

The Haybarn
Newnham Grounds
Kings Newnham Lane
Bretford
Warwickshire
CV23 0JU

Environmental Noise Survey

Prepared: 9th April 2019

Report No	19912-1(R1)
Client	Oakford Homes
Site	Former Gas Works Ford Road Arundel

Arundel

1. Quality Management

Report Number	19912 – 1(R1)
Issue	2
Prepared	9 th April 2019
Prepared By	Bill Whitfield PhD, MSc, MIOA
Authorised By	Dave Riley TechIOA

2. Executive Summary

2.1.1. An environmental noise assessment has been carried out for a proposed residential development at a former gas works site on Ford Road, Arundel ("Proposed Development").

2.2. Measurement, assessment and evaluation

2.2.1. The survey was carried out to BS7445-1:2003¹ and BS7445-2:1991² which are covered under our UKAS Accreditation.

2.2.2. The interpretation of the data and the specification of suitable mitigation or treatment are outside the scope of our UKAS accreditation but is covered in our 17025 Quality Management System and reporting procedure.

2.3. Scope

2.3.1. This report covers all aspects of the noise survey, including:

- the identification of acoustic design criteria;
- an objective sound pressure level survey of the existing site;
- analysis of the data;
- the design of any mitigation to meet the required internal noise criteria

2.4. Results summary

Noise risk assessment

2.4.1. A noise risk assessment of the Proposed Development has been carried out based on the results of the objective sound pressure level survey. The results suggest a low-medium noise risk level.

Risk assessment	Comment
Low	<i>"At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development."</i>
Medium	<i>"As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse impact will be avoided in the finished development."</i>

Table 1 – Noise risk assessment for the Proposed Development site

¹ BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Description of quantities and procedures"

² BS7445-2:1991 "Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use"

Mitigation

- 2.4.2. The facade sound insulation required to meet the guideline values from BS8233:2014 are summarised in Table 2. The glazing performance has been specified in terms of the road traffic corrected weighted sound reduction index, $R_w + C_{tr}$, and the ventilator performance has been specified in terms of the road traffic corrected element normalised level difference $D_{ne,w} + C_{tr}$.

Living rooms (Daytime)	Bedrooms (Night-time)
Specification 1 – Facades overlooking Ford Road and the A27 Road	
27dB $R_w + C_{tr}$ / 33dB $D_{ne,w} + C_{tr}$	25dB $R_w + C_{tr}$ / 31dB $D_{ne,w} + C_{tr}$
Specification 2 – Facades overlooking the River Arun	
20dB $R_w + C_{tr}$ / 26dB $D_{ne,w} + C_{tr}$	20dB $R_w + C_{tr}$ / 26dB $D_{ne,w} + C_{tr}$

Table 2 – Required facade sound insulation (Glazing/Ventilator)

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4. Contents

1. Quality Management	2
2. Executive Summary	3
3. Limitations	5
4. Contents.....	6
5. Background	7
6. Introduction	9
7. Assessment criteria.....	10
8. Survey	13
9. Noise risk assessment.....	15
10. Mitigation	16
11. Conclusions	18
12. Appendix.....	19

3. Background

5.1. Noise Policy Statement for England

- 5.1.1. The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to *“promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”*.
- 5.1.2. This long-term vision is supported by the following aims; through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
- Avoid significant adverse impacts on health and quality of life;
 - Mitigate and minimise adverse impacts on health and quality of life;
 - Where possible, contribute to the improvement of health and quality of life.
- 5.1.3. The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise).

5.2. National Planning Policy Framework

- 5.2.1. The National Planning Policy Framework (NPPF) was published in February 2019 and sets out the Government’s planning policies for England and how these are expected to be applied. The framework states that the planning system should contribute to and enhance the natural and local environment by:
- “preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”*.
- 5.2.2. The NPPF requires that new developments be appropriate to their locations such that the effects of pollution on health have been taken into account. Planning policies and decisions should aim to:
1. avoid noise giving rise to significant adverse impacts on health and the quality of life;
 2. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development; and,
 3. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.
- 5.2.3. Existing businesses near to proposed development should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

5.3. National Planning Practice Guidance

- 5.3.1. The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) in March 2014 to support the NPPF and make it more accessible.³
- 5.3.2. It advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated and noise is listed as a specific category.
- 5.3.3. A summary of the effects of noise exposure (in terms of health and quality of life) associated with both noise generating developments and noise sensitive developments is presented within the PPG and reproduced in Table 3.

Perception	Examples of outcomes	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 (NOAEL)	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
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
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very intrusive	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

Table 3 – Noise exposure hierarchy

³ <http://planningguidance.communities.gov.uk/>

7. Assessment Criteria

7.1.1. Professional practice guidance

7.1.2. The Professional Practice Guidance (ProPG) was published in May 2017 refers specifically for the consideration of new residential developments that will be exposed predominantly to airborne noise from transport sources. The ProPG advocates a two stage risk based approach to noise when planning new residential developments:

- Stage 1 – an initial noise risk assessment of the site; and
- Stage 2 – a systematic consideration of the acoustic design.

7.1.3. An initial noise risk assessment is required to determine the prevailing sound pressure levels at the location of the Proposed Development to indicate whether the proposed site is at a negligible, low, medium or high risk from noise caused by transportation sources. The assessment is based on free-field levels on the existing site and, therefore, does not take into account any new treatment (such as bunds or fences) that will be introduced as part of the development.

7.1.4. The guidance on negligible, low, medium and high risk levels has been summarised in Figure 2.

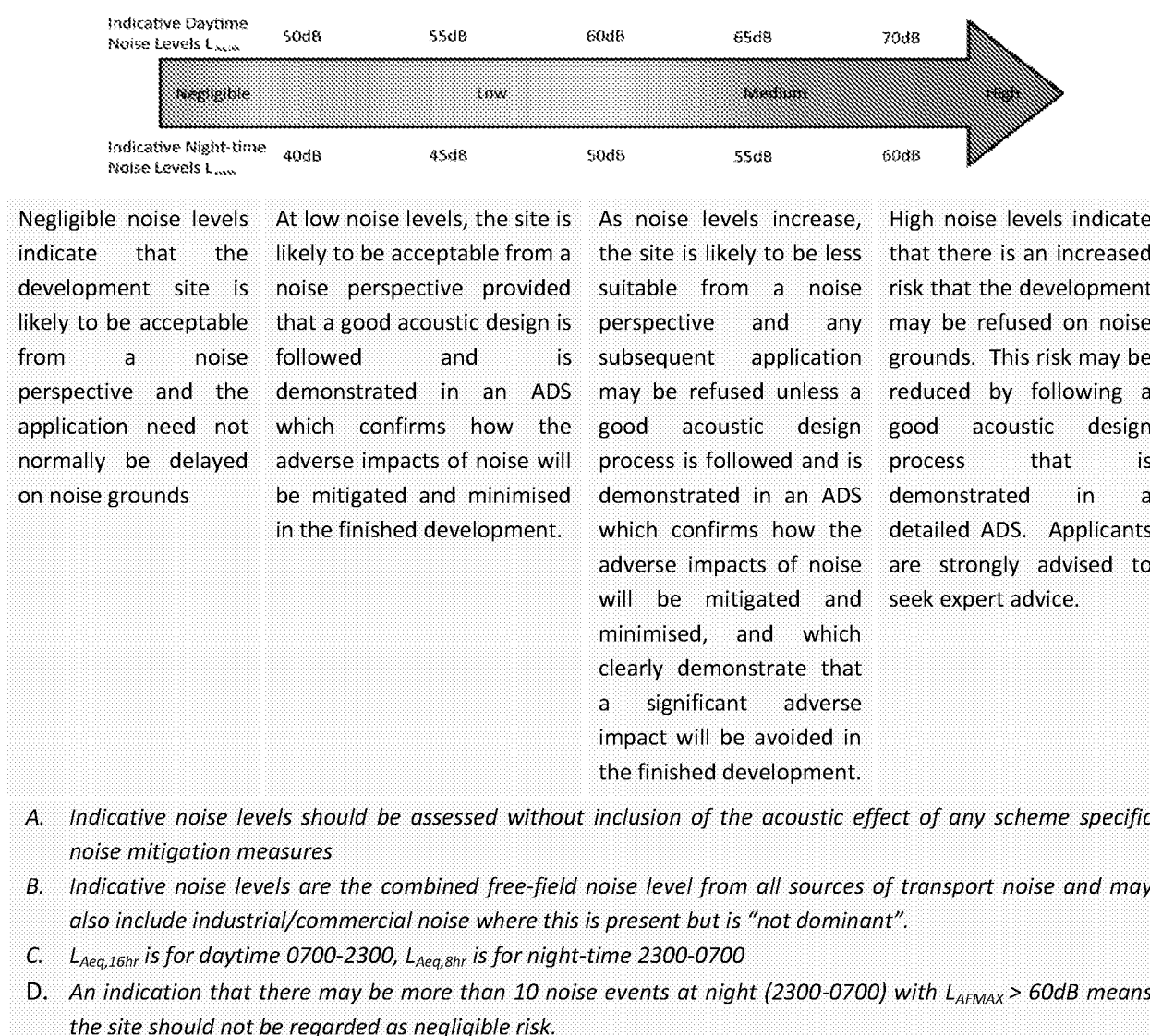


Figure 2 – Stage 1 – Initial site noise risk assessment

7.1.5. The ProPG stresses that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker.

7.2. Guideline Values

BS8233:2014 Internal Ambient Noise Criteria

- 7.2.1. BS8233:2014 draws on the results of research and experience to provide information on the design of buildings that have internal acoustic environments appropriate to their function. The standard provides guideline internal values for dwellings for steady external noise sources. These have been summarised in Table 4.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB $L_{Aeq,16hour}$	-
Dining	Dining Room	40dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$

Table 4 – BS8233:2014 guideline values for internal ambient noise levels from steady external noise sources

- 7.2.2. The guideline values are issued by the World Health Organisation (WHO) and assume normal diurnal fluctuations in external noise. They are expected to be achieved based on normal annual data and not in all circumstances. For example, it is normal to exclude occasional events such as fireworks night or New Year's Eve.

BS8233:2014 Garden Criteria

- 7.2.3. For traditional external areas that are used for amenity space, such as gardens and patios, 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 such cases, the lowest practicable levels should be achieved in external amenity areas but the development should not be prohibited.

7.3. Ventilation and Overheating Requirements

- 7.3.1. This section addresses ventilation issues that may conflict with the acoustic design of the building. They are provided for reference purposes only as this report is addressing the acoustic parameters of the development and building design only.
- 7.3.2. BS8233:2014 states that, if relying on closed windows to achieve the guideline values, there needs to be an appropriate alternative ventilation scheme that does not compromise the facade sound insulation or the resulting noise level. However, rooms should have adequate ventilation, i.e. trickle ventilators should be assumed to be open for any assessment.
- 7.3.3. Ventilation requirements for dwellings are covered under Building Regulations Approved Document F⁴ ("ADF"). It describes the purpose of ventilation as for the removal of stale air from inside a building and replacement with fresh air from outside.
- 7.3.4. ADF prescribes three types of ventilation provision:
1. **Whole dwelling ventilation** – running continuously (includes background ventilation)
 2. **Extract ventilation** – removing vapour/pollutants from a space e.g. from bathrooms and kitchens
 3. **Purge ventilation** – manually controlled rapid ventilation
- 7.3.5. ProPG⁵ states that the internal noise guidelines are generally not applicable under "purge ventilation" conditions as defined by ADF, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).
- 7.3.6. Where a means of ventilation is required as an alternative to open windows, there are four broad categories of ventilation system that each meet the requirements of ADF:
- System 1** – Background ventilators and intermittent extract fans
- System 2** – Passive stack ventilation
- System 3** – Continuous mechanical extract ventilation (MEV)
- System 4** – Continuous mechanical supply and extract with heat recovery (MVHR)
- Systems 1-3 require penetrations in the facade to allow air to flow into and out of the building. In order to control the noise break-in from external noise sources, it should be checked that the penetration offers sufficient resistance to the passage of sound. The sound insulation of these, typically small, penetrations is often specified in terms of the element normalised sound pressure level difference, $D_{ne,w}$, which is often corrected for the spectrum shape of road traffic using the C_{tr} correction term.
- 7.3.7. Ventilation provisions, including open windows, will not necessarily meet cooling needs. Building Regulations Approved Document L2a⁶ ("ADL2a") requires that overheating be mitigated by controlling the solar gains by means of building orientation, shading and the g-value of the glazing. It recommends that the developer assess the overheating risk using CIBSE TM 37.⁷

⁴ Approved Document F: Means of Ventilation (2010 Edition)

⁵ The Professional Practice Guidance on Planning and Noise, ANC, May 2017

⁶ Approved Document L2a : Conservation of Fuel and Power (2013 Edition)

⁷ CIBSE Guide TM 37 "Design for Improved Solar Shading Control"

8. Survey

8.1. Measurement Locations

- 8.1.1. Fixed position monitoring took place at two positions to account for the likely dominant noise sources. The monitoring equipment was located 1.5m from the ground and at least 3m from the next nearest reflecting surface. The monitoring positions are shown in Figure 3.



Figure 3 - Noise monitoring locations on site

- 8.1.2. The measurement instrumentation used during the survey is detailed in the appendix. The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003⁸ before and after the surveys. The calibration details are also detailed in the appendix.

8.2. Meteorology

- 8.2.1. During the survey the weather information was noted. This is summarised in Table 5.

	2 nd April 2019	3 rd April 2019
Roads(Wet/Dry)	Wet	Dry
Wind Speed (ms ⁻¹)/Direction	4/W	2/N

Table 5 - Meteorological data noted during the survey

⁸ BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures"

8.3. Measurement and Timescale

8.3.1. Unattended monitoring was carried out between the 2nd April 2019 and 3rd April 2019. The measurements that have been made are summarised in Table 6.

Monitoring position	Date	Type	Quantity
1	2 nd April 2019– 3 rd April 2019	Fixed/unattended	dB L _{Aeq, 5-min}
2	2 nd April 2019– 3 rd April 2019	Fixed/unattended	dB L _{Aeq, 5-min}

Table 6 – Measurements made at the site of the Proposed Development

8.3.2. Sound pressure measurements were subsequently averaged into hourly, daytime and night-time periods. The acoustic measurements and their interpretation have been in accordance with BS 7445: Parts 1, and 2⁹. All sound pressure levels are in dB (re 20µPa).

8.4. Results Summary

8.4.1. The fixed position external measurement results are summarised in Table 7.

Measurement location	Daytime dB, L _{Aeq, 16hr}	Night-time dB, L _{Aeq, 8hr}
1	61.4	54.4
2	54.7	50.0

Table 7 - Summary of the external sound pressure levels measured

⁹ BS7445-2:1991 “Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use”

9. Noise Risk Assessment

- 9.1.1. The noise risk assessment should not be seen as the basis for the recommendation to the decision maker. The aim is that higher risk sites will be recognised at the earliest possible stage and the increasing importance of good acoustic design can be emphasised.
- 9.1.2. We have assessed the objective sound pressure level data from the survey. The sound pressure levels measured at MP1 suggest a medium risk noise level. At MP2, the sound pressure levels suggest a low risk noise level. Therefore, the results suggest a low-medium noise risk level for the Proposed Development.
- 9.1.3. The risk assessment for the site is summarised in Table 8.

Risk assessment	Comment
Low	<i>"At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development."</i>
Medium	<i>"As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse impact will be avoided in the finished development."</i>

Table 8 – Noise risk assessment for the Proposed Development site

- 9.1.4. The noise risk assessment indicates that a good acoustic design process, documented in an acoustic design statement, is required in order to ensure that the impacts of noise will be mitigated and minimised.

10. Mitigation

10.1. Element 1: Good Acoustic Design Process

- 10.1.1. The client has appointed an acoustics consultant at an early stage. The Proposed Development has been arranged so that apartment blocks are set back from the dominant noise sources. The floor deck amenity area in the centre of the Proposed Development is shielded all around by apartment block A and B. The amenity area to the south of the Proposed Development is mostly shielded by apartment block B and set back from Ford Road. The amenity area to the west of the site is shielded by apartment block A from the A27 road and most of Ford Road. The locations of the amenity areas and surroundings will provide screening.

10.2. Element 2: Internal Noise Level Guidelines

- 10.2.1. Based on the measured and predicted free-field sound pressure levels at the worst affected facades, the simple calculation method from BS8233:2014 has been used to determine the necessary sound reduction to meet the guideline values. Standard forms of construction are assumed such that the glazing is likely to be the lowest performing facade element.

Required Mitigation

- 10.2.2. The single figure glazing and ventilator performance requirements in order to achieve the internal design criteria are summarised in Table 9. The glazing performance has been specified in terms of the road traffic corrected weighted sound reduction index, $R_w + C_{tr}$, and the ventilator performance has been specified in terms of the road traffic corrected element normalised level difference $D_{ne,w} + C_{tr}$.

Living rooms (Daytime)	Bedrooms (Night-time)
Specification 1 – Facades overlooking Ford Road and the A27 Road	
27dB $R_w + C_{tr}$ / 33dB $D_{ne,w} + C_{tr}$	25dB $R_w + C_{tr}$ / 31dB $D_{ne,w} + C_{tr}$
Specification 2 – Facades overlooking the River Arun	
20dB $R_w + C_{tr}$ / 26dB $D_{ne,w} + C_{tr}$	20dB $R_w + C_{tr}$ / 26dB $D_{ne,w} + C_{tr}$

Table 9 – Required facade sound insulation (Glazing/Ventilator)

Glazing and Ventilator Specifications

- 10.2.3. The glazing and ventilator performance has been specified based on the performance data provided by Saint-Gobain and Greenwood Airvac. These are suggested configurations and any other glazing and vent combination can be used provided it achieves the minimum performance levels given in Table 9. The recommended glazing specification is given in Table 10.

Living rooms (Daytime)	Bedrooms (Night-time)
Specification 1 – Facades overlooking Ford Road and the A27 Road	
4 (12) 4 (Saint-Gobain)	4 (12) 4 (Saint-Gobain)
Specification 2 – Facades overlooking the River Arun	
4 (12) 4 (Saint-Gobain)	4 (12) 4 (Saint-Gobain)

Table 10 - Our recommended glazing configurations

- 10.2.4. Should penetrations be required for ventilation purposes our recommended ventilator configurations, calculated to work in conjunction with the above glazing specifications, are summarised in Table 11. The specification provides an equivalent area of at least 5000mm². It should be checked by a suitably qualified person that this ventilator specification meets the requirements of Approved Document F.¹⁰

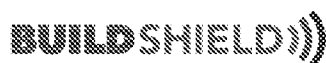
Living rooms (Daytime)	Bedrooms (Night-time)
Specification 1 – Facades overlooking Ford Road and the A27 Road	
1 x Greenwood Airvac Vent 5000EA	1 x Greenwood Airvac Vent 5000EA
Specification 2 – Facades overlooking the River Arun	
1 x Greenwood Airvac Vent 5000EA	1 x Greenwood Airvac Vent 5000EA

Table 11 - Our recommended ventilator configurations.

- 10.2.5. Given the assumptions in this method the information in this section should be treated as general guidance only. The acoustic performance of third party products cannot be guaranteed by noise.co.uk.
- 10.2.6. It should be noted that, in order to meet the internal ambient noise criteria in these areas, the windows will need to remain closed.

10.3. Element 3: External Amenity Area Noise Assessment

- 10.3.1. BS8223 states that it is desirable that the external noise level for amenity spaces, such as gardens and patios, does not exceed 50dB L_{Aeq,T} with an upper guideline value of 55dB L_{Aeq,T} which would be acceptable in noisier environments.
- 10.3.2. In this situation, measurement data at MP2 suggests the amenity area to the south of the Proposed Development are within the guideline values set out for amenity spaces. The amenity area to the west of the site is expected to have most areas below the upper noise limit. However, we suggest installing an acoustic fence 1.8m height to mitigate road traffic noise along Ford Road. We have provided in the appendix a mark-up for the acoustic fence. The amenity area in the centre of the proposed development is expected to be with the guideline values due the screening from apartment block A and block B.
- 10.3.3. The most significant property of the barrier that affects its sound insulation is the mass per unit area. The Department for Transport provides specific guidance on the specification of the minimum mass per unit area for such barriers.¹¹ Based on this guidance, we would recommend that the mass per unit of the close-boarded fence be equal to or greater than 10kg/m².
- 10.3.4. For more information, please contact:



Contact: Robin Millard



10.4. Element 4: Assessment Of Other Relevant Issues

To the best of our knowledge, at this current time, the design advice in this acoustic design statement does not conflict with any other local guidance and is not expected to affect amenity for future residents.

¹⁰ Approved Document F: Means of Ventilation (2010 Edition)

¹¹ Department for Transport (1976) Noise Barriers – Standards and materials, Technical Memorandum H14/76

11. Conclusions

- 11.1.1. An environmental noise survey has been carried out for a proposed residential development at a former gas works site on Ford Road, Arundel to determine typical ambient sound levels. The sound levels have been used to calculate the required facade sound insulation to meet the guideline internal levels from BS8233:2014.
- 11.1.2. Table 9 in section 10 gives the required facade sound reduction by any glazing and ventilator combination to be compliant with the guideline values.
- 11.1.3. We strongly recommend that this report be passed to the local planning authority for approval prior to any works being carried out.

12. Appendix

APPENDIX A: Summary information

Required ISO Test Report Information (cross referenced where required)			
		Measurements carried out to:	Analysed to:
A	Standards	BS 7445-1: 2003 BS 7445-2: 1991	BS 8233:2014
B	Organisation performed the measurements	noise.co.uk Ltd, The Haybarn, Newnham Grounds, Kings Newnham Lane, Bretford, Coventry, CV23 0JU.	
C	Name of Client	Oakford Homes	
D	Full site address	Former Gas Works Site Ford Road Arundel	
E	Date of surveys	Survey Date: 2 nd April 2019- 3 rd April 2019	
F	Description & identification of Proposed Development	It is proposed to develop the site for residential use.	
G	Brief Description of details of Procedure & equipment	See Section 6 of this report.	

APPENDIX B: Technical appendix

12.1.1. Measurements were made using the following equipment:

Monitoring Position	Sound Level Meter (Serial Number)	Calibrator (Serial Number)
1	Norsonic 140 (1405560)	Norsonic 1251 (33824)
2	Norsonic 140 (1405559)	Norsonic 1251 (33823)

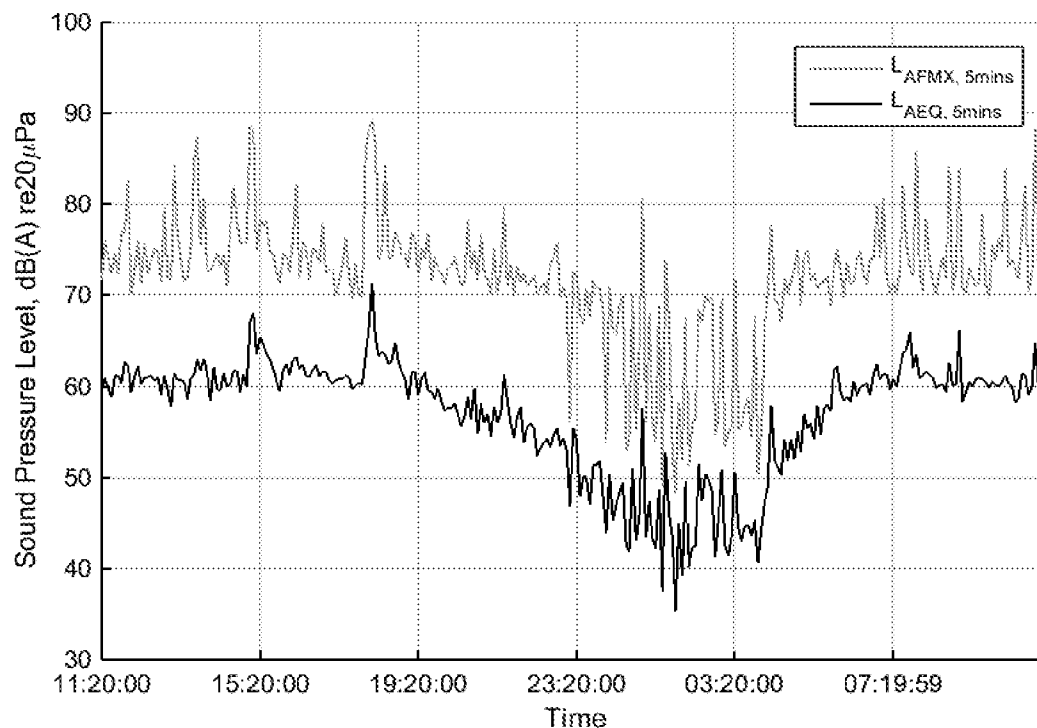
12.1.2. The equipment has traceable calibration. The sound level meter was calibrated immediately prior to and immediately after the measurements were carried out.

Sound Level Meter	Before	After
Norsonic 140 (1405560)	114.0 dB	114.0 dB
Norsonic 140 (1405559)	114.0 dB	114.0 dB

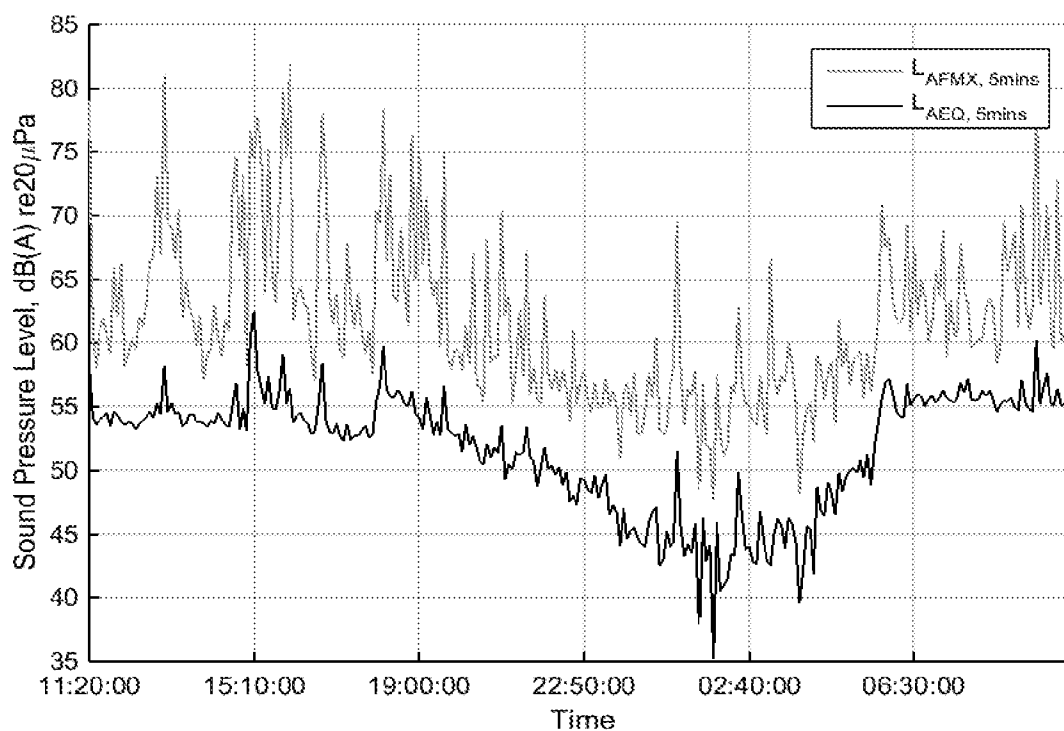
12.1.3. There was no adverse deviation.

APPENDIX D: Raw data

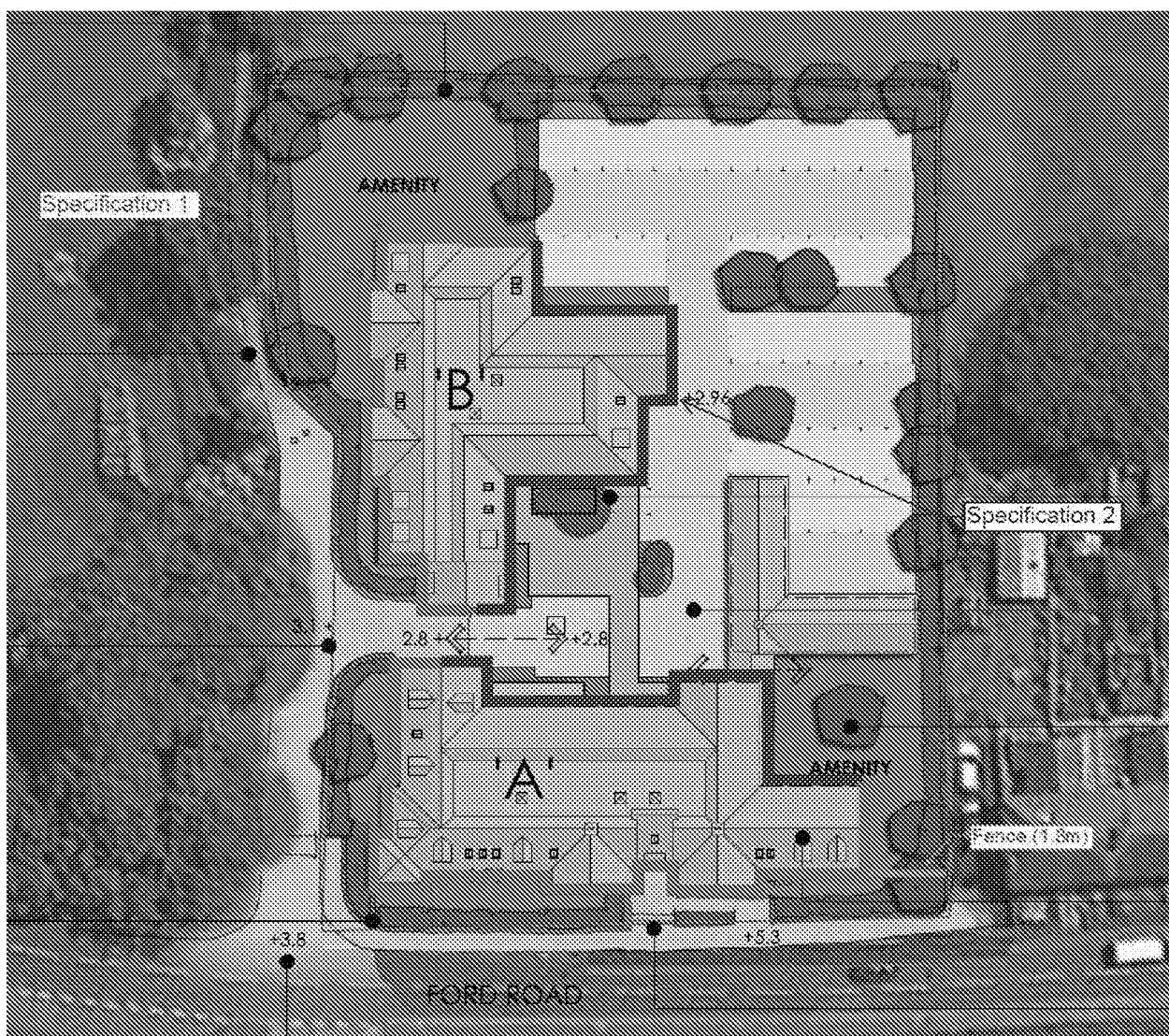
MP1



MP2



APPENDIX E: Glazing mark-up plan



Living rooms (Daytime)	Bedrooms (Night-time)
Specification 1 – Facades overlooking Ford Road and the A27 Road	
$27\text{dB } R_w + C_{tr} / 33\text{dB } D_{ne,w} + C_{tr}$	$25\text{dB } R_w + C_{tr} / 31\text{dB } D_{ne,w} + C_{tr}$
Specification 2 – Facades overlooking the River Arun	
$20\text{dB } R_w + C_{tr} / 26\text{dB } D_{ne,w} + C_{tr}$	$20\text{dB } R_w + C_{tr} / 26\text{dB } D_{ne,w} + C_{tr}$