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Noise Feasibility Study Proposed Commercial Development 16054 & 16060 Airport Road Caledon, Ontario

Prepared for:

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1 Introduction & Summary

Howe Gastmeier Chapnik Limited (HGC Engineering) was retained by N&N Donut Inc. to investigate the potential environmental noise impact of a proposed commercial development with a drive-through on Airport Road, north of Old Church Road in Caledon, on existing adjacent residences. This report is required by the Town as part of the approvals process.

The analysis is based on a review of the proposed concept site plan, floor plans, estimates of rooftop mechanical unit locations, tonnages, and quantities, sound level data from HGC Engineering project files for the mechanical equipment as well as vehicles in the drive through queuing lane, aerial photos and a site visit. The analysis includes an assessment of the noise impact anticipated at the closest existing residences, in accordance with the Ministry of the Environment, Conservation and Parks (MECP) guidelines.

A computer model of the area was created, using acoustic modelling software, to predict the sound levels at the adjacent nearby residences. The results indicate that the sound emissions of the commercial development can be within the applicable noise guideline limits of the MECP at the nearby residential receptors, with additional mitigation in the form of an acoustic barrier, as outlined in this report. Note, as the design develops and plans change, these results may differ. The results are discussed in this report.

2 Site Description

The commercial building is to be built on the west side of Airport Road, north of Old Church Road, at 16054 and 16060 Airport Road in Caledon, Ontario. Figure 1 represents a key plan of the area. Figure 2 shows the proposed site plan prepared by Weston Consulting, dated March 3, 2019. The commercial development consists of an independent single storey building with a drive through and parking lot. The hours of operation of the business are unknown, but are likely to be inclusive of the day, evening and nighttime hours every day. The proposed use of the development is a coffee and donut shop.

Currently, the subject site is occupied by existing residential dwellings, both of which are to be demolished to make way for the proposed development. There are existing one and two-storey residences surrounding the site, as well as several commercial buildings in the area. The residential





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buildings are included in the analysis. South of Old Church Road, there are other commercial buildings including restaurants, banks, and gas stations.

Airport Road is a two-lane road in the area of the site. The subject site is located in a Class 1 (urban) acoustical environment where the background sound is primarily made up of the sounds of road traffic and human activity (the urban hum) in the daytime and nighttime hours.

2.1 Noise Source Description

The primary sources of sound associated with the commercial development are expected to be rooftop HVAC equipment mechanical equipment, the drive-through speaker board, and the idling vehicles in the drive-through queuing lane. Typical sound levels associated with these sources were obtained from HGC Engineering's project files for similar past projects. Locations for the HVAC equipment were assumed to be roughly in the centre of the building since they are not indicated on the plans. Locations for the noise sources can be found in Figure 3. Sound power levels of the noise sources are included in Section 4. Sensitive receptor locations were taken at the most potentially impacted residences (R1 to R6) as shown in Figure 3. Each receptor location was assessed at the residence's closest top floor window, as these represent the most potentially impacted locations. Additionally, rear yards for residences R1, R2, R3, and R6 were analysed to determine if mitigation is required.

3 Criteria for Noise from Commercial Facilities

3.1 Stationary Noise Criteria

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. Noise from the proposed development may potentially impact neighbouring noise sensitive land uses. In terms of background sound, the development is located in an urban (Class I) acoustical environment which is characterized by an acoustical environment dominated by road traffic and human activity.







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 operations in that regard. The façade 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 an urban Class 1 area is taken to be 50 dBA during daytime/evening hours (07:00 to 23:00), and 45 dBA during nighttime hours (23:00 to 07:00). If the background sound levels due to road traffic exceed the exclusionary limits, then the background sound level becomes the criterion. The background sound level is defined as the sound level that occurs when the source under consideration is not operating, and may include traffic noise and natural sounds. To ensure a conservative analysis, the exclusionary minimum criteria has been adopted at all receptors.

Commercial activities such as the occasional movement of customer vehicles, occasional deliveries, and garbage collection are not of themselves considered to be significant noise sources in the MECP guidelines. Noise from safety equipment (e.g. back-up beepers) is also exempt from consideration and may be audible on occasion. The decision to include the sound from trucks in an assessment under MECP noise guidelines depends of the volume of trucking, and the nature of the facility. Occasional deliveries to retail stores and convenience stores are exempt, for example, but heavy trucking at a warehouse or busy shipping/receiving docks at an industry must generally be assessed.

The likely activities at the proposed commercial development include the occasional movement of customer vehicles on the property, the infrequent delivery of goods to convenience stores, fast food restaurants etc. and garbage collection and are not of themselves considered to be significant noise sources in the MECP guidelines. It is not expected that there will be significant tractor trailer truck traffic or refrigerated trucks associated with this relatively small commercial unit. Accordingly, these sources have not been considered in the study.

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 still be residual audibility during periods of low background sound.







4 Stationary Source Assessment

Predictive noise modelling was used to assess the potential sound impact of the commercial building at the most potentially impacted residential receptors. The noise prediction model was based on sound emission levels for mechanical equipment, assumed operational profiles, and established engineering methods for the prediction of outdoor sound propagation. These methods include the effects of distance, air absorption, and acoustical screening by barrier obstacles.

Since the tenancy of the building is intended to be a coffee shop, there is expected to be no significant noise sources associated with the commercial development beyond the rooftop mechanical equipment, idling cars, and drive-through speaker (i.e., deliveries would be sporadic and during daytime hours only).

Lennox LGA060 models (5 Tons) was assumed for the rooftop air conditioning units. This analysis considers two rooftop units on the proposed building in addition to two exhaust fans. Additionally, one speaker board was considered, per the site plan, and 12 cars were considered in the drive-through queue for this analysis. Table 1 summarizes the sound data used in the analysis.

		Octave Band Centre Frequency [Hz]								
HVAC Unit	63	125	250	500	1k	2k	4k	8 k		
Lennox LGA060 (5 Tons)		72	70	71	68	63	57	48		
Exhaust Fan	78	85	79	69	64	63	58	54		
Drive-through speaker board*	75	70	67	81	78	76	63	48		
Low Speed or Idling Car (Each)	90	86	76	72	71	68	62	58		

Table 1: Source Sound Power Levels [dB re 10-12 W]

Note: The above drive-through speaker board sound power specification equates to a sound pressure level of 71 dBA at 1.5 meters from the speaker, while the speaker is active. * Includes a 5 dB tonal penalty.

The above outlined sound levels were used as input to a predictive computer model. The software used for this purpose (*Cadna-A version 2019, build: 173.4905*) is a computer implementation of ISO Standard 9613-2.2 "Acoustics - Attenuation of Sound During Propagation Outdoors." The ISO method accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures such as barriers.

The following information and assumptions were used in the analysis.







- The most potentially impacted residences are a combination of two one-storey buildings (R2 and R3) and two two-storey buildings (R1). The first and second storey windows were assumed to be approximately 1.5 m and 4.5 m above grade, respectively. Rear yard receptor locations were assumed to be 1.5 m in height.
- The noise sources were assumed to be located as shown in Figure 3. The green crosses represent noise sources such as rooftop HVAC equipment and vehicles in the drive-through. The rooftop equipment was assumed to be Lennox models, 1.2 m in height. The exhaust fans were assumed to be 0.6 m in height. The height of the car engines were assumed to be 0.5 m high. Sound data was obtained from HGC project files which were originally from the manufacturer.

In this impact assessment, we have considered typical worst-case (busiest hour) scenarios for each time period to be as follows:

Assumed day worst-case scenario:

- All rooftop equipment operating continuously at full capacity,
- The drive-through of Tim Hortons includes 12 cars idling for the full hour
- Cars order from the speaker boards at a rate of one every 30 seconds (10 seconds per order) for 20 minutes out of an hour.

Assumed night worst-case scenario:

- All rooftop equipment operating on a 50% duty cycle;
- The drive-through of Tim Hortons includes 6 cars idling for the full hour
- Cars order from speaker boards at a rate of one every 30 seconds (10 seconds per order) for 10 minutes out of an hour.

4.1 Results

The calculations consider the acoustical effects of distance and shielding by the buildings. The calculated sound levels from the proposed development at the residences and rear yards are summarized in Table 2, and presented graphically in Figures 4 and 5.





	Daytime/Evening (07:00 – 23:00)	Nighttime (23:00 – 07:00)	Criteria (Daytime / Nighttime)					
R1 (Two-Storey Residence)	45	40	50 / 45					
R2 (One-Storey Residence)	48	42	50 / 45					
R3 (One-Storey Residence)	46	41	50 / 45					
R4 (Two-Storey Residence)	44	38	50 / 45					
R5 (One-Storey Residence)	46	40	50 / 45					
R6 (Two-Storey Residence)	45	40	50 / 45					
R1 Rear Yard	49		50					
R2 Rear Yard	52		50					
R3 Rear Yard	50		50					
R6 Rear Yard	49		50					

The results of the calculations indicate that the sound levels from the proposed commercial development are less than the MECP's sound level criteria at all locations except for the rear yard of R3. Figures 4 and 5 provide sound level contours at 4.5 m in height. Figure 6 provides sound level contours at 1.5 m in height.

Mitigation, in the form of an acoustic barrier 2.0 m in height is required along the rear property line of the commercial development as indicated in Figure 7. Sound levels in the adjacent rear yards will be reduced to less than 50 dBA.

4.2 Recommendations

HGC Engineering has predicted the sound levels near the proposed commercial building, reviewed the site plan, reviewed typical sound rating data for rooftop units, and performed calculations to determine the impact at the existing residential units with respect to MECP guidelines. The configuration of the commercial building on the site can achieve MECP guidelines, as long as the following are met.

 When further details of the roof plans and mechanical equipment selections are available, an acoustical engineer should verify that the source sound level specifications and locations for the HVAC units conform to the assumptions made in this report and that acceptable sound levels will result at all offsite residential receptors. Use of larger and louder rooftop equipment may result in the requirement for rooftop acoustic screens.







- 2) A 2 meter high acoustic barrier must be included along the rear property line of the commercial development to mitigate noise in the adjacent rear yards.
- Before the issuance of building permits, an acoustical consultant should review the plans and specifications to certify that the required noise control measures and rooftop equipment and specifications have been included in their entirety.
- 4) After construction, the municipal building inspector or a Professional Engineer qualified to perform acoustical engineering services in the Province of Ontario should certify that the rooftop mechanical equipment and/or acoustic screens or parapets (if deemed necessary) and rear property line acoustic barrier have been installed with the specifications contained in this report and/or the drawings reviewed before building permit.

5 Conclusion

Assuming typical worst-case equipment and operating scenarios as described in this report, the analysis indicates that the noise impact of the commercial development will comply with MECP criteria at the existing residential buildings and all rear yards with the inclusion of a 2.0 m high acoustic barrier along the rear property line of the commercial development. The reader is referred to previous sections of this report where the recommendations are discussed in detail.









Figure 1: Key Plan







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Figure 2: Site Plan



Figure 3: Assumed Noise Source Locations and Key Residential Receptors



Figure 4: Predicted Daytime Sound Level Contours at 4.5 m in Height, dBA



Figure 5: Predicted Nighttime Sound Level Contours at 4.5 m in Height, dBA



Figure 6: Predicted Daytime Sound Level Contours at 1.5 m Height, dBA



Figure 7: Site Plan Showing Recommended Mitigation Measures