March 13, 2025

Prepared for:

City of Hamilton
Public Works – Engineering Services
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Hamilton, Ontario L8P1A2

Prepared by:

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Noise and Vibration Impact Assessment Report

Garner Road Municipal Class Environmental Assessment

Project Number: 165001196

Sign-off Page

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Frank Babic, P.Eng., INCE
Principal, Acoustics Practice Area Lead Ontario

Executive Summary

The City of Hamilton retained Stantec Consulting Ltd. to undertake a Municipal Class Environmental Assessment (EA) for the widening of Garner Road from Wilson Street West to the 403 East exit ramp, in Hamilton, Ontario. This noise impact assessment report has been prepared to support the Municipal Class EA Phases 3 and 4 (the Project).

Garner Road is a two lane east-west arterial road that divides Urban Hamilton from Rural Hamilton. It includes a centre-left-turn lane through most of the study area and has a posted speed limit of 60 km/h. Residential areas are located along Garner Road, and several future residential developments are also proposed. The widening is required to support future growth within Hamilton, specifically within the Airport Employment Growth District.

The purpose of this assessment is to assess the Project noise impact at nearby noise sensitive areas (NSAs) and investigate noise mitigation where needed.

This assessment considers 51 receptors representing NSAs identified for the Project, and they include both existing dwellings and proposed developments. The receptors were identified through a review of aerial imagery, proposed layouts for new developments, or, where such layouts were unavailable, by referencing similar nearby layouts.

Noise impact at the existing dwellings in the study area was assessed with the Ontario Ministry of the Environment Conservation and Parks (MECP), formerly known as Ministry of Energy and Environment, / Ministry of Transportation “Joint Protocol” A Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highway’s Environmental Assessments. It is commonly adopted in Ontario for assessing regional and municipal road improvement projects.

To assess the noise impact at the existing dwellings, predicted future daytime noise levels for the horizon year of 2041 with the Project (Future Build) and without the Project (Future No-build) were compared. Where predicted Future Build noise levels increase more than 5 dB over Future No-build noise levels and Future Build noise levels exceed 55 dBA, consideration of mitigation options is required. For the mitigation to be implemented, it must be technically, economically, and administratively feasible.

The predicted daytime noise levels indicate that the Future Build noise level is not expected to increase over 5 dB at any of the existing receptors. Therefore, mitigation is not required for the existing receptors, even if some of the receptors exceed the 55 dBA absolute daytime noise limit.

Noise impact on the proposed residential developments was assessed with the MECP NPC-300 Environmental Noise Guideline – Stationary, and Transportation Sources – Approval and Planning in the context of land use planning. For the proposed developments within the Study Area, Future Build noise levels were assessed against an absolute daytime limit of 55 dBA and an absolute nighttime limit of 50 dBA.

Predicted Future Build noise levels at the proposed development receptors exceed the MECP daytime and/or nighttime noise limits for all future development receptors. However, noise mitigation for the future developments is expected to be addressed in the development noise report and implemented by the developers. Therefore, noise mitigation for these developments is not investigated or recommended.

The City of Hamilton does not have any noise guidelines applicable to assessing the Project noise impact. Its noise by-law (By-Law Number 11-285) limits the operation of construction equipment and is considered in this study. Construction noise for the Project was assessed in accordance with the applicable MECP Publication NPC-115 and NPC-118. It is expected that most of the planned construction equipment for the Project can be operated in compliance with the MECP limits. However, there is potential for sound levels over the stated limits for some equipment (e.g., paving machines). Once the equipment inventory and construction schedules are finalized, construction equipment sound levels should be reviewed to confirm that noise emissions are within permissible limits. If they exceed the limits, noise control options should be explored. Methods to reduce construction noise impacts are included in the Construction Code of Practice, as outlined in Section 6.2.

A vibration impact assessment for the most impactful construction source (vibratory roller) was conducted. In the absence of construction vibration limits from both the Province of Ontario and the City of Hamilton, vibration limits from the City of Toronto and the US FTA Manual are adopted for this assessment. The recommended setback distances to prevent building damage for typical and heritage buildings are summarized in Table 7-1 of this report.

Some vibration-sensitive areas are situated within the recommended setbacks from the proposed Project right-of-way. The current right-of-way includes provisions for bike lanes and the final width is subject to change. Given the potential for the right-of-way width to be adjusted, it is recommended that the minimum setback distance from each piece of equipment be maintained to prevent potential building damage from vibration. Alternatively, if this is not feasible, vibration monitoring should be conducted at the buildings to allow for observation of vibration levels and for consideration of construction vibration mitigation strategies if vibration levels do not remain within acceptable limits.

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Acronyms/Units

AADT	Annual Average Daily Traffic
dB	Decibel
dBA	Decibel, A-weighted
EA	Environmental Assessment
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
$L_{eq\text{-}8}$	8-hr Energy Equivalent Sound Level (Nighttime Sound Level)
$L_{eq\text{-}16}$	16-hr Energy Equivalent Sound Level (Daytime Sound Level)
m	Metre
m^2	Square Metre
MECP	Ontario Ministry of the Environment, Conservation and Parks
MOE	Ontario Ministry of the Environment
MTO	Ontario Ministry of Transportation
NPC	Noise Pollution Control
NSA	Noise Sensitive Area
OLA	Outdoor Living Area
ORNAMENT	Ontario Road Noise Analysis Method for Environment and Transportation
TNM	Traffic Noise Model

1.0 Introduction

The City of Hamilton (the City) retained Stantec Consulting Ltd. (Stantec) to undertake a Municipal Class Environmental Assessment (EA) for the widening of Garner Road from Wilson Street West to the 403 East exit ramp, in Hamilton, Ontario. This noise impact assessment report has been prepared to support the Municipal Class EA Phases 3 and 4 (the Project).

Garner Road is a two lane east-west arterial road that divides Urban Hamilton from Rural Hamilton. It includes a centre-left-turn lane through most of the project area and has a posted speed limit of 60 km/hr. The widening is required to support future growth within Hamilton, specifically within the Airport Employment Growth District. Residential areas are located along Garner Road, with several future residential developments proposed, including:

- 541 and 551 Garner Road West, proposed redevelopment to a 62-unit condominium townhouse project, consisting of 10 three-storey buildings.
- 577 Garner Road West, proposed redevelopment into a six-storey mixed-use building project with 115 dwelling units, 120 m^2 of retail area, and 133 parking spaces.
- 243, 263, and 281 Garner Road East, proposed redevelopment into a total of 243 units, including detached homes, street townhouse condominiums, and stacked townhouses
- 305 – 311 Garner Road West, proposed redeveloped into 118 townhouse units
- 339 Garner Road West, proposed redevelopment into three-storey condominiums, yielding a total of 40-45 townhouse units
- 563 Shaver Road, proposed redevelopment into a two-storey community centre with potential accommodation for a daycare space.

The purpose of this assessment is to assess the Project noise impact at nearby noise sensitive areas (NSAs) and investigate noise mitigation where needed. This noise impact assessment report is completed based on the Preferred layout for the Project as included in Appendix A.

The Project extent along with the site location is shown in Figure 1-1.

Stantec

Legend

- Project Extent
- Study Area
- Hydro Line
- UT Unknown Transmission Line
- Watercourse (Intermittent)
- Watercourse (Permanent)

0 500 1,000 m

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Notes

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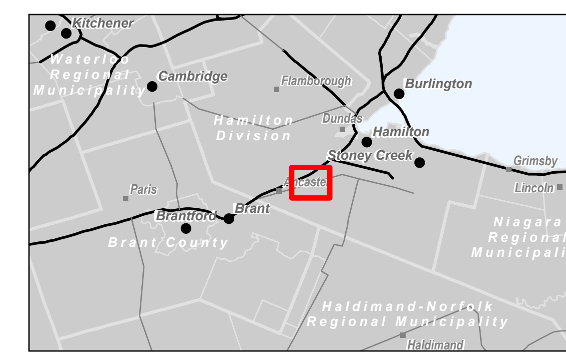

Project Location
City of Hamilton

165001196 REVA
Prepared by CSTAUFFER on 2025-03-12
Technical Review by JSA on 2025-03-12

Client/Project
CITY OF HAMILTON
GARNER ROAD (WILSON ST TO HIGHWAY 403 RAMP)
MUNICIPAL CLASS EA PHASE 3 AND 4

Figure No.
1-1

Title
Project Extent and Site Location

Revised: 2025-03-12 By: CSTAUFFER

2.0 Area of Investigation (Study Area)

The area of investigation (Study Area) for this Class EA noise impact assessment is within the City of Hamilton, along Garner Road between Wilson Street West and the Garner Road exit from Highway 403 East. The Study Area encompasses the area within which NSAs may be impacted from the Project.

The Study Area considered for this noise impact assessment is 600 m on either side of Garner Road and 100 m extended from both ends of the Project extent. The Study Area along with the receptors considered in the assessment is shown in Figure 2-1 through Figure 2-4.

Stantec

Legend

- Existing Noise-Sensitive Area
- Proposed Development
- Existing Noise Barriers (Modelled)
- Project Extent
- Study Area
- Watercourse (Intermittent)

0 100 200 m

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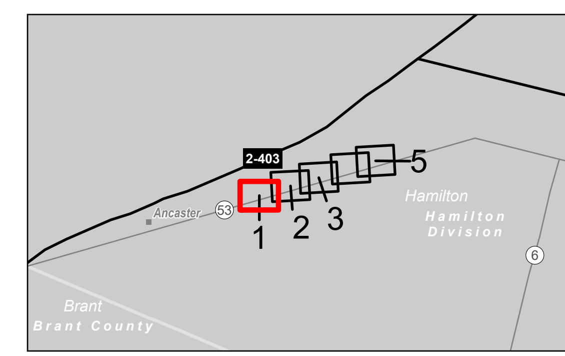

Project Location
City of Hamilton

165001196 REVA
Prepared by CSTAUFFER on 2025-03-12
Technical Review by JSA on 2025-03-12

Client/Project
CITY OF HAMILTON
GARNER ROAD (WILSON ST TO HIGHWAY 403 RAMP)
MUNICIPAL CLASS EA PHASE 3 AND 4

Figure No.
2-1

Title
Study Area and Receptors

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Stantec

Legend

- Existing Noise-Sensitive Area
- Proposed Development
- Existing Noise Barriers (Modelled)
- Project Extent
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- Watercourse (Intermittent)

0 100 200 m

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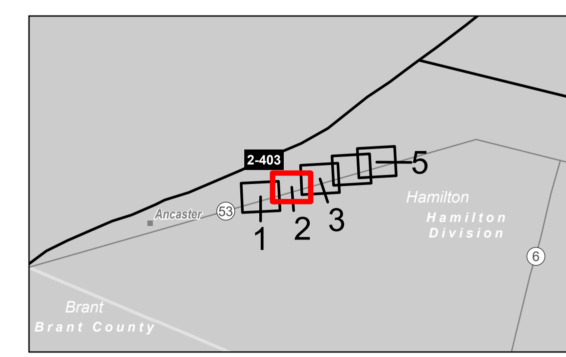


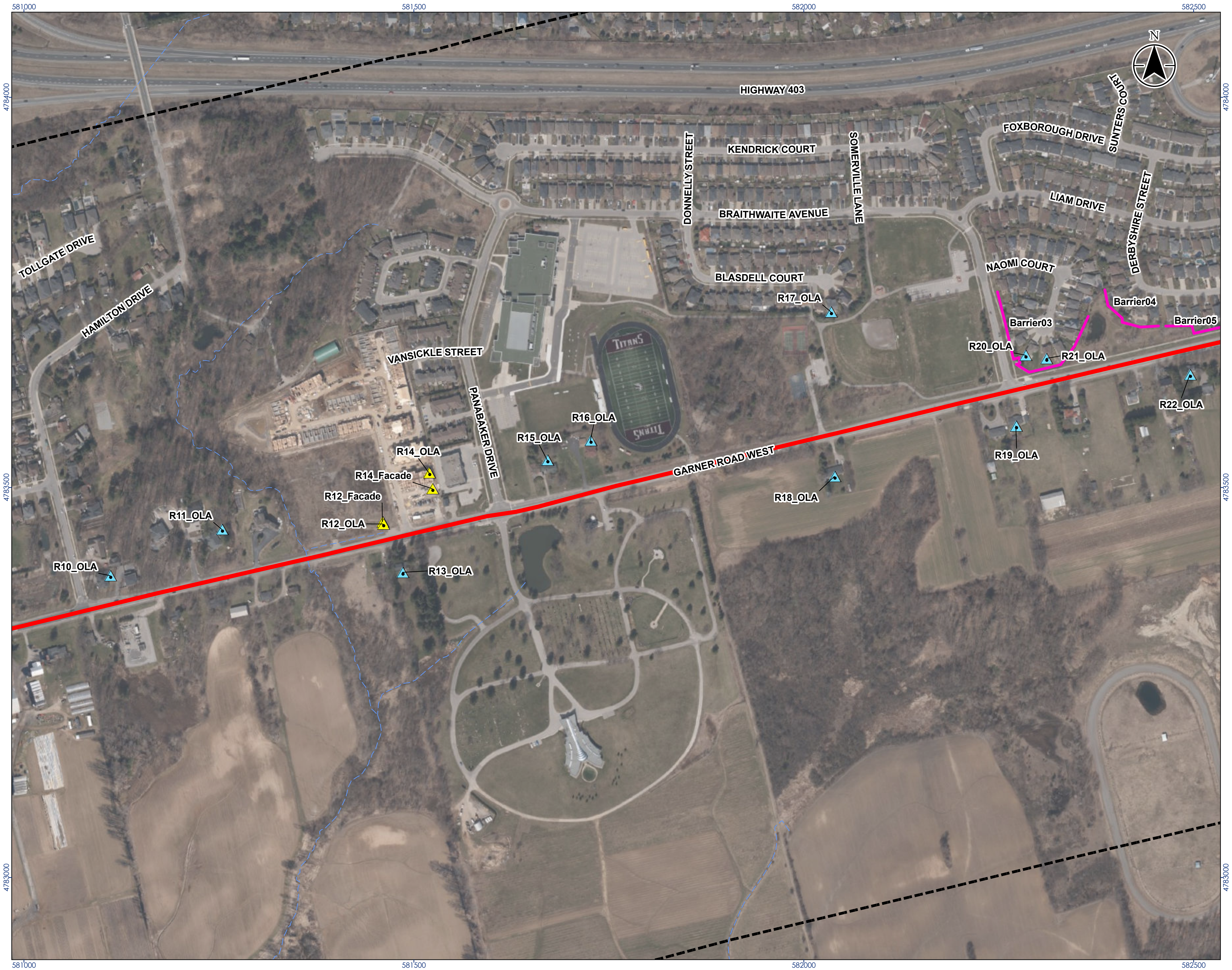
Project Location
City of Hamilton

165001196 REVA
Prepared by CSTAUFFER on 2025-03-12
Technical Review by JSA on 2025-03-12

Client/Project
CITY OF HAMILTON
GARNER ROAD (WILSON ST TO HIGHWAY 403 RAMP)
MUNICIPAL CLASS EA PHASE 3 AND 4

Figure No.
2-2

Title
Study Area and Receptors



Stantec

Legend

- Existing Noise-Sensitive Area
- Proposed Development
- Existing Noise Barriers (Modelled)
- Project Extent
- Study Area
- Watercourse (Intermittent)

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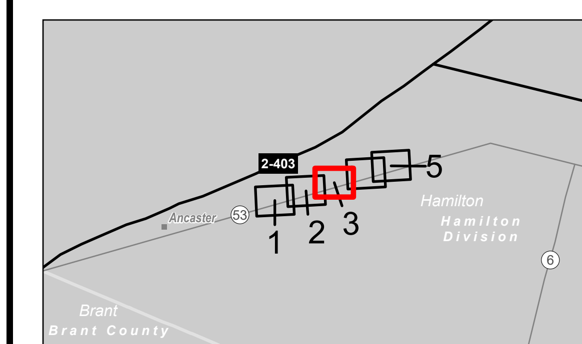

Project Location
City of Hamilton

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Technical Review by JSA on 2025-03-12

Client/Project
CITY OF HAMILTON
GARNER ROAD (WILSON ST TO HIGHWAY 403 RAMP)
MUNICIPAL CLASS EA PHASE 3 AND 4

Figure No.
2-3

Title
Study Area and Receptors

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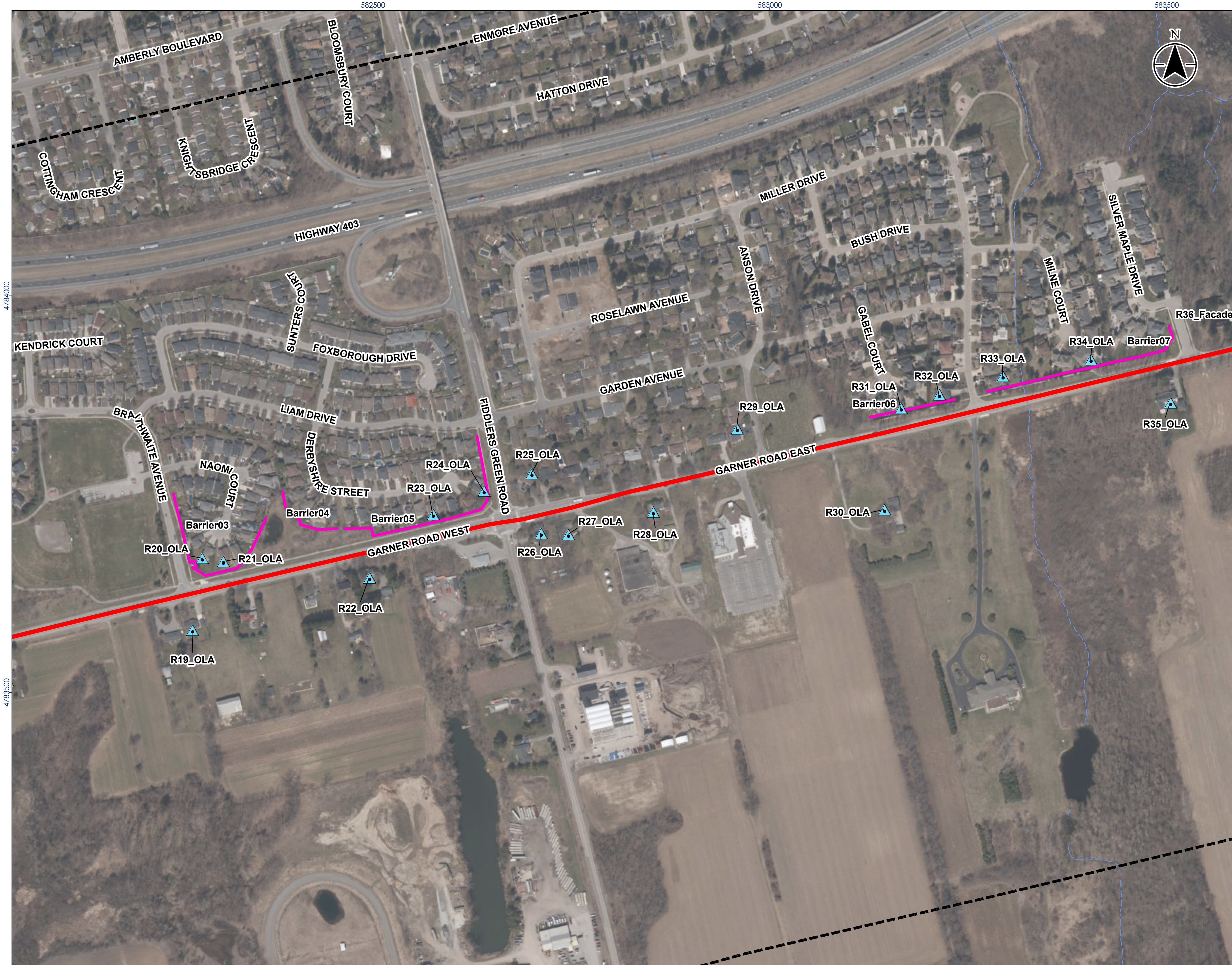

Stantec

Legend

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- Existing Noise Barriers (Modelled)
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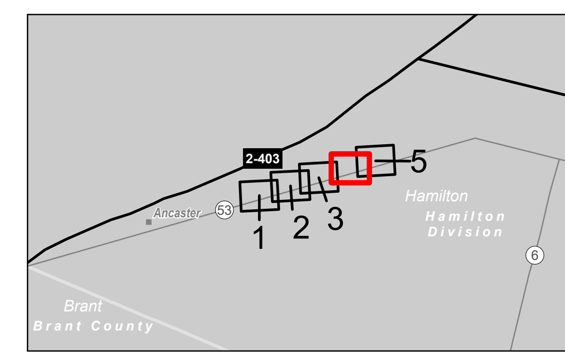

Project Location
City of Hamilton

165001196 REVA
Prepared by CSTAUFFER on 2025-03-12
Technical Review by JSA on 2025-03-12

Client/Project
CITY OF HAMILTON
GARNER ROAD (WILSON ST TO HIGHWAY 403 RAMP)
MUNICIPAL CLASS EA PHASE 3 AND 4

Figure No.
2-4

Title
Study Area and Receptors

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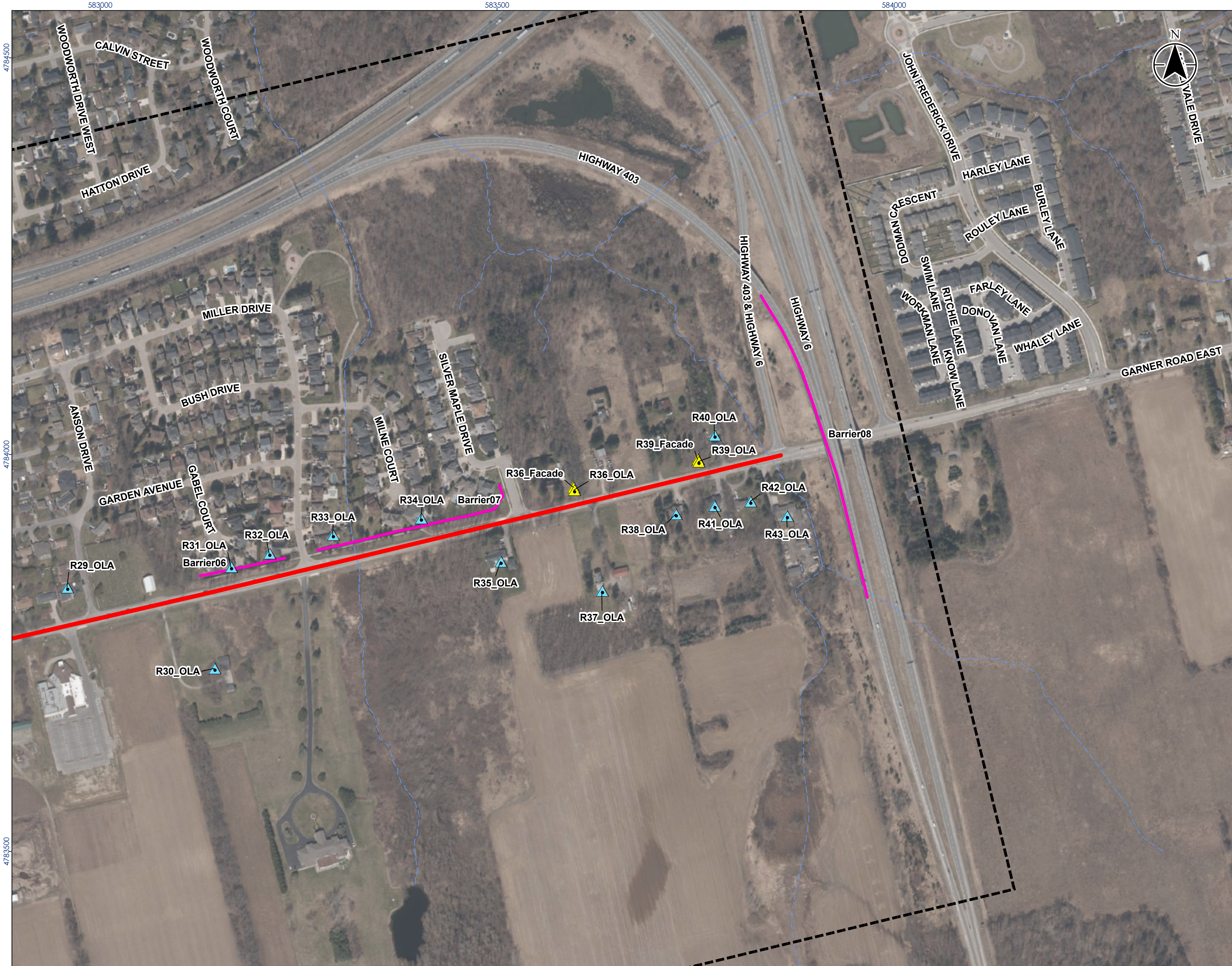

Stantec

Legend

- Existing Noise-Sensitive Area
- Proposed Development
- Existing Noise Barriers (Modelled)
- Project Extent
- Study Area
- Watercourse (Intermittent)

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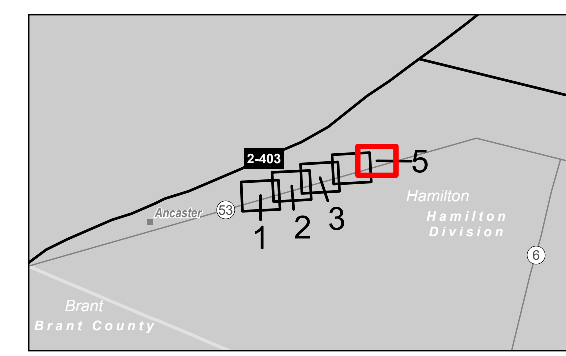

Project Location
City of Hamilton

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Client/Project
CITY OF HAMILTON
GARNER ROAD (WILSON ST TO HIGHWAY 403 RAMP)
MUNICIPAL CLASS EA PHASE 3 AND 4

Figure No.
2-5

Title
Study Area and Receptors

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3.0 Applicable Guidelines

Operational noise (road traffic noise) and construction noise are assessed with applicable Provincial guidelines. However, there are no Provincial construction vibration limits applicable to this Project. While the City of Hamilton does not have specific noise or vibration guidelines applicable to the Project, its noise bylaw, which restricts the operating hours of construction equipment, is considered in this assessment. In the absence of construction vibration limits from both the Province of Ontario and the City of Hamilton, vibration limits from the City of Toronto and the US FTA Manual are adopted for this assessment.

The applicable noise and vibration guidelines for the Project are discussed in the following subsections.

3.1 Operational Noise

Ontario has several guidelines and documents related to assessing road traffic noise impacts. The document most relevant to assessing potential impacts of municipal roadway projects on existing NSAs is the Ontario Ministry of the Environment Conservation and Parks (MECP), formerly known as Ministry of the Environment (MOE), / Ministry of Transportation (MTO) "Joint Protocol," A Protocol for Dealing with Noise Concerns During the Preparation, Review and Evaluation of Provincial Highway's Environmental Assessments (MOE/MTO 1986).

Although the MTO Environmental Guide for Noise (MTO 2022) superseded the Joint Protocol, it has not been adopted by the MECP for municipal projects. Therefore, MOE/MTO Joint Protocol has been used for the existing dwellings in this study.

In accordance with the Joint Protocol, the Project noise impact is assessed by comparing the predicted future daytime noise level between the scenarios with the Project (Future Build) and without the Project (Future No-build) for the existing receptors. Where predicted Future Build noise levels increase more than 5 dB over Future No-build and Future Build noise levels exceed 55 dBA, mitigation measures are to be investigated. Noise level is predicted at the outdoor living area (OLA). For the mitigation to be implemented, it must be technically, economically, and administratively feasible.

For the noise mitigation measure(s) to be considered technically feasible, it must achieve a minimum 5 dB noise level reduction averaged over the first row of receptors[1].

[1] First Row Receptors means the line of adjacent receptors closest to the road, usually running parallel to each other.

The MECP publication NPC-300 “Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning” (MOE 2013) Part C “Land Use Planning” provides guidelines and criteria for the assessment of road traffic noise in the context of the municipal land use planning process and is considered for the assessment of the proposed noise-sensitive developments. Future Build noise levels are predicted at the Outdoor Living Areas (OLAs) and the dwelling façades. These levels are assessed against a daytime limit of 55 dBA for both the façade and OLA, and a nighttime limit of 50 dBA for the façade only. Noise mitigation should be considered when daytime sound levels (16-hour L_{eq}) exceed 55 dBA at either the façade or OLA, and/or nighttime sound levels (8-hour L_{eq}) exceed 50 dBA at the façade, as outlined in the guidelines. The daytime limit of 55 dBA is consistent with the MOE/MTO Joint Protocol limit.

3.2 Construction Noise

Construction noise impacts are temporary in nature, and largely unavoidable. For some periods and types of work construction noise may be noticeable, and with adequate controls, impacts can be reduced. This section of the report provides overview of the criteria and applicable City of Hamilton noise by-law.

The relevant local noise by-laws and applicable criteria are discussed in the following subsections.

3.2.1 Local Noise Control By-Law

The local noise control by-law for the City of Hamilton, By-Law Number 11-285 (City of Hamilton 2021), provides only the periods during which construction activities are prohibited. No sound level limits are provided for construction activities in the by-law. The prohibited periods for construction activities are from 22:00 to 07:00 the next day, for all days of the week.

In certain situations, a contract may require work that does not align with local noise control by-laws. A by-law exception permit is required for construction during the prohibited hours.

3.2.2 MECP Model Municipal Noise Control By-law

The MECP stipulates limits on noise emissions from each piece of equipment, rather than an overall construction noise limit for the receptors. In the presence of persistent noise complaints, sound emission standards for the various types of construction equipment used on the project should be verified through measurements to ensure that they meet the specified limits contained in MECP Publication NPC-115 (MOE 1978) and NPC-118 (MOE 1982) as summarized in Table 3-1.

Table 3-1: Construction Noise Emission Limits (NPC-115 and NPC-118)

Type of Unit	Maximum Allowed Sound Pressure Level [a] (dBA)	Distance at Which Sound Levels are Measured (m)	Power Rating (kW)
Excavation Equipment [b]	83	15	Less than 75 kW
	85	15	75 kW or Greater
Pneumatic Equipment [c]	85	7	Any
Portable Compressors	76	7	Any
Track Drills	100	15	Any
Heavy Vehicles with Governed Diesel Engines	95	15	Any

Notes:

[a] Maximum permissible sound levels presented here are for equipment manufactured after Jan 1, 1981

[b] Excavation equipment includes bulldozers, backhoes, front end loaders, graders, excavators, steam rollers and other equipment capable of being used for similar applications

[c] Pneumatic equipment includes pavement breakers

3.3 Construction Vibration

In the absence of specific construction vibration limits from the Province of Ontario or the City of Hamilton, established guidelines from other jurisdictions have been adopted as part of standard practice. For this Project:

- **City of Toronto Vibration Limit**: A limit of 5 mm/s in terms of peak particle velocity (PPV) is applied for typical buildings. This threshold is aimed at preventing cosmetic or structural damage to conventional structures during project construction activities. (City of Toronto 2008)
- **US FTA Vibration Limit**: A more stringent limit of 3 mm/s (PPV) is applied for heritage buildings, recognizing their increased sensitivity to vibration-induced damage due to age, materials, and structural characteristics. (Federal Transit Administration 2018)

These adopted thresholds ensure a balanced approach to mitigating potential vibration impacts, prioritizing structural safety and addressing the specific sensitivities of heritage properties.

The recommended vibration limits for the Project construction are summarized in Table 3-2.

Table 3-2: Construction Vibration Limits

Building Type	Recommended Vibration Limit (mm/s) - PPV	Applied Source
Typical Buildings	5	City of Toronto Bylaw 514-2008
Heritage Buildings	3	US FTA Manual

4.0 Noise Sensitive Areas (Receptors)

Under the Joint Protocol, NSAs (also referred to as receptors in this report) include the following land uses, provided they have an OLA associated with them:

- Private homes (single family units and townhouses);
- Multiple unit buildings;
- Hospitals and nursing homes;
- Schools, educational facilities, and daycare centres;
- Campgrounds with overnight accommodation;
- Hotels and motels; and
- Churches and places of worship.

The NSAs with OLAs identified within the Project Study Area include existing dwellings and several proposed noise-sensitive developments along Garner Road. Thirty-five (35) representative receptors for existing NSAs and seven (7) representative receptors for proposed developments were identified for this assessment. Receptor locations were identified from a review of aerial imagery and the proposed development layout. Apartment balconies, cemeteries, parks and picnic areas that are not part of OLAs, as well as commercial and industrial properties, do not qualify as NSAs. Where proposed layouts were unavailable, receptor locations were identified based on the layout of nearby developments and/or existing dwellings. A copy of the available proposed development layouts is included in Appendix B.

The receptors considered for the assessment are listed in Table 4-1 and are shown in Figure 2-1. The receptors representing the OLA are located at 1.5 m above the existing ground, 3 m away from the dwelling, and are typically located in the backyard. Receptors representing the façade for the proposed subdivisions are located at the proposed height of the bedroom window with the predicted worst-case exposure to road traffic noise.

Table 4-1: Receptors Included in the Assessment

Receptor ID	Receptor Description	UTM Coordinates (Zone 17)		
		Easting (m)	Northing (m)	Height (m)
R01_OLA	OLA of church	579691	4783054	1.5
R02_OLA	OLA of detached home	579704	4782915	1.5

Receptor ID	Receptor Description	UTM Coordinates (Zone 17)		
		Easting (m)	Northing (m)	Height (m)
R03_OLA	OLA of detached home	580168	4783084	1.5
R04_OLA	OLA of townhouse	580281	4783175	1.5
R05_OLA	OLA of proposed development	580333	4783098	1.5
R05_Facade	Façade of proposed development	580326	4783125	1.5
R06_OLA	OLA of townhouse	580384	4783199	1.5
R07_OLA	OLA of proposed development	580501	4783281	1.5
R07_Facade	Façade of proposed development	580510	4783251	1.5
R08_OLA	OLA of proposed development	580643	4783260	1.5
R08_Facade	Façade of proposed development	580654	4783260	4.5
R09_OLA	OLA of detached home	580742	4783219	1.5
R10_OLA	OLA of detached home	581110	4783387	1.5
R11_OLA	OLA of detached home	581254	4783446	1.5
R12_Facade	Façade of proposed development	581460	4783456	4.5
R12_OLA	OLA of proposed development	581460	4783453	1.5
R13_OLA	OLA of detached home	581485	4783391	1.5
R14_OLA	OLA of proposed development	581519	4783519	1.5
R14_Facade	Façade of proposed development	581523	4783498	7.5
R15_OLA	OLA of detached home	581671	4783535	1.5
R16_OLA	OLA of detached home	581726	4783560	1.5
R17_OLA	OLA of detached home	582035	4783725	1.5
R18_OLA	OLA of detached home	582039	4783514	1.5
R19_OLA	OLA of detached home	582272	4783579	1.5
R20_OLA	OLA of detached home	582284	4783669	1.5
R21_OLA	OLA of detached home	582311	4783665	1.5
R22_OLA	OLA of detached home	582495	4783645	1.5
R23_OLA	OLA of detached home	582575	4783724	1.5
R24_OLA	OLA of detached home	582639	4783754	1.5
R25_OLA	OLA of detached home	582699	4783776	1.5

Receptor ID	Receptor Description	UTM Coordinates (Zone 17)		
		Easting (m)	Northing (m)	Height (m)
R26_OLA	OLA of detached home	582711	4783701	1.5
R27_OLA	OLA of detached home	582745	4783699	1.5
R28_OLA	OLA of detached home	582852	4783728	1.5
R29_OLA	OLA of detached home	582958	4783833	1.5
R30_OLA	OLA of detached home	583144	4783731	1.5
R31_OLA	OLA of detached home	583165	4783858	1.5
R32_OLA	OLA of detached home	583213	4783875	1.5
R33_OLA	OLA of detached home	583293	4783899	1.5
R34_OLA	OLA of detached home	583404	4783920	1.5
R35_OLA	OLA of proposed development	583504	4783865	1.5
R36_Facade	Façade of proposed development	583596	4783959	4.5
R36_OLA	OLA of detached home	583597	4783955	1.5
R37_OLA	OLA of detached home	583632	4783828	1.5
R38_OLA	OLA of proposed development	583725	4783925	1.5
R39_Facade	Façade of proposed development	583753	4783994	4.5
R39_OLA	OLA of detached home	583753	4783991	1.5
R40_OLA	OLA of detached home	583774	4784024	1.5
R41_OLA	OLA of detached home	583774	4783935	1.5
R42_OLA	OLA of detached home	583819	4783941	1.5
R43_OLA	OLA of detached home	583865	4783923	1.5

5.0 Operations Noise Assessment

The assessment predicts road traffic noise levels for the 2041 horizon year for the Future No-build (without Project) and Future Build (with Project) scenarios for the existing dwellings and Future Build scenario for the proposed development receptors.

The assessment considers road traffic noise from major roads, including Garner Road, McClure Road, Shaver Road, Hamilton Drive, Panabaker Drive, Braithwaite Avenue, Fiddlers Green Road, Highway 403, and Highway 6, as well as all ramps leading from Highway 403 to Highway 6 and Garner Road, and vice versa.

Project daytime noise impacts are assessed at OLAs and façades in terms of 16-hour equivalent sound level ($L_{eq\text{-}16hr}$) for the time period between 07:00 and 23:00 as per the guidelines for all receptors. Nighttime noise levels are assessed only at the building façade for proposed development receptors in terms of 8-hour equivalent sound level ($L_{eq\text{-}8hr}$) for the time period between 23:00 and 07:00 as per NPC-300.

Existing noise barriers identified for the Project are included in the assessment and are listed in Table 5-1 and shown in Figure 2-1 to 2-4.

Table 5-1: Barriers Included in the Assessment

Barrier ID	Benefitted Receptor(s)	Height (m)
Barrier01	R04_OLA	2.5
Barrier02	R06_OLA	2.5
Barrier03	R20_OLA, R21_OLA	1.8
Barrier04	-[a]	1.8
Barrier05	R23_OLA, R24_OLA	1.8
Barrier06	R31_OLA, R32_OLA	2.2
Barrier07	R33_OLA, R34_OLA	2.2
Barrier08	R40_OLA, R42_OLA, R43_OLA	4.0

Notes:
[a] No receptor was identified.

5.1 Assessment Methods

The MECP recommends the latest version of the United States Federal Highway Administration Traffic Noise Model (FHWA TNM©) for assessing road traffic noise in the released “Methods to Determine Sound Levels Due to Road and Rail Traffic – Publication NPC-306”, which is dated February 2020 and in draft form (MECP 2021).

The most current version of the US FHWA Traffic Noise Model (TNM v3.2) was used for this noise impact assessment (Federal Highway Administration 2023). The road traffic noise model considers the following inputs:

- Annual Average Daily Traffic (AADT)
- Commercial vehicle percentages, including heavy and medium trucks
- Vehicle speed
- Shielding from intervening ground
- Pavement type
- Elevation profiles for the existing and improved roadways

Estimates of the AADT were based on values presented in the Stantec Transportation Assessment report titled “Garner Road (Wilson Street to Highway 403 Ramp) Municipal Class Environmental Assessment Phases 3 and 4” (Stantec Report) (Stantec Consulting Ltd. 2023) and commercial vehicle percentages were calculated based on turning movement count data found within the Stantec Report. The percentage of vehicles for day/night and heavy/medium truck were derived from Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) Technical Document (MOE 1989). A growth rate of 2% was used to calculate future 2041 volumes for all data other than Highway 6, for which 2041 values were instead selected from the AECOM’s 2023 report titled “Noise Impact Assessment Report – Highway 6 from Highway 403 to Upper James Street” (AECOM Report) (AECOM 2023).

A summary of the road traffic data used for noise modelling is listed in Table 5-2. Data for the ramps leading to and from Highway 403 and Highway 6 were calculated based on the traffic volumes of other roadways found in Table 5-2.

Table 5-2: Road Traffic Data for Noise Modelling

Road	2041 AADT [a]	Commercial Vehicle % [b]	Heavy/Medium Truck % [b]	Day/Night Split % [c]	Traffic Speed (km/h) [d]
Garner Road, Wilson Street West to McClure Road	14920	3.8	72/28	90/10	60
Garner Road, McClure Road to Plaza Access Road	15246	3.8	72/28	90/10	60

Road	2041 AADT [a]	Commercial Vehicle % [b]	Heavy/Medium Truck % [b]	Day/Night Split % [c]	Traffic Speed (km/h) [d]
Garner Road, Plaza Access Road to Shaver Road	16449	3.8	69/31	90/10	60
Garner Road, Shaver Road to Hamilton Drive	18262	2.3	79/21	90/10	60
Garner Road, Hamilton Drive to Panabaker Drive	18115	2.5	73/27	90/10	60
Garner Road, Panabaker Drive to Braithwaite Avenue	18115	2.5	73/27	90/10	60
Garner Road, Braithwaite Avenue to Fiddlers Green Road	21531	8.0	79/21	90/10	60
Garner Road, Fiddlers Green Road to 403 East Exit	24339	6.4	81/19	90/10	60
Garner Road, 403 East Exit to 403 East Entrance	24384	6.5	80/20	90/10	60
Garner Road, East of 403 East Entrance	25157	6.0	80/20	90/10	60
McClure Road	1593	1.0	0/100	90/10	50
Shaver Road, North of Garner Road	6598	2.3	80/20	90/10	60
Shaver Road, South of Garner Road	4532	4.9	73/27	90/10	60
Hamilton Drive	2615	1.3	78/22	90/10	40
Panabaker Drive	13470	3.2	100/0	90/10	30
Braithwaite Avenue	2348	3.2	100/0	90/10	40

Road	2041 AADT [a]	Commercial Vehicle % [b]	Heavy/Medium Truck % [b]	Day/Night Split % [c]	Traffic Speed (km/h) [d]
Fiddlers Green Road, North of Garner Road	11026	9.3	87/13	90/10	50
Fiddlers Green Road, South of Garner Road	5632	10.6	78/22	90/10	50
Highway 403 Exit to Garner Road	1397	4.3	75/25	90/10	70
Highway 6 Northbound	12367	10	50/50	85/15	80
Highway 6 Southbound	12395	8.2	50/50	85/15	80
Garner Road 403 East Entrance	3685	4.0	50/50	67/33	70
Highway 403	109680	15	75/25	67/33	100
Highway 403 East to Highway 6 South Ramp[e]	1802	9.1	47/53	86/14	90
Highway 403 West to Highway 6 South Ramp[e]	1802	9.1	47/53	86/14	70
Highway 6 North to Highway 403 East Ramp[e]	2190	10	50/50	85/15	80
Highway 6 North to Highway 403 West Ramp[e]	2190	10	50/50	85/15	80
Highway 403 East On Ramp[e]	4263	7.1	50/50	83/17	80

Notes:

[a] AADT values for all roadways, except Highway 403, were calculated based on the assumption that peak hourly traffic represents 10% of the AADT and applying a 2% growth rate, as applicable. Highway 403 AADT data for 2041 was calculated by applying a 2% growth factor to the higher of the 2021 SADT and AADT values (MTO 2021).

[b] Commercial vehicle % and truck traffic split % were calculated from the turning movement counts.

[c] Daytime refers to the time period between 07:00 and 23:00. Traffic split % is estimated based on the recommended day-night traffic volume ratios provided in the ORNAMENT document (MOE 1989).

[d] Current posted speed limits for the existing roads.

[e] Traffic volumes for ramps were calculated from volumes of other roadways and were not based on measured or provided data.

Traffic volumes on Garner Road are expected to remain unchanged with and without the Project.

5.2 Future Noise Impacts

Daytime road traffic noise levels were predicted only at OLA receptors for the Future No-Build scenario for the 2041 horizon year. In contrast, daytime noise levels were predicted at all receptors under the Future Build scenario for the 2041 horizon year, while nighttime noise levels were predicted only at façade receptors for the 2041 horizon year. Table 5-3 lists the predicted daytime noise levels and identifies if noise mitigation should be investigated based on the appliable guidelines.

Table 5-3: Predicted Daytime Noise Levels and Mitigation Requirements

Receptor ID [a]	Predicted Daytime Noise Levels, $L_{eq\text{-}16hr}$ (dBA)		Predicted Noise Impact			
	Future No-build (2041)	Future Build (2041)	Increase in Noise Levels (dB) [c]	Is Increase in Noise Levels > 5 dB? (Yes/No)	Future Build Noise Levels > 55 dBA? (Yes/No)	Mitigation Investigated? (Yes/No)
R01_OLA	55.9	55.8	0	No	Yes	No
R02_OLA	53.9	53.4	0	No	No	No
R03_OLA	57.2	57.9	1	No	Yes	No
R04_OLA	53.5	52.6	-1	No	No	No
R05_OLA	N/A[b]	58.8	N/A[b]	N/A[b]	Yes	No[d]
R05_Facade	N/A[b]	62.1	N/A[b]	N/A[b]	Yes	No[d]
R06_OLA	53.4	52.4	-1	No	No	No
R07_OLA	N/A[b]	43.5	N/A[b]	N/A[b]	No	No[d]
R07_Facade	N/A[b]	59.3	N/A[b]	N/A[b]	Yes	No[d]
R08_OLA	N/A[b]	61.7	N/A[b]	N/A[b]	Yes	No[d]
R08_Facade	N/A[b]	63.9	N/A[b]	N/A[b]	Yes	No[d]
R09_OLA	54.6	54.6	0	No	No	No
R10_OLA	59.5	59.8	0	No	Yes	No
R11_OLA	56.2	56.5	0	No	Yes	No
R12_Facade	N/A[b]	63.9	N/A[b]	N/A[b]	Yes	No[d]
R12_OLA	N/A[b]	64.0	N/A[b]	N/A[b]	Yes	No[d]

Receptor ID [a]	Predicted Daytime Noise Levels, $L_{eq\text{-}16hr}$ (dBA)		Predicted Noise Impact			
	Future No-build (2041)	Future Build (2041)	Increase in Noise Levels (dB) [c]	Is Increase in Noise Levels > 5 dB? (Yes/No)	Future Build Noise Levels > 55 dBA? (Yes/No)	Mitigation Investigated? (Yes/No)
R13_OLA	55.0	56.4	1	No	Yes	No
R14_OLA	N/A[b]	55.1	N/A[b]	N/A[b]	Yes	No[d]
R14_Facade	N/A[b]	60.3	N/A[b]	N/A[b]	Yes	No[d]
R15_OLA	58.3	58.2	0	No	Yes	No
R16_OLA	58.2	58.0	0	No	Yes	No
R17_OLA	62.5	62.3	0	No	Yes	No
R18_OLA	54.5	55.2	1	No	Yes	No
R19_OLA	55.4	55.2	0	No	Yes	No
R20_OLA	61.5	61.5	0	No	Yes	No
R21_OLA	62.1	62.0	0	No	Yes	No
R22_OLA	57.6	58.4	1	No	Yes	No
R23_OLA	61.7	61.4	0	No	Yes	No
R24_OLA	61.6	61.5	0	No	Yes	No
R25_OLA	62.8	62.8	0	No	Yes	No
R26_OLA	59.4	60.3	1	No	Yes	No
R27_OLA	62.9	62.8	0	No	Yes	No
R28_OLA	59.9	60.5	1	No	Yes	No
R29_OLA	59.8	60.3	0	No	Yes	No
R30_OLA	59.0	59.6	1	No	Yes	No
R31_OLA	60.8	61.0	0	No	Yes	No
R32_OLA	58.3	58.6	0	No	Yes	No
R33_OLA	61.2	61.6	0	No	Yes	No
R34_OLA	61.6	60.6	-1	No	Yes	No

Receptor ID [a]	Predicted Daytime Noise Levels, $L_{eq\text{-}16hr}$ (dBA)		Predicted Noise Impact			
	Future No-build (2041)	Future Build (2041)	Increase in Noise Levels (dB) [c]	Is Increase in Noise Levels > 5 dB? (Yes/No)	Future Build Noise Levels > 55 dBA? (Yes/No)	Mitigation Investigated? (Yes/No)
R35_OLA	51.6	53.7	2	No	No	No
R36_Facade	N/A[b]	66.8	N/A[b]	N/A[b]	Yes	No[d]
R36_OLA	N/A[b]	67.4	N/A[b]	N/A[b]	Yes	No[d]
R37_OLA	52.6	51.4	-1	No	No	No
R38_OLA	54.1	54.4	0	No	No	No
R39_Facade	N/A[b]	67.2	N/A[b]	N/A[b]	Yes	No[d]
R39_OLA	N/A[b]	67.9	N/A[b]	N/A[b]	Yes	No[d]
R40_OLA	57.5	56.8	-1	No	Yes	No
R41_OLA	53.6	54.1	0	No	No	No
R42_OLA	60.3	60.6	0	No	Yes	No
R43_OLA	50.6	50.5	0	No	No	No

Notes:

[a] R05, R07, R08, R12, R14, R36, and R39 are the receptors representing proposed developments.

[b] Noise levels for the Future No-build scenario are not applicable for proposed developments.

[c] Change in noise level is calculated as the difference between Future Build and Future No-build road traffic noise levels.

[d] Mitigation for future developments is expected to be addressed in the development noise report and implemented by the developers.

Nighttime future noise levels were also predicted for the proposed subdivision receptors and reported in Table 5-4.

Table 5-4: Predicted Nighttime Noise Levels and Mitigation Requirements (Proposed Subdivisions)

Receptor ID [a]	Predicted Future Build Nighttime ($L_{eq\text{-}8hr}$) Noise Levels (dBA)	Future Build Nighttime Noise Levels > 50 dBA? (Yes/No)	Mitigation Investigated? (Yes/No)
R05_Facade[b]	-	-	-
R07_Facade	53.0	Yes	No[c]
R08_Facade	57.5	Yes	No[c]
R12_Facade	57.5	Yes	No[c]
R14_Facade	53.8	Yes	No[c]
R36_Facade	60.3	Yes	No[c]
R39_Facade	60.6	Yes	No[c]

Notes:

[a] Only proposed future development receptors are assessed as required by the guidelines.

[b] R05 is a proposed community centre; therefore, the nighttime noise limit is not applicable.

[c] Mitigation for the proposed developments is expected to be addressed in the development noise report and implemented by the developers.

The predicted daytime noise levels indicate that the Future Build noise level is not expected to increase over 5 dB at any of the existing receptors. The maximum increase in sound level due to the Project is predicted to be 2 dB at receptor R35. Since this increase is less than 3 dB, it is considered insignificant as it is not a perceptible change in loudness to the human ear. Therefore, mitigation is not required for the existing receptors, even if some of the receptors exceed the 55 dBA absolute daytime noise limit.

Predicted Future Build noise levels at the proposed development receptors exceed the MECP daytime and/or nighttime noise limits for all future development receptors. However, noise mitigation for the proposed subdivisions is expected to be addressed in the subdivision noise report and implemented by the developers. Therefore, noise mitigation for these developments is not investigated or recommended.

Sample calculations from the noise model are included in Appendix C.

6.0 Construction Noise Assessment

This section of the report provides an evaluation of construction equipment noise and discusses the Code of Practice to reduce construction noise impacts.

Construction activities will vary temporally and spatially as the Project progresses one end to the other. Noise levels from construction at a given receptor location will also vary over time as different activities take place, and as those activities change location within the right-of-way.

6.1 Construction Noise Levels

Table 6-1 lists the construction equipment considered for the assessment and compares their noise emissions to the applicable NPC-115 (MOE 1978) and NPC-118 (MOE 1982) noise limits. A detailed construction plan or equipment list is not currently available. Table 6-1 represents typical equipment expected to be used for this type of construction. The listed construction equipment noise emissions are based on Stantec's database of field measurements of construction equipment.

Table 6-1: Construction Equipment Sound Level Assessment

Type of Equipment	Typical Range of Maximum Sound Levels at 15 m (dBA)	NPC-115/118 Sound Level at 15 m (dBA)	Meets NPC-115/118 Sound Level? (Y/N)
Front-End Loaders	77 – 85	85	Y
Backhoe	66 – 80	85	Y
Dump Trucks	76 – 88	95b	Y
Concrete Trucks	77 – 85	85	Y
Concrete Pump and Boom	77 – 82	85	Y
Vibratory Compactors	79 – 83	85	Y
Paving Machines [a]	77 – 89	85	N
Cranes	73 – 83	85	Y
Grader	79 – 85	85	Y

Notes:

[a] This equipment has potential to exceed the applicable MECP limits, and precautions or noise control measures should be investigated if they are used near sensitive receptors.

[b] Refers to the NPC-118 Sound Level at 15 m.

The typical sound levels presented in Table 6-1 show that most equipment expected for this type of Project can be operated in compliance with the MECP NPC-115/118 limits. The list also shows that there is the potential for higher sound levels than permissible limits for paving machines. Once equipment and construction schedules are finalized, the equipment noise data should be reviewed during detailed design to confirm that noise emissions are within the permissible limits. If the sound levels are higher than the limits, noise control options should be explored.

6.2 Construction Code of Practice

The following best practices for construction should be considered to minimize disturbances outside of the noise by-law requirements:

- All construction equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order.
- There should be explicit indication that Contractors are expected to comply with all applicable requirements of the contract and local noise by-laws. Enforcement of noise control by-laws is the responsibility of the Municipality for all work done by Contractors.
- The Contract documents should contain a provision that any initial noise complaint will trigger verification of construction noise and typical noise control measures.
- In the presence of persistent noise complaints, all construction equipment should be verified to comply with MECP NPC-115 and NPC-118 guidelines.
- In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required where reasonably available. In selecting appropriate noise control and mitigation measures, consideration should be given to the technical, administrative, and economic feasibility of the various alternatives.

7.0 Construction Vibration Assessment

A vibration impact assessment for the most impactful construction source was conducted using the method as outlined in the FTA Manual, as described below.

7.1 Assessment Methods

Construction vibration impact for the Project is evaluated by establishing the construction vibration zone of influence (ZOI). Construction vibration ZOIs are calculated based on the applicable vibration limits for building damage as provided in Table 3-2. This assessment considers a vibration limit of 5 mm/s for typical construction (e.g., non-engineered timber and masonry buildings) in accordance with the City of Toronto limit and 3 mm/s for heritage structures, based on the FTA limit.

Construction vibration ZOI is calculated based on the following vibration propagation equation as provided in the Metrolinx Environmental Guide (RWDI AIR Inc. 2018), adopted from the US FTA Manual (Federal Transit Administration 2018):

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

Where:

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

The equipment reference vibration levels as provided in the FTA Manual is used in this assessment to calculate vibration ZOI.

7.2 Vibration Assessment

The closest building/structure is located as close as 5 m from the edge of Garner Road. A vibration impact assessment for the most impactful construction source, the vibratory roller, was conducted using the method outlined in the FTA Manual. The recommended setback distances to prevent building damage for typical and heritage buildings are summarized in Table 7-1.

Table 7-1: Construction Vibration Setback Distance for Vibratory Roller

Building Type	Recommended Setback Distance (m)	Applied Guideline
Typical Buildings	8	City of Toronto By-law 514
Heritage Buildings	12	US FTA Manual

Some vibration-sensitive areas are situated within the recommended setbacks from the proposed Project right-of-way. The current right-of-way includes provisions for bike lanes and the final width is subject to change. Given the potential for the right-of-way width to be adjusted, it is recommended that the minimum setback distance from each piece of equipment be maintained to prevent potential building damage from vibration. Alternatively, if this is not feasible, vibration monitoring should be conducted at the buildings to allow for observation of vibration levels and for consideration of construction vibration mitigation strategies if vibration levels do not remain within acceptable limits.

8.0 Conclusion and Closure

The noise impacts from the proposed Garner Road were assessed. Both road traffic (operational) and construction noise and vibration impacts were considered in the assessment.

The NSAs with OLAs identified within the Project Study Area include existing dwellings and several proposed developments along Garner Road. Thirty-five (35) representative receptors for existing NSAs and seven (7) representative receptors for proposed future developments were identified.

The predicted daytime noise levels indicate that the Future Build noise level is not expected to increase over 5 dB at any of the existing receptors. Therefore, mitigation is not required for the existing receptors, even if some of the receptors exceed the 55 dBA absolute daytime noise limit.

Predicted Future Build noise levels at the proposed development receptors exceed the MECP daytime and/or nighttime noise limits for all future development receptors. However, noise mitigation for the future developments is expected to be addressed in the development noise report and implemented by the developers. Therefore, noise mitigation for these developments is not investigated or recommended.

It is expected that most of the construction equipment typical for this type of Project can be operated in compliance with the MECP limits. However, there is potential for higher sound levels for some equipment (e.g., paving machines). Once equipment and construction schedules are finalized, construction equipment sound levels should be reviewed to confirm that noise emissions are within permissible limits. If they are higher than the limits, noise control options should be explored for the construction equipment exceeding the limits. Methods to reduce construction noise impacts are included in the Construction Code of Practice, as outlined in Section 6.2.

A vibration impact assessment for the most impactful construction source (vibratory roller) was conducted using the method as outlined in the FTA Manual. The recommended setback distances to prevent building damage for typical and heritage buildings are summarized in Table 7-1 of this report.

Some vibration-sensitive areas are situated within the recommended setbacks from the proposed Project right-of-way. The current right-of-way includes provisions for bike lanes and the final width is subject to change. Given the potential for the right-of-way width to be adjusted, it is recommended that the minimum setback distance from each piece of equipment be maintained to prevent potential building damage from vibration. Alternatively, if this is not feasible, vibration monitoring should be conducted at the buildings to allow for observation of vibration levels and for consideration of construction vibration mitigation strategies if vibration levels do not remain within acceptable limits.

9.0 References

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Appendix A
Project Preferred Plan


SUPPLEMENTAL LEGEND:
PROPOSED ROADWAY/MULTI-USE PATH
PROPOSED SIDEWALK/MEDIAN
EXISTING R.O.W.
PROPOSED 36m R.O.W.
BUS STOP
WILSON ST W

Appendix B
Proposed Future Development Layouts

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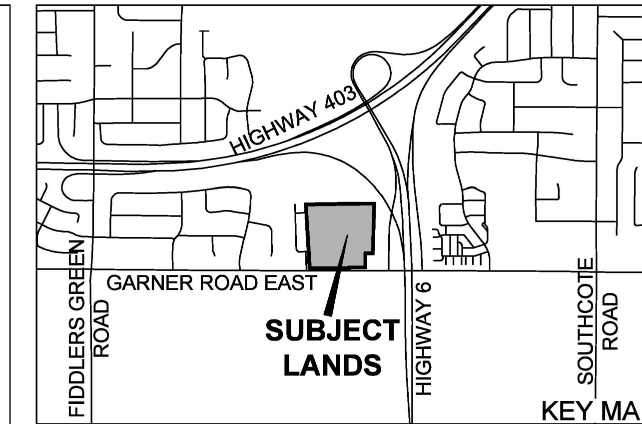

DEVELOPMENT CONCEPT PLAN
1541079 ONTARIO LTD.
OPTION 1

243, 263 & 281 GARNER ROAD EAST
PART OF LOT 45,
CONCESSION 3, ANCASTER
CITY OF HAMILTON

UNIT TYPES

DETACHED	33 UNITS
CONDO STREET TOWNHOUSE - 2 STOREY	65UNITS
CONDO STREET TOWNHOUSE - 3 STOREY	45 UNITS
CONDO BACK-TO-BACK TOWNHOUSE	52 UNITS
STACKED TOWNHOUSE	48 UNITS
TOTAL	243 UNITS

PARKING 471
195 Driveways + 243 Garage Space
33 Visitor space

AMENITY AREA PROVIDED - 950m² (5m²/CONDO UNIT)

WESTBROOK	07
KNIGHTON	58
ESPRIT	22
WHITEHAVEN	23
B2B	52
STACKED	48
SINGLE	33
TOTAL	243

Revision No.	Date	Issued / Revision	By
1	March 28, 2024	Prelim Concept	SS

DRAFT

Approval Stamp

Date	March 28, 2024
File No.	
Plan Scale	1:1250 (Arch D)
Drawn By	SS
Checked By	
Other	

Project

LOSANI HOMES

McNeilly and Hwy 8
Stoney Creek, Ontario

north

File Name **SITE PLAN**

Dwg No. 1 of 1

Appendix C
Sample Calculations

REPORT:	**Results: Sound Levels - No Barrier Objects**		
TNM VERSION	3.2.8741.34338	REPORT DATE:	18 November 2024
CALCULATED WITH:	TNM v3.2.8741.34338	CALCULATION DATE:	11/18/2024 4:03:42 PM
CASE:	GarnerRoad_FutureBuild_Day	ORGANIZATION:	
UNITS:	Metric	ANALYSIS BY:	marezina
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	10°C, 70%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
R01_OLA	1	1	---	55.8	0.0	---	---	Sound Level
R02_OLA	2	1	---	53.4	0.0	---	---	Sound Level
R03_OLA	3	1	---	57.9	0.0	---	---	Sound Level
R04_OLA	4	1	---	52.6	0.0	---	---	Sound Level
R05_OLA	5	1	---	58.8	0.0	---	---	Sound Level
R05_Facade	6	1	---	62.1	0.0	---	---	Sound Level
R06_OLA	7	1	---	52.4	0.0	---	---	Sound Level
R07_OLA	9	1	---	43.5	0.0	---	---	Sound Level
R07_Facade	10	1	---	59.3	0.0	---	---	Sound Level
R08_OLA	11	1	---	61.7	0.0	---	---	Sound Level
R08_Facade	12	1	---	63.9	0.0	---	---	Sound Level
R09_OLA	13	1	---	54.6	0.0	---	---	Sound Level
R10_OLA	14	1	---	59.8	0.0	---	---	Sound Level
R11_OLA	15	1	---	56.5	0.0	---	---	Sound Level
R12_Facade	16	1	---	63.9	0.0	---	---	Sound Level

REPORT:	**Results: Sound Levels - No Barrier Objects**		
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ATMOSPHERICS:	10°C, 70%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
R12_OLA	17	1	---	64.0	0.0	---	---	Sound Level
R13_OLA	18	1	---	56.4	0.0	---	---	Sound Level
R14_OLA	19	1	---	55.1	0.0	---	---	Sound Level
R14_Facade	20	1	---	60.3	0.0	---	---	Sound Level
R15_OLA	21	1	---	58.2	0.0	---	---	Sound Level
R16_OLA	22	1	---	58.0	0.0	---	---	Sound Level
R17_OLA	23	1	---	62.3	0.0	---	---	Sound Level
R18_OLA	24	1	---	55.2	0.0	---	---	Sound Level
R19_OLA	25	1	---	55.2	0.0	---	---	Sound Level
R20_OLA	26	1	---	61.5	0.0	---	---	Sound Level
R21_OLA	27	1	---	62.0	0.0	---	---	Sound Level
R22_OLA	28	1	---	58.4	0.0	---	---	Sound Level
R23_OLA	29	1	---	61.4	0.0	---	---	Sound Level
R24_OLA	30	1	---	61.5	0.0	---	---	Sound Level
R25_OLA	31	1	---	62.8	0.0	---	---	Sound Level

REPORT:	**Results: Sound Levels - No Barrier Objects**		
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DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	10°C, 70%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
R26_OLA	32	1	---	60.3	0.0	---	---	Sound Level
R27_OLA	33	1	---	62.8	0.0	---	---	Sound Level
R28_OLA	34	1	---	60.5	0.0	---	---	Sound Level
R29_OLA	35	1	---	60.3	0.0	---	---	Sound Level
R30_OLA	38	1	---	59.6	0.0	---	---	Sound Level
R31_OLA	39	1	---	61.0	0.0	---	---	Sound Level
R32_OLA	40	1	---	58.6	0.0	---	---	Sound Level
R33_OLA	41	1	---	61.6	0.0	---	---	Sound Level
R34_OLA	42	1	---	60.6	0.0	---	---	Sound Level
R35_OLA	43	1	---	53.7	0.0	---	---	Sound Level
R36_Facade	44	1	---	66.8	0.0	---	---	Sound Level
R36_OLA	45	1	---	67.4	0.0	---	---	Sound Level
R37_OLA	46	1	---	51.4	0.0	---	---	Sound Level
R38_OLA	47	1	---	54.4	0.0	---	---	Sound Level
R39_Facade	48	1	---	67.2	0.0	---	---	Sound Level

REPORT:	**Results: Sound Levels - No Barrier Objects**		
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UNITS:	Metric	ANALYSIS BY:	marezina
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	10°C, 70%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
R39_OLA	49	1	---	67.9	0.0	---	---	Sound Level
R40_OLA	50	1	---	56.8	0.0	---	---	Sound Level
R41_OLA	51	1	---	54.1	0.0	---	---	Sound Level
R42_OLA	52	1	---	60.6	0.0	---	---	Sound Level
R43_OLA	53	1	---	50.5	0.0	---	---	Sound Level

REPORT:	**Results: Sound Levels - No Barrier Objects**		
TNM VERSION	3.2.8741.34338	REPORT DATE:	18 November 2024
CALCULATED WITH:	TNM v3.2.8741.34338	CALCULATION DATE:	11/18/2024 7:34:29 PM
CASE:	GarnerRoad_FutureBuild_Night	ORGANIZATION:	
UNITS:	Metric	ANALYSIS BY:	marezina
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	10°C, 70%		
PAVEMENT TYPE(S) USED:	Average		

Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
R01_OLA	1	1	---	49.7	0.0	---	---	Sound Level
R02_OLA	2	1	---	47.2	0.0	---	---	Sound Level
R03_OLA	3	1	---	51.5	0.0	---	---	Sound Level
R04_OLA	4	1	---	46.0	0.0	---	---	Sound Level
R05_OLA	5	1	---	52.3	0.0	---	---	Sound Level
R05_Facade	6	1	---	55.7	0.0	---	---	Sound Level
R06_OLA	7	1	---	46.0	0.0	---	---	Sound Level
R07_OLA	9	1	---	38.3	0.0	---	---	Sound Level
R07_Facade	10	1	---	53.0	0.0	---	---	Sound Level
R08_OLA	11	1	---	55.2	0.0	---	---	Sound Level
R08_Facade	12	1	---	57.5	0.0	---	---	Sound Level
R09_OLA	13	1	---	48.3	0.0	---	---	Sound Level
R10_OLA	14	1	---	53.4	0.0	---	---	Sound Level
R11_OLA	15	1	---	51.0	0.0	---	---	Sound Level
R12_Facade	16	1	---	57.5	0.0	---	---	Sound Level

REPORT:	**Results: Sound Levels - No Barrier Objects**		
TNM VERSION	3.2.8741.34338	REPORT DATE:	18 November 2024
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CASE:	GarnerRoad_FutureBuild_Night	ORGANIZATION:	
UNITS:	Metric	ANALYSIS BY:	marezina
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	10°C, 70%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq dBA	Calc. dBA	Absolute Criterion dBA	Calc. dBA	Relative Criterion dBA	Type of Impact
R12_OLA	17	1	---	57.5	0.0	---	---	Sound Level
R13_OLA	18	1	---	50.0	0.0	---	---	Sound Level
R14_OLA	19	1	---	49.3	0.0	---	---	Sound Level
R14_Facade	20	1	---	53.8	0.0	---	---	Sound Level
R15_OLA	21	1	---	53.8	0.0	---	---	Sound Level
R16_OLA	22	1	---	54.0	0.0	---	---	Sound Level
R17_OLA	23	1	---	58.7	0.0	---	---	Sound Level
R18_OLA	24	1	---	48.7	0.0	---	---	Sound Level
R19_OLA	25	1	---	48.7	0.0	---	---	Sound Level
R20_OLA	26	1	---	56.0	0.0	---	---	Sound Level
R21_OLA	27	1	---	55.6	0.0	---	---	Sound Level
R22_OLA	28	1	---	52.0	0.0	---	---	Sound Level
R23_OLA	29	1	---	55.2	0.0	---	---	Sound Level
R24_OLA	30	1	---	55.4	0.0	---	---	Sound Level
R25_OLA	31	1	---	58.3	0.0	---	---	Sound Level

REPORT:	**Results: Sound Levels - No Barrier Objects**		
TNM VERSION	3.2.8741.34338	REPORT DATE:	18 November 2024
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UNITS:	Metric	ANALYSIS BY:	marezina
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	10°C, 70%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
R26_OLA	32	1	---	53.9	0.0	---	---	Sound Level
R27_OLA	33	1	---	57.0	0.0	---	---	Sound Level
R28_OLA	34	1	---	54.3	0.0	---	---	Sound Level
R29_OLA	35	1	---	56.8	0.0	---	---	Sound Level
R30_OLA	38	1	---	54.7	0.0	---	---	Sound Level
R31_OLA	39	1	---	56.8	0.0	---	---	Sound Level
R32_OLA	40	1	---	54.8	0.0	---	---	Sound Level
R33_OLA	41	1	---	56.5	0.0	---	---	Sound Level
R34_OLA	42	1	---	56.2	0.0	---	---	Sound Level
R35_OLA	43	1	---	47.2	0.0	---	---	Sound Level
R36_Facade	44	1	---	60.3	0.0	---	---	Sound Level
R36_OLA	45	1	---	60.9	0.0	---	---	Sound Level
R37_OLA	46	1	---	45.6	0.0	---	---	Sound Level
R38_OLA	47	1	---	47.9	0.0	---	---	Sound Level
R39_Facade	48	1	---	60.6	0.0	---	---	Sound Level

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UNITS:	Metric	ANALYSIS BY:	marezina
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	10°C, 70%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
Name	No.	Nb. R.R.	Existing LAeq dBA	LAeq Calc. dBA	LAeq Absolute Criterion dBA	Increase over Existing Calc. dBA	Increase over Existing Relative Criterion dBA	Type of Impact
R39_OLA	49	1	---	61.3	0.0	---	---	Sound Level
R40_OLA	50	1	---	50.8	0.0	---	---	Sound Level
R41_OLA	51	1	---	47.4	0.0	---	---	Sound Level
R42_OLA	52	1	---	54.1	0.0	---	---	Sound Level
R43_OLA	53	1	---	43.7	0.0	---	---	Sound Level

REPORT:	**Results: Sound Levels - No Barrier Objects**		
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CASE:	GarnerRoad_FutureNo Build_Day	ORGANIZATION:	
UNITS:	Metric	ANALYSIS BY:	marezina
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	10°C, 70%	Average pavement type shall be used unless a state	
PAVEMENT TYPE(S) USED:	Average	highway agency substantiates the use of a different	
		type with approval FHWA.	

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq dBA	Calc. dBA	Absolute Criterion dBA	Calc. dBA	Relative Criterion dBA	Type of Impact
R01_OLA	1	1	---	55.9	0.0	---	---	Sound Level
R02_OLA	2	1	---	53.9	0.0	---	---	Sound Level
R03_OLA	3	1	---	57.2	0.0	---	---	Sound Level
R04_OLA	4	1	---	53.5	0.0	---	---	Sound Level
R05_OLA	5	1	---	58.8	0.0	---	---	Sound Level
R05_Facade	6	1	---	61.4	0.0	---	---	Sound Level
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R36_Facade	44	1	---	67.0	0.0	---	---	Sound Level
R36_OLA	45	1	---	67.6	0.0	---	---	Sound Level
R37_OLA	46	1	---	52.6	0.0	---	---	Sound Level
R38_OLA	47	1	---	54.1	0.0	---	---	Sound Level
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R42_OLA	52	1	---	60.3	0.0	---	---	Sound Level
R43_OLA	53	1	---	50.6	0.0	---	---	Sound Level