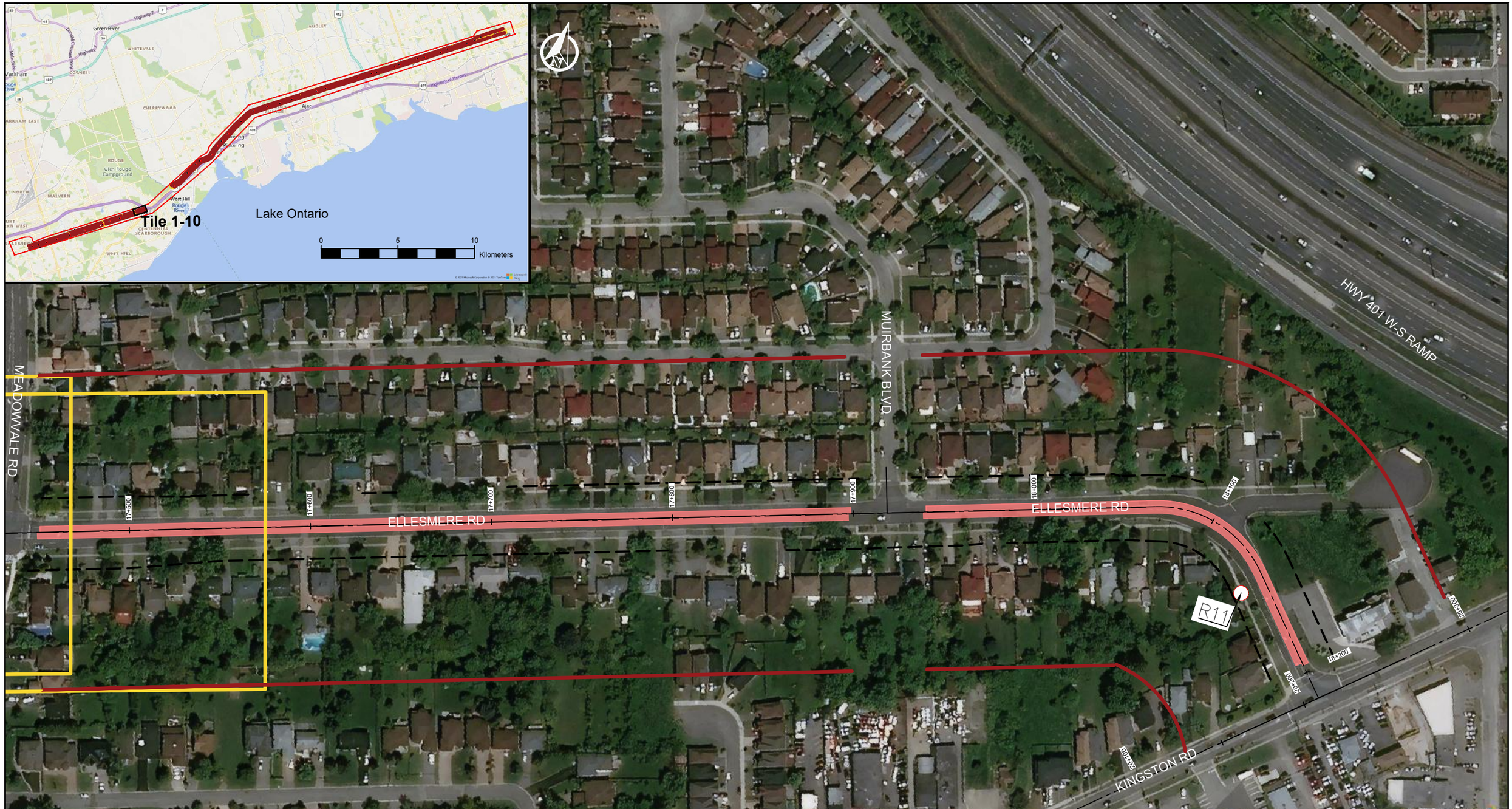
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title
CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-10

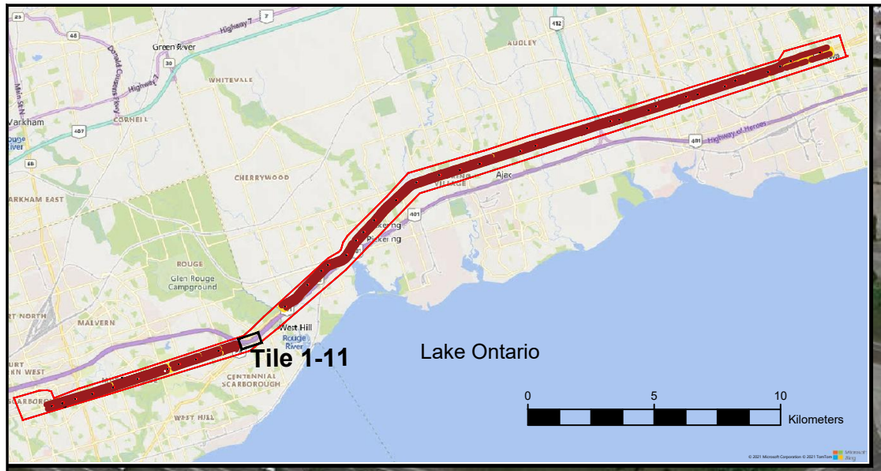
Project:
Durham Scarborough Bus Rapid Transit (DSBRT)

Client:
METROLINX

ARCADIS

Date:
June 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100

1:2000

Title
CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 1-11

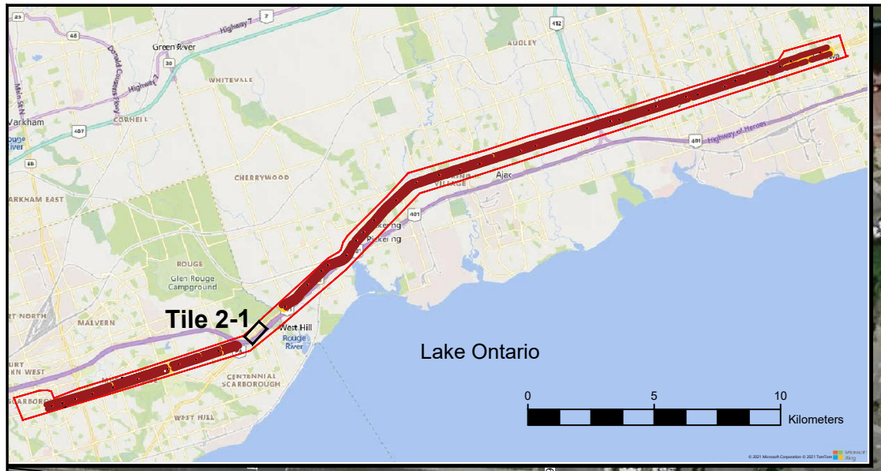
Project:
Durham Scarborough Bus Rapid Transit (DSBRT)

Client:
METROLINX

ARCADIS

Date:
June 2021

Background Reference: Microsoft Bing Maps



KINGSTON RD
SHEPPARD AVE E
PORT UNION RD
HWY 401 E-W RAMP
HWY 401 OFF-RAMP
N-W RAMP
HIGHWAY 401
RASPBERRY RD
20+900
21+000
21+100
21+200
21+300
21+400
21+500

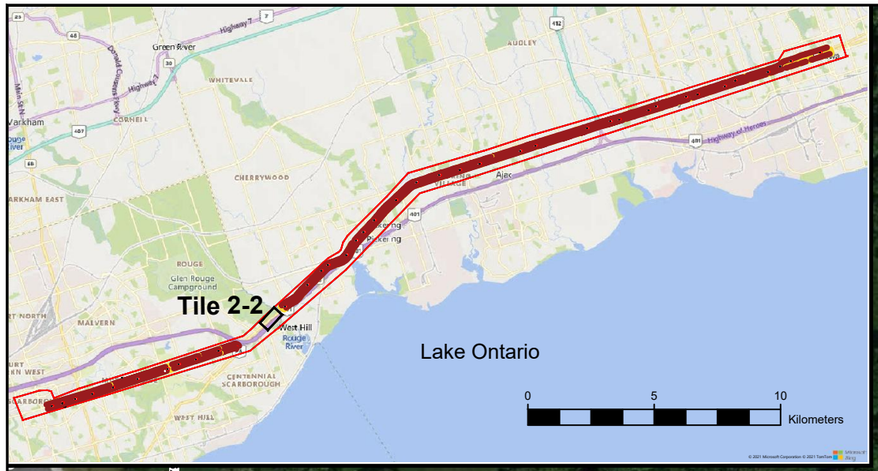
Legend

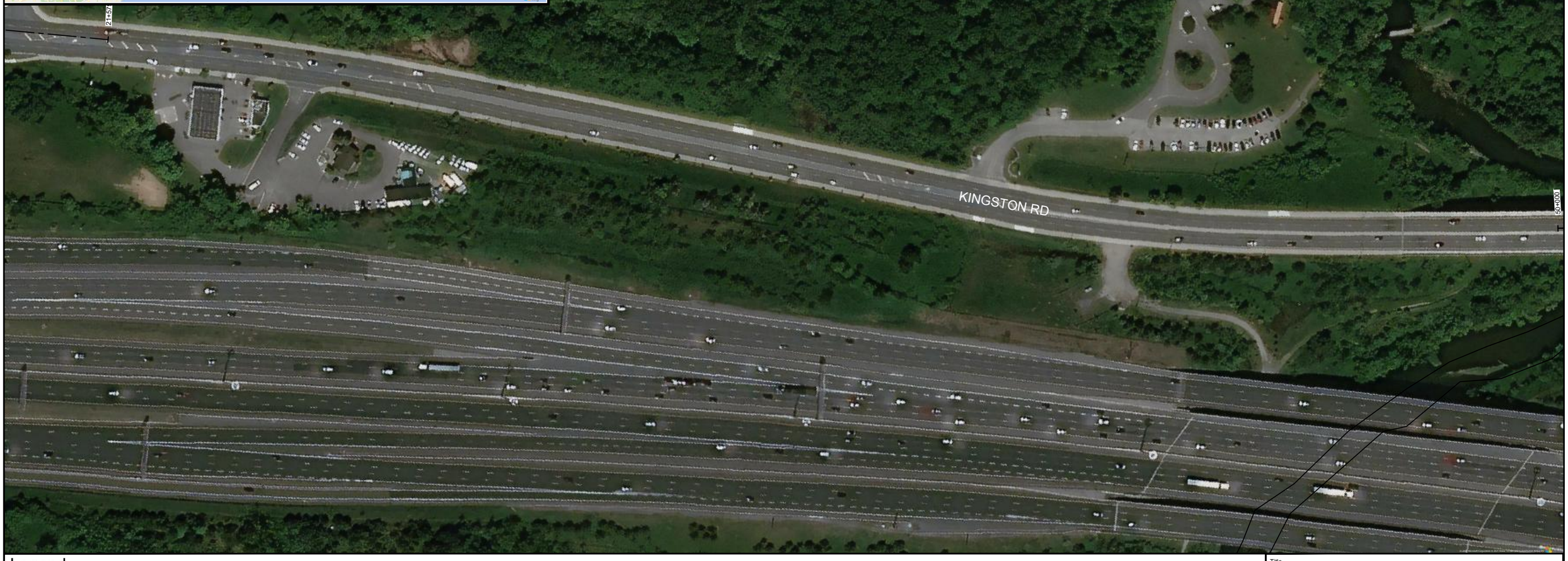
- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-1
Project: Durham Scarborough Bus Rapid Transit (DSBRT)
Client: METROLINX
ARCADIS
Date: June 2021

Background Reference: Microsoft Bing Maps





Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-2**

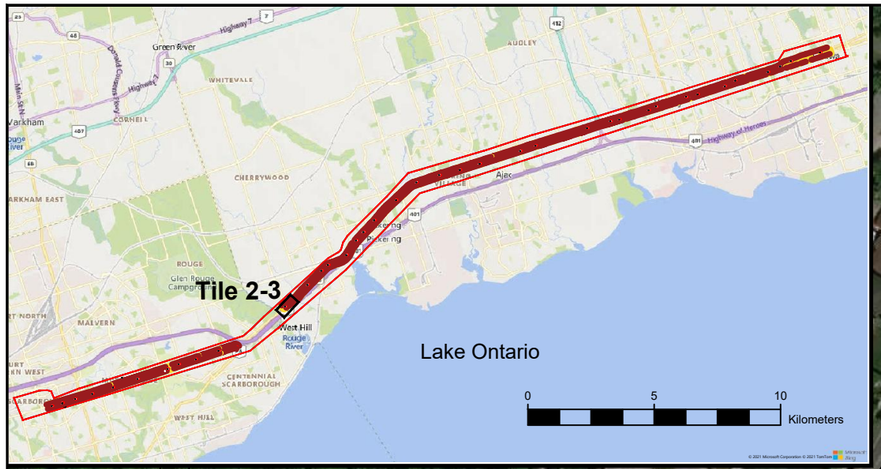
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-3**

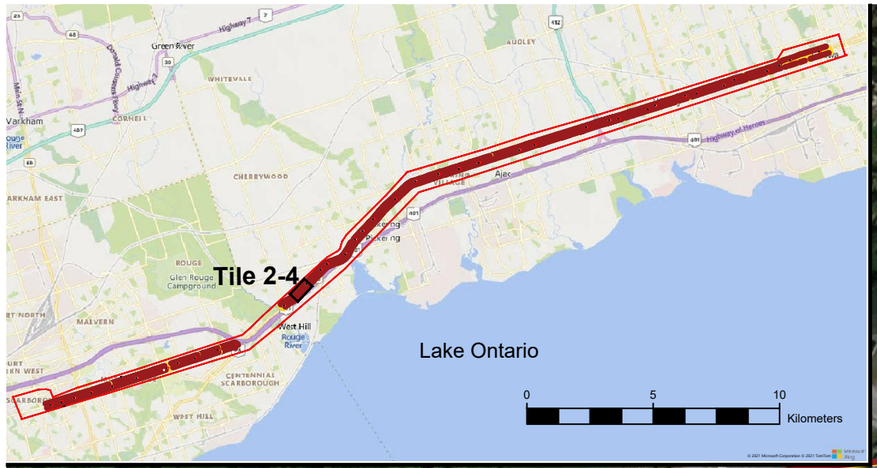
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-4**

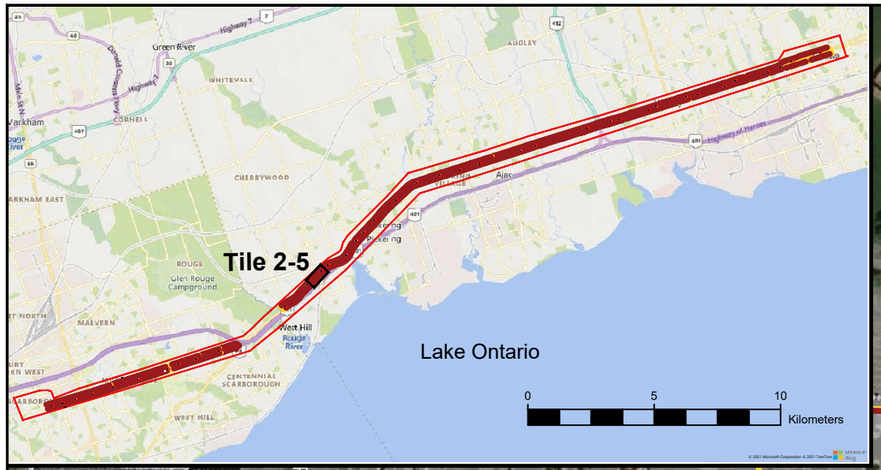
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-5**

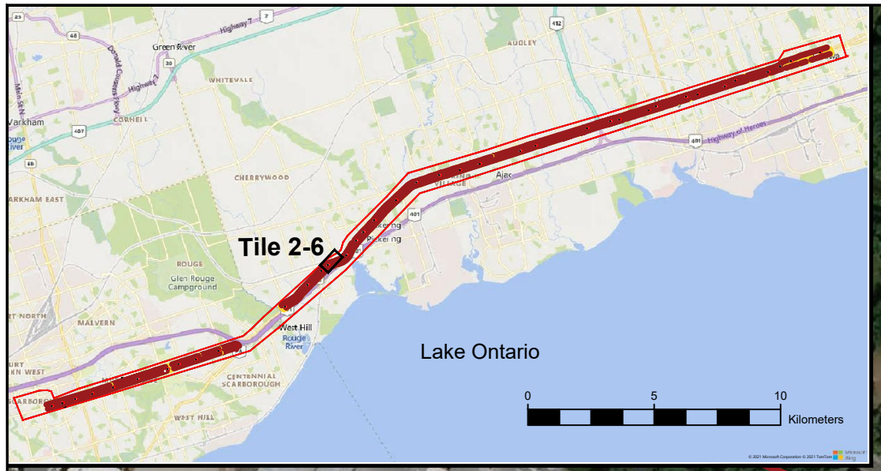
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-6**

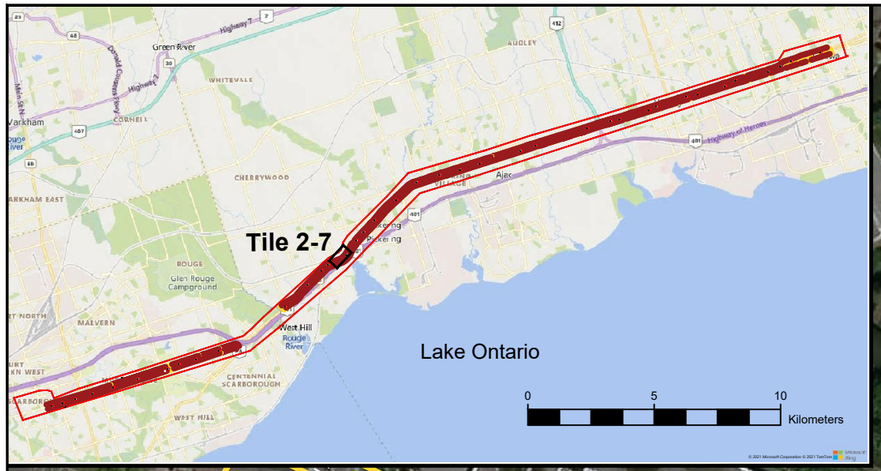
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

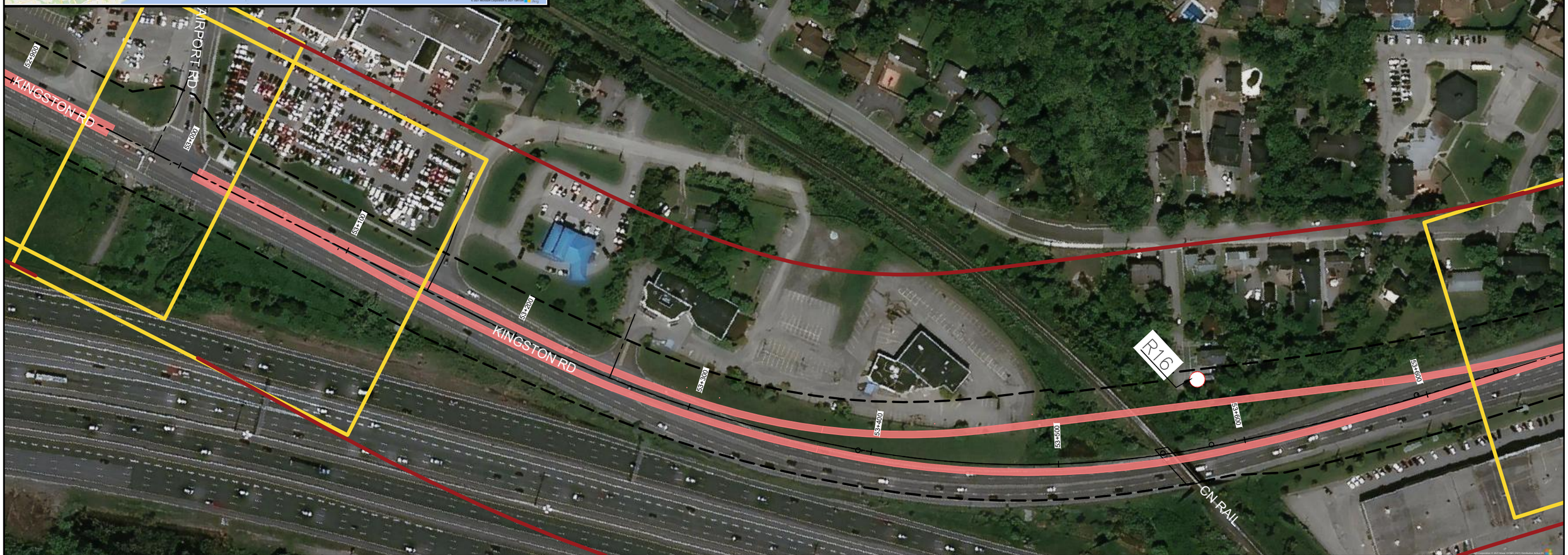
Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps





Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-7**

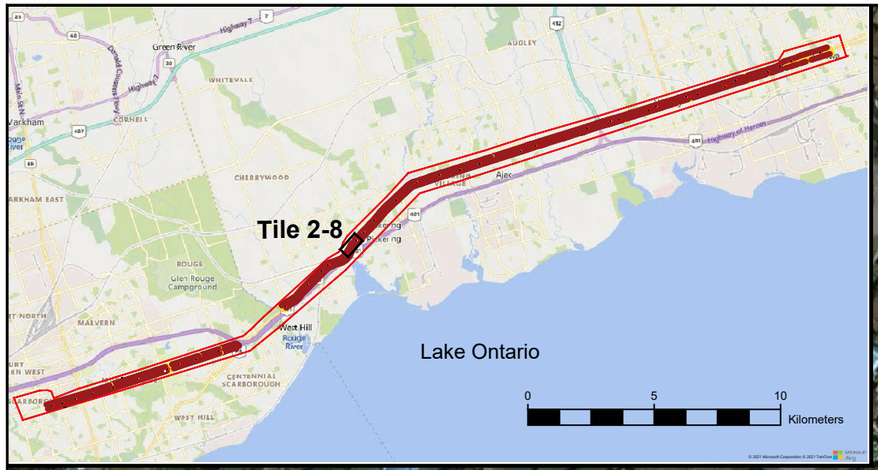
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-8**

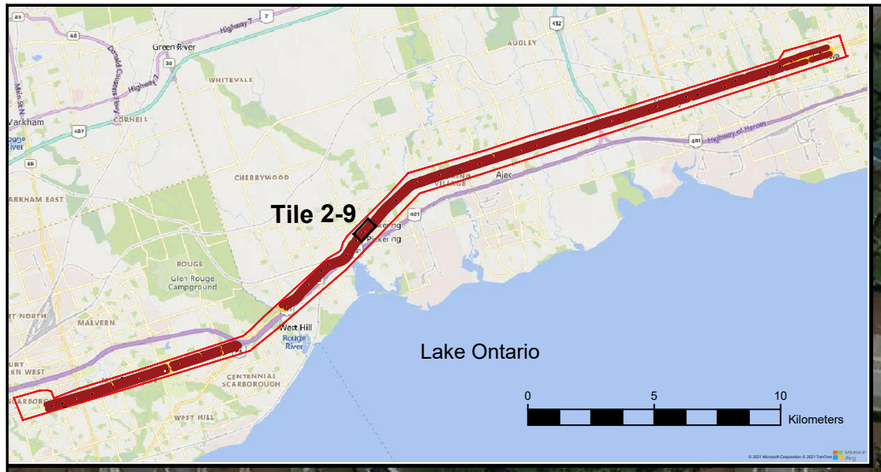
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100

1:2000

Title: CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-9

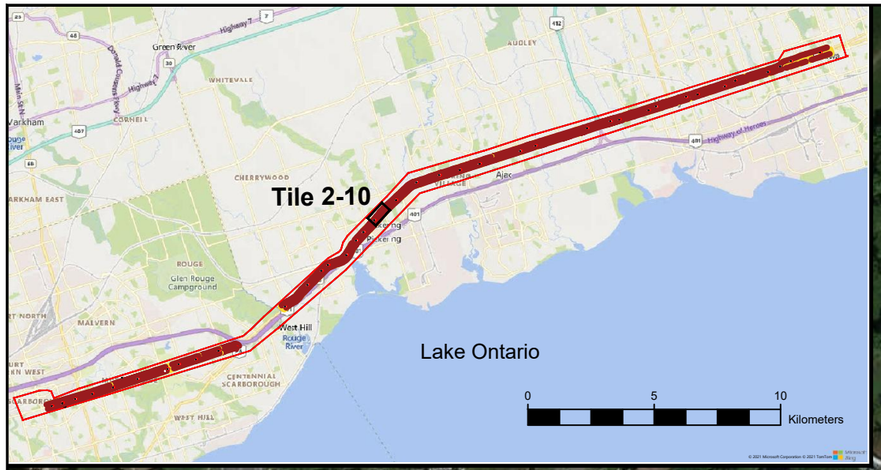
Project: Durham Scarborough Bus Rapid Transit (DSBRT)

Client: METROLINX

ARCADIS

Date: June 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title
CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-10

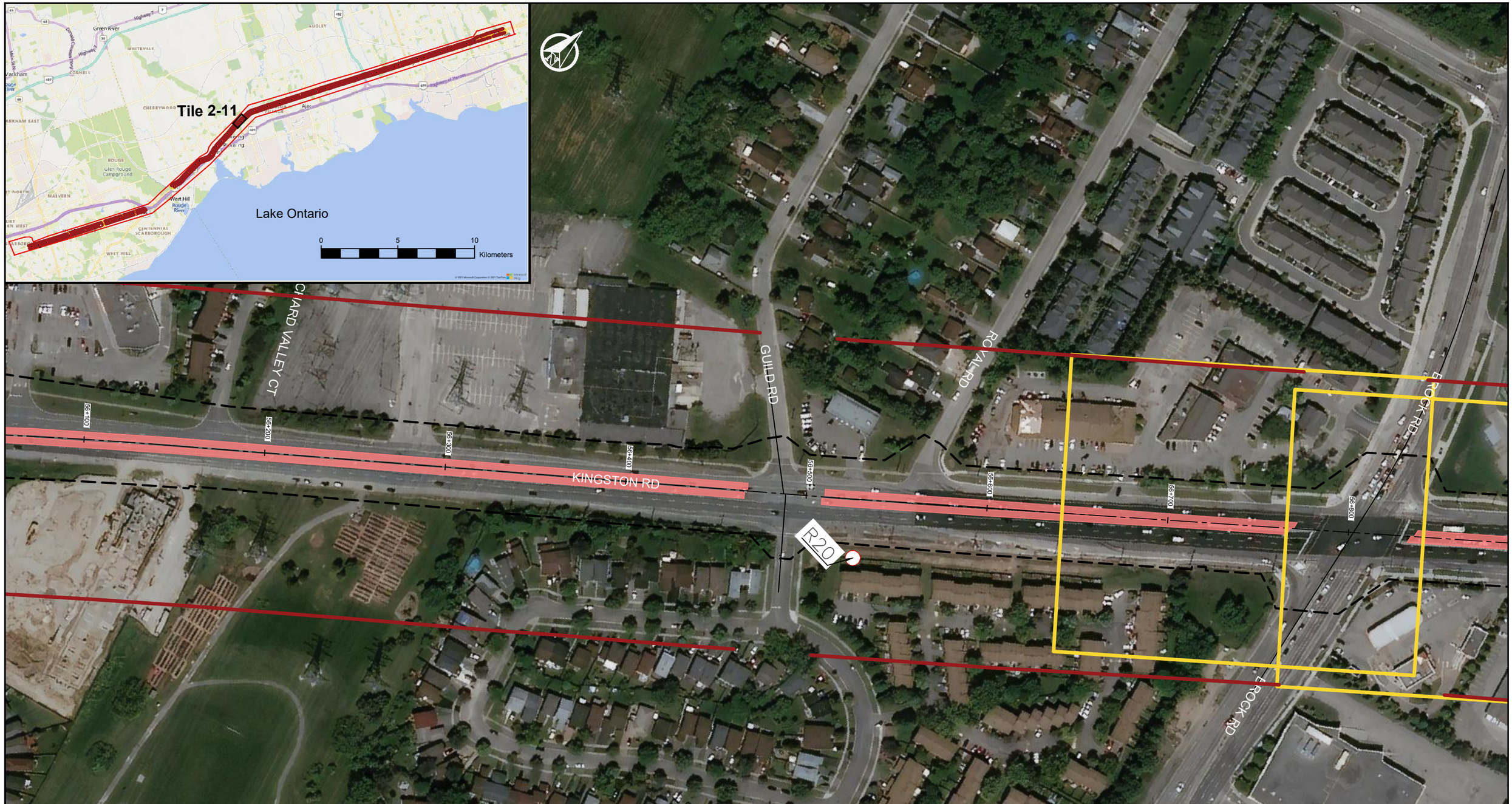
Project:
Durham Scarborough Bus Rapid Transit (DSBRT)

Client:
METROLINX

ARCADIS

Date:
June 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title
CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-11

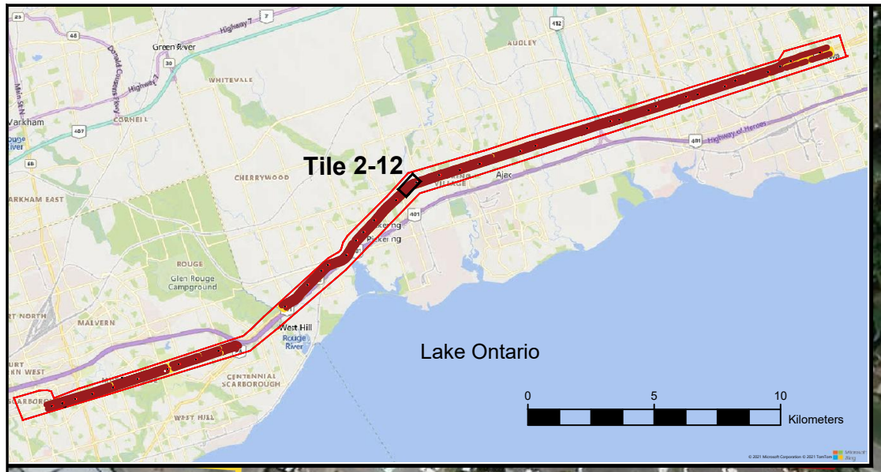
Project:
Durham Scarborough Bus Rapid Transit (DSBRT)

Client:
METROLINX

ARCADIS

Date:
June 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 2-12**

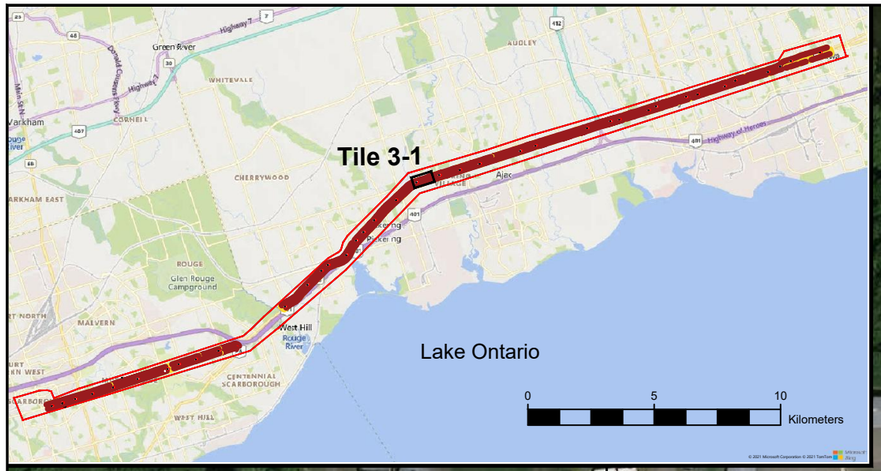
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-1

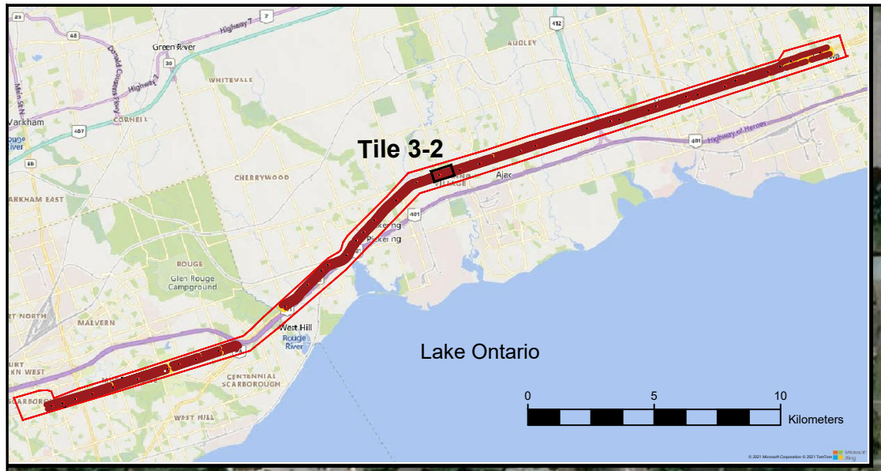
Project: Durham Scarborough Bus Rapid Transit (DSBRT)

Client: METROLINX

ARCADIS

Date: June 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100

1:2000

Title: CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-2

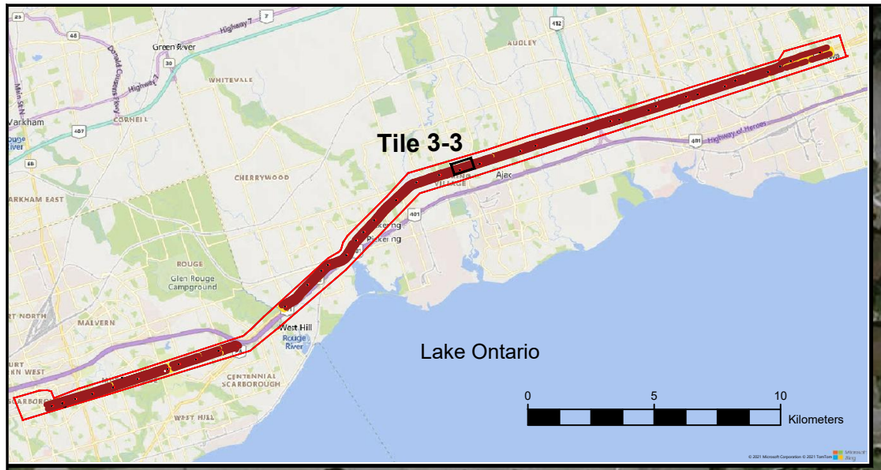
Project: Durham Scarborough Bus Rapid Transit (DSBRT)

Client: METROLINX

ARCADIS

Date: June 2021

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100

1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-3**

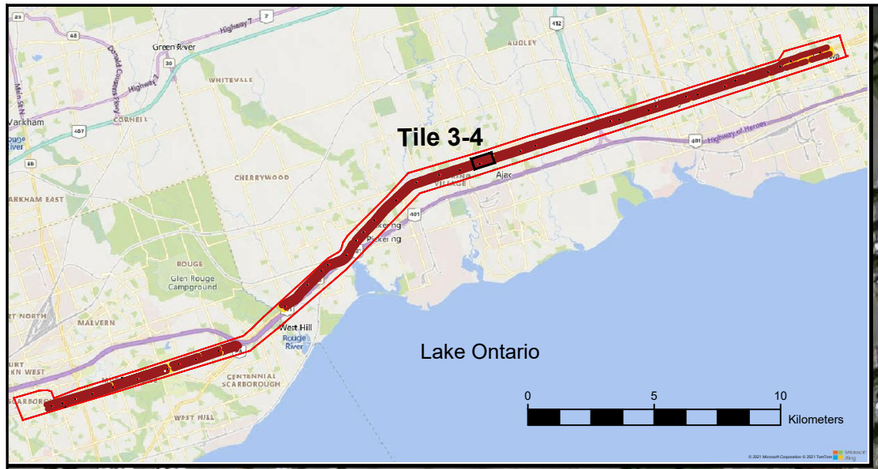
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

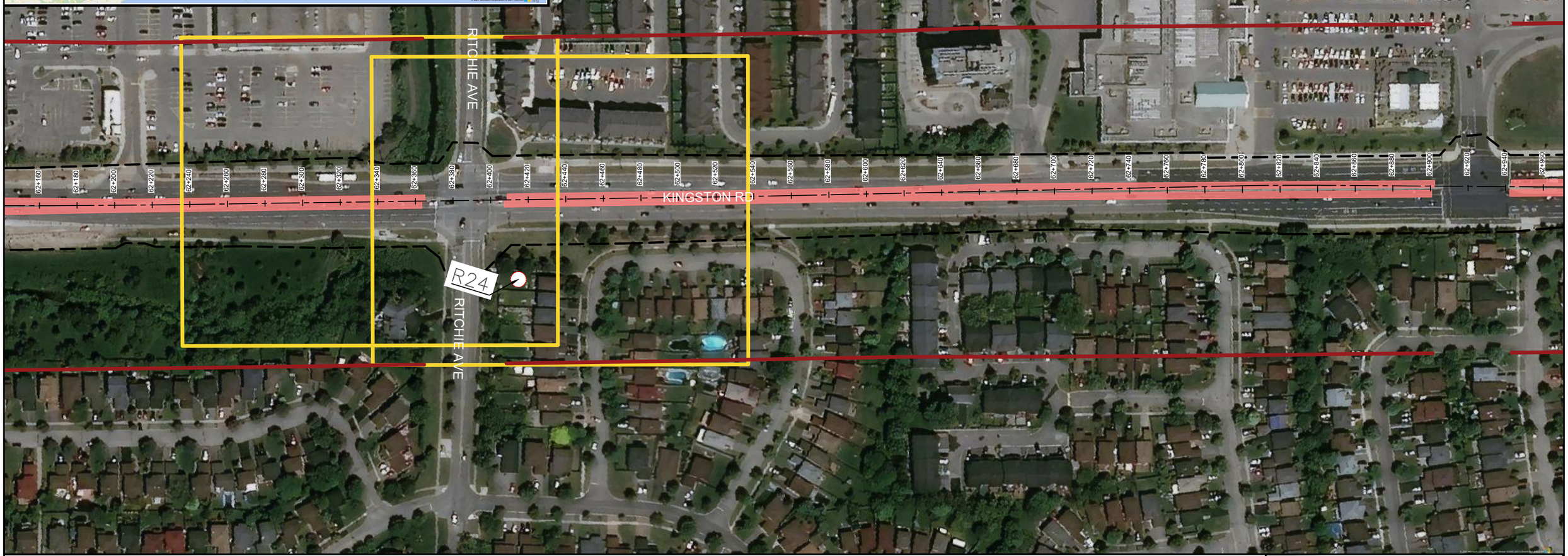
Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps





Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-4**

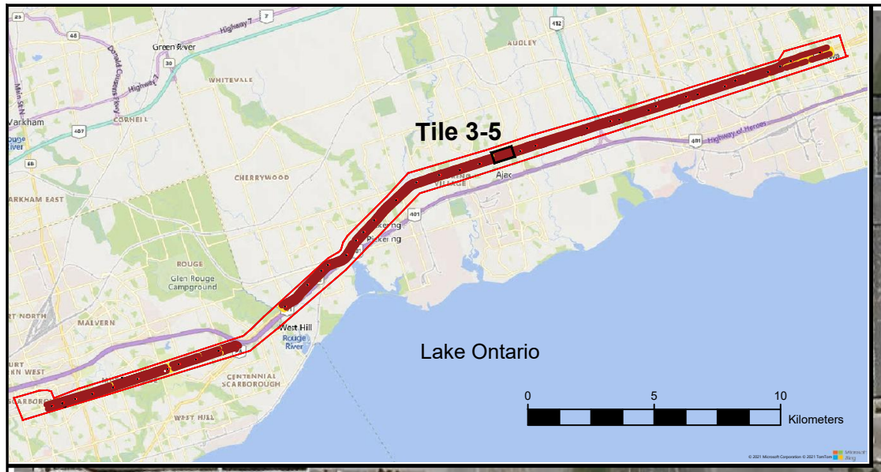
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-5**

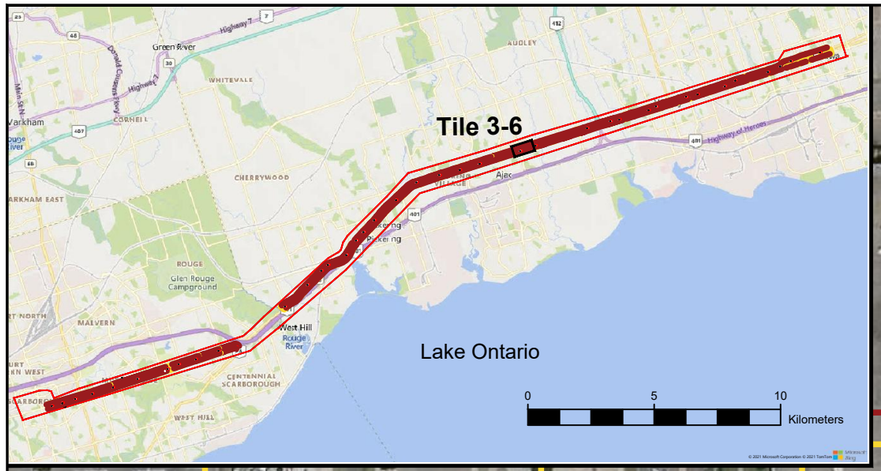
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-6**

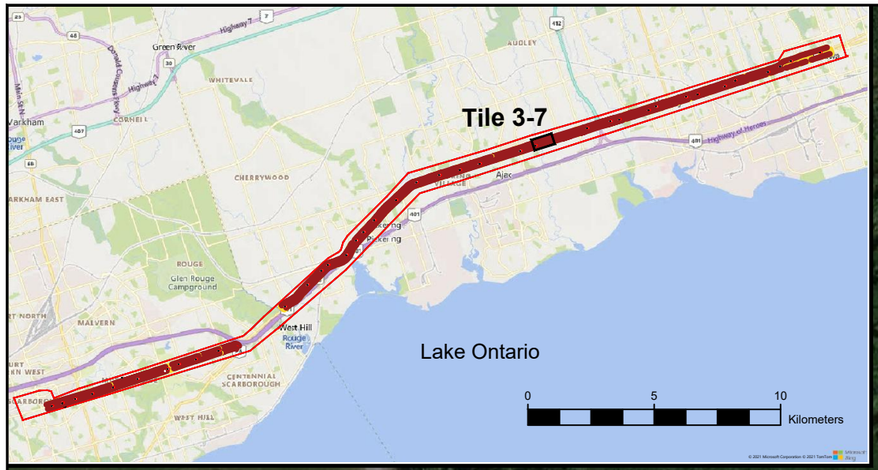
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



CARRUTHERS CREEK
B-04

KINGSTON RD

ALEXANDER'S CROSSING

FUTURE ACCESS

FUTURE ACCESS (BY OTHERS)

GALEA DR

R26

84+640 84+660 84+680 84+700 84+720 84+740 84+760 84+780 84+800 84+820 84+840 84+860 84+880 84+900 84+920 84+940 84+960 84+980 85+000 85+020 85+040 85+060 85+080 85+100 85+120 85+140 85+160 85+180 85+200 85+220 85+240 85+260 85+280 85+300 85+320 85+340 85+360 85+380 85+400 85+420 85+440

Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-7**

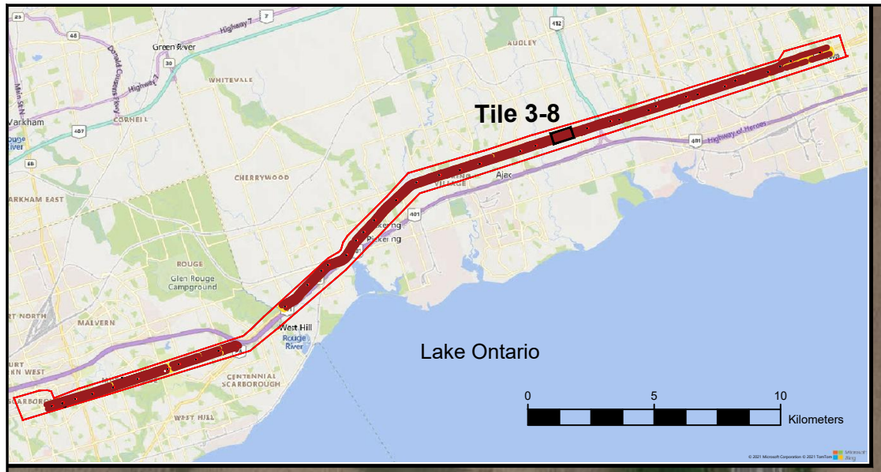
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-8**

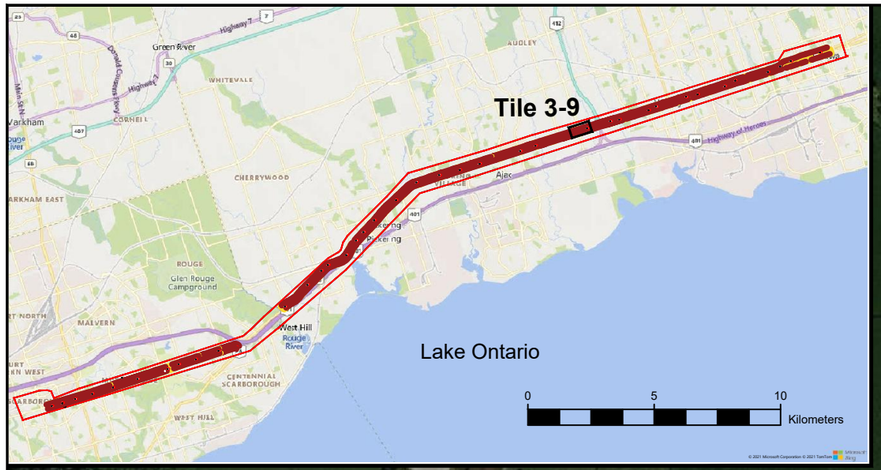
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-9**

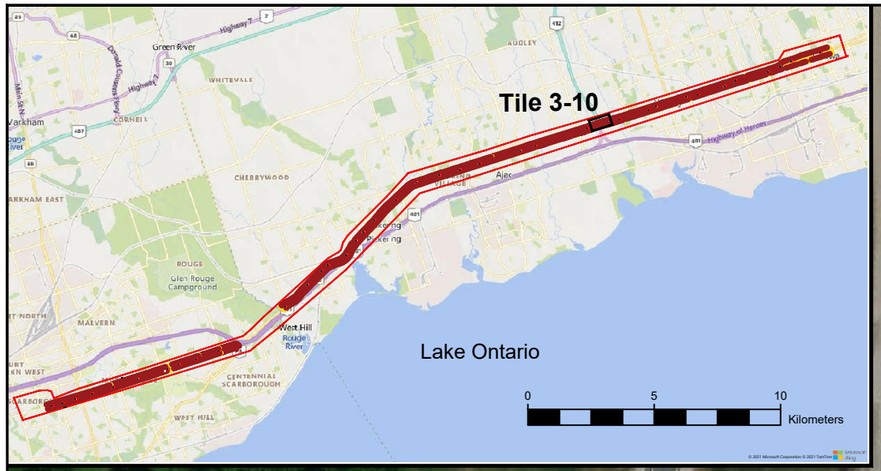
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



HIGHWAY 412

LYNDE CREEK C-13

LYNDE CREEK C-11

HWY 412 OFF RAMP

HWY 412 ON RAMP

DES NEWMAN BLVD

KINGSTON RD

R28

70+540 70+560 70+580 70+600 70+620 70+640 70+660 70+680 70+700 70+720 70+740 70+760 70+780 70+800 70+820 70+840 70+860 70+880 70+900 70+920 70+940 70+960 70+980 71+000 71+020 71+040 71+060 71+080 71+100 71+120 71+140 71+160 71+180 71+200 71+220 71+240 71+260 71+280 71+300 71+320 71+340

Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters

50 0 50 100

1:2000

Title
CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-10

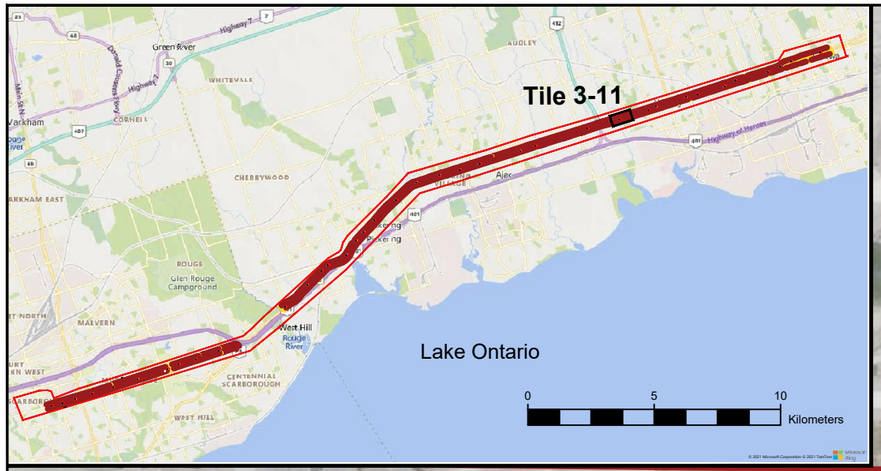
Project:
Durham Scarborough Bus Rapid Transit (DSBRT)

Client:
METROLINX

ARCADIS

Date:
June 2021

Background Reference: Microsoft Bing Maps



SWORDFISH DR

McQUAY BLVD

LYNDE CREEK B-06

71+360 71+380 71+400 71+420 71+440 71+460 71+480 71+500 71+520 71+540 71+560 71+580 71+600 71+620 71+640 71+660 71+680 71+700 71+720 71+740 71+760 71+780 71+800 71+820 71+840 71+860 71+880 71+900 71+920 71+940 71+960 71+980 72+000 72+020 72+040 72+060 72+080 72+100 72+120 72+140 72+160

DUNDAS ST W

R29

FOTHERGILL CT

LYNDE CREEK C-15

WHITE OAKS CT

JEFFERY ST

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Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-11**

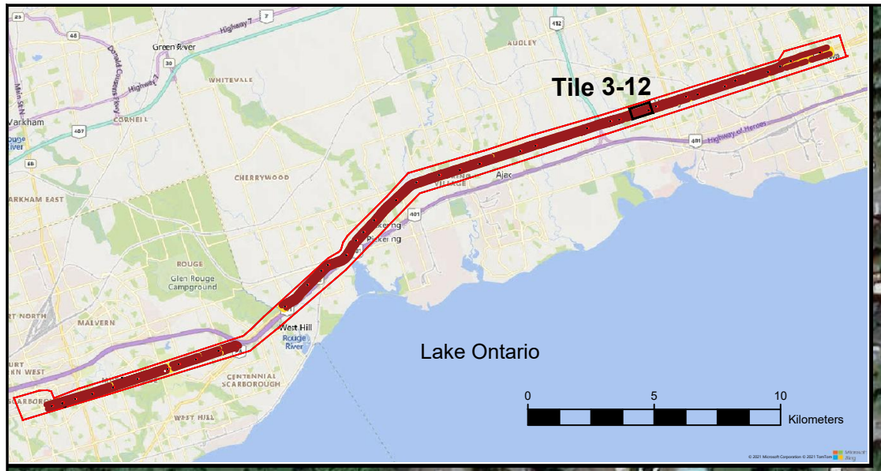
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-12**

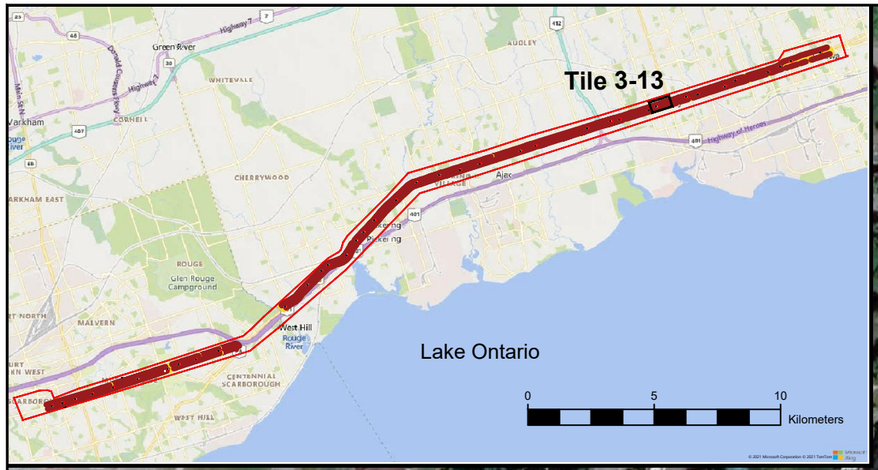
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-13**

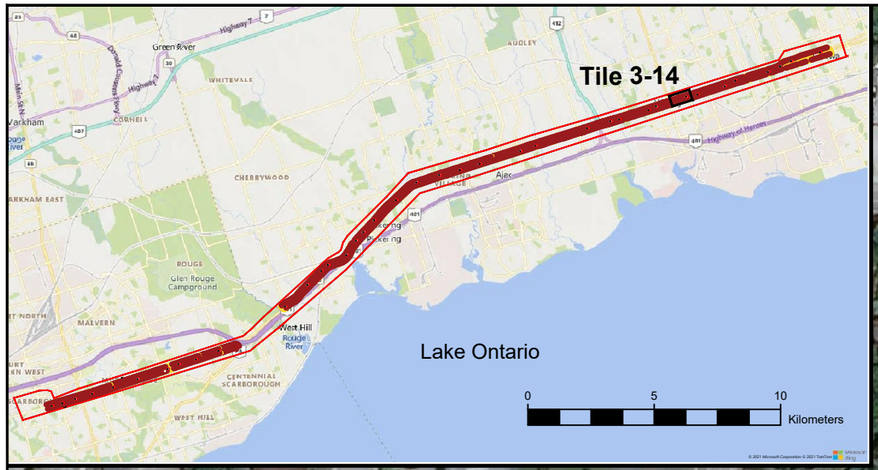
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-14**

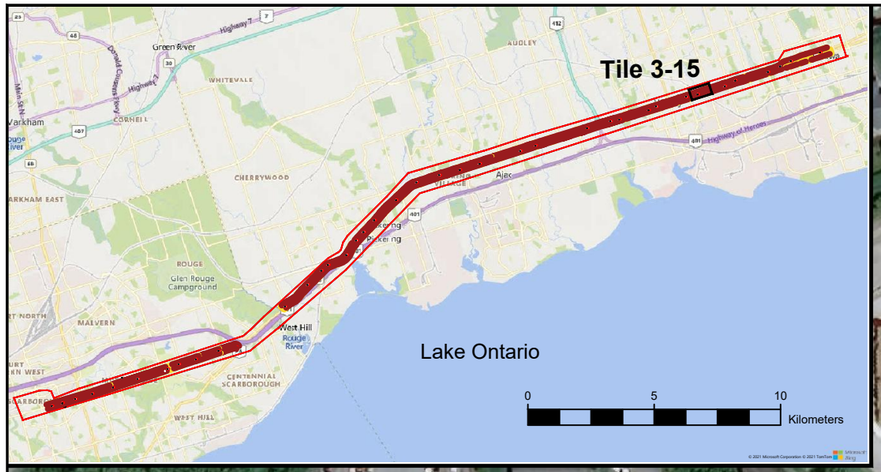
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-15**

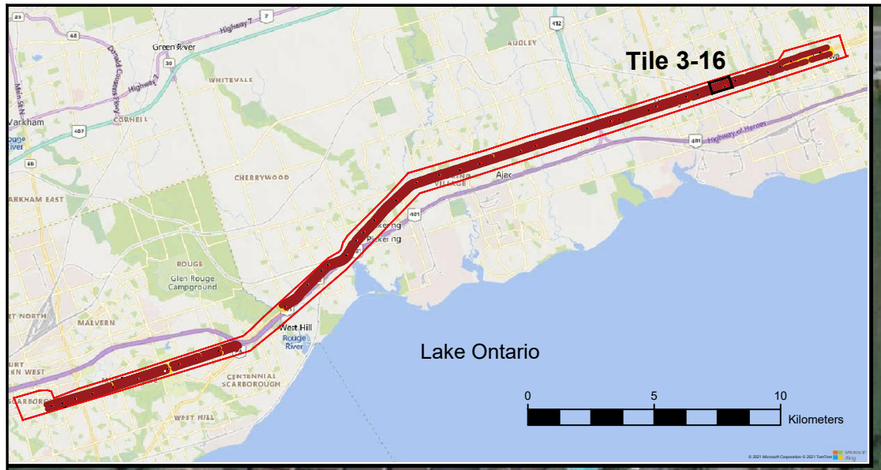
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-16**

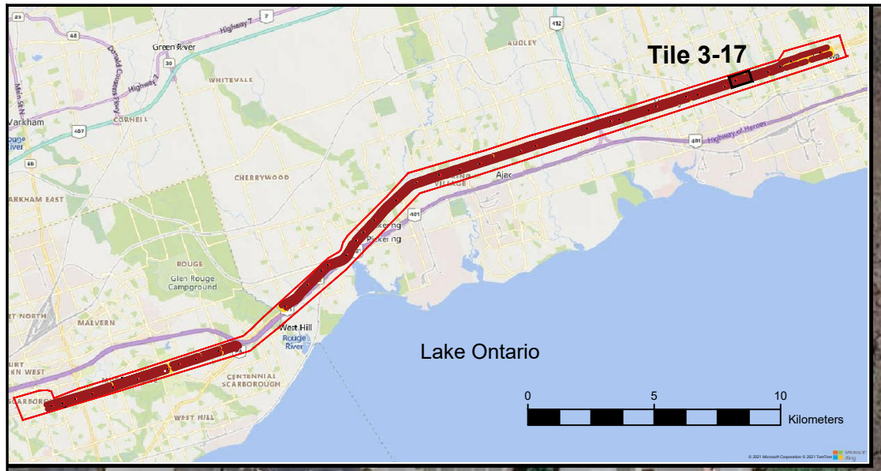
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



SCOTT ST

GARRARD RD

KATHLEEN ST

R35

76+340 76+360 76+380 76+400 76+420 76+440 76+460 76+480 76+500 76+520 76+540 76+560 76+580 76+600 76+620 76+640 76+660 76+680 76+700 76+720 76+740 76+760 76+780 76+800 76+820 76+840 76+860 76+880 76+900 76+920 76+940 76+960 76+980 77+000 77+020 77+040 77+060 77+080 77+100 77+120 77+140

DUNDAS ST E

CORBETT CREEK C-16

KENDALWOOD RD

Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100

1:2000

Title
CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-17

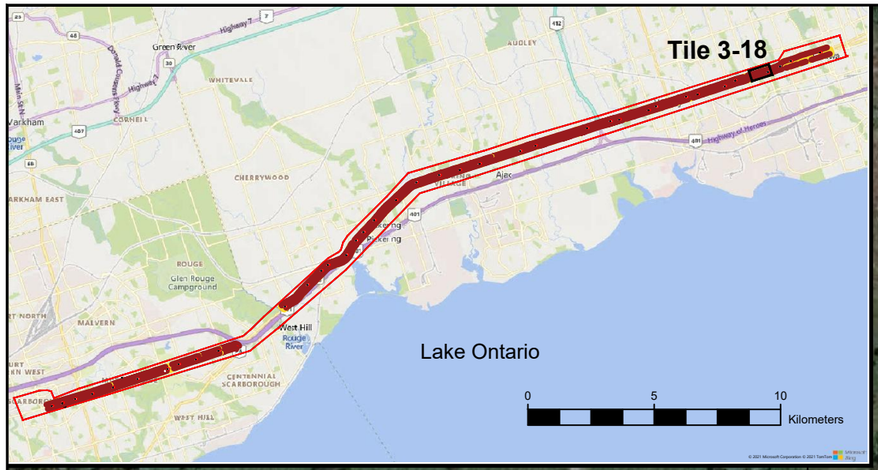
Project:
Durham Scarborough Bus Rapid Transit (DSBRT)

Client:
METROLINX

ARCADIS

Date:
June 2021

Background Reference: Microsoft Bing Maps



CORBETT CREEK C-17

THORNTON RD N

THORNTON RD S

POWELL RD

DUNDAS ST E

KING ST W

KING ST W

R36

77+160 77+180 77+200 77+220 77+240 77+260 77+280 77+300 77+320 77+340 77+360 77+380 77+400 77+420 77+440 77+460 77+480 77+500 77+520 77+540 80+000 80+020 80+040 80+060 80+080 80+100 80+120 80+140 80+160 80+180 80+200 80+220 80+240 80+260 80+280 80+300 80+320 80+340 80+360 80+380 80+400 80+420

Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-18

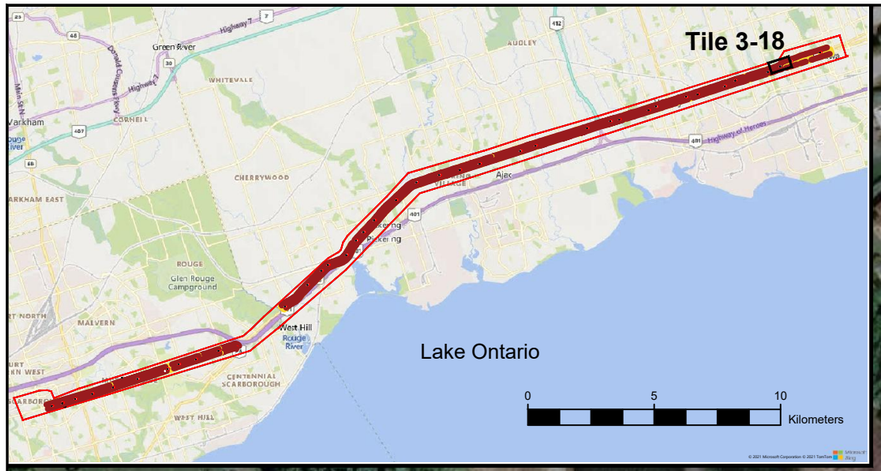
Project: Durham Scarborough Bus Rapid Transit (DSBRT)

Client: METROLINX

ARCADIS

Date: June 2021

Background Reference: Microsoft Bing Maps



OSHAWA CREEK C-18

STEVENSON RD N

HARRIS AVE

BOND ST W

KING ST W

WAVERLY ST S

STEVENSON RD S

R37

Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-19**

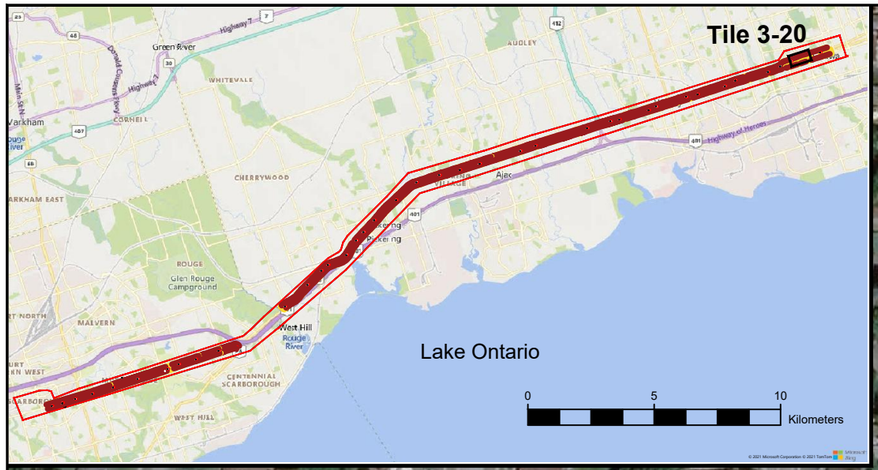
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters: 50 0 50 100

1:2000

Title: CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-20

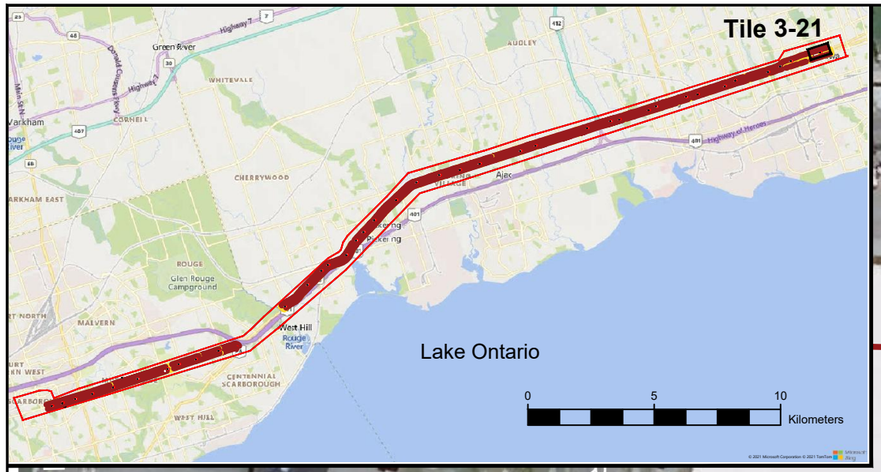
Project: Durham Scarborough Bus Rapid Transit (DSBRT)

Client: METROLINX

ARCADIS

Date: June 2021

Background Reference: Microsoft Bing Maps



OSHAWA CREEK B-08

McMILLAN DR

CENTRE ST N

PRINCE ST

IE AVE

RENA ST

91+400 91+420 91+440 91+460 91+480 91+500 91+520 91+540 91+560 91+580 91+600 91+620 91+640 91+660 91+680 91+700 91+720 91+740 91+760 91+780 91+800 91+820 91+840 91+860 91+880 91+900 91+920 91+940 91+960

R39

GLADSTONE AVE

82+100 82+120 82+140 82+160 82+180 82+200 82+220 82+240 82+260 82+280 82+300 82+320 82+340 82+360 82+380 82+400 82+420 82+440 82+460 82+480 82+500 82+520 82+540 82+560 82+580 82+600 82+620 82+640 82+660

KING ST W

NASS

MIDT

QUEEN

CENTR

Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-21**

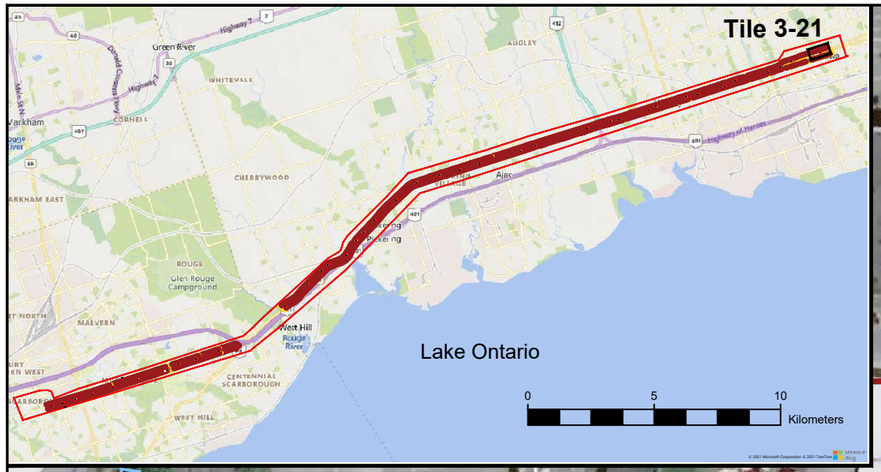
Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps



Legend

- Representative Construction Noise Sensitive Receptors
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way
- Daytime Runningway Construction Zone of Influence (ZOI)
- Daytime Bus Stop Construction Zone of Influence (ZOI)

Meters
50 0 50 100
1:2000

Title: **CONSTRUCTION NOISE: ZONE OF INFLUENCE (ZOI)- TILE 3-21**

Project: **Durham Scarborough Bus Rapid Transit (DSBRT)**

Client: METROLINX

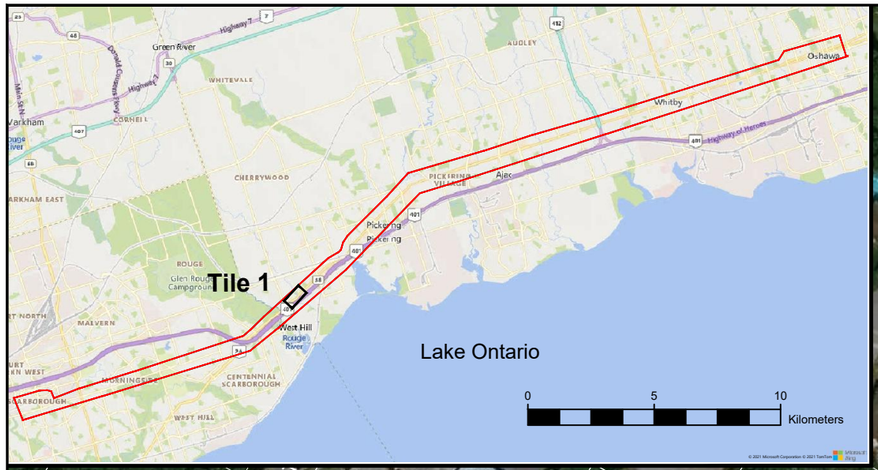
ARCADIS

Date: **June 2021**

Background Reference: Microsoft Bing Maps

APPENDIX J: CONSTRUCTION VIBRATION ZONE OF INFLUENCE

DRAFT



Legend

- Potential Monitoring Location
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

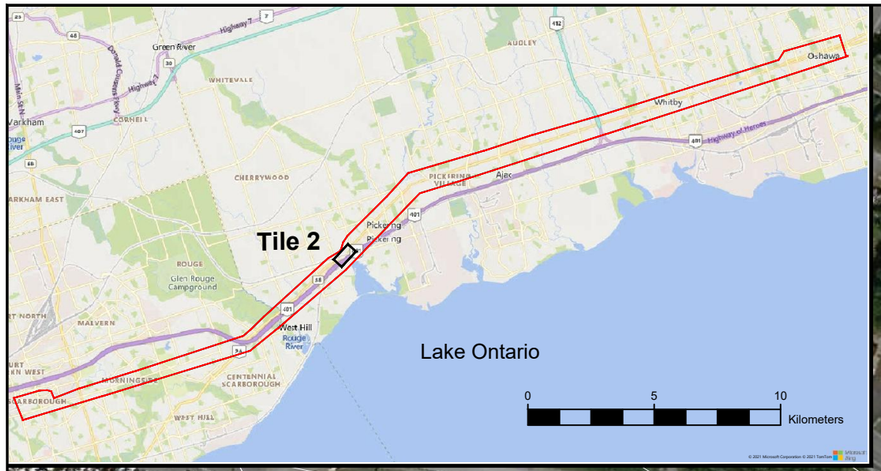
Meters

50 0 50 100

1:2000

Title	VIBRATION ZONE OF INFLUANCE DUE TO PILE DRIVING - TILE 1
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: July 2021

Background Reference: Microsoft Bing Maps



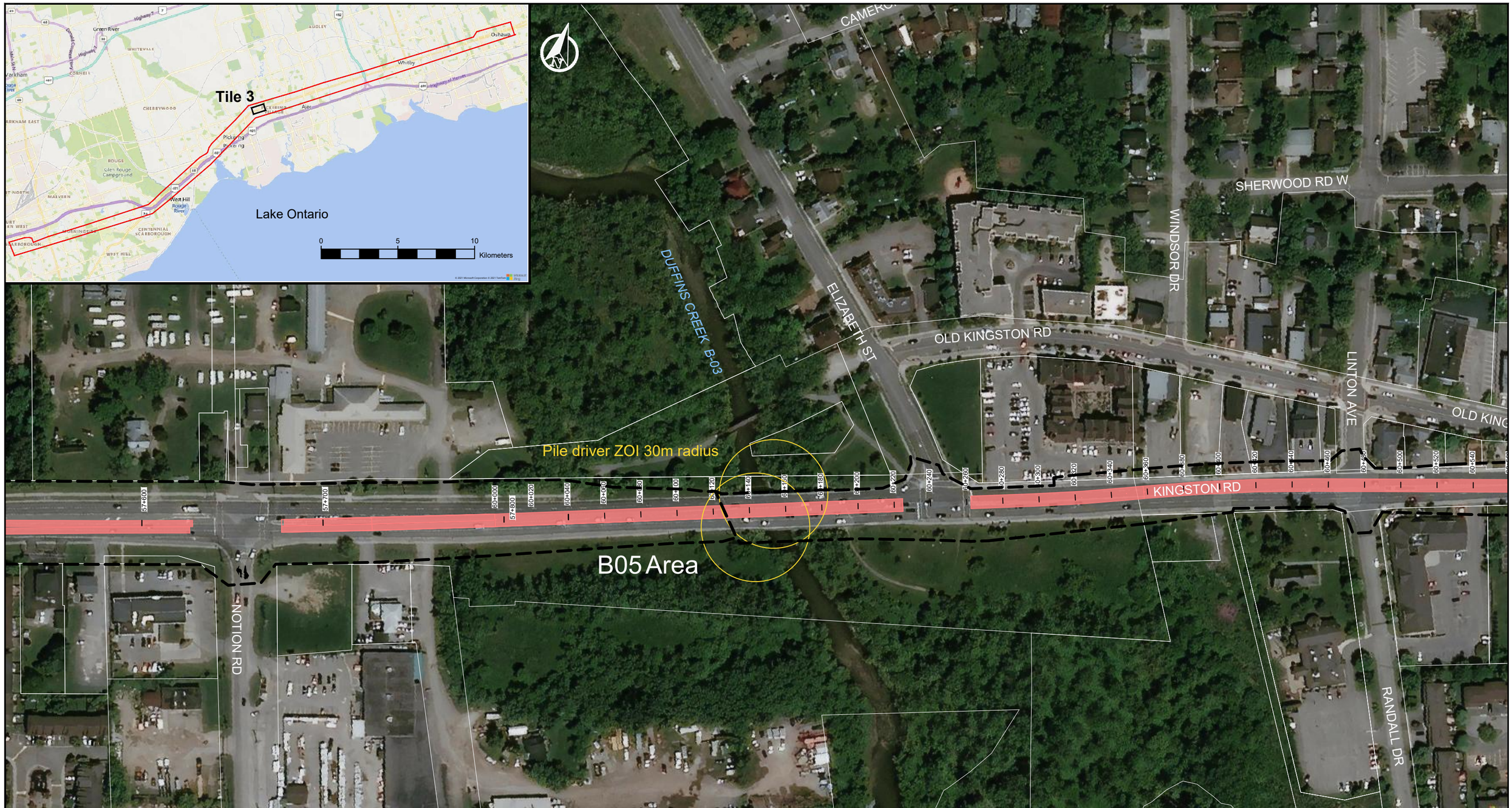
Legend

- Potential Monitoring Location
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Meters
50 0 50 100
1:2000

Title	VIBRATION ZONE OF INFLUENCE DUE TO PILE DRIVING - TILE 2
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: July 2021

Background Reference: Microsoft Bing Maps



Legend

- Potential Monitoring Location
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

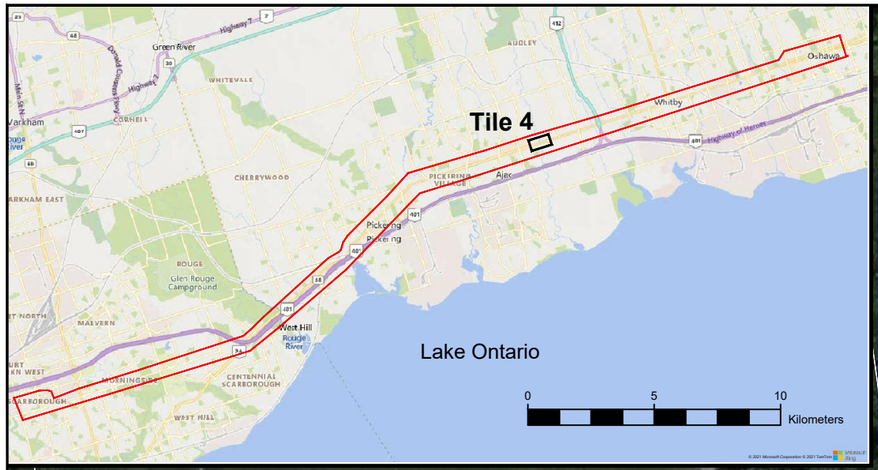
Meters

50 0 50 100

1:2000

Title	VIBRATION ZONE OF INFLUENCE DUE TO PILE DRIVING - TILE 3
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: July 2021

Background Reference: Microsoft Bing Maps



C05 Area

CARRUTHERS CREEK
B-04

Pile driver ZOI 30m radius

KINGSTON RD

KINGSTON RD

GALEA DR

FUTURE ACCESS

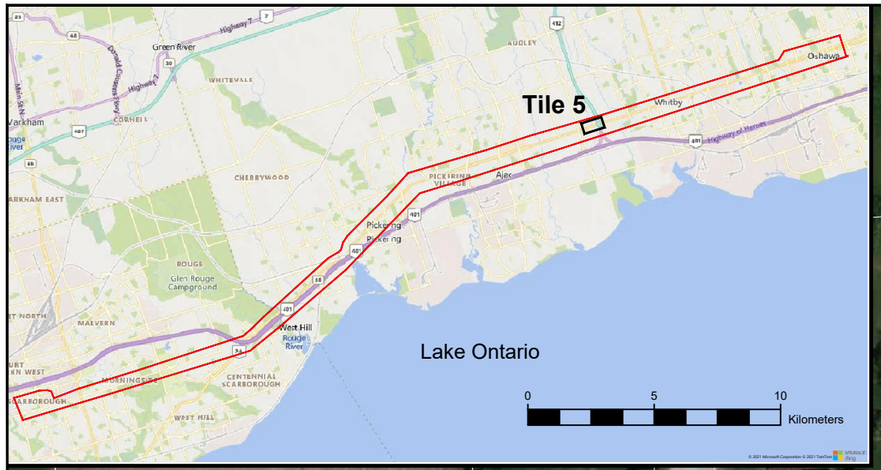
Legend

- Potential Monitoring Location
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Meters
50 0 50 100
1:2000

Title	VIBRATION ZONE OF INFLUENCE DUE TO PILE DRIVING - TILE 4
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
	ARCADIS
Date:	July 2021

Background Reference: Microsoft Bing Maps



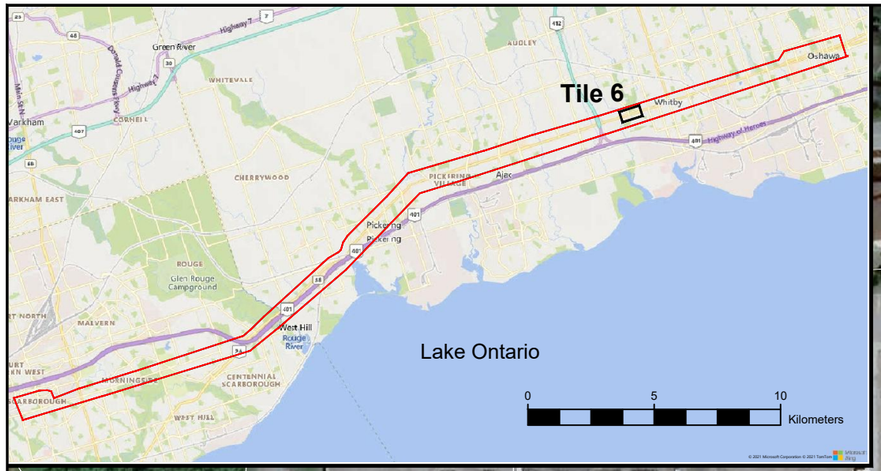
Legend

- Potential Monitoring Location
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Meters
50 0 50 100
1:2000

Title	VIBRATION ZONE OF INFLUENCE DUE TO PILE DRIVING - TILE 5
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: July 2021

Background Reference: Microsoft Bing Maps



McQUAY BLVD

LYNDE CREEK B-06

RAGLAN ST

WELLINGTON ST

B07 Area

Pile driver ZOI 30m radius

NDAS ST W

71+760 71+780 71+800 71+820 71+840 71+860 71+880 71+900 71+920 71+940 71+960 71+980 72+000 72+020 72+040 72+060 72+080 72+100 72+120 72+140 72+160 72+180 72+200 72+220 72+240 72+260 72+280 72+300 72+320 72+340 72+360 72+380 72+400 72+420 72+440 72+460 72+480 72+500 72+520 72+540 72+560 72+580

Gas Station

LYNDE CREEK C-12

WHITE OAKS CT

JEFFERY ST

BELL DR

Legend

- Potential Monitoring Location
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

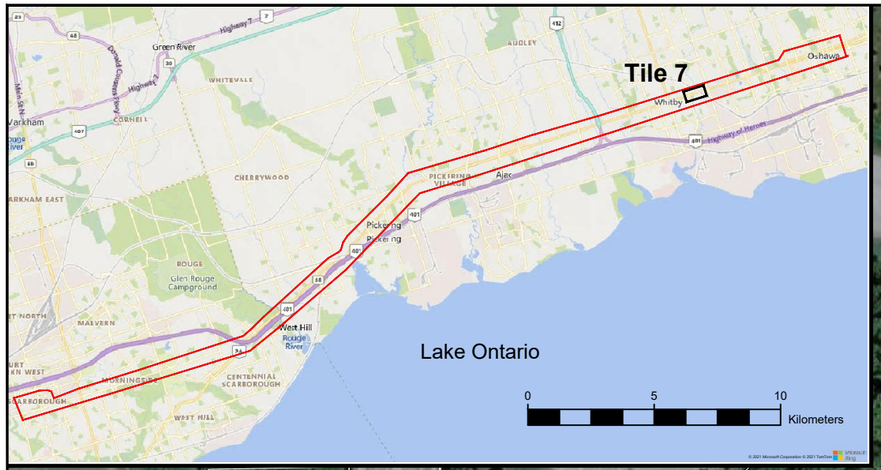
Meters

50 0 50 100

1:2000

Title	VIBRATION ZONE OF INFLUENCE DUE TO PILE DRIVING - TILE 6
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
	ARCADIS
Date:	July 2021

Background Reference: Microsoft Bing Maps



C07 Area

Pile driver ZOI 30m radius

B08 Area

Pile driver ZOI 30m radius

DUNDAS ST E

DUNDAS ST E

KANTIUM WAY

AutoShop/Service

Residential Buildings

GARDEN ST

PRINGLE CREEK B-07

LUPIN DR

CRAYDON RD

CP RAIL

Legend

- Potential Monitoring Location
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

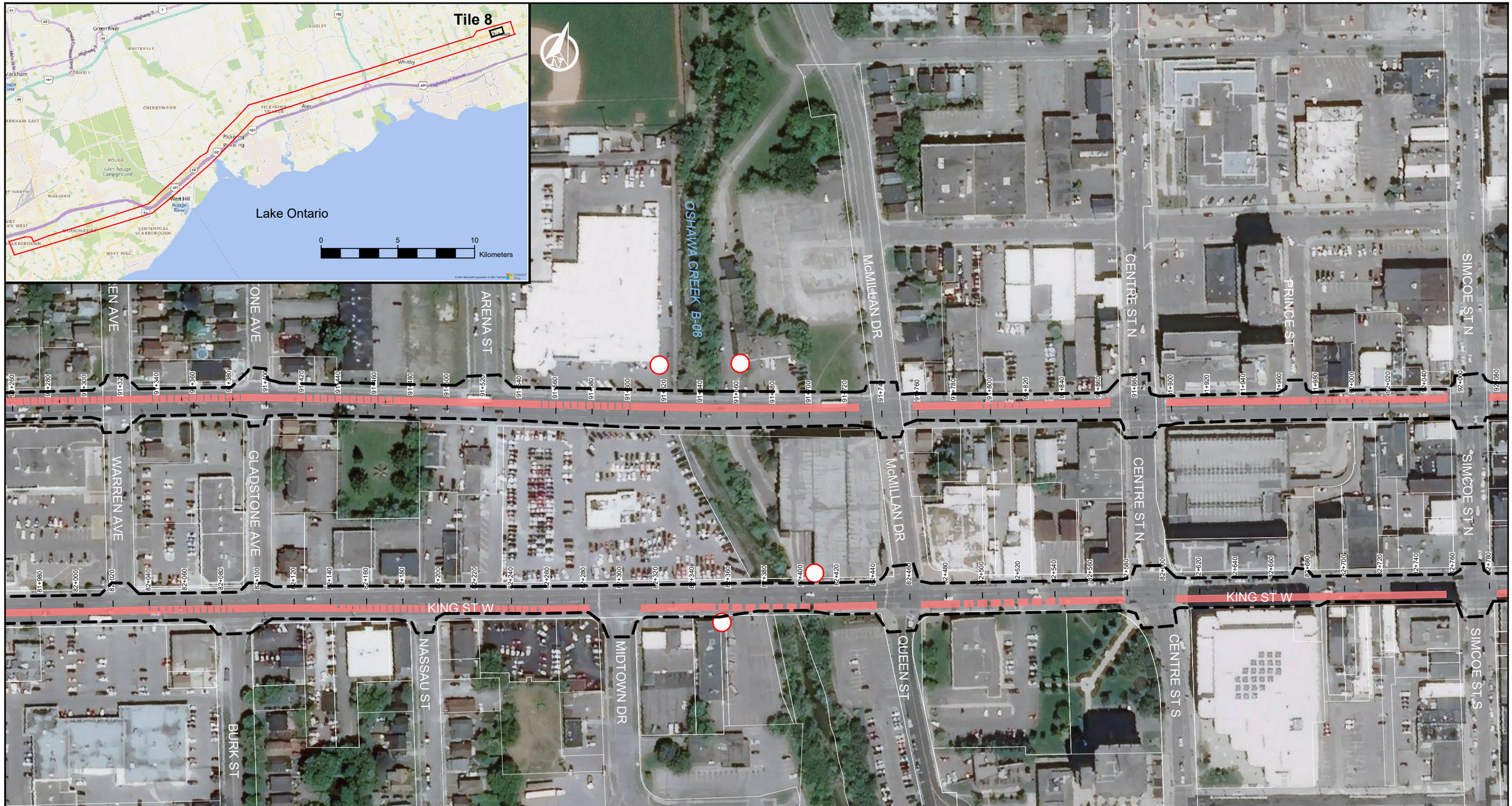
Meters

50 0 50 100

1:2000

Title	VIBRATION ZONE OF INFLUENCE DUE TO PILE DRIVING - TILE 7
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: July 2021

Background Reference: Microsoft Bing Maps



Legend

- Potential Monitoring Location
- BRT Corridor
- NVIA Study Area
- Proposed Right of Way

Meters

50 0 50 100

1:2000

Title	VIBRATION ZONE OF INFLUENCE DUE TO PILE DRIVING - TILE 8
Project:	Durham Scarborough Bus Rapid Transit (DSBRT)
Client:	METROLINX
ARCADIS	Date: July 2021

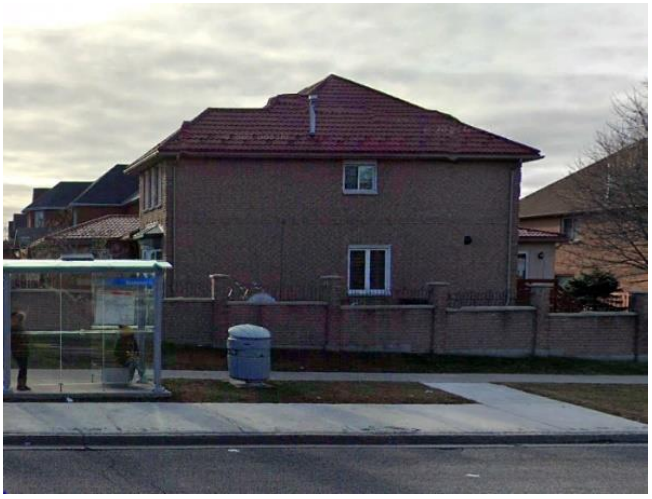
Background Reference: Microsoft Bing Maps

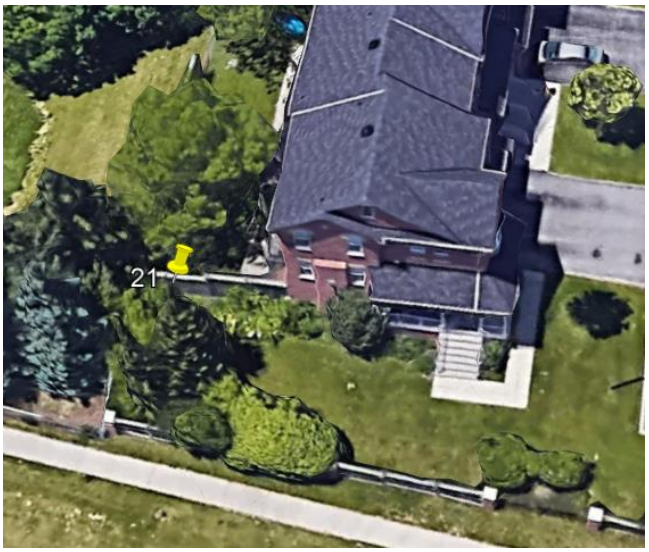
APPENDIX K: EXISTING NOISE BARRIERS INVENTORY

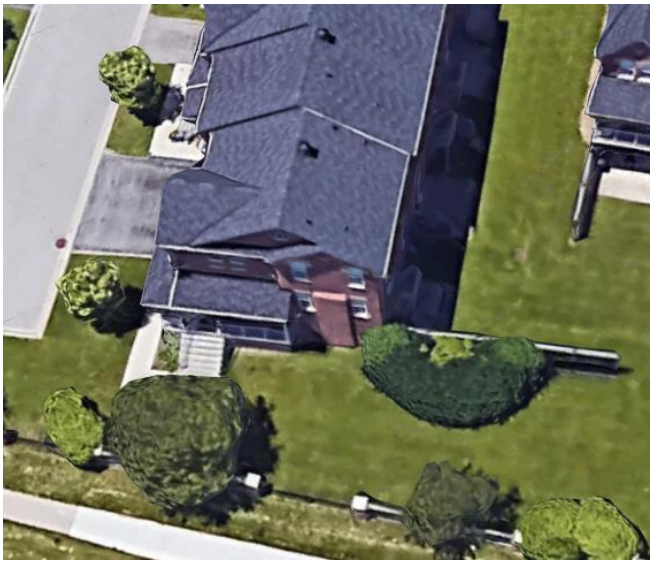
DRAFT

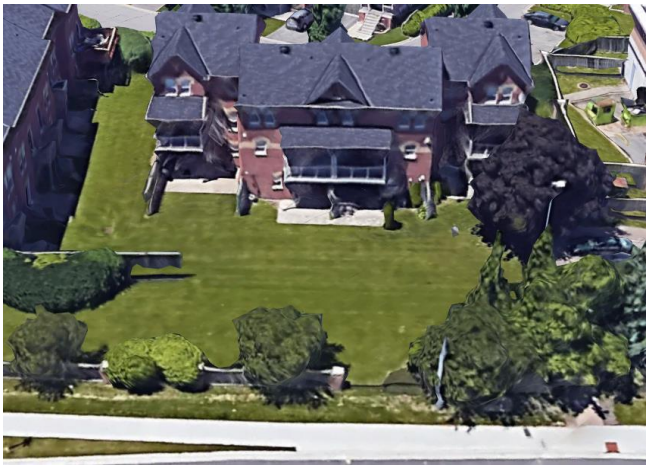
Existing Noise Wall Inventory – DSBRT Project

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA01, OLA01a-b	No			
OLA01d	No			
OLA02 & OLA02a-d	No			
OLA03 & OLA03a-c	No			
OLA04	No			
OLA05 & OLA05a-e	No			
OLA05f-i	No			
OLA06	No			
OLA06a-e	No			
OLA07 & OLA07a-b	No			
OLA08 & OLA08a-e	No			
OLA08f	No			
OLA09	No			
OLA10-Daycare	No			
OLA10a-b	No			
OLA11	No			
OLA11a-m	No			
OLA12	No			
OLA12a-i	No			
OLA13	No			
OLA13a-e	No			
OLA14	No			
OLA14a-f	No			

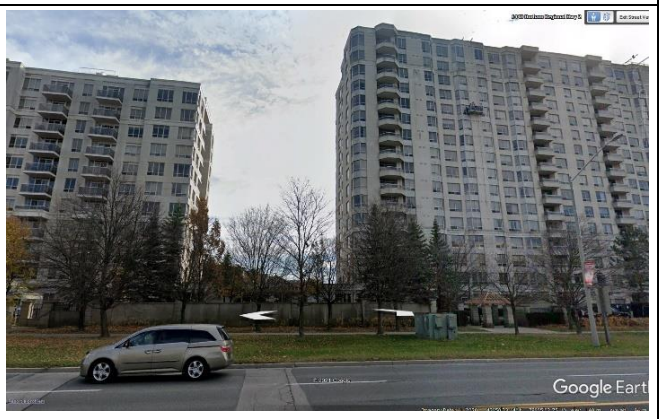
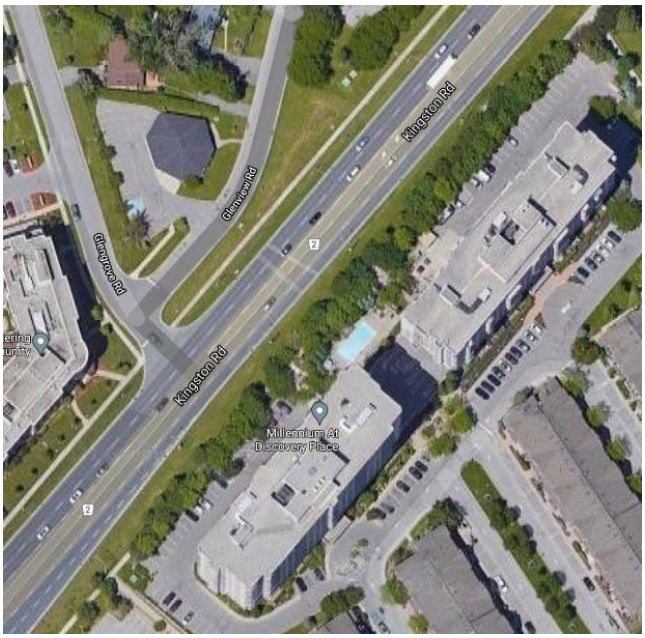
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA15	Yes	1.0/ 45	Good	 
OLA15a-e	No			
OLA16	No			
OLA17	No			
OLA18	No			
OLA19	No			
OLA20	No			
OLA20a	No			

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA21	Yes	1.5 / 34	Fair	 

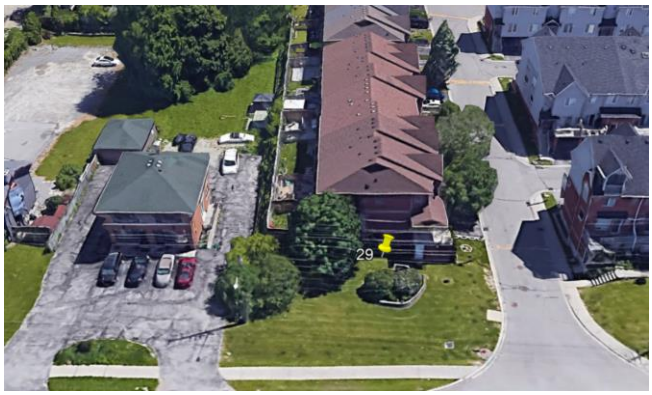
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA21a	Yes	1.5/27	Fair	 

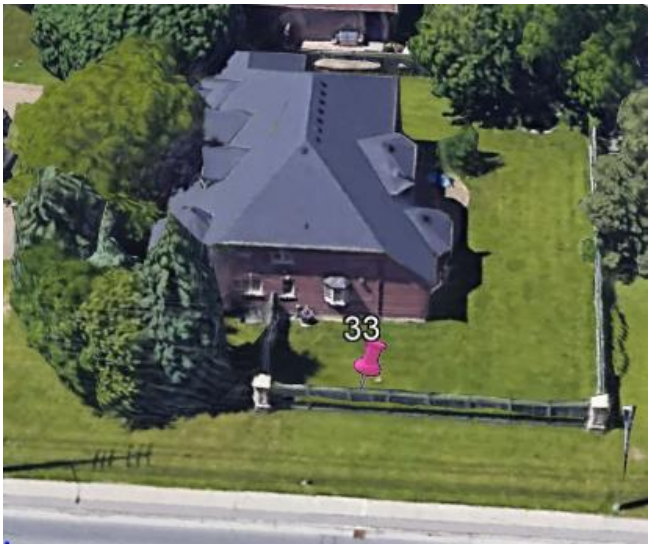
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA21b	Yes	1.5 / 14	Fair	 
OLA22	No			
OLA22a	No			
OLA23	No			
OLA23a-c	No			
OLA24	No			

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA24a-d	Yes	2.0 / 217	Poor	 
OLA25	Yes. Poor Noise wall identified in the past near Dixie Rd (Receptors R13, R14, R15, R16) SS Wilson Associate Report, Pg 21. Receptor 25 introduced in this location	2.0 / 245	Poor	 

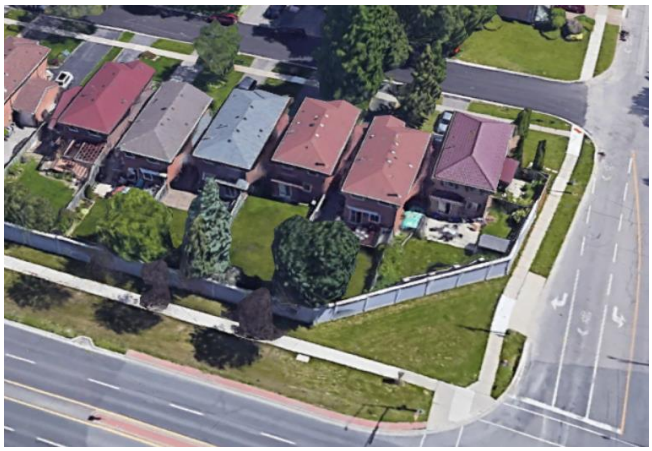
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA26	No			
OLA26a	Yes, but it only covers the pool area.	2.0 / 36	Fair	 
OLA26b-c	No			

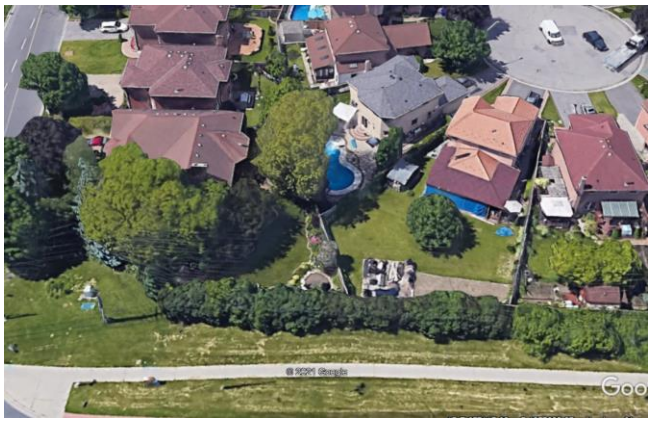
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA27	Noise wall identified in the past near Valley Farm Rd (Receptors R19, R20) SS Wilson Associate Report, Pg 21. Noise wall present at Receptor 27 as well.	2.0 / 194	Good	 
OLA27a-e	No			
OLA28	No			

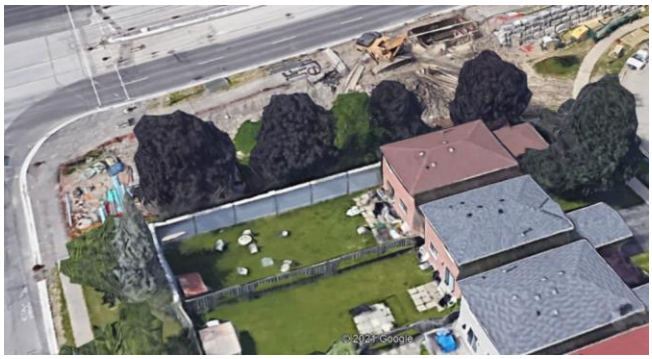
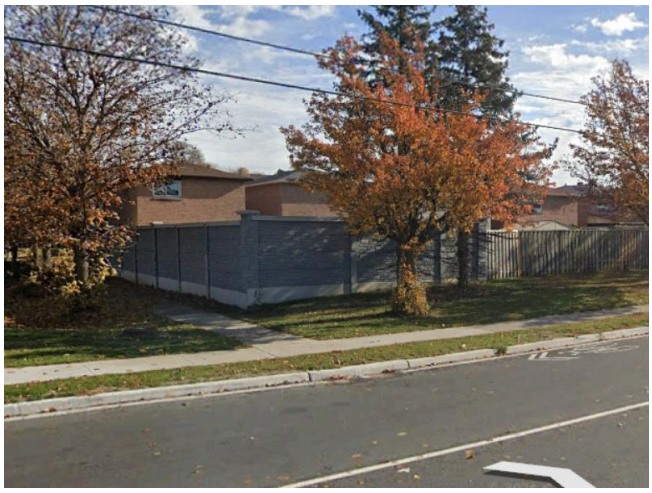
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA29	Yes	2.0 / 92[1]	Fair	 
OLA30	No			
OLA30a	No			
OLA31	No			
OLA32	No			
OLA32a	Yes	2.0 / 32	Fair	

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA33	Yes	2.0 / 141[1]	Fair	 
OLA33a-b	No			

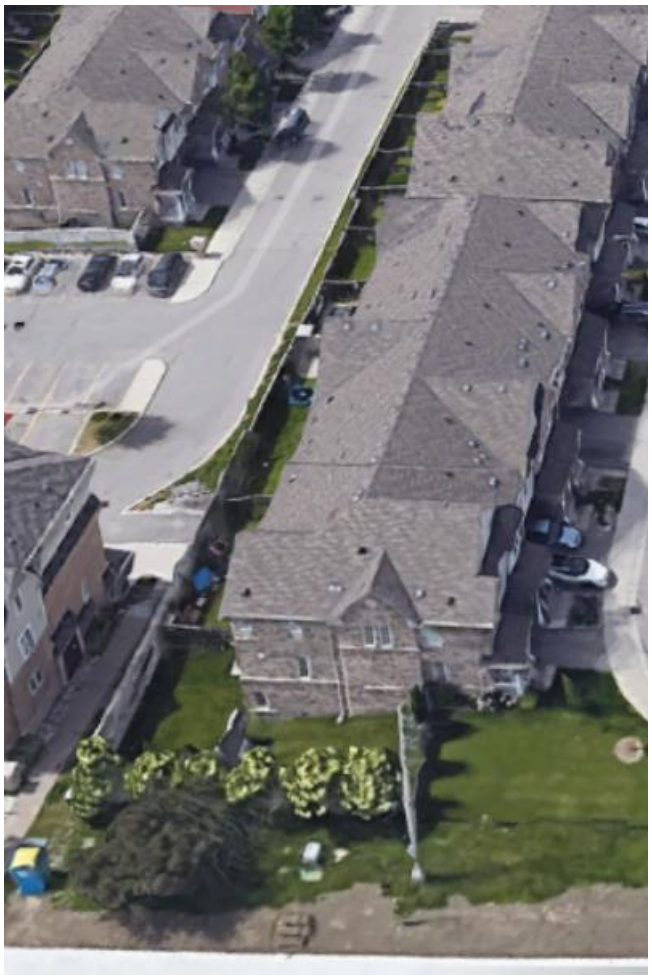
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA34	Yes	2.0 / 211	Good	 
OLA34a	No			

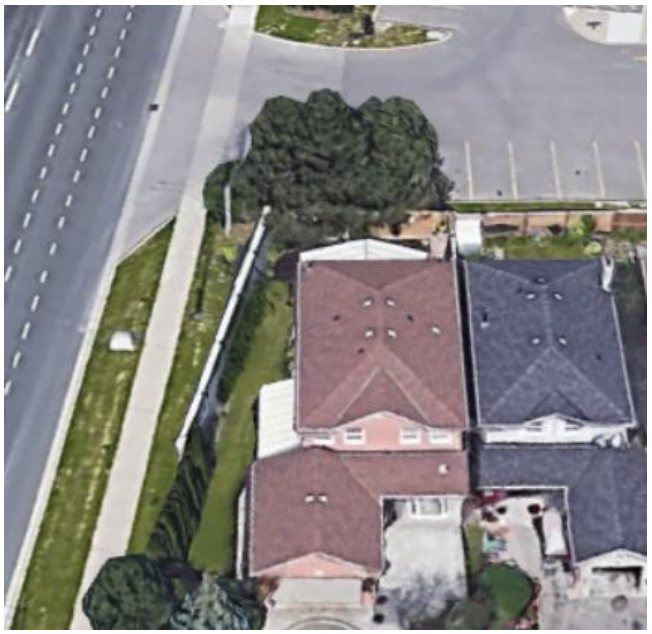
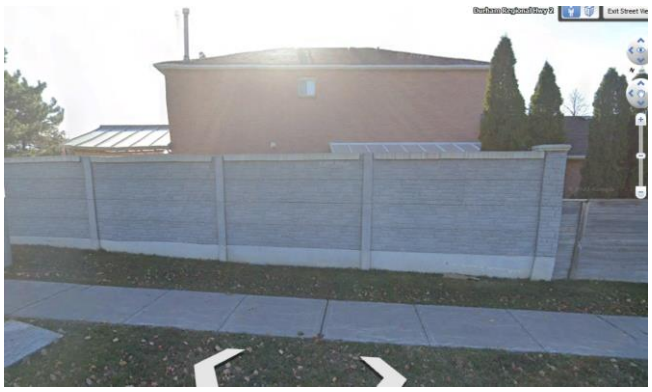
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA34b	Yes	2.0 / 211	Good	 
OLA34c	Yes	2.0 / 187	Good	 

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA34d-f	Yes	2.0 / 109	Fair	 
OLA35	No			
OLA35a	No			

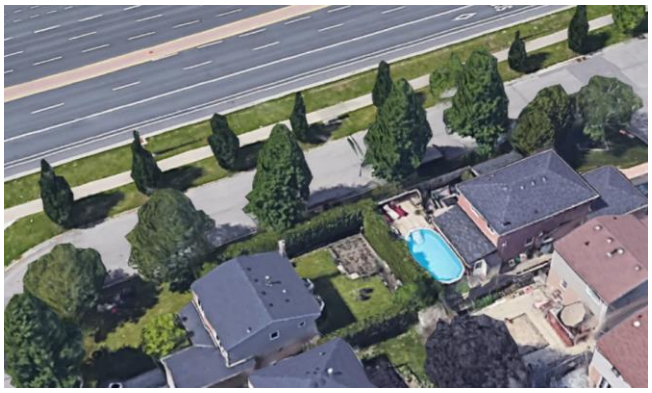
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA35b	Yes	2.0 / 28	Good	 
OLA35c-g	No			
OLA36	No			

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA36a	Yes	2.0 / 68	Fair	 

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA36b	Yes	2.0 / 73	Fair	 
OLA37	No			
OLA38	No			

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA38a	Yes	2.0 / 40	Good	 

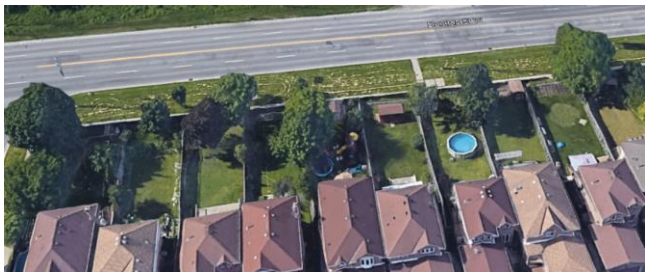
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA39	Yes	2.0 / 45	Fair	 

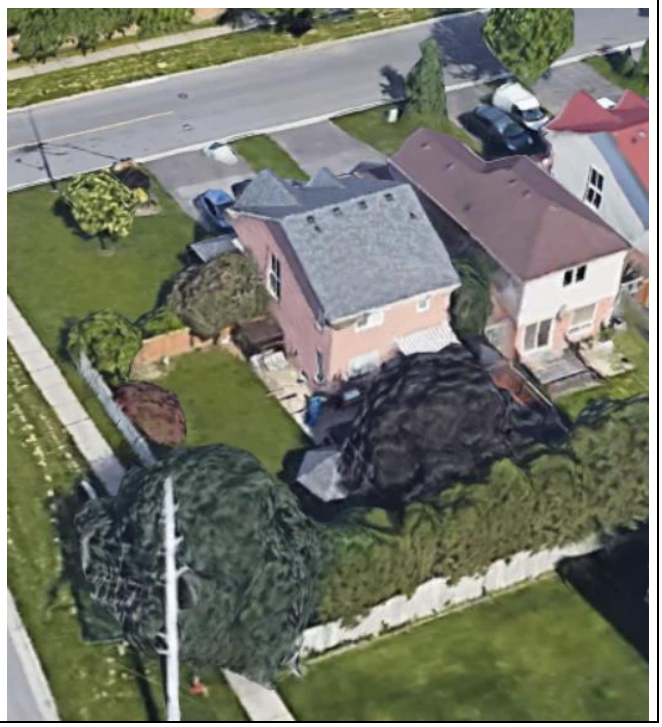
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA39a	Yes	2.0 / 37	Fair	 
OLA39b	No			

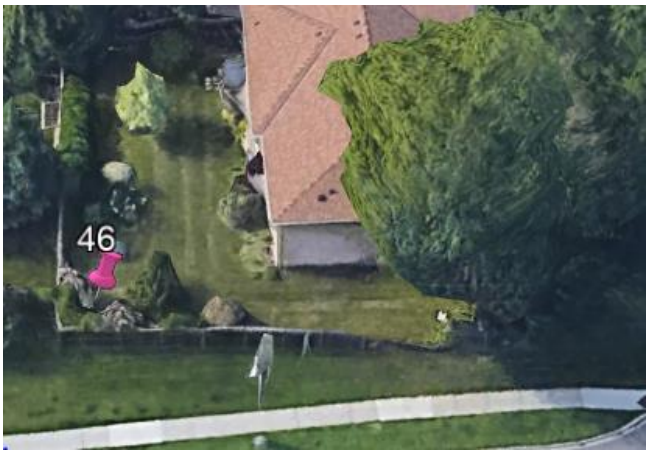
Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA40	Yes	2.0 / 463	Fair	 
OLA41	Yes	2.0 / 53[1]	Fair	

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA41a	Yes	2.0 / 59	Fair	 
OLA41b	No			
OLA42	No			
OLA43	No			
OLA44	No			

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA45	Yes	2.0 / 227	Fair	 

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA45a-d	Yes	2.0 / 227	Fair	 

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA45e	Yes	2.0 / 32	Fair	 

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA46	Yes	2.0 / 60	Fair	 

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA47	No			 
OLA48	No			
OLA49	No			
OLA50	No			
OLA50a	No			
OLA51	No			
OLA52	No			
OLA53 & OLA53a	No			
OLA53b-e	No			
OLA54	No			

Receiver ID	Existing Noise Wall? (Yes/No)	Approximate Existing Noise Wall Height (m)/ Length (m)	Existing Noise Wall Condition	Pictures
OLA55	Yes	2.0 / 227	Fair	 
OLA56	No			
OLA56a-e	No			
OLA57	No			
OLA57a	No			

Notes:

1- The entire length of the noise wall has been mentioned in the table. However, in our modeling only the effective portion of the noise wall length has been included. Effective length of the noise wall is a length extending the noise wall beyond which would not alter the sound level results.

2- The survey and review of the existing noise walls should be completed at the Detailed Design Stage.

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