

24Acoustics

Armstrong House
3 Bassett Avenue
SO15 7DP

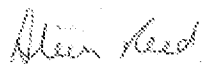
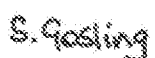
LAND SOUTH OF A259, ANGMERING
NOISE IMPACT ASSESSMENT

Technical Report: R8760-3 Rev 2

Date: 26th May 2021

For: Redrow Homes Limited
Unit 1 Faraday Office Park
Rankine Road, Basingstoke
RG24 8QB

24 Acoustics Document Control Sheet**Project Title:** Land South of A259, Angmering: Noise Impact Assessment**Report Ref:** R8760-3 Rev 2**Date:** 26th May 2021

	Name	Position	Signature	Date
Prepared by	Aileen Reed BEng MIOA	Principal Consultant		26/05/2021
Reviewed by	Stephen Gosling BEng MIOA	Principal Consultant		26/05/2021
Approved by	Stephen Gosling BEng MIOA	Principal Consultant		26/05/2021
For and on behalf of 24 Acoustics Ltd				

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1.0 INTRODUCTION

1.1 Redrow Homes Limited has commissioned 24 Acoustics Ltd to carry out a noise impact assessment at land south of the A259 in Angmering, which is proposed for residential development. The assessment has included:

- Ambient noise monitoring on the proposed site;
- Assessment of the noise arising from the A259 and the nearby railway;
- Production of noise contour maps including the illustrative masterplan;
- Proposed noise mitigation measures.

1.2 An explanation of acoustical terms used in this report is provided in Appendix A. All sound pressure levels in this report are given in dB re: 20 μ Pa.

2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 The site is located south-east of Angmering to the south of the A259 between East Preston and Ferring. The site lies adjacent to the Brighton to London Victoria mainline railway. The site, which can be seen in Figure 1, is currently open agricultural land.

2.2 The railway line runs along the southern boundary of the site. From observations made during site visits, this is primarily a passenger train route with occasional freight movements. The A259 runs along the northern site boundary and it was observed that road traffic noise along with railway noise are the dominant sources of noise for this site.

2.3 Residential properties lie to the west of the site with agricultural land to the east. Light industrial units are located some 170 m to the east. Noise from this premises was not audible at any time during visits to site.

2.4 Redrow Homes Limited intends to submit a planning application for 76 dwellings along with public open space. The masterplan for the proposed residential development is shown in Figure 2. A 3.2 m high acoustic fence (minimum surface density 12 kg/m²) is proposed to screen properties to the south of the development from railway noise.

3.0 STANDARDS AND GUIDANCE

National Planning Policy Framework and Noise Policy Statement for England

3.1 Paragraph 180 of the National Planning Policy Framework (NPPF) [Reference 1] states that planning policies and decisions should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

3.2 The NPPF also refers to the Noise Policy Statement for England (NPSE) [Reference 2] which is intended to apply to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise. The NPSE sets out the Government's long-term vision 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' which is supported by the following aims.

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life.

3.3 The NPSE defines the concept of a 'significant observed adverse effect level' (SOAEL) as 'the level above which significant adverse effects on health and quality of life occur'. The following guidance is provided within the NPSE:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."

- 3.4 The Planning Practice Guidance (PPG) [Reference 3] is written to support the NPPF with more specific planning guidance. The PPG reflects the NPSE and states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. It also states that opportunities should be taken, where practicable, to achieve improvements to the acoustic environment. The PPG states that noise can over-ride other planning concerns but should be considered in the context of the wider characteristics of the development proposal, its likely users and its surroundings.
- 3.5 The PPG expands upon the concept of SOAEL (together with Lowest Observable Adverse Effect Level, LOAEL and No Observed Effect Level, NOEL) as introduced in the NPSE and provides a table of noise exposure hierarchy for use in noise impact assessments in the planning system.
- 3.6 The NPPF, NPSE and PPG documents do not refer to specific noise criteria. For residential developments 24 Acoustics considers that the spirit of the requirements of the NPPF and NPSE will be complied with if criteria from British Standard 8233: 2014 and guidance from the World Health Organisation are adopted for internal noise levels within dwellings.

Professional Practice Guidance on Planning & Noise (ProPG)

- 3.7 The Professional Practice Guidance on Planning and Noise (ProPG) [Reference 4] was published jointly by the Association of Noise Consultants, Institute of Acoustics and Chartered Institute of Environmental Health in May 2017. The guidance relates to the consideration of existing sources of transportation noise upon proposed new residential development and strives to:
- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
 - Encourage the process of good acoustic design in and around new residential developments;
 - Outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
 - Improve understanding of how to determine the extent of potential noise impact and effect; and
 - Assist the delivery of sustainable development.

3.8 The guidance describes a recommended approach for new residential development, which includes four key elements of the assessment process, identified below:

- i. Good acoustic design process;
- ii. Internal noise level guidelines;
- iii. External amenity area noise assessment;
- iv. Assessment of other relevant issues.

3.9 It is important to note that the guidance in ProPG does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy.

BS 8233:2014 and WHO Guidelines

3.10 BS 8233:2014 [Reference 5] provides design guidance for dwelling houses, flats and rooms in residential use and recommends that internal noise levels in dwellings do not exceed 35 dB $L_{Aeq,16hr}$ in living rooms and bedrooms during the day, 40 dB $L_{Aeq,16hr}$ in dining rooms during the day and 30 dB $L_{Aeq,8hr}$ in bedrooms at night. A relaxation of 5 dBA in the above figures is given in the standard for rooms which are naturally ventilated (by opening windows).

3.11 BS 8233:2014 also notes that *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,T}$, depending on the character and number of events per night."*

3.12 Although the guidelines have no formal standing, the World Health Organisation (WHO) provides guidance on desirable internal noise levels to minimise the risk of sleep disturbance. The WHO 2000 guidelines [Reference 6] suggest internal night-time noise levels not exceeding 30 dB $L_{Aeq,8hr}$ or regularly (10 – 15 times per night) exceeding 45 dB $L_{Amax,T}$ for 'a good night's sleep'.

3.13 BS 8233:2014 suggests an upper guideline value of 55 dB $L_{Aeq,16hr}$ for noise levels in external amenity spaces such as gardens. This is considered an aspirational limit and BS 8233 recognises that the desirable noise levels for external amenity areas are not always achievable in certain locations. BS 8233 also states that development should not be prohibited on the basis of noise levels within external amenity areas.

3.14 Planning Noise Advice Document: Sussex (July 2015) has been reviewed and it is considered that the assessment contained herein meets the requirements of Section 5 "New Noise Sensitive Developments" set out in that document.

Summary

3.15 The impact of noise upon the proposed development has been assessed using the following recommended maximum internal noise levels, due to road/ rail traffic:

- 35 dB $L_{Aeq,16hr}$ daytime noise level for living rooms;
- 30 dB $L_{Aeq,8hr}$ night-time noise level for bedrooms;
- 45 dB $L_{Amax,f}$ night-time noise levels in bedrooms for regular events;
- Aspirational target limit of 55 dB $L_{Aeq,16hr}$ in external amenity areas.

4.0 NOISE MEASUREMENT PROCEDURE AND RESULTS

Instrumentation

4.1 Noise levels were measured using the following equipment:

- | | |
|---|------------|
| • Rion (Class 1) precision sound level meter | Type NL52; |
| • Svantek (Class 1) precision sound level meter x 2 | Type 958; |
| • Brüel and Kjær acoustic calibrator | Type 4231. |

Noise Measurement Procedure

4.2 The noise measurement locations used (shown in Figure 1 and described below) were chosen to establish how noise from the A259 and the railway line affects the proposed site. Subjective observations on site indicate that there is no sustained nor significant contribution to noise levels on the site from activity in the commercial units further to the east of the site.

- Location 1: On the northern site boundary adjacent to the A259;
- Location 2: Approximately 10 m from the southern site boundary adjacent to the railway line.

4.3 In order to assess typical ambient noise levels, the sound level meters were configured to continuously monitor in one minute sample periods. The meters were set up to measure and store overall A-weighted statistical parameters including the L_{Amax} and L_{Aeq} parameters (measured on fast response). Noise measurements were made in accordance with BS 7445: 1991 'Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use' [Reference 7].

- 4.4 The instrumentation was powered by an external battery and stored in a weatherproof case. Throughout the course of the survey, an outdoor microphone windshield was used. The microphone height was 1.5m above local grade. The weather was generally dry with wind speeds less than 5 m/s, however, where weather conditions were unsuitable for noise measurement, data has been removed prior to analysis.
- 4.5 Calibration was checked before and on completion of the measurements and no drift was found. The calibration of 24 Acoustics' instrumentation is traceable to National Standards.
- 4.6 The measured noise levels at Locations 1 and 2 (expressed as L_{Aeq} and L_{Amax}) are shown graphically in Appendix B. The measured average (L_{Aeq}) data values have been combined to generate the overall 16 hour daytime and 8 hour night-time free field levels; these are shown in Tables 1 and 2 below. 24 Acoustics take the typical L_{Amax} value to be the 10th highest value.

Date and Time	Daytime	Night-time	
	dB L_{Aeq} , 16 hour	dB L_{Aeq} , 8 hour	dB $L_{Amax,f}$
Tue 13/10/2020	59*	53	66
Wed 14/10/2020	60	53	67
Thurs 15/10/2020	60	52	67
Friday 16/10/2020	59	50	67
Saturday 17/10/2020	59	51	66
Sunday 18/10/2020	57	51	70
Monday 19/10/2020	60*	-	-
Average	59	52	70 max

Table 1: Noise Survey Results, Location 1

* partial measurement

Date and Time	Daytime	Night-time	
	dB L _{Aeq} , 16 hour	dB L _{Aeq} , 8 hour	dB L _{Amax,f}
Tue 13/10/2020	58*	54	77
Wed 14/10/2020	59	54	78
Thurs 15/10/2020	59	53	78
Friday 16/10/2020	58	54	78
Saturday 17/10/2020	58	53	76
Sunday 18/10/2020	56	55	80
Monday 19/10/2020	59*	-	-
Average	59	54	80 max

Table 2: Noise Survey Results, Location 2

* partial measurement

5.0 NOISE IMPACT ASSESSMENT

Calculated Noise Levels

- 5.1 An acoustic model of the site has been developed to determine the noise levels across the site from the existing railway line. The model has been produced using IMMI 2017 noise mapping software and has used the propagation methodology of ISO 9613 [Reference 8] which takes into account the effects of geometric divergence, acoustic screening and ground and atmospheric absorption. The model has used 50% hard/ soft ground ($G=0.5$), ambient temperature of 10 degrees C and a relative humidity of 70%. Downwind propagation has been assumed to represent a worst case assessment.
- 5.2 Figures 3 and 4 show the predicted L_{Aeq} noise contours across the proposed development site for the day and night-time periods. The model of daytime noise levels assumes a receiver height of 1.5 m whereas the night-time model assumes a receiver height of 4 m to represent bedroom height.

Internal Noise Levels

- 5.3 The analysis given below has been based on 24 Acoustics' understanding of the envelope construction to be used for this scheme (based on a cavity masonry construction). Calculations have been undertaken utilising drawings showing internal layouts and elevations of the various house types provided by Redrow Homes Limited.

- 5.4 Results of acoustic modelling have been used to determine the glazing and ventilation requirements for the proposed residential scheme which will ensure that the noise levels inside the properties do not exceed 35 dB $L_{Aeq, 16 \text{ hour}}$ during the day and 30 dB $L_{Aeq, 8 \text{ hour}}$ at night and also do not regularly exceed 45 dB $L_{Amax, 5 \text{ min}}$ at night.
- 5.5 Calculations have identified minimum required acoustic glazing and background ventilator specifications for proposed residential properties. The specifications for habitable rooms are described below in Table 3 and relevant Zone locations identified in Figure 2.

Zone	Room	Window Type	Ventilator Type
1	Lounge	A	A
	Bedroom	B	B
2	Lounge	A	A
	Bedroom	C	C
3	Lounge	A	A
	Bedroom	A	C
All Other Areas	Lounges & Bedrooms	A	A

Table 3: Acoustic Glazing and Background Ventilator Requirements

- 5.6 Windows when installed should be capable of achieving the performance stated below in Table 4.

Glazing	Minimum SRI (dB) per Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
Type A	21	17	25	35	37	39
Type B	26	28	31	40	44	50
Type C	23	22	27	38	40	41

Table 4: Required Window Performance

- 5.7 In making a comparison with the values in Table 4, it is important that the figures used are the result of tests in accordance with ISO 10140, Part 2: 2010 and that the quoted minimum sound reduction specifications are met by the entire window system as a whole, including frames, seals, any insulated panels and not just the glass. The requirements also apply to any external glazed doors to habitable rooms.

5.8 In order to assist with the selection process, the following suggested glazing configurations, if installed properly, would be capable of achieving the required sound reduction performance, however, this should be reviewed at detailed design:

- Window Type A: 4 mm glass: 12 mm cavity (minimum): 4 mm glass, Minimum 29 dB R_w ;
- Window Type B: 8 mm glass: 6 mm cavity (minimum): 6.4 mm Stadip Silence, Minimum 38 dB R_w ;
- Window Type C: 6 mm glass: 12 mm cavity (minimum): 4 mm, Minimum 33 dB R_w .

5.9 The acoustic performance criteria for background ventilators whilst in the open position are shown in Table 5 below.

Ventilator	Minimum Acoustic Performance $D_{n,e,w}$ (dB) per Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
Type A	23	26	29	30	33	33
Type B	42	35	37	49	62	69
Type C	37	36	35	36	34	56

Table 5: Required Background Ventilator Performance

5.10 In order to assist with the selection process, the following ventilator, if installed properly, would be capable of achieving the required sound reduction performances:

- Ventilator Type A: Standard Trickle Vent, Minimum 32 dB $D_{n,e,w}$;
- Ventilator Type B: Rytons Cowled Super Acoustic Controllable LookRyt® AirCore® AAC125HPCW, Minimum 45 dB $D_{n,e,w}$;
- Ventilator Type C: Sound Attenuated Trickle Vent, Minimum 36 dB $D_{n,e,w}$.

5.11 In making a comparison with the specifications in Table 5, it is important that the figures used are the result of laboratory tests with the vent in the open position. Note that the stated minimum performance values assume one ventilator per habitable room. All ventilators must comply with the requirements of Part F of the Building Regulations [Reference 9].

- 5.12 It is considered that with the proposed mitigation measures as detailed above, suitable internal noise levels can be achieved for the proposed dwellings. If the site layout / housing types change then these calculations should be revised accordingly.

External Noise Levels

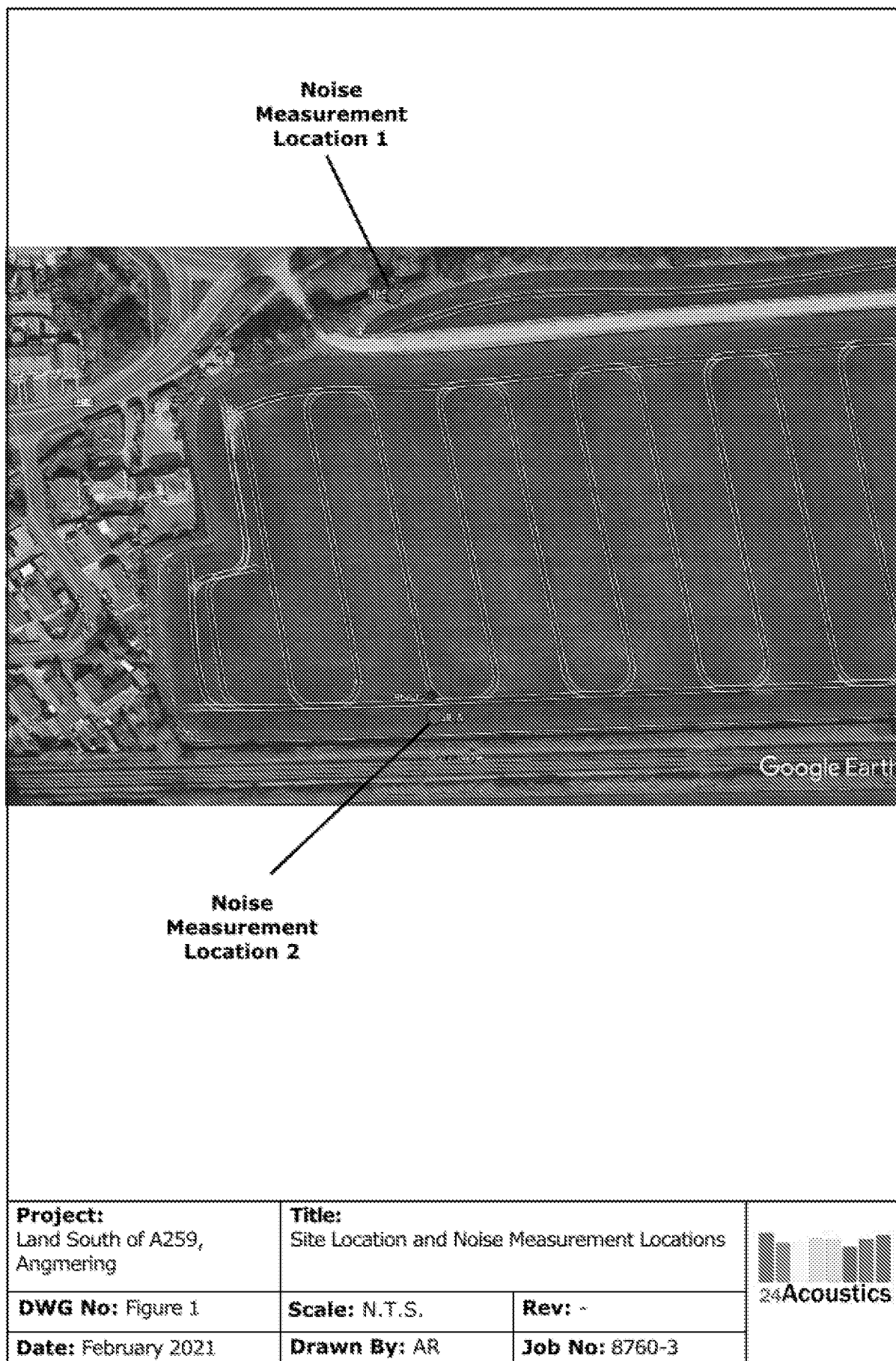
- 5.13 Noise levels in external amenity areas during the day are predicted to be no greater than 55 dB $L_{Aeq, 16hr}$ and this is considered acceptable in planning terms.

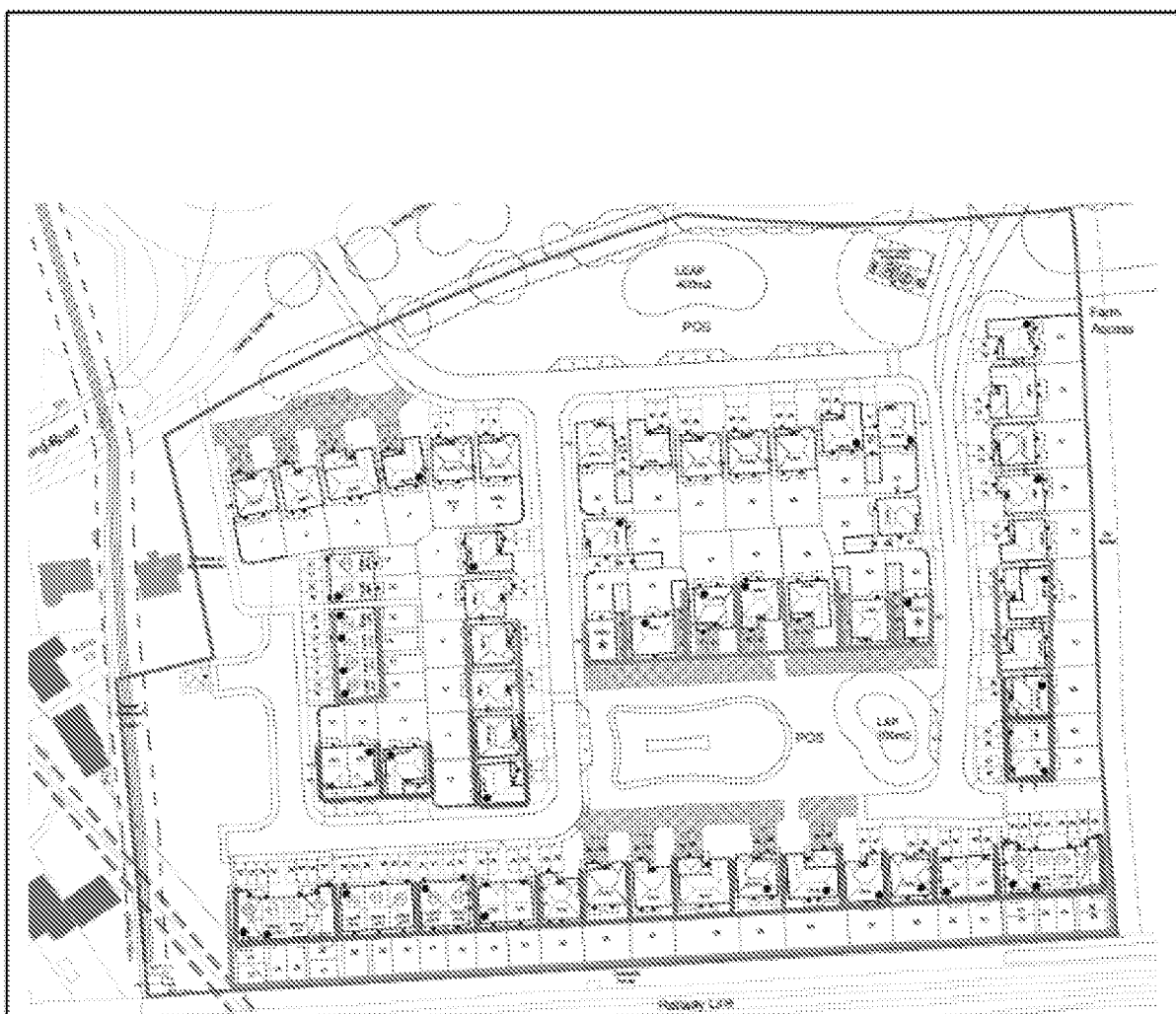
6.0 CONCLUSIONS

- 6.1 Redrow Homes Limited intends to submit a planning application to develop land south of the A259 at Angmering for residential use. The site is subject to noise from road traffic on the A259 and rail traffic using the adjacent Brighton to London Victoria railway line.
- 6.2 24 Acoustics Ltd has been retained by Redrow Homes Limited to provide an assessment of the impact of the existing sources of noise on the proposed new dwellings.
- 6.3 For internal noise, outline recommendations in terms of glazing and alternative means of ventilation have been provided to ensure that noise within habitable rooms, due to rail traffic, would comply with maximum internal levels of 35 dB L_{Aeq} during the daytime and 30 dB L_{Aeq} and 45 dB $L_{Amax, f}$ at night.
- 6.4 Noise levels in external amenity areas during the day are predicted to be less than 55 dB $L_{Aeq, 16hr}$ which is considered acceptable in planning terms.
- 6.5 On the above basis, it is considered that an appropriate acoustic environment can be provided to the proposed residential properties, both externally and internally.

REFERENCES

1. Department for Communities and Local Government. National Planning Policy Framework, updated February 2019.
2. DEFRA, Noise Policy Statement for England, March 2010.
3. National Planning Practice Guidance, Department of Communities and Local Government (revised July 2019).
4. Association of Noise Consultants, Institute of Acoustics, Chartered Institute of Environmental Health. Professional Practice Guidance on Planning and Noise, May 2017.
5. British Standards Institution. British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings, 2014.
6. World Health Organisation. Guidelines for Community Noise, 2000.
7. British Standards Institution. British Standard 7445:1991 Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use, 1991.
8. International Standards Organisation. ISO 9613. Acoustics - Propagation of Environmental Noise, 1997.
9. Building Regulations. Approved Document F - Ventilation, 2010.





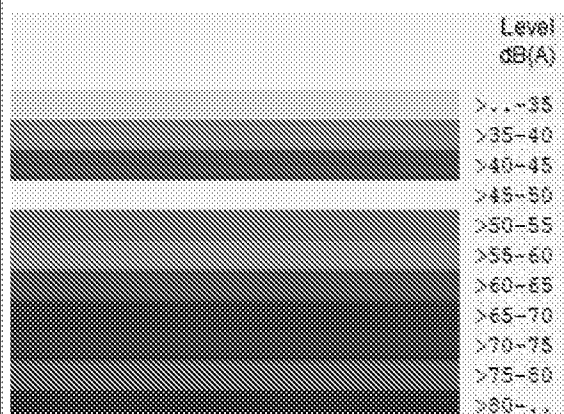
Acoustic Fence 3.2 m tall —————

Zone 1 —————

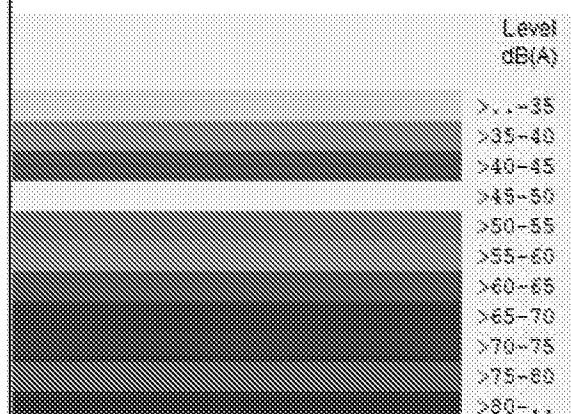
Zone 2 —————

Zone 3 —————

Project: Land South of A259, Angmering	Title: Site Masterplan showing Noise Mitigation Zones		 24Acoustics
DWG No: Figure 2	Scale: N.T.S.	Rev: A	
Date: May 2021	Drawn By: AR	Job No: 8760-3	



Project: Land South of A259, Angmering	Title: Daytime Noise Contours, 1.5 m receiver height L _{Aeq} , 36hr dB		 24Acoustics
DWG No: Figure 3	Scale: N.T.S.	Rev: B	
Date: May 2021	Drawn By: AR	Job No: 8760-3	



Project: Land South of A259, Angmering	Title: Night-time Noise Contours, 4 m receiver height L _{Aeq, 8hr} dB		 24Acoustics
DWG No: Figure 4	Scale: N.T.S.	Rev: B	
Date: May 2021	Drawn By: AR	Job No: 8760-3	

APPENDIX A: ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dB(A) weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dB(A) is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dB(A). The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dB(A) corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

- i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

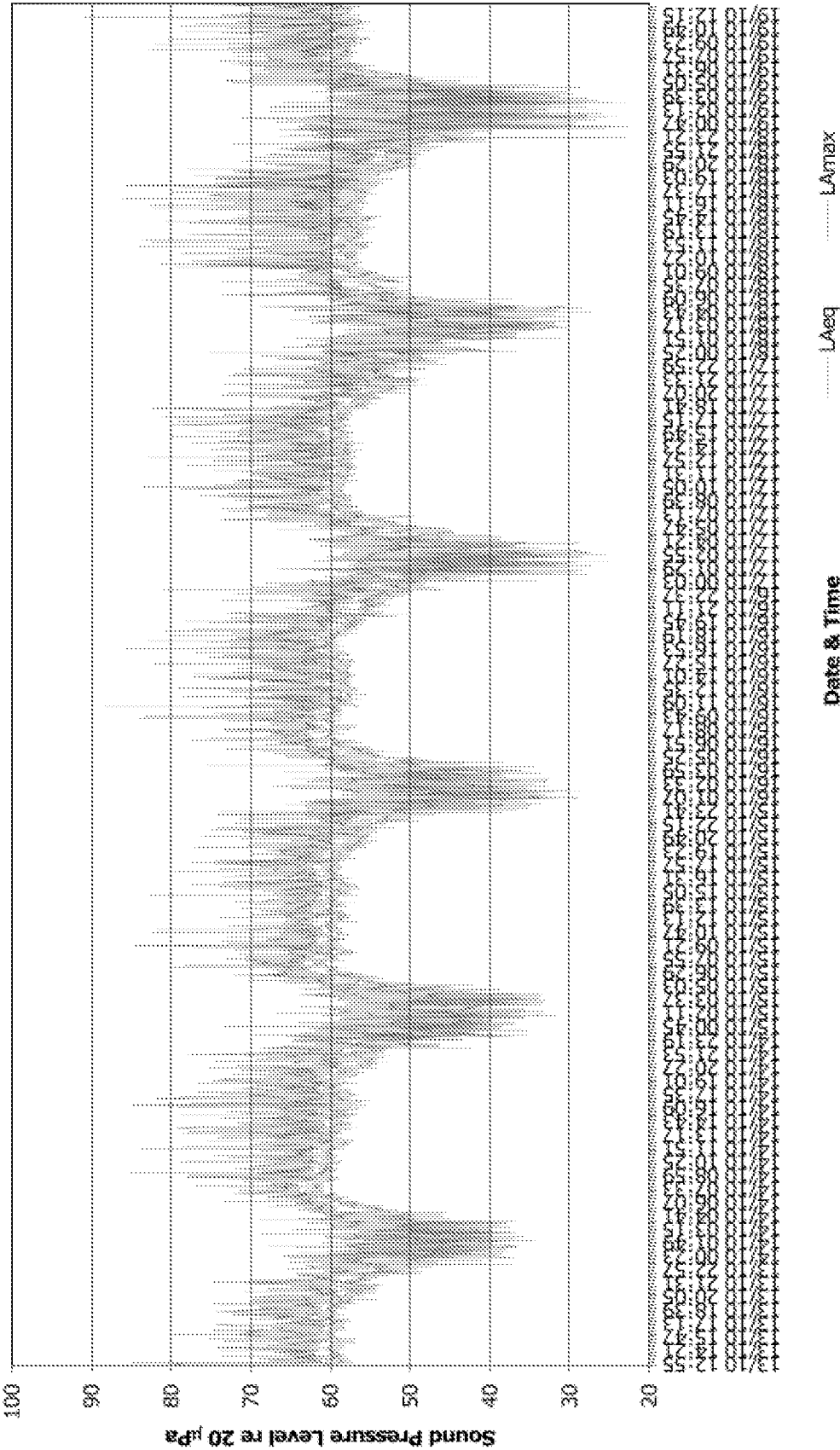
- ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the "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".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

APPENDIX B: Noise Survey Results

Figure B1: Location 1 - Land South of A259, Angmering
Noise Survey 13th - 19th October 2020



**Figure B2: Location 2 - Land South of A259, Angmering
Noise Survey 13th - 19th October 2020**

