
Noise Impact Assessment

Proposed Residential Development – Waterfold Lane, Heap Bridge

Client: David Gibbons

Reference: 22.007.1.R2

Issue Date: 6 August 2022



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Project: Proposed Residential Development – Waterfold Lane, Heap Bridge

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Prepared by	John Goodwin MIOA	John Goodwin MIOA		
Position	Director	Director		
Reviewed by	Martyn Parker AMIOA	Martyn Parker AMIOA		
Position	Senior Consultant	Senior Consultant		
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Professional Consult Limited

hello@professionalconsult.co.uk

07704 672683

www.professionalconsult.co.uk

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EXECUTIVE SUMMARY

This Assessment has been undertaken to identify any key surrounding noise sources within the vicinity of the Site which have the potential to produce noise impacts upon the noise-sensitive Development. Accordingly, this Assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance in addition to appropriate British Standards and guidance documents relevant to the assessment of noise impacts and these are detailed in Section 2.

This Assessment has relied upon a road traffic noise survey completed for the M66 over a full weekday period in order to accurately quantify the level of noise associated with the motorway.

This Assessment has also shown that internal noise levels across the Development can meet the daytime and night-time noise criteria levels through the use of upgraded glazing and alternative ventilation in form of a window frame-mounted acoustic trickle ventilator.

The Development proposal has been informed by high-level acoustic design advice in order to ensure that there are no external private amenity areas which may have unduly high levels of road traffic present.

In summary, where the recommended noise mitigation measures are implemented as identified, then the sound climate which future occupiers of the Development will be exposed to will accord with the 'No Observed Adverse Effect Level' as detailed in the PPG and as such, noise should not be deemed to be a determining factor in the granting of planning permission for this Site.

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1 INTRODUCTION

1.1 Appointment

- 1.1.1 Professional Consult Limited was instructed by David Gibbons ('the Applicant'), to prepare a Noise Impact Assessment ('the Assessment') for a proposed residential development ('the Development') on a parcel of land located off Waterfold Lane in Heywood BL9 to be referred to hereafter as 'the Site'.

1.2 The Development

- 1.2.1 The Development will comprise of two blocks of residential apartments, each over 3-storeys with associated infrastructure. It is understood that there will be no balconies associated with the apartments.
- 1.2.2 The Development proposal has been informed by high-level acoustic design advice in order to ensure that there are no external private amenity areas which may have unduly high levels of road traffic present.

1.3 The Site, Locality & Existing Soundscape

- 1.3.1 The Site is currently comprised of open land, formerly occupied by Waterfold Mill.
- 1.3.2 The neighbouring land uses comprise of the M66 to the west, the River Roch to the north and north east and Waterfold Lane to the east and south.
- 1.3.3 The soundscape at the Site is comprised predominantly of road traffic noise associated with road traffic movements on the M66 to the west.

1.4 Purpose of Assessment

- 1.4.1 This Assessment has been undertaken to identify any key surrounding noise sources within the vicinity of the Site which have the potential to produce noise impacts upon the noise-sensitive Development. Accordingly, this Assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance in addition to appropriate British Standards and guidance documents relevant to the assessment of noise impacts and these are detailed in Section 2.
- 1.4.2 This Assessment has relied upon a road traffic noise survey completed for the M66 over a full weekday period in order to accurately quantify the level of noise associated with the motorway.

1.5 Limitations

- 1.5.1 The limitations of this report are presented in Appendix 1.

1.6 Confidentiality

- 1.6.1 Professional Consult has prepared this report solely for the use of the Client. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Professional Consult; a charge may be levied against such approval.

2 POLICY & GUIDANCE

2.1 National Planning Policy Framework & National Planning Practice Guidance

- 2.1.1 The Government updated the National Planning Policy Framework (NPPF) on 20th July 2021 and its associated National Planning Practice Guidance (NPPG) on 24th June 2021. Together, the NPPF and NPPG set out what the Government expects of local authorities. The overall aim is to ensure the planning system allows land to be used for new homes and jobs, while protecting valuable natural and historic environments.
- 2.1.2 The NPPG adds further context to the NPPF and it is intended that the two documents should be read together.
- 2.1.3 Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.
- 2.1.4 Local planning authorities' plan-making and decision making should take account of the acoustic environment and in doing so consider:
- ② Whether or not a significant adverse effect is occurring or likely to occur;
 - ② Whether or not an adverse effect is occurring or likely to occur; and
 - ② Whether or not a good standard of amenity can be achieved.
- 2.1.5 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.
- 2.1.6 The Observed Effect Levels are as follows:
- ② Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
 - ② Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
 - ② No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.
- 2.1.7 Table 1 summarises the noise exposure hierarchy, based on the likely average response.

Table 1. 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
<i>Lowest Observed Adverse Effect Level</i>			
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 some reported 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
<i>Significant Observed Adverse Effect Level</i>			
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 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

2.1.8 The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.

2.1.9 These factors include:

- ② The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day - this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;
- ② For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;
- ② the spectral content of the noise and the general character of the noise. The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.

2.1.10 More specific factors to consider when relevant:

- ② where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;
- ② Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on

windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations; and

- ② If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.2 BS8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’

Noise Criteria Limits

- 2.2.1 The scope of this standard is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.
- 2.2.2 The standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in Table 2.

Table 2. BS8233:2014 Internal Target Noise Levels

Criterion	Typical Situation	Design $L_{Aeq,T}$ (dB)
Suitable resting / sleeping conditions	Living Room	35
	Bedroom*	30
*For a Reasonable standard in bedrooms at night, individual noise events (measured with fast time weighting) should not exceed 45dB L_{max}		

- 2.2.3 BS8233 goes on to recommend noise levels for gardens as follows:

“It is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted”.

- 2.2.4 BS8233 goes on to say:

“In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited”.

- 2.2.5 With regards to external noise within balcony areas, BS8233: 2014 provides the following advice:

“Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels”

Ventilation Requirements

- 2.2.6 Where a partially open window cannot be relied upon to provide an adequate level of facade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS8233 states:

“The Building Regulations’ supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant’s choice.

Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans.”

Section 7.7.2 states:

“NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.”

2.3 Local Authority Guidance and Criteria – Rochdale Borough Council’s Environmental Health Department

- 2.3.1 Professional Consult contacted Rochdale Borough Council’s Environmental Health Department on 21st January 2022 and the following consultation was provided:

‘We have been approached by a client to assist with providing a Noise Impact Assessment to support a proposed residential development on a parcel of land located off Waterfold Lane in Heywood.

I have attached the proposed layout and I am inviting comment in terms of the proposed layout as shown – whether or not this would be acceptable to the Council?

We will be undertaking a full 24-hr weekday road traffic noise survey for the M66 motorway and the Assessment criteria will revolve around the noise criteria limits presented in BS8233:2014. I am also aware of Rochdale’s acceptance to exceed the 55dB noise criteria limit for gardens on Sites such as this, which adjoin a strategic transport network, however the Council do request that noise levels from road traffic cannot exceed 58dB LAeq,16hr, or support for the application from Environmental Health will be removed.

If you have any comments on the layout, then please advise at your earliest convenience.’

3 NOISE SURVEYS

3.1 Road Traffic Noise Survey

3.1.1 Professional Consult has completed a 24-hour road traffic noise survey for the M66 motorway at a location approximately 174m to the south of the Site. This off-Site location was necessary given temporary construction works were being undertaken on the Site and would have interfered with the road traffic noise survey.

② Noise Measurement Position 1: 13:00 27th January – 13:00 28th January 2022. The microphone of the sound level meter was located 26m from the centre-line of motorway in free-field conditions.

3.1.2 Table 3 summarises the measured noise levels.

Table 3. Summary of Measured Road Traffic Noise Levels

Road	Measurement Period	Measured Free-field Sound Pressure Level (dB)			Measurement Distance from Centre of M66 (m)
		L _{Aeq,16hr}	L _{Aeq,8hr}	10 th Highest L _{Amax,fast}	
M66 Motorway	24hr	79.7	72.7	85.1	26

3.2 Survey Equipment

3.2.1 The following equipment was used for the Noise Surveys.

Table 4. Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer & Type No	Serial No.	Calibration Due Date
NMP1	Sound Level Meter	01dB Fusion	12211	19 January 2024
	Pre-amplifier	01dB PRE22	1915082	
	Microphone	GRAS 40CD	331766	
	Calibrator	01dB CAL-31	89095	30 June 2022

3.2.2 The sound level meter was field calibrated prior to and following the survey and no significant drift was identified.

3.2.3 During the noise surveys the weather conditions were conducive to the measurement of environmental noise, i.e. wind speeds of no more than 5m/s and dry conditions and Table 5 indicates a summary of the measured weather conditions.

Table 5. Range of Measured Wind Speeds

Period	Range of Measured Wind Speeds (m/s)	Rainfall Recorded?
10:00 Thursday 11 th April – 09:00 Monday 15 th April 2019	0 – 2.3	No

4 NOISE IMPACT ASSESSMENT

4.1 Road Traffic Noise

4.1.1 For the purposes of this assessment, Professional Consult has used noise modelling software CadnaA to determine the impact of noise from the M66 at the proposed residential dwellings. Accordingly, a noise model has been constructed in order to calculate façade noise levels in the interests of determining the level of noise break-in to proposed habitable rooms. It should be noted that there are no traditional balconies associated the apartments instead there will be Juliet-style balconies.

4.1.2 The following inputs have been included in the model:

- ② Proposed Scheme Layout;
- ② Site elevations have been taken as existing using 1m contours;
- ② Noise Measurement Position 1 has been used in order to calibrate the noise model;
- ② A floor height of 3m has been taken as the separating floor height between floors;
- ② A reflection order of 2 has been used in all calculations; and
- ② Noise levels generated using ISO 9613-1 and ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors” as incorporated into CadnaA software.

Internal Noise Impact for Proposed Dwellings

4.1.3 With regards internal noise levels, BS8233:2014 suggests that standard thermal double glazing will afford 33dB R_w of sound reduction, however this is for the pink noise spectrum and the same configuration will afford 30dB $R_w + C_{tr}$ for average noise levels from road traffic noise and so this value has been used to calculate internal noise levels. With regard to the maximum noise level ($L_{Amax,fast}$), the value of 33dB R_w has been used. BS8233:2014 also goes on to recommend that a partially open window provides approximately 15dB of attenuation.

4.1.4 Professional Consult uses a library database of glazing configurations issued by Saint Gobain and the glazing configuration 6mm glass / 12mm air space / 6mm glass affords 30dB $R_w + C_{tr}$ and 33dB R_w respectively.

4.1.5 For the purpose of the assessment the proposed apartment buildings have been divided into block A 1-3 and B 1-3, which can be seen in Figure 1 of Appendices 5 & 6.

4.1.6 Appendix 7 calculates the average daytime noise levels at the various facades of the plots and determines the requirement for upgraded glazing or alternative ventilation. Appendix 7 indicates that upgraded glazing will be required in order to control external noise to meet the internal noise criteria limits and with a partially open window, the internal noise criteria limit will be exceeded for a number of living rooms within plots and so the following section considers alternative ventilation.

4.1.7 Appendix 8 calculates the average night-time noise levels at the various facades of the plots and determines the requirement for upgraded glazing or alternative ventilation. Appendix 8 indicates that upgraded glazing will be required in order to control external noise to meet the internal noise criteria limits and with a partially open window, the internal noise criteria limit will be exceeded for a number of living rooms within plots and so the following section considers alternative ventilation.

4.1.8 It is also necessary to consider maximum noise levels for the night-time period in addition to the average noise levels. The measured 10th highest maximum noise level was 85.1dB $L_{Amax,fast}$ at 26m and the closest proposed

dwelling to the road lies at 40m and so the calculated noise level at the closest dwelling is 81.4dB. Allowing 33dB for a closed bedroom window gives an internal noise level of 48.4dB which exceeds the internal noise criteria of 45dB $L_{Amax,fast}$ by +3.4dB and so upgraded glazing is required to control maximum noise levels in bedrooms. Allowing 15dB for a partially open window will result in a maximum internal noise level of 66.4dB which is above the 45dB $L_{Amax,fast}$ criteria and so the following section considers appropriate noise mitigation for bedrooms.

- 4.1.9 It should be noted that the requirements for the maximum noise levels are below that of the average noise level assessment, as such, any mitigation measured used to protect the average noise levels will also mitigate the maximum levels.

5 MITIGATION

5.1 Road Traffic Noise

5.1.1 The previous Section has shown that a number of habitable rooms will require upgraded glazing, the highest required attenuation during the daytime (living rooms) is $42\text{dB } D_{n,e,w} + C_{tr}$ and for the night-time (bedrooms) is $40\text{dB } D_{n,e,w} + C_{tr}$. Appendices 7 and 8 show the required glazing specification for each floor.

5.1.2 Additionally, with a partially open window for various habitable rooms, Appendices 7 and 8 indicate that the internal average noise level will exceed the respective noise criteria limit and so for the identified plots, alternative ventilation will be required which does not require the opening of windows to provide fresh air flow and background ventilation. Adequate background ventilation can be achieved by using a window-frame mounted acoustic trickle ventilator as follows:

 Greenwoods EAR42W (affords up to $42\text{dB } D_{n,e,w} + C_{tr}$).

5.1.3 It has been shown that internal maximum noise level in bedrooms will be the maximum noise criteria level by 3.4dB, however this is below the average night-time noise level exceedance (+9.5dB), therefore any mitigation measures implemented for the average noise levels will also protect against the maximum noise levels.

6 CONCLUSION

- 6.1.1 Professional Consult Limited was instructed by David Gibbons, to prepare a Noise Impact Assessment for a proposed residential development on a parcel of land located off Waterfold Lane in Heywood BL9.
- 6.1.2 The Development will comprise of two blocks of residential apartments, each over 3-storeys with associated infrastructure. It is understood that there will be no balconies associated with the apartments.
- 6.1.3 The Development proposal has been informed by high-level acoustic design advice in order to ensure that there are no external private amenity areas which may have unduly high levels of road traffic present.
- 6.1.4 The Site is currently comprised of open land, formerly occupied by Waterfold Mill. The neighbouring land uses comprise of the M66 to the west, the River Roch to the north and north east and Waterfold Lane to the east and south.
- 6.1.5 The soundscape at the Site is comprised predominantly of road traffic noise associated with road traffic movements on the M66 to the west.
- 6.1.6 This Assessment has been undertaken to identify any key surrounding noise sources within the vicinity of the Site which have the potential to produce noise impacts upon the noise-sensitive Development. Accordingly, this Assessment has been completed with due regard to the National Planning Policy Framework and its associated National Planning Policy Guidance in addition to appropriate British Standards and guidance documents relevant to the assessment of noise impacts and these are detailed in Section 2.
- 6.1.7 This Assessment has relied upon a road traffic noise survey completed for the M66 over a full weekday period in order to accurately quantify the level of noise associated with the motorway.
- 6.1.8 This Assessment has also shown that internal noise levels across the Development can meet the daytime and night-time noise criteria levels through the use of upgraded glazing and alternative ventilation in form of a window frame-mounted acoustic trickle ventilator.
- 6.1.9 In summary, where the recommended noise mitigation measures are implemented as identified, then the sound climate which future occupiers of the Development will be exposed to will accord with the 'No Observed Adverse Effect Level' as detailed in the PPG and as such, noise should not be deemed to be a determining factor in the granting of planning permission for this Site.

APPENDIX 1: LIMITATIONS

This report and its findings should be considered in relation to the terms of reference and objectives agreed between Professional Consult Limited and the Client.

The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

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APPENDIX 2: GLOSSARY OF ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

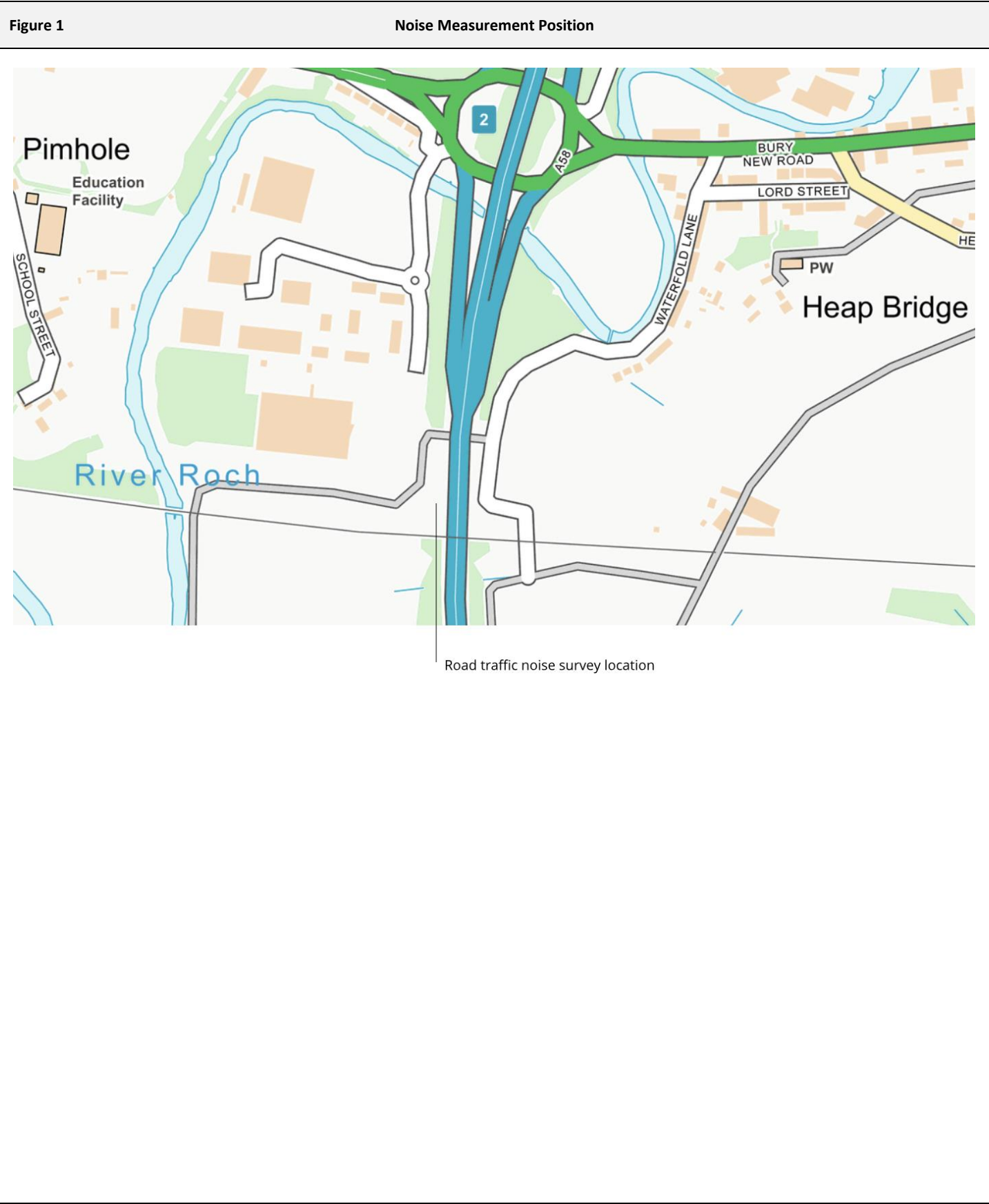
Table 1: Typical Sound Pressure Levels

Sound Pressure Level (dB)	Location/Example
0	Threshold of hearing
20 - 30	Quiet bedroom at night
30 - 40	Living room during the day
40 - 50	Typical office
50 - 60	Inside a car
60 - 70	Typical high street
70 - 90	Inside factory
100 - 110	Burglar alarm at 1m away
110 - 130	Jet aircraft on take off
140	Threshold of pain

Table 2: Terminology

Descriptor	Explanation
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10 ⁻⁵ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L _{Aeq, T}	L _{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L _{Amax}	L _{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L _{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L ₁₀ & L ₉₀	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L ₁₀ is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L ₉₀ is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L ₁₀ index to describe traffic noise.
Free-field Level	2A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Fast	A time weighting used in the root mean square section of a sound level meter with a 125millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000millisecond time constant.

APPENDIX 3: NOISE MEASUREMENT POSITION

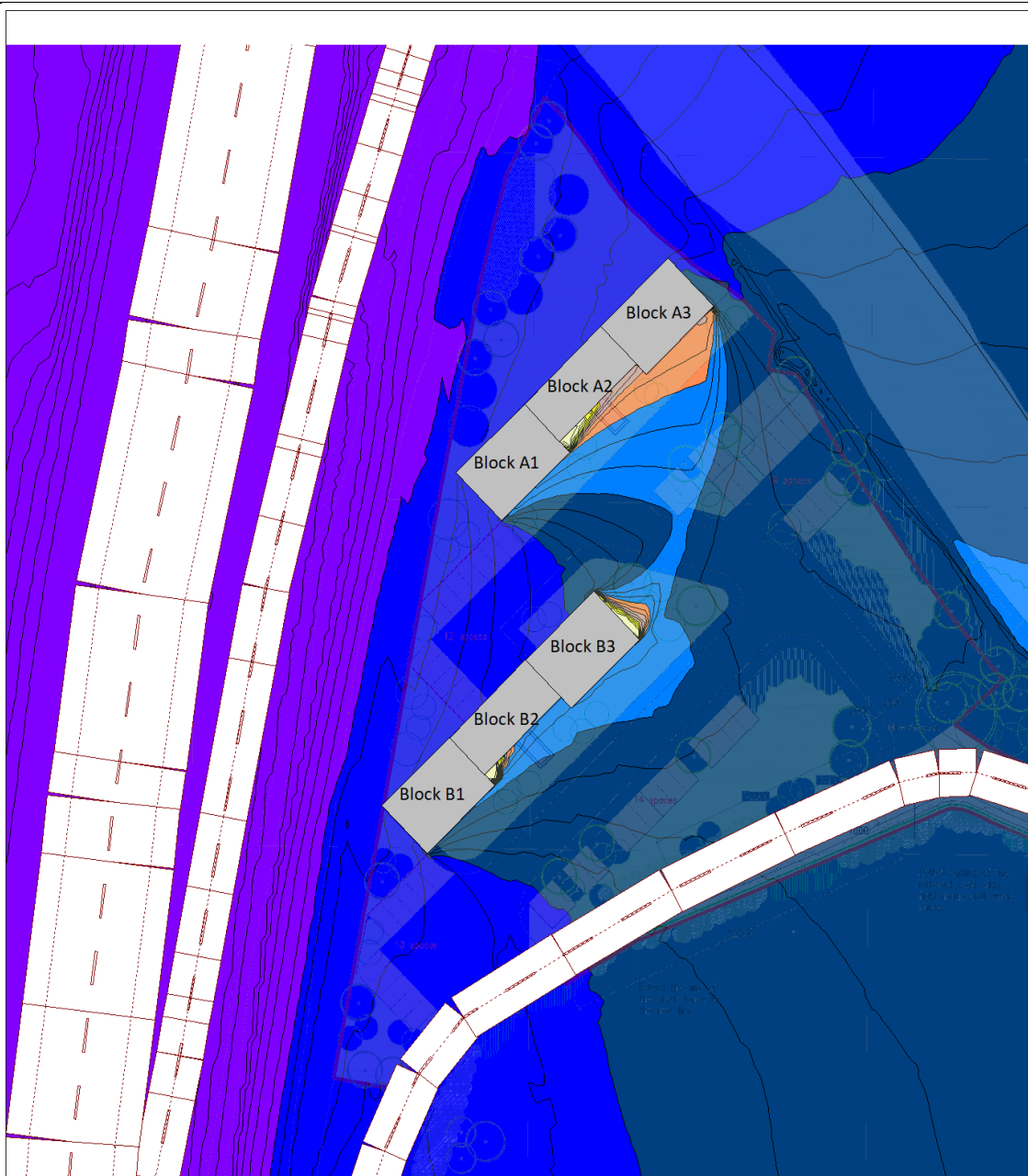


Drawing: **Site Layout Plan**
 Dwg No: **M21-13-08** Rev: **05**
 Scale: **1:500** Paper: **A1** Date: **Mar 2022**

APPENDIX 5: DAYTIME GRID NOISE MAP

Figure 1

Daytime Grid Noise Map



Noise Map Objects

- Road
- Railway
- Building
- Receiver
- Calculation Area

Level LAeq 16 hour in dB(A)

- ... < 43.0
- 43.0 ≤ ... < 46.0
- 46.0 ≤ ... < 49.0
- 49.0 ≤ ... < 52.0
- 52.0 ≤ ... < 55.0
- 55.0 ≤ ... < 58.0
- 58.0 ≤ ... < 61.0
- 61.0 ≤ ... < 63.0
- 63.0 ≤ ... < 66.0
- 66.0 ≤ ... < 70.0
- 70.0 ≤ ... < 75.0
- 75.0 ≤ ...

Title:

Daytime Grid Noise Map
at 1.5m above ground level

Project No: 22.007

Figure 1

Date : 23/03/2022

Built by: MP

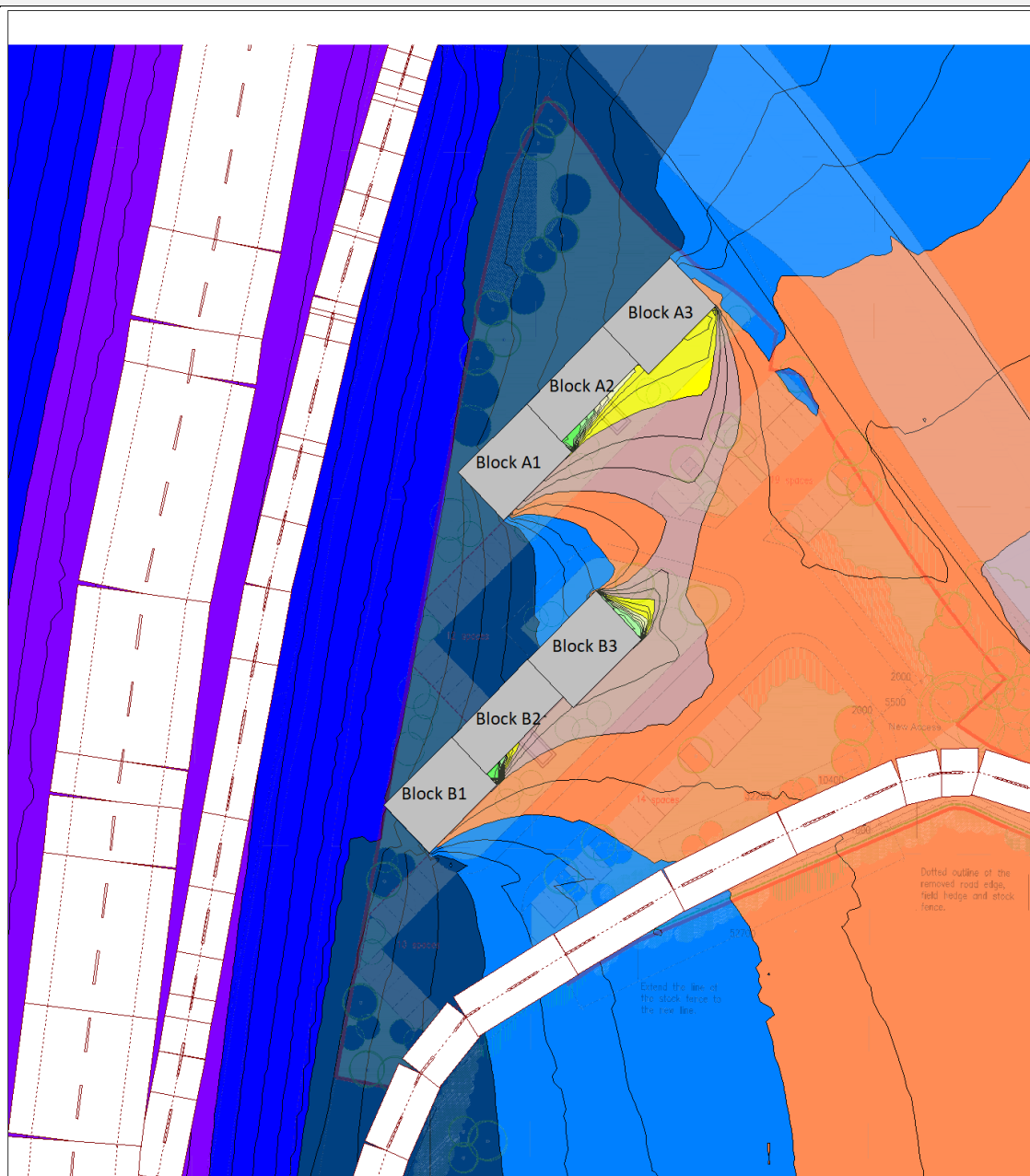
Checked by: JG

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APPENDIX 6: NIGHT-TIME GRID NOISE MAP

Figure 1

Night-time Grid Noise Map



Noise Map Objects

- Road
- Railway
- Building
- Receiver
- Calculation Area

Level LAeq 8 hour in dB(A)

- ... < 43.0
- 43.0 <= ... < 46.0
- 46.0 <= ... < 49.0
- 49.0 <= ... < 52.0
- 52.0 <= ... < 55.0
- 55.0 <= ... < 58.0
- 58.0 <= ... < 61.0
- 61.0 <= ... < 63.0
- 63.0 <= ... < 66.0
- 66.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ...

Title :
Night-Time Grid Noise Map
at 4.5m above ground level

Project No: 22.007

Figure 1

Date : 23/03/2022

Built by: MP

Checked by: JG

PROFESSIONAL
CONSULT
FUTURE ENVIRONMENTS

APPENDIX 7: DAYTIME FAÇADE ROAD TRAFFIC NOISE LEVELS

Block	Floor	Façade Direction	Calculated LAeq,16hr at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insulation Performance for Glazing (Rw + Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?	Acoustics Ventilation & Overheating Assessment - Appropriate AD-F System if Required
Block 1A	Ground	SE	63.7	30	33.7	35	-1.3	28.7	6/12/6	50.7	Yes	ADF Systems 3 or 4
Block 1A	1st	SE	66.3	30	36.3	35	1.3	31.3	4/16/6.4	53.3	Yes	ADF Systems 3 or 4
Block 1A	2nd	SE	67.2	30	37.2	35	2.2	32.2	4/10/6.4A	54.2	Yes	ADF Systems 3 or 4
Block 1A	Ground	SW	71.8	30	41.8	35	6.8	36.8	8/8/8.4A	58.8	Yes	ADF Systems 3 or 4
Block 1A	1st	SW	74.7	30	44.7	35	9.7	39.7	8/16/12.4A	61.7	Yes	ADF Systems 3 or 4
Block 1A	2nd	SW	75.5	30	45.5	35	10.5	40.5	12/16/10.4A	62.5	Yes	ADF Systems 3 or 4
Block 1A	Ground	NW	73.5	30	43.5	35	8.5	38.5	6/16/12.4A	60.5	Yes	ADF Systems 3 or 4
Block 1A	1st	NW	75.5	30	45.5	35	10.5	40.5	12/16/10.4A	62.5	Yes	ADF Systems 3 or 4
Block 1A	2nd	NW	76.4	30	46.4	35	11.4	41.4	12/16/10.4A	63.4	Yes	ADF Systems 3 or 4
Block 1B	Ground	NW	73	30	43	35	8	38	8/16/10.4A	60	Yes	ADF Systems 3 or 4
Block 1B	1st	NW	74.5	30	44.5	35	9.5	39.5	8/16/12.4A	61.5	Yes	ADF Systems 3 or 4
Block 1B	2nd	NW	75.6	30	45.6	35	10.6	40.6	12/16/10.4A	62.6	Yes	ADF Systems 3 or 4
Block 1B	Ground	SE	55.7	30	25.7	35	-9.3	20.7	6/12/6	42.7	Yes	ADF Systems 3 or 4
Block 1B	1st	SE	57.8	30	27.8	35	-7.2	22.8	6/12/6	44.8	Yes	ADF Systems 3 or 4
Block 1B	2nd	SE	60.6	30	30.6	35	-4.4	25.6	6/12/6	47.6	Yes	ADF Systems 3 or 4
Block 1C	Ground	NW	72.4	30	42.4	35	7.4	37.4	8/8/8.4A	59.4	Yes	ADF Systems 3 or 4
Block 1C	1st	NW	73.6	30	43.6	35	8.6	38.6	6/16/12.4A	60.6	Yes	ADF Systems 3 or 4
Block 1C	2nd	NW	74.7	30	44.7	35	9.7	39.7	8/16/12.4A	61.7	Yes	ADF Systems 3 or 4
Block 1C	Ground	NE	69	30	39	35	4	34	4/8/8.4A	56	Yes	ADF Systems 3 or 4
Block 1C	1st	NE	69.6	30	39.6	35	4.6	34.6	6/6/8.4A	56.6	Yes	ADF Systems 3 or 4
Block 1C	2nd	NE	70.2	30	40.2	35	5.2	35.2	6/6/8.4A	57.2	Yes	ADF Systems 3 or 4
Block 1C	Ground	SE	60.8	30	30.8	35	-4.2	25.8	6/12/6	47.8	Yes	ADF Systems 3 or 4
Block 1C	1st	SE	62.3	30	32.3	35	-2.7	27.3	6/12/6	49.3	Yes	ADF Systems 3 or 4
Block 1C	2nd	SE	63.9	30	33.9	35	-1.1	28.9	6/12/6	50.9	Yes	ADF Systems 3 or 4
Block 2A	Ground	SE	66.1	30	36.1	35	1.1	31.1	4/16/6.4	53.1	Yes	ADF Systems 3 or 4
Block 2A	1st	SE	68.7	30	38.7	35	3.7	33.7	4/8/8.4A	55.7	Yes	ADF Systems 3 or 4
Block 2A	2nd	SE	69.7	30	39.7	35	4.7	34.7	6/6/8.4A	56.7	Yes	ADF Systems 3 or 4
Block 2A	Ground	SW	72	30	42	35	7	37	8/8/8.4A	59	Yes	ADF Systems 3 or 4
Block 2A	1st	SW	75.5	30	45.5	35	10.5	40.5	12/16/10.4A	62.5	Yes	ADF Systems 3 or 4
Block 2A	2nd	SW	76.2	30	46.2	35	11.2	41.2	12/16/10.4A	63.2	Yes	ADF Systems 3 or 4
Block 2A	Ground	NW	73	30	43	35	8	38	8/16/10.4A	60	Yes	ADF Systems 3 or 4
Block 2A	1st	NW	75.8	30	45.8	35	10.8	40.8	12/16/10.4A	62.8	Yes	ADF Systems 3 or 4
Block 2A	2nd	NW	76.5	30	46.5	35	11.5	41.5	10/16/12.8A	63.5	Yes	ADF Systems 3 or 4
Block 2B	Ground	SE	63.7	30	33.7	35	-1.3	28.7	6/12/6	50.7	Yes	ADF Systems 3 or 4
Block 2B	1st	SE	65.4	30	35.4	35	0.4	30.4	6/12/6	52.4	Yes	ADF Systems 3 or 4
Block 2B	2nd	SE	66.5	30	36.5	35	1.5	31.5	4/10/6.4A	53.5	Yes	ADF Systems 3 or 4
Block 2B	Ground	NW	71.8	30	41.8	35	6.8	36.8	8/8/8.4A	58.8	Yes	ADF Systems 3 or 4
Block 2B	1st	NW	74.3	30	44.3	35	9.3	39.3	6/16/12.4A	61.3	Yes	ADF Systems 3 or 4
Block 2B	2nd	NW	75.1	30	45.1	35	10.1	40.1	8/16/12.4A	62.1	Yes	ADF Systems 3 or 4
Block 2C	Ground	NW	70.5	30	40.5	35	5.5	35.5	8/6/8.4A	57.5	Yes	ADF Systems 3 or 4
Block 2C	1st	NW	72.5	30	42.5	35	7.5	37.5	8/16/10.4A	59.5	Yes	ADF Systems 3 or 4
Block 2C	2nd	NW	73.3	30	43.3	35	8.3	38.3	8/16/10.4A	60.3	Yes	ADF Systems 3 or 4
Block 2C	Ground	SE	64.9	30	34.9	35	-0.1	29.9	6/12/6	51.9	Yes	ADF Systems 3 or 4
Block 2C	1st	SE	66.6	30	36.6	35	1.6	31.6	4/10/6.4A	53.6	Yes	ADF Systems 3 or 4
Block 2C	2nd	SE	67.5	30	37.5	35	2.5	32.5	4/16/6.4A	54.5	Yes	ADF Systems 3 or 4
Block 2C	Ground	NE	54.1	30	24.1	35	-10.9	19.1	6/12/6	41.1	Yes	ADF Systems 3 or 4
Block 2C	1st	NE	56.7	30	26.7	35	-8.3	21.7	6/12/6	43.7	Yes	ADF Systems 3 or 4
Block 2C	2nd	NE	60.3	30	30.3	35	-4.7	25.3	6/12/6	47.3	Yes	ADF Systems 3 or 4

APPENDIX 8: NIGHT-TIME FAÇADE ROAD TRAFFIC NOISE LEVELS

Block	Floor	Façade Direction	Calculated LAeq,8hr at Façade (dB)	Glazing Sound Reduction Index (Rw) (Standard Thermal)	Calculated Noise Level Inside Room (dB)	Criteria (dB)	Difference +/- (dB)	Required Sound Insulation Performance for Glazing (Rw + Ctr) (dB)	Example Glazing Specification (6/12/6 = standard thermal as minimum)	Calculated Internal Noise Level with a Partially Open Window (dB)	Alternative Ventilation Required?	Acoustics Ventilation & Overheating Assessment - Appropriate AD-F System if Required
Block 1A	Ground	SE	56.7	30	26.7	30	-3.3	26.7	6/12/6	43.7	Yes	ADF Systems 3 or 4
Block 1A	1st	SE	59.2	30	29.2	30	-0.8	29.2	6/12/6	46.2	Yes	ADF Systems 3 or 4
Block 1A	2nd	SE	60.2	30	30.2	30	0.2	30.2	6/12/6	47.2	Yes	ADF Systems 3 or 4
Block 1A	Ground	SW	64.7	30	34.7	30	4.7	34.7	6/6/8.4A	51.7	Yes	ADF Systems 3 or 4
Block 1A	1st	SW	67.6	30	37.6	30	7.6	37.6	8/16/10.4A	54.6	Yes	ADF Systems 3 or 4
Block 1A	2nd	SW	68.4	30	38.4	30	8.4	38.4	8/16/10.4A	55.4	Yes	ADF Systems 3 or 4
Block 1A	Ground	NW	66.5	30	36.5	30	6.5	36.5	8/8/8.4A	53.5	Yes	ADF Systems 3 or 4
Block 1A	1st	NW	68.4	30	38.4	30	8.4	38.4	8/16/10.4A	55.4	Yes	ADF Systems 3 or 4
Block 1A	2nd	NW	69.4	30	39.4	30	9.4	39.4	6/16/12.4A	56.4	Yes	ADF Systems 3 or 4
Block 1B	Ground	NW	65.9	30	35.9	30	5.9	35.9	8/6/8.4A	52.9	Yes	ADF Systems 3 or 4
Block 1B	1st	NW	67.4	30	37.4	30	7.4	37.4	8/8/8.4A	54.4	Yes	ADF Systems 3 or 4
Block 1B	2nd	NW	68.5	30	38.5	30	8.5	38.5	6/16/12.4A	55.5	Yes	ADF Systems 3 or 4
Block 1B	Ground	SE	48.7	30	18.7	30	-11.3	18.7	6/12/6	35.7	Yes	ADF Systems 3 or 4
Block 1B	1st	SE	50.7	30	20.7	30	-9.3	20.7	6/12/6	37.7	Yes	ADF Systems 3 or 4
Block 1B	2nd	SE	53.5	30	23.5	30	-6.5	23.5	6/12/6	40.5	Yes	ADF Systems 3 or 4
Block 1C	Ground	NW	65.4	30	35.4	30	5.4	35.4	6/6/8.4A	52.4	Yes	ADF Systems 3 or 4
Block 1C	1st	NW	66.5	30	36.5	30	6.5	36.5	8/8/8.4A	53.5	Yes	ADF Systems 3 or 4
Block 1C	2nd	NW	67.7	30	37.7	30	7.7	37.7	8/16/10.4A	54.7	Yes	ADF Systems 3 or 4
Block 1C	Ground	NE	62	30	32	30	2	32	4/10/6.4A	49	Yes	ADF Systems 3 or 4
Block 1C	1st	NE	62.6	30	32.6	30	2.6	32.6	4/16/6.4A	49.6	Yes	ADF Systems 3 or 4
Block 1C	2nd	NE	63.1	30	33.1	30	3.1	33.1	4/16/6.4A	50.1	Yes	ADF Systems 3 or 4
Block 1C	Ground	SE	53.8	30	23.8	30	-6.2	23.8	6/12/6	40.8	Yes	ADF Systems 3 or 4
Block 1C	1st	SE	55.2	30	25.2	30	-4.8	25.2	6/12/6	42.2	Yes	ADF Systems 3 or 4
Block 1C	2nd	SE	56.9	30	26.9	30	-3.1	26.9	6/12/6	43.9	Yes	ADF Systems 3 or 4
Block 2A	Ground	SE	59	30	29	30	-1	29	6/12/6	46	Yes	ADF Systems 3 or 4
Block 2A	1st	SE	61.6	30	31.6	30	1.6	31.6	4/10/6.4A	48.6	Yes	ADF Systems 3 or 4
Block 2A	2nd	SE	62.6	30	32.6	30	2.6	32.6	4/16/6.4A	49.6	Yes	ADF Systems 3 or 4
Block 2A	Ground	SW	64.9	30	34.9	30	4.9	34.9	6/6/8.4A	51.9	Yes	ADF Systems 3 or 4
Block 2A	1st	SW	68.4	30	38.4	30	8.4	38.4	8/16/10.4A	55.4	Yes	ADF Systems 3 or 4
Block 2A	2nd	SW	69.1	30	39.1	30	9.1	39.1	6/16/12.4A	56.1	Yes	ADF Systems 3 or 4
Block 2A	Ground	NW	65.9	30	35.9	30	5.9	35.9	8/6/8.4A	52.9	Yes	ADF Systems 3 or 4
Block 2A	1st	NW	68.8	30	38.8	30	8.8	38.8	6/16/12.4A	55.8	Yes	ADF Systems 3 or 4
Block 2A	2nd	NW	69.5	30	39.5	30	9.5	39.5	8/16/12.4A	56.5	Yes	ADF Systems 3 or 4
Block 2B	Ground	SE	56.7	30	26.7	30	-3.3	26.7	6/12/6	43.7	Yes	ADF Systems 3 or 4
Block 2B	1st	SE	58.3	30	28.3	30	-1.7	28.3	6/12/6	45.3	Yes	ADF Systems 3 or 4
Block 2B	2nd	SE	59.4	30	29.4	30	-0.6	29.4	6/12/6	46.4	Yes	ADF Systems 3 or 4
Block 2B	Ground	NW	64.7	30	34.7	30	4.7	34.7	6/6/8.4A	51.7	Yes	ADF Systems 3 or 4
Block 2B	1st	NW	67.2	30	37.2	30	7.2	37.2	8/8/8.4A	54.2	Yes	ADF Systems 3 or 4
Block 2B	2nd	NW	68	30	38	30	8	38	8/16/10.4A	55	Yes	ADF Systems 3 or 4
Block 2C	Ground	NW	63.4	30	33.4	30	3.4	33.4	4/16/6.4A	50.4	Yes	ADF Systems 3 or 4
Block 2C	1st	NW	65.4	30	35.4	30	5.4	35.4	6/6/8.4A	52.4	Yes	ADF Systems 3 or 4
Block 2C	2nd	NW	66.2	30	36.2	30	6.2	36.2	8/6/8.4A	53.2	Yes	ADF Systems 3 or 4
Block 2C	Ground	SE	57.9	30	27.9	30	-2.1	27.9	6/12/6	44.9	Yes	ADF Systems 3 or 4
Block 2C	1st	SE	59.6	30	29.6	30	-0.4	29.6	6/12/6	46.6	Yes	ADF Systems 3 or 4
Block 2C	2nd	SE	60.4	30	30.4	30	0.4	30.4	6/12/6	47.4	Yes	ADF Systems 3 or 4
Block 2C	Ground	NE	47.1	30	17.1	30	-12.9	17.1	6/12/6	34.1	Yes	ADF Systems 1 or 2
Block 2C	1st	NE	49.7	30	19.7	30	-10.3	19.7	6/12/6	36.7	Yes	ADF Systems 3 or 4
Block 2C	2nd	NE	53.3	30	23.3	30	-6.7	23.3	6/12/6	40.3	Yes	ADF Systems 3 or 4

APPENDIX 9: MEASURED ROAD TRAFFIC NOISE LEVELS

Period start	Measured Sound Pressure Level, dB L _{Aeq,1hr}
27/01/2022 13:00	80
27/01/2022 14:00	80.1
27/01/2022 15:00	80.3
27/01/2022 16:00	81
27/01/2022 17:00	80.1
27/01/2022 18:00	79.4
27/01/2022 19:00	78.9
27/01/2022 20:00	78
27/01/2022 21:00	76.7
27/01/2022 22:00	72.6
27/01/2022 23:00	62
28/01/2022 00:00	69.7
28/01/2022 01:00	67.8
28/01/2022 02:00	67.8
28/01/2022 03:00	67.6
28/01/2022 04:00	69.5
28/01/2022 05:00	75
28/01/2022 06:00	79
28/01/2022 07:00	80.9
28/01/2022 08:00	80.8
28/01/2022 09:00	80.2
28/01/2022 10:00	80
28/01/2022 11:00	80.3
28/01/2022 12:00	80.4