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PROPOSED COMMERCIAL KITCHEN 29 FOXTON BOULEVARD , HIGH WYCOMBE – NOISE ASSESSMENT

Report 10.00580R-01
prepared on 7/09/2023

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PROPOSED COMMERCIAL KITCHEN
29 FOXTON BOULEVARD, HIGH WYCOMBE – NOISE ASSESSMENT

REPORT PREPARED BY

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BASIS OF REPORT

This report has been prepared by **Acoustics Consultants Australia (ACA)** with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

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PROPOSED COMMERCIAL KITCHEN
29 FOXTON BOULEVARD, HIGH WYCOMBE – NOISE ASSESSMENT

CONTENTS

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au REF *Report 10.00580R-01*
ADDRESS Suite 4A / 755 Albany Highway ‣ East Victoria Park, WA 6101

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Report 10.00580R-01

1. INTRODUCTION

This report presents the findings of the noise assessment conducted by Acoustics Consultants Australia (ACA) for the proposed Commercial Kitchen to be located in the corner of Lot 316 (No. 29) Foxton Boulevard, High Wycombe.

The aims of this assessment are:

- To identify the main sources of noise from the proposal and the nearest noise sensitive receivers;
- to conduct noise predictions calibrated with noise measurements undertaken on site; and
- to provide recommendations that will set basis for noise management, where required.

Noise from the proposal may impact surrounding sensitive receivers. The site lays within 'urban' zoned land and it was previously used as a café. The lot is in close proximity to other lots of commercial and residential use.

This assessment has been prepared in accordance with the WA Environmental Protection (Noise) Regulations 1997 (EPNR). The methodology and Standards used to conduct the assessment, as well as the numeric assessment results are presented in the following sections of this report.

Acoustic terms used in this report are defined in the Glossary of **Appendix A**.

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2. BACKGROUND INFORMATION

The proposal is for refurbishment of an existing commercial building with previous café use to allow for a commercial kitchen. The change of use requires the proposed kitchen operations to comply with the Noise Regulations at all times. This noise impact assessment includes all the potential worst-case noise generating scenarios from the proposal that could generate noise impacts at the nearest sensitive receivers.

It is understood that the City of Kalamunda requires a review of operations and equipment to ensure they are compliant with the State Noise Regulations. This entails identification of the potential impacts and mitigation requirements, due to closeness to residential premises.

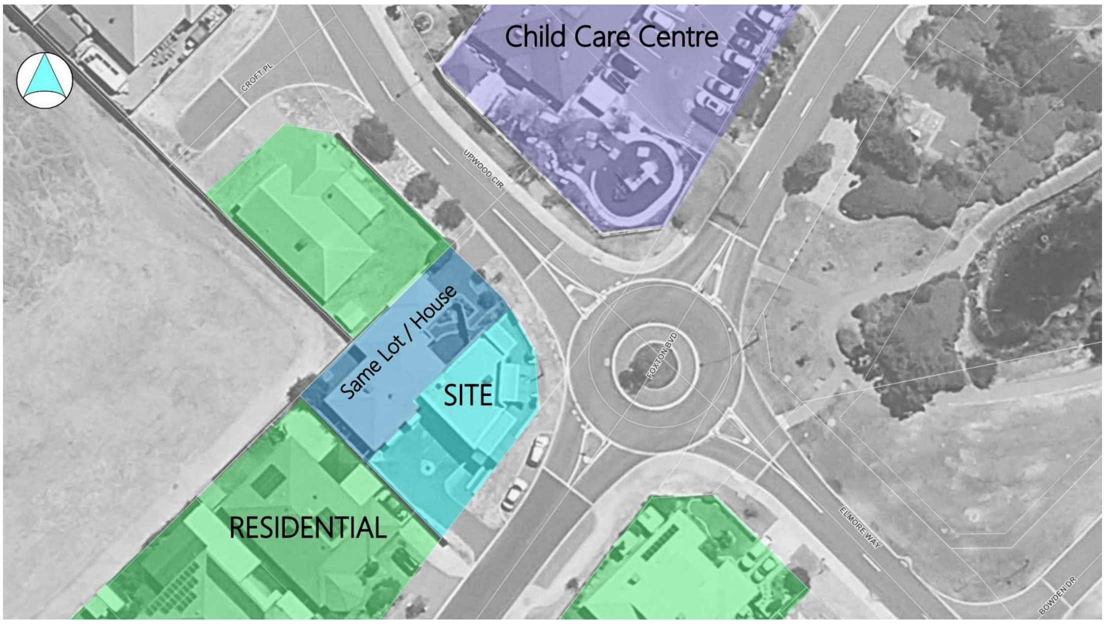
Noise emitted from the site and received at the sensitive premises is to be assessed considering highly sensitive receivers, as per the WA Noise Regulations (**Section 3**). Further details of the proposed operations are provided in the following sections.

2.1. Location

The site is located in the corner of 29 Foxton Boulevard, High Wycombe. The lot includes a residential dwelling attached to the subject commercial premises. As part of the same lot, the existing dwelling is considered a caretakers' home and not subject to assessment as a noise sensitive receiver for purposes of this assessment.

The nearest identified noise sensitive receivers are residential dwellings on and across Foxton Boulevard and houses on Upwood Circle. **Figure 1** depicts an annotated aerial view of the site.

Figure 1 Site location and nearest noise sensitive receivers



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The nearest and most exposed highly-sensitive receivers, as defined in Regulations (**Section 3**) have been identified and labelled R1 to R3 in **Figure 2.**

Figure 2 **Noise sensitive receivers**

The most exposed noise sensitive receivers are:

- R1 – 27 Foxton Blvd (single storey dwelling), adjacent to site and approximately 10 metres from the proposed commercial kitchen building
- R2 – 2 Elmore Way (single storey dwelling), at approximately 20 metres from site
- R3 – 1 Croft Pl (single storey dwelling), at approximately 15 metres from the proposed commercial kitchen building

A Child Care Centre is located directly across Upwood Cir. While this is also considered a sensitive receiver, these premises will not represent the worst-case impact scenario, since this occurs during night-time while the centre is closed.

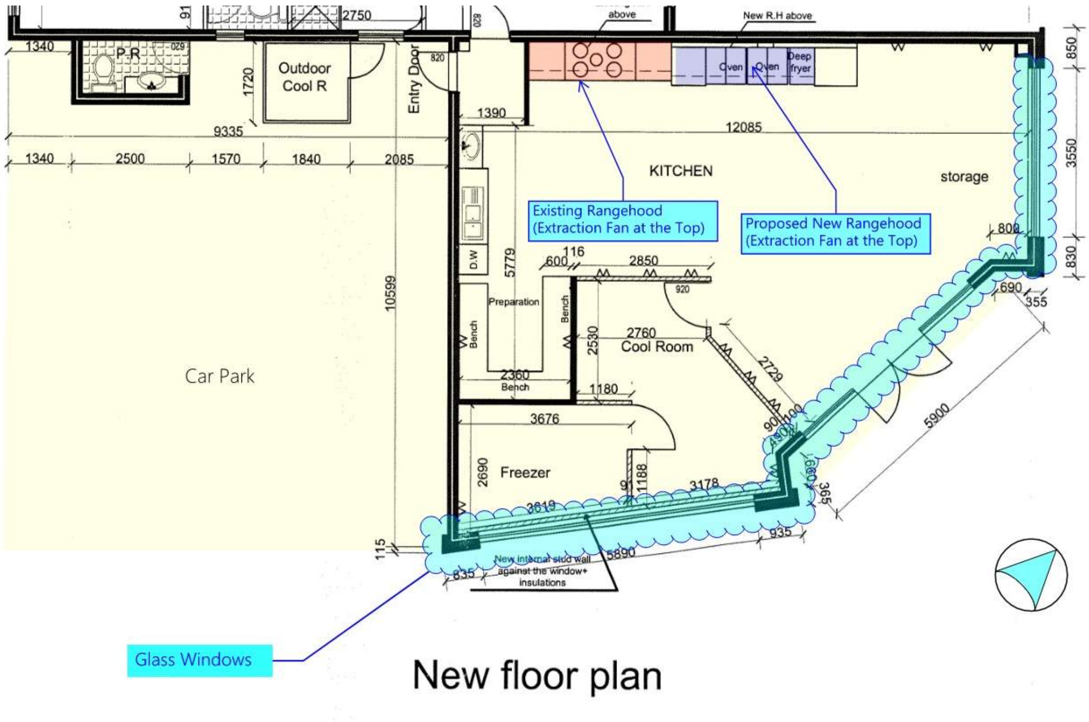
It is expected that noise emissions from the site would be dominated by two external kitchen extraction fans and breakout noise through the kitchen façades from internal preparation noise. There is an existing kitchen extraction fan, which is operational. ACA measured noise on site during an inspection.

2.2. Operations and Site Description

The existing building will be internally refitted for the proposed kitchen. The external building envelope is to be essentially preserved and partially modified to minimise noise breakout.

Figure 3 shows the proposed layout of the commercial kitchen and the identified elements that would impact on noise emissions from the proposed operations.

Figure 3 **Proposed layout**



ACA conducted a site visit on Friday 25th of August 2023 to inspect the current condition of the existing building and to take noise measurements of the kitchen extraction fan (KEF). The existing unit is a double brick building sitting on concrete foundation throughout with steel roof. The façade overlooking the lot corner is mainly glazed and it will be partially modified internally to allow for the new proposed cool room/freezer. Existing internal walls will be modified to extend the kitchen.

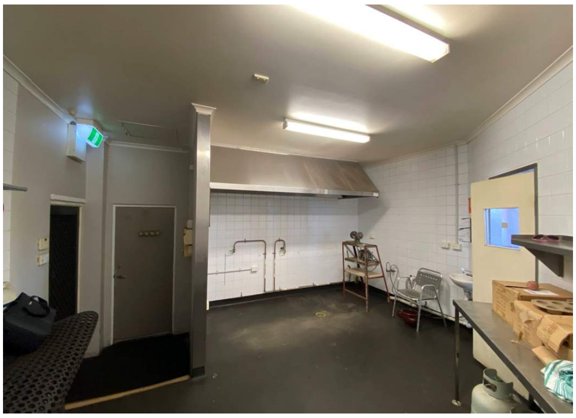
As seen in **Figure 3**, the existing rangehood and its associated KEF will be used and a second KEF will be required to service a new rangehood. A new freezer and cool room will use new chilling compressors. An existing air conditioning unit will be used.

Photos from the site visit are shown in **Figure 4** below.

Figure 4 Site condition during the inspection

i) External condition

ii) Internal condition



The proposed operational core hours are 7am to 7pm, every day. However, some overnight slow cooking (not preparation) is proposed. Thus, a night-time assessment scenario is required.

Other noise contributors identified from typical operations on site are goods' deliveries and waste disposal. Whilst these activities have not been numerically assessed due to their low frequency and short duration, they are still required to meet the environmental standards. These activities will be restricted to take place Monday to Saturday between 9am and 7pm.

2.3. Operational Noise Scenarios

The key noise sources identified in the previous section define the following noise generation scenarios:

1. Scenario 1 – Cooking and Preparation Noise L_{A10}:
    - 2 x kitchen extraction fans (existing and new) in operation
    - Air conditioning unit
    - Kitchen preparation
2. Scenario 2 – Overnight Slow Cooking Noise L_{A10}:
    - 2 x kitchen extraction fans (existing and new) in operation

Noise predicted from the two scenarios above will be assessed against the applicable noise criteria (**Section 3**).

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PROPOSED COMMERCIAL KITCHEN
29 FOXTON BOULEVARD, HIGH WYCOMBE – NOISE ASSESSMENT

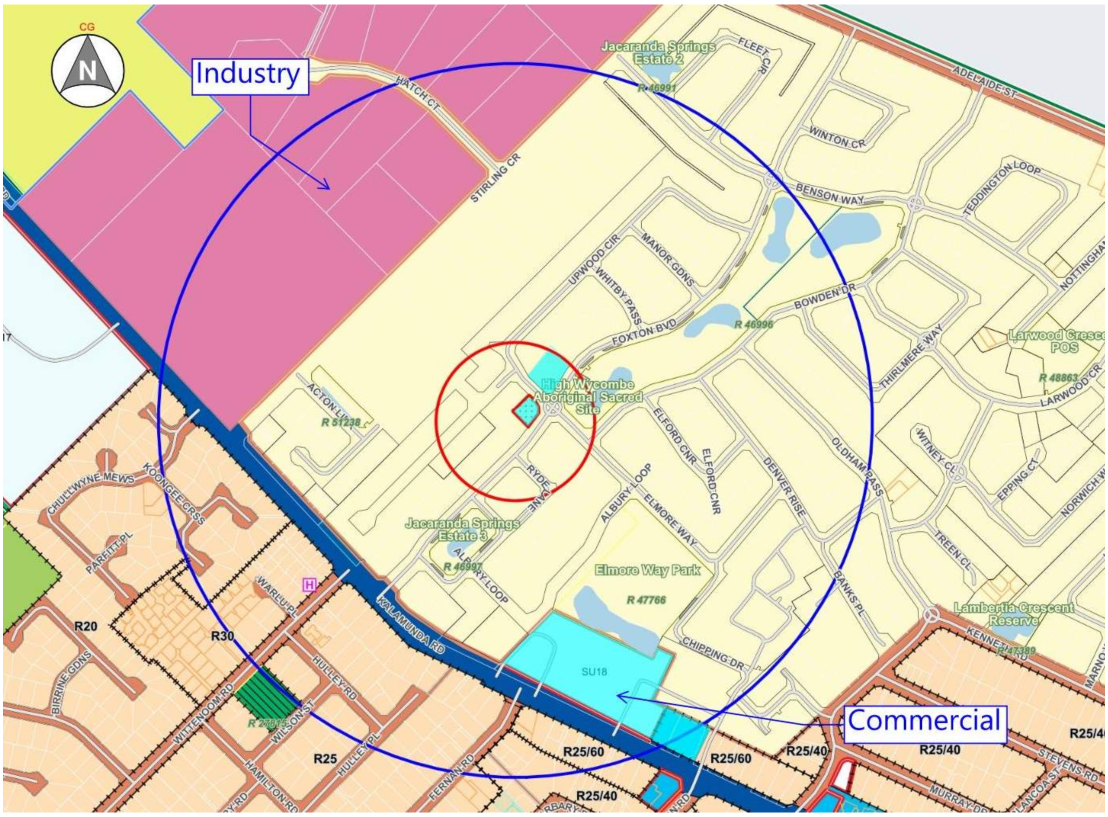
3. ACOUSTIC CRITERIA

3.1. WA Environmental Protection (Noise) Regulations 1997

Noise emissions from commercial premises are regulated by state noise policy in the form of the Western Australia Environmental Protection (Noise) Regulations of 1997 (EPNR). To achieve compliance with this policy, noise levels at nearby residential areas are not to exceed defined limits. These limits are determined from consideration of prevailing background noise levels and 'influencing factors' that consider the level of commercial and industrial zoning in the locality.

The influencing factor considers zoning and road traffic volumes around the sensitive receiver of interest R1, within a 100 m (red) and 450 m (blue) radii (see **Figure 5**).

Figure 5 **Influencing factor calculation map**



The resulting influencing factor is 4 dB, based on:

- An industrial zoning factor of 1.5 dB due to 15% industrial use area within the outer circle.

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- A commercial zoning factor of 0.5 dB due to 6% commercial/mixed use area within the inner circle, and 3% commercial/mixed use area in the outer circle.

- A major road (Kalamunda Road) within the outer circle.

A summary of the applicable outdoor noise criteria is provided in the following table.

Table 1 WA EPNR Assigned Noise Levels

Type of premises receiving noise	Time of day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	49	59	69
	0900 to 1900 hours Sunday and public holidays	44	54	69
	1900 to 2200 hours All days	44	54	59
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	39	49	59
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80

A series of adjustments must be added to the noise source levels if noise received at the sensitive premises cannot reasonably be free of audible characteristics of tonality, modulation and impulsiveness, and the adjusted level must comply with the assigned level. Definition of these terms (tonality, modulation and impulsiveness) are provided by Regulation 9(1) of the EPNR. **Table 2** summarises the adjustments, as defined by the Regulations.

Table 2 Noise character adjustments

Adjustment where noise emission is music		Adjustment where noise emission is not music		
Impulsiveness is not present	Impulsiveness is present	Tonality is present	Modulation is present	Impulsiveness is present
+10 dB	+15 dB	+5 dB	+5 dB	+10 dB

Adjustment for + 5 dB tonality adjustment will apply to mechanical plant noise.

3.2. Internal Noise Levels

For reference on acoustic amenity at internal spaces, Australian Standard 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS/NZS 2107) and the World Health Organisation Guidelines for Community Noise 1999 (The WHO Guidelines) documents provide recommended noise limits for specific room usages.

While AS2107 does not intend to set out environmental impact criteria, in some situations, indoor targets are considered appropriate to noise sensitive activities such as sleep and residential living since they generally occur indoors. Where it can be shown that the *outdoor* Assigned Noise Levels are impracticable to achieve, consideration may be given to appropriate application of guidelines such as Australian Standard 2107:2016.

Further, Regulation 19 of the EPNR provides an alternative to conduct compliance measurements indoors, when measuring outdoors is not a viable option.

The following table presents recommended internal noise levels recommended for residential houses and apartments near major roads in Table 1 of AS/NZS 2107.

Table 3 AS/NZS 2107 Recommended design sound levels

Type of occupancy	Design sound levels ($L_{Aeq,t}$ range) – dB
Houses near major roads	
Living areas	35-45
Sleeping areas (night-time)	35-40

From this table, a referential internal noise target of L_{Aeq} 35 dB is considered reasonable for living areas. The recommended sound levels given are not necessarily appropriate in all circumstances and may not reflect each occupant's expectations of quality; this is particularly the case when noise has considerable low frequency energy or when the levels do not correspond to a quasi-steady noise source (i.e. sound fluctuates by a significant range in a short period of time).

The WHO Guidelines (World Health Organisation) provide internal noise limits recommended to avoid negative health impacts based on sleep disturbance scenarios. The guidelines are not specific to entertainment noise; however, acknowledge that when a significant low frequency component is present, a 10 dB safety factor may be applied.

The recommended limits by the WHO Guidelines are shown in **Table 4**.

Table 4 WHO Guidelines, sleep disturbance recommended noise limits

Noise metric	Recommended indoor levels – dB
Sleep disturbance, inside bedrooms	
$L_{Aeq,8hour}$	35
L_{Amax}	50

Note: The WHO Guidelines set out outdoor limits based on assumptions of 10dB indoor-outdoor difference. For windows closed, indoor to outdoor level difference may be 5-15 dB higher than with windows open. We summarise the indoor goals, as the façade transmission would vary from resident to resident.

Recommended external noise limits may vary between 10 and 25 dB higher than the figures of **Table 4**, depending on the façade transmission loss specific to each case (i.e. some houses/apartments attenuate sound better than others).

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PROPOSED COMMERCIAL KITCHEN
29 FOXTON BOULEVARD, HIGH WYCOMBE – NOISE ASSESSMENT

4. ASSESSMENT

4.1. Approach

The assessment has been conducted based on the following steps:

- A site visit to take note of the condition of the existing building;
- A review of the proposed activities and functional spaces to identify the key noise emissions;
- Noise prediction based on the identified worst-case scenarios.
- Assessment of predictions against the applicable noise criteria.

4.2. Noise Levels

4.2.1. Noise Measurements

A site test was conducted to quantify the in-situ noise emissions from the existing KEF. The test undertaken during the site inspection described in **Section 2.2**, resulted on an estimation of the sound levels of the KEF, which was then used to predict the impact of two similar KEFs being used and calibrated to actual measurements.

The measurements were conducted on Friday 25th of August 2023 at two locations: Internally in the existing kitchen and externally 5m away from the KEF on the rooftop. **Figure 6** shows photos taken during the measurements and within the ceiling cavity. Background noise measurements were also conducted to adjust the test.

Figure 6 **Site test**

The equipment used to conduct the site test is listed in **Table 5** below.

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Table 5 Monitoring Equipment

Sound Level Meter			
Make and model	**Type**	**Serial No.**	**Calibrated on**
NTI Audio XL2	1	A2A-18134-E0	19/01/2022
Field Calibrator			
SVANTEK SV-33 (Type 1)		76674	13/03/2023

Note: This equipment is NATA certified, IEC 61672 Type 1. It is common practice to use Type 1 (or 2) noise loggers for measuring ambient noise levels in accordance with the Australian Standard AS 1055.1 *Acoustics – Description and measurement of environmental noise.*

The sound level meter was set to 'Slow' response. The instrumentation employed during the noise measurement surveys were designed to comply with AS IEC 61672.2-2004 *Electroacoustics-Sound level meters–Specifications*. The sound levels meters were field calibrated before and after the measurements with the calibrator. No significant drift (greater than 0.5 dB) in calibration was detected.

The source noise levels obtained are summarised in **Table 6**.

Table 6 Noise Source Levels

	1/1 Octave Band Sound Level – dB								
	63 Hz	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	**dBA**
Measured: Kitchen (KEF ON) – Internal L_{10} Sound Pressure Level									
L_{10}	68	72	63	58	59	55	46	37	64
Calculated (from Measurements): Outdoor (KEF ON) – External L_{10} Sound Power Levels									
L_W	75	79	88	84	73	63	69	65	84
Measured: Outdoor Background Noise (KEF OFF) – External L_{10} Level									
L_W	56	54	47	43	40	36	31	20	46

From the measurements above, it is evident that the noise levels generated by the existing KEF are higher than standard typical KEFs. It will be expected that newer fans will be quieter than the measured KEF. Nonetheless, noise prediction in the following section has been undertaken using the existing KEF noise levels.

4.3. Noise Prediction

Noise prediction at the nearest sensitive receivers was carried out considering the geometry from the site and surroundings, surfaces, existing buildings, barriers and sound sources from the site. An adaptation of the algorithm contained within ISO 9613:1996 *Acoustics – Attenuation of sound during propagation outdoors* was used to predict noise levels at receivers in this instance.

The following items are considered:

- Three-dimensional location, height and orientation;

- shielding/reflection effects due to surrounding structures (such as awnings, parapets and roofs); and

It is noted that these noise predictions are considered reasonably representative of 'worst case' scenarios and it is expected that actual noise levels would typically be less than that predicted for the majority of adjacent receivers.

4.3.1. Modelling Scenarios

The noise modelling scenarios described in **Section 2.3** are:

1. Scenario 1 (Core Hours): Noise sources are two KEFs operating on the rooftop and breakout noise from kitchen preparation and exhaust fans through the kitchen front façade.

2. Scenario 2 (Evening, Night-time): One KEF in operation on the rooftop.

4.3.2. Results

The tonality adjusted noise predictions are presented in **Table 7.**

Table 7 Outdoor adjusted noise level predictions

Receiver / Location	Predicted Noise Levels: Scenario 1 – L_{A10}	Predicted Noise Levels: Scenario 2 – L_{A10}
R1 – 27 Foxton Blvd	49 dB	46 dB
R2 – 2 Elmore Way	44 dB	41 dB
R3 – 1 Crofton Pl	45 dB	42 dB

4.4. Assessment and Discussion

The results presented in the previous section have been assessed to the applicable noise criteria (per **Section 3**) and the results are presented in **Table 8.**

Table 8 Assessment of results

Receiver	Time Period	Noise Criteria	Noise Prediction	Difference (dB)	Comments
R1	Daytime	L_{A10} 49 dB	49 dB	0	Compliant
	Night-time	L_{A10} 39 dB	46 dB	+7	Exceedance
R2	Daytime	L_{A10} 49 dB	44 dB	-5	Compliant
	Night-time	L_{A10} 39 dB	41 dB	+2	Exceedance

Receiver	Time Period	Noise Criteria	Noise Prediction	Difference (dB)	Comments
R3	Daytime	L_{A10} 49 dB	45 dB	-4	Compliant
	Night-time	L_{A10} 39 dB	42 dB	+3	Exceedance

The assessment suggests that the proposed commercial kitchen will be compliant with the EPNR assigned noise levels for all daytime core hours' operations and during night-time subject to noise management.

Noise exceedances are predicted for night-time operations on the basis of two kitchen extraction fans (similar to the existing fan) are used. This suggests that to enable overnight use of one kitchen extraction fan, treatment of the existing fan will be required and a newer and quieter fan be required to minimise noise. Up to 7 dB of the night-time exceedance may be reduced by:

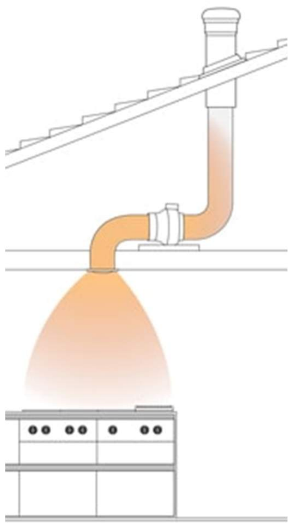
- Introducing noise barriers around the existing and new KEF exhaust chute;
- Replacing the existing fan for a quieter roof mounted system or replace for fan concealed in the ceiling cavity (not roof mounted);
- Purchasing the quietest possible fan for the new required KEF and using a fan concealed in the ceiling cavity (not roof mounted);
- Treating the existing building entry doors to ensure a tight door seal against frames. Consider replacing the double entry doors to a single hinged door.

The following section provides a set of recommendations.

5. RECOMMENDATIONS

Table 9 outlines the noise mitigation required to reduce impact on residents from operations at the proposed commercial kitchen.

Table 9 Noise Mitigation

Item #	Recommendation	Rationale
Treating the Source		
1	2 x Kitchen Extraction Fans (KEFs) on the rooftop: - **Existing KEF**: 1. Reuse the existing fan, then see item 3 (use noise barriers); or 2. Purchase a new KEF (see below for new KEF). - **New KEF**: 1. Purchase the quietest available KEF suitable for the application with Max Sound Power Levels L_W = 77 dBA; or 2. Use an in-line fan concealed in the ceiling cavity (see below) use a lined duct, and two metal duct bends (no flexi ducts). 	To avoid excessive noise emissions directly emitted in the outdoor environment.
Treating the Path		
3	**Noise Barriers:** Install short barriers on the roof next to each of the mechanical plant units. Material: The barriers may be built with compressed fibre cement with a minimum surface density of 12 kg/m^2 (9mm panels) and Location and extent: The barriers shall be installed in such a way to break the line of sight between the residential receivers and the mechanical units, as close as possible and at least 0.5 m taller than the top edge of the associated mechanical plant.	To minimise external noise emissions if the KEFs are roof mounted

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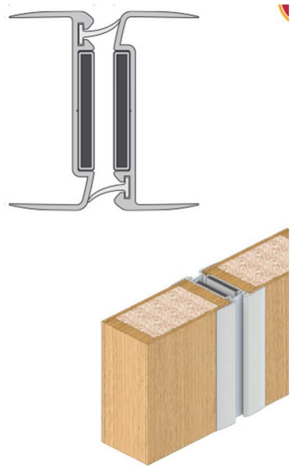
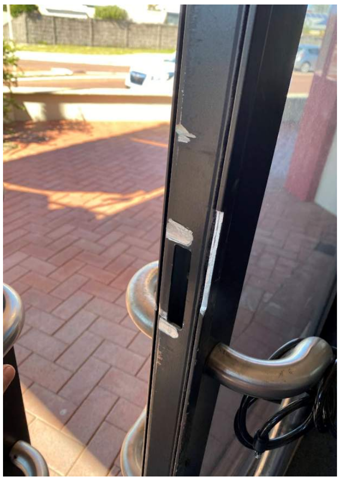
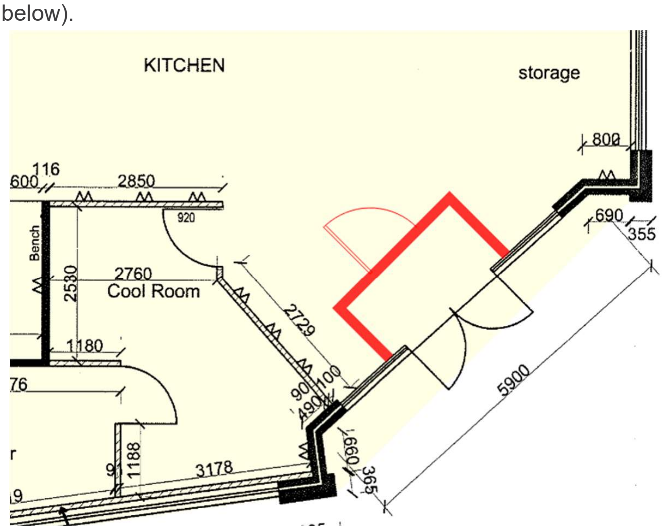
PROPOSED COMMERCIAL KITCHEN
29 FOXTON BOULEVARD, HIGH WYCOMBE – NOISE ASSESSMENT

Item #	Recommendation	Rationale
4	**External Door**: - Reusing the existing doors: 1. Treat the existing door seals to ensure an air-tight seal throughout the doors' perimeter. Use acoustic resilient seals (e.g. Raven, Lorient). 2. Fit in door meeting stiles to ensure proper sealing through the doors.   OR; - Replace the double swing doors for a single hinged solid core door with acoustic seals. OR; - Modify the internal layout to fit in a new solid core door (see below). 	To avoid breakout noise through the doors.

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REF *Report 10.00580R-01*

Item #	Recommendation	Rationale
Management		
5	Use a single KEF during night-time operations.	To avoid exceedance for cumulative KEFs noise
6	Schedule deliveries and waste management for daytime only (Mon-Sat between 7am and 7pm).	To avoid sudden noise peaks in close proximity to residents.

It is expected that when the above recommendations are thoroughly implemented, the night-time exceedances reported in **Table 8** would be reduced to compliant levels in accordance with the Environmental Protection (Noise) Regulations 1997.

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PROPOSED COMMERCIAL KITCHEN
29 FOXTON BOULEVARD, HIGH WYCOMBE – NOISE ASSESSMENT

APPENDICES

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APPENDIX A: GLOSSARY

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29 FOXTON BOULEVARD, HIGH WYCOMBE – NOISE ASSESSMENT

1 Sound Level or Noise Level

Sound consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. Noise is often used to refer to unwanted sound.

The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable range by using logarithms.

The symbols SPL, L or L_P are commonly used to represent Sound Pressure Level.

The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2 x 10^{-5} Pa.

2 "A" Weighted Sound Levels

The overall level of a sound is usually expressed in terms of dB(A), which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter with a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dB(A) is a good measure of the loudness of that sound. Different sources having the same dB(A) level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB(A) change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels:

Typical noise levels and subjective scale

Sound Pressure Level dB(A)	Noise Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely loud
110	Grinding on steel	
100	Loud car horn at 3 m	Very loud
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (e.g. B, C and D) are less commonly used than A-weighting in environmental acoustics. Sound Levels measured without any weighting are referred to as "linear" and the units are expressed as dB(Lin) or dB.

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PROPOSED COMMERCIAL KITCHEN
29 FOXTON BOULEVARD, HIGH WYCOMBE – NOISE ASSESSMENT

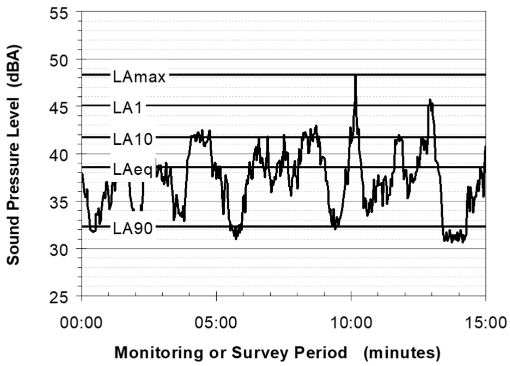
3 Sound Power Level

The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units, and these may be identified by the symbols SWL or L_W. The Sound Power definitions expressed in dB are typically referenced to the acoustic energy unit 10^{-12} W.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time.

The following figure presents a hypothetical 15-minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. Standardised methods are available for determining these representative levels. Different jurisdictions would choose to define their own preferred Standard.

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