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Noise Feasibility Study
Proposed Residential Development
Nissouri Road & Thorndale Road
Thorndale, Ontario

Prepared for:

1732432 Ontario Ltd.
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Thorndale, ON N0M 2P0

Prepared by:

[redacted]

Reviewed by:

[redacted]

April 10, 2023

HGC Project No: 02100251

VERSION CONTROL

Ver.	Date	Version Description / Changelog	Prepared By
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Table of Contents

1 INTRODUCTION & SUMMARY

HGC Engineering was retained by 1732432 Ontario Ltd. to conduct a noise feasibility study for a proposed residential development to be located to the west of Nissouri Road and north of Thorndale Road in Thorndale Ontario. Lands surrounding the subject site are a mixture of residential, agricultural and industrial uses. The study is required by the Municipality as part of their planning and approvals process.

Site visits were conducted to identify and investigate the significant noise sources in the vicinity of the proposed development. Road traffic on Nissouri Road and Thorndale Road is the dominant noise source in the area requiring assessment. Noise from the nearest industrial uses across Thorndale Road was also identified as having the potential to impact the proposed residential development.

The traffic sound level predictions indicate that noise control measures should be incorporated into the design of the building envelopes such that indoor sound levels can comply with the MECP noise criteria. The recommended noise control measures include noise barriers to protect the backyards of the closest lots and the inclusion of forced air ventilation systems designed for future installation of central air conditioning by the occupant. Warning clauses are also recommended to inform the future residents of the traffic noise excesses.

The results of the assessment indicate that the predicted noise emissions from the nearby industrial facilities can be within the applicable noise guideline limits of the MECP at the proposed residential development with the implementation of noise controls as outlined in this report. An additional noise warning clause is recommended to inform all future residents of the presence of these facilities. A detailed noise study shall be conducted when grading plans are available to refine noise barrier requirements.

2 SITE DESCRIPTION & NOISE SOURCES

The proposed residential development is to be located to the west of Nissouri Road and north of Thorndale Road in Thorndale, Ontario. Figure 1 is a key plan. The Site Plan with a print date of February 2023 is shown as Figure 2. The proposed development will include 2-storey townhouses.

Site visits were made by HGC Engineering personnel to make observations of the acoustical environment in May and June 2021. The surrounding area is considered to be Class II (semi-urban) in terms of its acoustical environment. Figure 3 is an aerial photo which shows the site and the adjacent land uses. There are existing residences to the north, east and southeast of the site and existing industrial uses to the south. Further details regarding the nearby industrial facilities can be found in Section 5.0. The lands immediately to the west of the site, owned by the same landowners, are proposed to be a future aggregate extraction facility. It is understood that aggregate operations at the adjacent lands will be completed and ceased prior to the occupancy of the subject residential development.

3 CRITERIA

3.1 Criteria Governing Road Traffic Noise

Guidelines for acceptable levels of road traffic noise impacting residential developments are given in the MECP publication NPC-300 "Environment Noise Guideline Stationary and Transportation sources – Approval and Planning", release date October 21, 2013, and are listed in Table I below. The values in Table I are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA].

Table I: MECP Road Noise Criteria (dBA)

Area	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

These criteria apply to road vehicular traffic, including intercity transit busses operating on Municipal Streets. 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 Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the property and tenancy agreements and offers of purchase and sale. Where 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. Warning clauses to notify future residents of possible excesses are also required when daytime sound levels exceed 55 dBA in the outdoor living area.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where future nighttime sound levels outside bedroom/living/dining room windows will exceed 60 dBA. The provision for the future installation of central air conditioning is required when nighttime sound levels at bedroom/living/dining room windows are in the range of 51 to 60 dBA or when daytime sound levels at bedroom/living/dining room windows are in the range of 56 to 65 dBA. Sound attenuating building constructions and the use of warning clauses to notify future residents of possible excesses are also required when nighttime sound levels exceed 60 dBA at the plane of the bedroom window due to road traffic noise.

Warning clauses to notify future residents of possible sound level excesses are also required when nighttime sound levels exceed 50 dBA at the plane of a bedroom window due to road traffic.

3.2 Criteria for Stationary Sources of Sound

MECP Guideline NPC-300, “Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning” is the MECP guideline for use in investigating Land Use Compatibility issues with regard to noise. An industrial or commercial facility is classified in MECP guidelines as a stationary source of sound (as compared to sources such as traffic or construction, for example) for noise assessment purposes.

NPC-300 is intended for use in the planning of both residential and commercial/industrial land uses

and provides the acceptability limits for sound due to commercial/industrial operations in that regard. The facade of a residence (i.e., in the plane of a window), or any associated usable outdoor area is considered a sensitive point of reception. NPC-300 stipulates that the exclusionary minimum sound level limit for a stationary noise source in a semi-urban Class 2 area is 50 dBA during daytime and evening hours (07:00 to 23:00) and 45 dBA during night-time hours (23:00 to 07:00) outside the windows, and 50 dBA during the day and 45 dBA during the evening in the OLA.

Where it can be demonstrated that the hourly ambient sound levels are greater than the exclusionary minimum limits listed above, the criterion becomes the lowest predicted one-hour L_{EQ} sound level during each respective period. At locations where the ambient sound levels are low, the exclusionary minimum criteria of 50/45 dBA apply along with a 50 dBA during the day and 45 dBA during the evening in the OLA would apply to the future residential dwellings. Representative 2-storey receptors location were chosen at the residential development site as indicated on Figures 3 to 4.

Commercial activities such as the occasional movement of customer/employee vehicles, garbage collection and activities associated with vehicle fuelling are not of themselves considered to be significant noise sources in the MECP guidelines. Accordingly, these sources have not been considered in this study. Noise from safety equipment (e.g. back-up beepers) is also exempt from consideration.

The MECP guidelines stipulate that the sound level impact during a "predicable worst-case hour" be considered. This is defined to be an hour when a typically busy "planned and predictable mode of operation" occurs at the subject facility, coincident with a period of minimal background sound.

Compliance with MECP criteria generally results in acceptable levels of sound at residential receptors although there may be residual audibility during periods of low background sound. NPC-300, also states that it is the developer's responsibility to ensure that the applicable sound level criteria are met. If noise sources are identified which generate excessive sound levels, source controls are generally favoured by the MECP.

4 Traffic Noise Assessment

4.1 Road Traffic Data

Traffic data for Nissouri Road and Thorndale Road was obtained from the County of Middlesex website and is included in Appendix A. The speed limit on Thorndale Road is 50 km/hr and the speed limit on Nissouri Road is 80 km/hr. An assumed day/night split of 90%/10% was used. A commercial vehicle percentage of 13% was split into 5% medium trucks and 8% heavy trucks for both roadways as per Ministry of Transportation guidelines. Table II summarizes the road traffic volume data used in this study.

Table II: Projected Road Traffic Data to 2034

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Nissouri Road	Daytime	5 767	331	530	6 629
	Nighttime	641	37	59	737
	Total	**6 408**	**368**	**589**	**7 366**
Thorndale Road	Daytime	5 458	314	502	6 274
	Nighttime	606	35	56	697
	Total	**6 064**	**349**	**558**	**6 971**

4.2 Road Traffic Noise Predictions

To assess the levels of road traffic noise which will impact the site in the future, predictions were made at the upper storey windows and in the rear yard OLAs using STAMSON version 5.04, a computer algorithm developed by the MECP. The results are summarized in Table III. Sample STAMSON output is included in Appendix B.

Table III: Future Road Traffic Sound Levels, [dBA]

Prediction Location	Description	Daytime in OLA, $L_{EQ-16\ hr}$	Daytime at Façade $L_{EQ-16\ hr}$	Nighttime at Façade L_{EQ-8hr}
[A]	Flanking Unit to Thorndale Rd	<55	54	<50
[B]	Interior flanking unit	<55	<50	<50
[C]	Unit with reverse frontage to Thorndale Rd	61	61	55
[D]	Interior Unit	<55	<55	<50
[E]	Unit with reverse frontage to Nissouri Rd	66	65	59
[F]	Interior Unit	<55	55	<40

4.3 Recommendations for Traffic Noise

The predictions indicate that traffic sound levels will exceed the MECP guidelines at the lots with exposure to the roadways and noise control measures are required. The following recommendations are provided.

4.3.1 Outdoor Living Areas

Units with Rear Yards Adjacent to Thorndale

For the first row of units adjacent to Thorndale Road , the predicted sound levels in the OLAs will be 61 dBA. Calculations indicate that a 2.0 m noise barrier will reduce the sound levels in these OLA's to 56 dBA. To further reduce to 55 dBA, a slightly higher barrier of 2.1 m will be required.

Units with Rear Yards Adjacent to Nissouri Road

For the three blocks of townhouses adjacent to Nissouri Road (Location [E]) the predicted sound levels in the OLAs are as high as 66 dBA. Noise barriers are required to reduce the sound levels in these OLAs to less 60 dBA. A table of barrier heights to meet 55 to 59 dBA is provided below. The heights are provided based on a review of the preliminary grading plan and cross sections dated March 2023.

Table IV: Summary of Barrier Heights Required to Meet 55 to 59 dBA for Units Adjacent to Nissouri Road

Prediction Location	Unit No.	Noise Barrier Height (m)				
		55 dBA	56 dBA	57 dBA	58 dBA	59 dBA
C	20 - 24	2.1	2.0	--	--	--
E	66 - 76	3.6	3.3	3.0	2.7	2.4

The heights and extents of the barriers should be chosen, subject to the approval of the municipality and respecting any applicable fence height by-laws. The location and extent of the acoustical barriers are shown on Figure 5. All noise barriers must return back to the dwelling units so that the rear yards are entirely shielded from the roadway. The acoustic barrier can be a combination of an acoustic wall on top of an earth berm. The wall component of the barrier should be of a solid construction with a surface density of no less than 20 kg/m2. The walls may be constructed from a variety of materials such as wood, brick, pre-cast concrete or other concrete/wood composite systems provided that it is free of gaps or cracks.

The remaining units in the development do not have any noise barrier requirements.

4.3.2 Indoor Living Areas and Ventilation Requirements

Forced Air Ventilation

The predicted daytime sound levels for the dwellings with exposure to Nissouri Road and Thorndale Road will be between 56 and 65 dBA. These dwelling units will require forced air ventilation systems with ducts sized to accommodate the future installation of air conditioning by the occupant. The installation of central air conditioning would also satisfy this requirement. 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.

4.3.3 Building Façade Constructions

The predicted daytime and nighttime sound levels at all dwellings in the development are less than 65 and 60 dBA respectively. Any building façade construction meeting the requirements of the Ontario Building Code will provide sufficient sound insulation.

4.3.4 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 future dwellings which have sound level excess is given below.

Type A:

> Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling unit occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks.

Suggested wording for future dwellings with daytime OLA sound levels exceeding the MECP criteria by more than 5 dB, 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 occasionally 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.

Suitable 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. The 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.

These sample clauses are provided by the MECP as examples and can be modified by the Municipality as required.

5 STATIONARY SOURCE NOISE ASSESSMENT

5.1 Description of Nearby Industrial Facilities

HGC Engineering visited the subject site to observe the nearby industrial operations and identify potentially significant sources of sound during the months of May and June 2021. The surrounding land uses are labelled on the aerial photo attached as Figure 3. The potentially significant industrial facilities are located to the south of Thorndale Road. These facilities are discussed below.

TRS Components

TRS Components is a manufacturer of wood trusses. The facility operates during daytime hours only. Two loaders were observed to be operating in the outdoor yard, moving finished products and loading them onto trailers. The outdoor yard is for the storage of finished products. Manufacturing was observed to take place inside the facility.

ADS

ADS is a manufacturer of plastic pipes and is located approximately 100 m to southwest of the site, west of TRS Components. The facility operates during daytime hours only. The area closest to the development, adjacent to Thorndale Road, is used for the storage of finished products. Two forklifts were observed to be operating in the outdoor yard. No manufacturing was observed outdoors.

5.2 Noise Assessment

Steady Sources

Source sound levels for typical rooftop equipment and trucking activities, and assumed operational information (outlined below) were used as input to a predictive computer model (Cadna/A version 2021 Build 183.5110), in order to estimate the sound levels from the existing industrial buildings at the future residences. Cadna/A is a computer implementation of ISO Standard 9613-2, “Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation”, which takes into account attenuation due to distance (geometrical spreading), shielding by intervening structures, air attenuation and ground absorption. Additional details are provided in Appendix C.

The sound power levels measured and obtained from similar facilities examined under other studies by HGC Engineering were used in the analysis and are summarized in Table V.

Table V: Source Sound Power Levels [dB re 10-12 W]

Source	Octave Band Centre Frequency [Hz]								
	63	125	250	500	1k	2k	4k	8k	A
Truck Passby	101	100	94	96	97	95	91	86	101
Idling Truck Engine	96	91	88	88	91	90	81	70	95
Loader (John Deere 444)	105	100	97	98	100	96	85	77	103
Forklift	98	96	91	94	92	88	83	79	96

The above outlined sound levels and various features of the site were used as input to a predictive computer model. Truck routes are identified as green lines and loader and forklift areas are hatched in Figure 4 and in Appendix C.

The following information and assumptions were used in the analysis:

- Both facilities operate during daytime hours only, typically from 8:00 am to 6:00 pm
- The height of the TRS Components building is assumed to be 5 m

Assumed worst-case hour scenario:

TRS Components

- 5 tractor trailers arrive and depart from the outdoor storage area.
- Two loaders and two forklifts are assumed to operate in the outdoor yard for 45 minutes, loading trucks or moving products within the yard.

ADS

- 5 tractor trailers arrive and depart from the outdoor storage area.
- Two forklifts are assumed to operate in the outdoor yard for 45 minutes, loading trucks or moving products within the yard.

5.3 Results

The calculations consider the acoustical effects of distance and shielding by the buildings. The predicted sound levels due to the trucking activities/deliveries (arriving, idling and departing) and storage yard activities at the closest façade of the proposed residences during an assumed worst-case busiest hour operating scenario, are summarized in Tables VI and on Figure 4.

Table VI: Predicted Industrial Sound Levels at Subject Site during a Worst-case Hour Operational Scenario [dBA, Leq_{1hr}]

Receptor	Criteria	Sound Level
R1	50	49
R2	50	48
R3	50	50
R4	50	48

The results of this analysis indicate that the stationary sources of sound can meet the applicable sound level limits at the proposed residences closest to the industrial facilities. Mitigation is not required.

The presence of the nearby industrial facilities should be addressed through the implementation of a noise warning clause in the offers of purchase and sale and tenancy agreements for the residential units in the development. An example of a suitable warning clause is provided below.

Type D:

> Purchasers are advised that due to the proximity of the adjacent commercial/industrial facilities, sound from these facilities may at times be audible.

The sample clause is provided by the MECP as an example only and can be modified by the Municipality as required.

6 SUMMARY OF RECOMMENDATIONS

The results of the study indicate that the proposed residential development is feasible. Noise control measures are recommended for units with exposure to the industrial facilities. The following list and Table VII summarizes the recommendations made in this report and shown on Figure 5.

1. Noise barriers are required for the rear yards of units adjacent to Nissouri and Thorndale Roads.

2. Forced air heating systems with ducts sized to accommodate the future installation of central air conditioning by the occupant are required for units with exposure to the roadways.

3. Warning clauses are required to inform future residents of the traffic noise impact and the presence of the nearby industrial facilities.

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

Location	Acoustic Barrier	Ventilation*	Type of Warning Clause	Building Façade Design
20 - 24	✓	Forced Air	A, B, C, D	OBC
66 - 76	✓	Forced Air	A, B, C, D	OBC
All Remaining Units	--	--	D	OBC

Note: -- no specific requirement
OBC – Ontario Building Code
* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300.

The reader is referred to the previous sections of the report where these recommendations are discussed in more detail.

6.1 Implementation

1) Prior to the issuance of building permits for this development, a Professional Engineer qualified to perform acoustical services in the Province of Ontario shall review the grading plans and builder's plans to ensure that the sound control measures as recommended in this report have been incorporated in their entirety.

2) Prior to the issuance of occupancy permits for this development, the municipal building inspector or a Professional Engineer qualified to provide acoustical engineering services in Ontario shall certify that the sound control measures have been properly installed and constructed, as required.

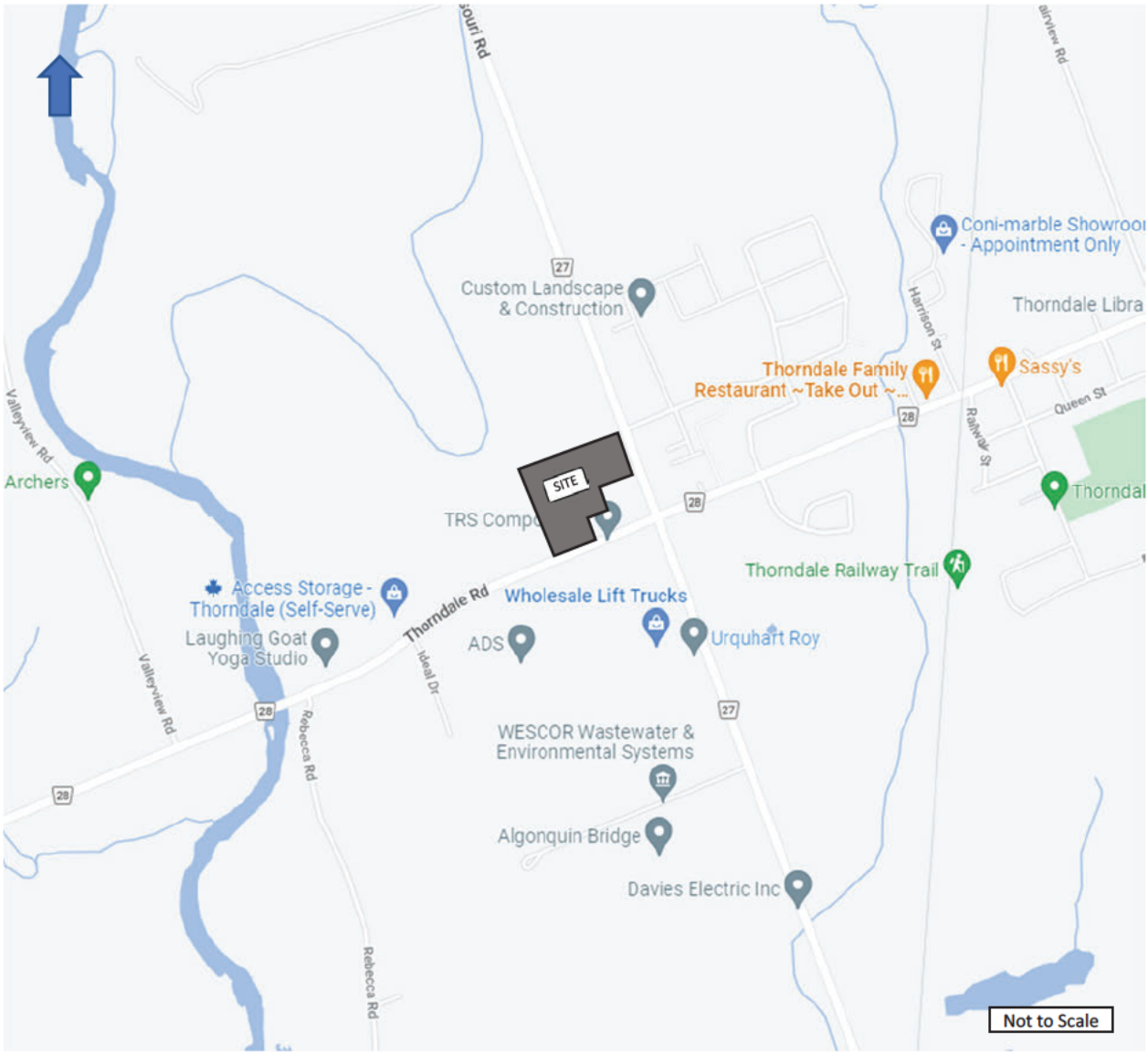
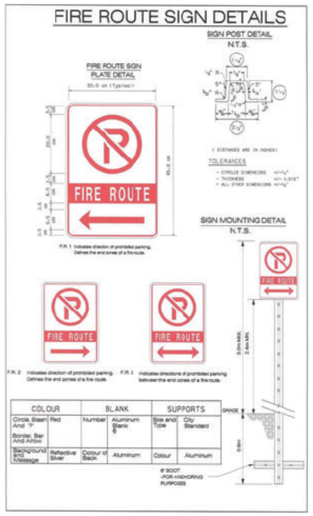


Figure 1: Key Plan



FIRE ROUTE SIGN DETAIL
NTS

LEGEND

- ▲ DENOTES ENTRANCE
- DENOTES PROPOSED DRIVEWAY
- DENOTES PROPOSED LANDING/WALKWAY POURED CONCRETE OR PRECAST STONE
- DENOTES DESIGNATED FIRE ROUTE PER OBC 3.2.5
- DENOTES GARAGE LIMIT
- DENOTES EASEMENT LIMIT
- CMB DENOTES CANADA POST MAIL BOX

SITE DATA TABLE
CURRENT FD-4, PROPOSED R3-9

TOWNHOUSE

ZONING REGULATION	Regulation	PROPOSED
LOT AREA (MIN)	6000 m²	32,274.76 m²
UNIT WIDTH (MIN)	6.0 m	7.0 m
FRONT YARD (MIN)	4.5 m TO MAIN BUILDING 6.0 m TO GARAGE	6.65 m TO BUILDING 6.90 m TO GARAGE
INTERIOR SIDE YARD (MIN)	1.2 m	3.0 m
EXTERIOR SIDE YARD (MIN)	4.5 m	4.5 m
REAR YARD (MIN)	7.5 m	8.5 m
HEIGHT (MAX)	12.0 m	2 STORIES
LOT COVERAGE (MAX)	45 %	31.43 %
LANDSCAPED OPEN SPACE (MIN)	30 %	46.51 %
DENSITY OF DWELLING UNITS WITH BLOCK WITHIN A REGISTERED PLAN (MAX)	35.0 UPH	28.2 UPH

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	No.	REVISIONS	DATE	CONSULTANT
DESIGN BY SD/RAS	1	***	MON. DAY, YEAR	DEVENG
DRAWN BY RAS				
CHECKED BY RAH				
F.BK. 1040				
FILE: DEL19-103 - BASE.DWG				

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ENGINEER'S STAMP

1732435 ONTARIO LTD.

SCALE — 1:500
5 0 10m

TITLE
SOUTHEAST PART WATSON FARM (9 ACRES)
THORNDALE, ONTARIO

SITE PLAN

PROJECT No. DEL19-103
SHEET No. SP
PLAN FILE No.

Figure 2: Site Plan Showing Traffic Noise Prediction Locations

Figure 3: Aerial Plan

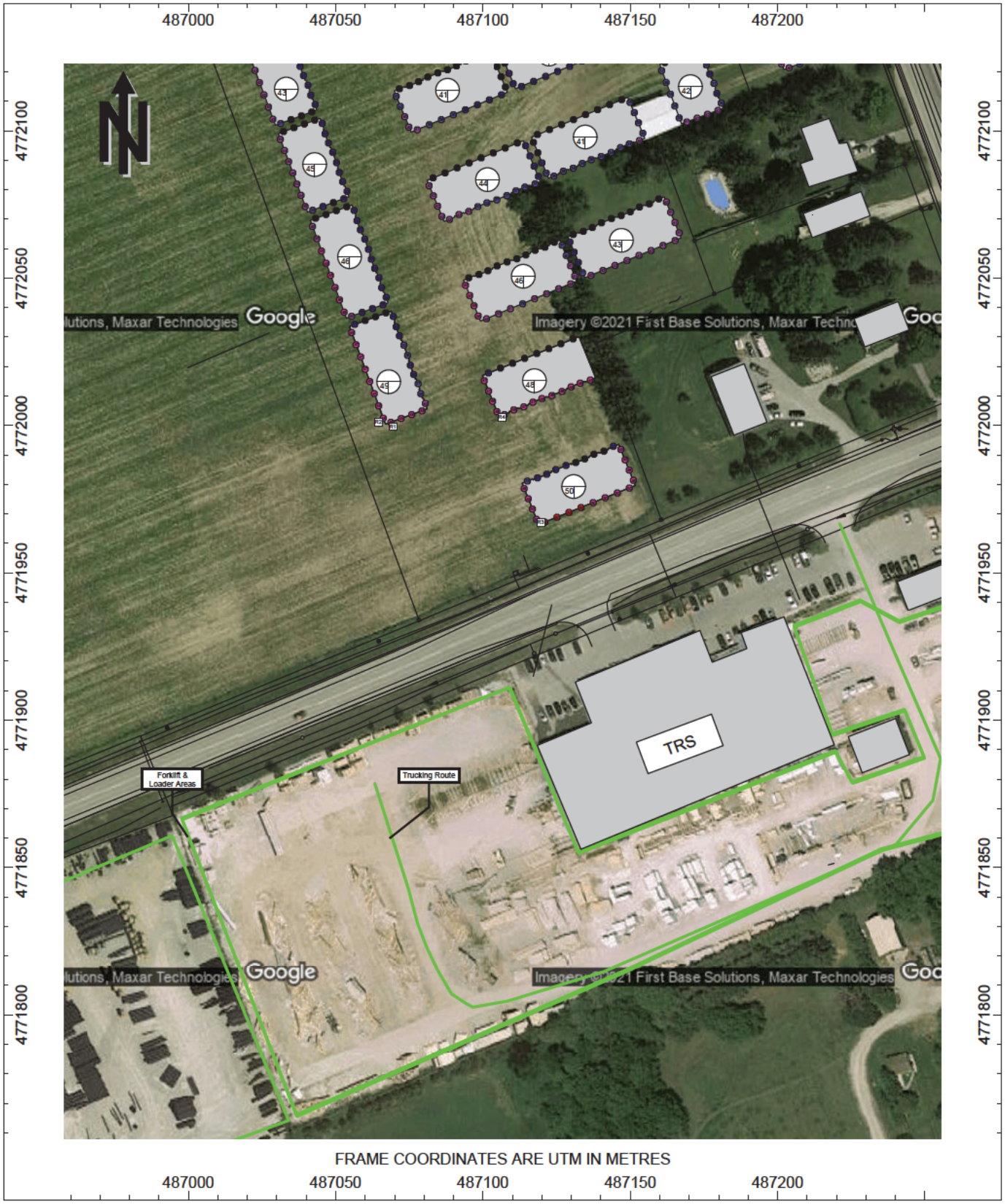
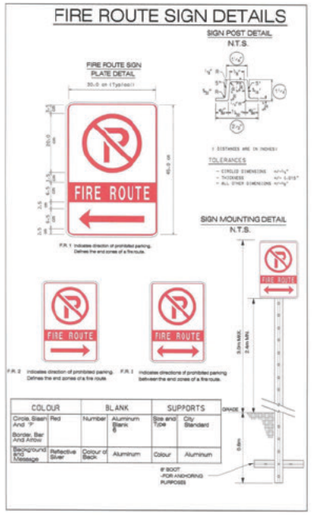


Figure 4: Predicted Daytime Stationary Noise Sound Levels, Leq [dBA]

FIRE ROUTE SIGN DETAILS



FIRE ROUTE SIGN DETAIL
NTS

LEGEND

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- DENOTES PROPOSED DRIVEWAY
- DENOTES PROPOSED LANDING/WALKWAY POURED CONCRETE OR PRECAST STONE
- DENOTES DESIGNATED FIRE ROUTE PER OBC 3.2.5
- DENOTES GARAGE LIMIT
- DENOTES EASEMENT LIMIT
- CMB — DENOTES CANADA POST MAIL BOX

- Forced Air Ventilation
- Noise Barrier

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					F.BK. 1040				
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ENGINEER'S STAMP

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TITLE: SOUTHEAST PART WATSON FARM (9 ACRES)
THORNDALE, ONTARIO

SITE PLAN

PROJECT No. DEL19-103
SHEET No. SP
PLAN FILE No.

Figure 5: Plan Showing Noise Control Recommendations

APPENDIX A

Traffic Data

ROAD NO.	LOCATION	AVERAGE TRAFFIC COUNT	LENGTH (Km)	BOUNDARY LENGTH	EQUIVALENT LENGTH	DAILY VEH-(Km)
NAIRN RD. 17	CR#81 TO CR#7	*1441*	2.7		2.7	3891
PARKHILL DR. 18	CR#81 TO THE LAMBTON COUNTY BOUNDARY	*1339*	11.4		11.4	15265
PETTY ST. 19	CR#7 TO CR#17	*4304*	5.6		5.6	24102
PETTY ST. 19	CR#17 TO CR#81	*2925*	9.3		9.3	27203
HYDE PARK RD. 20	LONDON TO CR#16	*6993*	6.4		6.4	44755
DENFIELD RD. 20	CR#16 TO CR#7	*1910*	8.4		8.4	16044
DENFIELD RD. 20	CR#7 TO HIGHWAY #4	*2296*	6.4		6.4	14694
CASSIDY RD. 21	CR#7 TO CR#24	*1012*	6.1		6.1	6173
EGREMONT DR. 22	LAMBTON COUNTY BOUNDARY TO CR#81	*2027*	13.4		13.4	27162
EGREMONT DR. 22	CR#81 TO CR#39	*3130*	6.1		6.1	19093
EGREMONT DR. 22	CR#39 TO CR#16 SOUTH	*9704*	3.8		3.8	36875
EGREMONT DR. 22	CR#16 SOUTH TO CR#17	*8420*	7.4		7.4	62308
EGREMONT DR. 22	CR#17 TO LONDON	*10274*	5.3		5.3	54452
HIGHBURY AVE. 23	HIGHWAY #7 TO CR#16 ILDERTON ROAD	*9906*	8.2		8.2	81229
HIGHBURY AVE. 23	CR#16 TO LONDON	*8735*	6.4		6.4	55904
McGILLIVRAY DR. 24	HIGHWAY #4 TO CR#21	*974*	8.4		8.4	8182
McGILLIVRAY DR. 24	CR#21 TO CR#81	*1286*	10		10	12860
GORE RD. 25	LONDON TO CR#32	*3894*	3	0.6	2.7	10514
GORE RD. 25	CR#32 TO OXFORD COUNTY BOUNDARY	*2786*	7.5		7.5	20895
WILTON GROVE RD. 26	LONDON TO CR#74	*2918 (2017)*	0.8		0.8	2334
NISSOURI RD. 27	CR#2 TO CR#28	*5213*	9.3		9.3	48481

ROAD NO.	LOCATION	AVERAGE TRAFFIC COUNT	LENGTH (Km)	BOUNDARY LENGTH	EQUIVALENT LENGTH	DAILY VEH-(Km)
NISSOURI RD. 27	CR#28 TO CR#16	*2813*	6.2		6.2	17441
WELLBURN RD. 27	CR#16 TO HIGHWAY #7	*3010*	7		7	21070
THORNDALE RD. 28	OXFORD COUNTY BOUNDARY TO CR#27	*4813*	7.1		7.1	34172
MEDWAY RD. 28	CR#27 TO CR#23	*6829*	8.4		8.4	57364
MEDWAY RD. 28	CR#23 TO HIGHWAY #4	*7477*	5		5	37385
MEDWAY RD. 28	HIGHWAY #4 TO CR#20	*6403*	5		5	32015
HAMILTON RD. 29	LONDON TO CR#74	*8510*	0.8		0.8	6808
HAMILTON RD. 29	CR#74 TO CR#32 DORCHESTER	*6620*	4.9		4.9	32438
HAMILTON RD. 29	CR#32 DORCHESTER TO CR#73	*8472*	3.4		3.4	28805
HAMILTON RD. 29	CR#73 TO OXFORD COUNTY BOUNDARY	*5781*	8		8	46248
PUTNAM RD. 30	OXFORD COUNTY BOUNDARY TO CR#29	*2803*	1.3		1.3	3644
PUTNAM RD. 30	CR#29 PUTNAM TO HIGHWAY #401	*5057*	1.7		1.7	8597
PUTNAM RD. 30	HIGHWAY #401 TO ELGIN COUNTY BOUNDARY AVON	*5125*	7.8		7.8	39975
HERITAGE RD. 31	CR#28 TO CR#16	*778*	6.2		6.2	4824
DORCHESTER RD. 32	CROMARTY DRIVE TO HIGHWAY #401	*2562*	0.7		0.7	1793
DORCHESTER RD. 32	HIGHWAY #401 TO CR#29	*3202*	4		4	12808
DORCHESTER RD. 32	CR#29 TO CR#49	*8042*	0.3		0.3	2413
SHAW RD. 32	CR#49 TO CR#2	*4308*	4.3		4.3	18524
SECOND ST. 33	CR#81 TO CR#39	*6057*	3.3		3.3	19988
LITTLEWOOD DR. 35	ONEIDA TO CR#15	*4216*	1.5		1.5	6324
LITTLEWOOD DR. 35	CR#15 TO LONDON	*3610*	6.8		6.8	24548

APPENDIX B

Sample STAMSON Calculations

```
STAMSON 5.0        NORMAL REPORT        Date: 10-04-2023 16:18:22
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: af2.te               Time Period: Day/Night 16/8 hours
Description: Predicted daytime & nighttime sound levels at the upper storey windows of Unit 19,
Prediction Location [A]


Road data, segment # 1: Thorndale (day/night)
----------------------------------------------
Car traffic volume  :  5458/606   veh/TimePeriod  *
Medium truck volume :   314/35    veh/TimePeriod  *
Heavy truck volume  :   502/56    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):   4813
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  15.00
    Medium Truck % of Total Volume     :   5.00
    Heavy Truck  % of Total Volume     :   8.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Thorndale (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  :  79.00 / 79.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Nissouri (day/night)
----------------------------------------------
Car traffic volume  :  5767/641   veh/TimePeriod  *
Medium truck volume :   331/37    veh/TimePeriod  *
Heavy truck volume  :   530/59    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):   5213
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  14.00
    Medium Truck % of Total Volume     :   5.00
    Heavy Truck  % of Total Volume     :   8.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Nissouri (day/night)
--------------------------------------------
Angle1   Angle2           :  45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 200.00 / 200.00 m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Thorndale (day)
-------------------------------------

Source height = 1.68 m

ROAD (0.00 + 53.66 + 0.00) = 53.66 dBA
```

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.56	66.24	0.00	-11.29	-1.29	0.00	0.00	0.00	53.66

Segment Leq : 53.66 dBA

Results segment # 2: Nissouri (day)

Source height = 1.68 m

ROAD (0.00 + 43.22 + 0.00) = 43.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
45	90	0.56	72.02	0.00	-17.60	-8.67	0.00	-2.53	0.00	43.22

Segment Leq : 43.22 dBA

Total Leq All Segments: 54.04 dBA

Results segment # 1: Thorndale (night)

Source height = 1.68 m

ROAD (0.00 + 47.14 + 0.00) = 47.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.56	59.72	0.00	-11.29	-1.29	0.00	0.00	0.00	47.14

Segment Leq : 47.14 dBA

Results segment # 2: Nissouri (night)

Source height = 1.68 m

ROAD (0.00 + 39.23 + 0.00) = 39.23 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
45	90	0.56	65.50	0.00	-17.60	-8.67	0.00	0.00	0.00	39.23

Segment Leq : 39.23 dBA

Total Leq All Segments: 47.79 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.04
(NIGHT): 47.79

```
STAMSON 5.0        NORMAL REPORT        Date: 10-04-2023 16:18:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: cf.te                Time Period: Day/Night 16/8 hours
Description: Predicted daytime & nighttime sound levels at the upper storey windows of Units 20-
24, Prediction Location [C]

Road data, segment # 1: Thorndale (day/night)
----------------------------------------------
Car traffic volume  :  5458/606   veh/TimePeriod  *
Medium truck volume :   314/35    veh/TimePeriod  *
Heavy truck volume  :   502/56    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):   4813
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  15.00
    Medium Truck % of Total Volume     :   5.00
    Heavy Truck  % of Total Volume     :   8.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Thorndale (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Nissouri (day/night)
----------------------------------------------
Car traffic volume  :  5767/641   veh/TimePeriod  *
Medium truck volume :   331/37    veh/TimePeriod  *
Heavy truck volume  :   530/59    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):   5213
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  14.00
    Medium Truck % of Total Volume     :   5.00
    Heavy Truck  % of Total Volume     :   8.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Nissouri (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     60 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 200.00 / 200.00 m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Thorndale (day)
-----------------------------------

Source height = 1.68 m

ROAD (0.00 + 53.75 + 0.00) = 53.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.56  66.24   0.00  -8.18  -4.30   0.00   0.00   0.00  53.75
-------------------------------------------------------------------------------

Segment Leq : 53.75 dBA

Results segment # 2: Nissouri (day)
-----------------------------------

Source height = 1.68 m

ROAD (0.00 + 49.86 + 0.00) = 49.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.56  72.02   0.00 -17.60  -1.29   0.00  -3.27   0.00  49.86
-------------------------------------------------------------------------------

Segment Leq : 49.86 dBA

Total Leq All Segments: 55.24 dBA

Results segment # 1: Thorndale (night)
-------------------------------------

Source height = 1.68 m

ROAD (0.00 + 47.24 + 0.00) = 47.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.56  59.72   0.00  -8.18  -4.30   0.00   0.00   0.00  47.24
-------------------------------------------------------------------------------

Segment Leq : 47.24 dBA

Results segment # 2: Nissouri (night)
-------------------------------------

Source height = 1.68 m

ROAD (0.00 + 43.34 + 0.00) = 43.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.56  65.50   0.00 -17.60  -1.29   0.00  -3.27   0.00  43.34
-------------------------------------------------------------------------------

Segment Leq : 43.34 dBA

Total Leq All Segments: 48.72 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.24
                           (NIGHT): 48.72
```

```
STAMSON 5.0        NORMAL REPORT        Date: 10-04-2023 14:10:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: e_ola2.te            Time Period: 16 hours
Description: Predicted daytime & nighttime sound levels in the OLA of Units 66 - 76, Prediction
Location [E] with Mitigation

Road data, segment # 1: Thorndale
----------------------------------
Car traffic volume  :  5458 veh/TimePeriod  *
Medium truck volume :   314 veh/TimePeriod  *
Heavy truck volume  :   502 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Thorndale
--------------------------------
Angle1   Angle2           :   0.00 deg   45.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 135.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 45.00 deg
Barrier height            :   2.40 m
Barrier receiver distance :  15.00 m
Source elevation          :  85.00 m
Receiver elevation        :  84.50 m
Barrier elevation         :  84.50 m
Reference angle           :   0.00

Road data, segment # 2: Nissouri
--------------------------------
Car traffic volume  :  5767 veh/TimePeriod  *
Medium truck volume :   331 veh/TimePeriod  *
Heavy truck volume  :   530 veh/TimePeriod  *
Posted speed limit  :    80 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Nissouri
--------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  23.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   2.40 m
Barrier receiver distance :   6.00 m
Source elevation          :  85.80 m
Receiver elevation        :  85.67 m
Barrier elevation         :  85.67 m
Reference angle           :   0.00

Results segment # 1: Thorndale
--------------------------------

Source height = 1.68 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.68 !        1.50 !        1.58 !        86.08
```

```
ROAD (0.00 + 39.46 + 0.00) = 39.46 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     45   0.51  66.24   0.00 -14.41  -6.26   0.00   0.00  -6.11  39.46
-------------------------------------------------------------------------------

Segment Leq : 39.46 dBA

Results segment # 2: Nissouri
------------------------------

Source height = 1.68 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.68 !        1.50 !        1.58 !        87.25

ROAD (0.00 + 59.21 + 0.00) = 59.21 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.51  70.16   0.00  -2.80  -1.19   0.00   0.00  -6.95  59.21
-------------------------------------------------------------------------------

Segment Leq : 59.21 dBA

Total Leq All Segments: 59.26 dBA

TOTAL Leq FROM ALL SOURCES:       59.26
```

APPENDIX C

Acoustical Modelling Assumptions

The predictive model used for this Assessment (*Cadna-A version 2023 Building 195.5312*) is based on methods from ISO Standard 9613-2.2 “Acoustics - Attenuation of Sound During Propagation Outdoors”, which accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures (or by topography). This modeling technique is acceptable to the MECP.

The subject site and surrounding area were modelled using existing topography and based on observations during the site visit. Foliage was not included in the modelling. Ground attenuation was assumed to be spectral for all sources, with a ground factor (G) of 0.0 for SWP, 0.25 in paved areas, 0.5 for non-paved areas at industrial sites (chosen to yield the best agreement between predictions and onsite measurements based on HGC Engineering experience)and 0.9 for soft ground covers. The temperature and relative humidity were assumed to be 10° C and 70%, respectively.

The predictive modelling considered one order of reflection, the sufficiency of which was verified through an iterative convergence analysis, using successively increasing orders of reflection.

On-site truck movements were modeled as a line source and forklift and loader movements as area sources as they can operate anywhere in the outdoor yard as shown in the appropriate figures.