

**Proposed Change of Use of  
Agricultural Building to Commercial Use**

**Penrhos Farm  
Penrhos  
Llanymynech  
Powys  
DL11 7UE**

**NOISE IMPACT ASSESSMENT**

**Acoustic Report M1841/R01  
16<sup>th</sup> August 2018**

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## 1. Introduction

This acoustic report documents a noise impact assessment with regard to the proposed change of use of an agricultural barn at Penrhos Farm, Llanynynech, Powys to commercial use; Figures 1 and 2.

The report is divided into the following sections:

- Section 2: Overview of the Development
- Section 3: Noise Impact Assessment
- Section 4: Conclusion
- Appendix A: Calculations

## 2. Overview of the Development

The proposal is for the change of use of an existing agricultural barn at Penrhos Farm, Llanynynech, Powys to B1 and B8 use; Figures 1 and 2.

B1 and B8 uses are defined as:

- B1 Business: Offices (excluding financial and professional services), research and development of products and processes, light industry appropriate in a residential area.
- B8 Storage or distribution (includes open air storage).

The barn's construction consist of:

- Roof: corrugated fibre cement sheets
- Facades: 1.5m high concrete panels at low level with 1.5m high timber panels above
- Entrance (east façade): 5.4m<sup>2</sup> steel roller shutter door and 6.6m<sup>2</sup> steel door
- Ventilation: eight ridge vents (non-mechanical)

The nearest dwellings to the barn, labelled A and B in Figure 1, are 160m and 145m respectively from the development. The line of sight of the barn is fully blocked by local topography for both dwellings.

Provisionally the end use of the barn will be for the storage of toys, which falls within B8 use. We have been informed that for this proposed use there will be no plant (e.g. condenser units/extract fans). The only noise associated with the storage of toys will therefore be the loading/unloading of vans/HGVs and stacking of shelves; this will be undertaken within the barn using an electric forklift during day period working hours only (09:00 – 17:00hrs). Reversing alarms will be disabled on all vehicles.

Vehicles (HGVs and vans) arriving/departing already occur in respect to agricultural activities at Penrhos Farm. No change in the noise impact is therefore expected in respect of transport movements as a result of the proposed development. The noise impact assessment has therefore been limited to the review of the noise emissions from the proposed activities within the barn.

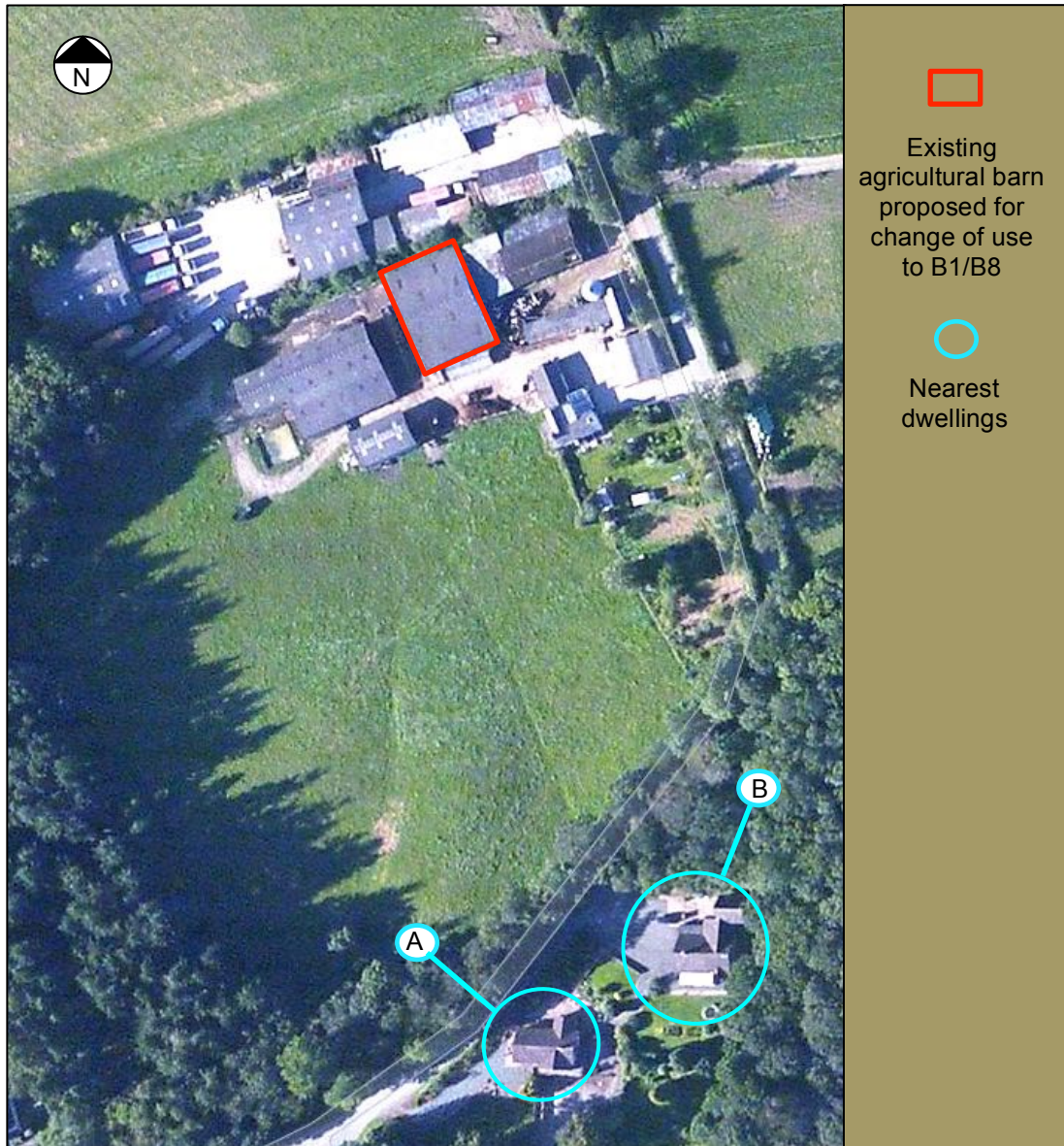


Figure 1. Aerial view (source: www.bing.com) with existing agricultural barn and nearest dwellings identified



Photo 1. View of east and south façades of existing barn



Photo 2. View of south façade of existing barn

Figure 2. Photos showing the east and south facades of the existing agricultural barn

### 3. Noise Impact Assessment

The impact of the activity noise emissions from the proposed use of the barn have been reviewed using the methodology provided in BS4142.

#### 3.1 BS4142

BS4142:2014 provides a methodology to assess the impact of industrial and commercial noise affecting dwellings, whereby the 'typical' background noise level is deducted from the industrial noise Rating Level. The following guidance is given based on the established difference:

- A difference of around +10dB or more is likely to be an indication of significant adverse impact, depending on context
- A difference of +5dB is likely to be an indication of an adverse impact, depending on context
- 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 context

Context, as defined in BS4142:2014, includes the consideration of the following factors:

- The absolute level of the noise emissions
- Character and level of the residual sound compared to the character and level of the Specific Level
- Sensitivity of the receptor and any acoustic design measures (e.g. façade sound insulation, use of mechanical ventilation and acoustic screening) incorporated at premises used for residential purposes

BS4142 provides four noise character correction categories with associated penalties that must be applied when determining the Rating Level, namely:

- **Tonality:**
  - Not perceptible = 0dB
  - Just perceptible = +2dB
  - Clearly perceptible = +4dB
  - Highly perceptible = +6dB
- **Impulsivity:**
  - Not perceptible = 0dB
  - Just perceptible = +3dB
  - Clearly perceptible = +6dB
  - Highly perceptible = +9dB
- **Intermittency:** +3dB if the intermittency of operation is readily distinctive against the residual noise environment
- **Other:** +3dB applied if the specific sound is neither tonal or impulsive but features noise characteristics that are readily distinctive against the residual noise environment

#### 3.2 Typical Background Noise Levels

A noise survey has not been undertaken to establish the existing background noise levels at the nearest dwellings. However, based on numerous surveys conducted in rural areas the typical background noise levels are not expected to be below  $L_{A90}$  30dB during the working day. This low typical background noise level has been used for the purpose of the assessment.

### 3.3 Internal noise level

For the proposed use (toy storage) the activity noise will consist of the loading/unloading of vehicles and stacking of shelves, both of which will be undertaken using an electric forklift within the barn.

From measurements undertaken elsewhere typical representative noise levels of the proposed activities are:

- Electric forklift loading wooden pallets off an HGV:  $L_{Aeq}$  76dB at 1m
- Electric forklift loading full metal cages on HGV:  $L_{Aeq}$  80dB at 1m
- Organising empty metal cages on HGV:  $L_{Aeq}$  79dB at 1m
- HGV engine idling:  $L_{Aeq}$  81dB at 1m

The above values are considered to be representative to the reverberant noise levels within the barn.

Periods of activity have been assumed to cover the 1hr BS4142 assessment period, for which the aggregate 1hr ambient noise level within the barn, using the logarithmic average of the assumed noise sources, has been taken to be  $L_{Aeq,1hr}$  80dB. It should be noted however that for the majority of time there will be no activity noise.

The  $L_{Aeq,1hr}$  80dB internal noise level is also considered to be representative to the highest internal noise level for the other potential B1 and B8 uses.

### 3.4 Derivation of noise emissions from barn

The 1hr noise emissions from each ridge vent and the façades/roof facing the dwellings have been established using the following corrections applied to the assumed  $L_{Aeq,1hr}$  80dB internal noise level:

- **Roof vents:**
  - Vent area correction:  $10 \times \log(A)$ , where A is the open area of the vent (assumed to be  $0.4m^2$  for each vent). The resultant value is added to the assumed internal sound pressure level to establish the sound power level at the vent opening
  - Distance correction:  $20 \times \log(d) + 11$ , where d is the distance between the vent and dwelling
  - Shielding correction: 10dB acoustic shielding has been applied as the line of sight of the ridge vents will be fully blocked by local topography.
  - Atmospheric attenuation: ISO 9613-2: Attenuation of sound during propagation outdoors, Formula 8:  $A_{atm} = \alpha d/100$ , where,  $\alpha$  = is the atmosphere attenuation coefficient for a temperature of  $10^\circ C$  and 70% relative humidity and d = distance from source to receptor
- **Façade/roof:**
  - Distance correction:  $10 \times \log(2 \times \pi \times d^2)$ , where  $d_1$  = distance between dwelling and the façade/roof
  - Façade/roof sound reduction: composite sound insulation of façade/roof determined by the sound reduction and areas of the proposed façade/roof elements.
  - Façade/roof area correction:  $10 \times \log(A)$ , where A is the total area of the façade/roof
  - Shielding correction: 10dB acoustic shielding has been applied if the façade/roof is fully acoustically shielded i.e. the line of sight is fully blocked by a solid barrier such as a masonry wall or the units themselves

- Atmospheric attenuation: ISO 9613-2: Attenuation of sound during propagation outdoors, Formula 8:  $A_{atm} = \alpha d/100$ , where,  $\alpha$  = is the atmosphere attenuation coefficient for a temperature of 10°C and 70% relative humidity and  $d$  = distance from source to receptor
- Note that the calculation determines the noise emissions from the façade/roof facing the dwelling only; these will be the dominant noise emissions from the barn

The full calculations of the Specific Level are provided in Tables A1 and A2, Appendix A.

### 3.5 Rating Level

The following BS4142 character corrections are considered to be applicable for the proposed toy storage usage:

- **Tonality:**
  - Correction: 0dB
  - Reason: the electric forklift noise emissions are not expect to be tonal
- **Impulsivity:**
  - Correction: 6dB
  - Reason: The loading/unloading of vehicles and stacking of shelves may result in a clearly perceptible impulsive noise
- **Intermittency:**
  - Correction: 3dB
  - Reason: Loading/uploading of vehicles will be intermittent
- **Other**
  - Correction: 0dB
  - Reason: no 'other' noise characteristics are expected

Though the combined activity BS4142 character corrections equals 9dB, the correction has been capped at 6dB; this is the common approach, where the dominant i.e. highest correction is only applied.

To establish the Rating Level a 6dB BS4142 character corrections has therefore been applied to the Specific Level:

### 3.6 Assessment Level

We define Assessment Level = RL – min  $L_{A90}$  dB, where:

$$RL = \text{Rating Level, dB(A)}$$

$L_{A90}$  dB = the assumed typical day background noise level,  $L_{A90}$ , based on numerous noise surveys in similar rural locations

Table 1 provides the resultant extract fan Assessment Levels at Dwellings A and B.

Table 1. Calculated Rating and Assessment Levels at Dwellings A and B			
Dwelling	[1] Aggregate Rating Level, dB	[2] Assumed typical background noise level, $L_{A90}$ dB	[1] - [2] Assessment Level, dB
A	30	30	0
B	29	30	-1

As can be seen in Table 1 the Assessment Level does not exceed 0dB at both Dwellings A and B.

Where the Rating Level is at parity with the typical background noise level (Assessment Level = 0 dB) BS4142 states that the Specific Level will have a low impact. On this basis we conclude that the noise impact will be **low**.

### 3.7 Calculation uncertainty

With all calculations there is a level of uncertainty, which in this case we do not expect to be greater than +/-3dB (3dB is a just perceptible change in noise level). This small level of uncertainty is not considered to have any significance to the outcome of the assessment.

The assumed typical background noise level is very low; we consider it very unlikely that the existing background noise levels are lower than this assumed level.

## 4. Conclusion

The aggregate activity noise emissions of the proposed toy storage at the existing barn at Penrhos Farm, Llanynynech, Powys have been determined by calculation at the nearest dwellings (Dwellings A and B, Figure 1); Table 1.

The assumed toy storage activity noise levels within the barn ( $L_{Aeq,1hr}$  80dB) are considered to also be representative to the highest internal noise levels for the other potential B1 and B8 uses for which the change of use of the barn is being sought.

The resultant Rating Levels at Dwellings A and B are low, not exceeding the low assumed typical day background noise level. According to BS4142 this will result in a low noise impact.

It should be noted that for the majority of time there will be no activity noise associated with the proposed storage usage.

We therefore conclude that the noise emissions of the proposed toy storage and other B1/B8 uses will be acceptable, with no mitigation measures required.

Table A1. Calculation of activity noise from ridge ventilation opening at Dwellings A and B															
Internal Lp 80 dB															
Area of ventilation opening 0.4 m <sup>2</sup>															
Lw 76 dB															
Vent		Dwelling			Dwelling			Dwelling			Dwelling		Dwelling		
		A	B		A	B		A	B		A	B	A	B	
1	Direct distance, m	165.5	150.7	Distance correction, dB	55.4	54.6	Shielding attenuation, dB	10.0	10.0	Atmospheric attenuation, dB	0.3	0.3	Sound pressure level at dwelling, dB	10.3	11.2
2		166.4	151.7		55.4	54.6		10.0	10.0		0.3	0.3		10.3	11.1
3		170.9	156.3		55.7	54.9		10.0	10.0		0.3	0.3		10.0	10.8
4		171.8	157.3		55.7	54.9		10.0	10.0		0.3	0.3		10.0	10.8
5		176.3	161.8		55.9	55.2		10.0	10.0		0.3	0.3		9.8	10.5
6		177.3	162.8		56.0	55.2		10.0	10.0		0.3	0.3		9.7	10.5
7		181.7	167.4		56.2	55.5		10.0	10.0		0.3	0.3		9.5	10.2
8		182.7	168.4		56.2	55.5		10.0	10.0		0.3	0.3		9.4	10.2
<b>Aggregate Lp at dwelling</b>												19	20		



Table A2. Calculation of noise emissions from radiating façades/roof facing Dwellings A and B			
		Dwelling	
		A	B
	Internal Lp	80	80
Distance from radiating façade to dwelling, m	Distance to south side façade	160	145
	Distance to mid south roof	167	152
	Distance to mid west gable end	175	N/A
Distance corrections, dB	South side façade	52.1	51.2
	South roof	52.4	51.6
	West gable end	52.8	N/A
Sound reduction, Rw dB	South side façade	23	23
	South roof	25	25
	West gable end	23	N/A
Radiating façade/roof areas, m <sup>2</sup>	South side façade	268.5	268.5
	South roof	109	109
	West gable end	252	N/A
Area corrections, dB	South side façade	24.3	24.3
	South roof	20.4	20.4
	West gable end	24.0	N/A
Atmospheric attenuation, dB	South side façade	0.3	0.3
	South roof	0.3	0.3
	West gable end	0.3	
Shielding attenuation, dB	South side façade	10	10
	South roof	10	10
	West gable end	10	N/A
Lp at dwelling, dB	South side façade	18.9	19.8
	South roof	12.6	13.5
	West gable end	17.8	
	Roof ventilation openings (see Table A1)	19.0	20.0
Aggregate Lp (Specific Level)		23.7	23.4
BS4142 character corrections		6	6
Rating Level		30	29