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REPORTS 4 PLANNING

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NOISE IMPACT ASSESSMENT

Commercial Unit adjacent to 41 Forest Road
Ollerton
Newark-on-Trent
Nottinghamshire
NG22 9PL

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NOISE IMPACT ASSESSMENT REPORT

41 FOREST ROAD, OLLERTON, NEWARK-ON-TRENT NG22 9PL

REPORT VERSION CONTROL:

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APPENDICES

1 INTRODUCTION

1.1.1 By instruction from Reports 4 Planning ('the client'), NoiseAir was commissioned to conduct a noise impact assessment (NIA) for the proposed change of use of existing vacant office space to seven self-contained flats to the first floor. The location for the proposal is: 41 Forest Road, Ollerton, Newark-on-Trent NG22 9PL, herein referred to as the 'development site'.

1.1.2 It is understood that there are three units on the ground floor currently operating as an off license, pharmacy and barber shop.

1.1.3 General limitations with respect to this NIA are presented in **Appendix A**.

1.2 Site Description

1.2.1 At the time of writing, the development site is a two storey building, the ground floor is operational, and the first floor is a former office that is currently vacant

1.2.2 The development site is located in Ollerton town centre which is considered to be a mix of residential and commercial units.

1.2.3 The site flanked to the east by a convenience store and to the north and west by Forest Road and Sherwood Drive. Forest Road is an 'A' road accommodating various traffic types and links Ollerton to Mansfield.

1.2.4 To the south of the site lies a residential housing estate accessed via Sherwood Drive.

1.2.5 It is also noted that there are four existing mechanical plant units to the rear of the existing off license on the corner of Sherwood Drive and Forest Road.

1.2.6 Given the existing use of the ground floor, the space at the south of the development site is considered likely to be used as a delivery area.

1.2.7 **Figure 1** presents an aerial image of the proposed development site with respect to the local area and its context.

Figure 1: Site aerial image.

1.3 Development Proposals

1.3.1 Proposals for the development site first floor are to convert the existing space into seven self-contained apartments.

1.3.2 **Figure 2** and **Figure 3** present the proposed ground and first floor plans provided at the time of writing.

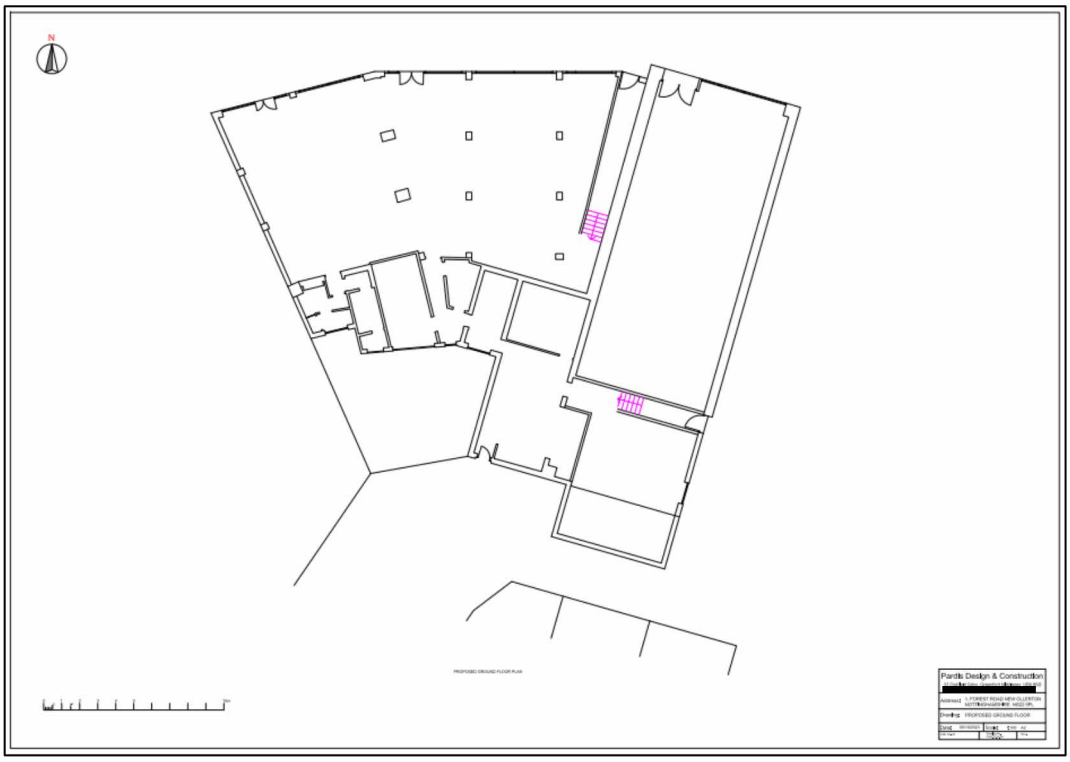

Figure 2: Proposed ground floor plan view of the development site

Figure 3: Proposed first floor plan view of the development site

1.3.3 Remaining Pardis Design & Construction drawings received at the time of writing are presented in **Appendix B.**

2 ASSESSMENT METHODOLOGY AND SCOPE OF WORKS

2.1 Planning Guidance and Noise

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

National Planning Policy Framework (NPPF), 2023;
Noise Policy Statement for England (NPSE), 2010;
Planning Practice Guidance – Noise, 2019;

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

National Planning Policy Framework [NPPF 2021]

2.1.3 The NPPF was published in March 2012 with the most recent version updated in January 2021. The NPPF sets out the Governments planning policies for England and how these are expected to be applied across a number of areas.

2.1.4 With respect to noise specifically, Section 15, Paragraph 174 of the NPPF 2021 states:

2.1.5 'Planning policies and decisions should contribute to and enhance the natural and local environment by:

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

2.1.6 The NPPF 2021 continues to state in Paragraph 185:

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

identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and;'

Noise Policy Statement for England [NPSE 2010]

2.1.7 The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to "*promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*".

2.1.8 This long-term vision is supported by the following aims; 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;
Where possible, contribute to the improvement of health and quality of life.

2.1.9 The NPSE also introduces the below categories with respect to 'adverse impacts'.

'NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur'.

2.1.10 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL, and it requires that all reasonable steps be taken to mitigate and minimise the adverse effects of noise. However, the requirement to mitigate and minimise the adverse effects of noise does not mean that such adverse effects cannot occur.

Planning Practice Guidance - Noise [PPG 2019]

2.1.11 The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) in March 2014 to support the NPPF[1].

2.1.12 The PPG advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated, and noise is listed as a specific category, the noise category was most recently updated on 22nd July 2019.

2.1.13 The PPG provides further detail about how the effect levels can be recognised. Above the NOEL noise becomes noticeable, however it has no adverse effect as it does not cause any change in behaviour or attitude. Once noise crosses the LOAEL threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise.

2.1.14 Increasing noise exposure further might cause the SOAEL threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

2.1.15 At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise.

2.1.16 **Table 1** summarises the noise exposure hierarchy outlined within the PPG.

[1] https://www.gov.uk/guidance/noise--2

Table 1: National Planning Practice Guidance noise exposure hierarchy			
Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g., turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g., avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g., auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.2 Consultation and Scope of Works

2.2.1 Given the context of the local area, it is considered that a detailed NIA is required. The NIA presented in this report is based on site specific data collected at the development site and assesses the likely impacts of the proposals with respect to existing local noise sources identified as follows:

Road traffic on the A6075 (Forest Road);
Road traffic on Sherwood Drive;
Service delivery yard located at the rear of the development site; and,
Condenser units located at the rear of the development site.

2.2.2 Where site data is not available, data from other reputable sources has been adopted.

2.3 Assessment Criteria

2.3.1 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 existing residents are unlikely to be exposed to noise levels which might breach the LOEL criteria.

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

2.3.3 Existing ambient noise impacting the development will be assessed with reference to BS 8233:2014.

2.3.4 Given the location of the existing condenser units and the likely use of the space at the south of the site for a service delivery yard, it is considered necessary to assess the potential noise impact of these existing noise sources with respect to the future residents of the proposed development. Typically, noise from these sources is commercial in nature and therefore the impact from these sources will be assessed utilising BS 4142:2014, a brief summary of which is provided below.

2.3.5 Given the existing commercial units to the ground floor, it is deemed necessary to assess the performance of the dividing floor. The assessment will seek to assess the floors performance and indicate whether it achieves a sound insulation performance such that the noise levels in the habitable rooms above achieve those presented in BS 8233:2014 and reproduced in **Table 2**.

Table 2: Summary of internal noise guidelines.			
Activity	**Location**	**07:00 – 23:00 hours**	**23:00 – 07:00 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 $L_{Aeq,8hour}$ 45 dB L_{AFmax}

2.3.6 It should be noted however that at the time of writing, the exact construction detail of the floor is not known.

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

2.4.1 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.

2.4.2 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.

2.4.3 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”.

2.4.4 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.

2.4.5 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 conducted primarily unattended fixed position noise monitoring between the 21st of November 2023 and the 24th of November 2023 at the development site (ML1 and ML2).

3.1.2 ML1, and ML2 are presented in **Figure 4** and described in **Table 3**.

Figure 4: Site layout plan and noise monitoring location – ML1 and ML2.

Table 3: Summary of Noise Monitoring Locations

Monitoring Location Number	Location Description	Time Period Monitored		Attended or Unattended Monitoring
		Start	End / Duration	
ML1	Protruding from the first floor window overlooking Forrest Road approximately 4.5m from local ground level	17:15 21/11/23	11:45 24/11/23	Unattended
ML2	Protruding from the first floor window at the rear of the existing building approximately 1.5m from existing roof level.	17:30 21/11/23	11:45 24/11/23	

3.1.3 ML1 was positioned to be representative of the existing ambient noise levels at the north façade of the proposed development site.

3.1.4 ML2 was positioned to be representative of the existing ambient and background noise levels at the south facade of the proposed development site.

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

3.1.6 The acoustic equipment was calibrated to comply with Section 4.2 of BS 7445-1:2003[2], before and after the noise monitoring periods.

3.1.7 Details of the SLMs and associated field calibration are presented in **Table 4**.

Table 4: Summary of the SLMs used for survey and associated field calibration

SLM (Serial Number)	Preamp (Serial Number	Microphone (Serial Number)	Start Calibration	End Calibration	Drift
NOR140 (1402826)	NOR1209 (15455)	NOR1225 (168289)	-25.5	-25.4	-0.1
1405016 (1405016)	NOR1209 (14242	NOR1225 (118503)	-25.9	-25.9	0.0

3.1.8 The weather conditions were noted to be as presented in **Table 5** during the site visits at the start and end of the monitoring period.

Table 5: Summary of weather conditions noted at the start and end of the monitoring duration.

Parameter	21st of November2023	24th of November2023
Roads (Wet / Dry)	Dry	Dry
Temperature (˚C)	8	6
Wind speed (ms-1) / direction	2.7 N	<5 NNW
Cloud Cover (Approx. %)	90	60
Humidity (%)	87	66

[2] BS 7445-2003 “Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.

3.1.9 A-weighted[3] L_{eq}[4] and L_{Fmax}[5] noise levels were measured at ML1 to comply with the requirements of BS 8233:2014. A-weighted[5] L_{90}[6] was also measured to provide further information

3.1.10 A-weighted[3] L_{eq}[4], and L_{Fmax}[5] noise levels were measured at ML2 to comply with the requirements of BS 8233:2014. A-weighted[3] L_{90}[7] was also measured at ML2 to comply with the requirements of BS 4142:2014.

3.1.11 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 the measured levels.

ML1

Dominant noise was that from road traffic on Forrest Road accommodating various vehicle types from cars to light commercial.

ML2

Dominant noise was that from operation of the existing condenser units. Secondary noise was that from road traffic on Sherwood Drive.

3.2 Measured Sound Levels

3.2.1 Following review of the weather data, it was noted that some of the weather during the monitoring period potentially influenced the measurements. Given this data from the periods of influential weather has been removed from the dataset and highlighted blue in **Figure 5** and **Figure 6**

3.2.2 Data presented in **Figure 5** details a level vs time graph of the recorded $L_{Aeq,T}$, L_{AFmax} and $L_{A90,T}$ sound levels over 15-minute time periods for the entire monitoring duration at ML1.

[3] An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.
[4] Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.
[5] An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.
[6] The noise level which is exceeded for 90% of the measurement period.
[7] The noise level which is exceeded for 90% of the measurement period.

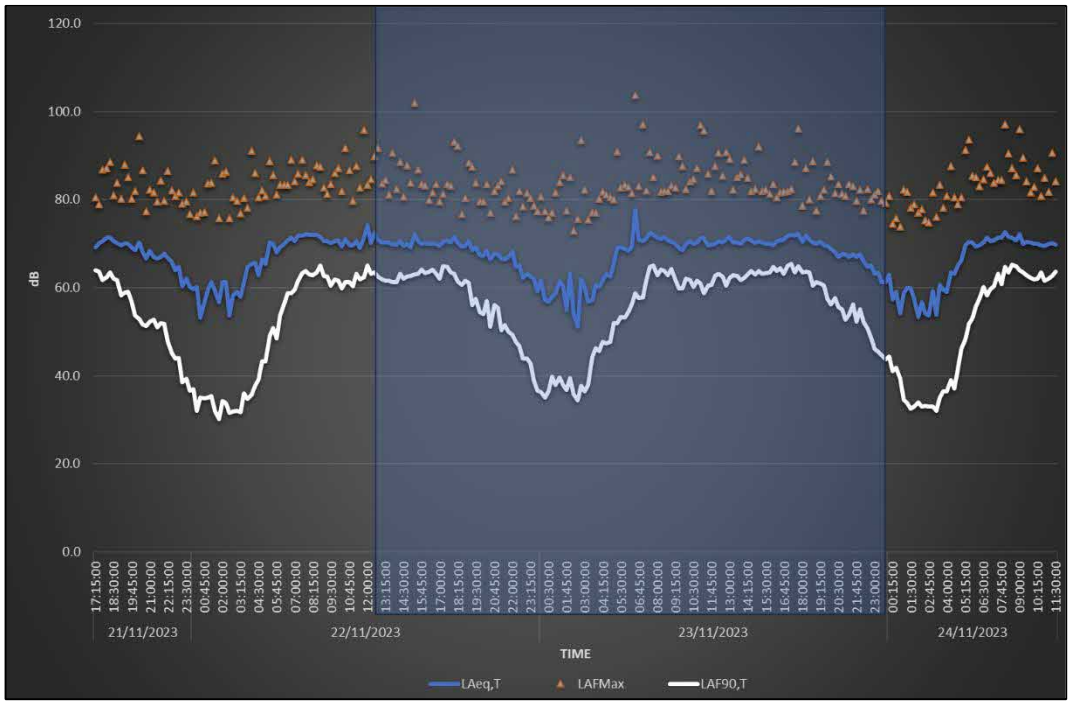

Figure 5: Level vs. time graph presenting $L_{Aeq,T}$, L_{AFmax} and $L_{A90,T}$ sound levels – ML1.

3.2.3 Data presented in **Figure 5** details a level vs time graph of the recorded $L_{Aeq,T}$, L_{AFmax} and $L_{A90,T}$ sound levels over 15-minute time periods for the entire monitoring duration at ML2.

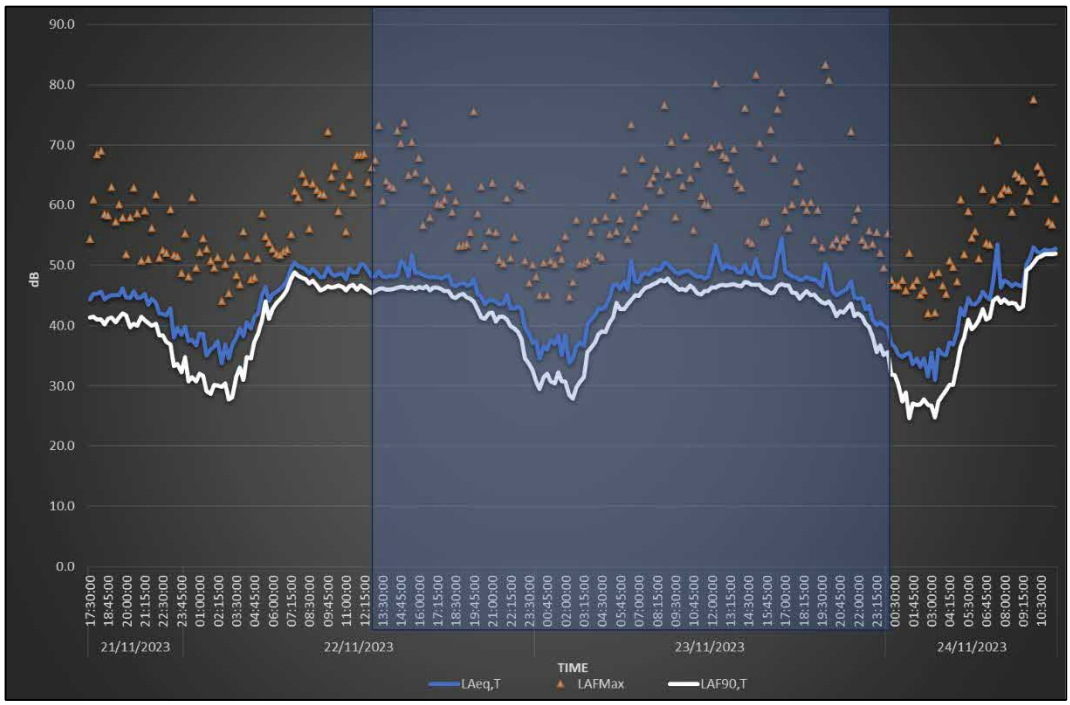

Figure 6: Level vs. time graph presenting $L_{Aeq,T}$, L_{AFmax} and $L_{A90,T}$ sound levels – ML2.

3.2.4 Given the location of the microphones being within 1m of the façade, to account for reflection and in accordance with BS 4142:2014, a -3dB correction is applied to the measurements.

3.2.5 The results for ML1 and ML2 are presented in **Table 6**.

Table 6: Average Measured Daytime / Night-time Noise Levels at ML1 and ML2

Monitoring Location	Time	Measured Noise Level		
		dB $L_{Aeq,16hour}$ / $L_{Aeq,8hour}$	dB $L_{Aeq,1hour}$ / $L_{Aeq,15mins}$	dB $L_{A90,1hour}$ / $L_{A90,15mins}$
ML1	07:00-23:00	66.0 – 68.2	63.3 – 68.9	44.2 – 60.6
	23:00-07:00	61.9 – 62.3	50.2 – 68.3	27.2 – 57.1
ML2	07:00-23:00	41.6 – 56.3	39.4 – 61.0	35.6 – 51.9
	23:00-07:00	36.6 – 38.4	28.0 – 43.7	21.6 – 42.1

3.2.6 The maximum noise level exceeded more than 10 times recorded during a single night-time period at ML1 and ML2, is presented in **Table 7**.

Table 7: Summary of the Maximum Night-time Noise Levels Exceeded More than 10 times in one Night-Time Period (Figures in dB L_{AFmax}).

Monitoring Location	Measured Maximum Noise Level Exceeded More than 20 times in one night-time period.
ML1	80.0
ML2	55.0

3.3 Typical Measured Background Sound Levels

3.3.1 Histograms presenting the distribution of existing background sound levels for the daytime and night-time at ML2 is presented in **Figure 7** and **Figure 8.**

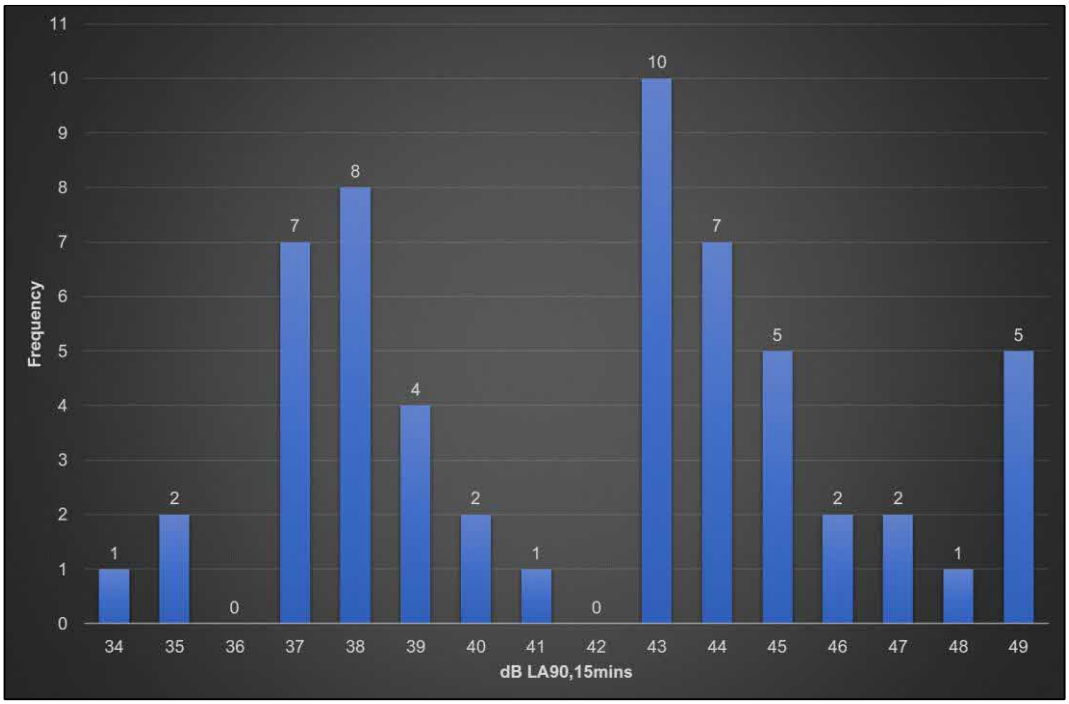

Figure 7: Histogram presenting frequency distribution of background noise readings at ML2 – Daytime.

3.3.2 It should be noted that given it was not possible to turn the source off for the purposes of residual measurements, the data informing **Figure 8** includes times when the specific source was operating.

3.3.3 The mode average daytime background noise level is 43 dB(A). However, in accordance with BS 4142:2014 for an existing specific sound source not operating continuously, background levels should be selected for the assessment should be adopted from the period immediately before or after the specific sound is operating. The excluded data due to weather influence restricts this and therefore a conservative background level of 37 dB(A) is selected for the BS 4142:2014 assessment.

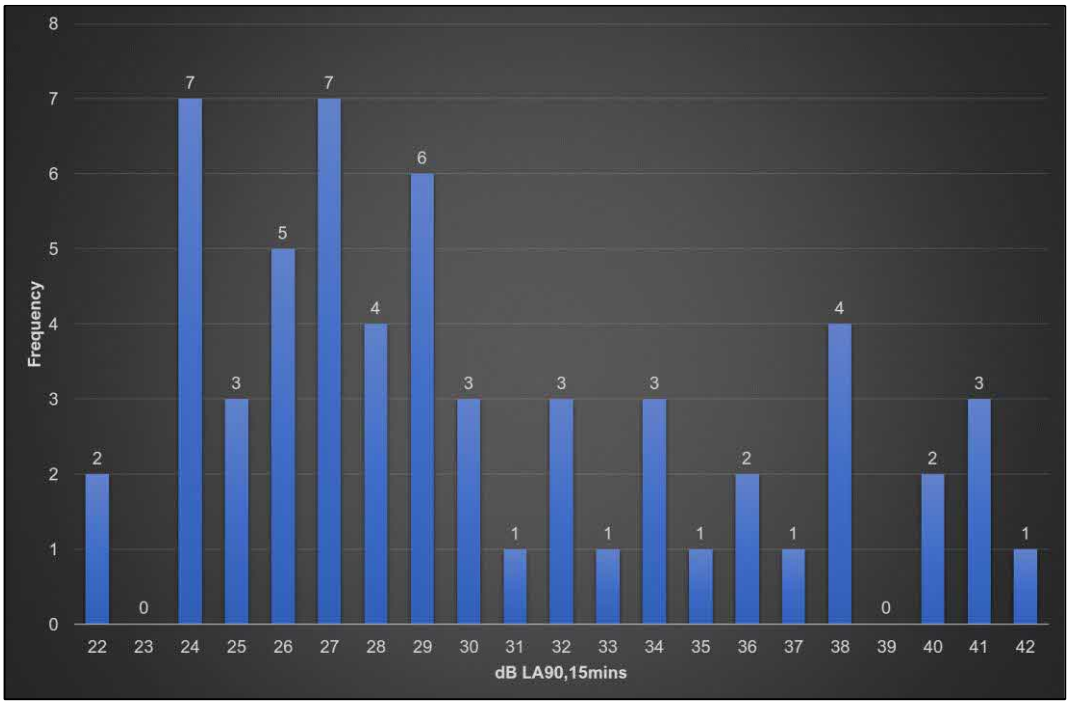

Figure 8: Histogram presenting frequency distribution of background noise readings at ML2 – Night-time.

3.3.4 The mode average daytime background noise level is 24 and 27 dB(A).

3.3.5 It should be noted that given it was not possible to turn the source off for the purposes of residual measurements, the data informing **Figure 8** includes times when the specific source was operating.

3.3.6 Therefore, 24 dB(A), therefore this level has been selected for the BS 4142:2014 assessment and is considered a conservative background level.

4 3D SOUND MODEL

4.1 Introduction

4.1.1 At the time of writing, the proposals for the development site are at planning stage and therefore in order to accurately conduct an NIA with respect to the new proposed noise sources it is considered that a 3D sound model should be utilised to calculate the predicted noise levels at selected receptor locations.

4.2 3D Sound Model

4.2.1 A 3D sound model has been constructed in SoundPLAN™ to calculate the predicted sound pressure levels at selected potential receiver facades. The model uses the calculation method from ISO 9613-2:1996[8] to account for the distance between the source and receiver and any screening or reflections provided by the surrounding buildings. The model is predominantly based on and calibrated against measured data. Where not available, data is adopted from other reputable sources.

4.2.2 Initial investigations indicate that given the location of the condensers being immediately next to a proposed noise sensitive room window, it is unlikely that mitigation at source will sufficiently reduce the noise to an acceptable level. Therefore, the model accounts for the relocation of the condensers and the shielding of them via a 2 m high acoustic barrier

4.2.3 The 3D noise model specifically includes noise breakout from the following sources:

Forrest Road traffic noise – This was modelled as a line source at 0.5 m from local ground level and calibrated to measured data at ML1.

Existing 4 no. condenser units (Relocated) – These were modelled as point sources at 1.5 m from local roof level and calibrated to previous NoiseAir data for existing condensers considered to be similar to those at the development site.

Sherwood Drive traffic noise – modelled as a line source at 0.5 m from local ground level. Given the onsite consultant observed this road to accommodate less traffic, the sound power assigned to the line source is adopted from the sound power from Forest Road traffic noise with a correction of -6 dB applied.

Service Yard – Modelled as an area source at 0.5 m from local ground level in the approximate area of the delivery operations.

[8] ISO9613-2:1996 “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation”

4.2.4 Noise contour plots illustrating the propagation of sound from source to receptor during the daytime and night-time ($L_{Aeq,16hour}$ / $L_{Aeq,8hour}$ / L_{AFmax}) condition is presented in **Figure 9** to **Figure 11**

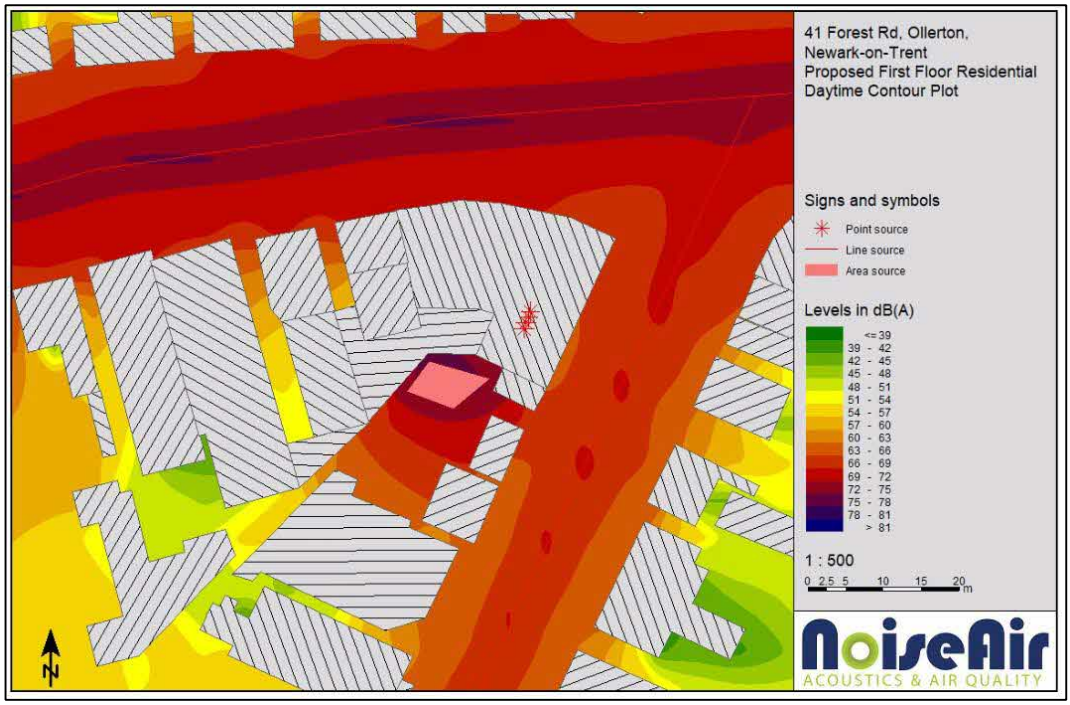

Figure 9: Noise contour plot illustration of the predicted propagation of sound from local noise sources to proposed NSRs for Daytime $L_{Aeq,16hour}$.

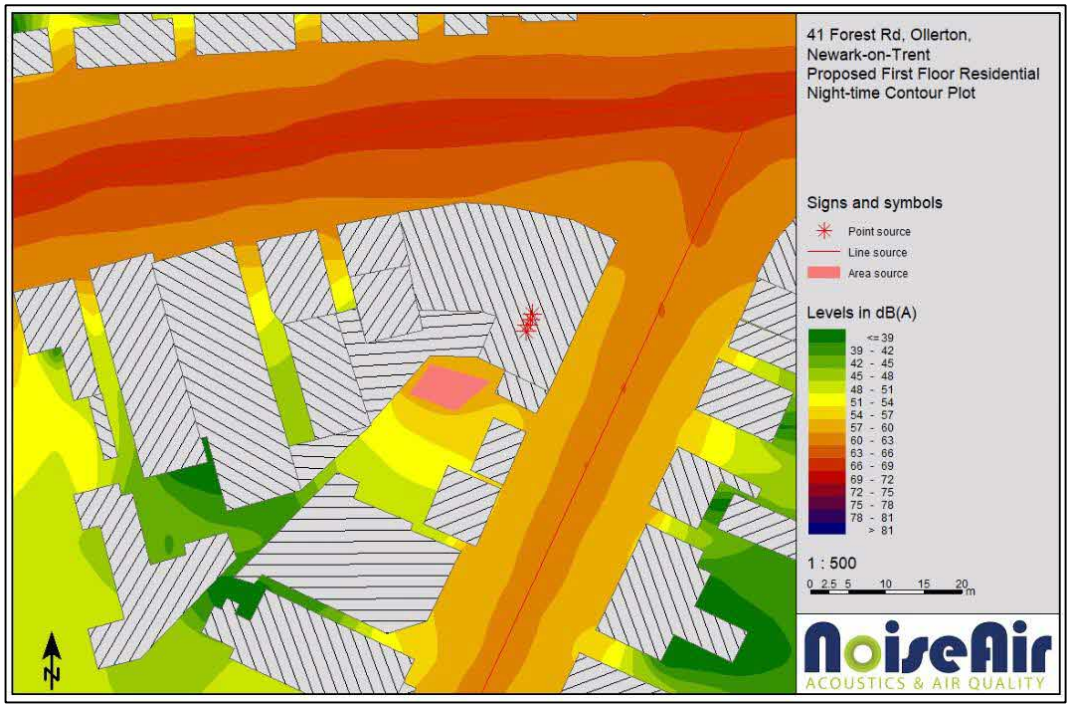

Figure 10: Noise contour plot illustration of the predicted propagation of sound from local noise sources to proposed NSRs for Night-time $L_{Aeq,8hour}$.

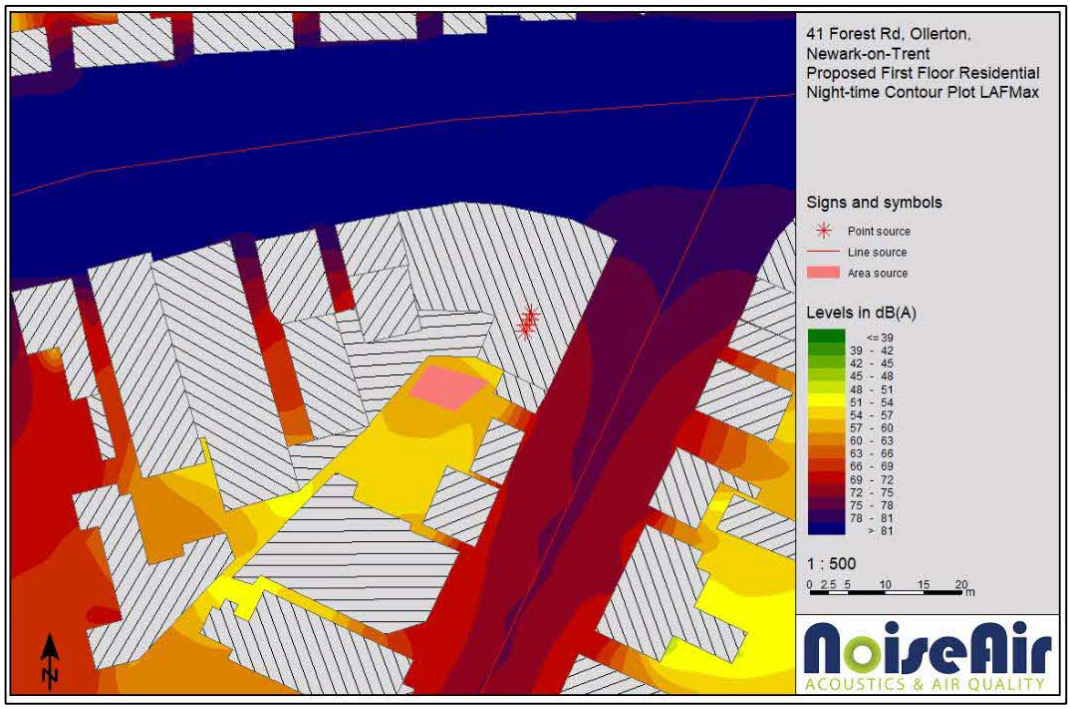

Figure 11: Noise contour plot illustration of the predicted propagation of sound from local noise sources to proposed NSRs for Night-time L_{AFmax}.

4.2.5 Selected receptors and predicted noise levels are presented in **Figure 12**.

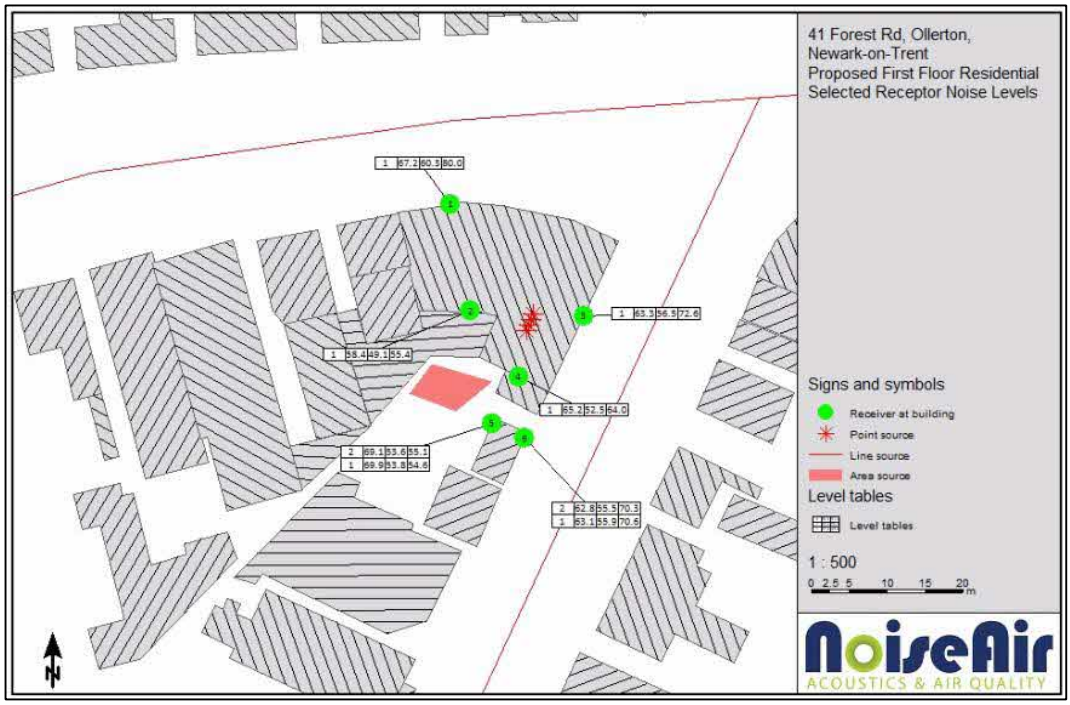

Figure 12*:* Illustration of the 3D sound model receptor sound pressure levels*.*

4.2.6 **Table 8** details the predicted noise levels at each receptor location.

Table 8: Predicted Receptor Noise Levels With Respect to All Noise Sources Modelled					
Receptor Number	**Façade Facing**	**Floor**	**Daytime dB $L_{Aeq,16hour}$**	**Night-time dB $L_{Aeq,8hour}$**	**Night-time dB L_{AFmax}**
1	N	GF	67.2	60.3	80.0
2	S	GF	58.4	49.1	55.4
3	SE	GF	63.3	56.5	72.6
4	SW	GF	65.2	52.5	64.0
5	NW	GF	69.9	53.8	54.6
		1.FL	69.1	53.6	55.1
6	SE	GF	63.1	55.9	70.6
		1.FL	62.8	55.5	70.3

4.2.7 Given the 3D model accounts for the relocation and mitigation of the existing condenser units, **Table 9** indicates the predicted difference at all investigated receptors between the existing scenario and the mitigated scenario.

Table 9: Predicted Receptor Noise Levels with Respect to the Condenser Units					
Receptor Number	**Façade Facing**	**Floor**	**Existing Location - Daytime dB $L_{Aeq,1hour}$**	**Revised Location + Barrier Mitigation - Daytime dB $L_{Aeq,1hour}$**	**Difference**
1	N	1.FL	26.9	39.3	12.4
2	S	1.FL	45.9	51.1	5.2
3	SE	1.FL	40.4	46.2	5.8
4	SW	1.FL	71.8	47.8	-24.0

4.2.8 **Table 9** indicates there to be a significant reduction of 30 dB(A) at receptor 4 with a 2 dB(A) reduction at receptor 2. While there is a slight increase in noise level at receptor 1, the dominant noise at this receptor is that from Forest Road.

4.2.9 **Table 10** details the predicted noise levels with respect to the 2 different commercial sources with a cumulative total at each receptor location.

Table 10: Predicted Receptor Noise Levels ($L_{Aeq,1hour}$ / $L_{Aeq,15mins}$)								
Rec #	**Façade Facing**	**Floor**	**Condensers**		**Service Yard**		**Cumulative**	
			Day	**Night**	**Day**	**Night**	**Day**	**Night**
1	N	1.FL	39.3	36.3	37.2	20.7	41.4	36.4
2	S	1.FL	51.1	48.1	57.3	40.8	58.2	48.8
3	SE	1.FL	46.2	43.2	40.1	23.6	47.2	43.3
4	SW	1.FL	47.8	44.8	64.6	48.1	64.7	49.8

4.2.10 **Table 10** indicates that following the introduction of mitigation and relocation of the condenser units, the commercial noise during the daytime at the worst affected receptor

(receptor 4) is dominated by the noise from the service yard. During the night-time, the service yard is the still the dominant source, however, operations in the service yard reduce.

5 SITE NOISE RISK ASSESSMENT

5.1 BS 8233:2014 Assessment of Noise Levels in Living Rooms and Bedrooms

5.1.1 The predicted noise levels at the façades of the proposed building structures, as detailed in **Table 8** for the daytime and night-time period, together with the level of attenuation required in accordance with BS 8233: 2014 are presented in **Table 11**.

Table 11: Level of Attenuation Required to Achieve the Internal Noise Guideline Levels.

Façade	Daytime ($L_{Aeq,16hours}$) / Night-Time ($L_{Aeq,8hours}$ / L_{AFmax})	Worst Case Noise Level at the Façade of the Property	Worst Case Level of Attenuation Required
S	Daytime $L_{Aeq,16hours}$	58	23*
	Night-Time $L_{Aeq,8hours}$	49	19
	Night-Time L_{AFmax}	55	10
All remaining	Daytime $L_{Aeq,16hours}$	67	32
	Night-Time $L_{Aeq,8hours}$	60	30
	Night-Time L_{AFmax}	80	35*
*Indicates the worst case façade noise levels at each façade			

5.2 BS 4142:2014 Assessment for the Service Yard

5.2.1 As indicated in **Table 10**, the worst affected receptor is receptor 4. Given the potential impact of noise from the service yard operations, a BS 4142:2014 has been conducted with respect to the proposed the development site.

5.3 Specific Sound Level

5.3.1 **T**he worst case predicted specific sound level for receptor 4 during the daytime and night-time is 65 dB(A) and 48 dB(A), respectively.

5.4 Background Sound Level

5.4.1 The typical background sound levels adopted for this assessment are 37 dB $L_{AF90,1hour}$ for the daytime and 24 dB $L_{AF90,15min}$ for the night-time.

5.5 Character Corrections

5.5.1 Given the service yard was not in operation at the time of the site visit, an objective assessment of the character of the noise is provided and has yielded the application of the following character corrections:

Tonality – 0 dB. Operations in service yards typically involve delivery vehicle engine and reverse tones. While these activities create their own independent tones, typically they are only for short periods of time. Therefore, it is reasoned that a correction is not applied in this case.

Impulsivity – 0 dB. Impulsive character is typically associated with rapid increases in noise. The deliveries at this site are not likely to present impulsive noise character.

Intermittency - +3dB – Typically during delivery operations, the cycle will involve the removal of goods from the delivery vehicle to be taken inside the shop. Given this, the noise of the operations is likely to be intermittent.

5.6 Initial Assessment

5.6.1 The BS 4142:2014 initial assessment based on the calculated noise breakout levels with respect to the worst and best case NSR façade is presented in **Table 12.**

Table 12: BS 4142:2014 Initial Assessment at Receptor 4

Quantity	Sound level dB	
	Daytime Pre-mitigation	Night-time pre-mitigation
Typical Background Sound Level, $L_{A90,T}$	37	24
Worst Case Specific sound level, $L_{Aeq,T}$	65	50
Acoustic feature correction	+3	
Rating Level	68	53
Excess of Rating Level over Background Sound Level	+31	+29
Initial Assessment impact	Significantly Adverse	

BS 4142:2014 Assessment Context and Outcome

5.6.2 The initial assessment predicts that the current operations cause a significant adverse impact at the NSR during the daytime and night-time, depending on the context.

5.6.3 While the initial assessment indicates significant adverse impact, there are existing receptors as indicated in Figure 12 (receptors 5 and 6) that are currently subjected to the noise from the service yard.

5.6.4 The initial assessment outcome is based on an excess rating level at the façade of the receptor. An important contextual consideration is to assess the impact internally. The sound insulation scheme in section 6 recommends mechanical ventilation which will allow the windows to remain closed. It is therefore reasoned that with the introduction of the recommended glazing and ventilation system, an adverse impact internally can be avoided.

5.7 BS 4142:2014 Assessment for the Condensers

5.7.1 As indicated in **Table 9**, the worst affected receptor is receptor 4. Given the potential impact of noise from the condenser operations, a BS 4142:2014 has been conducted with respect to the proposed the development site.

5.8 Specific Sound Level

5.8.1 **T**he predicted worst case predicted specific sound level for receptor 4 during the daytime for the pre mitigation scenario is 72 dB(A). With the mitigation measures recommended, the predicted specific sound is predicted to reduce to 48 dB(A).

5.9 Character Corrections

5.9.1 Given the condenser were not operating at the time of the site visit, an objective assessment of the character of the noise is provided and has yielded the application of the following character corrections:

Tonality – Tonal character is typically associated with condenser operations and is likely to be highly perceptible at the NSR in the pre mitigation scenario. This is likely to reduce to just perceptible in the post mitigation scenario.

Impulsivity – Impulsive character is typically associated with rapid increases in noise. Condenser operations are not typical of bangs and crashes and therefore no correction is applied.

Intermittency – The operation of the condensers is not considered intermittent with respect to the 1 hour and 15 minute reference periods for the daytime and night-time, respectively therefore a correction is not applied.

5.10 Initial Assessment

5.10.1 The BS 4142:2014 initial assessment based on the calculated noise breakout levels with respect to the worst and best case NSR façade is presented in **Table 13.**

Table 13: BS 4142:2014 Initial Assessment at Receptor 4		
Quantity	**Sound level dB**	
	Pre-mitigation	**Post-mitigation**
Typical Background Sound Level, $L_{A90,T}$	37	
Worst Case Specific sound level, $L_{Aeq,T}$	72	48
Acoustic feature correction	+6	+2
Rating Level	78	50
Excess of Rating Level over Background Sound Level	+41	+13
Initial Assessment impact	Significantly Adverse	Significantly Adverse

BS 4142:2014 Assessment Context and Outcome

5.10.2 The initial assessment predicts that a significant adverse impact is likely in the pre and post mitigation scenarios depending on the context.

5.10.3 The context in this case is that while the pre mitigation scenario is likely to present a significant adverse impact at the proposed receptor, the existing receptors 5 and 6 are currently subjected to this impact.

5.10.4 It is therefore reasoned that while the post mitigation scenario is presenting as significant adverse impact, the rating level at the façade is predicted to reduce significantly. This therefore provides a significant improvement with respect to the existing situation.

Uncertainty

5.10.5 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.

5.10.6 The SLM used was a Norsonic Class 1 SLM, it is generally recognised that Class 1 SLM's offer an uncertainty of ±1.0 dB(A). The instrumentation used for the survey has been calibrated by UKAS approved laboratories.

5.10.7 The sound levels measured (which include busier and quieter periods) are considered typical for the area.

5.10.8 Wind speeds during the measurement period adopted for the assessment 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.

5.10.9 The specific noise level has been calculated using a 3D sound model, however a conservative assessment of background levels and rating levels has been conducted.

5.10.10 It is therefore considered that in this instance the uncertainty of the calculations may have minimal influence on the outcome of this assessment, however no further steps are required to increase confidence in the results.

6 SOUND INSULATION SCHEME

6.1 Building Envelope Requirements – Windows Closed

6.1.1 Proposals for the development site at the time of writing outline residential use, specifically in the form of dwellings covering the first floor of the development site. The proposed layout is presented in **Appendix B.**

6.1.2 Noise sensitive rooms are proposed to all facades of the property. Therefore, internal noise levels are required to not exceed 35 dB $L_{Aeq,16hours}$ during the daytime hours in all noise sensitive habitable rooms and 30 dB $L_{Aeq,8hours}$ and 45 dB L_{AFmax} during the night-time hours in bedrooms.

6.1.3 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.

6.1.4 Based on the design details forwarded, worst case façade attenuation calculations have been conducted based on a typical bedroom / living room from the drawings and in accordance with BS EN ISO 12354-3:2017.

6.1.5 Given the documentation received at the time of writing does not indicate the construction detail of the external walls and roof, reasonable assumptions have been made in order to calculate the likely sound reduction of the building envelope.

6.1.6 Initial investigations indicate that given the elevated L_{AFMax} noise levels at the north and southeast facades and the exposure of the south and southwest facades to the commercial noise sources, utilising acoustically treated ventilation would require a high specification glazing and ventilation system.

6.1.7 Therefore, calculations are based on a glazing / ventilation system that adopts an active ventilation system (such as mechanical ventilation with heat recovery, MVHR) throughout all noise sensitive rooms.

6.1.8 Calculations indicate 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 14**.

Table 14: Summary of Building Envelope Performance Requirements – All facades		
Walls	47 R_w+C_{tr}	BS8233 Example - Brick and block external wall
Glazing	33 R_w+C_{tr}	10:12:6 mm
Roof	35 R_w+C_{tr}	Flat timber-joist roof, asphalt on boarding, 12mm plasterboard and 100mm quilt

6.2 Ventilation Requirements

6.2.1 It is recommended that the acoustic ventilation proposed at the site should, as a minimum, comply with Building Regulations Approved Document F1 Means of Ventilation and British Standard BS 5925 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.

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

6.2.3 Given the elevated excess rating level presented in the BS 4142:2014 assessment, specifically at the rear facades of the development site, it is recommended that all noise sensitive rooms on these facades are equipped with an active ventilation system. It should be noted however that ventilation requirements for future occupants of the proposed development are outside the scope of this report.

6.2.4 It is also recommended that given the elevated L_{AFMax} noise level during the night-time at the north and southeast facades, all noise sensitive rooms on these façades are equipped with an active ventilation system.

6.2.5 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.

6.2.6 Where mechanical ventilation may be the preferred choice for noise sensitive rooms the system should have a total noise output within each habitable room which complies with NR25 L_{eq} noise rating curve.

7 ADDITIONAL RECOMMENDATIONS

7.1 Divisional Floor Requirements Between the Ground Floor and First Floor

7.1.1 The ground floor uses, being predominantly retail are not considered to be onerous in terms of noise generation and are likely to be confined to the daytime hours. It is therefore considered that standard building regulation sound insulation requirements for the separating floor for a change of use are considered to be appropriate in this case.

7.2 Condenser Mitigation and Relocation

7.2.1 NoiseAir recommend that the condensers are relocated to roof level as indicated by the point sources in **Figure 12** with a 2 m high acoustic barrier constructed as presented in **Figure 13**.

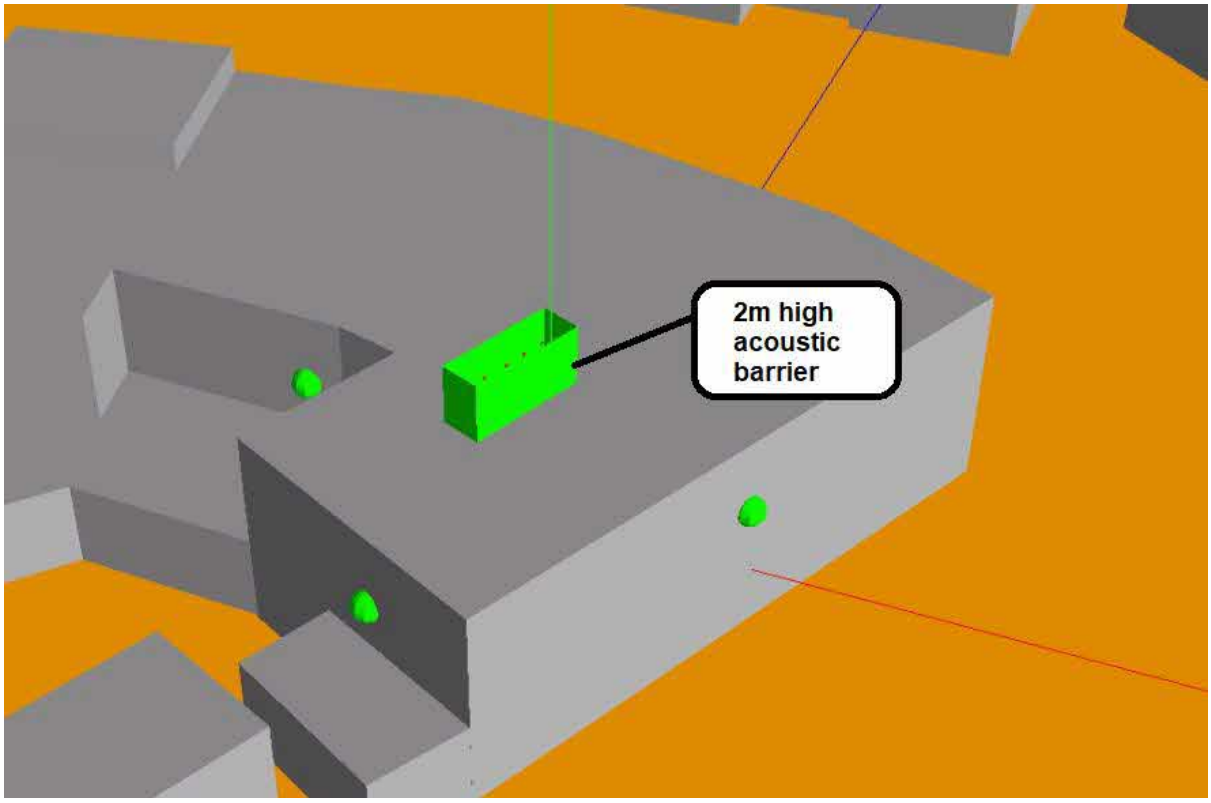

Figure 13*:* Recommended location of condensers and acoustic barrier

7.2.2 It is essential that the barrier is imperforate and achieves a surface density of at least 10 kg / m^2. Further to this the top of the barrier must be at a height that is at least 0.5 m above the top of the highest condenser unit to ensure that the direct line of sight between the condenser(s) and the NSR is broken.

7.2.3 Operation of condensers uses moving mechanical parts which can be associated with vibration. Given the units are attached to the structure, this vibration may lead to flanking

and transfer of sound through the structure. It is therefore recommended that the units are mounted on independent anti-vibration mounts.

7.2.4 It should be noted that while the acoustic barrier and relocation indicates a moderate to significant improvement. However, while noise emissions incident on existing NSRs from the condensers is likely to reduce (with implementation of the recommendations) a residual risk may still persist, particularly during times of low background noise, with respect to existing NSRs.

7.2.5 Should additional noise abatement be required an acoustic louvred enclosure system by proprietary design should be employed. The acoustic enclosure performance should be identified under separate cover.

8 CONCLUSIONS

8.1.1 NoiseAir has conducted a noise impact assessment with respect to the proposed development at the location: 41 Forest Road, Ollerton, Newark-on-Trent NG22 9PL.

8.1.2 The initial noise sources affecting the proposed development site are road traffic to the north and southeast facades and condenser and service yard operations to the south and southwest facades.

8.1.3 A BS 8233:2014 assessment has been conducted to assess the ambient noise incident on the facades. Following this, a BS 4142:2014 assessment has been conducted to assess the commercial noise sources potential for impact at the noise sensitive receptors.

8.1.4 A sound insulation scheme has been proposed for the development which recommends the installation of a mechanical ventilation system throughout habitable rooms. This is predominantly due to the potential for delivery noise to the south and southwest facades and night-time L_{AFMax} event to the north and southeast facades.

8.1.5 Given the close proximity of the existing condensers to a proposed bedroom window we also recommend that the condensers are moved to the building roof within an acoustic barrier to all sides. The recommendations are also likely to reduce the noise impact at the existing noise sensitive receptors.

8.1.6 The following building performance requirements with windows in the closed position are based on the building envelope design as presented in section 6 and are predicted to mitigate the noise such that the noise required noise levels internally are achieved**.** The designs are summarised as follows:

> **Roof and Exterior Walls -** Roof achieving 35 dB $R_W+C_{tr,}$ exterior wall achieving 47 dB R_W+C_{tr};
> **All façades -** glazing achieving at least 33 dB R_W+C_{tr} and all rooms equipped with an active ventilation system in compliance with NR25.

8.1.7 The dividing floor between the commercial units on the ground floor and the residential on the first floor has been considered. Given the operations in the retail units are not considered to be onerous in terms of acoustic impact and likely to operate in the daytime only, standard building regulation sound insulation is likely to be sufficient.

APPENDIX A - REPORT LIMITATIONS

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APPENDIX B – EXISTING AND PROPOSED DRAWINGS


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EXISTING FRONT ELEVATION
EXISTING SIDE ELEVATION
EXISTING REAR ELEVATION
Pardis Design & Construction
Drawing: EXISTING ELEVATIONS


N
EXISTING FIRST FLOOR PLAN
Pardis Design & Construction
Drawing: EXISTING FIRST FLOOR PLAN


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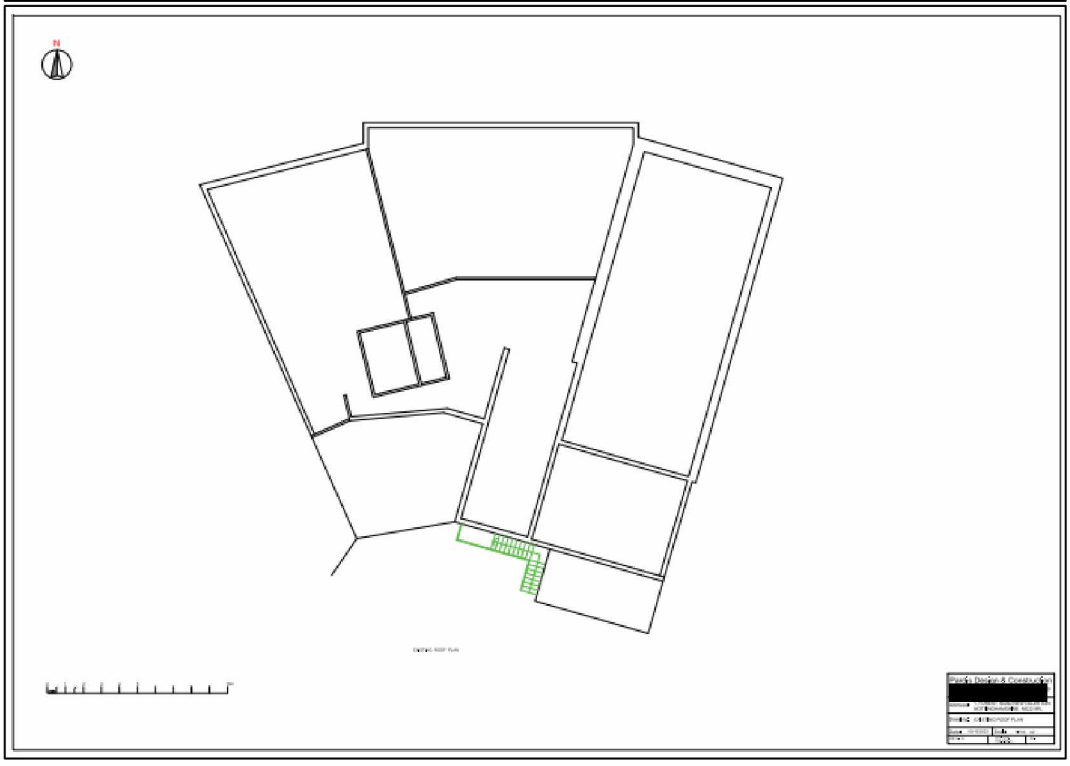
Pardis Design & Construction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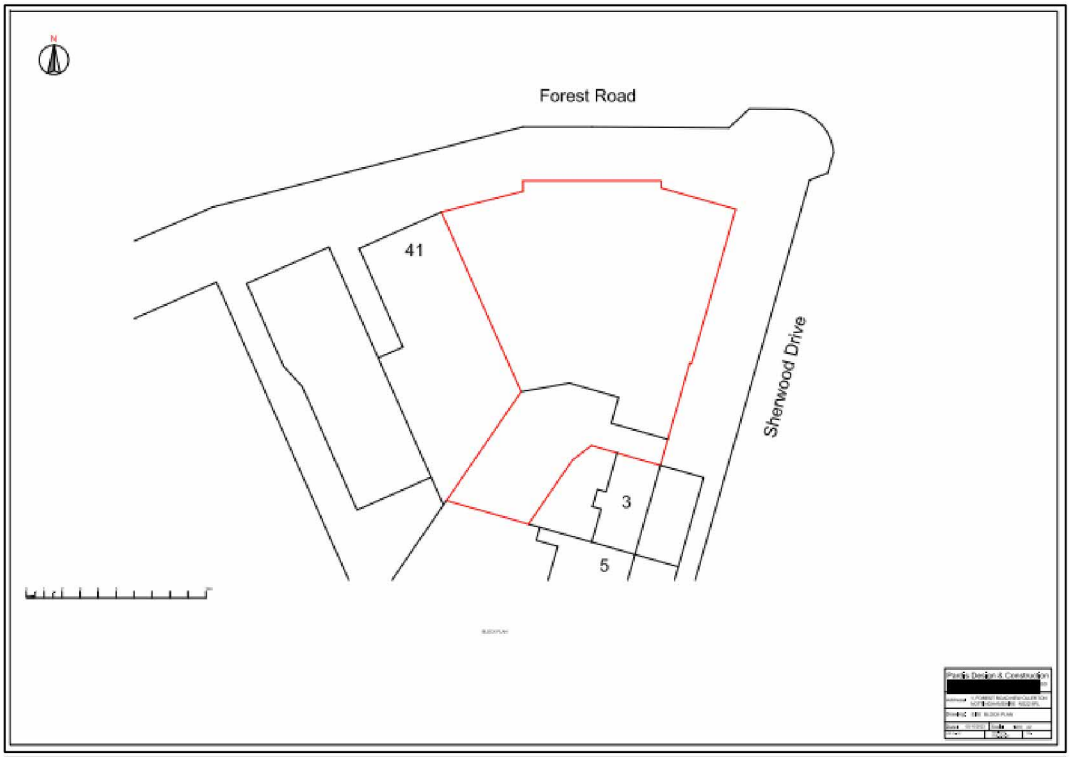
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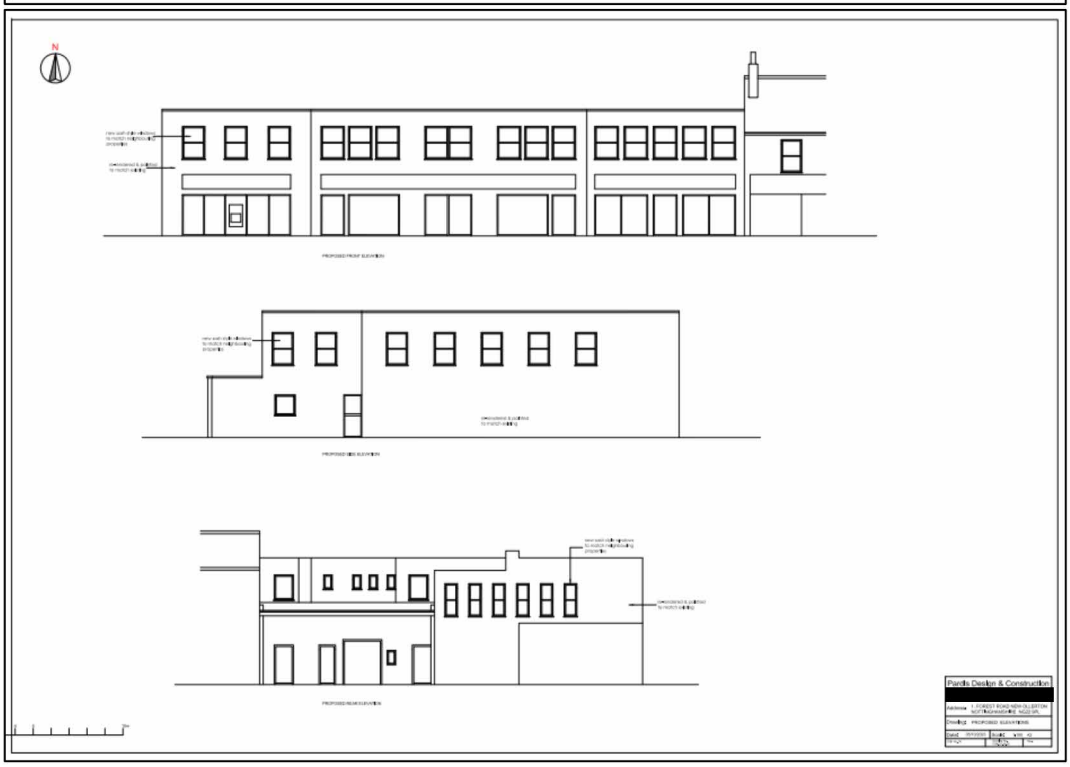
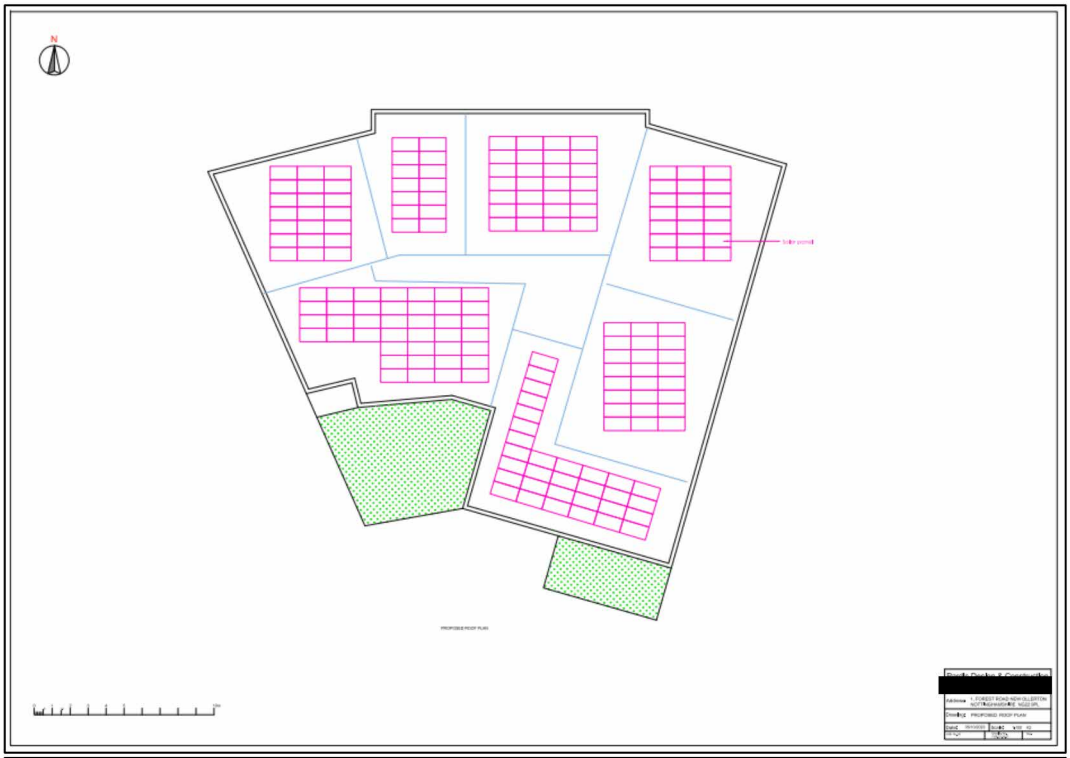
Sherwood Drive
3
5

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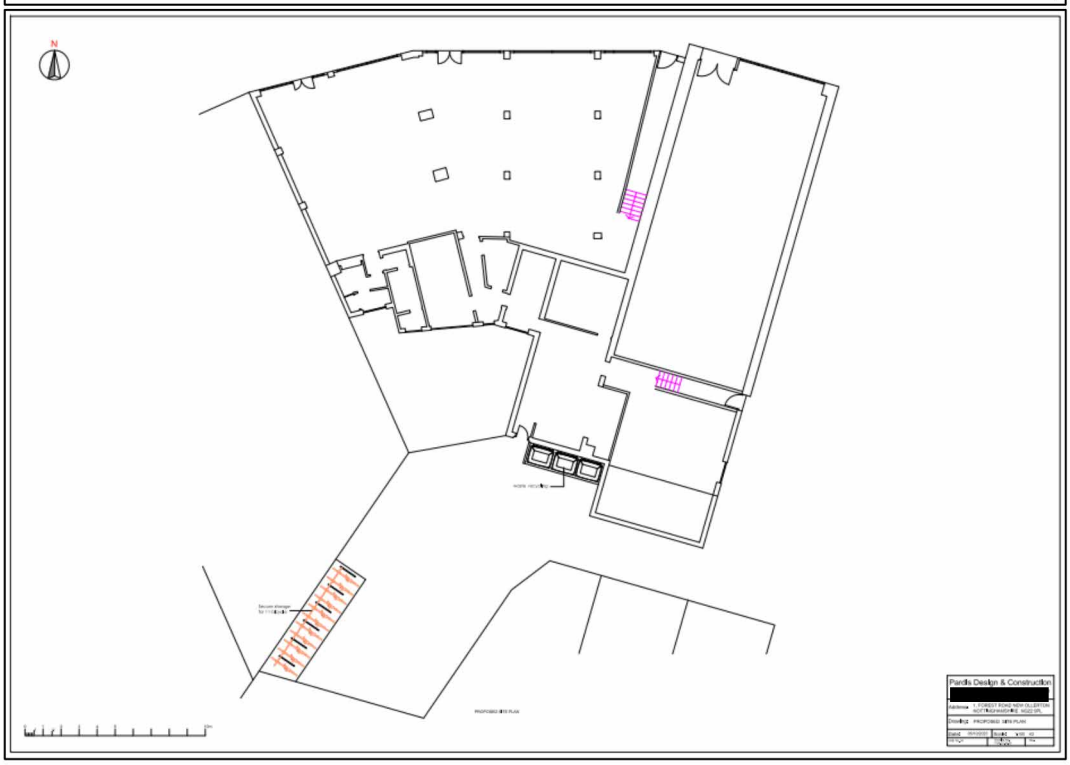
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APPENDIX C - GLOSSARY

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, $L_a = L_{Aeq,T}$ (BS 4142:2014)	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, $L_{A90,T}$ (BS 4142:2014)	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, $L_{Aeq,T}$ (BS 4142:2014)	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 (BS 4142:2014)	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 (BS 4142:2014)	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 (BS 4142:2014)	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, $L_r = L_{Aeq,T}$ (BS 4142:2014)	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, L_{AE}	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, $L_S = L_{Aeq,Tr}$ (BS 4142:2014)	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 (BS 4142:2014)	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)