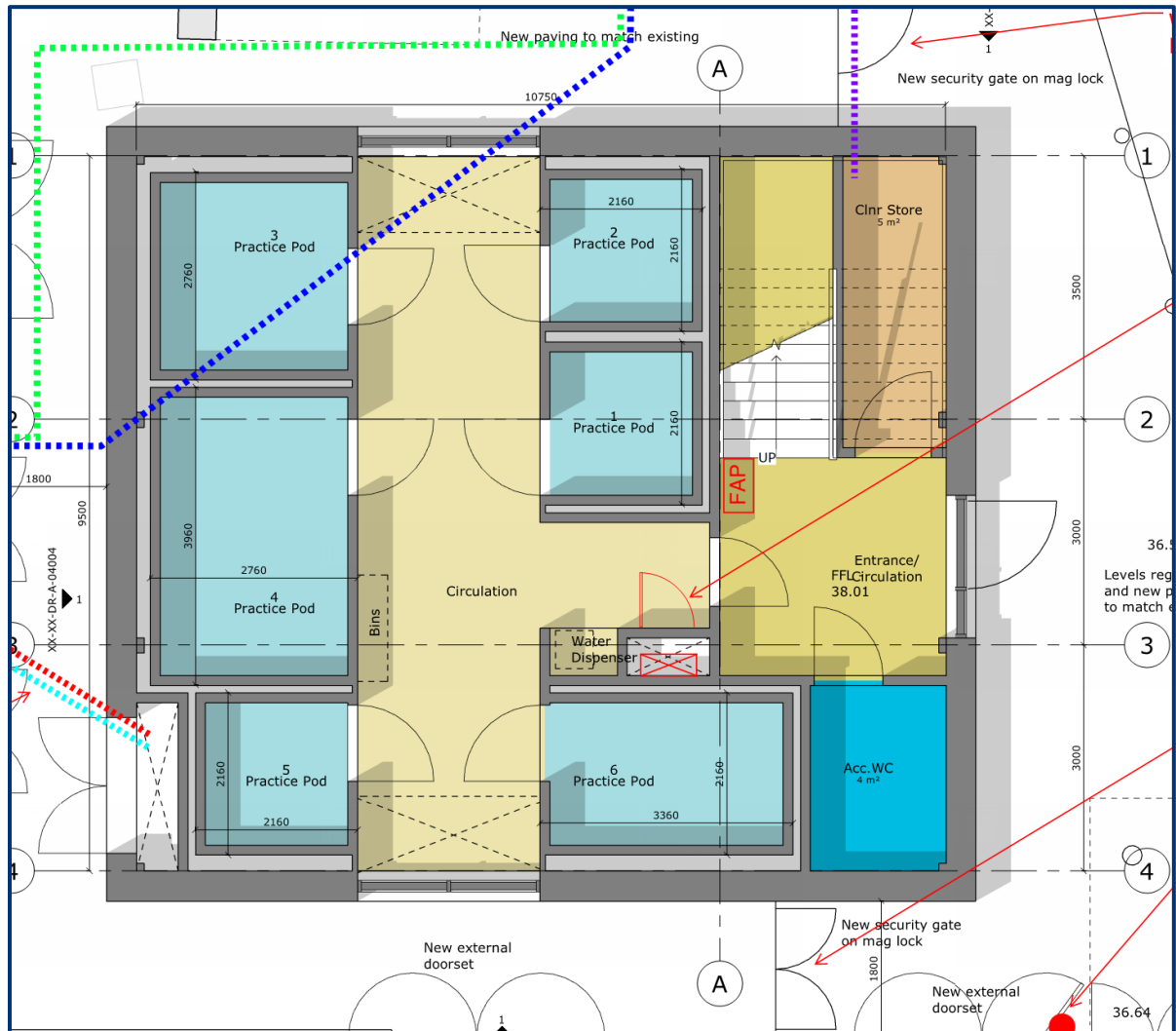


Martin Harris Building, University of Manchester

Acoustic Design Report

784-B033892



24th June 2022

Tetra Tech Limited.

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1.0 INTRODUCTION

Tetra Tech have been commissioned to undertake a noise assessment and provide acoustic design advice regarding the proposed Martin Harris Building, University of Manchester.

An acoustic design specification has been provided for the following areas: sound insulation, indoor ambient noise levels and reverberation criteria.

A description of the existing noise environment in and around the site is provided. Noise surveys have been undertaken and the results used to verify predictions of the effects of noise. The noise levels across the site have been predicted at proposed receptors using CADNA noise modelling software, which incorporates ISO 9613 and CRTN methodologies and calculations.

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A and a set of location plans, noise contour plots relevant to the assessment are presented throughout the document.

1.1 LEGISLATIVE CONTEXT

This report is intended to provide information relevant to the local planning authority and their consultees in support of a planning application for the above proposed development. Policy guidance with respect to noise is found in NPPF, published on 21st July 2021. Section 15, *Conserving and enhancing the natural environment* of the National Planning Policy Framework (NPPF) provides the following guidance in relation to noise impacts, which contains the following statement at paragraph 174:

“174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans...”*

A further 2 short statements are presented at paragraph 185, which state:

“185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) “mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life*

- b) *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...*

Furthermore, paragraphs 187 and 188 state:

“187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”

Planning Practice Guidance (PPG): Noise provides further guidance with regard to the assessment of noise within the context of Planning Policy. The overall aim of this guidance, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England, is to, *‘identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.’*

A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the PPG and repeated as follows:

Table 1.1 NPPG Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No Specific Measures Required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No Specific Measures Required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

The NPPF, NPSE and NPPG do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all situations. Therefore, within the context of the Proposed Development, national planning policy and appropriate guidance documents, Section 2.0 presents the noise level criteria used as a basis of this assessment.

The NPPG also states that *neither the NPSE nor the NPPF (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of the proposed development.*

1.2 ACOUSTIC CONSULTANTS' QUALIFICATIONS, PROFESSIONAL MEMBERSHIPS

The lead acoustic consultant for this assessment is Samantha Griffith. The report has been verified by Nigel Mann. Relevant qualifications, membership and experience are summarised below.

Table 1.3 Acoustic Consultants' Qualifications & Experience

Name	Education	Institute of Acoustics Post Graduate Diploma in Acoustic and Noise Control (Pass Date)	Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics)	Attained Associate Membership of the Institute of Acoustics (date)	Attained Membership of the Institute of Acoustics (date)
Samantha Griffith	BSc (2015)	Dec (2019)	Sep (2015)	Jan (2020)	-
Ashley Shepherd	BSc 2013	-	Feb 2014	Feb 2014	Nov 2017
Nigel Mann	BSc (1997) Msc (1999)	Nov (2001)	Nov (1998)	Nov (2001)	Jul (2005)

2.0 STANDARDS & GUIDANCE

2.1 NOISE ASSESSMENT CRITERIA

In order to enable the assessment of the proposed development in terms of LOAEL and SOAEL, Table 2.1 presents equivalent noise levels and associated actions with the target noise level criteria identified. The noise level criteria detailed below have been derived from the following standards and design guidance:

BS 4142:2014 + A1 2019 '*Methods for rating and assessing industrial and commercial sound*'

Building Bulletin 93 2004 '*Acoustic Design of Schools*'

Table 2.1 Noise Level Criteria and Actions

Effect Level	Assessment	Noise Level Criteria	Action / Justification
No Observed Adverse Effect Level	Proposed Building Service Plant	BS4142 Score of zero or lower	No Action Required Score of zero or lower is an indication of the sound source having a low impact
Lowest Observed Adverse Effect Level	Proposed Building Service Plant	BS4142 Score of +5 or lower	Difference of +5 dB likely to be an indication of an adverse effect Mitigate to achieve: BS4142 Score of plus 5 or lower
Significant Observed Adverse Effect	Proposed Building Service Plant	BS4142 Score between +5 and +10	Difference of +10 dB likely to be an indication of a significant adverse effect Mitigate to achieve as low as practicable
Unacceptable Observed Adverse Effect	Proposed Building Service Plant	BS4142 Score of +10 or higher	Prevent Mitigate to achieve as low as practicable

Acoustic performance specification is based on the requirements and design guidance of the following documents:

- Building Bulletin 93 Acoustic design of schools: performance standards, 2014

Airborne sound insulation, impact sound insulation, internal ambient noise levels and reverberation control are considered.

3.0 ASSESSMENT METHODOLOGY

3.1 NOISE MODELLING METHODOLOGY

Three-dimensional noise modelling has been undertaken based on the monitoring data to predict noise levels at a number of locations both horizontally and vertically. CADNA noise modelling software has been used. This model is based on ISO 9613 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically.

The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data and model settings as given in the table below have been used.

Table 3.1 Modelling Parameters Sources and Input Data

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels – around site	Ordnance Survey	Ordnance Survey
Ground levels – other areas	Site Observations and Ordnance Survey	OS 1:25,000 contours and OS 1:10,000 spot heights.
Building heights – around site	Tetra Tech Observations	8 m height for two storey residential properties, and 4 m for Bungalows. 3m per storey for multi-storey developments.
Barrier heights	Tetra Tech Observations	All existing barriers at 1.8 m with the exception of hedges and trees which are considered to offer no noise protection. Proposed garden fences are considered to be 1.8m.
Receptor positions	Tetra Tech	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties. 1.5 m height for model grid and monitoring locations for validation.
Plans	RPS	Drawing Title: Proposed Ground Floor and First Floor Mechanical Layout Dated: 25.04.2022

It is acknowledged that a number of the values of parameters chosen will affect the overall noise levels presented in this report. However, it should be noted that the values used, as identified above, are worst case.

3.2 MODEL INPUT DATA

3.1.1 Model Verification

The model was verified by modelling the monitoring locations for the ‘existing’ weekday scenario. Daytime L_{Aeq} scenario has been verified. The comparison between the monitoring and modelling results are shown in the tables below. It is understood that the building will be accessible for 24hours a day, however, as BB93 only has daytime noise levels, this is the only scenario assessed.

Table 3.2 Modelled vs. Monitored Results L_{Aeq} ; daytime 07:00 – 23:00

Location	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between Monitored and Modelled Results
LT1	54.5	53.6	-0.9
ST1	61.2	60.0	-1.2
ST2	70.2	70.1	-0.1
ST3	59.9	59.2	-0.7
ST4	61.2	62.3	1.1

All values are sound pressure levels in dB re: 2×10^{-5} Pa

All values are sound pressure levels in dB re: 2×10^{-5} Pa

The verification points show a divergence between monitored and modelled results of no more than +/- 1.2 dB. Therefore, the models are considered to be suitably verified.

3.1.3 Amplified Music

To represent potential amplified noise from the proposed development, noise data has been taken from an approved application (Planning Application: 18/00582/DPP). The L_{Aeq} levels have been modelled as a vertical source across all facades to represent all music pods being occupied at once. Although no pods are located on the eastern façade, noise levels have still been modelled for a worst-case assessment.

The noise level data and calculations below have been used in the model to assess noise from this source at nearby noise sensitive properties.

Table 3.3 External Seating Area Noise Data

Description	Octave Band Sound Pressure Levels (Hz)								Single Figure (dB)
	63	125	250	500	1K	2K	4K	8K	
Amplified Music – Internal Reverberant SPL dB	90	91	89	92	91	86	82	75	94

3.1.3 Proposed Building Service Plant

Point sources have been used in the model to represent potential plant associated with the Development, located on the roof of the building. The maximum sound pressure levels of the point sources at 1 and 3 metres were estimated in the model as a conditional maximum level that the noise levels at nearby receptors were predicted to meet the BS 4142 assessment criteria. Noise emission limits have been specified to ensure that plant noise rating levels (including a + 3 dB correction for potential tonal aspects of the noise source) are at least 5 dB below existing daytime and night-time background noise levels.

3.2 SENSITIVE RECEPTORS

Existing noise levels have been assessed on both floors of the proposed development, on all facades, for each phase of the proposed development. The locations of the proposed receptors are shown in In Figure 3.1 below.

Figure 3.1 Proposed Sensitive Receptor Locations

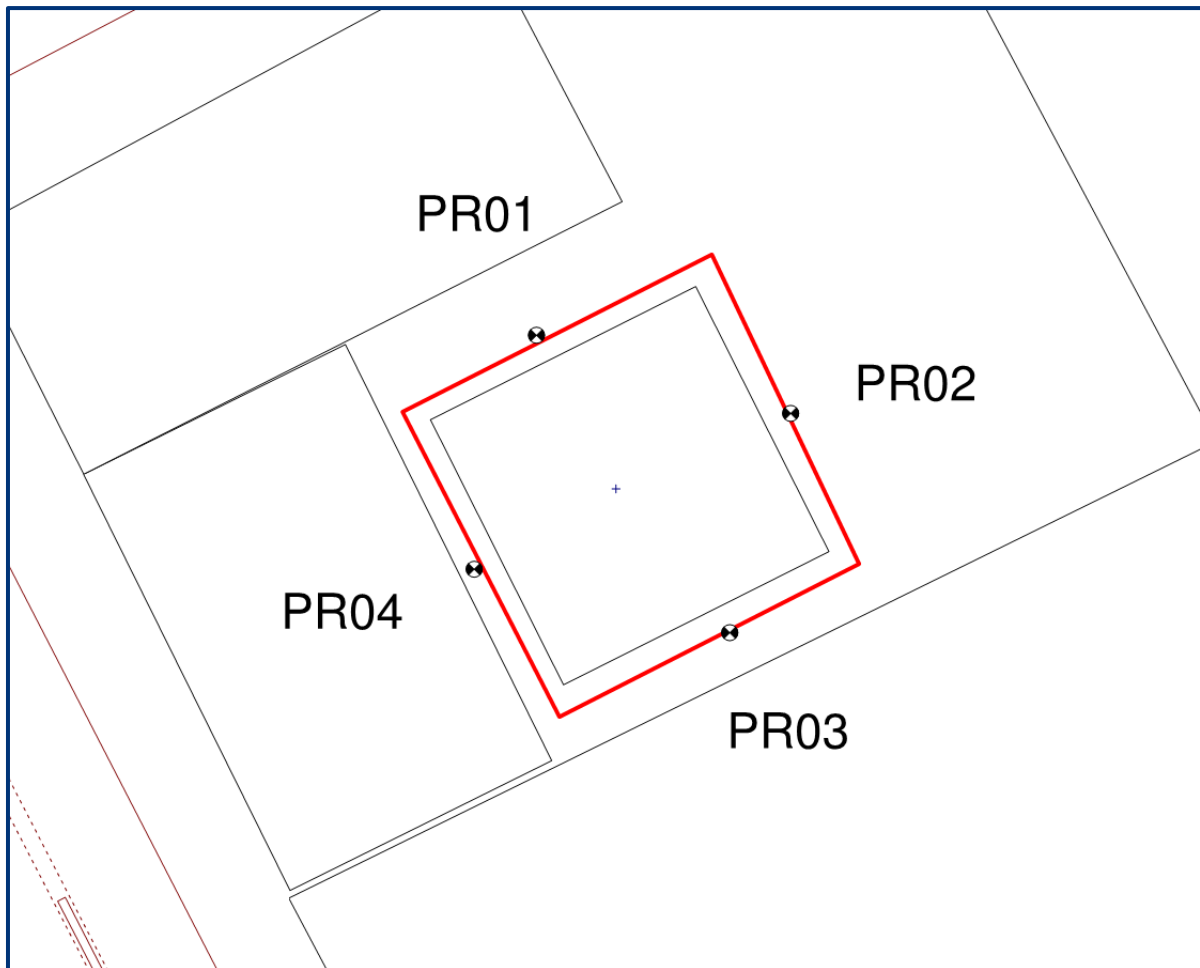


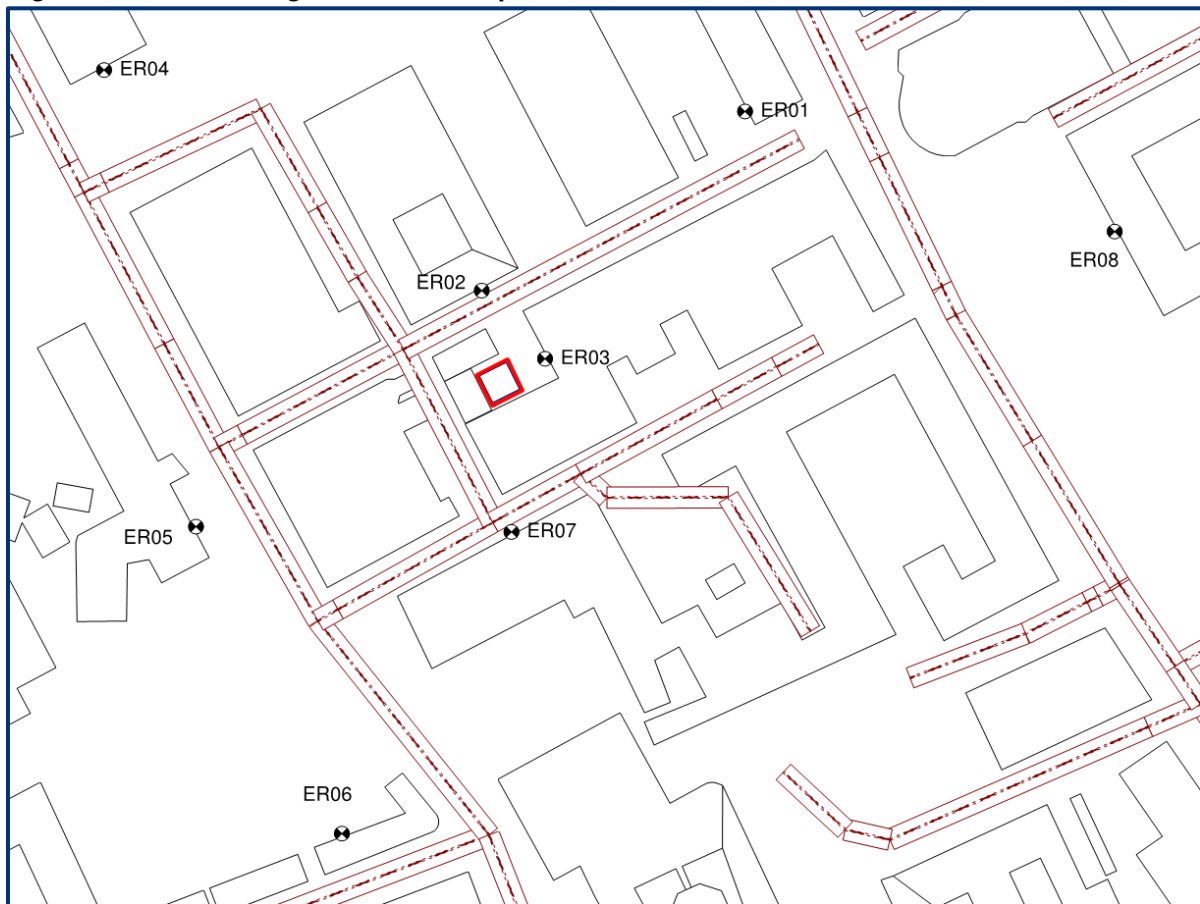
Table 3.4 summarises the existing receptor locations selected for the assessment of plant associated with the Development; the locations of the receptors are shown in Figure 3.2 below.

Table 3.4 Receptor Locations (Building Service Plant)

Ref.	Description	Height (m)
R01	188 Oxford Road	1.5/4.0
R02		9.5
R03	Martin Harris Building, UoM	9.5
R04	Hyatt Regency Hotel	24.5
R05	Trinity Church of England School	9.5
R06	8 Burlington Street	9.5

Ref.	Description	Height (m)
R07	Coupland Building, UoM	13.5
R08	Williamson Building, UoM	9.5

Figure 3.2 Existing Sensitive Receptor Locations



4.0 NOISE SURVEY

4.1 NOISE SURVEY METHODOLOGY

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels.

Equipment used during the survey included:

Rion NL-52	Environmental Noise Analyser	s/n	810559
Rion NL-52	Environmental Noise Analyser	s/n	1043466
Rion NC-75	Sound Calibrator	s/n	35270131

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice, a drift of 0.0 dB was observed. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

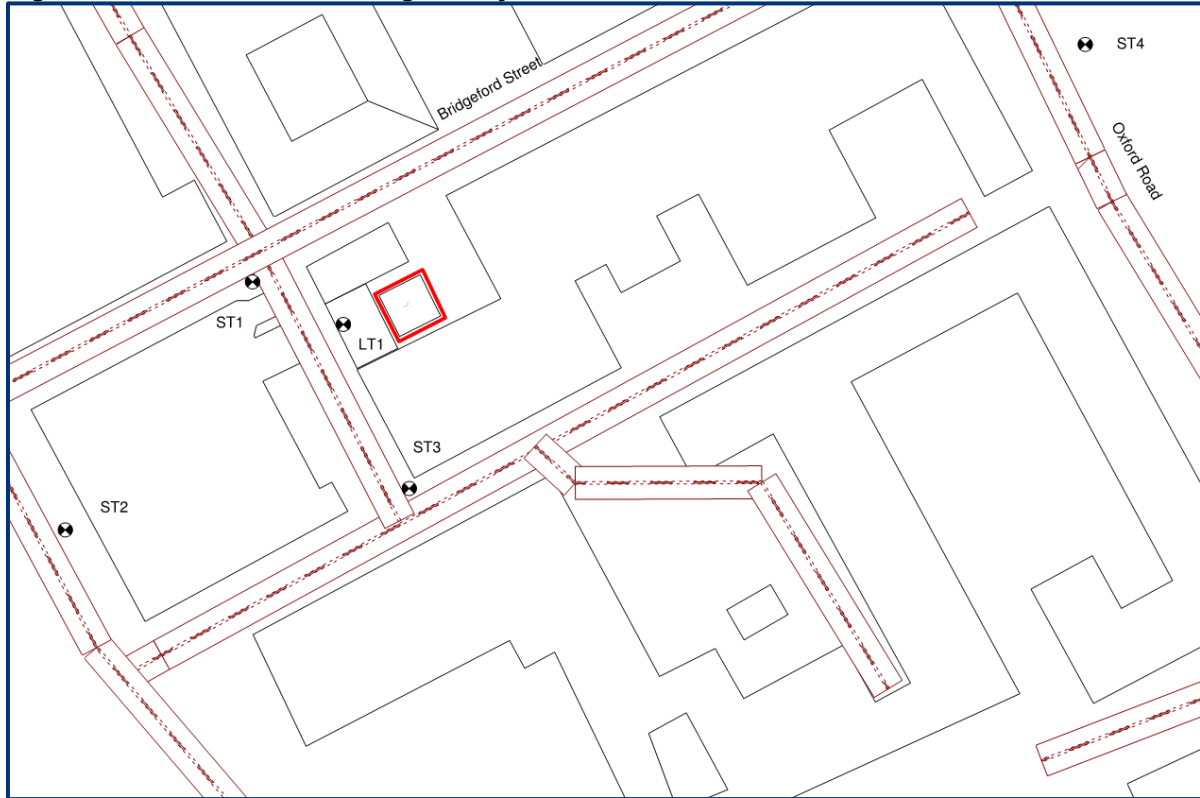
A baseline monitoring survey was undertaken at five locations (as specified in the following table and shown in figure 4.1 below) from Thursday 28th April 2022 to Wednesday 4th May 2022. Attended short term measurements were undertaken at four locations during day, evening and night-time periods with one additional location being measured unattended over a 144-hour period. The raw data collected from the long-term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 *The Description and Measurement of Environmental Noise: Guide to quantities and procedures*. Weather conditions during the survey period were observed as being dry. Anemometer readings confirmed that wind speeds were less than 5 ms⁻¹ at all times during the survey, with a variable wind direction during the survey.

Table 4.1 Noise Monitoring Locations

Ref	Description
LT1	On the roof of the existing building
ST1	North-west of the site, Higher Chatham Street
ST2	South-west of the site, Higher Cambridge Street
ST3	South of the site, Coupland Street
ST4	North-east of the site, Oxford Road

Figure 4.1 Noise Monitoring Survey Locations



4.2 NOISE SURVEY RESULTS

The existing road climate is characterised from road traffic noise from the surrounding roads, and music practice noise.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period). For the long-term (LT) locations, the presented $L_{Aeq,T}$ and $L_{A10,T}$ are average noise levels whilst the L_{A90} is the modal noise level of each 5 minute measurement over the stated survey period.

Table 4.2 Meteorological Conditions during the Survey

Survey Location	Date & Time	Temperature (°C)	Wind Speed (m/s)	Wind Direction	Cloud Cover (Oktas)	Dominant Noise Source
Day ST1	04/05/2022 10:29	13	0 – 1	S	8	Road traffic noise Higher Chatham Street, music practice noise
Day ST2	04/05/2022 11:02	13	0 – 1	S	8	Road traffic noise Higher Cambridge Street
Day ST3	04/05/2022 11:37	13	1 - 2	W	8	Road traffic noise Coupland Street, music practice noise
Day ST4	04/05/2022 12:10	13	1 - 2	NW	8	Road traffic noise Oxford Road
Evening ST1	03/05/2022 20:29	14	0 – 1	SW	5	Road traffic noise Higher Chatham Street, music practice noise

Survey Location	Date & Time	Temperature (°C)	Wind Speed (m/s)	Wind Direction	Cloud Cover (Oktas)	Dominant Noise Source
Evening ST2	03/05/2022 20:46	14	0 – 1	S	5	Road traffic noise Higher Cambridge Street
Evening ST3	03/05/2022 21:03	14	0 – 1	SW	5	Road traffic noise Coupland Street, music practice noise
Evening ST4	03/05/2022 21:22	14	0 – 1	SW	5	Road traffic noise Oxford Road
Night ST1	04/05/2022 01:04	12	0 – 1	S	7	Road traffic noise Higher Chatham Street,
Night ST2	04/05/2022 00:32	12	0 – 1	SE	7	Road traffic noise Higher Cambridge Street
Night ST3	04/05/2022 00:48	12	0 – 1	SW	7	Road traffic noise Coupland Street
Night ST4	04/05/2022 01:23	12	0 – 1	SE	7	Road traffic noise Oxford Road

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re: 2×10^{-5} Pa).

Table 4.3 Results of Baseline Noise Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Weekday Daytime 07:00 – 23:00	65 Hours	28/04/2022 – 04/05/2022 12:28 – 12:48	LT1	54.5	86.0	44.0	55.0	53
Weekday Night-time 23:00 – 07:00	32 hours	28/04/2022 – 04/05/2022 23:00 – 07:00		49.3	83.4	42.6	50.2	46
Weekend Daytime 07:00 – 23:00	32 Hours	30/04/2022 – 01/05/2022 07:00 – 23:00		50.6	83.0	43.7	51.8	48
Weekend Night-time 23:00 – 07:00	16 hours	30/04/2022 – 01/05/2022 23:00 – 07:00		48.0	75.9	42.8	49.6	46
Daytime 07:00 – 19:00	15 Mins	04/05/2022 10:29	ST1	61.2	90.7	52.4	63.1	55.9
	15 Mins	04/05/2022 11:02	ST2	70.2	82.9	51.7	74.6	56.9
	15 Mins	04/05/2022 11:37	ST3	59.9	81.7	51.9	61.1	54.2
	15 Mins	04/05/2022 12:10	ST4	61.2	73.3	48.8	65.6	52.2
Evening 19:00 – 23:00	15 Mins	03/05/2022 20:29	ST1	56.3	65.6	45.3	60.2	48.9
	15 Mins	03/05/2022 20:46	ST2	70.5	89.5	47.8	75.0	54.5
	15 Mins	03/05/2022 21:03	ST3	54.0	68.0	49.0	55.7	51.8
	15 Mins	03/05/2022 21:22	ST4	59.8	81.6	45.4	62.8	47.7
Night-time 23:00 – 07:00	15 Mins	04/05/2022 01:04	ST1	53.9	75.8	43.8	57.3	46.1
	15 Mins	04/05/2022 00:32	ST2	67.8	85.7	46.2	71.9	47.6
	15 Mins	04/05/2022 00:48	ST3	51.8	77.5	43.3	54.1	45.6
	15 Mins	04/05/2022 01:23	ST4	59.2	72.6	44.6	63.9	46.3

All values are sound pressure levels in dB re: 2×10^{-5} Pa

5.0 ASSESSMENT OF KEY EFFECTS

5.1 BS4142 ASSESSMENT: PROPOSED BUILDING SERVICE PLANT

This assessment has been undertaken in order to establish indicative maximum external noise levels from the proposed building services plant rooms located at the top of each building, and the maximum noise level for the building service plant. The assessment compares the predicted noise levels from proposed plant with the existing measured average background noise L_{A90} at the closest existing residential receptors.

Predictions were made by defining a sound power level (assuming hemi-spherical propagation) as a point source in the central part of the proposed plant area. When the sound pressure levels are set as shown in Table 5.1, the noise levels at all the existing receptors are predicted to be at least 10 dB below existing background levels during the daytime and night-time as shown in Table 5.2.

Table 5.1 Proposed Emission Limits for BSP as Modelled

BSP Location	Noise Emission Limit - Sound Pressure Level (Cumulative)	
	Daytime	Night-time
Rooftop Plant	62.5 dB(A) at 1m OR 52.9 dB(A) at 3m	62.5 dB(A) at 1m OR 52.9 dB(A) at 3m

Table 5.2 BS 4142 Assessment for Proposed Roof Mounted Plant

Ref	Existing Measured Average Background L_{A90}		Noise rating level from plant (with +3 dB Correction)		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
ER01	52	46	7	11	-45	-35
*ER02	56	0	34	34	-22	N/A
*ER03	48	0	38	38	-10	N/A
ER04	57	48	15	15	-42	-33
*ER05	57	0	9	9	-48	N/A
ER06	57	48	7	7	-50	-41
*ER07	48	0	21	21	-27	N/A
*ER08	52	0	8	8	-44	N/A

* Non-residential receptor, outside the scope of BS 4142

5.2 NOISE INTRUSION ASSESSMENT

Internal noise levels within all sensitive spaces of the proposed development have been assessed both with windows open, where a reduction from a partially open window of 10 dB has been used, and with windows closed where glazing with a sound reduction of $R_w + C_{tr}$ 30 dB. These noise levels are shown in Table 5.3 below. It is understood the 'music pods' have no windows and are located on the external facades. However, if the design plans were to change the noise intrusion levels for both the music rooms and circulation spaces are shown below.

Table 5.3 Noise Intrusion Levels L_{Aeq}

Location	External Noise Level dB L_{Aeq}	Noise Level with Windows Open dB L_{Aeq}	Noise Level with Windows Closed dB L_{Aeq}	Internal Ambient Noise Limit for Ensemble Rooms	Internal Ambient Noise Limit for Circulation Space
G01	37.0	27.0	7.0	30	45
G02	49.0	39.0	19.0	30	45
G03	35.8	25.8	5.8	30	45
G04	36.8	26.8	6.8	30	45
F01	39.3	29.3	9.3	30	45
F02	49.0	39.0	19.0	30	45
F03	37.8	27.8	7.8	30	45
F04	40.1	30.1	10.1	30	45

Based on the predicted noise levels, noise levels are achieved for a circulation space with windows open and closed. If the design is to change and windows are located within the music practise rooms, noise levels are predicted to be achieved with windows closed. However, with windows open, noise levels are predicted to be exceeded, as such alternative ventilation will be required in lieu of partially open windows.

It is understood that all pods will feature mechanical ventilation as standard designed to achieve the levels detailed in section 6.3 of this report, as such the ventilation specifications are suitable in respect to acoustics.

5.2 NOISE BREAKOUT

There is the potential for music to breakout of the proposed building, as such a worst-case assessment associated with the noise levels detailed in Section 3.1.2 have been used.

This assessment compares the noise from the existing ambient noise climate (based on existing measured ambient L_{Aeq} noise levels). The difference between the lowest 'existing' and the 'worst-case proposed' scenarios during the daytime is presented in Table 5.4, with the difference between the lowest 'existing' and the 'worst-case proposed' scenarios during the night-time presented in Table 5.5. The assessment assumes glazing will achieve a sound reduction of 30dB and the external facades will achieve a sound reduction of 45dB (inclusive of music pods), with an overall composite sound reduction of 39dB R_w . As a worst case the assessment assumes that noise is emitting from all four facades, however based on current plans the music pods are located on the northern, southern and western façade and not the eastern.

Table 5.4 Difference between Baseline and Proposed Scenario (Daytime)

Ref.	Daytime		
	Measured Baseline $L_{Aeq, 16 \text{ hour}}$	Measured Baseline Combined with Contribution from the Proposed Scenario	Contribution from Proposed Scenario L_{Aeq}
R1	61.2	4.3	0.0
R2	61.2	42.6	0.0
R3	50.6	47.7	0.0
R4	70.2	10.9	0.0
R5	70.2	9.2	0.0
R6	70.2	4.7	0.0
R7	50.6	16.9	0.0
R8	61.2	2.4	0.0

Table 5.5 Difference between Baseline and Proposed Scenario (Night-time)

Ref.	Daytime		
	Measured Baseline $L_{Aeq, 16 \text{ hour}}$	Measured Baseline Combined with Contribution from the Proposed Scenario	Contribution from Proposed Scenario L_{Aeq}
R1	59.2	4.3	0.0
R2	53.9	42.6	0.0
R3	48.0	47.7	0.0
R4	67.8	10.9	0.0
R5	67.8	9.2	0.0
R6	67.8	4.7	0.0
R7	48.0	16.9	0.0
R8	59.2	2.4	0.0

The results presented in the tables above show the change in noise levels between the existing measured L_{Aeq} noise levels and the contribution from potential amplified music breakout. The proposed worst-case scenario is expected to have a negligible impact at surrounding residential locations and the change in ambient L_{Aeq} noise levels is not considered to be significant.

6.0 INTERNAL ACOUSTICS

It is understood that the music rooms will be constructed from purpose-built music practice pods.

6.1 SOUND INSULATION

The pods are designed to achieve a sound reduction of between 60dB and 66dB R_w which is predicted to be suitable to achieve the requirements of BB93, between two ensemble rooms. Additionally, as the pods are constructed off site, are isolated individual units placed into the building, it is not expected that flanking noise will be an issue between adjacent pods.

It is understood that the façade leading to the circulation space will have a reduced acoustic performance due to thinner wall constructions and the presence of a door and window. However, providing doors are closed when the rooms are in use, it is predicted not to affect the use of adjacent music practice spaces.

If the circulation space has the potential to be used for a study area or breakout space, additional protection is likely to be required or noise management of the areas would be needed, when the music pods are being used.

The pods are not expected to be connected to one another between the first and ground floor, due to installation access being required, as such noise transfer between is predicted to be minimal. If the pods are to be connected, additional protection will be required to increase the impact sound insulation. This can be done either through carpets or resilient layers under vinyl or timber floor coverings. Additionally, if possible, a raised access floor will also provide additional impact acoustic protection.

6.2 INTERNAL AMBIENT NOISE LEVEL

It is understood that the music pod does not have a window leading from the external façade, only windows leading to the circulation space as such, noise intrusion from external sources are predicted to be negligible.

For mechanical ventilation, noise levels for the spaces should not exceed the levels detailed in Table 6.1 below.

Table 6.1 Required IANL from mechanical Ventilation

Room Classification	Required IANL dB $L_{Aeq,30mins}$
Ensemble Rooms	30
Circulation Space	45
Toilets	50

6.3 REVERBERATION

Reverberation control within the pods is designed within the system, with ceilings and floors already built within them. It is understood that the reverberation is designed to achieve a reverberation time of at least 1 second. However, the wall panels within the pods can be removed to achieve the desired reverberation time and acoustic character.

7.0 CONCLUSIONS

This report presents the findings of a noise assessment in support of a planning application for a proposed development for the Martin Harris Building at the University of Manchester.

In considering paragraphs 174 and 185 of the NPPF, the Proposed Development is not expected to generate significant volumes of traffic or other noticeable or intrusive noise sources and there will not have an 'adverse impact' on health or quality of life. Similarly, it is considered that all 'adverse impacts' on health and quality of life' (relating to noise) are mitigated by the use of the following mitigation:

Noise Impact on Existing Receptors

Maximum noise level limits have been set for proposed building services plant. Noise Levels are predicted to result in the plant noise rating levels being at least 10 dB below the existing background noise levels during both the daytime and night-time. Accordingly, the proposed plant is predicted to have a low impact at the closest sensitive receptors.

Noise breakout from amplified music has been assessed and based on the sound reduction of the glazing and external facades stated in this report, noise levels are not predicted to be higher than existing daytime and night-time ambient L_{Aeq} noise levels.

Noise Impact on Music Spaces

A glazing and ventilation strategy has been provided which achieves both ventilation and internal ambient noise level requirements for circulations spaces and ensemble rooms. It is understood that all pods will feature mechanical ventilation as standard, as such the ventilation specifications are suitable in respect to acoustics.

Internal Acoustics

An internal acoustic review of the music pods has been undertaken to identify the parameters regarding sound insulation, internal ambient noise levels and reverberation time. Based on the available data, the music pods are suitable for the potential future use of the development.

APPENDICES

APPENDIX A – ACOUSTIC TERMINOLOGY AND ABBREVIATIONS

Acoustic Terminology

- dB** Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.
- dB(A)** Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dBA value provides a good representation of how loud a sound is.
- L_{Aeq}** Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The L_{Aeq, 07:00 – 23:00} for example, describes the equivalent continuous noise level over the 12 hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower than the L_{Aeq, 07:00 – 23:00}.
- L_{Amin}** The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.
- L_{Amax}** The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
- L_n** Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say. 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the L_{A10, 1 hr} = x dB.
- The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.
- R_w** The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.

APPENDIX B – REPORT CONDITIONS

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