

JOSTEC

BUILDING REGULATIONS COMPLIANCE SERVICES



REPORT TITLE: BS4142:2014-A1:2019 AND BS8233:2014 ASSESSMENT OF 173-175
FRIAR STREET, READING

REPORT REFERENCE: 22127

ISSUED TO: Mountley Group

ISSUED BY: JAMES FLITTON

DATE: 02 August 2024

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1.0 Introduction

- 1.0.1 This report has been commissioned to determine the noise impact of existing plant noise to the rear and pedestrian noise to the front of 173-175 Friar Street, Reading and the potential for disturbances to the proposed dwellings in the conversion/redevelopment.
- 1.0.2 The assessment has been conducted in line with the BS4142:2014 to assess the existing plant noise with a BS8233:2014 assessment to determine recommendations of acoustic performance of glazing and, if required, ventilation proposals in order for the entire future dwellings to meet all necessary criteria.

2.0 Site Details

- 2.0.1 The site is located just off the pedestrianised area between Blagrove Street and Market place in the centre of Reading.
- 2.0.2 There are some extraction systems to the rear that will be assessed for tonal/impulsive noise in accordance with BS4142:2014. The rest of the noise impact will be assessed as part of the BS8233 section of the report.
- 2.0.3 The main noise sources in the area are the passing patrons and loading traffic to the front of the building as well as the industrial noise to the rear.

2.1 Location of Monitors

- 2.1.1 The noise location was chosen based on the proximity to the closest NSR.

Figure 1 - front



Figure 2 - rear



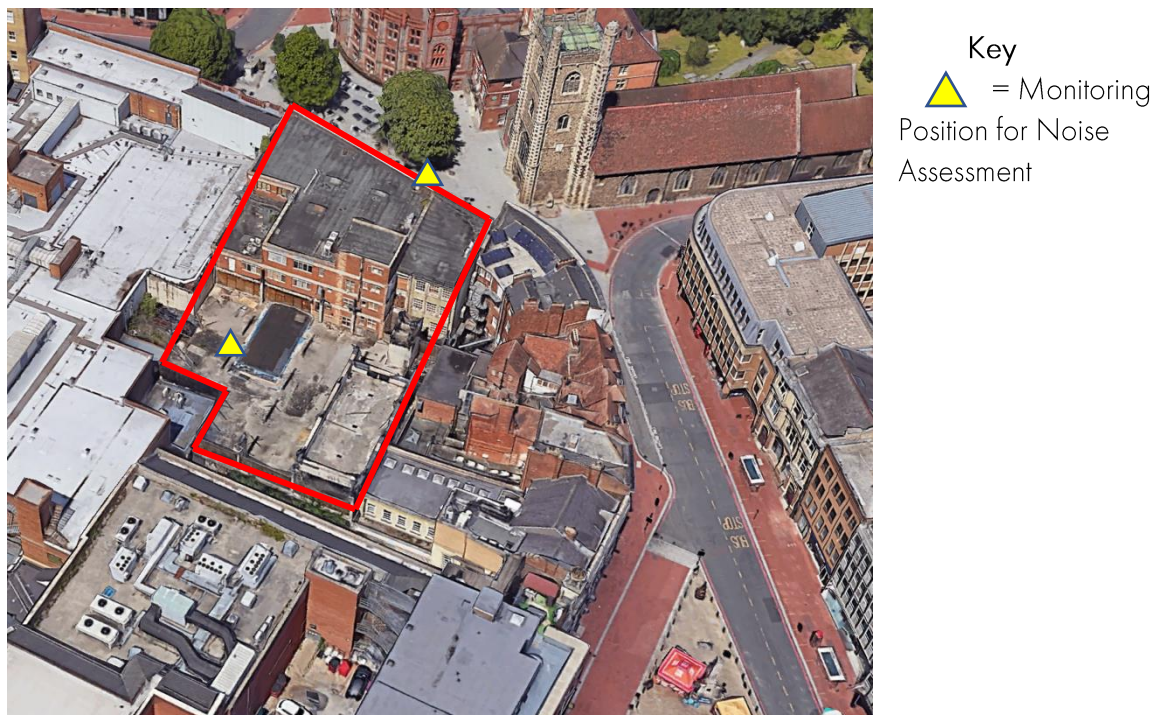
2.1.2

Measurements were made in 15 minute periods, on 1 second averaging, to allow for the removal of anomalies and increased accuracy. The data was averaged into L_{Aeq1hr} daytime and $L_{Aeq15min}$ night-time with data also recorded for L_{Amax} in both day and night periods for the BS4142:2014 assessment. The results were also averaged into $L_{Aeq16hr}$ daytime and L_{Aeq8hr} night-time for the BS8233 section of the assessment.

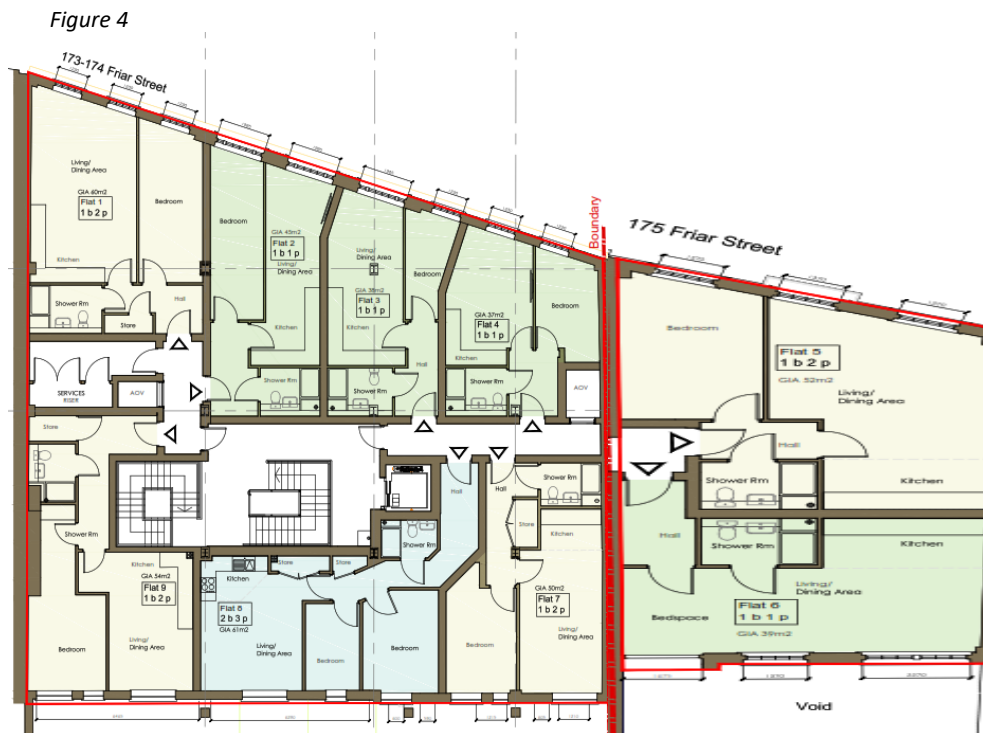
- 2.1.3 The monitoring was conducted using 2 x Type 1 NTi XL2 sound level meters with batteries and outdoor microphone protection. Measurement data from the front of the building was taken on a previous assessment so that has been reused for this investigation as there have been no significant changes to the area to affect the soundscape.
- 2.1.4 All measurements were taken after a field calibration was undertaken to ensure accuracy and repeatability of measurements. Calibration was also checked post measurements for drift to validate the data taken.
- 2.1.5 Further data such as wind speed, wind direction, rainfall intensity, temperature and cloud cover were all recorded at the beginning and end of the assessment at the monitoring location.
- 2.1.6 Any anomalies (such as noise by the engineer during setup and collection of the kit) were removed from the survey for a true reflection of the ambient levels in the vicinity. This was done by recording audio throughout the survey at each location and listening back through the files during the analysis process to confirm what was recorded manually during the survey.

2.2 Plan Views of Site with Designated Work Areas

Figure 3



2.3 Proposed Floor Plans (First Floor)



3.0 Legislation

3.0.1 The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 174 of the NPPF states the following:

"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...."

Paragraph 185 goes on to mention:

"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;”

3.0.2 The NPPF reinforces the March 2010 DEFRA publication, “Noise Policy Statement for England” (NPSE), which states three policy aims, as follows:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life;
- and where possible, contribute to the improvement of health and quality of life.”

3.0.3 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

“... all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.”

3.0.4. It is possible to apply objective standards to the assessment of noise and the effect produced by the introduction of a certain noise source may be determined by several methods, as follows:

- The effect may be determined by reference to guideline noise values. British Standard (BS) 8233:2014 and World Health Organisation (WHO) “Guidelines for Community Noise” contain such guidelines.
- Another method is to compare the resultant noise level against the background noise level (LA90) of the area. This is the method employed by BS 4142:2014 to determine the likelihood of complaint from noise of an industrial nature. It is best suited to the assessment of steady or pseudo-steady noise.

3.0.5 British Standard 8233:2014 is principally intended to assist in the design of new dwellings; however, the Standard does state that it may be used in the assessment of noise from new sources being brought to existing dwellings.

3.0.6 The WHO guideline values are appropriate to what are termed “critical health effects”. This means that the limits are at the lowest noise level that would result in any psychological or physiological effect.

The WHO/BS 8233 guideline noise values are summarised in the following table:

Table 1

Guidance Document	L _{AeqT}	L _{AMax}	Outcome
World Health Organisation “Community Noise 2000”	55dB		Serious annoyance, daytime and evening. (Continuous noise, outdoor living areas)
	50dB		Moderate annoyance, daytime and evening. (Continuous noise, outdoor living areas).
	35dB		Moderate annoyance, daytime and evening. (Continuous noise, dwellings, indoors)
	30dB		Sleep disturbance, night-time (indoors)
		60dB	Sleep disturbance, windows open at night. (Noise peaks outside bedrooms, external level).
		45dB	Sleep disturbance at night (Noise peaks inside bedrooms, internal level)
BS 8233:2014 “Sound Insulation and noise reduction for buildings”	55dB		Upper limit for external steady noise. (gardens and patios).
	50dB		Desirable limit for external steady noise. (gardens and patios).
	L _{Aeq} 16 hours = 35 dB		Resting, living room day. (Internal – steady noise)
	L _{Aeq} 16 hours = 40 dB		Dining, dining room day. (Internal – steady noise)

	LAeq 16 hour = 35 dB		Sleeping, bedroom day (Internal – steady noise)
	LAeq 8 hours = 30 dB		Sleeping, bedroom day (Internal – steady noise)

3.0.7 For LAeqT criteria the time base (T) given in the documents is 16 hours for daytime limits and 8 hours for night time limits. All surveys are conducted on 1 hour daytime and 15 minute night values – based on 1 second readings on a Type 1 sound level meter. The readings are taken every 5 mins for noise to allow the elimination of erroneous data if required.

3.0.8 The WHO guidelines are also concerned with the LA_{Max} for night-time sleep disturbance. The guideline states:

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LA_{Fmax} more than 10-15 times per night”

3.0.9 On this basis, for the purpose of assessing night-time LA_{Fmax} noise events, it is considered appropriate to adopt the 10th highest LA_{Fmax} noise event occurring in a typical night-time (23:00 – 07:00) period.

3.0.10 Audio recordings are taken throughout the measurements to allow for further assessments on high levels. Listening to the audio and performing tonal analysis will allow anomalies to be removed from the data, if required.

3.1 Local Authority Criteria

3.1.1 The Reading Local Plan 2019 makes references to the impact of noise generating sources. EN17: Noise Generating Equipment states:

“Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor. ”

3.1.2 Section 4.2.90 also goes on to state; “Exposure to high levels of noise can have a significant effect on human health. This policy deals with noise issues in general, whilst policy EN17 deals particularly with noise-generating equipment. It is worth noting that there is a Professional Practice Guide on Planning and Noise available which provides guidance on design of residential developments to take account of noise, and taking

account of this from the early design stage will help to reduce noise effects on future residents.”

- 3.1.3 The Local Plan document also references the ProPG: Planning and Noise document from May 2017 produced by the IOA, ANC and CIEH. The guidance states that;

- *“The cumulative impacts of more than one source of noise should be considered; and*
- *In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring.”*

- 3.1.4 Reading council have also imposed the ‘10dB below background’ ruling for all new plant noise added to developments. This will require all industrial noise sources introduced to the soundscape to meet this criteria at the nearest Noise Sensitive Receptor (NSR) point.

3.2 BS4142:2014 +A1 (2019)

- 3.2.1 The Local plan also makes reference to the measurement procedure used for BS4142:2014 as the best method.
- 3.2.2 Noise effects on residential properties due to the current operational hours and extended hours have been assessed according to the guidance in BS 4142:2014. This standard primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the ‘specific sound’ from the proposed development) at residential sensitive receptors.
- 3.2.3 The specific sound level may then be corrected for the character of the sound (e.g. perceptibility of tones and/or impulses), if appropriate, and it is then termed the ‘rating level’, whether or not a rating penalty is applied. The ‘residual sound’ is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
- 3.2.4 According to BS 4142:2014, the background sound levels adopted for the assessment should be representative of the periods being assessed. The standard recommends that the background sound level should be collected from continuous measurements of normally not less than 15-minute intervals. However, the Standard states that there is no ‘single’ background sound level that can be derived from such measurements. It is particularly difficult to determine what is ‘representative’ of the night-time period because it can be subject to a wide variation in background sound levels between the shoulder night periods.

- 3.2.5 The method chosen for this section of the report is to use the data collected at the nearest NSR for the day and night periods to provide the ambient and background noise levels. The mode $L_{Aeq_1hr(Day)}$ and $L_{Aeq_1.5min(Night)}$ value will then be used for each time period over the course of the measurement as the most appropriate way of creating a representative value.
- 3.2.6 The specific sound levels have been determined separately in terms of the L_{Aeq_1hr} during the daytime $L_{Aeq_1.5min}$ during the night-time. Daytime is typically between 07:00 and 23:00 hours and night-time is typically between 23:00 and 07:00 hours, so these periods have been adopted for this assessment.
- 3.2.7 At each of the most likely sensitive receptor locations, the rating level has been determined from the predicted specific sound level. Where it has considered it to be appropriate, a rating penalty has been applied for tonality, impulsivity and/or intermittent specific sounds as described in the commentary to paragraph 9.2 of BS4142:2014. This has been applied with consideration for the main sound sources from site that contribute to the level of specific sound at the receptor location.
- 3.2.8 As per the requirements of the standard, an initial estimate of the impact of the specific sound has been obtained by subtracting the measured background sound level from the rating level of the specific sound. Table 2 provides the initial evaluation of impact following this method.

Table 2

Magnitude	Difference Between rating Level and Background Level	Comments
High	+10dB	Significant Adverse impact Likely
Medium	+5 to +10dB	Adverse impact Likely
Low	0 to +5 dB	Adverse impact unlikely
Negligible	Less than 0dB	Low Chance of Adverse Impact

3.2.9 Following the initial evaluation of impact, the context of the sound has also been considered, which is a key requirement of the Standard. In evaluation of the context, the following factors have been considered:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound and
- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

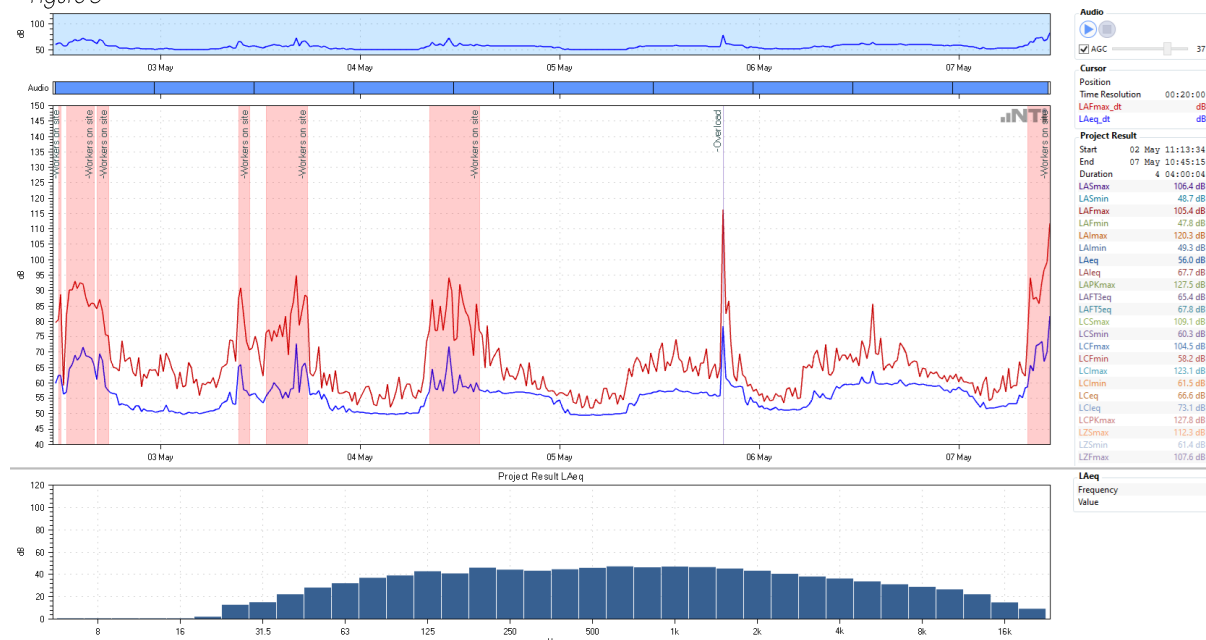
4.0 Results

4.1 – Rear of the Building 11.13am 02/05/24 – 10.45am 07/05/24

Table 3

Time Period	Start Date/Time	L _{Amax}	L _{Aeq} 1hr (Mode)	L _{Aeq} 15min (Mode)	L _{A90}
Day (0700-2300)	11.13am 02/05/24		56.6dBA		54.6dBA
Night (2300-0700)	23.00pm 02/05/24	59.1dBA		51.5dBA	50.3dBA

Figure 5



Comments

Steady background with passing traffic noise audible. Some faint plant noise. Workers on site excluded from measurement.

*based on Appendix C

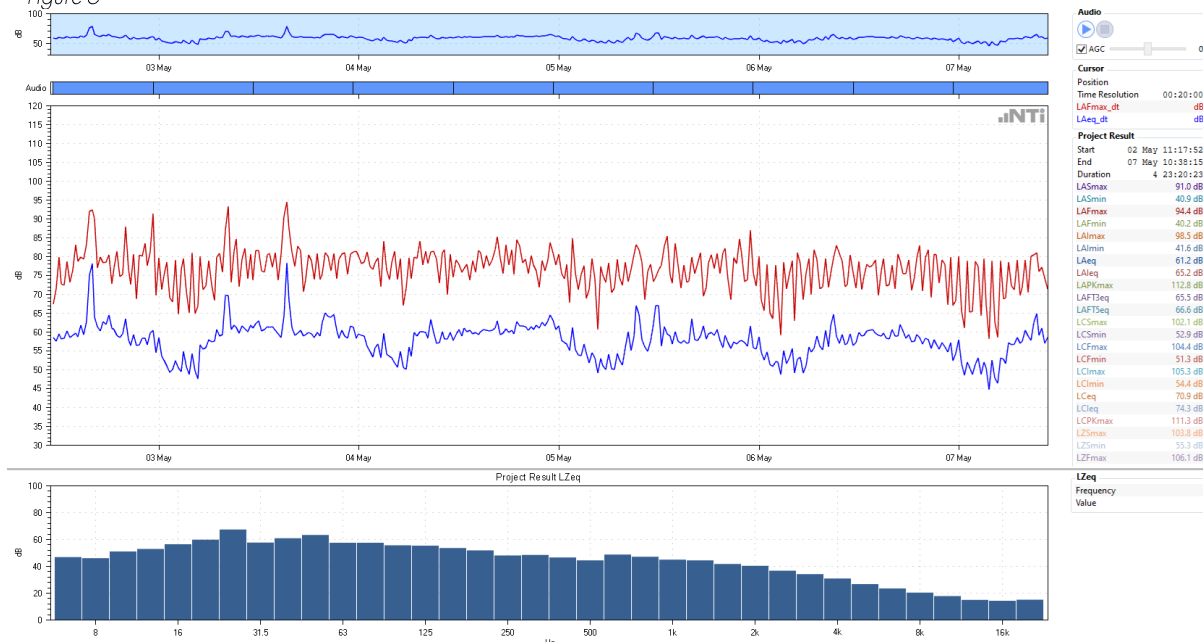
Time Period	Cloud Cover	Temperature (Celcius)	Presence of fog/snow/ice	Wind Speed (m/s)	Wind Direction
Installation	5	8	No	0.2	NNW
Collection	7	12	No	1.8	NW

4.2 – Front of the Building 11.17am 02/05/24 – 10.38am 07/05/24

Table 4

Time Period	Start Date/Time	L _{Amax}	L _{Aeq} 1hr (Mode)	L _{Aeq} 15min (Mode)	L _{A90}
Day (0700-2300)	11.17am 02/05/24		60.2dBA		52.0dBA
Night (2300-0700)	23.00pm 02/05/24	76.9dBA		53.8dBA	42.6dBA

Figure 6



Comments

Steady background with passing traffic noise audible. Some faint plant noise.

*based on Appendix C

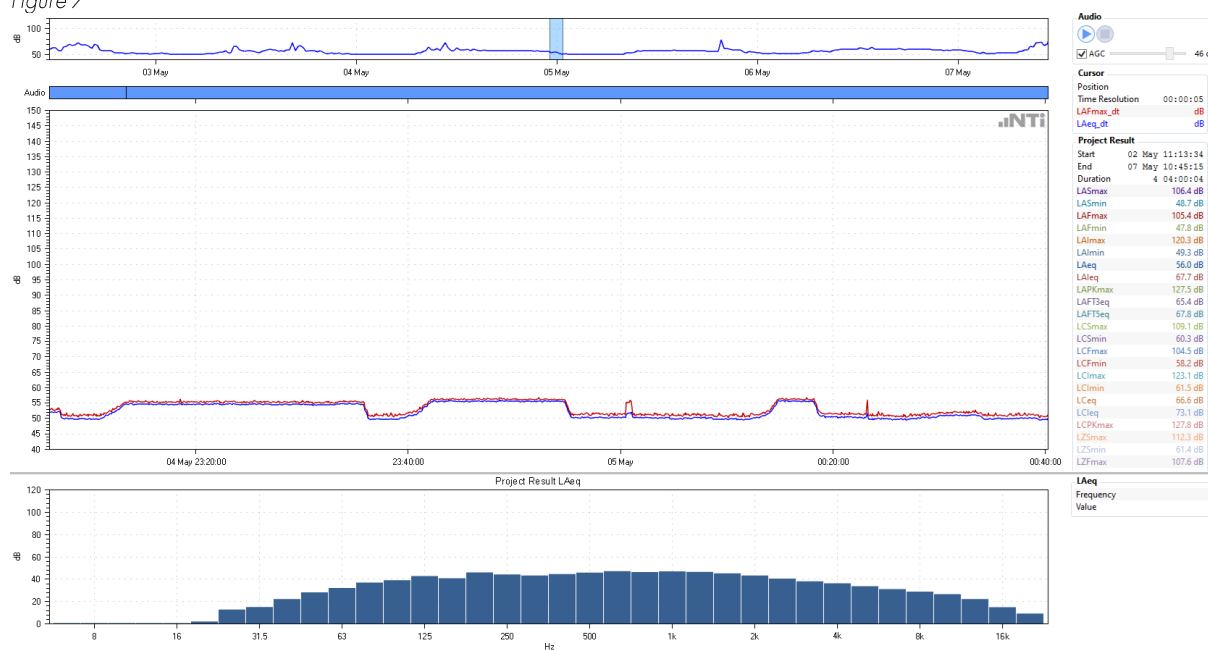
Time Period	Cloud Cover	Temperature (Celcius)	Presence of fog/snow/ice	Wind Speed (m/s)	Wind Direction
Installation	5	8	No	0.2	NNW
Collection	7	12	No	1.8	NW

5.0 Analysis of Results

5.1 Calculated Results

5.1.1 The specific noise level of the air conditioning units to the rear of the proposed site can be calculated by looking at the before and after measurements that have been taken for the sites. This can be seen when looking at the site when the background noise levels are at the lowest (so there is less interference from other sources). Figure 7 shows an area of the measurement where the AC units are turning on and off:

Figure 7



5.1.2 While it is impossible to pinpoint the specific noise levels of each individual unit; the measurements gathered can be used to gather a collective 'on' and 'off' industrial noise level. Frequency analysis was conducted on both assessments as well so the presence of tones can also be assessed.

5.1.3 The ambient noise level taken was 54.4dBA when the units were active, and 50.2dBA when they were not. This 50.2 dBA level can therefore be used as the residual noise level for the calculation of the specific noise level of the plant units at the rear of the building.

5.1.4 This provides a calculated specific noise level of 52.3dB based If the calculated specific noise level is used the following results can be obtained in table 5. The objective method for tonal analysis of the sets of data returned a value of no tones in the measurements from the existing plant units at the rear of the building.

Table 5

<i>Measurement Type</i>	<i>Parameter</i>	<i>Result</i>	<i>Comment</i>
Day			
<i>Ambient sound</i>	L_{Aeq}	57dBA	Measured at NSR-Source present
<i>Residual sound level</i>	L_{Aeq1hr}	-	
<i>Background sound level</i>	L_{A901hr}	55dBA	Measured at NSR-Source present
<i>Specific Sound Level</i>	L_{Aeq1hr}	52dBA	Calculated
<i>Acoustic Feature Correction</i>	dBA	+0	No tonal features present
<i>Rating Level</i>	dBA	52dBA	
<i>Difference of Background vs Rating level</i>	dBA	-3dB	
<i>Likelihood of Adverse Impact</i>			Low Chance of Adverse impact
Night			
<i>Ambient sound</i>	L_{Aeq}	52dBA	Measured at NSR-Source present
<i>Residual sound level</i>	L_{Aeq15mins}	50dBA	Original Assessment
<i>Background sound level</i>	L_{A9015mins}	50dBA	Measured at NSR
<i>Specific Sound Level</i>	L_{Aeq15mins}	52dBA	Calculated
<i>Acoustic Feature Correction</i>	dBA	0	No tonal features present
<i>Rating Level</i>	dBA	52dBA	
<i>Difference of Background vs Rating level</i>	dBA	+2dB	
<i>Likelihood of Adverse Impact</i>			Low Chance of Adverse impact

5.2 Discussion of Levels

- 5.2.1 The specific noise level of the air handling units to the rear of the building returns a qualification, in accordance with BS4142:2014, of 'low chance of adverse impact' on the proposed dwellings.
- 5.2.2 As the measurement was taken approximately 10m from the nearest façade (due to building materials and access) the levels quoted in table 5 will reduce further. This will be by just under 6dB as the measurement was taken 6m from the AC unit enclosure to avoid any impact from the screens on collecting background levels from other sources in the area, and therefore doesn't quite make the 'doubling of distance' rule.

5.3 BS8233:2014 Assessment

Table 6

Location	L _{AeqT} (16hr Day & 8hr Night)	L _{AMax}	BS8233 & WHO Internal noise	BS8233 & WHO External Noise	Difference to L _{Aeq} (internal/external)	Difference to Max (internal)
Rear						
Day (0700-2300)	57dBA		35dBA	55dBA	(+22dBA/ +2dBA)	-
Night (2300-0700)	52dBA	59dBA (10 th Highest)	30dBA (45dBA L _{AMax})	(60dBA L _{AMax})	(+22dBA)	(+14dBA)
Front						
Day (0700-2300)	60dBA		35dBA	55dBA	(+25dBA/ +5dBA)	-
Night (2300-0700)	54dBA	77dBA (10 th Highest)	30dBA (45dBA L _{AMax})	(60dBA L _{AMax})	(+24dBA)	(+32dBA)

5.4 Observations and Further Discussions

- 5.4.1 The measured LAeq values for both the day and the night periods are shown in table 6. The day period at the front of existing property is 25dBA above the limit for indoor noise levels. The day period at the rear of the property is only 22dBA above the limit for indoor noise levels. This means a lower-grade window specification will be acceptable to the rear of the building.
- 5.4.2 The night value at the front is 24dBA above the recommended value for internal noise to prevent sleep disturbance. The rear of the property is 22dBA above the values required for internal noise and therefore maintains the comment from 5.4.1 that the rear of the building can take a lower specification of glazing for noise reduction.
- 5.4.3 BS8233 assumes that a standard double-glazed window will provide up to 15dB reduction when open (with some council guidelines leaning on the side of caution and assuming a 10dB reduction). Either option would mean that any glazed window in the building cannot be relied upon as the source of ventilation without the chance of sleep disturbance being had by the inhabitants of the proposed dwellings to the front of the building. Trickle/acoustic vents will therefore be required at the front and rear of the property; to avoid the need to open windows to ventilate.
- 5.4.4 The L_{AMax} value to prevent the likelihood of sleep disturbance is set at 60dBA external and 45dBA internal. Based on the highest value from the tenth-highest daily value measured during the week the reading for L_{AMax night} at the front of the property was 77dBA. This value is 32dB and 14dB above the required value externally for sleep disturbance respectively. This therefore increases the required specification of the glazing to the front.
- 5.4.5 The L_{AMax night} at the rear of the property was only 14dB above the recommended levels.
- 5.4.6 These figures will now be checked against the calculation methodology in BS8233 annex G to provide exact specifications in section 6.

5.5 BS8233 Calculation Sheet

		Overall dBA	Octave Band Frequency (Hz)						
Time Period			125	250	500	1000	2000	4000	
LaMax	Night	76.9	69	70	71	71	65	64	
Room Details	(m)	First Floor small bedroom, Front							
Height		2.2							
Width		3							
Length		5.5							
Sample Room Volume		36.3							
Sample Room Surface Area		37.4							
Element	Area/No.of	Element Specification							
External Wall	6.6	Traditional solid 9" brick							
Windows	1.5	8 mm / (6 - 16 mm) / 6 mm Pilkington							
Ceiling	16.5								
Ventilation	1	Standard acoustic trickle ventilator typically $\geq D_{n,e,w}$ 35dB							
Element SRI									
Element	Area/No.of	Octave Band Frequency (Hz)							
		125	250	500	1000	2000	4000		
Walls	4	39	44	51	58	63	68		
Windows	1	20	21	33	40	36	48		
Ceiling	1	28	34	40	45	49	52		
Ventilation (Dn,e)	1	33	33	34	35	32	31		
Overall Sound Reduction									
Calculated Internal SPL									
	Overall	Octave Band Frequency (Hz)							
		125	250	500	1000	2000	4000		
Leq,2	44.7	34.5	39.1	38.5	38.0	34.8	33.8		
Limit	45								
Value under limit	0.3								

		Overall dBA	Octave Band Frequency (Hz)					
Time Period			125	250	500	1000	2000	4000
Leq,ff	Daytime	51.5	41	43	45	46	44	41
Room Details		(m)	First Floor small bedroom, Rear					
Height		2.2						
Width		2.5						
Length		5						
Sample Room Volume		27.5						
Sample Room Surface Area		33						
Element		Area/No.of	Element Specification					
External Wall		5.5	Traditional solid 9" brick					
Windows		1.5	4 mm / (6 - 16 mm) / 4 mm Pilkington					
Ceiling		12.5						
Ventilation		1	Standard acoustic trickle ventilator typically ≥ Dn,e,w 35dB					
Element SRI								
			Octave Band Frequency (Hz)					
Element	Area/No.of		125	250	500	1000	2000	4000
Walls	4		39	44	51	58	63	68
Windows	1		21	17	25	35	37	31
Ceiling	1		28	34	40	45	49	52
Ventilation (Dn,e)	1		30	30	30	30	30	28
Overall Sound Reduction								
Calculated Internal SPL			Octave Band Frequency (Hz)					
Overall			125	250	500	1000	2000	4000
Leq,2	23.6		6.3	15.5	17.2	17.6	16.1	15.6
Limit		30						
Value under limit		6.4						

6.0 Glazing and Ventilation Recommendations

6.1 External Walls

6.1.1 External walls of the proposed building are understood to be traditional 9" brick:

Table 7

Description	Octave Band Centre Frequency (Hz)					
	Sound Reduction Index R dB					
	125	250	500	1k	2k	4k
Traditional solid 9" brick	39	44	51	58	63	68

6.2 Glazing

6.2.1 The front of the proposed site requires a slightly higher spec of glazing compared to the rear of the proposed development. Example products for noise reduction to the front and rear of the property are shown in table 8.

Table 8

Description	Location	Octave Band Centre Frequency (Hz) Sound Reduction Index R dB						R_w (C; Ctr)
		125	250	500	1k	2k	4k	
Pilkington 8 mm / (6 - 16 mm) / 6 mm	Front of Proposed Site	20	21	33	40	36	48	35 (-2,-6)
Pilkington 4 mm / (6 - 16 mm) / 4 mm	Rear of Proposed Site	21	17	25	35	37	31	29 (-1,-4)

6.3 Ventilation

6.3.1 It is anticipated that a basic ventilation system will be needed to be incorporated into the scheme design to reduce the impact of the $L_{A,Max}$ levels, such that residents of the properties are able to have background ventilation without necessarily needing to open windows.

Table 9

Description	Location	Octave Band Centre Frequency (Hz) Sound Reduction Index $D_{n,e}$ dB					
		125	250	500	1k	2k	4k
Standard acoustic trickle ventilator typically $\geq D_{n,e,w}$ 35dB	Front of Proposed Site	33	33	34	35	32	31
Standard non-acoustic trickle ventilator typically $\geq D_{n,e,w}$ 30dB	Rear of Proposed Site	30	30	30	30	30	28

7.0 Conclusion

- 7.0.1 The use of the suggested configuration specification in section 6 will allow the proposed site to meet the regulations for acoustic performance in accordance with BS8233:2014, both to the front and the rear of the building. The front of the building has a high rating for the glazing. The noise levels to the front of the building are predominantly from local road traffic and pedestrian traffic only.
- 7.0.2 Any outdoor spaces to the rear of the proposed development, that are not currently part of the designs provided to the author, would need some basic mitigation measures. This is because the area is currently 2dBA above the BS8233:2014 limit value of 55dBA L_{Aeq_16hr} . This can be achieved through fencing and/or the addition of absorptive materials to the area, as it is currently a concreted open space.
- 7.0.3 The existing plant noise to the rear of the property, accompanied by the proposed glazing and ventilation plan, will also mean that the site fully conforms to the specified BS4142:2104 standard and provide a low chance of adverse impact.
- 7.0.4 Since writing the report, JosTec have learnt that glazing has already been installed at the site. Information provided to JosTec for the installed glazing shows the rear windows achieve 35dB which meets the requirements as outlined in table 8 of this report but the front windows only achieve 33dB which is 2dB short of the required glazing specification.
- 7.0.5 In order to get around this, the client is proposing to install secondary glazing to the window in order to achieve the sound rating. The client proposes to fit a frame or using a magnetic strip within the existing glazed areas to install a further sheet of 4mm Plexiglass. JosTec have been able to model this up using Insul software. With a minimum 3mm air gap prior to installing the Plexiglass, this brings the front façade rating up to R_w 36dB, which would then make the front glazing acceptable as outlined in Table 8 of this report. Please see appendix E for Insul calculation.

8.0 Credentials

Name	Title	Credentials
James Flitton BSc AMIOA	Acoustic Consultant	CSCS Professionally Qualified person
		Associate Member Institute of Acoustics
		Diploma in Acoustics and Noise Control
		Affiliate Member of IDE
		Affiliate Member of IOR
Signed		

Appendix A – Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A – weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

Appendix B – Survey Instrumentation

Type	Manufacturer	Model	Serial Number	Last Cal	Cal Due
SLM	NTi	XL2-TA	A2A-18475-E0	19/10/2022	18/10/2024
Pre-amp	NTi	MA220	9378	19/10/2022	18/10/2024
Microphone	NTi	MC230A	A19093	19/10/2022	18/10/2024
Calibrator	NTi	CAL200	19829	20/11/2023	19/11/2024
SLM	NTi	XL2-TA	A2A-18928-E0	10/05/2023	09/05/2025
Pre-amp	NTi	MA220	9785	10/05/2023	09/05/2025
Microphone	NTi	MC230A	A20919	10/05/2023	09/05/2025

Appendix C – Weather Conditions Chart Used

(Blank version)

Weather Conditions				
Measurement Location	Date/Time	Description	Beginning of Survey	End of Survey
		Temperature:		
Cloud Cover Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy (9) Sky obstructed from view		Precipitation:		
		Cloud cover (oktas - see guide)		
		Presence of fog/snow/ice		
		Presence of damp roads/wet ground		
		Wind Speed (m/s)		
		Wind Direction		
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)		

Appendix D – BS8233:2014 Annex G Calc Sheet

Highest impact location/time – Night L_{Amax} (Front)

		Octave Band Frequency (Hz)					
		125	250	500	1000	2000	4000
Leq,ff	A	69	70	71	71	65	64
Dn,e		33	33	34	35	32	31
$\frac{A_o}{S} 10^{\frac{-Dn,e}{10}}$	B	0.00022	0.00022	0.00017	0.00014	0.00027	0.00034
$\frac{Rwi}{Sf} 10^{\frac{-Rwi}{10}}$		20	21	33	40	36	48
$\frac{Rwi}{Sf} 10^{\frac{-Rwi}{10}}$	C	0.00227	0.00181	0.00011	0.00002	0.00006	0.00000
$\frac{Rw}{Sf} 10^{\frac{-Rw}{10}}$		39	44	51	58	63	68
$\frac{Rw}{Sf} 10^{\frac{-Rw}{10}}$	D	0.00010	0.00003	0.00001	0.00000	0.00000	0.00000
$\frac{Rrr}{Sf} 10^{\frac{-Rrr}{10}}$		28	34	40	45	49	52
$\frac{Rrr}{Sf} 10^{\frac{-Rrr}{10}}$	E	0.00396	0.00100	0.00025	0.00008	0.00003	0.00002
10log10(B+C+D+E)	F	-21.8	-25.2	-32.7	-36.2	-34.4	-34.4
A (furnished)		11	14	16	16	15	14
$\text{Log}10 \frac{S}{A}$		0.3	0.2	0.2	0.2	0.2	0.2
Leq,2	A+F+G+3	50.5	48.1	41.5	38.0	33.8	32.8
A-weighting		-16	-9	-3	0	1	1
LAeq,2		34.5	39.1	38.5	38.0	34.8	33.8
Total	44.7						

Highest impact location/time – Night L_{Aeq} (Rear)

		Octave Band Frequency (Hz)					
		125	250	500	1000	2000	4000
Leq,ff	A	41	43	45	46	44	41
Dn,e		30	30	30	30	30	28
$\frac{A_o}{S} 10^{\frac{-Dn,e}{10}}$	B	0.00056	0.00056	0.00056	0.00056	0.00056	0.00088
$\frac{Rwi}{Sf} 10^{\frac{-Rwi}{10}}$	C	0.00217	0.00544	0.00086	0.00009	0.00005	0.00022
$\frac{Rw}{Sf} 10^{\frac{-Rw}{10}}$	D	0.00009	0.00003	0.00001	0.00000	0.00000	0.00000
$\frac{Rrr}{Sf} 10^{\frac{-Rrr}{10}}$	E	0.00360	0.00090	0.00023	0.00007	0.00003	0.00001
10log10(B+C+D+E)	F	-21.9	-21.6	-27.8	-31.5	-31.9	-29.5
A (furnished)		11	14	16	16	15	14
$\text{Log}10 \frac{S}{A}$		0.2	0.1	0.1	0.1	0.1	0.1
Leq,2	A+F+G+3	22.3	24.5	20.2	17.6	15.1	14.6
A-weighting		-16	-9	-3	0	1	1
$L_{Aeq,2}$		6.3	15.5	17.2	17.6	16.1	15.6
Total		23.6					

Appendix E – Additional Plexiglass Layer

