

2112 BEL-AIR DRIVE
NOISE CONTROL FEASIBILITY STUDY



Prepared for:

UNIFORM URBAN DEVELOPMENTS LTD.
Suite 300, 117 CentrepoinTE Drive
Ottawa, Ontario
K2G 5X3

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

December 6, 2019

Novatech File: 119000
Ref: R-2019-204

December 6, 2019

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

Attention: **Laurel McCreight, MCIP, RPP
Planner**

**Justin Armstrong, E.I.T.
Engineering Intern**

Reference: **2112 Bel-Air Drive
Noise Control Feasibility Study
Novatech File No.: 119000**

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 development at 2112 Bel-Air Drive.

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

/bs

cc: Annibale Ferro, Uniform Urban Developments Ltd.

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1.0 INTRODUCTION

This report addresses the approach to site noise control for the development at 2112 Bel-Air Drive (Subject Site), which is being proposed by Uniform Urban Developments Ltd. (Developer).

The Subject Site is located at the south-east corner of the Field Street and Bel-Air Drive intersection, as shown on **Figure 1.1** – Key Plan. The site is bound to the north by Bel-Air Drive, south and east by open space owned by the National Capital Commission (NCC), and to the west by existing residences fronting Field Street.

The Subject Site has an area of 0.81 ha, and the proposed development will comprise of 25 row townhome units. The development will contain a private road with a 6.7-metres-wide paved surface. The proposed site plan is shown on **Figure 1.2** – Site Plan.

Novatech has been retained by Uniform Urban Developments 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.

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.

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, Highway 417 is considered a Provincial Highway and is within 500 m of the Subject Site, thus requiring analysis. Woodroffe Avenue to the west is considered an arterial but is greater than 100 m from the Subject Site. Iris Street to the south is considered a collector road but is also greater than 100 m from the Subject Site.

See markup of the Schedule E, Urban Road Network, highlighting the Subject Site location in **Appendix A**.

For aircraft noise, the City of Ottawa and the Ottawa International Airport Authority have defined the noise contours using the Noise Exposure Forecast (NEF) and Noise Exposure Projection (NEP) methods. The noise contours define the Airport Operating Influence Zone (AOIZ) and Airport Vicinity

SITE

HWY 417 / QUEENSWAY

BEL-AIR DR

FIELD ST

DUBLIN AV



NOVATECH

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

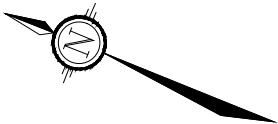
CITY OF OTTAWA
2112 BEL-AIR DRIVE

KEY PLAN

SCALE NOT TO SCALE

DATE	DEC 2019	JOB	119000	FIGURE	1.1
------	----------	-----	--------	--------	-----

NCC LANDS



6m WIDE EASEMENT

BEL-AIR DRIVE

PRIVATE ROAD

NCC LANDS

3m WIDE EASEMENT

UP

NOVATECH

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Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
2112 BEL-AIR DRIVE

SITE PLAN

SCALE 1 : 500 0 5m 10m 20m

DATE DEC 2019 JOB 119000 FIGURE 1.2

Development Zone (AVDZ) as illustrated on Schedule K, Environmental Constraints, in the OP. Annex 10 of the OP further details the Noise Exposure Projection (NEP) areas of the Macdonald-Cartier Airport for planning purposes. The Subject Site is located just outside the AVDZ.

See markup of the Annex 10, Land Use Constraints Due to Aircraft Noise, highlighting the Subject Site location in **Appendix A**.

Based on the foregoing, this study considers one noise source;

- Surface transportation noise from Highway 417 / Queensway, classified as Provincial Highway on Schedule E, Urban Road Network, in the OP;

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 night-time 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 Development Agreement(s) and Agreement(s) of Purchase and Sale of prospective home buyers, all of which will be registered on title.

3.0 NOISE SOURCES

3.1 Surface Transportation – Highway 417 / Queensway (Noise Source 1)

Highway 417 is classified as a Provincial Highway as per the 2013 Transportation Master Plan (TMP). At this particular section of Highway 417 there are 8-lanes for travel; therefore, for this study it was modelled as an 8-lane highway. The parameters to be used for sound level predictions are outlined in the ENCG (Appendix B, Table B1). The roadway noise parameters are summarized below in **Table 3.1**.

Table 3.1: Highway 417, 8-Lane Highway Traffic and Road Parameters

Roadway Parameters	Highway 417, 8-Lane Highway
Roadway Classification	Freeway, Queensway, Highway
Annual Average Daily Traffic (AADT)	18,333 vehicles/day/lane or 146,664 vehicles/day
Posted Speed	100 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, one point of reception was implemented at the critical OLA and one point of reception was implemented at the critical ILE. Refer to the noise control plan provided for 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**. Screening from the existing 4.8 m high noise barrier along the perimeter of the 417 Highway was included in this noise assessment. For the purpose of this report, the tabulated noise level summaries provided in the subsequent sections assume the existing 4.8 m high noise barrier to be an unattenuated condition. To be conservative, no further screening from existing buildings or vegetation surrounding the development was included in this noise assessment.

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)
Outdoor Living Areas										
R1	S1	-90	90	-90	90	185.2	161.6	78.90	79.50	78.90
Indoor Living Environments										
R1	S1	-90	90	-90	90	183.0	159.3	78.90	79.50	78.90

Notes:

- (1) Refer to Figure 119000-NC 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} (146,664 vpd)	On-site Attenuated L_{eq} (146,664 vpd)	Off-site Attenuated L_{eq} (146,664 vpd)	Noise Barrier Reference
	OLA-16	OLA-16	OLA-16	
R1	59.28	54.87	57.51	No noise barrier proposed.

Notes:

- (1) Refer to Figure 119000-NC 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 maximum tolerable OLA noise levels when left unattenuated. Refer to further discussions in Section 5.1 of this report.

For comparison, a 6.5 m high noise barrier (onsite attenuated condition) would need to be installed within the property limits to meet the target noise level for the OLA. Also for comparison, if the existing noise barrier (offsite attenuated condition) was increased to a height of 10.0 m the noise level predictions would still exceeds the target noise level for the OLA. In our opinion, neither options are practical nor desirable.

Table 4.3: ILE Noise Level Summary

Receiver	Unattenuated L_{eq} (146,664 vpd)		
	ILED-16	ILES-16	ILES-8
R1	59.36	61.17	53.58

Notes:

(1) Refer to Figure 119000-NC 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

As shown in the table in Section 4.2, when left unattenuated the noise levels at the specified OLAs remain below the maximum tolerable OLA noise level of 60 dBA.

In our opinion, the requirement of a noise barrier for the Subject Site is avoidable based on the following factors:

- Bel-Air Drive is classified as a 2-Lane Urban Local as per the 2013 TMP and is not currently a bus route.
- A 6.5 m high noise barrier (onsite attenuated condition) would need to be installed within the property limits to meet the target noise level for the OLA.
- If the existing noise barrier (offsite attenuated condition) was increased to a height of 10.0 m the noise level predictions would still exceed the target noise level for the OLA.
- As per the ENCG 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 unattenuated results of the STAMSON environmental noise software calculation were 59.28 dBA – under the maximum tolerable OLA noise level of 60 dBA.

- Given the Subject Site is located just outside the AVDZ and the 25 NEF/NEP defined noise contour (which is equivalent to a noise level of 57 dBa), the aircraft noise is close to the required 55 dBa.
- As per the ENCG acoustic barriers (also called noise walls) help to contain sound but they also separate communities; they interfere with the movement and views of people and wildlife, and they separate neighbourhoods. Acoustic barriers also decrease a feeling of safety in neighbourhoods and can be a barrier to community cohesiveness. With the goal of building livable communities, acoustic barriers should be avoided under most circumstances. Acoustic barriers should only be used when other noise control measures have been considered and there is no other alternative.

5.2 Indoor – Proposed Building Component Assessment

When ILE noise levels exceed the ENCG day-time or night-time criteria, the exterior shell system of the building envelope must be acoustically assessed to ensure the indoor noise criteria is achieved for the surface transportation noise sources. Based on the results in Section 4.2 of this report, in the proposed development the sound levels at the ILE receiver locations falls above the day-time and night-time allowances.

Thus, in order to meet the desired indoor noise levels as shown above in **Table 2.1** and **Table 2.2**, building components must provide a 16.17 dBa reduction to the noise levels from the surface transportation noise source.

Per common industry practice, buildings built in conformance with the Ontario Building Code (OBC) typically provide a 25 dBa reduction to the noise levels. As such, if the buildings are built to provide exterior wall, window and patio door, roof and ceiling, and exterior door component assemblies to meet the prescribed requirements of the OBC, no further assessment on the building envelope is required.

5.3 Provision for Central Air Conditioning

To provide indoor isolation and avoid noise intrusion through open windows or doors, it is proposed that the forced air ventilation system be sized to accommodate the installation of a central air conditioning system for Blocks 1-7 (inclusive). This will allow the homeowners to install central air conditioning systems and keep the windows and exterior doors closed, if desired, ensuring the indoor sound levels are within the noise criteria.

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.

Generic warning clauses from the ENCG for surface transportation are listed below. **Table 5.2** provides a tabulated approach to summarize warning clauses required for each Block.

Warning Clause Type 'A'

"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

Warning Clause Type 'B'

"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road and transitway traffic may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria."

Warning Clause Type 'C'

"This dwelling unit has been fitted with a forced air heating system and the ducting, etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.)"

Warning Clause Type 'D'

"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria."

Table 5.1: Warning Clause Summary

Location	Warning Clauses
Block 2	Combination of Type A and C
Blocks 1 and 3-7 (inclusive)	Type C

In order to simplify the required warning clauses for the effected units, refer to the Section 6.0 Conclusions and Recommendations for a consolidated warning clause version.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This study confirms the predicted outdoor noise levels for the proposed residential development from the adjacent Highway 417 are in excess of the City of Ottawa's required criteria, however are below the maximum tolerance per the ENCG. To mitigate the use of a noise barrier, noise levels, and to inform potential buyers/tenants, the following measures are being proposed:

Block 2

- Provide exterior wall, window and patio door, roof and ceiling, and exterior door component assemblies to meet the prescribed requirements of the OBC.
- For all the aforementioned units, the inclusion of the warning clause below is recommended:

“Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City’s and the Ministry of the Environment’s noise criteria.

This dwelling unit has been fitted with a forced air heating system and the ducting, etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City’s and the Ministry of the Environment’s noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.)”

Blocks 1 and 3-7 (inclusive)

- Provide exterior wall, window and patio door, roof and ceiling, and exterior door component assemblies to meet the prescribed requirements of the OBC.

For all the aforementioned units, the inclusion of the warning clause below is recommended:

“This dwelling unit has been fitted with a forced air heating system and the ducting, etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City’s and the Ministry of the Environment’s noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property.)”

Given the Phase 1 Noise Control Feasibility Study concludes that no further noise mitigations are required for outdoor and indoor livings areas, and the required warning clauses have been identified; therefore, a Phase 2 Detailed Noise Control Study is not warranted.

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

NOVATECH

Prepared by:



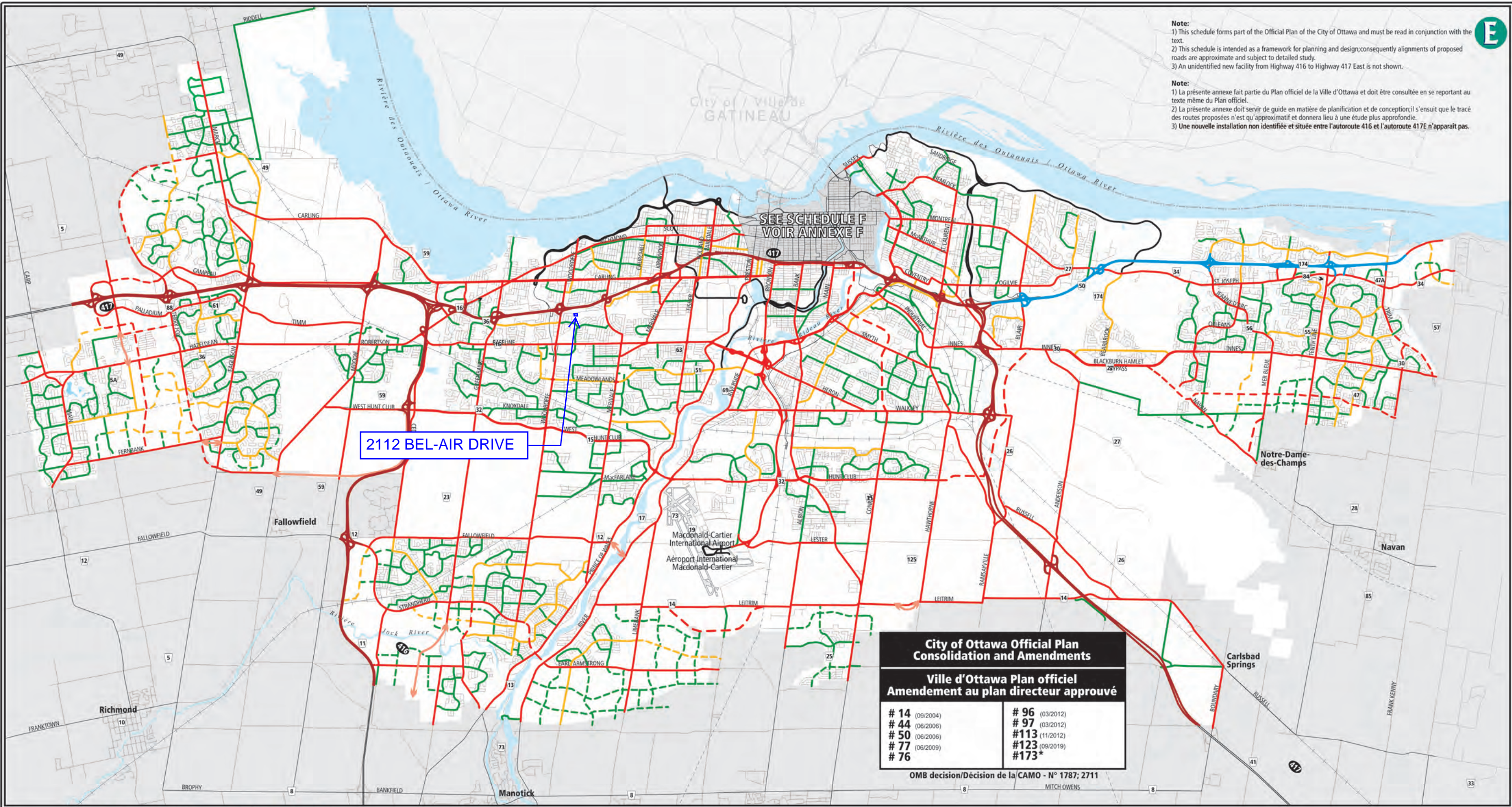
Ben Sweet, P.Eng.
Project Engineer | Land Development

Reviewed by:



Bassam Bahia, M.Eng., P.Eng.
Project Manager | 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)	# 96	(03/2012)
# 44	(06/2006)	# 97	(03/2012)
# 50	(06/2006)	# 113	(11/2012)
# 77	(06/2009)	# 123	(09/2019)
# 76		# 173*	

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

Official Plan - Schedule E
Urban Road Network

Plan officiel - Annexe E
Routes Arterial - Urbain

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

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

Provincial Highway
City Freeway

Federally Owned Road
Existing
Proposed
(Alignment defined)

Route provinciale
Autoroute de ville

Chemins de propriété fédéral
Établie
Proposé
(Alignement déterminée)

Arterials
Existing
Proposed
Conceptual
(Alignment Undefined)

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

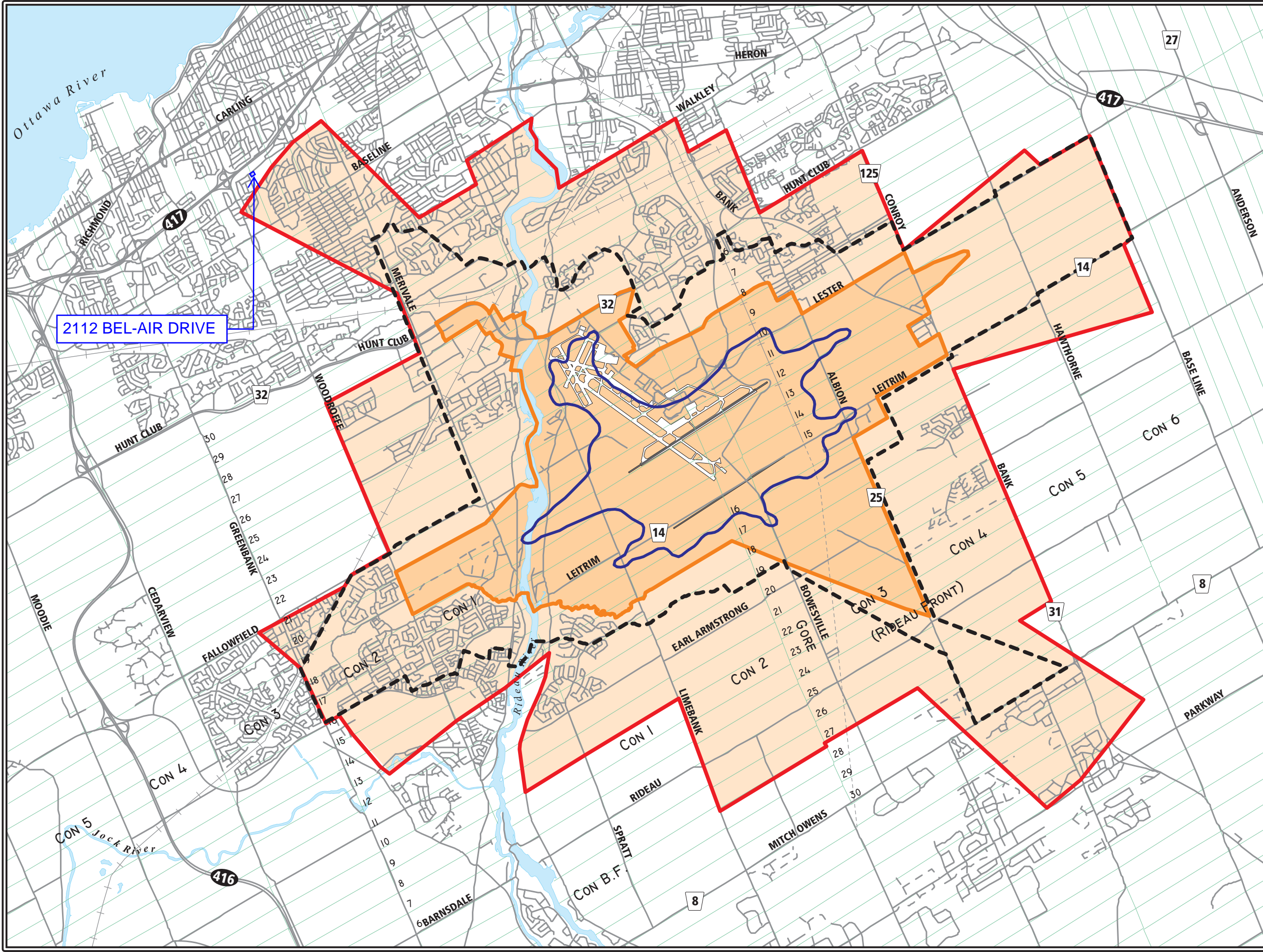
Major Collectors
Existing
Proposed

Grande collectrice
Établie
Proposé

Collectors
Existing
Proposed

Collectrice
Établie
Proposé

Scale / Échelle
2km 1 0 1 2 3 4km








**OFFICIAL PLAN -
ANNEX 10
Land Use Constraints
Due to Aircraft Noise**

Prepared by: City of Ottawa,
Department of Planning, Transit and the Environment,
September 2011

**PLAN OFFICIEL -
APPENDICE 10
Contraintes limitant
l'utilisation en raison
du bruit des avions**

Préparé par : Ville d'Ottawa,
Le Service de l'urbanisme, du transport en commun et de l'environnement,
septembre 2011

-  Airport Vicinity Development Zone
Zone d'aménagement dans le voisinage de l'aéroport
-  25 Line (Composite of 25 NEF/NEP)
Ligne 25 (ensemble des courbes NEF et NEP 25)
-  35 Line Noise Exposure Protection (NEP 2023)
Ligne 35 : prévisions à long terme de l'ambiance sonore (NEP 2023)
-  Airport Zoning Regulations
Règlements de zonage applicables à de l'Aéroport
-  Airport Operating Influence Zone
Zone d'influence d'exploitation de l'aéroport

Note:
The boundaries of the Ottawa Airport Operating Influence Zone and the Airport Vicinity Development Zone, are not subject to interpretation and their precise locations should be read from a map at a scale of 1:50,000 available from the City of Ottawa and the Ottawa International Airport Authority.

Scale / Échelle
1km 0 1 2 3 km



Appendix B
STAMSON Noise Modelling Results

STAMSON 5.0 NORMAL REPORT Date: 03-12-2019 10:14:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: olar1.te Time Period: Day/Night 16/8 hours
Description: Outdoor Living Area R1 (Unattenuated - Existing Noise Barrier)

Road data, segment # 1: HWY417 (day/night)

Car traffic volume : 118739/10325 veh/TimePeriod *
Medium truck volume : 9445/821 veh/TimePeriod *
Heavy truck volume : 6747/587 veh/TimePeriod *
Posted speed limit : 100 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): 146664
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: HWY417 (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 : 185.20 / 185.20 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 4.80 m
Elevation : 0.60 m
Barrier receiver distance : 161.60 / 161.60 m
Source elevation : 78.90 m
Receiver elevation : 79.50 m
Barrier elevation : 78.90 m
Reference angle : 0.00

Results segment # 1: HWY417 (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	1.57	80.47

ROAD (0.00 + 59.28 + 0.00) = 59.28 dBA

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

-90	90	0.35	84.41	0.00	-14.78	-0.89	0.00	0.00	-9.46
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Segment Leq : 59.28 dBA

Total Leq All Segments: 59.28 dBA

Results segment # 1: HWY417 (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	1.95	80.85

ROAD (0.00 + 53.49 + 0.00) = 53.49 dBA

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

-90	90	0.26	76.81	0.00	-13.80	-0.69	0.00	0.00	-8.83
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Segment Leq : 53.49 dBA

Total Leq All Segments: 53.49 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.28
(NIGHT): 53.49

STAMSON 5.0 NORMAL REPORT Date: 03-12-2019 10:17:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: iler1.te Time Period: Day/Night 16/8 hours
Description: Indoor Living Environment Living/Dining/Den Areas R1
(Unattenuated - Existing Noise Barrier)

Road data, segment # 1: HWY417 (day/night)

Car traffic volume : 118739/10325 veh/TimePeriod *
Medium truck volume : 9445/821 veh/TimePeriod *
Heavy truck volume : 6747/587 veh/TimePeriod *
Posted speed limit : 100 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): 146664
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: HWY417 (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 : 183.00 / 183.00 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 4.80 m
Elevation : 0.60 m
Barrier receiver distance : 159.30 / 159.30 m
Source elevation : 78.90 m
Receiver elevation : 79.50 m
Barrier elevation : 78.90 m
Reference angle : 0.00

Results segment # 1: HWY417 (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	1.57	80.47

ROAD (0.00 + 59.36 + 0.00) = 59.36 dBA

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

-90	90	0.35	84.41	0.00	-14.71	-0.89	0.00	0.00	-9.45
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Segment Leq : 59.36 dBA

Total Leq All Segments: 59.36 dBA

Results segment # 1: HWY417 (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	1.96	80.86

ROAD (0.00 + 53.58 + 0.00) = 53.58 dBA

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

-90	90	0.26	76.81	0.00	-13.73	-0.69	0.00	0.00	-8.81
53.58									

Segment Leq : 53.58 dBA

Total Leq All Segments: 53.58 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.36
(NIGHT): 53.58

STAMSON 5.0 NORMAL REPORT Date: 03-12-2019 10:18:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: iler1.te Time Period: Day/Night 16/8 hours
Description: Indoor Living Environment Sleeping Quarters R1 (Unattenuated
- Existing Noise Barrier)

Road data, segment # 1: HWY417 (day/night)

Car traffic volume : 118739/10325 veh/TimePeriod *
Medium truck volume : 9445/821 veh/TimePeriod *
Heavy truck volume : 6747/587 veh/TimePeriod *
Posted speed limit : 100 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): 146664
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: HWY417 (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 : 183.00 / 183.00 m
Receiver height : 4.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 4.80 m
Elevation : 0.60 m
Barrier receiver distance : 159.30 / 159.30 m
Source elevation : 78.90 m
Receiver elevation : 79.50 m
Barrier elevation : 78.90 m
Reference angle : 0.00

Results segment # 1: HWY417 (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	1.96	80.86

ROAD (0.00 + 61.17 + 0.00) = 61.17 dBA

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

-90	90	0.26	84.41	0.00	-13.73	-0.69	0.00	0.00	-8.81
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Segment Leq : 61.17 dBA

Total Leq All Segments: 61.17 dBA

Results segment # 1: HWY417 (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	1.96	80.86

ROAD (0.00 + 53.58 + 0.00) = 53.58 dBA

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

-90	90	0.26	76.81	0.00	-13.73	-0.69	0.00	0.00	-8.81
53.58									

Segment Leq : 53.58 dBA

Total Leq All Segments: 53.58 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.17
(NIGHT): 53.58

STAMSON 5.0 NORMAL REPORT Date: 06-12-2019 09:34:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: olar2.te Time Period: Day/Night 16/8 hours
Description: Outdoor Living Area R1 (Attenuated - Proposed Noise Barrier)

Road data, segment # 1: HWY417a (day/night)

Car traffic volume : 118739/10325 veh/TimePeriod *
Medium truck volume : 9445/821 veh/TimePeriod *
Heavy truck volume : 6747/587 veh/TimePeriod *
Posted speed limit : 100 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): 146664
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: HWY417a (day/night)

Angle1 Angle2 : -90.00 deg -46.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 185.20 / 185.20 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -46.00 deg
Barrier height : 5.25 m
Elevation : 0.60 m
Barrier receiver distance : 3.00 / 3.00 m
Source elevation : 78.90 m
Receiver elevation : 79.50 m
Barrier elevation : 78.90 m
Reference angle : 0.00

Road data, segment # 2: HWY417b (day/night)

Car traffic volume : 118739/10325 veh/TimePeriod *
Medium truck volume : 9445/821 veh/TimePeriod *
Heavy truck volume : 6747/587 veh/TimePeriod *
Posted speed limit : 100 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): 146664
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: HWY417b (day/night)

Angle1 Angle2 : -46.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 185.20 / 185.20 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -46.00 deg Angle2 : 90.00 deg
Barrier height : 6.50 m
Elevation : 0.60 m
Barrier receiver distance : 6.50 / 6.50 m
Source elevation : 78.90 m
Receiver elevation : 79.50 m
Barrier elevation : 78.90 m
Reference angle : 0.00

Results segment # 1: HWY417a (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	2.09	80.99

ROAD (0.00 + 49.60 + 0.00) = 49.60 dBA

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

-90	-46	0.33	84.41	0.00	-14.49	-7.78	0.00	0.00	-12.54
49.60									

Segment Leq : 49.60 dBA

Results segment # 2: HWY417b (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	2.08	80.98

ROAD (0.00 + 53.34 + 0.00) = 53.34 dBA

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

-46	90	0.25	84.41	0.00	-13.67	-1.69	0.00	0.00	-15.71
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Segment Leq : 53.34 dBA

Total Leq All Segments: 54.87 dBA

Results segment # 1: HWY417a (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	5.04	83.94

ROAD (0.00 + 50.81 + 0.00) = 50.81 dBA

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

-90	-46	0.24	76.81	0.00	-13.50	-7.35	0.00	0.00	-5.14
50.81									

Segment Leq : 50.81 dBA

Results segment # 2: HWY417b (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	4.97	83.87

ROAD (0.00 + 53.42 + 0.00) = 53.42 dBA

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

-46	90	0.16	76.81	0.00	-12.69	-1.54	0.00	0.00	-9.17
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Segment Leq : 53.42 dBA

Total Leq All Segments: 55.32 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.87
(NIGHT): 55.32

Enclosures

119000-NC
CD

Noise Control Plan
Report and Drawings

