

**296-298 Barlow Moor Road
& 651 Mauldeth Road West
Manchester**

Acoustic Planning Report
0924/APR1

7 March 2022

For:

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1.0 Introduction

Lighthouse Acoustics has been appointed by DHD & CO Accountants Ltd to undertake an environmental sound and vibration survey at the proposed development site at 296-298 Barlow Moor Road & 651 Mauldeth Road West, Manchester and to undertake an acoustic assessment for the proposed residential development.

The proposed residential development comprises the construction of new dwellings and flats.

The survey methodologies, results and assessments are presented in this report.

2.0 Objectives

To establish the Local Authority's acoustic requirements for the proposed development.

To visit site to undertake a detailed environmental sound survey in order to establish existing environmental sound levels at the proposed development.

To undertake a detailed sound assessment of the proposed development to establish the acoustic specification for glazing/ventilation elements required across the proposed residential element of the development in order to achieve the acoustic requirements of the Local Authority.

To undertake a preliminary vibration survey in order to establish existing vibration levels at the proposed development due to tram pass-by's from the tram lines to the north west of the site along with a preliminary vibration assessment to ascertain whether any isolation measures are required across the proposed development in order to achieve the acoustic requirements of the Local Authority.

To undertake a preliminary assessment of typical commercial noise from the ground/1st floor commercial units to the proposed 2nd floor residential flats to establish the acoustic specification for the separating floor required in order to achieve the acoustic requirements of the Local Authority.

To undertake a preliminary assessment of typical commercial noise from the ground/1st floor commercial units to the nearest noise sensitive receptors to establish the acoustic specification for the facade required in order to achieve the acoustic requirements of the Local Authority.

To propose atmospheric plant sound emission limits at the nearest noise sensitive receptors for subsequent use in designing building services proposals in order to comply with the requirements of the Local Authority.

3.0 Site Description

The proposed development is situated at 296-298 Barlow Moor Road & 651 Mauldeth Road West, Manchester and comprises a 2 storey end terrace building with 2 No. commercial units.

The site is bound by an adjoining commercial building (residential flat at 1st floor) to the north east, alley way to the south east, Barlow Moor Road (A5145) to the south west and Mauldeth Road West to the north west.

Existing residential properties are situated to the north east of the site along Mauldeth Road West, to the South east of the site along Barlow Moor Road and to the south west of the site along Hardy Lane. Chorlton Park Primary School is situated to the north west of the site opposite Mauldeth Road West.

The Metrolink tram lines are situated to the north west of the site along the centre of Mauldeth Road West/Hardy Lane. The Barlow Moor Road tram stop is situated to the north east of the site in the centre of Mauldeth Road West.

The site plan below indicates the extent of the site and the surrounding environment.



Site plan indicating the extent of the site and the surrounding environment

4.0 Local Authority Requirements

Manchester City Council have started the following Conditions for the proposed development under Planning Application Number 131616/FO/2021.

"6) a) The commercial premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.

Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 5dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (Leq,5min), respectively.

b) Prior to occupation of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that acceptable criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

7) a) Before the development commences a scheme for acoustically insulating the proposed residential accommodation against noise from Barlow Moor Road, Mauldeth Road West and the Metrolink shall be submitted to and approved in writing by the City Council as local planning authority. There may be other actual or potential sources of noise which require consideration on or near the site, including any local commercial/industrial premises including those that are part of this development. The approved noise insulation and ventilation scheme shall be completed before any of the dwelling units are occupied.

Noise survey data shall include measurements taken during a rush-hour period and night time to determine the appropriate sound insulation measures necessary. The following noise criteria shall be required to be achieved:

Bedrooms (night time - 23.00 - 07.00) 30 dB LAeq (individual noise events shall not exceed 45 dB L_{Amax,F} by more than 15 times)

Living Rooms (daytime - 07.00 - 23.00) 35 dB LAeq

Gardens and terraces (daytime) 55 dB LAeq

Due to the proximity of the development to the Metrolink it will be necessary for vibration criteria to apply which can be found in BS 6472: 2008 "Guide to evaluation of human exposure to vibration in buildings". Groundborne noise/re-radiated noise shall also be factored into the assessment and design.

b) Prior to first occupation of the residential units, a verification report shall be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that the internal noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the internal noise criteria.

8) a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the otherwise agreed in writing by the City Council as local planning authority.

b) Prior to the operation of the scheme a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria."

5.0 Environmental Sound Survey

5.1 Measurements

Automated environmental sound measurements were undertaken from 11:00 hours on Thursday 27 January 2022 to 11:00 hours on Friday 28 January 2022. During this period the L_{Amax} , L_{Aeq} and L_{A90} sound pressure levels were measured continuously over 15 minute periods along with the corresponding octave band sound pressure levels.

5.2 Weather Conditions

At the start of the survey period there was a gentle westerly breeze (<5m/s) and the sky was overcast. There was no rainfall and road surfaces were dry. The temperature was approximately 10°C.

At the end of the survey period there was a gentle southerly breeze (<5m/s) and the sky was scattered cloud. There was no rainfall and road surfaces were dry. The temperature was approximately 8°C.

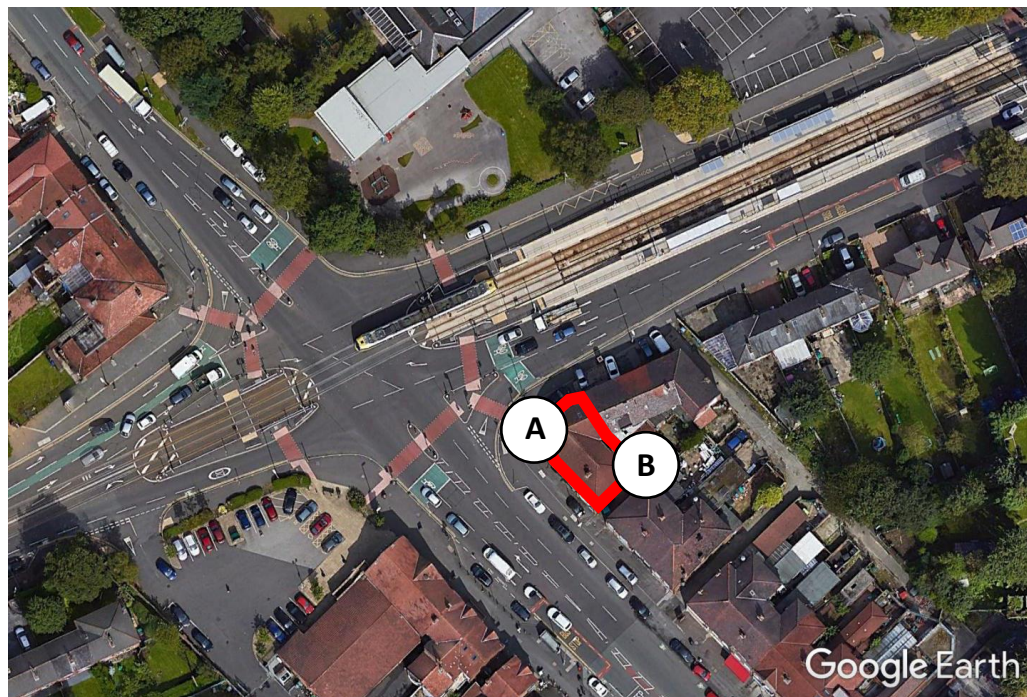
Based on publicly available weather data for the survey period it is understood that weather conditions remained similar for the duration of the survey with no periods of significant rainfall or strong breezes. The weather conditions during the survey period are therefore considered to be suitable for undertaking measurements of sound levels.

5.3 Measurement Positions

Environmental sound levels were measured at two positions on-site as described in the table below.

Position	Description
A	Microphone situated at 1 st floor level at 1m from the north west façade of the building overlooking the junction of Mauldeth Road West/Hardy Lane and Barlow Moor Road.
B	Microphone situated at 1 st floor level at 1m from the north east façade of the building overlooking the alley way to the rear of the building.

The measurement positions are shown on the site plan below.



Site plan showing measurement positions

The measurement positions were selected in order to assess typical environmental sound levels at the site.

5.4 Equipment

The following equipment was used to undertake the environmental sound survey.

Equipment	Manufacturer	Model	Serial No.	Calibration Date
Class 1 Sound Level Meter	Casella	633C	0721320	28/09/2021
Preamplifier	Casella	495	001414	28/09/2021
Microphone	Casella	251	1025	28/09/2021
Class 1 Sound Level Meter	Casella	633C	0721319	28/09/2021
Preamplifier	Casella	495	001446	28/09/2021
Microphone	Casella	251	1996	28/09/2021
Class 1 Sound Calibrator	Casella	120/1	3864878	02/11/2021
Environmental Noise Kits	Casella	6847	-	-
Microphone Extension Cables	Casella	C6717/5	-	-
Weather Protection Systems	Casella	6737	-	-

Field calibration checks were performed on the sound level meters prior to and on completion of the survey and were found to be within acceptable tolerance limits.

5.5 Results

5.5.1 Time History Graphs

The results of the environmental sound survey are presented on Time History Graphs 0924/THG1 and 0924/THG2 enclosed at the rear of the report. The presented results for Positions A and B have been corrected for reflections from the façade by subtracting 3dB from the measured sound levels in order to obtain free field sound levels.

5.5.2 $L_{Aeq,T}$ Ambient Sound Levels

In order to compare the results of the environmental sound survey with the BS 8233: 2014 levels it is necessary to convert the $L_{Aeq,15min}$ sound levels into single figure daytime $L_{Aeq,16hour}$ and night-time $L_{Aeq,8hour}$ sound levels. This has been calculated using the following formula:

$$L_{Aeq,T} = 10 \log_{10} \left(\frac{1}{N} \sum_i^N 10^{L_{Aeq,15min i}/10} \right)$$

The calculated daytime $L_{Aeq,16hour}$ and night-time $L_{Aeq,8hour}$ sound levels at each measurement position are presented in the table below.

Position	Daytime $L_{Aeq,16hour}$ (dB) (07:00 to 23:00)	Night-time $L_{Aeq,8hour}$ (dB) (23:00 to 07:00)
A	65	60
B	58	54

The presented results for Positions A and B have been corrected for reflections from the façade by subtracting 3dB from the measured sound levels in order to obtain free field sound levels.

The corresponding daytime $L_{Aeq,16hour}$ and night-time $L_{Aeq,8hour}$ octave band sound pressure levels at each measurement position are presented in the table below.

Position	Period	Leq Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
A	Daytime (16 hour)	71	64	59	61	62	59	51	44	65
	Night-time (8 hour)	62	58	54	55	56	54	48	41	60
B	Daytime (16 hour)	62	57	56	53	54	51	44	31	58
	Night-time (8 hour)	54	53	53	50	49	56	50	24	54

The presented results for Positions A and B have been corrected for reflections from the façade by subtracting 3dB from the measured sound levels in order to obtain free field sound levels.

5.5.3 L_{Amax,F} Sound Level Events

The highest 15No. individual L_{Amax,F} sound level events measured during the night-time period (23:00 to 07:00 hours) over the survey period at each position are presented in the table below along with the corresponding octave band sound pressure levels.

Position	L _{max,F} Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
A	89	90	89	91	88	92	86	80	95
	82	76	69	75	84	86	81	77	91
	82	86	89	67	71	66	57	51	80
	77	89	82	81	71	66	65	59	79
	82	71	76	78	73	70	64	56	78
	84	75	77	73	70	70	69	69	77
	87	75	70	75	72	69	63	57	76
	85	74	67	71	73	70	61	58	76
	88	88	77	73	73	66	62	54	75
	75	73	69	69	72	68	58	46	75
	84	83	66	72	70	66	63	60	74
	81	78	66	68	72	68	66	58	74
	87	88	77	72	69	66	62	55	73
	81	77	65	68	71	67	57	55	73
	86	74	67	69	71	66	57	54	73
B	78	83	85	84	82	79	80	61	86
	70	66	67	63	79	79	73	56	82
	66	87	80	76	62	61	60	42	76
	73	68	76	69	62	61	60	50	71
	74	64	71	67	65	61	54	36	69
	75	77	71	66	67	59	54	36	69
	68	75	78	62	62	60	49	32	69
	80	70	67	62	65	65	54	39	68
	67	60	63	62	64	62	52	31	67
	67	63	75	63	60	58	50	35	67
	69	68	61	60	63	64	60	44	67
	74	64	67	67	62	62	52	35	66
	74	65	61	60	64	61	53	41	66
	77	68	63	63	61	61	62	40	66
	67	63	64	62	63	62	56	40	66

The presented results for Positions A and B have been corrected for reflections from the façade by subtracting 3dB from the measured sound levels in order to obtain free field sound levels.

5.5.4 $L_{A90,T}$ Background Sound Levels

The lowest representative daytime and night-time $L_{A90,15min}$ background sound levels measured at each position during the survey period are detailed in the table below.

Position	Lowest Representative $L_{A90,15min}$ Background Sound Levels (dB)	
	Daytime $L_{Aeq,16hour}$ (dB) (07:00 to 23:00)	Night-time $L_{Aeq,8hour}$ (dB) (23:00 to 07:00)
A	57	40
B	51	49

The presented results for Positions A and B have been corrected for reflections from the façade by subtracting 3dB from the measured sound levels in order to obtain free field sound levels.

5.6 Discussion of Sound Climate

At the start and end of the survey period the dominant sound source at Position A was noted to be frequent road traffic along Mauldeth Road West/Hardy Lane and Barlow Moor Road. During lulls in local road traffic, frequent tram movements and distant road traffic from the surrounding road network contributed towards the measured sound climate.

At the start and end of the survey period the dominant sound source at Position B was noted to be road traffic from the surrounding road network. Low level building services sound from the surrounding buildings also contributed towards the measured sound climate.

Whilst we are unable to comment on dominant sound sources or individual sound events during the survey period, based on the surrounding environment it is likely that road traffic and tram movements remained the dominant sound sources.

6.0 Detailed Sound Assessment

6.1 Assessment Method

In order to establish the acoustic specification for glazing/ventilation elements required to achieve the internal daytime $L_{Aeq,16hour}$, night-time $L_{Aeq,8hour}$ and night-time $L_{Amax,F}$ requirements an assessment has been undertaken in accordance with the more rigorous calculation method detailed in BS 8233:2014, "Guidance on sound insulation and noise reduction for buildings".

This calculation method takes into account the external sound pressure level, the sound reduction indices of the façade elements, the area of the facade and the absorption within the room at octave band centre frequencies.

6.2 Proposed Development

The assessment has been based on the following drawings.

Author	Drawing No.	Revision	Date
Create It Studios (NW) Ltd	A1341(02)002	K	21/12/21
	A1341(02)003	K	21/12/21
	A1341(02)004	K	21/12/21
	A1341(02)005	K	21/12/21

The proposals include extension works to the existing building to form 2No. retail units at ground floor, 1No. office space at 1st floor and 2No. residential flats at 2nd floor.

6.3 Acoustic Requirements

The proposed flats comprise living room/dining room/kitchen and bedroom spaces.

Based on the requirements of the Local Authority detailed in Section 4.0, the following internal sound limits have been assessed to.

Room Type	07:00 to 23:00	23:00 to 07:00
Living Room/Dining Room/Kitchen	35dB $L_{Aeq,16hour}$	-
Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$ 45dB $L_{Amax,F}^*$

* should not normally be exceeded more than 15 times per night.

6.4 Construction Proposals

It is understood that the external walls and roof of the flats will comprise the following typical constructions.

Element	Typical Construction
External Walls	Brickwork with cavity, insulation and internal plasterboard lining
Roof	Tiled with timber boarding above ceiling joists, insulation and double layer plasterboard ceiling

The following typical Sound Reduction Indices have been assumed for the various elements.

Element	Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Walls	32	40	44	45	51	56	56	56
Roof	20	35	50	50	50	50	50	50

6.5 Room Assumptions

The following typical dimensions and finishes/furnishings have been assumed for the purpose of the assessment.

Room Type	Typical Room Dimensions	Typical Window Area	Typical Room Finishes / Furnishings
Living Room / Dining Room / Kitchen	5m x 5m x 2.4m	2m ²	Carpet, curtains, sofa, table chairs
Bedroom	4m x 4m x 2.4m	2m ²	Carpet, curtains, bed

6.6 Glazing Specifications

In order to achieve the internal daytime and night-time requirements the glazing system as a whole including glass, frame, seals and openings shall provide the following minimum sound insulation performance when tested in accordance with BS EN ISO 10140-2: 2010.

Facade	Room Type	Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Front	Living Room/Kitchen	23	27	29	36	41	42	52	56
	Bedroom	23	27	29	36	41	42	52	56
Rear	Living Room/Kitchen	20	24	20	25	34	37	35	39
	Bedroom	21	25	22	33	40	43	44	48

The table below presents typical configurations and R_w sound insulation values which may be expected to achieve the sound insulation performance specified above.

Facade	Room Type	Typical R_w Sound Insulation Value (dB)	Typical Configuration
Front	Living Room/Kitchen	40	10mm/16mm/6.4mm
	Bedroom	40	10mm/16mm/6.4mm
Rear	Living Room/Kitchen	30	6mm/16mm/4mm
	Bedroom	35	10mm/16mm/4mm

Acoustic test data for the proposed glazing systems should be forwarded for review.

6.7 Ventilation Provision

6.7.1 Background Ventilation

In order to achieve the internal daytime and night-time requirements openable windows must remain closed.

Background ventilation shall therefore be provided by ventilators in the building façade and shall provide the following minimum element normalised level differences in the open position when tested in accordance with BS EN ISO 10140-2: 2010.

Facade	Room Type	Element Normalised Level Difference, $D_{n,e}$ (dB) in Open Position at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Front	Living Room/Kitchen	27	33	39	39	43	50	50	50
	Bedroom	42	48	46	49	54	65	65	65
Rear	Living Room/Kitchen	31	34	39	34	41	31	33	35
	Bedroom	27	33	39	39	43	50	50	50

Should more than one ventilator be required per room the above element normalised level differences shall be increased by the following values:

Number of Ventilators Required Per Room	Additional Performance Required Per Ventilator (dB)
1	0
2	+3
3	+5
4	+6

The table below presents typical configurations and $D_{n,e,w}$ sound insulation values which may be expected to achieve the sound insulation performance specified above.

Facade	Room Type	Typical Open $D_{n,e,w}$ Sound Insulation Value (dB)	Typical Configuration
Front	Living Room/Kitchen	40	Acoustic Window Ventilators (e.g. Greenwood EAR42W)
	Bedroom	50	Acoustic Wall Ventilator (e.g. Greenwood MA3051) Or Acoustically Treated Forced Mechanical Ventilation
Rear	Living Room/Kitchen	35	Standard Window Ventilators
	Bedroom	40	Acoustic Window Ventilators (e.g. Greenwood EAR42W)

Acoustic test data for the proposed ventilators should be forwarded for review.

Should acoustically treated forced mechanical ventilation be considered, the system should achieve noise levels of $L_{Aeq} \leq 30\text{dB}$ in living rooms and bedrooms and $L_{Aeq} \leq 35\text{dB}$ in dining rooms, kitchens and bathrooms where providing continuous background ventilation.

A mechanical services engineer should be consulted to ensure that a suitable system is proposed. Detailed proposals should be forwarded for review acoustically.

6.7.2 Summer Cooling Ventilation

In addition to background ventilation Manchester City Council require rapid/summer cooling ventilation in order to minimize the need for occupants to open windows during hot summer days.

In order to provide this, the acoustically treated forced mechanical ventilation should feature a user controllable 'boost' function which delivers increased air flow at the occupants discretion.

A mechanical services engineer should be consulted to ensure that a suitable system is proposed. Detailed proposals should be forwarded for review acoustically.

6.7.3 Purge Ventilation

Purge ventilation will be provided via openable windows at the occupants discretion. As such, the internal daytime and night-time requirements may potentially be exceeded during purge ventilation conditions.

7.0 Preliminary Tram Vibration Survey

7.1 Measurements

Manned tram vibration measurements were undertaken between 12:00 and 14:00 hours on Thursday 27 January 2022. During this period the vibration acceleration levels of individual tram pass-by's travelling in both directions were measured in the z axis.

7.2 Weather Conditions

During the survey period there was a gentle westerly breeze (<5m/s) and the sky was overcast. There was no rainfall and road surfaces were dry. The temperature was approximately 10°C.

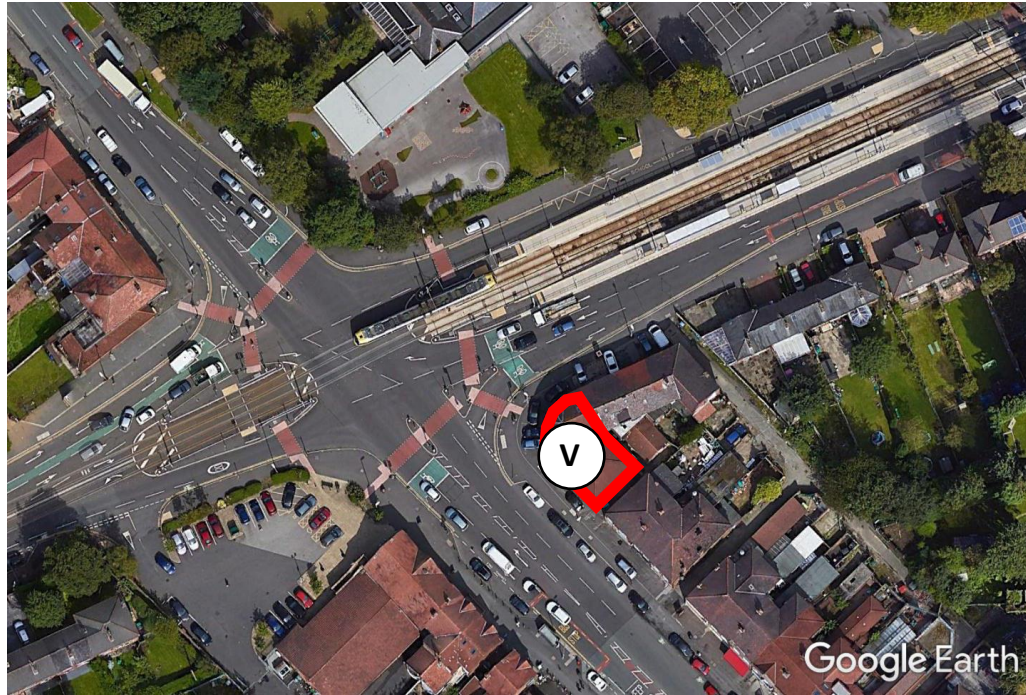
The weather conditions during the survey period are therefore considered to be suitable for undertaking measurements of vibration levels.

7.3 Measurement Position

Tram vibration levels were measured at a single position on-site as described in the table below.

Position	Description
V	Accelerometer magnetically attached to a metal washer bonded to the existing building structure at 1 st floor level.

The measurement position is shown on the site plan below.



Site plan showing measurement position

The measurement position was selected in order to assess typical tram vibration levels within the existing building at the nearest location to the proposed residential flats.

7.4 Equipment

The following equipment was used to undertake the tram vibration survey.

Equipment	Manufacturer	Model	Serial No.	Calibration Date
Class 1 Sound Level Meter	Brüel & Kjær	2250	2626230	26/10/2020
Seismic Accelerometer	MMF	KS48C	16028	30/09/2021
Binder 713 Connector to Standard BNC Cable (5m)	MMF	085	-	-
BNC-Triax Adapter Cable (1.5m)	Brüel & Kjær	AO-0440	-	-
Magnetic Mount	MMF	208	-	-

7.5 Results

The measured vibration acceleration levels of individual tram pass-by's will be used in the subsequent assessment of tram vibration and groundborne sound.

8.0 Preliminary Tram Vibration Impact Assessment

8.1 Tram Movements

The number of tram movements past the development site has been estimated from the timetable on the Metrolink website.

Based on the above, the table below presents the estimated number of weekday tram movements past the development site.

Direction	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Barlow Moor Road to St Werburgh's Road	80	13
Barlow Moor Road to Sale Water Park	80	13
Total	160	26

8.2 Proposed Building Structure

It is understood that the proposed 2nd floor extension will comprise a timber joist floor supported from masonry walls as per the existing 1st floor construction. As such, no corrections have been applied to the vibration levels recorded at the measurement position in order to calculate expected vibration and groundborne sound levels within the proposed residential flats

8.3 Vibration Criteria

BS 6472-1: 2008 "Guide to evaluation of human exposure to vibration in buildings, Part 1: Vibration sources other than blasting", provides methods of evaluating vibration in order to assess the likelihood of adverse comment.

The vibration dose value (VDV) is used to estimate the probability of adverse comment which might be expected from occupants experiencing vibration in buildings. The significance of the VDV for occupants in buildings can be derived from the table below.

Place and time	Low probability of adverse comment $m \cdot s^{-1.75}$ 1)	Adverse comment possible $m \cdot s^{-1.75}$	Adverse comment probable $m \cdot s^{-1.75}$ 2)
Residential buildings 16h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

1) Below these ranges adverse comment is not expected.

2) Above these ranges adverse comment is likely.

The VDV is influenced more by vibration magnitude than by duration or number of events.

8.4 Estimated Vibration Dose Value

The highest measured vibration acceleration levels in the z axis for individual tram pass-by's have been used to calculate the estimated vibration dose value (eVDV) for daytime and night-time periods as detailed in the table below.

Z-Axis (Vertical)	
eVDV _{b,day} m·s ^{-1.75}	eVDV _{b,night} m·s ^{-1.75}
<0.2	<0.1

As can be seen, the calculated eVDV for the daytime and night-time periods are below the range at which adverse comment would be considered low probability. As such, mitigation of tram vibration within the proposed development is unlikely to be necessary based on current tram movements.

8.5 Groundborne Sound Criteria

At present there are no British or International Standards that provide methods of evaluating groundborne sound in order to assess the likelihood of adverse comment. However, recent railway schemes in the UK have adopted the following assessment criteria.

Impact Classification	Groundborne Sound Level dB L _{Amax,slow} (measured indoors, near the centre of any dwelling room on the ground floor)	
Negligible	<35	Not significant
Low	35-39	
Medium	40-44	Significant Impact
High	45-49	
Very High	>49	

8.6 Groundborne Sound Level

The highest measured vibration acceleration levels in the x axis for an individual tram pass-by have been used to estimate the groundborne sound level as detailed in the table below.

Estimated Groundborne Sound Level dB L _{Amax,slow}
<39

As can be seen, the estimated groundborne sound level is within the range at which a low impact would be expected. As such, mitigation of groundborne sound within the proposed development is unlikely to be necessary based on current tram movements.

9.0 Commercial Sound Transfer

9.1 Commercial Tenants

Tenants for the proposed 2No. ground floor retail units have not been confirmed at this stage of the development. The tenant for the proposed 1No. 1st floor office space is understood to be an accountancy firm which currently occupies 651 Mauldeth Road West.

As such, noise transfer from the proposed 1No. 1st floor office space to the proposed 2No. residential flats at 2nd floor is unlikely to be an issue providing the new separating floor achieves the minimum requirement of Building Regulations Approved Document E for flats formed by material change of use of $D_{nT,w} + C_{tr}$ 43dB. Likewise, noise transfer/breakout to adjoining/surrounding noise sensitive receptors is unlikely to be an issue given the proposed office use only.

For the proposed 2No. ground floor retail units a preliminary best case and worst case assessment has been undertaken assuming operational sound levels for a typical retail unit with background music and a typical cafe/restaurant unit with amplified music respectively.

Once tenants for the proposed 2No. ground floor retail units have been confirmed an assessment of operational sound levels to the nearest noise sensitive receptors shall be undertaken.

This will determine sound limits for the ground floor tenants and the level of acoustic treatment likely to be required in order to achieve the proposed requirements at the nearest noise sensitive receptors.

9.2 Proposed Development

The assessment has been based on the following drawings.

Author	Drawing No.	Revision	Date
Create It Studios (NW) Ltd	A1341(02)002	K	21/12/21
	A1341(02)003	K	21/12/21
	A1341(02)004	K	21/12/21
	A1341(02)005	K	21/12/21

The proposals include extension works to the existing building to form 2No. retail units at ground floor, 1No. office space at 1st floor and 2No. residential flats at 2nd floor.

9.3 Operating Hours

The assessment has been based on the likely operational hours of a retail/café/restaurant unit between 07:00 to 23:00 hours.

9.4 L_{90,T} Background Sound Levels

The lowest representative L_{A90,15min} background sound levels measured at each position during the likely operational hours of a retail/café/restaurant unit between 07:00 to 23:00 hours are detailed in the table below along with the corresponding octave band sound pressure levels.

Position	Lowest Representative L _{90,15min} Background Sound Levels (dB) at Octave Band Centre Frequency (Hz) Between 07:00 to 23:00 hours								dBA
	63	125	250	500	1k	2k	4k	8k	
A	63	56	53	53	54	50	42	33	57
B	52	54	52	48	46	42	34	21	51

The presented results for Positions A and B have been corrected for reflections from the façade by subtracting 3dB from the measured sound levels in order to obtain free field sound levels.

9.5 Music Sound Data

Music sound levels have been assessed based on the following sound data for similar size units to that proposed.

Source Description	L _{eq} Sound Pressure level (dB) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Retail unit with background music	64	65	69	74	73	69	63	56	77
Cafe/restaurant with amplified music (no subwoofers)	86	89	81	77	76	73	71	71	82

9.6 Structurally Connected Receptors

The nearest structurally connected noise sensitive receptors will be the existing residential flat at 1st floor in the adjoining building to the north east and the proposed 2No. residential flats at 2nd floor.

9.7 Structurally Detached Receptors

The nearest structurally detached noise sensitive receptors will be the existing residential properties situated to the north east of the site along Mauldeth Road West, to the South east of the site along Barlow Moor Road and to the south west of the site along Hardy Lane.

9.8 Construction Proposals

It is understood that the external building fabric and internal separating elements will comprise the following constructions.

Element	Typical Construction
External Wall	Brickwork with cavity, insulation and internal plasterboard lining
Glazing	Single/double glazed units
Separating Wall	Double leaf brickwork, plaster
Separating Floor	Timber floorboards, timber joists, plasterboard ceiling

The following typical Sound Reduction Indices have been assumed for the various elements.

Element	Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
External Wall	32	40	44	45	51	56	56	56
Glazing	22	26	27	34	40	38	46	46
Separating Wall	34	41	44	48	55	55	55	55
Separating Floor	20	30	35	40	45	50	50	50

9.9 Acoustic Treatment

In order to maximise the sound insulation performance of the proposed building elements the following acoustic treatment is proposed to the various spaces.

Area	Element	Proposed Acoustic Treatment for Retail Unit
Ground Floor	Walls	All external and party walls are to be made good and internally lined with 1No. layer of 15mm plasterboard (min. 12.5kg/m ²) with studwork to create a cavity (min. 50mm) containing 25mm thick mineral wool (min. 16kg/m ³).
	Windows	All windows are to be single (min. 8mm) or double (min. 4mm/16mm/6mm) glazed units. Windows to be closed at all times during operational hours and may only be opened outside of operating hours in order to provide purge ventilation.
	Doors	All external entrance/escape doors to comprise a set of doors with acoustic seals to head, jambs and threshold.
	Ceiling	Mass barrier ceiling to be installed comprising 1No. layer of 15mm plasterboard (min. 12.5kg/m ²) supported from soffit with resilient hangers to create a cavity (min. 150mm) containing 50mm thick mineral wool (min. 16kg/m ³).

Area	Element	Proposed Acoustic Treatment for Cafe/Restaurant Unit
Ground Floor	Walls	All external and party walls are to be made good and internally lined with 2No. layers of 15mm plasterboard (min. 12.5kg/m ² each) with studwork supported from resilient braces to create a cavity (min. 100mm) containing 50mm thick mineral wool (min. 16kg/m ³).
	Windows	All windows are to be single (min. 10mm) or double (min. 10mm/12mm/6mm) glazed units. Additional secondary glazing (min. 10mm) to be installed within the internal wall lining to all windows to create a 200mm cavity (min.) with absorbent reveals. Windows to be closed at all times during operational hours and may only be opened outside of operating hours in order to provide purge ventilation.
	Doors	All external entrance/escape doors to comprise a lobbied set of doors with each set of doors achieving a sound reduction rating of R _w 35dB. Where this is not possible a single acoustic doorset achieving a sound reduction rating of R _w 45dB will be required. All internal doors to/from cafe/restaurant/kitchen areas to comprise a set of doors achieving a sound reduction rating of R _w 35dB.
	Ceiling	Mass barrier ceiling to be installed comprising 2No. layers of 15mm plasterboard (min. 12.5kg/m ² each) supported from soffit with acoustic hangers to create a cavity (min. 200mm) containing 100mm thick mineral wool (min. 16kg/m ³).

9.10 Assessment

Calculations indicate that music sound levels are likely to achieve the acoustic requirements of the Local Authority for both structurally connected and structurally detached receptors. This is on the basis that all acoustic treatment detailed in Section 9.9 is implemented to a high standard of workmanship and that the music sound levels detailed in Section 9.5 are not exceeded.

9.11 Music Level Limits

For the proposed ground floor retail units in-house loudspeaker systems, amplified music levels should be limited by means of an electronic noise limiter/compressor. The device should be capable of limiting individual octave bands over the frequency range 20Hz to 20kHz and controlling the number of speakers/zones required.

In order to set the device to achieve the proposed requirements a commissioning visit will be required in conjunction with an acoustic consultant upon completion of the fit-out works and prior to the operation of the units. The devices should be lockable once set to prevent tampering. Upon completion, a commissioning report should be issued to the Local Authority specifying details of the devices installed and the limits that they have been set to.

10.0 Building Services Sound Limits

Plant selections for the proposed 2No. ground floor retail units and 1No. 1st floor office space have not been made at this stage of the development. As such, it is not possible to assess atmospheric building services sound to the nearest noise sensitive receptors.

Based on the requirements of Manchester City Council detailed in Section 4.0 and the lowest representative L_{A90} sound levels measured during the environmental sound survey detailed in Section 5.5.4, it is proposed that cumulative atmospheric plant sound emissions should be designed to achieve the following limits at the nearest noise sensitive receptors.

Nearest Noise Sensitive Receptor	L_{Aeq} Cumulative Atmospheric Plant Sound Emission Limits at Nearest Noise Sensitive Receptor (dB)	
	Daytime (07:00–23:00)	Night-time (23:00–07:00)
To the north west & south west of the site along Barlow Moor Road & Mauldeth Road West	52	35
To the north east & south east of the site along the alley way	46	44

Plant sound emissions should be assessed in accordance with BS 4142:2014.

Plant sound limits for individual plant items will be dependent on the total number of plant items, the location of plant items in relation to nearest noise sensitive receptors and the proposed operational hours.

Once detailed design proposals are developed an assessment of atmospheric plant sound emissions from the proposed plant items to the nearest noise sensitive receptors should be undertaken. This will determine whether any attenuation measures are required in order to achieve the proposed limits.

11.0 Conclusions

The Local Authority's acoustic requirements for the proposed development have been established.

A detailed environmental sound survey has been undertaken in order to establish existing environmental sound levels at the proposed development.

A detailed sound assessment of the proposed development has been undertaken and glazing/ventilation acoustic specifications have been provided in order to achieve the acoustic requirements of the Local Authority.

A preliminary vibration survey has been undertaken in order to establish existing vibration levels at the proposed development due to tram pass-by's from the railway line to the north west of the site.

A preliminary vibration assessment indicates that mitigation of tram vibration within the proposed development is unlikely to be necessary based on current tram movements.

A preliminary assessment of typical commercial noise from the ground/1st floor commercial units to the proposed 2nd floor residential flats has been undertaken. A preliminary assessment of typical commercial noise from the ground/1st floor commercial units to the nearest noise sensitive receptors has been undertaken.

Calculations indicate that music sound levels are likely to achieve the acoustic requirements of the Local Authority for both structurally connected and structurally detached receptors on the basis that all acoustic treatment detailed is implemented and that the music sound levels detailed are not exceeded.

Atmospheric plant sound emission limits have been proposed at the nearest noise sensitive receptors for subsequent use in designing building services proposals in order to comply with the requirements of the Local Authority.

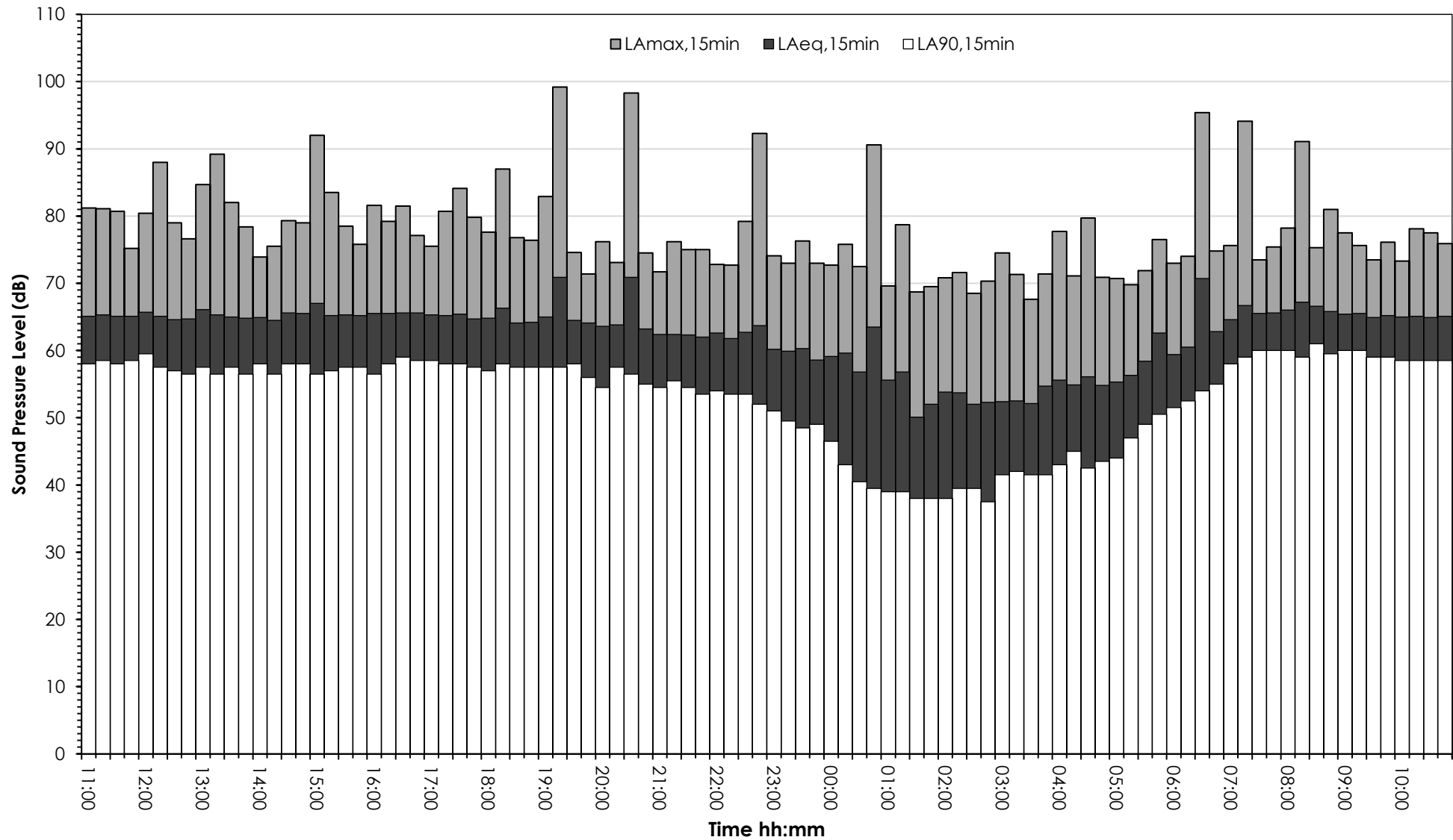
A handwritten signature in black ink, appearing to read 'Robin Wood', with a stylized flourish underneath.

Robin Wood
LIGHTHOUSE ACOUSTICS

0924/THG1

296-298 Barlow Moor Road, Manchester
Time History Graph - Thursday 27 January 2022 to Friday 28 January 2022

$L_{Amax,15min}$, $L_{Aeq,15min}$ & $L_{A90,15min}$ Noise Levels at Position A



296-298 Barlow Moor Road, Manchester
Time History Graph - Thursday 27 January 2022 to Friday 28 January 2022
 $L_{Amax,15min}$, $L_{Aeq,15min}$ & $L_{A90,15min}$ Noise Levels at Position B

