

University Academy Long Sutton, 84 Little London, PE12 9LF

Noise Impact Assessment

for Bowmer & Kirkland, High Edge Court, Belper, Derbyshire DE56 2BW

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Executive Summary

Environoise Consulting Limited has been commissioned by Bowmer & Kirkland Limited to undertake a noise impact assessment for the proposed University Academy Long Sutton at 84 Little London PE12 9LF.

The proposals comprise of a 3-storey new build school with a 3-court Multi-use Games Area (MUGA) and vehicle parking areas. The report provides an overview of indicative services plant, MUGA and car park at nearby noise-sensitive receptors.

A summary of the assessments and findings are as follows:

Noise Survey

Noise surveys were done on Monday 8th and Tuesday 9th January 2024 to inform a Building Bulletin 93, 2015 noise ingress assessment for proposed school spaces and associated outdoor spaces (excluded from this assessment) and noise limits for proposed fixed external plant.

The dominant noise source at all positions was road traffic along Little London road to the west.

Plant Noise Impact

Noise limits have been provided to achieve a 'low impact' in accordance with BS 4142 at the nearby residential receptors for any proposed external plant based on the background noise levels obtained from the noise surveys.

An outline noise impact assessment of proposed services plant has been done using indicative specifications obtained from the project M&E consultants. The assessment indicates that targets can be met at the nearby residential receptors where recommended noise mitigation measures are implemented. A detailed review will be done once plant is specified.

Multi-Use Games Area Impact

A MUGA noise impact assessment is presented using Sports England guidance and sample noise data obtained from a noise survey done of similar permeable surfaced MUGAs. The assessment indicates that targets are met at the nearest most exposed receptors with no further mitigation measures required. Recommendations for good practice and noise management have been provided so that noise is not unduly elevated.

Car Park & Coach Drop-off / Pick-up Noise Impact

The predicted change in ambient noise levels at the receptors due to car park and coach drop-off / pick-up movements is 'not significant' as per IEMA Guidelines when considering predicted noise generated by the current 50-space parking area; therefore, no further noise mitigation measures are necessary.

Music Noise Break-out

Reference has been made to DEFRA 'Noise from Pubs and Clubs, Phase 1'ⁱ to adopt a music breakout noise target of NR25 in living spaces of nearby noise sensitive receptors during the daytime period (07.00 – 23.00hrs) only. This considers the potential use of the Assembly Hall and Drama and Activity Studios for musical / dance performances.

Delivery Noise

Recommendations to reduce noise from deliveries for nearby residential dwellings are given in section 6 which can be included in a Services Management Plan.

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1.1 Site Description

- Figure 1.1:** Proposed site, residential receptors and noise survey positions.



1.2 Noise Survey Details

Attended

- 1.2.1 Attended noise surveys were done (between 10.45hrs and 15.17hrs on Monday 8th and Tuesday 9th January 2024) at Positions 2 and 3 as shown in Figure 1.1. Noise level measurements (including A-weighted ambient (L_{Aeq} and L_{A1}), background (L_{A90}) and associated octave bands) were taken over 15-minute periods.
- 1.2.2 The dominant noise source at both positions was road traffic noise from Little London to the west. Noise during break periods was also noted from the existing academy. These periods have been excluded from the assessment.

Unattended

- 1.2.3 Unattended noise surveys were done (between 13.15hrs, Monday 08th and 12.45hrs, Tuesday 09th January 2024) at Positions 1 and 4. Measurements at Positions 1 and 4 are representative of the nearest residential receptors on Little London to the north and south respectively.

Calibration

Table 1.1 Equipment list and calibration details.

Manufacturer	Equipment type	Serial number	Date of Laboratory Calibration
	NL-52 sound level meter	520927	09/08/2023
	NH-25 pre-amplifier	11774	
	UC-59 microphone	21324	
	NL-52 sound level meter	654072	23/10/2023
	NH-25 pre-amplifier	54117	
	UC-59 microphone	08333	
	NC-75 calibrator	34724230	

- 1.2.4 The sound level meters were calibrated at the start and end of the noise surveys. The meters were calibrated to 94.0dB at 1kHz with no recorded drift greater than 0.5dB at 1 kHz; therefore, the measurements are acceptable.

Weather Conditions

- 1.2.5 Weather data has been sourced from the nearest meteorological station and a summary is given in Table 1.2. Noise data has been cross-referenced with survey periods during relatively high wind speeds and no elevation of noise levels occurred; therefore, all noise survey data has been used.

Table 1.2: Summary of weather during noise survey.

Date	Rainfall	Wind speed (m/s)	Temperature range (°c)	Observed cloud cover (Oktas)
08/01/2024	None	≤5	2 – 4	8
09/01/2024		≤5	1 – 4	2

1.3 Ambient Noise Levels

- 1.3.1 Table 1.3 presents the averaged ambient (L_{eq}) noise levels (obtained from the two highest 15-minute values obtained at Positions 1 to 4), see Table A1, Appendix for the full data set.

Table 1.3: Averaged ambient noise levels.

Position	$L_{eq,30mins}$ at octave band centre frequency (Hz) dB							$L_{Aeq,30mins}$ (dB)
	63	125	250	500	1k	2k	4k	
1	57	60	53	52	51	49	48	56
2	69	58	50	42	40	39	38	49
3	67	60	53	49	49	49	41	54
4	59	51	47	47	47	47	41	51

1.4 Background Noise Levels

- 1.4.1 To assess the impact of plant noise on nearby noise sensitive receptors, BS 4142 requires the use of a 'representative' background noise level, see Table 1.4. Section 8.1.4 of BS 4142 states:
- 1.4.2 *the monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, there is no “single” background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed.*

Note 1 of the section states:

To obtain a representative background sound level a series of either sequential or disaggregated measurements should be carried out for the period(s) of interest, possibly on more than one occasion. A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value.

- 1.4.3 We have determined the representative background noise levels based on a statistical analysis for the daytime and night-time periods, see Figures A1 to A4, Appendix A.

Table 1.4: Measured background noise levels and limiting plant noise levels.

Position	Period	Measured background noise level [L _{A90} (15min) (dB)]	
		Range	Representative value
1	Daytime (07.00 – 23.00hrs)	34 – 63	44
	Night-time (23.00 – 07.00hrs)	34 – 41	35
4	Daytime (07.00 – 23.00hrs)	32 – 49	40
	Night-time (23.00 – 07.00hrs)	31 – 37	32

2 Indicative Plant Noise Impact

2.1 Criteria

2.1.1 BS 4142+A1:2019ⁱⁱ provides a method of determining the 'impact of specific sound' on noise sensitive receptors due to industrial and commercial noise sources through comparison between the measured background noise level (L_{A90}) and the noise source rating level ($L_{A,r,Tr}$) under consideration. The rating level is the specific noise level plus penalties of up to 18dB added for features to account for the character of the noise as follows:

- **Tonality:** +2dB penalty: Just perceptible; +4dB penalty: Clearly perceptible and +6dB penalty: Highly perceptible.
- **Impulsivity:** +3dB penalty: Just perceptible; +6dB penalty: Clearly perceptible and +9dB penalty: Highly perceptible.
- **Intermittency:** +3dB penalty: identifiable on/ off conditions.
- **Other:** +3dB penalty: where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent.

2.1.2 When comparing the rating plant noise level against the background noise level, BS 4142 provides the following noise impact descriptors:

- +10dB(A) is likely to be an indicator of 'a significant impact, depending on the context'.
- +5dB(A) is likely to be an indicator of 'an adverse impact, depending on the context'.
- No excess of the background noise level is an indicator of 'a low impact, depending on the context'.

2.2 Local Authority Consultation

2.2.1 Contact¹ was attempted with South Holland District Council to determine the required noise impact criteria as outlined in section 2.1.2; however, a response has not been achieved prior to issue of this report.

2.3 Plant Noise Emission Limits

2.3.1 Table 2.1 provides plant noise limits for proposed external plant to be assessed at 1 metre from the nearest noise sensitive receptor (NSR). This is to achieve a 'low impact, depending on the context', as per BS 4142. Please note, the limits apply to the cumulative level of noise from all plant. Where plant noise contains any distinguishable acoustic features, then penalty corrections will need to be applied in accordance with BS 4142.

¹ E-mail from Paul Kelly, Environoise to South Holland Public Protection (publicprotection@sholland.gov.uk) on 26.02.2024.

Table 2.1: Plant noise limits.

NSR	Period	Representative background noise level [L _{A90} (15min) (dB)]	Plant noise limit at 1m from NSR [L _{A,r,Tr} (dB)]
North	Daytime (07.00 – 23.00 hrs)	44	44
	Night-time (23.00 – 07.00hrs)	35	35
South	Daytime (07.00 – 23.00 hrs)	40	40
	Night-time (23.00 – 07.00hrs)	32	32

2.4 Plant Items

- 2.4.1 The plant items and layouts are yet to be finalised but are to be located on the roof of the school and within an external plant space at ground level.
- 2.4.2 To aid in the design and specification of plant and constructions, indicative plant details and noise data obtained from the project M&E consultants has been assessed, see Table 2.2 and the indicative layouts in Figures 2.2 and 2.3.

Table 2.2: Considered plant and associated sound power level data.

Key Colour	Main Block Item	No. of units	Sound power level [L _{WA} (dB)] per unit
Red	Carrier AquaSnap® 61AF 075 air-source heat pump	1	84
	Carrier AquaSnap® 61AF 105 air-source heat pump		85
Blue	Condensers (Daikin RZAG100MY1)	6	66
Orange	Internal Main Hall AHU (VES MAX27/B/SW/S) – exhaust cowl	1	79
	Internal Main Hall AHU exhaust (VES MAX27/B/SW/S) -		78
Yellow	Internal Activity Studio HRU (VES MAX27/B/SW/S) - exhaust cowl		79
	Internal Activity Studio HRU (VES MAX27/B/SW/S) - supply cowl		78
Green	Sub-station transformer ²		81

² We have used a standard noise level for dry type transformers up to 300kVA of 55dB(A) at 1m published by NEMA (Association of Electrical Equipment and Medical Imaging Manufacturers). The sound power level has been calculated using $L_w = \text{NEMA rating} + 10 \times \log A + C_3 + 10$, where A is the area of transformer side walls (assumed to be 5m²) and C₃ is an octave band correction where situated in any location where a serious noise problem would occur should the transformer become noisy above its NEMA rating following installation and initial period of use.

- Figure 2.2:** Indicative plant arrangement.



[illegible]

2.5 Noise Impact Assessment

Acoustic Feature Correction

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Table 2.3: Plant noise impact assessment at the most affected residential receptor.

	Noise impact at nearest NSR (north west)	
	Daytime (07.00 – 23.00hrs)	Night-time (23.00 – 07.00hrs)
Highest predicted noise level at NSR (dBA)	35	28
Acoustic feature correction (dB)	+3	+7
Rating plant noise level [$L_{Ar,Tr}$ (dB)]	38	35
Plant noise limit (dBA)	44	35
Level of excess (dB)	0 (-6)	0

Discussion

- 2.5.3 As shown in Table 2.3, the predicted noise levels at the nearest NSRs meet the plant noise limits for the daytime and night-time period.
- 2.5.4 A detailed plant noise impact assessment to the nearest NSRs and a breakthrough assessment into the proposed spaces below will need to be done at a later design stage once plant and layouts have been specified. Any excess of the plant noise limits can typically be mitigated by adopting the following options for noise mitigation as appropriate:

AHU / EF / Condenser / ASHP Plant

- Atmosphere side attenuators to AHU / EF plant
- Acoustic Kits to ASHPs
- Units programmed for 'quiet mode' operation (if available) during 23.00 – 07.00hrs.
- Units substituted for quieter models
- Relocation of plant
- Installation of localised screening
- Upgrade to roof system below any plant situation on lightweight roofing to control breakthrough noise in proposed occupied spaces.

Sub-station

- 2.5.5 We recommend the following options to mitigate sub-station noise:

-
- 2.5.6 Fully enclose the transformer in a GRP / steel / masonry enclosure and acoustic rated doors achieving a sound insertion loss of $\geq 30\text{dB(A)}$. If ventilation is required, acoustic baffled vents are recommended which should face away from the nearest NSRs to the northwest. Example supplier (<https://www.industrialgrp.co.uk/grp-product/acoustic-grp-buildings/>)
- 2.5.7 The transformer should be installed on a suitable mounting system (e.g. concrete slab and or suitable anti-vibration pads) to minimise low frequency structure borne noise transmission through the ground. Typically, this is achieved where a 95% vibration isolation efficiency is specified. An example specialist is <https://www.tvs-acoustics.com/industrial-applications/>

3 MUGA Noise Impact

3.1 Overview

- 3.1.1 A hard surfaced 3-court Multi-use Games Area (MUGA) is proposed to the south of the school, see Figure 3.1.
- 3.1.2 An assessment has been done to consider the level of noise impact from typical MUGA use (e.g. hockey, netball, tennis, football and basketball) on the nearest most exposed residential dwellings to the north, south and west. The assessment is done in two parts to consider the averaged ambient noise levels with reference to Sport England Guidance and transient noise events (such as ball impact on fencing, shouts and whistle blowing) with reference to a proposed maximum noise target. We consider that assessment of ambient noise levels together with transient (maximum) noise events would suitably address the character of the noise.

- 3.1.3 **Figure 3.1:** Proposed MUGA and NSR locations.



3.2 Criteria

Ambient Noise

- 3.2.1 Sport England, Design Guidance Note: Artificial Grass Pitch (AGP) Acoustics - Planning Implications 2015ⁱⁱⁱ gives advice on assessing noise from artificial grass pitches and makes reference to WHO 1999 Guidance^{iv}. The guidance states the following:
- 3.2.2 *'Based on a 15-decibel sound reduction of a partially open window, the noise level outside a residential property during the daytime about 1 metre from façades of living spaces should not exceed 50dB L_{Aeq}*
- 3.2.3 The above ensures that internal ambient noise levels at nearby properties do not exceed the guideline noise level of 35dB L_{Aeq} , but also to 'avoid moderate annoyance' at external living areas.

Maximum Noise

- 3.2.4 There are no specific daytime noise criteria for maximum noise levels from transient noise events such as ball impacts, whistle blowing and shouting which are typically associated with MUGA's. Night-time noise criteria of 60dB $L_{Amax,fast}$ (outside) / 45dB $L_{Amax,fast}$ (inside) for dwellings is given in WHO 1999 which considers a sound reduction of 15dBA through a partially open window. A higher maximum noise level is likely to be permitted for the daytime and therefore we propose a daytime target of 65dB $L_{Amax,fast}$ (i.e. 60 + 5dB) at 1m from facades of living spaces and gardens. This is based on the 5dB difference between daytime and night-time ambient noise criteria given in BS 8233 and WHO 1999.

3.3 Noise Source Levels

- 3.3.1 The Sports England guidance gives measured ambient noise levels at Artificial Grass Pitches (AGP) for use in noise assessments and states the following:
- 3.3.2 *'Noise levels were measured during nine sports sessions on three separate AGPs. The sessions included football, hockey and rugby and participation by men, women and children. The purpose was to determine a 'typical' noise level generated from a 'typical' AGP sports session. Noise level measurements were taken at a distance of 10 metres behind the mid-way points along goal lines and sidelines. They were found to be highest behind the sideline halfway line.*
- 3.3.3 *From the measurement data, a typical free-field noise level of 58dB $L_{Aeq(1\ hour)}$ at a distance of 10 metres (m) from the sideline halfway marking has been determined as representative for noise from an AGP.'*

- 3.3.4 There is concern that the Sports England AGP reference source noise level would not be representative of that generated within the proposed 'harder' surfaced MUGA. This is based on the assumption that there could potentially be increased impact noise from bouncing balls and footfall together with an increased level of sound reflections.
- 3.3.5 Noise surveys at similar macadam surfaced MUGAs have been done by Environoise to determine a representative level for both ambient and transient (maximum) noise. Details of the surveys and results are provided in Appendix C. A summary of the results used for the assessment are provided in Table 3.1.

Table 3.1: MUGA source noise levels.

Noise source	Ambient noise level [L_{Aeq} (1 hour) (dB)] at 10m	Maximum noise level [$L_{max,fast}$ (dB)] at 10m
General MUGA noise	59	-
Ball impact	-	79
Whistle blow	-	72
Voice (shout)	-	67

3.4 Calculations

- 3.4.1 The three MUGA courts have each been modelled as an area source at 1.5m high in SoundPLAN® 8.2 (see Appendix B, Figure B2) and calibrated to meet the ambient noise levels in Table 3.1 from the side of the centre line. Noise propagation has been calculated to the NSRs in accordance with ISO 9613-2. A ground absorption factor of 0 (hard ground) has been used representative of the MUGA surface and 0.5 for grass surfaces in the vicinity.
- 3.4.2 Transient noise events have also been modelled (with the maximum noise levels provided in Table 3.1) as individual point sources at multiple locations around the MUGA and noise levels predicted to the NSRs.
- 3.4.3 The assessment considers the simultaneous use of all three MUGA courts for a robust assessment.

3.5 Noise Impact Assessment

- 3.5.1 The results of the SoundPLAN® noise assessments have been compared to the target criteria, see Tables 3.2 and 3.3.

Table 3.2: Noise impact assessment – ambient noise.

	Noise Impact at NSRs		
	Dwellings (northwest)	Nursery (south)	Dwellings (west)
Highest predicted ambient noise level at NSR [$L_{Aeq,1hour}$ dB]	48	48	49
Target criterion [$L_{Aeq,1hour}$ dB]	≤ 50	≤ 50	≤ 50
Highest level of excess (dB)	0 (-2)	0 (-5)	0 (-1)

Table 3.3: Noise impact assessment – transient (maximum) noise.

	Noise Impact at NSRs		
	Dwellings (northwest)	Nursery (south)	Dwellings (west)
Highest predicted maximum noise level at NSR [$L_{Amax,fast}$ dB]	61	62	61
Target criterion [$L_{Amax,fast}$ dB]	≤ 65	≤ 65	≤ 65
Highest level of excess (dB)	0 (-4)	0 (-7)	0 (-4)

Discussion

- 3.5.2 As can be seen in Tables 3.2 and 3.3, the predicted noise levels meet the targets at the existing receptors to the northwest, south and west. Further noise mitigation is not required, except for noise management so that noise levels are not unduly elevated.
- 3.5.3 Sport England gives the following design / management advice:
- Impact noises of balls are found to be significantly reduced by the use of padding and the careful design and selection of perimeter fencing.
 - Weldmesh fencing should be securely clamped with resilient fixings to avoid vibrations due to ball impact.
 - Some users may act in an ‘unreasonable’ manner resulting in higher noise levels and a management/monitoring plan could be developed to effectively respond to specific incidents. Similarly, the restriction of use to authorised groups could be appropriate in many situations.

Noise Management Plan

3.5.4 The following management items should be considered for the use of the MUGA:

- It is recommended that a 'no whistle policy' is implemented for community use of the MUGA.
- Methods of connecting mesh fence panels which most effectively isolate (using neoprene strips) and reduce impact sounds should be implemented. It is advised that the mesh fencing to each side of the MUGA is disconnected from one another other to reduce the vibration transmission through the fencing following ball impact. A maintenance regime should be included to ensure that the fence panels do not become loose and rattle excessively if hit by a ball.
- It is recommended that padding to strike, goal boards and to fencing at ground level is used during hockey games to reduce impact noise from hockey balls.
- Any fixed items of sports equipment (e.g. basketball hoops, advertising boards) should not be directly attached to the fencing. It should either be supported by a surrounding frame or resiliently mounted to the fencing.
- It is recommended that daily use should be restricted to the hours of 08.00hrs and 22.00hrs to provide periods of respite for nearby residents and allow for users to arrive and depart within daytime hours. This will need to be considered by and approved by the local planning authority.
- Complaints tend to arise due to anti-social behaviour such as swearing. The noise management plan should include a method of informing the users that swearing and anti-social behaviour is unacceptable and that the MUGA operator reserves the right to dismiss users from the site.
- It is advised that neighbours are given a facility to report excessive noise or anti-social behaviour directly to the operator. This will allow the complaint to be investigated and addressed quickly.

4 Car Park Noise Assessment

4.1 Criteria

- 4.1.1 The potential change in ambient noise level due to increased activity of vehicles in the proposed car and coach drop-off / pick-up bay area can be assessed using the Guidelines for Environmental Noise Impact Assessment^v published by the Institute of Environmental Management & Assessment (IEMA) in October 2014.
- 4.1.2 In Section 3 of the Guidelines, noise impact is defined as:
- 4.1.3 *'The difference in the acoustic environment before and after the implementation of the proposals (also known as the magnitude of change). This includes any change in noise level and in other characteristics/features, and the relationship of the resulting noise level to any standard benchmarks'*
- 4.1.4 To determine the overall noise impact, the effect descriptors given in Table 4.1 are used.

Table 4.1: Effect descriptors within IEMA Guidelines.

Effect	Descriptor
Very Substantial	Greater than 10dB L _{Aeq} change in sound level perceived at a receptor of great sensitivity to noise.
Substantial	Greater than 5dB L _{Aeq} change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB L _{Aeq} change in sound level at a receptor of great sensitivity to noise.
Moderate	A 3 to 4.9dB L _{Aeq} change in sound level at sensitive or highly sensitive noise receptor, or a greater than 5 dB L _{Aeq} change in sound level at a receptor of some sensitivity.
Slight	A 3 to 4.9dB L _{Aeq} change in sound level at a receptor of some sensitivity.
None/Not Significant	Less than 2.9dB L _{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals.

4.2 Usage

Car Park

- 4.2.1 56 car parking bays and 8 accessible bays (64 in total) are proposed at the northwest of the site to replace an existing 50 space car park. The nearest noise sensitive receptors are the single storey residential dwellings towards the northwest at a distance of 26m from the centre of the proposed car parking area.

Coach Drop-off / Pick-up

- 4.2.2 An 8-bay coach drop-off / pick-up area is proposed to the west of the site. The nearest noise sensitive receptors are also the single storey residential dwellings towards the northwest at a distance of 73m from the centre of the proposed coach parking area.

4.3 Noise from Vehicle Movements

- 4.3.1 Vehicles manoeuvring at low speeds in car parks generate low levels of noise, but higher levels can be generated (albeit briefly) from car doors being closed and engines being started. In order to determine the likely car park noise levels outside the nearest dwellings, calculations have been undertaken based on typical values from vehicle activities that we have measured previously in car parks. We have assumed that during a busy daytime / evening peak hour period each car parking space will be occupied during any 1-hour period for a robust assessment.
- 4.3.2 The cumulative noise impact at the nearest NSRs due to proposed car park movements together with noise generated from the 8 coach drop-off / pick-up bays has been assessed considering the potential increase in noise due to the additional 14 spaces to that currently existing.
- 4.3.3 The calculation for determining the noise level of these events at the receptor is as follows:

$$L_{Aeq,T} = L_{AX} - 20 \times \log (R_2/R_1) + 10 \times \log (n/t)$$

Where:

L_{AX} = Single event noise level of event (dB)

n = number of events occurring in t (seconds)

R_1 = noise measurement distance from source [i.e. 10m]

R_2 = distance from centre of vehicle park to 1m from the nearest receptor

4.3.4 The calculations consider distance attenuation only.

4.3.5 The noise values in Tables 4.2 and 4.3 for car and coach park area vehicle movements have been used in our assessment.

Table 4.2: Existing car park noise source data.

Car park (existing 50 spaces)			
Activity	Source height	Events considered per hour	Sound pressure level [L _{Aeq,1 hr} (dB)] at 10m
Door slam	1.0m	100	48
Car drive by	0.5m	50	48
Starting and pulling out	0.5m		53
Cumulative sound pressure level [L _{Aeq,1 hr} (dB)] at NSR (i.e. 26m)			47

Table 4.3 Proposed car and coach park noise source data.

Car park (proposed 64 spaces)			
Activity	Source height	Events considered per hour	Sound pressure level [L _{Aeq,1 hr} (dB)] at 10m
Door slam	1.0m	128	50
Car drive by	0.5m	64	50
Starting and pulling out	0.5m		55
Cumulative sound pressure level [L _{Aeq,1 hr} (dB)] at NSR (i.e. 26m)			48
Coach drop-off / pick-up (proposed 8 bays)			
Activity	Source height	Events considered per hour	Sound pressure level [L _{Aeq,1 hr} (dB)] at 10m
Coach drive by	1.0m	8	47
Starting and pulling out	0.5m		52
Cumulative sound pressure level [L _{Aeq,1 hr} (dB)] at NSR (i.e. 73m)			35

4.4 Car Park Noise Impact

- 4.4.1 The cumulative noise level impact at the NSRs has been determined using the noise levels in Tables 4.2 and 4.3 and IEMA guidance in Table 4.1 by a comparison of the predicted cumulative noise from the proposed vehicle park areas and that of the existing car park noise over any 1-hour period, see Table 4.4. Full calculations are shown in Figures B3 and B4, Appendix B.

Table 4.4: Predicted noise impact at the receptor due to proposed car park and coach drop-off movements.

Item	Vehicle Park Noise Impact
Overall proposed vehicle park noise level at NSR [$L_{Aeq,1hr}$ (dB)]	48
Overall existing vehicle park noise level at NSR [$L_{Aeq,1hr}$ (dB)]	47
Predicted change to existing noise at NSR [$L_{Aeq,1hr}$ (dB)]	+1.0
IEMA impact rating	Not significant

Discussion

- 4.4.2 As shown in Table 4.4, the predicted change in ambient noise levels at the receptors is not significant as per IEMA Guidelines; therefore, no further noise mitigation measures are necessary.

5 Noise Break-Out

5.1 Music Break-out

5.1.1 We have assessed the potential level of music break-out from the Assembly Hall, Drama and Activity Studios combined should the spaces be used for musical / dance performances, discos etc. Calculations have been done considering the areas and composite sound insulation performances of the building envelope and recommended glazing specifications, see Figure B6 Appendix B. This is to determine compliance with proposed NR25 daytime criteria to be achieved within nearby residential dwellings 35m to the northwest. The considered octave band noise levels approximately equate to an overall level of 90dBA.

5.1.2 Table 5.1 provides the building envelope construction considered together with predicted sound insulation performances used in the assessment.

Table 5.1: Building envelope constructions and sound insulation performances.

Building element	Construction	Sound insulation performance (R) at octave band centre frequency						
		63	125	250	500	1k	2k	4k
External wall	• ≥15mm brick slip / 12mm fibre cement cladding • 12mm cement particle board (≥13kg/m²) • 150mm SFS stud fully filled with mineral wool insulation (≥10kg/m³)							
	• 198mm cavity fully filled with mineral wool insulation (≥10kg/m³)	15	32	42	47	51	50	52
	• 92mm independent stud fully filled with mineral wool insulation (≥10kg/m³)							
	• 1 layer of 15mm Knauf Wallboard (8kg/m²)							
Roof	• Single ply membrane							
	• 180mm rigid insulation							
	• RoofDek D60 metal deck							
	• Mineral fibre ceiling tiles on MF ceiling system	11	16	35	43	43	43	43
Minimum considered glazing specification	• 10mm pane							
	• 6 – 20mm cavity	19	24	24	32	37	37	44
	• 6mm pane							

- 5.1.3 Windows to the Assembly Hall and Activity Studio have been considered closed with mechanical ventilation (during music performances) and windows of the dwellings have been considered partially open with attenuation as shown in Table 5.1. Table 5.2 shows the predicted levels within the existing living spaces of the NSRs.

Table 5.2: Assembly Hall music break-out calculation

	Noise level [$L_{eq,T}$ (dB)] at octave band frequency (Hz) dB						
	63	125	250	500	1k	2k	4k
Assumed reverberant music level	85	85	80	80	80	80	80
Music noise breakout at NSR (i.e. 35m)	58	52	31	24	22	22	21
Attenuation for partially open window	-5	-7	-10	-10	-15	-15	-15
Music noise ingress in NSR living space	53	45	21	14	7	7	6
NR25 target	55	44	35	29	25	22	20
Excess of target	0	1	0	0	0	0	0

Discussion

- 5.1.4 As can be seen in Table 5.1, the NR25 target criterion is exceeded by 1dB with the considered constructions. This is considered a negligible excess. However, it would be prudent to include an additional mass ($\geq 10\text{kg}^2$) layer to the relatively light weight Assembly Hall roof system should higher noise levels than those considered be proposed. This can be a layer of 18mm timber decking board or an acoustic membrane (e.g. 5mm thick Rockwool Acoustic Membrane). Our calculation considers use of the spaces between 07.00 – 23.00hrs only.

6 Delivery Noise

6.1 Noise Management

- 6.1.1 For the management of deliveries and noise, reference should be made to the Department of Transport's - Quiet Deliveries Good Practice Guidance, April 2014 documents - <https://www.gov.uk/government/publications/quiet-deliveries-demonstration-scheme>
- 6.1.2 The following measures are recommended for a service management plan to reduce noise impacts:
- Low volume broadband white noise reversing alarms should be used.
 - A 'banksman' should be used where practicable to guide HGVs into and out of loading / unloading areas.
 - Reduce vehicle speed where appropriate to avoid excessive bumping and jolting particularly on more uneven surfaces around the site.
 - Effective preparation and maintenance of the vehicle area surfaces to minimise potholes and other defects.
 - It is important to reduce noise impact that an open dialogue is kept with nearby residents and any concerns they have in relation to noise are dealt with and followed up.
 - The school operator should introduce procedures within a noise management plan to reduce the possibility of drivers and employees slamming doors, banging of trolleys, shouting and causing unnecessary noise.

Appendix A: Noise Data

Table A1: Measured daytime ambient noise levels ($L_{eq,15mins}$) at Positions 2 and 3.

Position	Time (hh.mm, dd.mm.yy)	$L_{eq,15mins}$ at octave band centre frequency (Hz) dB							$L_{Aeq,15mins}$ (dB)
		63	125	250	500	1k	2k	4k	
2	13.58, 08.01.24	61	50	40	37	36	35	32	43
	14.41, 08.01.24	66	54	42	39	38	35	30	46
	15.32, 08.01.24	71	61	53	44	38	35	30	51
	13.30, 09.01.24	64	53	42	40	41	41	40	47
3	14.21, 08.01.24	67	61	53	49	49	49	41	54
	15.04, 08.01.24	68	58	52	49	49	49	41	54

Figure A1: Statistical analysis of daytime background level measurements at Position 1.

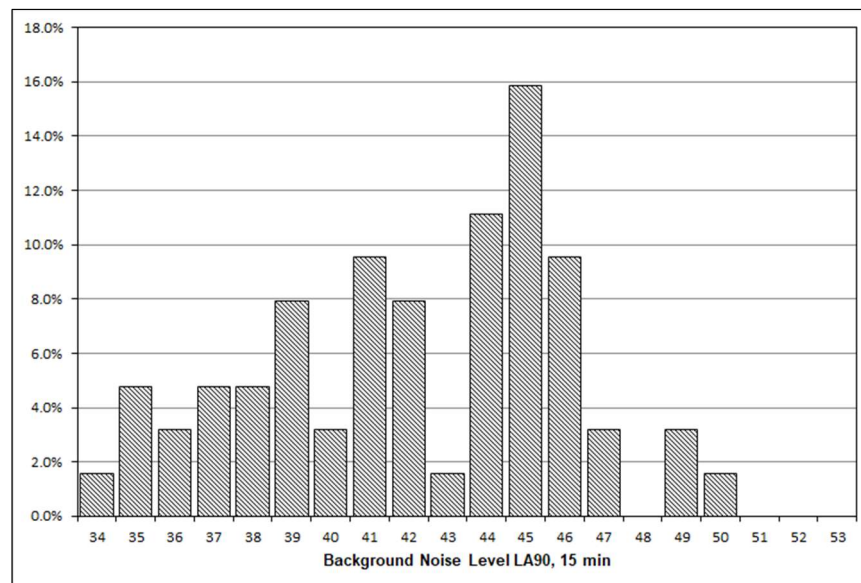


Figure A2: Statistical analysis of night-time background level measurements at Position 1.

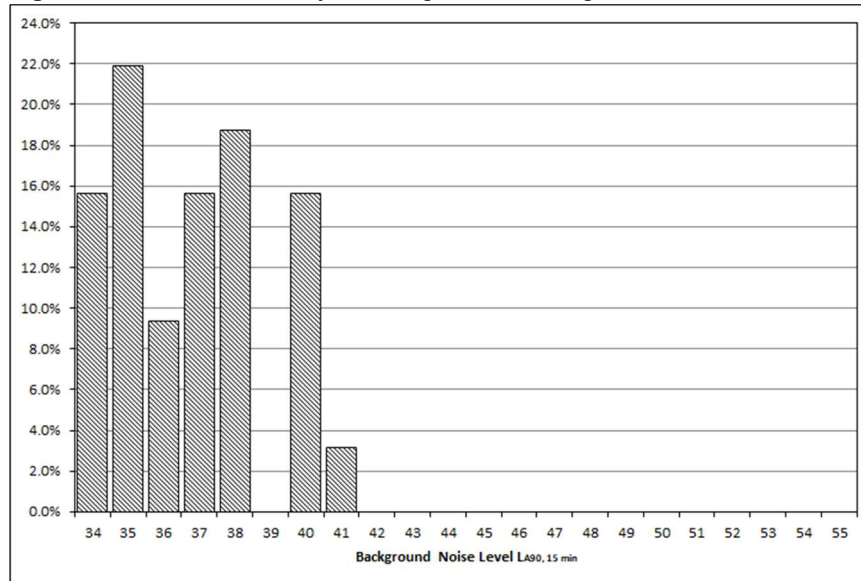


Figure A3: Statistical analysis of daytime background level measurements at Position 4.

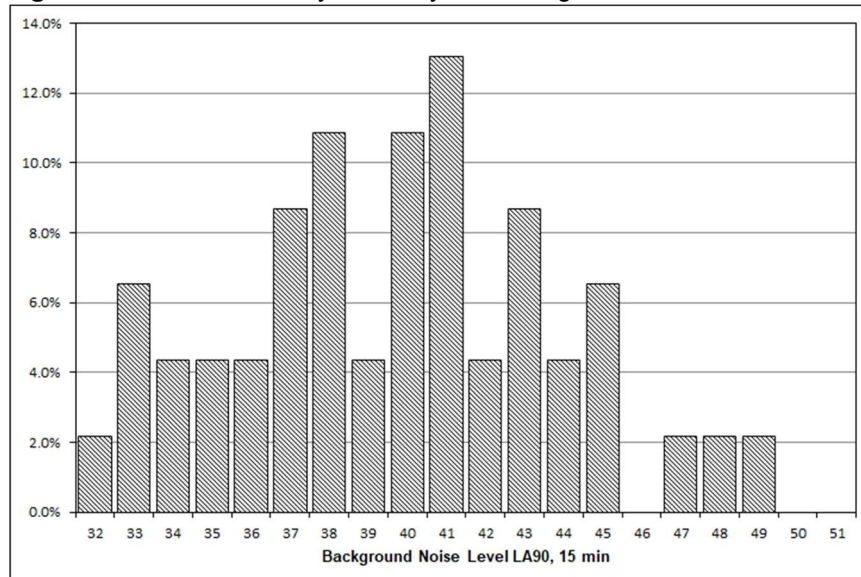
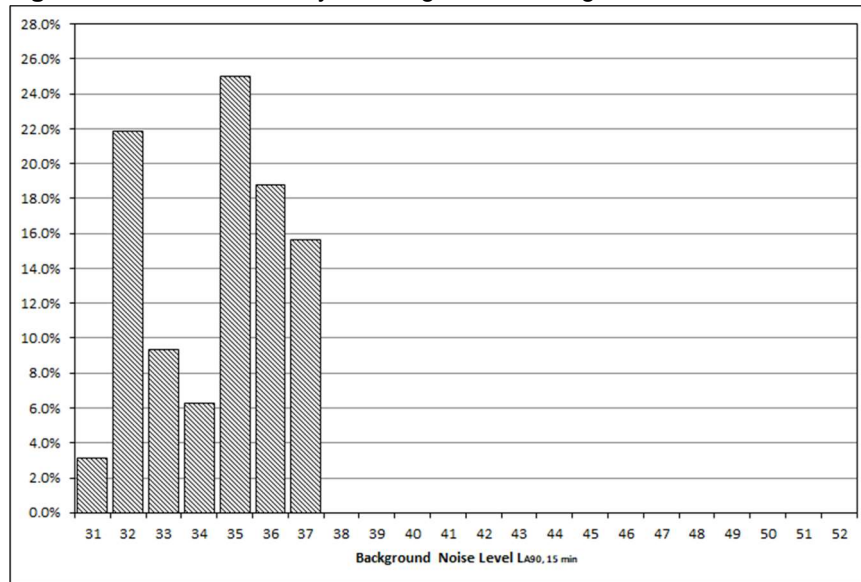


Figure A4: Statistical analysis of night-time background level measurements at Position 4.



Appendix B: Calculations

Figure B1: 3D view of SoundPLAN® noise model – School & Plant

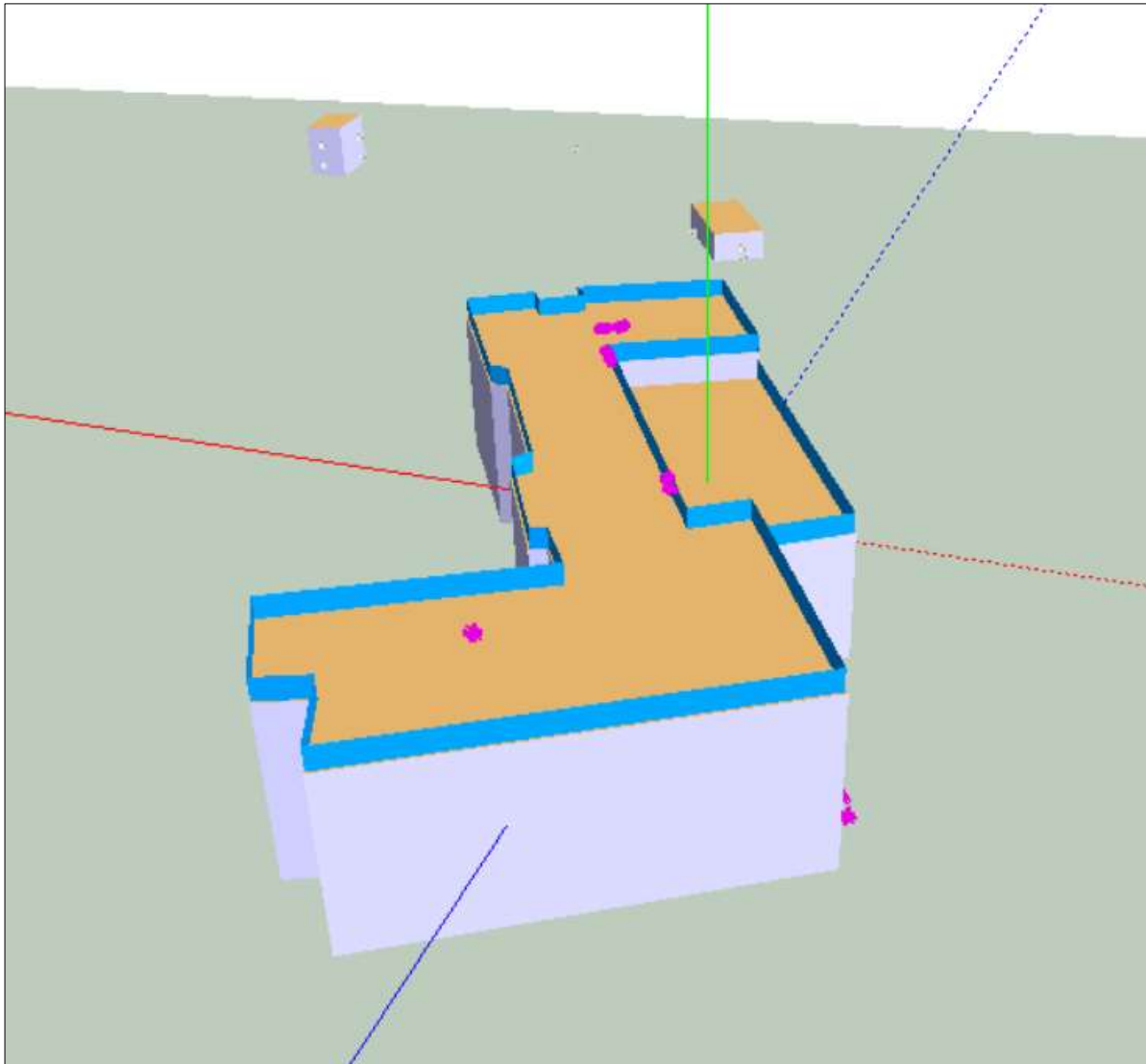


Figure B2: 3D view of SoundPLAN® noise model – MUGA

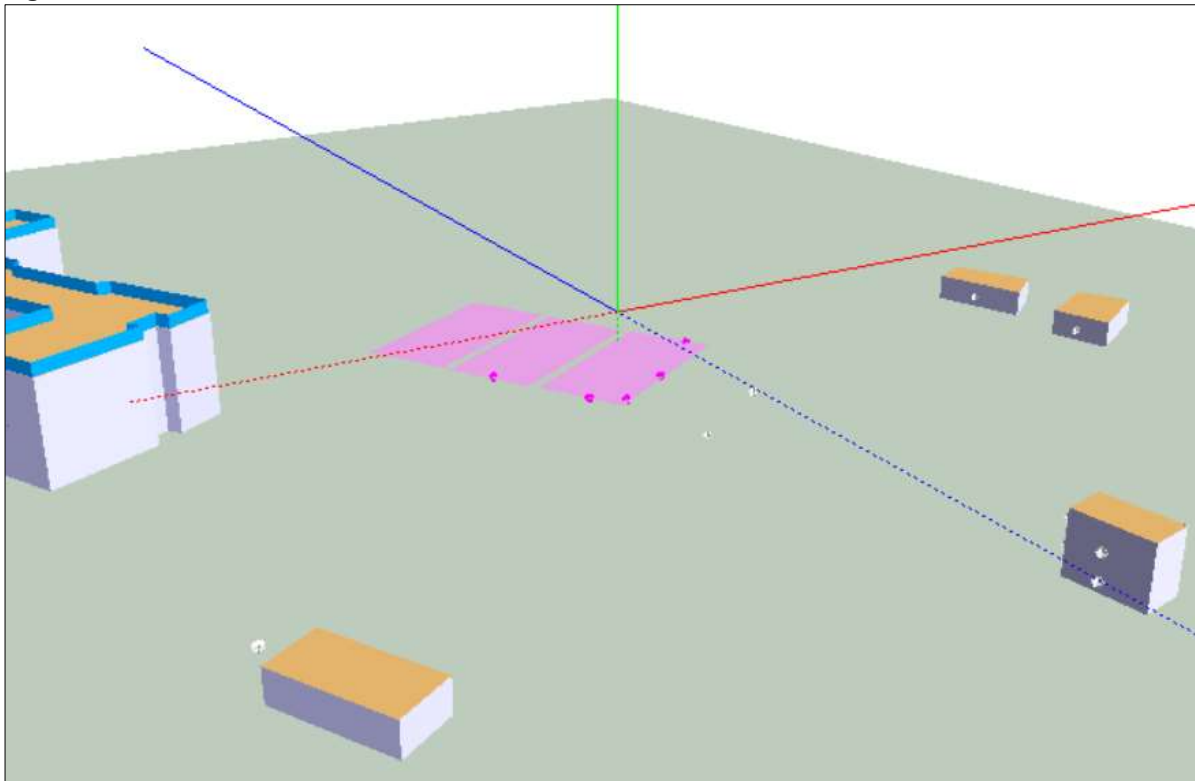


Figure B3: Predicted existing car park noise levels.

ENVIRONOISE Noise Impact Calculation						
NOISE DATA	Time	No. Events	Measurement Distance	Distance to NSR		
Door Slam	64	3600	100	10	26	
Drive by	67	3600	50	10		
Start up	72	3600	50	10		
LAeq, T		at 10m				
Door Slam	48.4	69774.6	55.6			
Drive by	48.4	69609.3				
Start up	53.4	220124.1				
LAeq, T		at NSR				
Door Slam	40.1	10321.7	47.3			
Drive by	40.1	10297.2				
Start up	45.1	32562.7				

Figure B4: Predicted proposed car park noise levels.

ENVIRONOISE Noise Impact Calculation						
NOISE DATA	Time	No. Events	Measurement Distance	Distance to NSR		
Door Slam	64	3600	128	10	26	
Drive by	67	3600	64	10		
Start up	72	3600	64	10		
LAeq, T		at 10m				
Door Slam	49.5	89311.5	56.6			
Drive by	49.5	89100.0				
Start up	54.5	281758.8				
LAeq, T		at NSR				
Door Slam	41.2	13211.8	48.3			
Drive by	41.2	13180.5				
Start up	46.2	41680.3				

Figure B5: Predicted coach drop off noise levels.

ENVIRONOISE Noise Impact Calculation						
NOISE DATA	Time	No. Events	Measurement Distance	Distance to NSR		
Drive by	73	3600	8	10	73	
Start up	78	3600	8	10	73	
LAeq, T			at 10m			
Drive by	46.5	44339.2	52.7			
Start up	51.5	140212.7				
LAeq, T			at NSR			
Door Slam	29.2	832.0	35.4			
Drive by	34.2	2631.1				

Figure B6: Predicted noise break-out to NSR

ENVIRONOISE

NSR Living Space

Project	Long Sutton														
Client	B&K														
Receive Room	NSR Living Space														
Description of Source	Restaurant music E 1 - All front elevation glazing E 2 - Front Doors E 3 - Description E 4 - Description					E 1 - All front elevation glazing E 2 - Front Doors E 3 - Description E 4 - Description									
Element 1						All front elevation glazing					Directiviti 4				
Element area						284.04 m²									
Receiver						Description									
Distance to Receiver	35 m														
Facade Correction	0 dB					Freefield = 0dB									
Frequency Hz	63	125	250	500	1000	2000	4000	dB(A)							
Internal Level dB	85	85	80	80	80	80	80	86							
SRI of element	15	32	42	47	51	50	52								
Additional Directivity Shielding															
Additional Correction															
External Freefield Level at Receiver															
Element 1	53	36	21	16	12	13	11	38							
A-weighted	27	20	12	13	12	14	12								
Sound Insulation dB R	15	32	42	47	51	50	52								
Element 2		33	28	20	15	15	8	24							
A-weighted	12	17	19	16	15	16	9								
Sound Insulation dB R	19	24	24	32	37	37	44								
Element 3	57.0	52.0	28.0	20.0	20.0	20.0	20.0	38.0							
A-weighted	31.7	36.4	19.6	16.8	20.0	21.2	20.9								
Sound Insulation dB R	11.0	16.0	35.0	43.0	43.0	43.0	43.0								
Element 4	-	-	-	-	-	-	-	-							
A-weighted	53.0	-	-	-	-	-	-								
Total	58	52	31	24	22	22	21	41							

Appendix C: MUGA Noise Surveys

Survey Descriptions

Saracens High School, London NW9

Contiguous 1 second ambient ($L_{Aeq,1s}$) noise level measurements over a 45-minute period were taken using a Type 1 sound level meter at 1.2m above the ground; 10m away from the side of the centre line of the macadam surfaced MUGA at the Saracens High School, London on Monday 16th May 2022 during after school activities, see Figure C1. Activities included up to 25 pupils playing football and basketball. Noise sources included balls bouncing on the ground, against the basketball backboard and mesh fencing, shouting from pupils including those not playing sport, infrequent passing light aircraft and occasional passing trains. The meter was within 3m of a building façade to the rear and therefore measurements are considered 'façade' noise levels.

Figure C1: MUGA site and noise survey position.



Arnolds Way, Yatton, North Somerset BS49

Controlled 'free-field' measurements of typical MUGA transient noise events (i.e. ball impact, ball bouncing, shouting, referee whistles) were done at a macadam surfaced MUGA in North Somerset on Monday 16th May 2022, see Figure C2. A Type 1 sound level meter was positioned towards the centre of the MUGA at a height of 1.2m above the ground. Three 5 – 10 second measurements of each activity (except ball impact) were done at a distance of 10m from the sound level meter. Ball impact measurements were done with the ball kicked at distances of 3m, 5m, and 10m from the mesh fencing. The fencing was damped with neoprene isolators.

Figure C2: MUGA site and noise survey position.



The weather conditions were dry with wind speeds of $\leq 5\text{m/s}$ at both locations and were therefore suitable for the noise surveys.

Survey Equipment

Table C1: Equipment list and calibration details (at the time of the surveys)

Manufacturer	Equipment type	Serial number	Date of Laboratory Calibration
Rion	NA-28 sound level meter	00501403	11 th September 2020
	NH-23 preamplifier	22018	
	UC-59 microphone	07542	
	NC-74 calibrator	34904967	11 th October 2021

The sound level meter was calibrated at the start and end of the noise surveys. Meters were calibrated to 94.0dB at 1kHz with no recorded drift greater than 0.5dB at 1 kHz; therefore, the measurements are acceptable.

Survey Results

Figure C3 shows the time history of ambient noise level measurements obtained at the Saracans High School MUGA. Noise levels due to erroneous events have been excluded from the analysis. A correction of -2dB has also been applied to convert noise levels to 'free-field' to account for reflections off a building façade and considering the relatively short distance of the noise sources to the measurement position as per BS 4142 / BS8233 guidance.

Figure C3: Time history of measured MUGA 'free-field' ambient noise levels (16.05.2022)

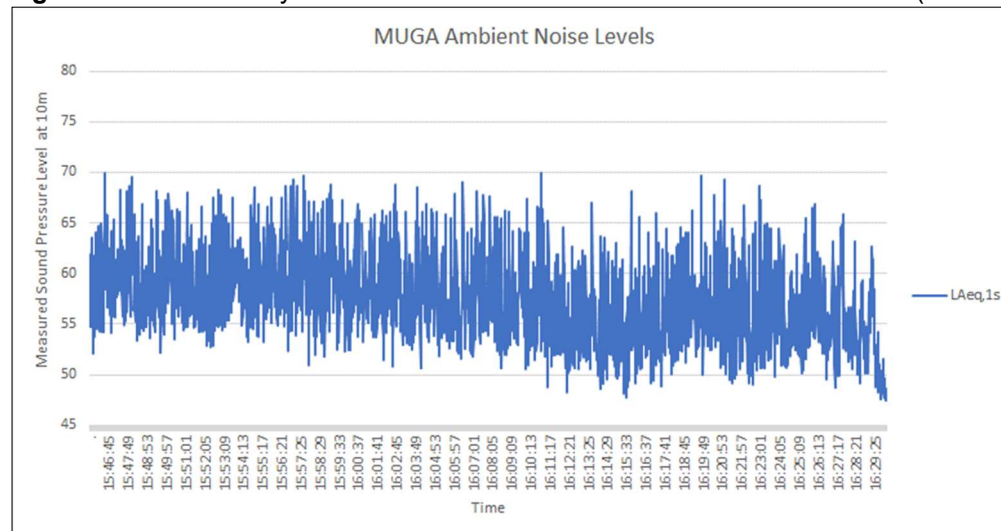


Table C2 provides a summary of the measured transient noise levels obtained at the North Somerset MUGA. An arithmetic average of the results obtained for each activity corrected to 10m has been provided and used for the assessment.

Table C2: Summary of noise level results of typical MUGA transient events.

Noise source	Ambient noise level [$L_{Aeq,T}$ (dB)] at 10m	Maximum noise level [$L_{max,fast}$ (dB)] at 10m
Ball impact at 3m	61	74
Ball impact at 5m	61	76
Ball impact at 10m	62	79
Basketball bounce	54	66
Basketball on back board	51	65
Whistle blow	64	72
Voice (shout)	51	67

References

ⁱ DEFRA 'Noise from Pubs and Clubs, Phase 1', 2005.

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

ⁱⁱⁱ Sport England, Design Guidance Note: Artificial Grass Pitch (AGP) Acoustics - Planning Implications 2015

^{iv} WHO Guidelines for Community Noise, 1999

^v Guidelines for Environmental Noise Impact Assessment, Institute of Environmental Management & Assessment (IEMA), 2014.