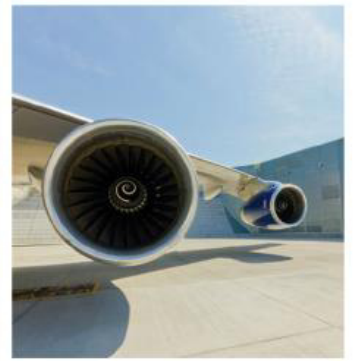
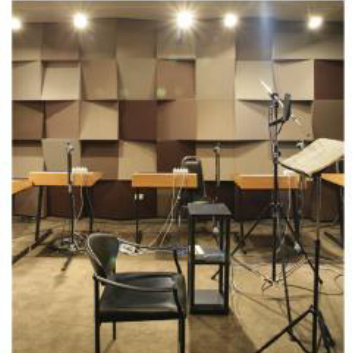


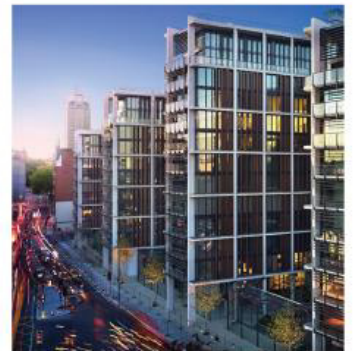


REPORT AS10285.180326.ADS

LAND TO THE WEST OF ORCHARD BUSINESS PARK  
YAPTON



ProPG STAGE 2 ACOUSTIC DESIGN STATEMENT

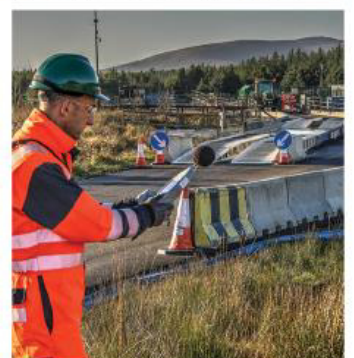


Prepared: 31 May 2018



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## 1.0 INTRODUCTION

It is proposed to develop land to the west of Orchard Business Park, Yapton for residential use to accommodate 10 new detached houses.

Clarke Saunders Associates has been commissioned by Crayfern Homes Ltd to undertake an assessment of the current environmental noise impact on the site. Noise will be assessed in accordance with the National Planning Policy Framework, the recently published ProPG: Planning and Noise<sup>1</sup> for new residential developments and with reference made to the relevant guidance set out in BS8233:2014 *Guidance on sound insulation and noise reduction for buildings*.

Furthermore, the business park within close proximity of the proposed site may have an adverse impact on the future residents of the future residents of the development. In order to assess the impact and any potential mitigation measures, an assessment would be undertaken following procedures in BS4142:2014 *Methods for rating and assessing industrial and commercial sound*.

Following the initial Stage 1 Risk Assessment (see Appendix B) which identified the development area as a low to medium risk area in terms of noise impact, this Stage 2 Acoustic Design Statement considers the noise impact of the site in detail and addresses the requirement for any outline mitigation measures as appropriate for the proposed residential development.

## 2.0 ProPG ELEMENT 1 – ACOUSTIC DESIGN CONSIDERATIONS

It is understood through liaison with the Developer that the risk of noise impact, due to North End Road adjacent to the western boundary and Orchard Business Park adjacent to the eastern boundary of the site, has been well understood from the beginning of initial design and that due consideration of this noise source has been accommodated in the scheme to encourage good acoustic design of the site. Site and plot layout and dwelling floor plan layout have all been considered in order to mitigate noise impact. It is understood that:

- Non-glazed building elements of suitable materials and mass have been proposed for dwellings across the site. All facades are constructed from masonry, with casement double-glazed units.
- The orientation and floorplan layout of plots 1, 2, 5, 8, 9 and 10 have been arranged such that the majority noise-sensitive windows are orientated away from the most affected façades.
- Site layout has been designed to ensure that, wherever possible, distance between noise sensitive façades and nearby noise sources has been maximised. All plots have been

positioned such that a buffer zone has been provided in the form of external amenity and parking areas.

- The site plan proposes to build a retaining wall on the western side of the site adjacent to North End Road, as well as a 1.8m close board boundary fence surrounding the site.
- Any development must balance acoustic design, a variety of monetary and health and safety concerns, as well as other common considerations such as aspect, light and management/utilities access issues. Wherever possible at the proposed site, good acoustic design has been implemented in the context of these (sometimes competing) concerns and has been prioritised wherever appropriate.

### 3.0 ProPG ELEMENT 2 – INTERNAL NOISE LEVEL ASSESSMENT

The second element of the assessment is to seek to achieve recommended noise levels inside noise sensitive rooms in new residential development.

#### 3.1 ProPG Internal Noise Level Guidelines

ProPG brings together relevant guidance from several sources including a British Standard (BS 8233: 2014 *Guidance on sound insulation and noise reduction for buildings*) and internationally published guidance in the form of World Health Organisation *Guidelines for Community Noise* (1999). This is summarised in following Table 3.1.

| Activity                   | Location    | 07:00 to 23:00            | 23:00 to 07:00                                          |
|----------------------------|-------------|---------------------------|---------------------------------------------------------|
| Resting                    | Living Room | 35 dB $L_{Aeq}$ , 16 hour | -                                                       |
| Dining                     | Dining Room | 40 dB $L_{Aeq}$ , 16 hour | -                                                       |
| Sleeping (daytime resting) | Bedroom     | 35 dB $L_{Aeq}$ , 16 hour | 30 dB $L_{Aeq}$ , 8 hour<br>45 dB $L_{Amax,F}$ (Note 4) |

**Table 3.1 – Excerpt from ProPG: summary of internal noise criteria****[dB ref. 20µPa]**

**NOTE 1** The Table provides recommended **internal  $L_{Aeq}$  target** levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

**NOTE 2** The **internal  $L_{Aeq}$  target** levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal  $L_{Aeq}$  target levels recommended in the Table.

**NOTE 3** These **internal  $L_{Aeq}$  target** levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

**NOTE 4** 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  $L_{Amax,F}$ , depending on the character and number of events per night. Sporadic noise events could require separate values. **In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB  $L_{Amax,F}$  more than 10 times a night.** However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

**NOTE 5** Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal  $L_{Aeq}$  target levels should not normally be exceeded, subject to the further advice in Note 7.

**NOTE 6** Attention is drawn to the requirements of the Building Regulations.

**NOTE 7** Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal  $L_{Aeq}$  target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. **The more often internal  $L_{Aeq}$  levels start to exceed the internal  $L_{Aeq}$  target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable".** Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal  $L_{Aeq}$  levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).

### 3.2 External Building Fabric Specification & Internal Noise Level Assessment

The following design review is based on the architectural drawings for the proposed construction and site layout available at the time of writing, targeting the internal noise levels set out in Table 3.1.

### 3.2.1 Principle Noise Sources and Propagation Across Site

The principal source of noise impact on the site is from road traffic noise and this determines the required performance specification for the external building fabric envelope.

### 3.2.2 Non-Glazed Façade Element

It has been assumed that all non-glazed elements, i.e. masonry walls/facings and the roof systems, will provide the following minimum sound insulation performances, when tested in accordance with ISO 10140-2:2010.

| Frequency (Hz) | Single Figure Weighted Sound Reduction Figure (dB) |
|----------------|----------------------------------------------------|
| Masonry        | 51                                                 |

Table 3.2 - Assumed minimum sound reduction index of solid constructions

### 3.2.3 Glazing Specification

The minimum sound insulation specifications for the glazed elements of the building façades are provided in Table 3.3. These have been calculated using the site survey data.

| Glazing Type | Single Figure Weighted Sound Reduction Figure (dB) | Ventilator Performance (dB) |
|--------------|----------------------------------------------------|-----------------------------|
| Type A       | $R_w$ 21                                           | $D_{n,e,w}$ 27              |
| Type B       | No acoustic specification required                 | Natural Ventilation         |

Table 3.3 – Minimum required sound reduction indices for glazing and ventilators

Table 3.4 below, identifies where the performance requirements shown in Table 3.3 apply:

| Façades                                                                                   | Glazing type required |
|-------------------------------------------------------------------------------------------|-----------------------|
| coloured façades (first floor only)<br>see attached glazing location plan (bedrooms only) | Type A                |
| All other areas                                                                           | Type B                |

Table 3.4 - Locations for glazing types

Given the measured noise levels at the site boundary, it is anticipated that proprietary well sealed standard thermal double-glazing units may be sufficient to achieve the Type A specification.

In order that 'Type A' windows may remain closed to maintain internal noise levels, it is expected that an alternative means of ventilation will be required. If passive ventilation (wall or trickle vents) are used the performance shown in Table 3.3 will be required. The figures stated are for a single vent per room. If multiple vents are required, then the performance requirement shown in Table 3.3 will increase by a value equal to  $+10\log(N)$ , with  $N$  being the total number of vents serving the room.

There is no reason why windows in Type A areas could not be opened as a matter of personal preference or for purge ventilation, since no such internal noise criteria are specified for the purge scenario.

The above analysis is based on controlling internal noise levels to the criteria outlined in the ProPG. This document also notes that the judgment of acceptability of noise from regular specific noise events such as from scheduled aircraft or train movements should also take into account other factors such as predictability and regularity and not simply maximum noise levels.

It is important that the quoted minimum sound reduction specifications are met by the panels and windows, including frames, seals, etc. Glass performance alone is not an acceptable means of demonstrating compliance with the specification for window performance.

The sound reduction of the windows should be met with any proposed trickle vents installed and open. If this cannot be met then an alternative means of ventilation may be required.

In Type B areas, no acoustic specification is required since internal noise levels can be achieved in bedrooms and living rooms with windows open.

### 3.2.4 Assessment

It is expected that with the adoption of the specified facade design measures, ventilation strategies, and proposed 1.8m close-boarded boundary fencing, internal noise levels across the development can be controlled to levels commensurate with, or lower than the aspirational guidance levels shown in Table 3.1. In the specific circumstances set out above this can be achieved with natural ventilation of all noise sensitive rooms in the areas of the proposed development denoted Type B.

## 4.0 ProPG ELEMENT 3 – EXTERNAL AMENITY AREA NOISE ASSESSMENT

The ProPG makes it clear that consideration of noise in proposed external amenity areas is an important element in managing noise impact in new residential developments. The ProPG encourages a more holistic consideration of amenity that simply rating the level of noise outside.

## 4.1 ProPG External Noise Level Guidelines

ProPG states the following regarding the consideration and assessment of noise in external amenity spaces.

- 3(i) *“If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended”.*
- 3(ii) *“The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB  $L_{Aeq,16hr}$ .”*
- 3(iii) *“These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.”*
- 3(iv) *Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.*
- 3(v) *Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
  - *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
  - *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or ProPG Planning & Noise: New Residential Development*
  - *May 2017 2. Recommended Approach for New Residential Development 18 large open balcony in a different, protected, location); and/or*
  - *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*

- *a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations*

## 4.2 External Amenity Space Noise Assessment

### 4.2.1 Proposals

All dwellings will have external amenity spaces to the rear, which are to be surrounded by 1.8m high close-board timber fencing.

### 4.2.2 Anticipated Noise Levels

Anticipated noise levels in the areas of external amenity described above have been calculated from existing noise levels across the proposed development site, taking into account screening losses from the 1.8m boundary fence and distance losses. On the basis of the proposed site layout, it is anticipated that noise levels in all amenity areas would be commensurate with or lower than the aspirational design range of 50 – 55 dB  $L_{Aeq,16hour}$ .

## 5.0 ProPG ELEMENT 4 – ASSESSMENT OF OTHER RELEVANT ISSUES

### 5.1 Compliance with Relevant National and Local Policy

National planning policy for England, set out in the Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and the ProPG, aims to promote the building of high quality sustainable homes in desirable areas while ensuring future and existing nearby residents and businesses are not adversely affected by the scheme (including by noise, amongst others).

The ProPG outlines a staged process by which to initially assess the risk posed by the existing noise climate followed by a more in-depth assessment of those risks and consideration of strategies by which they can be mitigated.

This assessment has been carried out following the ProPG process, with reference to the conclusions of noise impact assessments for previous residential schemes at the site.

This assessment has demonstrated that by the use of suitable mitigation measures and careful design of facade performance, layout of the site and internal layout of the dwellings, acceptable noise levels can be achieved both internally and externally.

## 5.2 Magnitude of Extent of Compliance with the ProPG

This assessment has demonstrated that using careful acoustic design, both internal and external noise levels can be maintained in properties across the proposed scheme. The development is, therefore, generally compliant with the ProPG. The following factors are highlighted as undesirable in the context of the ProPG and the justification for inclusion in the scheme is provided:

| Reason for non-compliance                                                           | Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Suitable internal noise levels are achieved on some façades when windows are closed | <p>Due to the close proximity of the plots on the western boundary of the site to North End Road, there is little opportunity to mitigate noise impact on noise sensitive rooms via means other than keeping the windows shut.</p> <p>Alternative ventilation strategies have been recommended for these rooms as a result.</p> <p>This is only applicable for first floor bedrooms. Noise sensitive rooms on the ground floor are able to achieve suitable internal noise levels with natural ventilation.</p> |

Table 5.1 – ProPG Non-compliances and justifications

## 5.3 Likely Future Occupants

The scheme consists of 10 dwellings ranging from 2 to 4 bedrooms. Occupants are likely to be professionals and families.

Each house will have a private fenced garden, all of which are adequately screened from the road traffic noise on North End Road. It is unlikely that the noise exposure of the site would be expected to conflict with the likely future occupant's aspirations and expectations for these dwellings.

## 5.4 Acoustic Design vs Unintended Adverse Consequences

No significant adverse consequences resulting from the use of the proposed acoustic design have been identified.

## 5.5 Acoustic Design vs. Wider Planning Objectives

The acoustic design outlined in the report generally supports the wider planning objectives of providing new homes in desirable areas, close to local and national transport links and local amenities.

## 6.0 BS4142:2014

British Standard BS4142:2014 describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- *Sound from industrial and manufacturing processes;*
- *Sound from fixed installations which comprise mechanical and electrical plant and equipment;*
- *Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and;*
- *Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.*

The Standard is therefore suited to this assessment.

This Standard compares the sound levels in terms of a  $L_{Aeq}$  for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) due to the sound source, the “Specific Sound Level”, with the existing background sound level in terms of an  $L_{A90}$  when the sound source is not operating.

The Specific Sound Level can be determined by various means, depending upon the relative level, of otherwise-occurring sound, i.e. the “Residual Sound Level”.

As part of the assessment, consideration is given to the character of the sound. The Standard provides the following advice.

### Tonality

For sound ranging from not tonal to prominently tonal, the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be allocated as a penalty of 2 dB for a tone which is just perceptible at the sound receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

### Impulsivity

A correction of up to +9dB can be applied for sound that is highly impulsive considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be allocated as a penalty of 3 dB for impulsivity which is just perceptible at the receiver, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

## Other sound characteristics

Where the specific sound contains characteristics that are neither tonal nor impulsive, but are otherwise startling, disturbing or incongruous with the residual acoustic environment, a penalty of +3 dB can be applied.

## Intermittency

When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.

## Impact Assessment

The resultant Background Sound Level is subtracted from the Rating Level to obtain an initial estimate of the impact.

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB could be an indication of an adverse impact, depending on the context.*
- *The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that there will be an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context.*

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

## 6.1 Sound Impact

Using the noise levels acquired during the environmental noise survey as described in Section 3.0 of the Stage 1 Risk Assessment (see Appendix B), sound emissions arising from Orchard Business Park have been assessed following procedures set out in BS4142:2014 *Methods for rating and assessing industrial and commercial sound*. A summary of this assessment is shown Table 6.1 below.

All measurements were witnessed on Friday 16<sup>th</sup> March 2018 by Fiona Fitzgerald of Arun District Council. It was agreed during the visit that an assessment of noise arising from the 'Classic Perfections' unit's extractor fan was the primary concern, with general workshop noise levels not likely to give rise to adverse impact. Use of this extractor fan was intermittent depending on the

type of work being undertaken in the workshop. It is therefore expected that extractor fan would be in use for approximately half of the working day.

The most affected receptors have been identified as the rear gardens of plot 5. As required by the standard, extract fan sound emissions to the garden area have been assessed at 3.5 metres from the rear façade (approximately 17m from the extract fan).

Full calculations are shown in attached Appendix C.

| BS4142:2014 Assessment Summary         |      | Comments                                                                                       |
|----------------------------------------|------|------------------------------------------------------------------------------------------------|
| Specific Sound Level                   | 38dB |                                                                                                |
| Total Acoustic Character Correction(s) | +3dB | A 3dB penalty for intermittency was agreed due to the on/off nature of the extractor fan.      |
| Rating Level                           | 41dB |                                                                                                |
| Background Sound Level (LA90)          | 44dB | Derived from taking the modal value of all LA90 measurement during working hours (0800 – 1800) |
| Assessment Level                       | -3dB | Assessment indicates low impact.                                                               |

**Table 6.1 – BS4142:2014 Assessment Summary**

## 6.2 Context

The above summary assessment indicates a low impact from Classic Perfections' extract fan, as the standard states *'Where the rating level does not exceed the background sound level, this is an indication of the specific sound level having a low impact, depending on the context'*.

After discussion with Classic Perfections, it was confirmed that the workshop is typically open on weekdays and the occasional Saturday mornings. Use of the extract fan can vary dependent on the nature of work being undertaken in the workshop.

The nature of the noise source does not have any subjective tonal or impulsive characteristics, and is relatively broadband. Excluding the noise associated with the extract fan, the noise environment at the development site is low without other significant noise sources in proximity to the area.

The context of the noise impact on the proposed rear gardens of Plot 5 shows that noise emissions from the extract fan are of a limited frequency and duration and typically occur at a time when the external amenity areas are unoccupied (weekdays 0800 – 1800) with the exception of occasional Saturday mornings.

### 6.3 Uncertainty

As per the requirements of BS4142:2014, the uncertainty in the assessment is considered and reported. This is not an indication of error but an acknowledgment of possible variability of the factors contributing to the assessment.

Use of a calibrated type 1 sound level meter is considered to reduce measurement instrument error to insignificant levels as compared with environmental variations.

Measurements were taken at the assessment position, however the proposed 1.8m fence has not yet been installed. A correction for the screening provided by the boundary fence has been allowed in the calculations.

## 7.0 CONCLUSIONS

Measurements have been made of the prevailing noise climate at the proposed site for residential development at the land to the west of Orchard Business Park, Yapton.

The measured noise levels have been assessed against the National Planning Policy Framework and currently available standards and guidance documents including the Professional Practice Guidance on Planning and Noise, World Health Organisation *Guidelines for Community Noise* (1999) and BS8233:2014 *Guidance on sound insulation and noise reduction for buildings*, to consider whether the site is suitable for its proposed residential use.

The survey has allowed the minimum sound reduction requirements of the external building fabric to be established as a performance specification.

Where appropriate, it is important that the successful contractor demonstrates in a UKAS accredited or an equal and approved laboratory that the minimum sound reduction requirements can be achieved by their proposed window systems.

Mitigation measures including acoustically specified double-glazing have been recommended in a small number of areas. The acoustic performance of the external building fabric would be reviewed to verify compliance with the performance specification.

Noise sensitive windows on exposed façades will require an alternative means of ventilation due to high external noise levels. A suitable acoustic specification has been provided for trickle ventilation, where this solution is desired. It has been shown that apartments on the least exposed facades may be ventilated via openable windows whilst maintaining reasonable internal noise levels.

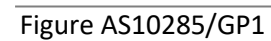
The sound impact of an extractor fan used by 'Classic Perfections', a tenant of Orchard Business Park, has been assessed following procedures in BS4142:2014 *Methods for rating and assessing industrial and commercial noise*, as required by Arun District Council.

The assessment summary indicates a '*low impact*', when considered in the context of the environment in which the assessment is set.



Daniel Saunders MIOA

CLARKE SAUNDERS ASSOCIATES



## ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND SOUND

### 1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

|                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sound</b>                                                                                                         | Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Noise</b>                                                                                                         | Sound that is unwanted by or disturbing to the perceiver.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Frequency</b>                                                                                                     | The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>dB(A):</b>                                                                                                        | Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or $L_A$ .                                                                                                                                                                                                                                                                                                                                                                                 |
| <b><math>L_{eq}</math> :</b>                                                                                         | <p>A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).</p> <p>The concept of <math>L_{eq}</math> (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because <math>L_{eq}</math> is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.</p> |
| <b><math>L_{10}</math> &amp; <math>L_{90}</math> :</b>                                                               | <p>Statistical <math>L_n</math> indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, <math>L_{10}</math> is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, <math>L_{90}</math> is the typical minimum level and is often used to describe background noise.</p> <p>It is common practice to use the <math>L_{10}</math> index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.</p>                                                                                                   |
| <b><math>L_{max}</math> :</b>                                                                                        | The maximum sound pressure level recorded over a given period. $L_{max}$ is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged $L_{eq}$ value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b><math>R_w</math> <math>D_w</math><br/><math>D_{nT,w}</math> <math>D_{n,e,w}</math><br/><math>D_{n,f,w}</math></b> | Value of parameter, determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1 to provide a single-figure value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

### 1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

|                                 |    |     |     |     |      |      |      |      |
|---------------------------------|----|-----|-----|-----|------|------|------|------|
| Octave Band Centre Frequency Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|---------------------------------|----|-----|-----|-----|------|------|------|------|

## ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND SOUND

### 1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

#### INTERPRETATION

| Change in Sound Level<br>dB | Subjective Impression                             | Human Response   |
|-----------------------------|---------------------------------------------------|------------------|
| 0 to 2                      | Imperceptible change in loudness                  | Marginal         |
| 3 to 5                      | Perceptible change in loudness                    | Noticeable       |
| 6 to 10                     | Up to a doubling or halving of loudness           | Significant      |
| 11 to 15                    | More than a doubling or halving of loudness       | Substantial      |
| 16 to 20                    | Up to a quadrupling or quartering of loudness     | Substantial      |
| 21 or more                  | More than a quadrupling or quartering of loudness | Very Substantial |

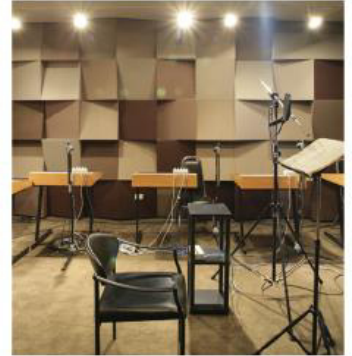
### 1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

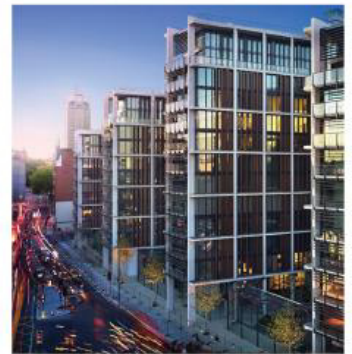
Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.



**REPORT AS10285.180326.RA1.1**



**LAND TO THE WEST OF ORCHARD BUSINESS PARK  
YAPTON**



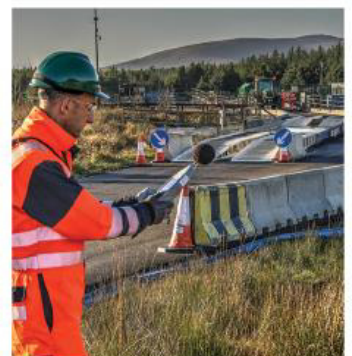
## **STAGE 1 RISK ASSESSMENT**

Prepared: 30 May 2018



**Crayfern Homes Ltd**

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Southampton



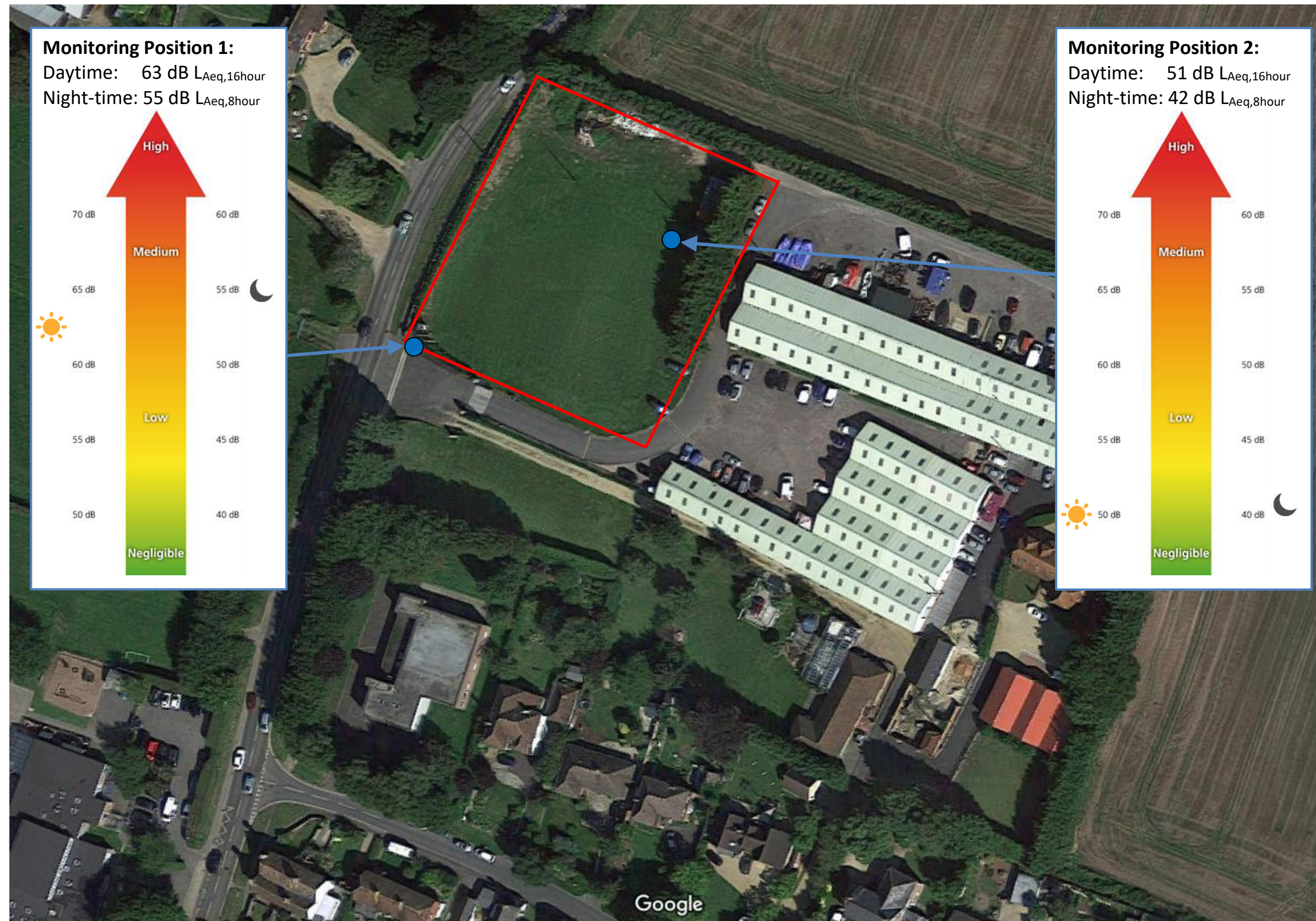
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## Executive Summary:

A survey of the existing background noise levels was undertaken at the locations shown between 12:20 hours on Friday 16<sup>th</sup> March and 13:20 hours on Tuesday 20<sup>th</sup> March 2018.

The site is affected mainly by road traffic noise using North End Road as well as a contribution from industrial noise from Orchard Business Park

Daytime and night-time noise levels are considered to be a low to medium risk of adverse effect, primarily a result of road traffic noise from North End Road during this period.

A detailed Acoustic Design Statement outlining appropriate measures, if necessary, to mitigate the noise impact will be required in order to demonstrate that the site would be suitable for residential development.

**Project:** Land to the West of Orchard Business Park, Yapton

**Figure:** AS10285/PPG01

**Date:** 05/04/2018

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| 2.0 | SITE DESCRIPTION               | 1 |
| 3.0 | ENVIRONMENTAL NOISE SURVEY     | 1 |
| 3.1 | <i>Procedure and Equipment</i> | 1 |
| 3.2 | <i>Results</i>                 | 2 |
| 4.0 | CONCLUSION                     | 2 |

List of Attachments

|                 |                                       |
|-----------------|---------------------------------------|
| AS10285/PPG01   | Initial Noise Risk Assessment Summary |
| AS10285/TH1-TH8 | Environmental Noise Time Histories    |
| Appendix A      | Acoustic Terminology                  |

## 1.0 INTRODUCTION

It is proposed to develop land to the west of Orchard Business Park, Yapton for residential use to accommodate 10 new detached houses.

Clarke Saunders Associates has been commissioned by Crayfern Homes Ltd to undertake an assessment of the current environmental noise impact on the site. Noise will be assessed in accordance with the National Planning Policy Framework, the recently published *ProPG: Planning and Noise*<sup>1</sup> for new residential developments and with reference made to the relevant guidance set out in BS8233: 2014 *Guidance on sound insulation and noise reduction for buildings*.

This report presents the results of the Stage 1 Risk Assessment which will be used to inform the requirement for a subsequent Stage 2 Acoustic Design Statement.

## 2.0 SITE DESCRIPTION

The greenfield site is bounded by agricultural land to the north, Orchard Business Park to the east, access road to Orchard Business Park to the south, and North End Road to the west.

## 3.0 ENVIRONMENTAL NOISE SURVEY

### 3.1 Procedure and Equipment

A survey of the existing background noise levels was undertaken at the location shown in figure AS10285/PPG01. Measurements of consecutive 5-minute  $L_{Aeq}$ ,  $L_{Amax}$ ,  $L_{A10}$  and  $L_{A90}$  sound pressure levels were taken between 12:20 hours on Friday 16<sup>th</sup> March and 13:20 hours on Tuesday 20<sup>th</sup> March 2018.

Short term manual measurements were also undertaken on Friday 16<sup>th</sup> March 2018 in order to assess the noise from Orchard Business Park in accordance with BS4142:2014 *Methods for rating and assessing industrial and commercial sound*.

Measurements were witnessed on Friday 16<sup>th</sup> March by Fiona Fitzgerald of Arun District Council.

<sup>1</sup> <http://ioa.org.uk/publications/propg>

The following equipment was used during the course of the survey:

- Rion data logging sound level meter type NA28;
- NTi data logging sound level meter type XL2;
- Rion sound level calibrator type NC74.

The calibration of the sound level meters was verified before and after use. No significant calibration drift was detected.

The weather during the survey was mainly dry with light winds, which made the conditions suitable for the measurement of environmental noise. There were some snow showers on Saturday evening and Sunday morning, however this has not been deemed to have a significant effect on the noise environment over the measurement period but has been omitted from the data analysis.

Measurements were made following procedures in BS 7445:1991 (ISO1996-2:1987) *Description and measurement of environmental noise Part 2- Acquisition of data pertinent to land use*.

Please refer to Appendix A for details of the acoustic terminology used throughout this report.

3.2 Results

Figures AS10285/TH1-TH8 show the  $L_{Aeq}$ ,  $L_{Amax}$ ,  $L_{A10}$  and  $L_{A90}$  sound pressure levels as time histories at the measurement positions.

The site is affected mainly by road traffic noise using North End Road with sporadic industrial noise from Orchard Business Park. The average noise levels for the ‘Daytime’ and ‘Night-time’ periods are shown in Table 3.1, as well as the typical  $L_{AFmax}$ , defined as the 10<sup>th</sup> percentile of the night-time  $L_{AFmax}$  dataset.

| Daytime $L_{Aeq}$ , 16 hour          | Night-time, $L_{Aeq}$ , 8 hour       | Typical Night-time, $L_{AFmax}$      |
|--------------------------------------|--------------------------------------|--------------------------------------|
| Position 1: 63dB<br>Position 2: 51dB | Position 1: 55dB<br>Position 2: 42dB | Position 1: 76dB<br>Position 2: 60dB |

Table 3.1 Daytime and night-time average; and typical night-time maximum noise levels [dB ref. 20µPa]

4.0 CONCLUSION

This Stage 1 Risk Assessment has identified the development area as a low to medium risk area in terms of noise impact. The ProPG guidance recommends that a Stage 2 Acoustic Design

Statement be prepared to consider the noise impact of the site in detail and to address the requirement for any outline mitigation measures as appropriate for the proposed residential development.

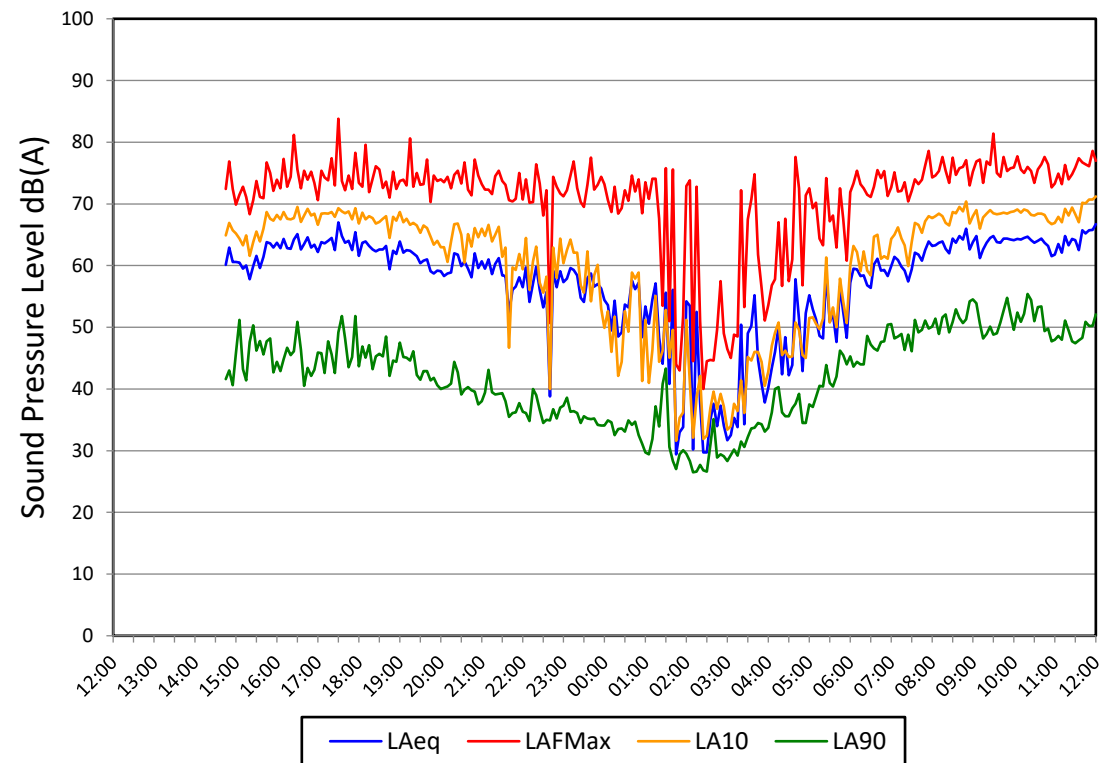


Daniel Saunders MIOA

CLARKE SAUNDERS ASSOCIATES

## Land to the West of Orchard Business Park, Yapton

### Environmental Noise Time History: 1

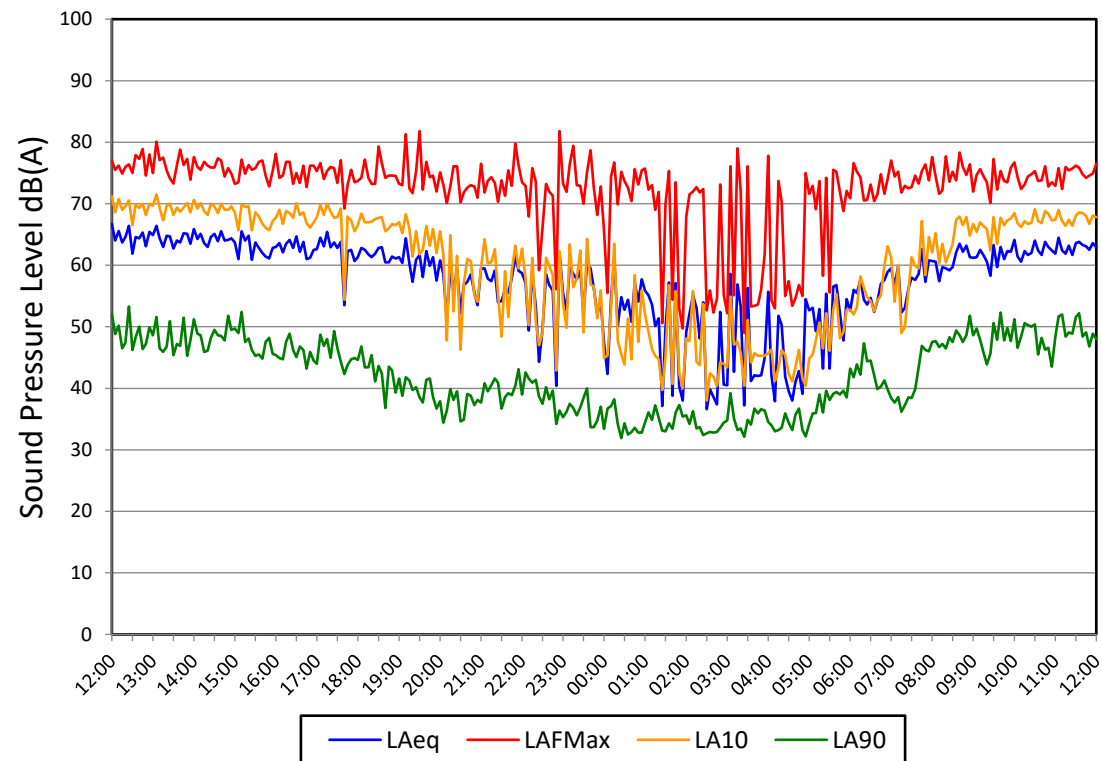


Friday 16 March to Saturday 17 March 2018

Figure AS10285/TH1

## Land to the West of Orchard Business Park, Yapton

### Environmental Noise Time History: 1

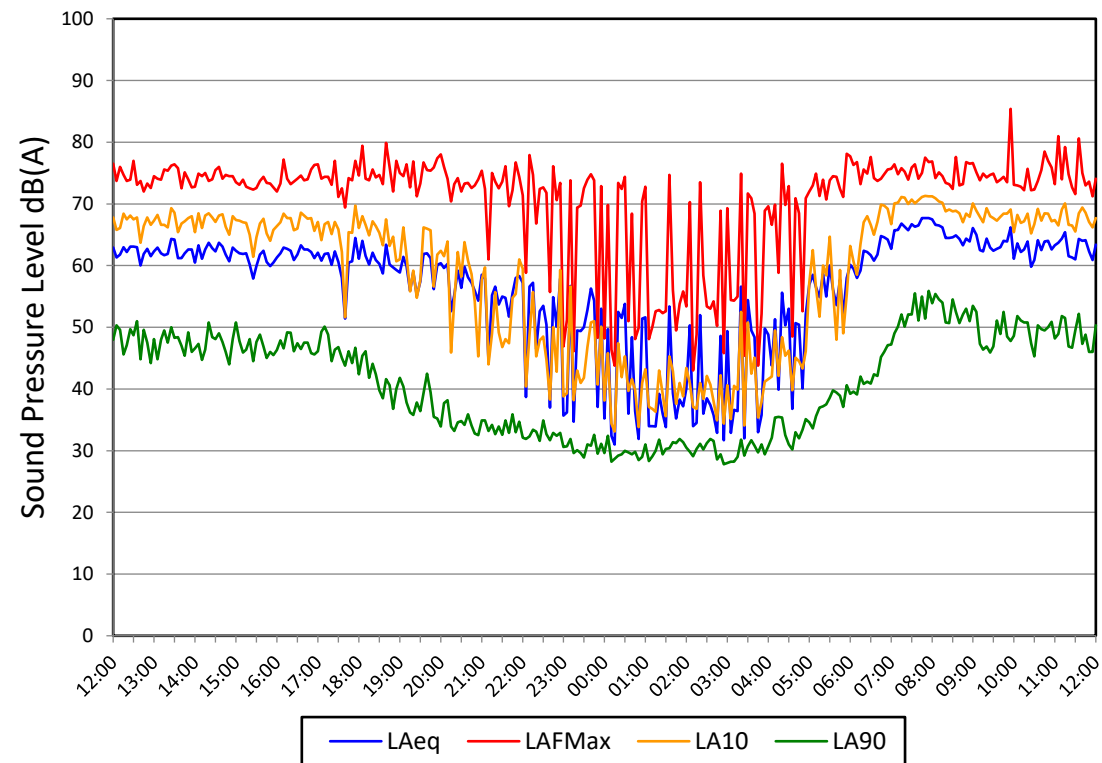


Saturday 17 March to Sunday 18 March 2018

Figure AS10285/TH2

## Land to the West of Orchard Business Park, Yapton

### Environmental Noise Time History: 1

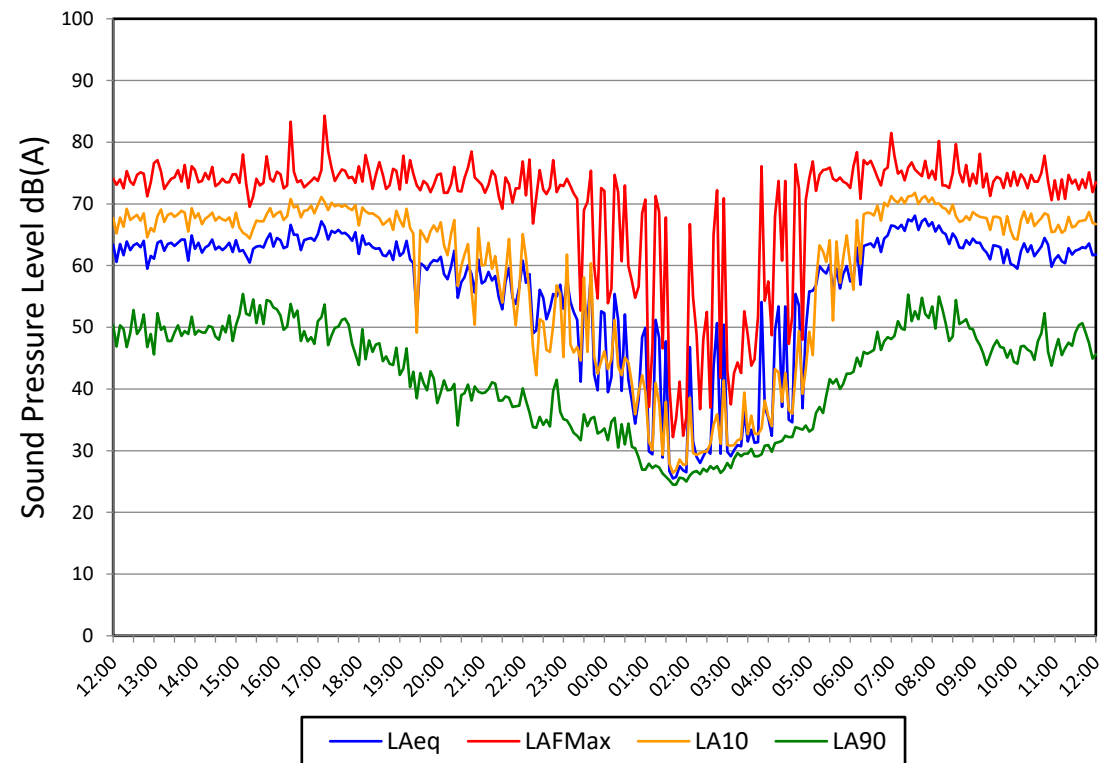


Sunday 18 March to Monday 19 March 2018

Figure AS10285/TH3

## Land to the West of Orchard Business Park, Yapton

### Environmental Noise Time History: 1

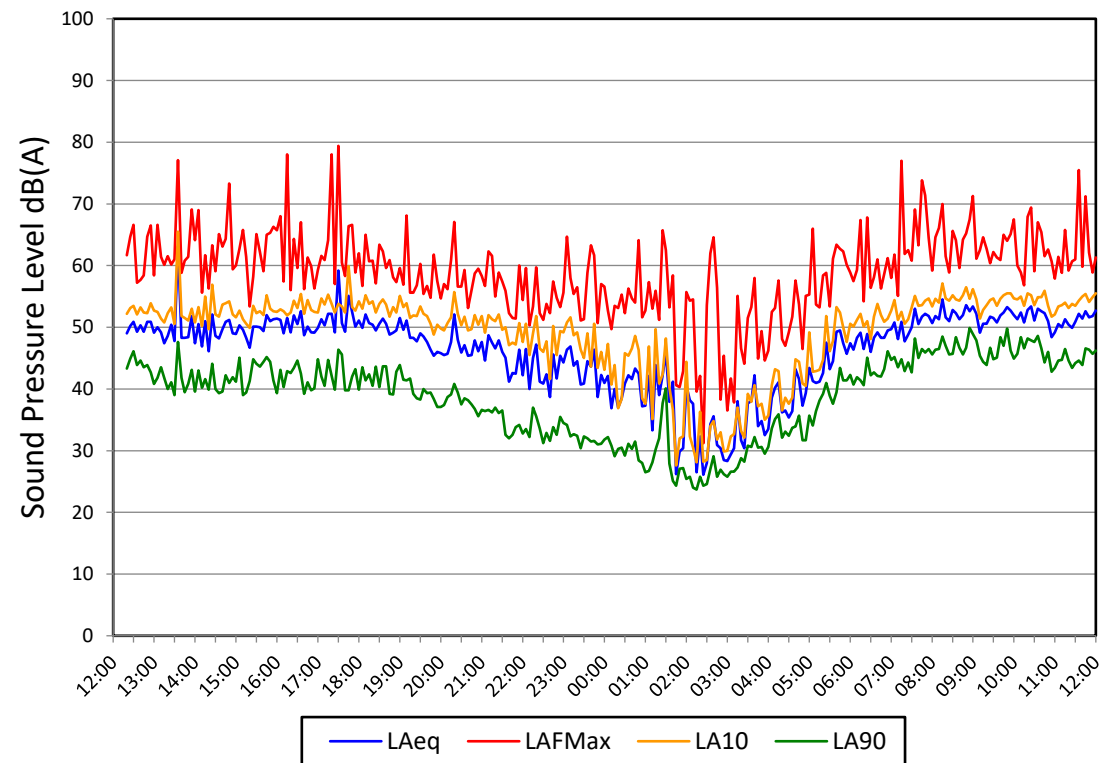


Monday 19 March to Tuesday 20 March 2018

Figure AS10285/TH4

## Land to the West of Orchard Business Park, Yapton

### Environmental Noise Time History: 2

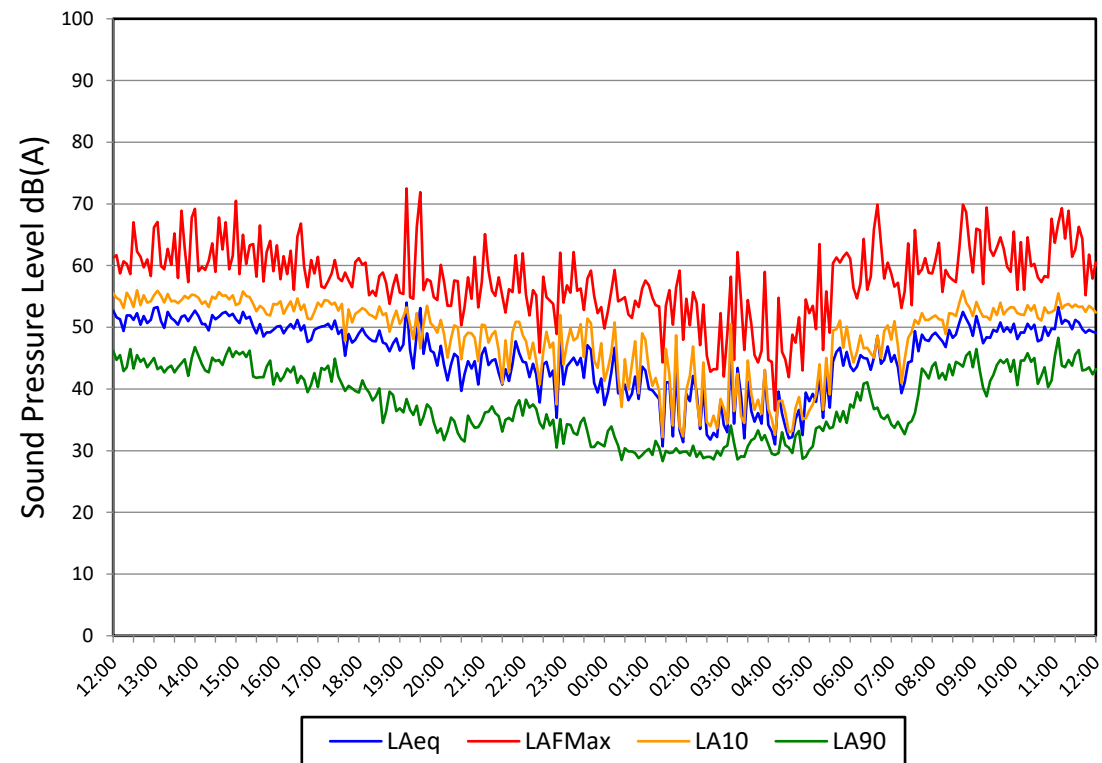


Friday 16 March to Saturday 17 March 2018

Figure AS10285/TH5

## Land to the West of Orchard Business Park, Yapton

### Environmental Noise Time History: 2

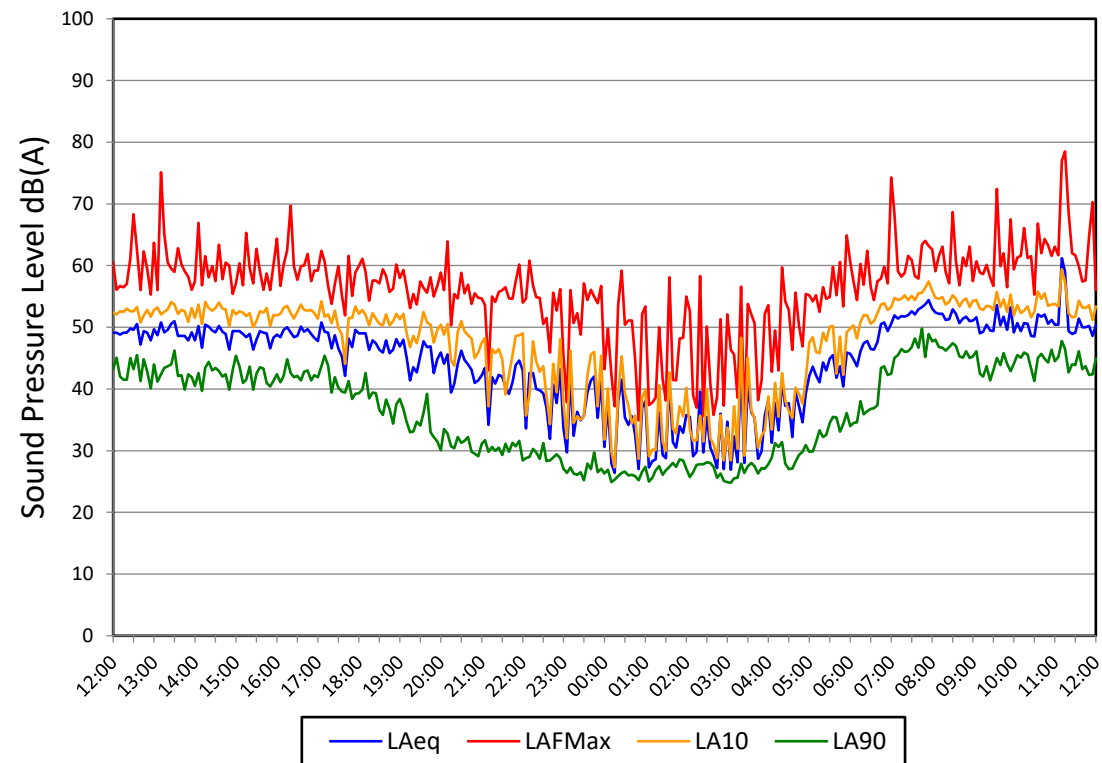


Saturday 17 March to Sunday 18 March 2018

Figure AS10285/TH6

## Land to the West of Orchard Business Park, Yapton

### Environmental Noise Time History: 2

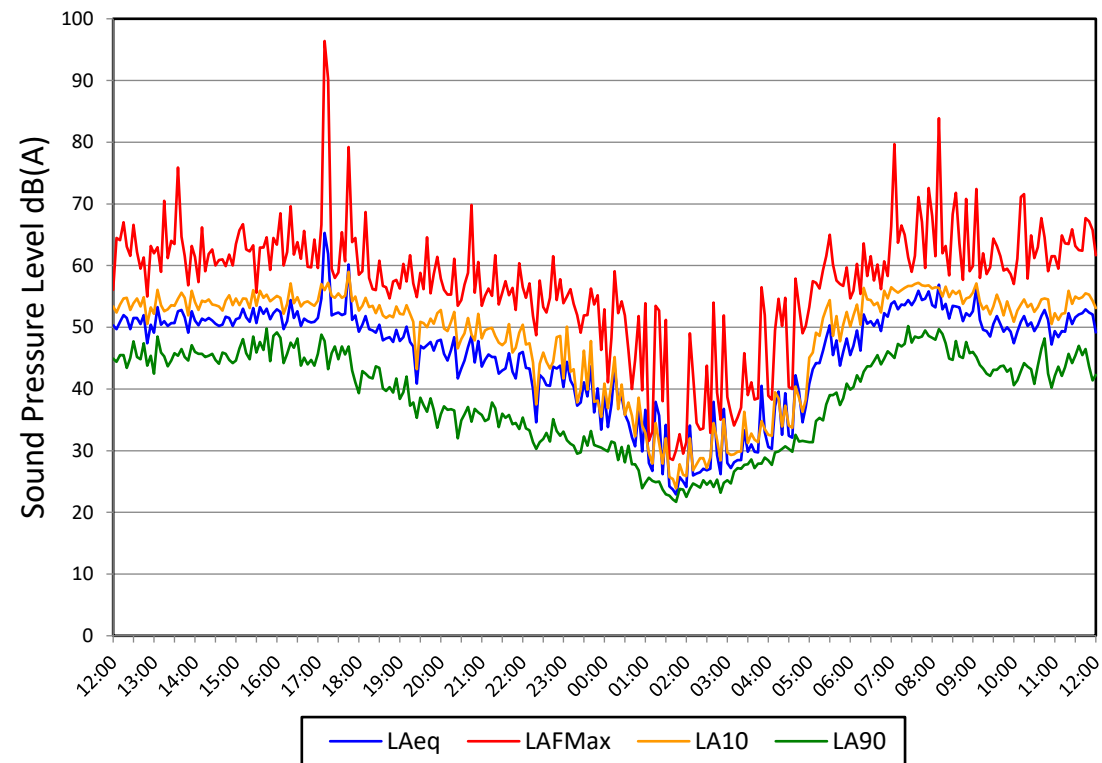


Sunday 18 March to Monday 19 March 2018

Figure AS10285/TH7

## Land to the West of Orchard Business Park, Yapton

### Environmental Noise Time History: 2



Monday 19 March to Tuesday 20 March 2018

Figure AS10285/TH8

**APPENDIX C**  
**AS10285 - Land to the West of Orchard Business Park, Yapton**  
**BS4142 Assessment**

| <b>Classic Perceptions</b>                                 |                | <b>Comments</b>                                                                                                 |
|------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------|
| Measured Ambient Sound Level ( $L_{Aeq}$ ):                | 51dB(A)        | Specific sound source active                                                                                    |
| Residual Sound Level ( $L_{Aeq}$ ):                        | 49dB(A)        | Specific sound source inactive                                                                                  |
| Background Sound Level ( $L_{A90}$ ):                      | 44dB(A)        | Derived from taking the modal value of each LA90 measurement during working hours (0800 - 1800)                 |
| Specific Sound Level ( $L_{Aeq}$ ):                        | 44dB(A)        | Time corrected to be representative of a 60 minute period. Assumed extract fan active for half the working day. |
| Acoustic Feature Correction:                               | +3dB(A)        | intermittency                                                                                                   |
| Loss for 1.8m Boundary Fence:                              | -6dB(A)        | As per proposed site plan                                                                                       |
| Rating Level:                                              | <b>41dB(A)</b> |                                                                                                                 |
| <b>Excess of Rating Level over Background Sound Level:</b> | <b>-3dB(A)</b> |                                                                                                                 |