

Proposed Apartment Development, Bendix Street, Manchester M4

Noise Impact Assessment

for GMI Construction, 77 Dale Street, Manchester M1 2HG

Our Reference
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Your Reference
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Executive Summary

Environoise Consulting Limited has been instructed by GMI Construction to provide a noise impact assessment for the proposed apartment development at Bendix Street, Manchester M4.

Plant Noise Impact

- A noise survey was done between 04.30hrs and 05.00hrs, Tuesday 13th October 2020 in accordance with BS4142:2014+A1:2019 to determine 'representative' background noise levels.
- Predicted plant noise levels meet the plant noise limit at the nearest residential receptors for both the daytime and night-time periods, indicating a 'low impact' in accordance with BS4142. Therefore, no further mitigation is necessary.

Rooftop Plant Noise Breakthrough

- The level of rooftop plant noise breakthrough in 11th floor apartments meets the NR15 L_{eq} target for bedrooms; therefore, no further mitigation measures are necessary.

1 Criteria

1.1 Local Authority Requirements

1.1.1 The Manchester City Council 'Planning & Noise – Technical Guidance' document states the following:

Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.

1.2 BS4142+A1:2019

1.2.1 BS 4142:2014+A1:2019ⁱ provides a method of determining the 'impact of specific sound' on dwellings due to industrial and commercial noise sources through comparison between the measured background noise level (L_{A90}) and the noise source rating level ($L_{A,T,r}$) under consideration. The rating level is the specific noise level plus penalties of up to 18dB added for features to account for the character of the noise as follows:

- **Tonality:** +2dB penalty: Just perceptible; +4dB penalty: Clearly perceptible and +6dB penalty: Highly perceptible.
- **Impulsivity:** +3dB penalty: Just perceptible; +6dB penalty: Clearly perceptible and +9dB penalty: Highly perceptible.
- **Intermittency:** +3dB penalty: identifiable on/ off conditions.

1.2.2 When comparing the rating plant noise level against the background noise level, BS 4142:2014+A1:2019 provides the following noise impact descriptors:

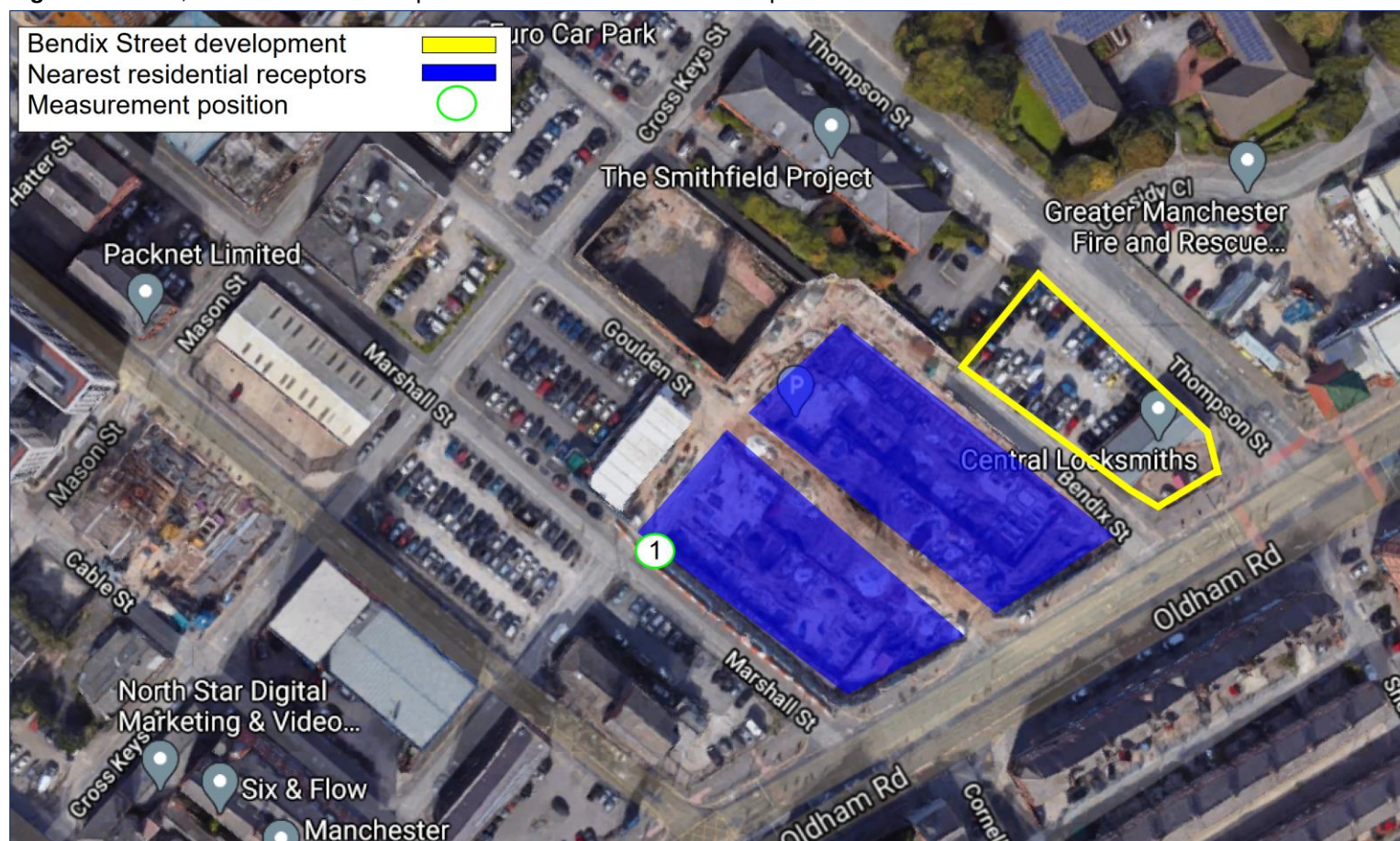
- +10dB(A) is likely to be an indicator of 'a significant impact, depending on the context'.
- +5dB(A) is likely to be an indicator of 'an adverse impact, depending on the context'.
- No excess of the background noise level is an indicator of 'a low impact, depending on the context'.

2 Plant Noise Impact

2.1 Noise Survey

- 2.1.1 A-weighted background noise levels ($L_{A90(15min)}$) and associated octave band noise levels were measured at one unattended position representative of the nearest noise-sensitive receptors (NSRs) between 04.30hrs and 05.00hrs, Tuesday 13th October 2020. Noise level measurements were also taken at three further positions but are not relevant to this assessment; full details of this survey can be found in report ref: 21462R02aSWpak.

Figure 2.1: Site, noise measurement position and noise sensitive receptors.



2.2 Background Noise Levels for Plant Limiting Levels

- 2.2.1 To assess the impact of plant, BS4142 requires the use of a 'representative' background noise level and due to the short-term measurement period, the lowest level of 42dB $L_{A90(15min)}$ has been used, see Table 2.1. The limiting noise level considers a 5dB reduction to the representative background noise level in order to comply with Local Authority requirements as per section 1.1.

Table 2.1: Measured background noise levels and limiting plant noise levels.

Position	Period	Background noise level range [$L_{A90(15min)}$ (dB)]	Representative background noise level [$L_{A90(15min)}$ (dB)]	Limiting noise level [$L_{Ar,Tr}$ (dB)]
1	04.30hrs – 05.00hrs, Tuesday 13 th October 2020	42 - 43	42	37

2.3 Proposed Plant Items

- 2.3.1 Details of the proposed air source heat pump units are given in Table 2.2 together with associated sound pressure levels at 1m sourced from manufacturers noise data. The key colours correlate with the proposed plant locations shown in Figure 2.2.

Table 2.2: Proposed plant and sound pressure level data.

Key	Item	No. of units	Octave band (Hz) sound pressure level per unit at 1m [$L_{eq,T}$ (dB)]							$L_{Aeq,T}$ at 1m (dB) per unit
			63	125	250	500	1k	2k	4k	
	Mitsubishi CAHV-P500YB-HPB (air source heat pump)	8	70	65	60	57	51	47	49	59

[illegible]

2.4.1	A SoundPLAN® computer noise model has been created of the proposed development (see Figure B1, Appendix B). Noise levels at NSR locations have been calculated as per the methodology in ISO 9613-2:1996 'Attenuation of sound during propagation outdoors. Part 2, General method of calculation' ⁱⁱ .
2.4.2	Plant noise will be non-varying, with no identifiable 'on-off' conditions and therefore no acoustic feature corrections have been applied for impulsivity and intermittency. Tonal characteristics will be 'just perceptible', and therefore a +2dB acoustic feature correction for tonality has been applied, see Table 2.4.

Table 2.4: Plant noise impact assessment at the most affected residential receptor.

	Noise impact at NSR (Upper floors of Broadside receptors)	
	Daytime (07.00 – 23.00hrs)	Night-time (23.00 – 07.00hrs)
Highest predicted specific noise level at NSR (dBA)	31	31
Acoustic feature correction (dBA)	+2	+2
Rating plant noise level ($L_{A_r,Tr}$ [dB])	33	33
Limiting noise level (dBA)	37	37
Level of excess (dB)	0 (-4)	0 (-4)
BS4142 impact descriptor	Low impact	Low impact

2.5 Conclusion

- 2.5.1 The limiting noise level is met at the NSR for both the daytime and night-time periods, indicating a 'low impact' in accordance with BS4142. Therefore, no further mitigation measures are required.

3 Rooftop Plant Noise Breakthrough

3.1 Plant Noise Levels

- 3.1.1 The highest plant noise levels at 1m above the roof of the bedroom of Apartment 1102, 4th floor have been determined from the noise model, see Table 3.1.

Table 3.1: Calculated ambient roof-top plant noise levels.

	L _{eq,T} at octave band frequency (Hz)							L _{Aeq,T} (dB)
	63	125	250	500	1k	2k	4k	
Plant noise level 1m from roof (dB)	76	71	66	63	57	53	55	66

3.2 Roof Construction

- 3.2.1 The proposed roof and ceiling construction is predicted to offer the sound reduction indices given in Table 3.2.

Table 3.2: Calculated SRI of roof / ceiling construction.

Proposed construction	Sound Reduction Indices [SRI (dB)] at octave band frequency (Hz)							R _w (dB)
	63	125	250	500	1k	2k	4k	
230mm rigid insulation/ 250mm reinforced concrete slab (≥2300kg/m ³) / Suspended MF ceiling system forming a ≥150mm void / 1 layer of 12.5mm Gyproc wallboard (8kg/m ²)	42	58	68	73	87	87	87	78

3.3 Assessment

- 3.3.1 Table 3.3 summarises a noise break-through calculation using the values in Tables 3.1 and 3.2 and considers a reverberation time of 0.5 seconds for bedrooms with recommended building services noise level target of NR15 for bedrooms to allow internal noise level targets to be achieved, see Table 3.3.

Table 3.3: Calculated plant noise breakthrough level in Apartment 1102.

	L _{eq,T} at octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Plant noise in apartment 1102 (dB)	35	14	0	0	0	0	0
NR15 target [L _{eq,T} (dB)]	47	35	26	19	15	12	9
Level of excess in apartment 1102 (dB)	0	0	0	0	0	0	0

3.4 Conclusion

- 3.4.1 Table 3.3 shows that rooftop plant noise breakthrough to Apartment 1102 meets the NR15 L_{eq} target; therefore, no further mitigation measures are required.

3.5 Recommendations

Structure-borne Vibration

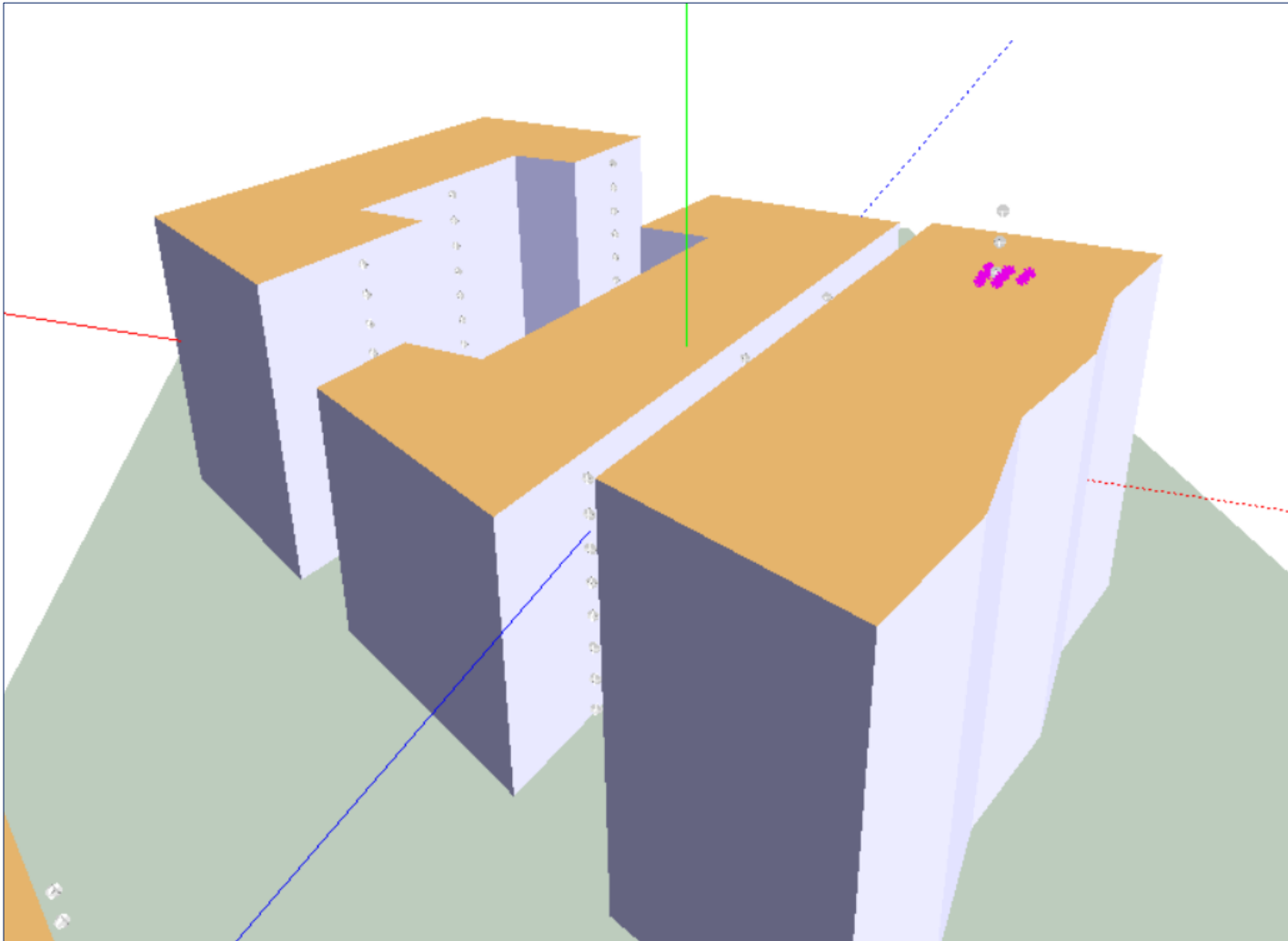
- 3.5.1 Table 3.4 gives recommendation to minimise structure borne vibration from roof-top plant to spaces below which should be considered by the M&E Consultant / Engineer.

Table 3.4: Plant vibration target.

Requirement	Target	Recommendation
Vibration to spaces	Vibration within spaces below roof-top plant should not be perceived	95% isolation efficiency should be achieved at frequencies of concern. It is likely that rubber/spring anti-vibration mounts should be installed between plant and the supporting structure, advice on this is typically provided by the manufacturer/supplier, examples of such companies are Total Vibration Solutions and Christie & Grey.

Appendix A: SoundPLAN® Model

Figure A1: 3D view of SoundPLAN® noise model.



Appendix B: Calculations

Figure B1: Roof-top plant noise-breakthrough calculation.

Project		Bendix St, Manchester						
Client	GMI							
Receive Room	Apt 1102							
Source Room	Rooftop Plant							
Element	Area	Description	Comments					
Element 1	17.0: m²	Floor	Floor					
Element 2	0.0: m²	Description						
Element 3	0.0: m²	Description						
Element 4	0.0: m²	Description						
Receiving Room	Apartment 1102							
Height of room	2.4: m							
Width of room	10.0: m							
Length of room	1.7: m	Volume can be manually overwritten if required						
Volume of room	41.8: m³	Use Volume Recalc button after overwriting to restore Autocalc						
Frequency Hz	63	125	250	500	1000	2000	4000	dB(A)
Apartment 1102 - Rev Time (sec)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Absorption (m² Sabines)	13.4	13.4	13.4	13.4	13.4	13.4	13.4	
Room Correction (dB)	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	
Frequency Hz	63	125	250	500	1000	2000	4000	dB(A)
Rooftop Plant - Reverberant Lp dB	76	71	66	63	57	53	55	65
10logS(tot) S = 17	12.3	12.3	12.3	12.3	12.3	12.3	12.3	
Sound Power In - dB	82.3	77.3	72.3	69.3	63.3	59.3	61.3	
SRI of Element Area								
Floor 1 17								
Description 2 0								
Description 3 0								
Description 4 0								
Combined SRI	42	58	68	73	87	87	87	
Sound Power Out - dB	40.3	19.3	4.3	-3.7	-23.7	-27.7	-25.7	
Apartment 1102 - Lp dB	35	14	-1	-9	-29	-33	-31	10
Criterion (NR at 1kHz)	47	35	26	19	15	12	9	
Additional SRI Required to meet NR15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Contributions	63	125	250	500	1000	2000	4000	dB(A)
Floor 1	77	72	67	64	58	54	56	66
Description 2	-	-	-	-	-	-	-	-
Description 3	-	-	-	-	-	-	-	-
Description 4	-	-	-	-	-	-	-	-

References

ⁱ BS4142:2014+A1:2019 'Methods for rating or assessing industrial and commercial sound', 2014.

ⁱⁱ ISO 9613-2:1996 'Attenuation of sound during propagation outdoors. Part 2, General method of calculation.' 1996.