Road Traffic Noise Impact Study

Bradley Avenue Extension
Wharncliffe Road South to West Leg of Jalna Boulevard
Project # TPB186089

Prepared for:

The Corporation of The City of London

May 2022

Wood Environment & Infrastructure Solutions
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May 16, 2022

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Dear Mr. Patel and Ms. Morris,

Re: Road Traffic Noise Impact Study in Support of a Municipal Class Environmental Assessment of Bradley Avenue Extension, City of London

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood) is pleased to provide the attached Road Traffic Noise Impact Study to be used in support of a Municipal Class Environmental Assessment (MCEA) of Bradley Avenue Extension. This report specifically addresses the noise impacts of the proposed Bradley Avenue extension between Wharncliffe Road South and White Oak Road, and the widening of existing Bradley Avenue between White Oak Road and West leg of Jalna Boulevard.

This report will support the Addendum to the 2005 MCEA study which recommended a preferred alignment for Bradley Avenue from While Oak Road to Bostwick Road. The Addendum will focus on the section of Bradley Avenue between White Oak Road and West leg of Jalna Boulevard, and will not revisit the previously approved recommendations in the 2005 MCEA.

'Wood' is a trading name for John Wood Group PLC and its subsidiaries

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

Yours truly,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

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Executive Summary

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood) was retained by the Corporation of the City of London (the City of London) to complete a Road Traffic Noise Impact Study (Noise Impact Study) to be used in support of a Municipal Class Environmental Assessment of the Bradley Avenue Extension from Wharncliffe Road South to West leg of Jalna Boulevard. The objective of the report is to address the noise impacts of the proposed Bradley Avenue extension between Wharncliffe Road South and White Oak Road, and the widening of existing Bradley Avenue between White Oak Road and West leg of Jalna Boulevard.

This report will support the Addendum to the 2005 MCEA study which recommended a preferred alignment for Bradley Avenue from While Oak Road to Bostwick Road. The Addendum will focus on the section of Bradley Avenue between White Oak Road and West leg of Jalna Boulevard, and will not revisit the previously approved recommendations in the 2005 MCEA.

The project was assessed using the noise limit provided in the MOEE/MTO protocol. While the City of London Sound By-Law is considered an applicable noise guideline for the project, a review the By-Law indicated that it does not include specific requirements with respect to traffic noise assessment or noise barrier policies.

The results presented in Table 5-1 of Section 5.0 indicate that the noise impacts within the study area are predicted to be less than 5 dB for three (3) receptors (R01, R02 and R03) when comparing the Future "build" 2030 and Future "no-build" 2030 scenarios. The remaining seven (7) receptors (R04 through R10) are expected to have a noise level increase of more than 5 dB as a result of the new Bradley Avenue extension, but the Future "build" noise levels at these receptors are expected to be below the 55 dBA criterion. Therefore, in accordance with the MOEE/MTO protocol consideration of noise mitigation is not required for all receptors.

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 London Sound By-Law and MECP Publication NPC-115.

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1.0 Introduction

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood) was retained by the Corporation of the City of London (the City of London) to complete a Road Traffic Noise Impact Study (Noise Impact Study) to be used in support of a Municipal Class Environmental Assessment (MCEA) of the Bradley Avenue Extension from Wharncliffe Road South to West leg of Jalna Boulevard. This report specifically addresses the noise impacts of the proposed Bradley Avenue extension between Wharncliffe Road South and White Oak Road, and the widening of existing Bradley Avenue between White Oak Road and West leg of Jalna Boulevard.

This report will support the Addendum to the 2005 MCEA study which recommended a preferred alignment for Bradley Avenue from While Oak Road to Bostwick Road. The Addendum will focus on the section of Bradley Avenue between White Oak Road and West leg of Jalna Boulevard, and will not revisit the previously approved recommendations in the 2005 MCEA.

1.1 Definition of Study Area

The study area was comprised of approximately 2 kilometers of Bradley Avenue. The western limit of the study area is the Wharnecliffe Road South and the eastern limit of the study area is the West leg of Jalna Boulevard. The study area is presented in Appendix A.

1.2 Description of Scenarios

Three scenarios were considered as part of this Noise Impact Study:

1. Existing (2018);
2. Future "no-build" (2030); and
3. Future "build" (2030).

Existing (2018): The existing Bradley Avenue lane configuration consists of a 2-lane cross-section between White Oak Road and West leg of Jalna Boulevard with additional turning lanes near road intersections. Figures for this scenario are provided in Appendix C.

Future "no-build" (2030): Consists of the same lane configurations as Existing (2018) but with increased traffic volumes due to forecasted population and employment growth. Figures for the scenario are provided in Appendix D.

Future "build" (2030): Consists of a 4-lane cross-section between White Oak Road and West leg of Jalna Boulevard, and a new segment of Bradley Avenue between Wharncliffe Road South and White Oak Road with a 4-lane cross-section configuration. This scenario implements projected Future "build" 2030 traffic volume predictions. Figures for this scenario are provided in Appendix E.

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 is 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

The following sections describe the noise guidelines which are considered 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 City of London – Sound By-Law

The City of London Sound By-Law [4] provides guidelines for the regulation and prohibition of noise which include both qualitative and quantitative requirements. The quantitative noise prohibitions are established with respect to stationary noise sources and are based on the MECP NPC series publications. The Sound By-Law does not outline requirements with respect to roadway traffic noise assessment, nor does it include policies related to noise barriers.

As such, the MOEE/MTO protocol is considered the primary guideline for this Noise Impact Study.

3.0 Project Noise Impact 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 Impact 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.
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 used in the assessment was based on information provided by the City of London and information available from existing transportation studies. Three scenarios were investigated: Existing (2018), Future without development (2030) and Future with development (2030). These scenarios correspond to Existing, Future "no-build" and Future "build" scenarios respectively. The Annual Average Daily traffic (AADT) values for each road segment of Bradley Avenue were estimated by Wood utilizing recent traffic counts, historical transportation planning studies and applicable assumptions. The day/night traffic split percentages were assumed to be approximately 90% and 10% respectively. Truck volumes were assumed to be 3% 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 this Noise Impact Study is provided in Appendix B.

4.2 Noise Modelling

Two software options were considered for the traffic noise prediction - STAMSON V5.04 (2000) and Cadna/A with TNM 2.5 implementation. Preference was given to the later as explained below.

STAMSON V5.04 (2000) is a computerized implementation of the road and rail traffic noise prediction methods described in ORNAMENT [5] (Ontario Road Noise Analysis Method for Environment and Transportation) and STEAM [6] (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, i.e., 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 Cadna/A 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. Cadna/A 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 (FHWA) 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 through a combination of source and propagation settings. 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. A summary of the validation and STAMSON output can be found in Appendix F.

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 Bradley Avenue. A digital terrain model of the area was used to model the terrain within the study area.

Bradley Avenue was the dominant source of noise considered in the traffic noise impact study. The noise level contributions from roads crossing Bradley Avenue 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 improvements.

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 existing and future Bradley Avenue.

Ten (10) representative receptors were selected to predict the future noise levels as a result of the proposed improvements. These locations are expected to be the most affected by the noise associated with the project. These receptors represent existing residences as well as locations where future residential communities are expected to be developed[1]. Three (3) of the selected receptors (R01, R02 and R03) are located along the existing Bradley Avenue, while the remaining seven (7) are located close to the future Bradley Avenue extension. Predicted noise levels were assessed in the OLA of each receptor location. The OLA locations were modelled at 1.5 meters (m) high and approximately 3 m horizontally from the rear wall of the residence. Other residences with similar setback and orientation to the noise

1 Receptors representing future residential developments were selected based on available city subdivision approvals and parcel map (https://london.maps.arcgis.com/apps/webappviewer/index.html?id=0187f8a72f204edcbc95d595f31b5117).

source will receive similar sound exposure and noise impacts. Table 4-1 summarizes the receptor numbers and their locations. Illustrations of their locations are provided in Appendix A.

Table 4-1: Receptor Locations and Elevations

Location	Coordinates[1] (m)		Elevations[2] (m)	
	Northing	Easting	Receptor	Ground
R01	480053.8	4753355.3	265.5	264.0
R02	479972.9	4753351.3	266.0	264.5
R03	479929.5	4753267.8	265.5	264.0
R04	479177.4	4753345.2	270.3	268.8
R05	479125.7	4753286.4	269.5	268.0
R06	478971.3	4753273.9	269.3	267.8
R07	478849.9	4753259.9	270.5	269.0
R08	478689.4	4753240.4	271.5	270.0
R09	478271.1	4752979.4	272.8	271.3
R10	478140.2	4753128.9	275.3	273.8

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.

5.0 Assessment Results

This section describes the noise prediction results, noise impact assessment results and the resulting noise mitigation recommendations.

Table 5-1 summarizes the predicted average sound levels for the Existing 2018, Future "no-build" 2030 and Future "build" 2030 scenarios at the identified receptors. A 1-dB increase (when rounded to the nearest whole number) is predicted at receptors R01, R02 and R03 as a result of the project. Therefore, in accordance with the MOEE/MTO protocol consideration of noise mitigation is not required at these locations.

The remaining receptors (R04 through R10) are located along the Bradley Avenue extension and are more than 450 m away from the existing Bradley Avenue segment between White Oak Road and West leg of Jalna Boulevard. Under the Existing and Future "no-build" scenarios, the noise levels at these locations are below 35 dBA[2]. The noise modeling showed an increase of more than 15 dB at these locations as the new Bradley Avenue extension will introduce a significant noise source to these receptors. It is to be noted that this noise assessment did not consider the noise contribution from existing cross-roads, and is therefore overpredicting the increase in sound levels. Despite the significant noise impact, the Future "build" noise

2 Although the noise levels predicted at these receptors represent the noise contribution from the existing Bradley Avenue only, the ambient traffic noise levels at these locations are still expected to be relatively low, as they are located more than 250m away from any existing arterial roads. The only exception may be found at receptor R10 which is adjacent to the Wharncliffe Road South. However, as indicated in Section 4.2, noise contributions from roads other than Bradley Avenue were neglected in this study as part of the conservative approach to examine the significance of noise impact with the roadway improvements.

levels at these locations as a result of the new Bradley Avenue are predicted to be below the 55 dBA criterion. A barrier investigation is not warranted since the MOEE/MTO target level is already met.

Given the ongoing planning development within the study area, developers should ensure the development of sensitive land use follow applicable policies outlined in The London Plan – "Our Tools"[3], including but not limited to policies 1766 and 1768.4. Developers are responsible for the design of residential development (not rear or side-lot onto the adjacent streets), noise assessment studies and mitigation measures (if necessary).

Table 5-1: Noise Level Predictions

Location	Existing Daytime (16 hr) L_{eq} (dBA)	Future "no build Daytime (16 hr) L_{eq} (dBA)	Future "build Daytime (16 hr) L_{eq} (dBA)	Noise Impact[1] (dB)	> 5 dB Impact? (Yes/No)	Future "build > 55 dBA Citierion?[2] (Yes/No)
R01	64.8	65.5	66.4	1	No	Yes
R02	63.9	64.6	65.8	1	No	Yes
R03	59.4	60.1	61.4	1	No	Yes
R04	34.0	34.7	51.3	17	Yes	No
R05	33.4	34.1	53.7	20	Yes	No
R06	29.8	30.5	53.0	23	Yes	No
R07	28.2	28.9	52.7	24	Yes	No
R08	25.8	26.5	52.2	26	Yes	No
R09	20.9	21.6	46.5	25	Yes	No
R10	20.7	21.4	48.5	27	Yes	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 greater than 55 dBA when rounded to nearest whole number (Yes/No).

3 https://london.ca/sites/default/files/2021-07/8.%20Our%20Tools%20-%20The%20London%20Plan%20-%20May%2028%20Consolidation%20FULL%20Version%20AODA.pdf

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 City of London Noise By-Law [4] includes qualitative noise prohibitions on construction activities and allows for an application for a temporary noise permit for construction. Exemptions are provided on City Construction Projects for "*the operation of equipment in conjunction with City Construction projects, City general maintenance projects, and City emergency maintenance projects*".

6.2 MECP Sound Emission Standards

MECP Publication NPC-115 [7] 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 London Sound By-Law 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 be less than 5 dB for three (3) receptors (R01, R02 and R03) when comparing the Future "build" 2030 and Future "no-build" 2030 scenarios. The remaining seven (7) receptors (R04 through R10) are expected to have a noise level increase of more than 5 dB as a result of the new Bradley Avenue extension, but the Future "build" noise levels at these receptors are expected to be below the 55 dBA criterion. Therefore, in accordance with the MOEE/MTO protocol consideration of noise mitigation is not required for any of the considered receptors.

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 London Sound By-Law 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 may need to be updated to reflect the latest development progress. In addition, given the ongoing planning development within the study area, developers should ensure the development of sensitive land use follow applicable policies outlined in The London Plan – "Our Tools", including but not limited to policies 1766 and 1768.4. Developers are responsible for the design of residential development (not rear or side-lot onto the adjacent streets), noise assessment studies and mitigation measures (if necessary).

8.0 Closure

This road traffic noise impact study was completed by Wood for the sole benefit of the City of London 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,
Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Prepared by:	**Reviewed by:**
Shelly Yuan, M.Sc., P.Eng. Engineer, Acoustics & Vibration	Henrik Olsen, M.Sc., INCE Bd. Cert. Principal Consultant, Acoustics & Vibration
Signature: 	Signature: 
Date: **2022-05-16**	Date: **2022-05-16**

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] City of London, Ontario, "Sound By-Law, PW-12," September 14, 2021.

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

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

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

Appendix A

Study Area Figure



LEGEND

- Proposed Road Allowance
- Bradley Avenue Extension
- Bradley Avenue Widening

0 250 500 750 1,000 Metres

Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Study Area

PROJECT NO: TPB186089	FIGURE: A-1
SCALE: 1:6000	DATE: May 2022



LEGEND

- Proposed Road Allowance
- Bradley Avenue Extension
- Bradley Avenue Widening
- Receptor

0 250 500 750 1,000 Metres

Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Location of Noise Sensitive Areas

PROJECT NO: TPB186089	FIGURE: A-2
SCALE: 1:6000	DATE: May 2022

Appendix B

Summary of Traffic Data

Scenario 1	Existing volumes									
Road Segment		AADT	SADT	Speed Limit (kph)	% Trucks	Medium Truck as % of AADT/SADT	Heavy Truck as % of AADT/SADT	Day/Night Split as % of AADT/SADT		No. of Lanes
Start	Finish							Daytime	Nighttime	
White Oak Road	Jalna Boulevard	19,390	19,390	60	3%	1.5%	1.5%	90%	10%	2
Wharncliffe Road	White Oak Road	Not Built in this scenario								

Scenario 2	Future volumes "No-Build" or "Without Improvements"									
Road Segment		AADT	SADT	Speed Limit	% Trucks	Medium Truck as % of AADT/SADT	Heavy Truck as % of AADT/SADT	Day/Night Split as % of AADT/SADT		No. of Lanes
Start	Finish							Daytime	Nighttime	
White Oak Road	Jalna Boulevard	22,830	22,830	60	3%	1.5%	1.5%	90%	10%	4
Wharncliffe Road	White Oak Road	Not Built in this scenario								

Scenario 3	Future volumes "Build" or "With Improvements"									
Road Segment		AADT	SADT	Speed Limit	% Trucks	Medium Truck as % of AADT/SADT	Heavy Truck as % of AADT/SADT	Day/Night Split as % of AADT/SADT		No. of Lanes
Start	Finish							Daytime	Nighttime	
White Oak Road	Jalna Boulevard	22,830	22,830	60	3%	1.5%	1.5%	90%	10%	4
Wharncliffe Road	White Oak Road	24,569	24,569	60	3%	1.5%	1.5%	90%	10%	4

Appendix C

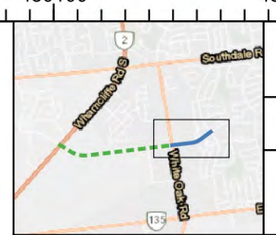
Existing 2018



LEGEND

- Receptor
- Existing Bradley Avenue

0 100 200 300 400 500 Metres



Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Existing

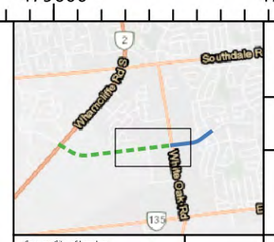
PROJECT NO: TPB186089	FIGURE: C-1
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Existing Bradley Avenue

0 100 200 300 400 500 Metres



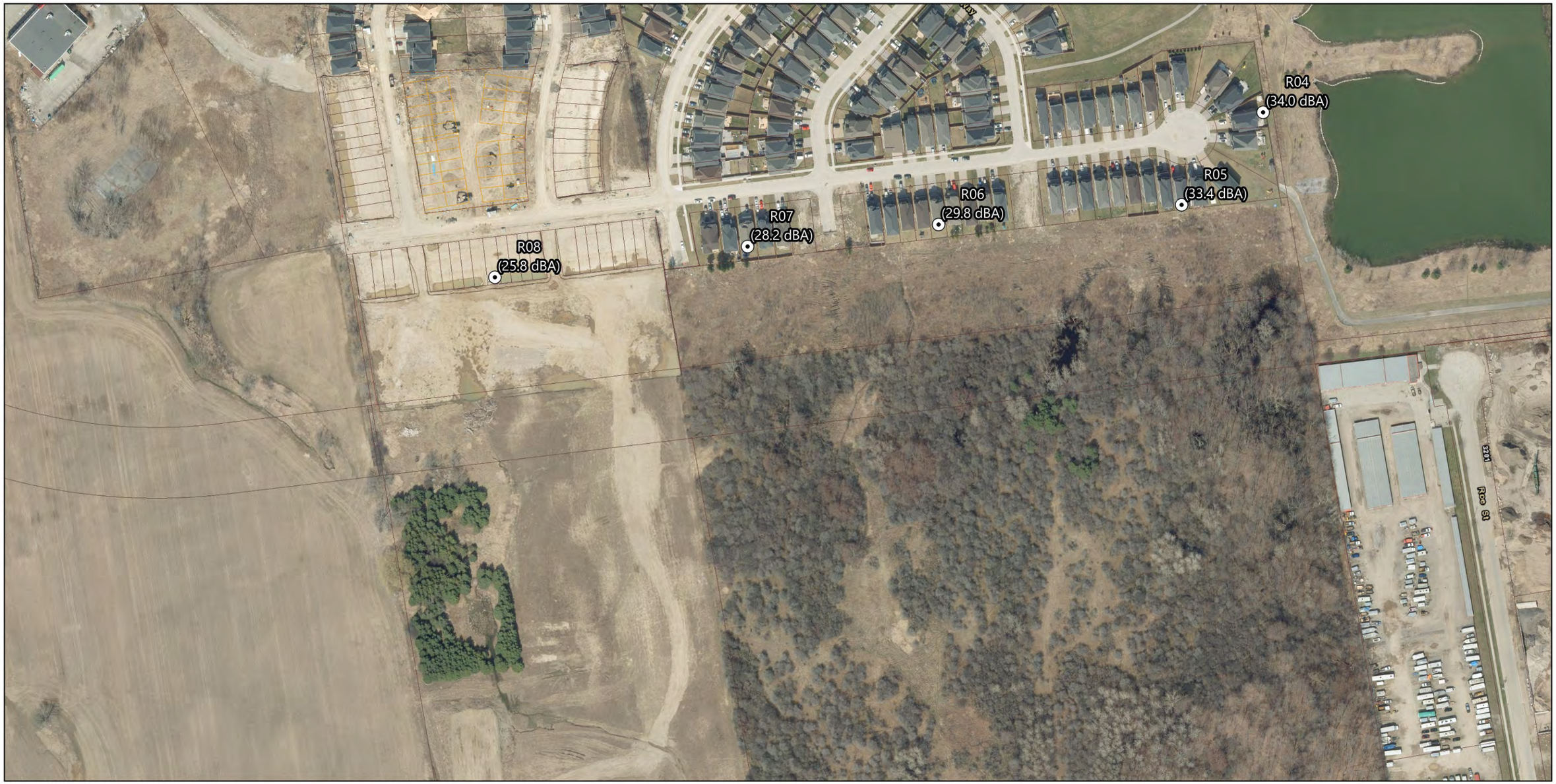
Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Existing

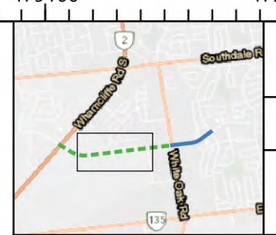
PROJECT NO: TPB186089	FIGURE: C-2
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Existing Bradley Avenue

0 100 200 300 400 500 Metres



wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Existing

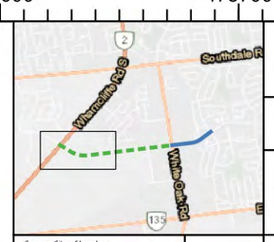
PROJECT NO: TPB186089	FIGURE: C-3
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Existing Bradley Avenue

0 100 200 300 400 500 Metres



Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Existing

PROJECT NO: TPB186089	FIGURE: C-4
SCALE: 1:2500	DATE: May 2022

Appendix D

Future “no-build” 2030



LEGEND

- Receptor
- Existing Bradley Avenue

0 100 200 300 400 500 Metres



Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

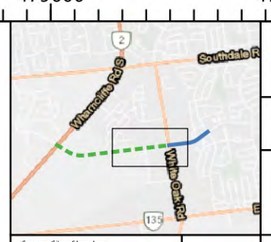
Noise Levels
Future No-Build

PROJECT NO: TPB186089	FIGURE: D-1
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Existing Bradley Avenue



Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

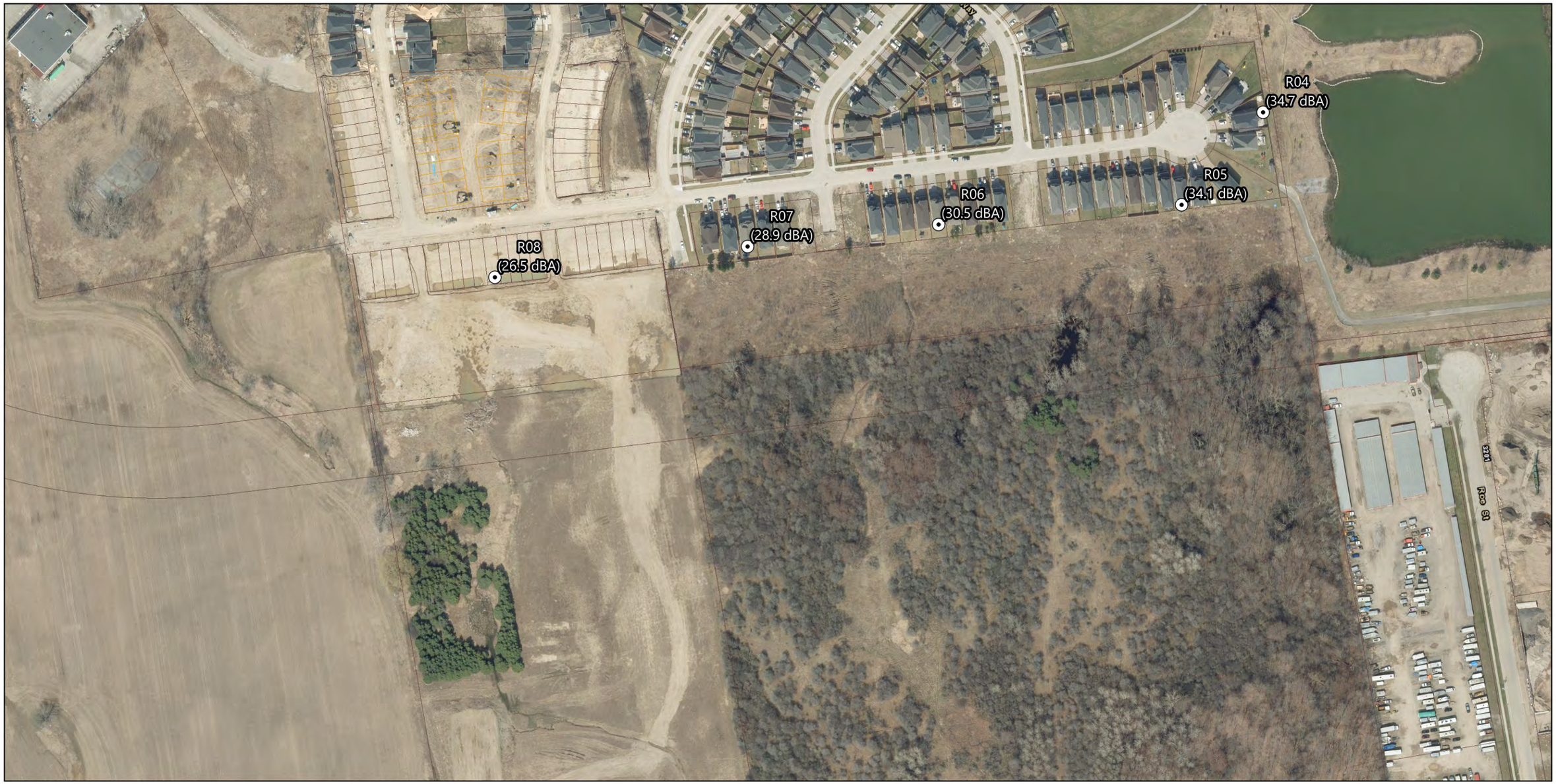
0 100 200 300 400 500 Metres

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Future No-Build

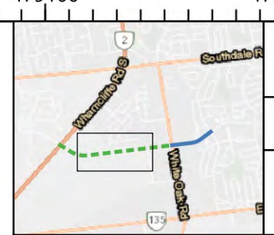
PROJECT NO: TPB186089	FIGURE: D-2
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Existing Bradley Avenue

0 100 200 300 400 500 Metres



wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Future No-Build

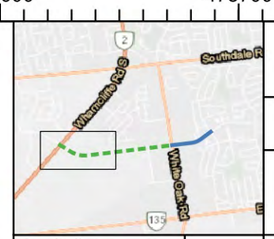
PROJECT NO: TPB186089	FIGURE: D-3
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Existing Bradley Avenue

0 100 200 300 400 500 Metres



Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Future No-Build

PROJECT NO: TPB186089	FIGURE: D-4
SCALE: 1:2500	DATE: May 2022

Appendix E

Future “build” 2030



LEGEND

- Receptor
- Bradley Avenue Extension
- Bradley Avenue Widening

0 100 200 300 400 500 Metres



Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Future Build

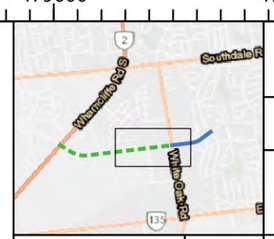
PROJECT NO: TPB186089	FIGURE:E- 1
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Bradley Avenue Extension
- Bradley Avenue Widening

0 100 200 300 400 500 Metres



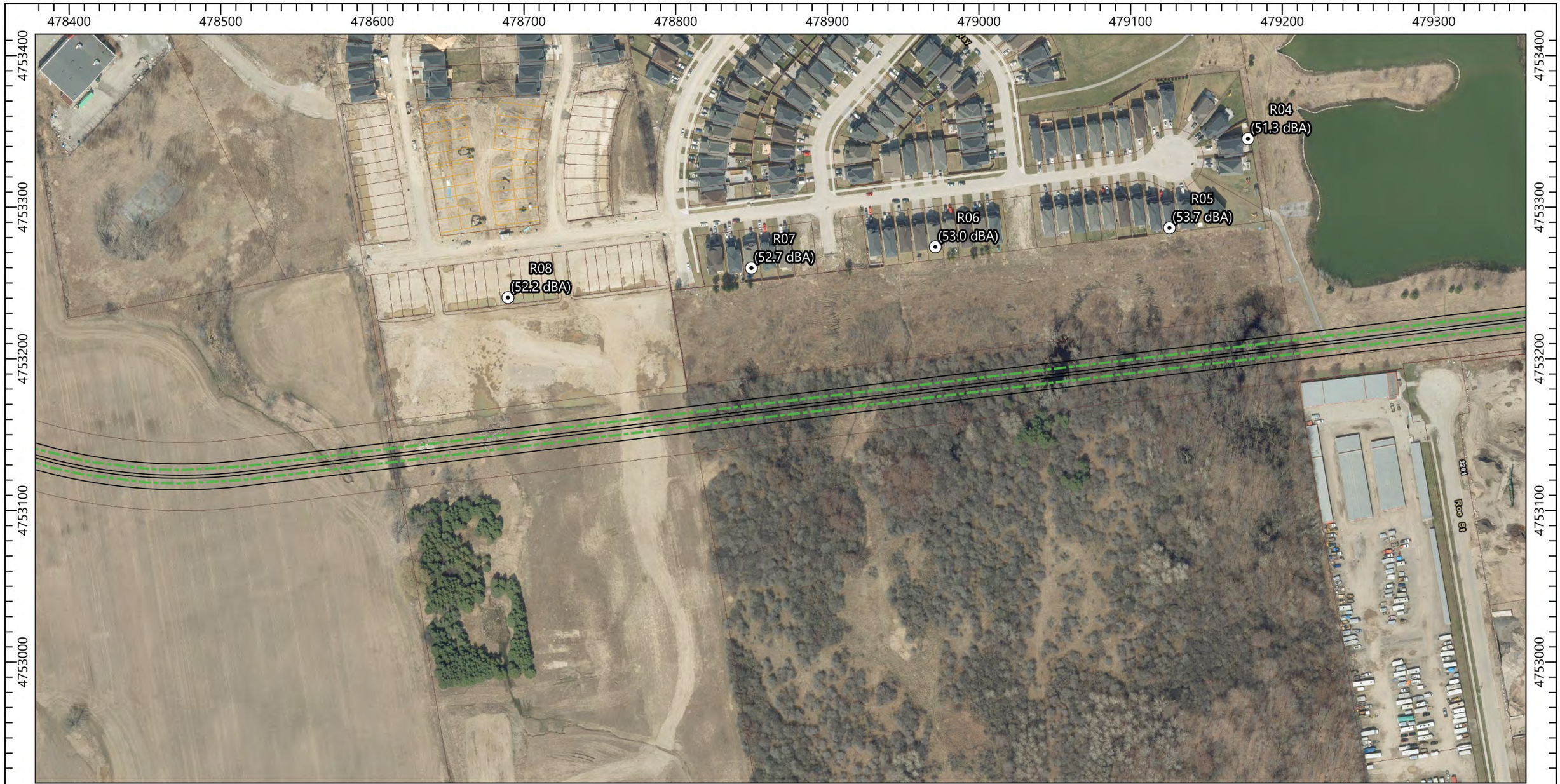
Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Future Build

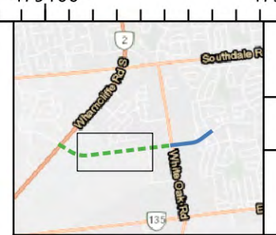
PROJECT NO: TPB186089	FIGURE:E- 2
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Bradley Avenue Extension
- Bradley Avenue Widening

0 100 200 300 400 500 Metres



Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Future Build

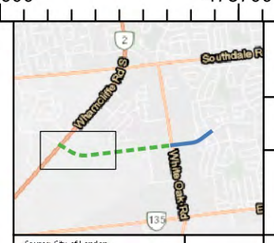
PROJECT NO: TPB186089	FIGURE:E- 3
SCALE: 1:2500	DATE: May 2022



LEGEND

- Receptor
- Bradley Avenue Extension
- Bradley Avenue Widening

0 100 200 300 400 500 Metres



Source: City of London
Datum & Projection:
NAD83 / UTM zone 17N

wood.

Road Traffic Noise Impact Assessment
Bradley Avenue Extension

Noise Levels
Future Build

PROJECT NO: TPB186089	FIGURE:E- 4
SCALE: 1:2500	DATE: May 2022

Appendix F

Noise Model Validation

Comparison of Leq at 15 m away from roadway

ID	Scenario	Road	Road Segment	Daytime Hourly Traffic				Speed (km/h)	Leq at 15 m		
				Car	Heavy Truck	Medium Truck	Total		Cadna/A TNM [dBA]	STAMSON[1] [dBA]	Difference [dB]
1	Existing	Bradley Ave	White Oak Road to Jalna Boulevard, EB	530	8	8	546	60	64.6	63.8	-0.8
2	Future No-Build	Bradley Ave	White Oak Road to Jalna Boulevard, EB	622	10	10	642	60	62.8	63.0	0.2

Note(s):
1. STAMSON print-out attached

Comparison of predicted Leq at receptor

Receptor	Scenario	Road	Road Segment	Daytime Hourly Traffic				Speed (km/h)	Leq at Receptor		
				Car	Heavy Truck	Medium Truck	Total		Cadna/A TNM [dBA]	STAMSON[1] [dBA]	Difference [dB]
R05	Future Build	Bradley Ave	Multiple	-	-	-	-	-	53.7	54.2	0.5
R06	Future Build	Bradley Ave	Multiple	-	-	-	-	-	53.0	53.7	0.7

Note(s):
1. STAMSON print-out attached

STAMSON 5.0 NORMAL REPORT Date: 25-02-2022 12:15:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: bradley.te Time Period: 1 hours
Description:

Road data, segment # 1: BRADLEY W-J

Car traffic volume : 622 veh/TimePeriod
Medium truck volume : 10 veh/TimePeriod
Heavy truck volume : 10 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BRADLEY W-J

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 : 15.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BRADLEY W-J

Source height = 1.12 m

ROAD (0.00 + 63.83 + 0.00) = 63.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	65.29	0.00	0.00	-1.46	0.00	0.00	0.00	63.83

Segment Leq : 63.83 dBA

Total Leq All Segments: 63.83 dBA

TOTAL Leq FROM ALL SOURCES: 63.83

STAMSON 5.0 NORMAL REPORT Date: 25-02-2022 12:12:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: bradley.te Time Period: 1 hours
Description:

Road data, segment # 1: BRADLEY W-J

Car traffic volume : 530 veh/TimePeriod
Medium truck volume : 8 veh/TimePeriod
Heavy truck volume : 8 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: BRADLEY W-J

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 : 15.00 m
Receiver height : 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BRADLEY W-J

Source height = 1.10 m

ROAD (0.00 + 63.00 + 0.00) = 63.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	64.46	0.00	0.00	-1.46	0.00	0.00	0.00	63.00

Segment Leq : 63.00 dBA

Total Leq All Segments: 63.00 dBA

TOTAL Leq FROM ALL SOURCES: 63.00

STAMSON 5.0 NORMAL REPORT Date: 08-02-2022 14:50:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: brdlyr05.te Time Period: 1 hours
Description:

Road data, segment # 1: FB BRDLY WB

Car traffic volume	670	veh/TimePeriod
Medium truck volume	10	veh/TimePeriod
Heavy truck volume	10	veh/TimePeriod
Posted speed limit	60	km/h
Road gradient	0	%
Road pavement	1	(Typical asphalt or concrete)

Data for Segment # 1: FB BRDLY WB

Angle1 Angle2	-79.00 deg	83.00 deg
Wood depth	0	(No woods.)
No of house rows	0	
Surface	1	(Absorptive ground surface)
Receiver source distance	83.00 m	
Receiver height	1.50 m	
Topography	1	(Flat/gentle slope; no barrier)
Reference angle	0.00	

Road data, segment # 2: FB BRDLY EB

Car traffic volume	670	veh/TimePeriod
Medium truck volume	10	veh/TimePeriod
Heavy truck volume	10	veh/TimePeriod
Posted speed limit	60	km/h
Road gradient	0	%
Road pavement	1	(Typical asphalt or concrete)

Data for Segment # 2: FB BRDLY EB

Angle1 Angle2	-80.00 deg	82.00 deg
Wood depth	0	(No woods.)
No of house rows	0	
Surface	1	(Absorptive ground surface)
Receiver source distance	92.00 m	
Receiver height	1.50 m	
Topography	1	(Flat/gentle slope; no barrier)
Reference angle	0.00	

Results segment # 1: FB BRDLY WB

Source height = 1.10 m

ROAD (0.00 + 51.55 + 0.00) = 51.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-79	83	0.66	65.45	0.00	-12.33	-1.57	0.00	0.00	0.00	51.55

Segment Leq : 51.55 dBA

Results segment # 2: FB BRDLY EB

Source height = 1.10 m

ROAD (0.00 + 50.81 + 0.00) = 50.81 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	82	0.66	65.45	0.00	-13.08	-1.57	0.00	0.00	0.00	50.81

Segment Leq : 50.81 dBA

Total Leq All Segments: 54.21 dBA

TOTAL Leq FROM ALL SOURCES: 54.21

STAMSON 5.0 NORMAL REPORT Date: 08-02-2022 14:30:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: brdlyr06.te Time Period: 1 hours
Description:

Road data, segment # 1: FB BRDLY WB

Car traffic volume	670	veh/TimePeriod
Medium truck volume	10	veh/TimePeriod
Heavy truck volume	10	veh/TimePeriod
Posted speed limit	60	km/h
Road gradient	0	%
Road pavement	1	(Typical asphalt or concrete)

Data for Segment # 1: FB BRDLY WB

Angle1 Angle2	-83.00 deg	83.00 deg
Wood depth	0	(No woods.)
No of house rows	0	
Surface	1	(Absorptive ground surface)
Receiver source distance	89.00 m	
Receiver height	1.50 m	
Topography	1	(Flat/gentle slope; no barrier)
Reference angle	0.00	

Road data, segment # 2: FB BRDLY EB

Car traffic volume	670	veh/TimePeriod
Medium truck volume	10	veh/TimePeriod
Heavy truck volume	10	veh/TimePeriod
Posted speed limit	60	km/h
Road gradient	0	%
Road pavement	1	(Typical asphalt or concrete)

Data for Segment # 2: FB BRDLY EB

Angle1 Angle2	-79.00 deg	79.00 deg
Wood depth	0	(No woods.)
No of house rows	0	
Surface	1	(Absorptive ground surface)
Receiver source distance	98.00 m	
Receiver height	1.50 m	
Topography	1	(Flat/gentle slope; no barrier)
Reference angle	0.00	

Results segment # 1: FB BRDLY WB

Source height = 1.10 m

ROAD (0.00 + 51.08 + 0.00) = 51.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-83	83	0.66	65.45	0.00	-12.84	-1.53	0.00	0.00	0.00	51.08

Segment Leq : 51.08 dBA

Results segment # 2: FB BRDLY EB

Source height = 1.10 m

ROAD (0.00 + 50.31 + 0.00) = 50.31 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-79	79	0.66	65.45	0.00	-13.53	-1.61	0.00	0.00	0.00	50.31

Segment Leq : 50.31 dBA

Total Leq All Segments: 53.72 dBA

TOTAL Leq FROM ALL SOURCES: 53.72

Limitations

Limitations

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    b. Any and all time, budgetary, access and/or site disturbance, risk management preferences, constraints or restrictions as described in the contract, in this report, or in any subsequent communication sent by Wood to the Client in connection to the Contract; and
    c. The limitations stated herein.

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