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City Labs 4.0, Manchester

BREEAM Pre-Completion Acoustic Assessment

L025-SOL-XX-01.XX-T-O-000002

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PROJECT

City Labs 4.0, Manchester
BREEAM Pre-Completion Acoustic
Assessment

CLIENT

GMI Group Plc

DOCUMENT
REFERENCE

L025-SOL-XX-01:XX-T-O-000002

SIGNED



Mike Hartley

CHECKED



Joe Sinker

DATE

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REVISIONS

Issue No.	Reviewer	Authorised by	Approval Date	Summary of Revisions
P01	Joe Sinker	Joe Sinker	31/01/2025	Initial issue.

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Name of Organisation

Sol Acoustics Limited

Company Registration Number

4218702

Summary

Sol Acoustics Ltd ("Sol") has been commissioned by GMI Group Plc to undertake a BREEAM pre-completion acoustic assessment of the new-build office and laboratory building for City Labs ("Development") located in Manchester.

This acoustic assessment sets out the minimum acoustic performance requirements to be achieved by the as built development in order to be capable of being awarded the three BREEAM Credits available under 'Hea 05: Acoustic Performance' ("Hea 05") and the single BREEAM Credit available under 'Pol 05: Reduction of Noise Pollution' ("Pol 05") as set out in the BREEAM 'New Construction Non-Domestic Buildings Technical Manual' (SD5078 – 5.0:2014 ("BREEAM").

The acoustic assessment also sets out the minimum acoustic performance requirements to be achieved by the as built construction in order to provided evidence to support the discharge of Planning Condition 15b, 19 and 29b.

Pre-completion acoustic testing was undertaken by Sol on 24 January 2025 in order to assess whether the as built construction meets the requirements of BREEAM Credits for Acoustics as under Hea 05 and Pol 05, in addition to evidence to support the discharge of Planning Condition 15b, 19 and 29b.

The key findings of the noise survey and assessment are as follows:

BREEAM

✓ **BREEAM Hea 05 – Acoustic Performance, Sound Insulation (1 Credit):** The measured airborne sound insulation performance of all separating walls and floors tested demonstrated compliance with the minimum acoustic performance requirements as cited in BS 8233:2014 and the BCO Guide. The measured impact sound insulation performance of the single separating floor tested demonstrated compliance with the maximum acoustic performance requirement as cited in BS 8233:2014 and the BCO Guide. *As such, full compliance with the requirements of this single BREEAM Credit has been demonstrated.*

✓ **BREEAM Hea 05 – Acoustic Performance, Indoor Ambient Noise Levels (1 Credit):** The measured indoor ambient noise levels within the development demonstrated compliance with the maximum acoustic performance requirements of the BCO Guide to Specification 2019, BS 8233:2014 and HTM 08-01 2013. *As such, full compliance with the requirements of this single BREEAM Credit has been demonstrated.*

✓ **BREEAM Hea 05 – Acoustic Performance, Reverberation Times (1 Credit):** The Cat A proposals and on-site visual inspection can confirm that the proposals are in line with acceptable guidance set out in BCO as part of the design stage of the project. *As such, full compliance with the requirements of this single BREEAM Credit has been demonstrated.*

✓ **BREEAM Pol 05 – Reduction of Noise Pollution (1 Credit):** The measured and derived BS4142:2014+A1: 2019: 'Method for rating and assessing industrial and commercial sound' ("BS4142") defined "Rating Level" as arising from the operation of all as fitted externally sited mechanical services associated with the Development does not exceed the pre-existing Background Sound Level at the nearest and worst affected Noise Sensitive Receptor (NSR) as during the proposed house of operation. *As such, full compliance with the requirements of this single BREEAM Credit has been demonstrated.*

Planning Conditions

✓ **Planning Condition 15b** The measured and derived BS4142:2014+A1: 2019: 'Method for rating and assessing industrial and commercial sound' ("BS4142") defined "Rating Level" as arising from the operation of all as fitted externally sited mechanical services associated with the Development meets the require criterion of 5dB below the Background Sound Level at the nearest and worst affected Noise Sensitive Receptor (NSR) as during the proposed hours of operation. *As such, full compliance with the requirements of this Planning Condition has been demonstrated.*

✓ **Planning Condition 19:** All targeted BREEAM credits pertaining to acoustic performance have been derived, measured, and achieved in the new-build office and laboratory building. *As such, evidence has been provided to support the Discharge of Planning Condition 19 has been demonstrated.*

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1 Introduction

- 1.2 Sol Acoustics Ltd ("Sol") has been commissioned by BIM Yorkshire Limited to undertake a BREEAM pre-completion acoustic assessment of the new-build office and laboratory building for City Labs located in Manchester.
- 1.3 This acoustic assessment sets out the minimum acoustic performance requirements to be achieved by the as built construction in order to be capable of being awarded the three BREEAM Credits available under 'Hea 05: Acoustic Performance' ('Hea 05') and the single BREEAM Credit available under Pol 05: 'Reduction of Noise Pollution' ('Pol 05') as set out in the BREEAM 'New Construction Non-Domestic Buildings Technical Manual' SD5078 – 5.0:2014 ('BREEAM').
- 1.4 The acoustic assessment also sets out the minimum acoustic performance requirements to be achieved by the as built construction in order to provide evidence to support the discharge of Planning Condition 15b, 19 and 29b.
- 1.5 Pre-completion acoustic testing was undertaken by Sol during 24 January 2025 in order to assess whether the as built construction meets the requirements of BREEAM Credits for Acoustics as under Hea 05 and Pol 05, in addition to evidence to support the discharge of Planning Condition 15b, 19 and 29b.
- 1.6 This report provides the results of the pre-commissioning survey and acoustic assessment.

2 BREEAM New Construction 2014

2.1 Hea 05: Acoustic Performance

2.1.1 There are three Credits available for the acoustic performance as achieved within the completed Development in terms of:

- ◆ Sound insulation
- ◆ Indoor ambient noise level
- ◆ Reverberation times

2.1.2 Under BREEAM, a single Credit is available for each of these three acoustic features; these Credits are awarded individually and regardless of compliance (or otherwise) with regards to the other two Credits.

2.1.3 In order to confirm compliance in each case, a programme of pre-completion acoustic testing is required to be carried out by a compliant test body. (Sol meets the requirements of a 'Suitably Qualified Acoustician' as detailed in the BREEAM Technical Manual.

2.2 BREEAM HEA 05 – Acoustic Performance, Sound Insulation

2.2.1 BREEAM UK New Construction 2018 Hea 05 provides the following criteria for a single Credit to be awarded:

'... The sound insulation between acoustically sensitive rooms and other occupied areas complies with the performance criteria given in section 7 of BS 8233:2014.'

2.2.2 It should be noted that compliance must be demonstrated by

'... A programme of pre-completion acoustic testing is carried out by a compliant test body'.

2.2.3 Arup's *Work Stage 4 Acoustic Strategy Report* (doc ref. L025-ARU-XX-01:XX-T-S-0000005) provides the following sound insulation requirements for walls and floors:

Walls

The BCO Guide states that internal walls between adjacent demises should provide an airborne sound insulation of at least 48 dB $D_{nT,ww}$. Within a demise, the airborne sound insulation requirements from BS 8233 have been referenced.

Floors

The BCO Guide states that internal floors, when fitted out to Cat A standards, should provide a minimum airborne sound insulation of 48 dB $D_{nT,wf}$. In addition, the BCO Guide states that a weighted standardised impact sound pressure ($L_{nT,w}$) of 60 dB is a reasonable maximum.'

2.2.4

The internal sound insulation performance layouts have been provided within Arup's report and are stated by Arup to be compliant with BS 8233:2014 and the BCO Guide

2.3 BREEAM Hea 05 – Acoustic Performance, Internal Indoor Ambient Noise Levels

2.3.1 BREEAM UK New Construction 2018 Hea 05 provides the following criteria for a single Credit to be awarded:

'... Achieve indoor ambient noise levels that comply with the design ranges given in section 7 of BS 8233:2014.'

2.3.2 It should be noted that compliance must be demonstrated by *'... A programme of pre-completion acoustic testing is carried out by a compliant test body'.*

2.3.3 Arup's *Work Stage 4 Acoustic Strategy Report* (doc ref. L025-ARU-XX-01:XX-T-S-0000005) provides the following limits for external noise intrusion:

Space	Design Limit (dB $L_{Aeq,T}$)
Consulting rooms	40
Cellular offices / quiet rooms	40
Speculative office areas	43
Laboratories	45
Waiting areas	50
WC / circulation / atria	55

Table 1: Summary of external noise intrusion criteria

In addition, the Stage 4 report states the following regarding individual noise events:

'... to avoid speech interference, regular individual noise events such as scheduled aircraft or passing trains should not normally be more than 55 dB $L_{A0.1\text{ hour}}$ in open plan / speculative offices or 50 dB $L_{A0.1\text{ hour}}$ in cellular offices/meeting rooms.'

2.3.5 The above criteria are considered to be consistent with the BCO Guide to Specification 2019, BS 8233:2014 and HTM 08-01 2013 criteria and will allow the BREEAM requirements to be met.

2.4 BREEAM Hea 05 – Acoustic Performance, Reverberation Times

2.4.1 BREEAM UK New Construction 2018 Hea 05 provides the following criteria for a single Credit to be awarded:

‘... Achieve the requirements relating to sound absorption and reverberation times, where applicable, set out in section 7 of BS 8233:2014.’

2.4.2 It should be noted that compliance must be demonstrated by

‘... A programme of pre-completion acoustic testing is carried out by a compliant test body’.

2.4.3 No specific criteria has been proposed for this scheme. However, the guidance provided by BCO, states that suitable acoustic conditions in open plan office areas can be achieved by means of including a “Class A” acoustic ceiling in the space covering all areas excluding lighting, grilles, etc. relating to acoustic treatment in the open plan office and laboratory spaces:

2.4.4 For laboratories suitable acoustic conditions can be achieved by the inclusion of a full “Class C” ceiling.

2.4.5 As such, this BREEAM credit shall be assessed through visual inspection and confirmation of performance through product data sheets.

2.5 Pol 05: Reduction of Noise Pollution

2.5.1 The aim of this Credit is to reduce the likelihood of noise arising from fixed installations associated with the Development affecting nearby NSRs. This single Credit can be awarded by default where there are, or will be, no noise sensitive areas or buildings within 800m radius of the assessed development.

2.5.2 Where there are NSRs within an 800m radius of the site, as in this case, a single Credit is available where it can be demonstrated that the BS4142:2014+A1: 2019: ‘Method for rating and assessing industrial and commercial sound’ (“BS4142”) defined Rating Level ($L_{A,r,n}$) from the Development is no greater than 5dB above the pre-existing daytime (07:00 hours – 23:00 hours) Background Sound Level ($L_{A90,T}$) and no greater than +3dB above the corresponding pre-existing night time (23:00 hours – 07:00 hours) Background Sound Level at the nearest NSRs.

2.5.3 An environmental noise survey was carried out by Arup during October 2019 (full details of the environmental noise survey are presented in Arup’s report: L025-ARU-XX-01:XX-T-S-000005 - WSA Acoustic Strategy - P03 dated April 2022). Table 1 shows the typical measured Background Sound Levels recorded:

Assessment Period	Typical background noise level L_{A90} (dB)	Cumulative environmental Pol 05 noise limit $L_{A90,Tn}$ (dB)
Daytime (07:00 – 23:00)	49	54
Night time (23:00 – 07:00)	43	46

Table 1: External building services noise limits at nearest residential receptors (BREEAM Pol05)

3 Planning Conditions

3.1 Planning Condition 15b – Externally Mounted Plant

3.1.1 This Planning Condition relates to the verification of external plant noise egress meeting the criteria stipulated by the Local Planning Authority. The Planning Condition is as follows:

‘a) Externally mounted plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 db (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location. For the avoidance of doubt, these details may be phased if necessary

b) Notwithstanding the approved documents and plans as specified in condition 2 or part a, prior to the first occupation of the development, a verification report will be required to validate that the work undertaken conforms to the recommendations and requirements as approved under part a of this condition. The verification report shall include post completion testing to confirm the noise criteria has been met. In instances of non conformity, these shall be detailed along with mitigation measures required to ensure compliance with the noise criteria.

Any mitigation measures shall be implemented in accordance with a timescale to be agreed with the City Council, as Local Planning Authority, and thereafter retained and maintained in situ.

For the avoidance of doubt, these details may be phased if necessary”

3.1.2 In accordance with the requirements of Planning Condition 15, Table 2 shows the maximum permissible Rating Level limits to be achieved by the as fitted, as commissioned, fixed mechanical services plant associated with the Development as at the nearest NSR:

Assessment Period	Typical background noise level L_{Aeq} (dB)	Cumulative environmental rating level limit L_{Aeq} (dB)
Daytime (07:00 – 23:00)	49	44
Night time (23:00 – 07:00)	43	38

Table 2: External building services noise limits at nearest residential receptors (PC-15)

3.2 Planning Condition 19 – BREEAM

3.2.1 This planning condition relates to achieving a rating of at least "Very Good" and states the following:

"The development hereby approved shall achieve a post-construction Building Research Establishment Environmental Assessment Method (BREEAM) rating of at least 'Very Good'. A post construction certificate/verification shall be submitted to and approved in writing by the City Council as local planning authority before any of the development hereby approved is first occupied."

3.2.2 This report provides assessment of the 4 available BREEAM credits and provides confirmation of where these credits have been achieved as part of evidence to support the discharge of Condition 19.

3.3 Planning Condition 29 – Commercial Unit – Acoustic Insulation

3.3.1 This planning condition relates to limiting the break out of noise from the ground floor commercial units and states the following:

"a) Notwithstanding the approved plans or documents specified in condition 2, prior to the first occupation of each of the ground floor commercial demise, as indicated on drawing no. 6312-SRA-00-DR-A-20800 REV P00, stamped as received by the City Council as local planning authority on 29 November 2019, details of how the commercial units will be acoustically insulated and treated to limit the break out of noise shall be submitted for approval in writing by the City Council, as Local Planning Authority.

This shall include a noise study of the premises and a scheme of acoustic treatment, which shall include confirmation of how any external plant would conform to the overarching acoustic report recommendations for the development. For the avoidance of doubt, where entertainment noise is proposed the L_{Aeq} (entertainment noise) shall be controlled to 10 db below the L_{A90} (without entertainment noise) in each octave band at the façade of the nearest noise sensitive location.

b) The approved scheme shall be implemented and prior to the first occupation of each of the commercial units, a verification report will be required to validate that the work undertaken conforms to the recommendations and requirements approved as part of part (a) of this planning condition. The verification report shall include post completion testing

to confirm the noise criteria has been met. In instances of non conformity, these shall be detailed along with mitigation measures required to ensure compliance with the noise criteria. Any mitigation measures shall be implemented in accordance with a timescale to be agreed with the City Council, as Local Planning Authority, and thereafter retained and maintained in situ."

3.3.2 At this stage the ground floor units are Cat A fit-out that shall be fully fit out by the future tenant. As such this Planning Condition cannot be discharged and will be the responsibility of the future tenant to demonstrate compliance with such that the condition can be discharged.

4 BS4142: 2014+A1: 2019 'Method for rating and assessing industrial and commercial sound'

4.1.1 BS4142 is intended to be used to assess environmental noise of an industrial nature, which includes sound from fixed installations, which comprise mechanical and electrical plant and equipment.

4.1.2 The procedure contained in BS4142 for assessing the impact is to compare the measured or predicted noise level from the source in question, the "Specific Sound Level" immediately outside the noise sensitive receptor (NSR), with the "Background Sound Level". Where the noise exhibits attention attracting characteristics (i.e. acoustic features) such as tonal, impulsive, intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level to obtain the "Rating Level".

4.1.3 BS4142 states that the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level and the context in which the sound occurs:

- ◆ Typically, the greater this difference, the greater the magnitude of the impact.
- ◆ A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- ◆ A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

4.1.4 The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.

4.1.5 For the daytime, the assessment is carried out over a one-hour period, and over a 15-minute period at night. The daytime and night time periods are typically defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours respectively.

5 BREEAM HEA 05 Pre-Completion Assessment

5.1 Sound Insulation (1 Credit)

5.1.1 The BREEAM pre-completion survey of sound insulation was carried out as per the methodology set out in the BREEAM 'New Construction Non-Domestic Buildings Technical Manual SD5076 - 5.0:2014, Section HEA 05 Acoustic Performance' and also in accordance with the methodology set out in BS EN ISO 140-4 and BS ISO EN 140-7.

5.1.2 Table 3 compares the measured airborne sound insulation performance of the separating walls as against the target performance requirements as cited in Section 7 of BS 8233:2014 and BCO guidance:

Test ID	Source Room	Receive Room	Test Result, dB $D_{nT,w}$	Performance Standard Cited by BCO, dB $D_{nT,w}$	Criterion Met?
1	Fifth Floor Demise 06	Fifth Floor Demise	51	≥ 48	YES
2	Fifth Floor Lab Demise 01	Fifth Floor Lab Demise 03	48	≥ 48	YES
3	First Floor Demise 02	First Floor Demise 3	48	≥ 48	YES
4	First Floor Demise 07	First Floor Demise 08	51	≥ 48	YES
5	First Floor Demise 02	First Floor Demise 03	48	≥ 48	YES
6	Ground Floor Demise 01	Ground Floor Office	49	≥ 48	YES

Table 3: Separating wall airborne sound insulation test results

5.1.3 Table 4 compares the as measured airborne sound insulation performance of the separating floors as against the target performance requirements as cited in Section 7 of BS 8233:2014 and BCO guidance:

Test ID	Source Room	Receive Room	Test Result, dB $D_{nT,w}$	Performance Standard Cited by BCO, dB $D_{nT,w}$	Criterion Met?
7	Sixth Floor Demise 01	Fifth Floor Lab Demise 01	49	≥ 48	YES
8	Third Floor Demise 01	Second Floor Demise 01	50	≥ 48	YES
9	Second Floor Demise 01	First Floor Demise 07	50	≥ 48	YES
10	Second Floor Demise 01	First Floor Demise 03	50	≥ 48	YES
11	Ground Floor Demise 01	First Floor Demise 07	51	≥ 48	YES

Table 4: Separating floor airborne sound insulation test results

5.1.4

Table 5 compares the as measured impact sound insulation performance of the separating floors tested as against the target performance requirements as cited in Section 7 of BS 8233:2014 and BCO guidance:

Test ID	Source Room	Receive Room	Test Result, dB $L_{nT,w}$	Performance Standard Cited by BCO, dB $L_{nT,w}$	Criterion Met?
11	Third Floor Demise 01	Second Floor Demise 01	55	≤ 60	YES
12	Second Floor Demise 01	First Floor Demise 07	52	≤ 60	YES
13	Second Floor Demise 01	First Floor Demise 03	51	≤ 60	YES
14	First Floor Demise 07	Ground Floor Demise 01	46	≤ 60	YES

Table 5: Separating floor impact sound insulation test results

5.1.5

The results in Tables 8, 9 and 10 demonstrate FULL compliance with the airborne and impact sound insulation performance standards as cited in BCO, as such the requirement of HEA 05 – Sound Insulation is met and the credit awarded.



5.2 Indoor Ambient Noise Levels (1 Credit)

5.2.1 This Section confirms the results of the indoor ambient noise level measurements as measured within the completed Development as during normal duty ventilation conditions during typical office working hours (07:00-19:00).

5.2.2 The BREEAM pre-completion survey of internal ambient noise levels was carried out as per the methodology set out in the BREEAM 'New Construction Non-Domestic Buildings Technical Manual SD5076 - 3.0:2015, Section HEA 05 Acoustic Performance' and therefore also in accordance with the methodology set out in the ANC 'Good Practice Guide, Acoustic Testing of Schools November 2015'. Specifically, the following methodology was adopted:

- ◆ Three five-minute measurements were carried out in each space, per ventilation condition.
- ◆ Each measurement was taken at a height of 1.2 metres above local ground level and at least 1 metre distance from any room surfaces and 1.5 metres distance from all specific noise sources, e.g. building services.
- ◆ The room was unoccupied, with the exception of the Sol Acoustician conducting the measurements.
- ◆ The tests rooms were finished and unfurnished.
- ◆ Measurements were conducted during normal office operation hours.

5.3 Indoor Ambient Noise Levels

5.3.1 The indoor ambient noise level measurements within the occupiable spaces were conducted with all building services operating at design duty as confirmed by the M&E engineer on site.

5.3.2 Table 6 summarises the as A-weighted, time-averaged ($L_{Aeq,T}$) daytime IANLs as measured during the pre-completion survey for the normal office working hours ventilation condition:

Room	Position	Results, dB $L_{Aeq, 5min}$	Average Result, dB $L_{Aeq, T}$	Performance Standard Cited by BCO, dB $L_{Aeq, 30min}$	Criterion Met?
Ground Floor Demise 01	1	41	40	≤43	YES
	2	40			
	3	38			
Ground Floor Office	1	35	36	≤40	YES
	2	36			
	3	36			
First Floor Demise 02	1	40	39	≤43	YES
	2	38			
	3	37			
First Floor Demise 07	1	37	37	≤43	YES
	2	38			
	3	37			

Table 6: Summary of A-weighted, time averaged IANL

Room	Position	Results, dB $L_{Aeq, 5min}$	Average Result, dB $L_{Aeq, T}$	Performance Standard Cited by BCO, dB $L_{Aeq, 30min}$	Criterion Met?
Second Floor Demise 01	1	42	43	≤45	YES
	2	44			
	3	43			

5.3.3 

The results in Table 6 shows that compliance with the indoor ambient noise level performance standards as cited by BCO has been achieved within all spaces tested.

5.4 Mid-Frequency Reverberation Time (1 Credit)

5.4.1 

Reverberation time criteria has been specified in terms of acoustic ceiling provisions rather than a defined criteria. Based on observations on site, no acoustic ceiling has been provided to the Cat A speculative office spaces or open office floors. It is understood that for these spaces the following BCO guidance has been followed

"...Where an acoustically absorbent suspended ceiling is not provided there are a wide range of alternative options for providing acoustic absorption to the soffit.

Where an acoustically absorbent ceiling achieving Absorption Class A, or acoustically equivalent soffit treatment, is not provided, the base build definition (BBD) should clearly state what provisions are to be made for sound absorbing finishes in the offices. It is likely that the level of information provided could vary between developments but, as a minimum, it is envisaged that either the total quantity of acoustic absorption (m2 Sabine in the 500 Hz, 1kHz and 2kHz octave bands) for each treatment type, or the predicted mid-frequency reverberation time (Tmf i.e. the average of the 500 Hz, 1kHz and 2kHz octave band values), should be stated.

The BBD should draw explicit attention to the occupiers to consider potential augmentation of sound absorbing finishes in the offices for purposes of acoustic privacy and, in certain cases where the evacuation strategy utilises a voice alarm system, any additional sound absorption they need to introduce as part of the fit out works to achieve the speech intelligibility target agreed with the district surveyor/ approved inspector."

5.4.2 

Providing the above statement has been followed and is acceptable the BREEAM Credit for Mid-frequency Reverberation Time has been achieved.

6 BREEAM POL 05 Pre-Completion Assessment

6.1.1 Sol attended the Development during Friday 24 January 2025 in order to carry out in-situ noise measurements of all externally-sited mechanical services equipment. Not all external condensers could be manually operated, as such at least 1no. of each model was operating at maximum design duty and representative of all other identical models, all other plant was advised to Sol to be operating at their maximum design duties and speeds. The MEP Engineer, have confirmed to Sol that all plant associated with the Development shall only operate during daytime periods (ie. 07:00 – 23:00 hours).

6.1.2 All noise measurements were carried out using Type 1 Precision Grade noise monitoring equipment. The complete measuring systems were field calibrated immediately prior to, and following the noise survey period. (Full details of the noise monitoring systems are retained on file by Sol, including traceable calibration records; these are available for review if needed).

6.1.3 The noise survey comprised of full broadband A-weighted, ($L_{Aeq,T}$) and one-third octave unweighted ($L_{eq,T}$) sound pressure level measurements. As plant noise was at a steady state, all measurements were conducted over 10-second sample periods, as using an omnidirectional microphone, at a measurement distance of one metre from each plant item. In all cases, two measurements were conducted at each position in order to demonstrate repeatability of the results. The results of all individual plant noise measurements are summarised in Appendix B of this report.

6.1.4 The Specific Sound Level from the as installed externally sited building services equipment at the residential dwellings at Melrose Apartments has been calculated, as based on the measured plant sound pressure levels, the dimensions of the plant and the distances to the receptor in each case. The predicted Specific Sound Levels from each as fitted externally sited plant item are as confirmed in Appendix B.

6.1.5 It shall be noted from the Specific Sound Level predicted at the nearest noise sensitive receptor, as set out in Appendix D that the noise contribution cumulatively arising from all individual plant noise sources is 8dB below the existing typical daytime Background Sound Level of 49dB $L_{Aeq,15min}$. As a result, any acoustic character associated with individual noise sources is not expected to be discernible at the nearest noise sensitive receptor above the existing environmental noise climate.

6.1.6 On this basis, and in accordance with BS4142, no acoustic feature corrections have been applied to the calculated Specific Sound Level, in order to determine the BS4142 defined Rating Level for acoustic assessment purposes.

6.1.7 Table 7 presents the predicted overall A-weighted, plant noise Rating Level $L_{Aeq,T}$ at the identified NSRs compared against the BREEAM Pol 05 criterion:

Noise Sensitive Receptor	Assessment Period	Predicted Specific Level, dB $L_{Aeq,T}$	BREEAM Pol 05 Credit Maximum Permissible Rating Level Limit, dB $L_{Aeq,T}$	Criteria Met
Melrose Apartments	Daytime (07:00hrs - 23:00hrs) T = 1 hour	41	54	YES

Table 7: BREEAM Pol 05 plant noise egress assessment summary

7 Planning Condition 19 Assessment

Section 5 provides the details of the plant noise measurements carried out by Sol.

7.1.1 Specific Sound Level from the as installed externally sited building services equipment at the residential dwellings at Melrose Apartments has been calculated, as based on the measured plant sound pressure levels, the dimensions of the plant and the distances to the receptor in each case. The predicted Specific Sound Levels from each as fitted externally sited plant item are as confirmed in Appendix B.

7.1.3 It shall be noted from the Specific Sound Level predicted at the nearest noise sensitive receptor, as set out in Appendix D that the noise contribution cumulatively arising from all individual plant noise sources is 8dB below the existing typical daytime Background Sound Level of 49dB $L_{Aeq,15min}$. As a result, any acoustic character associated with individual noise sources is not expected to be discernible at the nearest noise sensitive receptor above the existing environmental noise climate.

7.1.4 On this basis, and in accordance with BS4142, no acoustic feature corrections have been applied to the calculated Specific Sound Level, in order to determine the BS4142 defined Rating Level for acoustic assessment purposes.

7.1.5 Table 8 presents the predicted overall A-weighted, BS4142-defined Rating Level at the identified NSRs as due to noise from the as fitted mechanical services plant compared against the BREEAM Pol 05 criterion:

Noise Sensitive Receptor	Assessment Period	Predicted Specific Level, dB $L_{Aeq,T}$	Predicted Rating Level, dB $L_{Aeq,T}$	Planning Condition 19 Maximum Permissible Rating Level Limit, dB $L_{Aeq,T}$	Criteria Met
Melrose Apartments	Daytime (07:00hrs - 23:00hrs) T = 1 hour	41	41	44	YES

Table 8: Planning Condition plant noise egress assessment summary

APPENDIX A

Glossary of Acoustic Terms

Term	Abbreviation	Description
Decibel	dB	A scale for comparing the ratios of two quantities, including sound pressure and sound power.
A-weighting	dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the change in sensitivity of the human ear at varying frequencies.
Sound Pressure Level	L_p	A measure of the sound pressure at a particular location. Typically expressed in dB(A) referenced to 2×10^{-5} Pascals.
Equivalent Continuous Sound Level	$L_{Aeq,T}$	The steady level of sound over a prescribed period of time which would contain the same total sound energy as the actual fluctuating noise under consideration in the same period of time.
Statistical Sound Levels	L_{A10} and L_{A90}	The level of noise exceeded for a percentage of the time period being sampled, namely 10% or 90% respectively.
Background Sound Level	$L_{A90,T}$	The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of the time period being sampled.
Maximum Sound Level	L_{Amax}	The maximum sound or noise level determined with instrumentation set to either a fast time weighting, L_{AFmax} , or a slow time weighting, L_{ASmax} , as occurring during the time period being sampled.
Sound Power Level	L_W	A measure of the total sound energy radiated from a source. Like sound pressure levels, this is also expressed in dB(A) terms, but it is referenced to 1×10^{-12} W.
Broadband		Sound sampled over a wide range of frequencies.
Narrow band		Sound sampled over a specific, restricted frequency range. Used to ascertain the amplitude and significant of individual, audible tones, and to assist in identifying particular sources of noise within a complex, multi-source soundscape environment.
Ambient Sound	$L_{eq,T}$	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far.
Specific Sound Level	$L_{eq,T}$	The Equivalent Continuous A-Weighted Sound Level at an assessment position produced by a specific sound over a given reference time interval, T
Rating Level	$L_{A,r,T}$	The Specific Sound Level plus any adjustment for the acoustic characteristic features of the noise (e.g. intermittency, tones etc.).
Residual Noise	$L_{Aeq,T}$	The ambient sound remaining at given position in a given situation, when the specific sound source is suppressed to such an extent that it no longer contributes to the ambient sound.
Sound Reduction Index	SRI	The reduction in sound energy when transmitted through a panel or similar planar element, typically used in relation to single octave or one-third octave frequency band values.
Weighted Sound Reduction Index	R_w	The Sound Reduction Index expressed as a single figure, as expressed against a reference curve.
Dynamic Insertion Loss	DIL	Reduction in acoustic energy resulting from the insertion of a noise control element (e.g. an attenuator, acoustic enclosure etc.).
Free Field		Noise measuring location that is free from the presence of sound reflecting objects (except the ground), usually taken to mean being at least 3.5 metres distance from reflective surface(s) or greater.

APPENDIX B Predicted Specific Sound Levels

Equipment Name	Data Source / Specification	Average Sound Pressure Level, dB, at Octave Band Centre Frequency, Hz							Average Sound Pressure Level on Measurement Surface, dB LpA	Measurement Distance, m	Measurement Surface area at Measurement Position, m2	Estimated Sound Power Level, dB LwA	Predicted Specific Sound Level at Melrose Apartments NSR (@ c.20m distance), dB LAeq,T
		63	125	250	500	1k	2k	4k	8k				
EF_1_Outlet	On-site measurements on 24 January 2025	99	93	80	68	63	61	60	58	1	6	87	37
EF_2_Outlet													23
EF_1_Body	On-site measurements on 24 January 2025	79	78	74	59	55	54	50	42	1	27	82	30
EF_2_Body													17
AHU_1_Intake	On-site measurements on 24 January 2025	74	67	67	58	54	50	46	39	1	6	70	18
AHU_1_Body	On-site measurements on 24 January 2025	77	76	72	59	55	54	48	41	1	99	87	35
AHU_1_Outlet	On-site measurements on 24 January 2025	76	74	73	61	62	61	59	51	1	6	77	24
AHU_2_Outlet	On-site measurements on 24 January 2025	72	72	70	58	57	56	49	40	1	6	73	18
AHU_2_Intake	On-site measurements on 24 January 2025	69	76	68	58	56	52	46	36	1	6	72	17
AHU_2_Body	On-site measurements on 24 January 2025	71	69	63	57	55	50	45	38	1	99	81	24
AHU_3_Body	On-site measurements on 24 January 2025	73	73	69	58	56	54	48	39	1	99	84	29
AHU_3_Intake	On-site measurements on 24 January 2025	71	74	67	55	54	50	43	33	1	6	71	14
AHU_3_Outlet	On-site measurements on 24 January 2025	66	70	60	53	52	51	50	41	1	6	68	10
AHU_4_Intake	On-site measurements on 24 January 2025	67	69	62	56	54	50	44	34	1	6	68	8
AHU_4_Body	On-site measurements on 24 January 2025	66	69	60	55	51	47	43	34	1	99	78	18
AHU_4_Outlet	On-site measurements on 24 January 2025	65	66	58	54	50	49	50	48	1	6	66	7
Small_Hut_Louvre	On-site measurements on 24 January 2025	65	66	63	53	50	47	41	32	1	6	66	4
AHU_5_Body	On-site measurements on 24 January 2025	69	76	66	57	53	50	44	38	1	99	83	18
AHU_5_Outlet	On-site measurements on 24 January 2025	69	76	63	57	53	51	47	42	1	6	71	9
AHU_5_Intake	On-site measurements on 24 January 2025	67	72	64	56	54	52	45	37	1	6	69	4

Equipment Name	Data Source / Specification	Average Sound Pressure Level, dB, at Octave Band Centre Frequency, Hz							Average Sound Pressure Level on Measurement Surface, dB LpA	Measurement Distance, m	Measurement Surface area at Measurement Position, m2	Estimated Sound Power Level, dB LwA	Predicted Specific Sound Level at Metrose Apartments NSR (@ c.20m distance), dB LAeq,T
		63	125	250	500	1k	2k	4k	8k				
Multi_Condenser_1	On-site measurements on 24 January 2025												15
Multi_Condenser_2													15
Multi_Condenser_4													15
Multi_Condenser_3													15
Multi_Condenser_5		67	68	66	65	60	55	51	54	1	18	79	15
Multi_Condenser_6													15
Multi_Condenser_7													15
Multi_Condenser_8													15
Multi_Condenser_9													15
Mitsubishi_PUZ_2	Manufacturer confirmed sound power level data (Mitsubishi HWM140YHA)											67	2
Mitsubishi_PUZ_1													2
Multi_Condenser_10	On-site measurements on 24 January 2025												21
Multi_Condenser_13	On-site measurements on 24 January 2025												22
Multi_Condenser_12	On-site measurements on 24 January 2025												22
Multi_Condenser_11	On-site measurements on 24 January 2025												22
Multi_Condenser_14	On-site measurements on 24 January 2025	73	69	67	69	62	58	53	49	1	18	81	21
Multi_Condenser_15	On-site measurements on 24 January 2025												22
Multi_Condenser_16	On-site measurements on 24 January 2025												22
Multi_Condenser_17	On-site measurements on 24 January 2025												22
Multi_Condenser_18	On-site measurements on 24 January 2025												21
AHU_6_Body	On-site measurements on 24 January 2025	69	70	59	56	53	49	46	43	1	99	80	20
AHU_6_Inlet	On-site measurements on 24 January 2025	63	64	59	56	53	49	43	36	1	6	66	5

Equipment Name	Data Source / Specification	Average Sound Pressure Level, dB, at Octave Band Centre Frequency, Hz							Average Sound Pressure Level on Measurement Surface, dB LpA	Measurement Distance, m	Measurement Surface area at Measurement Position, m2	Estimated Sound Power Level, dB LwA	Predicted Specific Sound Level at Melrose Apartments NSR (@ c.20m distance), dB LAeq,T	
		63	125	250	500	1k	2k	4k						8k
AHU_6_Outlet	On-site measurements on 24 January 2025	69	68	58	56	54	49	43	36	59	1	6	67	5
Daikin_1	Manufacturer confirmed sound power level data (Daikin ERQ125A7V1B)													14
Daikin_2														11
Daikin_3														10
Daikin_4														9
Daikin_5													67	8
Daikin_6														6
Daikin_7														5
Daikin_8														0
Total														41

APPENDIX C

Plan of Plant Item References



APPENDIX D

Predicted Plant Noise Egress Levels

