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Noise Feasibility Study
Proposed Residential Development
6633 McLeod Road
Niagara Falls, Ontario

Prepared for:

Stefan Boncore
6-302 Merritt Street
St. Catharines, Ontario, L2T 1J9

Prepared by

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Reviewed by

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November 22, 2022

HGC Project No. 02200233

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1 Introduction and Summary

HGC Engineering was retained by Stefan Boncore to conduct a noise feasibility study for a proposed residential development to be located at 6633 McLeod Road in the City of Niagara Falls, Regional Municipality of Niagara, Ontario. The study has been prepared for submission as part of the approval process by the municipality.

Road traffic data for McLeod Road was obtained from HGC Engineering past project files in the area and originally obtained from the Region of Niagara. The data was used to predict future traffic sound levels at the proposed dwellings. The predicted sound levels were compared to the guidelines of the Ministry of the Environment, Conservation and Parks (MECP) and the Region of Niagara.

The sound level predictions indicate that the future road traffic sound levels will exceed MECP guidelines at the proposed dwellings. An acoustic barrier is recommended for the dwelling closest to the McLeod Road. Forced air ventilation with ducts sized for the future installation of air conditioning by the occupant is required for the proposed townhouse block. Any building constructions meeting the minimum requirements of the Ontario Building Code (OBC) will provide sufficient acoustical insulation for the dwelling units. Warning clauses are recommended to inform future residents of the road traffic noise impacts and to address sound level excesses.

2 Site Description and Sources of Sound

A key plan showing the location of the proposed site is indicated in Figure 1. The development is located at 6633 McLeod Road in the City of Niagara Falls, Ontario. The concept plans prepared by Matthew Schmid Architecture dated January 11, 2022 is attached as Figure 2, also showing the prediction locations. Option 2 was used for the purposes of this analysis. The proposed development will consist of one 3-storey townhouse block along with an associated roadway and parking.

A site visit was performed by HGC Engineering personnel in April 2022. The primary source of noise is road traffic on McLeod Road. The surrounding lands are primarily existing residential. Niagara Falls Gospel Hall is located to the northwest of the site. Further to the southwest of the stie and across the road is a small commercial plaza. There are existing residences backing onto this commercial plaza. During the site visit sounds from these stationary sources were not audible at the subject site above road traffic noise. There were no other significant stationary sources of sound within 500 m of the subject site.

3 Criteria for Acceptable Sound Levels

3.1 Road Traffic Noise Criteria

Guidelines for acceptable levels of road traffic noise impacting residential developments are given in the MECP publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", Part C release date October 21, 2013 and are listed in Table 1 below. The values in Table 1 are energy equivalent (average) sound levels [L_{EQ}] in units of A weighted decibels [dBA]. These criteria have generally been adopted by the Regional Municipality of Niagara.

Table 1: Road Traffic Noise Criteria

	Daytime $L_{EQ(16\ hour)}$ Road	Nighttime $L_{EQ(8\ hour)}$ Road
Outdoor Living Areas	55 dBA	--
Inside Living/Dining Rooms	45 dBA	45 dBA
Inside Bedrooms	45 dBA	40 dBA

Daytime refers to the period between 07:00 and 23:00, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace or other area where passive recreation is expected to occur. Balconies that are less than 4 m in depth are not considered to be outdoor living areas under MECP guidelines.

The guidelines in the MECP publication allow the sound level in an OLA to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements and offers of purchase and sale for the property. When OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels at the façade exceed 60 dBA or daytime sound levels exceed 65 dBA at the façade. A forced air ventilation system with ducts sized for the future provision of air conditioning by the occupant, or some other alternative form of mechanical ventilation, is required where nighttime sound levels at the façade are in the range of 51 – 60 dBA or daytime sound levels are in the range of 56 - 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria sound level at the façade is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise.

Warning clauses are required to notify future residents of possible excesses when nighttime sound levels exceed 50 dBA at the façade and daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the bedroom/living/dining room window due to road traffic.

4 Traffic Sound Level Assessment

4.1 Road Traffic Data

Road traffic data for McLeod Road was obtained from HGC Engineering past project files in the area and originally obtained from the Region of Niagara in the form of annual summer average daily traffic (SADT) for the year 2018 and is included in Appendix A. The data was projected to the year 2042 using a 2.5%/year growth rate as per Region of Niagara guidelines. A calculated commercial

vehicle percentage of 1.9% was split into 1.1% heavy trucks and 0.8% medium trucks. A day/night split of 90%/10% was used. A posted speed limit of 50 km/h was used in the analysis. Table 2 summarizes the traffic data.

Table 2: Projected Road Traffic Data to 2042

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
McLeod Road	Daytime	25 870	210	290	26 370
	Nighttime	2 874	24	32	2 930
	Total	**28 744**	**234**	**322**	**29 300**

4.2 Road Traffic Noise Predictions

To assess the levels of road traffic noise which would impact the site in the future, road traffic predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. Sample STAMSON output is included in Appendix B.

Predictions of the traffic sound levels were made at the various façades with exposure to the roadway and in rear yard outdoor living areas. The predictions were performed at the third storey windows during the daytime hours and nighttime hours to investigate ventilation requirements. The results of these predictions are summarized in Table 3. The acoustic requirements may be subject to modifications if the site plan is changed significantly.

Table 3: Future Road Traffic Sound Levels, [dBA], Without Mitigation

Prediction Location	Description	Daytime in OLA $L_{EQ-16\,hr}$	Daytime at Façade $L_{EQ-16\,hr}$	Nighttime at Façade $L_{EQ-8\,hr}$
[A]	South façade of townhouse block	60	63	57
[B]	2nd southerly unit of townhouse block	57	58	52
[C]	4th southerly unit of townhouse block	<55	56	<50

5 Traffic Noise Recommendations

The predictions indicate that the future traffic sound levels will exceed MECP guidelines at the proposed residential development. Recommendations to address these excesses are discussed below.

5.1 Outdoor Living Areas

The predicted sound level in the OLA of southern unit with exposure to McLeod Road (prediction location [A]) will be up to 60 dBA, 5 dBA in excess of the MECP limit of 55 dBA. A 2.0 m acoustic barrier is recommended for this rear yard. With a 2.0 m acoustic barrier the sound level in the rear yard will be reduced to less than 55 dBA.

The predicted sound level in the OLA of southern unit with exposure to McLeod Road (prediction location [B]) will be up to 57 dBA, 2 dBA in excess of the MECP limit of 55 dBA. With a 2.0 m acoustic barrier located for the unit at prediction location [A], the sound level in this rear yard will be reduced to less than 55 dBA.

For the rear yards of the remaining townhouse units, the predicted sound level in the rear yards will be less than 55 dBA. No further mitigation is required.

Figure 3 shows the barrier recommendations for the proposed site. As a general note, acoustic barriers may be a combination of an acoustic wall and an earth berm. All noise barriers must return back to the dwelling units so that the rear yards are entirely shielded from the roadway. The wall component of the barrier should be of a solid construction with a surface density of no less than 20 kg/m^2.

5.2 Indoor Living Areas

Provision for the Future Installation of Air Conditioning

The predicted sound levels of the proposed townhouse block will be between 51 and 60 dBA during the nighttime hours and/or between 56 to 65 dBA during the daytime hours. To address these excesses, the MECP guidelines recommend that these dwelling units be equipped with forced air ventilation systems with ducts sized to accommodate the future installation of air conditioning by the

occupant. The guidelines also recommend warning clauses for these dwellings. Figure 3 shows the ventilation requirements for the proposed site.

Window or through-the-wall air conditioning units are not recommended for any residential units because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall noise insulating properties of the envelope. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MECP publication NPC-300, as applicable.

5.3 Building Façade Constructions

Road traffic noise does not sufficiently impact the proposed development to require upgraded glazing constructions since the nighttime sound levels are less than 60 dBA and the daytime sound levels are less than 65 dBA. Any double-glazed window, building constructions and any insulated metal exterior door meeting the minimum requirements of the Ontario Building Code (OBC) will provide sufficient acoustic insulation for the indoor spaces.

5.4 Warning Clauses

The MECP guidelines recommend that warning clauses be included in the property and tenancy agreements and offers of purchase and sale for all units with anticipated traffic sound level excesses. Examples are provided below.

Suggested wording for buildings with sound level excesses the MECP criteria is given below:

Type A:

> 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 traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the noise criteria of the Municipality and the Ministry of the Environment, Conservation and Parks.

Suggested wording for future dwellings for which physical mitigation has been provided is given below.

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 traffic may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks. The acoustical barrier as installed shall be maintained, repaired or replaced by the owner. Any maintenance, repair or replacement shall be with the same material, to the same standards and having the same colour and appearance of the original.

Suggested wording for future dwellings requiring forced air ventilation systems is given below.

Type C:

> This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks.

This sample clause is provided by the MECP as examples and can be modified by the Municipality as required.

6 Discussion and Recommendations

We have the following recommendations with regard to noise control. Please refer to previous sections of this report where these recommendations are discussed in more detail.

1. An acoustic barrier is recommended for the OLA of the dwelling closest to McLeod Road. When final grading information is available for this dwellings, acoustic barrier requirements should be refined.
2. Forced air ventilation systems with ducts sized for the future installation of air conditioning by the occupant is required for the proposed townhouse block. The location, installation and sound ratings of the air conditioning devices should comply with NPC-300.

3. Any exterior building façade and window glazing constructions meeting the minimum requirements of the OBC will provide sufficient acoustical insulation for the indoor spaces of the proposed dwellings.

4. Warning clauses should be used to inform future residents of the traffic noise and presence of the nearby commercial facilities.

These recommendations are summarized in Table 4 below.

Table 4: Summary of Noise Control Requirements and Noise Warning Clauses

Prediction Locations	Unit	Acoustic Barrier	Ventilation Requirements	Type of Warning Clause	Required STC
[A]	Townhouse 1	✓	Forced Air	B, C	OBC
[B], [C]	Townhouse 2 – 4	--	Forced Air	A, C	OBC
--	Remaining dwellings	--	--	--	OBC

Notes:
-- no specific requirement
OBC – meeting the minimum requirements of the Ontario Building Code

6.1 Implementation

To ensure that the noise control recommendations outlined above are properly implemented, it is recommended that:

1. When final grading information is available, a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario shall review the drawings for the residential dwellings to certify the required noise barriers and refine the height as necessary.

2. Prior to occupancy, a Professional Engineer qualified to perform acoustical services in the province of Ontario or the Municipal Building Department shall conduct a site inspection to confirm that the sound control measures have been incorporated, installed and constructed in their entirety.

Limitations

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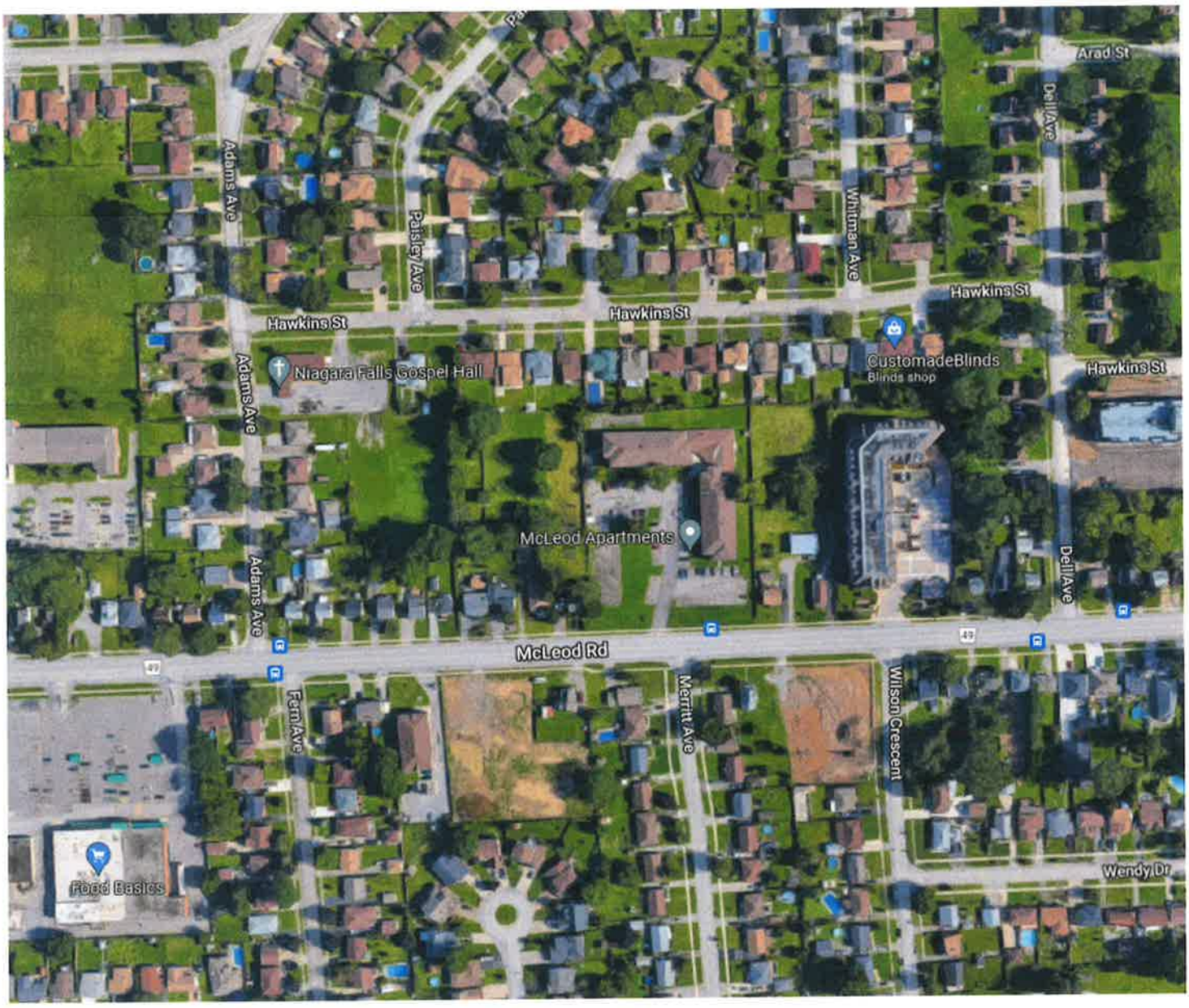
Any conclusions and/or recommendations herein reflect the judgment of HGC Engineering based on information available at the time of preparation, and were developed in good faith on information provided by others, as noted in the report, which has been assumed to be factual and accurate. Changed conditions or information occurring or becoming known after the date of this report could affect the results and conclusions presented.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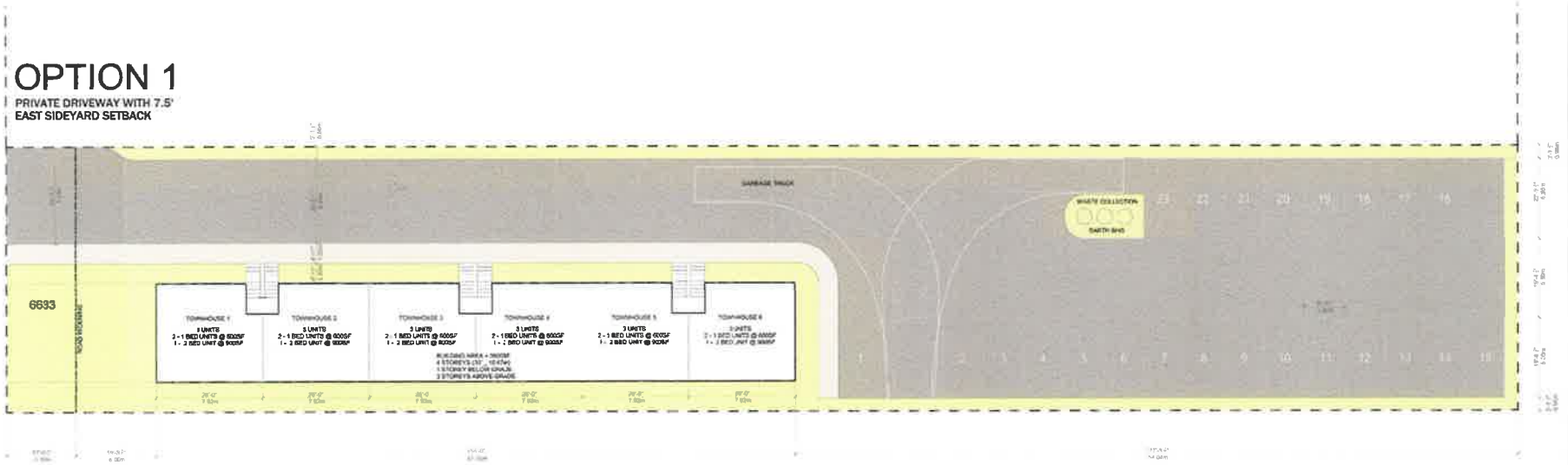
Whitman Ave
Paisley Ave
Adams Ave
Hawkins St
Hawkins St
Hawkins St
Hawkins St
Niagara Falls Gospel Hall
CustomadeBlinds
Blinds shop
McLeod Apartments
Adams Ave
Dell Ave
McLeod Rd
49
49
Fern Ave
Merritt Ave
Wilson Crescent
Food Basics
Wendy Dr

OPTION 1

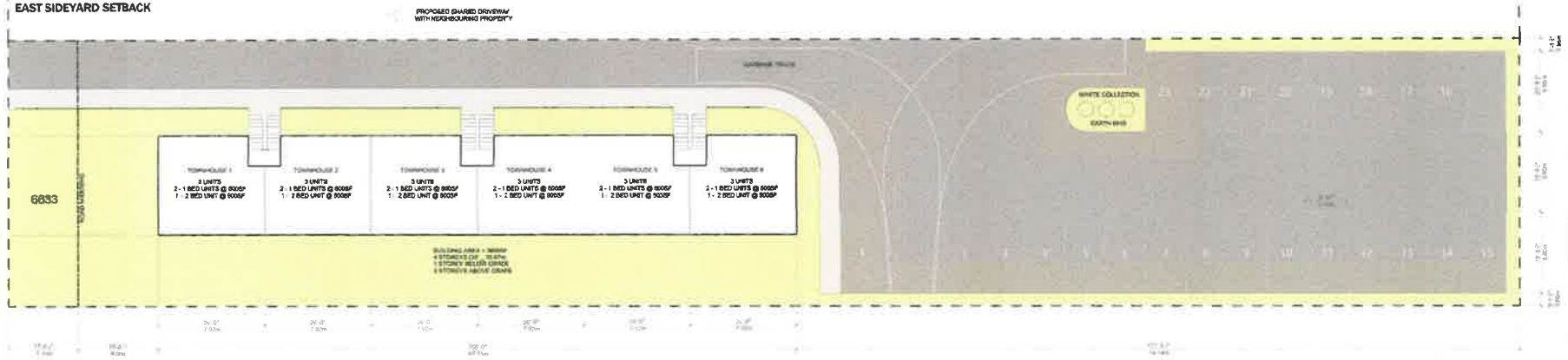
PRIVATE DRIVEWAY WITH 7.5'
EAST SIDEYARD SETBACK



PRIVATE DRIVEWAY WITH 7.5' EAST SIDEYARD SETBACK

OPTION 2

SHARED DRIVEWAY WITH 17.5'
EAST SIDEYARD SETBACK



SHARED DRIVEWAY WITH 17.5' EAST SIDEYARD SETBACK

MATTHEW SCHMID ARCHITECTURE

CONTRACTOR MUST CHECK & VERIFY ALL DIMENSIONS ON THE JOB.

DO NOT SCALE DRAWINGS.

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6633 McLeod Rd
Niagara Falls, ON

PROJECT

McLeod Stacked Townhouses

NIAGARA FALLS, ONTARIO

REVISION	DATE
1	
2	
3	
4	
5	
6	

SHEET

NOT FOR CONSTRUCTION

N

CONCEPT SITE PLAN

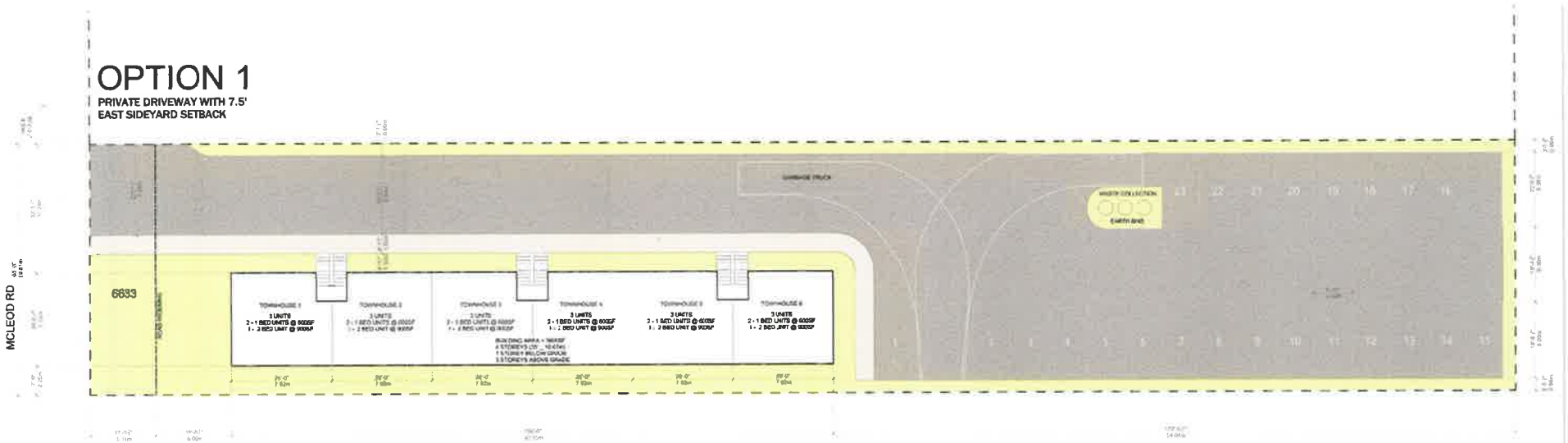
SCALE 1:200 @ 24x36

A001

SHEET NO.

OPTION 1

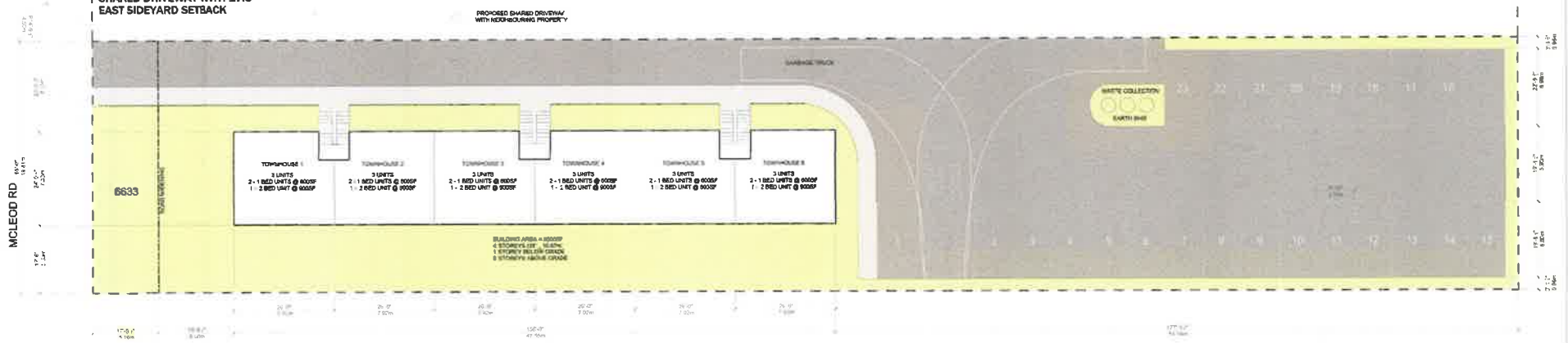
**PRIVATE DRIVEWAY WITH 7.5'
EAST SIDEYARD SETBACK**



1 OPTION 1 - PRIVATE DRIVEWAY WITH 7.5' EAST SIDEYARD SETBACK

OPTION 2

**SHARED DRIVEWAY WITH 17.5'
EAST SIDEYARD SETBACK**



2 OPTION 2 - SHARED DRIVEWAY WITH 17.5' EAST SIDEYARD SETBACK

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6633 McLeod Rd
Niagara Falls, ON

PROJECT

McLeod Stacked Townhouses

NIAGARA FALLS, ON L2E 6S5

REVISION	DATE
1	
2	
3	
4	
5	
6	

NOTES:

NOT FOR CONSTRUCTION

N

CONCEPT SITE PLAN

SCALE: 1:150

A001

DRAWN BY:

APPENDIX A

Road Traffic Data

Victor Garcia

From: Fricke, Britney <Britney.Fricke@niagararegion.ca>
Sent: May 7, 2021 10:49 AM
To: Victor Garcia
Subject: RE: Comments regarding McLeod Road and Alex Avenue

- Count Year

  2018

- AADT

  13900

- AM Peak Hour

  N/A

- PM Peak Hour

  N/A

- SADT

  16200

- WADT

  12700

From: Fricke, Britney
Sent: Friday, May 07, 2021 10:30 AM
To: 'Victor Garcia' <vgarcia@hgcengineering.com>
Subject: RE: Comments regarding McLeod Road and Alex Avenue

Hi Victor,

Here are the comments from the OPA/ZBA stage that provide further details on the updates required to the noise study, to inform our call at 1045.

Thanks,
Britney

From: Victor Garcia <vgarcia@hgcengineering.com>
Sent: Tuesday, May 04, 2021 11:42 AM
To: Fricke, Britney <Britney.Fricke@niagararegion.ca>
Subject: Comments regarding McLeod Road and Alex Avenue

Nu-Metrics Traffic Analyzer Study
Computer Generated Summary Report
City: Niagara Region
Street: 610326 - EB
Location: 6014

A study of vehicle traffic was conducted with HI-STAR unit number 20DD1. The study was done in the EB lane on 610326 - EB in Niagara Region, ON in county. The study began on 2015-07-15 at 12:00 AM and concluded on 2015-07-16 at 12:00 AM, lasting a total of 24 hours. Data was recorded in 15 minute time periods. The total recorded volume of traffic showed 7,653 vehicles passed through the location with a peak volume of 160 on 2015-07-15 at 01:45 PM and a minimum volume of 1 on 2015-07-15 at 04:15 AM. The AADT Count for this study was 7,653.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin.

Chart 1

0 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 >
1320	1340	1462	1273	1033	612	286	186	33	32	14	6	0	0	0

At least half of the vehicles were traveling in the 45 - 49 km/h range or a lower speed. The average speed for all classified vehicles was 47 km/h with 45.7 percent exceeding the posted speed of 50 km/h. The mode speed for this traffic study was 45 km/h and the 85th percentile was 60.24 km/h.

CLASSIFICATION

Chart 2 lists the values of the eight classification bins and the total traffic volume accumulated for each bin.

Chart 2

0.0 to 4.5	5.0 to 7.5	8.0 to 9.5	10.0 to 12.5	13.0 to 15.5	16.0 to 18.5	19.0 to 21.5	22.0 >
2913	4315	206	59	34	24	23	23

Most of the vehicles classified during the study were Passenger Cars. The number of Passenger Cars in the study was 7,228 which represents 95.10 percent of the total classified vehicles. The number of Small Trucks in the study was 206 which represents 2.70 percent of the total classified vehicles. The number of Trucks/Buses in the study was 59 which represents 0.80 percent of the total classified vehicles. The number of Tractor Trailers in the study was 104 which represents 1.40 percent of the total classified vehicles.

HEADWAY

During the peak time period, on 2015-07-15 at 01:45 PM the average headway between the vehicles was 5.59 seconds. The slowest traffic period was on 2015-07-15 at 04:15 AM. During this slowest period, the average headway was 450.0 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 23 and 41 degrees Celsius. The HI-STAR determined that the roadway surface was Dry 100.00 percent of the time.

Nu-Metrics Traffic Analyzer Study
Computer Generated Summary Report
City: Niagara Region
Street: 610326 - WB
Location: 6014

A study of vehicle traffic was conducted with HI-STAR unit number 20FFE. The study was done in the WB lane on 610326 - WB in Niagara Region, ON in county. The study began on 2015-07-15 at 12:00 AM and concluded on 2015-07-16 at 12:00 AM, lasting a total of 24 hours. Data was recorded in 15 minute time periods. The total recorded volume of traffic showed 8,272 vehicles passed through the location with a peak volume of 215 on 2015-07-15 at 05:00 PM and a minimum volume of 3 on 2015-07-15 at 03:30 AM. The AADT Count for this study was 8,272.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin.

Chart 1

0 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 >
165	297	742	1616	2302	1750	903	370	62	25	16	7	0	0	0

At least half of the vehicles were traveling in the 55 - 59 km/h range or a lower speed. The average speed for all classified vehicles was 57 km/h with 85.4 percent exceeding the posted speed of 50 km/h. The mode speed for this traffic study was 55 km/h and the 85th percentile was 65.80 km/h.

CLASSIFICATION

Chart 2 lists the values of the eight classification bins and the total traffic volume accumulated for each bin.

Chart 2

0.0 to 4.5	5.0 to 7.5	8.0 to 9.5	10.0 to 12.5	13.0 to 15.5	16.0 to 18.5	19.0 to 21.5	22.0 >
3487	4531	105	65	21	20	15	11

Most of the vehicles classified during the study were Passenger Cars. The number of Passenger Cars in the study was 8,018 which represents 97.10 percent of the total classified vehicles. The number of Small Trucks in the study was 105 which represents 1.30 percent of the total classified vehicles. The number of Trucks/Buses in the study was 65 which represents 0.80 percent of the total classified vehicles. The number of Tractor Trailers in the study was 67 which represents 0.80 percent of the total classified vehicles.

HEADWAY

During the peak time period, on 2015-07-15 at 05:00 PM the average headway between the vehicles was 4.17 seconds. The slowest traffic period was on 2015-07-15 at 03:30 AM. During this slowest period, the average headway was 225.0 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 23 and 41 degrees Celsius. The HI-STAR determined that the roadway surface was Dry 100.00 percent of the time.

APPENDIX B

Sample STAMSON 5.04 Output

STAMSON 5.0 NORMAL REPORT Date: 21-11-2022 15:14:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: a.te Time Period: Day/Night 16/8 hours

Description: South facade of townhouse block

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

Car traffic volume : 25870/2874 veh/TimePeriod *
Medium truck volume : 211/23 veh/TimePeriod *
Heavy truck volume : 290/32 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): 16200
Percentage of Annual Growth : 2.50
Number of Years of Growth : 24.00
Medium Truck % of Total Volume : 0.80
Heavy Truck % of Total Volume : 1.10
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: McLeod (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 : 21.90 / 21.90 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: McLeod (day)

Source height = 1.02 m

ROAD (0.00 + 63.17 + 0.00) = 63.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.49	66.79	0.00	-2.46	-1.16	0.00	0.00	0.00	63.17

Segment Leq : 63.17 dBA

Total Leq All Segments: 63.17 dBA
Results segment # 1: McLeod (night)

Source height = 1.02 m

ROAD (0.00 + 56.62 + 0.00) = 56.62 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.49	60.24	0.00	-2.46	-1.16	0.00	0.00	0.00	56.62

Segment Leq : 56.62 dBA

Total Leq All Segments: 56.62 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.17 dBA
(NIGHT): 56.62 dBA

STAMSON 5.0 NORMAL REPORT Date: 21-11-2022 15:14:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: aola.te Time Period: 16 hours

Description: Southeern OLA with 2.0 m acoustic barrier

Road data, segment # 1: McLeod

Car traffic volume : 25870 veh/TimePeriod *
Medium truck volume : 211 veh/TimePeriod *
Heavy truck volume : 290 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: McLeod

Angle1 Angle2 : -90.00 deg 30.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.90 m
Receiver height : 1.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 30.00 deg
Barrier height : 2.00 m
Barrier receiver distance : 2.50 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00
Road data, segment # 2: McLeod

Car traffic volume : 25870 veh/TimePeriod *
Medium truck volume : 211 veh/TimePeriod *
Heavy truck volume : 290 veh/TimePeriod *
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: McLeod

Angle1 Angle2 : 30.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.90 m
Receiver height : 1.50 m

```
Topography                  :      2        (Flat/gentle slope; with barrier)
Barrier angle1              :  30.00 deg    Angle2 : 90.00 deg
Barrier height              :  10.00 m
Barrier receiver distance   :   2.50 m
Source elevation            :   0.00 m
Receiver elevation          :   0.00 m
Barrier elevation           :   0.00 m
Reference angle             :   0.00

Results segment # 1: McLeod
---------------------------

Source height = 1.02 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.02 !        1.50 !        1.45 !         1.45

ROAD (0.00 + 53.43 + 0.00) = 53.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     30   0.55  66.79   0.00  -3.69  -2.71   0.00   0.00  -6.96  53.43
-------------------------------------------------------------------------------

Segment Leq : 53.43 dBA

Results segment # 2: McLeod
---------------------------

Source height = 1.02 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.02 !        1.50 !        1.45 !         1.45

ROAD (0.00 + 41.17 + 0.00) = 41.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    30     90   0.07  66.79   0.00  -2.55  -5.09   0.00   0.00 -17.98  41.17
-------------------------------------------------------------------------------

Segment Leq : 41.17 dBA

Total Leq All Segments: 53.68 dBA
```

TOTAL Leq FROM ALL SOURCES: 53.68 dBA