Sister Plot H, Manchester

Demolition Noise and Vibration Impact Assessment

18th July 2025

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1. Executive Summary

Project Overview

Heyda Ltd has been commissioned by ID Manchester Limited to conduct a demolition noise and vibration impact assessment for the proposed demolition of the existing multi-storey car park located on Charles Street within Plot H of the Sister site, in Manchester City Centre. This report has been prepared to support the ES Chapter for the proposed demolition works and the associated planning application process.

Objectives and Compliance

The primary objective of this assessment is to evaluate the potential noise and vibration impacts of demolition activities on nearby sensitive receptors and recommend appropriate mitigation strategies to minimise disruption. The report has been prepared in accordance with BS 5228:2009+A1:2014, Noise and Vibration Control on Construction and Open Sites, ensuring compliance with local planning conditions and national standards.

Methodology

The assessment has set construction/demolition noise and vibration thresholds based on BS 5228 guidance. A 3D noise model using the ISO 9613-2:2024 methodology has been developed to predict noise levels at the nearest receptors during demolition. Similarly, vibration impacts were predicted using data from BS 5228 and the Federal Transit Administration's (FTA) vibration assessment guide. These predictions consider the proximity of sensitive receptors, expected equipment usage, and site layout.

Impact Assessment

- **Noise:** Predicted demolition noise levels are expected to exceed the "significant effect", and in some instances the "noise insulation" thresholds. This is predominantly down to the short distances between the site and sensitive receptors and the high impact nature of the works. It will be vital to ensure that all measures to mitigate noise are implemented to ensure best practicable means can be demonstrated.

- **Vibration:** Predicted vibration levels are generally expected to be within the thresholds for significant adverse effects and cosmetic damage at the majority of surrounding receptors. With reference to the nearest receptors to the south of the site, the threshold for significant adverse effects is expected to be marginally exceeded, due to the short distance between the site and the receptors. These exceedances should be tolerable if prior warning is given to the building occupants.

Mitigation Strategies

The assessment outlines a comprehensive set of mitigation measures following Best Practicable Means (BPM), including:

- Use of quieter, modern construction equipment.
- Application of site hoarding and acoustic barriers to reduce noise propagation.
- Scheduling noisy activities during agreed working hours.
- Continuous monitoring of noise and vibration to ensure compliance with thresholds.

Monitoring and Compliance

A robust noise and vibration monitoring strategy has been proposed, including the use of continuous monitors at key locations. Real-time monitoring and alerts will enable proactive management of any threshold exceedances, ensuring that mitigation measures are adjusted promptly.

Community Liaison and Communication

The report underscores the importance of community engagement. The contractor is encouraged to implement a community liaison strategy, including:

- Regular updates to local residents, building occupants and stakeholders.
- A dedicated enquiry line for complaints or questions.
- Advanced notice of high-impact demolition activities. This proactive approach will foster transparency and maintain positive relationships with the surrounding community.

Conclusion

This noise and vibration impact assessment concludes that, with the recommended mitigation measures, continuous monitoring, and community liaison strategies in place, the proposed demolition works will effectively manage potential noise and vibration impacts. The outlined measures will support the successful and responsible delivery of the works.

2. Introduction

Heyda Ltd has been commissioned to conduct a demolition noise and vibration impact assessment for the proposed demolition of the existing multi-storey car park located on Charles Street within Plot H of the Sister site, in Manchester City Centre.

The assessment presented herein complies with the provisions of BS 5228:2009, Code of Practice for Noise and Vibration Control on Construction and Open Sites, and provides full details of proposed demolition activities and mitigation measures to protect nearby sensitive receptors.

This document includes an overview of the site setting and surroundings, proposed demolition methodologies, and associated potential impacts, alongside mitigation measures to ensure noise and vibration levels remain within acceptable thresholds. Best Practicable Means (BPM) will be employed throughout the demolition process to minimise impacts on the surrounding community.

A glossary of technical terminology is provided in Appendix A for information purposes.

3. Policy, Standards and Guidance Documents

The noise and vibration impact assessment for the proposed demolition works has been prepared in line with the following key legislative and policy documents, which form the basis for the assessment methodology and mitigation measures:

- **Planning and Noise – Technical Guidance, Manchester City Council 2022:** Provides advice on addressing noise in planning contexts to promote good acoustic design, aiming for new developments to achieve high standards and minimise impact on surrounding communities, promoting effective planning and mitigation strategies to protect health and well-being.
- **British Standard BS 5228:2009+A1:2014 'Noise and Vibration Control on Construction and Open Sites':** Provides comprehensive guidance on assessing, managing, and mitigating noise and vibration on construction sites. It includes thresholds for noise and vibration, methodologies for assessment, and source noise data for construction activities, serving as a crucial reference for ensuring that impacts are kept within acceptable limits.
- **Control of Pollution Act 1974, Section 61:** Provides the legal framework by which contractors can apply for prior consent to manage potential noise and vibration impacts from construction activities. Applying for consent under this section offers protection against enforcement actions under Section 60 of the Act.
- **Control of Pollution Act 1974, Section 60:** Sets out the conditions under which local authorities may serve notices to control noise from construction sites, specifying permissible noise levels and times of operation.
- **Control of Pollution Act 1974, Section 72:** Defines the Best Practicable Means (BPM) necessary for minimising noise and vibration during construction. BPM involves employing the most suitable mitigation techniques available that are practical and cost-effective.
- **Federal Transit Administration's Transit Noise and Vibration Impact Assessment Manual, May 2006:** Provides additional guidance on predicting and assessing noise and vibration impacts, particularly for projects involving complex construction phases or sensitive receptors, offering criteria for impact severity and mitigation.

These documents collectively inform the methodologies employed in this assessment, guiding the development of effective strategies to mitigate noise and vibration and ensure the project aligns with both local policies and national legislation. This approach ensures that the impacts on the surrounding community are effectively managed and minimised.

4. Site Location and Proposed Development

4.1. Site Description

The site is located on Charles Street within Plot H of the Sister site in Manchester city centre, located in an urban setting, surrounded by a mix of land uses. The site falls under the jurisdiction of Manchester City Council (MCC). The site currently comprises a disused multi-storey car park and a live music bar Retro.

The surrounding area features a range of sensitive receptors, primarily comprising of private residential properties, PBSA residences, hotels and educational/research buildings, which have been identified and considered in the subsequent noise and vibration assessment. The receptors listed below have been selected as the nearest and most representative of each building use type, ensuring a focused and relevant analysis of potential impacts:

Private Residential:

- West of the site: Residential flats at 90 Princess Street
- North-west of the site: Residential flats at Salisbury House
- North of the site: Residential flats at Orient House
- North of the site: Residential flats at Granby House
- North of the site: Residential flats at Fairbairn Building
- North of the site: Residential flats at 1 Samuel Ogden Street
- North of the site: Residential flats at Granby Village
- South-west of the site: Montana House

PBSA Residences/Hotels:

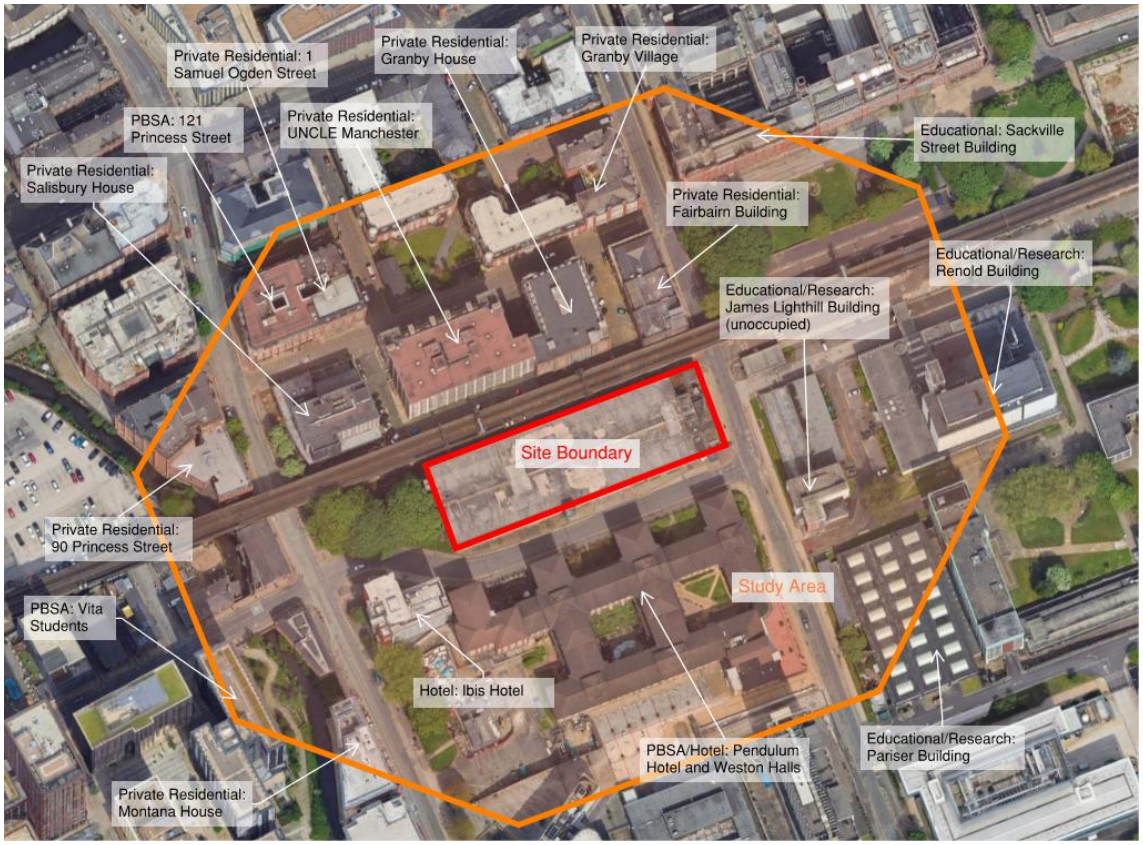
- North of the site: 121 Princess Street
- South of the site: Pendulum Hotel/Weston Halls
- South-west of the site: Ibis Hotel
- West of the site: Vita Students

Educational/Research Buildings:

- North-east of the site: Sackville Street Building
- East of the site: James Lighthill Building (understood to be unoccupied at present, however still considered in the assessment)
- South-east of the site: Pariser Building
- East of the site: Renold Building

A visual representation of the site, including the site boundary and the study area (100 meters beyond the site boundary), and its surroundings, including the nearest sensitive receptors, is illustrated in Figure 1 below.

Figure 1: Site Location and Nearest Noise-sensitive Receptors



4.2. Proposed Development

The Proposed Development comprises the demolition of the existing multistorey car park. The site forms part of the ID Manchester Strategic Regeneration Framework (SRF) area and is being brought forward to facilitate its future redevelopment as part of a major mixed-use innovation district. This assessment focuses solely on the demolition phase, as the operational phase of the future development is not part of the current planning application.

It is understood that the demolition works will comprise of top-down demolition, initially carried out by excavators fitted with demolition attachments, positioned on each slab, with debris subsequently cleared up and loaded up onto lorries for removal. Thereafter, a high reach excavator fitted with a demolition attachment, operating from the ground level, will be used to demolish the remaining structures. Debris will again be cleared using excavators and transported off-site via lorries.

Based on information provided by the Client and the proposed demolition programme, the assessment has been divided into the following eight phases, outlined below, with the assumed extent illustrated in Figures 2 and 3:

- P1A, P1B, P1C and P1D (location dependant – each subphase comprising approximately 25% of the existing car park): On slab top-down demolition and debris clear-up

- P2A, P2B, P2C and P2D (location dependant – each subphase comprising approximately 25% of the existing car park): Demolition of remaining structures and debris clear-up using a high reach

Figure 2: Assumed Assessment Demolition Locations for Phases 1A – 1D

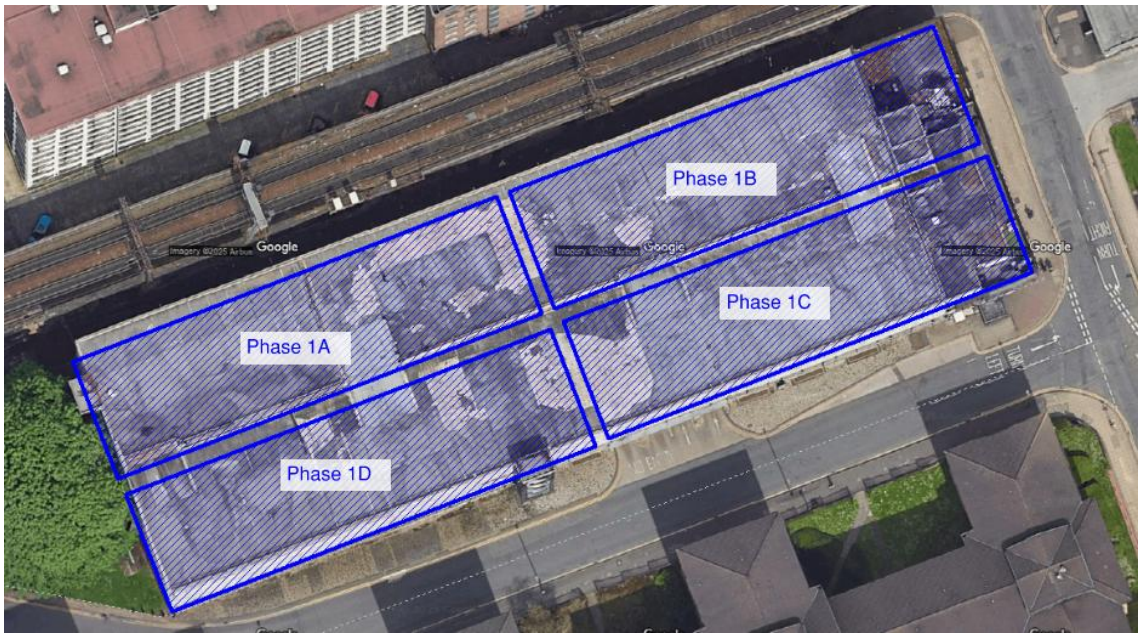


Figure 3: Assumed Assessment Demolition Locations for Phases 2A – 2D

The schedule of assumed demolition plant/machinery/activities, used as a basis of this assessment, is detailed in Appendix B of this report. These have been based on information provided by the Contractor.

5. Baseline Sound Conditions

5.1. Noise Survey Overview

An environmental noise survey has been undertaken by Blackbird Acoustics, to determine the existing ambient noise levels in the area and at a location representative of the nearest noise-sensitive receptors. This survey consisted of unattended long-term measurement positions at three locations. Measurements were conducted between 4th and 8th July 2025. Heyda Acoustics have been granted permission to use and rely on this data for the purpose of this assessment.

5.2. Survey Methodology

All measurements were undertaken by a consultant experienced in environmental noise monitoring, using suitable measurement instrumentation. The survey procedure followed the principles of BS 7445.

The sound data was analysed to determine the following parameter for a time interval (T):

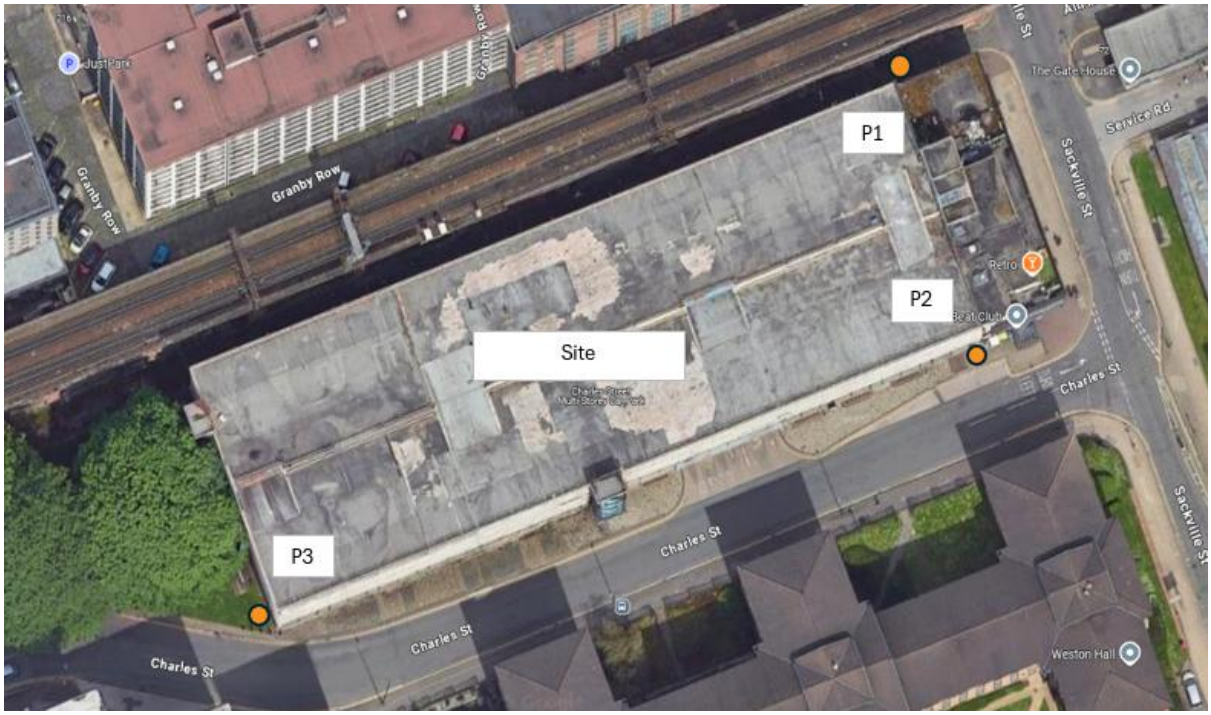
- **dB $L_{Aeq,T}$**: The A-weighted equivalent continuous sound pressure level over the measurement period, T. This parameter represents the average sound level during the period.

The measurement positions are detailed in Table 1 and illustrated in Figure 3.

Table 1: Noise Measurement Positions

Position Ref.	Position Description	Distance from Relevant Feature	Conditions
P1	Unattended sound measurement position near the northern-eastern corner of the site. The microphone was attached to an extension pole and extended from the third floor of the existing car park, directly overlooking the adjacent railway line.	9 meters above the ground level	Free-field
P2	Unattended sound measurement position near the south-eastern corner of the site. The microphone was attached to an extension pole and extended from the second floor of the existing car park, overlooking Charles Street and Sackville Street.	5 meters above the street level	Free-field
P3	Unattended sound measurement position near the south-western corner of the site. The microphone was attached to an extension pole and extended from the second floor of the existing car park, overlooking Charles Street and Princess Street.	8 meters above the street level	Free-field

Figure 4: Noise Measurement Positions



5.3. Measurement Equipment

All acoustic measurement equipment used during the surveys conformed to Type 1 specification of British Standard 61672.

The meters had been calibrated by a UKAS accredited laboratory within the previous 24 months. The calibration level was also checked at the start and end of the survey using a field calibrator.

No significant drift in the calibration was measured over the course of the survey (≤0.2 dB). The calibrator used had itself been calibrated by a UKAS accredited calibration laboratory in accordance with IEC 60942, 2017 within the twelve months preceding the measurements.

The microphones were fitted with protective windshields for the measurements.

5.4. Observations

The noise climate at the site was noted to be influenced by the following:

- At P1, the sound climate was dominated by railway traffic noise, as well as partially screened road traffic noise from the surrounding road network.
- At P2, the sound climate was dominated by road traffic noise from the surrounding road network.
- At P3, the sound climate was dominated by road traffic noise from the surrounding road network.

These observations provide a detailed understanding of the acoustic environment surrounding the proposed development site.

5.5. Weather Conditions

The weather conditions during the survey were observed and noted as being suitable for environmental sound measurement.

For the majority of the measurements the conditions were dry, with local wind speeds suitable for noise measurements. The local roads were dry.

5.6. Measurement Results

A summary of the daytime and night-time sound levels is presented in Table 1 below. Numbers have been rounded to the nearest integer.

Table 1: Summary of Measured Ambient Sound Levels Used in Assessment

Position	Period (T)	Equivalent continuous SPL $L_{Aeq,T}$ (dB)
P1	Weekday Daytime Working Hours (07:30 – 18:00)	66
	Saturday Daytime Working Hours (08:30 – 14:00)	65
P2	Weekday Daytime Working Hours (07:30 – 18:00)	62
	Saturday Daytime Working Hours (08:30 – 14:00)	61
P3	Weekday Daytime Working Hours (07:30 – 18:00)	62
	Saturday Daytime Working Hours (08:30 – 14:00)	60

6. Demolition Noise Impact Assessment

6.1. Assessment Method

An assessment has been conducted to predict demolition noise emissions at the nearest noise-sensitive receptors in accordance with BS 5228-1:2009+A1:2014. The method comprises the following steps:

1. Identify appropriate construction/demolition noise thresholds at which significant adverse effects may occur, at which an offer of noise insulation would be required, and at which temporary/permanent rehousing may be necessary.
2. Identify suitable source noise levels, based on the plant information provided by the contractor, by referencing the noise level database in BS 5228.
3. Construct a 3D noise model and insert the plant noise sources in appropriate locations, representative of the likely worst-case scenario.
4. Predict the demolition noise levels, using the 3D noise model, at the nearest noise sensitive receptors in accordance with ISO 9613.
5. Compare the predicted noise levels against the various noise thresholds.
6. Determine whether mitigation measures are required to protect nearby receptors from demolition noise.
7. Conclude on the significance of the predicted noise levels once accounting for the proposed mitigation measures.

6.2. Working Hours

It is understood that all works will be carried out during normal daytime hours only, with the following proposed construction/demolition working hours:

- 07.30 – 18.00 Monday to Friday
- 08.30 – 14.00 Saturdays

No works are proposed to be carried out on Sundays or Bank Holidays.

6.3. Construction/Demolition Noise Thresholds

BS 5228 presents different noise thresholds, exceedance of which triggers different responses. These are as follows:

1. **Significant Effect:** BS 5228 provides the "ABC method" and the "5 dBA change method" which are used to define the construction/demolition noise level above which significant effect could occur at a noise sensitive receptor. Where this level is exceeded, it will be essential that Best Practicable Means (BPM) for noise reduction are employed, and community liaison is used to make residents/building users aware of what works are being undertaken and how long they will last.
2. **Noise Insulation:** BS 5228 provides fixed thresholds above which noise insulation should be offered to the occupants of the nearest noise sensitive

receptors. Noise insulation normally comprises secondary glazing with alternative means for ventilation where necessary. This is only applicable to permanently occupied residential dwellings.

3. **Temporary Rehousing:** BS 5228 provides fixed thresholds above which temporary or permanent re-housing should be offered to occupants of the nearest noise sensitive receptors. This is only applicable to permanently occupied residential dwellings.

Based on the above and the measured ambient noise levels, the various noise limits applicable to the nearest sensitive receptor locations are summarised below, in accordance with the 5 dBA change method. Numbers have been rounded to the nearest integer.

Table 2: Construction Noise BS5228 Limits (Private Residential Receptors)

Receptor	Period	Measured Ambient Noise Level, dB $L_{Aeq,T}$	BS5228 Total Noise Limit (Ambient + Construction Noise), dB $L_{Aeq,T}$	BS5228 Construction Noise Limit, dB $L_{Aeq,T}$
90 Princess St Salisbury House Orient House Granby House Fairbairn Building 1 Samuel Ogden St Granby Village	Weekday Daytime	66 (using P1)	71	69
	Saturday Daytime	65 (using P1)	70	68
Montana House	Weekday Daytime	62 (using P3)	65	63
	Saturday Daytime	60 (using P3)	67	65

Table 3: Construction Noise BS5228 Limits (PBSA/Hotel Receptors)

Receptor	Period	Measured Ambient Noise Level, dB $L_{Aeq,T}$	BS5228 Total Noise Limit (Ambient + Construction Noise), dB $L_{Aeq,T}$	BS5228 Construction Noise Limit, dB $L_{Aeq,T}$
121 Princess St	Weekday Daytime	66 (using P1)	71	69
	Saturday Daytime	65 (using P1)	70	68
Pendulum Hotel/Weston Halls	Weekday Daytime	62 (using P2)	67	65
	Saturday Daytime	61 (using P2)	66	64
Ibis Hotel Vita Students	Weekday Daytime	62 (using P3)	67	65
	Saturday Daytime	60 (using P3)	65	63

Table 4: Construction Noise BS5228 Limits (Educational/Research Buildings)

Receptor	Period	Measured Ambient Noise Level, dB $L_{Aeq,T}$	BS5228 Total Noise Limit (Ambient + Construction Noise), dB $L_{Aeq,T}$	BS5228 Construction Noise Limit, dB $L_{Aeq,T}$
Sackville Street Building	Weekday Daytime	66 (using P1)	71	69
	Saturday Daytime	65 (using P1)	70	68
James Lighthill Building Pariser Building Renold Building	Weekday Daytime	62 (using P2)	67	65
	Saturday Daytime	61 (using P2)	66	64

Based on the above, the noise thresholds applicable to the nearest sensitive receptor locations are summarised as follows:

Table 5: BS 5228 Construction/Demolition Noise Thresholds (Private Residential Receptors)

Receptor	Period	Significant Effect Threshold dB $L_{Aeq,T}$	Noise Insulation Threshold dB $L_{Aeq,T}$	Temporary Re-Housing Threshold dB $L_{Aeq,T}$
90 Princess St Salisbury House Orient House Granby House Fairbairn Building 1 Samuel Ogden St Granby Village	Weekday Daytime	69	75	85
	Saturday Daytime	68	75	85
Montana House	Weekday Daytime	63	75	85
	Saturday Daytime	65	75	85

Table 6: BS 5228 Construction/Demolition Noise Thresholds (PBSA/Hotel Receptors)

Receptor	Period	Significant Effect Threshold dB $L_{Aeq,T}$	Noise Insulation Threshold dB $L_{Aeq,T}$	Temporary Re-Housing Threshold dB $L_{Aeq,T}$
121 Princess St	Weekday Daytime	69	75	85
	Saturday Daytime	68	75	85
Pendulum Hotel/Weston Halls	Weekday Daytime	65	75	85
	Saturday Daytime	64	75	85
Ibis Hotel Vita Students	Weekday Daytime	65	75	85
	Saturday Daytime	63	75	85

Table 7: BS 5228 Construction/Demolition Noise Thresholds (Educational/Research Receptors)

Receptor	Period	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
Sackville Street Building	Weekday Daytime	69	-*	-*
	Saturday Daytime	68	-*	-*
James Lighthill Building Pariser Building Renold Building	Weekday Daytime	65	-*	-*
	Saturday Daytime	64	-*	-*
*Not applicable to non-residential receptors				

An offer of noise insulation or temporary re-housing is only normally required where the threshold is exceeded for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

6.4. Demolition Plant Noise Levels

The magnitude of the potential impact will depend on the type of activity, period of operation, source to receiver distance, ground absorption and reflections.

Demolition noise predictions have been based on the demolition plant/machinery/activity likely to be used at the site during each of phase. The sound data for the various demolition plant and activities are largely based on sound data from BS5228-1, with all references provided.

The calculations are based on the quantity and a percentage on-time for each plant/machinery/activity. The percentage on-time covers periods when a specified tool, machine or activity is in peak operation. Using the sound power level data from manufacturer data sheets and from BS 5228-1, the total sound power level for each phase of works has been calculated.

Appendix B outlines the construction/demolition plant, machinery and activities considered in the assessment, along with the quantity and the expected percentage on-time for each plant/machinery/activity. The assessment should be updated once a Contractor is on board, and the actual plant types are known.

6.5. Noise Model

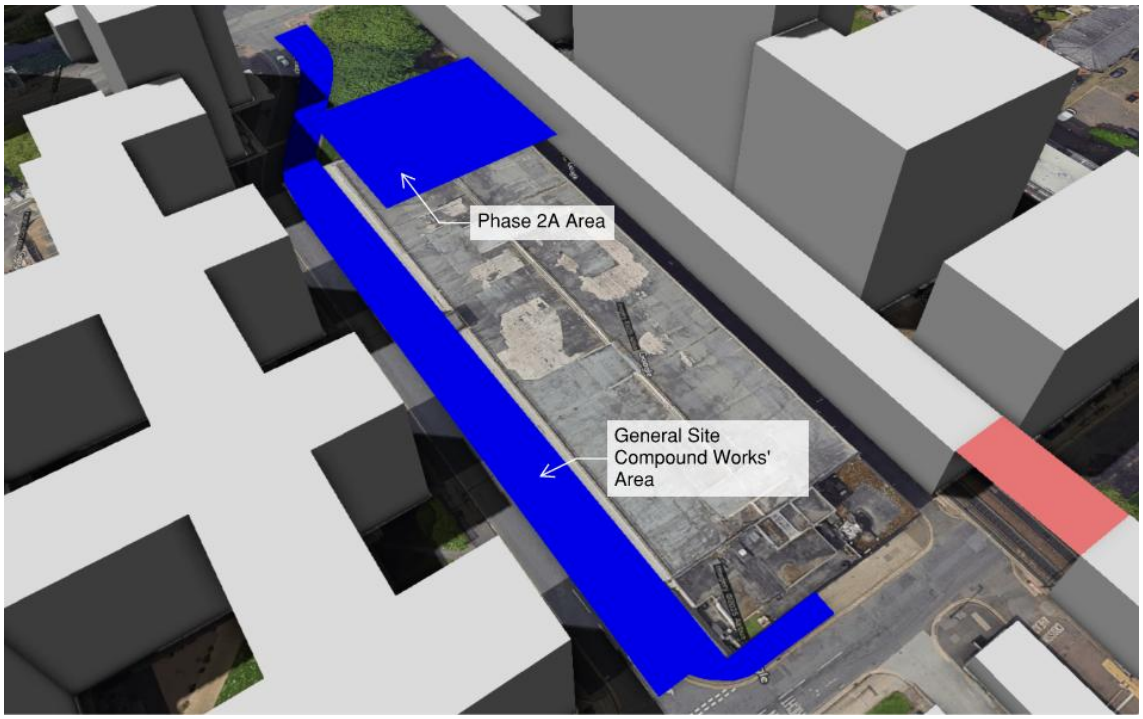
The demolition noise model was developed using the Datakustik Cadna/A software package, applying the ISO 9613-2:2024 noise prediction methodology. This sound propagation model facilitates precise prediction of noise levels at each assessment location, considering critical factors such as geometric spreading, acoustic screening, and reflections. The built-form of the car park has been omitted for screening purposes, to represent a worst-case scenario.

Based on the demolition programme and information provided by the Client, the assessment was segmented into eight primary phases, as outlined in Section 4.2. Noise levels for each phase were modelled using the following methodology:

- **P1A, P1B, P1C, P1D – On Slab Top-down Demolition and Clear-up:** Predictions for each of these top-down on slab demolition works utilised a single area source covering approximately 25% of the site area (extent illustrated in Figure 2). The source was modelled at an average height of 10m above ground level, representative of the upper floors of the existing car park. The built-form of the car park has been omitted for screening purposes, to represent a worst-case scenario. The assigned sound power levels are detailed in Appendix B.
- **P2A, P2B, P2C, P2D – Demolition of Remaining Structures Using a High Reach and Clear-up:** Predictions for each of these top-down on slab demolition works utilised a single area source covering approximately 25% of the site area (extent illustrated in Figure 3). The source was modelled at an average height of 10m above ground level, representative of the upper floors of the existing car park. The assigned sound power levels are detailed in Appendix B.
- **General Site Compound Works:** In addition to the above outlined primary demolition works, general site compound works have been included throughout all eight phases, comprising activities such as arrival/departure of lorries and the operation of on-ground excavators loading these lorries with the demolition debris. Predictions for these activities utilised a single area source covering the designated area directly to the south of the site. The assigned sound power levels are detailed in Appendix B.

Figure 5 below illustrates a 3D screenshot of Phase 2A from the noise model, for information purposes.

Figure 5: Phase 2A 3D Noise Modelling Screenshot



6.6. Noise Level Predictions

6.6.1. Private Residential Receptors

The predicted demolition noise levels at the worst-affected private residential receptors, located to the west and northwest of the site, are summarised in Tables 8 – 15.

Table 8: Predicted Demolition Noise Levels – 90 Princess Street

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	60	Weekday: 69 Saturday: 68	75	85
P1B	56			
P1C	57			
P1D	61			
P2A	70			
P2B	66			
P2C	64			
P2D	63			

Table 9: Predicted Demolition Noise Levels – Salisbury House

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	68	Weekday: 69 Saturday: 68	75	85
P1B	63			
P1C	63			
P1D	67			
P2A	77			
P2B	73			
P2C	70			
P2D	69			

Table 10: Predicted Demolition Noise Levels – Orient House

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	70	Weekday: 69 Saturday: 68	75	85
P1B	67			
P1C	66			
P1D	67			
P2A	77			
P2B	77			
P2C	75			
P2D	72			

Table 11: Predicted Demolition Noise Levels – Granby House

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	71	Weekday: 69 Saturday: 68	75	85
P1B	70			
P1C	68			
P1D	69			
P2A	77			
P2B	78			
P2C	78			
P2D	76			

Table 12: Predicted Demolition Noise Levels – Fairbairn Building

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	64	Weekday: 69 Saturday: 68	75	85
P1B	71			
P1C	68			
P1D	64			
P2A	71			
P2B	74			
P2C	78			
P2D	79			

Table 13: Predicted Demolition Noise Levels – 1 Samuel Ogden Street

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	60	Weekday: 69 Saturday: 68	75	85
P1B	48			
P1C	49			
P1D	60			
P2A	70			
P2B	63			
P2C	54			
P2D	50			

Table 14: Predicted Demolition Noise Levels – Granby Village

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	52	Weekday: 69 Saturday: 68	75	85
P1B	63			
P1C	63			
P1D	51			
P2A	56			
P2B	62			
P2C	73			
P2D	69			

Table 15: Predicted Demolition Noise Levels – Montana House

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	57	Weekday: 65 Saturday: 63	75	85
P1B	57			
P1C	58			
P1D	56			
P2A	65			
P2B	65			
P2C	66			
P2D	66			

Based on the predicted noise levels presented in Tables 4 to 7, the following conclusions have been drawn for the most-exposed façade/window of the worst-affected private residential receptors:

90 Princess St (Table 8)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during all phases, except Phase P2A, with the highest predicted noise level of 70 dBA.
- No exceedance of the noise insulation or temporary re-housing thresholds are anticipated.

Salisbury House (Table 9)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during four phases.
- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during four phases (P2A – P2D), with phase P2A predicted to also exceed the noise insulation threshold, with the highest predicted noise level of 77 dBA.

- No exceedance of the temporary re-housing threshold is anticipated.

Orient House (Table 10)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during three phases.
- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during five phases (P1A, P2A – P2D), with phases P2A and P2B predicted to also exceed the noise insulation threshold, with the highest predicted noise level of 77 dBA.
- No exceedance of the temporary re-housing threshold is anticipated.

Granby House (Table 11)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during one phase.
- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during all but one phase, with phases P2A – P2D predicted to also exceed the noise insulation threshold, with the highest predicted noise level of 78 dBA.
- No exceedance of the temporary re-housing threshold is anticipated.

Fairbairn Building (Table 12)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during three phases.
- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during five phases (P2A, P2A – P2D), with phases P2C and P2D predicted to also exceed the noise insulation threshold, with the highest predicted noise level of 79 dBA.
- No exceedance of the temporary re-housing threshold is anticipated.

1 Samuel Ogden Street (Table 13)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during all phases, except Phase P2A, with the highest predicted noise level of 70 dBA.
- No exceedance of the noise insulation or temporary re-housing thresholds are anticipated.

Granby Village (Table 14)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during all phases, except Phases P2C and P2D, with the highest predicted noise level of 73 dBA.
- No exceedance of the noise insulation or temporary re-housing thresholds are anticipated.

Montana House (Table 15)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during the first four phases (P1A – P1D).
- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during the last four phases (P2A – P2D), with the highest predicted noise level of 66 dBA.
- No exceedance of the noise insulation or temporary re-housing thresholds are anticipated.

6.6.2. Hotel/PBSA Receptors

Predicted construction noise levels for the worst-affected Hotel and PBSA receptors to the site are provided in Tables 16 and 19.

Table 16: Predicted Demolition Noise Levels – 121 Princess Street

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	58	Weekday: 69 Saturday: 68	75	85
P1B	50			
P1C	51			
P1D	58			
P2A	68			
P2B	63			
P2C	59			
P2D	53			

Table 17: Predicted Demolition Noise Levels – Pendulum Hotel and Weston Halls

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	69	Weekday: 65 Saturday: 64	75	85
P1B	69			
P1C	71			
P1D	72			
P2A	79			
P2B	79			
P2C	79			
P2D	79			

Table 18: Predicted Demolition Noise Levels – Ibis Hotel

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	69	Weekday: 65 Saturday: 63	75	85
P1B	66			
P1C	66			
P1D	70			
P2A	79			
P2B	76			
P2C	73			
P2D	72			

Table 19: Predicted Demolition Noise Levels – Vita Students

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	60	Weekday: 65 Saturday: 63	75	85
P1B	58			
P1C	56			
P1D	58			
P2A	68			
P2B	66			
P2C	65			
P2D	65			

Based on the predicted noise levels presented in Tables 8 and 9, the following conclusions have been drawn for the most-exposed façade/window of the worst-affected hotel/PBSA receptors:

121 Princess Street (Table 16)

- Demolition noise levels are predicted to remain below all thresholds throughout the works.

Pendulum Hotel and Weston Halls (Table 17)

- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during all eight phases, with phases P2A – P2D predicted to also exceed the noise insulation threshold, with the highest predicted noise level of 79 dBA.
- No exceedance of the temporary re-housing threshold is anticipated.

Ibis Hotel (Table 18)

- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during all eight phases, with phases P2A and P2B predicted to also exceed the noise insulation threshold, with the highest predicted noise level of 79 dBA.
- No exceedance of the temporary re-housing threshold is anticipated.

Vita Students (Table 19)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during the first four phases (P1A – P1D).
- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during the last four phases (P2A – P2D), with the highest predicted noise level of 68 dBA.
- No exceedance of the noise insulation or temporary re-housing thresholds are anticipated.

6.6.3. Educational/Research Receptors

Predicted construction noise levels for the worst-affected educational/research receptors to the site are provided in Table 20 – 23.

Table 20: Predicted Demolition Noise Levels – Sackville Street Building

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	53	Weekday: 69 Saturday: 68	-	-
P1B	57			
P1C	59			
P1D	56			
P2A	62			
P2B	65			
P2C	67			
P2D	70			

Table 21: Predicted Demolition Noise Levels – James Lighthill Building

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	64	Weekday: 65 Saturday: 64	-	-
P1B	69			
P1C	69			
P1D	64			
P2A	70			
P2B	73			
P2C	77			
P2D	80			

Table 22: Predicted Demolition Noise Levels – Pariser Building

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	58	Weekday: 65 Saturday: 64	-	-
P1B	63			
P1C	63			
P1D	57			
P2A	65			
P2B	67			
P2C	72			
P2D	73			

Table 23: Predicted Demolition Noise Levels – Renold Building

Phase	Predicted Demolition Noise Levels dB $L_{Aeq, T}$	Significant Effect Threshold dB $L_{Aeq, T}$	Noise Insulation Threshold dB $L_{Aeq, T}$	Temporary Re-Housing Threshold dB $L_{Aeq, T}$
P1A	60	Weekday: 65 Saturday: 64	-	-
P1B	64			
P1C	64			
P1D	60			
P2A	68			
P2B	70			
P2C	72			
P2D	74			

Based on the predicted noise levels presented in Table 10, the following conclusions have been drawn for the most-exposed façade/window of the worst-affected educational/research receptors:

Sackville Street Building (Table 20)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during all phases, with exception of P2D, with the highest predicted noise level of 70 dBA.

James Lighthill Building (Table 21)

- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during six, with phases P2C and P2D predicted to also exceed the noise insulation threshold, with the highest predicted noise level of 80 dBA.

Pariser Building (Table 22)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during the first four phases (P1A – P1D).
- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during the last four phases (P2A – P2D), with the highest predicted noise level of 73 dBA.

Renold Building (Table 23)

- Demolition noise levels are predicted to remain below the threshold for a significant adverse effect during the first four phases (P1A – P1D).
- Demolition noise levels are predicted to exceed the threshold for a significant adverse effect during the last four phases (P2A – P2D), with the highest predicted noise level of 74 dBA.

6.6.4. Conclusion

The predictions indicate that demolition noise levels are likely to exceed both the significant adverse effect level during several phases of the works, particularly at the closest receptors to the south of the site.

It is therefore essential the contractor implements best practicable means for noise reduction and that high-impact works are conducted in the least disruptive manner. In line with BS 5228 guidance, noise insulation (or temporary re-housing) trigger thresholds should not be exceeded for more than 10 days in any 15 consecutive days, or 40 days in any six-month period. A noise monitoring scheme, as outlined later in this report, will be required to manage and track noise levels, to ensure ongoing compliance.

Additionally, the contractor should proactively engage with any affected residents and building occupants. They should be informed about the detailed demolition plans and the expected impacts from noise. The contractor should have a comprehensive discussion with the occupants to understand their daily routines and be prepared to modify the proposed methods and adopt additional mitigation measures (such as adopting '2 hours on and 2 hours off' working approach), where feasible, to minimise disruption from the works.

If noise levels still exceed the noise insulation thresholds for periods longer than those specified above, and where residents who cannot work around the potential noise impacts, then an offer of additional noise insulation (typically secondary glazing and alternative ventilation where necessary) or temporary housing may need to be offered.

These measures will help minimise disruption and address any exceedances effectively. More detail has been provided in the following Section.

6.7. Recommended Noise Mitigation Measures

To justify the predicted noise emissions and ensure compliance during demolition, it must be ensured that Best Practicable Means (BPM) are being used to limit noise emissions wherever possible.

Best Practicable Means (BPM) as defined in Section 72 of the Control of Pollution Act 1974, is a key regulatory concept in managing environmental impacts, particularly noise and vibration from demolition sites. BPM is not explicitly defined in terms of specific measures; instead, it emphasises the adoption of all reasonably practicable precautions, considering the current state of technical knowledge and the financial implications of applying various control techniques.

Summary of Best Practicable Means

- **Practicability:** This includes the suitability and feasibility of the noise and vibration control measures. It considers what is technically feasible with the available technology and methods.
- **Current Technical Knowledge:** BPM requires the use of the latest technology and methods that are proven to be effective in noise and vibration reduction.
- **Costs and Benefits:** The measures should be cost-effective, meaning the cost of implementing the measure is balanced against the benefit gained from the reduction in noise or vibration.
- **Nature of the Industry:** The specific characteristics and operational requirements of the construction industry are considered. This includes the type of work being carried out and the typical equipment used.

Site-Specific Best Practicable Means

The following table presents the list of BPM that must be considered and applied where possible in accordance with BS 5228.

Table 24: Best Practicable Means for Noise Reduction Applicable to the Proposed Works

BPM Measure	Applicability to the Works	Required to be Implemented on Site?
Use the quietest plant that it is feasible to do so for any given task.	This is applicable and shall be employed by the Contractor.	Yes
Use of modern, quieter machinery and technology as part of project planning and implementation.	The plant being used should be modern and up-to-date.	Yes

Avoid unnecessary revving of engines and switch off equipment when not required.	Applicable to all machinery/plant.	Yes
Maintain internal haul routes well to avoid noise from bumpy or uneven surfaces.	Applicable to primary routes on site used by machinery/plant.	Yes
Use rubber linings in chutes and dumpers to reduce impact noise.	Applicable to the trucks.	Yes
Minimise the drop height of materials to reduce noise from impacts.	Applicable to the trucks	Yes
Start up plant and vehicles sequentially rather than all together to avoid peak noise levels.	Applicable to all of the main machinery/plant.	Yes
Orient noisy plant to direct noise away from sensitive areas.	Plant is mobile and not particularly directional and therefore this may not be applicable in this instance.	No
Use acoustic enclosures for noisy equipment.	Plant is mobile and therefore enclosures will not likely be feasible.	No
Apply sound-absorbing materials to the inner surfaces of enclosures.	Enclosures are not proposed as detailed above.	No
Manage the movement of plant on site concerning operational hours and proximity to noise-sensitive receptors	Primary mobile plant routes/haul roads should be through the centre of the site, rather than around the boundaries wherever possible.	Yes
Alternative reversing warning systems should be used instead of conventional audible alarms to minimise disturbance.	White noise reverse warning systems should be used wherever possible.	Yes
Maintenance of machinery should be regular and involve checks for potential noise increases which indicate maintenance needs.	All plant should be regularly checked and maintained.	Yes
Increase distance between the noise source and receptors to naturally reduce noise levels.	The plant will need to operate in set locations and therefore increasing distance to the receptors is not possible.	No
Use of noise barriers and screens to physically block sound paths to receptors.	Site hoarding is proposed around the site, which will reduce noise emissions where plant is used near the boundary.	Yes
Positioning of noise screens or barriers close to either the noise source or the receiver to maximise their effectiveness.	All plant is mobile and therefore positioning/moving screening closer to the plant will not be possible.	No
Site layout planning to use natural topography or existing structures to shield noise-sensitive areas.	Works are generally proposed to be carried out by maximising the use of existing structures for acoustic screening. In some instances, however, the works will inevitably	Yes

	have to be carried out in a direct line of sight with the receptors.	
Vegetative barriers like trees or shrubs, although more psychological in their effect, can be used to give a perception of noise reduction.	There are no significant existing vegetative barriers and adding any in a short timeframe would not be possible.	No

In addition to these measures, BS 5228 provides details of community liaison and demolition noise monitoring, as detailed in Sections 8 and 9 of this report.

The purpose of the scheme of demolition noise monitoring will be to ensure noise levels from the demolition works are managed and controlled.

The noise insulation and temporary-rehousing thresholds only apply after exceedance periods defined as 10 days within any 15 consecutive days, or 40 days within any consecutive 6-month period. If these thresholds are exceeded during these periods, appropriate measures (or reasonable costs thereof) must be offered to affected occupants. This may include the installation of secondary glazing, alternative ventilation in their properties, or temporary re-housing for the duration of the noisy works.

6.8. Construction/Demolition Noise Significance

The predicted demolition noise levels have the potential to cause significant adverse effects and exceed noise insulation thresholds at the nearby noise sensitive receptors identified in the assessment.

Further to the implementation of BPM, and the community liaison and monitoring measures detailed later in this report, the works are **expected to align with BS 5228 and the principle of BPM**.

7. Demolition Vibration Impact Assessment

7.1. Assessment Method

An assessment has been conducted to predict demolition vibration emissions at the nearest noise-sensitive receptors in accordance with BS 5228-2:2009+A1:2014. The method comprises the following steps:

1. Identify appropriate vibration thresholds at which significant adverse effects may occur, and at which temporary/permanent rehousing may be necessary.
2. Identify suitable source vibration levels, based on the anticipated plant/machinery, by referencing the vibration level databases in either BS 5228 or the United States (US) Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment Guide ("the FTA Guide").
3. Predict the demolition vibration levels at the nearest noise sensitive receptors in accordance with BS 5228 or the FTA Guide.
4. Compare the predicted vibration levels against the vibration thresholds.
5. Determine whether mitigation measures are required to protect nearby receptors from demolition vibration.
6. Conclude on the significance of the predicted vibration levels, accounting for the proposed mitigation measures.

7.2. Construction/Demolition Vibration Thresholds

BS 5228 presents different vibration thresholds, exceedance of which triggers different responses. These are as follows:

1. **Significant Effect:** BS 5228 states that a peak particle velocity (PPV) vibration level greater than 1.0 mm/s is likely to cause complaint but can be tolerated in prior warning and explanation has been given to residents.
2. **Upper Limit:** BS 5228 states that a PPV of 10 mm/s is likely to be intolerable for any more than a very brief exposure to this level in most building environments. This is therefore deemed the upper threshold and should not be exceeded.

The applicable vibration thresholds have been selected in accordance with BS 5228 as presented below.

Table 25: Construction/Demolition Vibration Thresholds

Receptor	Significant Effect Threshold PPV mm/s	Upper Limit Threshold PPV mm/s
Private residential, PBSA residences and hotels	1.0	10.0

In addition to the above, BS 5228 also indicates that light cosmetic damage to buildings is possible when vibration levels exceed 15 mm/s at receptor locations, particularly when the buildings are connected. Minor structural damage to residential buildings is typically only expected at levels above 30 mm/s.

7.3. Prediction of Vibration Levels

Table 26 summarises key demolition equipment expected to dominate vibration levels in the immediate vicinity of the site boundary. The equipment types, working locations, and activities are based on activities/machinery as provided by the Client (detailed in Appendix B). Source vibration levels for each item of plant were selected from the databases in BS 5228 and the Federal Transit Administration (FTA) guide.

Table 26: Source Vibration Level for Proposed Plant

Equipment Type	Working location / activity	Database Reference	Source Vibration Level PPV mm/s
High Reach	Across the building footprint	FTA guide (Hoe Ram)	2.3 at 7.6m
Lorry	Vehicle entrance and access/haul routes	FTA guide (Loaded Trucks)	1.9 at 7.6 m
Excavator	Across the majority of site	FTA guide	1.9 at 7.6 m

The demolition vibration levels were predicted using the FTA guide methodology, which incorporates simple assumptions for soil damping and geometric dispersion. The results of these predictions are presented in Table 27. The shortest distance from the nearest site boundary to the façade of each receptor type was used to model the vibration levels.

Table 27: Predicted Demolition Vibration Levels at the Nearest Receptors

Receptor	Distance	Predicted Demolition Vibration Levels PPV mm/s			Significant Effect Threshold PPV mm/s	Temporary Re-Housing Threshold PPV mm/s
		High Reach	Lorry	Excavator		
Nearest private residential receptor	13	1.0	<1.0	<1.0	1.0	10.0
Nearest Hotel/PBSA receptors	10	1.5	1.3	1.3	1.0	10.0
Educational/ Research receptors	16	<1.0	<1.0	<1.0	1.0	10.0

The receptor points for vibration are located within the buildings where occupants would experience the vibration. However, the predictions are based on theoretical free-field receptors, which do not consider the effects of building structure. As the receptor buildings are predominantly large, heavyweight structures, it is likely that vibration levels will decrease as they transmit into the building interiors. These predictions, therefore, represent a conservative worst-case scenario.

Key Findings:

1. **Nearest Private Residential:** The predicted vibration levels are below the significant adverse effect threshold of 1.0 mm/s, reflecting the distance between the proposed site and these receptors. While perceptible vibration may occur at levels of 0.14 mm/s or higher, the predicted vibration levels are considered acceptable.

2. **Nearest Hotel/PBSA Receptors:** The predicted vibration levels suggest that operations involving high reach demolition activities and lorry departures may marginally exceed the significant adverse effect threshold at the nearest façades of Pendulum Hotel and Weston Halls, given the short distance of around 10 metres from the nearest site boundary. This exceedance should be tolerable if prior warning is provided to the occupants.
3. **Nearest Educational/Research Receptors:** The predicted vibration levels are below the significant adverse effect threshold of 1.0 mm/s. While perceptible vibration may occur at levels of 0.14 mm/s or higher, the predicted vibration levels are considered acceptable.
4. **Damage Thresholds:** All predicted vibration levels are significantly below the upper threshold of 10 mm/s for temporary re-housing and the levels at which cosmetic damage to structures is likely to occur. Thus, the risk of structural damage to buildings is negligible.

In addition to the above, consideration has been given to safeguarding the adjacent elevated railway structure from potential cosmetic or structural damage due to vibration emissions. The railway lines are located approximately 4 metres from the northern boundary of the existing car park. Using the same methodology outlined in the FTA guidance, predicted vibration levels from high-reach demolition activities are not expected to exceed a peak particle velocity (PPV) of 6 mm/s. This level is below typical thresholds for cosmetic or structural damage, indicating a low likelihood of adverse effects on the railway infrastructure, which is considered acceptable.

Recommendations:

- **Mitigation Measures:** Best Practicable Means (BPM) should be implemented to minimise vibration levels during demolition works.
- **Community Liaison:** Clear communication with nearby occupants and building users is recommended to provide advance notice of potential vibration levels during critical demolition activities.
- **Vibration Monitoring:** Continuous vibration monitoring should be conducted to verify compliance with the predicted vibration levels and ensure adherence to the established thresholds.

By implementing these recommendations, the potential for significant adverse effects on sensitive receptors can be effectively mitigated while maintaining compliance with applicable standards.

7.4. Required Vibration Mitigation Measures

To justify the predicted vibration emissions and ensure compliance during demolition, it must be ensured that Best Practicable Means (BPM) are being used to limit vibration emissions wherever possible.

The BPM principle for vibration is the same as it is for noise; vibration should be limited wherever practicable.

The following table presents the list of BPM that must be considered and applied where possible in accordance with BS 5228.

Table 28: Best Practicable Means for Vibration Reduction Applicable to the Proposed Works

BPM Measure	Applicability to the Works	Required to be Implemented on Site?
Use of modern methods which lower vibration emissions as part of project planning and implementation.	The plant being used should be modern and up-to-date. The construction methods are understood to be those with the lower vibration emissions, given the relevant constraints on access and programme.	Yes
Isolate vibration at source by installing equipment on anti-vibration mountings where necessary.	Not applicable to mobile plant.	No
Position vibrating equipment far from sensitive receptors, and not on the same structure as the receptor.	Plant must operate where required in this instance which includes the site boundaries.	No
Remove any known obstructions from the piling locations.	Not applicable, no piling works proposed.	No
Mudding in for rotary bored piles. Seat the casing using a twister bar where possible as opposed to tapping or vibrating into position.	Not applicable, no piling works proposed.	No
Avoid sheer leg contact with sensitive structures which can transfer vibration directly to the receptor.	Not applicable.	No

In addition to the above measures, BS 5228 recommends community liaison and vibration level monitoring which are detailed further in Sections 8 and 9 of this report.

7.5. Construction/Demolition Vibration Significance

Whilst the prediction demolition vibration levels are generally within the adopted thresholds, they do have the potential to marginally exceed the significant adverse effect threshold at the worst-affected locations of Pendulum Hotel and Weston Halls.

Further to the implementation of BPM, and the community liaison and monitoring measures detailed later in this report, the works are **expected to align with the BS 5228 guidelines** and therefore offers of additional measures such as temporary re-housing are not likely to be required.

8. Community Liaison

Effective co-ordination and time management of demolition works is essential in avoiding noise and vibration nuisance to surrounding uses. Early and helpful communications with the surrounding residents and building occupants will assist in reducing the potential for, and in managing, any complaints arising during demolition.

Details of the proposed community liaison strategy are provided as follows:

1. **Communication with Nearby Building Occupants:** Contractors are required to ensure that sensitive receptors are kept informed about the activities. This includes providing advance notice of any works that may cause significant disruption due to noise or vibration.
2. **Site Contact Board:** A site contact board must be displayed prominently at the site entrance. This board should include:
    - The name of the main contractor.
    - The address and telephone number where a responsible person can be contacted.
    - The name of the site manager.
    - The expected month and year of completion of the works.
3. **Regular Updates:** The contractor should issue regular updates to affected receptors and other stakeholders about the progress of the work and any changes to the expected schedules or impacts.
4. **Handling Complaints:** A procedure must be in place for handling complaints from the public effectively. This includes recording complaints, actions taken in response, and ensuring timely communication back to the complainant.
5. **Staffed Telephone Line:** There should be a telephone line available at all times during working hours, which can be used by the public to make enquiries or complaints. This line should be manned by staff who are knowledgeable about the project and capable of addressing concerns.
6. **Newsletter:** Contractors are encouraged to issue newsletters, ideally monthly, to keep the local community informed about the project progress, upcoming activities, and other relevant information.

These community liaison requirements are designed to ensure transparency, maintain good relations with the local community, and address any concerns promptly during the demolition period.

By implementing the above, the Contractor is demonstrating a commitment to BPM with regards to community liaison.

9. Noise and Vibration Monitoring Strategy

9.1. Strategy Overview

The following monitoring strategy has been developed and is considered appropriate for this project and in line with Manchester City Council's 2022 Noise and Planning Technical Guidance.

9.2. Monitoring Locations

It is recommended that continuous demolition noise and vibration monitoring is carried out for the duration of the works at locations representative of the surrounding receptors.

As such, two noise monitors and two vibration monitors are recommended as a minimum, in this instance.

The proposed monitoring locations are shown in Figure 6 and described below.

Figure 6: Proposed Noise and Vibration Continuous Monitoring Position

9.3. Noise and Vibration Limits

9.3.1. Noise Limits

Table 29 presents the applicable limits at the recommended noise monitoring locations. A 1-hour warning alert is recommended so that the Contractor can check methods and ensure that operations are not expected to exceed the noise limit for the full daytime working period.

Table 29: Demolition Noise Limits and Alerts

Measurement Location	Noise Limit dB	
	Warning Alert $L_{Aeq,1hour}$	Noise Limit $L_{Aeq,working\ day}$
Position 1 and 2	74	80

If the monitors are installed closer to the works than the receptors then higher limits may be applicable.

9.3.2. Vibration Limits

It should be ensured that vibration levels do not exceed a peak particle velocity (PPV) of 10 mm/s as an absolute worst-case. It is recommended that alerts are set to notify the Contractor when they are likely to exceed both 3 mm/s and 5 mm/s.

Table 30 presents the applicable limits at the recommended vibration monitoring location. The Contractor should stop works and inspect the operations being undertaken as soon as exceedances are recorded.

Table 30: Demolition Vibration Limits and Alerts

Measurement Location	Vibration Limit PPV mm/s	
	Warning Alert	Vibration Limit
Position 1 and 2	3	5

As above, if the monitoring position is installed closer to the works than the receptor then higher limits may be applicable.

9.4. Monitoring Specifications

Both the noise and vibration monitors should be automatic remote logging systems, collecting noise and vibration data at regular intervals (e.g., every 15 minutes) throughout the monitoring period.

Data should be accessible in real-time and historically through a web-based platform. Noise alert and action levels shall be set up at the limits defined in the previous section. Should noise or vibration levels exceed these thresholds, emails shall be dispatched to a designated contact list.

A monthly monitoring report should be produced, summarising the measurement results from each location and comparing them against established baselines or limits.

Where the measured noise levels are more than the predicted noise levels or in the event of a complaint of noise an investigation shall be carried out to ascertain the cause of the exceedance or the complaint and to check that Best Practicable Means are being used to control the noise in accordance with the steps set out in this report. Noise levels shall be reduced further if it is reasonably practicable to do so.

A similar procedure should be applied to the vibration measurements.

The Contractor shall carry out these investigations and report back to the monitoring team to confirm the reason for exceedance, and the measures put in place to rectify the situation.

10. Conclusion

Heyda Ltd has been commissioned by ID Manchester Limited to undertake a demolition noise and vibration impact assessment for the proposed demolition of the existing multi-storey car park at Charles Street, within Plot H of the Sister site in Manchester City Centre.

The assessment has established appropriate noise and vibration thresholds in accordance with BS 5228:2009+A1:2014 and has evaluated the likely impacts on nearby sensitive receptors. Predictions indicate that demolition noise levels have the potential exceed the "significant effect" threshold and, in some cases, the "noise insulation" threshold, primarily due to the proximity of receptors and the high-impact nature of the works. Vibration levels are generally expected to remain within acceptable limits, although marginal exceedances may occur at the nearest receptors to the south of the site.

To manage these impacts, the assessment recommends a comprehensive suite of mitigation measures aligned with Best Practicable Means (BPM), including the use of quieter modern demolition equipment, and strict scheduling of high-impact activities. A robust monitoring regime, featuring real-time noise and vibration monitoring and alert systems, has also been proposed to ensure proactive compliance and rapid response to any exceedances.

Community engagement has been highlighted as a critical element of impact management. A structured liaison strategy, providing regular updates, advance notice of disruptive works, and a dedicated point of contact, will help foster transparency and maintain good relationships with local residents and stakeholders.

In conclusion, this assessment confirms that the proposed demolition activities, when carried out in accordance with the recommended mitigation measures and monitoring protocols, can be managed effectively to minimise adverse impacts. The adoption of transparent communication strategies and early community engagement will further support the smooth progression of the development while addressing concerns and maintaining positive relationships with local stakeholders.

This report provides assurance that the development is committed to achieving compliance with regulatory standards and safeguarding the well-being of the surrounding community throughout the demolition process.

Appendix A - Glossary of Acoustic Terminology

This glossary provides an overview of key acoustic terms and concepts:

- Sound: Vibration of particles in a medium like air, detectable by the human ear. When sound is audible and unwanted or undesirable, it is termed 'noise'.
- Sound Pressure: Local pressure fluctuations from the normal pressure caused by the vibration or oscillation of particles. The number of oscillations per second is termed 'frequency'.
- Frequency: The rate at which particles oscillate, measured in Hertz (Hz). The human ear can typically detect frequencies from 20 Hz (low bass) to 20,000 Hz (high treble), with varying sensitivity across this range.
- Sound Pressure Level: Quantified in decibels (dB), this logarithmic parameter approximates the human ear's response to sound, measuring the ratio of a given pressure to the threshold of hearing.
- A-Weighted Decibels (dB(A) or dB L_{pA}): A frequency weighting used in sound level meters to mimic the human ear's response, particularly at typical environmental sound pressure levels.
- Measurement Parameters in Acoustics:
    - dB $L_{Aeq,T}$: Equivalent continuous A-weighted sound pressure level over a period, T, representing the energy-average sound pressure.
    - dB $L_{AFmax,T}$: Maximum A-weighted sound pressure level during a period, T, approximating the ear's time-response.
    - dB $L_{A90,T}$: The 90th percentile A-weighted sound pressure level, exceeded for 90% of the period, T, often referred to as the background sound level.
- Sound Level Meters: Instruments incorporating a microphone to measure sound pressure levels, using frequency filters to approximate the human ear's response.

Tables A1 and A2 in the appendix present sound pressure levels in typical environments and further definitions of acoustic parameters, respectively.

Table A1: Sound pressure levels within typical environments

Sound Pressure Level, dB	Typical Environment or Description
0	Threshold of hearing
15 to 25	A recording studio
25 to 35	A hotel bedroom at night
35 to 45	An unoccupied office
45 to 55	Quiet residential street
55 to 65	Normal conversation, 1 m away TV programme, listener position
65 to 75	Raised voices, 1 m away Urban high street traffic
75 to 85	Busy motorway traffic, on hard shoulder Typical small plant room
85 to 95	High-speed hand-dryer, operator position Inside London underground (average)
95 to 105	Pneumatic hammer, operator position Concert orchestra
105 to 115	Typical nightclub Untreated generator plantroom
115 to 140	Aircraft take-off, close proximity Threshold of pain

Table A2: Definitions of Acoustic Terminology and Parameters

Wording	Description
A-weighting	A process adjusting observed sound pressure levels across different frequencies to mimic the human ear's sensitivity to sound. Expressed as dB(A).
Ambient Sound Level	The total sound pressure level at a specific position from all surrounding noise sources, usually expressed as dB $L_{Aeq,T}$, the equivalent continuous A-weighted sound pressure level.
Best Practicable Means (BPM)	The most suitable mitigation techniques available that are practical and cost-effective for minimizing noise and vibration during construction.
BS 5228	British Standard for "Noise and Vibration Control on Construction and Open Sites," providing guidelines for assessing, managing, and mitigating noise and vibration on construction sites.
Decibel	A logarithmic unit measuring sound pressure or power relative to a reference value (20 µPa for sound pressure, 10^-12 W for sound power).
Equivalent Continuous Sound Pressure Level ($L_{Aeq,T}$)	A measure of the average sound level over a specified period, representing the energy mean of the sound pressure levels. Often used to describe exposure to noise.
Noise Insulation	Measures or methods used to reduce the transmission of sound from one area to another, usually involving structural modifications or the use of specific building materials.

Peak Particle Velocity (PPV)	A measure used in the assessment of vibration, indicating the maximum speed of a particle at a point, measured in mm/s, often used to assess potential damage to structures from vibration.
Receptor	Locations or individuals receiving or susceptible to environmental impacts like noise or vibration from a construction site.
Sound Absorption	The process by which material, structure, or object takes in sound energy when sound waves collide with it, as opposed to reflecting the sound.
Sound Power Level	The total sound energy emitted by a source per unit of time, measured in watts, and often converted to a decibel scale to describe the intensity of the source.
Sound Pressure Level (SPL)	The pressure level of sound relative to a reference value, measured in decibels (dB), used to describe the loudness at a specific location.
Substructure	The underlying structure forming the foundation of a construction project, involving initial phases like excavation and foundation laying, typically associated with higher vibration levels.
Thresholds	Pre-determined levels at which additional actions, such as mitigation or compensation, are required to manage the impact of construction noise or vibration.
Vibration Mitigation	Techniques or measures implemented to reduce the intensity and effects of vibration caused by construction activities, aimed at protecting structures and occupants from discomfort or damage.

Appendix B - Demolition Plant Details

Table B.1: Schedule of Proposed Demolition Plant – P1A – P1D – On Slab Demolition

Plant/Machinery/Activity	Reference (BS 5228 or Makita database)	Sound Power Level (dBA)	Quantity on site	Percentage on-time during a typical day (%)
Excavator (with demolition attachment)	C.1.3	108	2	50
Excavator (clearing rubble on slab)	C.2.7	98	2	50

Table B.1: Schedule of Proposed Demolition Plant – P2A – P2D – High Reach Demolition

Plant/Machinery/Activity	Reference (BS 5228 or Makita database)	Sound Power Level (dBA)	Quantity on site	Percentage on-time during a typical day (%)
High Reach Excavator (hydraulic pulveriser)	C.1.1	120	1	50
Excavator (on ground clearing rubble)	C.2.7	98	2	50

Table B.1: Schedule of Proposed Demolition Plant – General Site Compound Works

Plant/Machinery/Activity	Reference (BS 5228 or Makita database)	Sound Power Level (dBA)	Quantity on site	Percentage on-time during a typical day (%)
Excavator (on ground clearing rubble)	C.2.7	98	2	20
Lorries (deliveries/skip/waste)	D.7.121	98	5	15