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Portakabin®

Noise Impact Assessment

Lambeth College, 45 Clapham Common South Side, London SW4 9BL

Report Reference: CE-LR2340-RP-001 - FINAL

Report Date: 27 July 2023

Produced by Crestwood Environmental Ltd.

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Crestwood Report Reference: CE-LR2340-RP-001 - FINAL:

Issued Version Status	Date Produced	Written / Updated by:	Checked & Authorised by:
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1 INTRODUCTION

1.1 BACKGROUND

1.1.1 Crestwood Environmental Ltd ('Crestwood'), were commissioned by Portakabin Limited to undertake a Noise Impact Assessment of the proposals for two temporary buildings ('the Proposed Development') at Lambeth College, 45 Clapham Common South Side, London SW4 9BL ('the Site').

1.1.2 A site location plan showing the site boundary and the locations of the proposed temporary buildings is provided at Figure 1.

1.1.3 Crestwood have undertaken the following key tasks:

- Carried out an environmental noise survey on the site recording the prevailing ambient, background and maximum noise levels at a location representative of the new development and/or nearest noise sensitive receptors.
- Assessed the measured noise levels against the indoor ambient noise level requirements found in the relevant standards and guidance including but not limited to Building Bulletin 93, British Standard BS 8233:2014 and the BREEAM Technical Manual.
- Established appropriate mechanical plant noise limits at the nearest noise sensitive receptors based upon the requirements of the local planning authority and other relevant standards and guidance.
- Reviewed the proposals against the requirements of the BREEAM Technical Manual.

1.1.4 Since this is a technical report, it will be necessary to make use of some technical terms. To assist the reader a glossary has been provided.

1.2 CONSULTANT'S EXPERIENCE

1.2.1 This assessment has been carried out by Chris Turner for and on behalf of Crestwood Environmental Limited. Chris is an Incorporated Engineer registered with the Engineering Council and has over 18 years of post-graduate consultancy experience.

1.2.2 Chris has an undergraduate degree in Physics and Computer Science from the University of Wales, Swansea and a post-graduate degree in Applied Acoustics and Noise Control from the University of Surrey. He is a full corporate member of the Institute of Acoustics, the Institute of Directors, and the Institute of Physics.

1.2.3 On this basis, Chris is considered a suitably qualified acoustician for undertaking this type of assessment.

2 Planning and Policy Guidelines

2.1 National Planning Policy

2.1.1 The National Planning Policy Framework [1], NPPF, is the overarching guidance document for planning purposes in England. The July 2021 edition states the following regarding the effects of noise and vibration:

Paragraph 165

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative 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:

a) 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 the quality of life…"

Paragraph 187

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

2.2 Planning Practice Guidance (Noise)

2.2.1 The Planning Practice Guidance (Noise) [2] provides further information and guidance regarding the increasing effects of increased noise exposure as follows.

"At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the 'lowest observed adverse effect' level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the 'significant observed adverse effect' level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided."

2.2.2 A table summarising the noise exposure hierarchy, based on the likely average response of those affected

may be found in Appendix 1.

2.3 Noise Policy Statement for England

2.3.1 The Noise Policy Statement for England [3] (NPSE) advises the following regarding the numerical values of the No Observed Adverse Effect Level (NOEL), the Lowest Observed Adverse Effect Level (LOAEL) and the Significand Observed Adverse Effect Level (SOAEL):

"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."

2.3.2 The NPSE provides the following additional requirements for periods where noise levels exceed the LOAEL but are below the SOAEL.

"It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

2.4 Local Planning Policy

2.4.1 The Local Planning Authority ('LPA'), Lambeth Council, has provided the following planning policy in relation to proposals for new and improved social infrastructure which includes places of further and higher education.

Policy S2: New or improved social infrastructure	
A.	Proposals for new or improved premises for higher, further and adult education, childcare, worship, health care (including hospitals), sports, recreation, affordable meeting space and other community uses will be supported where:
	i. the site or buildings are appropriate for their intended use and accessible to the community; and
	ii. the location, nature and scale of the proposal, including hours of operation, do not unacceptably harm the amenities of the area through noise, disturbance, traffic generation, congestion, local parking or negative impacts on road safety; and
	iii. buildings and facilities are designed to be flexible, adaptable, promote social inclusion and sited be to maximise shared community use of premises, where practical.

2.4.2 From a review of recent planning applications on the Lambeth Council planning portal the mechanical plant noise emission criteria is understood to be as follows:

Mechanical Plant Noise Emissions
The rating level from new mechanical plant and associated equipment to be at least 10dBA below the prevailing background sound level to 1m outside the closest noise-sensitive properties, when assessed in accordance with British Standard BS 4142:2014+A1:2019

2.5 BREEAM Technical Manual

2.5.1 The Client is expected to assess the Proposed Development against the requirements of the BREEAM Technical Manual 2018 [4]. The acoustic related elements for a building for educational use are reproduced below.

HEA05 – Acoustic Performance

HEA05.01 – Sound Insulation
Achieve the performance standards set out in Section 1 of Building Bulletin 93:Acoustic Design of Schools: Performance Standards, February 2015 (BB93) relating to airborne sound insulation between spaces and impact sound insulation of floors

HEA05.02 – Indoor Ambient Noise Levels
Achieve the indoor ambient noise level standards set out within Section 1 of BB93 for all room types

HEA05.03 – Room Acoustics
Room acoustics (Control of reverberation, sound absorption and speech transmission index (STI)): **Teaching and study spaces** achieve the requirements relating to reverberation time for teaching and study spaces set out within Section 1 of BB93. **Open plan teaching spaces** achieve the performance requirements relating to reverberation time and STI set out within Section 1 of BB93. **Corridor and stairwells**, for those that give direct access to teaching and study spaces, achieve the performance requirements relating to sound absorption.

Pol05 – Reduction of Noise Pollution
Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS4142:2014 is commissioned. Noise levels must be measured or determined for: a. Existing background noise levels: i. at the nearest or most exposed noise-sensitive development to the proposed assessed site ii including existing plant on a building, where the assessed development is an extension to the building b Noise rating level from the assessed building. The noise impact assessment must be carried out by a suitably qualified acoustic consultant. The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise sensitive development, must be at least 5dB lower than the background noise throughout the day and night. If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.

2.5.2 As the requirements of the LPA are more onerous than the requirements of BREEAM Credit Pol05, this credit may be awarded by default.

2.6 Building Bulletin 93 (2015)

2.6.1 Regulation E4 of the Building Regulations 2010 states:

Regulation E4 – Acoustic Conditions in Schools
Each room or other space in a school building shall be designed and constructed in such a way that it has the acoustic conditions and insulation against disturbance by noise appropriate to its intended use. For the purposes of this Part – 'school' has the same meaning as in Section 4 of the Education Act 1996; and 'school building' means any building forming a school or part of a school.

2.6.2 Guidance provided in Approved Document E [5] states:

Paragraph 0.12
In the Secretary of States's view the normal way of satisfying Requirement E4 will be to meet the values for sound insulation, reverberation time and indoor ambient noise which are given in Building Bulletin 93 *Acoustic design of schools: performance standards*, published by the Department for Education and available on the internet at *www.gov.uk*.

2.6.3 At the time of preparation, whether Lambeth College fulfils the requirements of Section 4 of the Education Act 1996 is unknown. Nevertheless, the scope of Building Bulletin 93 [6] ('BB93') advises that "many of the acoustic specifications are desirable and can be used as a guide" in the design of further education and higher education buildings.

2.6.4 Furthermore, the BREEAM Technical Manual requires these buildings meet the performance standards of BB93. As a result, the performance criteria shall be used within this assessment and are reproduced below.

Indoor Ambient Noise Levels

2.6.5 The objective is to provide suitable indoor ambient noise levels for clear communication of speech between teacher and student, clear communication between students, learning and study activities.

2.6.6 Table 1 specifies upper limits for indoor ambient noise levels in terms of $L_{Aeq,30mins}$ during normal teaching hours. Where natural ventilation is used the values may be relaxed by up to 5dB. This relaxation does not apply to spaces where the Table 1 value is greater than or equal to 45dB. Only the relevant spaces have been provided.

Table 1 Upper Limits of Indoor Ambient Noise Level

Type of room	Upper limit for the indoor ambient noise level $L_{Aeq,30mins}$ (dB, ref: 20 micro Pascals)
Secondary School Classroom	35 dB
D&T Electronics, Textiles, Food Room	40 dB
Meeting Room	40 dB
Corridor	45 dB
Toilet	50 dB

Sound Insulation

2.6.7 The objective is to attenuate airborne sound transmitted between spaces and between circulation spaces (e.g. corridors, stairwells etc.) and other spaces used by students, for the purposes of minimising disturbance to teaching and learning spaces.

2.6.8 The performance requirements for the airborne sound insulation requirements of the separating walls may be found on the acoustic mark-up in Appendix 2.

2.6.9 The separating floors are required to meet the airborne and impact sound insulation performances given in BB93. The following has been provided as a guide.

Table 2 Airborne and Impact Sound Insulation Performance Requirements

Building Reference	Separating Floor	Minimum Airborne Sound Insulation Performance	Maximum Impact Sound Insulation Level
Building 1	Ground and First Floor	≥ 50 dB $D_{mT,w}$	≤ 60 dB $L'_{nT,w}$
	First and Second Floor	≥ 45 dB $D_{nT,w}$	≤ 60 dB $L'_{nT,w}$
Building 2	Ground and First Floor	≥ 45 dB $D_{nT,w}$	≤ 60 dB $L'_{nT,w}$
	First and Second Floor	≥ 45 dB $D_{nT,w}$	≤ 60 dB $L'_{nT,w}$

Reverberation Time

2.6.10 The objective is to provide suitable reverberation times for clear communication of speech between teacher and student and clear communication between students. Table 3 presents the reverberation time criteria relevant to the Proposed Development.

2.6.11 The reverberation times are quoted in terms of the mid-frequency reverberation time, T_{mf}, which is the arithmetic average of the reverberation times in the 500Hz, 1kHz and 2kHz octave bands.

Table 3 Performance standards for reverberation time

Type of room	Maximum reverberation time T_{mf} (seconds)
Secondary School Classroom	≤ 0.8 s
D&T Electronics, Textiles, Food Room	≤ 0.8 s
Meeting Room	≤ 0.8 s
Corridor	Refer to Section 2.6.12 below.
Toilet	≤ 1.5 s

2.6.12 For corridors and stairwells, the amount of absorption required should be calculated according to Section 7 of Approved Document E. This describes two calculation methods, A and B, for controlling reverberation in the common internal parts of domestic buildings. Either of these methods can be used to determine the amount of absorption required in corridors, entrance halls and stairwells.

3 Environmental Noise Survey

3.1 Measurement Methodology

3.1.1 To determine the prevailing background, ambient and maximum noise levels around the Site an environmental noise survey was carried out between Friday 30 June 2023 and Mondary 03 July 2023.

3.1.2 The microphone was fixed to a tripod approximately 1.5m above local ground level in a location representative of the nearest noise sensitive premises and the new buildings. The location of the measurement position on the British National Grid was TQ 29326 74869 and this is shown on the site plan in Figure 1, in Appendix 2.

3.1.3 The primary sources of noise were local road traffic noise from the surrounding urban environment.

3.1.4 The weather during the survey was observed as follows:

- At the start of the survey, the temperature was 19°C, with 80% cloud cover and measured wind speeds of 0.8m/s.
- At the end of the survey, the temperature was 24°C, fully overcast with wind speeds of approximately 1m/s.

3.1.5 Analysis from a local weather station[1] shows that there were some periods of precipitation and some periods where wind speeds came close to exceeding 5m/s. However, analysis of the measured noise levels indicates that these meteorological conditions have not had a significant effect on the survey results.

3.1.6 The acoustics parameters, L_{Aeq}, L_{AFMax}, and L_{A90} along with octave band sound pressure levels were measured every 15 minutes and a 5-minute time history was collated to further analyse the intervening measurements.

3.1.7 The equipment used during the survey was as listed in Table 4. All equipment had valid calibration certificates at the time of the survey, and these are available upon request.

3.1.8 An on-site sensitivity check was carried out at the start and the end of the survey; the drift was less than 1dB.

Table 4 Schedule of Noise Measurement Equipment

Description	Manufacturer & Model	Serial No.	Last Calibration Date	Certificate No.
Integrating Sound Level Meter	NTi Audio XL2-TA	A2A-21412-E0	08 Sept 2022	UK-22-090
Microphone	NTi Audio MC230A	A22991	08 Sept 2022	UK-22-090
Pre-Amplifier	NTi Audio MA220	10699	08 Sept 2022	UK-22-020
Acoustic Calibrator	Larson Davis Cal 200	20189	29 July 2022	44771-20189-CAL200

3.2 Summary Of Noise Survey Results

3.2.1 A summary of the noise survey results is presented in Table 5. A graphical representation of the results from each measurement position is included in Appendix 2.

Table 5 Summary of Measured Free-Field Noise Survey Results

Measurement Period	Measured Noise Levels (dB, ref: 20 micro-Pascals)		
	$L_{Aeq,T}$	Typical $L_{A90,\ 15mins}$	Typical L_{AFMax}
Daytime (07:00 to 19:00)	53	45	-

[1] https://www.wunderground.com/dashboard/pws/ILONDON37/graph/2023-06-30/2023-06-30/weekly

Measurement Period	Measured Noise Levels (dB, ref: 20 micro-Pascals)		
	$L_{Aeq,T}$	Typical $L_{A90,\ 15mins}$	Typical L_{AFMax}
Evening (19:00 to 23:00)	49	43	-
Night-time (23:00 to 07:00)	47	39	72

3.3 External Noise Levels used in Assessment

3.3.1 The external free-field noise levels used in the assessment have been derived using an environmental acoustic model and the measured noise spectra from the noise survey. The external free-field spectrum shape is presented in Table 6 below.

Table 6 Spectrum shape used in this Assessment

External Noise Levels (Free Field)	Measured Noise Levels (dB, re: 20 micro Pascals)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Average Noise Level ($L_{Aeq,16hr}$)	56	56	53	51	47	41	37	31
Average Noise Level ($L_{Aeq,8hr}$)	51	51	48	45	42	36	33	30
Typical Maximum Noise Level (L_{AFMax})	72	72	69	67	63	65	66	55

3.4 External Noise Emission Criteria

3.4.1 Based on the measured external noise levels the following external noise emission criteria has been established, see Table 7.

Table 7 Mechanical Plant Noise Emission Criteria

Description	Noise Limit at the Nearest Noise Sensitive Receptor
Mechanical Plant Noise	33dB $L_{Ar,Tr}$ for all plant switching off before 23:00hrs 29dB $L_{Ar,Tr}$ for plant operational 24 hours per day 7 days per week

4 Building Bulletin 93 Assessment

4.1 Indoor Ambient Noise Levels

4.1.1 An assessment of the predicted indoor ambient noise levels has been undertaken using the more rigorous calculation methodology as described in British Standard BS 8233:2014 [7] and the external free-field noise levels presented in Table 6.

4.1.2 The predictions show that it should be acoustically possible to make use of partially openable windows and provide natural ventilation into the teaching spaces. The indoor ambient noise levels should comply with the requirements of BB93 and fulfil the requirements of Local Planning Policy should the performance recommendations given in the schedule be carried forward to the final scheme.

4.1.3 The detailed results of the assessment are presented on a room-by-room basis in the BB93 Room schedule found in Appendix 3.

4.2 Internal Partitions Assessment

Separating Walls

4.2.1 The site measured performance requirements for the internal walls are provided on the acoustic mark-up drawing found in Appendix 3. Typical constructions which should achieve the performance requirements shown on the mark-up are presented in Table 8, below.

Table 8 Acoustic Performance Requirements for Separating Walls

Wall Colour	Site Measured Requirement	Minimum Laboratory Requirement	Typical Construction
	N/A	40dB R_w	Two layers of 12.5mm British Gypsum Wallboard either side of 70mm 'C'-studs with no insulation in the cavity.
	35dB $D_{nT,w}$	42dB R_w	Two layers of 12.5mm British Gypsum Wallboard either side of 70mm 'C'-studs with no insulation in the cavity.
	45dB $D_{nT,w}$	52dB R_w	Two layers of 12.5mm British Gypsum Soundbloc either side of 70mm 'C' studs with 25mm Isover 1200 APR within the cavity.
	50dB $D_{nT,w}$	57dB R_w	Two layers of 15mm British Gypsum Soundbloc either side of 70mm 'C' studs with 50mm Isover 1200 APR within the cavity.

4.2.2 It is the acoustic performance, which is specified, and any construction is indicative and subject to a full, robust assessment carried out by a suitably qualified acoustician as defined in the BREEAM Technical Manual 2018.

Separating Floors

4.2.3 At the time of writing, the proposed construction for the separating floors is still under development. Nevertheless, the separating floors should meet the site measured performance criteria found in Table 2. A typical construction which should be capable of achieving the site measured performance requirements is as follows:

- Two layers of 18mm flooring board, or approved equivalent.
- Steel frame minimum 100mm thick at 600mm centres with mineral wool insulation in the cavity.
- Resilient bar to the underside of the steel frame'

- Two layers of 12.5mm plasterboard with superficial mass of at least 10kg/m^2.

4.2.4 However, it is the acoustic performance which is specified, and any construction is indicative and subject to a full, robust assessment carried out by a suitably qualified acoustician as defined in the BREEAM Technical Manual 2018.

4.2.5 At this stage, we have assumed that the upper floors of the buildings will be finished with a carpet floor finish. Provided that the floor finish achieves an impact sound level reduction of 17dB ΔL_w then the impact sound levels in the rooms beneath should meet the requirements of Building Bulletin 93.

4.2.6 Should the site measured acoustic performances of the separating walls and floors achieve the requirements outlined in this report then the proposed development should comply with the requirements of BB93 and the LPA.

4.3 Reverberation Time Assessment

4.3.1 The assumed room finishes have been provided in the room schedule found in Appendix 3.

4.3.2 The predicted reverberation times within the teaching and learning spaces should comply with the requirements of BB93 with the assumed room finishes.

4.3.3 The detailed results of the assessment are presented on a room-by-room basis in the BB93 Room schedule found in Appendix 3.

4.4 Mechanical Plant Noise Levels

4.4.1 At the time of preparation, the exact design and specification any mechanical plant is unknown. The Local Authority have provided the mechanical plant noise criteria which is provided in Section 2 and quantified in Table 7, above.

4.4.2 The nearest noise sensitive receptors have been identified as follows:

- Existing and retained college buildings on the Lambeth College, Clapham Campus site;
- The residential properties on Timothy Close, Waldo Close and Elms Road;
- The Elms Academy School;
- The residential properties on Shaftsbury Mews

4.4.3 Provided that any mechanical plant installation complies with the noise emission limits provided in Table 7 then the Proposed Development should comply with the requirements of the Local Planning Policy and the BREEAM Technical Manual.

4.5 Assessment Summary

4.5.1 Should the recommendations and performance criteria outlined in this report be continued into the final construction then the Proposed Development should comply with the requirements of the Local Planning Authority, Building Bulletin 93 and the BREEAM Technical Manual.

4.5.2 All the BREEAM credits under Hea05 and Pol05 may be awarded and the Proposed Development should not be refused on noise grounds.

5 Conclusion

5.1.1 Crestwood Environmental Ltd ('Crestwood'), has been commissioned by Portakabin Limited to undertake a Noise Impact Assessment of the proposals for two temporary buildings at Lambeth College, 45 Clapham Common South Side, London SW4 9BL.

5.1.2 A site location plan showing the site boundary and the locations of the proposed temporary buildings is provided at Figure 1.

5.1.3 An environmental noise survey was undertaken on the site to determine prevailing ambient average, background and maximum sound levels affecting the Proposed Development. The noise survey was used to inform the noise modelling process which informed the assessment.

5.1.4 An assessment of the indoor ambient noise levels was undertaken using the methodology found in Building Bulletin 93. The assessment showed that it should be acoustically feasible to use openable windows to provide background ventilation and comply with the indoor ambient noise level requirements of Building Bulletin 93 and Local Planning Policy.

5.1.5 The assessment of the internal separating walls and floors has been carried out and the results presented within this report.

5.1.6 An assessment of the reverberation time requirements has been undertaken and the results presented in this report.

5.1.7 At the time of preparation, the mechanical plant and equipment has not been specified. The nearest noise sensitive receptors have been identified and mechanical plant noise emission limits have been provided in accordance with Local Planning Policy and the BREEAM Technical Manual.

5.1.8 Should the recommendations and performance criteria outlined in this report be continued into the final construction then the Proposed Development should comply with the requirements of the Local Planning Authority, Building Bulletin 93 and the BREEAM Technical Manual.

5.1.9 All the BREEAM credits under Hea05 and Pol05 may be awarded, and the Proposed Development should not be refused on noise grounds.

REFERENCES:

- [1] Ministry of Housing, Communities & Local Government, “National Planning Policy Framework,” Ministry of Housing, Communities and Local Government, Fry Building, 2 Marsham Street, London, SW1P 4DF, London, 2021.
- [2] Ministry of Housing, Communities and Local Government, “Planning Practice Guidance - Noise,” 22 July 2019. [Online]. Available: https://www.gov.uk/guidance/noise--2. [Accessed 11 November 2022].
- [3] Department for Environment, Food and Rural Affairs, “Noise Policy Statement for England,” Department for Environment, Food and Rural Affairs, Nobel House, 17 Smith Square, London, SW1P 3JR, London, 2010.
- [4] BREEAM UK, “BREEAM UK New Construction Technical Manual,” BRE Global Limited, 2018.
- [5] HM Government, “Approved Document E - Resistance to the passage of sound,” 2003 Edition incorporating 2004, 2010, 2013 and 2015 amendments.
- [6] Department for Education, “Building Bulletin 93 - Acoustic design of schools: performance standards,” 2015.
- [7] British Standards Institution, “BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings,” British Standards Institution, 2014.

GLOSSARY:

For the avoidance of confusion, the terms used in this report follow the definitions given below:

Fundamentally, 'sound' are vibrations of the air which are detectable by the ear. Noise is defined as a sound or sounds which is unwanted, considered unpleasant or loud. Sound or noise levels are commonly measured in terms of the sound pressure level in terms of decibels (dB). The sound pressure level is commonly given as 'A'-weighted to simulate the human ear's response to sounds at different frequencies. Examples of typical A-weighted sound pressure levels from typical noise sources are shown in the table below.

Sound Level (dBA)	Typical Noise Source
130	Threshold of pain
120	Large jet aircraft on take-off
110	Rock Band
100	Pneumatic Drill
90	Heavy lorry
80	Medium-sized lorry
70	Passenger car
60	Normal conversation
50	Suburban residential neighbourhood
40	Quiet living room
30	Quiet rural setting, within a bedroom at night
20	Speaking in a whisper
10	
0	

In this report, the terms sound and noise are used interchangeably.

Noise levels are usually expressed with an associated measurement parameter. Commonly used measurement parameters are presented below.

Parameter	Definition
dB	Decibel – A logarithmic scale applied to acoustic units such as sound pressure and sound power.
L_{PA}	The instantaneous A-weighted sound pressure level measured in terms of dB
L_{A90}	This is the 'A'-weighted sound pressure level exceeded for 90% of the measurement period over which the measurement is taken. It is commonly used to represent the "background noise level".
L_{Aeq}	This is the equivalent 'A'-weighted sound pressure level of steady noise which, under the period under consideration, contains the same amount of (A-Weighted) sound energy as the time-varying noise over the same period. Also called the time-averaged sound level.
L_{A10}	This is the 'A'-weighted sound pressure level exceeded for 10% of the measurement period over which the measurement is taken. It is the accepted noise metric for describing road traffic noise.
L_{AMax}	This is the maximum root-mean-square (RMS) 'A'-weighted sound pressure level measured during the measurement period.

Other relevant acoustic parameters are defined below:

Parameter	Definition
R_w	The weighted Sound Reduction Index is the single figure value of laboratory measured sound reduction according to the procedures in British Standard BS EN ISO 717-1 and used for rating and comparing partitions and based on the measured sound reductions at different frequencies
$D_{nT,w}$	The weighted standardised level difference is a single figure value of airborne sound insulation performance, derived according to the procedures in British Standard BS EN ISO 717-1 and used for rating and comparing partitions and based on the measured sound level difference at different frequencies and standardised to a reverberation time (normally 0.5 seconds).
$D_{ne,w}$	The weighted normalised sound level difference is used to describe the sound insulation provided by small building elements and derived according to the procedures in British Standard BS EN ISO 717-1 and used for rating and comparing partitions and based on the measured sound level difference at different frequencies and normalised to an absorptive area (normally 10m^2).
C	A spectral adaptation term used in connection with the measurement and assessment of airborne sound insulation and defined in British Standard BS EN ISO 717-1. This is considered equivalent to the A-weighted weighted normalised sound level difference ($D_{nT,A}$)
C_{tr}	A spectral adaptation term used in connection with the measurement and assessment of airborne sound insulation and defined in British Standard BS EN ISO 717-1. This is considered equivalent to the normalised sound level difference weighted for road traffic noise ($D_{nT,tr}$)
$L'_{nT,w}$	The weighted standardized impact sound pressure level is a single-figure value of impact sound insulation performance, derived according to the procedures in British Standard BS EN ISO 717-2, used for comparing and rating floors and based on the values of measured impact sound pressure level at different frequencies and standardised to a reverberation time (normally 0.5 seconds).

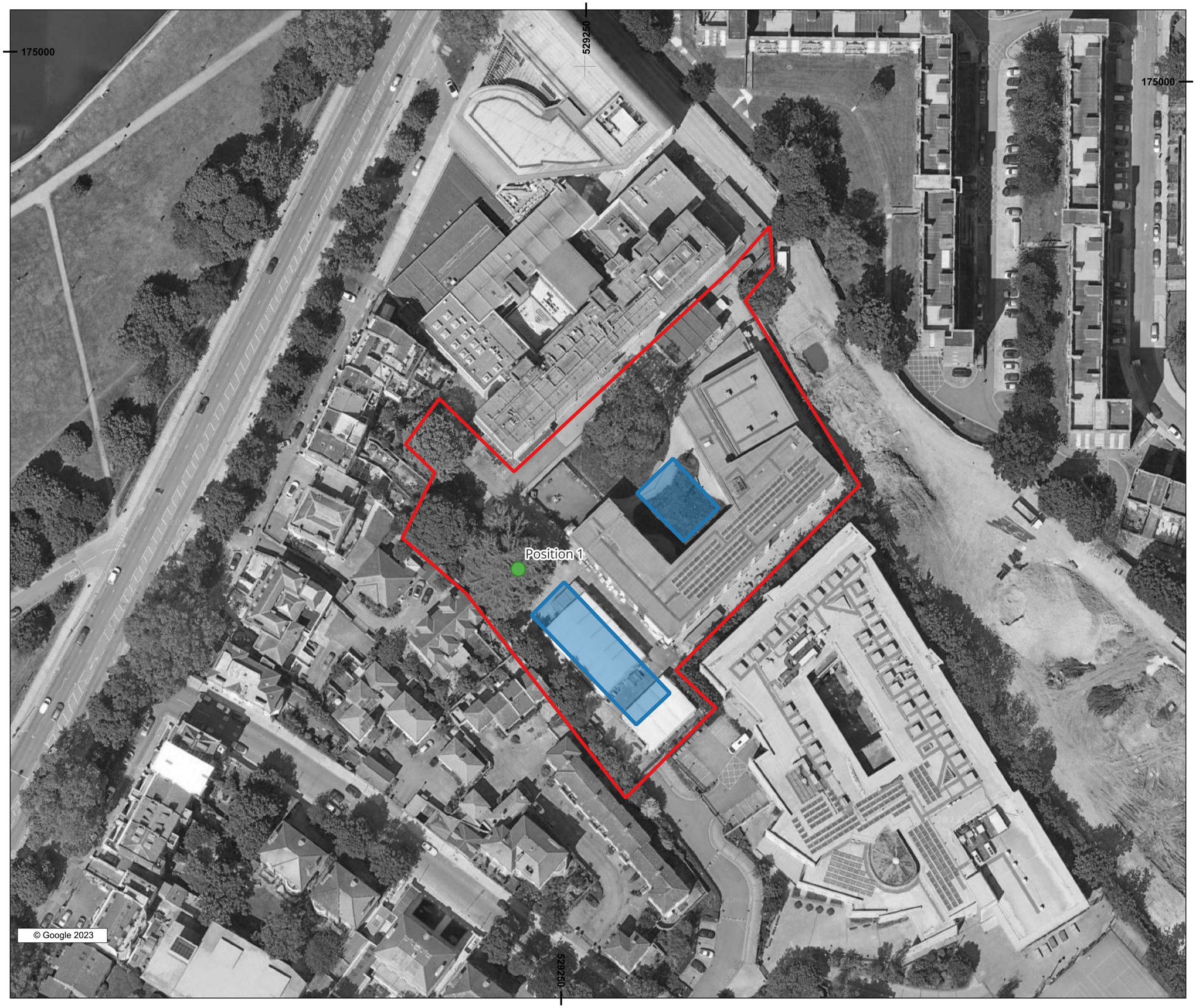
APPENDICES:

APPENDIX 1 NOISE EXPOSURE HEIRARCHY
APPENDIX 2 REPORT FIGURES
APPENDIX 3 BB93 ROOM SCHEDULE AND MARK-UP

APPENDIX 1 NOISE EXPOSURE HEIRARCHY

Response	Examples of Outcome	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

APPENDIX 2 REPORT FIGURES



Legend:

- Noise Measurement Position
- Site Boundary
- Location of Portakabin Buildings

Final Revision:	Date:	Description:	By:	Chk:

Consultant:

Crestwood Environmental Ltd

Science, Technology & Prototyping Centre
University of Wolverhampton Science Park
Glaisher Drive, Wolverhampton
WV10 9RU

Tel: 01902 229563
info@crestwoodenvironmental.co.uk
www.crestwoodenvironmental.co.uk

Client:

Portakabin

Site: Lambeth College,
45 Clapham Common South Side

Drawing Title:
Site Plan Showing Noise Measurement Locations

Date:	Scale	Paper Size:
27 / 7 / 2023	1:1,500	A3 (420×297mm)

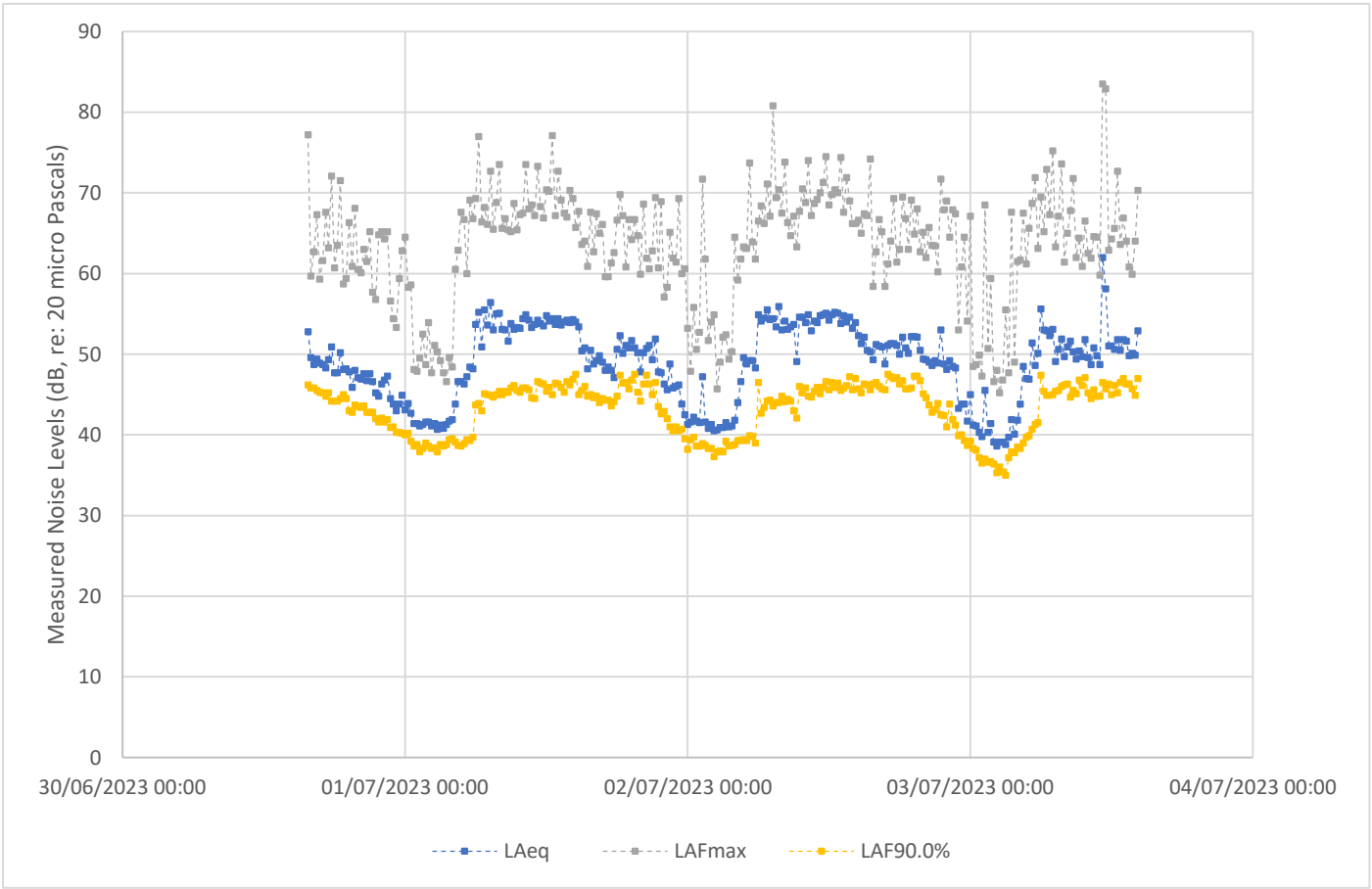
Drawn By:	Checked By:	Status:	Final Revision:
CT	KB	FINAL	-

Drawing Ref:	Drawing No:
CE-LR2340-GDW-001	**Figure 1**

Project Information	
Project Number	LR-2340
Date	04/07/2023
Measurement Position	Position LT1
Sheet Reference	CE-LR2340-CALC-001

External Broadband Noise Levels	Measured Noise Levels (dB, re: 20 micro Pascals)		
	$L_{Aeq,T}$	Typical $L_{A90,\ 15mins}$	Typical L_{AFMax}
Daytime (07:00 to 19:00)	53	45	
Evening (19:00 to 23:00)	49	43	
Night-time (23:00 to 07:00)	47	39	72

External Noise Levels (Free Field)	Measured Noise Levels (dB, re: 20 micro Pascals)								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dBA
Average Noise Level ($L_{Aeq,16hr}$)	56	56	53	51	47	41	37	31	52
Average Noise Level ($L_{Aeq,8hr}$)	51	51	48	45	42	36	33	30	47
Typical Maximum Noise Level (L_{AFMax})	72	72	69	67	63	65	66	55	72



APPENDIX 3 BB93 ROOM SCHEDULE AND MARK-UP

Project Number	LR-2340
Project Name	Lambeth College, Clapham
Document Reference	CE-LR2340-SCH-001
Building Type	New Build

Author	Chris Turner
Approved By	Kate Brady
Date	26/07/2023
Revision	-

Room Ref	Room Description	BB93 Classification	Ventillation Type	Indoor Ambient Noise Level ($L_{Aeq, 30mins}$)				Reverberation Time (T_{mf})				
				Requirement	Window Performance	Ventilator Performance	Predicted Level	Requirement	Floor Finish	Ceiling Finish	Predicted Level	Additional Treatment (If Required)
GF.01	3 Person Consultant	Meeting Room	Natural	≤ 45 dB	29 dB R_w	19 dB $D_{ne,w}$	38 dB	≤ 0.8 s	Carpet	Mineral Tile	0.43 s	Ceiling tile to meet minimum Class C absorption
GF.02	3 Person Consultant	Meeting Room	Natural	≤ 45 dB	29 dB R_w	19 dB $D_{ne,w}$	38 dB	≤ 0.8 s	Carpet	Mineral Tile	0.43 s	Ceiling tile to meet minimum Class C absorption
GF.03	3 Person Consultant	Meeting Room	Natural	≤ 45 dB	29 dB R_w	19 dB $D_{ne,w}$	38 dB	≤ 0.8 s	Carpet	Mineral Tile	0.43 s	Ceiling tile to meet minimum Class C absorption
GF.04	25 Pupil Classroom	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0.46 s	Ceiling tile to meet minimum Class C absorption
GF.05	Cookery School	D&T Electronics/Textiles/ICT/Art	Natural	≤ 45 dB	29 dB R_w	19 dB $D_{ne,w}$	33 dB	≤ 0.8 s	Vinyl	Mineral Tile	0.50 s	Ceiling tile to meet minimum Class C absorption
GF.06	Canteen	D&T Electronics/Textiles/ICT/Art	Natural	≤ 45 dB	29 dB R_w	19 dB $D_{ne,w}$	38 dB	≤ 0.8 s	Vinyl	Mineral Tile	0.54 s	Ceiling tile to meet minimum Class C absorption
GF.07	Female Toilet	Toilet	Natural	≤ 50 dB	29 dB R_w	19 dB $D_{ne,w}$	38 dB	≤ 1.5 s	Vinyl	Plasterboard	1.41 s	Plasterboard ceiling with large air gap to soffit
GF.08	Male Toilet	Toilet	Natural	≤ 50 dB	29 dB R_w	19 dB $D_{ne,w}$	38 dB	≤ 1.5 s	Vinyl	Plasterboard	1.41 s	Plasterboard ceiling with large air gap to soffit
GF.09	Disabled Toilet	Toilet	Natural	≤ 50 dB	29 dB R_w	19 dB $D_{ne,w}$	38 dB	≤ 1.5 s	Vinyl	Plasterboard	1.41 s	Plasterboard ceiling with large air gap to soffit
GF.10	25 Pupil Classroom	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0..46	Ceiling tile to meet minimum Class C absorption
GF.11	Circulation	Corridor/Stairwell	Natural	≤ 45 dB	-	-	-	ADE	Carpet	Mineral Tile	-	Comply with Section 7 of Approved Document E
FF.01	20 Pupil Classroom	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0.44 s	Ceiling tile to meet minimum Class C absorption
FF.02	25 Pupil Classroom	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0.46 s	Ceiling tile to meet minimum Class C absorption
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FF.07	Female Toilet	Toilet	Natural	≤ 50 dB	29 dB R_w	19 dB $D_{ne,w}$	38 dB	≤ 1.5 s	Vinyl	Plasterboard	1.41 s	Plasterboard ceiling with large air gap to soffit

Project Number	LR-2340
Project Name	Lambeth College, Clapham
Document Reference	CE-LR2340-SCH-001
Building Type	New Build

Author	Chris Turner
Approved By	Kate Brady
Date	26/07/2023
Revision	-

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FF.11	Circulation	Corridor/Stairwell	Natural	≤ 45 dB	-	-	-	ADE	Carpet	Mineral Tile	-	Comply with Section 7 of Approved Document E
SF.01	20 Pupil Classroom	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0.44 s	Ceiling tile to meet minimum Class C absorption
SF.02	25 Pupil Classroom	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0.46 s	Ceiling tile to meet minimum Class C absorption
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SF.11	Circulation	Corridor/Stairwell	Natural	≤ 45 dB	-	-	-	ADE	Carpet	Mineral Tile	-	Comply with Section 7 of Approved Document E
Mod.GF.01	Modular Space	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0.55 s	Ceiling tile to meet minimum Class C absorption
Mod.FF.01	Modular Space	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0.55 s	Ceiling tile to meet minimum Class C absorption
Mod.SF.01	Modular Space	Secondary School Classroom	Natural	≤ 40 dB	29 dB R_w	19 dB $D_{ne,w}$	36 dB	≤ 0.8 s	Carpet	Mineral Tile	0.55 s	Ceiling tile to meet minimum Class C absorption

Phase 1

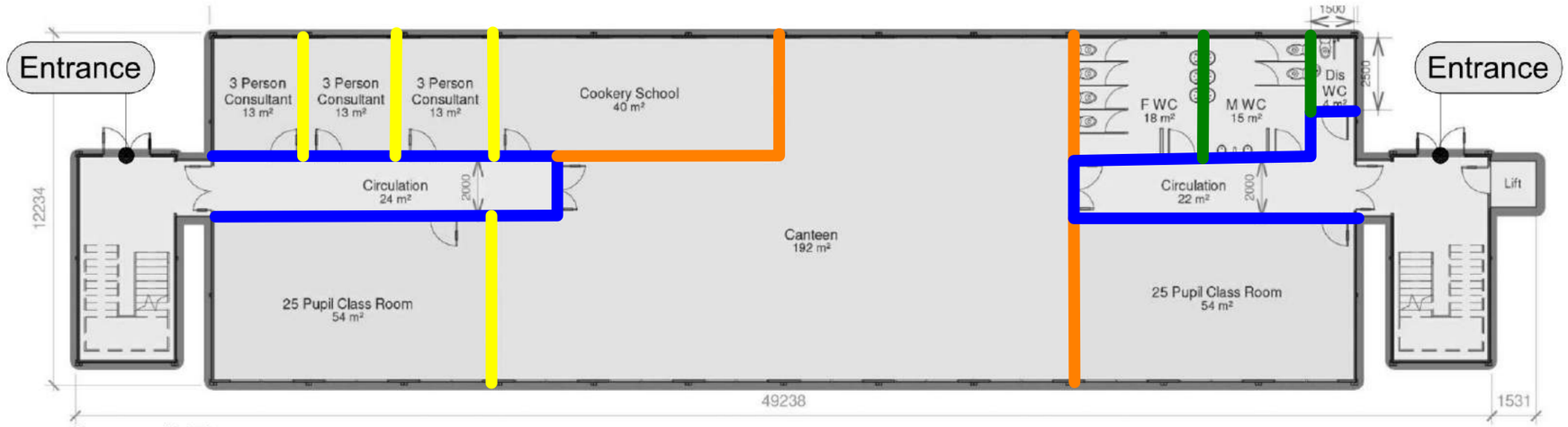
Establishment of Modular Campus

October 2023

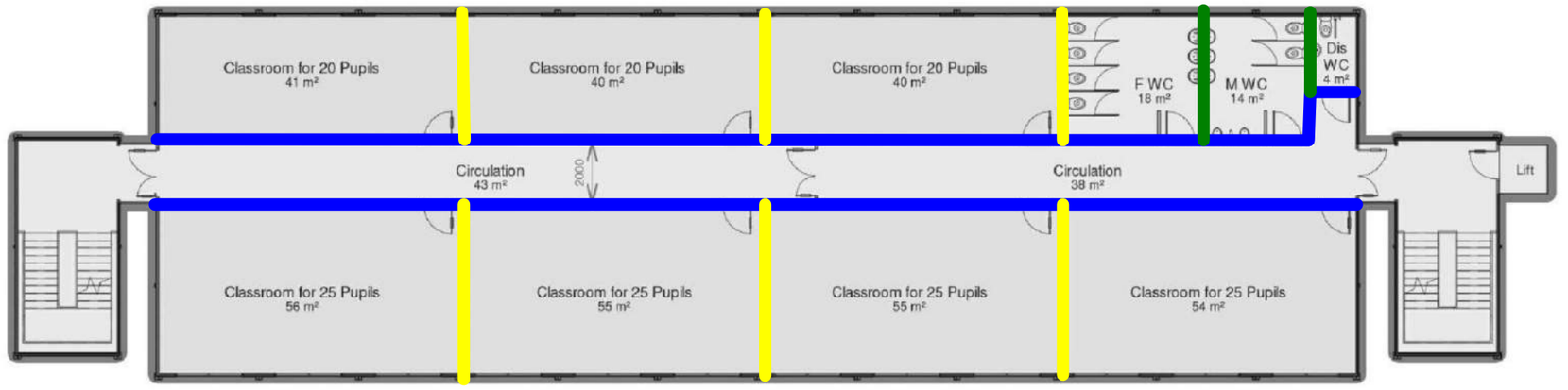
Key

- Teaching
- Canteen
- Offices
- WCs
- Circulation

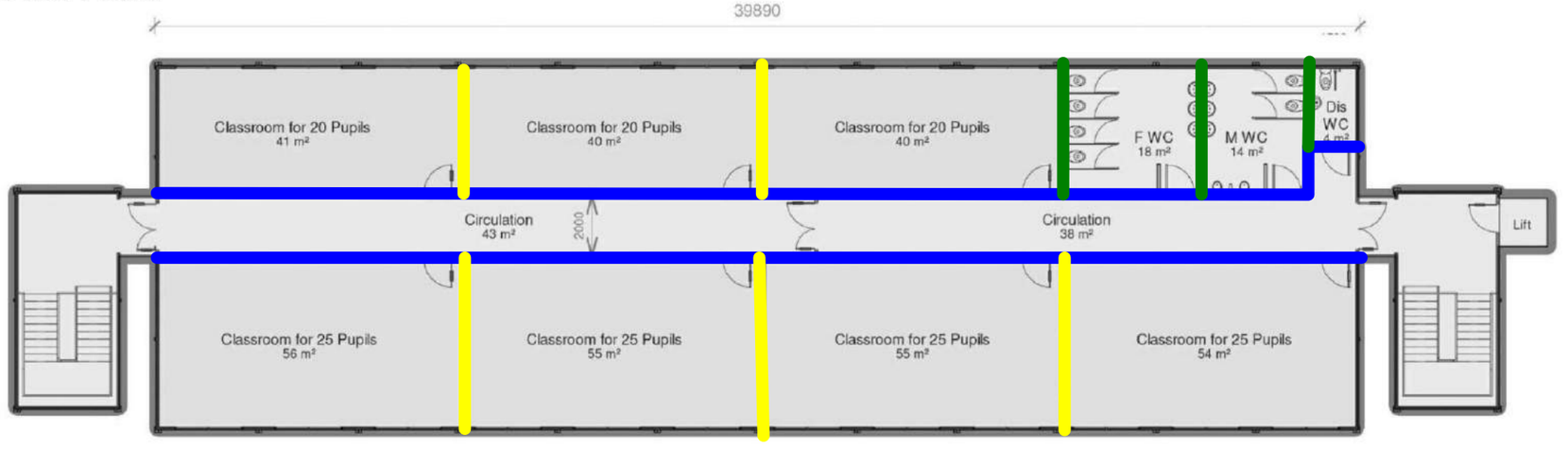
Building is fully accessible with step free access at ground floor and lift access to 1st and 2nd floors



Ground Floor

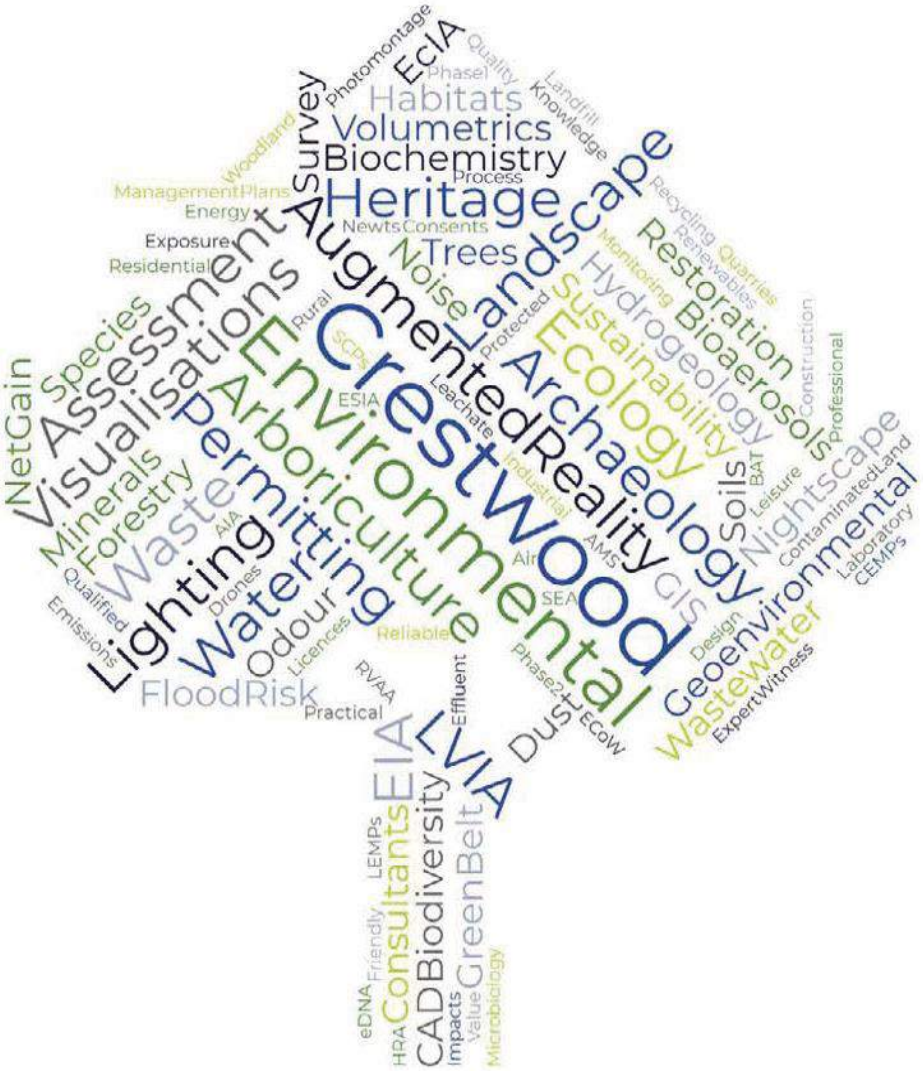


First Floor



Second Floor

LONDON REALTY



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