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M1 TRADE LIMITED

NOISE IMPACT ASSESSMENT REPORT

ROXBURGH HOUSE, 12 HILL STREET, WREXHAM LL11 1SN

Client: M1 Trade Limited

Report Ref: P9413-R1-V1

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1 INTRODUCTION

1.1.1 By instruction from Mr Ivan Apukthin ('the client'), NoiseAir was commissioned to undertake a noise impact assessment (NIA) for a proposed residential development at Roxburgh House 11 Hill Street, Wrexham LL11 1SN, herein referred to as the 'development site'.

1.1.2 This noise report has been prepared in support of a planning application (Ref: P/2025/0833) and assesses the results of a noise survey carried out in accordance with current guidance and includes recommendations and mitigation as appropriate.

1.1.3 General limitations of this report are outlined in **Appendix A**.

1.2 Site Description

1.2.1 The development site is an existing four storey building located in the urban centre of Wrexham Town. The development site fronts onto Hill Street/ Regent Street which is a busy town thoroughfare trafficked predominantly by cars, vans and local buses. Traffic speeds along Hill Street/ Regent Street are generally slow moving with the roads restricted to 20 miles per hour (mph).

1.2.2 The local area is predominantly of commercial/ retail use with he following uses in the immediately vicinity:

- Ground floor of the development site: HSBC bank branch, Silvers Amusements, Specsavers store, Hill St. Social (Public House Premises);
- Ground floor to south of development site: Grove Park Theatre;
- Ground floor on opposite side of Regent Street: McDonald's restaurant, Lloyds bank branch, Pincipality Building Society branch; and,
- Ground floor on opposite side of Hill Street: Waterstones, Lot 11 café

1.2.3 The McDonald's restaurant is listed as being open 24 hours a day.

1.2.4 The opening hours of Hill Street Social public house are generally listed as the following:

- Monday – Thursday: 14:30 to 22:30 hours;
- Friday: 14:30 to 23:00 hours;
- Saturday: 12:00 to 23:00 hours; and,
- Sunday: 12:00 to 22:00 hours.

1.2.5 It is understood that Hill Street Social operates as a sports bar over the ground and first floor. Deliveries are understood to occur to the rear courtyard area at ground floor level. It is assumed that delivery times can vary during the daytime and night-time hours.

1.2.6 Lot 11 Café operating hours are listed as the following:

- Monday to Friday: 08:30 to 16:00 hours;
- Saturday: 09:00 to 16:00 hours; and,
- Sunday: 10:00 to 14:00 hours.

1.2.7 Lot 11 Café has outside seating on the front pavement area.

1.2.8 The remaining retail shops and similar in the immediate locality operate between typical daytime working hours of 08:00 to 17:00 hours.

1.2.9 Grove Park Theatre is noted to accommodate regular play events throughout the year however no play events occurred during the survey period. The theatre building is structurally connected at ground floor level to the entrance/ reception area of the theatre however the main theatre auditorium is located away from the separating wall and the proposed development only related to floors three and four, it is therefore considered that structural borne vibration is an unlikely pathway for noise transmission to the proposed residential. It was noted also while on site that the stage doors are located on the southern side of the theatre building away from the courtyard and development site.

1.2.10 It is also noted that there is multiple mechanical plant to the rear courtyard, principally wall mounted at approx. 2 m height to the rear of Hill St. Social and also a series of air handling units at approx. 1st floor level on an adjacent flat roof.

1.2.11 **Figure 1** shows an aerial photograph of the development site with respect to the local area and its context.

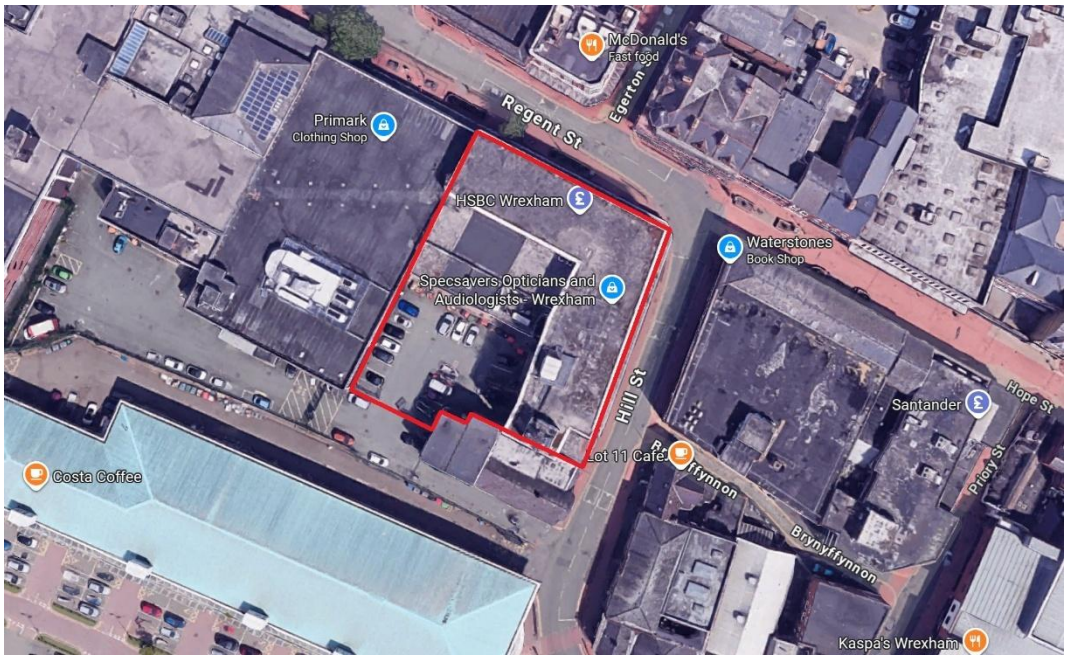


Figure 1: Site aerial photograph.

1.3 Development Proposals

1.3.1 Proposals outline the change of use from office on the second and third floors to 30 no. residential apartments. The 30 no. proposed dwellings are to be located across the second and third floors, with the existing ground and first floor use to be maintained.

1.3.2 Noise sensitive rooms are proposed to both the front and rear facades.

1.3.3 The proposed site layout is presented in **Figure 2** and **Figure 3** below.

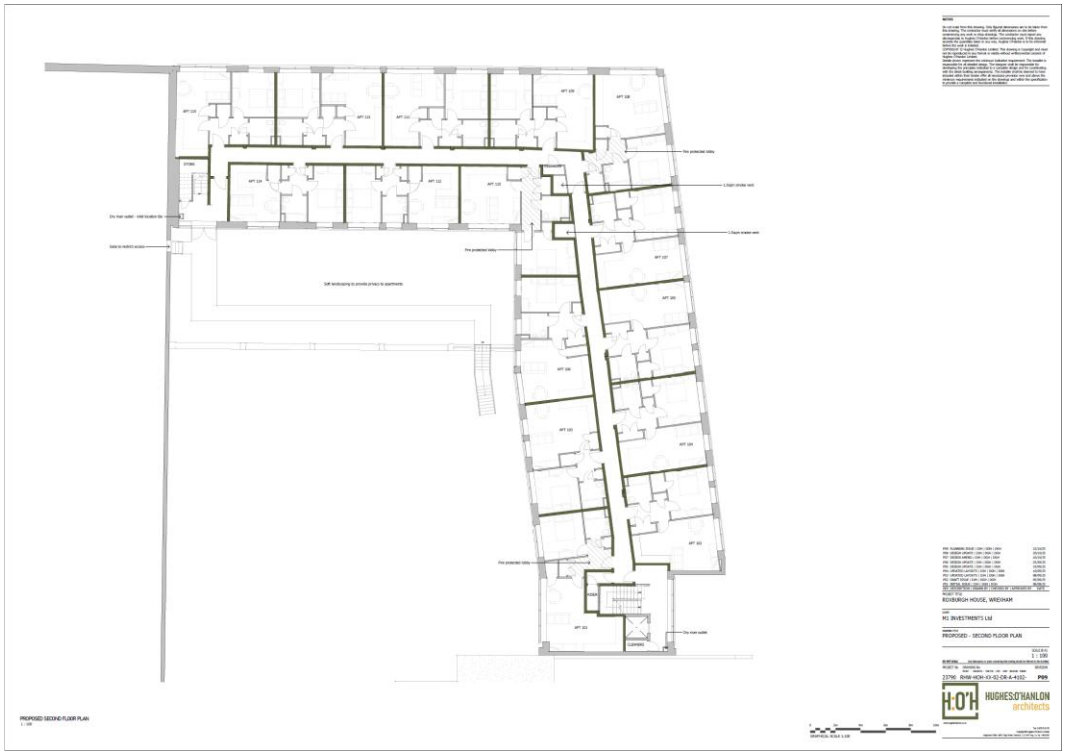


Figure 2: Proposed Site Layout – Second Floor.

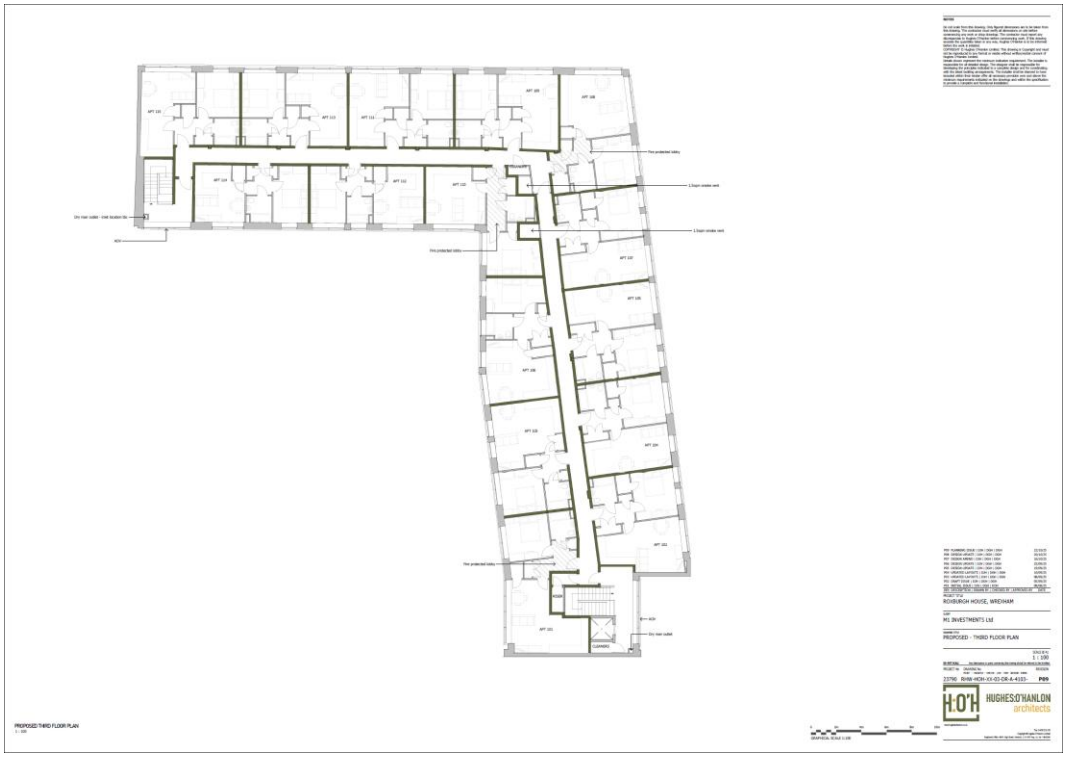


Figure 3: Proposed Site Layout – Third Floor.

2 ASSESSMENT METHODOLOGY AND SCOPE OF WORKS

2.1 Planning Guidance and Noise

2.1.1 This acoustic report has been prepared in support of a planning application and therefore it is considered that reference should be made to the appropriate planning guidance documentation, specifically:

- Planning Policy Wales – Edition 12 (PPW), 2024; and,
- Planning Guidance (Wales) – Technical Advice Note 11 - Noise (TAN11), 1997.

2.1.2 A summary of the relevant planning documentation and its relevance with respect to noise is provided below.

2.2 Planning Policy Wales - Edition 12 (February 2024)

2.2.1 Planning Policy Wales – Edition 12 (PPW12)1 sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW11 provide the national planning policy framework for Wales.

2.2.2 The primary objective of PPW12 is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation.

2.2.3 PPW12 outlines planning policy with respect to Air Quality and Noise. PPW12 outlines that the planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.

2.2.4 PPW12 also aligns with the agent of change principle which says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable.

2.2.5 In proposing new development, planning authorities and developers must, therefore:

- address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors
- not create areas of poor air quality or inappropriate soundscape; and
- seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.

2.2.6 Furthermore, PPW12 states that the potential impacts of noise pollution arising from existing development (be this commercial, industrial, transport related or cultural venues i.e. music venues, theatres or arts centres), must be fully considered to ensure the effects on new development can be adequately controlled to safeguard amenity. Any necessary measures and controls should be incorporated as part of the proposed new development. This will help to prevent the risk of restrictions or possible closure of existing premises or adverse impacts on transport infrastructure due to noise and other complaints from occupiers of new developments. It will be important that the most appropriate level of information is provided and assessment undertaken.

2.3 Technical Advice Note (Wales) - Noise [TAN 11 1997]

2.3.1 TAN 11 was introduced in 1997 and sets out guidance on the assessment of noise in Wales. It should be noted however that this document is currently under review.

2.3.2 TAN 11 sets out a series of Noise Exposure Categories (NECs) which have been derived to assist local planning authorities in their consideration of planning applications for residential development near transport related noise sources. The NECs are set out in Annex A of TAN 11.

2.3.3 Measures introduced to control the source of, or limit exposure to, noise should be proportionate and reasonable, and may include:

- engineering: reduction of noise at point of generation (e.g. using quiet machines and/or quiet methods of working); containment of noise generated (e.g. insulating buildings which house machinery and/or providing purpose-built barriers around sites); protection of surrounding noise-sensitive buildings (e.g. improving sound insulation in these buildings and/or screening them by purpose-built barriers);
- layout: adequate distance between noise source and noise-sensitive building or area; screening by natural barriers, other buildings, or non-critical rooms in a building;
- administrative: limiting operating time of noise source; restricting activities allowed on the site; specifying an acceptable noise limit.

2.4 Consultation and Scope of Works

2.4.1 The scope of the assessment includes consideration of noise at sensitive areas of the proposed development, i.e., proposed residential areas/ bedrooms, specifically in terms of the potential impact of local noise sources such as traffic noise, noise from mechanical plant and noise transmission from the ground floor public house/ sports bar.

2.4.2 As part of the planning application the planning officer has requested that a noise assessment be undertaken given the location of the development site and noise sources in the locality. The planning officer comments are provided below for reference:

> *"Due to the presence of city centre nightlife and noise generated by trading businesses in close proximity to the proposal site, this section is unable to make a recommendation without a noise assessment being carried out. The assessment is required to establish the potential impact of existing noise sources on future residential occupiers and to determine whether appropriate mitigation measures should be implemented.*
>
> *The report should be In line with Technical Advice Note (TAN) 11: Noise, and the associated guidance documents, the proposal to convert a building from offices to apartments must be supported by a comprehensive noise impact assessment. This should include baseline measurements of existing noise levels, an evaluation of how those levels may affect the internal and external living environment of the proposed dwellings, and recommendations for mitigation where necessary.*
>
> *Furthermore, the assessment must demonstrate compliance with BS 8233:2014, which sets out appropriate internal noise level criteria for residential developments. This ensures that habitable rooms such as bedrooms and living areas achieve acceptable acoustic conditions, safeguarding the health, comfort, and quality of life of future residents.*
>
> *Such reports are essential to demonstrate compliance with national planning policy and acoustic standards, and to ensure that the development will provide acceptable living conditions. Without this report, this department is unable to make further consideration of the proposal, and it cannot proceed."*

2.5 Assessment Criteria

2.5.1 In order to achieve noise levels which are considered to be in alignment with the planning approaches and policies discussed in Section 2.1, it is considered that all efforts are made to ensure that future occupants are unlikely to be exposed to noise levels which might breach the criteria.

2.5.2 It should be noted however that planning guidance does not preclude development where the criteria is likely to be breached in certain circumstances as long as reasonable efforts are made to mitigate and reduce such an effect.

2.5.3 It is therefore considered that the noise assessment and subsequent criteria should be undertaken in accordance with BS 8233:2014, a summary of which is provided below.

2.5.4 In addition, it has also been identified that noise breakout from the nearby mechanical plant may cause adverse impact and should therefore be assessed in accordance with BS 4142:2014+A1:2019, a summary of which has been provided below also.

2.6 British Standard 8233:2014 (BS 8233:2014)

2.6.1 British Standard 8233:2014 – *Guidance on sound insulation and noise reduction for buildings* (BS 8233) provides guidance on internal ambient noise levels, resulting from break-in of external environmental noise that should not be exceeded in various locations within dwellings.

2.6.2 Guidelines for buildings in terms of internal noise level are reported in TABLE.

Table 1: Summary of internal noise guidelines.

Activity	Location	0700 – 2300 hours	2300 – 0700 hours
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.6.3 The standard clarifies that these values are based on the existing guidelines issued by the World Health Organisation (WHO). In addition, it states that the internal noise levels may be relaxed by up to 5 dB whilst maintaining a reasonable living condition. Conversely, in terms of internal maximum levels to be achieved during the night, the standard does not recommend any limits for individual noise events. However, a guideline value may be set in terms of SEL or L_{AFmax}, depending on the type and the number of events per night.

2.6.4 Furthermore, BS 8233:2014 provides guidance on desirable noise levels in areas that are intended to be used for external amenity space, such as gardens, balconies and roof gardens which are intended to be used for relaxation. For these spaces it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ up to a level of 55 dB $L_{Aeq,T}$ for noisier environments.

2.7 British Standard 4142:2014 (BS 4142:2014)

2.7.1 British Standard 4142:2014 - Methods for rating and assessing industrial and commercial sound, sets the methodology for rating and assessing sound of an industrial and commercial nature, which includes sound from fixed installations such as mechanical and electrical plant and equipment.

2.7.2 In BS 4142:2014, a noise rating is determined and compared with the existing local background sound level based on several more cumulative acoustic feature corrections to apply where appropriate. For example if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic, then additional cumulative penalties individually ranging from 0 to 9 dB may be applied depending on the type of noise.

2.7.3 BS 4142:2014 seeks to determine a “representative” background sound level, stating that “…the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods”.

2.7.4 The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

- Typically, the greater this difference, the greater the magnitude of the impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and,
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the

background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.7.5 Therefore, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is below the background sound level.

3 ACOUSTIC SURVEY

3.1 Acoustic Survey Details

3.1.1 NoiseAir carried out fixed position noise monitoring between 29th November 2025 to 1st December 2025 at the development site.

3.1.2 Noise monitoring was undertaken at two monitoring locations (ML1 and ML2), all positions are shown in **Figure 4** and **Table 2** below.



Figure 4: Site layout plan and noise monitoring locations.

Table 2: Summary of Noise Monitoring Locations

Monitor Location Number	Location Description	Time Period Monitored		Attended or Unattended Monitoring
		Start	End/ Duration	
ML1	Sound level meter microphone was mounted at second floor level out of a window approx. 1 m from the front façade overlooking the corner of Regent Street and Hill Street.	15:00 29/11/25	14:00 01/12/25	Unattended
ML2	Sound level meter microphone was mounted at second floor level out of a window approx. 1 m from the rear façade overlooking the rear courtyard.	15:00 29/11/25	14:15 01/12/25	Unattended

3.1.3 The monitor locations were positioned to be representative of the noise levels at the approximate location of the development site and so data from all locations will be used for the NIA.

3.1.4 The noise measurements were made using two Class 1, integrating sound level meters (SLMs).

3.1.5 The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003[1] before and after the noise monitoring periods.

3.1.6 Details of the SLMs and associated field calibration can be found in **Table 3** below;

Table 3: Summary of SLM's used for survey and associated field calibration

SLM (Serial Number)	Preamp (Serial Number	Microphone (Serial Number)	Calibrator (Serial Number)	Start Calibration	End Calibration	Drift
NOR140 (1406247)	NOR1209 (12739)	NOR1225 (96123)	B&K2238 (2431761)	-25.1 dB	-25.3 dB	0.2 dB
NOR140 (1402868)	NOR1209 (12172)	NOR1225 (79633)	B&K2238 (2431761)	-25.4 dB	-25.7 dB	0.3 dB

3.1.7 The weather conditions were noted to be as outlined in **Table 4** during the site visits at the start and end of the monitoring periods.

Table 4: Summary of weather conditions noted at the start and end of the monitoring duration.

	29th November 2025	1st December 2025
Roads (Wet / Dry)	Dry	Dry
Temperature (˚C)	13	11
Wind speed (ms^{-1})	< 5 S	< 5 SW
Cloud Cover (Approx. %)	100	100
Humidity (%)	88	78

3.1.8 A-weighted[2] L_{eq}[3] and L_{AMax}[4] noise levels were measured to comply with the requirements of BS 8233:2014 and BS 4142:2014. A-weighted L_{90}[5] were also measured to provide additional information.

3.1.9 Attending the development site at the start and end of the survey monitoring period provided opportunity for observations and detailed notes to be made of the significant noise sources which contribute to each of the measured levels.

ML1

Road Traffic Noise from Regent Street/ Hill Street: Regular/ constant vehicle noise was audible at ML1 from vehicles passing. Vehicles generally consisted of cars, vans and buses.

[1] BS7445-2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.
[2] An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.
[3] Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.
[4] The instantaneous maximum noise level recorded for a measurement period.
[5] The noise level which is exceeded for 90% of the measurement period.

Pedestrian Footfall Noise: Low to medium level noise of pedestrians along Regent Street/ Hill Street was audible. It is noted that the monitoring period included a daytime when a local Wrexham Football Club match was scheduled, local football fans were in the locality of the development site.

ML2

Mechanical Plant Noise: Continuous noise from local mechanical plant was audible at ML2. Individual noise sources were not readily distinguishable against each other and the magnitude of the noise was considered to be low/ medium.

3.2 Measured Sound Levels – Noise Monitoring (ML1 and ML2)

3.2.1 Data is shown in **Figure 5** and **Figure 6** detailing a level vs. time graph of the recorded L_{Amax}, L_{Aeq} and L_{A90} sound level over 15-minute time periods for ML1 and ML2.

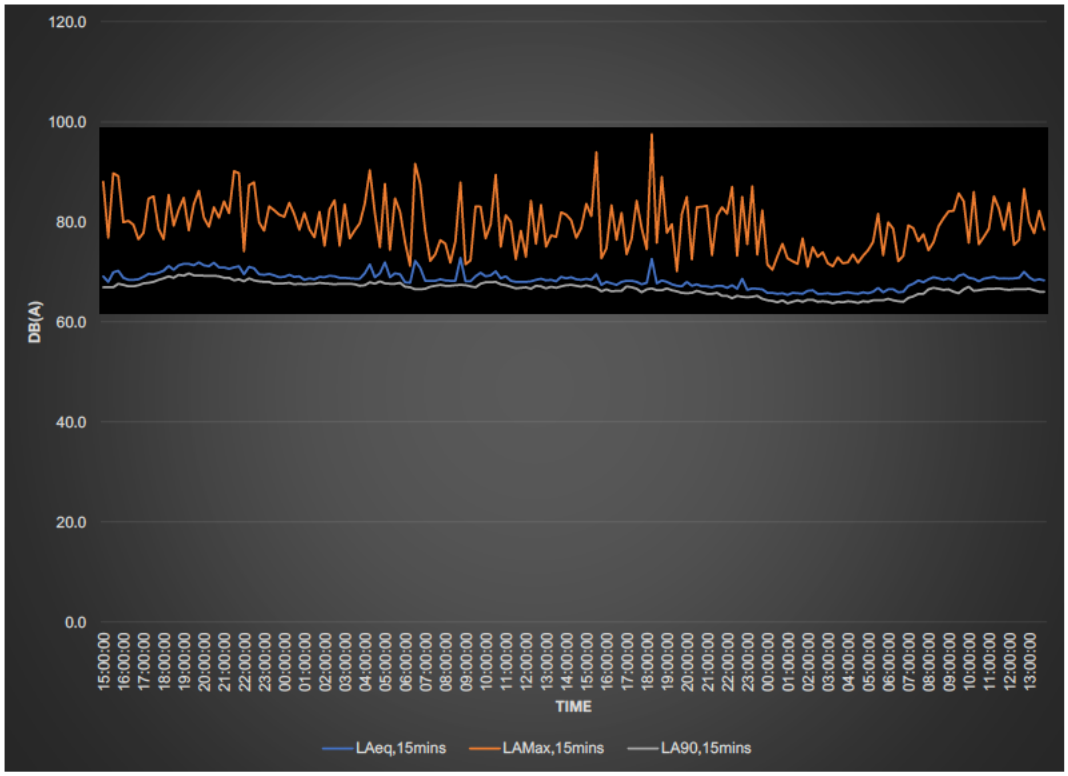


Figure 5: Level vs. time graph showing L_{Amax}, L_{Aeq} and L_{A90} sound levels – ML1.

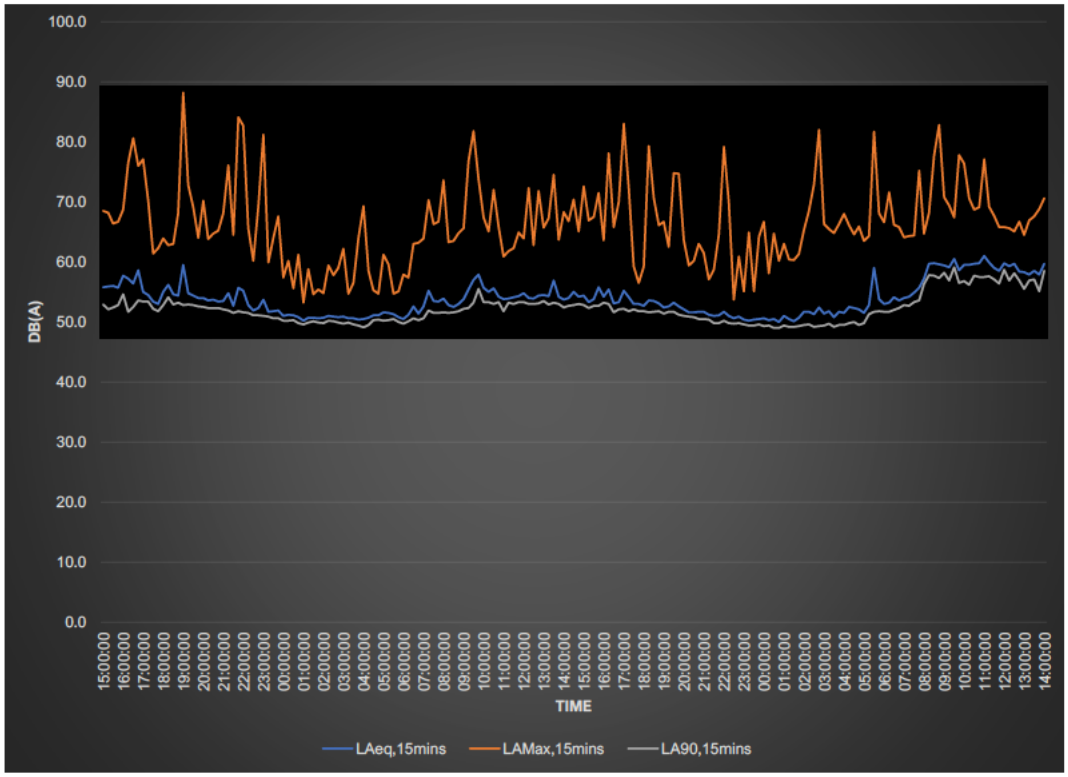


Figure 6: Level vs. time graph showing L_{Amax}, L_{Aeq} and L_{A90} sound levels – ML2.

3.2.2 The results for monitoring locations ML1 and ML2 during the daytime and night-time periods are presented in **Table 5**.

Table 5: Average Measured Daytime and Night-time Noise Levels				
Monitoring Location	Time	Measured Noise Level		
		dB $L_{Aeq,16hour}$ / dB $L_{Aeq,8hour}$	dB $L_{Aeq,1hour}$ / dB $L_{Aeq,15mins}$	dB $L_{A90,1hour}$ / dB $L_{A90,15mins}$
ML1	07:00-23:00	68.4 – 70.4*	67.1 – 71.6	65.0 – 69.4
	23:00-07:00	66.0 – 69.4	65.4 – 72.2	63.7 – 68.1
ML2	07:00-23:00	53.9 – 58.9*	51.1 – 59.7	49.9 – 57.7
	23:00-07:00	51.2 – 52.3	50.0 – 59.0	49.0 – 52.3
* 16 hour time period (note that some measurements were not made over the entire period, however an appropriate proportion of this period was included such that a typical / conservative noise climate was derived).				

3.2.3 The maximum noise level exceeded more than 10 times in one night-time period is summarised in **Table 6**.

Table 6: Summary of the Maximum Noise Level Exceeded More than 10 Times in One Night-time Period (Figures in dB $L_{Amax,2mins}$).	
Monitoring Location	Maximum Noise Level (dB)
ML1	83.6
ML2	68.5

3.3 Measured Sound Levels – Background and Residual (ML2)

3.3.1 Mechanical plant noise was noted to be dominant at ML2 from multiple mechanical plant noise sources to the rear of the development site.

3.3.2 The background and residual sound levels measured at this location appear to demonstrate that the mechanical plant is dominant and did not appear to cease during the survey. It is therefore considered that a reliable background and residual sound level can be determined from the dataset obtained and it is not viable to request that the all neighbouring business shut down the plant on account of a noise survey to support the proposals for the development site.

3.3.3 Given the above and in order to undertake as robust assessment as possible with the constraints of the measured noise levels at the development site it is considered that a typical background sound level be adopted of 35 dB(A) for the daytime and 30 dB(A) for the night-time.

3.3.4 It is acknowledged that the aforementioned noise levels are an approximation however NoiseAir have extensive experience over many years of noise assessments of mechanical plant in such location and the levels proposed to be adopted are considered likely to be moderately conservative.

3.3.5 As an added consideration the measured ambient sound levels at ML2 will not be corrected against the residual sound level (as it could not be appropriately derived from the dataset). This therefore is likely to present a conservative value for the BS 4142 assessment presented later in the report.

3.3.6 We also acknowledge that BS 4142 advises in such situations that a surrogate position should be considered to obtain and derive a typical background and/ or residual sound level. BS 4142 also advises however that the selection of such a position should be considered extremely carefully. In the case of the development site courtyard it is considered that there were no other viable locations where a dataset could be obtained without influence from other noise sources which would likely result in extremely high uncertainty.

3.4 Measured Sound Levels – Mechanical Plant Ambient Sound Levels (ML2)

3.4.1 A histogram showing the distribution of measured $L_{Aet,T}$ sound levels for the daytime and night-time are presented in **Figure 7** and **Figure 8** for ML2.

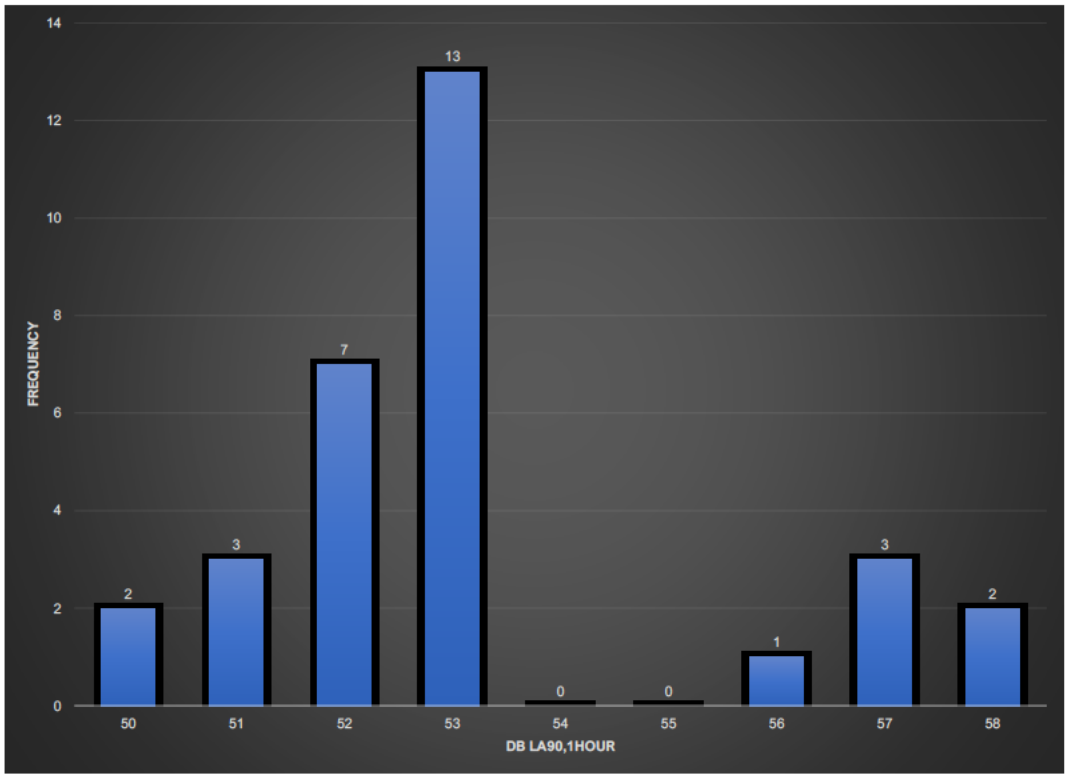


Figure 7: Histogram showing frequency distribution of $L_{Aeq,1hour}$ noise readings at ML2 - Daytime.

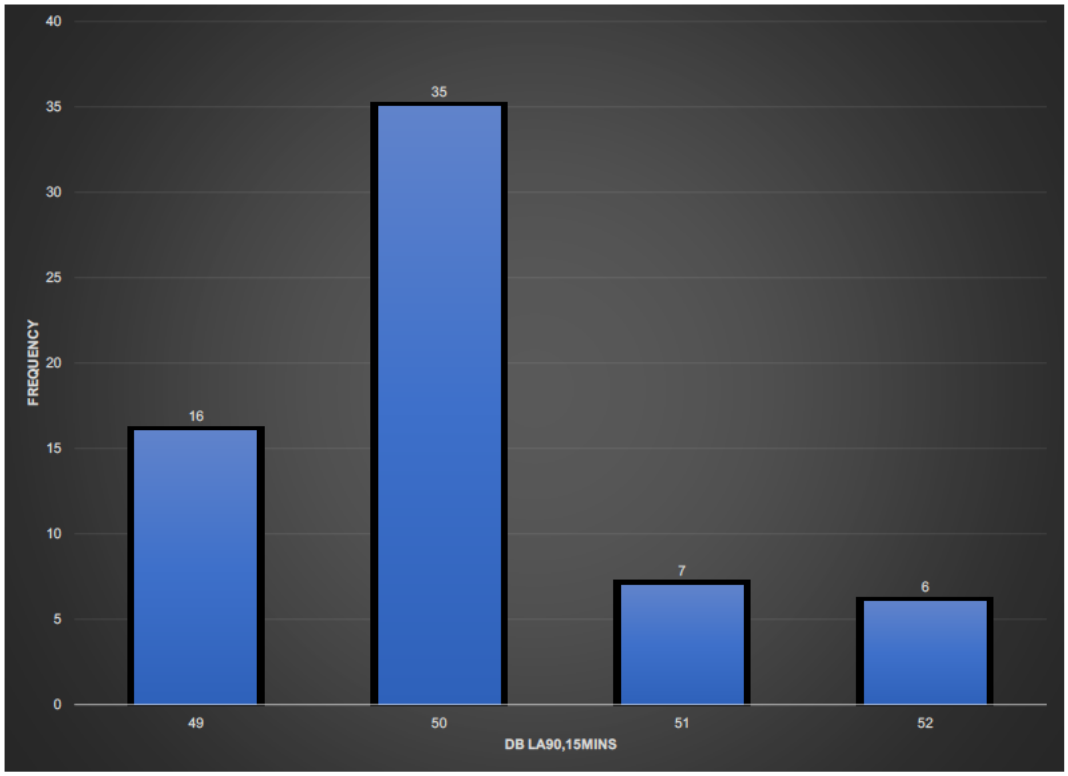


Figure 8: Histogram showing frequency distribution of $L_{Aeq,15mins}$ noise readings at ML2 – Night-time.

3.4.2 Typical ambient noise levels during the daytime are considered to be 53 dB $L_{Aeq,T}$.

3.4.3 Typical ambient noise levels during the night-time are considered to be 50 dB $L_{Aeq,T}$.

4 BS8233: 2014 ASSESSMENT

4.1 Introduction

4.1.1 An assessment against the criteria in BS 8233:2014 has been conducted with reference to the general sound levels at the site.

4.2 Assessment of Daytime Noise Levels in Living Rooms and Bedrooms

4.2.1 The measured noise levels at the façades of the existing building structure, as detailed in Section 3 for the daytime and night-time period, together with the level of attenuation required in accordance with BS 8233: 2014, are presented in **Table 7**.

Table 7: Level of Attenuation Required to Achieve the Internal Noise Guideline Levels.

Façade	Daytime ($L_{Aeq,16hours}$) / Night-Time ($L_{Aeq,8hours}$ / L_{Amax})	Worst Case Noise Level at the Façade of the Property (dB(A))	BS 8233:2014 Target Internal Level (dB(A))	Worst Case Level of Attenuation Required (dB(A))
Front	Daytime $L_{Aeq,16hours}$	70	35	35
	Night-Time $L_{Aeq,8hours}$	69	30	39
	Night-Time L_{Amax}	84	45	39
Rear	Daytime $L_{Aeq,16hours}$	59	35	24
	Night-Time $L_{Aeq,8hours}$	52	30	22
	Night-Time L_{Amax}	69	45	24

4.3 Building Envelope Performance – Windows Open

4.3.1 The sound performance requirements for bedrooms, living and dining rooms at the development site during the daytime and night-time in rooms with windows closed are summarised in **Table 7**.

4.3.2 However, with windows open, the attenuation provided by the façade will be approximately 10-15 dB(A). This would potentially allow the recommended internal noise limit to be exceeded within some rooms at the development.

4.3.3 BS 8233:2014 suggests that where development is desirable the guideline internal noise levels can be relaxed typically by up to 5 dB(A) and therefore is unlikely to breach the criteria discussed in Section 2 of this report.

4.3.4 Based on the measurements conducted at the development site it is likely that windows will need to be maintained in the closed position to achieve the internal recommended sound levels outlined in BS 8233:2014.

4.3.5 It should be noted however that it is generally accepted as good practice that residents should have the option to open their windows as increased noise levels may be acceptable to certain individuals in certain circumstances. For example, some level of noise from a street scene may be preferential to an individual who feels a connection to the locality, at least for a period. However, the individual should be afforded the option to be able to close their windows to achieve acceptable internal noise levels for relaxation.

4.4 Noise Transmission from the neighbouring Italian Restaurant

4.4.1 It has been identified that the noise breakout from the neighbouring Hill St. Social public house/ sports bar into the proposed residential development has the potential to give rise to adverse impact.

4.4.2 Typical noise levels within sports bar premises is generally approximately up to 75-80 dB(A) which allows normal to elevated conversational levels based on historic assessments undertaken by NoiseAir within similar premises.

4.4.3 Given the nature/ character of the noise source within the sports bar we recommend that noise transmission and associated noise break in to habitable rooms within the proposed development does not exceed 25 dB(A) during the daytime.

5 BS 4142:2014 ASSESSMENT – MECHANICAL PLANT TO REAR

5.1 Introduction

5.1.1 Based on the measured sound levels presented in Section 3, a BS 4142:2014 assessment has been undertaken with respect to the mechanical plant located to the rear of the development site.

5.2 Background Sound Level

5.2.1 Adopted daytime and night-time background L_{A90} sound levels of 35 dB(A) and 30 dB(A) have been adopted for this assessment, respectively.

5.3 Ambient Sound Level

5.3.1 Adopted daytime and night-time ambient $L_{Aeq,T}$ sound levels of 53 dB(A) and 50 dB(A) have been adopted for this assessment, respectively.

5.3.2 As outlined the ambient sound levels have not been corrected against the residual sound level due to it not being possible to derive a residual sound level with an acceptable level if uncertainty.

5.3.3 The ambient sound level was considered to be the dominant source of noise in the locality and therefore has been adopted as the specific sound level. This is considered to be a conservative approach.

5.4 Character Corrections

5.4.1 Character corrections have been applied to the identified noise sources based on site observations.

5.4.2 All mechanical plant was noted to exhibit tonal characteristics however the magnitude of the tonal characteristics is likely to be 'just perceptible'. A +2 dB character correction has therefore been applied.

5.4.3 The mechanical plant noise emissions where also identified as being intermittent in nature and therefore a +3 dB character correction has been applied.

5.5 Initial Assessment

5.5.1 The BS 4142:2014 initial assessment based on the measured noise levels for the mechanical plant is presented in **Table 8** with respect to the rear façade.

Table 8: BS 4142:2014 Assessment to Determine the Likelihood of Adverse Impacts at the Rear Façade.		
Quantity	**Sound level dB(A)**	
	Day	**Night**
Typical Background Sound Level, dB L_{A90}	35	30
Specific sound level.	53	50
Acoustic feature correction for tonality.	+5	+5
Rating Level	58	55
Excess of Rating Level over Background Sound Level	**+23**	**+25**
Initial Assessment	**Significant Adverse (Context Depending)**	**Significant Adverse (Context Depending)**

5.6 BS 4142:2014 Assessment and Context

5.6.1 The BS 4142:2014 initial assessment for all mechanical plant to the rear of the development site indicates a significant adverse impact associated with an excess rating level of +23 dB for the daytime and up to +25 dB for the night-time.

5.6.2 BS 4142:2014 recommends that the context of the assessment is taken into account when providing a final assessment.

5.6.3 The proposals outline the introduction of new residents into an urban locality. While the absolute noise levels measured are not uncommon for such situations, the mechanical plant noise source is the dominant source of noise in the locality and appears to be relatively continuous in an overall sense (individual units were noted to start and stop). With windows partially open therefore, it is considered that the perceptible level of impact is likely to be less than the indications of the initial assessment, the assessment outcome of **significant adverse impact** is likely to remain.

5.6.4 It is further considered however that the absolute internal noise levels across the building façade when windows are in the closed position, with the benefit of appropriately selected glazing (Section 6), internal noise levels can be adequately reduced to acceptable levels and adverse impact can be avoided. We would therefore recommend appropriate glazing along with a System 4 mechanical ventilation with heat recovery (MVHR) ventilation option be

selected to achieve internal noise levels which conforms to the recommended BS 8233:2014 levels. The sound insulation scheme recommended is presented in Section 6.

Uncertainty

5.6.5 Uncertainty of measurements can have a significant effect on the outcome and findings of an assessment and therefore such constraints are documented and discussed below.

5.6.6 The SLMs used were Norsonic Class 1 SLMs, it is generally recognised that Class 1 SLMs offer an uncertainty of ±1.0 dB. The instrumentation used for the survey has been calibrated by UKAS approved laboratories.

5.6.7 The sound levels measured (which include busier and quieter periods) are considered typical for an urban area.

5.6.8 Wind speeds during the survey visits were typically less than 5 ms-1 and the effect of wind generated noise is not considered to have a significant impact on this assessment.

5.6.9 The specific noise level and therefore rated noise levels have been measured at the existing building facade; however, a conservative assessment of breakout noise levels has been undertaken.

5.6.10 It was not possible to derive background and residual noise levels at the development site and therefore typical levels have been adopted based on past experience of NoiseAir. While this approach introduces a level if increased uncertainty it is considered that appropriately conservative values have been selected to minimise the uncertainty within this element of the assessment.

5.6.11 It is therefore considered that, given the level of the calculated excess of the rating level over the background sound level, in this instance, the uncertainty of the calculations is likely to have minimal influence on the outcome of the assessment.

6 BS 4142:2014 ASSESSMENT – DELIVERIES TO THE REAR

6.1 Introduction

6.1.1 A BS 4142:2014 assessment has been undertaken with respect to potential delivery activities that occur at to the rear of the development site.

6.2 Background Sound Level

6.2.1 Adopted daytime and night-time background L_{A90} sound levels of 35 dB(A) and 30 dB(A) have been adopted for this assessment, respectively.

6.3 Ambient Sound Level

6.3.1 No deliveries were noted to have occurred during the noise survey duration. The delivery noise source is calculated as being at an approximate distance of 8 m from the closest window of a noise sensitive receptor (NSR) at the second-floor level

6.3.2 A typical ambient sound level has therefore been adopted of up to 75 dB(A) at the NSR location over a 30-minute period. This is considered a moderately conservative value based on historic experience of such noise sources.

6.4 Character Corrections

6.4.1 Character corrections have been applied to the identified noise sources based on site observations.

6.4.2 No delivery noise was noted during the survey duration however such noise sources are generally predominantly intermittent and impulsive in character, therefore a +3 dB and +6 dB character correction for intermittency and impulsivity have been adopted, respectively.

6.4.3 It is noted that delivery activities can generate tonal characteristics however it is considered that such characteristics are often of a lesser perceptibility when compared to intermittency and impulsivity, therefore no character correction for tonality has been applied.

6.5 Initial Assessment

6.5.1 The BS 4142:2014 initial assessment based on the measured noise levels for the delivery noise is presented in **Table 8** with respect to the rear façade.

Table 9: BS 4142:2014 Assessment to Determine the Likelihood of Adverse Impacts at the Rear Façade.		
Quantity	**Sound level dB(A)**	
	Day	**Night**
Typical Background Sound Level, dB L_{A90}	35	30
Specific sound level.	72	75
Acoustic feature correction for tonality.	+9	+9
Rating Level	81	84
Excess of Rating Level over Background Sound Level	**+46**	**+55**
Initial Assessment	**Significant Adverse (Context Depending)**	**Significant Adverse (Context Depending)**

6.6 BS 4142:2014 Assessment and Context

6.6.1 The BS 4142:2014 initial assessment for delivery activities to the rear of the development site indicates a significant adverse impact associated with an excess rating level of +46 dB for the daytime and up to +55 dB for the night-time.

6.6.2 BS 4142:2014 recommends that the context of the assessment is taken into account when providing a final assessment.

6.6.3 The proposals outline the introduction of new residents into an urban locality and there is likely some level of expectation given the outlook of the proposed habitable rooms over a courtyard. However, with windows partially open, it is considered that the perceptible level of impact is likely to be marginally less than the indications of the initial assessment, the assessment outcome of **significant adverse impact** is likely to remain.

6.6.4 It is further considered however that the absolute internal noise levels across the building façade when windows are in the closed position, with the benefit of appropriately selected glazing (Section 6), internal noise levels can be adequately reduced to acceptable levels and adverse impact can be avoided. We would therefore recommend appropriate glazing along with a System 4 mechanical ventilation with heat recovery (MVHR) ventilation option be selected to achieve internal noise levels which conforms to the recommended BS 8233:2014 levels. The sound insulation scheme recommended is presented in Section 6.

Uncertainty

6.6.5 Uncertainty of measurements can have a significant effect on the outcome and findings of an assessment and therefore such constraints are documented and discussed below.

6.6.6 It was not possible to derive background and residual noise levels at the development site and therefore typical levels have been adopted based on past experience of NoiseAir. While this approach introduces a level if increased uncertainty it is considered that appropriately conservative values have been selected to minimise the uncertainty within this element of the assessment.

6.6.7 It was also not possible measure the ambient sound level at the development site and therefore typical noise levels for such sources has been adopted. While it is acknowledged that the assessment is therefore based on typical data, the data adopted is considered to be conservative. This is likely to result in a absolute worst case assessment outcome which has then been used to inform the sound insulation design.

7 SOUND INSULATION SCHEME

7.1 Building Envelope Requirements – Windows Closed

7.1.1 Proposals for the development site at the time of writing outline residential use to the first and second floor.

7.1.2 Noise sensitive rooms are proposed to all facades of the property. Therefore, internal noise levels are required to not exceed 35 dB L_{Aeq} during the daytime hours in all rooms and 30 dB L_{Aeq} and 45 dB L_{Amax} during the night-time hours in bedrooms. It is also noted however that to the rear façade the aforementioned noise levels with respect to the mechanical plant and delivery noise sources will be reduced by 5 dB(A).

7.1.3 When assessing sound levels in habitable areas of the proposed development, the sound attenuation provided by the overall building facade should be considered. To mitigate sound levels, the composition of the building facade can be designed to provide the level of attenuation required. Glazing is generally the building element which attenuates noise the least, so the proportion of glazing in a building facade is an important consideration when assessing overall sound attenuation. Additionally, any façade penetrations should also be considered such as for ventilation i.e., trickle ventilation.

7.1.4 Based on the design details forwarded, worst case façade attenuation calculations have been undertaken in accordance with BS EN ISO 12354-3:2017.

7.1.5 Calculations show that to achieve a reasonable internal acoustic environment in habitable rooms as specified within BS 8233:2014, the building envelope constructions should be selected to meet the sound reduction index (SRI) values presented in **Table 10**. Given the elevated noise measured calculations are based on a full System 4 MVHR system being adopted. The final ventilation design however is to be considered by others.

Table 10: Building Envelope Requirements

Façade	Room Type	Glazing Performance Requirement[1]								
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	R_w+C_{tr}
All	Living/ Dining Room & Bedroom	21[3]	26	36	46	50	52	63	63	39[3]

[1] Wall construction assumed to be not less than 52 dB R_w+C_{tr}, roof construction assumed to be not less than 47 dB R_w+C_{tr}. Calculations have been conducted in accordance with BS EN ISO 12354-3:2017 methodology.
[2] Window area assumed to be not more than 2.0 m^2 per room.
[3] 63 Hz and 8000 Hz acoustic performance data is not published by the adopted example glazing manufacturer and therefore likely/ assumed conservative values have been adopted.

7.1.6 **Table 10** above outlines the acoustic glazing performance requirement to be adopted to all habitable rooms at the development site, the typical example adopted is shows below:

- 8.8 mm Pilkington Optiphon pane / 20 mm argon / 12.8 mm Pilkington Optiphon pane.

7.1.7 It should be noted that other glazing manufacturers/ suppliers can be adopted however the acoustic performance values presented in **Table 10** must be achieved.

7.1.8 The glazing element typical examples outlined in **Table 10** are based on the performance of the glazing panes only, advice should be sought from the manufacturer at detailed design stage to ensure that the window framing does not undermine the overall performance requirement recommended in **Table 10**.

7.1.9 Building envelope performance elements outlined in **Table 10** are based on the information provided at the time of writing and assumptions based on typical requirements for such projects. The building envelope final design should be confirmed through detailed design at the appropriate stage including the consultation of specialist manufacturers to confirm individual building element performance.

7.2 Acoustic Ventilation Requirements

7.2.1 It is recommended that the acoustic ventilation proposed at the site should, as a minimum, comply with Building Regulations 2022 Approved Document F1 Means of Ventilation and British Standard BS5925 1991: “Code of Practice for Ventilation Principles and Designing for Natural Ventilation”. Acoustic ventilation is only recommended for noise sensitive rooms, which are bedrooms and living/dining rooms.

7.2.2 The implementation of the recommended glazing together with appropriate acoustic ventilation would ensure that the required internal daytime and night-time noise limits are achieved.

7.2.3 It should be further noted that the glazing and ventilation configurations within this report are for guidance only. Similar products to those used in NoiseAir calculations may achieve a similar level of sound reduction however this should be verified by the manufacturer.

7.2.4 Given the noise levels measured at the development site and the character of noise observed we recommend that a System 4 MVHR ventilation system is adopted within all habitable rooms at the development site.

7.2.5 Where a mechanical ventilation system is installed within habitable rooms at the development site, the cumulative ambient noise breakout within any room should not exceed NR20.

7.3 Sound Insulation Requirements to the Separating Floor

7.3.1 As outlined in Section 4.4, the separating floor should achieve a sound insulation performance such that noise break-in from the underneath sports bar does not exceed 25 dB(A) during the daytime.

7.3.2 We therefore recommend that the separating floor achieve at least $D_{nt,w}+C_{tr}$ 55 dB(A). It was not possible to complete a sound insulation test between the spaces and therefore the performance of the existing construction has not been confirmed.

7.3.3 Inspection of the separating wall was limited to visual means from the development side however it is considered that the separating floor is likely to be of concrete construction type.

7.3.4 In order to improve the acoustic performance, we recommend that a detailed sound insulation design should be completed along with a sound insulation test once completed to confirm performance. It is recommended that at this stage this is secured by way of an appropriately worded condition.

8 CONCLUSIONS

8.1.1 NoiseAir has carried out a noise impact assessment with respect to the proposed residential development to be located at Roxburgh House, 12 Hill Street, Wrexham LL11 1SN.

8.1.2 Proposals outline the change of use from office on the second and third floors to 30 no. residential apartments. The 30 no. proposed dwellings are to be located across the second and third floors, with the existing ground and first floor use to be maintainedThe main noise source affecting the development site is noise emissions from Wood Street to the front and mechanical plant to the rear.

8.1.3 A noise impact assessment has been conducted at the development site and noise levels have been directly measured to the front and rear facades of the development site at second floor level.

8.1.4 Noise is generally dominated by traffic noise sourced to the front and mechanical plant to the rear; however the noise assessment also includes provision for the potential of delivery noise to the rear. Delivery noise activities did not occur during the survey duration.

8.1.5 A BS 4142:2014 assessment has been undertaken with respect to noise breakout from the nearby mechanical plant noise sources and the potential noise emissions from delivery activities. While it is considered that all mechanical plant and delivery noise sources assessed are likely to present as a Significant Adverse Impact at the exterior façade to the rear, with the inclusion of an appropriate sound insulation strategy significant adverse impact can be avoided within the habitable rooms of the development site. We recommend therefore that System 4 MVHR is provided throughout the development site to minimise the potential for noise impact.

8.1.6 Building performance requirements with windows closed are based around one design category as presented in **Table 10** of this report, the proposed glazing performance is outlined below:

- 8.8 mm Pilkington Optiphon pane / 20 mm argon / 12.8 mm Pilkington Optiphon pane – R_w+C_{tr} 39 dB.

8.1.7 We recommend that the separating floor between the development site and the neighbouring sports bar is enhanced to achieve a sound insulation rating of not less than $D_{nt,w}+C_{tr}$ 55 dB(A). It is recommended that at this stage this is secured by way of an appropriately worded condition.

APPENDIX A - REPORT LIMITATIONS

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APPENDIX B - GLOSSARY

A-weighted sound pressure, p_A	Value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network. *NOTE: The A-weighting network modifies the electrical response of a sound level meter with frequency in approximately the same way as the sensitivity of the human hearing system.*
A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure in decibels (dBA).
Acoustic environment	Sound from all sound sources as modified by the environment [BS ISO 12913-1:2013].
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. *NOTE: The ambient sound comprises the residual sound and the specific sound when present.*
Ambient sound level, $L_a = L_{Aeq,T}$ (BS4142:2014)	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T *NOTE: The ambient sound level is a measure of the residual sound and the specific sound when present.*
Background sound	Underlying level of sound over a period, *T*, which might in part be an indication of relative quietness at a given location.
Background sound level, $L_{A90,T}$ (BS4142:2014)	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Break-in	Noise transmission into a structure from outside.
Break-out	Noise transmission from inside a structure to the outside.
Cross-talk	Noise transmission between one room and another room or space via a duct or other path.
C_{tr}	Correction term applied against the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) to provide a weighting against low frequency performance. *NOTE: The reference values used within the C_{tr} calculation are based on urban traffic noise.*
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time.
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ (BS4142:2014)	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time.
Equivalent sound absorption area of a room, A	Hypothetical area of a totally absorbing surface without diffraction effects, expressed in square metres (m2), which, if it were the only absorbing element in the room, would give the same reverberation time as the room under consideration
Facade level	Sound pressure level 1 m in front of the façade. *NOTE: Facade level measurements of L_{pA} are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the facade.*
Free-field level	Sound pressure level away from reflecting surfaces. *NOTE: Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source). Estimates of noise from aircraft overhead usually include a correction of 2 dB to allow for reflections from the ground.*

Impact sound pressure level, L_i	Average sound pressure level in a specific frequency band in a room below a floor when it is excited by a standard tapping machine or equivalent.
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants. *NOTE: The location(s) within the room at which the ambient indoor noise is to be measured or calculated ought to be considered.*
Measurement time interval, T_m (BS4142:2014)	Total time over which measurements are taken. *NOTE: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.*
Noise criteria	Numerical indices used to define design goals in a given space.
Noise rating, NR	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves.
Normalised impact sound pressure level, L_n	Impact sound pressure level normalized for a standard absorption area in the receiving room. *NOTE: Normalised impact sound pressure level is usually used to characterize the insulation of a floor in a laboratory against impact sound in a stated frequency band.*
Octave band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.
Percentile level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting "F", which is exceeded for *N*% of a specified time interval.
Reference time interval, T_r (BS4142:2014)	Specified interval over which the specific sound level is determined. *NOTE: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.*
Residual sound (BS4142:2014)	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.
Residual sound level, $L_r = L_{Aeq,T}$ (BS4142:2014)	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.
Rating level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise. *NOTE: This is used in BS 7445 and BS 4142 for rating industrial noise, where the noise is the specific noise from the source under investigation.*
Reverberation time, *T*	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped.
Sound exposure level, *LAE*	Level of a sound, of 1 s duration, that has the same sound energy as the actual noise event considered.
Sound level difference, *D*	Difference between the sound pressure level in the source room and the sound pressure level in the receiving room.
Sound pressure, *p*	Root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound.
Sound pressure level, L_p	Quantity of sound pressure, in decibels (dB).
Sound reduction index, *R*	Laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,Tr}$ (BS4142:2014)	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.
Specific sound source (BS4142:2014)	Sound source being assessed.
Standardised impact sound pressure level, L'_{nT}	Impact sound pressure level normalized to a reverberation time in the receiving room of 0.5 s.
Standardised level difference, D_{nT}	Difference in sound level between a pair of rooms, in a stated frequency band, normalized to a reference reverberation time of 0.5 s for dwellings.
Groundborne noise	Audible noise caused by the vibration of elements of a structure, for which the vibration propagation path from the source is partially or wholly through the ground. *NOTE Common sources of ground-borne noise include railways and heavy construction work on adjacent construction sites.*
Structure-borne noise	Audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements. *NOTE Common sources of structure-borne noise include building services plant, manufacturing machinery and construction or demolition of the structure.*
Third octave band	Band of frequencies in which the upper limit of the band is 2% times the frequency of the lower limit.
Weighted level difference, D_w	Single-number quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions. *NOTE Weighted level difference is used to characterize the insulation between rooms in a building as they are. Values cannot normally be compared with measurements made under other conditions (see BS EN ISO 717-1).*
Weighted normalised impact sound pressure level, $L'_{n,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or
Weighted standardised impact sound pressure level $L'_{nT,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted standardised level difference, $D_{nT,w}$	Single-number quantity that characterizes the airborne sound insulation between rooms.

Symbols

D_w	Weighted level difference (dB)
D_{nT}	Standardized level difference (dB)
$D_{nT,w}$	Weighted standardized level difference (dB)
L_{Amax}	Maximum noise level (dB)
$L_{Ar,Tr}$	Rating level (dB)
L_n	Normalised impact sound pressure level (dB)
L'_{nT}	Standardised impact sound pressure level (dB)
$L'_{nT,w}$	Weighted standardised impact sound pressure level (dB)
$L'_{n,w}$	Weighted normalised impact sound pressure level (dB)
L_p	Sound pressure level (dB)
L_{pA}	A-weighted sound pressure level (dB)
$L_{AN,T}$	Percentile level (dB)
L_{AE}	Sound exposure level (dB)
$LAeq,T$	Equivalent continuous A-weighted sound pressure level (dB)
p	Sound pressure (Pa)
p_A	A-weighted sound pressure (dB)
$p_{A(t)}$	Instantaneous A-weighted sound pressure (Pa)

R	Sound reduction index (dB)
R_w	Weighted sound reduction index (dB)
T	Time interval (also used for reverberation time) (s)
t_0	Reference time interval (s)

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