

Our ref: NA/1131/23/163 v2.0

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Mr Philip Fletcher
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Dear Mr Fletcher

**NOISE ASSESSMENT (VERSION 2) FOR REPLACEMENT KITCHEN EXTRACTION SYSTEM
7A STATION ROAD, DODWORTH, BARNSELY, S75 3JD (APP REF: 2022/1248)**

1.00 INTRODUCTION

- 1.01 RP Acoustics Ltd (RPA) has been commissioned to undertake a noise assessment for a proposed replacement kitchen extraction system at the existing hot food takeaway at 7A Station Road, Dodworth (hereafter referred to as the application site).
- 1.02 Version 2 of this report has been prepared following confirmation from the Environmental Health Department (EHD) at Barnsley Metropolitan Borough Council that (i) measured existing background noise levels are required for the assessment, and (ii) a +3 dB character penalty is appropriate for an assessment in accordance with British Standard BS 4142.
- 1.03 The objectives of the assessment were to:
- Determine the existing residual noise climate in the vicinity of the application site during representative periods of the opening times of the premises.
 - Based on British Standard BS 4142:2014+A1:2019 'Methods for Rating and Assessing Industrial and Commercial Sound' (BS 4142) and other pertinent guidance, develop limiting noise levels for the extraction system at the nearest identified noise sensitive receptors (NSRs).
 - Based on the limiting noise levels, recommended appropriate fan and attenuator specifications for the extraction system.
- 1.04 This report details the methodology and results of the assessment and has been prepared for Philip Fletcher Architectural Design Services and its client for the sole purpose described above. No extended duty of care to any third party is implied or offered.
- 1.05 A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

2.00 SITE SETTING AND DEVELOPMENT PROPOSALS

- 2.01 The application site is located in a mixed residential and commercial environment and is bound by:
- Station Road to the north, with the Dodworth Tap public house on the far side of the road.
 - An electricity sub-station and Baslow Crescent to the east, with the Dodworth Central Social Club beyond.
 - Land approved for a new bungalow to the south (app ref: 2022/0008).
 - Existing residential development to the west.
- 2.02 An annotated aerial image of the site and its environs is contained in Appendix 2.1.

- 2.03 The development proposals consist of a new shop front, a replacement kitchen extraction flue and a single storey extension to the rear. The replacement kitchen extraction flue exits the building on the eastern gable end, with the atmospheric termination above roof level. The proposed opening times of the takeaway are understood to be 11:00 to 23:00 hours. Proposed plans are contained in Appendix 2.2.
- 2.04 The nearest noise sensitive receptors (NSRs) have been identified as the approved bungalow to the south (NSR1) and the adjacent existing dwelling to the west (NSR2). The NSRs and approximate flue location are identified on the annotated aerial image contained in Appendix 2.1. The nearest façades of both NSR1 and NSR2 are located circa 9 metres horizontally from the proposed extraction flue.

3.00 RESIDUAL NOISE CLIMATE IN THE VICINITY OF THE APPLICATION SITE

- 3.01 A Noise Impact Assessment (NIA) undertaken by Acoustic Solutions (ref: 1965-62-20) was submitted as part of the application for the approved bungalow (app ref: 2022/0008). As part of the NIA, noise measurements in the vicinity of the application site were undertaken on 29th and 30th August 2020. Of these measurements, monitoring position 2 (ASMP2) is considered the most relevant for the NSRs adjacent to the application site, as it is screened from traffic on Station Road. The approximate location of ASMP2 is identified in Appendix 2.1. The measured $L_{Aeq,T}$ between 22:00 and 23:00 hours (the proposed closing time of the takeaway) was 41 dB. Whilst the corresponding background $L_{A90,T}$ was not reported, given the description in the report that the main noise source was intermittent screened road traffic on Station Road and that traffic volumes were low, from experience, a background noise level of 38 dB $L_{A90,T}$ was used for assessment purposes in Version 1 of this report.
- 3.02 Based on the requirements of the EHD, in order to establish the existing (residual) background noise climate in the vicinity of the NSRs adjacent to the application site, a noise survey was undertaken on Thursday 20th April 2023.
- 3.03 For the purpose of the assessment, a single monitoring position (MP1) was adopted, which was located in a free field environment, at 1.5 metres above ground level (mAGL) in the vicinity of the proposed bungalow (NSR1). The approximate location of MP1 is identified in Appendix 2.1.
- 3.04 Noise measurements were undertaken using a NTi Audio XL2 Type 1 integrating sound level meter. A 90 mm windshield was fitted for all measurements. The measurement system calibration was verified immediately before the commencement of the measurement session and again at the end. No drift in calibration level was noted. Weather conditions throughout the survey were appropriate for monitoring.
- 3.05 Measurements consisted of A-weighted broadband parameters, together with linear third octave band L_{eq} levels, with a logging interval of 1 second. Measurement data was post-processed using NTi Audio Data Explorer software.
- 3.06 Table 3.1 contains a summary of the measurement data rounded to the nearest decibel.

Table 3.1: Summary of Noise Measurement Data

Position	Date	Time	$L_{Aeq,T}$ (dB)	L_{AFmax} (dB)	$L_{A90,T}$ (dB)	Comment
MP1	20/4/23	21:48-22:48	45	69	38*	Residual noise climate. Distant and local traffic and occasional pedestrians leaving local pub (L_{AFmax}).

*Note: successive 15 min background levels during the survey were 39 dB $L_{A90,T}$, 40 dB $L_{A90,T}$, 38 $L_{A90,T}$ and 38 $L_{A90,T}$ respectively.

- 3.07 During the course of the noise survey, the residual noise climate consisted of distant and local traffic, with discrete event maxima associated with occasional pedestrians leaving the local pub.
- 3.08 Based on the noise survey, the representative background noise level during the proposed opening times of the application site is 38 dB $L_{A90,T}$. On this basis, the BS 4142 assessment detailed in Section 5 remains valid.

4.00 NOISE IMPACT ASSESSMENT CRITERIA

British Standard BS 4142:2014+A1:2019

- 4.01 British Standard BS 4142:2014+A1:2019 '*Methods for Rating and Assessing Industrial and Commercial Sound*' (BS 4142) describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in BS 4142 use outdoor sound levels to assess the likely effects of sound on people for the purposes of (i) investigating complaints, (ii) assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature, and (iii) assessing sound at proposed new dwellings or premises used for residential purposes.
- 4.02 BS 4142 considers that the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. It goes on to suggest that:
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
 - The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- 4.03 Where the initial estimate of the impact needs to be modified due to the context, factors to be taken into account include the absolute level of sound and whether dwellings will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.
- 4.04 The rating level is described as the specific sound level (L_s - the equivalent continuous A-weighted sound pressure level at the assessment position (NSR) produced by the specific sound source over the given reference time interval) plus any adjustment for the characteristic features of the sound. The character correction relates to whether and to what degree the specific sound is assessed to have an element of tonality, impulsivity and/or characteristics that are readily distinctive against the residual acoustic environment.
- 4.05 The background sound level is the A-weighted sound pressure level of the residual sound at the assessment position that is exceeded for 90 percent of a given time interval, T , measured using time weighting 'F' and quoted to the nearest whole number of decibels. The residual sound is described as the ambient sound remaining in a given position in a given situation when the specific sound source is suppressed to a degree such that it does not contribute to the ambient sound.

5.00 CALCULATION OF THE EXTRACTION SYSTEM NOISE EMISSIONS

- 5.01 On the basis of the above, it is considered appropriate that the kitchen extraction system is designed such that the rating level ($L_{A,r,T}$) of the system doesn't exceed the residual background noise level at the NSRs (38 dB $L_{A90,T}$).
- 5.02 As a worst case, NSR1 has been used for the calculations as it is exposed to both the atmospheric termination and fan casing (NSR2 is screened from the fan casing by the building).
- 5.03 Due to the close proximity of the receptors and relatively low background noise level, an insulated centrifugal box fan has been selected. The reference model used for the calculations is a Systemair MUB 042 500EV sileo Multibox.
- 5.04 For attenuation of fan noise on the atmospheric termination side of the fan, a rectangular splitter attenuator has been selected. The reference model used for the calculations is a Trox XS 1000 mm long splitter attenuator with 50 mm airway width. Note: It is also recommended that an attenuator is fitted to the canopy side of the fan to control noise levels internal to the takeaway – the specification of this attenuator is not part of this assessment.

5.05 Table 5.1 summarizes the predicted specific noise levels associated with the extraction atmospheric termination and fan casing breakout at a distance of 9 metres from the extraction system (NSR1).

Table 5.1: Calculation of Specific Noise Level

Atmospheric Discharge										
Octave band (Hz)		63	125	250	500	1000	2000	4000	8000	Broadband
Outlet SWL dB(A)		48	67	69	75	79	78	74	66	83
Systemair MUB 042 500EV sileo Multibox										
SPL = SWL - 20log r + DI(Θ) - 11										
Distance attenuation at 9 m (dB)		19	19	19	19	19	19	19	19	
DI(Θ) (dB)		4	5	6.1	7.1	8	9	9	9	
Termination attenuation (dB)		12	7	3.5	1	0	0	0	0	
Insertion loss 1000 mm long splitter attenuator (dB)		6	10	14	28	44	48	35	29	
(Trox XS, 50 mm airway width)										
SPL at 9 metres from termination (dB(A))		4	25	27.6	23.1	13	9	18	16	31
(including attenuator)										
Casing Breakout										
Octave band (Hz)		63	125	250	500	1000	2000	4000	8000	Broadband
Casing breakout SWL dB(A)		26	47	44	43	48	50	41	29	54
Systemair MUB 042 500EV sileo Multibox										
SPL = SWL - 20log r - 8										
Distance attenuation at 9 m (dB)		19	19	19	19	19	19	19	19	
SPL at 9 metres from fan casing (dB(A))		-1	20	17	16	21	23	14	2	27
Combined atmospheric termination and casing breakout noise emissions at 9 metres from source (dB(A))										33

5.06 On the basis of the above, the predicted specific noise level associated with the extraction system at NSR1 is 33 dB $L_{Aeq, T}$.

5.07 A BS 4142 assessment for the impact of the extraction system at NSR1 is contained in Table 5.2.

5.08 Whilst the noise emissions are non-tonal in nature and steady, a +3 dB acoustic feature has been applied to the specific noise level based on the BS 4142 premise that *'where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied'*.

Table 5.2: BS 4142 assessment for extraction system at NSR1

Noise Parameter	Value	Comments
(A) Specific noise level	33 dB $L_{Aeq, T}$	Calculated specific extraction system noise level at NSR1 (Para 5.06).
(B) Acoustic feature correction	+3 dB	Character penalty for operation (Para. 5.08).
(C = A+B) Rating level	36 dB $L_{Ar, T}$	
(D) Background noise level	38 dB $L_{A90, T}$	Residual background noise level during the late evening period (Section 3).
Excess of rating over background noise level (C – D)	-2 dB	Initial estimate of impact: 'low impact'.

5.09 BS 4142 considers that where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

6.00 CONCLUSIONS AND RECOMMENDATIONS

- 6.01 Based on the assessment detailed above, the proposed kitchen extraction system is considered to be acceptable in terms of noise impact, subject to the following measures:
- Extraction fan to be a centrifugal box fan (e.g. Systemair Sileo Multibox or equivalent)
 - A 1000 mm long splitter attenuator (e.g. Trox XS or equivalent) to be fitted to the outlet of the fan casing.
 - Fan connected to attenuators using flexible couplings
 - Fan and associated ductwork to be fixed to the building façade using anti-vibration mounts.
- 6.02 It is strongly recommended that a specialist kitchen ventilation company is used to undertake the design/installation of the extraction system, as if system components are undersized (e.g. not taking into account the pressure losses across the attenuators), or, positioned badly, this can lead to high velocity and turbulent flows in the system which will significantly increase noise emission levels relative to optimum conditions.

I trust the foregoing is sufficient for your needs. Should you have any queries regarding the above, please do not hesitate to contact me.

Yours sincerely



Richard Pennell. MIOA
For RP Acoustics Ltd

Appendix 1

Glossary of Acoustic Terms

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 μPa).

A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T , has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T . $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T . L_{A90} is typically taken as representative of background noise.

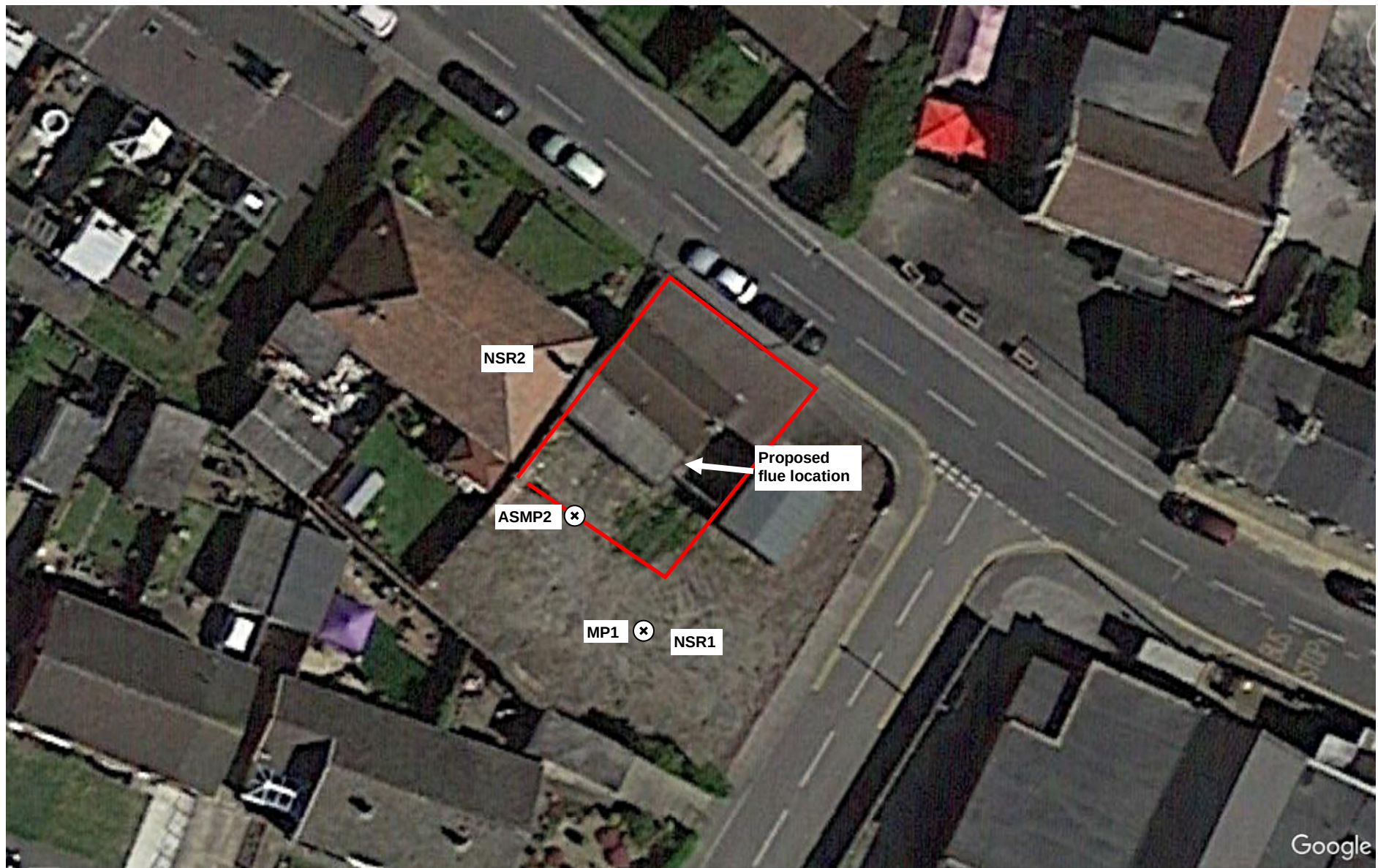
$L_{AF \max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparison between different noise events which occur over different lengths of time.

Appendix 2.1: Annotated aerial image identifying the noise measurement positions (MP) and noise sensitive receptors (NSRs)



Appendix 2.2: Proposed plans and elevations

