24Acoustics
Armstrong House
3 Bassett Avenue
Southampton
SO16 7DP

T: 02381 555000

PROPOSED TRAINING BUILDING
FILTON ATC

NOISE IMPACT ASSESSMENT

Technical Report: R9536-1 Rev 0 DRAFT

Date: 30th June 2022

For: SC Architecture Ltd
Anchor House
School Lane
Chandlers Ford
SO53 4DY

24 Acoustics Document Control Sheet

Project Title: Proposed Training Building for Filton ATC – Noise Impact Assessment

Report Ref: R9536-1 Rev 0 DRAFT

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	Name	Position	Signature	Date
Prepared by	Chris McConnell BSc MSc MIOA	Senior Consultant	[redacted]	30/06/2022
Reviewed by	Neil McLeod BA (Hons) MIOA	Senior Consultant		30/06/2022
Approved by	Stephen Gosling BEng MIOA	Principal Consultant		30/06/2022
For and on behalf of 24 Acoustics Ltd				

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1.0 INTRODUCTION

1.1 24 Acoustics Ltd has been retained by SC Architecture Ltd to undertake a noise impact assessment for a proposed new training building for North Bristol Air Training Corps (ATC), at a site located off Pine Grove in Filton, Bristol, South Gloucestershire.

1.2 This report has assessed the impact of noise from the proposed development on existing nearby residential properties around the site. The assessment has considered noise breakout from the building and noise from external plant.

1.3 The project will be targeting credits under DREAM (Defence Related Environmental Assessment Methodology) and there are three credits available under design item IEQ 5: Acoustic Design. Accordingly, noise break-in to the proposed accommodation has also been assessed.

1.4 This report presents the results of the assessment, following site visits and ambient noise surveys undertaken between 1st and 7th June 2022.

1.5 All noise levels in this report are quoted in dB relative to 20 μPa.

2.0 SITE DESCRIPTION & PROPOSED DEVELOPMENT

2.1 The site is located off Pine Grove in Filton, Bristol and currently comprises various existing buildings, an indoor tube firing range, hard standing and car parking used by North Bristol Air Training Corps (ATC). The site is bounded by residential properties on Pine Grove to the north, a public park to the east, allotments to the south and residential properties to the west on Park Road.

2.2 It is proposed to demolish the existing buildings and construct a new two-storey building to be used as a training facility by the Air Training Corps (ATC). The room uses will include classrooms, training rooms, conference/meeting room, offices and an indoor firing range within the first floor attic space. External areas will include a car parking at the northern and southern ends of the site, bike and bin stores. Vehicular access will be from the northern end of the site, off Pine Grove, as per the current use. Proposed hours of operation are not yet confirmed; however it is expected that the building will be used during evenings and weekends. The current use of the existing facility includes training on Wednesday and Friday evenings, 19:00 to 22:00 hours.

2.3 A site location plan of the site is shown in Figure 1. A site layout plan of the proposed development is shown in Figure 2 and proposed floor plans are shown in Figure 3.

3.0 ASSESSMENT CRITERIA

National Planning Policy Framework and Noise Policy Statement for England

3.1 The National Planning Policy Framework (NPPF) [Reference 1] states that planning policies and decisions should ensure that new development is appropriate for its location taking into account the likely effects of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- Mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development- and avoid noise giving rise to significant adverse impacts on health and quality of life;

- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

3.2 The NPPF refers to the Noise Policy Statement for England (NPSE) [Reference 2] which is intended to apply to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise. The NPSE sets out the Government's long-term vision to 'promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development' which is supported by the following aims.

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life.

3.3 The NPSE defines the concept of a 'significant observed adverse effect level' (SOAEL) as 'the level above which significant adverse effects on health and quality of life occur'. The following guidance is provided within the NPSE:

> *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

3.4 The National Planning Practice Guidance (NPPG) [Reference 3] is written to support the NPPF with more specific planning guidance. The NPPG reflects the NPSE and states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. It also states that opportunities should be taken, where practicable, to achieve improvements to the acoustic environment. The NPPG states that noise can over-ride other planning concerns, where justified, but that it is important to look at noise in the context of wider characteristics of the proposal, its users and its surroundings.

3.5 The NPPG expands upon the concept of SOAEL (together with Lowest Observable Adverse Effect Level, LOAEL and No Observed Effect Level, NOEL) as introduced in the NPSE and provides a table of noise exposure hierarchy for use in noise impact assessments in the planning system.

3.6 In general terms it is considered that a noise impact with an effects level which is lower than SOAEL is acceptable (providing the effect is mitigated to a minimum).

DREEAM IEQ5: Acoustic Design

3.7 Defence Related Environmental Assessment Methodology (DREAM) [Reference 4] Design Item IEQ 5 (Acoustic Design) allows three credits to be achieved, based on the following criteria:

> *"Predicted internal noise levels should be in accordance with noise levels and level ranges as stated in BS8233:2014. Where a minimum level is also specified, this is to ensure reasonable privacy in shared areas." [two credits]*
>
> *"Noise emissions from plant or from processes within the building should be in compliance with local authority standards where applicable." [one credit]*

3.8 Section 7 of BS 8233: 2014 [Reference 5] provides guideline ranges for internal noise levels within different spaces. Upper limits for internal noise levels within each type of room are given in Table 1 below, alongside recommended noise rating levels for mechanical services plant (where applicable).

Room Type	Upper Internal Noise Level (dB $L_{Aeq, 1\ hour}$)	Recommended Plant Noise Level (L_{eq})
Classroom, Training Room	≤ 35	NR 25 to 30
Offices, Breakout/Meeting, Firing Range	≤ 40	NR 30 to 35

Table 1: Criteria for Internal Ambient Noise Levels

Local Authority Requirements – External Noise from Plant

3.9 The site is located within the jurisdiction of South Gloucestershire Council. The council's Specific Guidance Note 1 – Planning and Noise [Reference 6], states the following in relation to noise-generating development:

> *"For proposed industrial and commercial developments, the main acoustic consideration relevant to planning is the minimisation of noise emitted from the site such that any adverse effects at neighbouring noise sensitive properties are considered to be not significant. Reference should be made to British Standard 4142: 2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142)."*
>
> *"Where proposed industrial and commercial sources are being introduced next to dwellings, South Gloucestershire Council would expect the rating level to be no greater than the background level both day and night as defined by BS4142."*

3.10 For design purposes it is recommended that external noise from new plant shall be at least 5 dBA below the existing background noise levels at the nearest noise sensitive facades and assessed in accordance with BS 4142: 2014 [Reference 7].

Noise Breakout from the Proposed Building – Indoor Firing Range

3.11 Noise breakout for the indoor firing range will be assessed and it is considered that noise breakout from other uses of the building will be insignificant.

3.12 There is no specific guidance relating to the assessment of noise from rifle/ pistol shooting ranges in the UK. There is, however, a code of practice for clay target shooting published by the Chartered Institute of Environmental Health titled "Clay Target Shooting – Guidance on the Control of Noise" [Reference 7]. This guidance contains a statement on the limitation in scope of its use, as follows:

'The scope of this guidance is limited to clay target (pigeon) shoots. It should not be taken as having any application to other outdoor shooting events or other gun club activities.'

3.13 In particular, consideration should be given to the scope and applicability of the guidance given the rural nature of the environment in which clay pigeon shoots are held (hence with lower background noise levels) and the urban environment (within a residential area) in which the ATC facility is located. It is also relevant to note that the new indoor firing range is replacing an existing tube firing range.

3.14 The CIEH Code of Practice defines a shooting noise level (SNL) as the logarithmic average of the 25 highest noise levels ($L_{Aeq,\ 100\ ms}$ or $L_{Aeq,125\ ms}$) in a 30-minute period. Research carried out by the Building Research Establishment (BRE) in 1997 which states that, based on this

'Annoyance is less likely to occur at a mean shooting noise level (mean SNL) below 55 dB(A), and highly likely to occur at a mean shooting noise level (mean SNL) above 65 dB(A). The likelihood of annoyance at levels within this range will depend upon local circumstances…'

4.0 NOISE SURVEY

Ambient Noise Survey Methodology

4.1 An ambient noise survey was undertaken between 1st and 7th June 2022 at a location representative of the proposed building and the nearest residential properties. The noise measurement location is described below and can be seen in Figure 1.

- Location 1: On the western site boundary, at approximately 2m above local ground level (free-field conditions);

4.2 The following instrumentation was used during the surveys:

- 1 x Rion NL-52 precision grade Class 1 accuracy sound level meter;
- Brüel and Kjær Type 4231 precision acoustic calibrator.

4.3 The instrumentation was configured to measure continuously and store overall A-weighted statistical parameters including L_{Aeq}, L_{Amax} and L_{A90} (all measured on fast response) in 5-minute intervals. Measurements were made in accordance with BS 7445: 1991 'Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use' [Reference 8].

4.4 The sound level meter was equipped with an environmental microphone and windshield. The instrumentation was powered by external batteries and stored in a weatherproof case. The calibration of the instrumentation was checked before and on completion of the measurements and no significant drift was found. The calibration of all 24 Acoustics' equipment is traceable to National Standards.

4.5 Weather conditions throughout the survey period were variable with some periods of precipitation which have been removed from the analysis. Weather conditions were otherwise generally dry with wind speeds less than 5 m/s.

Results

4.6 The measured noise levels are shown graphically in Appendix B.

4.7 Table 2 shows the representative values for ambient and background noise at Location 1. 24 Acoustics defines the 'typical' background noise level as the average minus 1 standard deviation.

Period	**Sound Pressure Level (dB)**					
	Daytime 07:00 – 19:00		**Evening 19:00 – 23:00**		**Night-time 23:00 – 07:00**	
	Average $L_{Aeq,\ 1\ hour}$	**Typical $L_{A90,1\ hr}$**	**Average $L_{Aeq,\ 1\ hour}$**	**Typical $L_{A90,1\ hr}$**	**Average $L_{Aeq,\ 1\ hour}$**	**Typical $L_{A90,15min}$**
Wed 01/6/2022	44	36	43	33	41	32
Thu 02/6/2022	46	38	43	34	39	29
Fri 03/6/2022	46	36	45	39	44	36
Sat 04/6/2022	47	41	41	36	*rainfall*	
Sun 05/6/2022	47	35	*rainfall*		43	30
Mon 06/6/2022	46	36	46	32	41	28
Tue 07/6/2022	47	37	44	38	-	-
Representative	**46**	**37**	**44**	**35**	**42**	**31**

Table 2 - Measured Ambient and Background Levels at Location 1

4.8 Typical maximum noise levels, from existing sources, were in the order of 60 to 65 dB $L_{Amax,f}$ during daytime and evening hours.

4.9 The prevailing noise levels at the measurement location were affected by general ambient noise including distant road traffic. Noise levels were not significantly affected by activities at the existing training facility during the survey period.

5.0 NOISE IMPACT ASSESSMENT

Noise Breakout from Indoor Firing Range

5.1 The proposed building includes a firing range within the first floor attic space, as shown on the proposed floor layout in Figure 3.

5.2 Calculations have been undertaken to determine the breakout noise levels from the indoor firing range at the nearest residential properties. The calculations have taken into account losses due to building fabric, distance and directivity. Room dimensions are based on the latest floor plans provided by SC Architecture Ltd.

5.3 It is understood that .22 Calibre rifles are likely to be used, as per the existing tube range on site and at other ranges used by the ATC. The following source-term noise level has been used in the assessment based on data obtained by 24 Acoustics for Basildon Rifle and Pistol Club:

- Bolt Action Single Shot Rifle, 0.22 Calibre $L_{Amax,\,f}$ sound power level 124 dB

5.4 For simplicity the SNL is considered to be equivalent to the $L_{Amax,f}$ noise level

5.5 The assessment has assumed a mid-frequency reverberation time of 0.6 seconds within the indoor firing range, which will require absorptive finishes within the space, e.g acoustically absorptive ceiling.

5.6 It is understood that the building will comprise a traditional masonry construction with pitched roof. There will be no windows or external openings to the indoor firing range and, therefore, alternative means of ventilation will be required (e.g. mechanical ventilation with comfort cooling). Fans should be ducted and attenuated, rather than through-wall units.

5.7 The typical sound reduction indices shown in Table 3 for external building fabric have been used in the calculations and are recommended as minimum specifications for the attic space

Building Element	Minimum Sound Reduction Index per Octave Band Frequency, Hz							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Cavity Masonry External Wall 51 dB R_w	33	40	44	45	51	56	60	60
Tiled/slated roof, 25mm plasterboard ceiling, 100mm mineral wool above ceiling 46 dB R_w	23	27	37	43	48	52	55	56

Table 3 – Minimum Sound Reduction Indices of Attic Building Elements

5.8 The calculated levels of noise breakout at the nearest residential properties are shown in Table 4.

Residential Receptor	External $L_{Amax,\,f}$ / Shooting Noise Level (dB)
Park Road (to West of site)	47
Pine Grove (to North of site)	37

Table 4 - Calculated Shooting Noise Levels

5.9 As shown in Table 4, noise breakout levels from the building, in terms of the shooting noise level (SNL) will be significantly lower than level at which annoyance is highly likely to occur (SNL of 65 dBA). The predicted noise levels are also low in the context of the prevailing maximum noise levels 60 to 65 dB $L_{Amax,f}$.

5.10 On the basis of the above assessments and the recommended measures, noise breakout from the building will be well-controlled. In context, the new firing range is replacing an existing tube firing range on the site and therefore highly unlikely to cause unreasonable disturbance to the amenity of neighbouring properties.

Proposed Plant Noise Limits – DREEAM IEQ5

5.11 As no detailed information is available regarding plant serving the proposed development, it is appropriate to propose noise limits for fixed plant. A cumulative plant noise limit of 5 dB below the typical background noise level has been applied, for daytime, evening and night-time periods.

5.12 Plant noise limits have been derived for all fixed plant associated with operation of the new development and these are given in Table 5, applicable at the nearest residential properties on Pine Grove and Park Road.

Period	Proposed Noise Limit (Rating Level)
Daytime (07:00 – 19:00)	32 dB $L_{Ar, 1hr}$
Evening (19:00 – 23:00)	30 dB $L_{Ar, 1hr}$
Night-time (23:00 – 07:00)	26 dB $L_{Ar, 15\ min}$

Table 5 - Plant Noise Limits at Nearest Residential Receptors

5.11 Noise from proposed plant shall be assessed in accordance with BS 4142: 2014. When determining the rating level, it will be necessary to take into account any acoustic features such as tonality or impulsivity which may incur a character correction.

5.12 Proposed plant shall be selected and design to achieve the criteria in Table 5, with noise attenuation measures specified where necessary. On this basis, the DREAM IEQ 05 credit and the local authority's requirements for plant noise can be achieved.

DREAM IEQ 05 – Internal Ambient Noise Levels

5.13 From the results of the noise survey, the daytime external ambient noise levels affecting the facades of the proposed building are low and in the region of 46 to 47 dB $L_{Aeq, 1\ hour}$.

5.14 Based on the typical attenuation of an open window, internal levels within the proposed rooms will be comfortably below the upper internal noise level criteria (set out in Section 3), and therefore acceptable with windows open for ventilation. As set out in paragraph 5.6, mechanical ventilation will be required to the indoor firing range in order to control noise breakout.

5.15 The acoustic requirements of the external building fabric and ventilation systems will be specified during detailed design.

5.16 On this basis, with the recommendation measures given, the DREAM IEQ 05 credits for indoor ambient noise levels can be achieved.

6.0 CONCLUSIONS

6.1 24 Acoustics Ltd has been retained by SC Architecture Ltd to undertake a noise impact assessment in relation to a proposed new training building for North Bristol Air Training Corps (ATC), at a site located off Pine Grove in Filton, Bristol, South Gloucestershire.

6.2 The report has assessed the impact of noise from the proposed development on existing nearby residential properties around the site. The assessment has considered noise breakout from the indoor firing range and noise from external plant. Noise break-in to the proposed building, from road traffic, has also been assessed.

6.3 The assessments undertaken have indicated that, with the recommended measures, noise breakout from the replacement firing range would be well-controlled and therefore noise levels at the nearest residential property would be acceptable.

6.4 External noise limits for fixed plant have been derived, in accordance with the requirements of BS 4142: 2014. Suitable internal noise levels can be achieved within the proposed building, based on a natural ventilation strategy to most of the rooms. On this basis, the three credits under IEQ 5: Acoustic Design credit would be achievable for the proposed development.

6.5 It is concluded that, with the recommended mitigation measures, the proposed development is unlikely to result in a significant noise impact at nearby existing receptors and this is therefore considered acceptable in planning terms.

REFERENCES

1. Department for Communities and Local Government. National Planning Policy Framework, updated July 2021.

2. DEFRA, Noise Policy Statement for England, March 2010.

3. National Planning Practice Guidance, Department of Communities and Local Government (revised July 2019).

4. Defence Related Environmental Assessment Methodology (DREAM)

5. British Standards Institution. British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings, 2014.

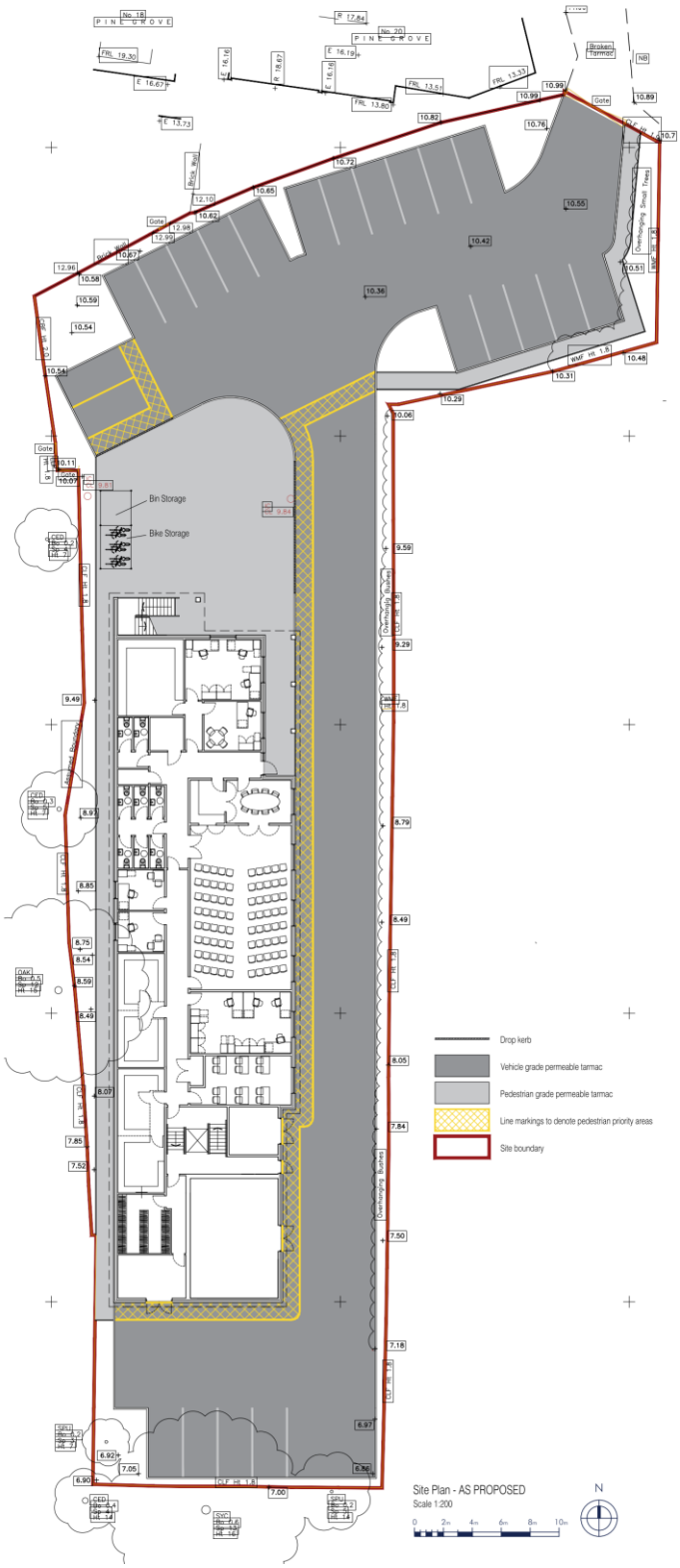
6. South Gloucestershire Council, Specific Guidance Note 1 – Planning and Noise, 2015.

7. British Standards Institution. British Standard 4142. Method for Rating Industrial and Commercial Sound, 2014+A1:2019.

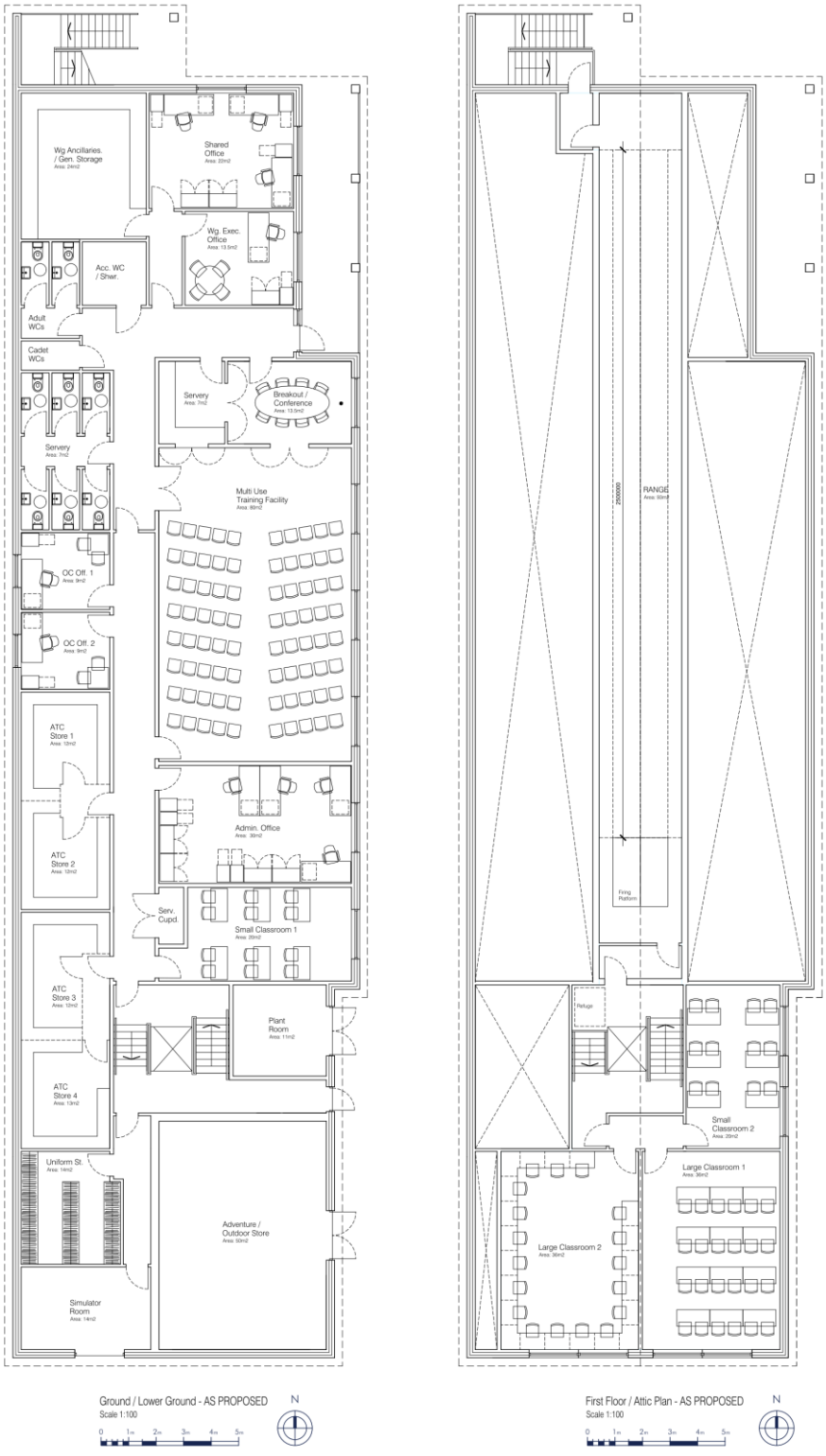
8. Clay Target Shooting- Guidance on the Control of Noise, Shooting Chartered Institute of Environmental Health, 2003.

9. British Standards Institution. BS 7445: 'Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use' 1991

Project: Filton ATC	**Title:** Site Location showing Noise Measurement Location and Receptors	
DWG No: Figure 1	**Scale:** N.T.S.	**Rev: -**
Date: June 2022	**Drawn By:** CM	**Job No:** 9536



Project: Filton ATC	**Title:** Proposed Development Layout	
DWG No: Figure 2	**Scale:** N.T.S.	**Rev: -**
Date: June 2022	**Drawn By:** CM	**Job No:** 9536



Project: Filton ATC	**Title:** Proposed Floor Plans	
DWG No: Figure 3	**Scale:** N.T.S.	**Rev: -**
Date: June 2022	**Drawn By:** CM	**Job No:** 9536

APPENDIX A – ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the " value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

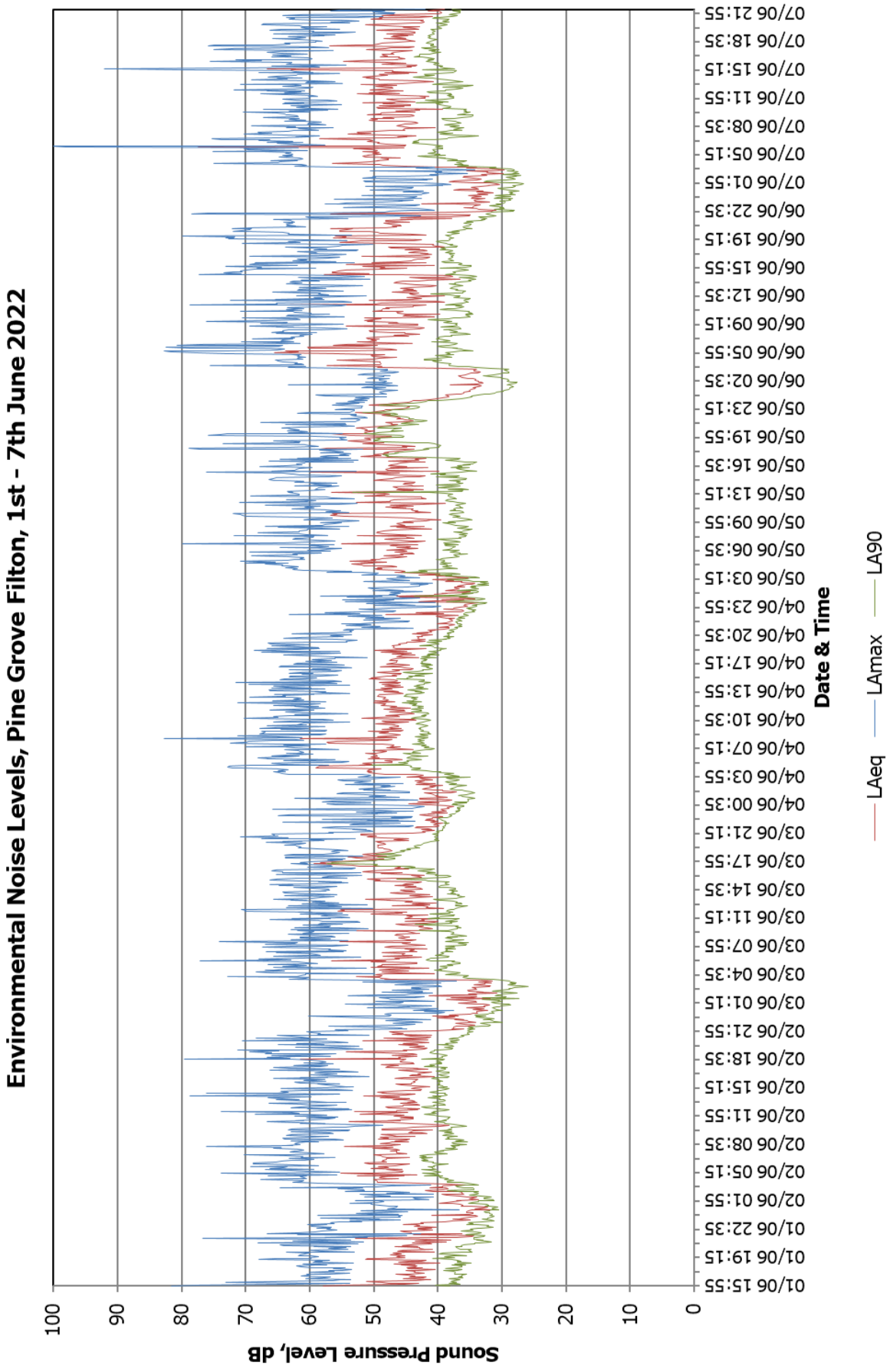
iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B – AMBIENT NOISE SURVEY DATA


Environmental Noise Levels, Pine Grove Filton, 1st - 7th June 2022
Sound Pressure Level, dB
100
90
80
70
60
50
40
30
20
10
0
Date & Time
01/06 15:55
01/06 19:15
01/06 22:35
02/06 01:55
02/06 05:15
02/06 08:35
02/06 11:55
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02/06 18:35
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07/06 21:55
LAeq
LAmax
LA90