

NOISE IMPACT ASSESSMENT

Residential Development – Impact from
Road, Plant, and Environmental Noise

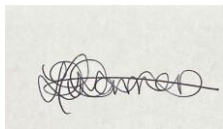


NOISE
ASSESSMENTS LTD
YOUR LOCAL ACOUSTIC SPECIALIST

REPORT DETAILS

Client	Mr Gareth Walsh
Report Title	Residential Development
Site Address	Trinity House, Trinity Street, Wrexham, LL11 1NL
Project No.	NALPRO131221.01
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QUALITY ASSURANCE

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Contents

Assessment Summary	1
1. Proposal	3
2. Existing Context.....	3
3. Noise Policy and Guidance.....	3
4. Subjective Impressions	9
5. Measurement Location.....	9
6. Measurement Procedure.....	10
7. Measurement Equipment.....	10
8. Weather Conditions.....	11
CRTN: Calculation of Road Traffic Noise Assessment	11
9. Noise Survey.....	11
10. Noise level Calculations	12
BS4142:2014 Assessment	14
11. Noise Source Levels.....	14
12. Specific Sound Levels	15
13. Background Sound Level	15
14. Rating Level	15
15. Rating Level Vs Background	16
BS 8233:2014 Assessment	16
16. Noise Survey.....	16
17. Noise level Calculations	17
18. Summary	18
APPENDIX A - Measurement Details.....	20
APPENDIX B - Equipment Details	20
APPENDIX C - Calibration Details	20
APPENDIX D - Meteorology Details.....	20
APPENDIX E – Traffic Survey Data.....	21
APPENDIX F – Noise Attenuation.....	22
APPENDIX G – Layout Drawings	23
APPENDIX H Terminology and Definitions	26

Assessment Summary

Noise Assessments Ltd was commissioned by Mr Gareth Walsh in relation to a detached three/four-storey building with commercial units on the ground/first floor at Trinity House, Trinity Street, Wrexham, LL11 1NL (herein referred to as the development), to assess the impact of road noise, plant and environmental noise on proposed residential apartments on the first to fourth floors.

No external amenity areas are provided with this development.

As part of the Planning permission condition from Wrexham County Borough Council (WCBC) a noise assessment has been requested to demonstrate that various external/internal noise does not impact future residents in the new dwellings during the day and night-time.

Road Traffic Assessment: Internal Noise Levels in Habitable Rooms along Trinity Street

Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), daytime road noise would be reduced from 68 dB LAeq,16hr to interior levels of 31 dB LAeq,16hr within habitable rooms. The assumed standard of construction would place the internal levels in habitable rooms below 35 dB, therefore within the desirable category.

Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), night-time road noise in bedrooms would be reduced from 58 dB LAeq,8hr to interior levels 28 dB LAeq,8hr with maximum individual noise events reduced from 79 dB LAFmax to 41 dB LAFmax, therefore within the desirable category.

BS4142 Assessment: Adjacent Plant Noise in Habitable Rooms along Egerton Street

Based on the potential impact of AC units and extraction system noise adjacent to the development, the results demonstrate that, with windows partially open, internal LAeq and LAmx noise levels during the daytime within habitable rooms are expected to exceed the recommended target levels and openable windows cannot therefore be relied upon for ventilation for an extended period.

It is recommended to install a minimum 26 dB Rw+Ctr rated glazing (6/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60) therefore within the desirable category within bedrooms and living areas.

BS8233 Internal Noise Levels in Habitable Rooms along Lord Street

Based on the environmental noise in the area, the results demonstrate that, with windows partially open, internal LAeq and LAmx noise levels during the day and night-time within habitable rooms at the front of the development are expected to exceed the recommended target levels and openable windows cannot therefore be relied upon for ventilation for an extended period.

Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), daytime environmental noise

would be reduced from 68 dB LAeq,16hr to interior levels of 31 dB LAeq,16hr within habitable rooms. The assumed standard of construction would place the internal levels in habitable rooms below 35 dB, therefore within the desirable category.

Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), night-time environmental noise in bedrooms would be reduced from 52 dB LAeq,8hr to interior levels 24 dB LAeq,8hr with maximum individual noise events reduced from 73.0 dB LAFmax to 40 dB LAFmax, therefore within the desirable category.

1. Proposal

- 1.1 Noise Assessments Ltd was commissioned by Mr Gareth Walsh in relation to a detached three/four-storey building with commercial units on the ground/first floor at Trinity House, Trinity Street, Wrexham, LL11 1NL (herein referred to as the development), to assess the impact of road noise, plant and environmental noise on proposed residential apartments on the first to fourth floors. No external amenity areas are provided with this development.
- 1.2 As part of a Planning permission condition from Wrexham County Borough Council (WCBC) a noise assessment has been requested to demonstrate that various external/internal noise does not impact future residents in the new dwellings during the day and night-time.

2. Existing Context

- 2.1 The site is set within a commercial area, along a main road for buses and cars, a small carpark, and shopping high street (Lord St.) with various shops, cafes and commercial units.

3. Noise Policy and Guidance

Planning Policy Wales

- 3.1 Planning Policy Wales (PPW) is the current planning policy guidance within Wales. The planning guidance defines the primary objective of the document in paragraph 1.2 as follows:

‘...to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales...’

- 3.2 In particular reference to noise Paragraph 6.7.3 of the PPW states:

‘Problematic forms of sound are generally experienced as noise pollution and can affect amenity and be prejudicial to health or a nuisance. Noise action plans drawn up by public bodies aim to prevent and reduce noise levels where necessary and preserve soundscape quality where it is good. Noise levels used to identify priority areas contained in noise actions plans are usually set quite high in order to focus resources on the most polluted areas and noise must meet a number of tests before it qualifies as a statutory nuisance. Lower levels of noise however, can still be annoying or disruptive and impact on amenity and as such should be protected through the planning process wherever necessary.’

Technical Guidance

ProPG: Planning and Noise

3.3 The Institute of Acoustics (IOA), the Association of Noise Consultants (ANC) and the Chartered Institute of Environmental Health (CIEH) have jointly produced a Professional Practice Guidance (ProPG) document focussing on noise sensitive development. 'ProPG: Planning & Noise' (ProPG)iii describes an approach to encourage good acoustic design in proposed new residential development predominantly exposed to airborne transportation noise. It includes a two-stage design process consisting of an initial noise risk assessment, followed by a systematic consideration of the following key elements:

1. demonstrating a "Good Acoustic Design Process";
2. observing internal "Noise Level Guidelines";
3. undertaking an "External Amenity Area Noise Assessment"; and
4. consideration of "Other Relevant Issues".

3.4 An initial noise risk assessment should be performed to "provide an indication of the likely risk of adverse effects from noise were no subsequent mitigation to be included as part of the development proposal."

3.5 The risk of adverse effect is determined based on the external day and night-time noise levels across the development as shown below in Table 1.

Table 1. ProPG Initial Site Noise Risk Assessment (Taken from Figure 1 of ProPG)

Indicative daytime noise levels <i>L_{Aeq,16hr}</i>	Indicative night-time Noise Levels <i>L_{Aeq,8hr}</i>	Risk	Potential Effect without mitigation
> 70 dB	> 60 dB	High	 Increasing risk of adverse effect
60 – 70 dB	50 – 60 dB	Medium	
50 – 60 dB	40 – 50 dB	Low	
< 50 dB	< 40 dB	Negligible	No Adverse Effect

a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".

c. *L_{Aeq,16hr}* is for daytime 0700 – 2300, *L_{Aeq,8hr}* is for night-time 2300 – 0700.

d. An indication that there may be more than 10 noise events at night (2300 – 0700) with *L_{Amax, F}* > 60 dB means the site should not be regarded as negligible risk.

3.6 Where the level of risk is assessed as greater than 'negligible', a further more detailed assessment is required, which includes assessing both internal and external noise levels at the proposed residential properties. Following on from the initial risk assessment, ProPG states that a planning application should demonstrate good acoustic design has been incorporated, according to the following procedures:

1. "Check the feasibility of relocating or reducing noise levels from relevant sources.

2. Consider options for planning the site or building layout.
 3. Consider the orientation of proposed building(s).
 4. Select construction types and methods for meeting building performance requirements.
 5. Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.
 6. Assess the viability of alternative solutions.
 7. Assess external amenity area noise."
- 3.7 ProPG recommends internal and external sound levels in line with those described in BS 8233 and WHO Guidelines.
- 3.8 Whilst there are no prescribed standards for the assessment of noise impact where human voice is the primary source, reference can be made to 'BS8233:2014 – Guidance on sound insulation and noise reduction for buildings' [British Standards Institution] which gives guideline criteria for internal ambient noise levels in residential dwellings.

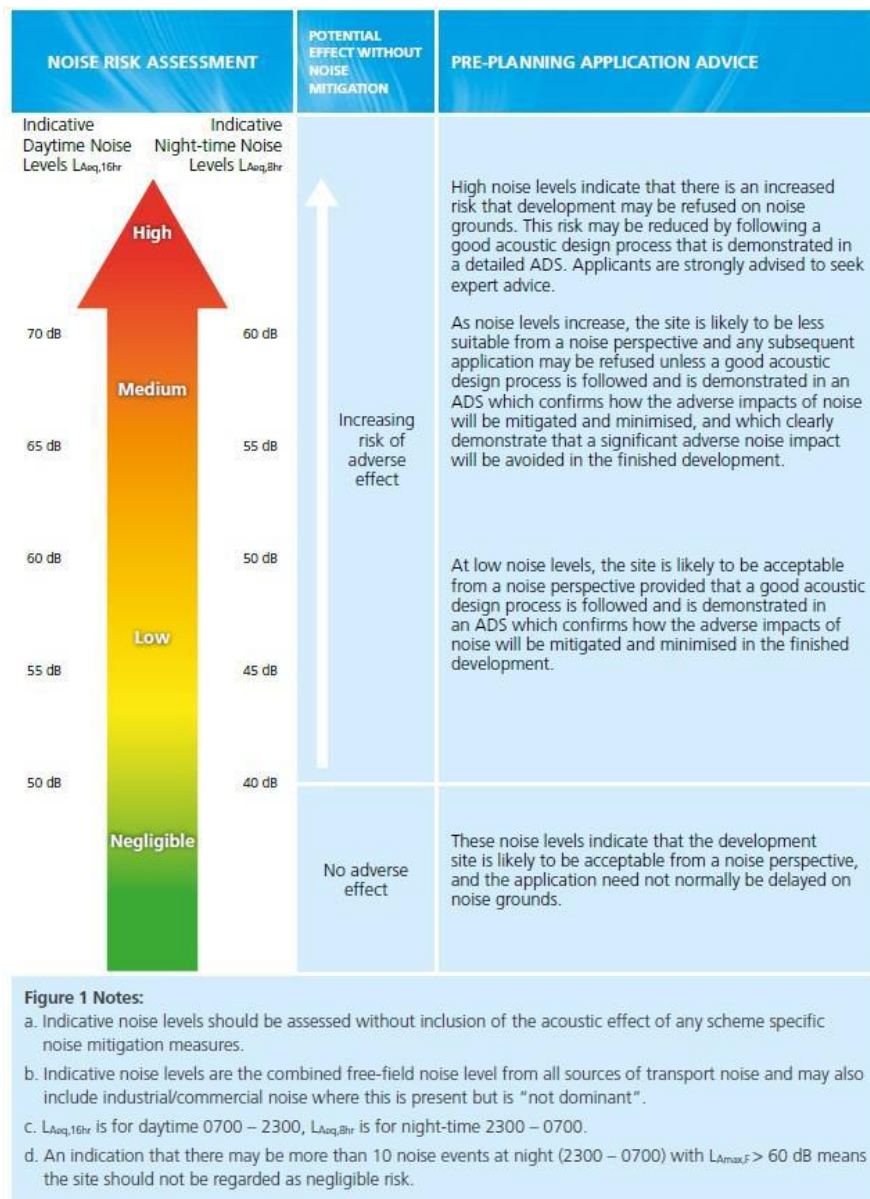
CRTN: Calculation of Road Traffic Noise – 1988

- 3.9 This document was published by the Department for Transport and the Welsh office in 1988. It sets out the procedures used to calculate noise generated by road traffic. The calculation method is based on various input variables such as traffic speed, road surface and the percentage of heavy's (HGVs) as well as the site geometry and barrier attenuation. The calculation inputs allow for the LA10, 18hour and LA10, 1hour to be calculated at any given receiver.
- 3.10 The document also provides methods for measuring the noise produced by road traffic stating three different methodologies. The first, "The Measurement Method" is used for direct measurement of the LA10, 18hour. The second, "The Shortened Measurement Procedure" for measurement of the LA10, 3hour noise level from which the LA10, 18hour and LAeq, 16hour level can be derived. The third method 'Comparative Measurements' is a procedure to ascertain noise levels from a single road traffic route at various points, where the road traffic on that route is the dominant source. CRTN states that if the Shortened Measurement Procedure is followed, a correction of -1dB can be applied to approximate the LA10,18hour noise level a further subtraction -2dB gives an approximation of the LAeq,16hour.

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

- 3.11 This British Standard was published in February 2014 and supersedes BS 8233:1999, which is withdrawn.
- 3.12 This Standard provides guidance for the control of noise in and around buildings and is applicable to the design of new buildings, or refurbished buildings undergoing a change of use,

but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.



3.13 For dwellings, the main considerations are:

- for bedrooms, the acoustic effect on sleep; and
- for other rooms, the acoustic effect on resting, listening and communicating.

3.14 It is desirable that the internal ambient noise level does not exceed the following guideline values.

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16\text{hour}}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\text{hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{hour}}$	30 dB $L_{Aeq,8\text{hour}}$

3.15 For traditional external areas that are used for amenity space, such as gardens, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.

3.16 However, it is also recognized that these external noise 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, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

3.17 When determining the sound insulation of a building envelope, the requirements should be determined on the basis of the assessment of:

- the level and characteristics of the noise outside the building
- the design noise levels in the rooms and other spaces of the building

3.18 Initial estimates may be obtained using calculations based on single-figure data, however, for detailed noise intrusion calculations to be undertaken, knowledge or assumptions of the following are required.

- Frequency characteristics of the noise source(s).
- Frequency characteristics of the sound reducing elements.
- Surface area of the common construction separating the two areas.
- Reverberation time of the receiving space.

World Health Organisation (WHO)

3.19 The World Health Organisation 'Guidelines for Community Noise' 1999 aims to provide environmental health authorities and professionals with guidance on the adverse health effects of community noise on people.

3.20 This document presents a summary of research and opinions on the impacts of noise and recommends guideline values for avoidance of particular effects e.g. annoyance and sleep

disturbance. It is the primary reference point for other guidance value based documents, such as BS 8233.

- 3.21 The following guideline values have been derived according to specific environments. The values relevant to residential development are shown in the table below.

Specific Environment	Critical Health Effect(s)	L _{Aeq} (dB)	Time base (hrs)	L _{Amax,f} (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	
Inside bedrooms	Sleep disturbance, night-time	30	8	45

- 3.22 The above values are consistent with those recommended within BS 8233, however unlike BS 8233:2014, the WHO guidelines present a specific guide value for L_{Amax} levels affecting bedrooms. The research suggests that sleep disturbance effects have been observed at individual L_{Amax} exposures of 45 dB or less. Consequently, it is important to limit the number of individual noise events with a L_{Amax} exceeding 45 dB.

AVO: Acoustics, Ventilation and Overheating Residential Design Guide

- 3.23 The AVO guide recommends an approach to acoustic assessments for residential development that takes into consideration the interdependence of provisions for acoustics, ventilation and overheating. The application of the AVO Guide is intended to demonstrate good acoustic design in accordance with ProPG. A two-stage assessment approach is advised as:

- Stage 1: Site Risk Assessment
- Stage 2: Detailed Assessment of Adverse Effect

- 3.24 The guide provides a means of assessment to satisfy the need to consider acoustics, ventilation and overheating at the planning stage. It also assists in educating clients, environmental health officers, planning officers and other stakeholders of the interdependence of design for acoustics, ventilation and overheating.

BS4142:2014– Method for Rating & Assessing Industrial and Commercial Sound

- 3.25 BS4142:2014 – Methods for rating and assessing industrial and commercial sound' is a recognised standard for assessing the noise impact of fixed plant machinery via relation of noise emissions to current background noise levels.

4. Subjective Impressions

- 4.1 The noise climate along Trinity Street is dominated by Buses and one way road traffic.
- 4.2 The noise climate at the side of the site along Egerton Street is dominated adjacent hot food establishment extraction flue, and a number of ac units attached to ground floor units.
- 4.3 Along Lord Street the noise is dominated by shoppers passing along the high street.

5. Measurement Location

- 5.1 Noise monitoring equipment for measuring sound levels was set up to capture daytime and night-time noise on Monday 20th to Tuesday 21st December 2021. Due to the COVID-19 virus pandemic, and following the lifting of the national lockdown, road traffic was back to normal levels. The location of the measurement positions are shown in Figure 2.
- 5.2 The data collected during this period has been used to characterise the existing acoustic environment at the proposed development site.
- 5.3 Measurements and site location are shown in figure 1 below:

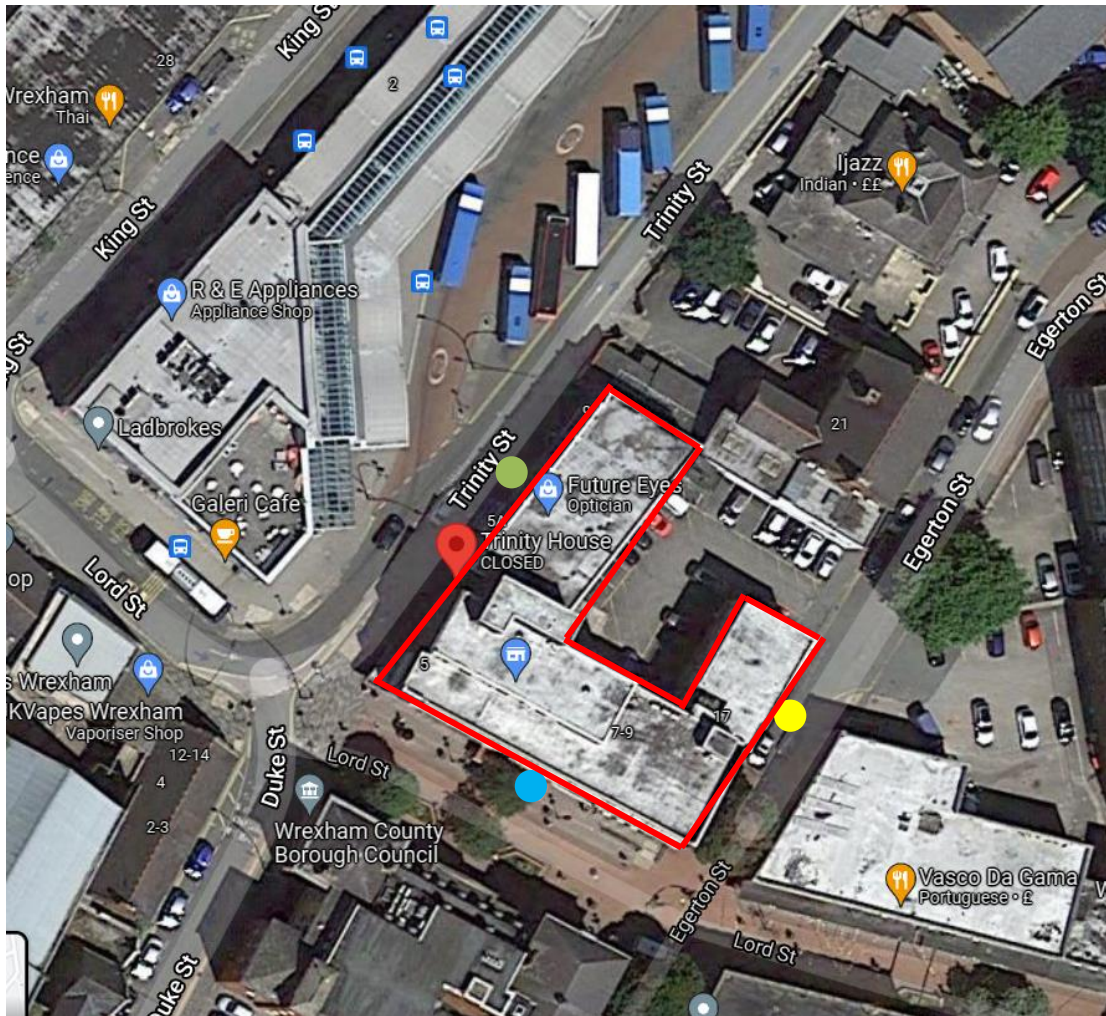


Figure 1: Site & Measurement Location

- Measurement location M1
- Measurement location M2
- Measurement location M3
- ▬ Site location

6. Measurement Procedure

- 6.1 Noise levels were measured on the 20th to 21st December 2021. Full measurement times and durations can be found in **Appendix A**.

7. Measurement Equipment

- 7.1 Measurements were undertaken using a calibrated, Pulsar N45 class 1 sound level meters. Full equipment details can be found in **Appendix B**.

- 7.2 Measurements at all monitoring location were 'free field' (no vertical reflective surfaces within 3.5 metres of the microphone) and at a height of between 1.2 – 1.5 metres above ground level. During all measurements the microphone was protected with an outdoor windshield.
- 7.3 The calibration level of the meters were checked before and after the survey with a sound calibrator with no variation in the levels observed.
- 7.4 The sound level meters were set to measure various noise parameters including LAeq and LAmax values using a 'fast' time weighting.
- 7.5 Full calibration details can be found in **Appendix C**.

8. Weather Conditions

- 8.1 Weather conditions were deemed acceptable for noise measurement. Full meteorological conditions are detailed in **Appendix D**.

CRTN: Calculation of Road Traffic Noise Assessment

9. Noise Survey

- 9.1 A noise survey at monitoring location M1 was conducted on Monday 20th to Tuesday 21st December 2021.
- 9.2 The traffic noise survey was carried out at the site from location M1 for representative periods of the daytime and night/early morning. The traffic noise monitoring was carried out for a number of 15 minute sample periods.
- 9.3 The measured daytime noise levels have been evaluated in accordance with the 'shortened measurement method' described in the Department of Transport document 'Calculation of Road Traffic Noise' (CRTN), 1988.
- 9.4 The CRTN shortened measurement method involves taking traffic noise measurements (LA10) over representative sample periods within any three consecutive hours. By using the LA10 (3 hour), as the arithmetic mean of the measured LA10 values, the LA10 (18 hour) value can then be calculated. The LA10 (18 hour) values have then been converted into the equivalent LAeq (16 hour) values using the -2 dB correction that is described in BS 8233:2014.
- 9.5 The measured night/early morning period LAeq values have been logarithmically averaged to obtain the LAeq (3 hour) night-time value which has been taken as representative of the LAeq(8 hour) night-time value.

9.6 The daytime and night-time road traffic noise exposure levels are shown below (see **Appendix E**).

Location	Daytime dB LAeq (07:00 – 23:00 hrs)	Night time dB LAeq (23:00 – 07:00 hrs)
Development property façade M1	68	58

9.7 Peaks of noise from passing vehicles at night was 73 – 79 dB LAmax at Location M1.

10. Noise level Calculations

10.1 Noise intrusion levels with windows open have been determined assuming that the insulation provided by a window, partially open for ventilation, is 15 dB as suggested by BS 8233 and WHO.

Parameter	Measured External Free-Field Noise Level at facade	Internal Noise Level with Windows Open for Ventilation	Internal Noise Level with Windows Closed and Vents Open	ProPG Guidance	BS 8233 Classification
<i>Living Space</i>					
Daytime L _{Aeq,16hr} (dB)	68	53	31	Low Risk of Adverse Effects	Desirable (≤35)
<i>Bedrooms</i>					
Daytime L _{Aeq,16hr} (dB)	68	53	31	Low Risk of Adverse Effects	Desirable (≤35)
<i>Bedrooms</i>					
Night-time L _{Aeq,8hr} (dB)	58	43	28	Low Risk of Adverse Effects	Desirable (≤30)
Night-time L _{Amax(f)} (dB)	79	64	41	Low Risk of Adverse Effects	Desirable (≤45)

AVO – Stage 1 Overheating Risk Assessment

- 10.2 In January 2020 the Acoustics Ventilation and Overheating: Residential Design Guide (AVO) was published by the Association of Noise Consultants. Therefore, the risk of overheating within proposed dwellings can be considered in line with the AVO guide.
- 10.3 In accordance with AVO, the noise levels across the proposed development site as described in the table above have been compared to the Level 1 risk assessment shown in Table 3.2 of AVO, to establish the potential risk of an overheating condition.
- 10.4 The table above indicates that site will be subject to a 'Medium' risk of an overheating condition during the daytime during periods of high volumes of traffic. Therefore, mitigation is considered necessary and discussed below.

Assessment of Daytime Noise Levels in Living Rooms and Bedrooms

- 10.5 The results demonstrate that, with windows partly open internal LAeq and LMax noise levels during the day and night-time within habitable rooms at the front of the development are expected to exceed the recommended target levels and openable windows cannot therefore be relied upon for ventilation for an extended period.
- 10.6 The assessment suggests that an alternative means of ventilation is required to provide occupants with the ability to maintain adequate background ventilation rates without having to rely entirely on openable windows. Care should be taken not to confuse a reliance on closed windows to achieve the noise level criteria with the need to have sealed glazing units. Windows may remain openable for rapid or purge ventilation, or at the occupant's choice.
- 10.7 In situations where there is a reliance on closed windows to meet the guide value, there needs to be an appropriate alternative means of ventilation that does not compromise the façade insulation or the resulting internal noise level. Typically trickle ventilators can be used and sound attenuating types are available.
- 10.8 The following is a list of manufacturers and suppliers of acoustic ventilation products.

Rytens

<http://rts.vents.co.uk/blog/products/background-ventilators/>

Titon

<https://www.titon.com/uk/products/ventilation-systems/window-vents/>

R.W.Simon Ltd

<https://www.rwsimon.co.uk/products/window-ventilation/>

Greenwood

<https://www.greenwood.co.uk/window-vents>

Internal Noise Levels in Habitable Rooms along King Street

- 10.9 Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), daytime environmental noise would be reduced from 68 dB LAeq,16hr to interior levels of 31 dB LAeq,16hr within habitable rooms. The assumed standard of construction would place the internal levels in habitable rooms below 35 dB, therefore within the desirable category.
- 10.10 Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), night-time environmental noise in bedrooms would be reduced from 58 dB LAeq,8hr to interior levels 28 dB LAeq,8hr with maximum individual noise events reduced from 79.0 dB LAFmax to 41 dB LAFmax, therefore within the desirable category.

Noise Levels in External Amenity Areas

- 10.11 No external amenity areas are provided with this development.

BS4142:2014 Assessment

11. Noise Source Levels

- 11.1 There are several AC units (10m) on an adjacent building at the side of the development along Egerton Street as well as an extraction flue (15m), venting above the first-floor eaves from the ground floor hot food unit.
- 11.2 The noise levels from the extraction unit have been monitored, and the 5x AC units have been measured based on similar AC units.
- 11.3 The outlet noise levels are tabulated below:

Table 2: Measured Noise Level

Equipment	LAeq (dB)	r, m
AC units	54	1.0

Table 3: Measured Noise Level

Equipment	LAeq (dB)	r, m
Flue extraction unit	62	3.0

12. Specific Sound Levels

- 12.1 The specific sound level is denoted LAs and is the A-weighted, equivalent noise level at the NSR locations over the reference time period.
- 12.2 The NSRs are located directly adjacent the AC units, however the location of the extractor unit ducting is partially blocked from for the apartments. Full calculations are shown in Appendix F:
- 12.3 The overall combined specific Sound Level of 5x AC units and extraction system at the nearest NSR locations distance corrected at the side of the site is summarised below:

Specific Sound Levels

NSR	Specific Sound Level, dB L _{As}
M2	49

13. Background Sound Level

- 13.1 Environmental noise levels were measured on site Monday 20th to Tuesday 21st December 2021
- 13.2 The lowest daytime background sound level was measured between 21:45-22:00 as 41 dB LA90,15min.

14. Rating Level

- 14.1 The specific sound level may be corrected for certain characteristics that make a sound more noticeable at the NSR locations. Corrections for tonality, impulsivity and intermittency may be applied.
- 14.2 The associated rating penalties and resultant sound rating levels, dB L_{Ar}, are tabulated below:

Rating Penalties, dB, and Sound Rating Levels

NSR	dB L _{As}	Tonality	Impulsivity	Intermittency	dB L _{Ar}
M2	49	3	0	3	55

15. Rating Level Vs Background

- 15.1 The rating level is to be compared to the background sound level to determine the resultant noise impact in accordance with BS4142:

A Sound Rating Level at or below the background noise level is indicative of *Low Impact*;

A Sound Rating Level that exceeds the background noise level by around + 5dB is likely an indication of *Adverse Impact*, depending on the context;

A Sound Rating Level that exceeds the background noise level by around + 10dB is likely an indication of *Significant Adverse Impact*, depending on the context.

- 15.2 The noise impact during the daytime is tabulated below:

Noise Impact

NSR	Rating Level, dB L _{Ar}	Difference, dBA	Impact
M2	55	+14	Significant Adverse Impact

- 15.3 Significant Adverse and Adverse Impact has been identified at the NSRs therefore mitigation is required.

- 15.4 The results demonstrate that, with windows partially open, internal LAeq and LAmax noise levels during the day and night-time within habitable rooms are expected to exceed the recommended target levels and openable windows cannot therefore be relied upon for ventilation for an extended period.

- 15.5 It is recommended to install a minimum 26 dB Rw+Ctr rated glazing (6/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60) therefore within the desirable category within bedrooms and living areas.

BS 8233:2014 Assessment

16. Noise Survey

- 16.1 A noise survey was conducted at monitoring location M3 along Lord Street to understand the potential noise impact from the main shopping high street. For the purposes of the assessment the loudest 16hr day and 8hr night were selected and are tabulated below.

Measurement Summary				
Measurement	Date	Period	LAeq (dB)	LAFmax (dB)
M3	20/12/21	Day (16hr)	68	N/A
	21/12/21	Night (8hr)	52	73

16.2 There is potential for adverse impact arising from the shopping high street, however during the monitoring periods, no specific noise was identified.

17. Noise level Calculations

17.1 Noise intrusion levels with windows open have been determined assuming that the insulation provided by a window open.

Parameter	Measured External Free-Field Noise Level at facade	Internal Noise Level with Windows Open for Ventilation	Internal Noise Level with Windows Closed and Vents Open	ProPG Guidance	BS 8233 Classification
<i>Living Space</i>					
Daytime L _{Aeq,16hr} (dB)	68	53	31	Low Risk of Adverse Effects	Desirable (≤35)
<i>Bedrooms</i>					
Daytime L _{Aeq,16hr} (dB)	68	53	31	Low Risk of Adverse Effects	Desirable (≤35)
<i>Bedrooms</i>					
Night-time L _{Aeq,8hr} (dB)	52	37	24	Low Risk of Adverse Effects	Desirable (≤30)
Night-time L _{Amax(f)} (dB)	73	58	40	Low Risk of Adverse Effects	Desirable (≤45)

- 17.2 The results demonstrate that, with windows partially open, internal LAeq and LMax noise levels during the day and night-time within habitable rooms are expected to exceed the recommended target levels and openable windows cannot therefore be relied upon for ventilation for an extended period.

Internal Noise Levels in Habitable Rooms along Lord Street

- 17.3 Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), daytime environmental noise would be reduced from 68 dB LAeq,16hr to interior levels of 31 dB LAeq,16hr within habitable rooms. The assumed standard of construction would place the internal levels in habitable rooms below 35 dB, therefore within the desirable category.
- 17.4 Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), night-time environmental noise in bedrooms would be reduced from 52 dB LAeq,8hr to interior levels 24 dB LAeq,8hr with maximum individual noise events reduced from 73.0 dB LAFmax to 40 dB LAFmax, therefore within the desirable category.
- 17.5 The potential for adverse impact arising from the shopping high street, however during the monitoring periods, no specific noise was identified.

18. Summary

- 18.1 Noise Assessments Ltd was commissioned by Mr Gareth Walsh in relation to a detached three/four-storey building with commercial units on the ground/first floor at Trinity House, Trinity Street, Wrexham, LL11 1NL (herein referred to as the development), to assess the impact of road noise, plant and environmental noise on proposed residential apartments on the first to fourth floors. No external amenity areas are provided with this development.
- 18.2 As part of the Planning permission condition from Wrexham County Borough Council (WCBC) a noise assessment has been requested to demonstrate that various external/internal noise does not impact future residents in the new dwellings during the day and night-time.

Road Traffic Assessment: Internal Noise Levels in Habitable Rooms along Trinity Street

- 18.3 Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), daytime road noise would be reduced from 68 dB LAeq,16hr to interior levels of 31 dB LAeq,16hr within habitable rooms. The assumed standard of construction would place the internal levels in habitable rooms below 35 dB, therefore within the desirable category.

- 18.4 Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), night-time road noise in bedrooms would be reduced from 58 dB LAeq,8hr to interior levels 28 dB LAeq,8hr with maximum individual noise events reduced from 79 dB LAFmax to 41 dB LAFmax, therefore within the desirable category.

BS4142 Assessment: Adjacent Plant Noise in Habitable Rooms along Egerton Street

- 18.5 Based on the potential impact of AC units and extraction system noise adjacent to the development, the results demonstrate that, with windows partially open, internal LAeq and LAmx noise levels during the daytime within habitable rooms are expected to exceed the recommended target levels and openable windows cannot therefore be relied upon for ventilation for an extended period.
- 18.6 It is recommended to install a minimum 26 dB Rw+Ctr rated glazing (6/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60) therefore within the desirable category within bedrooms and living areas.

BS8233 Internal Noise Levels in Habitable Rooms along Lord Street

- 18.7 Based on the environmental noise in the area, the results demonstrate that, with windows partially open, internal LAeq and LAmx noise levels during the day and night-time within habitable rooms at the front of the development are expected to exceed the recommended target levels and openable windows cannot therefore be relied upon for ventilation for an extended period.
- 18.8 Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), daytime environmental noise would be reduced from 68 dB LAeq,16hr to interior levels of 31 dB LAeq,16hr within habitable rooms. The assumed standard of construction would place the internal levels in habitable rooms below 35 dB, therefore within the desirable category.
- 18.9 Assuming the use of minimum 32 dB Rw+Ctr rated glazing (10/12/6mm) and 40 dB Dne,w+Ctr acoustic trickle ventilation (Titon Xtra Sound Attenuator V75+C60), night-time environmental noise in bedrooms would be reduced from 52 dB LAeq,8hr to interior levels 24 dB LAeq,8hr with maximum individual noise events reduced from 73.0 dB LAFmax to 40 dB LAFmax, therefore within the desirable category.

Appendices

APPENDIX A - Measurement Details				
Measurement	Start Date	Start Time	End Date	End Time
M1-M4	20/12/21	11:00	21/12/21	11:00

APPENDIX B - Equipment Details				
Equipment	Make	Model	Class	Serial Number
Sound Meter	Pulsar	N45	1	1365
Calibrator	Pulsar	PM1	1	011121C

APPENDIX C - Calibration Details					
Measurement	Calibrator Ref Level (dB)	Level Before (dB)	Deviation Before (dB)	Level After (dB)	Deviation After (dB)
M1-M4	94.0	94.0	0	94.0	0

APPENDIX D - Meteorology Details						
Date	Temp C	Wind Speed m/s*	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
20-21/12/21	8	2.9	W	84	0.0	4/8

*Windspeeds measured on site using a Skywatch Xplorer 2 Anemo-Thermometer

APPENDIX E – Traffic Survey Data

M1

Daytime

Start	End	L _{Amax}	L _{A10}	L _{Aeq}	L _{A90}
16:10	16:40	84.8	71.2	67.8	58.0
16:50	17:15	77.2	70.2	66.4	55.8
17:30	18:00	77.4	70.1	66.3	56.0

LA10 (3 hr) = 70.5 dB

LA10 (18 hr) = LA10 (3 hr) -1 = 69.5 dB

LAeq (16 hr) = LA10 (18 hr) -2 = 67.5 dB

Night/Early Morning

Start	End	L _{Amax}	L _{A10}	L _{Aeq}	L _{A90}
05:15	05:40	76.6	63.7	59.4	47.5
06:15	06:30	73.5	58.7	56.9	45.0
06:45	07:00	79.0	62.1	58.4	45.8

Log Average LAeq = 58.4 dB LAeq(3 hr)

APPENDIX F – Noise Attenuation

Utilising Measured Levels

Equipment	Noise Data, dB L _{Aeq,T}	r ₁ , m	r ₂ , m	Barrier	Level at NSR ₂
Extractor and AC units	54	1	10.0	-	34
	62	6	15.0	-5	49

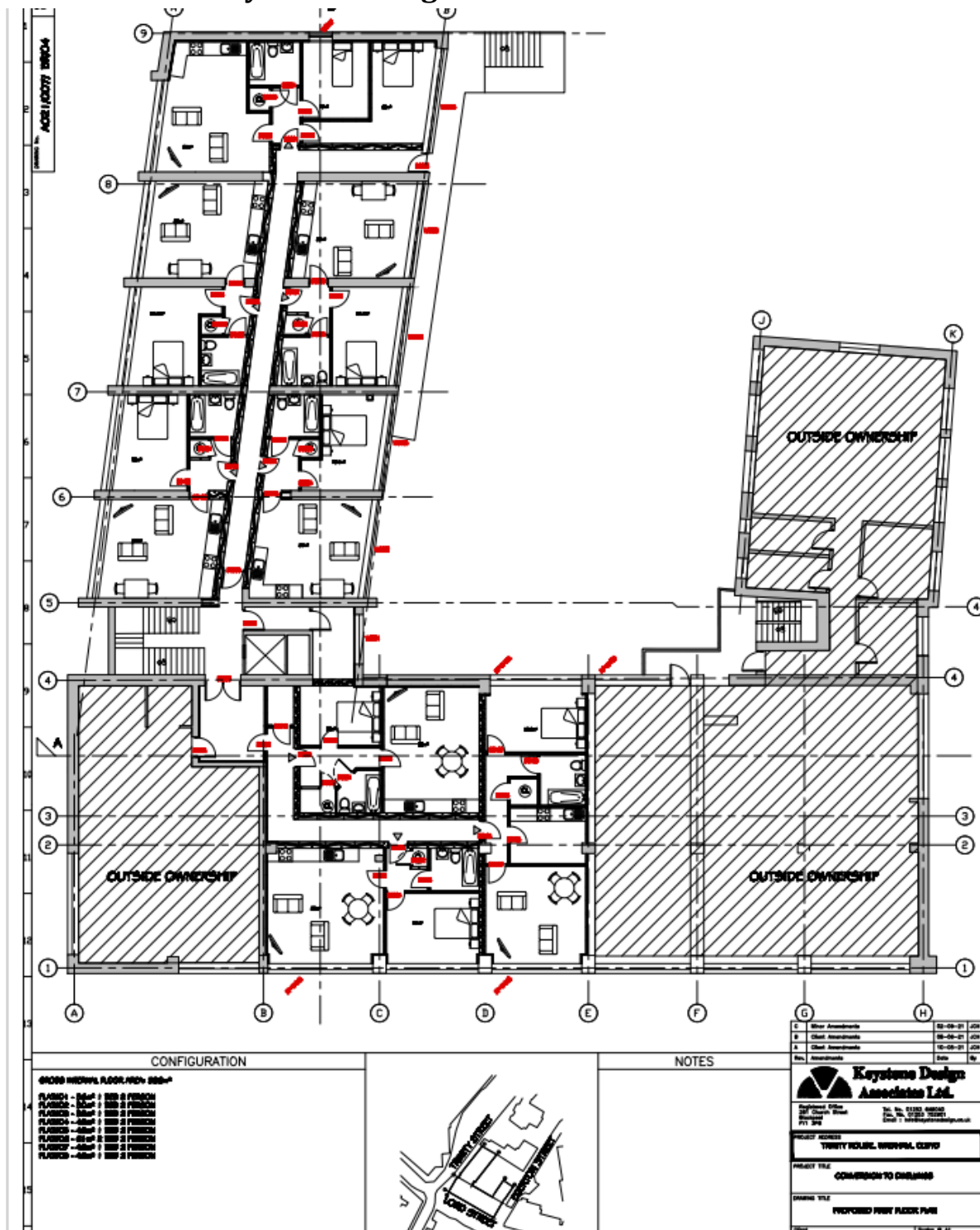
Barrier attenuation assumed as 5 dB and 10 dB for the partial and complete blockage of the line of sight respectively between source and receiver as per 'BS5228-1:2009 – Noise and vibration control on construction and open sites' pg. 130.

Point source distance attenuation

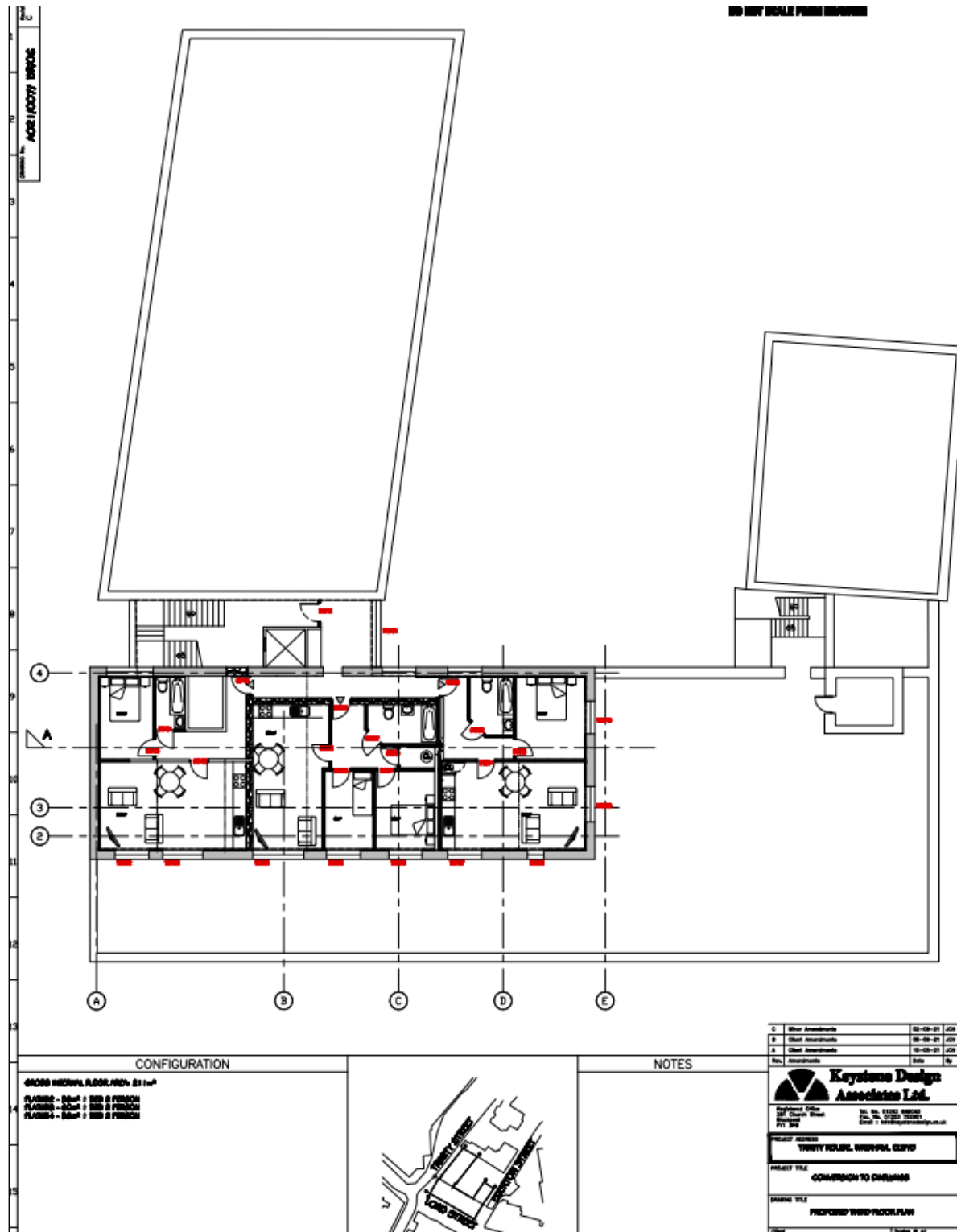
$$L_y = 20 \times \log \frac{r_1}{r_2}$$

Where L_y is the distance attenuation factor and r_{1,2} are the source -> measurement distance and source -> NSR distance in metres respectively

APPENDIX G – Layout Drawings







APPENDIX H Terminology and Definitions

Noise

Sound only becomes noise (often defined as 'unwanted sound' or sound that is considered undesirable or disruptive) when it causes or contributes to some harmful or otherwise unwanted effect, like annoyance or sleep disturbance.

Acoustic Environment

Sound from all sound sources as modified by the environment.

Equivalent continuous A-weighted sound pressure level $L_{Aeq,T}$

Value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval T, has the same mean square sound pressure as a sound under consideration whose level varies with time.

A-weighting

The human ear is most sensitive to frequencies in the range 1 kHz to 5 kHz. On each side of this range the sensitivity falls off. A-weighting is used in sound level meters to replicate this sensitivity and respond in the same way as the human ear.

Octave Band

Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.

Maximum Sound Pressure Level $L_{Amax,T}$

Highest value of the A-weighted sound pressure level with a specified time weighting that occurs during a given event or measuring period.

The $L_{A10,T}$ Sound Level

The A-weighted sound pressure that is exceeded for 10% of a given time interval, T. It is often used to evaluate road traffic noise.

The $L_{A90,T}$ Sound Level

The A-weighted sound pressure that is exceeded for 90% of a given time interval, T, measured using time weighting F. It is often referred to as the background noise level and which might in part be an indication of relative quietness at a given location

Free-field Level

The 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).

Façade Level

The sound pressure level 1 m in front of the façade.

NOTE Facade level measurements of LpA are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the facade.

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.



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