APPENDIX

N ROAD TRAFFIC NOISE IMPACT STUDY

Road Traffic Noise Impact Study

Arterial Roads within Highway 427 Industrial Secondary Plan Area
Area 47

Project # TP115086

Prepared for:

The Corporation of the City of Brampton
Region of Peel

October 2022

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October 21, 2022

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Dear Ms. Bubas & Mr. Nejatian,

Re: Road Traffic Noise Impact Study in Support of a Municipal Class Environmental Assessment of Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47), City of Brampton

Wood Vibration Dynamics and Noise (VDN) is pleased to provide the attached Road Traffic Noise Impact Study to be used in support of a Municipal Class Environmental Assessment of Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47). This report specifically addresses the noise impacts of the proposed improvements and re-alignment of the existing road corridors (Coleraine Drive, Countryside Drive and Clarkway Drive), and the new arterial roadways (Arterial A2 & East-West Arterial).

The Addendum following this page was completed after the Road Traffic Impact Noise Study was completed to address additional questions and outline that some of the final details will need to be completed during the detailed design phase of this project.

Should you have any questions regarding the study or its findings, please do not hesitate to contact us.

Yours truly,

Wood Vibration Dynamics and Noise

Mike Cyca, PEng, MSc
Service Lead Americas - Noise

Addendum 1 - Road Traffic Noise Impact Study Summary

A Road Traffic Noise Impact Study was undertaken for both Part A and Part B roadways in accordance with the provincial guidelines (MOEE/MTO Protocol) and the Region and City's Noise Policies. As per the MOEE/MTO Protocol, the objective sound level is 55 A-weighted decibels (dBA) (16-hour Leq) and consideration of noise attention is only required if the noise impact is greater than 5 dB and the overall sound level is greater than 55 dBA. Noise impact is defined as the difference between the future "build" noise level (future noise level with the proposed improvements) and the future "no-build" noise level (future noise level without the proposed improvements).

In addition to the MOEE/MTO Protocol, the Region of Peel corporate policy W30-04 and the City of Brampton document "Noise Attenuation – Retrofit Policy and Road Widenings" were also considered in the Noise Impact Study. According to these documents, noise attenuation should be considered when the noise levels are predicted to be 60 dBA or higher (16-hour Leq) and only if a reduction of 5 dB or more can be achieved for the 16-hour period between 07:00 and 23:00.

The focus of this assessment was to predict the noise levels at properties within the study area and adjacent to the assessed roadways. Ninety (90) representative receptors were selected to predict the future noise levels as a result of the Project. These locations are expected to be the most affected by the noise associated with the road network improvements. Roadways within the study area, as well as the encompassing roads (i.e., Mayfield Road, Regional Road 50, Castlemore Road and The Gore Road) were the dominant source of noise considered in the traffic noise impact study.

Both the MOEE/MTO Protocol and Region/City policies were used for the assessment. With respect to the MOEE/MTO Protocol, the results indicate that the noise impacts within the study area are predicted to be more than 5 decibels (dB) for a total of 12 receptors when comparing the Future "build" 2041 and Future "no-build" 2041 scenarios. However, the overall sound levels of the Future "build" scenario at 8 of the identified receptors are less than or equal to the 55 dBA (16-hour Leq) criterion. Therefore, in accordance with the MOEE/MTO protocol, consideration of noise mitigation is not required for those receptors. For the other 4 receptors, consideration of noise mitigation is required in accordance with the MOEE/MTO protocol.

The Peel Region and the City of Brampton Noise Attenuation Policies identify a 60 dBA (16-hour Leq) criterion for consideration for noise mitigation. The Future "build" levels are at or above the 60 dBA criterion at 6 reverse frontage or side exposure locations. Therefore, these locations were considered for possible noise mitigation in accordance with the Peel Region and City of Brampton Noise Attenuation Polices.

Based on the noise modelling results, a noise barrier/mitigation investigation was completed for 8 receptors: mitigation consideration was warranted for 2 receptors in accordance with the MOEE/MTO Protocol, 2 receptors with both the MOEE/MTO Protocol and the Region and City's Noise Policies, and 4 receptors with Region/City Policies only. Three barrier heights were considered in this investigation: 2.4 m, 3 m and 4 m. As per the noise policies, in order to be warranted, the barrier must achieve a minimum 5 dB reduction at a targeted receptor. An objective level of 55 dBA (16-hour Leq) was also considered as per the MOEE/MTO Protocol. The investigation results indicated that none of the barriers with lower heights (i.e., 3 m and 2.4 m) can achieve the 5 dB minimum reduction requirement at the target receptors, except

Barrier 7 which is expected to provide 7 dB and 5 dB reductions at receptor RD08 with heights of 3 m and 2.4 m, respectively. However, the mitigated future “build” levels at RD08 under both cases would remain above the MOEE/MTO Protocol objective level of 55 dBA by at least 3 dB. As a result, 5 barriers (each 4 m high) were considered feasible and recommended for implementation. The proposed barrier height may be achieved via a combination of earth berm and barrier. The use of earth berm may also require other considerations as such slope requirement and potential effects on nearby properties and/or development lands. Further investigations to verify the noise wall locations and heights are recommended during the detailed design stage. In addition, as the assessed receptors were identified based on existing conditions (i.e. land uses), should land uses be updated in the future, the mitigation recommendation may require a re-evaluation.

Further details on the Noise Impact Study including the barrier investigation can be found in Appendix F

Yours truly,

Wood Group Asset Integrity Solutions, Inc.

Mike Cyca, PEng, MSc,
Service Lead Americas - Noise

Road Traffic Noise Impact Study

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Area 47
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October 21, 2022

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Executive Summary

Wood Vibration Dynamics and Noise completed a Road Traffic Noise Impact Study (Noise Impact Study) to be used in support of a Municipal Class Environmental Assessment of Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47) for City of Brampton (the City of Brampton) and The Regional Municipality of Peel (Peel Region). The objective of the report is to address the noise impacts of the proposed improvements/re-alignment of the existing road corridors (Coleraine Drive, Countryside Drive and Clarkway Drive) and the addition of two new arterial roadways (Arterial A2 and East-West Arterial).

The noise guidelines applicable are the MOEE/MTO joint protocol, the Region of Peel corporate policy W30-04, and the City of Brampton document "Noise Attenuation – Retrofit Policy and Road Widenings". The project was assessed using the limits provided by these sources.

The results presented in Table 5-1 of Section 5.1 indicate that the noise impacts within the study area are predicted be more than 5 dB for a total of 12 receptors (RB09, RB10, RD08, RD23, RD24, RE11, RE12, RE27, RE29, RE30, RE31 and RE32) when comparing the Future "build" 2041 and Future "no-build" 2041 scenarios. However, the overall sound levels of the Future "build" scenario at 8 of the above identified receptors are at or below the 55 dBA criterion. Therefore, in accordance with the MOEE/MTO protocol consideration of noise mitigation is not required for those receptors. For the other 4 receptors (RB09, RB10, RD08 and RE30), consideration of noise mitigation is required in accordance with the MOEE/MTO protocol.

The Peel Region and the City of Brampton Noise Attenuation Policies identify a 60 dBA criterion for consideration for noise mitigation. The Future "build" levels are at or above the 60 dBA criterion at 6 reverse frontage or side exposure locations (RB01, RC01, RD08, RE25, RE30 and RF01). Therefore these locations were assessed for possible noise mitigation in accordance with the Peel Region and City of Brampton Noise Attenuation Polices.

The barrier investigation concluded that of the 7 barriers investigated Barriers 1, 2, 3, 4 and 7 provided sufficient attenuation as to be warranted and these were recommended for implementation. Figures showing the recommended barrier extents and locations are provided in Appendix H. All recommended noise barriers are 4.0 metres in height above existing grade. The proposed height may be achieved via a combination of earth berm and barrier

Construction noise impacts are temporary and largely unavoidable. However, the contract documents should identify the contractor's responsibilities with respect to controlling noise, as well as recording, investigating and, if possible, addressing complaints. The contract documents should also explicitly state that compliance with all applicable law is an expectation of the contract including adherence to the City of Brampton Noise By-Law 93-84 and MECP Publication NPC-115.

Table of Contents

Page

List of Tables

List of Appendices

1.0 Introduction

Wood Vibration Dynamics and Noise completed a Road Traffic Noise Impact Study (Noise Impact Study) to be used in support of a Municipal Class Environmental Assessment of Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47) for City of Brampton (the City of Brampton) and The Regional Municipality of Peel (Peel Region). This report specifically addresses the noise impacts of the proposed improvements/re-alignment of the existing road corridors (Coleraine Drive, Countryside Drive and Clarkway Drive) and the addition of two new arterial roadways (Arterial A2 and East-West Arterial).

1.1 Definition of Study Area

The study area is located in the northeast area of the City of Brampton and encompasses major roadways between Mayfield Road, Regional Road 50, Castlemore Road and The Gore Road. A figure showing the study area is presented in Appendix A.

1.2 Description of Scenarios

Five scenarios were considered as part of this noise impact study:

1. Existing (2013);
2. Future "no-build" (2041);
3. Future "build" (2041);
4. Future "build" (2041) Barrier Investigation; and
5. Future "build" (2041) Recommended Barriers.

Existing (2013): Consists of the existing road network within the study area, which is comprised dominantly of two-lane rural roadways with narrow shoulders, with existing traffic volume counts. Figures for this scenario are provided in Appendix C.

Future "no-build" (2041): Consists of the existing road network with the projected future "no-build" 2041 traffic volume predictions. Figures for the scenario are provided in Appendix D.

Future "build" (2041) without Barrier: Consists of the proposed road network improvements/re-alignments listed as follows:

- Widening of Countryside Drive to four lanes and realignment/reconfiguration of the intersection of Countryside Drive and Regional Road 50;
- Widening of Coleraine Drive to four lanes from Arterial A2 to Mayfield Road including realignment at Arterial A2 and disconnection of the current intersection with Regional Road 50; and
- Widening of Clarkway Drive from Castlemore Road to East-West Arterial road.

The following proposed roadway additions are also included in this scenario:

- A new 6-lane arterial roadway, Arterial A2, running between Mayfield Road and Regional Road 50 at Major Mackenzie Drive; and
- A new East-West Arterial road connecting from Arterial A2 west-bound to The Gore Road.

This scenario implements projected future "build" 2041 traffic volume predictions. Figures for this scenario are provided in Appendix E.

Future "build" (2041) Barrier Investigation: Consists of the proposed road network improvements/re-alignments and proposed roadway additions. This scenario includes possible noise barrier locations put forward for evaluation. Figures for this scenario are provided in Appendix F.

Future "build" (2041) Recommended Barriers: Consists of the proposed road network improvements/re-alignments and proposed roadway additions. This scenario includes noise barriers which were found to be warranted based on the barrier investigation. Figures for this scenario are provided in Appendix H.

2.0 Environmental Noise Guidelines

Environmental noise is typically assessed based on noise or sound levels. The term "noise level" in this context typically refers to the equivalent continuous sound pressure level (L_{eq}) expressed in A-weighted decibels (dBA referenced to 20µPa) having the same total sound energy as a time-varying sound pressure level over a specified time period. It is important to note that, although environmental noise is reported in A-weighted decibels (dBA), the difference between two A-weighted values is reported in decibels (dB).

Road traffic noise impact assessments for road widenings (under the Municipal Class EA process) typically consider outdoor noise levels only. This limitation is a result of the fact that the only practical noise mitigation measure under such circumstances are retrofit noise barriers as alterations to existing residential building envelopes is not considered practical or feasible. Therefore, this road traffic noise assessment is limited to the assessment of Outdoor Living Areas (OLAs).

2.1 Perception of Increases in Sound level

Increases in noise level can be ranked as shown in Table 2-1 below. This ranking information is based on general practice and is documented within the draft MOEE/GO Transit noise and vibration protocol [1].

Table 2-1: Perception of Changes in Noise Level

Change in Noise Level [dB]	Perception of Change
0 to less than 3	Insignificant
3 to less than 5	Noticeable
5 to less than 10	Significant
Over 10	Very Significant

2.2 Noise Guidelines which are Applicable to this Project

The following sections describe the noise guidelines which are both applicable within the projects geographical area and appropriate for a project of this type.

2.2.1 Provincial – MOEE/MTO Protocol

The Ontario Ministry of the Environment, Conservation and Parks (MECP) does not have a specific noise guideline for the assessment of regional or municipal road improvements, widenings or expansions. However, the MECP does have a protocol which was developed with the Ontario Ministry of Transportation (MTO) which relates to road traffic noise assessments of provincial highway improvements. Although not specifically intended for this purpose this guideline is typically adopted within Ontario to assess regional and municipal road improvement projects. At the time of publication the MECP was the Ministry of Environment and Energy (MOEE).

The MOEE/MTO joint protocol "A Protocol for Dealing with Noise Concerns during the Preparation, Review and Evaluation of Provincial Highway's Environmental Assessments" [2] states that if the expected noise impact of implementing the roadway improvements is 5 dB or less, then noise mitigation need not be considered. Conversely if the noise impact is expected to be greater than 5 dB, an investigation into possible noise mitigation measures is required. Noise impact is defined as the difference between the future "build" noise level with the proposed improvements and the future "no-build" noise level without the proposed improvements. To be feasible, the protocol states that noise control measures should achieve a minimum attenuation of 5 dB at the OLAs when averaged over the first row of receivers. The objective noise level is stated to be 55 dBA and thus an impact of greater than 5 dB but resulting in an overall noise level of less than or equal to 55 dBA would not require consideration of noise mitigation since the objective level is already met. Therefore, if the noise impact is greater than 5 dB and the overall sound level is greater than 55 dBA, investigation of noise mitigation is required.

The MOEE/MTO protocol does not outline the detailed requirements of the noise assessment. However, the protocol does refer to the Ontario Ministry of Transportation and Communication (MTC) Directive A-1 [3], which does outline the specific requirements of noise assessment.

According to Directive A-1 the noise assessment should be based on the 24-hour L_{eq} noise level. This is appropriate for provincial highways since the day-time (07:00 to 23:00) traffic volume typically accounts for roughly 66 percent of the total daily traffic with the remainder of the traffic occurring during night-time (23:00 to 07:00). However, for regional and municipal roads the majority of the traffic occurs during day-time hours. Thus, it is more appropriate to assess regional and municipal roads based on the day-time 16-hour L_{eq} (07:00 to 23:00).

2.2.2 Peel Region – Noise Attenuation Barriers

The Region of Peel corporate policy W30-04 [4] [5] outlines the specific circumstances under which the Region will consider the construction of noise barriers for existing reverse frontage dwellings adjacent to regional roads. According to this document, noise attenuation will be considered for OLAs for existing residential properties when the noise levels are predicted to be 60 dBA or higher (16-hour L_{eq}) and only if a reduction of 5 dB or more can be achieved for the 16 hour period between 07:00 and 23:00.

2.2.3 City of Brampton– Noise Attenuation Policy

The City of Brampton document "Noise Attenuation – Retrofit Policy and Road Widenings" [6] specifically addresses the noise levels calculated from proposed road widening within the City. According to this document, noise attenuation will be considered for OLAs for existing residential properties when the noise levels are predicted to be 60 dBA or higher (16-hour L_{eq}) and only if a reduction of 5 dB or more can be achieved for the 16 hour period between 07:00 and 23:00.

In the event that a noise wall is proposed to attenuate traffic noise levels at the residential properties adjacent to the road widening, the funding would be provided as part of the Capital Road project (per the City's six-lane widening policy).

3.0 Project Noise Criteria

This section outlines the specific noise criteria drawn from the documents discussed in Section 2.2 which apply to this project. Table 3-1 provides a summary of the criteria for consideration of noise mitigation which are applicable to this project.

Table 3-1: Project Noise Criteria

Noise Criteria	Mitigation Effort Required
Daytime $L_{eq-16hr}$ > 55 dBA **AND** Noise Impact > 5 dB	• Mitigation in accordance with the MOEE/MTO Noise Protocol; • Investigate noise mitigation measures within the Right-of-Way; • Noise mitigation measures, where introduced, should achieve a minimum of 5 dB attenuation, over first row receivers.
Daytime $L_{eq-16hr}$ ≥ 60 dBA	• If reverse frontage investigate mitigation in accordance with the Region of Peel and City of Brampton retrofit policies; • Noise mitigation measures, where introduced, should achieve a minimum of 5 dB attenuation, over first row receivers; • The Region of Peel and City of Brampton policies have further non-technical, including financial, requirements which must be met to warrant mitigation effort.
All other cases	• None

4.0 Noise Impact Assessment Methodology

This section outlines the noise impact methodology which was applied to the assessment of this project.

4.1 Road Traffic Data

Road traffic data was provided by CIMA for the Project and consisted of AM peak hour and PM peak hour traffic volumes. Three scenarios were provided: Existing (2013), Future without the proposed road improvements (2041) and Future with the proposed road improvements (2041). These scenarios correspond to Existing, Future "no-build" and Future "build" scenarios respectively. The Annual Average Daily traffic (AADT) values for each road segment were estimated by Wood utilizing the AM/PM peak data provided by CIMA. The AADT estimates were calculated based on the assumptions that the PM peak hour volume represents approximately 8% of the total daily traffic and that the AM peak hour volume represents approximately 10% of the total daily traffic. The higher of the two AADT estimates (i.e. from AM and PM peak hours) in each case was used to represent the traffic volume for a given road segment. The day/night traffic split percentages were assumed to be approximately 90% and 10% respectively.

Truck volumes were assumed to be 10% of AADT and these were further assumed to be divided equally between heavy and medium trucks for each road segment and scenario.

A summary of the compiled traffic data used for the Noise Impact Study is provided in Appendix B.

4.2 Noise Modelling

STAMSON V5.04 (2000) is a computerized implementation of the road and rail traffic noise prediction methods described in ORNAMENT [7] (Ontario Road Noise Analysis Method for Environment and Transportation) and STEAM [8] (Sound from Trains Environmental Analysis Method). Older modelling software and models such as STAMSON/ORNAMENT are limited to assessing idealized two-dimensional vertical slices. This limitation is primarily due to the limited computer resources available at the time of their development 1993 and 1989 for STAMSON and ORNAMENT, respectively (Although STAMSON V5.04 was released in 2000 the original STAMSON program was released in 1993). The use and application of STAMSON is further limited by the fact that it is a 16-bit DOS program and thus will not run on modern computers without the aid of specialist virtualization as modern computer processors no longer include native 16-bit instructions sets.

To take advantage of modern computing capabilities the road traffic noise levels for this project were calculated using the CadnaA implementation of TNM 2.5. Cadna/A is a modern noise prediction and modelling software suite which implements many internationally recognized calculation models and standards for noise propagation and prediction from industrial, rail and road traffic sources. CadnaA was selected for its ability to utilize the available CAD and GIS data to model complex terrain and barrier configurations to account for the various resulting vantage points, in three dimensions, from sources to points of reception which occur in the natural and built physical environments. The TNM 2.5 noise model is published by the United States Federal Highway Administration and represents the most recently acquired and standardized database of North American vehicle fleet noise emissions.

The Cadna/A modelling for this project was carefully developed in order to minimize the deviation from equivalent results obtained using STAMSON/ORNAMENT. This was achieved by setting all road sources to full throttle. Validation of sound levels predicted at 15m from road sources was performed and the resulting levels were within ± 1 dB from equivalent calculations completed in STAMSON/ORNAMENT.

Based on the traffic data, daytime noise levels were calculated at the OLAs. The OLA location was selected in the rear yard in accordance with the guideline requirements. Reverse frontage and side-frontage exposures to evaluated roadways were assessed. No existing noise barriers were identified along the roadways within the study area. A digital terrain model of the area was used to model the terrain within the study area.

Roadways within the study area, as well as the encompassing roads (i.e. Mayfield Road, Regional Road 50, Castlemore Road and The Gore Road) were the dominant source of noise considered in the traffic noise impact study. The noise level contributions from roads outside the identified area were neglected. This is a conservative approach as these secondary noise sources would reduce the significance of noise level changes (impact) due to the proposed widening/realignment of existing roads and the addition of new roads.

4.3 Location of Noise Sensitive Areas

The focus of this assessment was to predict the noise levels at properties within the study area and adjacent to the assessed roadways.

Ninety (90) representative receptors were selected to predict the future noise levels as a result of the Project. These locations are expected to be the most affected by the noise associated with the road network improvements. Predicted noise levels were assessed in the OLA of each receptor location. The OLA locations were modelled at 1.5 metres (m) high and approximately 3 m horizontally from the rear wall of the residence. Other residences with similar setback and orientation to the noise source will receive similar sound exposure and noise impacts. Table 4-1 summarizes the receptor numbers and their locations and illustrations of their locations are provided in Appendix C.

Table 4-1: Receptor Locations and Elevations

Location	Coordinates[1] (m)		Elevations[2] (m)		Adjacent Roadway [3] (R): Regional Road (C): City Road
	Easting	Northing	Receptor	Ground	
RA01	605220.0	4854603.0	223.0	221.5	Countryside Dr (C) & Hwy 50 (R)
RA02	605058.0	4854196.0	223.3	221.8	Countryside Dr (C)
RA03	605027.7	4854166.1	223.6	222.1	Countryside Dr (C)
RA04	604964.5	4854068.4	224.0	222.5	Countryside Dr (C) & Coleraine Dr (R) [4]
RA05	604781.0	4854140.0	225.5	224.0	Coleraine Dr (R)
RB01	604862.0	4853903.0	222.8	221.3	Countryside Dr (C) & Coleraine Dr (R) [4]
RB02	604486.0	4854191.0	225.3	223.8	Coleraine Dr (R)
RB03	604418.0	4854232.0	225.7	224.2	Coleraine Dr (R)
RB04	603906.7	4854504.4	230.5	229.0	Mayfield Rd (R)
RB05	603881.4	4854475.0	230.7	229.2	Mayfield Rd (R)
RB06	603755.0	4853222.1	221.6	220.1	Clarkway Dr (C)
RB07	604032.2	4852925.4	219.8	218.3	Countryside Dr (C) & Clarkway Dr (C) [4]
RB08	604336.0	4853287.0	221.7	220.2	Countryside Dr (C)
RB09	604380.0	4853369.0	222.7	221.2	Countryside Dr (C) & Arterial Rd (R) [4]
RB10	604448.0	4853446.0	222.9	221.4	Countryside Dr (C) & Arterial Rd (R) [4]
RB11	604785.0	4853815.0	222.7	221.2	Countryside Dr (C)
RC01	604017.0	4852839.0	218.1	216.6	Countryside Dr (C) & Clarkway Dr (C) [4]
RC02	603662.5	4852422.4	218.8	217.3	Countryside Dr (C)
RC03	603644.5	4852374.4	218.3	216.8	Countryside Dr (C)
RC04	602816.6	4853144.9	223.8	222.3	Mayfield Rd (R)
RC05	602840.4	4853171.1	223.5	222.0	Mayfield Rd (R)
RD01	604314.0	4852513.0	216.4	214.9	Clarkway Dr (C)
RD02	604357.0	4852469.0	213.6	212.1	Clarkway Dr (C)
RD03	604506.0	4852320.0	214.6	213.1	Clarkway Dr (C)
RD04	604534.0	4852291.0	213.3	211.8	Clarkway Dr (C)
RD05	604569.0	4852193.0	215.3	213.8	Clarkway Dr (C)
RD06	604668.0	4852128.0	214.0	212.5	Clarkway Dr (C)
RD07	604853.0	4851904.0	213.3	211.8	Clarkway Dr (C)
RD08	605319.0	4851341.0	209.1	207.6	E-W Arterial Rd (C)
RD09	605576.0	4851238.0	209.9	208.4	Clarkway Dr (C)
RD10	606013.0	4850821.0	207.5	206.0	Clarkway Dr (C)
RD11	606064.0	4850792.0	207.3	205.8	Clarkway Dr (C)
RD12	605996.0	4850422.0	203.7	202.2	Castlemore Rd (C)
RD13	605843.6	4850232.0	203.8	202.3	Castlemore Rd (C)

Location	Coordinates[1] (m)		Elevations[2] (m)		Adjacent Roadway [3] (R): Regional Road (C): City Road
	Easting	Northing	Receptor	Ground	
RD14	605422.0	4849704.0	202.0	200.5	Castlemore Rd (C) & Gore Rd (R) [4]
RD15	605330.0	4849778.0	201.0	199.5	Gore Rd (R)
RD16	605292.5	4849791.0	200.6	199.1	Gore Rd (R)
RD17	605249.8	4849882.0	201.3	199.8	Gore Rd (R)
RD18	605245.3	4849951.8	201.6	200.1	Gore Rd (R)
RD19	605068.5	4850082.3	203.3	201.8	Gore Rd (R)
RD20	604844.7	4850262.1	205.2	203.7	Gore Rd (R)
RD21	604809.5	4850293.1	205.3	203.8	Gore Rd (R)
RD22	604687.4	4850379.0	205.2	203.7	Gore Rd (R) & E-W Arterial Rd (C) [4]
RD23	604543.1	4850529.5	205.8	204.3	Gore Rd (R) & E-W Arterial Rd (C) [4]
RD24	604506.1	4850551.2	206.0	204.5	Gore Rd (R)
RD25	604476.0	4850574.0	206.3	204.8	Gore Rd (R)
RD26	604134.0	4850934.6	209.7	208.2	Gore Rd (R)
RD27	603699.0	4851343.1	212.3	210.8	Gore Rd (R)
RD28	603670.3	4851371.9	213.0	211.5	Gore Rd (R)
RD29	603610.4	4851443.5	213.5	212.0	Gore Rd (R)
RD30	603518.1	4851527.9	215.3	213.8	Gore Rd (R)
RD31	603480.9	4851603.1	215.3	213.8	Gore Rd (R)
RD32	603369.3	4851653.0	215.0	213.5	Gore Rd (R)
RD33	603599.0	4852115.0	217.9	216.4	Countryside Dr (C)
RD34	603629.0	4852141.0	217.2	215.7	Countryside Dr (C)
RE01	604160.1	4852817.8	219.0	217.5	Countryside Dr (C) & Clarkway Dr (C) [4]
RE02	604453.1	4852552.5	217.7	216.2	Clarkway Dr (C)
RE03	604528.9	4852438.5	216.9	215.4	Clarkway Dr (C)
RE04	604782.7	4852185.3	214.4	212.9	Clarkway Dr (C)
RE05	604940.4	4852049.1	212.8	211.3	Clarkway Dr (C)
RE06	604970.2	4852018.9	212.9	211.4	Clarkway Dr (C)
RE07	605002.0	4851990.7	213.5	212.0	Clarkway Dr (C)
RE08	605021.1	4851940.8	213.3	211.8	Clarkway Dr (C)
RE09	605076.7	4851888.8	213.3	211.8	Clarkway Dr (C)
RE10	605158.0	4851790.0	212.4	210.9	Clarkway Dr (C)
RE11	605254.1	4851810.2	212.8	211.3	Clarkway Dr (C)
RE12	605382.7	4851584.8	212.1	210.6	Coleraine Dr (R) & Clarkway Dr (C) [4]
RE13	605679.0	4851421.0	211.3	209.8	Clarkway Dr (C)
RE14	605664.6	4851345.6	211.2	209.7	Clarkway Dr (C)
RE15	605848.0	4851352.0	210.3	208.8	Clarkway Dr (C)
RE16	605865.1	4851164.9	208.6	207.1	Clarkway Dr (C)
RE17	606159.1	4850963.5	208.2	206.7	Clarkway Dr (C)
RE18	606197.0	4850801.9	208.3	206.8	Clarkway Dr (C)
RE19	606281.1	4850718.0	207.8	206.3	Clarkway Dr (C) & Castlemore Rd (C) [4]
RE20	606292.0	4850794.0	208.7	207.2	Clarkway Dr (C) & Castlemore Rd (C) [4]
RE21	606340.0	4850861.0	207.3	205.8	Clarkway Dr (C) & Castlemore Rd (C) [4]
RE22	606648.5	4851246.8	208.2	206.7	Hwy 50 (R)
RE23	606465.0	4851841.0	210.0	208.5	Hwy 50 (R)

Location	Coordinates[1] (m)		Elevations[2] (m)		Adjacent Roadway [3] (R): Regional Road (C): City Road
	Easting	Northing	Receptor	Ground	
RE24	606531.5	4851865.6	210.2	208.7	Hwy 50 (R)
RE25	606083.3	4852694.4	212.3	210.8	Hwy 50 (R) & Arterial Rd (R) [4]
RE26	606062.0	4852726.0	212.4	210.9	Hwy 50 (R) & Arterial Rd (R) [4]
RE27	605308.5	4853467.6	219.3	217.8	Coleraine Dr (R)
RE28	605261.1	4853506.8	219.6	218.1	Coleraine Dr (R)
RE29	605222.3	4853547.5	219.9	218.4	Coleraine Dr (R)
RE30	604520.6	4853219.0	221.0	219.5	Arterial Rd (R)
RE31	604443.4	4853168.4	221.2	219.7	Countryside Dr (C)
RE32	604421.3	4853143.4	220.1	218.6	Countryside Dr (C)
RE33	604371.5	4853060.7	219.5	218.0	Countryside Dr (C)
RF01	606171.0	4852726.0	212.5	211.0	Hwy 50 (R) & Arterial Rd (R) [4]
RF02	605374.3	4853543.0	219.2	217.7	Coleraine Dr (R)

Notes:

1. Northing and Easting coordinates are provided in the UTM coordinate projection using datum NAD83 zone 17N.
2. The receptor and ground elevations provided are the elevations above sea level. All receptors were modeled at a relative elevation of 1.5 m above ground.
3. Roadway listed are adjacent to the identified receptor location under future "build" scenario.
4. Receptor located near the identified intersection.

5.0 Results

The following sections describe the noise prediction results, noise impact assessment results and the resulting noise mitigation recommendations.

5.1 Noise Modelling Results

The predicted average sound levels for the Existing 2013, Future "no-build" 2041 and Future "build" 2041 scenarios are summarized in Table 5-1.

The predicted noise impacts do exceed the 5 dB change criterion at 12 receptors (RB09, RB10, RD08, RD23, RD24, RE11, RE12, RE27, RE29, RE30, RE31 and RE32). However, the overall sound levels at 8 of the above identified receptors are at or below the 55 dBA overall criterion for the Future "build" scenario and therefore, in accordance with the MOEE/MTO protocol, consideration for noise mitigation is not required for those receptors. For the other 4 receptors (RB09, RB10, RD08 and RE30), consideration of noise mitigation is required in accordance with the MOEE/MTO protocol.

The Peel Region and the City of Brampton Noise Attenuation Policies identify a 60 dBA criterion for consideration for noise mitigation. The predicted Future "build" levels are predicted to be at or above the 60 dBA criterion, when rounded to the nearest whole decibel, at 7 locations (RB01, RC01, RD08, RD13, RE25, RE30 and RF01). Location RD13 is a frontage lot and therefore the Peel Region and City of Brampton Noise Attenuation Policies do not apply. However, locations RB01, RC01, RD08, RD13, RE30 and RF01 are either reverse frontage or side exposure lots. Therefore, a barrier investigation is warranted for these locations.

Table 5-1: Noise Level Predictions

Location	Existing (2013) Daytime (16-hr) L_{eq} (dBA)	Future "no-build" (2041) Daytime (16-hr) L_{eq} (dBA)	Future "build" (2041) Daytime (16-hr) L_{eq} (dBA)	Noise Impact[1] (dB)	> 5 dB Impact? (Yes/No)	Future "build" (2041) ≥60 dBA Citierion?[2] (Yes/No)
RA01	53.2	54.7	56.3	2	No	No
RA02	45.3	46.7	49.9	3	No	No
RA03	43.7	45.2	48.2	3	No	No
RA04	50.8	52.0	56.2	4	No	No
RA05	47.1	48.4	52.3	4	No	No
RB01	54.8	56.0	60.4	4	No	Yes
RB02	43.2	44.4	47.4	3	No	No
RB03	43.8	45.0	48.3	3	No	No
RB04	48.8	50.1	52.2	2	No	No
RB05	42.1	43.3	46.9	4	No	No
RB06	45.8	47.0	47.9	1	No	No
RB07	57.6	58.8	56.6	-2	No	No
RB08	51.4	52.6	53.5	1	No	No
RB09	44.2	45.4	57.6	12	Yes	No
RB10	40.8	42.0	59.4	17	Yes	No
RB11	48.0	49.2	53.2	4	No	No
RC01	61.8	63.0	61.0	-2	No	Yes
RC02	49.2	50.4	48.4	-2	No	No
RC03	52.0	53.2	51.1	-2	No	No
RC04	48.1	49.4	50.0	1	No	No
RC05	47.5	48.7	49.4	1	No	No
RD01	48.6	49.8	49.2	-1	No	No
RD02	43.9	45.2	43.7	-2	No	No
RD03	40.5	41.7	40.7	-1	No	No
RD04	44.9	46.1	45.9	0	No	No
RD05	42.9	44.1	44.2	0	No	No
RD06	45.6	46.8	47.9	1	No	No
RD07	40.3	41.5	42.8	1	No	No
RD08	39.8	41.0	65.0	24	Yes	Yes
RD09	44.6	45.8	48.1	2	No	No
RD10	47.6	48.8	49.3	1	No	No
RD11	49.1	50.3	50.5	0	No	No
RD12	51.3	52.6	52.6	0	No	No
RD13	60.1	61.3	61.3	0	No	Yes
RD14	54.4	55.6	55.6	0	No	No
RD15	52.8	54.1	54.1	0	No	No
RD16	48.5	49.7	49.8	0	No	No
RD17	48.0	49.2	49.3	0	No	No
RD18	46.8	48.0	48.3	0	No	No
RD19	43.6	44.8	45.5	1	No	No

Location	Existing (2013) Daytime (16-hr) L_{eq} (dBA)	Future "no-build" (2041) Daytime (16-hr) L_{eq} (dBA)	Future "build" (2041) Daytime (16-hr) L_{eq} (dBA)	Noise Impact[1] (dB)	> 5 dB Impact? (Yes/No)	Future "build" (2041) ≥60 dBA Citierion?[2] (Yes/No)
RD20	40.8	42.0	45.1	3	No	No
RD21	43.4	44.6	47.0	2	No	No
RD22	53.4	54.6	54.7	0	No	No
RD23	43.1	44.3	55.3	11	Yes	No
RD24	40.4	41.6	50.4	9	Yes	No
RD25	49.5	50.7	52.5	2	No	No
RD26	50.6	51.8	51.9	0	No	No
RD27	49.9	51.1	51.1	0	No	No
RD28	47.1	48.3	48.1	0	No	No
RD29	50.1	51.3	51.1	0	No	No
RD30	48.8	50.0	49.6	0	No	No
RD31	47.6	48.9	47.8	-1	No	No
RD32	58.1	59.3	59.3	0	No	No
RD33	52.9	54.1	52.1	-2	No	No
RD34	44.1	45.3	44.4	-1	No	No
RE01	59.1	60.3	59.2	-1	No	No
RE02	45.3	46.5	48.6	2	No	No
RE03	48.2	49.4	50.6	1	No	No
RE04	45.5	46.7	48.9	2	No	No
RE05	43.1	44.2	47.9	4	No	No
RE06	40.7	41.9	47.1	5	No	No
RE07	42.8	44.0	47.4	3	No	No
RE08	50.2	51.4	52.0	1	No	No
RE09	49.5	50.7	51.6	1	No	No
RE10	51.6	52.8	53.4	1	No	No
RE11	40.6	41.8	47.8	6	Yes	No
RE12	43.7	44.9	54.9	10	Yes	No
RE13	43.7	44.9	48.4	4	No	No
RE14	42.8	44.0	47.8	4	No	No
RE15	42.3	43.5	46.3	3	No	No
RE16	43.5	44.7	46.4	2	No	No
RE17	43.0	44.2	45.6	1	No	No
RE18	50.2	51.4	51.9	1	No	No
RE19	56.8	58.0	58.1	0	No	No
RE20	47.7	48.9	49.4	1	No	No
RE21	49.8	51.0	51.3	0	No	No
RE22	50.4	51.5	52.3	1	No	No
RE23	55.1	56.3	57.1	1	No	No
RE24	52.6	53.8	54.7	1	No	No
RE25	55.7	56.9	61.5	5	No	Yes
RE26	49.7	50.9	54.1	3	No	No
RE27	41.1	42.3	47.9	6	Yes	No

Location	Existing (2013) Daytime (16-hr) L_{eq} (dBA)	Future "no-build" (2041) Daytime (16-hr) L_{eq} (dBA)	Future "build" (2041) Daytime (16-hr) L_{eq} (dBA)	Noise Impact[1] (dB)	> 5 dB Impact? (Yes/No)	Future "build" (2041) ≥60 dBA Citierion?[2] (Yes/No)
RE28	45.7	46.9	52.0	5	No	No
RE29	46.3	47.5	53.3	6	Yes	No
RE30	52.6	53.8	61.0	7	Yes	Yes
RE31	41.9	43.1	52.6	10	Yes	No
RE32	42.4	43.6	50.3	7	Yes	No
RE33	44.7	45.9	49.6	4	No	No
RF01	60.9	62.1	63.1	1	No	Yes
RF02	48.0	49.3	52.7	3	No	No

Note(s):

1. The noise impact is defined as the Future "build" noise level minus the Future "no-build" noise level. A positive value indicates an increased impact and a negative value indicates a decreased impact. Noise Impact values have been rounded to the nearest whole decibel.
2. Future "build" value equal to or greater than 60 dBA when rounded to nearest whole number (Yes/No).

5.2 Barrier Investigation

5.2.1 Investigation Results

Based on the noise modelling results presented in Table 5-1, consideration for noise mitigation is a requirement for the project. Table 5-2 presents the results of a noise barrier investigation which compares the results of the Future "build" 2041 without barriers (Appendix E) scenario to the Future "build" 2041 Barrier Investigation (Appendix F) scenario. In order to be warranted the barrier must achieve a minimum 5 dB reduction at a targeted receptor but not necessarily at all targeted receptors.

Table 5-2: Noise Barrier Investigation (Height: 4 m)

Barrier Segment	Barrier Height (m) Above Grade [1]	Receptor Location	Barrier along Roadway (R): Regional Road (C) City Road	Future "build" Daytime (16-hr) L_{eq} (dBA) Without Barriers (Appendix E)	Future "build" Daytime (16-hr) L_{eq} (dBA) Barrier Investigation (Appendix F)	Barrier Reduction [2] (dB)	Barrier Reduction ≥5 dB
1	4	RB01	Coleraine Dr (R)	60.4	54.1	6	Yes
2	4	RE30	Coleraine Dr (R)	61.0	56.2	5	Yes
3	4	RB09	Arterial Rd (R)	57.6	52.2	5	Yes
4	4	RB10	Arterial Rd (R)	59.4	52.9	7	Yes
5	4	RE25	Arterial Rd (R)	61.5	57.8	4	No
	4	RF01	Arterial Rd (R)	63.1	61.4	2	No
6	4	RC01	Clarkway Dr (C)	61.0	58.4	3	No
7	4	RD08	E-W Arterial (C)	65.0	55.4	10	Yes

Note(s):

1. The proposed barrier height may be achieved via a combination of earth berm and barrier.

2. Barrier reductions have been rounded to the nearest whole decibel.

Additional results have also been included in this section to discuss the barrier investigation with lower barrier heights: 3 m and 2.4 m in comparison with the 4 m height as shown in Table 5-2. The results presented in Table 5-3 and Table 5-4 indicate that none of the barriers with lower heights (i.e. 3 m and 2.4 m) can achieve the 5 dB minimum reduction requirement at the target receptors, except Barrier 7 which is expected to provide 7 dB and 5 dB reductions at RD08 with a height of 3 m and 2.4 m, respectively. However, the mitigated future "build" levels at RD08 under both cases would remain above the MOEE/MTO Protocol objective level of 55 dBA by at least 3 dB.

Given the discussion presented above, a 4-m height is considered in the barrier investigation presented in this report. This is based on the requirements of a minimum 5 dB reduction as well as the need to meet the MOEE/MTO criteria.

Detailed prediction results of the barrier investigation can be found in Table G-1 in Appendix G. The table shows the predicted average sound levels for the Future "build" 2041 at all receptors with barriers at the height of 4 m, 3 m and 2.4 m. The predicted average sound levels for the Future "no-build" 2041 (Appendix D) and Future "build" 2041 without Barriers (Appendix E) are also included in the table for comparison.

Table 5-3: Noise Barrier Investigation (Height: 3 m)

Barrier Segment	Barrier Height (m) Above Grade [1]	Receptor Location	Barrier along Roadway (R): Regional Road (C) City Road	Future "build" Daytime (16-hr) L_{eq} (dBA) Without Barriers (Appendix E)	Future "build" Daytime (16-hr) L_{eq} (dBA) Barrier Investigation (Appendix F)	Barrier Reduction [2] (dB)	Barrier Reduction ≥5 dB
1	3	RB01	Coleraine Dr (R)	60.4	56.0	4	No
2	3	RE30	Coleraine Dr (R)	61.0	58.7	2	No
3	3	RB09	Arterial Rd (R)	57.6	54.8	3	No
4	3	RB10	Arterial Rd (R)	59.4	55.3	4	No
5	3	RE25	Arterial Rd (R)	61.5	60.0	2	No
	3	RF01	Arterial Rd (R)	63.1	62.2	1	No
6	3	RC01	Clarkway Dr (C)	61.0	58.8	2	No
7	3	RD08	E-W Arterial (C)	65.0	58.3	7	Yes

Note(s):
1. The proposed barrier height may be achieved via a combination of earth berm and barrier.
2. Barrier reductions have been rounded to the nearest whole decibel.

Table 5-4: Noise Barrier Investigation (Height: 2.4 m)

Barrier Segment	Barrier Height (m) Above Grade [1]	Receptor Location	Barrier along Roadway (R): Regional Road (C) City Road	Future "build" Daytime (16-hr) L_{eq} (dBA) Without Barriers (Appendix E)	Future "build" Daytime (16-hr) L_{eq} (dBA) Barrier Investigation (Appendix F)	Barrier Reduction [2] (dB)	Barrier Reduction ≥5 dB
1	2.4	RB01	Coleraine Dr (R)	60.4	57.5	3	No
2	2.4	RE30	Coleraine Dr (R)	61.0	59.3	2	No
3	2.4	RB09	Arterial Rd (R)	57.6	55.6	2	No
4	2.4	RB10	Arterial Rd (R)	59.4	56.6	3	No
5	2.4	RE25	Arterial Rd (R)	61.5	60.5	1	No
	2.4	RF01	Arterial Rd (R)	63.1	62.4	1	No
6	2.4	RC01	Clarkway Dr (C)	61.0	59.2	2	No
7	2.4	RD08	E-W Arterial (C)	65.0	60.5	5	Yes

Note(s):
1. The proposed barrier height may be achieved via a combination of earth berm and barrier.
2. Barrier reductions have been rounded to the nearest whole decibel.

5.2.2 Barrier along Regional Roads

Five (5) barriers have been proposed to be located along regional roads, as shown in Table 5-2. The results indicate that Barriers 1, 2, 3 and 4 achieve a reduction of 5 dB or greater. Although Barrier 2 introduces a reduction of 5 dB at the targeted receptor RE30, it is to be noted that the future "build" level at RE30 is above the MOEE/MTO Protocol objective level of 55 dBA by 1 dB (rounding to the nearest whole decibel) with the proposed barrier.

Barrier 5 achieves an average reduction of 3 dB which is below the minimum 5 dB requirement for warranting the barrier. The effectiveness of Barrier 5 for receptors RE25 and RF01 is limited due to the direct frontage exposures to Highway 50 which is a major noise source for these two locations.

5.2.3 Barrier along City Roads

Two (2) barriers have been proposed to be located along city roads. Barrier 7 is expected to achieve a reduction greater than 5 dB. A 3 dB reduction is predicted for Barrier 6 which is below the minimum 5 dB requirement. The targeted receptor RC01 is located in a corner lot with direct frontage exposure to Countryside Drive and side exposure to Clarkway Drive. For RC01 Countryside Drive is considered a more significant noise source than Clarkway Drive due to a higher traffic volume (existing and future prediction) and the side exposure noise reduction achieved by Barrier 6 is limited.

5.2.4 Proposed Barriers

Based on the discussions presented above, only Barriers 1, 2, 3, 4 and 7 are feasible and recommended for implementation.

A summary of the proposed barriers can be found in Table 5-5 which includes the UTM coordinates of the start and end points of the barrier as well as the barrier length. Appendix H includes figures showing the proposed locations and extents of the recommended noise barriers.

Table 5-5: Proposed Noise Barriers

Barrier Segment	Barrier Height (m) Above Grade [1]	Barrier along Roadway (R): Regional Road (C) City Road	Start Point Coordinates [2] (m)		End Point Coordinates [2] (m)		Barrier Length (m)
			Easting	Northing	Easting	Northing	
1	4	Coleraine Dr (R)	604846.5	4853964.4	604900.2	4853910.2	76
2	4	Coleraine Dr (R)	604498.5	4853312.9	604736.7	4853084.2	330
3	4	Arterial Rd (R)	604357.8	4853446.6	604455.5	4853349.0	138
4	4	Arterial Rd (R)	604386.6	4853468.6	604474.9	4853387.0	120
7	4	E-W Arterial (C)	605363.9	4851409.7	605268.6	4851292.9	151

Note(s):

1. The proposed barrier height may be achieved via a combination of earth berm and barrier.
2. Northing and Easting coordinates are provided in the UTM coordinate projection using datum NAD83 zone 17N.

5.3 Noise Modelling Results with Recommended Mitigation

The predicted average sound levels for the Future "no-build" 2041 (Appendix D), Future "build" 2041 without Barriers (Appendix E) and Future "build" 2041 with Recommended Barriers (Appendix H) scenarios are summarized in Table 5-6.

Table 5-6: Noise Level Predictions with Recommended Mitigation

Location	Future "no-build" Daytime (16-hr) L_{eq} (dBA) (Appendix D)	Future "build" Daytime (16-hr) L_{eq} (dBA) Without Barriers (Appendix E)	Noise Impact [1] (dB)	Future "build" Daytime (16-hr) L_{eq} (dBA) Recommended Barriers [2] (Appendix H)	Barrier Warranted? (Yes/No)	Barrier Reduction [3] (dB)
RA01	54.7	56.3	2	56.3	No	0
RA02	46.7	49.9	3	49.9	No	0
RA03	45.2	48.2	3	48.2	No	0
RA04	52.0	56.2	4	56.1	No	0
RA05	48.4	52.3	4	52.3	No	0
RB01	56.0	60.4	4	54.1	Yes	6
RB02	44.4	47.4	3	47.4	No	0
RB03	45.0	48.3	3	48.3	No	0
RB04	50.1	52.2	2	52.2	No	0
RB05	43.3	46.9	4	46.9	No	0
RB06	47.0	47.9	1	47.7	No	0

Location	Future "no-build" Daytime (16-hr) L_{eq} (dBA) (Appendix D)	Future "build" Daytime (16-hr) L_{eq} (dBA) Without Barriers (Appendix E)	Noise Impact [1] (dB)	Future "build" Daytime (16-hr) L_{eq} (dBA) Recommended Barriers [2] (Appendix H)	Barrier Warranted? (Yes/No)	Barrier Reduction [3] (dB)
RB07	58.8	56.6	-2	56.6	No	0
RB08	52.6	53.5	1	52.3	No	1
RB09	45.4	57.6	12	52.2	Yes	5
RB10	42.0	59.4	17	52.9	Yes	7
RB11	49.2	53.2	4	52.6	No	1
RC01	63.0	61.0	-2	60.9	No	0
RC02	50.4	48.4	-2	48.4	No	0
RC03	53.2	51.1	-2	51.1	No	0
RC04	49.4	50.0	1	50.0	No	0
RC05	48.7	49.4	1	49.4	No	0
RD01	49.8	49.2	-1	49.2	No	0
RD02	45.2	43.7	-2	43.7	No	0
RD03	41.7	40.7	-1	40.6	No	0
RD04	46.1	45.9	0	45.9	No	0
RD05	44.1	44.2	0	44.1	No	0
RD06	46.8	47.9	1	47.9	No	0
RD07	41.5	42.8	1	42.8	No	0
RD08	41.0	65.0	24	55.4	Yes	10
RD09	45.8	48.1	2	47.7	No	0
RD10	48.8	49.3	1	49.3	No	0
RD11	50.3	50.5	0	50.5	No	0
RD12	52.6	52.6	0	52.6	No	0
RD13	61.3	61.3	0	61.3	No	0
RD14	55.6	55.6	0	55.6	No	0
RD15	54.1	54.1	0	54.1	No	0
RD16	49.7	49.8	0	49.8	No	0
RD17	49.2	49.3	0	49.3	No	0
RD18	48.0	48.3	0	48.3	No	0
RD19	44.8	45.5	1	45.5	No	0
RD20	42.0	45.1	3	45.1	No	0
RD21	44.6	47.0	2	47.0	No	0
RD22	54.6	54.7	0	54.7	No	0
RD23	44.3	55.3	11	55.3	No	0
RD24	41.6	50.4	9	50.4	No	0
RD25	50.7	52.5	2	52.5	No	0
RD26	51.8	51.9	0	51.9	No	0
RD27	51.1	51.1	0	51.1	No	0
RD28	48.3	48.1	0	48.1	No	0

Location	Future "no-build" Daytime (16-hr) L_{eq} (dBA) (Appendix D)	Future "build" Daytime (16-hr) L_{eq} (dBA) Without Barriers (Appendix E)	Noise Impact [1] (dB)	Future "build" Daytime (16-hr) L_{eq} (dBA) Recommended Barriers [2] (Appendix H)	Barrier Warranted? (Yes/No)	Barrier Reduction [3] (dB)
RD29	51.3	51.1	0	51.1	No	0
RD30	50.0	49.6	0	49.6	No	0
RD31	48.9	47.8	-1	47.7	No	0
RD32	59.3	59.3	0	59.3	No	0
RD33	54.1	52.1	-2	52.1	No	0
RD34	45.3	44.4	-1	44.3	No	0
RE01	60.3	59.2	-1	59.1	No	0
RE02	46.5	48.6	2	48.1	No	1
RE03	49.4	50.6	1	50.6	No	0
RE04	46.7	48.9	2	48.8	No	0
RE05	44.2	47.9	4	47.7	No	0
RE06	41.9	47.1	5	46.9	No	0
RE07	44.0	47.4	3	47.3	No	0
RE08	51.4	52.0	1	52.0	No	0
RE09	50.7	51.6	1	51.6	No	0
RE10	52.8	53.4	1	53.4	No	0
RE11	41.8	47.8	6	47.8	No	0
RE12	44.9	54.9	10	54.9	No	0
RE13	44.9	48.4	4	48.2	No	0
RE14	44.0	47.8	4	47.8	No	0
RE15	43.5	46.3	3	46.3	No	0
RE16	44.7	46.4	2	46.4	No	0
RE17	44.2	45.6	1	45.6	No	0
RE18	51.4	51.9	1	51.9	No	0
RE19	58.0	58.1	0	58.1	No	0
RE20	48.9	49.4	1	49.4	No	0
RE21	51.0	51.3	0	51.3	No	0
RE22	51.5	52.3	1	52.3	No	0
RE23	56.3	57.1	1	57.1	No	0
RE24	53.8	54.7	1	54.7	No	0
RE25	56.9	61.5	5	61.5	No	0
RE26	50.9	54.1	3	54.1	No	0
RE27	42.3	47.9	6	47.9	No	0
RE28	46.9	52.0	5	52.0	No	0
RE29	47.5	53.3	6	53.2	No	0
RE30	53.8	61.0	7	56.2	Yes	5
RE31	43.1	52.6	10	49.1	No	4
RE32	43.6	50.3	7	47.7	No	3

Location	Future "no-build" Daytime (16-hr) L_{eq} (dBA) (Appendix D)	Future "build" Daytime (16-hr) L_{eq} (dBA) Without Barriers (Appendix E)	Noise Impact [1] (dB)	Future "build" Daytime (16-hr) L_{eq} (dBA) Recommended Barriers [2] (Appendix H)	Barrier Warranted? (Yes/No)	Barrier Reduction [3] (dB)
RE33	45.9	49.6	4	48.1	No	2
RF01	62.1	63.1	1	63.1	No	0
RF02	49.3	52.7	3	52.7	No	0

Note(s):

1. The noise impact is defined as the Future "build" noise level minus the Future "no-build" noise level. A positive value indicates an increased impact and a negative value indicates a decreased impact. Noise Impact values have been rounded to the nearest whole decibel.
2. The results shown represent the noise levels with five (5) recommended barriers out of the seven (7) barriers investigated in Section 5.2.
3. Barrier reductions have been rounded to the nearest whole decibel.

6.0 Construction Noise

The following sections describe policies to consider with respect to the generation and mitigation of construction noise related to the project.

6.1 Local By-Laws

The Brampton By-Law 93-84 [9] of the Corporation of the City of Brampton states that any sound arising from road work and road improvements undertaken by or on behalf of the Ministry of Transportation (Ontario) or the Region of Peel are specifically permitted and the presence of these sounds and noises is not to be considered a contravention of the By-Law.

6.2 MECP Sound Emission Standards

MECP Publication NPC-115 [10] provides sound emission standards for various types of construction equipment. Due to the temporary and unavoidable nature of construction, these MECP guidelines stipulate limits on individual pieces of equipment instead of a site limit. Table 6-1 illustrates maximum noise emission levels which should be adhered to for typical construction equipment per NPC-115.

Table 6-1: NPC-115 Noise Emission Limits for Construction Equipment

Type of Equipment	Maximum Sound Level (dBA)[1]	Power Rating (kW)
Excavation equipment, bulldozers, loaders, backhoes or other equipment	83	Less than 75
	85	75 and greater
Pneumatic Pavement Breakers	85	-
Portable Air Compressors	70	-

Note(s):
1. Maximum Sound Level (dBA) as determined using Publication NPC – 103 – Procedures, Section 6

6.3 Contract Documentation

The construction contract should include provisions relating to the adequate control of noise, compliance with related laws, establishment of a complaints process and outline the responsibilities with respect to investigations of noise up to and including remedial measures.

The contract documents should also explicitly state that compliance with all applicable law is an expectation of the contract including adherence to the City of Brampton By-Law 93-84 and MECP Publication NPC-115.

7.0 Conclusions and Recommendations

The results of the noise impact study indicated that the noise impacts of the study area are predicted to be more than 5 dB for a total of 12 receptors (RB09, RB10, RD08, RD23, RD24, RE11, RE12, RE27, RE29, RE30, RE31 and RE32). Four (4) receptors within the identified group have an overall sound level above the 55 dBA overall criterion when comparing the Future "build" 2041 and Future "no-build" 2041 scenarios. Consideration of noise mitigation is required in accordance with the MOEE/MTO protocol for these 4 receptors.

The Peel Region and the City of Brampton Noise Attenuation Policies identify a 60 dBA criterion for consideration for noise mitigation. Six (6) reverse frontage or side exposure locations (RB01, RC01, RD08, RE25, RE30 and RF01) were assessed for possible noise mitigation in accordance with the Peel Region and City of Brampton Noise Attenuation Policies.

The barrier investigation concluded that Barriers 1, 2, 3, 4 and 7 provided sufficient attenuation as to be warranted and these are recommended for implementation. Figures showing the recommended barrier extents and locations are provided in Appendix H. All recommended noise barriers are 4.0 metres in height above existing grade. A combination of earth berm and barrier can be used to achieve the proposed 4 m height. Construction noise impacts are temporary and largely unavoidable. However, the contract documents should identify the contractor's responsibilities with respect to controlling noise, as well as recording, investigating and, if possible, addressing complaints. The contract documents should also explicitly state that compliance with all applicable law is an expectation of the contract including adherence to the City of Brampton By-Law 93-84 and MECP Publication NPC-115.

This assessment was prepared based on the information available during the stage of development at the time of preparation. Should more details of the planning and design become available, the assessment, including the recommended mitigations, may need to be updated to reflect the latest development progress. In addition, given the ongoing planning development within this study area, it is recommended that developers also conduct independent noise assessment studies and propose mitigation measures (if necessary) to support future developments.

8.0 Closure

This road traffic noise impact study was completed by Wood for the sole benefit of the City of Brampton and Region of Peel and is based on information available at the time of this study. We have relied on information provided to us by others and therefore are not liable or responsible for incomplete, incorrect and inadequate information. The material in this report reflects Wood's judgment in light of the information available to us at the time of preparation.

Yours truly,
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9.0 References

[1] MOEE/GO Transit, "Noise and Vibration Protocol," January 1995 (Draft #9).

[2] MTO/MOEE, "A Protocol for Dealing with Noise Concerns during the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments," The Queen's Printer for Ontario, 1986.

[3] Ontario Ministry of Transportation, "Directive A-1: Noise Policy and Acoustic Standards Provincial Highways," February 1992.

[4] The Regional Municipality of Peel, "Noise Attenuation Barriers. Policy No.:W30-04," June 1996.

[5] The Regional Municipality of Peel, "Private Noise Attenuation Walls Conversion Policy. Policy No.: W30-04," 2016.

[6] The Corporation of the City of Brampton, "Noise Attenuation - Retrofit Policy and Road Widenings," October 2007.

[7] Ontario Ministry of the Environment, "Ontario Road Noise Analysis Method for Environment and Transportation, ORNAMENT.," October 1989.

[8] Ontario Ministry of the Environment and Climate Change, "Sound from Trains Environment Analysis Method, STEAM," July 1990.

[9] The Corporation of the City of Brampton, "Noise By-Law 93-84," April 25, 1984.

[10] Ontario Ministry of the Environment and Climate Change, *Publication NPC-115 Construction Equipment*.

Appendix A

Study Area Figure

Appendix B

Summary of Traffic Data

Appendix C

Existing 2013

Appendix D

Future “no-build” 2041

Appendix E

Future “build” 2041

Appendix F

Future “build” 2041 Barrier Investigation

Appendix G

Future “build” 2041 Barrier Investigation – Noise Level Predictions with Mitigation

Appendix H

Future “build” 2041 Recommended Barriers

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Limitations

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