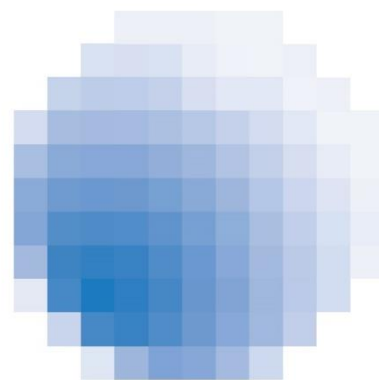




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Bet365

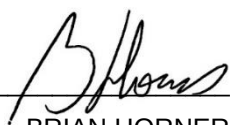
Environmental Noise Impact Assessment
P2097-REP01-BDH
26 January 2023

PROJECT: Zenith Building, Spring Gardens, Manchester
Bet365
Environmental Noise Impact Assessment

CLIENT: Bet365 Group Ltd
Zenith Building
Spring Gardens
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DOCUMENT
REFERENCE: P2097-REP01-BDH

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DATE: 26 January 2023

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1.0 EXECUTIVE SUMMARY

Sol Acoustics Ltd has been appointed by Bet365 Group Ltd to provide an environmental noise impact assessment for proposed new plant to be installed on the first floor roof of the existing Zenith Building as located at 26 Spring Gardens, Manchester, M2 1AB.

This acoustic assessment report considers the environmental noise impact as arising from the operation of the proposed new plant at the nearest identified noise sensitive receptors ("NSRs").

The pre-existing environmental noise climate at the identified NSRs has been measured by Sol Acoustics, as between c.11:30 hours during Friday 20 January and c.10:00 hours during Monday 23 January 2023.

The environmental noise levels as expected from the operation of the proposed externally sited items of M&E plant have been assessed based upon manufacturer advised noise data.

The environmental noise emissions from the plant have been quantified, modelled and assessed using proprietary "CadnaA" 3D acoustic software.

It is the conclusion of this environmental noise assessment that the total, aggregate environmental noise impact arising from the operation of the proposed plant does not exceed the derived maximum permissible Rating Level noise limits at off-site receptor locations, or result in an adverse impact on the office spaces within the Zenith Building, provided that the noise emitted from each of the proposed AC units does not exceed a sound pressure level of 49dB $L_{Aeq,T}$ as at 1 metre distance from any external surface of the plant (in acoustic "free field" conditions) as during any required operation (i.e. equivalent to each of the proposed 11 no. Samsung type AM260AXVGGH/EU air cooling units operating simultaneously and specifically only as according to the manufacturer's assigned "Silent 3" mode in any and all instances).

Please refer to the main report and appendices for further information.

2.0 INTRODUCTION

Sol Acoustics Ltd ("Sol") has been appointed by Bet365 Group Ltd to provide an environmental noise impact assessment for proposed new plant (comprising of 11 no. Samsung type AM260AXVGGH/EU air conditioning plant) that is to be installed on the first floor roof of the existing Zenith Building as located at 26 Spring Gardens, Manchester, M2 1AB.

The purpose of this acoustic assessment is as follows:

- To identify the nearest pre-existing noise sensitive receptors (NSRs), which are most likely to be affected by environmental noise arising from the proposed new plant.
- To determine the prevailing, pre-existing background noise climate at the NSRs, through direct, environmental noise measurement.
- To identify all new significant noise sources proposed.
- To obtain suitable noise level data for all new proposed acoustically significant and externally sited new M&E plant.
- To calculate the likely resultant environmental noise level contribution and impact at the nearest NSRs to the plant, taking factors into account such as attenuation due to distance, acoustic screening, and other environmental features, as appropriate.
- To carry out an environmental noise assessment of the proposed plant in accordance with the assessment methodology that is prescribed in relevant Standards and other acoustic guidance, and specific guidance as provided by Manchester City Council ("MCC"), in order to determine the likely significance of the noise impact generated.
- To specify, in outline terms, the requirements for any further noise mitigation to be implemented.

This acoustic report is structured as follows:

- Section 3 provides a basic description of the existing development, the proposed new plant and the surrounding noise sensitive receptors.
- Section 4 provides summary details of the benchmark environmental noise survey undertaken in order to determine the pre-existing environmental noise climate at the identified NSRs.
- Section 5 provides the results of the benchmark environmental noise survey.
- Section 6 provides a summary of pertinent assessment criteria, for the purposes of assessment and rating of environmental noise impact.
- Section 7 provides a summary of the proprietary 3D acoustic models constructed and acoustic calculations undertaken.
- Section 8 provides the results of acoustic assessment, and a summary description of the environmental noise mitigation measures which will be required.
- Section 9 provides a conclusion statement.
- *Appendix A provides a glossary of acoustic terminology.*
- *Appendix B provides details of the noise surveys undertaken and a summary of the data obtained from these.*
- *Appendix C provides details of the 3D computer noise model as constructed for this project*
- *Appendix D gives details and qualifications of contributing Sol Acoustics' staff.*

3.0 DESCRIPTION OF SITE

3.1 General Overview and Noise Sensitive Receptors (NSRs)

The Zenith building is located at 26 Spring Gardens in Manchester City Centre in a predominantly commercial area and is surrounded by neighbouring office and retail establishments.

With regards to the nearest existing noise sensitive premises, Sol has liaised with the Environmental Protection Team at Manchester City Council (MCC), refer to Section 6.1 for further details; it has been confirmed that there are no residential premises within the vicinity of the site. However, for the purposes of this assessment, it has been agreed that the nearby office developments are to be considered as being noise sensitive. On this basis, the nearest noise sensitive premises, which are likely to be affected by the proposed new plant, are as follows:

- A. The existing offices within the Zenith Building (i.e. form part of the development).
- B. The existing offices at 40 Spring Gardens, which is located c.6 metres distance to the south of the Zenith Building.
- C. The existing offices at 24 – 30 Brown Street, which is located c.10 metres distance to the west of the Zenith Building.
- D. The existing offices and retail units at 19 Spring Gardens, which is located c.10 metres distance to the east of the Zenith Building.

Figure 1 overleaf indicates the location of the Zenith Building in relation to the identified NSRs, and also the corresponding location of the noise monitoring position used in order to inform this acoustic assessment (all as discussed in Section 4 of this report).

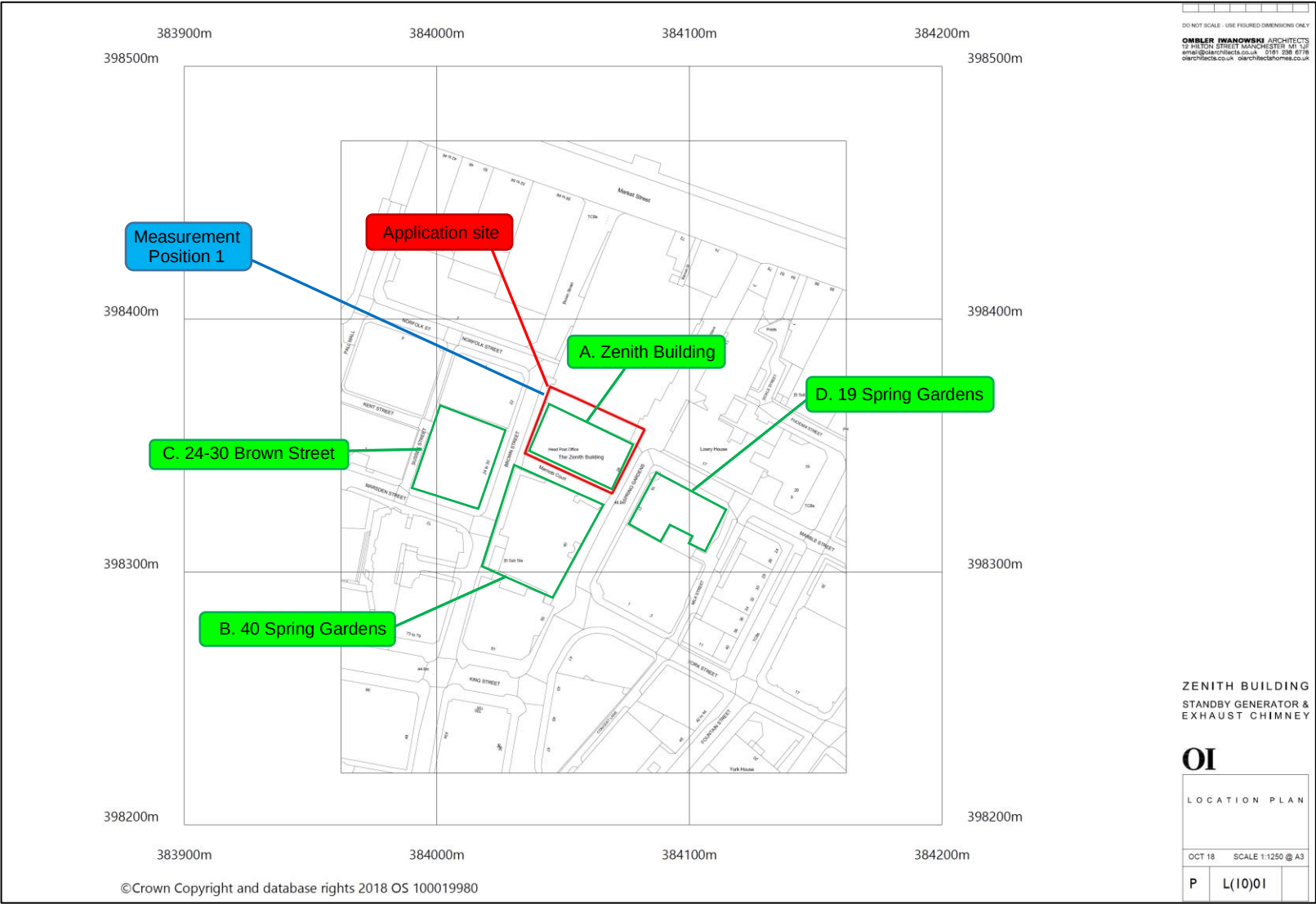


Figure 1: Location site layout, showing the site in relation to the surrounding noise sensitive receptors

3.2 Characteristics of the Facility

Air conditioning (“AC”) plant is proposed to be installed to the first floor roof area of the Zenith Building, just outside and to the north of the main Zenith Building office tower. The proposed external plant, with the potential to generate a noise impact, comprises of 11 no. Samsung AM260AXVGGH/EU units.

The AC units are expected to operate continuously during daytime and night time periods and all units may operate simultaneously. Table 1 provides a summary of the advised noise level data for the proposed plant as stated by the manufacturer:

Plant Unit		Sound Pressure Level at 1m Distance, dB $L_{Aeq,T}$		Sound Power Level, dB L_{WA}
Ref	Model	Cooling	Heating	
AC01-11	Samsung AM260AXVGGH/EU	65	67	87

Table 1: Advised noise data for the proposed M&E plant

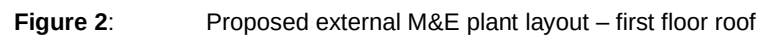
The proposed Samsung AC unit type has various manufacturer advised “silent” mode operations. Table 2 provides manufacturer-advised octave band sound pressure level for the proposed unit for each mode of operation:

Plant Unit		Mode	Sound Pressure Level at 1m Distance, dB L_{eq,T_1} @ Octave Band Centre Frequency, Hz								dB(A)
Ref	Model		63	125	250	500	1k	2k	4k	8k	
AC01-11	Samsung AM260AXVGGH/EU	Standard (Cooling)	64	65	64	63	60	54	50	45	65
		Silent 1	61	63	61	60	57	51	46	43	62
		Silent 2	57	59	57	56	53	46	42	38	57
		Silent 3	49	50	49	48	45	38	33	30	49

Table 2: Manufacturer advised sound pressure Level for the possible operating modes

Figure 2 shows the intended locations of the proposed external plant.

Figure 3 provides a photograph of the location of the proposed AC plant on the existing site in relation to the Zenith building offices.



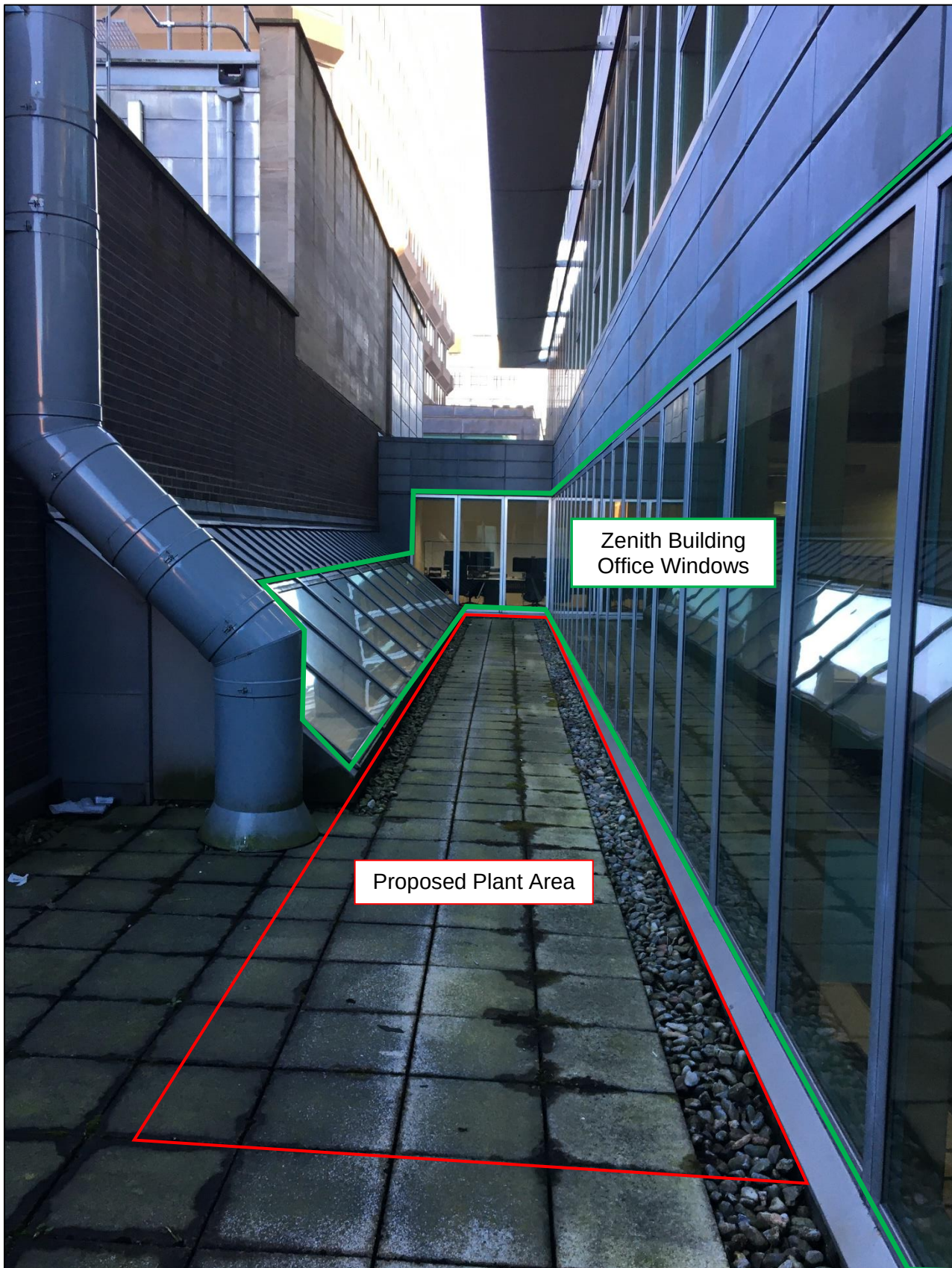


Figure 3: Photograph of the proposed plant area

4.0 DETAILS OF INVESTIGATION

4.1 Pre-Existing Environmental Noise Climate

In order to inform the assessment, an unattended environmental noise survey has been conducted by Sol between c.11:30 hours during Friday 20 January and c.10:00 hours during Monday 23 January 2023.

The purpose of these noise measurements was to determine the typical, prevailing pre-existing Background Sound Levels expected at the nearest noise sensitive premises to the existing site for environmental noise benchmarking and subsequent acoustic impact assessment purposes.

The environmental noise survey consisted of a single environmental noise measurement position as follows:

- **Measurement Position 1:** Tripod-mounted microphone located at first floor roof level. Key noise sources included road traffic noise and noise from pedestrians as during daytime periods. The measurement position was sited away from any (existing) significant building services equipment as associated with the Zenith Building (or indeed any other surrounding buildings), albeit noise from distant building services equipment may have been audible at quieter times.

The location of the noise monitoring position is as shown in Figure 1 and Figure 4.

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

Meteorological data was recorded for the duration of the noise survey, as using a Professional Grade Vaisala “WXT530” weather station. No periods of significant rainfall, exceeding 1mmh^{-1} , occurred and the average windspeed throughout the survey remained below 2ms^{-1} .

Notwithstanding the weather conditions recorded, the microphone system was entirely weatherproofed and fitted with an all-weather environmental windshield and bird spike.

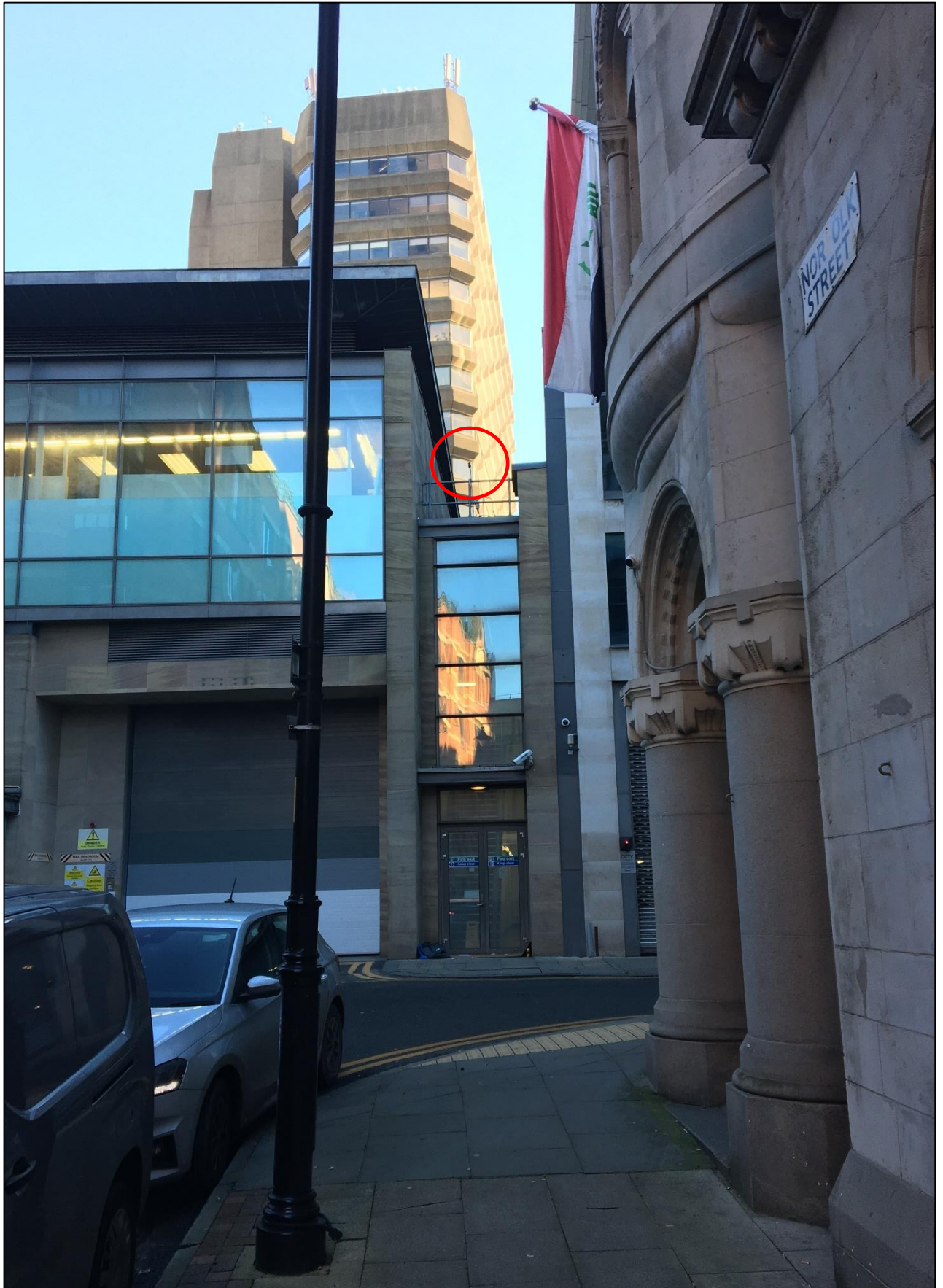


Figure 4: Photograph of Measurement Position 1

5.0 ENVIRONMENTAL NOISE SURVEY RESULTS

5.1 Background Noise Climate

Appendix B provides full detailed time history for the environmental noise levels as recorded for the duration of the environmental noise survey.

Table 3 provides a basic summary of the typical overall, A-weighted noise levels measured at the noise monitoring location, in $L_{Aeq,T}$ and $L_{A90,15min}$ terms. The specific, measured noise levels pertinent to the required BS 4142: 2014+A1: 2019 environmental noise assessment are highlighted in ***bold, italic*** text:

Measurement Position	Date	Daytime (07:00 – 23:00 Hours)		Night Time (23:00 – 07:00 Hours)	
		dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)
1	Friday 20 January 2023	58*	53	57	53
	Saturday 21 January 2023	59	54	56	53
	Sunday 22 January 2023	57	53	55	52
	Monday 23 January 2023	62*	55	-	-
* Measurement not conducted for the full assessment period					

Table 3: Summary of typical, measured broadband environmental noise levels

6.0 ENVIRONMENTAL NOISE PERFORMANCE SPECIFICATION REQUIREMENTS

6.1 Consultation with the Local Authority

Sol has liaised with Mr Souter of Manchester City Council (“MCC”) to determine the location of the nearest noise sensitive receptors to the Development site and also to determine the requirements for the assessment. There are no residential dwellings in the vicinity of the Development. However, MCC considers the surrounding office buildings to be noise sensitive and therefore the surrounding offices, including those located within the Zenith Building, have been considered as being noise sensitive receptors for the purposes of this acoustic assessment.

The environmental noise impact assessment is required to be undertaken in accordance with MCC’s guidance document: “Planning and Noise, Technical Guidance”, dated October 2022.

Section 3.7.1.5 of the document provides MCC’s requirements for noise and vibration from fixed plant and equipment (such as that proposed to be installed to the first-floor roof of the Zenith Building):

‘... Noise and vibration from fixed plant / equipment

Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.

Many of the complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted, but also its particular characteristics. The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:

‘Externally mounted ancillary 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 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location’.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages. See Appendix A with regards to the expectation of how to calculate a ‘typical’ background level.

Past experience has shown that this criterion can be readily achieved. Where available, product specification data for new items should be submitted with the acoustic report. Consultants should be using these to compare with data from the noise survey and propose mitigation where the levels are above those specified in the criterion. Where this information is not available a consultant may choose to measure the noise, levels generated by the equipment in question where the equipment has already been installed elsewhere (and in accordance with BS 4142).

Where fixed plant, equipment or machinery is attached to a building the vibration caused by it can pass through the building structure and cause structure borne noise elsewhere in the building. Where it is to be installed in or on a building containing a noise sensitive use structure borne noise should be considered in the noise assessment and adequate control measures should be proposed. An example of where this would be required is where there is a proposal to install ventilation equipment on the roof of a residential apartment block or it could be an air source heat pump attached to the side of a building ...'

A summary of BS4142: 2014+A1:2019 is provided in the following report section.

6.2 BS4142: 2014+A1:2019

BS 4142: 2014+A1: 2019: *'Method for rating and assessing industrial and commercial sound'* is intended to be used to assess noise of an industrial nature, which includes sound from fixed installations comprising of mechanical and/or electrical plant and equipment. The methods prescribed in this British Standard use outdoor sound levels in order to assess the likely effects of sound on people who might be inside or outside a dwelling or premises that is used for residential purposes upon which sound is incident.

The procedure contained in BS 4142: 2014+A1: 2019 for assessing environmental noise impact is to compare the measured or predicted noise level from the source in question - the "Specific Sound Level" immediately outside the noise sensitive premises - with the corresponding "Background Sound Level". Where the noise contains attention attracting characteristics such as tonal, impulsive and/or intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level in order to obtain the "Rating Level."

BS 4142: 2014+A1: 2019 states that the significance of sound arising from 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 also the context in which the sound occurs:

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

For daytime periods, the assessment is conducted over a one-hour period, and over a 15-minute period at night. Daytime and night time periods are defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively. Table 4 presents a summary of the as measured typical Background Sound Level at each of the identified residential noise sensitive receptors (NSRs):

Noise Sensitive Receptor (NSRs)	Typical Background Sound Level, dB $L_{A90,15min}$	
	Daytime (07:00 – 23:00 Hours)	Night Time (23:00 – 07:00 Hours)
A. Zenith Building. (south of the plant area)	53	52
B. 40 Spring Gardens (south of the Zenith Building)		
C. 24 – 30 Brown Street (west of the Zenith Building)		
D. 19 Spring Gardens (east of the Zenith Building)		

Table 4: Summary of typical Background Sound Levels applicable at each noise sensitive receptors

On this basis, Table 5 sets out the maximum permissible noise Rating Level limits, as derived in accordance with MCC guidance (as equating to 5dB below the measured typical Background Sound Level, please refer to Section 6.1 for further details) at each identified residential noise sensitive receptors (NSRs):

Noise Sensitive Receptor (NSRs)	Maximum permissible Noise Rating Level limits, dB $L_{A,T,r}$ in Accordance with MCC Requirements	
	Daytime (07:00 – 23:00 Hours)	Night Time (23:00 – 07:00 Hours)
A. Zenith Building. (south of the plant area)	48	47
B. 40 Spring Gardens (south of the Zenith Building)		
C. 24 – 30 Brown Street (west of the Zenith Building)		
D. 19 Spring Gardens (east of the Zenith Building)		

Table 5: Maximum permissible noise Rating Level limits, dB $L_{A,T,r}$, in accordance with MCC requirements

The above maximum permissible noise level limits are specified in terms of the BS4142 defined Rating Level. The acoustic character of the sound generated from the proposed AC plant must therefore be considered and where appropriate, an acoustic character correction (penalty) must be applied to the predicted Specific Sound Level when assessing compliance with the above specified receptor noise level limits.

6.3 BS 8233: 2014

BS 8233: 2014: '*Guidance on sound insulation and noise reduction for buildings*' provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It sets out appropriate guidance for typical indoor ambient noise levels within non-domestic developments as summarised in Table 6:

Activity	Location	Design Range, dB $L_{Aeq,T}$
Speech or telephone communications	Department Store, Cafeteria, Canteen, Kitchen	50 – 55
	Concourse, Corridor, Circulation Space	45 – 55
Study and work requiring concentration	Library, Gallery, Museum	40 – 50
	Staff/Meeting Room, Training Room	35 – 45
	Executive Office	35 – 40

Table 6: Typical noise levels in non-domestic buildings

7.0 ENVIRONMENTAL NOISE MODEL

7.1 Methodology and Basis of 3D Environmental Models

In order to predict the likely noise levels impinging on the surrounding noise sensitive receptors, proprietary 3D computer noise models were created using the DataKustik “CadnaA” Noise Mapping software. The following assumptions have been made in the generation of the noise models:

- (a) The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: *‘Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation’*.
- (b) The model was set to include third order reflected noise from solid structures.
- (c) Ground absorption, as defined in ISO 9613-2, has been taken into consideration. The base ground absorption for the model has been set to $G=0.0$ (hard ground).
- (d) The existing land topography and the various building heights of the site and surrounding area up to and including the nearest NSR has been obtained from emapsite.com.
- (e) Noise egress from the proposed plant has been predicted using point source approximation using the manufacturer advised sound power level data.

Figure 5 overleaf provides a three-dimensional visualisation of the noise model used to inform the noise impact assessment.

Appendix C provides further information in respect of the 3D computer environmental noise model.

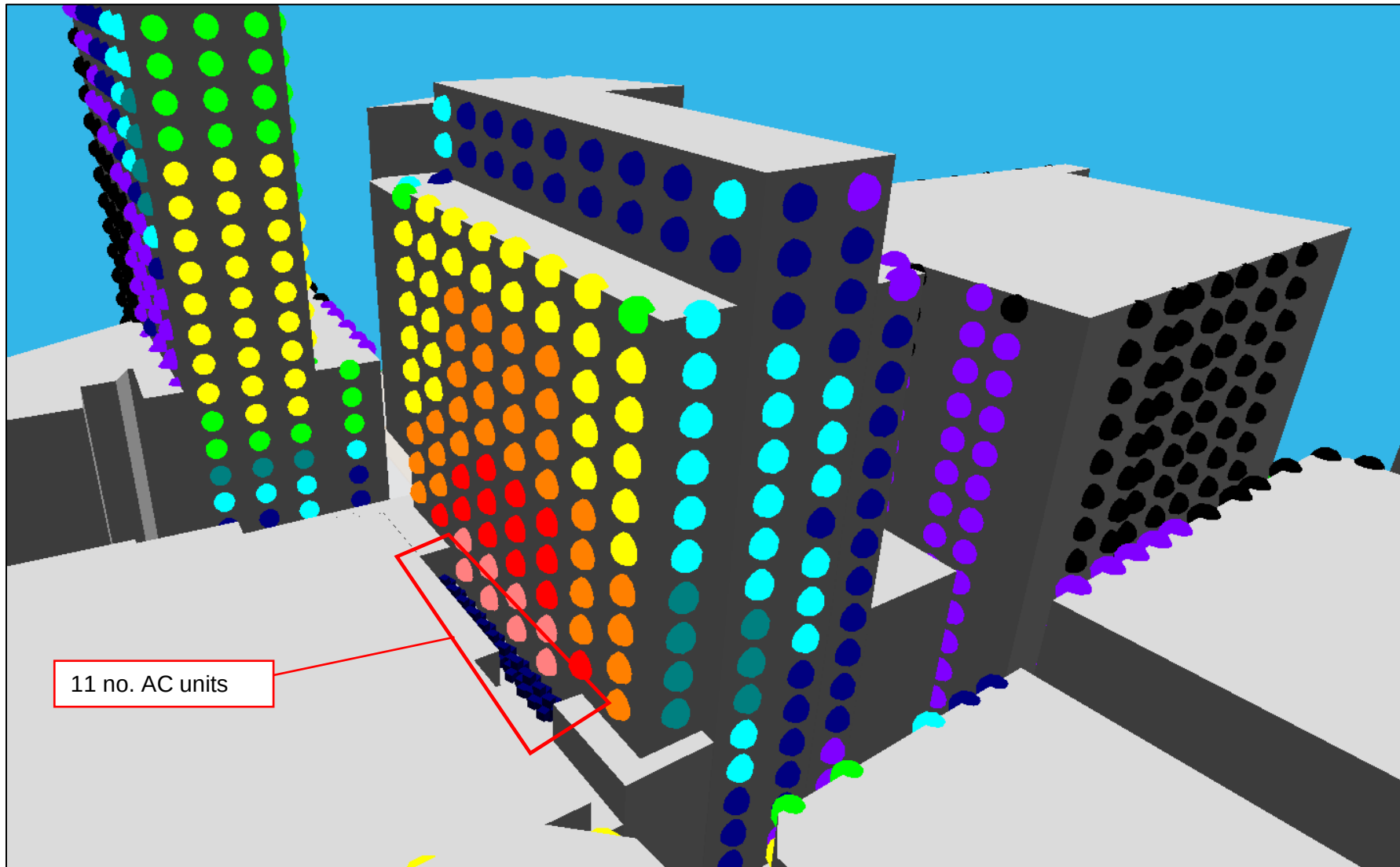


Figure 5: 3D view of the noise model for the proposed new AC plant installation

8.0 ENVIRONMENTAL NOISE IMPACT ASSESSMENT

8.1 BS4142: 2014 A1:2019 Assessment

8.1.1 AC Units Operating in “Standard” Mode

Appendix C provides a CadnaA noise maps of the site and the surrounding environment, presenting the Specific Sound Levels expected at each of the surrounding noise sensitive receptor locations.

Table 7 overleaf presents the predicted overall A-weighted, BS4142-defined ‘Rating Level’ at the identified noise sensitive receptors.

The following BS 4142:2014+A1:2019 defined “acoustic character corrections” have been applied to the predicted Specific Sound Levels in order to determine the overall noise Rating Level at each noise sensitive residential receptor:

- Where the predicted Specific Sound Level is less than 10dB below the pre-existing Background Sound Level, no acoustic character correction has been applied.
- Elsewhere, a +2dB correction has been applied to account for a “just perceptible” tone associated with the external AC units.

The potential acoustic character associated with the acoustically intermittent operation of the plant has also been considered as part of the assessment, although no specific correction has been applied.

Given that there are eleven AC units proposed, the combined noise level produced by all units simultaneously operating will be c.10dB(A) higher than that produced by any individual AC unit, and as such the intermittent character of the noise of individual units switching on/off is not expected to be discernible when the majority of the plant is operating.

The acoustic character associated with the intermittent operation of units could be expected to be more discernible when the majority/all of the other AC units are switched off. However, in this instance, the Specific Sound Level generated from the plant would be lower and would not result in a higher Rating Level impact than that expected when all AC are operating.

For example, applying an additional correction of +3dB for the intermittent operation of AC units switching on/off but assuming that only two of the eleven AC units are operating (-7dB correction) would result in a lower Rating Level (i.e. 4dB lower) at the nearest noise sensitive premises than that expected when all AC units are operating simultaneously.

Noise Sensitive Receptor	Assessment Period	Predicted Specific Level, dB $L_{Aeq,T}$	Predicted Rating Level, dB $L_{Ar,Tr}$	Maximum Permissible Noise Rating Level limits, dB $L_{Ar,Tr1}$	Rating Level sub. Background $\pm$ dB
A. Zenith Building. (south of the plant area)	Daytime (07:00 – 23:00 Hours)	72	74	48	+26
	Night Time (23:00 – 07:00 Hours)	72	74	47	+27
B. 40 Spring Gardens (south of the Zenith Building)	Daytime (07:00 – 23:00 Hours)	25	25	48	-23
	Night Time (23:00 – 07:00 Hours)	25	25	47	-22
C. 24 – 30 Brown Street (west of the Zenith Building)	Daytime (07:00 – 23:00 Hours)	51	53	48	+5
	Night Time (23:00 – 07:00 Hours)	51	53	47	+6
D. 19 Spring Gardens (east of the Zenith Building)	Daytime (07:00 – 23:00 Hours)	52	54	48	+6
	Night Time (23:00 – 07:00 Hours)	52	54	47	+7

Table 7: BS4142 summary assessment (office receptors) – AC units operating in “Standard” mode

Table 7 shows that the calculated and assessed Rating Level at Receptor A (Zenith Building) exceeds the maximum permissible Noise Rating Level limit by up to +27dB. It must be noted however that the AC units are located just c.700mm distance from the façade the Zenith Building and are proposed in service of this building.

At all other receptor locations, the Rating Level exceeds the derived maximum permissible Noise Rating Level limits by up to +7dB at Receptor C (19 Spring Gardens). As such, further noise mitigation shall be required in order to be capable of meeting the maximum permissible Noise Rating Level limits as imposed by MCC guidance.

8.1.2 AC Units Operating in “Silent 3” Mode

Sol have liaised directly with the project’s M&E Consultant (Futureserv Ltd) to discuss possible options for noise mitigation. It was agreed that the use of localised screening is not expected to be particularly effective given that the worst affected noise sensitive receptor (Zenith Building) overlooks the plant area.

Given the already restricted air flow to the proposed plant area and limited space available, it would not be practicable to install an acoustic enclosure to the AC units. Therefore, any proposed noise mitigation would need to be applied to the AC units at source. The proposed units Samsung AM260AXVGGH/EU are able to operate in three “silent” modes (the corresponding noise data for the three silent modes are provided within Table 2 in report Section 3.2).

Table 8 overleaf presents the predicted overall A-weighted, BS4142-defined ‘Rating Level’ at the identified noise sensitive receptors with all eleven AC units operating in “Silent 3” mode (i.e. equates to a sound pressure level of 49dB $L_{Aeq,T}$ at one metre distance, per unit).

Noise Sensitive Receptor	Assessment Period	Predicted Specific Level, dB $L_{Aeq,T}$	Predicted Rating Level, dB $L_{Ar,Tr}$	Maximum Permissible Noise Rating Level limits, dB $L_{Ar,Tr1}$	Rating Level sub. Background $\pm$ dB
A. Zenith Building. (south of the plant area)	Daytime (07:00 – 23:00 Hours)	57	59	48	+11
	Night Time (23:00 – 07:00 Hours)	57	59	47	+12
B. 40 Spring Gardens (south of the Zenith Building)	Daytime (07:00 – 23:00 Hours)	11	11	48	-37
	Night Time (23:00 – 07:00 Hours)	11	11	47	-36
C. 24 – 30 Brown Street (west of the Zenith Building)	Daytime (07:00 – 23:00 Hours)	36	38	48	-10
	Night Time (23:00 – 07:00 Hours)	36	38	47	-9
D. 19 Spring Gardens (east of the Zenith Building)	Daytime (07:00 – 23:00 Hours)	37	39	48	-9
	Night Time (23:00 – 07:00 Hours)	37	39	47	-8

Table 8: BS4142 summary assessment (office receptors) – AC units operating in “Silent 3” mode

Table 8 shows that noise from the proposed plant is still expected to exceed the maximum permissible Rating Level limits by up to +12dB at the adjacent offices within the Zenith Building. In BS 4142 2014: +A1: 2019 terms, the predicted Rating Level exceeds the Background Sound level by +7dB. This corresponds to an indication of an ‘... *adverse impact, depending on the context*...’.

At all other receptor locations, noise from the proposed plant is not expected to exceed maximum permissible Rating Level limits as imposed by MCC guidance. In each case, the predicted Rating Level is significantly below the Background Sound level, which is an indication of a ‘... *low impact, depending on the context*...’ in BS 4142: 2014 +A1: 2019 terms.

It shall be noted that the predicted BS4142 defined magnitude of the impact is subject to the consideration of context. BS4142 states the following with regards to context:

‘... Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following...

...3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i) facade insulation treatment;

ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

iii) acoustic screening ...'

In this case, the worst affected noise sensitive receptor is the existing offices which form part of the Zenith Building. The occupants are expected to be less sensitivity to noise from the proposed AC units, which are provided in service of the building, and occupants are likely to expect that noise from the AC units will be dominant source of noise intrusion given their proximity. Taking the context in which the sound occurs in to consideration, it is anticipated that noise from the new AC units (when operating in "Silent 3" mode) will result in a low impact occupant of the Zenith Building, provided that appropriate internal noise levels for an office environment are achieved.

In full accordance with BS 4142: 2014 +A1: 2019 methodology, it is therefore appropriate to consider the anticipated internal ambient noise level within the existing Zenith Building offices as located adjacent to the proposed plant area.

The specification of the existing external glazing to the offices is not currently known to Sol but it was noted during a site inspection that the existing glazing are fully sealed double glazed units without any trickle ventilation (all offices are wholly mechanically ventilated). For the purposes of this assessment, it is therefore conservatively assumed that standard thermal insulating glazing (4mm glass / 12 mm air gap / 4 mm glass) has been installed; this typically provides a sound insulation performance of c.27dB $R_w + C_{tr}$ (albeit a higher acoustic specification is likely).

Based upon the predicted external sound pressure level from the proposed AC units and assuming that the existing glazing provides a minimum sound insulation performance of c.27dB $R_w + C_{tr}$, an internal sound pressure level of c.33dB $L_{Aeq,T}$ (c.NR28) could be expected within the offices directly adjacent to the proposed plant area. This predicted internal ambient sound level is below the BS8233:2014 defined design ranges for speech, telephone communications and work requiring concentration as set out in Table 6. Therefore, whilst noise from the proposed plant is likely to be audible within the adjacent offices within the Zenith Building, it is not expected to be of a sufficient level to affect typical office activities.

Additionally, it is essential that all AC units are wholly vibration isolated from all building structures and thus must be mounted on appropriate anti-vibration ("AV") mountings in every instance. The specification of the AV mountings is outside the scope of this report.

Whilst not deemed necessary at this stage, the resultant noise impact can be further limited by considering the internal layout of the adjoining office space i.e. locate noise sensitive office areas, such as meeting rooms etc. away from the plant area.

As a result, noise from the proposed AC units on the surrounding noise sensitive receptors (which in this case comprise of commercial offices only) is expected to be low.

8.2 Uncertainty

Section 10 of BS4142: 2014 states the following with regards to uncertainty:

‘... Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty. Report the level and potential effects of uncertainty...’

In accordance with the requirements of BS 4142: 2014: +A1: 2019, Sol have undertaken the following steps to limit the level of uncertainty in the acoustic assessment:

1. All noise measurements have been carried out using Type 1 Precision Grade noise mounting equipment. All noise measuring instruments have traceable laboratory calibration certification.
2. All environmental noise level measurements were accompanied by continuous meteorological measurements as conducted at, or close to, the measurement position in order to ensure that the measurement data was not adversely affected by unfavourable weather conditions. Periods of adverse weather conditions have been excluded from the assessment.
3. Calculations have been conducted in line with appropriate and nationally recognised acoustic standards (ISO 9613-2), and using proprietary 3D noise modelling software, CadnaA.
4. The assessment assumes downwind propagation in all cases as this represents the worst case.

9.0 CONCLUSION

Sol Acoustics Ltd has been appointed by Bet365 Group Ltd to provide an environmental noise impact assessment for proposed new plant to be installed on the first floor roof of the existing Zenith Building as located at 26 Spring Gardens, Manchester M2 1AB

The pre-existing environmental noise climate has been determined by direct measurement at the existing noise sensitive receptors. Using this benchmark environmental noise measurement data, it has been possible to set appropriate environmental noise limits for the site, all as based on applicable guidance provided by British Standard BS 4142: 2014 +A1: 2019 and British Standard B8233: 2014, and also specific guidance as provided by the Environmental Protection Team of Manchester City Council.

The environmental noise emissions from the site, as arising from the proposed cumulative operation of all plant and associated processes, has been assessed and reported herein, as modelled using proprietary “CadnaA” 3D noise modelling software.

This acoustic assessment considers the environmental noise level impacts arising from all new proposed externally sited plant at the worst affected noise sensitive receptors (which in this case comprise of commercial offices only), comparing the predicted and assessed environmental noise Rating Level as arising from the Development with the derived maximum permissible Noise Rating level limits as determined in accordance with guidance as provided by the Environmental Protection Team of Manchester City Council.

It is the conclusion of this environmental noise assessment that the total, aggregate environmental noise impact arising from the operation of the proposed plant shall not exceed the derived maximum permissible noise Rating Level limits at off-site receptor locations or result in an adverse impact on the office spaces within the Zenith Building, provided that noise from each of the proposed AC units does not exceed an emitted sound pressure level of 49dB $L_{Aeq,T}$ at 1 metre distance (per unit), free field as during any operation (i.e. equivalent to each of the proposed Samsung AM260AXVGGH/EU air cooling units operating to the manufacturer’s assigned “Silent 3” mode).

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 considers the change in sensitivity of the human ear at varying frequencies.
Sound Pressure Level	L_{pA}	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_{WA}	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_r
Rating Level	L_{Ar,T_r}	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

NOISE SURVEY DETAILS AND SUMMARY RESULTS

LOCATION

Spring Gardens, Manchester

DATES, TIMES, AND WEATHER CONDITIONS

Date	Daytime (07:00 hours – 23:00 Hours)				Night Time (23:00 hours – 07:00 hours)			
	Temp, °C	Rain, mm/h	Wind Direction	Average Wind Speed, m/s	Temp, °C	Rain, mm	Wind Direction	Average Wind Speed, m/s
20/01/2023	5	0.0	SE	1.1	2	0.0	SE	0.6
21/01/2023	3	0.0	SE	0.4	2	0.0	SE	0.3
22/01/2023	5	0.0	SE	0.4	6	0.0	SE	0.4
23/01/2023	5	0.0	SE	0.4	-	-	-	-

PERSONNEL

Brian Horner – Sol Acoustics

Chris Downing – Sol Acoustics

INSTRUMENTATION

Measurement Position 1

01dB Cube Sound level meter (serial no. 12069)

01dB Pre22 Microphone preamplifier (serial no. 1936010)

GRAS 40CD Microphone capsule (serial no. 292577)

01dB Cal21 acoustic calibrator (serial no. 34375244)

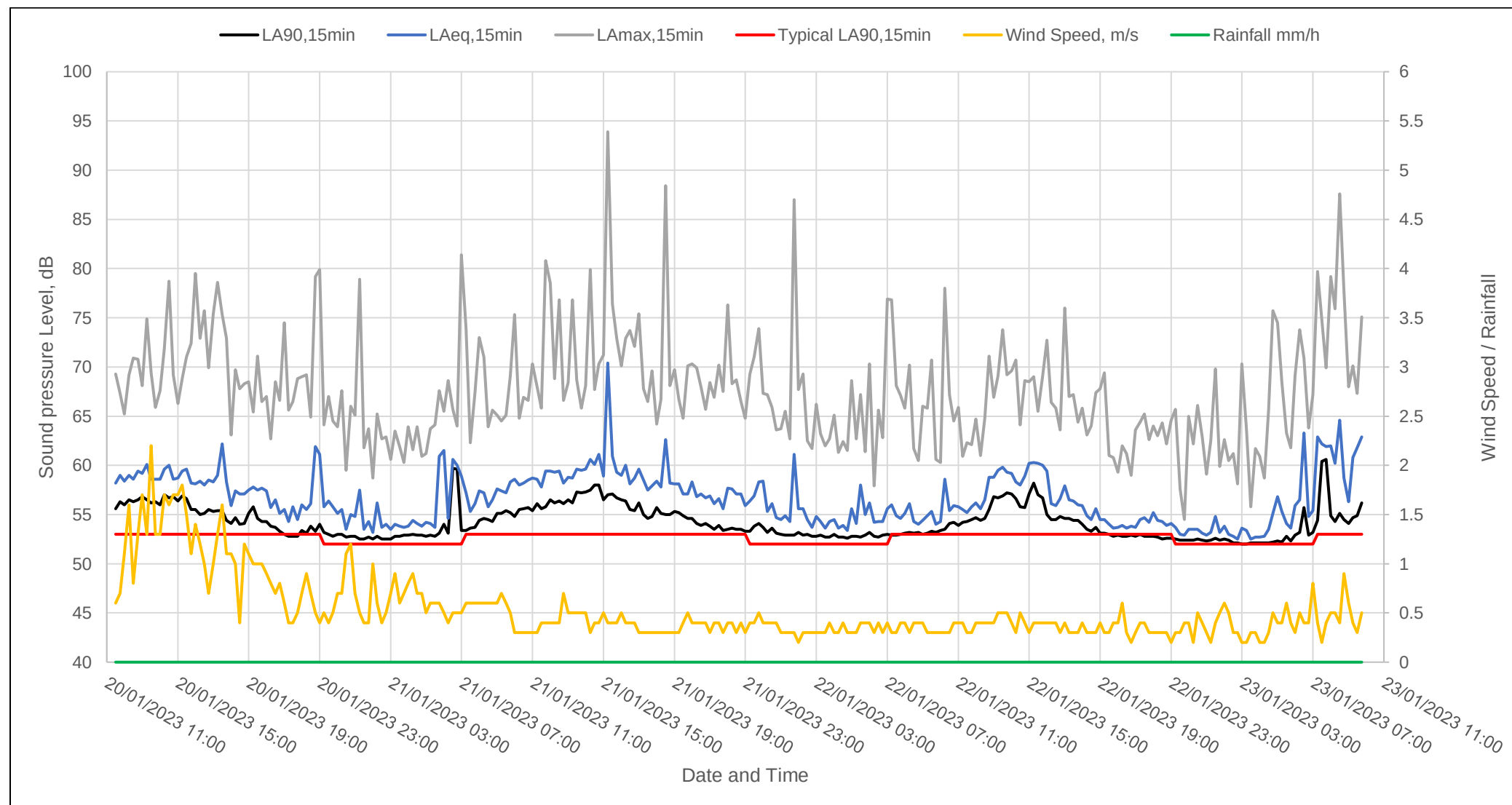
Vaisala WXT520 Weather Station

METHODOLOGY

Before and after the measurements the noise monitoring equipment was calibrated to an accuracy of ± 0.4 dB using the Cal 21 Calibrator. The calibrator produces a sound pressure level of 94 dB re 2×10^{-5} Pa @ 1 kHz.

MEASUREMENT RESULTS

Graphs B1 summarise the broadband A-weighted results obtained at unattended measurement position 1.



Graph B1: Environmental noise time history, Measurement Position 1, 20 to 23 January 2023

APPENDIX C

ENVIRONMENTAL NOISE MODELLING RESULTS

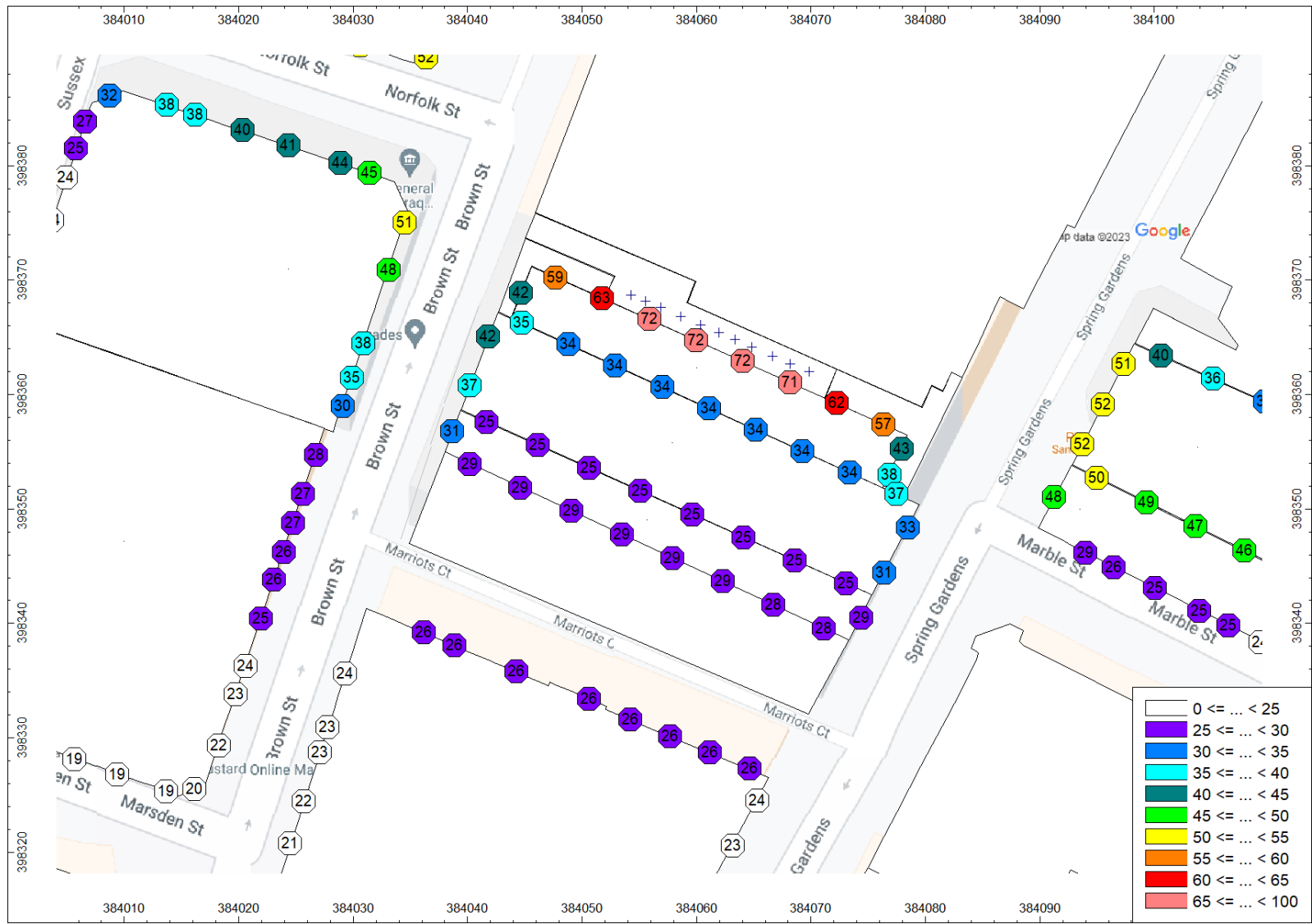


Figure D1: Predicted Specific Sound Level on the façades of the surrounding offices (free field) – AC units operating in “Standard” mode, dB $L_{Aeq,1hour}$

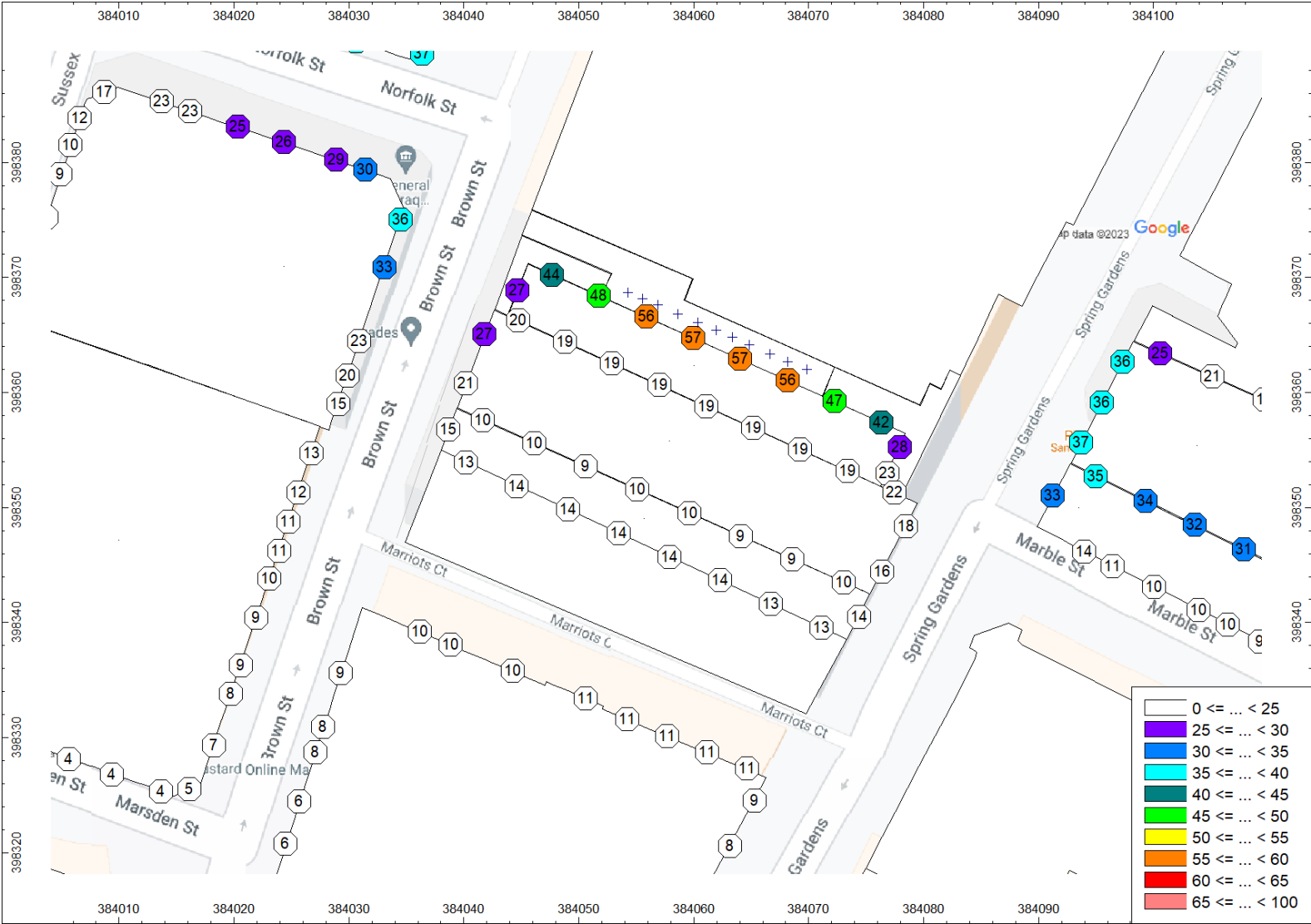


Figure D2: Predicted Specific Sound Level on the façades of the surrounding offices (free field) – AC units operating in “Silent 3” mode, dB $L_{Aeq,1hour}$

APPENDIX D
DETAILS AND PROFESSIONAL QUALIFICATIONS OF CONTRIBUTING SOL STAFF

Company Details

Name of Organisation: Sol Acoustics Limited

Status: Private Limited Company

Address: Unit 11, Brunel Court,
Gadbrook Park
CW9 7LP

Telephone Number: 01565 632535

E-Mail: info@solacoustics.co.uk

Nature of Business: Acoustic Consultancy

Directors: Simon Ferenczi

Company Registration Number: 4218702

Key Technical Personnel & Qualifications

Simon Ferenczi	Institute of Acoustics Diploma (with additional modules), MIOA
Brian Horner	BSc (Hons), MIOA

Company Accreditations

Sol Acoustics is a member of The Association of Noise Consultants (ANC) and is qualified to perform sound insulation testing under the ANC's accredited testing scheme to demonstrate compliance with the requirements of Approved Document E of the Building Regulations.