

3610 INNES ROAD (FORMER BMR LANDS)
NOISE CONTROL FEASIBILITY STUDY



Prepared for:

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Novatech File: 118224
Ref: R-2019-175

April 3, 2020

City of Ottawa
Planning and Growth Management Department
Development Review (Urban Services - East) Branch
Infrastructure Approvals Division
110 Laurier Avenue West, 4th Floor
Ottawa, ON K1P 1J1

Attention: **Steve Belan, MCIP, RPP
Planner II**

**Mike Giampa
Senior Engineer**

Reference: **3610 Innes Road (Former BMR Lands)
Noise Control Feasibility Study
Novatech File No.: 118224**

In support of the Draft Plan of Subdivision application for the above-noted site, you will find enclosed the Noise Control Feasibility Study for the 3610 Innes Road (Former BMR Lands) development.

The study evaluates the environmental impact of noise to the proposed residential development, the feasibility of mitigation measures, and recommends the appropriate noise attenuation measures.

Should you have any questions, or require additional information, please contact me.

Yours truly,

NOVATECH



Bassam Bahiā, M.Eng., P. Eng.
Project Manager | Land Development

cc: Michael Michaud, Glenview Homes (Innes) Ltd.

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1.0 INTRODUCTION

The proposed development at 3610 Innes Road (Subject Site), formerly known as BMR Lands, is located within the north-west quadrant of the East Urban Community (EUC) Phase 3 Area Community Design Plan. More specifically, the site is south of Innes Road, 240m east of its intersection with Lamarche Avenue, as shown on **Figure 1.1 – Key Plan**. The site is bound to the south and east by future development lands owned by Richcraft Homes, to the west by the recently constructed residential subdivision known as Orleans Village by Caivan Communities, and to the north by Innes Road, and remnant mixed use parcels.

The Subject Site has an area of 15.72 ha, and the proposed subdivision will comprise of residential housing, public right-of-ways and parkland. The development will contain City of Ottawa municipal road allowances of 18.0, and 24.0 metres wide. The proposed site development plan is shown on **Figure 1.2 – Site Plan**.

Novatech has been retained by Glenview Homes (Innes) Ltd. (Developer) to assess the environmental impact of noise for the Subject Site, the feasibility of mitigation measures, and recommend the appropriate noise attenuation measures to ensure compliance with the City of Ottawa Environmental Noise Control Guidelines, January 2016 (ENCG) and the Ministry of the Environment Environmental Noise Guideline, August 2013 (Provincial Guideline).

As per the ENCG, this report is considered a Phase 1 Noise Control Feasibility Study. A Phase 2 Noise Control Detailed Study will be included as part of the supporting documentation submitted in support of the Plan of Subdivision Application.

2.0 NOISE CONTROL CRITERIA AND GUIDELINES

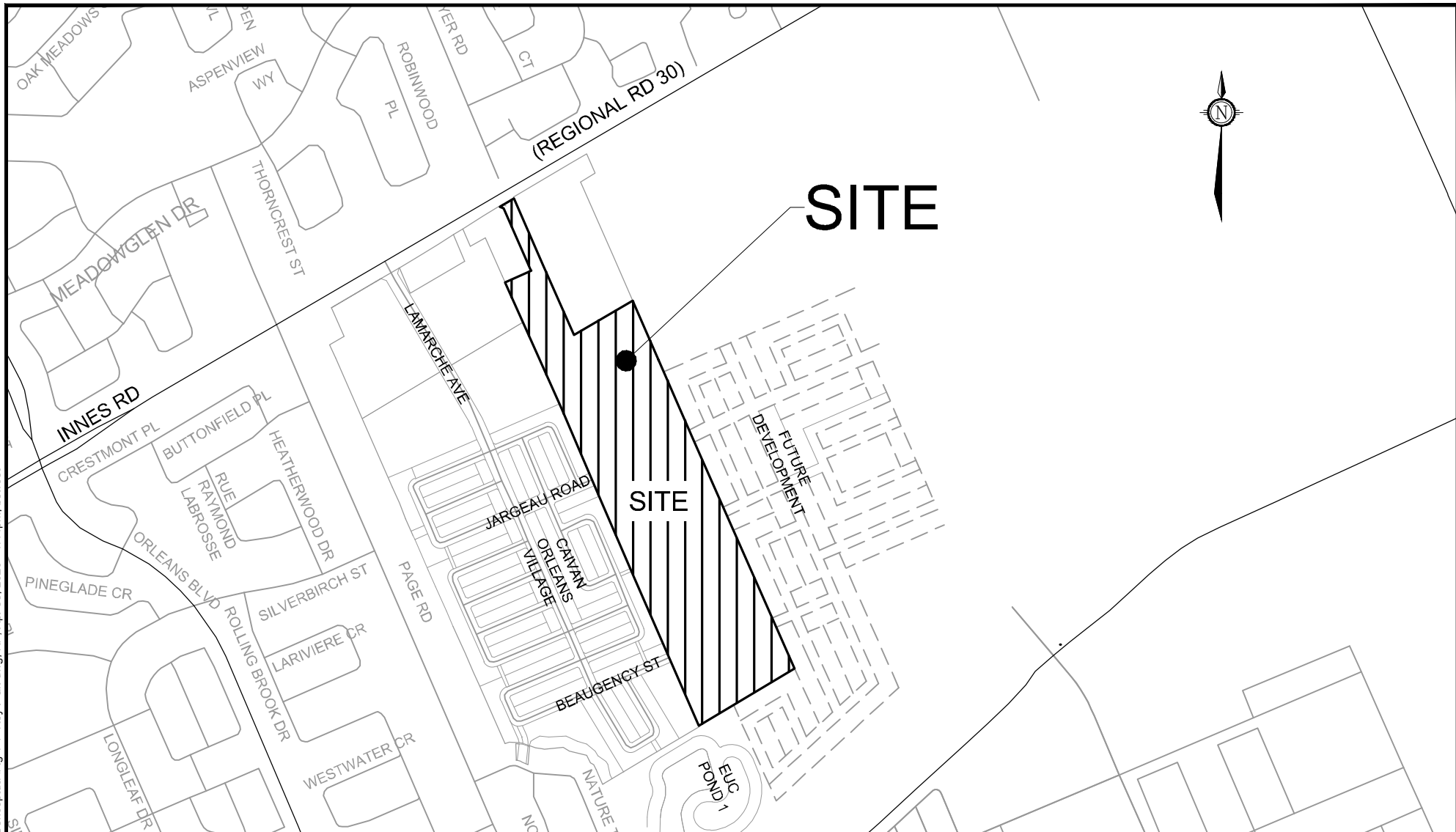
2.1 Sound Level Criteria

The City of Ottawa is concerned with noise from aircraft, roads, transitways and railways as expressed in Section 4.8.7 of the Official Plan (OP). These policies are supported by the ENCG which is a technical document that outlines the specific sound level criteria, commonly referred to as the Logarithmic Energy Equivalent Continuous Sound Level (L_{eq}). The ENCG has been used as a guideline for this study. This study considers surface transportation noise from the proposed collector road.

When considering surface transportation noise, proposed noise-sensitive developments must be evaluated within 100 m from the right-of-way of an existing or proposed arterial, collector, major collector, light rail transit, or bus transitway; 250 m from the right-of-way of an existing or proposed highway or a Secondary Main railway line; and 500 m from the right-of-way of a freeway, 400 series provincial highway, or Principle Main railway line. For the purposes of this study, proposed Street One is classified as a collector and runs through the Subject Site, thus requiring analysis. Innes Drive is classified as an arterial road, and Pagé Road is classified as a collector road, however both are greater than 100 m from the Subject Site. The future Bus Rapid Transit line alongside Brian Colburn Boulevard and is also greater than 100 m from the Subject Site.

For stationary noise, when developments are in proximity to existing noise sensitive receptors or lands designated for future development of noise sensitive receptors, noise sources must be

M:\2018\118224\CAD\Design\Figures\Design Brief\Conceptual Fig 1.1 - Key Plan.dwg, KP, Apr 03, 2020 - 1:44pm, bsweet



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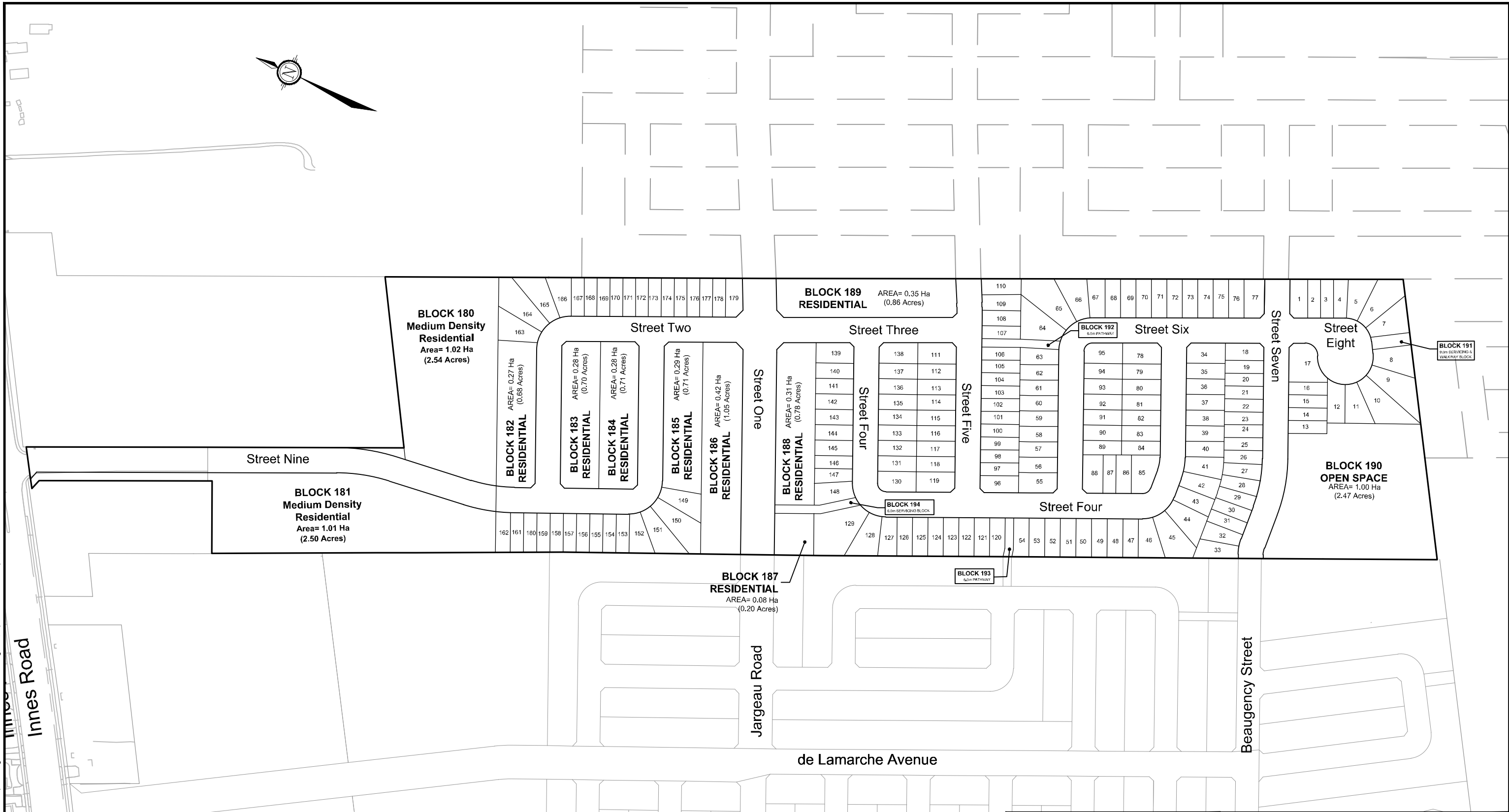
3610 INNES ROAD
(FORMER BMR LANDS)

KEY PLAN

SCALE NOT TO SCALE

DATE	APR 2020	JOB	118224	FIGURE	1.1
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M:\2018\118224 CAD\Design\Figures\Design Brief\Conceptual\Fig 3.1 - Service Connections.dwg, SP, Apr 05, 2020 - 2:08pm, bsweet



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	SITE PLAN		
	NOT TO SCALE		
	SCALE	DATE	JOB
	APR 2020	118224	1.2

evaluated. At this time and for the purpose of this report, it is not anticipated that there will be any stationary noise sources within the Subject Site. This includes the proposed medium density (2-bedroom apartment) blocks 180 and 181. In addition, the proposed site plans located at 3636 Innes Road (known as the Uhaul Site, City File: TBD) and 3598 Innes Road (known as the McEwen Site, City File: D07-12-18-0132), which are part of separate planning applications, have demonstrated that they will not impact the Subject Site. Refer to correspondence and noise assessment excerpts (by others) included in **Appendix C**. As such, no additional analysis for stationary noise source is required at this time.

Due to the foregoing, this study will just consider the one type of noise source:

- Surface transportation noise from Street One, classified as a collector road.

The mandate of acoustical engineering in respect to land-use planning is typically to analyze, and where required, design an acceptable acoustic environment that complies with the ENCG document to the extent that is both reasonable and practical. The areas which must be assessed for acoustic protection include the Outdoor Living Area (OLA); and the Indoor Living Environment (ILE), for both living/dining area and sleeping quarters.

The OLA is defined as part of the outdoor amenity area provided for the quiet enjoyment of the outdoor environment during the day-time period. These amenity areas are typically backyards, gardens, terraces and patios.

The ILE is provided for the quiet enjoyment of the living/dining and sleeping quarters within a dwelling, during both the day-time and night-time periods.

Surface Transportation Noise

The OLA noise target for road surface transportation noise sources is 55 dBA. This criterion may be exceeded by an amount not greater than 5 dBA, subject to justification and the use of a warning clause.

The ILE sets noise target for road surface transportation noise sources at 45 dBA (day-time) and 40 dBA (night-time), respectively. If this criterion is exceeded, the property may be subject to building component analysis to ensure noise criteria are met and warning clauses.

The outdoor and indoor sound level criteria for surface transportation noise are summarized below in **Table 2.1**.

Table 2.1: Outdoor and Indoor Sound Level Criteria for Surface Transportation Noise

Environment	Receiver Location and Description	Time Period	Abbreviation for Report & Modelling	ENCG Equivalent Sound Level Criteria, L_{eq}
Outdoor	Outdoor Living Area	Day-time (07:00 - 23:00 hrs) 16 hour period	OLA-16	55 dBA
Indoor	Living/ dining, den areas of residences, hospitals, nursing homes, schools, daycare centres, etc.	Day-time (07:00 - 23:00 hrs) 16 hour period	ILED-16	45 dBA
	Living/ dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	Night-time (23:00 - 07:00 hrs) 8 hour period	ILED-8 *	45 dBA
	Sleeping quarters	Day-time (07:00 - 23:00 hrs) 16 hour period	ILES-16	45 dBA
	Sleeping quarters	Night-time (23:00 - 07:00 hrs) 8 hour period	ILES-8	40 dBA

Notes:

(1) **ILED-8** has not been analysed or modelled in this study, as the noise levels would be governed by **ILES-8**.

2.2 Noise Attenuation Requirements

When sound levels are predicted to be less than the specified criteria for the day-time and nighttime conditions, no attenuation measures are required by the proponent. As the noise criteria is exceeded, a combination of attenuation measures is recommended by the City of Ottawa to modify the development environment. These attenuation measures may include:

- Adjusting the site layout to maximize noise insensitive land uses between the noise source and sensitive receptor;
- Orienting buildings to provide sheltered zones in rear yards;
- Constructing noise barriers and/or berms;
- Building component design for acoustic insulation;
- Installation of a forced air ventilation system with provision for central air conditioning;
- Warning Clauses within Subdivision Agreement and Agreement of Purchase and Sale of prospective home buyers, all of which will be registered on title.

In order to inform the purchasers, warning clauses will reference the specific mitigation measures utilized and state the need to maintain the specified noise mitigation measures.

3.0 NOISE SOURCES

3.1 Surface Transportation – Proposed Collector Road

Street One is classified as a 2-Lane Urban Collector (2-UCU) as per the 0 Innes Road – Transportation Impact Assessment (TIA), dated October 2019. As outlined in the ENCG (Appendix B, Table B1), this particular roadway class specifies an AADT of 8,000 vpd which should be used for sound level predictions. See markup of the Schedule E, Urban Road Network, highlighting the Subject Site location in **Appendix A**.

For the purpose of this study an AADT of 8,000 vpd was utilized. The roadway noise parameters are summarized below in **Table 3.1**.

Table 3.1: Street One Traffic and Road Parameters

Roadway Parameters	Street One
Roadway Classification	2 - Lane Urban Collector
Annual Average Daily Traffic (AADT)	8,000 vehicles/day
Posted Speed	40 - 50 km/hr.
Day / Night Split (%)	92 / 8
Medium Trucks (%)	7
Heavy Trucks (%)	5

4.0 NOISE LEVEL MODELLING AND PREDICTIONS

4.1 Surface Transportation - Acoustic Modeling

For surface transportation sources, noise levels are calculated using the STAMSON computer program, version 5.03. This program allows us to input variables of a road or railway such as traffic volume, types of vehicles, speed, barrier locations and topography to determine the environmental noise impact at a point of reception.

To analyze the noise impact on the Subject Site from the aforementioned surface transportation noise source, three points of reception were implemented at the critical OLAs and two points of reception were implemented at the critical ILEs. The noise control plan for surface transportation noise (Figure 118224-NC1) shows the receiver locations.

The parameters used in STAMSON to assess the noise impacts at the receiver locations can be found below in **Table 4.1**. It should be noted that, when practical and when the proposed layout of the Subject Site in relation to the existing and proposed residences permitted, screening was implemented to limit noise exposure from Street One. To be conservative, a height of 5.25 meters was used since the builder has various bungalow products that may be constructed.

Noise modeling was undertaken for the following environments:

OLAs

For the purposes of this noise impact assessment, all receivers for the OLA-16 time period are located 3.0 meters from the building façade, 1.5 meters above grade, and aligned with the midpoint of the subject façade as per the ENCG.

ILEs

For the purposes of this noise impact assessment, all receivers for the ILED-16 time period are located at the plane of window, 1.5 meters above grade, and aligned in closest proximity to the noise source as per the ENCG.

All receivers for the ILES-16, and ILES-8 time periods are located at the plane of window, 4.5 meters above grade, and aligned in closest proximity to the noise source as per the ENCG.

Table 4.1: Road Segment/ Receiver Parameters

Receiver	Segment Reference	Road Segment - Receiver Angles		Shielding - Barrier Angles		Shielding - Barrier Parameters				
		RØ1	RØ2	BØ1	BØ2	Receiver source distance (m)	Barrier receiver distance (m)	Source ground elevation (m)	Receiver ground elevation (m)	Barrier ground elevation (m)
R1	S1	-90	-38	-90	-38	20.8	3.0	89.77	89.43	89.81
	S2	-38	90	-38	90	20.8	8.5	89.77	89.43	89.81
R2	S1	-90	90	-90	48	35.6	3.0	89.53	89.47	89.47
R3	S1	-90	90	-90	90	34.9	3.0	89.66	89.38	89.51
Indoor Living Environments										
R1	S1	-90	90	-	-	17.4	-	89.78	89.71	-
R2	S1	-90	90	-	-	15.5	-	89.51	89.52	-

Notes:

- (1) Refer to Figure 118224-NC1 for receiver and noise source locations.
- (2) All receiver angles are the same for both unattenuated and attenuated scenarios.
- (3) All receiver angles are the same for ILEs (i.e., ILED-16, ILES-16, and ILES-8).
- (4) Source height = source ground elevation + 1.5m.
- (5) Receiver height = receiver ground elevation + 1.5m (for all OLA and ILED-16 time periods); receiver ground elevation + 4.5m (for ILES-16, and ILES-8 time periods).

4.2 Surface Transportation - Noise Level Predictions

The following **Table 4.2** summarizes the predicted sound levels at the receiver locations from the results of the STAMSON environmental noise software calculation. The complete modelling outputs can be found in **Appendix B**.

Table 4.2: OLA Noise Level Summary

Receiver	Unattenuated L_{eq} (8,000 vpd)	Attenuated L_{eq} (8,000 vpd)	Noise Barrier Reference
	OLA-16	OLA-16	
R1	60.92	55.37	Noise Barrier No.1 – 1.8 m Ht
R2	50.64	-	No barrier required
R3	43.98	-	No barrier required

Notes:

(1) Refer to Figure 118224-NC1 for receiver and noise source locations.

As outlined in **Table 2.1**, the target noise level for the OLA is 55 dBA, with a provision of an additional 5 dBA tolerance subject to justification and the use of a warning clause. For the established OLAs affected by the surface transportation noise within this proposed development, the day-time noise levels fall below the required OLA noise levels or maximum tolerable OLA noise levels when implementing the attenuated measures where required. Refer to further discussions in Section 5.1 of this report.

Table 4.3: ILE Noise Level Summary

Receiver	Unattenuated L_{eq} (8,000 vpd)		
	ILED-16	ILES-16	ILES-8
R1	63.22	63.44	55.84
R2	64.06	64.22	56.63

Notes:

(1) Refer to Figure 118224-NC1 for receiver and noise source locations.

The target noise levels for the ILE, also outlined in **Table 2.1**, for both living/dining area and sleeping quarters is 45 dBA and 40 dBA, respectively. To mitigate these sound levels, additional building component analysis is required to ensure noise criteria are met. Refer to further discussions in Section 5.2 of this report.

5.0 NOISE LEVEL ATTENUATION MEASURES

5.1 Outdoor – Proposed Noise Barrier

To meet the required OLA noise levels for the surface transportation and based on the current plan of subdivision layout, two noise barriers will need to be implemented within the Subject Site. The following outlines the proposed:

- Noise Barrier No.1 – 1.8 m high noise barrier, 20 m in length, within block 189;
- Noise Barrier No.2 – 1.8 m high noise barrier, 20 m in length, within lot 179

Based on the noise level results from R1 at block 189, a noise barrier will need to be implemented at block 189 and lot 179 to provided adequate noise attenuation. Additional details on the noise barriers will be provided as part of the Phase 2 Noise Control Detailed Study.

Based on the noise level results from R2 and R3 at block 186 and 188, it is not anticipated that additional noise attenuation measures will need to be implemented for any units fronting onto Street One.

5.2 Indoor – Proposed Building Component Assessment

When ILE noise levels exceed the day-time or night-time, the exterior shell system of the building envelope must be acoustically assessed to ensure the indoor noise criteria is achieved for the surface transportation. Based on the results in Section 4.2 and Section 4.3 of this report, in the proposed development the sound levels at various receiver locations are above both the day-time and night-time allowances. Therefore, additional analysis of the cladding system is warranted. To comply with the ENCG policies, the building envelope will require a minimum Acoustic Insulation Factor (AIF) or Sound Transmission Class (STC) rating to provide the desired indoor noise levels as shown above in **Table 2.1** and **Table 2.2**.

At a minimum, all of the units within the Subject Site will need to have a building envelope capable of providing acceptable noise levels to meet the greater of the noise level predictions within **Table 4.3**.

Per common industry practice, complete walls and individual wall elements are rated per the STC value. The STC ratings of common residential walls built in conformance with the Ontario Building Code typically exceed an STC rating of 35; and standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40 depending on the manufacturer, components, glazing or air spaces thickness, and seal materials. Generally, common industry practice provides sufficient mitigation to obtain the target noise levels for the ILE.

Additional details and assessment of the proposed building components will be provided as part of the Phase 2 Noise Control Detailed Study. It is anticipated that the units along Street One will require further assessment on the proposed building components.

5.3 Provision for Central Air Conditioning

To provide indoor isolation and avoid noise intrusion through open windows or doors, the installation of a forced air ventilation system with provisions for central air conditioning may be required.

Additional details on which lots may be required to implement provisions for central air conditioning will be provided as part of the Phase 2 Noise Control Detailed Study. It is anticipated that the units along Street One will require provisions for central air conditioning.

5.4 Proposed Warning Clauses

If noise levels are expected to exceed the applicable ENCG sound level criteria, the City of Ottawa recommends a warning clause be registered on title and incorporated into the Subdivision Agreement and in the Agreement of Purchase and Sale. The warning clause serves to alert potential buyers and/or renters of the possible noise condition and of any limitations that may exist on his/her property rights.

Additional details on which lots will be required to apply warning clauses will be provided as part of the Phase 2 Noise Control Detailed Study. It is anticipated that the units along Street One will be required to apply warning clauses.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This study confirms the predicted noise levels for the proposed residential development from the proposed Street One are in excess of the City of Ottawa's required criteria and are above the maximum tolerance per the ENCG. The following outlines the summary of findings and recommendations being made:

- Based on the noise level results, it is anticipated that a noise barrier will need to be implemented at block 189 and lot 179 due to the surface transportation along Street One;
- Based on the noise level results and the layout of the Subject Site, it is not anticipated that additional noise attenuation measures will need to be implemented for any units fronting onto Street One;
- A Phase 2 Noise Control Detailed Study will be required to provide:
 - Additional details on the noise barriers;
 - Additional details and assessment of the proposed building components;
 - Additional details on which lots/blocks may be required to implement provisions for central air conditioning;
 - Additional details on which lots/blocks will be required to apply warning clauses.

This study is respectfully submitted in support of the subdivision application. Please contact the undersigned should you have questions or require additional information.

NOVATECH

Prepared by:



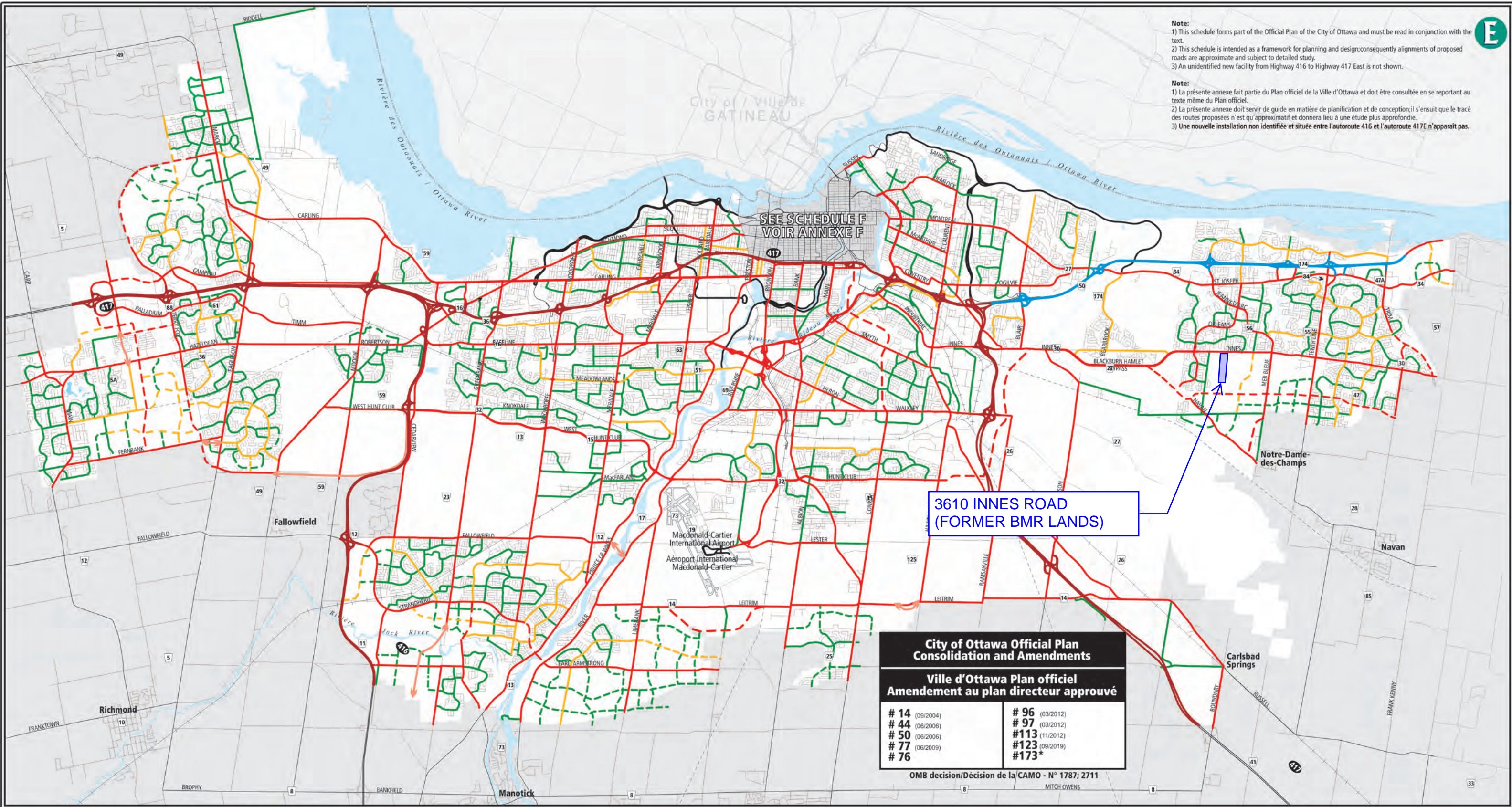
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Project Manager I Land Development

Appendix A
Official Plan and Environmental Noise Control Guidelines Excerpts



Note:
1) This schedule forms part of the Official Plan of the City of Ottawa and must be read in conjunction with the text.
2) This schedule is intended as a framework for planning and design; consequently alignments of proposed roads are approximate and subject to detailed study.
3) An unidentified new facility from Highway 416 to Highway 417 East is not shown.

Note:
1) La présente annexe fait partie du Plan officiel de la Ville d'Ottawa et doit être consultée en se reportant au texte même du Plan officiel.
2) La présente annexe doit servir de guide en matière de planification et de conception; il s'ensuit que le tracé des routes proposées n'est qu'approximatif et donnera lieu à une étude plus approfondie.
3) Une nouvelle installation non identifiée et située entre l'autoroute 416 et l'autoroute 417E n'apparaît pas.

City of Ottawa Official Plan Consolidation and Amendments	
Ville d'Ottawa Plan officiel Amendement au plan directeur approuvé	
# 14	(09/2004)
# 44	(06/2006)
# 50	(06/2006)
# 77	(06/2009)
# 76	
# 96	(03/2012)
# 97	(03/2012)
# 113	(11/2012)
# 123	(09/2019)
# 173*	

OMB decision/Décision de la CAMO - N° 1787; 2711

Official Plan - Schedule E

Urban Road Network

Prepared by: Planning and Growth Management Department, Mapping & Graphics Unit

Plan officiel - Annexe E

Routes Arterial - Urbain

Préparé par : Service de l'urbanisme et de la gestion de la croissance, Unité de la cartographie et des graphiques

Provincial Highway — Route provinciale
City Freeway — Autoroute de ville

Federally Owned Road
Existing — Établie
Proposed — Proposé
(Alignment defined)

Chemins de propriété fédéral
Établie — Établie
Proposé — Proposé
(Alignement déterminée)

Arterials
Existing — Établie
Proposed — Proposé
Conceptual — Conceptuelle
(Alignment Undefined)

Artère
Établie — Établie
Proposé — Proposé
Conceptuelle — Conceptuelle
(Alignement à déterminer)

Major Collectors
Existing — Établie
Proposed — Proposé

Grande collectrice
Établie — Établie
Proposé — Proposé

Collectors
Existing — Établie
Proposed — Proposé

Collectrice
Établie — Établie
Proposé — Proposé

Scale / Échelle
2km 1 0 1 2 3 4km

Appendix B

STAMSON Noise Modelling Results

STAMSON 5.0 NORMAL REPORT Date: 08-10-2019 14:40:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 118224.te Time Period: Day/Night 16/8 hours
Description: OLAR1-Attenuated

Road data, segment # 1: Street 1 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Street 1 (day/night)

Angle1 Angle2 : -90.00 deg -38.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.80 / 20.80 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -38.00 deg
Barrier height : 5.25 m
Elevation : 0.00 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 89.77 m
Receiver elevation : 89.43 m
Barrier elevation : 89.81 m
Reference angle : 0.00

Road data, segment # 2: Street 2 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Street 2 (day/night)

Angle1 Angle2 : -38.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.80 / 20.80 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -38.00 deg Angle2 : 90.00 deg
Barrier height : 1.80 m
Elevation : 0.00 m
Barrier receiver distance : 8.75 / 8.75 m
Source elevation : 89.77 m
Receiver elevation : 89.43 m
Barrier elevation : 89.81 m
Reference angle : 0.00

Results segment # 1: Street 1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.17	90.98

ROAD (0.00 + 42.00 + 0.00) = 42.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	-38	0.35	65.75	0.00	-1.91	-6.91	0.00	0.00	-14.93
42.00									

Segment Leq : 42.00 dBA

Results segment # 2: Street 2 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.26	91.07

ROAD (0.00 + 55.17 + 0.00) = 55.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-38	90	0.55	65.75	0.00	-2.20	-2.40	0.00	0.00	-5.98
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Segment Leq : 55.17 dBA

Total Leq All Segments: 55.37 dBA

Results segment # 1: Street 1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	3.74	93.55

ROAD (0.00 + 40.14 + 0.00) = 40.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	-38	0.26	58.16	0.00	-1.78	-6.55	0.00	0.00	-9.69
40.14									

Segment Leq : 40.14 dBA

Results segment # 2: Street 2 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	3.00	92.81

ROAD (0.00 + 53.51 + 0.00) = 53.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq									
-38	90	0.46	58.16	0.00	-2.08	-2.28	0.00	0.00	-0.45
53.35*									
-38	90	0.57	58.16	0.00	-2.23	-2.42	0.00	0.00	0.00
53.51									

* Bright Zone !

Segment Leq : 53.51 dBA

Total Leq All Segments: 53.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 55.37
(NIGHT) : 53.71

STAMSON 5.0 NORMAL REPORT Date: 03-10-2019 12:49:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 118224.te Time Period: Day/Night 16/8 hours
Description: OLAR1-Unattenuated

Road data, segment # 1: Street 1 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Street 1 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 20.80 / 20.80 m
Receiver height : 1.50 / 1.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -38.00 deg
Barrier height : 5.25 m
Elevation : 0.00 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 89.77 m
Receiver elevation : 89.43 m
Barrier elevation : 89.53 m
Reference angle : 0.00

Results segment # 1: Street 1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.45	90.98

ROAD (0.00 + 42.38 + 60.86) = 60.92 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	-38	0.35	65.75	0.00	-1.91	-6.91	0.00	0.00	-14.55
42.38									

-38	90	0.66	65.75	0.00	-2.36	-2.53	0.00	0.00	0.00
60.86									

Segment Leq : 60.92 dBA

Total Leq All Segments: 60.92 dBA

Results segment # 1: Street 1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.45	90.98

ROAD (0.00 + 34.78 + 53.27) = 53.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	-38	0.35	58.16	0.00	-1.91	-6.91	0.00	0.00	-14.55
34.78									

-38	90	0.66	58.16	0.00	-2.36	-2.53	0.00	0.00	0.00
53.27									

Segment Leq : 53.33 dBA

Total Leq All Segments: 53.33 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 60.92
(NIGHT) : 53.33

STAMSON 5.0 NORMAL REPORT Date: 03-10-2019 12:54:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 118224.te Time Period: Day/Night 16/8 hours
Description: OLAR2-Unattenuated

Road data, segment # 1: Street 1 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Street 1 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 35.60 / 35.60 m
Receiver height : 1.50 / 1.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 48.00 deg
Barrier height : 5.25 m
Elevation : 0.00 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 89.53 m
Receiver elevation : 89.47 m
Barrier elevation : 89.47 m
Reference angle : 0.00

Results segment # 1: Street 1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.50	90.97

ROAD (0.00 + 42.07 + 49.99) = 50.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	48	0.35	65.75	0.00	-5.05	-1.77	0.00	0.00	-16.85
42.07									

48	90	0.66	65.75	0.00	-6.23	-9.53	0.00	0.00	0.00
49.99									

Segment Leq : 50.64 dBA

Total Leq All Segments: 50.64 dBA

Results segment # 1: Street 1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.50	90.97

ROAD (0.00 + 34.48 + 42.40) = 43.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	48	0.35	58.16	0.00	-5.05	-1.77	0.00	0.00	-16.85
34.48									

48	90	0.66	58.16	0.00	-6.23	-9.53	0.00	0.00	0.00
42.40									

Segment Leq : 43.05 dBA

Total Leq All Segments: 43.05 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 50.64
(NIGHT) : 43.05

STAMSON 5.0 NORMAL REPORT Date: 03-10-2019 12:57:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 118224.te Time Period: Day/Night 16/8 hours
Description: OLAR3-Unattenuated

Road data, segment # 1: Street 1 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Street 1 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 34.90 / 34.90 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 5.25 m
Elevation : 0.00 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 89.66 m
Receiver elevation : 89.38 m
Barrier elevation : 89.51 m
Reference angle : 0.00

Results segment # 1: Street 1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.39	90.90

ROAD (0.00 + 43.98 + 0.00) = 43.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.35	65.75	0.00	-4.93	-0.87	0.00	0.00	-15.97
43.98									

Segment Leq : 43.98 dBA

Total Leq All Segments: 43.98 dBA

Results segment # 1: Street 1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	4.14	93.65

ROAD (0.00 + 43.73 + 0.00) = 43.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.26	58.16	0.00	-4.60	-0.67	0.00	0.00	-9.15
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Segment Leq : 43.73 dBA

Total Leq All Segments: 43.73 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 43.98
(NIGHT) : 43.73

STAMSON 5.0 NORMAL REPORT Date: 03-10-2019 12:51:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 118224.te Time Period: Day/Night 16/8 hours
Description: ILER1 (D)-Unattenuated

Road data, segment # 1: Street 1 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Street 1 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 17.40 / 17.40 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 0.00 m
Elevation : 0.00 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 89.78 m
Receiver elevation : 89.71 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Street 1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	91.22	91.22

ROAD (0.00 + 63.22 + 0.00) = 63.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq									

-90	90	0.66	65.75	0.00	-1.07	-1.46	0.00	0.00	-0.00
63.22*									
-90	90	0.66	65.75	0.00	-1.07	-1.46	0.00	0.00	0.00
63.22									

* Bright Zone !

Segment Leq : 63.22 dBA

Total Leq All Segments: 63.22 dBA

Results segment # 1: Street 1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	93.70	93.70

ROAD (0.00 + 55.84 + 0.00) = 55.84 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.57	58.16	0.00	-1.01	-1.30	0.00	0.00	-0.00
55.84*									
-90	90	0.57	58.16	0.00	-1.01	-1.30	0.00	0.00	0.00
55.84									

* Bright Zone !

Segment Leq : 55.84 dBA

Total Leq All Segments: 55.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 63.22
(NIGHT) : 55.84

STAMSON 5.0 NORMAL REPORT Date: 03-10-2019 12:52:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 118224.te Time Period: Day/Night 16/8 hours
Description: ILER1 (S)-Unattenuated

Road data, segment # 1: Street 1 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Street 1 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 17.40 / 17.40 m
Receiver height : 4.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 0.00 m
Elevation : 0.00 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 89.78 m
Receiver elevation : 89.71 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Street 1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	93.70	93.70

ROAD (0.00 + 63.44 + 0.00) = 63.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq									

-90	90	0.57	65.75	0.00	-1.01	-1.30	0.00	0.00	-0.00
63.43*									
-90	90	0.57	65.75	0.00	-1.01	-1.30	0.00	0.00	0.00
63.44									

* Bright Zone !

Segment Leq : 63.44 dBA

Total Leq All Segments: 63.44 dBA

Results segment # 1: Street 1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	93.70	93.70

ROAD (0.00 + 55.84 + 0.00) = 55.84 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq									
-90	90	0.57	58.16	0.00	-1.01	-1.30	0.00	0.00	-0.00
55.84*									
-90	90	0.57	58.16	0.00	-1.01	-1.30	0.00	0.00	0.00
55.84									

* Bright Zone !

Segment Leq : 55.84 dBA

Total Leq All Segments: 55.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 63.44
(NIGHT) : 55.84

STAMSON 5.0 NORMAL REPORT Date: 03-10-2019 12:55:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 118224.te Time Period: Day/Night 16/8 hours
Description: ILER2 (D)-Unattenuated

Road data, segment # 1: Street 1 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Street 1 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.50 / 15.50 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 0.00 m
Elevation : 0.00 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 89.51 m
Receiver elevation : 89.52 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Street 1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	91.02	91.02

ROAD (0.00 + 64.06 + 0.00) = 64.06 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq									
-90	90	0.66	65.75	0.00	-0.24	-1.46	0.00	0.00	-0.00
64.06*									
-90	90	0.66	65.75	0.00	-0.24	-1.46	0.00	0.00	0.00
64.06									

* Bright Zone !

Segment Leq : 64.06 dBA

Total Leq All Segments: 64.06 dBA

Results segment # 1: Street 1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	93.44	93.44

ROAD (0.00 + 56.63 + 0.00) = 56.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq									

-90	90	0.57	58.16	0.00	-0.22	-1.30	0.00	0.00	-0.00
56.63*									
-90	90	0.57	58.16	0.00	-0.22	-1.30	0.00	0.00	0.00
56.63									

* Bright Zone !

Segment Leq : 56.63 dBA

Total Leq All Segments: 56.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.06
(NIGHT): 56.63

STAMSON 5.0 NORMAL REPORT Date: 03-10-2019 12:56:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 118224.te Time Period: Day/Night 16/8 hours
Description: ILER2 (S)-Unattenuated

Road data, segment # 1: Street 1 (day/night)

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 8000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Street 1 (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.50 / 15.50 m
Receiver height : 4.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 0.00 m
Elevation : 0.00 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 89.51 m
Receiver elevation : 89.52 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Street 1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	93.44	93.44

ROAD (0.00 + 64.22 + 0.00) = 64.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.57	65.75	0.00	-0.22	-1.30	0.00	0.00	-0.00
64.22*									
-90	90	0.57	65.75	0.00	-0.22	-1.30	0.00	0.00	0.00
64.22									

* Bright Zone !

Segment Leq : 64.22 dBA

Total Leq All Segments: 64.22 dBA

Results segment # 1: Street 1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	93.44	93.44

ROAD (0.00 + 56.63 + 0.00) = 56.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq									
-90	90	0.57	58.16	0.00	-0.22	-1.30	0.00	0.00	-0.00
56.63*									
-90	90	0.57	58.16	0.00	-0.22	-1.30	0.00	0.00	0.00
56.63									

* Bright Zone !

Segment Leq : 56.63 dBA

Total Leq All Segments: 56.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 64.22
(NIGHT) : 56.63

Appendix C
Correspondence and Noise Assessment Excerpts (By Others)

NOISE IMPACT STUDY
HALO CAR WASH
3604 INNES ROAD
OTTAWA, ONTARIO

FOR

BICORP DESIGN GROUP LTD.

BY


HOWARD R. PATLIK, C.E.T.



CHECKED BY


JOHN E. COULTER, B.A.Sc., P.ENG.



J.E. COULTER ASSOCIATES LIMITED
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APRIL 18, 2019

1. INTRODUCTION

At the request of Bicorp Design Group Ltd., J.E. COULTER ASSOCIATES LIMITED has reviewed the Site Plan for the proposed development of a car wash facility at 3604 Innes Road in Ottawa, Ontario (see Appendix A, Figure 1). The development includes a new tunnel car wash and a central vacuum system with 21 vacuum stands (see Appendix A, Figure 2). The purpose of this review is to identify any potential noise impacts from the operation of the proposed car wash facility on the existing residential neighbourhood. This report will establish whether or not any noise control measures are necessary to satisfy the noise guidelines of the City of Ottawa (By-law 2017-255) and the Ministry of the Environment, Conservation & Parks (MECP) *NPC-300* guideline.

2. DESCRIPTION OF SITE AND SURROUNDING NEIGHBOURHOOD

This report will focus on the proposed car wash building and vacuum cleaner system for their potential noise impact on the neighbourhood (see Appendix A, Figure 2). There is a residential development (two-storey dwellings) directly to the north of the proposed site. The closest dwellings are approximately 60m from the entrance to the car wash. These are the only identified points of reception that may be impacted from this proposed operation

The proposal for the site includes the following:

- i. A tunnel car wash with the entrance on the north side of the building (Innes Road) and exit on the south side. Vehicles will queue in an L-shaped line along the east side of the site. The analysis assumed a maximum of 32 idling cars in the car wash queue as a worst-case scenario.
- ii. A central vacuum system (mechanical room with silenced exhaust) to accommodate 21 vacuum bays and nozzles along the western part of the site. The sound of the nozzle at the vehicles was also considered.

3. NOISE CRITERIA

The permissible sound levels generated by a car wash facility and the retail store are governed by MECP's *NPC-300* Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (see Appendix C). MECP's noise guideline basically states that the average sound level generated by a stationary source should not exceed the average noise of the roadway traffic during the same hourly time period, as noted in Table 1, below.

We note that the City of Ottawa has a Noise By-law 2017-255 referencing the operation of a commercial car wash. It is stated as follows:

No person shall use or operate or cause to be used or operated any exhaust fan, exhaust system, intake fan, generators, dryer in a commercial car wash or similar device which includes combustion exhaust of a high efficiency furnace, the noise from which has a level greater than 50 dB(A) when measured at the point of reception.

This is equivalent to MECP *NPC-300* daytime exclusion limit of 50 dB L_{eq} or the ambient traffic noise, whichever is higher.

The points of reception considered for potential noise impact are as follows (see also Appendix A, Figure 3):

Receiver R1: 3592 Innes Road – Front façade of dwelling west of car wash facility.

Receiver R2: 3592 Innes Road – Rear yard of bungalow located directly west of the proposed car wash facility.

Receiver R3: 3581 Innes Road – Two-storey dwelling, northwest of car wash entrance.

Receiver R4: Glenview Properties – Proposed Residential development including a potential 6-storey apartment building. The north façade may be as close as 1.5m from the common property line (south of the car wash exit).

These points of reception are the closest and most sensitive receivers to the proposed car wash facility.

Table 1 summarizes the ambient traffic noise at the various points of reception at different times of the day when the car wash is in operation (0800-2000 hours) (see Appendix C, Traffic Data). Based on traffic data provided by the City of Ottawa (see Appendix D), the quietest ambient sound levels were calculated at the points of reception when the car wash and vacuums are in operation (0800-2000 hours).

Table 1: Noise Criteria at Receivers			
Receptor Location	Time Period	Quietest Sound Level (dB L_{eq} 1 hr.)	MECP Exclusion Limit
R1 (Rear yard)	0800-2000	50	50
R2 (Front Façade)	0800-2000	61	50
R3 (Front Façade)	0800-2000	61	50
R4 (North Façade)	0800-2000	50	50

4. POTENTIAL NOISE SOURCES AND IMPACT AREAS

The activities within this site that have the potential for noise concern are those involved with the operation of the car wash, in particular, the sound generated by the dryers travelling down the tunnel and exiting from the car wash entrance and exit, the vacuum cleaners, and the idling vehicles in the car wash queuing line.

For this study, the following assumptions were made for the equipment:

Table 2: Sound Levels of Car Wash Equipment	
Equipment	Sound Pressure Level
IDS Dryer System (55 Hz)	66 dBA @1m
Central Vacuum (Mechanical Room, 30 HP motor with exhaust silencer)	74 dBA @3m (free-field), including +5 dB for tonality
Vacuum Nozzle	73 dBA @1m

Note: Final equipment selection to be confirmed.

The car wash's mechanical equipment (vacuum motor) is located in the mechanical room, along the west side of the site. The doors to the mechanical room are to be fully weather-stripped.

5. PROJECTED SOUND LEVELS

The site plan indicates the activities at the car wash entrance will be fully or partially exposed to the residential units. The calculations include the directivity of the sound from the car wash building. The sound calculations were conducted using Cadna/A 3D modelling software (Version 2019) based on the ISO-9613-2 standard for stationary sound sources. The sound level data have been projected to the closest sensitive points of reception (R1 to R4) in order to determine if any noise impact can be expected (see Appendix A, Figure 3).

The analysis was based on the following assumptions:

Daytime (0800-2000 Hours)

1. Continuous operation of the car wash; entrance and exit doors are open during the wash and dry cycles.
2. The 21 vacuums are each used equivalent to 45 minutes per hour.
3. 32 idling vehicles in the car wash queue.

Evening and Nighttime (1900-2300 Hours)

1. No operation between 2000 hours and 0800 hours the next day.

The following tables summarize the anticipated unmitigated (no barriers) sound levels (1 hour L_{eq}) for the above noted operation and compares them to a time when the ambient traffic sound levels are at a minimum, as required by MECP. Appendix B provides detailed sound level calculations for the entire operation and its potential noise impact on the residences. The operation between 0800 and 2000 hours assumes all equipment is operating at or near full capacity (see Appendix A, Figure 3).

Table 3: Points-Of-Reception Noise Impact (Unmitigated) Daytime (0800-2000 Hours)				
Source ID	R1	R2	R3	R4
	Sound Level (L_{eq})	Sound Level (L_{eq})	Sound Level (L_{eq})	Sound Level (L_{eq})
Idling Vehicles at Car Wash (32)	37.8	41.1	37.2	40.2
Car Wash Entrance	22.3	30.8	26.5	21.4
Car Wash Exit	2.1	7.7	-2.2	46.5
Vacuum Nozzles (21)	42.0	55.4	41.0	48.4
Central Vacuum Motor, 75% duty cycle	20.8	38.4	18.0	37.2
Total Sound Level (dB L_{eq})	43	56	42	56
Noise Criteria (dBA)	61	50	61	50
Noise Impact (dB)	-18	6	-19	6

The projected unmitigated sound levels of the entire operation (car wash blowers, idling vehicles and vacuum cleaners) will result in a noise impact, if unmitigated, for R2 (rear yard) during the daytime (0800-2000 hours). The unmitigated sound levels at R2 and R4 are expected to be 6 dB above the quietest traffic sound levels during the daytime. The central vacuum system was not found to be a noise concern at any time of the day for any residence. Noise control measures are recommended to meet MECP's *NPC-300* noise guideline.

6. NOISE CONTROL MEASURES

Noise control measures are required to meet MECP's *NPC-300* noise criteria when the car wash is operating during the daytime (0800 to 2000 hours).

To meet MECP's *NPC-300* noise criteria during the daytime, the following measures are recommended:

1. It is recommended that the exit of the car wash building be extended by 3m. To reduce the sound of the blowers, two areas are to be acoustically lined with perforated sheet metal (35% open area) and 50mm thick mineral wool. The walls and ceiling of the 3m building extension are to be lined with this acoustic material (see Appendix A, Figure 5). As well, the walls and ceiling of the area just south of the dryer blowers in the main car wash building are to be lined with the same perforated sheet metal and 50mm mineral wool.

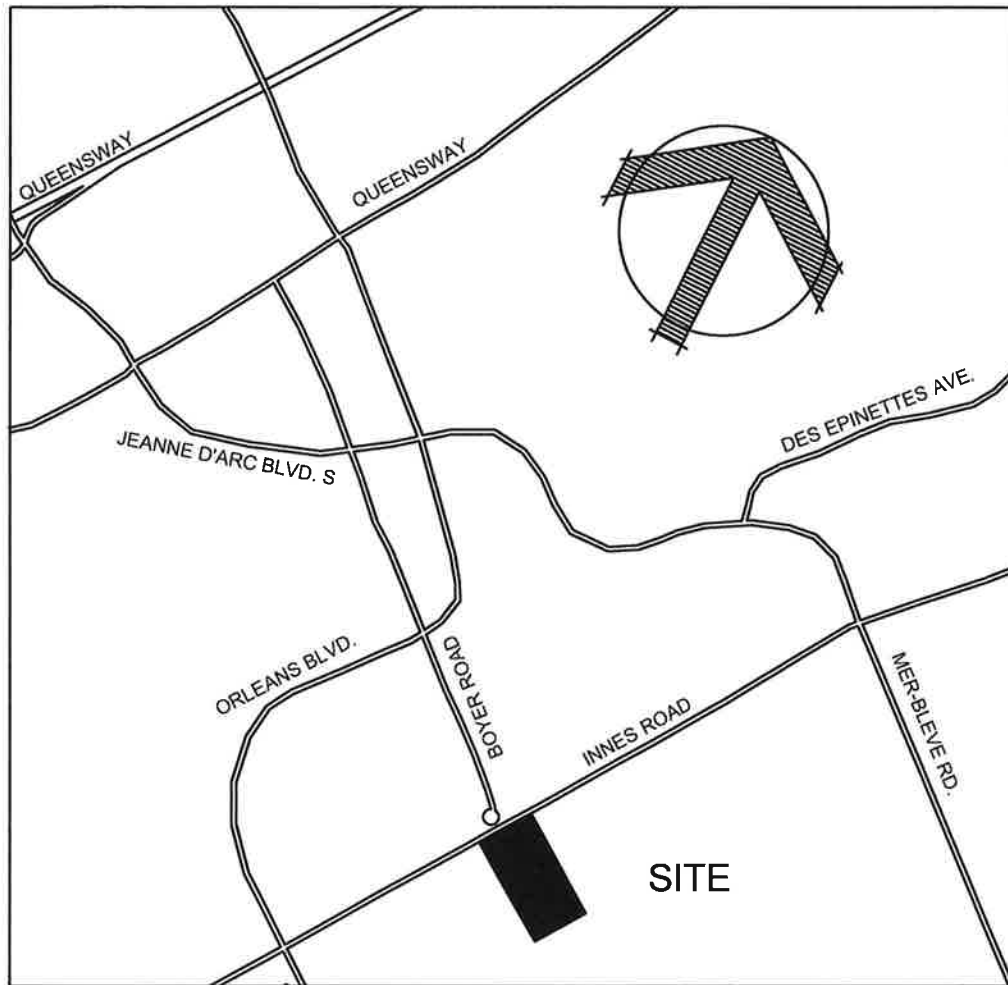
2. The car wash can be operated from 0800 to 2300 hours as per the Town's Noise By-law 113-79. The proponent has indicated the car wash will operate from 0800 to 2000 hours.
3. An acoustic barrier should be constructed at the west side of the property. The height of the acoustic fence is to be 2.1m with a total length of 34m, minimum (see Appendix A, Figure 4). The acoustic fence will commence at the northwest corner of the site and terminate at the mechanical room (vacuum system). There is no acoustic benefit to extending the 2.1m high acoustic fence to the garbage carol area as the sound level will not be reduced in the OLA of R1.
4. The mechanical room (block construction) for the central vacuum motor is to be designed so that the exhaust louvres face east, away from the residential dwelling to the west. The vacuum motor is to be connected to an acoustically lined duct inside the mechanical building.

With the 2.1m high barrier in place at the car wash, the following sound levels are expected (see Appendix A, Figure 4):

Table 4: Points-of-Reception Noise Impact (Noise Control Measures) Daytime (0800-2000 Hours)				
Source ID	R1	R2	R3	R4
	Sound Level (L_{eq})	Sound Level (L_{eq})	Sound Level (L_{eq})	Sound Level (L_{eq})
Idling Vehicles at Car Wash (27)	37.8	35.7	37.2	40.2
Car Wash Entrance	22.3	14.3	26.5	21.4
Car Wash Exit	-1.7	1.3	-5.7	43.6
Vacuum Nozzles (21)	41.6	48.2	40.8	48.4
Central Vacuum Motor, 75% duty cycle	20.5	33.5	18.0	37.2
Total Sound Level (dB L_{eq})	43	49	43	49
Noise Criteria (dBA)	57	50	58	50
Noise Impact (dB)	-14	- 1	-15	- 1

With the recommended noise control measures (extended exit of car wash building and 2.1m high acoustic barrier, 34m long west of the car wash building as shown in Appendix A, Figure 4) in place for the car wash, the proposed development will meet MECP's *NPC-300* noise criteria

APPENDIX A: FIGURES



KEY PLAN

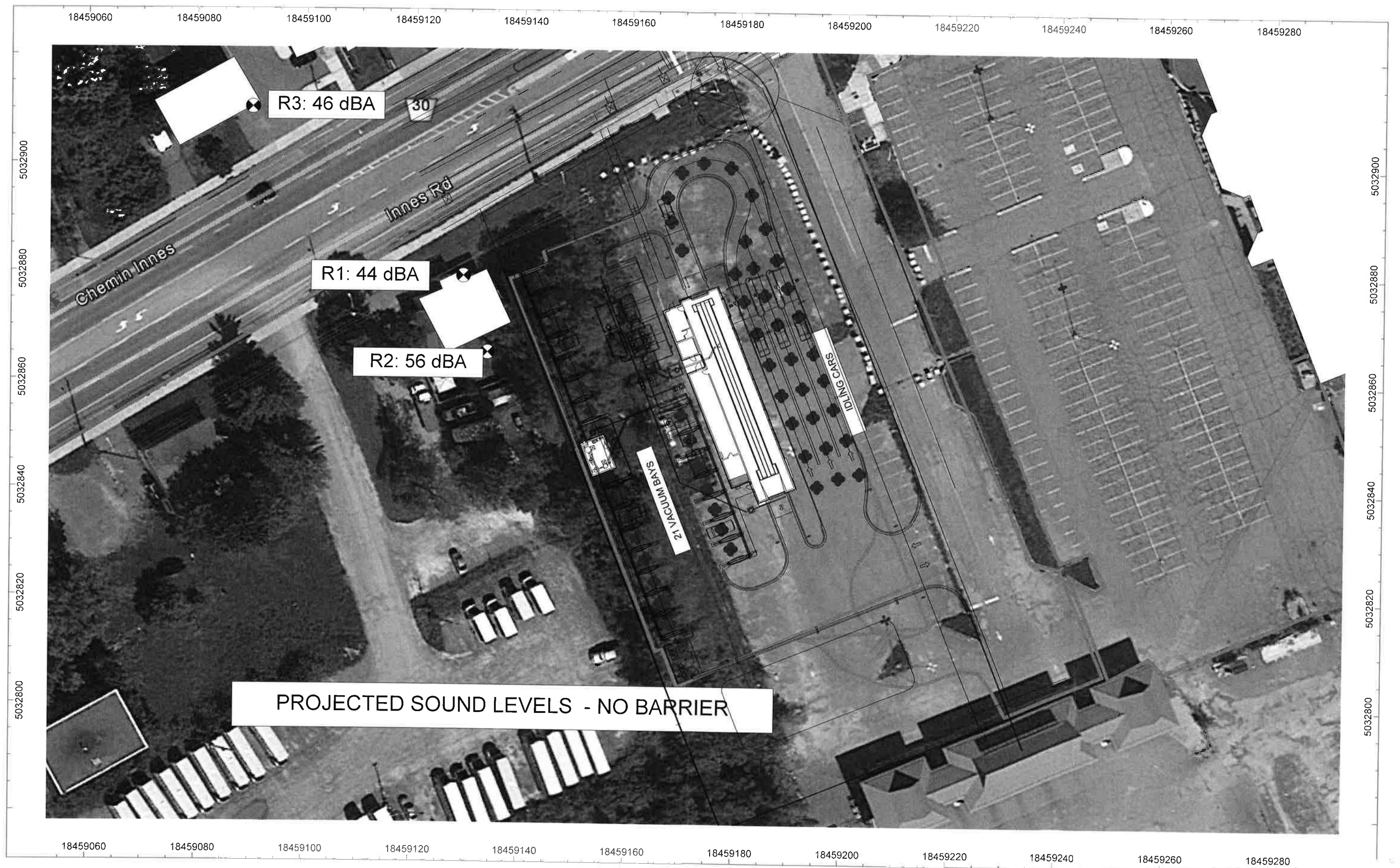


FIGURE 3

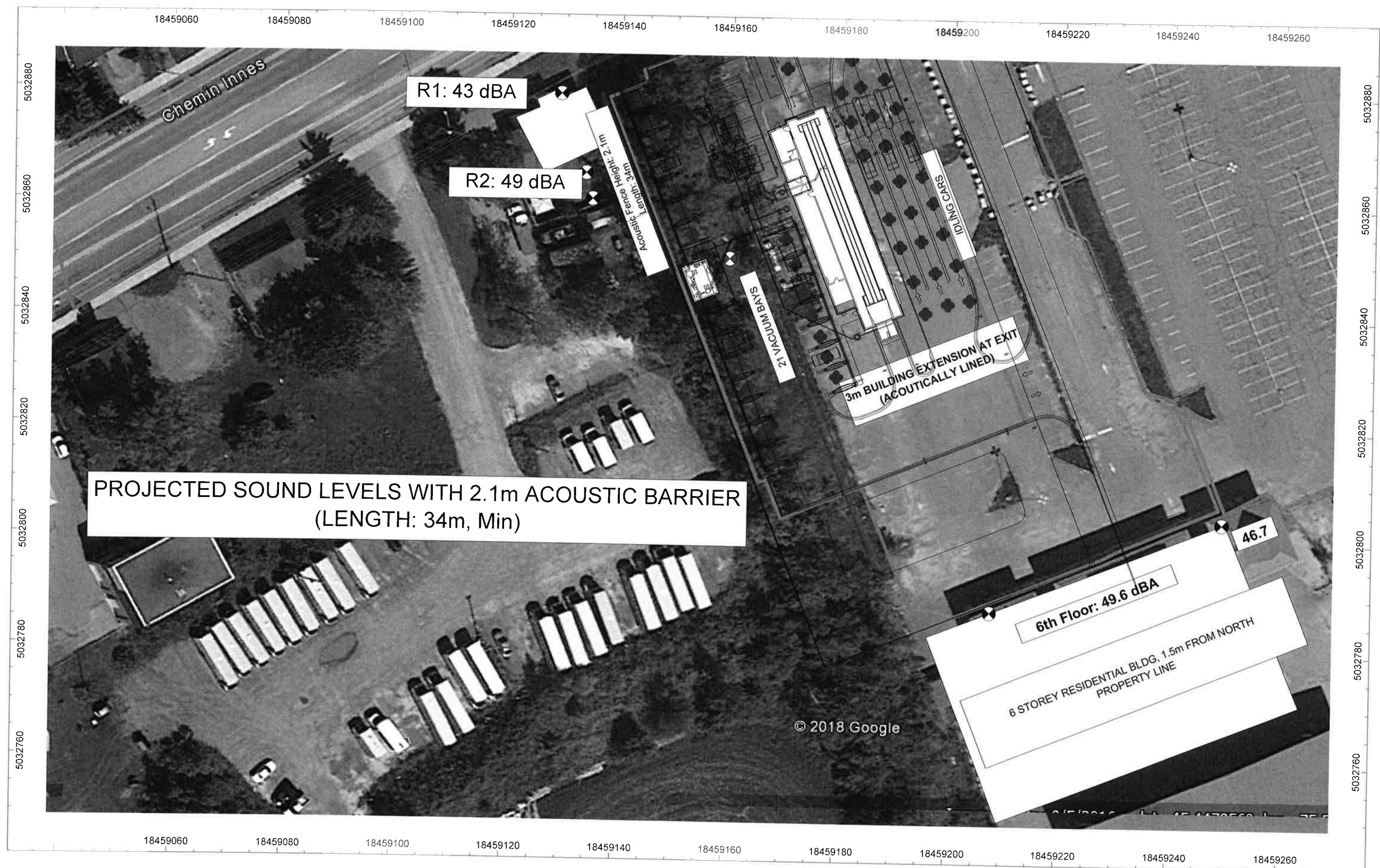


FIGURE 4

Enclosures

118224-NC1
CD

Noise Control Plan (surface transportation noise)
Report and Drawings

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