

Ysgol-Yr-Hafod Primary School Kitchen Extract Noise Impact Assessment

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This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.



CONTENTS

1.0	SUMMARY.....	4
2.0	SITE DESCRIPTION	5
3.0	ASSESSMENT CRITERIA.....	6
3.1	National Planning Policy Framework.....	6
3.2	Planning Practice Guidance – Noise.....	8
3.3	BS 4142:2014 + A1:2019 Methods for rating and assessing industrial and commercial sound'	9
4.0	SURVEY DETAILS AND RESULTS	11
4.1	Noise Survey Details	11
5.0	NOISE IMPACT ASSESSMENT	12
5.1	Noise From Kitchen Extract	12
5.2	Noise Egress To NSR	12
5.3	BS 4142 Assessment Results.....	13
5.3.1	Further Impact Assessment, BS 4142 Context	13
6.0	CONCLUSION	14
	APPENDIX A – DEFINITION OF ACOUSTIC TERMS	15



1.0 SUMMARY

At the request of Wynne Construction, PDA has carried out a noise impact assessment in relation to the kitchen extract system to the proposed kitchen refurbishment at Ysgol-Yr-Hafod Primary School, Johnstown.

A noise survey has previously been conducted at site to establish the existing acoustic climate at the nearest noise sensitive receivers (NSR's). This is detailed in the Acoustic Survey and Design Specification report issued previously on 6th July 2021.

Noise egress from the proposed development has been modelled to the nearest NSR's and compared against the background noise climate in accordance with BS 4142 methodology.

The results of the initial BS 4142 assessment for noise egress from the proposed kitchen extract indicate a 'low' impact at the NSR's. The absolute noise levels from the kitchen extract are 'low' and more than 10 dB below the existing background noise climate. Noise egress from the kitchen extract is therefore concluded to be inaudible at the nearest NSR's. Allowing for context in accordance with BS 4142 it is concluded that no adjustment is required to the results of the initial BS 4142 assessment and the kitchen extract will have a 'low' impact at the NSR's.

2.0 SITE DESCRIPTION

Ysgol Yr Hafod is a primary school located in Johnstown. The kitchen extract termination is located on the south facing façade. The surrounding area of the school is largely residential, with a presently disused commercial/industrial unit to the rear of the school.

An overview of the development is provided in figure 1 below:

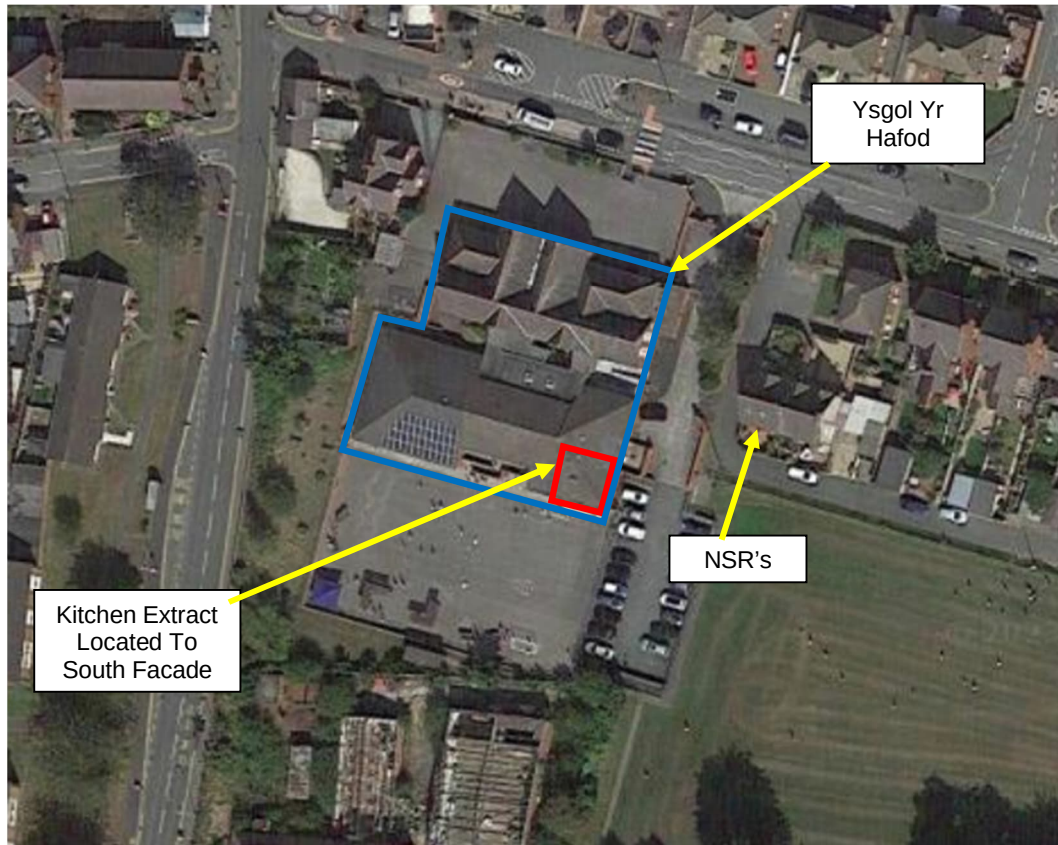


Figure 1: Site Overview

The nearest noise sensitive receivers (NSR's) to the school extract have been identified as the residential properties on Noddfa Ct to the east side of the school.

3.0 ASSESSMENT CRITERIA

3.1 National Planning Policy Framework

National Planning Policy is guided by the National Planning Policy Framework (NPPF) updated in July 2021. With regard to Noise the Framework states the following;

Planning policies and decisions should contribute to and enhance the natural and local environment by:

- *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.*

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

The terms 'significant adverse impact' and 'adverse impact' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE)' which states;

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The notes also offer an explanation of the term 'adverse impacts' as follows;

... refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

Although no specific noise limits for LOAEL and SOAEL have been defined, in 2014 the UK Government published a planning practice guidance document for noise which indicates where these limits fall with relation to the perception of noise. A summary is reproduced in Section 4.2 below, and the full document



is published at <https://www.gov.uk/guidance/noise--2>. It is considered that guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

The National Planning Policy Framework also states:

Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

3.2 Planning Practice Guidance – Noise

In March 2014 (updated July 2019) the UK Government published further guidance on the assessment of noise for planning purposes in the form of the on-line publication, Planning Practice Guidance on noise (<http://www.gov.uk/guidance/noise--2>). This document offers further guidance on the typical levels which constitute the NOEL, LOAEL and SOAEL. The relevant section is reproduced in the table below;

Table 1. Planning Practice noise level guidance

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

It is notable from the above planning guidance that development should not normally be permitted above Significant Observed Adverse Effect Levels, and should aim to minimise Other Adverse Effect Levels (below SOAEL but above LOAEL). However, it is clear that noise is permitted to approach and/or exceed the Lowest Observed Adverse Effect Level, providing that noise is mitigated and reduced to a minimum.

3.3 BS 4142:2014 + A1:2019 Methods for rating and assessing industrial and commercial sound'

The standard describes a method of determining the level of sound of a commercial nature, together with procedures for assessing the impact of such a sound outside nearby noise sensitive areas.

The standard may be thought of as a procedure for comparing the sound from commercial sources with background sound levels in the absence of the commercial sound and determining the likely impact of the sound on noise sensitive residences.

In accordance with BS 4142 the background sound level is the typical A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific sound level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the commercial source over a given time interval.

Certain acoustic features can increase the impact over that expected from a simple comparison between the specific sound level and the background level. Where such features are present, these are taken into account by adding corrections to the specific sound level.

This correction is applied based on whether the following features occur, or are expected to be present. The correction values can either be determined subjectively, or by various objective measurement procedures.

- The sound contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.). 0 – 6 dB penalty
- The sound contains distinct impulses (bangs, clicks, clatters, or thumps). 0 – 9 dB penalty.
- The sound is irregular enough to attract attention. 0 – 3 dB penalty.
- 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.

From the addition of the above penalties where appropriate the rating level is established, this being the value that is compared with the background noise. Note that corrections for impulsivity and tonality may be added arithmetically where both are present and likely to affect perception within the same reference period. However, if any single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics.

According to BS 4142 an initial estimate of the impact is given based on the rating level value as follows:

- a rating level 10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.
- a rating level 5 dB(A) above the background is an indication of an adverse impact, depending on the context.
- where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

BS4142 indicates that the noise source should be evaluated over the appropriate time interval which is as follows:

- 1h during the day (07:00 – 23:00 hours)
- 15 min during the night (23:00 – 07:00 hours)



The above initial assessment may then be modified depending on the context, to take into account;

- The absolute level of the sound.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
 1. Façade insulation treatment
 2. Ventilation and / or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
 3. Acoustic screening

4.0 SURVEY DETAILS AND RESULTS

4.1 Noise Survey Details

An ambient background noise survey has been undertaken in the past and is detailed in the Acoustic Survey and Design Specification report issued previously on 6th July 2021.

Measurements recorded by the noise survey are as follows in Table 1.

Table 2: Noise Survey Results

Maximum $L_{Aeq,30min}$ (dB)	L_{A90} (dB)
52	43-45

To give a conservative estimate for the noise impact assessment, the L_{A90} background level will be taken as 43dB.

5.0 NOISE IMPACT ASSESSMENT

5.1 Noise From Kitchen Extract

A 3-dimensional sound model has been created using SoundPLAN sound modelling software. The software uses the method of ISO 9613 'Acoustics – attenuation of sound during propagation outdoors – general method of calculation' and takes into account geometric spreading, ground effects, air attenuation, barrier attenuation and reflections.

The SoundPLAN model was calibrated so that the sound power level from the supply fan with atmosphere attenuator at 5m and the extract fan with atmosphere attenuator at 5m read 45dB using the relevant spectra detailed in Table 2 in accordance with the installer's specification of 45 dB(A) at 5m.

The spectra of both fans and the insertion losses of the attenuators have been detailed in the provided technical specifications, and shown in Table 2. However, we would note that for the purposes of calculation we have used the attenuated spectra normalised to an equivalent of 45 dB(A) at 5m.

Table 3: Fan and Attenuator Spectra

	63	125	250	500	1000	2000	4000	8000
Intake Fan L _w	66	73	73	70	66	63	60	60
Supply Insertion Loss	6	12	19	30	45	39	99	22
Intake Fan L _w w/ Attenuator	60	61	54	40	21	24	-39	38
Extract Fan L _w	81	85	92	96	100	99	88	81
Exhaust Insertion Loss	7	14	17	28	38	30	23	18
Extract Fan L _w w/ Attenuator	74	71	75	68	62	69	65	63

5.2 Noise Egress To NSR

Based on the SoundPLAN model with receivers assigned the façade of the nearest noise sensitive receivers (where floor levels are calculated at 1.5m for the ground floor and 2.8m for each additional storey), the noise levels calculated at the nearest noise sensitive receivers are as follows in Table 3.

Table 4: Calculated Levels at NSR

Location	Calculated Noise Level (Ground Floor/1 st Floor)
Noddfa Ct (West Façade)	29.0/29.5
Noddfa Ct (South Façade)	28.3/28.8

5.3 BS 4142 Assessment Results

The results of the full BS 4142 assessments are presented below.

Table 5. BS 4142 Impact Assessment, Noise Breakout

Results	dBA	Comments
Background noise level L_{A90}	43	Evaluated from noise survey results (See Section 4.4)
Specific Noise L_{Aeq}	30	Calculated based on kitchen extract operating at maximum fan speed
Feature Correction	+0	
Rating Noise Level	30	Specific Noise Level + Feature Correction
Rating Level Over Background	-13dB	Rated Level 3dB above the evaluated Background Level

It is noted that BS4142 indicates the following:

- 10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.
- 5 dB(A) above the background is an indication of an adverse impact, depending on the context.
- Where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

The noise impact assessment has indicated that the Rating Level is 13dB below the background level. Therefore in accordance with BS 4142 a 'low' impact is indicated. It should be noted however that in accordance with BS4142:2014 this initial impact will need to be modified to account for the context of the site. This is further discussed within Section 5.3.1 below.

5.3.1 Further Impact Assessment, BS 4142 Context

The BS 4142 initial estimate in regards to the noise egress from the kitchen extraction system is described within Section 5.3, however it should also be noted that BS4142 indicates that this initial estimate of impact needs to be modified for context. BS 4142 indicates that pertinent factors that could modify context would include: the absolute level of sound; the character and level of the residual sound compared to the character and level of the specific sound; the sensitivity of the receptor and whether dwellings or other premises used for residential purpose already incorporate design measures that secure for internal and/or outdoor acoustic conditions.

With reference to context we would comment as follows:

The predicted absolute noise level from kitchen extract is 30 dBA. This is more than 10 dB below the background noise climate (43 dBA) and therefore the noise egress from the extraction fan is not predicted to be audible at the nearest NSR's.

It can be noted that the site will not be operational during the night-time period (23:00-07:00). Therefore sleep disturbance as a result of noise egress from the extraction system will not occur.



Allowing for the context of the assessment in accordance with BS 4142, it is concluded that an adjustment is not required to the result of the initial assessment and that a 'low' impact is indicated for noise from the kitchen extract system.

6.0 CONCLUSION

At the request of Wynne Construction, PDA has carried out a noise impact assessment in relation to the kitchen extract system to the proposed kitchen refurbishment at Ysgol-Yr-Hafod Primary School, Johnstown.

A noise survey has previously been conducted at site to establish the existing acoustic climate at the nearest noise sensitive receivers (NSR's). This is detailed in the Acoustic Survey and Design Specification report issued previously on 6th July 2021.

Noise egress from the proposed development has been modelled to the nearest NSR's and compared against the background noise climate in accordance with BS 4142 methodology.

The results of the initial BS 4142 assessment for noise egress from the proposed kitchen extract indicate a 'low' impact at the NSR's. The absolute noise levels from the kitchen extract are 'low' and more than 10 dB below the existing background noise climate. Noise egress from the kitchen extract is therefore concluded to be inaudible at the nearest NSR's. Allowing for context in accordance with BS 4142 it is concluded that no adjustment is required to the results of the initial BS 4142 assessment and the kitchen extract will have a 'low' impact at the NSR's.

APPENDIX A – DEFINITION OF ACOUSTIC TERMS

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq} . Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq} . It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB L_{An} . It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max} , dB L_{Amax} , etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq} , L_{90} , L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.