

Approved and Issued by:

I. Critchley

Date: 26th August 2021

Acoustic Report.

Noise assessment for:
Proposed development at Station Road, Chirk
Dates of Survey: 12th to 13th August 2021



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Acoustic Report

Site: Proposed Development Plot
Jarmay,
Station Avenue
Chirk
Wrexham
LL14 5LS

Client: Wendy Roberts
Jarmay,
Station Avenue
Chirk
Wrexham
LL14 5LS

Dates of Survey: 12th to 13th August 2021

Acoustic Consultant: *Iain Critchley MIOA MInstSCE for Peninsular Acoustics Ltd*

1. Introduction.

This assessment and report was instructed by Scott McLaren (architect), on behalf of their client, Wendy Roberts (developer). It will be informed by the recommendations for indoor and outdoor noise levels defined in BS8233:2014 and The World Health Organisation (WHO) Guidelines for Community Noise 1999, so as to comply with the principles of the National Planning Policy Framework for England (the NPPF), which became effective on the 27th March 2012 (and its 2019 amendment).

The purpose of this survey and assessment is to assist the developer in the discharge of planning condition 7, issued by Wrexham Borough Council, under Planning Application number CHI P/2021/0101 for the erection of a new detached dwelling at Station Avenue, Chirk, Wrexham.

Planning Condition 7

No part of the development shall commence until a noise survey in order to determine noise levels, both day and night, has been carried out, and a detailed report of the findings together with a detailed scheme of noise attenuation and/or noise insulation measures has been submitted to and approved in writing by the Local Planning Authority. The measures as are approved shall be fully implemented prior to first occupation/use of the development.

An unattended on-site noise survey was carried out at the site during stable weather conditions, in accordance with BS 7445, to obtain representative daytime and night time noise levels across the development site. The survey period commenced at midday on Thursday the 12th August and terminated at midnight on Friday 13th August 2021

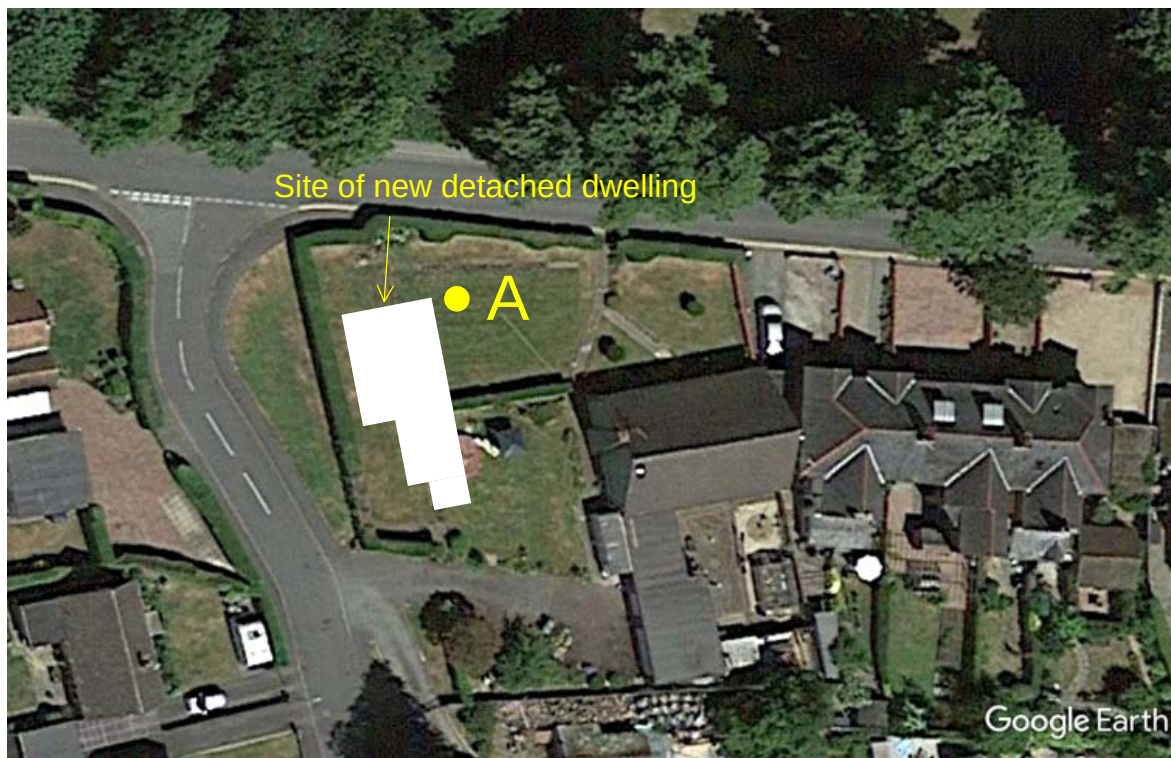
Weather conditions were mild, typically 15⁰ Celsius during the day with light wind and some rain over the survey period. At the measurement distances involved, the effect of rain and wind on the measurements is probably negligible.

2. Site Description.

The proposed development site is a portion of the front garden of the existing property known as 'Jarmay' which is owned by Wendy Roberts, also the developer of the new site. The site is located at the junction of Station Avenue and Castle Crescent. Station Avenue is a moderately busy through route while Castle Crescent leads into a quiet residential area. There is open land opposite the site.

A site layout plan of the proposed development are included in Annex A. An aerial view of the site is shown in Figure 1 (from a licensed copy of Google Earth).

Figure 1 - aerial view of site showing monitoring location A.



3. Survey Procedure and Results.

3.1 Measurement location

The site plan and floor plans show that the ground floor bedroom and first floor bedroom windows are approximately 7 metres from the property boundary and 8 metres from the road edge. The measurement location (Location A) was therefore selected so as to be representative of the free-field noise conditions at the windows, due to road traffic.

An outdoor, weatherproof measurement microphone was placed on a stand at a height of 1.5 metres above ground and connected to a logging sound level meter in a waterproof case. This measurement location is considered to be representative of noise levels at ground floor and first floor level.

The equipment comprised a Norsonic 118 sound level meter (Serial number 31512) fitted with a GRAS 41AL weatherproof microphone via an extension cable. Calibration certificates for the equipment are available for inspection if required.

3.2 Site conditions

Weather conditions were warm and dry with light wind and some light rain over the survey period.

Traffic conditions are assumed to be normal, with no roadworks, temporary traffic controls, or other obstructions nearby.

3.3 Results of noise measurements from fixed location A.

Noise levels were recorded in 5 minute periods and the parameters LA_{eq} , $LA_{f,max}$ and LA_{90} logged continuously.

The noise records for location A are illustrated by the level/time graphs in Annex B. This data is further analysed and the daytime and night time summary noise levels presented in Table 1.

Location A had a clear view of road traffic passing along Station Avenue, in both directions, the junction with Station Avenue/Castle Crescent and occasional pedestrian traffic.

Table 1 - Summary noise data for Location A

Location A	Daytime $LA_{eq(16)}$	Night time $LA_{eq(8)}$	Highest $LA_{f,max}$ (night)*	Max events > 70 dBA
Thursday 12th August	53.9 dBA	47.3 dBA	74.8 dBA	6
Friday 13th August	54.3 dBA			

* Note regarding $LA_{f,max}$.

There were 6 night time Lmax events which exceeded 70 dB $LA_{f,max}$ over the survey period.

The design criterion for the north elevation of the proposed dwelling, in terms of glazing and to achieve the 45 dB night time criterion for bedrooms, is therefore reasonably assumed to be 70 dB $LA_{f,max}$.

4. Plotting noise levels on other elevations.

4.1 Road traffic noise.

The noise data for the fixed location A was used to 'calibrate' a CADNA noise model of the site, with a 'building evaluation' model for the proposed apartments. The 'worst case' noise levels were used for this assessment i.e. 54 dBA (day) and 47 dBA (night).

This enables 'free-field' equivalent noise levels to be plotted on all elevations of the building.

The CADNA plots are included in Figures 3 and 4 with a 3D view shown in Figure 2.

Figure 2 - 3D view of CADNA model, from the west.

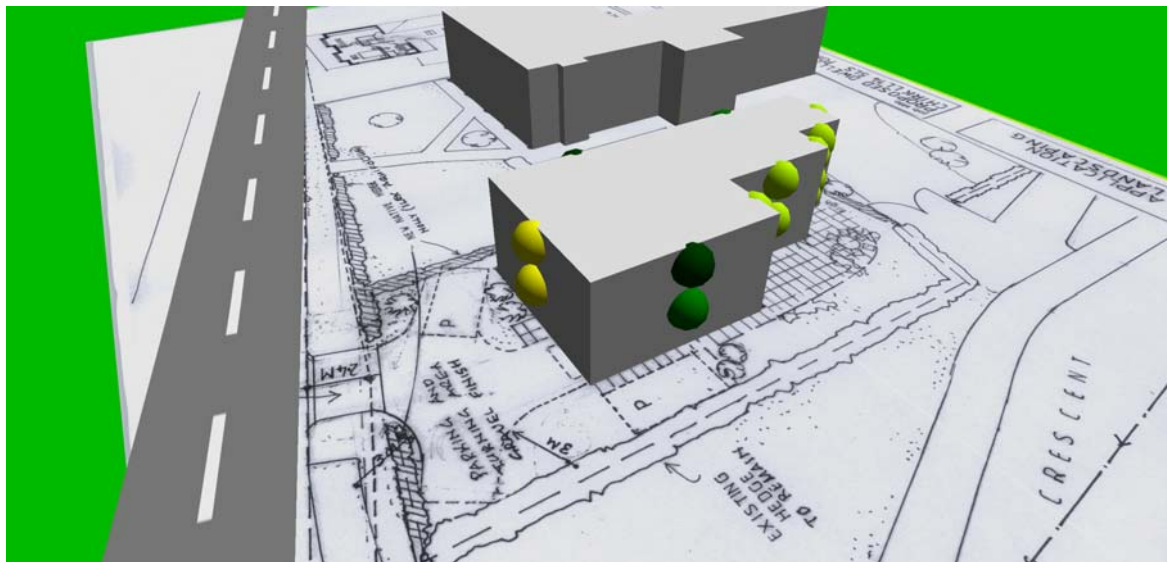


Figure 3 - resulting noise level plot around building (daytime).

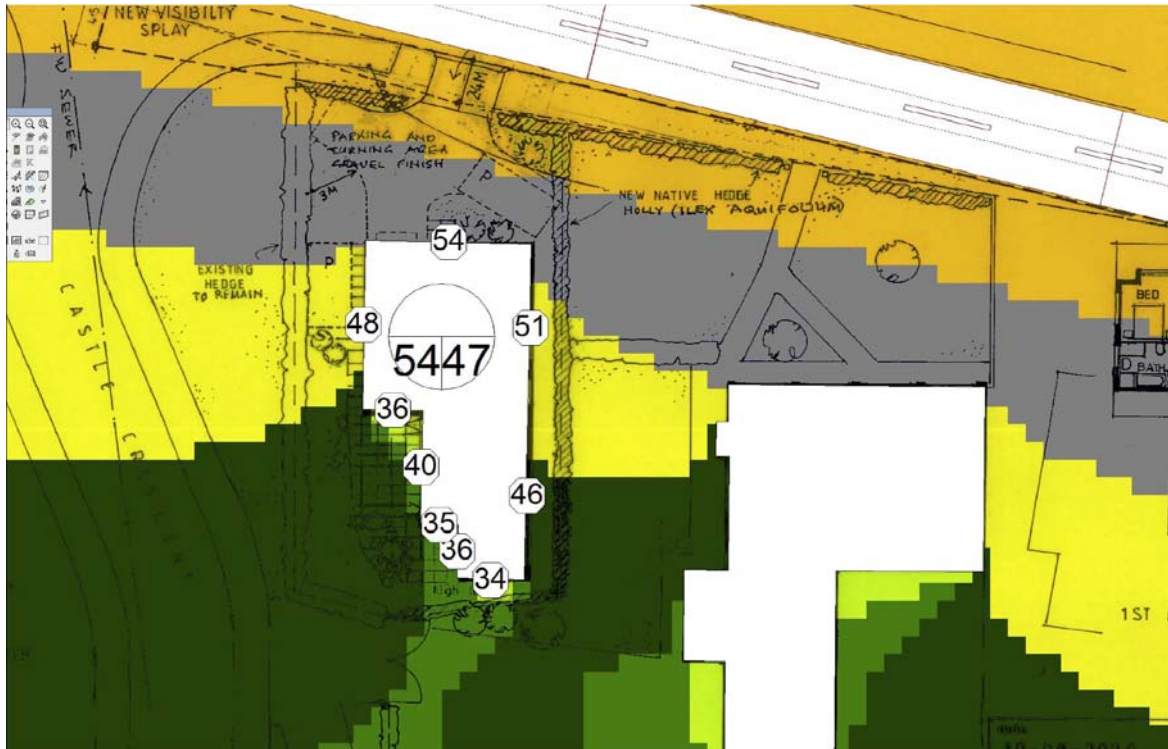
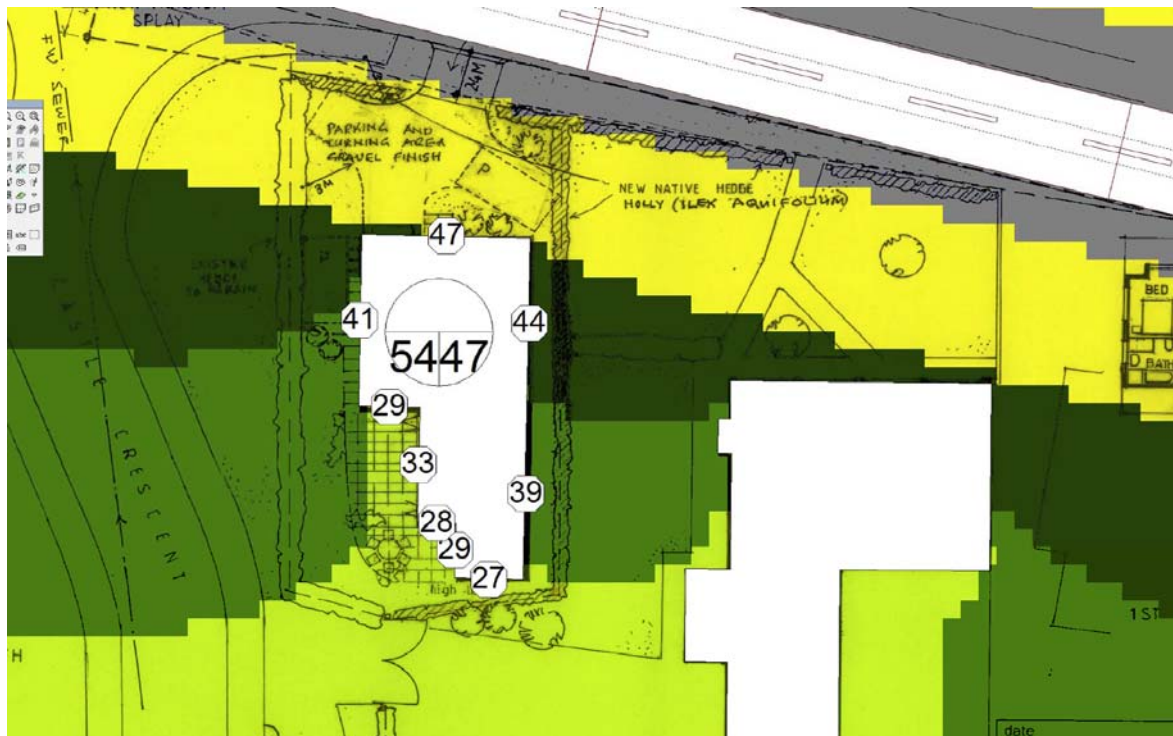


Figure 4 - resulting noise level plot around building (night time).



The external noise levels affecting all rooms on the north elevation are up to 54 dBA (day) and 47 dBA (night) due to road traffic.

In the absence of specific measurement data for the Kinnock Park elevation, it will be assumed that external noise levels are 6 dB less than the Chapel Lane elevation, i.e. 58 dBA (day) and 50 dBA (night).

On the west elevation, the external noise levels are up to 48 dBA (day) and 41 dBA (night).

The above levels are quoted as the daytime 16 hour energy averaged sound pressure level (L_{Aeq16}) and the night time 8 hour energy averaged sound pressure level (L_{Aeq8}).

Values of $LA_{f,max}$ are assumed to 'not normally exceed' 70 dBA on the north facing elevation, which is 'worst case'.

5 Achieving acceptable indoor noise levels.

5.1 Noise Criteria

The indoor noise criteria are not specified in the planning condition but are assumed to be as recommended in British Standard BS8233:2014, which is concerned only with 'average' internal noise levels in bedrooms, dining rooms and living rooms, in dwellings, as summarised by the table below.

Indoor ambient noise levels for dwellings (BS8233:2014)			
Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$	
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

There is an additional, implicit requirement, which is not explicit in BS8233:2014, that "*individual noise events shall not normally exceed 45dB L_{Amax}* ". This is commensurate with World Health Organisation Guidelines and is a limit recommended for restful sleep.

5.2 North (Station Avenue) elevation.

Sample calculations of noise ingress are based on the first floor corner bedroom which has two windows, one north-facing and one west-facing. The corner bedroom has a floor area of 14.4 m² and a volume of approximately 36 m³. The total window area of the two windows is approximately 3.7 m². The RT when furnished is assumed to be 0.5 seconds.

The ground floor bedroom has a floor area of 14.3 m² and a volume of approximately 36 m³. The total window area is 2.1 m². The RT is also assumed to be 0.5 seconds.

Initial calculations using the BRE 'Building Envelope Insulation' model show that satisfactory noise levels can be achieved in all bedrooms using 4/16/4 standard, thermal double glazing, or equivalent, in well-sealed frames with 'acoustic' trickle vents. The glazing should be rated at least 27 dB R_{TR} .

For the bedrooms, the more critical night time criteria, where the driving factor is the L_{Amax} , can still be achieved using 4/16/4 standard, thermal double glazing, or equivalent, in well-sealed frames with 'acoustic' trickle vents. The glazing should be rated at least 27 dB R_{TR} .

Table 2 - Worst-case internal noise levels Station Avenue (corner bedroom)

Room	Worst case external noise levels from survey.			Internal level*
	Daytime $L_{Aeq(16)}$	Night time $L_{Aeq(8)}$	$L_{A_{f,max}}$ (night)	
First floor bedroom (daytime)	54 dBA		-	27.5 dBA
First floor bedroom (night time)	-	47 dBA		20.5 dBA
First floor bedroom (night time)	-	-	70 dBA	43.5 dBA

*Calculated using BRE Building Envelope Calculation model.

6 Outdoor noise levels.

The Cadna daytime plot shows that typical daytime noise levels in the garden area surrounding the new dwelling range from 43 dBA to 56 dBA close to the north boundary hedge. The area shaded 'grey' on the Cadna plot is below 55 dBA and the area shaded 'yellow' is below 50 dBA. It is evident that there are large areas of garden which are below 50 dBA (yellow and dark green) and are therefore fully in accordance with WHO Guidance.

7. Ventilation.

External noise levels could give rise to unacceptably high internal noise levels if relied upon as the only source of ventilation in bedrooms facing onto Station Avenue.

Acoustic trickle vents, such as the Greenwood 2500EA, can be used but most trickle vents provide poor airflow generally and are no help with 'summer cooling'. Some alternative means of providing fresh air to habitable rooms should therefore be considered, e.g. Mechanical Extract Ventilation (MEV).

8. Summary Recommendations and Conclusion.

1. The bedrooms are the worst-affected rooms in the proposed dwelling as they are on the north-facing elevation of the dwelling and affected by road traffic on Station Avenue.
2. However, our calculations show that the bedrooms can be protected from road traffic noise using standard double glazing, with windows tightly closed, with the recommended acoustic trickle vents in the open position.

Bedroom windows (all elevations) - 4/16/4 double-glazing

3. Planning condition 7 can therefore be discharged if the recommendations in this report are adopted.
4. This report concludes that the proposed site is suitable for residential development.

This concludes the report.

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9. Definitions.

1. LAeq (t)

This is a measure of the 'average' noise level, in decibels, which has occurred over a given time period (t) e.g. LAeq (8 hours). The 'eq' stands for equivalent level as its proper definition is *"the equivalent steady sound level containing the same energy as the fluctuating sound level over the same time period"*. The 'A' means that the quoted sound level is 'A' - weighted.

2. 'A' - weighting e.g. in dBA.

The sound level has been measured with an instrument whose sensitivity has been 'tailored' to match the typical frequency response of the human ear. Nearly all environmental noise measurements are expressed in dBA.

3. LA90.

This is the sound level, in decibels (dBA), which is exceeded for 90% of the measurement period. LA90 is used to determine the background noise level of an area.

4. LA10.

This is the sound level which is exceeded for 10% of the measurement period and is a traditional unit for the measurement of road traffic noise.

5. LAf,max.

This is the highest level or 'peak' level*, measured with 'fast' time weighting, which is reached by the fluctuating noise level over the stated time period, even if it is only reached for a fraction of a second. Used to describe the highest sound level of short duration individual events such as a vehicle pass-by, which might cause disturbance or wake someone from sleep. It is possible to have high values of LAf,max even where the 'average' noise level, the LAeq, is relatively low.

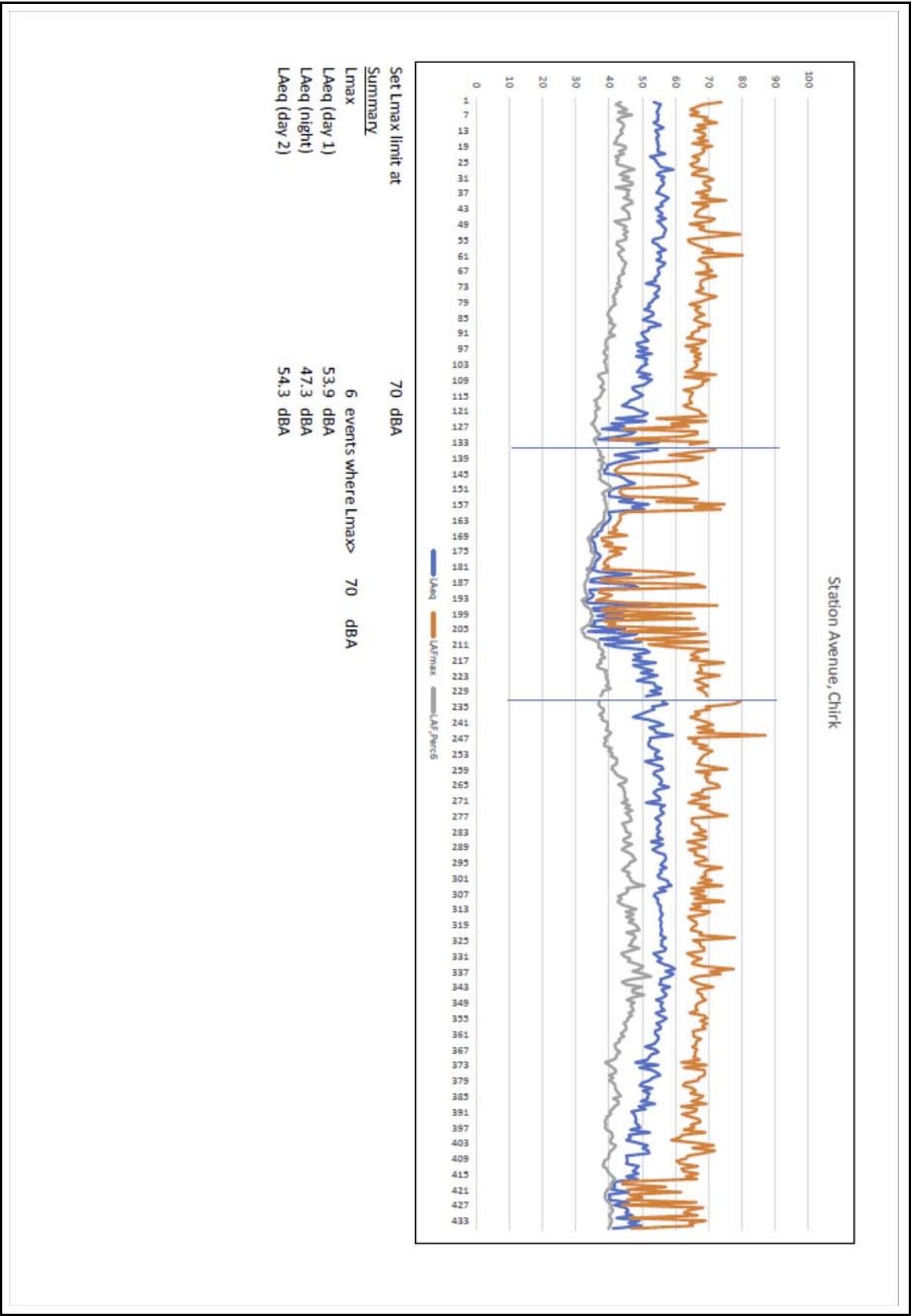
* Technically, the term 'peak noise level' refers to a different parameter which is not measured as part of a normal noise survey. It is occasionally used in this report as a convenient shorthand for LAf,max as it is a concept which is more easily understood by people who do not have a knowledge of acoustics theory.

Annex A.

Proposed site layout.

Annex B

Graphs of level vs time at location A
Glazing calculations.



Bedroom L_{max} (night)

BRE		Building Envelope Insulation		Switch to Reverberation Time Calculation	
1) Enter room dimensions or volume		2) Select elements of facade structure, and enter corresponding internal surface area in m ² OR enter number of vents.			
☐ Use dimensions x 4.6 m y 4.2 m z 2.5 m Volume - 36 m ³ OR ☒ Use volume 36 m ³		Wall 1 None m ² Wall 2 None m ² Window 1 4/12/4 double glazing 2.1 m ² Window 2 4/12/4 double glazing 1.6 m ² Door None m ² Roof/Ceiling None m ² Vent 1 Acoustic trickle vent (4000mm^2) 1 Vent 2 Acoustic trickle vent (4000mm^2) 1		Surface area OR number of vents View/Edit Data	
		3) Enter reverberation time of the room.		4) Select exterior sound level type	
		.5 seconds		Option (A) ☐ User defined spectrum Station Avenue (max) 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} 70 dB ISO 717 - 1 (Ctr) View Data	
				Internal sound level L _{Aeq} 43.5 dB	

Bedroom L_{Aeq} (night)

BRE		Building Envelope Insulation		Switch to Reverberation Time Calculation	
1) Enter room dimensions or volume		2) Select elements of facade structure, and enter corresponding internal surface area in m ² OR enter number of vents.			
☐ Use dimensions x 4.6 m y 4.2 m z 2.5 m Volume - 36 m ³ OR ☒ Use volume 36 m ³		Wall 1 None m ² Wall 2 None m ² Window 1 4/12/4 double glazing 2.1 m ² Window 2 4/12/4 double glazing 1.6 m ² Door None m ² Roof/Ceiling None m ² Vent 1 Acoustic trickle vent (4000mm^2) 1 Vent 2 Acoustic trickle vent (4000mm^2) 1		Surface area OR number of vents View/Edit Data	
		3) Enter reverberation time of the room.		4) Select exterior sound level type	
		.5 seconds		Option (A) ☐ User defined spectrum Station Avenue (L<sub>Aeq</sub>) 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} 47 dB ISO 717 - 1 (Ctr) View Data	
				Internal sound level L _{Aeq} 20.5 dB	

Bedroom LAeq (day)

BRE		Building Envelope Insulation		Switch to Reverberation Time Calculation																										
1) Enter room dimensions or volume ☒ Use dimensions x: 4.6 m y: 4.2 m z: 2.5 m Volume: 36 m ³ OR ☒ Use volume 36 m ³		2) Select elements of facade structure, and enter corresponding internal surface area in m ² OR enter number of vents.		HELP																										
		<table border="1"> <thead> <tr> <th></th> <th>Surface area OR number of vents</th> <th>m²</th> </tr> </thead> <tbody> <tr> <td>Wall 1</td> <td>None</td> <td></td> </tr> <tr> <td>Wall 2</td> <td>None</td> <td></td> </tr> <tr> <td>Window 1</td> <td>4/12/4 double glazing</td> <td>2.1</td> </tr> <tr> <td>Window 2</td> <td>4/12/4 double glazing</td> <td>1.6</td> </tr> <tr> <td>Door</td> <td>None</td> <td></td> </tr> <tr> <td>Roof/Ceiling</td> <td>None</td> <td></td> </tr> <tr> <td>Vent 1</td> <td>Acoustic trickle vent (4000mm²)</td> <td>1</td> </tr> <tr> <td>Vent 2</td> <td>Acoustic trickle vent (4000mm²)</td> <td>1</td> </tr> </tbody> </table>			Surface area OR number of vents	m ²	Wall 1	None		Wall 2	None		Window 1	4/12/4 double glazing	2.1	Window 2	4/12/4 double glazing	1.6	Door	None		Roof/Ceiling	None		Vent 1	Acoustic trickle vent (4000mm ²)	1	Vent 2	Acoustic trickle vent (4000mm ²)	1
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				4) Select exterior sound level type Option (A) ☐ User defined spectrum Station Avenue (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} 54 dB ISO 717 - 1 (Ctr) View Data																										
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