

Noise Feasibility Study for a Class "A" Pit above Water Elliot Pit

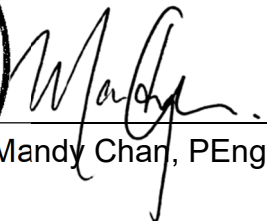
Part Lot 16, Concession 2 Municipality of Thames Centre County of Middlesex, Ontario

Prepared for:

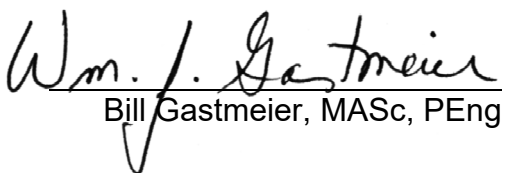
5026367 Ontario Inc.
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Thorndale, ON N0M 2P0



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Project No. 02000450

Table of Contents

1	INTRODUCTION AND SUMMARY	1
2	SITE DESCRIPTION	1
3	CRITERIA	2
3.1	Receptors	2
3.2	Noise Criteria.....	2
4	NOISE ASSESSMENT	3
4.1	Description of Noise Sources and Aggregate Operations	3
4.2	Acoustical Modelling	4
5	RECOMMENDATIONS.....	5
6	CONCLUSIONS	6
7	REFERENCES	7

Figure 1 – Existing Features Plan

Figure 2 – Aerial Plan

Figure 3 – Operational Plan Showing Perimeter Berm Location

Appendix A – Sample Calculations

Appendix B – Curriculum Vitae

1 INTRODUCTION AND SUMMARY

HGC Engineering was retained by 5026367 Ontario Inc. to undertake an analysis of the potential impact of noise from a proposed gravel pit at neighbouring noise sensitive receptors (residential dwellings) in accordance with the Ministry of Natural Resources and Forestry (MNR) and the Ministry of the Environment, Conservation and Parks (MECP) Guidelines. The proposed gravel pit is located west of Nissouri Road and north of Thorndale Road (County Road 28) in the Municipality of Thames Centre in the Municipality of Middlesex.

This assessment was conducted in accordance with MNR and MECP guidelines and considered the potential effects of noise from extraction, processing and on site transportation sources with regard to neighbouring noise sensitive receptors.

This assessment is also based on a review of the operational plans prepared by Harrington McAvan Ltd. dated November 2020 and sound levels taken from our files based on measurements of similar aggregate processing equipment to be used in the pit.

There are noise sensitive receptors located to the northwest and east of the proposed pit. The equipment and activities which are potential sound sources are outlined in Section 4. This assessment is based on a scenario representing the worst-case operations located closest to the receptors.

The results of our analysis indicate that sound levels produced by worst case scenario operations are expected to comply with MECP Guideline limits with the implementation of noise control measures.

2 SITE DESCRIPTION

The existing features plan attached as Figure 1 and aerial plan attached as Figure 2 show the location of the proposed site, the neighbouring residences and nearby roadways.

The proposed pit is located west of Nissouri Road north of Thorndale Road (County Road 28) in the Municipality of Middlesex Centre. The proposed licence area is ±14.2 hectares with a maximum annual excavation limit of 300,000 tonnes. There are existing residential and agricultural land uses to the east, west and north of the site and industrial facilities to the southwest and south of the site.



3 CRITERIA

3.1 Receptors

The Provincial Standards – Aggregate Resources of Ontario (Category 1 – Class “A” Pit below Water) state: “If extraction and / or processing facilities are located within 150 meters of a sensitive receptor, a noise assessment report is required to determine whether or not provincial guidelines can be satisfied” and “Sensitive receptors include residences or facilities where people sleep (nursing homes, hospitals, trailer parks, camping grounds, etc); schools; day-care centres.”

There are residential properties located within 150 m of the site to east and west (R1 to R5). R1, R2 and R4 are 1-storey dwellings and R3 is a 2-storey dwelling. An additional receptor was included to represent the residential subdivision to the east of Nissouri Road (R5). Any useable outdoor locations on residential properties within 30 m of the building, and also locations immediately outside the plane of the residential windows are considered to be points of reception. For aggregate facilities, the worst case points of reception are considered to be outside the upper story windows due to potentially increased exposure to the pit operations. The receptor locations are shown on the Figures.

3.2 Noise Criteria

Appropriate sound level limits used in the assessment of sound from aggregate operations are provided in MECP publication NPC-300, “Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning”, Part C release date October 21, 2013”. Under MECP guidelines, the acoustical environment at the receptors is classified as semi-urban as the background sound is dominated by traffic noise from Thorndale Road and Nissouri Road. The gravel pit will operate during daytime hours only. NPC-300 specifies that the sound level limit at any receptors due to the operation of a stationary source is the higher of the background one hour energy equivalent sound level (L_{EQ-1HR}) or 50 dBA for semi-urban areas during the daytime hours.

To ensure a conservative analysis, since road traffic sound levels may be relatively low during some daytime hours, the minimum daytime sound levels of 50 dBA are used in the following sections of this report as the criterion by which the potential noise impact of the proposed aggregate extraction and processing operations are assessed.

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. The guidelines of NPC-300 apply to sound from the ongoing day-to-day operations of the subject site. They do not apply to the temporary sound produced during the preparation and rehabilitation of extraction sites, or to the sound produced by road trucks on public roadways. The initial operations of building access roadways, stripping top soil, and building localized shielding and perimeter berms, as well as the final operations of rehabilitation and removal of localized shielding and perimeter berms) are defined as construction activity. In order to satisfy Provincial Standards, the sound levels emitted by the equipment involved in those construction activities must comply with MECP Guideline NPC-115, "Sound Levels due to Construction Equipment" [3].

4 NOISE ASSESSMENT

4.1 Description of Noise Sources and Aggregate Operations

The following details the future above and below water extraction and processing operations in the pit as indicated on the Operational Plan.

1. The gravel pit will typically operate from 07:00 to 19:00 on Monday to Friday, and from 07:00 to 12:00 on Saturday. No other evening or nighttime operations are anticipated.
2. The entrance to the pit is located on the south side of the site.
3. Operations will begin in the east end of Area 1 and proceed in a westerly direction into Areas 2 and 3.
4. The aggregate excavation, processing and loading equipment consists of a crushing and screening plant with an associated loader, and an excavator. The loader and excavator can operate in each area for extraction at the working face or loading of trucks.
5. All operations including excavation, processing, and loading will typically occur on the floor of the pit at an elevation of approximately 278.1 to 281.3 mASL.
6. Processing equipment will not be located within 90 m of any boundary of the site that abuts residential land uses as per “The Provincial Standards – Aggregate Resources of Ontario”, Operational Standards for Licences, Section 5.13.



ACOUSTICS



NOISE



VIBRATION

7. The peak number of trucks expected to arrive and depart in a typical busy hour is 12.

MECP guidelines require that a worst case hourly scenario be used in the evaluation. This scenario is discussed below.

4.2 Acoustical Modelling

Predictive modeling was used to assess the potential sound emissions of the worst case gravel pit activities. The prediction model is based on established engineering methods from the MECP and ISO Standard 9613 for the prediction of outdoor sound propagation.

To consider a worst-case operational scenario, the following assumptions were made:

- All extraction, processing, and loading could occur simultaneously at the closest possible location to the receptor;
- All equipment will be located on the pit floor at an elevation of approximately 278.1 to 281.3 mASL.
- 12 haul trucks arrive and depart.

The calculations consider the acoustical effects of distance, foliage, topography and shielding by the excavation face where applicable. Using the sound level data and the assumptions outlined above and the details contained in the operational plan, the sound levels at the receptors were predicted.



5 RECOMMENDATIONS

Using the predictive model and assumptions described in the previous section, the following noise control requirements were developed and should be included as notes on the Operational Plans:

1. The following table presents the reference sound levels used for the acoustic modeling presented herein. These sound levels were based on site measurements of similar processing equipment to be used in this pit.

Table 2 – Reference Sound Power Levels of Processing Equipment

Equipment	Sound Power Level dBA re: 10 ⁻¹² W
A Crushing and Screening Plant with an associated loader	115
Excavator	108
Trucks	103

If other equipment is proposed for operation in the gravel pit, it shall be confirmed through measurement to produce sound levels consistent with the above referenced sound levels or additional mitigation measures may be required.

2. A minimum 3.0 m high perimeter berm (above existing grade) shall be constructed along the eastern boundary and northeast corner of the pit prior to the commencement of extraction or processing activities in Area 1. The 3.0 m high perimeter berm shall remain after all activities are moved into Area 2.
3. A minimum 7.0 m high acoustical barrier shall be constructed and maintained on the pit floor beside the crushing and screening plant in the direction of R1 to R3 (to the east of the plant).
4. A minimum 6.0 m high acoustical barrier shall be constructed and maintained on the pit floor beside the crushing and screening plant in the direction of R4 (to the west of the plant).

5. The acoustical barriers mentioned above could be comprised of the pit face, an earth berm, a noise wall, aggregate stockpiles or any other construction with a minimum surface density of 20 kg/m².
6. Activities used to prepare the site for excavation, such as the stripping of topsoil, construction of berms, or activities related to the remediation of the site are considered to be construction activities. They are regulated under municipal bylaws and NPC-115 “Sound Level Limits for Motorized Construction Equipment”.

6 CONCLUSIONS

HGC Engineering has reviewed the operational plan, prepared an acoustical model of the proposed activities in the pit and conducted an analysis of those operations based on worst-case operational scenarios. Using the modeling assumptions detailed in Section 4 incorporating the noise control recommendations detailed in Section 5 and Figure 3, sound levels were predicted at each of the selected receptors as summarized in Table 3. Sample calculations are provided in Appendix A.

Table 3: Predicted Sound Levels at the Residential Receptors [dBA] During Worst-Case Operational Scenarios (With Noise Mitigation)

Receptor	Daytime Criteria (dBA)	Predicted Sound Level (dBA)
R1	50	47
R2	50	47
R3	50	50
R4	50	47
R5	50	46

These results indicate that the sound emissions from the proposed pit operations, with the recommended noise control measures in place, are expected to comply with MECP guideline limits at neighbouring noise sensitive receptors under worst case operating scenarios.

7 REFERENCES

1. Ontario Ministry of the Natural Resources and Forestry, *Aggregate Resources of Ontario – Provincial Standards*, 1997.
2. Ontario Ministry of the Environment and Climate Change Publication NPC-300, *Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning*, August 2013.
3. Ontario Ministry of the Environment and Climate Change Publication NPC-115, *Sound Level Limits for Motorized Construction Equipment”*.
4. International Organization for Standardization, *Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation*, ISO-9613-2, Switzerland, 1996.
5. Google Maps Aerial Imagery, Internet application: *maps.google.com*.



ACOUSTICS

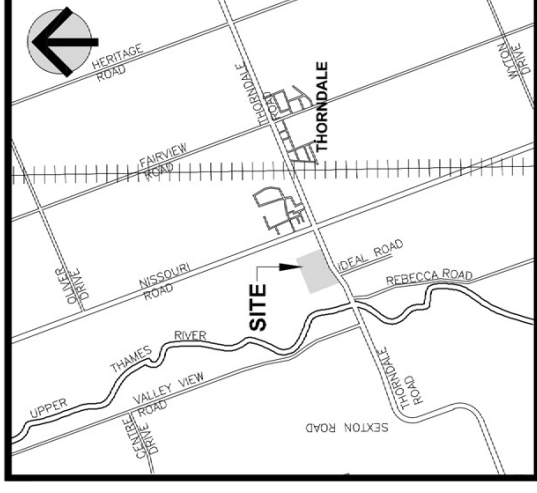


NOISE



VIBRATION

KEY MAP



LEGEND

- BOUNDARY OF AREA TO BE LICENCED
- - - 120m INFORMATION BOUNDARY
- - - POSSIBLE FUTURE RIGHT-OF-WAY LINE
- PROPERTY LINES
- REGULATORY SETBACK LINE
- LIMIT OF EXTRACTION
- WATERCOURSE
- 1 EXISTING BUILDING AND NUMBER
- IP
- DIRECTION OF SURFACE WATER DRAINAGE
- ↻ BH/AW
- BOREHOLE LOCATION AND NUMBER DRILLED
- WELL INSTALLED BY
- EXISTING FENCE
- EXISTING 5m CONTOUR LINE
- EXISTING 1m CONTOUR LINE
- EXISTING SPOT ELEVATION
- EXISTING VEGETATION
- LOCATION OF SECTION
- A

BUILDING LIST

No.	Description
1.	BARN
2.	HOUSE
3.	INDUSTRIAL BUILDING
4.	STORAGE FACILITY BUILDINGS

Site Plan Amendments

No.	Date	Revisions	Drawn	Checked	Scale	Sheet	Total

Harrington McAvan Ltd

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 1732435
 Tel: 905-294-8282 Fax: 905-294-7623
 www.harringtonmcavan.com

Project Name
1732435
Ontario Ltd.
ELLIOT PIT

LICENSEE SIGNATURE
 LICENCE No.
 PART LOT 16, CONCESSION 2
 MUNICIPALITY OF THAMES CENTRE (FORMERLY TOWNSHIP OF WEST NISSOURI), COUNTY OF MIDDLESEX

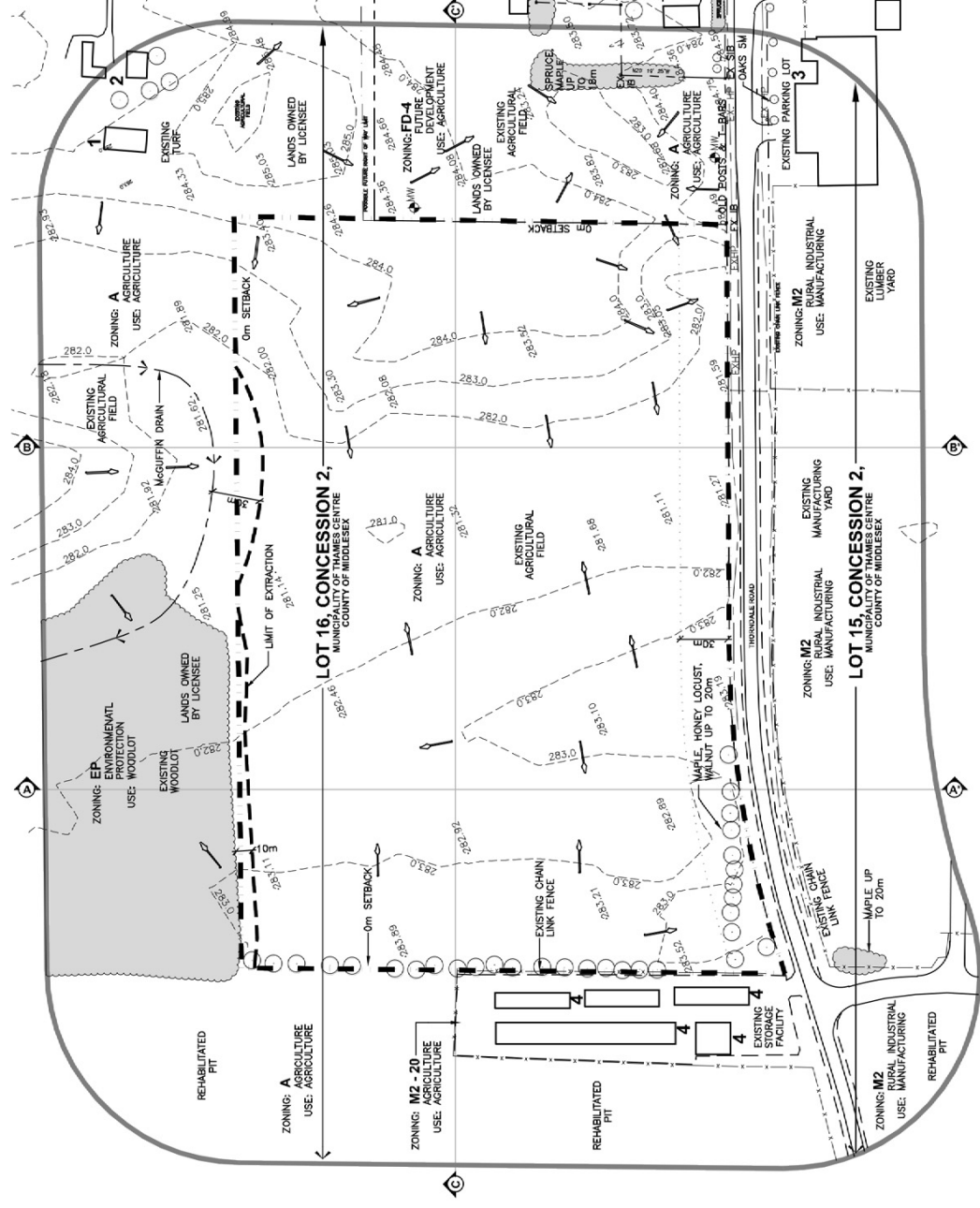
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North

Drawing Status
DRAFT
 PRELIMINARY FOR DISCUSSION

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Drawn SB	Checked MH	Issue Date
Drawing Title		Project Number
EXISTING FEATURES PLAN		20-22
Drawing Number		1
		OF 4



EXISTING FEATURES NOTES

- GENERAL SITE PLAN INFORMATION**
- THIS SITE PLAN CONSIST OF 5 DRAWINGS AND MUST BE READ COLLECTIVELY.
 - ALL MEASUREMENTS SHOWN ON THIS SITE PLAN ARE IN METRES.
 - THIS SITE PLAN IS PREPARED FOR SUBMISSION TO THE MINISTRY OF NATURAL RESOURCES AND FORESTRY UNDER THE AGGREGATE RESOURCES ACT FOR A CATEGORY 1 - CLASS 'X' LICENCE, PIT ABOVE THE WATER TABLE.
- LICENCE INFORMATION**
- APPLICANT:
1732435 ONTARIO LTD.
- BASE INFORMATION**
- TOTAL AREA TO BE LICENCED:
14.2 ha
 - TOTAL AREA TO BE REHABILITATED:
12.2 ha
 - TOPOGRAPHIC INFORMATION WAS OBTAINED FROM SURVEY, PROJECT # DEL15-103 BY DEVELOPMENT ENGINEERING. ALL ELEVATIONS ARE GEODETIC AND ABOVE SEA LEVEL (ASL).
 - THE SITE WAS FIELD CHECKED BY HARRINGTON MCAVAN LTD., SEPTEMBER 1, 2020
 - ZONING INFORMATION OBTAINED FROM MUNICIPALITY OF THAMES CENTRE ZONING BY-LAW 281-75-2018, MAPS 13 AND 17, OFFICE CONSOLIDATION MARCH 2018. MAJORITY OF THE ZONING INFORMATION IS BASED ON THE 2018 ZONING BY-LAW. ANY CHANGES APPLIED FOR TO CHANGE ED TO M2 EXTRACTIVE INDUSTRIAL.

- HYDROGEOLOGICAL INFORMATION**
- HYDROGEOLOGICAL INFORMATION INCLUDING GROUNDWATER ELEVATION WAS OBTAINED FROM REPORT BY GROUNDWATER SCIENCE CORP. DATED.....
 - THE WATER TABLE ELEVATION WITHIN THESE PROPERTIES IS ESTIMATED TO BE BETWEEN..... AND..... BASED ON..... CORRESPONDENCE FROM GROUNDWATER SCIENCE CORP.
- TECHNICAL REPORTS**
- HYDROGEOLOGICAL INFORMATION WAS OBTAINED FROM REPORT BY GROUNDWATER SCIENCE CORP. DATED..... (REFER TO SHEET..... FOR TECHNICAL RECOMMENDATIONS).
 - NATURAL ENVIRONMENT INFORMATION WAS OBTAINED FROM REPORT BY..... DATED..... (REFER TO SHEET..... FOR TECHNICAL RECOMMENDATIONS).
 - ARCHAEOLOGICAL INFORMATION WAS OBTAINED FROM REPORT BY..... DATED..... (REFER TO SHEET..... FOR TECHNICAL RECOMMENDATIONS).
 - ACOUSTICAL INFORMATION WAS OBTAINED FROM NOISE REPORT BY..... DATED..... (REFER TO SHEET..... FOR TECHNICAL RECOMMENDATIONS).

Figure 1: Existing Features Plan



Figure 2: Aerial Photo

LEGEND

--- 120m INFORMATION BOUNDARY	--- 120m INFORMATION BOUNDARY
--- PROPERTY LINE	--- PROPERTY LINE
--- REGULATORY SETBACK LINE	--- REGULATORY SETBACK LINE
--- EXISTING FENCE	--- EXISTING FENCE
--- EXISTING 5m CONTOUR LINE	--- EXISTING 5m CONTOUR LINE
--- EXISTING 1m CONTOUR LINE	--- EXISTING 1m CONTOUR LINE
--- EXISTING SPOT ELEVATION	--- EXISTING SPOT ELEVATION
--- EXISTING VEGETATION	--- EXISTING VEGETATION
--- EXISTING WETLAND	--- EXISTING WETLAND
--- LOCATION OF SECTION	--- LOCATION OF SECTION
--- EXTRACTION FACE	--- EXTRACTION FACE
--- BERM (MIN. HEIGHT AS SHOWN)	--- BERM (MIN. HEIGHT AS SHOWN)
--- UNDISTURBED AREA	--- UNDISTURBED AREA
--- AREA STRIPPED OF TOPSOIL AND OVERBURDEN	--- AREA STRIPPED OF TOPSOIL AND OVERBURDEN
--- AREA UNDER REHABILITATION	--- AREA UNDER REHABILITATION
--- DIRECTION OF EXTRACTION	--- DIRECTION OF EXTRACTION
--- DIRECTION OF TOPSOIL AND OVERBURDEN MOVEMENT	--- DIRECTION OF TOPSOIL AND OVERBURDEN MOVEMENT
--- PROSPECT TRANSPORTATION VIA HAUL ROAD	--- PROSPECT TRANSPORTATION VIA HAUL ROAD
--- RECEPTOR	--- RECEPTOR
--- EXISTING ELEVATION	--- EXISTING ELEVATION
--- PROPOSED ELEVATION	--- PROPOSED ELEVATION
--- PROPOSED MARKER POST	--- PROPOSED MARKER POST

OPERATIONS NOTES

GENERAL INFORMATION

- THIS PLAN SHOWS A SCHEMATIC OPERATIONS AND REHABILITATION SEQUENCE FOR THIS PROPERTY BASED ON THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION. THE SEQUENCE IS SUBJECT TO CHANGE BASED ON FIELD CONDITIONS, OPERATIONAL, HYDROLOGICAL AND HYDROGEOLOGY OR MARKET DEMAND. PHASES DO NOT REPRESENT ANY SPECIFIC OR EQUAL TIME PERIOD.
- EXTRACTION SHALL GENERALLY FOLLOW THE SEQUENCE SHOWN, WHEN PARTIAL REHABILITATION OF A PHASE IS POSSIBLE IT SHALL BE CARRIED OUT. NOT WITHSTANDING THE EXTRACTION AND REHABILITATION PROCESS ABOVE, DEMAND FOR CERTAIN PRODUCTS OR REHABILITATION PHASING, ANY MAJOR DEVIATIONS FROM THE OPERATIONS SEQUENCE SHOWN WILL REQUIRE APPROVAL FROM MNR.
- ON DRAWING OF 4, EXISTING FEATURES, FOR A DESCRIPTION OF EXISTING VEGETATION AND BUILDINGS WITHIN THE 120 METRE BOUNDARY AND ON SITE.
- SITE PLAN OVERLAYS ARE LISTED IN THE SITE PLAN OVERLAYS TABLE SHOWN ON THIS PAGE.

EXTRACTION/PROCESSING/HAULING INFORMATION

- TOTAL AREA TO BE EXTRACTED IS 2.1 HECTARES.
- MAXIMUM NUMBER OF TONNES OF AGGREGATE TO BE REMOVED FROM THE SITE IN ANY CALENDAR YEAR IS --- TONNES.
- EXTRACTION OF SAND AND GRAVEL ABOVE WATER TABLE WILL TAKE PLACE IN ONE OR TWO BENCHES, WITH A MAXIMUM HEIGHT OF 48 METRES. THE GROUNDWATER TABLE IS ESTIMATED TO BE AT A DEPTH OF 1.5 METRES BELOW THE SURFACE. MATERIAL TO BE EXTRACTED WILL BE CARRIED TO THE PORTABLE PLANT AND HAUL TRUCKS OR CONVEYORS WILL CARRY MATERIAL TO THE PORTABLE PLANT FOR FURTHER PROCESSING. REFER TO SECTIONS AA', BB', AND CC' ON DRAWING 4 OF 5 FOR FURTHER DETAILS.
- PORTABLE PROCESSING EQUIPMENT, FOR CRUSHING AND SCREENING WILL BE USED ON SITE AND WILL BE LOCATED CLOSE TO THE PIT FACE. MATERIAL TO BE EXTRACTED FROM THE SITE WILL BE CARRIED TO THE PORTABLE PLANT BY HAUL TRUCKS. LOADERS, EXCAVATOR, BACKHOES, BULLDOZERS, SCRAPERS, CONVEYORS AND OTHER RELATED EQUIPMENT, PROCESSING EQUIPMENT, STACKERS AND PRODUCT PILES WILL NOT EXCEED 2.5 METRES IN HEIGHT AND WILL BE LOCATED CLOSE TO PIT FACES.
- OFFICE/STORAGE BUILDING AND/OR SCALEHOUSE MAY BE CONSTRUCTED WHERE SHOWN.
- EQUIPMENT, SCRAP AND MACHINERY ASSOCIATED WITH THE EXTRACTION OPERATIONS WILL BE REMOVED UPON COMPLETION OF EXTRACTION.
- THE WATER TABLE ELEVATION VARIES ACROSS THIS LICENCE FROM APPROXIMATELY 1 --- 1 --- 1M ABOVE SEA LEVEL (A.S.L.) BASED ON THE JANUARY 2017 HYDROGEOLOGICAL REPORT (SEE ABOVE), REFER TO SECTIONS ON SHEET 3 OF 4.
- SURFACE DRAINAGE WILL BE DIRECTED TO LOW AREAS FOR WATER TO INFILTRATE INTO THE GRANULAR MATERIALS ON THE PIT FLOOR. THERE WILL BE NO OFF-SITE LATCHING/DISCHARGE.

NOISE MITIGATION INFORMATION

HOURS OF OPERATION:

- 07:00-19:00 WEEKDAYS; 07:00-NOON SATURDAYS
- 07:00-19:00 WEEKDAYS; 07:00-NOON SATURDAYS
- 07:00-19:00 WEEKDAYS; 07:00-NOON SATURDAYS

AIR QUALITY INFORMATION

- WATER OR CALCIUM CHLORIDE WILL BE APPLIED TO INTERNAL HAUL ROADS AND PROCESSING AREAS AS OFTEN AS REQUIRED TO MITIGATE DUST.

SITE MANAGEMENT INFORMATION

MAINTENANCE/PROTECTION OF VEGETATION INFORMATION

- EXISTING VEGETATION WITHIN THE LICENCED AREA SHALL BE MAINTAINED IN A HEALTHY CONDITION THROUGHOUT THE EXTRACTION AND REHABILITATION PROCESS. WHERE NECESSARY, PROGRESSIVE AND FINAL REHABILITATION WILL ALSO BE MAINTAINED IN A HEALTHY, VIGOROUS GROWING CONDITION.
- BOUNDARIES OF THE AREA TO BE LICENCED THAT ARE PRESENTLY FENCED ARE SHOWN ON THIS PLAN. THE FENCING SHALL BE MAINTAINED THROUGHOUT THE EXTRACTION AND REHABILITATION PROCESS. THE LICENCED BOUNDARIES WILL BE UPGRADED TO 1.2m HIGH POST AND WIRE TO COMPLY WITH THE AGGREGATE RESOURCES ACT WHERE REQUIRED.
- 1.2m HIGH, HIGHLY VISIBLE MARKER POSTS SHALL BE USED TO DEMARCATATE THE LIMITS OF EXTRACTION AND THE LICENCE CORNERS WHEN AGRICULTURAL ACTIVITY PERMITS.
- SILT FENCE SHALL BE INSTALLED ALONG THE LIMITS OF EXTRACTION WHEN OPERATIONS ARE WITHIN 50m. ALL FENCING SHALL BE MAINTAINED.
- TOPSOIL/SOIL/AND OVERBURDEN STORAGE INFORMATION
- TOPSOIL AND OVERBURDEN SHALL BE STRIPPED AND STORED SEPARATELY IN BERMS WHERE SHOWN AND STOCKPILES ON PIT FLOOR CLOSE TO EXTRACTION FACE.
- BERM INFORMATION
- BERMS SHALL BE A MINIMUM OF 1.2 METRES ABOVE THE EXISTING GRADE, OR AS SPECIFIED IN THE AGGREGATE RESOURCES ACT. ALL BERMS SHALL BE CONSTRUCTED TO COMPLY WITH THE AGGREGATE RESOURCES ACT. ALL BERMS SHALL BE SEEDING USING GRASS/LEGUME MIXTURE. SEE REHABILITATION PLAN, NOTE #7) IMMEDIATELY UPON COMPLETION TO MINIMIZE NOISE, DUST AND EROSION.
- ON COMPLETION OF THE BERMS, EXCESS ON-SITE OVERBURDEN WILL BE USED TO PROGRESSIVELY BACKFILL AND REHABILITATE THE SITE. TOPSOIL CAN BE TEMPORARILY STOCKPILED ON THE PIT FLOOR.
- SCRAP STORAGE INFORMATION
- SCRAP STORAGE INFORMATION AND OTHER CHEMICALS GENERATED THROUGH THE OPERATIONS WITHIN THIS LICENCE WILL BE STORED IN THE SCALE AREA A MINIMUM OF 300M FROM THE BOUNDARY OF THE SITE AND NOT WITHIN 30M OF ANY BODY OF WATER AND SHALL BE DISPOSED OF ON AN ONGOING BASIS. STUMP/POORLY MATERIAL MAY BE CHIPPED AND USED FOR SOIL ENHANCEMENT (TERRACING) FOR FIREWOOD AND/OR THEIR BEST USE. UPON COMPLETION OF EXTRACTION, ALL SCRAP EQUIPMENT AND USED MACHINERY SHALL BE REMOVED.
- PETROLEUM STORAGE INFORMATION
- FUEL, OIL, RADIATOR AND HYDRAULIC FLUID, AND OTHER CHEMICALS NEEDED FOR THE EXTRACTION OPERATIONS SHALL BE STORED IN ABOVE-GROUND CONTAINERS AND SHALL MEET THE REQUIREMENTS OF THE GASOLINE HANDLING ACT, AS AMENDED, AND THE GASOLINE HANDLING CODE AND REGULATIONS. ALL CONTAINERS SHALL BE PROTECTED BY FENCING AND SHALL BE MAINTAINED IN A HEALTHY AND LIQUID FIELDS HANDLING CODE AND IN ACCORDANCE WITH THE MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE GUIDELINES. ALL REFUELLING SHALL BE WITHIN A CONTAINED PAD. ALL SPILLS TO THE ENVIRONMENT MUST BE REPORTED TO THE SPILLS RESPONSE CENTRE. ANY SPILL SHALL BE REMOVED AND DISPOSED OF AT AN APPROPRIATE MEO APPROVED FACILITY.

PHASE A NOTES

- ESTABLISH THE ENTRANCE/EXIT AND HAUL ROAD INTO THE SITE AT THORNDALE ROAD, ACCORDING TO THE APPROPRIATE MUNICIPAL STANDARDS. CONSTRUCT THE PROPOSED SCALE, SCALEHOUSE AND/OR OFFICE AND FUEL STORAGE IN THE AREA SHOWN.
- PRIOR TO ANY ON-SITE OPERATIONS, CONSTRUCT OR UPGRADE THE FENCING TO COMPLY WITH THE AGGREGATE RESOURCES ACT. UPGRADE THE FENCING TO 1.2m HIGH POST AND WIRE FENCE, EXCEPT WHERE SITE PLAN OVERLAYS ARE NOTED. ALL FENCING SHALL BE MAINTAINED.
- CONSTRUCT THE HAUL ROAD THROUGHOUT SOUTH PART OF AREA 1 AND 2 AND USE STRIPPED SOIL TO CONSTRUCT ACOUSTIC BERM 1.
- PRIOR TO EXTRACTION STRIP TOPSOIL AND OVERBURDEN SEPARATELY USE THE MATERIALS TO CONTINUE CONSTRUCTION OF ACOUSTIC BERM 1 AND 2 TO RECOMMENDED SPECIFICATIONS FOR PHASE A.
- ANY REMAINING STRIPPED MATERIAL MAY BE USED TO CONTINUE CONSTRUCTION OF BERMS.
- BEGIN EXTRACTION OF AREA 1 IN A WESTERLY DIRECTION. PORTABLE PROCESSING PLANT AND STOCKPILE AREA MAY BE TEMPORARILY LOCATED NEAR THE PIT FACE.
- UNDISTURBED PORTIONS OF AREAS 1 AND 2 SHALL REMAIN IN AGRICULTURAL USE.

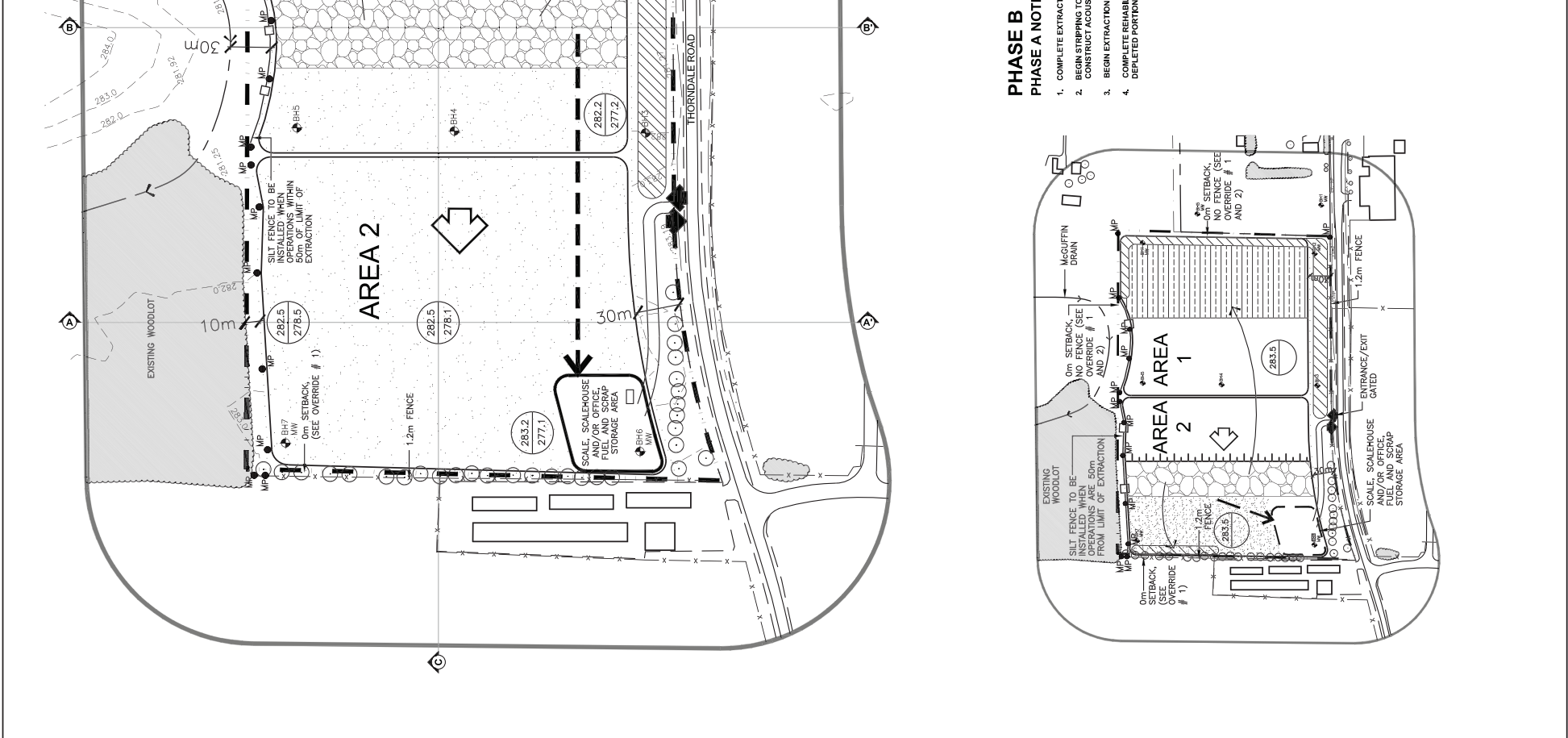
PHASE B

PHASE A NOTES

- COMPLETE EXTRACTION OF AREA 1.
- BEGIN STRIPPING TOPSOIL AND OVERBURDEN SEPARATELY AND USE TO CONSTRUCT ACOUSTIC BERM 2 AND BEGIN REHABILITATION OF AREA 1.
- BEGIN EXTRACTION OF AREA 2 IN A WESTERLY DIRECTION.
- COMPLETE REHABILITATION OF AREA 1 AND BEGIN REHABILITATION OF SELECTED PORTIONS OF AREA 2.

PHASE B NOTES

- COMPLETE EXTRACTION OF AREA 2.
- REMOVE SCALE AND SCALE HOUSE AND ALL SCRAP AND EQUIPMENT AND COMPLETE REHABILITATION OF AREA 1.
- COMPLETE REHABILITATION OF ALL REMAINING AREAS INCLUDING ALL INTERNAL HAUL ROADS USING TOPSOIL AND OVERBURDEN STOCKPILED IN BERMS.
- RETURN SITE TO AGRICULTURE.



OPERATIONS PLAN

Project Name
 1732435 Ontario Ltd. ELLIOT PIT

LICENSEE SIGNATURE
 LICENCE No. _____
 PART LOT 16, CONCESSION 2
 MUNICIPALITY OF THAMES CENTRE (FORMERLY TOWNSHIP OF WEST NISSOURI), COUNTY OF MIDDLESEX

Scale 1:1000

Drawing Status
 PRELIMINARY FOR DISCUSSION

Stamp
 North

Scale 0 10 20 30 40m

Drawing Title
 OPERATIONS PLAN

Checked MH

Issue Date
 20-22

Project Number
 20-22

Drawing Number
 2 OF 4

Figure 3: Operation Plan

APPENDIX A

Sample Calculations



ACOUSTICS



NOISE



VIBRATION

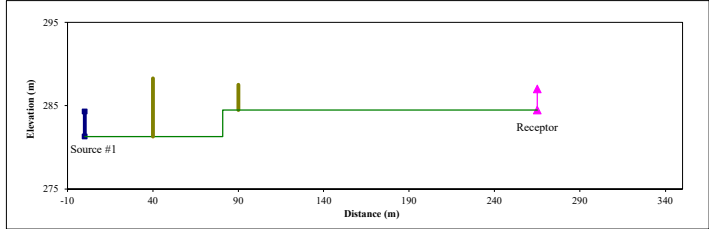
Project Name: Elliot Pit
 Receptor: R1 with Mitigation

Source #	Description	Distances			Elevations				Height			
		S-R	S-SB	S-RB	S Elev	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Crusher, Screener, Stackers, Loader	265	40	90	281.3	284.5	284.5	281.3	3	2.5	3	7
Source #2	Loader	205	30	30	281.3	284.5	284.5		2	2.5	3	
Source #3	Haul Truck (Passby)	215	40	40	281.3	284.5	284.5		2	2.5	3	
Source #4	Truck at Entrance	350	175	175	281.3	284.5	284.5		2	2.5	3	

Output Summary

Description	SPL at Receiver
Source #1 Crusher, Screener, Stackers, Loader	46
Source #2 Loader	37
Source #3 Haul Truck (Passby)	32
Source #4 Truck at Entrance	27
Total	47 dBA
Criteria	50 dBA

Barrier for Source #1



Note: For general illustration purposes only

TOP

Description	S-R	S-SB	S-RB	S Ele	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1 Crusher, Screener, Stackers, Loader	265	40	90	281.3	284.5	284.5	281.3	3	2.5	3	7
Number of Sources	1										
Time Duration	60 (minutes per hour)										
Tonality Penalty	0 dB										
Measurement Distance	50 m										
Frequency	63	125	250	500	1000	2000	4000	8000	dBA		
Meas SPL	78.6	79.5	71.3	67.9	66.7	66.1	63.3	57.4	73.1		
# Sres	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Time Dur	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Tonality	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Directivity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Air Abs	0.0	-0.1	-0.2	-0.6	-1.1	-1.9	-4.9	-16.5	0.0		
Gnd Atten	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Dist Atten	-14.5	-14.5	-14.5	-14.5	-14.5	-14.5	-14.5	-14.5	-14.5		
Barr. Att	-6.1	-7.1	-8.6	-10.8	-13.5	-16.4	-19.4	-22.4	46.2		
SPL @ Rec	57.9	57.8	47.9	42.0	37.6	33.3	24.4	4.1			

Barrier Calculations

Is there a source barrier:	Y	Source barrier BRIGHT ZONE:	N	SB Intercept Height	0.41
Is there a receiver barrier:	Y	Receiver barrier BRIGHT ZONE:	N	RB Intercept Height	0.92
		S->RB BRIGHT ZONE:	N	S-RB Intercept Height	1.42
		SB->RB BRIGHT ZONE:	Y	SB-RB Intercept Height	-0.29

[S->SB]	40.20	[S->RB]	90.06
[SB->R]	225.00	[RB->R]	175.00
[SB->RB]	50.01	[S->R]	265.01

Max Attenuation	-6.1	-7.1	-8.6	-10.8	-13.5	-16.4	-19.4	-22.4
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Combined

PLD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1
N	0.1	0.1	0.3	0.6	1.1	2.2	4.4	8.8	
Combined Attenuation	-6.1	-7.1	-8.6	-10.8	-13.5	-16.4	-19.4	-22.4	

Source Barrier

PLD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1
N	0.1	0.1	0.3	0.6	1.1	2.2	4.4	8.8	
Source Barrier Attenuation	-6.1	-7.1	-8.6	-10.8	-13.5	-16.4	-19.4	-22.4	

Receiver Barrier

PLD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1
N	0.0	0.0	0.1	0.1	0.3	0.5	1.0	2.0	
Source Barrier Attenuation	-5.3	-5.6	-6.1	-7.0	-8.4	-10.5	-13.2	-16.1	



HGC Engineering

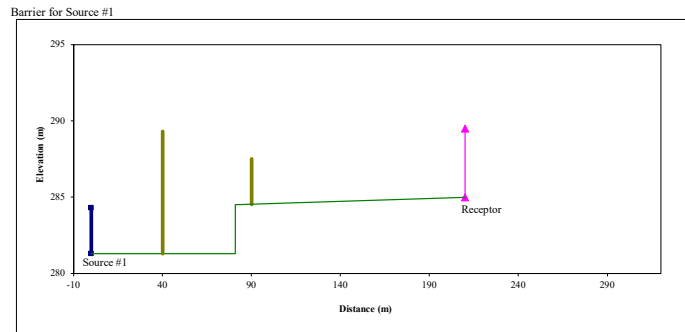
Environmental Noise Prediction Summary Sheet

Project Name: Elliot Pit
 Receiver: R3 with Mitigation

Source #	Description	Distances			Elevations				Height			
		S-R	S-SB	S-RB	S Elev	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Crusher, Screener, Stackers, Loader	210	40	90	281.3	285	284.5	281.3	3	4.5	3	8
Source #2	Loader	150		30	281.3	285	284.5		2	4.5	3	
Source #3	Haul Truck (Passby)	160		40	281.3	285	284.5		2	4.5	3	
Source #4	Truck at Entrance	375		255	281.3	285	284.5		2	4.5	3	

Output Summary

Description	SPL at Receiver
Source #1	48
Source #2	40
Source #3	36
Source #4	33
	0
	0
	0
	0
	0
	0
Total	49 dBA
Criteria	50 dBA



Note: For general illustration purposes only

TOP

Source #1	Description	S-R	S-SB	S-RB	S Ele	R Elev	RB Elev	SB Elev	S Height	R Height	RB Height	SB Height
Source #1	Crusher, Screener, Stackers, Loader	210	40	90	281.3	285	284.5	281.3	3	4.5	3	8
Number of Sources		1										
Time Duration		60 (minutes per hour)										
Tonality Penalty		0 dB										
Measurement Distance		50 m										
Frequency		63	125	250	500	1000	2000	4000	8000	dBA		
Meas SPL		78.6	79.5	71.3	67.9	66.7	66.1	63.3	57.4	73.1		
# Sres		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Time Dur		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Tonality		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Directivity		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Air Abs		0.0	0.0	-0.2	-0.4	-0.8	-1.4	-3.7	-12.3	0.0		
Gnd Atten		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Other		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Dist Atten		-12.5	-12.5	-12.5	-12.5	-12.5	-12.5	-12.5	-12.5	-12.5		
Barr. Att.		-6.5	-7.6	-9.4	-11.8	-14.6	-17.6	-20.6	-23.6	0.0		
SPL @ Rec		59.7	59.3	49.2	43.2	38.8	34.6	26.5	9.1	47.5		

Barrier Calculations

Is there a source barrier:	Y	Source barrier BRIGHT ZONE:		N	SB Intercept Height		0.99		
Is there a receiver barrier:	Y	Receiver barrier BRIGHT ZONE:		N	RB Intercept Height		2.23		
		S->RB BRIGHT ZONE:		N	S-RB Intercept Height		1.42		
		SB->RB BRIGHT ZONE:		Y	SB-RB Intercept Height		0.06		
		[S->SB]	40.31	[S->RB]	90.06				
		[SB->R]	170.00	[RB->R]	120.02				
		[SB->RB]	50.03	[S->R]	210.06				
Max Attenuation	-6.5	-7.6	-9.4	-11.8	-14.6	-17.6	-20.6	-23.6	
Combined									
PLD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1
N	0.1	0.2	0.4	0.7	1.4	2.9	5.7	11.5	
Combined Attenuation	-6.5	-7.6	-9.4	-11.8	-14.6	-17.6	-20.6	-23.6	
Source Barrier									
PLD	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1
N	0.1	0.2	0.4	0.7	1.4	2.9	5.7	11.5	
Source Barrier Attenuation	-6.5	-7.6	-9.4	-11.8	-14.6	-17.6	-20.6	-23.6	
Receiver Barrier									
PLD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1
N	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	
Source Barrier Attenuation	-5.1	-5.1	-5.2	-5.5	-5.9	-6.7	-8.0	-9.9	

APPENDIX B

Consultant Curriculum Vitae



ACOUSTICS



NOISE



VIBRATION

Mandy Chan, Senior Engineer PEng.

Education University of Waterloo, Bachelor of Applied Science, 2006

Professional Memberships Professional Engineers of Ontario (PEO)
Canadian Acoustical Association (CAA)
Ontario Society of Professional Engineers (OSPE)

Professional History 2014 to Present Senior Engineer, Associate, HGC Engineering, Mississauga
2010 to 2014 Project Engineer, HGC Engineering, Mississauga
2006 to 2010 Project Consultant, HGC Engineering, Mississauga

Experience Ms. Chan has been involved in a wide variety of projects related to acoustics, noise and vibration. She has experience with the measurement and analysis of traffic noise and stationary noise sources, architectural acoustic design of learning spaces, office spaces and churches. She has a broad familiarity with Ministry of Environment guidelines regarding noise and vibration and an understanding of Ministry criteria and methods for prediction of noise due to roadway, railway, aircraft traffic, industrial and aggregate facilities. Additionally, Ms. Chan has analysis experience using computer aided modelling and prediction software.

Selected Projects Banner Pit, *Thamesford, Ontario*
Block 5 Developments, *Brampton, Ontario*
Bremont Homes, *Mississauga, Ontario*
City Centre Condominiums, *Mississauga, Ontario*
Edmonton Clinic, *Edmonton, Alberta*
Greensborough Subdivision, *Markham, Ontario*
Gurney Sands and Gravel, *Brantford, Ontario*
Knox Presbyterian Church, *Waterloo, Ontario*
Inland West Pit, *Warwick, Ontario*
Johnson Bros. Gravel Pits, *Southern Ontario*
Mattamy Homes, *Milton, Ontario*
Liberty Village Condominiums, *Toronto, Ontario*
Linamar Tech Centre, *Guelph, Ontario*
Nelson Granite Quarries, *Kenora, Ontario*
St. Leonard's Boys' Secondary School, *Bermuda*
Tisdale Mining Lands, *Timmins, Ontario*
Waterloo Christian Reformed Church, *Waterloo, Ontario*
Warren Stewart Limestone Quarry, *Cockburn Island, Ontario*
West Village at Stratford, *Stratford, Ontario*

William J. Gastmeier, Principal, MAsc, PEng

Education:

BSc, Honours Physics, University of Waterloo, May 1974.
MAsc, Electrical Engineering (Acoustics) University of Waterloo, May 1976.
“Preparing & Presenting Evidence”, York University, 1991
“Noise Control in Land Use Planning”, Ministry of the Environment, 1987

Memberships:

Designated Consulting Engineer, Province of Ontario
Registered Professional Engineer, Association of Professional Engineers of Ontario (PEO)
Acoustical Society of America (ASA)
Canadian Acoustical Association (CAA), Member, Board of Directors
Canadian Environmental Industries Association (CEIA)

Professional Experience:

1993 to Present

Principal, Howe Gastmeier Chapnik Limited Mississauga, ON

Assess environmental noise and vibration from transportation and industrial sources, mining operations race tracks and gun ranges. Provide expert testimony with regard to noise and vibration in land use planning and land use compatibility. Gained extensive experience with noise control in Land Use Planning including Official Plan and Secondary Plan Amendments and Zone Change Applications across Ontario.

Design architectural acoustics and noise control for council chambers, performance spaces, worship spaces, studios, music rooms, offices, laboratories, museums and public spaces.

Provide third party expert peer review and certification services for clients across North America.

Specify and design noise control measures to ensure compliance with Ministry of the Environment Guidelines and the Occupational Health and Safety Act.

1987 to 1993

Project Coordinator, Vibron Limited, Mississauga, ON, Consulting Engineering Division

Supervised engineering staff in consulting engineering projects in acoustics, noise and vibration. Provided client liason, technical expertise, attended public meetings and hearings.

1981 to 1987

Manager, Unitron Industries, Electroacoustic Design

Hired and supervised staff in the acoustical and electronic design of hearing aids.



ACOUSTICS



NOISE



VIBRATION

Researched the physiology of hearing, hearing loss, psychoacoustics, speech intelligibility and audiology to design the electroacoustic performance of hearing assistive devices.

1976 to 1978

Project Engineer, Turner Division of Conrac Corporation

Developed a vibration sensor to detect engine knock, designed high intelligibility paging microphones and other new microphone products.

Selected Significant Projects & Studies:

Transportation

- Blue Water Bridge Twinning, Sarnia, Ontario
- Ambassador Bridge Enhancement Project (twinning), Windsor, Ontario
- Highway Widening and Alignments in Sudbury, Port Colborne, Brantford and Thunder Bay
- Winnipeg International Airport
- Layover/Expansion Facilities for Go Transit and CPR
- Golf Links Road Widening, Thunder Bay, 2010
- Pavement Rehabilitation, Highway 140, Port Colborne, 2009
- Highway 11/17, Sault Ste. Marie, 2009
- Ambassador Bridge Twinning, Windsor, 2007 and 2011
- Road Widening/Realignment, RR 35, Sudbury, 2006
- Kingsway Road Widening, Sudbury, 2005
- Fischer Hallman Road Widening, Waterloo, 2003
- Southwest Bypass Extension, Brantford, 2001
- The Kingsway Realignment, Sudbury, 2000
- Blue Water Bridge Twinning, Sarnia, 1995
- Many Noise Impact Studies for Subdivisions (Road, Rail & Air traffic sources) in Ontario

Noise Studies for Expropriation Proceedings:

- Highway 6 South, Puslinch
- Derry Road Mississauga
- Highway 403, Ancaster
- Highway 407, Markham
- Leslie Street, Newmarket

Acoustics

- Lecture and performance theatres, studios and classrooms at McMaster University, Western University, University of Windsor, University of Alberta, University of Waterloo, Upper Canada College, Ryerson University and Fanshawe, Mohawk and Niagara Colleges
- Performance Theatres for Drayton Entertainment in Kitchener and St. Jacobs, Ontario and the Toronto District School Board
- The Carlu (Eaton's Theatre), College Park, Toronto
- Design and Certification of Acoustical Test Facilities across North America



ACOUSTICS



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VIBRATION

- Acoustical Design of Worship Spaces for many faiths across Canada including 1000+ seat sanctuaries for the Metropolitan Bible Church in Ottawa, Richmond Hill Chinese Community Church and St. Thomas the Apostle Roman Catholic Church in Waterdown.
- Recreational, Library and Civic Facilities in Kitchener, Welland, Ingersoll and Brantford

Land Use Planning and Compatibility

- Transmetro Properties 1500 Unit Residential Development, Scarborough, ON
- Peer Reviews for Toronto, Waterloo Region, Simcoe, Oxford and Wellington Counties
- Hundreds of Road and Rail Traffic Noise and Vibration Impact Studies for new Residential Developments
- Noise Compatibility Studies for Official Plan Amendments and Zone Change Applications for Adjacent Proposed Residential/Industrial Land Uses.

Mines, Pits and Quarries

- Scores of Ministry of Natural Resources applications for licences for pits and quarries across Ontario, above and below water.
- De Beers Diamond Mine, Attawapiskat, Gold Mines in Red Lake, Timmins and Matheson ON
- Vale Inco in Sudbury and Port Colborne.

Power Plants, Pipelines and Utilities

- Combined Cycle Peaking Power Plant, Eastern Power, Missisauga
- Compressor Station Noise Assessments at TransCanada PipeLines Facilities across Canada
- Union Gas Province Wide Certificate of Approval Application and Environmental Noise Management
- Electrical/Steam Cogeneration Facilities, York University and Brock University

Teaching Experience:

1998 to 2010

Lecturer, Dalhousie University, School of Architecture: “Architectural Acoustics Module of ARB 211 Environment”

1988 to 2014

Adjunct Professor, University of Waterloo, Dept of Environmental Studies, School Of Architecture: “Architectural Acoustics, Noise Control, Sound Systems”

1988 to 1990

Lecturer, Ontario Ministry of the Environment: “Noise Control in Land Use Planning”

1982 to 1993

Guest lecturer, Physics Department, University of Waterloo: “Science of Hi-Fidelity”

Expert Testimony:

OMB Hearing, Aggregate License Application, Zoning and OP Amendment, Galway Cavendish, ON, 2014

Provincial Court, Prosecution under the Environmental Protection Act, Race Track, Seguin Twp., 2014

OMB Hearing, Aggregate License, Zone Change Application, Woolwich Township, 2013

OMB Hearing, Aggregate Licence Application, Ashfield- Colborne-Wawanosh, ON, 2011



ACOUSTICS



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VIBRATION

OMB Hearing, Aggregate Licence Application, Thames Centre ON, 2010
OMB Hearing, Proposed Golf Driving Range, Markham ON, 2010
OMB Hearing, Proposed Commercial Development near a Recycling Facility, Newmarket ON, 2010
OMB Hearing, proposed Quarry, Michipicoten Harbour, Wawa ON, 2009
OMB Hearing, proposed Residential Development near existing Industrial Land Use, Listowel, ON, 2009
OMB Hearing, proposed Mixed Use Development near Industrial Uses, Brampton ON, 2008
OMB Hearing, proposed Power Plant, Mississauga, Ontario, 2007
OMB Hearing, proposed Retirement Complex in Scarborough, 2007
OMB Hearing, compatibility of Residential Development near Feed Mill, Ingersoll, Ontario, 2006
OMB Hearing, proposed gravel pit, Simcoe, Ontario, 2005.
Ontario Superior Court of Justice, matter relating to noise from the St.Thomas Dragway, 2004
OMB Hearing, proposed aviary, Scotland, Ontario, 2004
OMB Hearing, proposed warehousing facility near existing residential neighbourhood, Oakville, 2004
OMB Hearing, proposed gravel pit, Oro-Medonte Township, 2004
OMB Hearing, high-rise residential development near industry and Highway 401, 2002
Provincial Court, Brantford Ontario, Prosecution under the Municipal Noise Bylaw, 2000
OMB Hearing, residential development adjacent to a CPR Classification Yard, Scarborough, 1999
OMB Hearing, Aggregate Extraction Facility, Windy Lake, Ontario, 1998
OMB Hearing, residential development adjacent to railway, Norwood Road, Toronto, 1996
OMB Hearing, proposed rail transfer facility, Shakespeare, Ontario, 1995
OMB Hearing, residential development, Rogers Road, City of Toronto, 1993
Consolidated Board Hearing, residential development in the City of York, 1992
NEC Hearing, Cogeneration Plant, Brock University, St. Catharines, 1992

Patents:

U.S. Patent 4,553,627 "Hearing Aid Wax Guard"
U.S. Patent 4,349,082 "Acoustical Damping Element and Method of Forming Same"
U.S. Patent 4,193,647 "Piezoelectric Ceramic Transducers with uniform Resonant Frequency"

Publications:

"Considerations in the Acoustical Design of Black Box Theatres", Proceedings of Acoustics Week in Canada, Canadian Acoustics, October 2015
"Recent Trends in the Acoustical Design of Institutional Facilities", Proceedings of Acoustics Week in Canada, Canadian Acoustics, September 2014
"Architectural Personality" Perspectives, Fall 2010
"Occupational Noise Exposure in Nightclubs" Proceedings of Acoustics Week in Canada, Canadian Acoustics, September 2010.
"The Consumer Handbook on Hearing Loss and Noise - Chapter 11 - Architectural Strategies to Minimize Noise" Edited by Marshall Chasin, Auricle Ink Publishers, 2010
"Acoustical Performance Criteria and Treatment Protocols for Learning Spaces at a Large Institutional Teaching Facility" Proceedings of Acoustics Week in Canada, Canadian Acoustics, September 2009.
"Hearing Loss in Musicians – Prevention and Management - Chapter 8 - Room and Stage Acoustics for Optimal Listening and Playing" Edited by Marshall Chasin, Plural Publishing Inc., 2009



ACOUSTICS



NOISE



VIBRATION

- “Acoustical Performance Criteria, Treatment and Guidelines for Multifunctional School Gymnasias” with Kana A. Ananthaganesan, Canadian Acoustics, December 2007
- “Room Acoustics and Modifications for Performing Artists” Hearing Review, March 2006
- “The Use of Environmental Noise Standards and Guidelines in Canada”, Canadian Acoustics, Sept. 2005
- “ISO-1996 ‘Acoustics-Description and Measurement of Environmental Noise’ Round Robin Testing”, Canadian Acoustics, December 2001
- “Reverberation in Public School Gymnasias” Canadian Acoustics, December, 1999
- “Air Traffic Noise”, Ontario Planning Journal, Spring, 1998
- “Musicians and the Prevention of Hearing Loss, Chapter 7, Room Acoustics” Edited by Marshall Chasin, Singular Publishing Group, San Diego, 1996
- “Applying Sound Intensity Methods In-situ to Measure Exhaust Noise levels and Estimate Silencer Performance” Proceedings of the Alberta Energy & Utilities Board 1996 Conference on Environmental Noise Control Engineering
- “The Assessment of Rail Traffic Noise and Vibration in Land Use Planning” Ontario Planning Journal, March /April, 1996
- “Acoustical Materials” The Canadian Architect, April, 1995
- “Environmental Noise & Vibration Part 2” Ontario Planning Journal, Jan/Feb, 1995
- “Noise Control & the Building Envelope” Ontario Building Envelope Council Newsletter, 1995
- “Environmental Noise & Vibration Part 1” Ontario Planning Journal, Nov/Dec, 1994.
- “Occupational Noise Exposure in the High School Music Practice Room” 1994 Congress of the Canadian Acoustical Association.
- “Field Sound Transmission Loss of Demising Walls and Floor/Ceiling Assemblies”. Proceedings of the 1992 International Congress on Noise Control Engineering.
- “The Control of Bus Noise and Vibration in Mixed Use Urban Construction”. Proceedings of the 1992 International Congress on Noise Control Engineering, Toronto, 1992, pp.857-860.
- “Noise Complaints in Residential Condominiums” Proceedings of Noise Control, 1990.
- “Noise Control of Underground Bus Stations - A Case Study” Canadian Acoustical Association Conference, Toronto, 1988.
- “The Acoustically Damped Earhook” Hearing Instruments No. 10, October 1981

Standardization and Professional Committees:

- Canadian Standards Association Member of Occupational Hearing Technical Committee, 2010 to Present
- Canadian Standards Association Member of Technical Committee S251 “Acoustics and Noise Control” 2005 to 2010
- Canadian Standards Association “Chair of Environmental Noise Subcommittee of Technical Committee S251 “Acoustics and Noise Control” 2005 to 2010
- Canadian Standards Association ISO 9613 / CSA Z107.55 Working Group on Industrial Noise Propagation, 2002 to 2010



ACOUSTICS



NOISE



VIBRATION

Canadian Standards Association - Working Group for the Adoption of "ISO-1996 'Acoustics-Description and Measurement of Environmental Noise', 2000 – 2007

Acoustical Society of America – Member of Noise Control Technical Committee, 1999 – Present

Association of Professional Engineers of Ontario - Committee for the Establishment of Guidelines for Professional Engineers Providing Acoustical Services in Land Use Planning, 1997



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VIBRATION