



Noise Impact Assessment

O2 Ritz Manchester

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Noise Impact Assessment

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Noise Impact Assessment

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1 Introduction

1.1 Background

- 1.1.1 Stantec UK Limited (Stantec) has been commissioned by Academy Music Group Limited to undertake a noise impact assessment in relation to installation of building services at the O2 Ritz, Manchester.
- 1.1.2 It is understood that four heating and cooling units are to be installed in blocks of two units on the roof the O2 Ritz.
- 1.1.3 An environmental sound survey has been undertaken by Stantec, to establish the existing environmental sound levels at a position considered representative of the nearest noise sensitive receptors.
- 1.1.4 The results of the environmental sound survey have been used to establish background sound levels which form the basis of our noise impact assessment.
- 1.1.5 This report presents the relevant results of the environmental sound surveys, details of our assessment and proposed acoustic mitigation as required to achieve the relevant criteria.
- 1.1.6 Advice and recommendations within this report will need to be integrated, coordinated and ratified with the design by the principal designer and design team to ensure that all other design interfaces, buildability, workmanship and other requirements are considered. Any sketches or drawings provided illustrate acoustic principles only.
- 1.1.7 An explanation of the acoustic terminology used in this report is included in **Appendix A**.

1.2 Statement of Competency

- 1.2.1 This report has been prepared by George Webb who has 1 year of experience in acoustics consultancy and undertaking noise impact assessments. George has a Bachelors in Acoustics with Music (BSc) and is an Associate Member of the Institute of Acoustics.
- 1.2.2 The environmental sound survey was also conducted by George Webb, who has 1 year of experience in undertaking noise impact assessments and sound surveys.
- 1.2.3 This report, assessment and calculations have been reviewed by Paul Taylor who has 13 years of experience in acoustics consultancy and undertaking noise impact assessments. Paul has a Masters in Acoustical Engineering (MEng), is a Chartered Engineer and is a Member of the Institute of Acoustics.

1.3 Scope of Report

- 1.3.1 The scope of this report is to:
- Establish, by means of a 48-hour daytime and night-time environmental sound survey, the existing environmental sound levels at one selected location considered representative of the nearest noise sensitive receptor.
 - Determine relevant plant noise emission criteria based on Local Authority requirements and the results of the environmental sound survey.
 - Undertake a detailed assessment of the likely airborne noise propagation to nearby noise sensitive receptors and determine the required acoustic performance for any required items of acoustic mitigation to achieve the proposed criteria.



1.4 Site Description and Location

- 1.4.1 The installation site of the proposed building services is the roof of the O2 Ritz, Manchester, located just north of Whitworth Street West and falling within the jurisdiction of Manchester City Council.
- 1.4.2 The installation site consists of flat, raised roofing to the south, and a pitched roof with a flat perimeter at a lower level to the north. The site is bound by Rochdale Canal to the north, Whitworth Street West to the south, 51 Whitworth Street West to the east and The Lock Building to the west.
- 1.4.3 The location of the installation site is detailed in **Figure 1**.

Figure 1. Site Location Plan



Esri Community Maps Contributors, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Maxar, Microsoft

2 Assessment Criteria

2.1 National Planning Guidance

The National Planning Policy Framework (NPPF)

- 2.1.1 The revised National Planning Policy Framework (NPPF) was published in December 2024. In respect of noise, paragraph 187 states that in relation to conserving and enhancing the natural environment:

“Planning policies and decisions should contribute to and enhance the natural and local environment by...

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ... noise pollution...”

- 2.1.2 In relation to ground conditions and pollution, paragraph 198 states that:

“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 quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...”

- 2.1.3 The NPPF indicates that the Noise Policy Statement for England (NPSE) (Defra, 2010) should be used to define the “significant adverse impacts”.

- 2.1.4 In relation to the integration of new development with existing premises and community facilities, paragraph 200 states that:

“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.”

Planning Practice Guidance: Noise

- 2.1.5 The Planning Practice Guide (PPG) was launched in 2014 (with the latest update to noise aspects being in 2019) and provides additional guidance and interpretation to the Government’s strategic policies outlined within the NPPF in a regularly updated, web-based resource.

- 2.1.6 Paragraph: 001 Reference ID: 30-001-20190722, “When is noise relevant to planning?” states:

“Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When



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preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.”

- 2.1.7 PPG provides advice on how noise impacts should be determined. Paragraph: 003 Reference ID: 30-003-20190722 states the plan-making and decision makes processes should consider:
- whether or not a significant adverse effect is occurring or likely to occur;
 - whether or not an adverse effect is occurring or likely to occur; and
 - whether or not a good standard of amenity can be achieved.
- 2.1.8 Paragraph 003 Reference ID: 30-003-20190722 also refers to the Noise Policy Statement for England (NPSE), in stating that the overall effect of the noise exposure (including the impact during the construction phase where applicable) should be identified against the significant observed adverse effect level (SOAEL) and the lowest observed adverse effect level (LOAEL) for the given situation.
- 2.1.9 It provides more descriptive detail for the definitions of NOEL, LOAEL and SOAEL but refrains from using numerical values. A summary of the descriptions is provided within the noise exposure hierarchy table in Paragraph: 005 Reference ID: 30-005-20190722 and reproduced in Table 1.



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Table 1. Noise Exposure Hierarchy Table

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level (NOEL)			
Not present	No effect	No observed effect	No specific measures required
No Observed Adverse Effect Level (NOAEL)			
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 (LOAEL)			
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 (SOAEL)			
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

2.1.10 Paragraph: 006 Reference ID: 30-006-20190722 provides guidance factors which influence noise impact. It states that *“The subjective nature of noise means there is not a simple relationship between noise levels and the impact on those affected.”*

2.1.11 It goes on to state that the impact will depend on how various factors combine in any particular situation. These factors include:

- Source and absolute level of the noise together with the time of day it occurs.
- How new noise making source relates to the existing sound environment.
- Number and pattern of noise events (for non-continuous sound).



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- Frequency content (i.e. whether the noise contains particular high or low frequency content) and general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features).
- The extent to which the local arrangement of buildings, surfaces and green infrastructure reflects or absorbs noise.

2.1.12 PPG provides more specific factors to consider, when relevant, including:

- The cumulative impact of multiple sources of noise.
- The provision of alternative ventilation if proposed mitigation relies on closed windows most of the time.
- In situations where noise sensitive locations are already subject to high noise levels, a development which is expected to cause even a small increase in the overall noise level may result in a significant adverse effect, even though little to no change in behaviour would be likely to occur.
- Noise Action Plans and Important Areas (as defined in the Environmental Noise Directive) should be taken into account.
- The effect of noise on wildlife. Consideration should be given to the potential effects of noisy development on international, national and locally designated sites of importance for biodiversity.
- Some commercial developments can have particular impacts in the evening and at night, when they are trading at their peak (e.g. restaurants, hot food takeaways, night clubs and public houses). This includes noise generated within the premises as well as noise that may be made by customers within the vicinity.

2.1.13 Paragraph: 009 Reference ID: 30-009-20190722 advises on how the risk of conflict between new development and existing businesses or facilities can be addressed. It states that:

“Development proposed in the vicinity of existing businesses, community facilities or other activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme.

In these circumstances the applicant (or ‘agent of change’) will need to clearly identify the effects of existing businesses that may cause a nuisance (including noise, but also dust, odours, vibration and other sources of pollution) and the likelihood that they could have a significant adverse effect on new residents/users. In doing so, the agent of change will need to take into account not only the current activities that may cause a nuisance, but also those activities that businesses or other facilities are permitted to carry out, even if they are not occurring at the time of the application being made.

The agent of change will also need to define clearly the mitigation being proposed to address any potential significant adverse effects that are identified. Adopting this approach may not prevent all complaints from the new residents/users about noise or other effects, but can help to achieve a satisfactory living or working environment, and help to mitigate the risk of a statutory nuisance being found if the new development is used as designed (for example, keeping windows closed and using alternative ventilation systems when the noise or other effects are occurring).

It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints.”

2.1.14 Paragraph: 010 Reference ID: 30-010-20190722 provides advice on how the adverse effects of noise can be mitigated which are dependent on the type of development being considered



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and the character of the proposed location. Four broad classifications of mitigation are defined as follows:

- Engineering: reducing the noise generated at source and/or containing the noise generated;
- Layout: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose built barriers, or other buildings;
- Using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night; and
- Mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building.

2.1.15 Paragraph: 011 Reference ID: 30-011-20190722 advises that the impact of noise may be partially offset if the residents of those dwellings have access to one or more of the following:

- A relatively quiet façade (containing windows to habitable rooms) as part of their dwelling.
- A relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects.
- A relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings.
- A relative quiet, protected, external publicly accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).

Noise Policy Statement for England

2.1.16 The Noise Policy Statement for England (NPSE) was published in March 2010 and clarifies the underlying principles and aims of existing policy documents that relate to noise. It also sets out the long-term vision of Government noise policy which is: *“to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”*.

2.1.17 The NPSE states that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and its effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

2.1.18 Paragraphs 2.20 and 2.21 define ‘significant adverse’ and ‘adverse’ impacts as applied to noise as follows:

“There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.



Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.”

2.1.19 Paragraph 2.22 clarifies that:

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

2.1.20 The three aims of the NPSE are defined as follows:

“Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

“Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.” (Note: Applies when the impact lies somewhere between the LOAEL and SOAEL and does not mean that adverse effects cannot occur).”

“Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

2.1.21 It is necessary to define the LOAEL and SOAEL for the potential source of noise so that the potential impact can be related to the aims and requirements of the NPSE.

2.2 Local Planning Guidance

Manchester City Council Planning and Noise Technical Guidance October 2022

2.2.1 The Planning and Noise Technical Noise, in conjunction with the “Our Manchester Strategy” document, *“outlines what is expected in relation to current guidance and policy with the aspiration that new developments achieve the highest possible standards”*.

2.2.2 With regards to noise from industrial and commercial sources, it states:

“BS4142 should be used to assess the likely impact of noise from industrial and commercial sources at noise sensitive premises.”

“The development should be 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.”

2.3 Standards

British Standard 4142:2014 + A1 2019 ‘Methods for Rating and Assessing Industrial and Commercial Sound’

2.3.1 British Standard 4142:2014 + A1 2019 “Methods for rating and assessing industrial and commercial sound” (BS4142) describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard use outdoor



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sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

- 2.3.2 The standard is used to determine the rating levels for sources of sound of an industrial and/or commercial nature and the ambient, background and residual sound levels at outdoor locations. These levels could be used for the purposes of investigating complaints; assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. However, the determination of noise amounting to a nuisance is beyond the scope of the standard.
- 2.3.3 The standard should not be used to assess sound from the passage of vehicles on public roads and railway systems; recreational activities; people among other sources; and other sources falling within the scopes of other standards or guidance. The standard cannot be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels.
- 2.3.4 The procedure contained in BS 4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur.
- 2.3.5 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering the following:
- Typically, the greater this difference, the greater the magnitude of the impact;
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context; and
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
 - 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.
- 2.3.6 Where the initial estimate of the impact needs to be modified due to the context, the following factors should be considered:
- The absolute level of sound, as BS 4142 notes that the magnitude of the overall impact might be greater where the residual sound level is high than for an acoustic environment where the residual sound level is low;
 - The character and level of the residual sound compared to the character and level of the specific sound;
 - 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:
 - Façade insulation treatment;
 - Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
 - Acoustic screening.



2.4 Proposed Assessment Criteria

- 2.4.1 The proposed effect levels, based on the difference between the rating level of proposed plant and the existing measured background sound levels, are identified in Table 2. Both the Rating Level and the Background Sound Level should be determined at a location considered representative of the worst affected noise sensitive residential receptor (expressed as a façade incident sound level). This is based on BS 4142:2014+A1:2019 and Manchester City Council Guidance.
- 2.4.2 The suggested effect levels are preliminary, as the final determined effect level includes contextual factors.

Table 2. Proposed Preliminary Effect Levels

Effect Level	Difference Between Rating Level (L_{Ar,T_r}) and Background Sound Level ($L_{A90,T}$), dB
Significant adverse impact, depending on the context	$\geq +10$
Adverse impact, depending on the context	$\geq +5$
Low impact, depending on the context	≥ 0
No impact	≥ -5



3 Environmental Sound Survey

3.1 Procedure

- 3.1.1 An unattended environmental sound survey was undertaken between approximately 10:30 hours on Monday 31 March 2025 and approximately 10:00 hours on Wednesday 2 April 2025.
- 3.1.2 Measurements were made over 15-minute intervals of the L_{Aeq} , L_{A90} , and L_{AFMax} sound levels.
- 3.1.3 The sound level meter was located in an environmental case. The microphone was connected to the meter via an extension cable and fitted with the manufacturer's windshield.
- 3.1.4 The instrumentation used in the survey (including calibration information) is listed in **Appendix B**.
- 3.1.5 Field calibrations were performed before and after the measurements with no significant fluctuations recorded (< 0.5 dB). Calibration certificates are available upon request.

3.2 Measurement Location

- 3.2.1 Sound measurements were undertaken at a single position on site, considered to be representative of the typical background sound levels at the worst-affected noise sensitive receptors. The measurement position is detailed in Figure 2 and detailed in Table 3.

Figure 2. Environmental Sound Measurement Location



Esri Community Maps Contributors, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Maxar, Microsoft



Table 3. Description of Measurement Location

Position	Description
LT1	The microphone was located in a free field position to the southeast boundary of the roof. The microphone was 2 m above the roof.

3.3 Meteorological conditions

- 3.3.1 Due to the unattended nature of the survey it is not possible to accurately comment on the meteorological conditions throughout the entire survey period. However, based on a review of publicly available weather forecasts and observations at the beginning and end of the survey period, the weather conditions are detailed in Table 4.

Table 4. Meteorological Conditions

Date	Average Temperature (°C)	Total Precipitation (mm)	Maximum Wind Speed (m/s)	Average Wind Direction
31/03/2025	11	0.0	1.8	ENE
01/04/2025	12	0.0	2.4	ENE
02/04/2025	11	0.0	2.6	E

- 3.3.2 These conditions are considered suitable for obtaining representative sound level measurements.

3.4 Environmental Sound Climate

- 3.4.1 Due to the unattended nature of the survey, it is not possible to accurately comment on the dominant noise sources or specific noise events during the entire survey period. However, at the beginning and end of the survey period, it was noted that on-site were sound levels were dominated by vehicular movements on the surrounding road network (specifically, Whitworth Street West) and rail movements at Oxford Road Station.

3.5 Assumptions/Limitations

- 3.5.1 The engineer noticed nothing unusual in terms of the sound climate at the time of the survey. This report refers, with the limitations stated, to the environment of the site in the context of the surrounding area at the time of inspections. Environmental conditions can vary. No warranty is given as to the possibility of changes in the environment of the site and surrounding area at different times.



4 Environmental Sound Survey Results

- 4.1.1 The results of the survey are presented in the time history graphs in **Appendix C** and statistical L_{A90} histograms are presented in **Appendix D**. A summary of the survey results is provided in Table 5.

Table 5. Summary of Measured Environmental Sound Survey Results – LT1

Date	Period,	Measured Sound Level (dB)				
		$L_{Aeq,T}$	Typical L_{AFMax}^*	$L_{A90,15min}$		
				Range	Mean	Median
31/03/2025	Daytime (07:00 – 23:00 hours)	63	-	52-62	56	56
	Night-time (23:00 – 07:00 hours)	58	72	44-56	49	47
01/04/2025	Daytime (07:00 – 23:00 hours)	62	-	53-62	56	56
	Night-time (23:00 – 07:00 hours)	58	70	45-56	49	48
02/04/2025	Daytime (07:00 – 23:00 hours)	64	-	56-59	57	57
* Based on the 10th highest measured L_{AFMax} level.						



5 Site Activity Noise Impact Assessment

5.1 Overview

- 5.1.1 An assessment of noise from the proposed plant has been undertaken in accordance with BS 4142:2014+A1:2019 and Manchester City Council guidance to determine the likely noise impact from the proposed development site on nearby noise-sensitive residential receptors.

5.2 Assessment Assumptions

- 5.2.1 The equipment could be operational between 11:00 – 04:00 depending on the cooling required within the venue. However, to provide a worst-case assessment it has been assumed the plant could be operational at any time.
- 5.2.2 **Appendix E** shows the site layout on which the assessment has been based.
- 5.2.3 It is understood that the units to be installed are:
- 2x DAIKIN RYYQ14U
 - 1x DAIKIN RYMQ16U
 - 1x DAIKIN RYMQ12U
- 5.2.4 Louvred acoustic enclosures for the units are also proposed. The minimum dynamic insertion loss to be achieved by the enclosures is set out in Table 6.

Table 6. Required Minimum Dynamic Insertion Loss – Acoustic Enclosure

	Minimum Dynamic Insertion Loss (dB) at Octave Band Centre Frequency (Hz)					
	125	250	500	1000	2000	4000
Acoustic Enclosure	0	3	6	3	1	0

5.3 Noise Sensitive Receptors

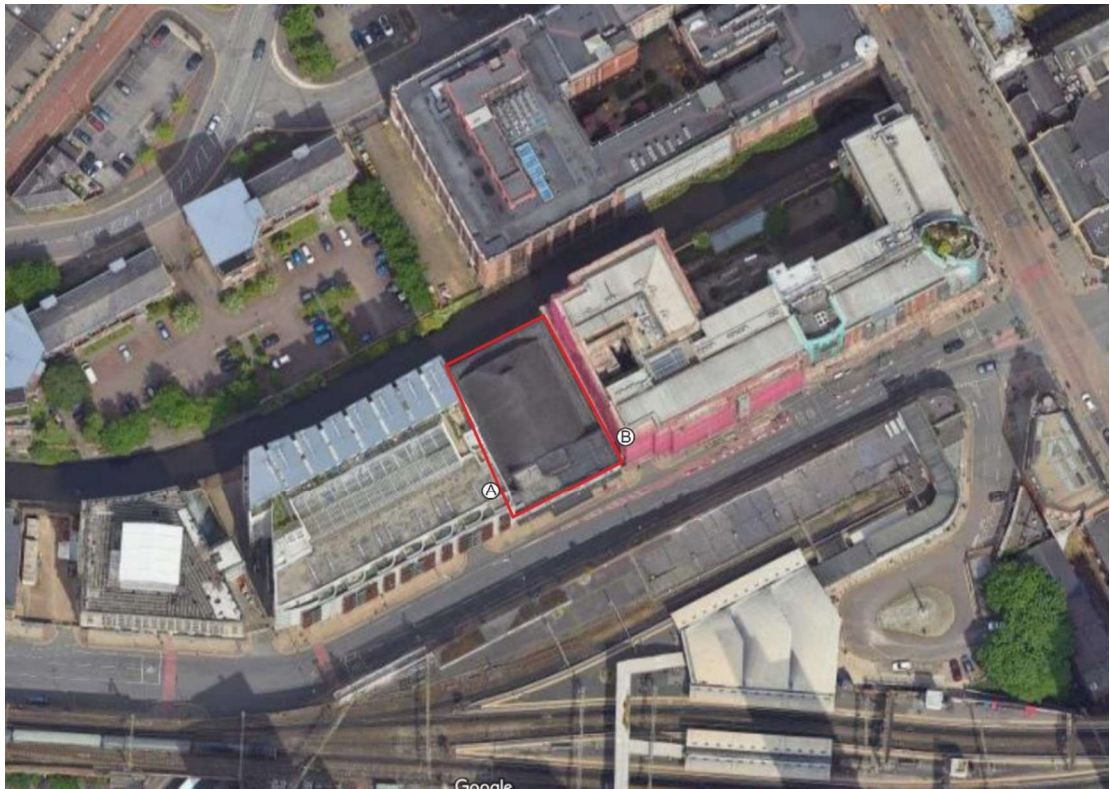
- 5.3.1 The noise-sensitive receptors considered within the assessment are described in Table 7 and identified in Figure 3. Where there are multiple receptors, they have been grouped, and the worst-case receptor considered in the assessment.

Table 7. Noise Sensitive Receptors

Receptor	Description
A	Residential dwellings immediately to the south-west of the site in The Lock Building
B	Residential dwellings immediately to the east of the site.



Figure 3. Approximate Location of Noise Sensitive Receptors



Esri Community Maps Contributors, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Maxar, Microsoft

5.4 Background Sound Levels

- 5.4.1 Typical background sound levels have been obtained from the environmental sound survey for the daytime and night-time operational period, calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS 4142:2014+A1:2019.
- 5.4.2 For the purpose of this assessment, background sound levels at the nearest noise-sensitive receptors during the operational period are detailed in Table 8.

Table 8. Background Sound Levels

Receptors	Operational Period	Typical Background Sound Level ($L_{A90,15mins}$), dB
Receptor A	Daytime (07:00 – 23:00 hours)	55
	Night-time (23:00 – 07:00 hours)	47
Receptor B	Daytime (07:00 – 23:00 hours)	55
	Night-time (23:00 – 07:00 hours)	47

5.5 Equipment Sound Levels and Calculations

- 5.5.1 The specific sound level associated with the heating and cooling units has been calculated from the manufacturer's datasheet. It is understood that the units are only to operate in cooling mode.



5.5.2 The manufacturer's data is presented in **Appendix F** and summarised in Table 9.

Table 9. Building Services Manufacturer's Data

Unit	Manufacturer's Sound Pressure Level (dB) at a Distance of 1m
DAIKIN RYMQ12U	75
DAIKIN RYYQ14U	60
DAIKIN RYMQ16U	63

5.6 Specific Sound Level

5.6.1 The calculated specific sound levels ($L_{Aeq,T}$) at the receptors are presented in Table 10.

Table 10. Calculated Specific Sound Levels

Receptors	Specific Sound Level ($L_{Aeq,T}$), dB	
	Daytime (07:00 – 23:00 hours) Reference Interval, $T = 1$ hour	Night-time (23:00 – 07:00 hours) Reference Interval, $T = 15$ minutes
A	42	42
B	40	40

5.7 Acoustic Feature Corrections

5.7.1 Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound levels and the background sound level. The calculated specific sound level should therefore be modified in accordance with the following guidance. Due to the type of assessment, the subjective method has been used to determine the type and level of acoustic feature corrections applied to each source.

5.7.2 Note 2 within Paragraph 9.2 of BS 4142:2014 + A1 2019 states:

"If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically. However, if any single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics."

5.7.3 BS 4142 offers the following guidance on the subjective assessment of acoustic feature corrections.

"Tonality

For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0 dB and + 6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to + 9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

Other Sound Characteristics



Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment a penalty of 3 dB can be applied.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time... If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

- 5.7.4 The octave-band manufacturer's data in **Appendix F** suggests tonality will not be identifiable at the receptor.
- 5.7.5 The units are not expected to generate impulsive sounds, as their primary sources of noise generation are pumps and fans.
- 5.7.6 The equipment duty is 'demand led' depending on the amount of cooling required. While this may lead to intermittent operation within an hour's reference period during the day, it is unlikely this will lead to intermittent operation within a 15-minute reference period during the night. There are also four units, and so the likelihood of all the units turning on or off at one time is low.
- 5.7.7 An acoustic feature correction for intermittency of +3 dB has been applied for the daytime period, but not for the night-time period.
- 5.7.8 No other acoustic feature corrections have been considered applicable, as the specific sound level is 5 dB or more below the typical background sound level and is therefore unlikely to be identifiable.

5.8 Preliminary Assessment Results

- 5.8.1 The results of the preliminary noise assessment of impact from proposed building services at nearby noise-sensitive receptors is presented in Table 11.

Table 11. Preliminary Assessment of Impact – Receptor A

Period	Combined Rating Level at Receptor ($L_{Ar,Tr}$), dB	Background Sound Level ($L_{A90,15minutes}$), dB	Excess of Rating over Background Sound Level
Daytime (07:00 – 23:00)	45	55	-10
Night-time (23:00 – 07:00)	42	47	-5

Table 12. Preliminary Assessment of Impact – Receptor B

Period	Combined Rating Level at Receptor ($L_{Ar,Tr}$), dB	Background Sound Level ($L_{A90,15minutes}$), dB	Excess of Rating over Background Sound Level
Daytime (07:00 – 23:00)	43	55	-12
Night-time (23:00 – 07:00)	40	47	-7

- 5.8.2 The above assessment details the results of the preliminary numerical assessment of sound levels at the nearest noise-sensitive receptors. The preliminary results show that the Rating level at Receptor A is likely to be 10 dB below the background sound level during the daytime



and 5 dB below the background sound level during the night-time. These levels are likely to result in no impact and are below levels in Manchester City Council guidance.

- 5.8.3 The preliminary results show that the Rating level at Receptor B is likely to be 12 dB below the background sound level during the daytime and 7dB below the background sound level during the night-time. These levels are likely to result in no impact and are below levels in Manchester City Council guidance.

5.9 Context and Mitigating Factors

- 5.9.1 Various factors influence the context of the assessment including the absolute level of sound, the character and level of the residual sound compared to the character and level of the specific sound and the sensitivity of the receptor.

Absolute Sound Level

- 5.9.2 The absolute level of sound in the assessment is not noted to be particularly high or low and therefore it is considered that this has no impact on context.
- 5.9.3 In relation to resultant internal sound levels within the nearest dwelling (Receptor A), based on a level difference of 10 dB being provided by an open window facing the sound source, internal sound levels at night would be 32 dB $L_{A,Tr}$. This level is likely to be at least 10 dB lower with closed windows, i.e. < 22 dB $L_{A,Tr}$. For context, BS 8233:2014 advises that internal sound levels should ideally not exceed 30 dB $L_{Aeq,8hours}$ during night-time hours (although it is noted that this should not be applied to the assessment of industrial sound sources and this level is only referred to for contextual purposes).

Character of the Residual Sound and Specific Sound

- 5.9.4 The area surrounding the proposed development is urban and therefore it is likely that activities from the proposed development would not be readily identifiable against existing sound sources at the proposed residential receptors. As such, the acoustic environment in the area is considered to have no impact on the context.

5.10 Uncertainty

- 5.10.1 Care has been taken to reduce uncertainty as far as reasonably possible. However, it should be recognised that in any environmental sound survey and assessment process uncertainty exists.

Uncertainty in Measured Sound Levels

- 5.10.2 Uncertainty in measured background sound levels can occur due to variation in temporary/non-representative meteorological conditions affecting the survey result. Uncertainty has been reduced within our assessment by obtaining background sound levels at locations considered representative of the nearest noise-sensitive receptors.

Uncertainty in the Operation Characteristics of the Proposed Plant

- 5.10.3 Plant emission levels in Table 9 are taken from the manufacturer's data sheet. The amount of uncertainty arising from using these values is therefore considered to be low.

Uncertainty in the Calculation Method

- 5.10.4 Results have been obtained by direct propagation calculations, taking into account barriers present between the units and the receptors.



5.11 Summary of Assessment

- 5.11.1 The result of the assessment indicates that the operation of the proposed development is likely to have no impact at any nearby receptors and complies with Manchester City Council guidance. Adverse impacts have been avoided, and so the proposed development is considered compliant with noise-related requirements in the National Planning Policy Framework.



6 Conclusions

- 6.1.1 Stantec has been commissioned by Academy Music Group Limited to undertake a noise impact assessment in relation to installation of building services at the O2 Ritz, Manchester.
- 6.1.2 This report assesses the potential noise impact of the proposed development on local noise-sensitive receptors.
- 6.1.3 An unattended environmental sound survey was undertaken in March 2025 to determine the current sound climate at the site at a location representative of the nearest dwellings.
- 6.1.4 An assessment has been undertaken of the proposed plant items. The numerical assessment indicates that the plant is likely to pose no impact to nearby receptors and is below limits in Manchester City Council guidance.



Appendix A Acoustic Terminology

Parameter	Description
Ambient Sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. Comprises of the residual sound and the specific sound when present.
Ambient Sound Level ($L_a = L_{Aeq,T}$)	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T .
A-Weighted Decibel (dBA)	A decibel level that has been corrected for the A-Weighting curve.
A-Weighting	Octave band and 1/3 octave band filters that correlate to the response of the human hearing system to sound pressure levels at different frequencies.
Background Sound	The level of sound measured in the absence of extraneous noise sources.
Background Sound Level ($L_{A90,T}$)	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T , measured using a fast time-weighting and quoted to the nearest whole number of decibels.
Daytime	BS 8233:2014 defines the daytime period as 07:00 to 23:00 hours.
Decibel (dB)	A logarithmic unit used to describe the ratio between the measured level and a reference level of 0 dB. The ratio can be sound pressure, intensity or power. The reference value for sound pressure is 20 μ Pa and for sound power is 1 pW.
Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$)	Value of the time-averaged A-weighted sound pressure level, in decibels (dB), of a continuous steady sound for the duration of the specified time interval, T .
Free-Field Level	The sound pressure level measured away from any reflective surfaces.
Frequency (f)	The number of cycles of pressure fluctuations within a given period of time. Measured in Hertz.
Hertz (Hz)	The unit of frequency or pitch of a sound. One hertz is equal to one cycle per second.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T . This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
L_{Amax}	The maximum A-weighted level measured during a given time period.
Octave Band	Band of frequencies where the upper limit of the band is twice the frequency of the lower limit. E.g., the 1000 Hz band contains noise energy at all frequencies from 707 to 1414 Hz.
Percentile Level ($L_{AN,T}$)	The A-Weighted Sound Pressure Level which is exceeded for N% of the specified time interval. E.g., the $LA_{90,1\text{hour}}$ is the A-weighted sound level exceeded for 90% of 1 hour/
Rating Level (L_{Ar,T_r})	Specific sound level plus any adjustment for the characteristic features of the sound.
Reference Time Interval (T)	Specified interval over which the specific sound level is determined.
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual Sound Level ($L_r = L_{Aeq,T}$)	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T .
Sound Pressure	The difference between the pressure caused by a sound wave and the ambient pressure of the medium the sound wave is passing through. Measured in Pascals.



Noise Impact Assessment

Sound Pressure Level (L_p)

The logarithm of the ratio of a given sound pressure (p) to the reference sound pressure (p_0). The reference value for sound pressure is 20 μPa . Defined as:

$$L_p = 20 \log \left(\frac{p}{p_0} \right)$$



Appendix B Instrumentation

B.1.1 The instrumentation used in the survey is listed in Table 13.

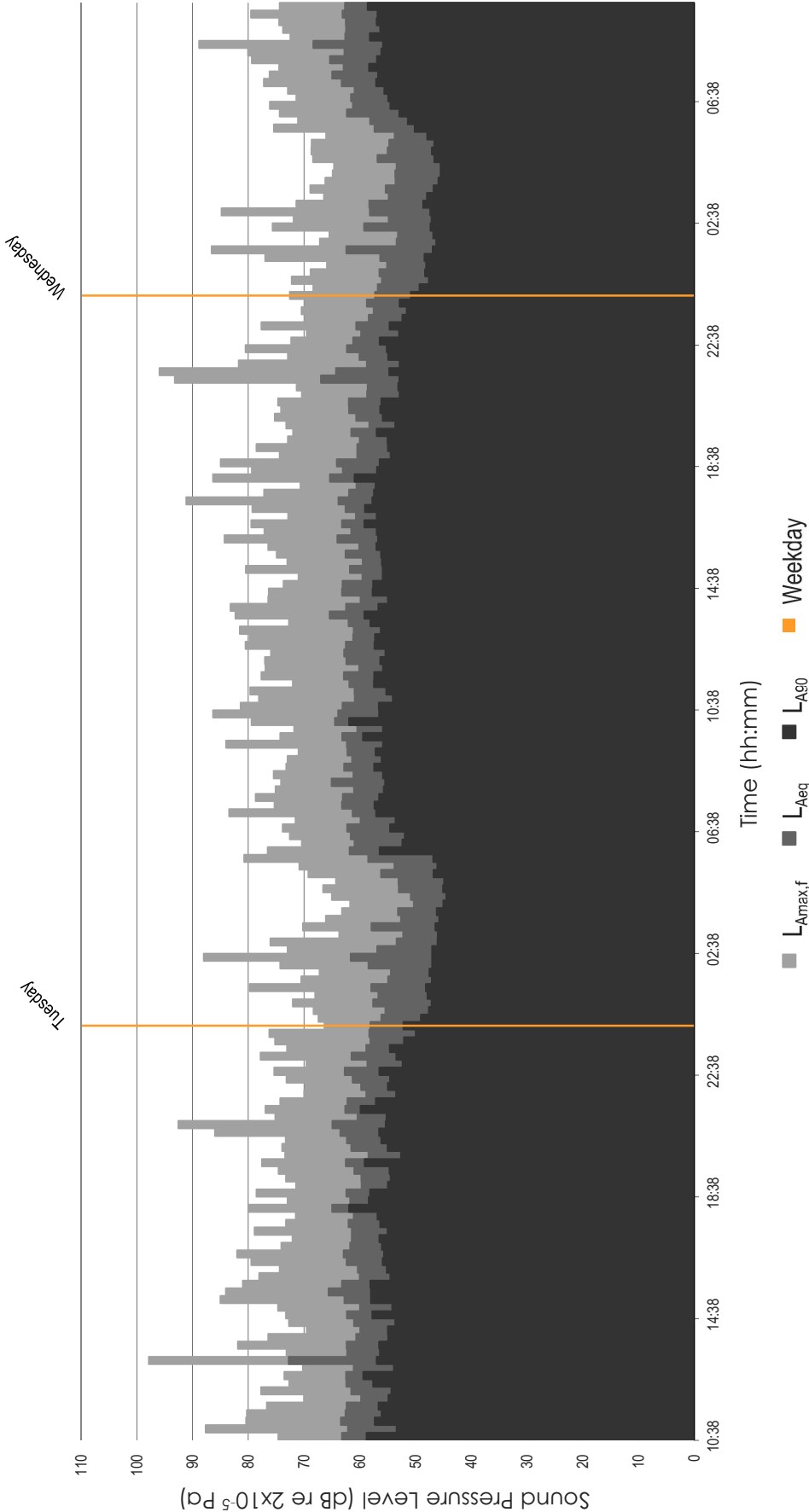
Table 13. Instrumentation

Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Level Meter	Brüel & Kjær	2250	2626232	26/01/2024
½" Pre-polarised microphone		4189	3148083	
Pre-amplifier		ZC0032	31157	
Sound Calibrator	Brüel & Kjær	4231	2619373	07/01/2025

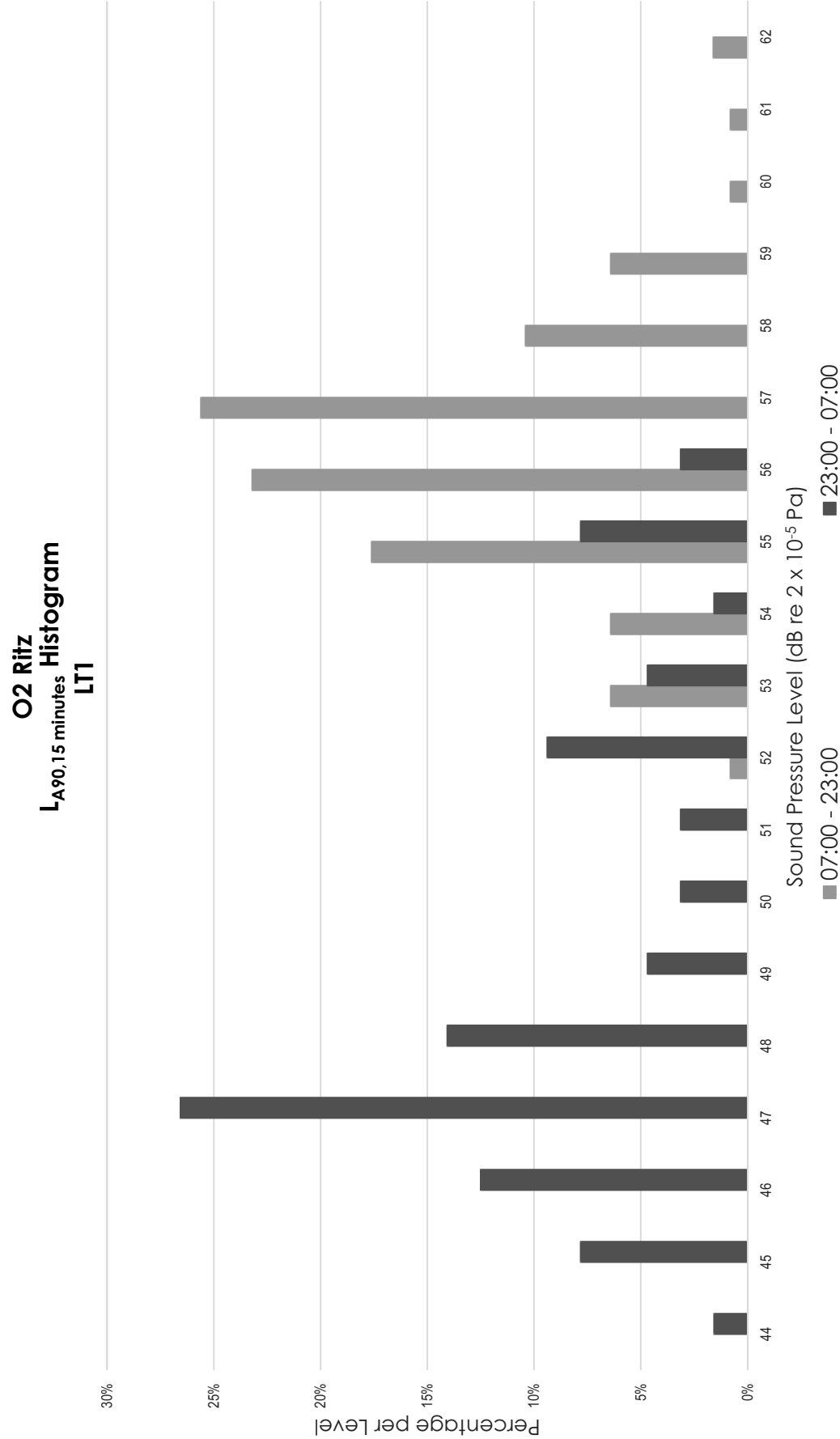


Appendix C Sound Time History Graphs

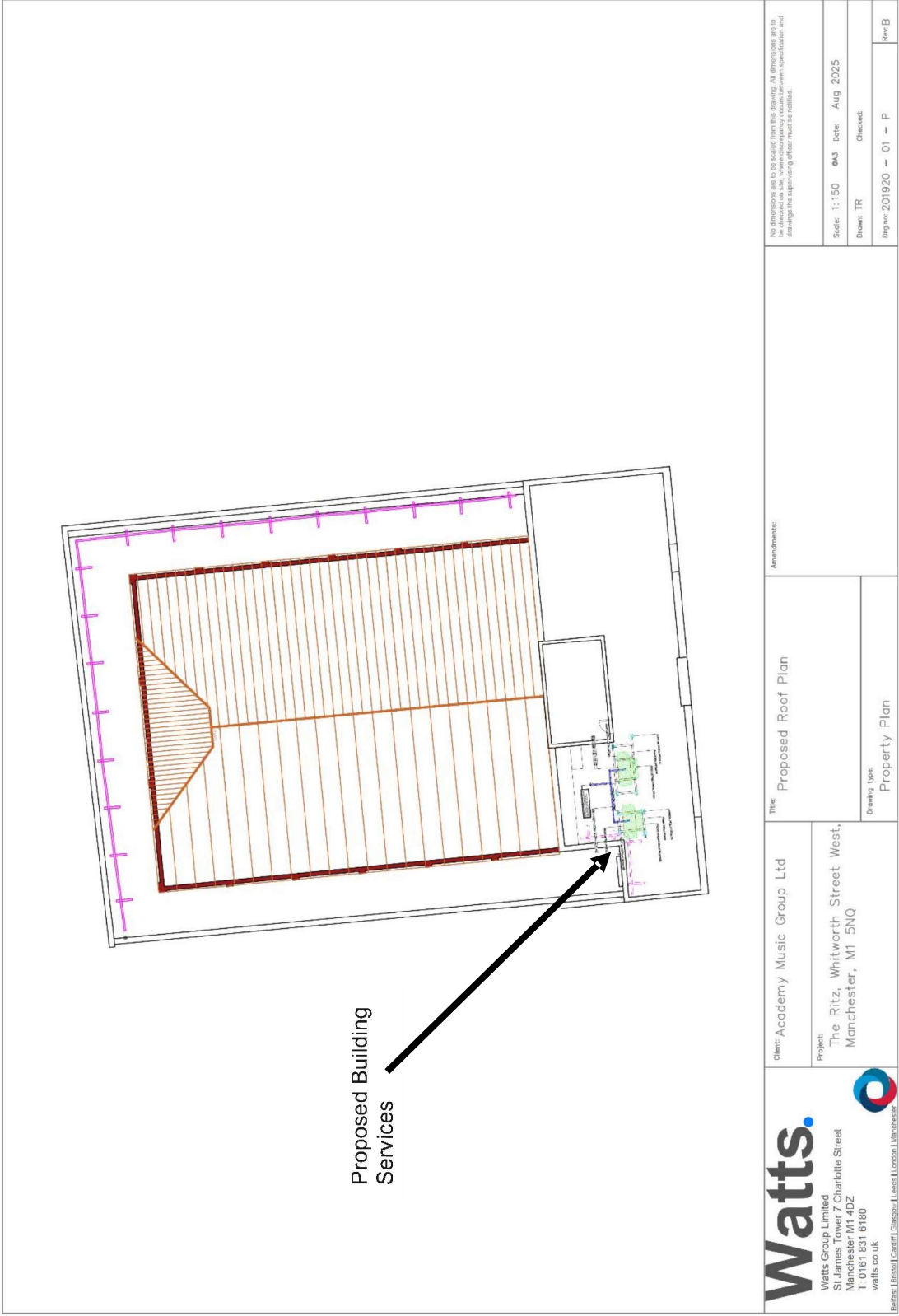
O2 RitZ
L_{Aeq}, L_{Amax,f} and L_{A90} Time History
LT1 - Monday 31 March to Wednesday 2 April 2025



Appendix D L90,15min Histograms



Appendix E Proposed Site Layout



Appendix F Plant Noise Data

Table 14. Plant Noise Data

Reference	Parameter	Sound Level (dB) at Octave band Centre Frequency (Hz)							
		63	125	250	500	1 k	2 k	4 k	8 k
DAIKIN RYYQ14U	L_p at 1m	62	63	60	60	5	49	48	46
DAIKIN RYMQ16U	L_p at 1m	68	69	64	61	55	52	52	43
DAIKIN RYMQ12U	L_p at 1m	64	66	61	57	53	51	54	44

