

ENVIRONMENT

British Council

Bridgewater House
Manchester

Noise Assessment

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March 2023

DOCUMENT ISSUE RECORD

Document Number:	BHM-BWB-ZZ-ZZ-RP-YA-0001_NIA_S2_P02
BWB Reference:	221850-001

Revision	Date of Issue	Status	Author:	Checked:	Approved:
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EXECUTIVE SUMMARY

BWB Consulting was instructed by British Council to undertake a Noise Assessment to support a planning application for proposed rooftop plant at Bridgewater House on Whitworth Street, Manchester.

A baseline noise survey was undertaken at the site in February 2023. The results of the survey and subsequent assessment work have been undertaken in accordance with current standards and guidance, and Manchester City Council requirements.

An assessment of proposed fixed building service plant has shown that the requirements of Manchester City Council will be achieved. Therefore, based on the results of the assessment, it is considered that noise need not be a determining factor in the granting of planning approval for the proposed fixed plant.

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1. INTRODUCTION

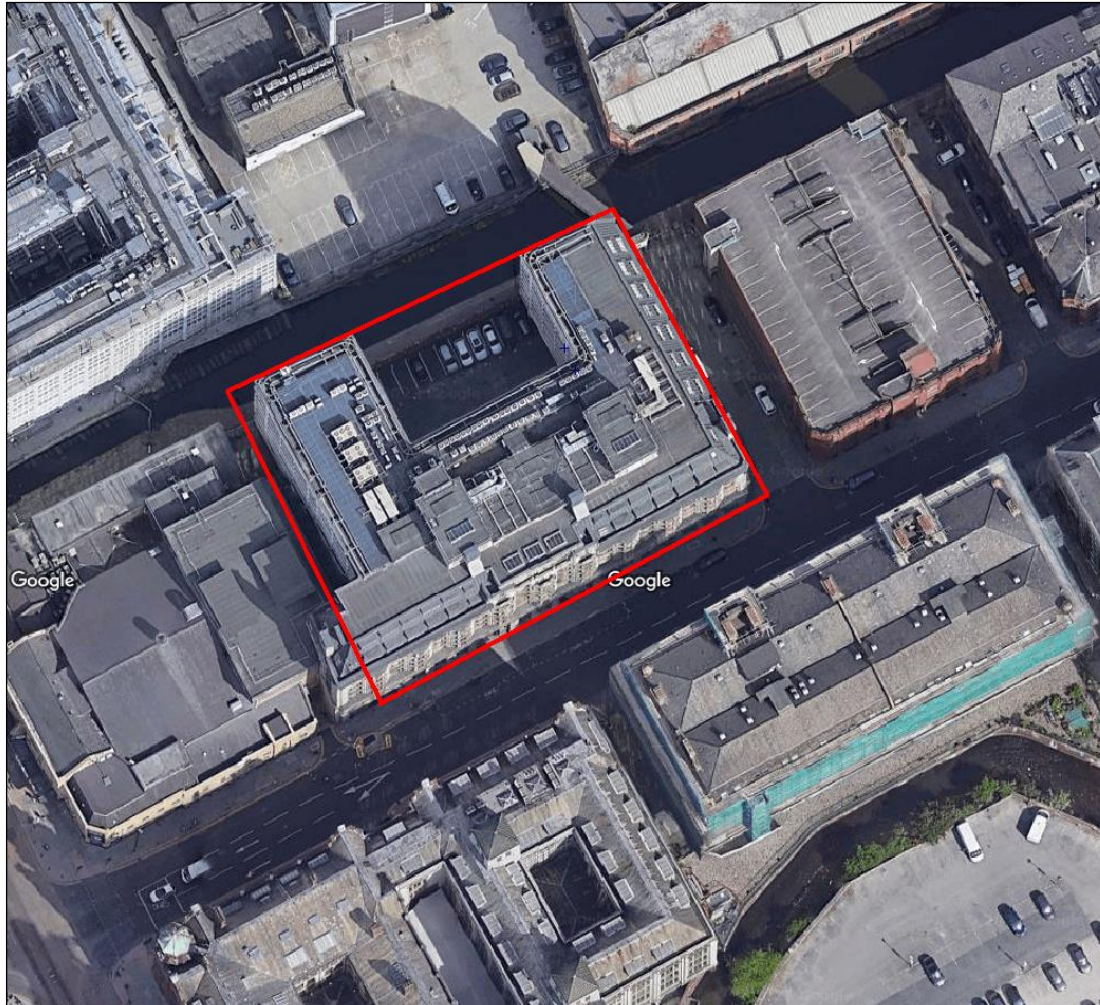
Appointment & Background

- 1.1 BWB Consulting (BWB) was instructed by British Council (the Client) to undertake a Noise Assessment for the installation of new rooftop plant at Bridgewater House on Whitworth Street, Manchester (the Site).
- 1.2 This assessment has been undertaken based on the results of a baseline noise survey on the Site. The results of the survey have been assessed in accordance with current standards and guidance, and Manchester City Council (MCC) requirements.
- 1.3 Where appropriate, consideration has been given to noise mitigation measures to demonstrate how an appropriate level of protection could be afforded to future noise sensitive receptors on the Site.
- 1.4 This report is necessarily technical in nature, so to assist the reader, a glossary of acoustic terminology can be found in **Appendix A**.

Site Setting

- 1.5 The location of the Site is shown in **Figure 2.1** overleaf.

Figure 1.1: Location Plan



Ref: Google Maps. Imagery © 2023 Infoterra Ltd & Bluesky, Maxar Technologies, The Information Group, Map data [Accessed February 2023]

Proposed Development

- 1.6 Proposals include for an office interior fit out project at 6th floor, Bridgewater House, Manchester of 985sqm, which includes new Air Conditioning (AC) units on the roof.
- 1.7 The proposed Site Plan is detailed in **Appendix B**.

Noise-Sensitive Receptors

- 1.8 Noise from any proposed sources will be assessed at nearby existing noise sensitive receptors (NSRs). The nearest existing NSR is located to south east off Whitworth Street, and is detailed below in **Table 1.1** and shown in **Figure 1.2** overleaf.

Table 1.1: Noise-Sensitive Receptors

NSR Number	Description	Grid Reference		Bearing from Site	Distance from Site Boundary
		Easting	Northing		
1	Residential flats at Lancaster House, Whitworth Street	384244	397645	South west	45m

- 1.9 An impact may be experienced at other receptors, for example Asia House on Princess Street the south of Whitworth Street, however, given the greater distance, any impact is likely to be less than at those receptors stated above.

2. STANDARDS AND GUIDANCE

National Planning policy Framework (NPPF)

- 2.1 Published in July 2021, this document sets out the Government's planning policies for England and supersedes the previous NPPF published in 2012. It makes the following reference to noise in the section entitled Conserving and enhancing the natural environment:

"174. 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 soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."

- 2.2 It also makes the following references to noise in the Section entitled Ground conditions and pollution:

"185. 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 the quality of life⁶⁰;

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.

⁶⁰ See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."

BS 4142: 2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

- 2.3 The BS 4142 Standard describes methods for rating and assessing the following:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;

- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
 - Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.
- 2.4 The methods use outdoor 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. The Standard advises the purpose of the methodology includes the assessment of sound from any plant and activities associated with existing industrial and/or commercial uses at proposed residential dwellings.
- 2.5 If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,Tf}$). The Standard effectively compares and rates the difference between the rating level of the specific sound and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound.
- 2.6 The Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) the source in question operates or is proposed to operate in the future.
- 2.7 Comparing the rating level with the background sound level, BS 4142 states:

"Typically, the greater this difference, the greater the magnitude of impact.

A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

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."

BS 8233:2014: Guidance on Sound Insulation and Noise Reduction for Buildings

- 2.8 This standard provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.
- 2.9 The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in **Table 2.1** below:

Table 2.1: Summary of Internal Ambient Noise Levels to be achieved in Habitable Rooms when Assessed in Accordance with BS 8233

Activity	Location	Period	
		07:00 to 23:00 Hours, i.e. Daytime	23:00 to 07:00 Hours, i.e. Night-time
Resting	Living Room	35 dB L _{Aeq} , 16 Hour	-
Dining	Dining Room/area	40 dB L _{Aeq} , 16 Hour	-
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq} , 16 Hour	30 dB L _{Aeq} , 8 Hour

MCC: Planning and Noise Technical Guidance document

- 2.10 MCC's Planning and Noise Technical Guidance document (Dec 2015) states the following regarding noise and vibration from fixed plant:

'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'.

3. BASELINE NOISE MONITORING

Summary

- 3.1 A baseline noise survey has been undertaken to establish typical background noise levels at existing sensitive receptors. During the survey, the rooftop plant due to be made redundant was switched off. Baseline noise monitoring has been undertaken at the Measurement Locations (MLs) identified in **Figure 3.1**.

Figure 3.1: Baseline Noise Measurement Locations



Survey Methodology

Measurement Location 1

- 3.2 Noise monitoring was undertaken at ML1 from 13:20 until 13:40 on Thursday 23rd February 2023. ML1 is approximately 60 m southeast of the Site Boundary. The microphone at ML1 was positioned at 2.0 m above local ground level in free-field conditions.

- 3.3 During attendance, the noise climate was noted to be dominated by road traffic on Whitworth Street and train passbys on the rail line, with distant road traffic and audible as a secondary noise source. A shorter measurement was undertaken at ML1 due to the onset of nearby construction, which has been excluded from the data.
- 3.4 Noise levels measured at ML1 are considered representative of the prevailing noise climate at the façade of the NSR facing away from the Site.

Measurement Location 2

- 3.5 Noise monitoring was undertaken at ML2 from 14:15 until 15:15 on Thursday 23rd February 2023. ML2 is approximately 10 m east of the Site Boundary. The microphone at ML2 was positioned at 2.0 m above local ground level in free-field conditions.
- 3.6 During attendance, the noise climate was noted to be dominated by road traffic on Whitworth Street. Distant construction noise and chatter from pedestrians were consistently audible as secondary noise sources.
- 3.7 Noise Levels at ML2 are considered representative of incident noise levels at the façade of the closest NSR facing towards the Site.

Measurement Equipment

- 3.8 The baseline noise survey was undertaken using the Class 1 specification noise measurement equipment detailed in **Table 3.1**. Equipment was calibrated using a portable calibrator immediately before and after the measurements with no significant drift in calibration observed. The sound level meters, pre-amplifiers and microphones were calibrated to traceable standards at an accredited laboratory within the 24 months prior to the measurements. The portable calibrators were calibrated within the 12 months preceding the date of the survey.

Table 3.1: Noise Measurement Equipment

Equipment	Make & Model	Serial Number
Sound Level Meter	01 dB Fusion	14145
Microphone	Grass 40CD	466815
Calibrator	01dB CIRRUS	98098

Meteorological Conditions

- 3.9 The weather throughout the survey remained conducive to environmental noise measurement, it being dry with negligible winds (<5ms⁻¹).

Measurement Results

- 3.10 A summary of the measured levels to be used within the assessment are provided below in **Tables 3.2** and **3.3**.

Table 3.2: Summary of Measured Sound Pressure Levels at ML1

Period	Start Time	Duration	dB L _{Aeq,T} ¹	dB L _{A90,T} ²
Thursday Daytime	23/02/2023 13:20	15-min	57	52
¹ Logarithmic average sound pressure levels during measurement period				
² Typical backgrounds determined from an arithmetic average of the mean, mode and median L _{A90,15mins} values during measurement period.				

Table 3.3: Summary of Measured Sound Pressure Levels at ML2

Period	Start Time	Duration	dB L _{Aeq,T} ¹	dB L _{A90,T} ²
Thursday Daytime	23/02/2023 14:15	1-hour	67	59
¹ Logarithmic average sound pressure levels during measurement period				
² Typical backgrounds determined from an arithmetic average of the mean, mode and median L _{A90,15mins} values during measurement period.				

4. ASSESSMENT

Fixed Building Services Plant

- 4.1 It is understood that 2 no. AC Units are to be installed at rooftop level and are assumed to operate during the daytime periods only. Therefore, the night-time period has not been included within the following assessment.
- 4.2 Based on the environmental noise survey data and in accordance with MCC's requirements, maximum plant emission levels have been set in controlling fixed plant noise in **Table 4.1**.

Table 4.1: Plant Noise Emission Limits

Façade	Period	Typical Background Sound Level (dB L _{A90})	Criteria	Plant Noise Emission Limit (dB)
North facing	Daytime (07:00 – 23:00 hrs)	59	= L _{A90} – 5dB	54
South facing		52		47

- 4.3 Noise limits apply at a position 1m from the façade of the nearest noise sensitive properties and include the total contribution of noise from all plant items associated with the proposed plant scheme that may run during any particular period.
- 4.4 It is understood that the Client proposes to install:
- PURY-EP400YSNW-A2 with a Sound Power of 74dB(A).
 - PURY-EP750YSNW-A2 with a Sound Power Level of 90 dB(A).

Sound power levels refer to the units operating at 100% capacity on a heating setting in order to represent a worst-case scenario.

Noise Model

- 4.5 In order to predict the noise levels from the Site at the NSR, a detailed acoustic model of the Site has been generated using the PC based CadnaA® noise modelling package, applying the following prediction methodology:
- For industrial/commercial noise sources, the noise model was set to apply the noise prediction methodology set out in ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation¹.
 - Mapping of the Site and the surrounding area was calibrated into the noise model based on known Ordinance Survey grid reference points.

¹ International Organization for Standardization (1996), ISO 9613-2:1996, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation

- To reflect the local ground cover, ground absorption was set to $G = 0.0$ (0% acoustically absorptive ground).
- The model was set to include second order reflected noise from solid structures.
- Off-site buildings which would provide screening to the Site have been incorporated as reflective façades.

4.6 Proposed fixed plant units have been included within the noise model as point sources using the Sound Power and Sound Pressure Levels supplied, at a height of 1m above rooftop level. No "on-time" correction has been applied i.e. the units are assumed to be operating at all times during the daytime period only.

4.7 The specific sound level at NSR 1 has been calculated as a building evaluation to consider 7-storeys above ground at NSR 1. The worst-case specific sound level due to fixed plant is presented in **Table 4.2**.

Table 4.2: Predicted Specific Sound Level at NSR, dB Ls

NSR	Daytime
1	37

4.8 The predicted noise level at NSR 1 is 37dB Ls at the closest first floor bedroom. In accordance with BS 4142: 2014+A1:2019, penalties are applied to the specific sound level in order to provide the rating level. These penalties relate to the acoustic features of the sound source.

4.9 The results of the noise model indicate that the ambient noise level at NSR 1 is 67dB $L_{Aeq,16h}$ at façades facing Whitworth Street and 57dB $L_{Aeq,16h}$ at façades facing away from Whitworth Street. Noise from the fixed plant items is predicted to be more than 10 dB below the ambient noise level at both façades at NSR 1 during the daytime, and therefore, noise from the fixed plant items is unlikely to be perceptible. As such, no penalties are required and the rating level would be equal to the specific sound level.

4.10 **Table 4.3** presents the assessment, which has been undertaken in accordance with MCC's criteria.

Table 4.3: Assessment in Accordance with MCC Criteria

Description	NSR 1	
	North facing	South facing
Rating level ($L_{Ar,T}$)	37	
MCC criteria	54	47
Excess over criteria	-17	-10
Criteria achieved	Yes	Yes

- 4.11 The predicted plant noise level in **Table 4.3** is predicted to achieve the requirements of MCC. Therefore, based on the results of the assessment, no mitigation is required for the proposed rooftop plant.

5. CONCLUSION

- 5.1 BWB Consulting was instructed by British Council to undertake a Noise Assessment to support a planning application for proposed rooftop plant at Bridgewater House on Whitworth Street, Manchester.
- 5.2 A baseline noise survey was undertaken at the site in February 2023. The results of the survey and subsequent assessment work have been undertaken in accordance with current standards and guidance, and MCC requirements.
- 5.3 An assessment of proposed fixed building service plant has shown that the requirements of MCC will be achieved. Therefore, based on the results of the assessment, it is considered that noise need not be a determining factor in the granting of planning approval for the proposed fixed plant.

APPENDICES

APPENDIX A: Glossary of Terms

Noise

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Table A.1: Acoustic Terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10 ⁻⁵ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L _{Aeq,T}	L _{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L _{Amax}	L _{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L _{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L ₁₀ and L ₉₀	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L _n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L ₁₀ is the level exceeded for 10% of the time, and the L ₉₀ is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1 m in front of a large sound reflecting object such as a building façade.

APPENDIX B: Proposed Site Layout

Figure B.1: Proposed Roof Floor Mechanical and Electrical Layout

