
Our ref: NIA/9613/21/9621/v2 Llay

15th April 2021

Terri-Anne Cross
Watkin Jones Group
Llandygai Industrial Estate
Bangor
Gwynedd
LL57 4YH



Sent by email only: terri-anne.cross@watkinjones.com

NOISE IMPACT ASSESSMENT FOR THE PROPOSED RESIDENTIAL DEVELOPMENT OF LAND AT LLAY ROYAL BRITISH LEGION, WATTS DYKE, LLAY, WREXHAM, NORTH WALES

WREXHAM COUNTY BOROUGH COUNCIL PLANNING PERMISSION REFERENCE P/2018/0933

1.00 INTRODUCTION

- 1.01 Environmental Noise Solutions Ltd (ENS) have been commissioned by Watkin Jones Group to carry out a noise impact assessment for the proposed residential development of land at Llay Royal British Legion (RBL), Watts Dyke, Llay, Wrexham, North Wales (hereafter referred to as the subject site).
- 1.02 Outline planning permission (ref: P/2018/0933) for a mixed-use residential/commercial development at the subject site was granted by Wrexham County Borough Council (WCBC) in October 2019.
- 1.03 Proposals are now to submit a new full planning application for 8 no. dwellings fronting towards Watts Dyke and a separate reserved matters planning application for 43 no. dwellings across the remainder of the subject site.
- 1.04 The objectives of the noise impact assessment were to:
- Determine the ambient noise climate at the subject site
 - Assess the potential noise impact of the ambient noise climate at the subject site on the proposed development with reference to pertinent guidelines
 - Provide mitigation measures, as necessary, in order to protect the amenity of the proposed residential dwellings
- 1.05 This report details the methodology and results of the assessment. It has been prepared to accompany a full planning application for 8 no. dwellings fronting towards Watts Dyke and a reserved matters planning application for 43 no. dwellings across the remainder of the subject site to be submitted to WCBC.
- 1.06 This report has been prepared for Watkin Jones Group for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Watkin Jones Group and ENS as to the extent to which the findings may be appropriate for their use.
- 1.07 A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

2.00 SUBJECT SITE SETTING AND PROPOSED DEVELOPMENT

- 2.01 The subject site is located in a residential setting in the village of Llay, near Wrexham. Roughly rectangular in shape, the subject site is bound by (see Appendix 2 for site location plan):
- The B5425 Llay New Road (a moderately-trafficked road) to the east
 - Watts Dyke (a lightly-trafficked estate road) to the north
 - Existing residential dwellings to the west
 - Open fields to the south
- 2.02 Although two separate planning applications are to be submitted, for brevity this report considers the residential development as a whole. For the avoidance of doubt, Appendix 3 contains a site layout plan for the overall residential scheme showing the separate land parcels.
- 2.03 The preliminary layout plan indicates that the residential development footprint is set back:
- Circa 20 metres from the B4525 Llay New Road
 - Circa 5 metres from Watts Dyke
- 2.04 The land directly to the north and west of the Llay RBL is to be developed as a new car park for the club (40 no. spaces) as part of detailed proposals.
- 2.05 The Llay RBL has a lounge and a function room which are used for scheduled events (e.g. dance classes, organ society meetings, live music events) and are also hired out for ad hoc day and evening events. The opening hours of the Llay RBL are as follows:
- Mon–Thu 1700–2300 hours
 - Friday 1500–0000 hours
 - Saturday 1200–0000 hours
 - Sunday 1200–2300 hours
- 2.06 For reference, the outline planning application (ref: P/2018/0933) was accompanied by a noise impact assessment carried out by ENS (ref: NIA/7057/16/6999/v3). No objections to the development were received from Public Protection at WCBC in relation to noise, and conditions were recommended to control noise from the commercial aspect of the wider outline scheme.

3.00 BASELINE NOISE SURVEY AND NOISE BREAKOUT TESTS

- 3.01 In order to establish the ambient noise levels at the subject site, a baseline noise survey was undertaken during the daytime and night time on Thursday 24th November 2016.
- 3.02 For the purpose of the assessment, the following noise monitoring positions were adopted (the approximate location of the noise monitoring positions is contained in Appendix 2 for reference):
- MP1 was located towards the eastern boundary of the subject site at approximately 30 metres to the nearside kerb of the B4525 Llay New Road
 - MP2 was located towards the northern boundary of the subject site at approximately 10 metres to the nearside kerb of Watts Dyke
- 3.03 Noise measurements were undertaken using a Bruel & Kjaer 2250 Type 1 integrating sound level meter. A windshield was fitted for all measurements. Measurements were made in a free field environment at 1.5 metres above local ground level. The measurement system calibration was verified immediately before the commencement of the measurement sessions and again at the end, using a Bruel & Kjaer Type 4231 calibrator.

- 3.04 The following table contains a summary of the measurement data for each measurement session, at each measurement position, rounded to the nearest decibel.

Table 3.1 – Noise Measurement Data

Position	Time	L _{Aeq} (dB)	L _{A90} (dB)	L _{A10} (dB)	L _{A1} (dB)	Comments
MP1	1254–1554	57	51	60	63	B5425 Llay New Road traffic (circa 400 vehicles / hour)
MP1	2301–0003	50	40	54	59	B5425 Llay New Road traffic (circa 60 vehicles / hour)
Daytime ambient noise level 57 dB L_{Aeq} (0700–2300) based on CRTN methodology Night time ambient noise level circa 49 dB L_{Aeq} (2300–0700) based on TRL methodology						
MP2	1613–1628	56	50	59	66	Watts Dyke traffic (circa 120 vehicles / hour)
MP2	0014–0029	43	34	46	54	1 car pass on Watts Dyke, occasional traffic on B5425 Llay New Road and distant traffic on A483.
Daytime ambient noise level 56 dB L_{Aeq, T} Night time ambient noise level circa 43 dB L_{Aeq, T}						

- 3.05 Ambient noise levels across the subject site were associated with road traffic on the surrounding road network, with no other noise sources noted.

- 3.06 For the prediction of daytime road traffic noise, the Department of Transport's Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of L_{A10} are made over any three consecutive hours between 10:00 and 17:00 hours. Using L_{A10} (3 hour) as the arithmetic mean of the three consecutive values of hourly L_{A10}, the L_{A10} (18 hour) can be calculated from the equation:

$$(i) \quad L_{A10} (18 \text{ hour}) = L_{A10} (3 \text{ hour}) - 1 \text{ dB}$$

- 3.07 BS 8233 further states that for road traffic noise:

$$(ii) \quad L_{Aeq} (0700-2300) \approx L_{A10} (0600-0000) - 2 \text{ dB}$$

- 3.08 Substituting (ii) into (i) gives the following approximation:

$$(iii) \quad L_{Aeq} (0700-2300) \approx L_{A10} (3 \text{ hour}) - 3 \text{ dB}$$

- 3.09 Based on the above formula, the daytime ambient noise level at MP1 is measured / calculated at **57 dB L_{Aeq} (0700–2300)**.

- 3.10 A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled 'Converting the UK Traffic Noise Index L_{A10} (18 hour) to EU Noise Indices for Noise Mapping' presents a methodology for calculating night time road traffic noise levels based on daytime road traffic noise level based on the following formula:

$$(iv) \quad L_{Aeq} (23:00-07:00) \approx 0.90 * L_{A10, 18 \text{ hour}} - 3.77 \text{ (for non-motorways)}$$

- 3.11 Based on the above formula, the night time ambient noise level at MP1 is measured / calculated at **49 dB L_{Aeq} (2300–0700)**.

- 3.12 Daytime and night time ambient noise levels at MP2 (Watts Dyke) were measured at circa **56 dB L_{Aeq, T}** and **43 dB L_{Aeq, T}** respectively.

- 3.13 The layout plan indicates that the residential development footprint is set back:

- Circa 20 metres from the B4525 Llay New Road
- Circa 5 metres from Watts Dyke

- 3.14 Correcting for distance, assuming worst case point-source propagation of –6 dB per doubling of distance (due to the relatively low traffic numbers on the surrounding road network), the design noise levels at the façades of road-fronting dwellings are as follows:
- **61 dB L_{Aeq} (0700–2300)** and **54 dB L_{Aeq} (2300–0700)** at 20 metres to the B4525 Llay New Road
 - **62 dB L_{Aeq} (0700–2300)** and **49 dB L_{Aeq} (2300–0700)** at 5 metres to Watts Dyke
- 3.15 In addition to the external noise measurements, a noise breakout test was carried out in order to predict the impact of events at the Llay RBL on the proposed residential aspect of the development.
- 3.16 For reference, the (larger) function room has (non-openable) windows and an emergency fire door on its southern external wall, and no openings on its western external wall. The remaining walls of the function room are internal. The nearest proposed dwelling to the function room is located circa **32 metres** from the fire door on the southern façade.
- 3.17 The (smaller) lounge has an emergency fire door on its eastern (road-fronting) external wall whilst all remaining walls are internal. The nearest proposed dwelling to the lounge is located circa 45 metres to the fire door.
- 3.18 On the basis of the above, noise breaking out through the function room fire door during a live event represents the worst case.
- 3.19 For the purpose of the noise breakout test, a reverberant internal noise level of 100 dB $L_{Aeq, T}$ was generated within the function room. Such levels are considered representative of worst-case noise levels within the function room, based on previous measurements undertaken by ENS in comparable venues during a live event with drums.
- 3.20 The corresponding noise levels (based on a source level of 100 dB L_{Aeq}) were as follows:
- 84 dB L_{Aeq} at 2 metres to the southern façade of the Llay RBL with the fire door **open**
 - 60 dB L_{Aeq} at 2 metres to the southern façade of the Llay RBL with the fire door **closed**
 - Note: Fire door provides circa 24 dB attenuation
 - 77 dB L_{Aeq} at 4 metres to the southern façade of the Llay RBL with the fire door **open**
 - 71 dB L_{Aeq} at 8 metres to the southern façade of the Llay RBL with the fire door **open**
 - 64 dB L_{Aeq} at 16 metres to the southern façade of the Llay RBL with the fire door **open**
 - Not audible at 16 metres to the southern façade of the Llay RBL with the fire door **closed**
- 3.21 From the measurements above it is evident that noise breakout through the door exhibits point-source propagation characteristics. It follows that noise levels would be circa **58 dB L_{Aeq}** at 32 metres to the southern façade of the Llay RBL (considered representative of the nearest proposed dwelling façade) with the fire door **open**.
- 3.22 Measurements undertaken in close proximity to the Llay RBL façade demonstrated a 24 dB reduction due to the fire door. On this basis, noise levels at the nearest dwelling façade are predicted to be **≤ 34 dB $L_{Aeq, T}$** with the door **closed** (i.e. 58 dB $L_{Aeq, T}$ at 32 metres (door open) – 24 dB reduction from fire door).
- 3.23 It was noted during the site visit that fire doors were very clearly marked with notices requiring the doors to be kept closed except in an emergency.

4.00 NOISE IMPACT ASSESSMENT CRITERIA

Planning Policy Wales (Edition 11)

4.01 Planning Policy Wales (PPW) updated in February 2021 and sets out the Government's planning policies for Wales and how these are expected to be applied.

4.02 Where issues of noise impact are concerned, Paragraph 6.7.14 of the PPW advises that:

'Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur.'

4.03 No specific criteria are presented in relation to adverse impacts, and therefore ENS makes reference to existing guideline documents, which are summarised in the following paragraph(s).

British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

4.04 BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS 8233) sets guideline indoor ambient noise levels for dwellings. These levels are reproduced in the following table.

Table 4.1 – Indoor Ambient Noise Levels in Dwellings (BS 8233:2014)

Activity	Location	Good Internal Conditions		Reasonable Internal Conditions	
		0700–2300	2300–0700	0700–2300	2300–0700
Resting	Living room	35 dB L_{Aeq}	–	40 dB L_{Aeq}	–
Sleeping (daytime resting)	Bedroom	35 dB L_{Aeq}	30 dB L_{Aeq}	40 dB L_{Aeq}	35 dB L_{Aeq}

4.05 Note 4 to the above table states '*Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{AFMax} depending on the character and number of events per night. Sporadic noise events could require separate values*'.

ENS note: it is evident that BS 8233 considers that night time maxima guideline values relate to discrete, individual noise events (such as aircraft or trains, etc) rather than general road traffic noise.

4.06 Note 5 to the above table states '*If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment*'.

ENS comment: it is evident that BS 8233 considers that adequate whole dwelling ventilation is provided by open trickle ventilators.

4.07 With respect to garden amenity, BS8233 states:

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'

4.08 On the basis of the above, the following criteria are considered appropriate for the proposed residential development:

- 35 dB L_{Aeq} (0700-2300) in living rooms and bedrooms during the daytime
- 30 dB L_{Aeq} (2300-0700) in bedrooms at night
- ≤ 55 dB L_{Aeq} (0700-2300), or as low as practicable, in gardens during the daytime

5.00 SOUND ATTENUATION SCHEME PROPOSALS

5.01 The ambient noise levels at the proposed dwelling facades fronting towards the B4525 Llay New Road have been measured / calculated at **61 dB L_{Aeq} (0700-2300)** and **54 dB L_{Aeq} (2300-0700)**.

5.02 The daytime and night time ambient noise levels at the proposed dwelling facades fronting towards Watts Dyke have been measured / calculated at circa **62 dB $L_{Aeq, T}$** and **49 dB $L_{Aeq, T}$** respectively.

5.03 Remaining habitable rooms at the development will be set back from the road network and screened by the road-fronting dwellings.

5.04 In order to calculate the sound insulation requirements of road-fronting façades at the subject site, the Building Research Establishment (BRE) building envelope insulation calculation spreadsheet was used (see Appendix 4 for calculation spreadsheets). This spreadsheet is based on the calculation methodology advocated in BS 8233. The spreadsheet allows input of external noise levels, room dimensions and reverberation time together with parameters for the various elements of the building envelope and calculates the internal noise level in terms of the external noise level metric (L_{Aeq} in this case).

5.05 The scheme of sound insulation for the subject site is set out in the following table.

Table 5.1 – Scheme of Sound Insulation Works

Location	Noise Level	Internal Criteria	Glazing and Ventilation
Habitable rooms fronting onto Watts Dyke	62 dB L_{Aeq} (0700-2300) 49 dB L_{Aeq} (2300-0700)	≤ 35 dB L_{Aeq} (0700-2300) ≤ 30 dB L_{Aeq} (2300-0700)	Double glazing rated at ≥ 32 dB R_w+C i.e. enhanced 8/(6-20)/4 and acoustic trickle vent *
Habitable rooms fronting onto Llay New Road	61 dB L_{Aeq} (0700-2300) 54 dB L_{Aeq} (2300-0700)	≤ 35 dB L_{Aeq} (0700-2300) ≤ 30 dB L_{Aeq} (2300-0700)	Double glazing rated at ≥ 28 dB R_w+C i.e. standard 4/(6-20)/4 and acoustic trickle vent *
Remaining habitable rooms set back/screened from the road network			Double glazing rated at ≥ 28 dB R_w+C i.e. standard 4/(6-20)/4 and standard trickle vents

* Acoustic trickle vents rated at least 39 dB $D_{n,e,w}$ (vent open), such as the Greenwood 5000EAW.AC1 (note: 1 no. required per habitable room) – ventilation requirements to be confirmed by developer.

5.06 The glazing recommendations apply to the window within a sealed unit. It is the responsibility of the window supplier to ensure that the window frame does not compromise the performance of the glazing.

5.07 The gardens of road-fronting dwellings at the subject site are located to the rear and therefore screened by the dwellings themselves. On this basis there is no issue with respect to garden amenity.

Noise associated with the Llay Royal British Legion

5.08 Worst case predicted noise levels at the nearest proposed dwelling façade (32 metres to the fire door) associated with use of the Llay RBL function room are **≤ 34 dB $L_{Aeq, T}$** .

5.09 Such levels are relatively low. For reference the World Health Organisation's Night Noise Guidelines Europe (2009) state '*an external noise level of 40 dB L_{Aeq} (2300-0700) represents the Lowest Observed Adverse Effect Level.*'

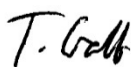
- 5.10 **It is therefore concluded that the impact associated with noise breakout from the function room to the proposed residential development is negligible.**
- 5.11 For use of the proposed Llay RBL car park during the night time period consideration also needs to be given to discrete event maxima such that they would not give rise to sleep disturbance. WHO Guidelines on Community Noise states that in order to sleep with windows partially open, maximum noise levels outside a dwelling should generally not exceed **60 dB L_{AFMax}** more than 10 to 15 times per night.
- 5.12 The proposed new car park area is ≥ 5 metres to the nearest proposed dwelling façade. Monitoring previously undertaken by ENS at various car parks have recorded maximum noise levels of circa 65 dB L_{AFMax} associated with car door slams at 5 metres.
- 5.13 In order to reduce maximum noise levels to < 60 dB L_{AFMax} at the nearest proposed dwelling façades, it is recommended that a 1.8 metre high close-boarded timber fence is installed along the western boundary of the car park, such that the nearest car parking bays are fully screened (see Appendix 2 for location of fence).
- 5.14 The fence should have a superficial mass of at least 10 kg/m² and the panels should be rigidly mounted and there should be no gaps between adjacent panels, or the barrier and the ground. The fence should be designed (e.g. through the use of cover strips) so that gaps do not develop between abutting panels through warping or shrinking.
- 5.15 For reference, BS 5228:2009 Part 1 states *'In the absence of spectral data, as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver. High topographical features and specifically designed and positioned noise barriers could provide greater attenuation.'* It is therefore considered appropriate to allow at least 10 decibels screening attenuation for the fence.

6.00 CONCLUSIONS

- 6.01 A noise impact assessment has been undertaken for the proposed residential development of land at Llay Royal British Legion (RBL), Watts Dyke, Llay, Wrexham, North Wales.
- 6.02 The ambient noise climate across the subject site is attributable to road traffic on the surrounding road network.
- 6.03 A scheme of sound attenuation works has been developed to protect the proposed residential development from the ambient noise climate in accordance with pertinent guidelines. On this basis, the ambient noise climate does not pose a constraint to the proposed residential development.

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



Thomas Crabb
MIOA, Diploma in Acoustics & Noise Control, BSc (Hons)
Environmental Noise Solutions Limited

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.

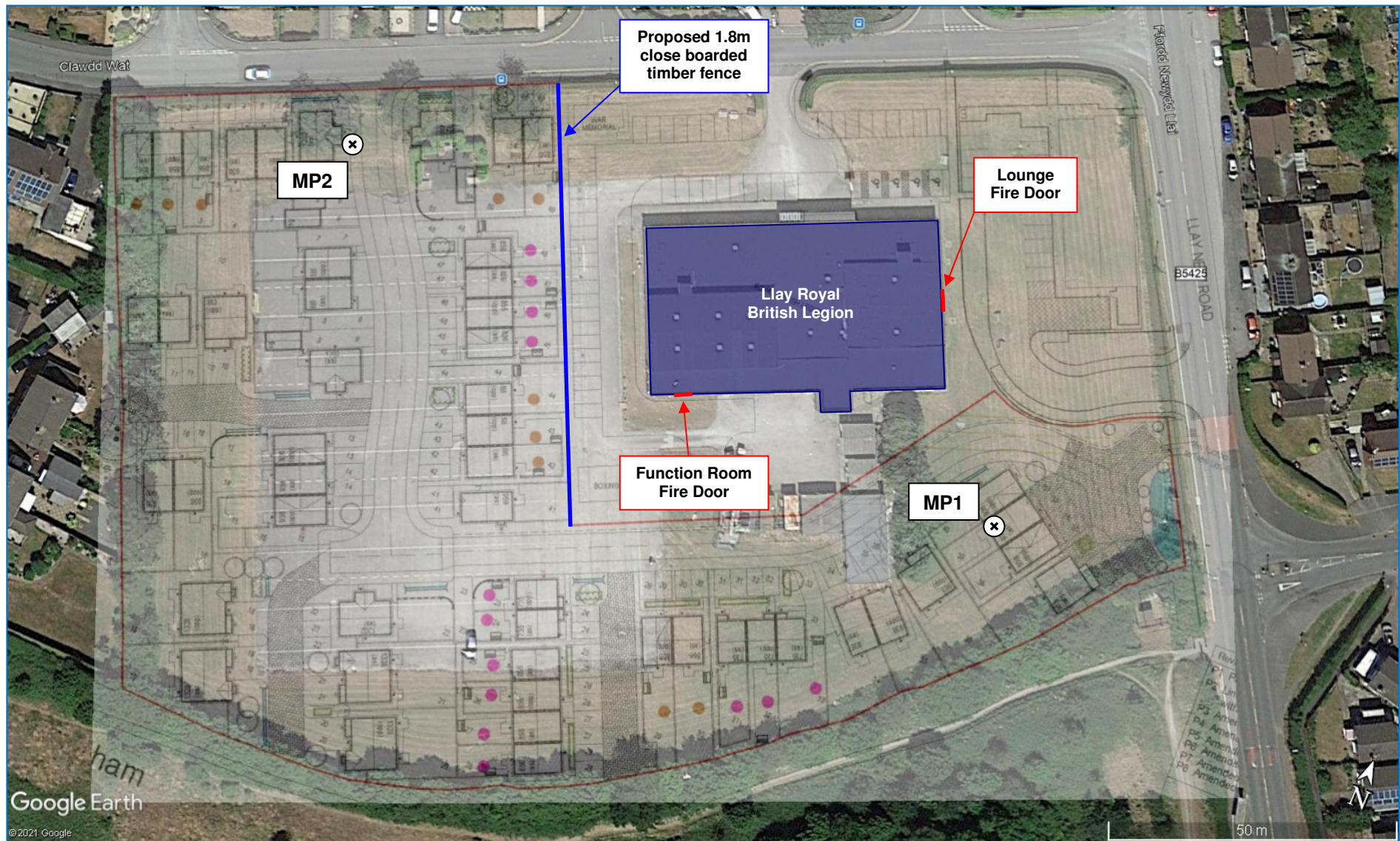
Sound Exposure Level (SEL or L_{AE})

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.

Weighted Sound Reduction Index (R_w)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_w is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix 2 – Annotated Site Plan and Approximate Noise Monitoring Positions



Appendix 3 – Site Layout Plan



Appendix 4 BRE Calculation Spreadsheets

B4525 Llay New Road elevation – Daytime (worst case) ambient noise levels

BRE	Building Envelope Insulation Switch to Reverberation Time Calculation		4) Select exterior sound level type Option (A) ☒ User defined spectrum 61 dB LAeq View/Edit Data Option (B) ☐ Spectrum shape Select spectrum shape and enter free field exterior sound level, L_{Aeq} (considering only the octave bands between 125Hz and 2kHz) L_{Aeq} 61 dB ISO 717 - 1 (C) View Data																
	2) Select elements of facade structure, and enter corresponding internal surface area in m² OR enter number of vents. HELP <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 20%; text-align: right; font-size: small;">Surface area OR number of vents</th> </tr> </thead> <tbody> <tr> <td>Wall 1 Brick/block cavity </td> <td style="text-align: right;">5.8 m²</td> </tr> <tr> <td>Wall 2 None </td> <td style="text-align: right;">m²</td> </tr> <tr> <td>Window 1 4/12/4 double glazing </td> <td style="text-align: right;">1.4 m²</td> </tr> <tr> <td>Window 2 None </td> <td style="text-align: right;">m²</td> </tr> <tr> <td>Door None </td> <td style="text-align: right;">m²</td> </tr> <tr> <td>Roof/Ceiling None </td> <td style="text-align: right;">m²</td> </tr> <tr> <td>Vent 1 Greenwood 5000EAW.AC1 </td> <td style="text-align: right;">1</td> </tr> <tr> <td>Vent 2 None </td> <td style="text-align: right;">m²</td> </tr> </tbody> </table> View/Edit Data				Surface area OR number of vents	Wall 1 Brick/block cavity	5.8 m ²	Wall 2 None	m ²	Window 1 4/12/4 double glazing	1.4 m ²	Window 2 None	m ²	Door None	m ²	Roof/Ceiling None	m ²	Vent 1 Greenwood 5000EAW.AC1	1
	Surface area OR number of vents																		
Wall 1 Brick/block cavity	5.8 m ²																		
Wall 2 None	m ²																		
Window 1 4/12/4 double glazing	1.4 m ²																		
Window 2 None	m ²																		
Door None	m ²																		
Roof/Ceiling None	m ²																		
Vent 1 Greenwood 5000EAW.AC1	1																		
Vent 2 None	m ²																		
1) Enter room dimensions or volume ☐ Use dimensions x m y m z m Volume m ³ OR ☒ Use volume 25 m ³	3) Enter reverberation time of the room. 0.5 seconds		Internal sound level L_{Aeq} 29.2 dB																

Watts Dyke elevation – Daytime (worst case) ambient noise levels

BRE	Building Envelope Insulation Switch to Reverberation Time Calculation		4) Select exterior sound level type Option (A) ☒ User defined spectrum 62 dB LAeq View/Edit Data Option (B) ☐ Spectrum shape Select spectrum shape and enter free field exterior sound level, L_{Aeq} (considering only the octave bands between 125Hz and 2kHz) L_{Aeq} 62 dB ISO 717 - 1 (Ctr) View Data																
	2) Select elements of facade structure, and enter corresponding internal surface area in m² OR enter number of vents. HELP <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 20%; text-align: right; font-size: small;">Surface area OR number of vents</th> </tr> </thead> <tbody> <tr> <td>Wall 1 Brick/block cavity </td> <td style="text-align: right;">5.8 m²</td> </tr> <tr> <td>Wall 2 None </td> <td style="text-align: right;">m²</td> </tr> <tr> <td>Window 1 8 / (6-20) / 4 double glazing </td> <td style="text-align: right;">1.4 m²</td> </tr> <tr> <td>Window 2 None </td> <td style="text-align: right;">m²</td> </tr> <tr> <td>Door None </td> <td style="text-align: right;">m²</td> </tr> <tr> <td>Roof/Ceiling None </td> <td style="text-align: right;">m²</td> </tr> <tr> <td>Vent 1 Greenwood 5000EAW.AC1 </td> <td style="text-align: right;">1</td> </tr> <tr> <td>Vent 2 None </td> <td style="text-align: right;">m²</td> </tr> </tbody> </table> View/Edit Data				Surface area OR number of vents	Wall 1 Brick/block cavity	5.8 m ²	Wall 2 None	m ²	Window 1 8 / (6-20) / 4 double glazing	1.4 m ²	Window 2 None	m ²	Door None	m ²	Roof/Ceiling None	m ²	Vent 1 Greenwood 5000EAW.AC1	1
	Surface area OR number of vents																		
Wall 1 Brick/block cavity	5.8 m ²																		
Wall 2 None	m ²																		
Window 1 8 / (6-20) / 4 double glazing	1.4 m ²																		
Window 2 None	m ²																		
Door None	m ²																		
Roof/Ceiling None	m ²																		
Vent 1 Greenwood 5000EAW.AC1	1																		
Vent 2 None	m ²																		
1) Enter room dimensions or volume ☐ Use dimensions x m y m z m Volume m ³ OR ☒ Use volume 20 m ³	3) Enter reverberation time of the room. 0.5 seconds		Internal sound level L_{Aeq} 33.0 dB																