

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

21131-R02-F

13 July 2023

Warwick Mill, Rochdale

Acoustic planning report

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

Sandy Brown Ltd

Registered in England & Wales

No. 13227735

post@sandybrown.com

www.sandybrown.com

Registered Office: 55 Charterhouse Street, London EC1M 6HA

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

Version	Date	Comments	Author	Reviewer
A	9 Dec 21		Jessica Wright	Matthew Robinson
B	20 Dec 21	Minor updates to Section 2.2 following comments by GMA Architecture	Jessica Wright	James Atha
C	12 Jan 22	Inclusion of The Loom development	Jessica Wright	Matthew Robinson
D	7 Feb 22	Revised following comments from WSP. Updates to Section 3, 4.3, 4.4, 8.12, 9.2, 10.2.5	Jessica Wright	Matthew Robinson
E	28 Jun 23	Addition of a simplified acoustic assessment against the requirements of ADO2021	Rita Campos	Matthew Robinson
F	13 Jul 23	Update following comments from WSP	Jessica Wright	Matthew Robinson

Disclaimer

This report has been prepared for the sole benefit and use of our client based on their instructions and requirements. Sandy Brown Ltd extends no liability in respect of the information contained in the report to any third party.

Summary

Sandy Brown has been commissioned by Kam Lei Fong (UK) Limited to provide an assessment of noise in relation to the proposed development at Warwick Mill, Rochdale.

An environmental noise survey has been carried out at the site. The noise survey was carried out between 18 November 2021 and 23 November 2021.

Representative background sound levels measured during the survey were:

- $L_{A90,15min}$ 67 dB during the daytime and $L_{A90,15min}$ 45 dB at night at position A.
- $L_{A90,15min}$ 65 dB during the daytime and $L_{A90,15min}$ 63 dB at night at position B.

Based on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed the limits specified.

The average ambient noise levels measured during the survey were:

- $L_{Aeq,16h}$ 73 dB during the daytime and $L_{Aeq,8h}$ 68 dB at night at position A
- $L_{Aeq,16h}$ 67 dB during the daytime and $L_{Aeq,8h}$ 64 dB at night at position B.

An initial assessment has been carried out to determine required acoustic performances for the facades and provide guidance on the ventilation strategy. Options for controlling noise ingress are provided and double glazing or secondary glazing will be required.

A Level 1 AVO assessment has been carried out which indicates that the proposed development falls into the negligible risk category for the south facade and high risk category for the north, west and east facades. Therefore, a Level 2 assessment is required.

A simplified ADO2021 acoustic assessment has been carried out which indicates that windows will likely be closed overnight, therefore additional ventilative cooling will likely need to be provided by other means.

Operational noise egress limits have been set for the development.

Contents

1	Introduction	5
2	Site description	5
3	Development proposals	7
4	Assessment criteria	7
5	Survey method	15
6	Measurement results	17
7	Plant noise egress	23
8	Operational noise egress	24
9	Facade sound insulation – noise ingress	26
10	ProPG Acoustic Design Statement – The Loom	35
11	Conclusion	37
	Appendix A	38
	Survey details	38
	Appendix B	41
	Results of unattended measurements at position A	41
	Appendix C	43
	Results of unattended measurements at position B	43
	Appendix D	45
	BS 4142 corrections for attention catching features	45
	Appendix E	47
	External noise level mark-ups	47

1 Introduction

Sandy Brown has been commissioned by Kam Lei Fong (UK) Limited to provide acoustic design input in relation to the proposed development at Warwick Mill, Rochdale. This includes the refurbishment of Warwick Mill and a new build block, The Loom.

An environmental noise survey has been carried out to establish:

- background sound levels around the site and by nearby noise sensitive premises
- ambient and maximum noise levels at the site.

The background sound levels measured during the survey are used as the basis for setting limits for noise emission from proposed building services plant.

Ambient and maximum noise levels will be used to assess building envelope sound insulation requirements to achieve appropriate internal noise levels for residences. These follow standards set in accordance with standard guidance from BS 8233.

This report provides details of the noise surveys, including measurement results, and provides recommendations.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown outlined in red in Figure 1.

The site is bounded by Oldham Road to the north and Ashton Lane to the east, and Wince Brook to the South.

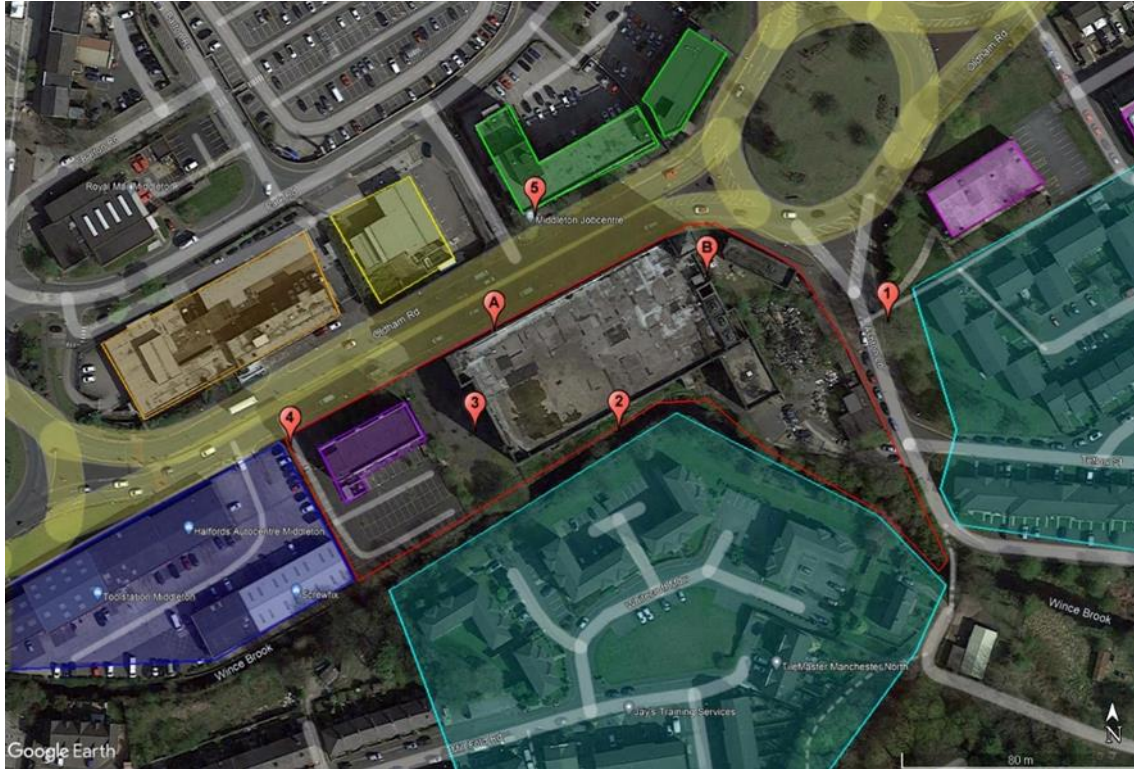


Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The following premises are adjacent to the site as highlighted in Figure 1:

1. Residential premises 25 m to the south and 45 m to the east of the site highlighted in cyan
2. Middleton Job Centre highlighted in green
3. Middleton Trade Park highlighted in blue
4. St Peter's RC Church and The Church of Jesus Christ of Latter Day Saints highlighted in pink
5. Greater Manchester Police Station highlighted in orange
6. Tesco Petrol Station highlighted in yellow.

The building to the west of the site shown in purple is proposed to be demolished with a new build residential building proposed to this site called The Loom.

3 Development proposals

The development is a refurbishment of Warwick Mill, a Grade II listed former cotton mill with an additional new build floor proposed at roof level. The Loom is a new build development.

The site comprises of:

- Warwick Mill
 - Residential apartments to upper levels
 - Commercial units with external terrace areas
 - Lower ground car park
- The Loom
 - Residential apartments to upper levels
 - 3 commercial units at lower ground level
 - Lower ground car park
 - Residential amenity areas at upper levels
 - Plant rooms at lower ground level.

3.1 Hours of operation

The operational hours for the commercial uses are unknown.

3.2 Potential noise sources

The potential noise sources associated with the scheme can be broadly divided into two categories:

- Building services plant
- Internal activity in commercial units.

The potential impact of these sources will be assessed, and mitigation measures proposed to minimise impact on existing noise sensitive premises around the development.

4 Assessment criteria

4.1 NPPF and NPSE

The National Planning Policy Framework, July 2021 (NPPF) sets out the UK government's planning policies for England. It supersedes previous guidance notes such as PPG24. No specific noise criteria are set out in the NPPF, or in the Noise Policy Statement for England (NPSE) to which it refers.

The NPPF states:

‘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:

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.’*

and

‘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.’

The NPSE states that its aims are as follows:

‘Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life*
- *Mitigate and minimise adverse impacts on health and quality of life and*
- *Where possible, contribute to the improvement of health and quality of life.’*

As such, neither document sets out specific acoustic criteria for new residential developments, but they require consideration of the effect of existing noise on the new development and the effect of noise from the development on the surroundings.

4.1 ProPG

ProPG *Planning & Noise (Professional Practice Guidance on Planning & Noise)*, *New Residential Development*, 2017 provides guidance to the management of noise within the planning system in England. It is restricted to consideration of new residential developments that will be exposed predominantly to airborne noise from transport sources.

The two stages of the approach are given below

- Stage 1 – Initial noise risk assessment of the proposed development site
- Stage 2 – Systematic consideration of four key elements
 - Element 1 – Demonstrating a “Good Acoustic Design Process”
 - Element 2 – Observing internal “Noise Level Guidelines”
 - Element 3 – Undertaking an “External Amenity Area Noise Assessment”
 - Element 4 – Consideration of “Other Relevant Issues”.

Following this approach, there are four possible recommendations, the choice of recommendation is as follows:

- Grant without conditions
- Grant with conditions
- Avoid
- Prevent.

Guidance provided in ProPG has been used to assess the proposed development site and recommend mitigation measures to reduce noise levels.

4.2 Noise egress

4.2.1 Standard guidance

BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains ‘attention catching features’ such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

4.2.2 Local Authority criteria

Rochdale Metropolitan Borough Council were previously contacted in relation to a different project regarding any specific requirements for the assessment of noise egress from plant equipment. Paul Fletcher (EHS) at Rochdale Metropolitan Borough Council confirmed in correspondence in March 2019 that the assessment method stated in BS4142:2014 ‘*Methods for rating assessing industrial and commercial sound*’ would be appropriate and that any plant should be designed to achieve a rating level of 5 dB below the existing background at the nearest noise sensitive location.

4.3 Noise ingress

4.3.1 Local Authority criteria

It is understood that Rochdale Metropolitan Borough does not have specific internal noise criteria. Therefore, internal noise criteria as set out in BS 8233:2014 should be achieved.

Rochdale Metropolitan Borough also does not state specific internal noise criteria to control internal noise transfer. As such, it is recommended that the internal noise levels from operational noise (including amplified sound) should meet 47 dB at 63 Hz octave band and 41 dB at 125 Hz octave band. This is in line with guidance in Moorhouse et al (2005) *Proposed criteria for the assessment of low frequency noise disturbance*, Defra, HMG (updated in 2008 and 2011).

4.3.2 British Standard guidance

Guidance on acceptable internal noise levels in residential dwellings is given in BS 8233:2014 *Sound insulation and noise reduction for buildings*. The guidance limits are shown in Table 1.

These internal levels are based on annual average data and do not have to be achieved in all circumstances. It is normal to exclude occasional events, such as fireworks night or New Year's Eve.

Table 1 Internal noise criteria for sleeping/resting

Internal space	Indoor ambient noise level, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
Living rooms	35	-
Dining room	40	-
Bedrooms	35	30 ^[1]

[1] BS 8233 notes that individual noise events can cause sleep disturbance, and that a guideline value may be set depending on the character and number of events per night, although no specific limit is provided. For regular events, such as scheduled aircraft or passing trains, a guideline value may be set in terms of SEL or $L_{Amax,F}$. Sporadic noise events could require separate values.

The standard states that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

For external amenity areas, such as gardens and patios, the standard states:

'it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as

city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'

It is recommended that commercial units have an internal noise criterion of L_{Aeq} 45 dB. This is based on design ranges set out in BS 8233:2014 for restaurant and open plan offices.

4.3.3 ProPG

Internal noise ingress criteria in ProPG are the same as in BS 8233:2014 but additional guidance is provided. In relation to regular individual noise events the following additional guidance is provided:

'In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.'

Whilst ProPG is not applicable to the entire development as it only covers new build schemes, the design is based on meeting the maximum noise level criteria as best practice.

4.3.4 Approved Document O – Overheating

Approved Document O 2021 Edition (to the Building Regulations 2010) states the following in relation to noise ingress during overheating periods:

'In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (23:00-07:00 hours).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- a. $L_{Aeq,T}$ 40 dB average over 8 hours (between 23:00-07:00)
- b. L_{AFmax} 55 dB more than 10 times a night (between 23:00-07:00).'

The above applies to residential dwellings, institutional residential accommodation, and other types of residential accommodation, such as student accommodation.

4.3.5 Acoustics, ventilation and overheating

Guidance on external noise levels from transport noise sources and the assessment of risk in an overheating condition is given in the Association of Noise Consultants *Acoustics Ventilation and Overheating, Residential Design Guide* (AVOG).

A Level 1 assessment comprises assessing the external free-field noise levels to guideline thresholds. External noise levels and the associated risk categories for a Level 1 assessment are adapted and summarised in Table 2, though consideration also has to be given the duration and frequency of any overheating periods.

Table 2 Guidance for Level 1 assessment of noise from transport sources relating to overheating condition

Risk category for Level 1 assessment	External free-field noise level	
	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
Negligible	$L_{Aeq} \leq 52$ dB	$L_{Aeq} \leq 47$ dB
Low	$L_{Aeq} > 52$ dB and $L_{Aeq} \leq 57$ dB	$L_{Aeq} > 47$ dB and $L_{Aeq} \leq 52$ dB
Medium	$L_{Aeq} > 57$ dB and $L_{Aeq} \leq 62$ dB	$L_{Aeq} > 52$ dB and $L_{Aeq} \leq 55$ dB
High	$L_{Aeq} > 62$ dB	$L_{Aeq} > 55$ dB

If a Level 1 assessment finds that the development falls into a ‘Medium’ or ‘High’ risk category a Level 2 assessment should be carried out, assessing the expected internal noise levels for an overheating condition and the associated risk of adverse effect. The Level 2 assessment would consider the following:

- Duration of period where additional ventilative cooling is required (to be assessed by others, typically part of a CIBSE TM59 assessment)
- How wide the external windows would need to be open to control overheating (to be assessed by others, typically part of a CIBSE TM59 assessment).

The guidance for suitable internal noise levels in order that noise ingress can be suitably controlled for an overheating condition are provided in AVOG. These are adapted and summarised in Table 3, though are not supposed to be taken as limits, rather guidelines to be assessed while also considering the adverse effect of any overheating (duration and severity).

The lowest observed affect level (LOAEL) and the significant observed affect level (SOAEL) for increased noise levels associated with controlling overheating are specific to each project as these depend on the magnitude of the increased internal noise levels and the duration for which they occur.

Table 3 Guidance for Level 2 assessment of noise from transport sources relating to overheating condition

Effect level	Internal noise level from transport sources		
	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)	
LOAEL (noise can be heard, but does not cause any change in behaviour)	$L_{Aeq} \leq 35$ dB	$L_{Aeq} \leq 30$ dB	L_{AFmax} 45 dB not normally exceeded
SOAEL upper limit for longer overheating durations	$L_{Aeq} > 35$ dB and $L_{Aeq} \leq 40$ dB	$L_{Aeq} > 30$ dB and $L_{Aeq} \leq 35$ dB	-
SOAEL upper limit for shorter overheating durations	$L_{Aeq} > 40$ dB and $L_{Aeq} \leq 50$ dB	$L_{Aeq} > 35$ dB and $L_{Aeq} \leq 42$ dB	-
Exceeds SOAEL (noise causes a material change in behaviour)	$L_{Aeq} > 50$ dB	$L_{Aeq} > 42$ dB	L_{AFmax} 65 dB normally exceeded

The AVOG illustrates that there is a link between adverse effects, increasing internal ambient noise levels and the duration of exposure to noise for an overheating condition. These are indicated in Figure 2.

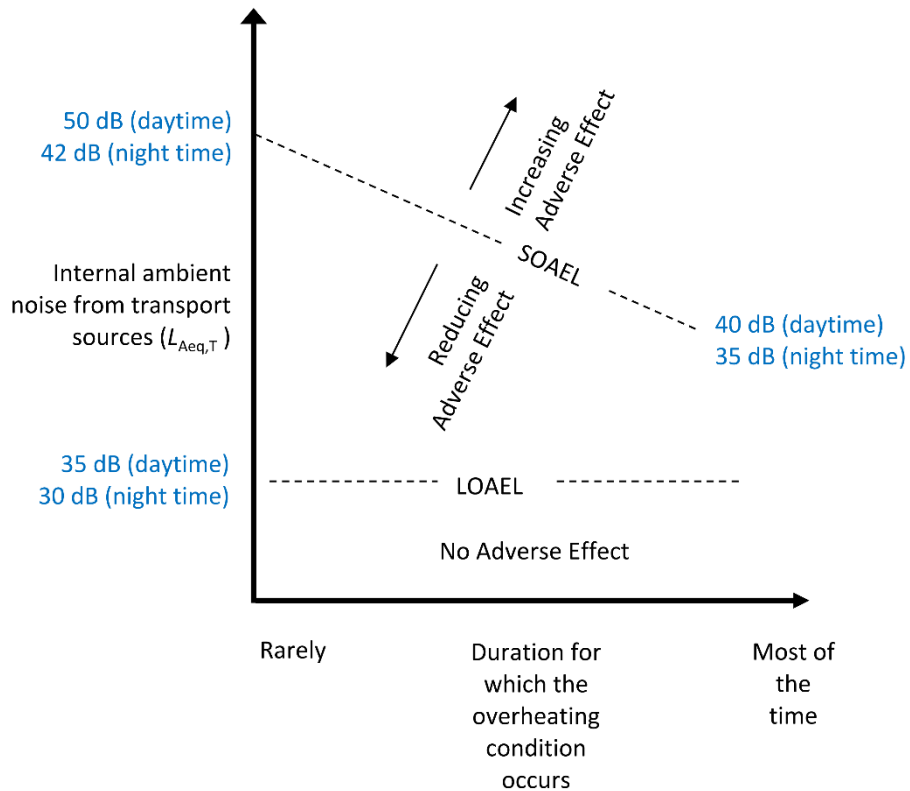


Figure 2 Internal ambient noise levels and increasing adverse effects for an overheating condition

When internal noise levels are above Significant Observed Adverse Effect Level (SOAEL), it is likely that there will be a high potential for an adverse outcome. These adverse outcomes will include:

- Material change in behaviour and/or attitude, eg 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 and difficulty in getting back to sleep
- Quality of life diminished.

As illustrated, the potential for adverse risk increases with the duration of exposure to noise, ie, a shorter exposure will result in a lower risk of adverse outcomes.

4.4 Operational noise egress

4.4.1 BS 4142:2014

Noise limits for operational noise egress have been set in accordance with BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.

Though BS 4142 only relates to plant noise and commercial activity and does not provide guidance in relation to amplified sound. In order that operational noise limits can encompass amplified sound egress and commercial operations we have considered the guidance detailed within BS 4142.

4.4.2 Local Authority criteria

Rochdale Council does not provide guidance on operational noise limits.

For this reason, operational noise limits relating to commercial activity have been set in accordance with BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* which is detailed in the previous section.

Though BS4142:2014 only relates to plant noise and commercial activity and does not provide guidance in relation to amplified sound. In order that operational noise limits can encompass amplified sound egress and commercial activities, we have considered the guidance detailed within BS 4142, though ultimately, we recommend more stringent limits which are set 10 dB below the representative background sound levels as measured 1 m from the nearest residential or noise sensitive premises.

These limits would also be more stringent than the those based on the guidance in BS 4142:2014.

It has been confirmed by Rochdale Council via email on 10 January 2022 that setting operational noise limits in accordance with BS 4142:2014+A1:2019 is correct and acceptable.

5 Survey method

5.1 Noise survey method

The survey included unattended and attended noise measurements.

5.1.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 5 days.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 5 minute periods between 13:00 on 18 November 2021 and 13:30 on 23 November 2021. The equipment was installed by Jessica Wright and collected by Jessica Wright and Thomas Dent.

The measurement position used during the survey is indicated in Figure 1, denoted by the letters 'A' and 'B'. Photographs showing the measurement locations are provided in Figure 3. These locations were chosen to be reasonably representative of noise levels at the site and the nearest noise sensitive premises. It should be noted that the background sound levels at position B are not considered to be representative due to plant noise from the adjacent pipe causing high background levels.

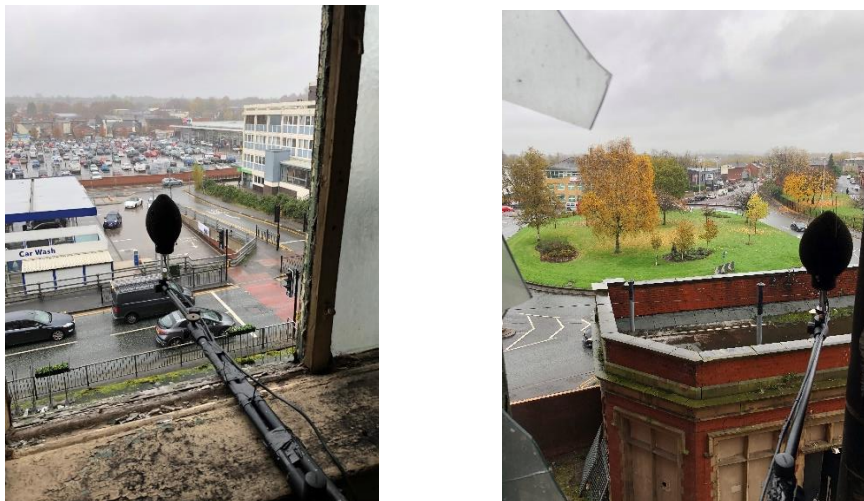


Figure 3 Photographs showing locations of the unattended noise monitoring positions A (left) and B (right)

5.1.2 Attended measurements

Attended sample measurements were taken by Jessica Wright and Thomas Dent at 5 positions around the site. These are indicated in Figure 1 as positions 1 to 5. The attended measurements were carried out on 23 November 2021, over 5 minute periods.

At each position the microphone was mounted on a tripod approximately 1.5 m above the ground level and at least 1 m from any other reflective surface. Details of the equipment used and the noise indices measured are provided in Appendix A.

Dominant noise sources occurring during the measurements were noted.

5.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

6 Measurement results

6.1 Observations

6.1.1 Noise

The dominant noise sources observed at the site during the survey were from road traffic on Oldham Road and the adjacent roundabout.

Less significant noise sources included road traffic from Ashton Lane, and running water from Wince Brook. Noise measurement results

6.2.1 Unattended measurement results – Position A

A graph showing the results of the unattended measurements is provided in Appendix B.

Day and night-time ambient noise levels measured during the unattended survey are presented in Table 4.

Table 4 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Thursday 18 November 2021	-	67
Friday 19 November 2021	73	67
Saturday 20 November 2021	73	68
Sunday 21 November 2021	73	68
Monday 22 November 2021	73	68
Average	73	68

Analysis of night-time maximum noise levels indicates that the night-time maximum noise level not normally exceeded 10 times a night is L_{AFmax} 84 dB.

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night time statistical analysis of representative values at position A are given in Figure 4 to Figure 5. From this analysis, the representative background sound levels measured

during the survey were $L_{A90,5min}$ 67 dB during the daytime and $L_{A90,5min}$ 45 dB at night at position A.

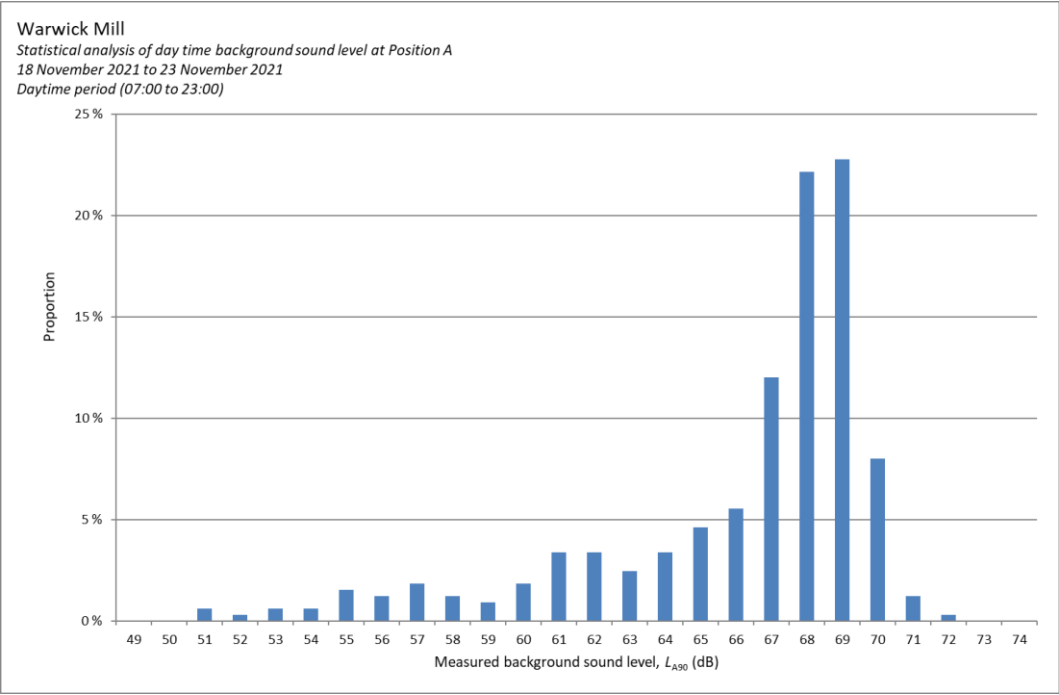


Figure 4 Statistical analysis of daytime background sound levels at position A

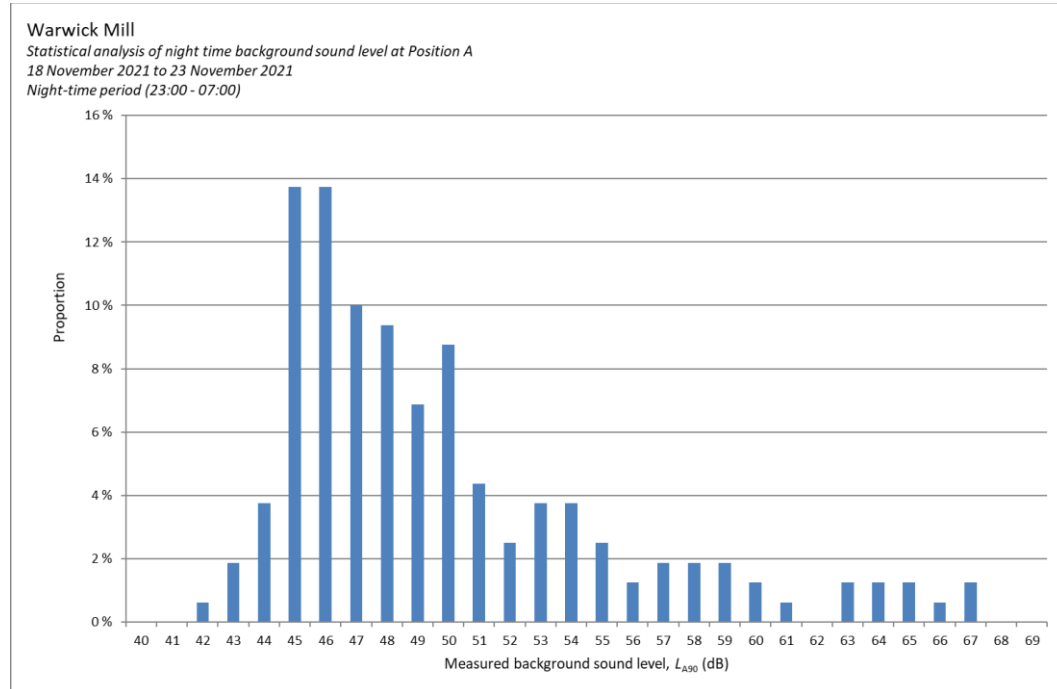


Figure 5 Statistical analysis of night time background sound levels at position A

6.2.2 Unattended measurement results – Position B

A graph showing the results of the unattended measurements is provided in Appendix C.

Day and night-time ambient noise levels measured during the unattended survey are presented in Table 5.

Table 5 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Thursday 18 November 2021	-	64
Friday 19 November 2021	67	64
Saturday 20 November 2021	67	64
Sunday 21 November 2021	67	64
Monday 22 November 2021	67	64
Average	67	64

[1] Measurement not made over full period due to monitoring start and end time; not included in the average.

Analysis of night-time maximum noise levels indicates that the night-time maximum noise level not normally exceeded 10 times a night is L_{AFmax} 73 dB.

Daytime and night time statistical analysis of representative values at position A are given in Figure 6 to Figure 7. From this analysis, the representative background sound levels measured during the survey were $L_{A90,5min}$ 65 dB during the daytime and $L_{A90,5min}$ 63 dB at night at position B. The background sound levels at position B are not considered to be representative due to plant noise from the adjacent pipework causing high background sound levels.

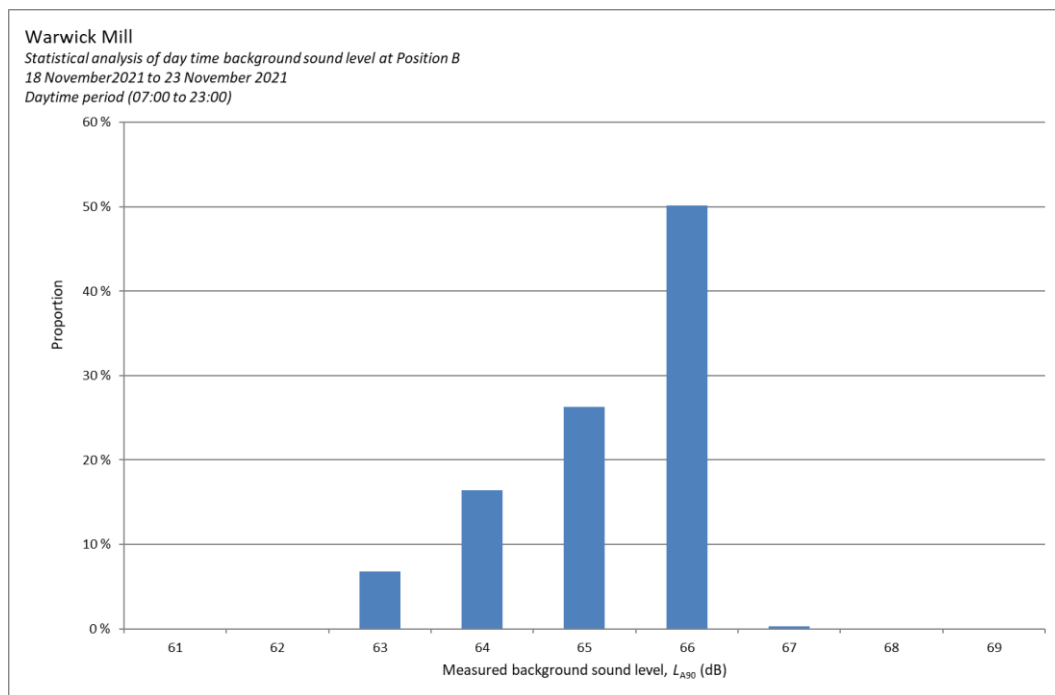


Figure 6 Statistical analysis of daytime background sound levels at position B

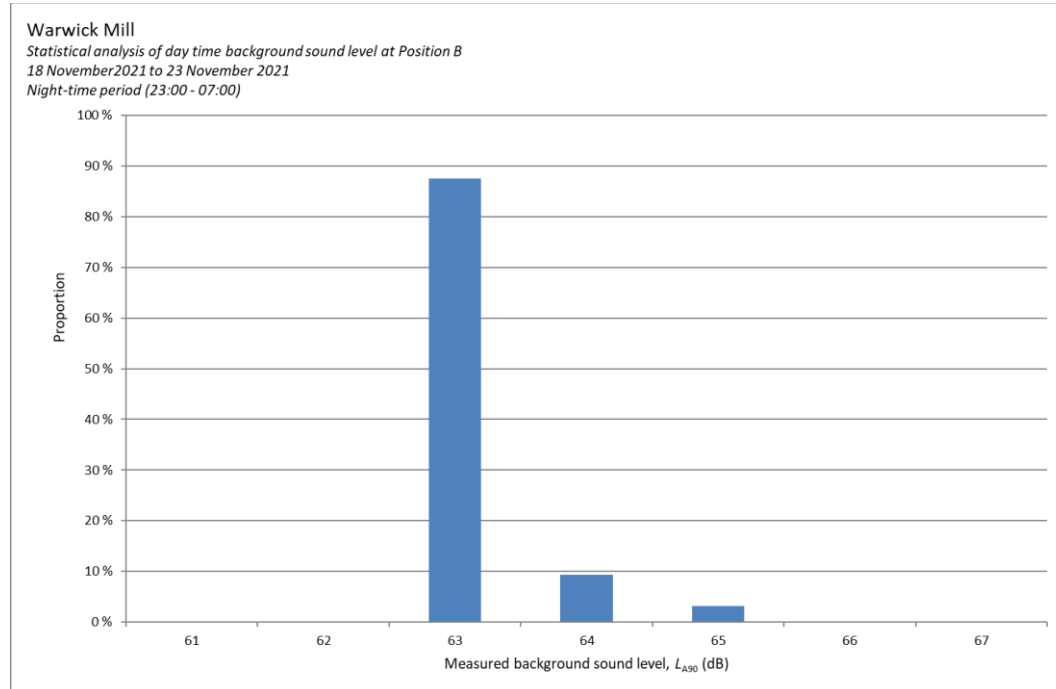


Figure 7 Statistical analysis of night time background sound levels at position B

6.2.3 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 6. Positions 1 to 4 were free field measurements and position 5 was a facade measurement.

Table 6 Noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
1	10:45	61	69	56	Road traffic on Oldham Road, very occasional road traffic on Ashton Lane
	10:50	60	69	57	
	10:55	60	71	57	
5	11:00	74	86	67	Road traffic on Oldham Road
	11:05	74	86	68	
	11:10	74	84	67	

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{A90,5min}$	
4	11:30	72	81	66	Road traffic on Oldham Road
	11:35	72	81	65	
	11:40	72	79	66	
5	11:45	73	83	65	Road traffic on Oldham Road
	11:50	75	91	68	
	11:55	73	86	68	
4	12:15	73	82	66	Road traffic on Oldham Road
	12:20	72	81	66	
	12:25	71	81	62	
2	10:45	46	62	44	Distant Road traffic, water running in stream.
	10:50	45	60	43	
	10:55	46	58	43	
3	11:15	56	70	53	Road traffic on Oldham Road
	11:20	56	68	54	
	11:25	56	61	53	
2	11:30	49	65	43	Distant Road traffic, water running in stream.
	11:35	44	54	43	
	11:40	54	71	43	
3	11:45	55	63	51	Road traffic on Oldham Road
	11:50	59	76	53	
	11:55	58	67	54	
1	12:10	62	79	58	Road traffic from roundabout and Oldham Road
	12:15	62	76	56	
	12:20	63	81	57	
	12:25	62	81	56	

6.3 Representative sound background levels at NSPs

The representative sound background sound levels used for setting noise limits are presented in Table 7.

Table 7 Representative background levels at nearest noise sensitive premises

Location	Time of day	Representative background sound level, $L_{A90,15min}$ (dB)
Residential premises on Mill Fold Road	Daytime (07:00-23:00)	46
	Night-time (23:00-7:00)	23
Residential premises on Ashton Lane	Daytime (07:00-23:00)	60
	Night-time (23:00-07:00)	36
Middleton Trade park, Greater Manchester Police Station, Tesco Petrol Station, Middleton Job Centre	Daytime (07:00-23:00)	67
St Peter's RC Church, Church of Jesus Christ and Latter Day Saints	Daytime (07:00-23:00)	60

7 Plant noise egress

7.1 Plant noise limits

Based on the above criteria and the measurement results, the cumulative noise level from the operation of all new normally operating plant should not exceed the limits set out in Table 8.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels.

Table 8 Plant noise limits at 1 m from the nearest noise sensitive premises

Location	Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)
Residential premises on Mill Fold Road	Daytime (07:00-23:00)	41
	Night-time (23:00-7:00)	18
Residential premises on Ashton Lane	Daytime (07:00-23:00)	55
	Night-time (23:00-07:00)	31
Middleton Trade Park, Greater Manchester Police Station, Tesco Petrol Station, Middleton Job Centre	Daytime (07:00-23:00)	62
St Peter's RC Church, Church of Jesus Christ and Latter Day Saints	Daytime (07:00-23:00)	55

^[1] The limits set out in Table 8 do not include any attention catching features. The penalty corrections for attention catching features may be significant, and will need to be considered as the building services design progresses. This is discussed in Appendix D.

7.2 Assessment

All building services plant will be designed to achieve the noise limits set out above, including any corrections for attention catching features. This will be assessed as the design progresses.

8 Operational noise egress

8.1 Noise egress to nearby sensitive premises

Based on the above criteria and the measurement results, the cumulative noise level from the operation of commercial units should not exceed the limits set out in Table 8.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels.

Table 9 Operational noise limits at 1 m from the nearest noise sensitive premises

Location	Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)
Residential premises on Mill Fold Road	Daytime (07:00-23:00)	36
	Night-time (23:00-7:00)	13
Residential premises on Ashton Lane	Daytime (07:00-23:00)	50
	Night-time (23:00-07:00)	26
Middleton Trade Park, Greater Manchester Police Station, Tesco Petrol Station, Middleton Job Centre	Daytime (07:00-23:00)	57
St Peter's RC Church, Church of Jesus Christ and Latter Day Saints	Daytime (07:00-23:00)	50

8.1.1 Noise transfer to proposed dwellings

Operational noise limits will be set on the basis of the construction proposed to ensure that internal noise criteria set out in Section 4.3 are met. If higher levels are desired by tenants they will be required to enhance the sound insulation performance as part of their fit-out works (eg provision of sound insulating ceiling).

In order to control noise transfer from the ground level commercial premises to the dwellings above and allow internal operational noise limits to be set, it is recommended as a guide that the separating floor provides a minimum sound insulation performance at least 10 dB above the minimum standard required in Building Regulations Approved Document E between individual dwellings ie, $D_{nT,w} + C_{tr}$ 55 dB.

8.1.2 Operational noise limits

Operational noise limits within the commercial units will be set as the design progresses to control noise transfer to both the proposed dwellings and nearby noise sensitive premises.

Based on the limits set out in Table 9, a minimum overall facade sound insulation performance of $R_w + C_{tr}$ 35 dB (to control noise ingress see Section 9.2) and internal noise transfer limits due to operational noise (including amplified sound) set out in Section 4.3, internal operational noise limits within the commercial units are set out in Table 10. This is based on the separating

floor providing a minimum sound insulation performance of $D_{nT,w}+C_{tr}$ 55 dB. The daytime noise limit is defined by the transfer internally and the night time limit is defined by the noise egress.

Table 10 Operational noise limit in commercial units based on controlling noise transfer to the dwellings above

	Operational noise limit in commercial units, L_{eq} (dB)						
	Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime	77	79	80	87	90	90	90
Night time	70	65	65	68	68	65	65

Maximum operational noise levels (L_{Fmax}) should be limited to 10 dB above those set out in Table 10.

If higher noise levels are required by the tenant, then the enhancement works to improve the sound insulation performance of the separating floor and building envelope will be required.

9 Facade sound insulation – noise ingress

This section describes an assessment of facade sound insulation to control noise ingress. The required facade specification largely depends on the external noise levels and the internal noise criteria.

The following assessment is based on achieving the internal noise levels recommended in BS 8233:2014 and by ProPG, set out in Section 4.3.

9.1 External noise levels

A 3D environmental noise model of the site and its surroundings has been generated using CadnaA software by Datakustik. This allows for a more accurate assessment of noise ingress by incorporating the screening that the proposed building will provide when it is completed.

The software carries out calculations using a ray tracing technique. This takes account of the effects of topography, reflections, screening and distance attenuation for noise sources to predict noise levels in three dimensions. Calculations are carried out in accordance with ISO 9613 “Attenuation of sound during propagation outdoors”.

The results from the noise survey detailed in Section 5 and 6 have been used to establish the levels at each facade. The noise levels across the site have been used to calibrate the model in order to establish the levels at each facade as well as noise levels across the site.

A bridge is proposed between Warwick Mill and the Loom. This has not been included in the modelling for the scheme as a worst case as this element cannot be accurately modelled within the software.

An external seating area is proposed close to the east facade with a deck proposed to the south facade. Both are to serve the ground floor commercial units. Noise sources in this location have not been included within the assessment.

Predicted external noise levels at the facades of the proposed development are shown in Figure 8 to Figure 11 and presented on a mark-up in Appendix E.

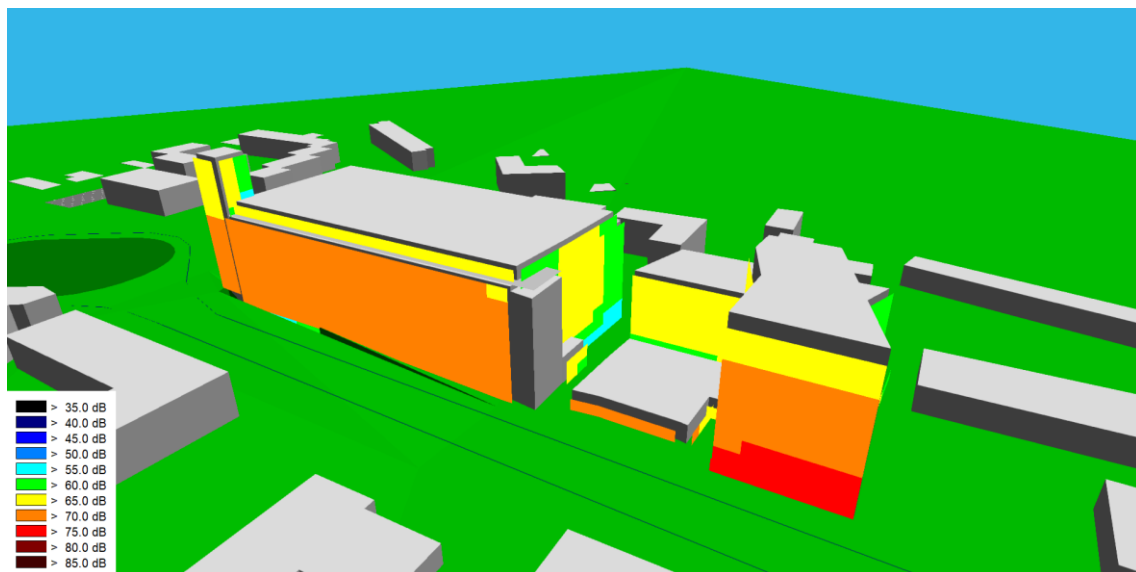


Figure 8 CadnaA screenshot showing external daytime noise levels, L_{Aeq} (dB)

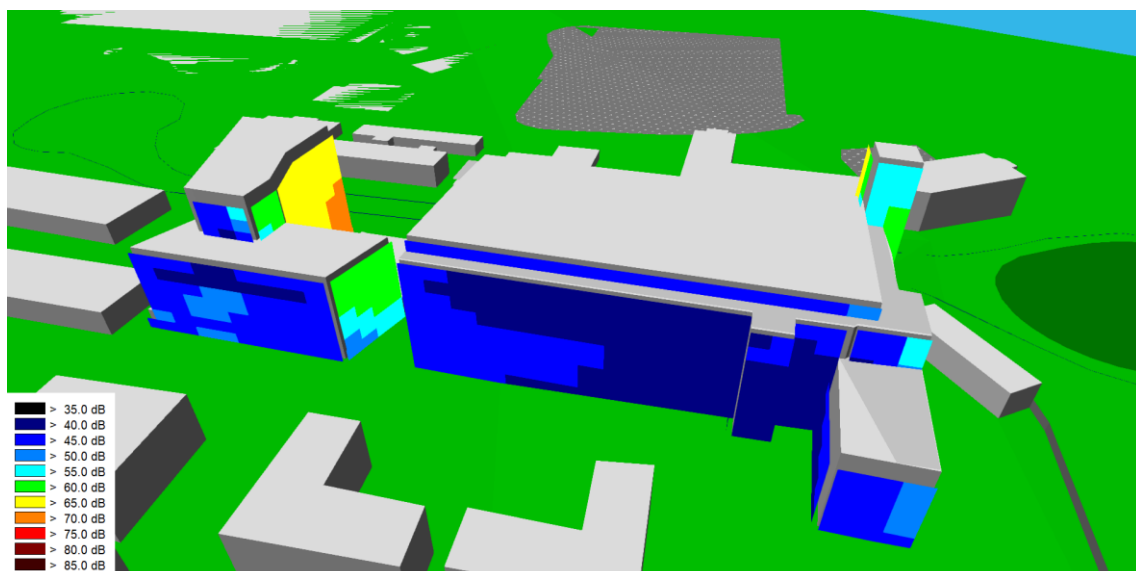


Figure 9 CadnaA screenshot showing external daytime noise levels, L_{Aeq} (dB)

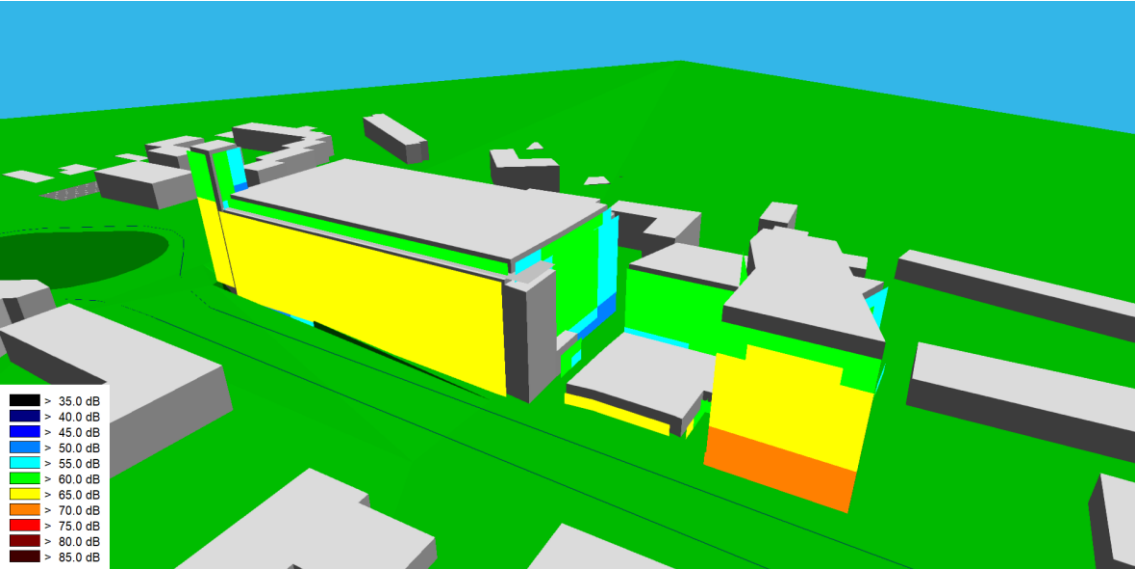


Figure 10 CadnaA screenshot showing external night-time noise levels, L_{Aeq} (dB)

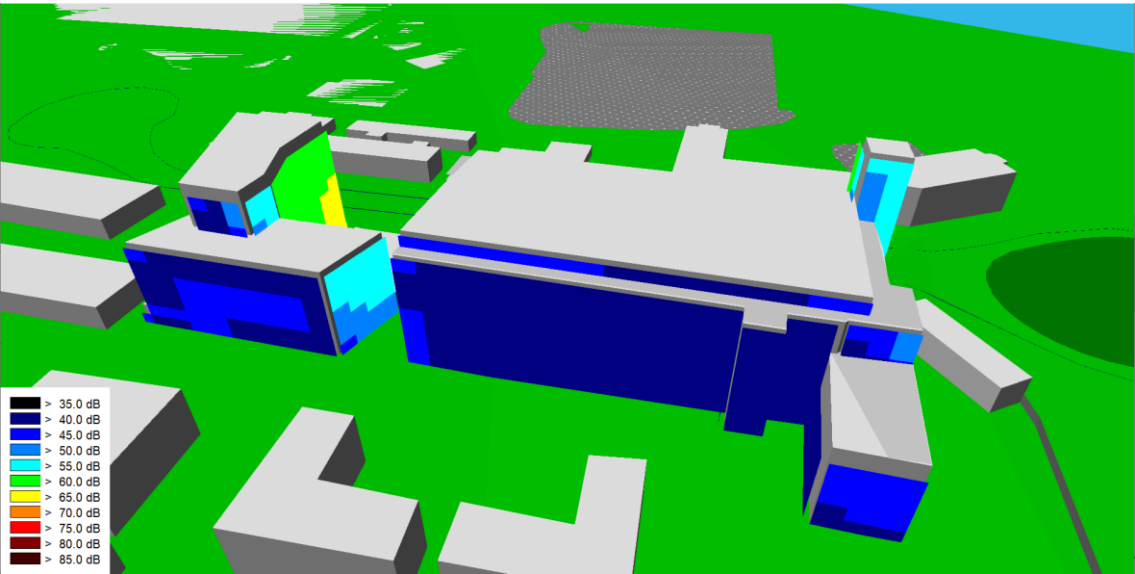


Figure 11 CadnaA screenshot showing external night-time noise levels, L_{Aeq} (dB)

9.2 Facade sound insulation

An initial assessment of the facade sound insulation performance requirements has been carried out on the basis of the current design information and results of the noise measurements carried out at site and 3D environmental noise modelling.

Minimum facade sound insulation requirements for the facades, under the background ventilation condition, are given in Table 11. These have been determined to achieve the internal noise criteria for bedrooms and living areas using predicted external noise levels at the facades.

At this site, the facade performance requirements for living rooms are driven by the daytime ambient noise levels and for bedrooms night time maximum noise levels. The facade specification for bedrooms has been determined to ensure that $L_{AFmax\ 15\ min}$ criteria is exceeded on no more than 10 occasions based on the worst affected night during the survey.

Table 11 Minimum overall facade sound insulation requirements

Facade zone (see Appendix E)	External noise level (dB)			Minimum overall facade sound insulation performance, $R'_w + C_{tr}$ (dB)			
	Daytime (07:00 to 23:00) L_{Aeq}	Night time (23:00 to 07:00) L_{Aeq}	L_{AFmax} not normally exceeded at night	Living rooms		Bedrooms	
				Corner	General	Corner	General
A 	77-75	72-71	88	47	44	46 ^[1]	43
B 	74-71	70-66	86	44	41	44 ^[1]	41
C 	70-66	65-61	81	40	37	39 ^[1]	36
D 	65-58	60-55	76	35	32	34 ^[1]	31
E 	57-51	54-48	70	27	24	28 ^[1]	25
F 	50-45	≤ 47	63	20	17	21 ^[1]	18

^[1] This condition does not currently exist but has been included for completeness

For commercial units, in order to meet the internal noise criteria on the worst case facade ie Zone A, this will require an overall minimum facade sound insulation performance of $R'_w + C_{tr}$ 35 dB. This will be refined as the design progresses.

9.3 Guidance on facade construction, glazing, and ventilation strategy

9.3.1 Non-glazed facade construction

The existing facade construction Warwick Mill is to be retained for the majority of the building. The existing facade construction is a minimum of 500 mm masonry and would typically have a facade sound insulation performance of at least R'_w+C_{tr} 55 dB.

For areas of the facade that will be replaced, and to The Loom, the facade will be designed to have a facade sound insulation performance at least 10 dB better than the minimum overall facade sound insulation performance given in Table 11.

Table 12 sets out some examples of glazing configurations and ventilation strategies that could achieve the required sound insulation performances.

Table 12 Example glazing configurations and ventilation strategies for overall facade sound insulation

Overall facade sound insulation, R'_w+C_{tr} (dB)	Example glazing configuration	Ventilation strategy
15-27	6 mm glass/16 mm cavity/6 mm glass OR Existing 6 mm glazing/50 mm cavity with sound absorbent reveals/6 mm secondary glazing	Acoustically attenuated passive ventilation (eg, trickle vents)
28-29	6.8 mm acoustic laminate/16 mm cavity /6 mm glass OR Existing 6 mm glazing/50 mm cavity with sound absorbent reveals/6 mm secondary glazing	Acoustically attenuated passive ventilation (eg, trickle vents)
30-32	8.8 mm acoustic laminate /16 mm cavity/6 mm glass OR Existing 6 mm glazing/100 mm cavity with sound absorbent reveals/6 mm secondary glazing	Acoustically attenuated passive ventilation (eg, trickle vents)

Overall facade sound insulation, $R'_w + C_{tr}$ (dB)	Example glazing configuration	Ventilation strategy
33-35	8.8 mm acoustic laminate/16 mm/10 mm glass OR Existing 6 mm glazing/100 mm cavity with sound absorbent reveals/6 mm secondary glazing	High performance acoustically attenuated passive ventilation
36-38	8.8 mm acoustic laminate/16 mm/10 mm glass OR Existing 6 mm glazing /100 mm cavity with sound absorbent reveals/6 mm secondary glazing	Mechanical ventilation (eg, whole house ventilation)
39-41	12.8 mm acoustic laminate/20 mm/10 mm glass OR Existing 6 mm glazing /150 mm cavity with sound absorbent reveals/6.4 mm secondary laminate glazing	Mechanical ventilation (eg, whole house ventilation)
42-47	This represents a very high sound insulation performance. For higher performances, thicker acoustic laminate glazing with wider air spaces can be used. Secondary glazing may be required. A substantial non-glazed facade construction, limited glazing area, and mechanical ventilation is likely to be required.	

The performance required by each element will depend on the relative areas of glazed and non-glazed elements, and the ventilation strategy. If applicable, this includes the acoustic performance of trickle ventilators and the number of ventilators per room. As a guide, for a mechanically ventilated room with a 50% glazed facade, the glazing sound insulation requirement would typically be 3 dB lower than the overall facade sound insulation requirement. This is provided the non-glazed external wall elements provide at least 10 dB more sound insulation than the glazed elements.

9.3.2 Glazing to retained Mill element of development

As the glazing positions for the retained element of the Mill are fixed, a glazing sound insulation assessment has been carried out. This is based on a typical window area of 5.8 m² and a worst case of 60% glazing to both bedrooms and living rooms. Glazing performances for each facade zone are set out in Table 13. For dual aspect rooms, the glazing performance will likely be 3 dB higher than set out in Table 13. Facade zone A is not predicted to the Mill, and therefore has not been included in Table 13.

Table 13 Proposed glazing performances for retained Mill areas

Facade zone	Minimum glazing sound insulation performance	Example glazing configuration
B 	$R'_w + C_{tr}$ 39 dB	8.8 mm acoustic laminate glass/20 mm cavity/10 mm glass OR Existing 6 mm glazing /150 mm cavity with sound absorbent reveals/6.4 mm secondary laminate glazing
C 	$R'_w + C_{tr}$ 35 dB	8.8 mm acoustic laminate glass/16 mm cavity/6 mm glass OR Existing 6 mm glazing/100 mm cavity with sound absorbent reveals/6 mm secondary glazing
D 	$R'_w + C_{tr}$ 30 dB	8 mm glass/16 mm cavity/6 mm glass OR Existing 6 mm glazing/100 mm cavity with sound absorbent reveals/6 mm secondary glazing
E, F  	$R'_w + C_{tr}$ 28 dB ^[1]	8 mm glass/16 mm cavity/6 mm glass OR Existing 6 mm glazing/50 mm cavity with sound absorbent reveals/6 mm secondary glazing

^[1] Glazing performance capped at $R'_w + C_{tr}$ 28 dB as this can be achieved with standard double glazing

9.4 Acoustics, ventilation and overheating assessment

ADO2021 sets out requirements for internal noise levels in bedrooms during the night, and therefore takes precedence over AVO Guide. For living rooms during the day, the guidance in AVO Guide has been used to inform the recommendations provided.

9.4.1 Approved Document O 2021 (during the night)

Although demonstrating compliance with ADO2021 is not strictly a requirement of planning, achieving the requirements will likely have implications on the building's design. This may include impacts on the appearance of the facade and requirements for additional building services plant (eg, external heat rejection plant, mechanical ventilation with/without cooling units within apartments).

The results of noise modelling have been used to assess external noise levels at the facades of the building. The external noise levels at night can be summarised as shown in Table 14. The presented predicted free-field façade noise levels result from subtracting 3 dB from the predicted facade noise levels presented before in this report.

Table 14 Predicted external free-field noise levels

Facade zone (see appendix E)	Building facade	Night-time external free-field noise level (23:00-07:00)	
		L_{Aeq} (dB)	L_{AFmax} (dB)
A 	North (rear) elevation	69	85
B 	North (rear) elevation	67	83
	East (side) elevation		
C 	North (rear) elevation	62	78
	East (side) elevation		
D 	South (rear) elevation	57	73
	East (side) elevation		
E 	South (rear) elevation	51	67
F 	South (rear) elevation	≤ 44	60

When compared with the levels set out in Section 3.2 of ADO2021, the results indicate that noise in all bedrooms, except from bedrooms in the south facade zone marked up in blue, will be such that windows will likely be closed overnight.

Therefore, open windows in bedrooms at night can likely not be relied upon as a method to remove excess heat, and the 'dynamic thermal modelling method' (eg, a CIBSE TM59 assessment) will need to be used to demonstrate compliance with the requirements of ADO2021.

9.4.2 Acoustics, ventilation and overheating assessment (during the day)

The results of acoustic modelling have been used to carry out a Level 1 assessment of noise ingress during an overheating condition for living rooms during the day in line with Association of Noise Consultants *Acoustics Ventilation and Overheating, residential Design Guide*.

The Level 1 assessment indicates that both the Mill and The Loom elements of the proposed development fall into the negligible risk category for the south facade and high risk category for the north, west and east facades. It should be noted that there are some areas of medium risk category. Therefore, a Level 2 assessment is required.

For the north, east and west facades a more detailed, Level 2 assessment is required and will need to consider the following:

- Duration of period where additional ventilative cooling is required (to be assessed by others, typically part of a CIBSE TM59 assessment)
- How wide the external windows would need to be open to control overheating (to be assessed by others, typically part of a CIBSE TM59 assessment)
- Design, extent and construction of attenuated passive ventilation.

9.4.3 Recommendations

Based on the results of the ADO2021 simplified assessment open windows in bedrooms at night will likely need to be closed.

It is recommended that measures other than the use of opening windows, are incorporated within the design to reduce overheating within the bedrooms. Typical these measures will include:

- Minimising internal heat generation through energy efficient designs
- Reducing the amount of heat entering the building by:
 - Reducing the proportion of glass and/or adjusting the depth of window reveal
 - Reducing the glazing's G-value
 - Installing internal blinds
 - Utilising fixed shading devices, eg, shutters, external blinds, overhangs, awnings.
- Exposing thermal mass within the apartments

- Removing exceed heat via:
 - Ventilation louvres in external walls
 - A mechanical ventilation system
 - A mechanical cooling system (mechanical cooling is expected only to be used where insufficient heat is capable of being removed via openings).
- Providing shared amenity which will be comfort cooled.

Through a combination of the above the total amount of time that windows will need to be open to control overheating is expected to be reduced. It is recommended that the overheating strategies developed during subsequent design phases provide feedback on the duration of time when overheating is expected to occur and the extent of opening required, so that further analyses of internal noise levels and their effects can be provided.

10 ProPG Acoustic Design Statement – The Loom

This section sets out a ProPG Acoustic Design Statement for The Loom only as this is the only new build element of the scheme.

10.1 Stage 1 assessment

The measured external ambient noise levels, as detailed in Section 6 indicate that the site would be exposed to a low to high risk of adverse noise effects. This level of risk reduces on the south facade where there is screening from the road.

10.2 Stage 2 assessment

This section discusses the assessed external noise levels at the facades of the proposed development and the good acoustic design processes adopted so that appropriate conditions for a residential development (internal noise levels and external noise levels in amenity areas) are provided.

10.2.1 External noise level evaluation

The existing environmental noise sources in the vicinity of the proposed development comprise:

- Road traffic noise from Oldham Road
- Noise from Wince Brook to the south of the development.

The environmental noise survey indicates that due to the geometry of the building, there are areas of the development that will be exposed to higher noise levels (to the north and part of the east and west facades close to Oldham Road), and areas with low risk of adverse noise effect (to the south of the building screened from the road).

10.2.2 Noise levels in the vicinity of the residential development

Based on the predicted noise level across the site, the external noise levels during the daytime fall between L_{Aeq} 47-77 dB, and between L_{Aeq} 47-72 dB at night.

The measured maximum noise levels at night-time range between L_{AFmax} 88 dB to the north and L_{AFmax} 63 dB to the south.

These levels need to be controlled to achieve internal noise level in line with BS 8233: 2014 and ProPG.

10.2.3 Element 1 – Good Acoustic Design

Oldham Road is located directly next to the north of the site. This is the main noise source. Due to the proximity of the road to the site, it is not possible to mitigate noise from this.

10.2.4 Element 2 – Internal noise levels

Based on the measured and assessed external noise levels and internal noise criteria presented in Table 1, the facade sound insulation requirements can be determined. Compliance with Table 1 criteria will meet Element 2 requirements of the Stage 2 assessment.

10.2.5 Element 3 – External amenity area noise levels

Based on the measured and assessed external noise levels and external amenity area noise criteria presented Section 4.3.2, the external noise levels are minimised as much as practicable without significantly reducing the building footprint or omitting external terraces.

BS 8233:2014 states that the development should be '*designed to achieve the lowest practicable levels ... but should not be prohibited*', which infers that permission should not be refused on this basis. Noise levels on the ground floor amenity area are predicted to be around L_{Aeq} 65 to 70 dB. Noise levels on the rooftop amenity area are predicted to be around L_{Aeq} 52 to 65 dB.

10.2.6 Element 4 – Assessment of other relevant issues

In regard to overheating, it is recommended that a Level 2 assessment is carried out as set out in Section 9.4.

An enhanced standard of sound insulation has been recommended to control noise transfer from commercial units to residences above. This is set out in Section 8.1.1.

10.2.7 Recommendation to the decision maker

When considering the good acoustic design process that has been followed and demonstrated within this statement, it is recommended that consent be granted with conditions associated with noise ingress to the proposed residences.

11 Conclusion

The representative background sound levels were:

- $L_{A90,5min}$ 51 dB during the day, and $L_{A90,5min}$ 42 dB during the night at position A
- $L_{A90,5min}$ 65 dB during the daytime and $L_{A90,5min}$ 63 dB at night at position B.

Based on the local authority guidance, the relevant plant noise limits at the worst affected existing noise sensitive premises have been set. These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent.

Based on standard guidance, the operational noise limits at the worst affected existing noise sensitive premises have been set. These limits are cumulative, and apply with all plant operating under normal conditions.

At this stage, no detailed information is available in relation to the proposed installation of building services plant, and this will need to be assessed in detail as the design progresses.

Based on the typical guidance, operational noise limits for noise from amplified music from the commercial units proposed as part of the development. These limits are cumulative and apply 1 m from the nearest noise sensitive receptors.

An initial assessment of the required facade sound insulation performances across the development has been carried out based on controlling external noise ingress to meet the typical guidance.

Guidance on example glazing configurations capable of meeting the facade sound insulation requirements is also provided.

A Level 1 AVO assessment has been carried out. This indicates that both Warwick Mill and The Loom fall into the negligible risk category for the south facade and high risk category for the north, west and east facades. Therefore, a Level 2 assessment is required.

A simplified ADO2021 acoustic assessment has been carried which indicates that that windows will likely be closed overnight, therefore additional ventilative cooling will likely need to be provided by other means.

Appendix A

Survey details

Equipment

The attended noise measurements were taken using a Brüel and Kjær 2250 sound level meter and a Norsonic 118 sound level meter. The unattended noise measurements were undertaken with Rion NL-52 sound level meters.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	2250/3011964	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Microphone	4189/3100176	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Pre-amp	ZC0032/26376	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Calibrator	4231/3019123	Brüel & Kjær	8 Sep 23	UCRT21/2086
Sound level meter	Nor118/31754	Norsonic	16 Feb 23	UCRT21/1226
Microphone	40AF/62396	Gras	16 Feb 23	UCRT21/1226
Pre-amp	1206/30873	Norsonic	16 Feb 23	UCRT21/1226
Calibrator	1251/31322	Norsonic	16 Feb 23	UCRT21/1224
Sound level meter	NL-52/01143564	Rion	15 Dec 22	TCRT20/1738
Microphone	UC-59/10153	Rion	15 Dec 22	TCRT20/1738
Pre-amp	NH-25/43581	Rion	15 Dec 22	TCRT20/1738
Calibrator	NC-74/34257023	Rion	14 Dec 22	TCRT20/1736
Sound level meter	NL-52/00932326	Rion	16 Mar 23	TCRT21/1182
Microphone	UC-59/05549	Rion	16 Mar 23	TCRT21/1182
Pre-amp	NH-25/32354	Rion	16 Mar 23	TCRT21/1182
Calibrator	NC-74/34125432	Rion	16 Mar 23	TCRT21/1181

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meter(s) used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

During the attended noise measurements, the weather was generally clear and dry and no rain occurred.

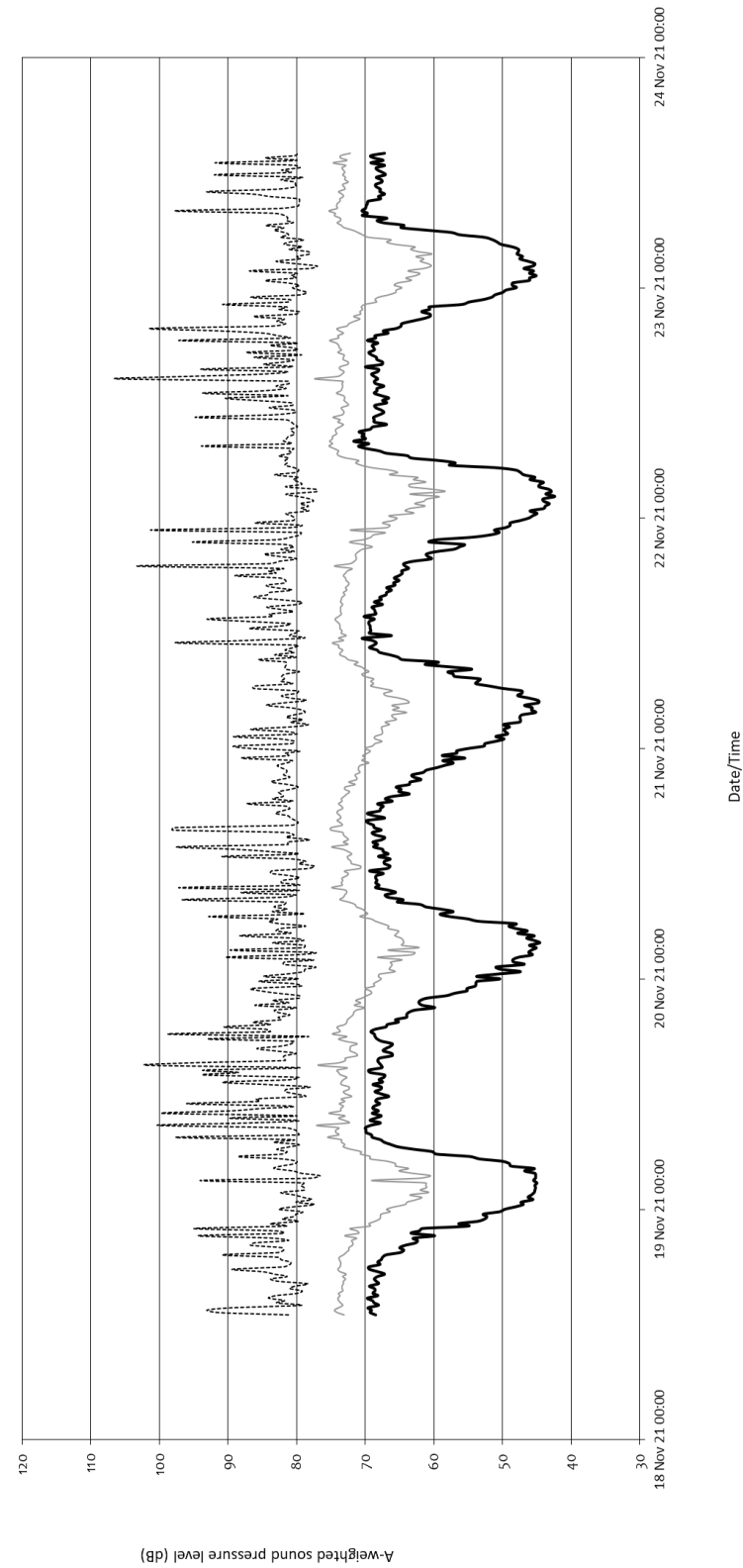
During the unattended noise measurements, weather reports for the area indicated that temperatures varied between -1°C at night and 14°C during the day, and the wind speed was less than 6 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at position A

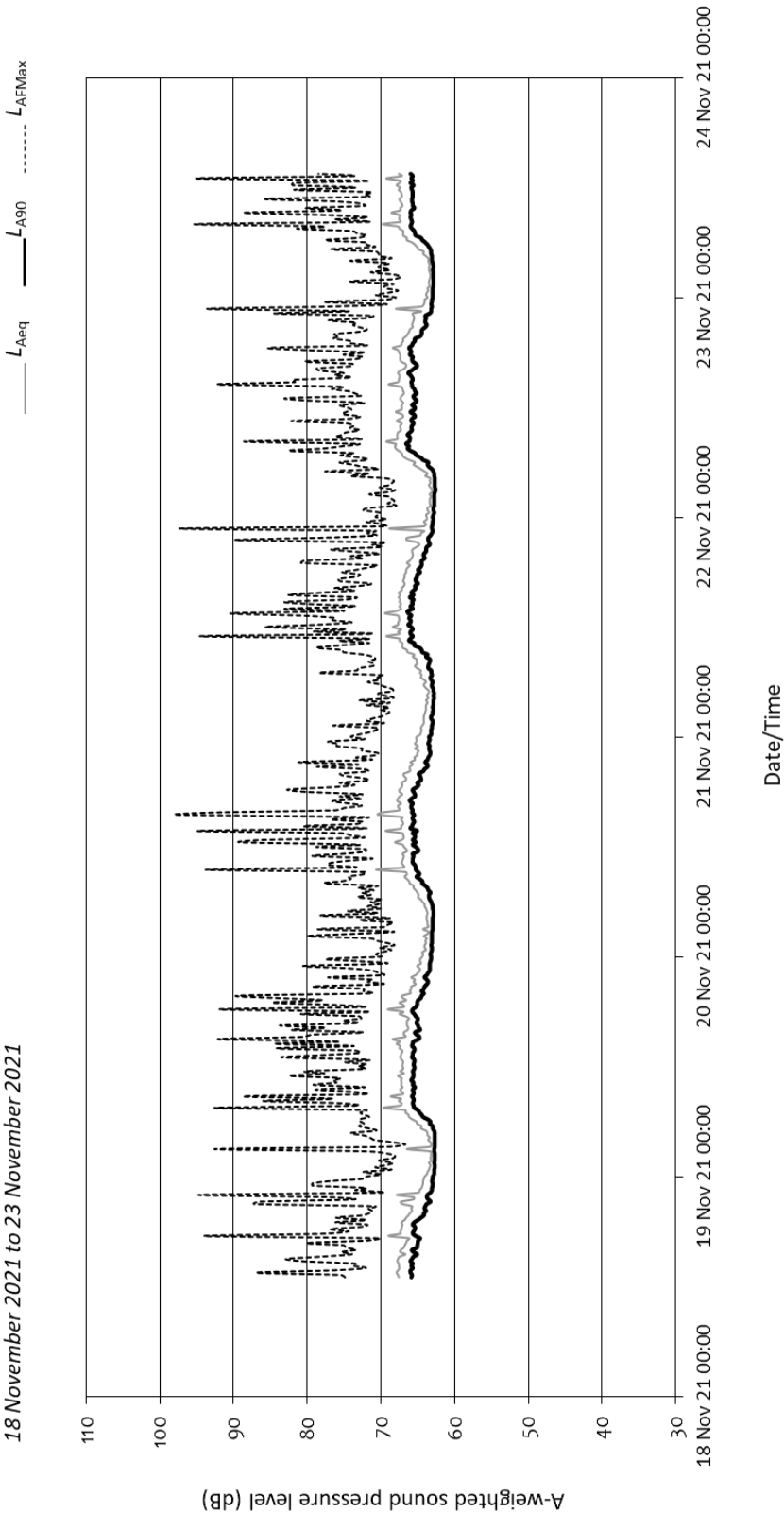
Warwick Mill
Results of noise logging survey at Position A
18 November 2021 to 23 November 2021



Appendix C

Results of unattended measurements at position B

Warwick Mill
Results of noise logging survey at Position B
18 November 2021 to 23 November 2021



Appendix D

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

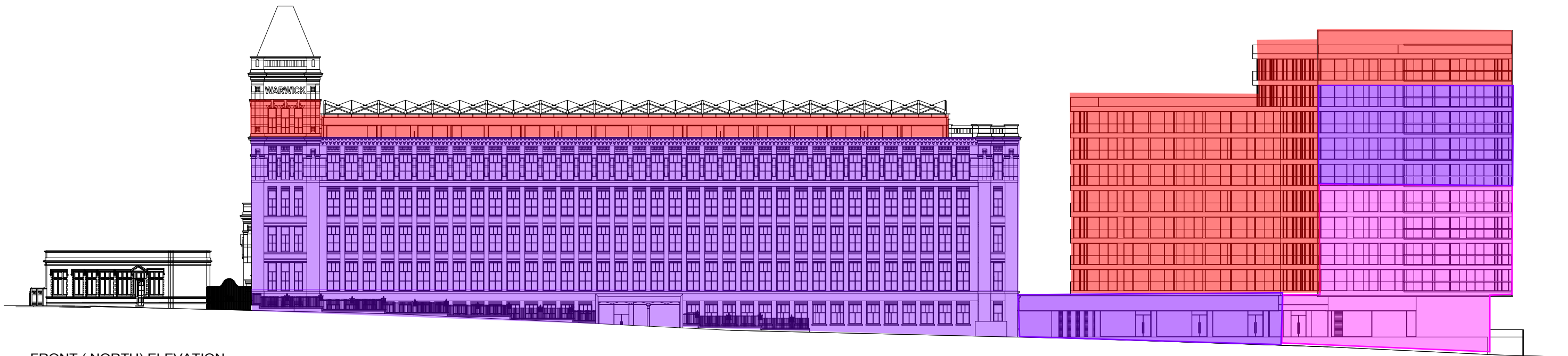
If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

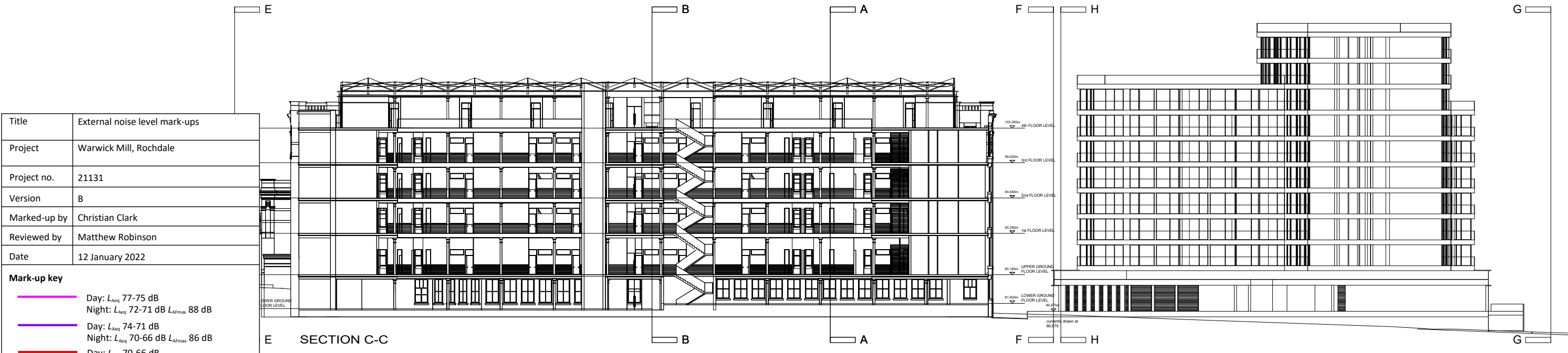
If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

Appendix E

External noise level mark-ups

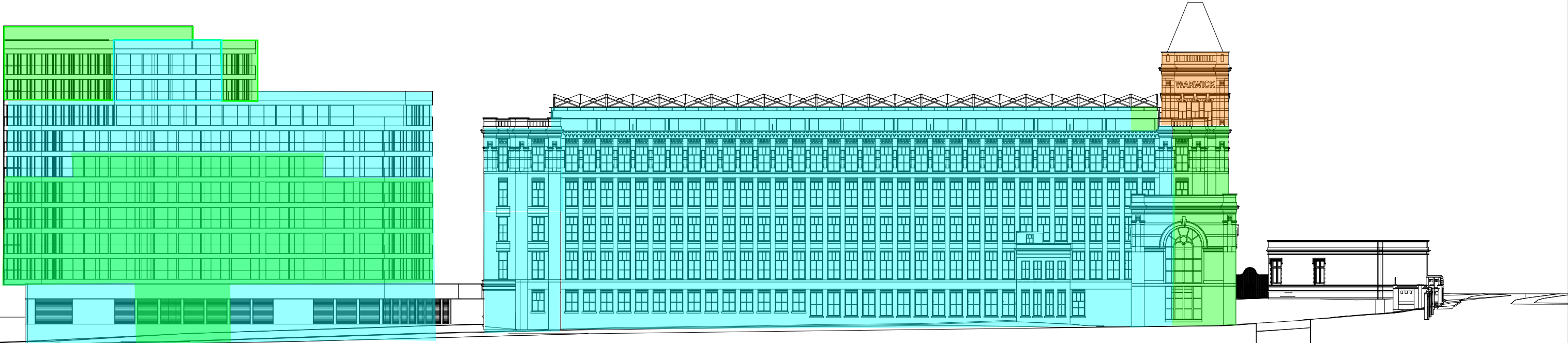


FRONT (NORTH) ELEVATION



Night: L_{Aeq} 54-50dB L_{AFmax} 70 dB Day: L_{Aeq} 50-45 dB Night: $L_{Aeq} \leq 47$ dB L_{AFmax} 63 dB			Notes : ■ Dimensions are to be checked on site before fabrication and construction ■ Any discrepancies are to be immediately notified to the architects ■ Structural measurements are to be taken from the structural engineers drawings ■ Do not scale ■ Copyright reserved by GMA	KEY	GMA ARCHITECTURE Architects and Designers UK House 82 Heath Road Twickenham TW1 4BA Telephone 020 8891 5959 Fax 020 8607 9933 Email enquiries@gmaarchitecture.co.uk www.gmaarchitecture.co.uk	DRAWING ISSUE STATUS for information	Client KAM LEI FONG LTD	Scale 1:250@A1 1:100@A3	Date OCT 21	Drawn PA
SANDY BROWN Consultants in Acoustics, Noise & Vibration						Project WARWICK MILL MIDDLETON MANCHESTER M24 1 AZ	Drawing NORTH (REAR) ELEVATION + SECTION A-A	Type 01	Client 277-01	Drawing No WM-TL-201
REV	DATE	DRAWN				DESCRIPTION				

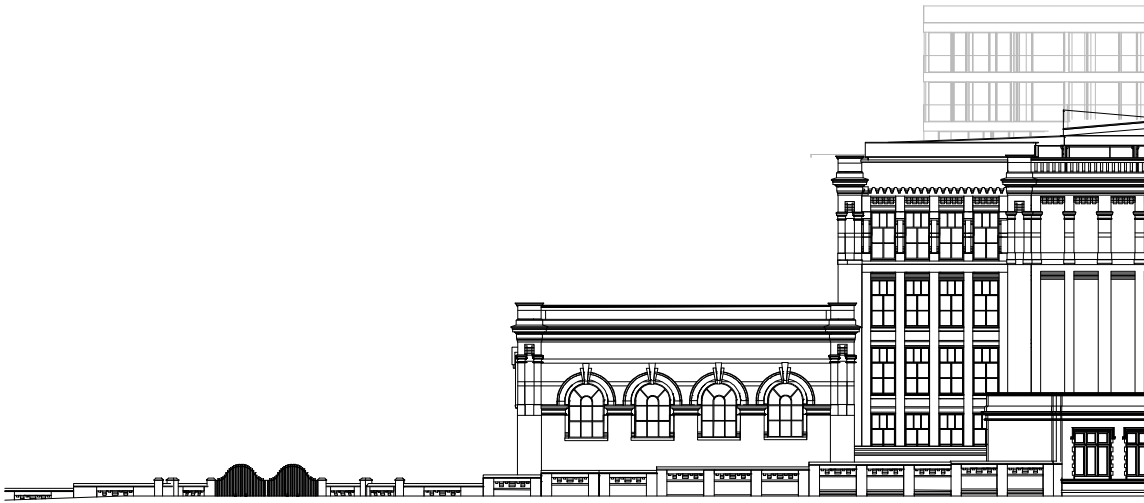
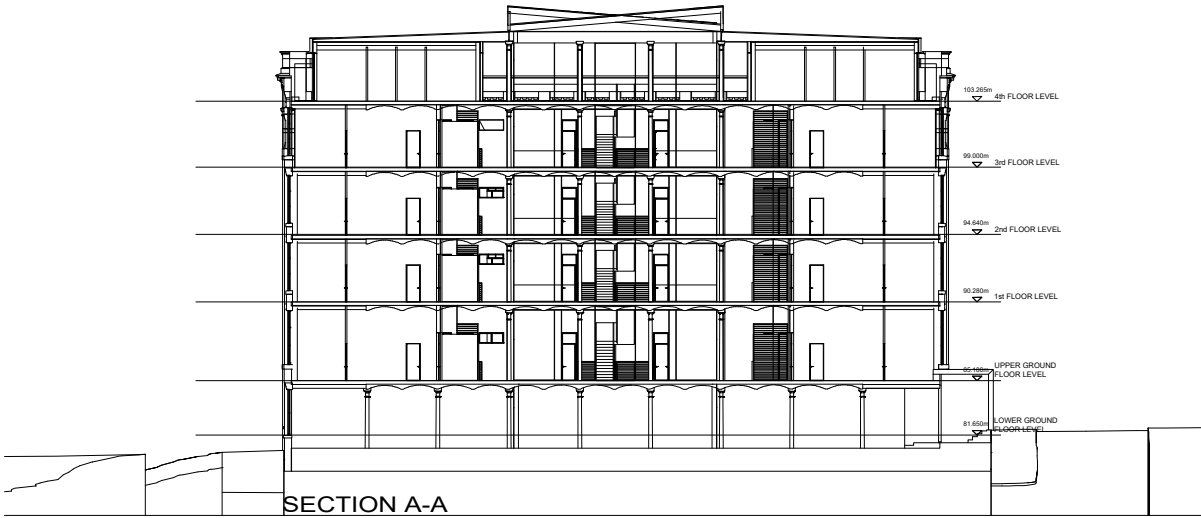
Title	External noise level mark-ups
Project	Warwick Mill, Rochdale
Project no.	21131
Version	B
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	12 January 2022
Mark-up key Day: L_{Aeq} 77-75 dB Night: L_{Aeq} 72-71 dB $L_{Afm\max}$ 88 dB Day: L_{Aeq} 74-71 dB Night: L_{Aeq} 70-66 dB $L_{Afm\max}$ 86 dB Day: L_{Aeq} 70-66 dB Night: L_{Aeq} 65-61 dB $L_{Afm\max}$ 81 dB Day: L_{Aeq} 65-58 dB Night: L_{Aeq} 60-55 dB $L_{Afm\max}$ 76 dB Day: L_{Aeq} 57-51 dB Night: L_{Aeq} 54-50dB $L_{Afm\max}$ 70 dB Day: L_{Aeq} 50-45 dB Night: $L_{Aeq} \leq 47$ dB $L_{Afm\max}$ 63 dB	
SANDY BROWN <i>Consultants in Acoustics, Noise & Vibration</i>	



REAR (SOUTH) ELEVATION

	Notes : ■ Dimensions are to be checked on site before fabrication and construction ■ Any discrepancies are to be immediately notified to the architects ■ Structural measurements are to be taken from the structural engineers drawings ■ Do not scale ■ Copyright reserved by GMA	KEY	GMA ARCHITECTURE Architects and Designers UK House 82 Heath Road Twickenham TW1 4BA Telephone 020 8891 5959 Fax 020 8607 9933 Email enquiries@gmaarchitecture.co.uk www.gmaarchitecture.co.uk	DRAWING ISSUE STATUS		Client KAM LEI FONG LTD	Scale 1:250@A1 1:100@A3	Date OCT 21	Drawn PA	Checked IL
				Project WARWICK MILL MIDDLETON MANCHESTER M24 1AZ	Drawing SOUTH (REAR) ELEVATION					
REV	DATE	DRAWN	DESCRIPTION			Type 01	Client 277-01	Drawing No WM+TL-202	Revision -	

K:\Warwick Mill, Middleton, Manchester\Drawings\elevations + sections\

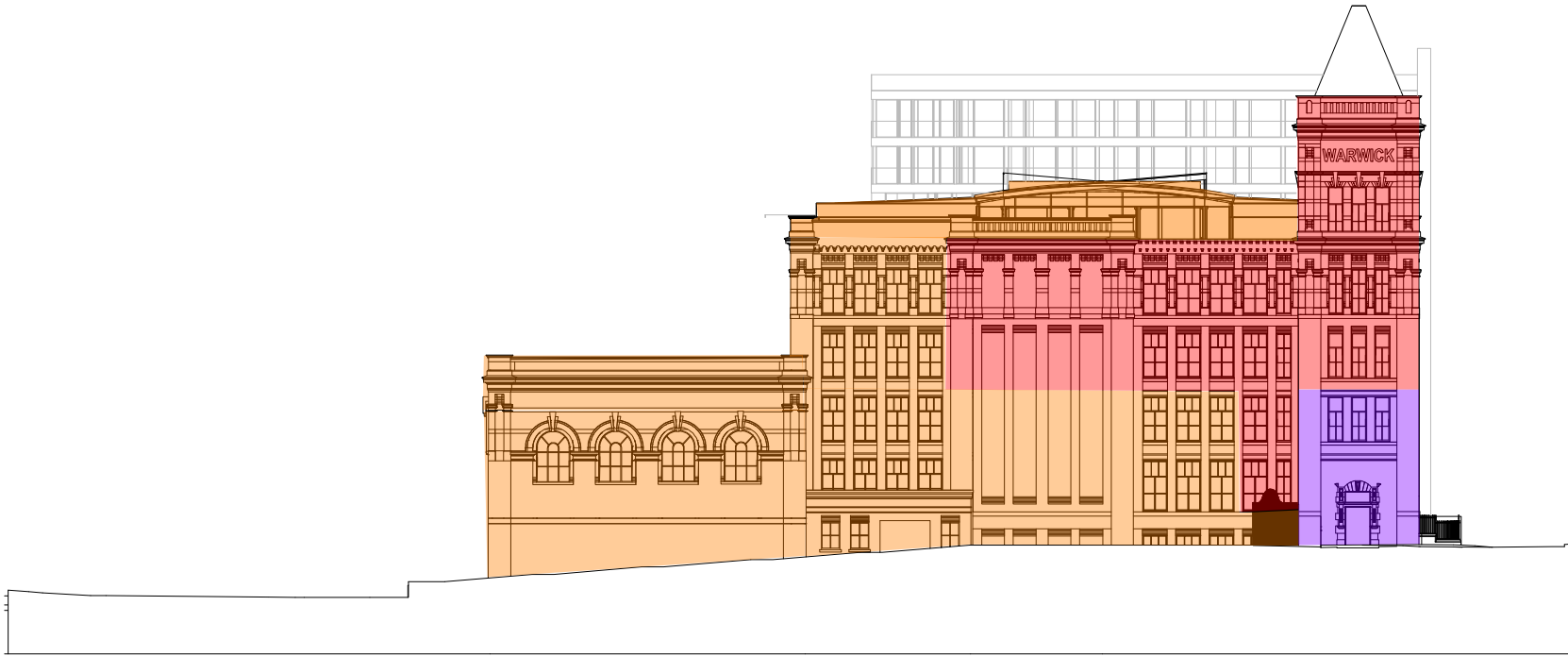
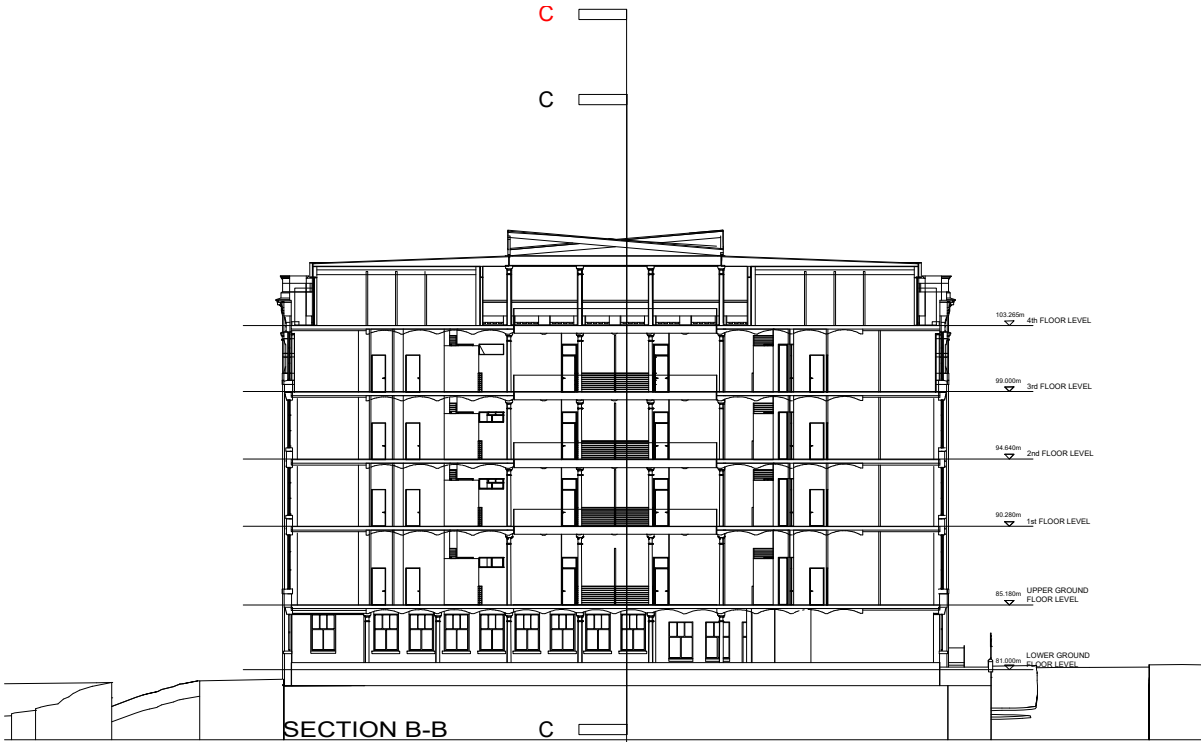


Title	External noise level mark-ups
Project	Warwick Mill, Rochdale
Project no.	21131
Version	B
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	12 January 2022

Mark-up key	
—	Day: L_{Aeq} 77-75 dB Night: L_{Aeq} 72-71 dB L_{Amax} 88 dB
—	Day: L_{Aeq} 74-71 dB Night: L_{Aeq} 70-66 dB L_{Amax} 86 dB
—	Day: L_{Aeq} 70-66 dB Night: L_{Aeq} 65-61 dB L_{Amax} 81 dB
—	Day: L_{Aeq} 65-58 dB Night: L_{Aeq} 60-55 dB L_{Amax} 76 dB
—	Day: L_{Aeq} 57-51 dB Night: L_{Aeq} 54-50dB L_{Amax} 70 dB
—	Day: L_{Aeq} 50-45 dB Night: $L_{Aeq} \leq 47$ dB L_{Amax} 63 dB

SANDY BROWN
Consultants in Acoustics, Noise & Vibration

SIDE (EAST) ELEVATION D

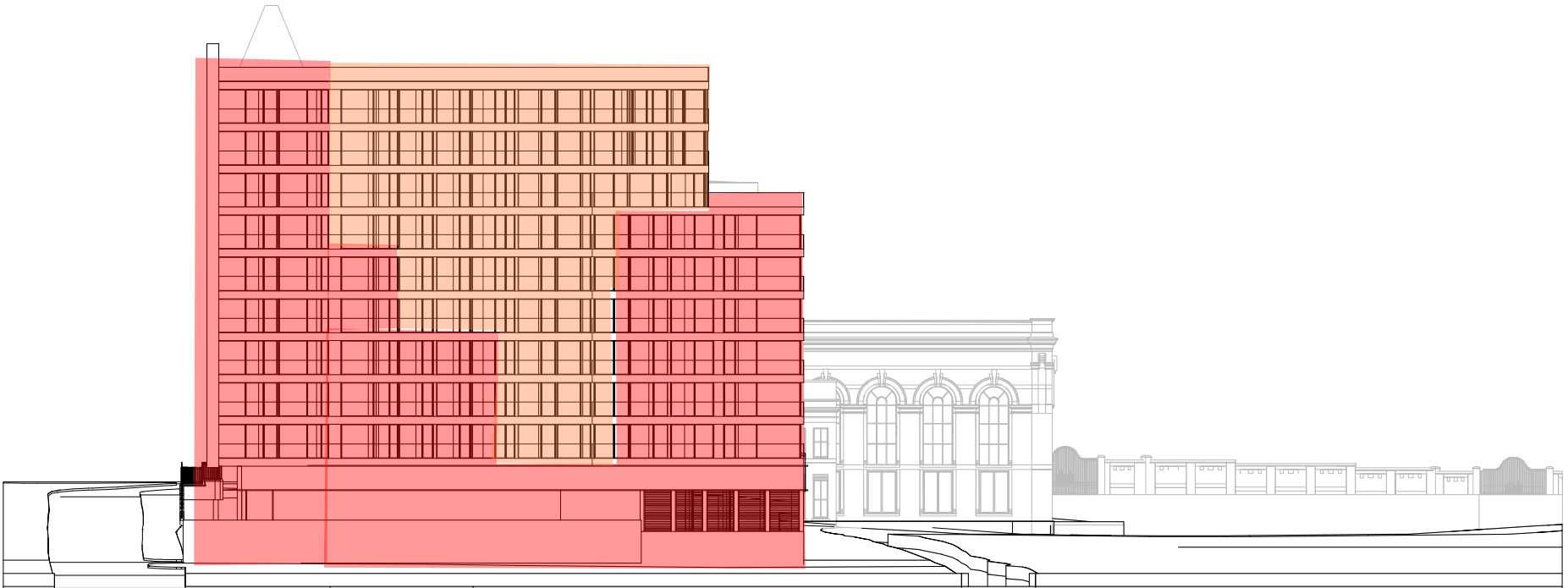


SIDE (EAST) ELEVATION E

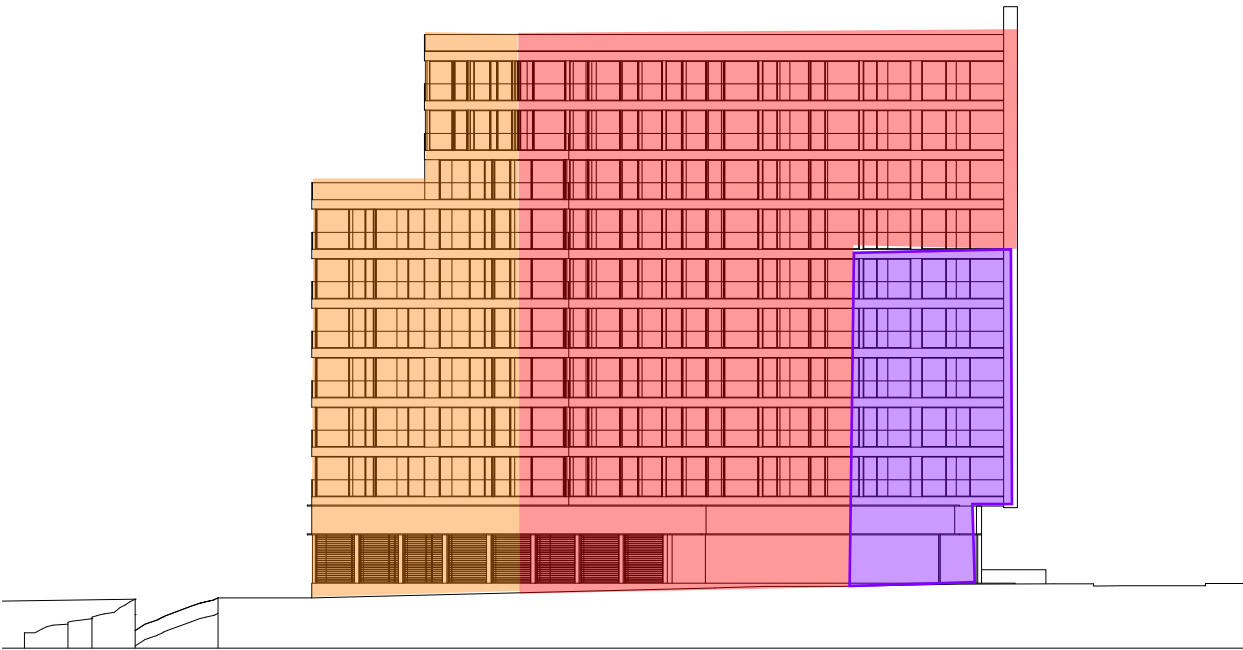
	Notes : ■ Dimensions are to be checked on site before fabrication and construction ■ Any discrepancies are to be immediately notified to the architects ■ Structural measurements are to be taken from the structural engineers drawings ■ Do not scale ■ Copyright reserved by GMA	KEY	GMA ARCHITECTURE Architects and Designers UK House 82 Heath Road Twickenham TW1 4BA Telephone 020 8891 5959 Fax 020 8607 9933 Email enquiries@gmaarchitecture.co.uk www.gmaarchitecture.co.uk	DRAWING ISSUE STATUS		Client KAM LEI FONG LTD		Scale	Date	Drawn	Checked
				for information				1:250@A1 1:100@A3	OCT 21	PA	IL
REV DATE	DRAWN	DESCRIPTION		Project	WARWICK MILL MIDDLETON MANCHESTER M24 1 AZ	Drawing	EAST (SIDE) ELEVATION E at BUILDING + BOUNDARY F SECTIONS A-A and B-B	Type	Client	Drawing No	Revision
								01	277-01	WM+TL-203	-



SIDE (WEST) ELEVATION F



THE LOOM - SIDE (WEST) ELEVATION G



THE LOOM - SIDE (EAST) ELEVATION H

Title	External noise level mark-ups
Project	Warwick Mill, Rochdale
Project no.	21131
Version	B
Marked-up by	Christian Clark
Reviewed by	Matthew Robinson
Date	12 January 2022
Mark-up key Day: L_{Aeq} 77-75 dB Night: L_{Aeq} 72-71 dB L_{Afmmax} 88 dB Day: L_{Aeq} 74-71 dB Night: L_{Aeq} 70-66 dB L_{Afmmax} 86 dB Day: L_{Aeq} 70-66 dB Night: L_{Aeq} 65-61 dB L_{Afmmax} 81 dB Day: L_{Aeq} 65-58 dB Night: L_{Aeq} 60-55 dB L_{Afmmax} 76 dB Day: L_{Aeq} 57-51 dB Night: L_{Aeq} 54-50dB L_{Afmmax} 70 dB Day: L_{Aeq} 50-45 dB Night: L_{Aeq} ≤ 47 dB L_{Afmmax} 63 dB	
SANDY BROWN <i>Consultants in Acoustics, Noise & Vibration</i>	

Notes : ■ Dimensions are to be checked on site before fabrication and construction ■ Any discrepancies are to be immediately notified to the architects ■ Structural measurements are to be taken from the structural engineers drawings ■ Do not scale ■ Copyright reserved by GMA			KEY		GMA ARCHITECTURE Architects and Designers UK House 82 Heath Road Twickenham TW1 4BA Telephone 020 8891 5959 Fax 020 8607 9933 Email enquiries@gmaarchitecture.co.uk www.gmaarchitecture.co.uk		DRAWING ISSUE STATUS for information		Client KAM LEI FONG LTD		Scale 1:250@A1 1:100@A3	Date OCT 21	Drawn PA	Checked IL
REV	DATE	DRAWN	DESCRIPTION	Project WARWICK MILL MIDDLETON MANCHESTER M24 1AZ		Drawing THE LOOM SIDE ELEVATION G and SIDE ELEVATION G SIDE ELEVATION F		Type 01	Client 277-01	Drawing No WM+TL-204	Revision -			