



Fraser House, 36 Charlotte Street, Manchester

Noise Survey and Noise Impact Assessment

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Client: ARE Assets

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Revision History

Revision	Date	Revision Details	Author	Checked
R01	5/12/2022	Original Issue	Joseph Tony BTech MIOA	Ben Tomlin BSc MIOA
R01A	16/12/2022	Updated to address client's comments	Joseph Tony BTech MIOA	Ben Tomlin BSc MIOA
R01B	08/03/2023	Updated to address Local Authority comments	Ben Tomlin BSc MIOA	Susan Witterick BSc MIOA
R01C	29/03/2023	Updated to address further Local Authority comments	Ben Tomlin BSc MIOA	Susan Witterick BSc MIOA
R01D	13/04/2023	Updated to address further Local Authority comments	<i>Ben Tomlin</i> Ben Tomlin BSc MIOA	<i>Susan Witterick</i> Susan Witterick BSc MIOA

1 INTRODUCTION

- 1.1 dBx Acoustics has been appointed by ARE Assets to undertake a noise survey and noise assessment for the proposed mixed-use development (Fraser House) at 36 Charlotte Street, Manchester City Centre.
- 1.2 The proposal is for the conversion of the upper floors (4 storeys) to residential, with the ground and lower ground floors used for restaurant space.
- 1.3 The intent of the report is to present the results of noise surveys undertaken at the site, and to provide outline guidance on appropriate acoustic requirements for façade and glazing build ups to control noise intrusion in line with the requirements of Manchester City Council (MCC).
- 1.4 This report updates dBx Acoustics' previous report ref 22101-R01A-JT to address comments raised by Manchester City Council's Environmental Health department in a letter dated 9/2/2023, their ref 763067.
- 1.5 The full wording of their comments is reproduced in Appendix A, but in summary the comments relate to four main concerns;
 - *Noise levels in the alleyway to the rear of the building;*
 - *Flanking via the steel frame of the building;*
 - *Mitigation measures for listed windows;*
 - *Plant noise level from proposed kitchen plant at windows of same building.*
- 1.6 This report therefore presents the results of an additional manned noise survey, as well as addressing the other points raised.
- 1.7 A glossary of acoustic terminology is presented in Appendix B.

2 BASIS OF NOISE ASSESSMENT

2.1 The principal aims of the assessment are summarised below:

- Assess the suitability of the site for residential accommodation;
- Control noise intrusion to residential units from external noise sources; and
- Control noise breakout from building services and any noise generating uses associated with the proposed development to nearby sensitive receptors.

2.2 The noise impact assessment is based on the following:

- BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings';
- World Health Organization (2000) 'Guidelines for Community Noise'; and
- BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound';
- Manchester City Council – Planning & Noise Technical Guidance (October 2022).

Local Authority Criteria

2.3 This site falls under the jurisdiction of Manchester City Council (MCC).

2.4 Manchester City Council's *Planning & Noise Technical Guidance* (October 2022) sets out Manchester City Council's requirements with regard to current guidance and policy, with the aspiration that new developments achieve the highest standards without compromising the health and wellbeing of residents. The guidance refers to the WHO Guidelines for Community Noise 1999, BS 8233:2014, BS 4142:2014, NPPF and NPSE as described below.

2.5 MCC has adopted the following internal noise limits for residential properties:

- *Bedrooms (night time 23:00-07:00h) 30 dBL_{Aeq,8h} (individual noise events should not normally exceed 45 dB L_{Amax,F} more than 15 times);*
- *Living Rooms (daytime – 07:00-23:00h) 35 dBL_{Aeq,16h}.*

2.6 In terms of commercial noise affecting the apartments above, MCC's standard guidance is

"...a criterion that would achieve a condition of 'inaudible' / 'virtually inaudible' which is applicable for new residential developments that are structurally connected to entertainment venues (or vice versa) would be:

'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (L_{eq}), respectively'.

2.7 MCC also requires that externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 dB L_{Ar,Tr} below the typical background L_{A90} level at the nearest noise sensitive location.

National Planning Policy Framework

- 2.8 The revised National Planning Policy Framework (NPPF, last updated February 2019) supersedes the 2012 and 2018 versions of the NPPF. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; and as part of this, make effective use of land, help to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate to adapt to climate change including moving to a low carbon economy.
- 2.9 One of the core planning principles is to contribute to conserving and enhancing the natural environment. Allocations of land for development should prefer land of lesser environmental or amenity value, where consistent with other policies in the Framework (Paragraph 171). The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability (Paragraph 170).
- 2.10 Paragraph 185 of 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 (see Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food and Rural Affairs, 2010));*
 - *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”*
- 2.11 Additionally, Paragraph 187 states:
- “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.”*

Noise Policy Statement for England

- 2.12 The Noise Policy Statement for England (NPSE) aims to “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”.*
- 2.13 Based on concepts from toxicology, it introduces three ‘Effect Levels’ relevant to the assessment of noise. These are:
- *NOEL: No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise;*
 - *LOAEL: Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected; and*
 - *SOAEL: Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.*

Planning Practice Guidance

- 2.14 The Planning Practice Guidance for Noise (PPG-N) was published in March 2014 and most recently updated in July 2019. The PPG-N suggests that the most appropriate and cost-effective solutions to potential noise issues are best identified when good acoustic design needs to be considered early in the planning process.
- 2.15 The PPG-N provides the following advice on how to determine the noise impact on development:
- “Plan-making and decision making need to take account of the acoustic environment and in doing so consider:*
- *Whether or not a significant adverse effect is occurring or likely to occur;*
 - *Whether or not an adverse effect is occurring or likely to occur; and*
 - *Whether or not a good standard of amenity can be achieved.”*
- In line with the Explanatory note of the noise policy statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.”* (Paragraph 003 Reference ID 30-003-20190722).
- 2.16 The document goes on to acknowledge the levels of noise exposure at which an effect may occur as provided in the NPSE and introduces a fourth effect level:
- *UAE: Unacceptable Adverse Effect: Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise lead to psychological stress or physical effects.*
- 2.17 Where residential development is proposed in the vicinity of existing businesses, community facilities or other activities that produce noise, the PPG-N advises that the applicant (or ‘agent of change’) will need to clearly identify the effects of the existing businesses that may cause a nuisance (including noise) and clearly define the mitigation measures being proposed to address

any potential significant adverse effects that are identified. The agent of change needs to not only consider the current activities of the business, but the permitted activities too, even if they are not occurring at the time of the application being made. The PPG-N acknowledges that:

“It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints.” (Paragraph 009 Reference ID 30-009-20190722).

- 2.18 It is important to understand that as the PPG-N does not specifically provide any advice with respect to noise levels/limits for different sources of noise, it is appropriate to consider other sources of advice and guidance documents when considering whether new developments would be sensitive to the prevailing acoustic environment and the PPG-N signposts a number of appropriate guidance documents.

Table 1: Noise Exposure Hierarchy

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life	No observed adverse effect	No specific measures required
		Lowest observed adverse effect level (LOAEL)	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude. E.g. turning up the volume of the television; speaking more loudly; where there is no alternative ventilation, having to close windows are some of the time because of the noise. Potential for some reported disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
		Significant observed adverse effect level (SOAEL)	
Noticeable and disruptive	The noise causes material change in behaviour and/or attitude e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep the windows closed most of the time because of the noise. Potential for sleep disturbance result in difficulty in getting to sleep. Premature awakening and difficulty getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed adverse effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or psychological effects e.g. regular sleep deprivation/awakening; loss of appetite; significant, medically definable harm e.g. auditoria and non-auditory	Unacceptable adverse effect	Prevent

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

Indoor Noise Level Limits

- 2.19 BS 8233:2014 gives guidance for noise levels within residential properties. It discusses appropriate criteria for reasonable rest and sleep conditions and provides noise levels which are considered to provide appropriate conditions in accordance with WHO guidelines. The guidance on limits from the standard is reproduced in Table 2, below.

Table 2: Indoor Ambient Noise Limits (BS8233)

Activity	Location	07:00 – 23:00 hrs	23:00 – 07:00 hrs
Resting	Living room	35 dBL _{Aeq,16h}	-
Dining	Dining room/area	40 dBL _{Aeq,16h}	-
Sleeping (daytime resting)	Bedroom	35 dBL _{Aeq,16h}	30 dBL _{Aeq,8h}

- 2.20 It should be noted that these levels represent the average noise level over the 16-hour day or 8-hour night period. This potentially means that higher noise levels may be experienced internally over a shorter period (e.g., individual passing trams or vehicles). These equivalent noise levels, over a period of time, are the best representation of the average noise level and are generally the main focus when it comes to evaluating noise exposure.
- 2.21 Under the updates to BS 8233 in 2014, for both day and night-time cases, a relaxation of up to 5dB is considered to provide “reasonable internal conditions” where development is considered necessary or desirable.
- 2.22 To assess the maximum noise levels, the World Health Organisation (WHO) document “Guidelines for Community Noise: 1999” recommends that maximum noise levels (dBL_{Amax,F}) do not exceed 45dBL_{Amax,F} more than 10-15 times a night.

BS 4142:2014 – Methods for Rating and Assessing Industrial and Commercial Sound

- 2.23 BS 4142:2014 sets out a procedure for assessing noise impact whereby a Noise Rating is determined and compared with the existing local Background Sound Level.
- 2.24 MCC requires that externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of $5\text{dBL}_{\text{Ar,Tr}}$ below the typical background L_{A90} level at the nearest noise sensitive location.
- 2.25 The Rating Level ($\text{dBL}_{\text{Ar,Tr}}$) is evaluated from the Specific Noise Level by including several, cumulative corrections to account for factors such as distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristics.
- 2.26 BS 4142:2014 seeks to determine a “representative” Background Sound Level, stating that
“...the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods”.
- 2.27 The assessment of the impact depends upon the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level. An initial estimate of the impact of the specific sound is made by subtracting the Background Sound Level from the Rating Level, while considering the following points:
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
 - d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

3 SITE DESCRIPTION

Site Description

- 3.1 Fraser House is a Grade II listed building located in Manchester City Centre. It is bounded by Reyner Street to the north, Portland Street to the south, Charlotte Street to the east, and commercial developments to the west.
- 3.2 The area surrounding the site is predominantly commercial in nature including offices and restaurants.
- 3.3 Figure 1 illustrates the location of the building, and the nearest noise sensitive receptors (NSRs).

Figure 1: Site Boundary and Nearby Noise Sensitive Properties



Nearby Noise Sensitive Receptors (NSR)

- 3.4 The nearest noise sensitive receptor is the Britannia Adelphi Hotel, approximately 59m to the south-east. The Clayton Hotel Manchester is located approximately 60m to the south-west.

Proposed Development

- 3.5 The proposal seeks to conversion of the upper floors (4 storeys) to residential, with a restaurant on the ground and lower ground floors. The fifth-floor residential units are understood to have clerestory windows.

Noise Sources

- 3.6 The noise climate around the site is dominated by vehicle movements on Portland Street, Charlotte Street and the surrounding road network as well as pedestrian activities and plant noise from the surrounding commercial properties on Reyner Street, and activity noise from nearby drinking establishments.

4 NOISE SURVEYS

Methodology

- 4.1 dBx Acoustics has undertaken noise measurements at the site to establish the existing ambient, background and maximum noise levels affecting the site and its surroundings.

Long Term Measurements

- 4.2 Unattended noise measurements were undertaken between Thursday 10th November 2022 and Tuesday 15th November 2022. The measurement locations are shown in Figure 2, below.

Figure 2: Noise Monitoring Locations



- 4.3 Noise levels were measured continuously over this period, which therefore included daytime, evening and night-time periods (including rush hour periods) as required by MCC.
- 4.4 All measurements were undertaken in accordance with BS 7445-1:2003 *Description and Measurement of Environmental Noise*, with microphones located at third floor level approximately 10m above ground level and around 1 m from the façade.

Equipment

- 4.6 The equipment used during the long term noise survey is detailed in Table 3.

Table 3: Equipment Used in the Environmental Noise Survey

Measurement Locations (Figure 2)	Equipment	Manufacturer & Part No	Serial Number
LT1 Charlotte St	Sound Level Meter	Norsonic Nor140	1405619
	Microphone	Norsonic Nor1225	168247
	Calibrator	Norsonic 1251	33827
LT2 Portland St	Sound Level Meter	Cirrus 171C	G300656
	Microphone	MK:224	215619A
	Calibrator	Cirrus 515	87921

- 4.7 The sound level meters were calibrated before and after measurements, with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrators, which had been calibrated not more than one year prior to the survey.

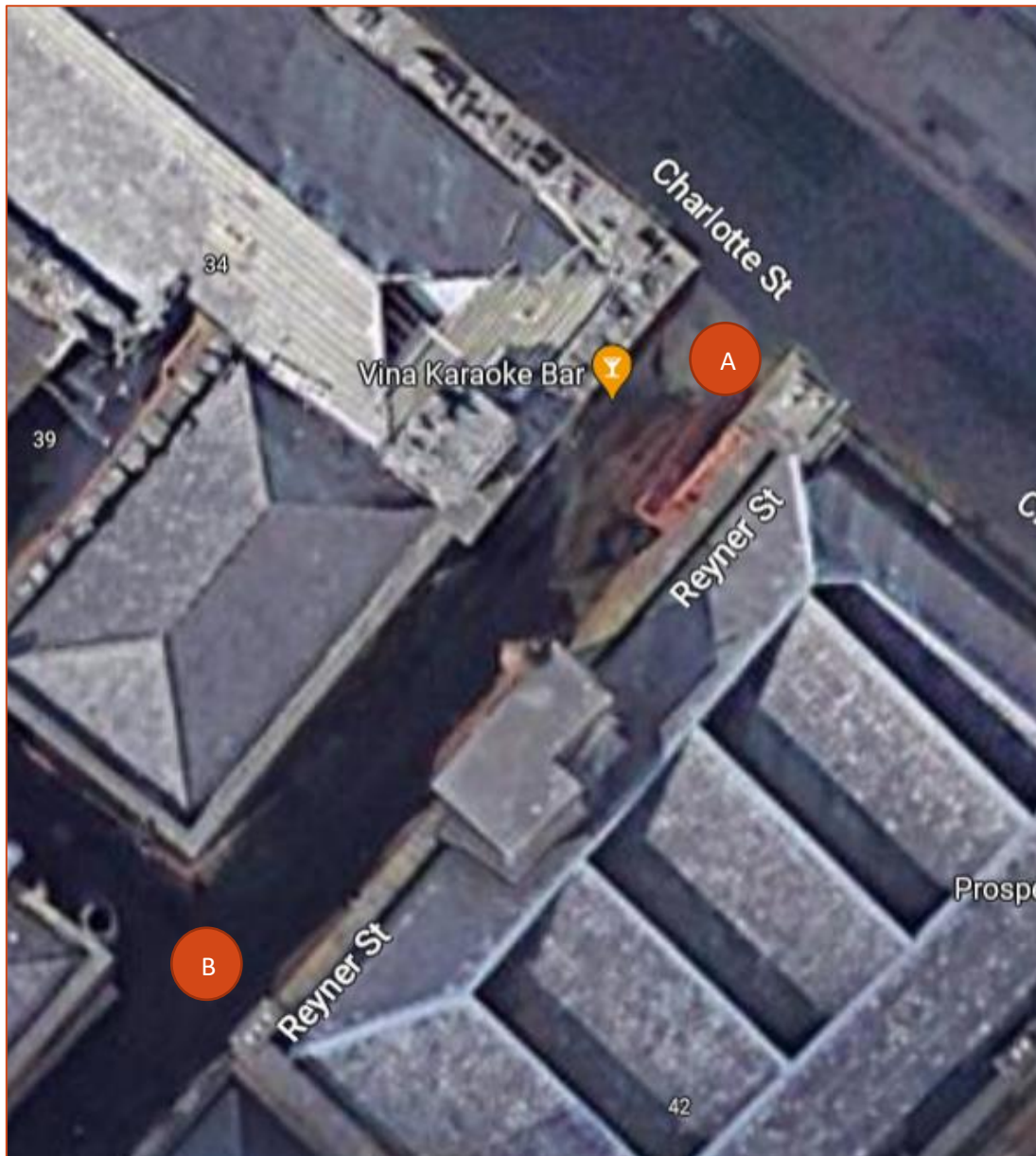
Weather Conditions

- 4.8 Weather conditions throughout the survey period were suitable for environmental measurements with wind speeds of less than 5 m/s. No precipitation was recorded during the noise survey. Temperatures varied between 7°C and 16°C.

Spot Check Measurements

- 4.9 Further attended noise measurements were undertaken on Friday 24th February 2023, primarily to consider plant noise, and noise breaking out of the Vina karaoke bar on the corner of Reyner Street and Charlotte Street. The measurement locations are shown in Figure 3, below.

Figure 3: Attended Measurement Locations



5 ENVIRONMENTAL NOISE SURVEY RESULTS

Long Term Measurements

- 5.1 A summary of the day and night-time noise levels measured at the long-term noise monitoring Locations LT1 and LT2 are presented in Tables 4 and 5, below. All measurements at these locations were façade measurements and hence are corrected by -3 dB to obtain the free-field noise levels incident upon the proposed development.

Table 4: Summary of Measured Noise Levels at Long Term Noise Monitoring - Location LT1 Charlotte Street

Day/Date	Period (hh:mm)	Ambient Noise Level (dB L _{Aeq,T})	Maximum Noise Level (dB L _{AFmax})	Typical Background Noise Level (dB L _{A90, 15mins})
Thursday 10th November 2022	Daytime (11:45-23:00)	65	n/a	61
	Night-Time (23:00-07:00)	63	83	56
Friday 11th November 2022	Daytime (07:00-23:00)	66	n/a	61
	Night-Time (23:00-07:00)	65	88	60
Saturday 12th November 2022	Daytime (07:00-23:00)	66	n/a	62
	Night-Time (23:00-07:00)	65	88	62
Sunday 13th November 2022	Daytime (07:00-23:00)	65	n/a	60
	Night-Time (23:00-07:00)	61	81	52
Monday 14th November 2022	Daytime (07:00-16:00)	65	n/a	60
	Night-Time (23:00-07:00)	61	81	52

Table 5: Summary of Measured Noise Levels at Long Term Noise Monitoring - Location LT2 Portland Street

Day/Date	Period (hh:mm)	Ambient Noise Level (dB L _{Aeq,T})	Maximum Noise Level (dB L _{AFmax})	Typical Background Noise Level (dB L _{A90, 15mins})
Thursday 10th November 2022	Daytime (11:45-23:00)	65	n/a	60
	Night-Time (23:00-07:00)	62	82	58
Friday 11th November 2022	Daytime (07:00-23:00)	66	n/a	61
	Night-Time (23:00-07:00)	65	87	61
Saturday 12th November 2022	Daytime (07:00-23:00)	66	n/a	62
	Night-Time (23:00-07:00)	65	83	62
Sunday 13th November 2022	Daytime (07:00-23:00)	65	n/a	59
	Night-Time (23:00-07:00)	62	83	55
Monday 14th November 2022	Daytime (07:00-16:00)	65	n/a	60
	Night-Time (23:00-07:00)	62	82	49

- 5.2 The maximum noise levels (L_{Amax,F}) shown represent typical occurrences; these are not exceeded more than 15 times per night, in accordance with the WHO guidance.
- 5.3 Appendix C of this report presents a time history graph showing the ambient, background and maximum noise levels measured.

Spot Check Measurements

- 5.4 A summary of the day and night-time noise levels measured at the attended noise monitoring Locations A and B is presented in Table 6, below.

Table 6: Summary of Spot Check Measurements

Period	Location	Time, h	Ambient Noise Level (dB $L_{Aeq,T}$)	Maximum Noise Level (dB L_{AFmax})
Day	B	22:00-22:15	72	77
Day	B	22:16-22:31	73	84
Day	A	22:35-23:40	66	85
Day	B	22:51-22:59	73	76
Night	A	23:01-23:16	72	79
Night	B	23:16-23:31	72	98*
Night	A	23:32-23:47	71	94*

* Shouts near microphone, excluded as atypical

6 BUILDING ENVELOPE SOUND INSULATION

Indoor Ambient Noise Criteria

- 6.1 The indoor noise criteria required to be achieved are detailed in Table 7, below.

Table 7: Internal Ambient Noise Criteria

Daytime (07:00 – 23:00 hrs)	Night-time (23:00– 07:00 hrs)	
$L_{Aeq, 16h}$	$L_{Aeq, 8h}$	L_{Amax}
35 dB	30 dB	45 dB ¹
¹ It is generally agreed that this limit would not apply to atypical night-time maximum events. The previous version of BS 8233:1999 stated that, “...individual noise events should not normally exceed 45 dB L_{Amax} .”		

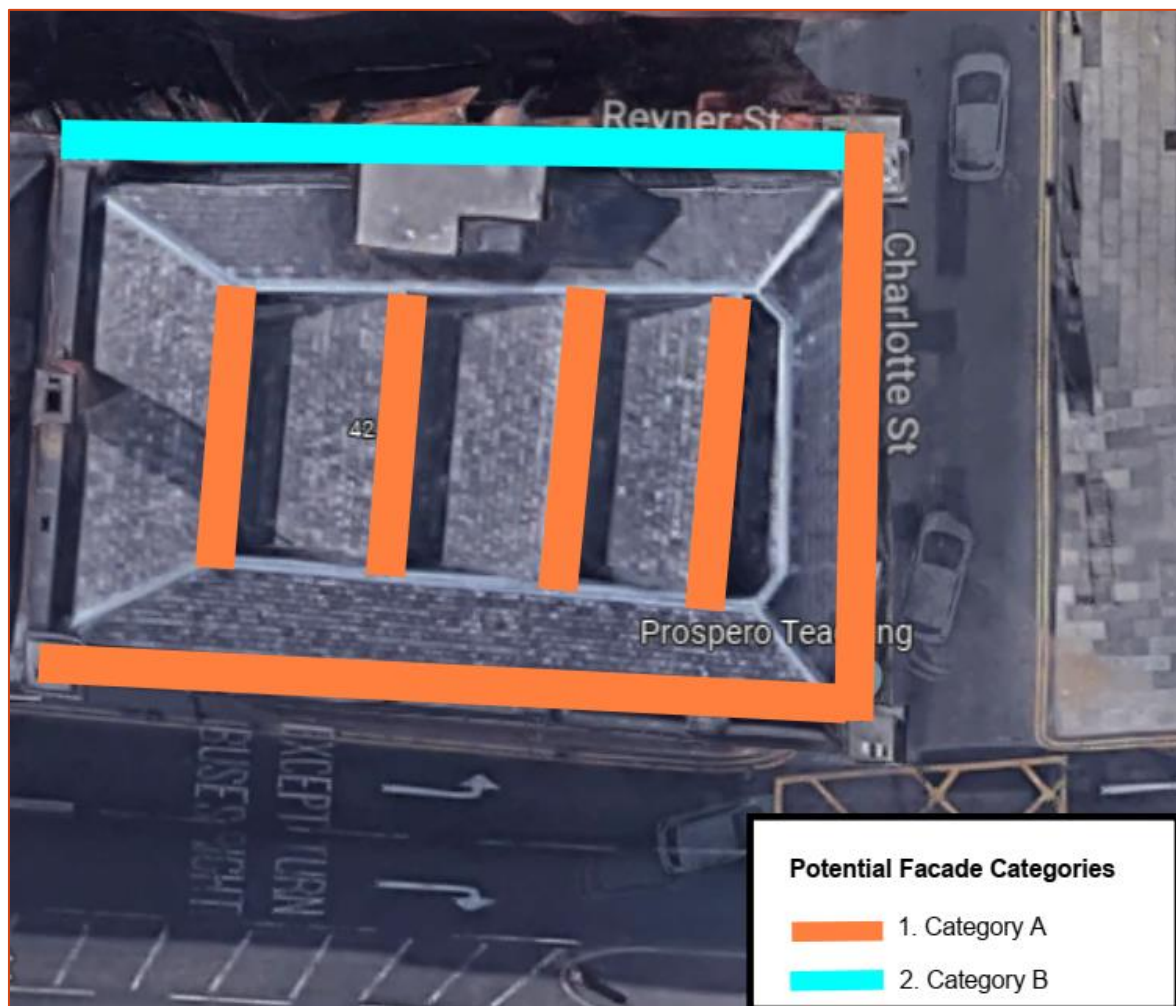
External Noise Break-in Assessment

- 6.2 An external noise break-in assessment has been undertaken to assess the suitability of the site for residential development and to specify the minimum sound insulation performance of the façades required to meet the internal noise criteria.
- 6.3 Based on the survey data, a summary of the noise levels used to calculate noise ingress on all facades are detailed in Table 8, and Figure 4, below.

Table 8: Noise Levels per Façade

Façade Direction	Day, $dBL_{Aeq, 16hour}$	Night $dBL_{Aeq, 8hour}$	Night, $dBL_{Amax, F}$
Category A -Portland Street and Charlotte Street & Roof Clerestory	63	62	85
Category B- Reyner Street	73	72	85

Figure 4: Indicative Façade Categories



- 6.4 Based on a typical reduction in external noise levels to internal noise levels of 15dB for a partially opened window (based on BS8233), allowable external noise levels for are therefore 50dB_{L_{Aeq,T}} outside living rooms in the day, and 45dB_{L_{Aeq,T}} and 60dB_{L_{Amax,F}} outside bedrooms at night.
- 6.5 With reference to Table 7, and the allowable external noise levels detailed above, it can be seen that for all habitable rooms, the required internal ambient noise levels can only be achieved with closed windows.
- 6.6 Ventilation will therefore need to be provided via alternative means.
- 6.7 Based on the assessment undertaken, the minimum sound reduction indices to be achieved for glazing and ventilators, and examples of typical glazing configurations to meet these requirements are presented in Table 9, below.

Table 9: Glazing and Ventilator Sound Insulation Requirements

Façade	Room	Glazing Sound Insulation Performance, dB R_w (+ C_{tr})	Example Glazing Construction, mm	Ventilator Sound Insulation Performance, dB $D_{n,e,w}$
Category A - Portland Street, Charlotte Street and Roof Clerestory	Living Rooms	36 (-7)	10mm/Thermal Cavity/4mm	41
	Bedrooms	42 (-7)	10mm/Thermal Cavity/8.8mm	46
Category B- Reyner Street	Living Rooms	46 (-9)	6.5mm Acoustic Laminate/Thermal Cavity/8.8mm Acoustic Laminate OR Secondary Glazing (6mm/≥100mm/4mm)	45
	Bedrooms	49 (-2)	12.8mm Acoustic Laminate /Thermal Cavity/12.8mm Acoustic Laminate OR Secondary Glazing (10mm/≥200mm/4mm)	45

- 6.8 The stated sound insulation performance must be achieved by the window as a whole, including frames, seals, opening lights etc., as opposed to the glass panels alone.
- 6.9 The glazing configurations shown above are suggestions only, and alternative configurations may be acoustically suitable. If the existing glazing is retained within the proposed development, the above performance may be achieved by introducing secondary glazing (with sufficient airgap).
- 6.10 In all cases, the performances stated in Table 9 can be achieved with secondary glazing (a second layer of at least 6mm glass, forming a cavity of at least 100mm unless stated otherwise) which will also comply with the heritage requirements.
- 6.11 The external wall and roof should achieve a sound insulation performance at least 10dB greater than the glazing. This is not an onerous requirement and would be achieved a cavity masonry construction, and a tiled roof with plasterboard ceiling.

Overheating

- 6.12 At this stage, an overheating assessment has not been completed. This initial guidance is therefore presented on the basis that an overheating condition may arise, but will be reviewed as the scheme progresses.
- 6.13 MCC require that an assessment is made based on guidance in the Association of Noise Consultants' document '*Acoustics, Ventilation and Overheating Guide*' (2020) (AVO). This guidance is not definitive.
- 6.14 Primarily, a Stage 1 assessment is undertaken by considering the external noise levels. External daytime noise levels of $50\text{dBL}_{\text{Aeq,T}}$ are considered '*negligible risk*', while a noise level of $65\text{dBL}_{\text{Aeq,T}}$ is considered 'high risk'. At night, these limits are reduced to $45\text{--}55\text{dBL}_{\text{Aeq,T}}$.
- 6.15 As can be seen from Table 8, all façades would be considered to be within the 'high risk' criteria during daytime and night-time periods.
- 6.16 On this basis, a Level 2 assessment should be undertaken.
- 6.17 For the Level 2 assessment, again, there are no definitive criteria proposed, only a sliding scale of 'Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night'.
- 6.18 However, internal noise level limits of $50\text{dBL}_{\text{Aeq,16hour}}$ in the day, and $42\text{dBL}_{\text{Aeq,8hour}}$ and $65\text{dBL}_{\text{Amax,F}}$ at night are the limits at which '*Noise causes a material change in behavior e.g. having to keep windows closed most of the time....Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep.*'
- 6.19 These limits would therefore appear to be a worst-case upper limit.
- 6.20 Furthermore, any adverse effects relating to noise are affected by both the noise level itself, and the duration (how long overheating occurs) and frequency (how many times per year/month) with which the overheating condition occurs.
- 6.21 The AVO guide also states that the reduction in external noise levels via a partially opened window is 13dB, slightly more cautious than the WHO guidance of 15dB. This therefore relates to worst case allowable external noise levels of $63\text{dBL}_{\text{Aeq,16hour}}$ in the day, and $55\text{dBL}_{\text{Aeq,8hour}}$ and $78\text{dBL}_{\text{Amax,F}}$ at night.
- 6.22 With reference to Table 8, above, therefore, it can be seen that these noise levels are exceeded at all times. The building is therefore likely to require some form of attenuated ventilation, or mechanical ventilation, to control noise ingress during the overheating condition.
- 6.23 The implications of the noise levels under overheating conditions will need to be discussed and agreed with the design team and the Local Authority once full details of the ventilation strategy are known.

Separation Between Commercial and Residential Units

- 6.24 The upper ground floor of the proposed development will contain a restaurant, directly below the proposed residential units. An assessment has been undertaken to assess the potential noise impact from the restaurant to the vertically adjacent residential units.
- 6.25 As a minimum, the floor will need to achieve a minimum sound insulation performance of $43\text{dB}_{\text{D}_{\text{NT,W}}+\text{C}_{\text{tr}}}$ to meet Building Control requirements (Approved Document E) as well as the requirements of Manchester City Council with regard to low frequency noise transfer as detailed above.
- 6.26 dBx Acoustics has measured noise levels in a number of restaurants and commercial kitchens, which vary significantly (between $65\text{--}85\text{dB}_{\text{Aeq,T}}$).
- 6.27 Calculations have been undertaken using the worst case measured noise levels of $85\text{dB}_{\text{Aeq,T}}$, and the predicted sound insulation performance of an upgraded timber floor construction adequate to meet Approved Document E (floated mass layer $\sim 25\text{kg/m}^2$, resilient layer, existing timber floorboards, suspended plasterboard ceiling $\sim 25\text{kg/m}^2$) of around $55\text{dB}_{\text{R}_w+\text{C}_{\text{tr}}}$.
- 6.28 As can be seen in Calculation 1, below, the predicted sound pressure level in the apartment above is around $27\text{dB}_{\text{L}_{\text{Aeq,T}}}$, and $44\text{dB}_{\text{L}_{\text{Aeq,T}}}$ at 63Hz and $35\text{dB}_{\text{L}_{\text{Aeq,T}}}$ at 125Hz .

Calculation 1 – Prediction of Restaurant Noise in Apartment Above

	NOISE BREAK IN FROM ADJACENT SPACE											
Noise Source/Location	First Floor Restaurant											
Element	Floor											
Area	23.9	m ²	Width=	4.2		Height=	5.7	m				
Construction Details	Floor											
Receiving Room												
Volume	60.9	m ³	Width=	4.2	m	Length=	5.8	m	Height=	2.5	m	
Reverberation Time	0.8	seconds										
Calculation												
			Frequency,HZ	63	125	250	500	1k	2k	4k	8k	dBA
	L1			68	77	76	83	78	76	72	55	84
	10log(S)			14	14	14	14	14	14	14	14	
	10log(A), A=T/0.16V			-11	-11	-11	-11	-11	-11	-11	-11	
	Element SRI			27	45	52	60	69	63	84	80	
	L2			44	35	27	26	12	16	-9	-22	27

- 6.29 The predicted noise levels are 8dB lower than the MCC daytime indoor noise limits, and 3dB below the night-time indoor noise limits within the residential properties, and also meet MCC's entertainment noise criterion at all times. The predictions are also based on an absolute worst case internal noise level within the restaurant of around $85\text{dB}_{\text{Aeq,T}}$ and hence are typically likely to be significantly lower than predicted.
- 6.30 As it has been determined that the minimum airborne sound insulation performance defined in ADE would also control commercial noise, the standard ADE flanking details would also therefore be appropriate.
- 6.31 On this basis all common steelwork should be clad in an enclosure with a minimum mass of 15kg/m^2 (e.g. two layers of 12.5mm WallBoard) with at least 50mm mineral fibre in the enclosure formed. This should be undertaken on both sides of the separating floor.
- 6.32 Noise transfer between the restaurant and proposed residential units is therefore not a concern.

7 NEW BUILDING SERVICES NOISE EMISSIONS

- 7.1 Manchester City Council's 'Planning & Noise Technical Guidance' (October 2022) states that the rated plant noise level should be controlled to 5dB below the background noise level during the periods in which the plant operates.
- 7.2 Consequently, suitable limits to which the cumulative plant noise should adhere have been determined, and are presented in Table 10.

Table 10: Proposed Building Service External Noise Limits

Noise Sensitive Receptors (Figure 1)	External Building Services Plant Noise Limit ($L_{Ar,Tr}$) dB	
	Daytime 07:00 – 23:00 hours (T = 1 hour)	Night-time 23:00 – 07:00 hours (T = 15 minutes)
All Noise Sensitive Receptors	54 dB	44 dB

- 7.3 The nearest noise sensitive receptor is the Britannia Adelphi Hotel, approximately 59m to the south-east. The Clayton Hotel Manchester is located approximately 60m to the south-west.
- 7.4 On this basis, the allowable noise level would be around $84dBL_{Ar,Tr}$ @ 1m from the plant in the day, and $74dL_{Ar,Tr}$ @ 1m at night.
- 7.5 It is unclear exactly where the kitchen plant and exhaust serving the Fraser House kitchen is to be located, but noise from these units should also not affect the residents of the upper floors of the building.
- 7.6 On this basis, noise from the kitchen plant should be controlled to at least 10dB lower than the ambient noise levels of the affected apartments. Achieving this noise limit ensures that glazing and ventilation sound insulation performance requirements derived to control noise ingress from the existing road traffic and plant will also be suitable to control noise ingress from new plant items.
- 7.7 On this basis, a noise limit of $52dBL_{Ar,Tr}$ outside the nearest affected window would ensure that all new plant would be inaudible at all locations.
- 7.8 This would also ensure compliance with the limits set in Table 10, above, at the surrounding NSRs at the Britannia Adelphi Hotel and Clayton Hotel.

8 SUMMARY AND CONCLUSION

- 8.1 dBx Acoustics has been appointed by ARE Assets to undertake a noise survey and noise assessment for the proposed development of Fraser House at 36 Charlotte Street, Manchester City Centre.
- 8.2 A long term noise survey was undertaken at the site to determine existing noise levels affecting the site and nearby noise sensitive receptors. Additional spot check manned measurements were undertaken to consider specific noise sources identified by the Local Authority.
- 8.3 Using the measured noise levels, calculations have been undertaken to determine indicative sound insulation requirements for glazing and ventilators to achieve the required internal noise level limits. It is anticipated that attenuated ventilation will be required to control noise ingress during overheating.
- 8.4 An assessment of the sound insulation performance requirements of the floor separating the restaurant from the apartments has been undertaken. It is demonstrated that noise transfer can be controlled such that the requirements of Manchester City Council are achieved.
- 8.5 Appropriate flanking measures are proposed to ensure flanking via the steel frame does not affect the design sound insulation performance, and hence transmitted noise level.
- 8.6 Plant noise limits have been set such that noise from new items of building services plant will be inaudible within the new residential units within Fraser House, and to ensure that Manchester City Council's plant noise limit is also comfortably achieved at other noise sensitive receptors.
- 8.7 Taking the above into account, noise should not be a limiting factor in any planning application.

APPENDIX A – EHO COMMENTS



MANCHESTER
CITY COUNCIL

Environmental Health Internal Memorandum

To Head of Planning FAO: Anthony Mitchell
From Head of Compliance, Enforcement and Community Safety

Contact Officer: Laura Miller Our Ref: 763067

Date: 09 February 2023 Telephone: 31742

Consultation on Planning Application

Application No: 135858/FO/2022

Description: Change of use and conversion to provide 14no. apartments (use class C3) on first to fourth floors, retention of existing restaurant use (in an altered format) on lower ground floor and upper ground floor (use class E(c)), with associated internal and external alterations

Location: 36 Charlotte Street, Manchester

I write in response to your memorandum of the 13 January 2023 regarding the above application and to inform you that I have considered the application and recommend that the application is refused.

The supporting information has not fully assessed the impacts of noise and odour and as such this could result in disamenity being caused to future residents.

A site visit was undertaken on the 31 January 2023 due to concerns regarding noise from existing plant on Reyner Street as no noise monitoring had been undertaken on this side of the building

(monitoring points were positioned to measure the impact of traffic noise from Charlotte Street and Portland Street).

It was also noted on the site visit that there is a karaoke bar on the corner of Charlotte Street and Reyner Street opposite the site (Photo 1). It is not clear from the report if this was one of the nearby drinking establishments where noise was coming from. There was significant noise in this location due to noise being reflected between buildings and on this basis, I do not agree with the noise consultant's conclusions that noise levels will be 14dB lower than those on Charlotte Street and Portland Street.



Photo 1 - From Google street view showing the karaoke bar and external plant on Reyner Street.

A further noise pathway that has not been addressed in the acoustic report is noise transmission via the steel columns running through the full height of the building from the basement. These could act as a pathway for noise to migrate from the restaurant to the residential accommodation.

Recommendations have been made to upgrade the existing glazing, but these have not taken into consideration the listed status of the building. The mitigation scheme should be designed in consultation with the conservation officers report.

It has been stated in the application that the kitchen extraction system serving the restaurant is being replaced. No supporting odour risk assessment has been submitted. Given the roof top termination point (which needs to be 1m above eaves and any openable windows), odours will cause disamenity to the residents on the fourth floor unless adequate odour treatment is provided. Noise from the kitchen extraction also needs to be fully assessed especially given the large number of windows being retained within the roof of the building.

The proposals for waste management in the proposed residential units do not appear to fully adhere to Council requirements and in this regard the applicant is advised to contact the Council's Waste and Recycling Team.

Information for Developers guidance documents can be downloaded using the following link:

http://www.manchester.gov.uk/info/500207/planning_and_regeneration/1962/additional_planning_guidance/3

Should you wish to discuss this matter further please contact Laura Miller.

Fiona Sharkey

Head of Compliance, Enforcement and Community Safety

APPENDIX B – GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is 2×10^{-5} N/m ² . The sound pressure level existing when microphone measured pressure is 2×10^{-5} N/m ² is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A-weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
L_{Fmax}	The instantaneous maximum sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
L_{AFmax}	The instantaneous maximum A weighted sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
$L_{Ar,Tr}$	The rating level: the equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Reverberation Time, T	The time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. The descriptor T, often includes other nomenclature to describe the type of reverberation time measurement or if the reverberation time is an average taken for specific frequencies. For example, a T_{mf} is the mid-frequency reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Acoustic Class, A - E	Classification of sound absorbers into Sound Absorption Classes A-E, according to BS EN ISO 11654, including frequencies 200-5000 Hz
NRC	A single-number rating system used to compare the sound-absorbing characteristics of building materials. A measurement of the acoustical absorption performance of a material, calculated by averaging its Sound Absorption Coefficients at 250, 500, 1000 and 2000 Hz
STI	Speech Transmission Index , Metric ranging between 0 and 1 representing the transmission quality of speech with respect to intelligibility by a speech transmission channel
R	Sound Reduction Index , the laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
R_w	Weighted Sound Reduction Index , a single number which represents the sound reduction of a material. It is derived by plotting the sound reduction index against a set of reference curves. The curves are shifted until a best-fit is established and the curve which best fits the sound reduction spectrum is used to represent the single figure value.
D_w	Weighted Level Difference , the weighted level difference between a pair of rooms, stated as a single figure.

D_{nT}	Standardised Level Difference, a frequency-dependent measurement of airborne sound insulation, calculated using the following formula: $D_{nT} = L_1 - L_2 + 10\log(T/T_0)$ dB Where: L_1 is the energy-averaged sound pressure level due to the pink noise source measured in the source room using a sweep technique. L_2 is the energy-averaged sound pressure level measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (= 0.5s for dwellings).
$D_{nT,w}$	Weighted Standardised Level Difference, a single-figure value of airborne sound insulation performance, derived according to procedures in BS EN ISO 717-1, based on the D_{nT} values at different frequencies (100-3150 Hz third octave bands).
$D_{n,F,w}$	Weighted, Normalised Flanking Level Difference, the normalised, weighted difference in sound level between a pair of rooms via a flanking element, such as mullion or ceiling detail. The level difference in octave bands is first normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
D_{ne}	Normalised Element Level Difference. The normalised difference in sound level between a pair of rooms via a small element such as a trickle ventilator. The level difference in octave bands is normalized to a reference amount of absorption.
$D_{n,e,w}$	Weighted, Normalised Element Level Difference. The normalised, weighted difference in sound level between a pair of rooms via a small element such as a trickle ventilator, stated as a single figure. The level difference in octave bands is normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
C_{tr}	Spectrum Adaptation Term, a correction term applied to the sound insulation single-number values (R_w, $D_{w,T}$, and $D_{nT,w}$) in accordance with BS EN ISO 717-1. Applying the C_{tr} penalises a construction's performance if its low frequency performance is poor in relation its performance at higher frequencies.
Impact Sound	The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking or moving furniture on a floor structure.
L_{nT}	Standardised Impact Sound Pressure Level, a frequency dependent measurement of impact sound insulation, calculated using the following formula: $L_{nT} = L_1 + 10\log(T/T_0)$ dB Where: L_1 is the mean sound pressure level due to the tapping machine measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (0.5s for dwellings)
$L'_{nT,w}$	Weighted Standardised Impact Sound Pressure Level, a single-figure value (@ 500 Hz) of impact sound insulation, performance, derived according to BS EN ISO 717-2, based on the L_{nT} values at different frequencies (100Hz- 3150 Hz third octave bands).
Insertion Loss, IL	The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence.
NR	The Noise Rating level. This is a single figure value derived by plotting a noise spectrum against a set of curves. The curve under which the spectrum fits is the resulting NR level.

APPENDIX C – TIME-HISTORY GRAPH (LOCATIONS LT1 AND LT2)

Figure 3: Time History Graph of Measured Noise Levels - Position LT-1 Charlotte St

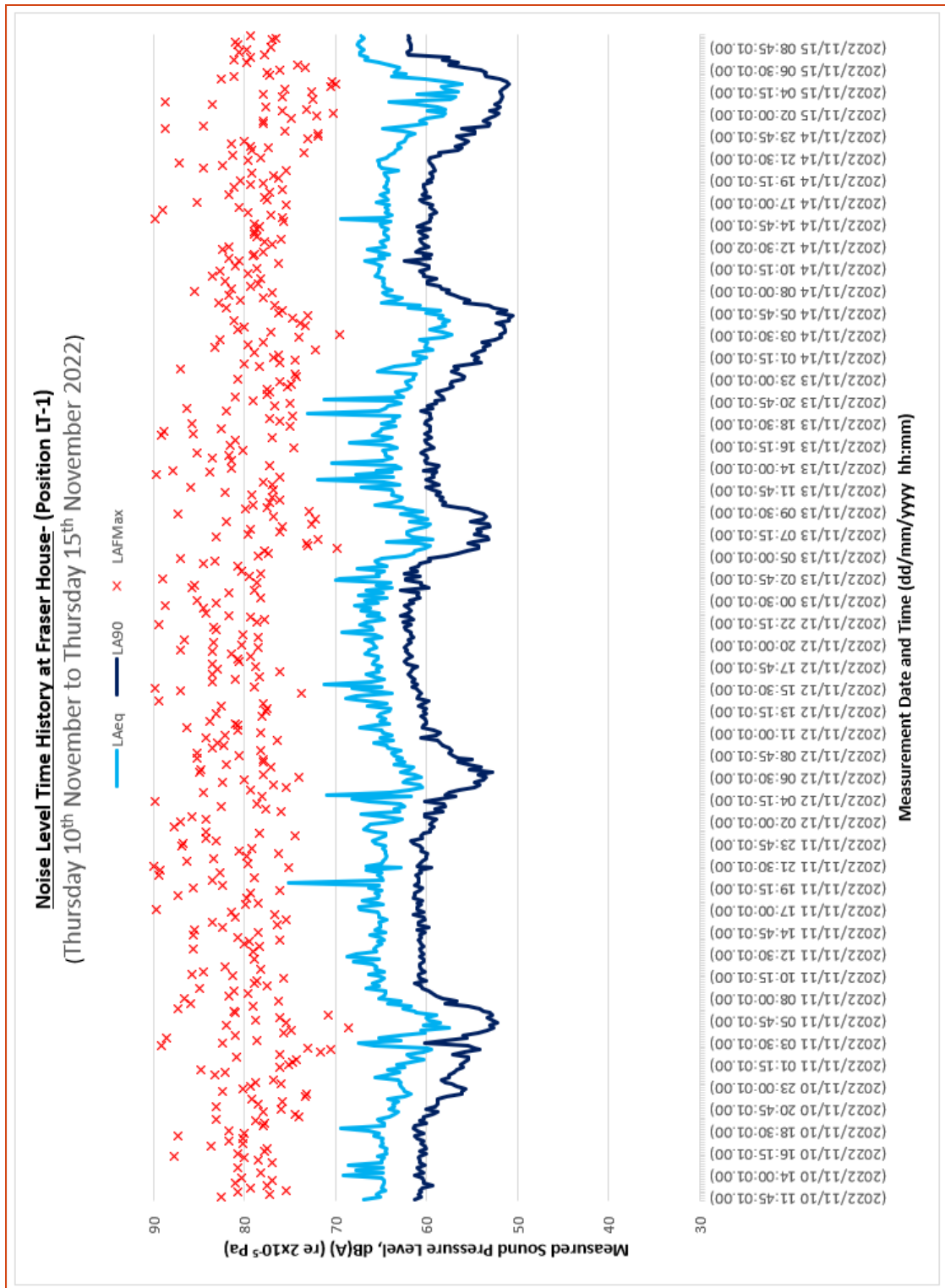
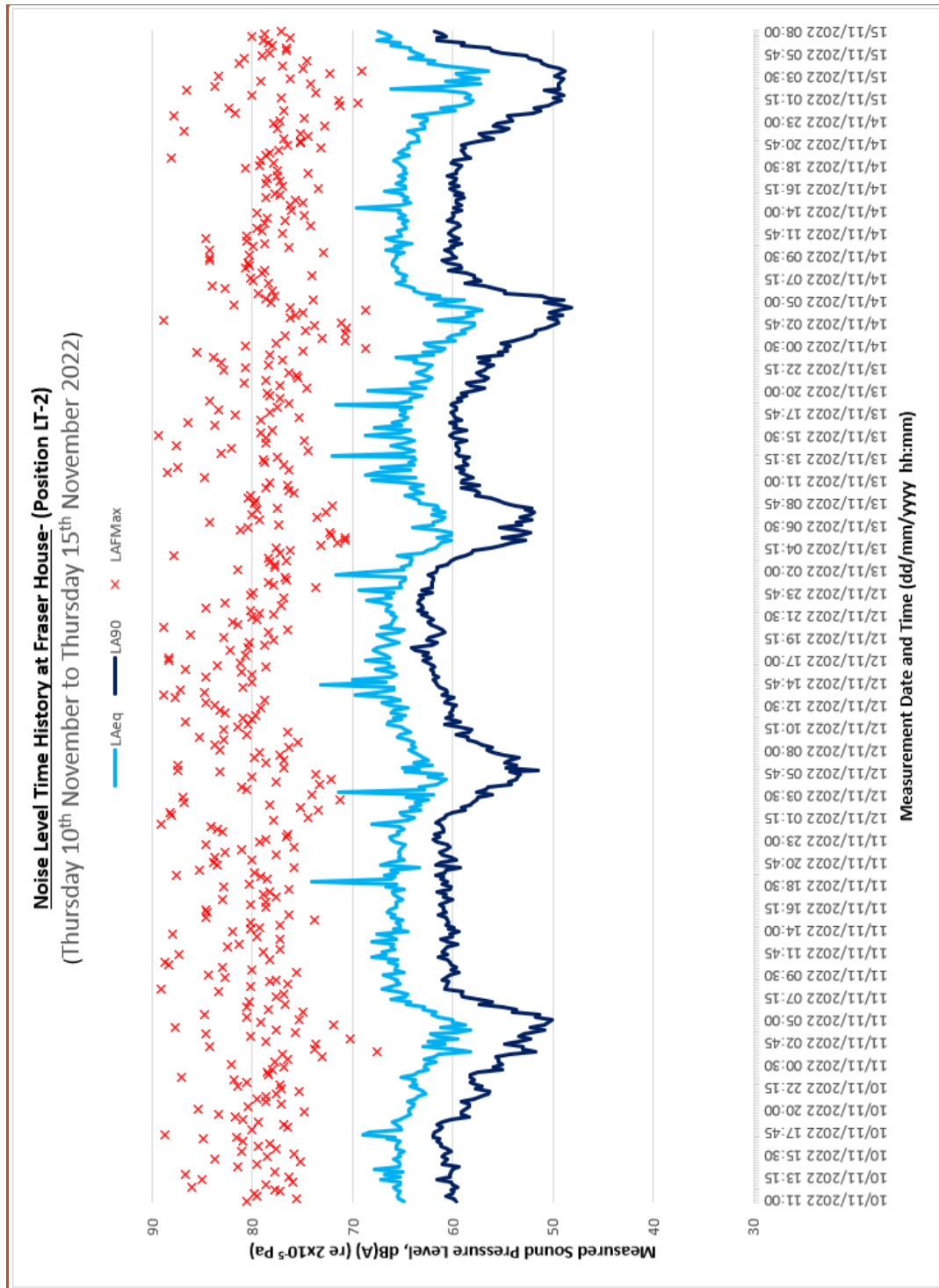


Figure 4: Time History Graph of Measured Noise Levels - Position LT-2 Portland Street



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Registered in England and Wales, Company Number 08371474



22101-R01D-BT -Fraser House, 36 Charlotte Street-NIA

Final Audit Report

2023-04-13

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