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# The Head of the River, Oxford

**Fuller, Smith & Turner PLC**

## Noise Impact Assessment

**Revision 01**

**11/09/2023**

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## Project Particulars

Client Name: Fuller, Smith & Turner PLC

Project Name: The Head of the River, Oxford

## Disclaimer



## Revision History

| Revision | Date | Prepared By | Checked By |
|---|---|---|---|
| 00 | 05/09/2023 | Jason Clouston<br>BEng MSc MIOA | Nick Brown<br>BEng MSc MIOA |
| 01 | 11/09/2023 | Jason Clouston<br>BEng MSc MIOA | Nick Brown<br>BEng MSc MIOA |

# Contents

# 1 Introduction

1.1 An air conditioning units is proposed to be installed to the front of the Head of the River public house, to serve guest bedrooms.

1.2 An external noise survey has been conducted at the site to establish the prevailing ambient and background noise levels affecting the site and neighbouring noise sensitive properties.

1.3 The measurement data have been used to assess the impact of noise emission from the air conditioning unit on the nearest noise sensitive receivers (NNSRs). The impact on bedrooms within the public house has also been assessed, as the unit is far closer to these rooms than those of neighbouring properties.

1.4 Separate criteria are proposed: noise emission limits to neighbouring properties, and noise limits within (inside) bedrooms of the pub itself.

1.5 The full measurement data are available on request. Definitions of some of the terminology used throughout the report have been included in an appendix.

# 2 Acoustic requirements

## 2.1 Local authority requirements

2.1.1 Oxford City Council's *Local Plan 2036* (adopted 8th June 2020) contains a policy relating to noise and vibration:

> *"Policy RE8: Noise and vibration*
>
> *Planning permission will only be granted for development proposals which manage noise to safeguard or improve amenity, health, and quality of life.*
>
> *Planning permission will not be granted for development that will generate unacceptable noise and vibration impacts.*
>
> *Planning permission will not be granted for development sensitive to noise in locations which experience high levels of noise, unless it can be demonstrated, through a noise assessment, that appropriate attenuation measures will be provided to ensure an acceptable level of amenity for end users and to prevent harm to the continued operation of existing uses.*
>
> *Conditions will be used to secure such mitigation measures and operational commitments.*
>
> *Measures to mitigate the impacts of noise and vibration associated with demolition and construction will be secured by legal agreement through Construction Management Plans (Refer to Policy M2)."*

2.1.2 It is believed that Oxford City Council do not specify any objective criteria, therefore the assessment of noise emission will be undertaken in accordance with good practice guidance.

## 2.2 British Standard 4142:2014+A1:2019

2.2.1 British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*, presents a methodology for comparing the noise level of the new source (the specific sound level) with that of the existing background noise level in the area in the absence of the new source (the background sound level) and establishing the likely impact of the noise.

2.2.2 The methodology requires consideration to be given to all aspects of the assessment process and accounts for unusual acoustic features such as tonal, impulsive, or intermittency characteristics of the noise by the addition of various decibel corrections to the specific sound level. The corrected specific sound level is the rating level.

2.2.3 The background sound level is then arithmetically subtracted from the rating level. The greater the positive difference between the rating level and the background sound level, the greater the magnitude of the impact.

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending upon the context.

- A difference of around +5dB or more is likely to be an indication of an adverse impact, depending upon the context.

- Where the rating level does not exceed the background sound level, this is an indication of a low impact, depending upon the context.

2.2.4 It is proposed to target a rating level at or below the prevailing background sound level at all times the AC units are to be operating, in order to achieve a low impact at neighbouring noise sensitive receivers. It is considered that by doing this, noise would be sufficiently controlled such that it is in line with the requirements of Policy RE8.

## 2.3 Landlord requirements

2.3.1 There are no specific requirements Fullers stipulate for noise levels within their own bedrooms, such as those that would be affected by noise from the proposed new AC unit.

2.3.2 There are various industry standards for external noise ingress into bedrooms, but in our experience, noise from AC equipment should be very well controlled into hotel bedrooms. An upper limit of NR25 is relatively common, and a more onerous NR20 is stipulated by some hotel operators.

2.3.3 It is therefore proposed to control noise from the external AC units to a level of no more than NR20 ($L_{eq}$) within the Head of the River bedrooms. The assessment should assume windows to bedrooms will be closed, as the AC being provided will serve air conditioning to those affected rooms, meaning windows won't need to be ordinarily opened.

2.3.4 For clarity, the proposed NR20 criterion applies within (inside) bedrooms of the Head of the River pub, and the limits discussed in Section 2.2 apply to neighbouring properties only and not the pub itself. They are therefore two separate requirements.

# 3 External noise survey

## 3.1 Site description

3.1.1 The Head of the River pub is located at Folly Bridge, St Aldate's, Oxford OX1 4LB.

3.1.2 The site is located on the busy Abingdon Road which is an arterial road serving central Oxford. As a result, traffic is generally quite heavy past the site, and tends to be busy most of the day and evening, with reductions in traffic flows expected overnight. Traffic on Abingdon Road mostly comprises cars and light vehicles, although there are some buses and HGVs passing the site.

3.1.3 The pub is on the River Thames with a boat hire company located directly to the rear of the property. Immediate neighbours are understood to be light commercial and residential.

3.1.4 The dominant noise source observed in the area during the time of measurement was considered to be road traffic on Abingdon Road, pedestrian movement past the site, patrons of the pub itself, and existing plant to the rear of the pub.

## 3.2 Measurement methodology

3.2.1 Continuous, unattended noise level measurements were conducted on the timber walkway at first floor level of the pub, in the south-western most corner of the building and with a clear line-of-sight to traffic on Abingdon Road. The microphone was placed in what is considered representative of free-field conditions; extended around 1.5m above the timber walkway.

3.2.2 The measurement position was chosen as it was secure and considered likely to represent the lowest background noise levels that may be experienced at neighbouring noise-sensitive properties. Consideration was given to installing equipment to the rear of the pub as well, but discounted owing to existing building services noise in that area.

3.2.3 The measurement position is shown via a satellite image in Figure 3-1 and a photograph of the microphone in place is shown in Figure 3-2 (overleaf).

3.2.4 The following equipment was used for the survey:

| Type | Model | Serial No. |
|---|---|---|
| Class 1 Sound level meter | Norsonic 139 | 1392774 |
| Environmental microphone | Norsonic 1227 | 170634 |
| Portable sound calibrator | B&K 4231 | 2291098 |

*Table 3-1: Noise level measurement equipment*

3.2.5 Statistical and spectral data were recorded in 15-minute samples between 11:45 on Friday 11th and 17:45 on Sunday 13th August 2023.

3.2.6 The calibration of the sound level meter and associated microphone was checked prior to and on completion of the measurement period in accordance with recommended practice. No significant drift in calibration occurred during the measurement period. The accuracy of the calibrator can be traced to National Physical Laboratory Standards.

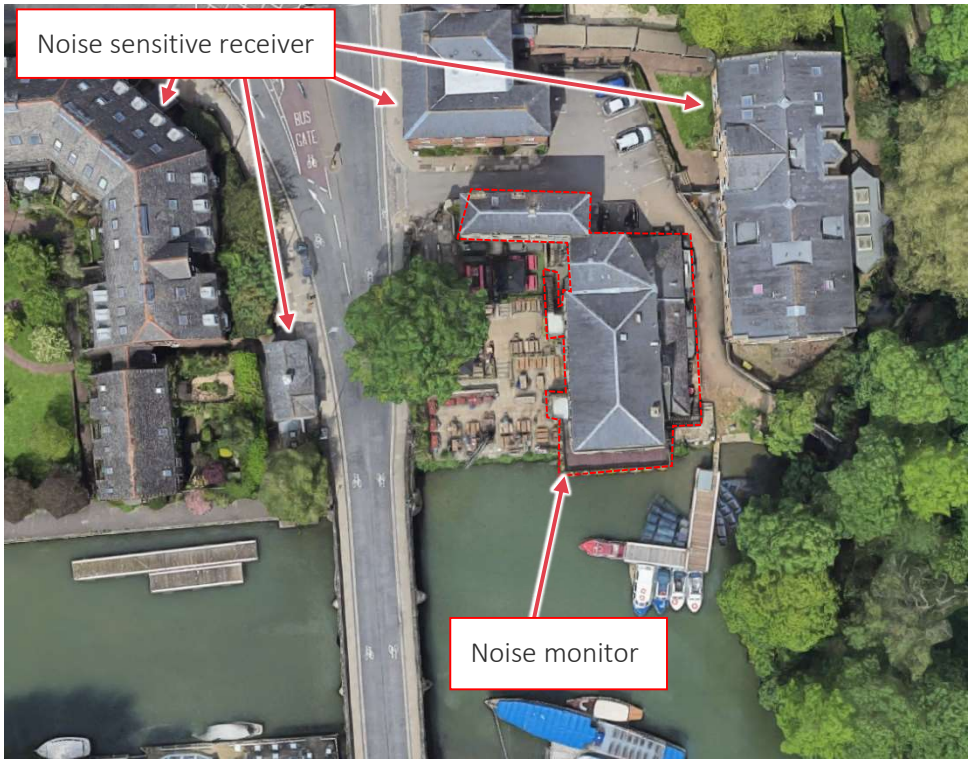


*Figure 3-1: Satellite image of site showing the measurement position (pub outlined)*

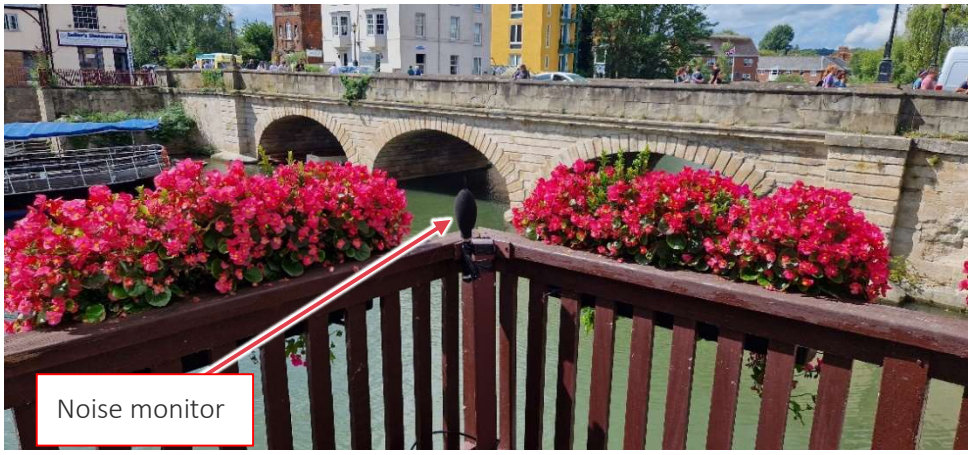


*Figure 3-2: Photo taken on-site of noise monitor in place*

## 3.3 Weather

3.3.1 Weather conditions throughout the survey were observed to be generally calm and dry. The measurement data are not believed to have been adversely affected by the weather in the context of this assessment.

## 3.4 Measurement results

3.4.1 Full measurement data are available in digital format upon request.

3.4.2 Figure 3-3 presents a graph showing the noise level history captured at the measurement position.

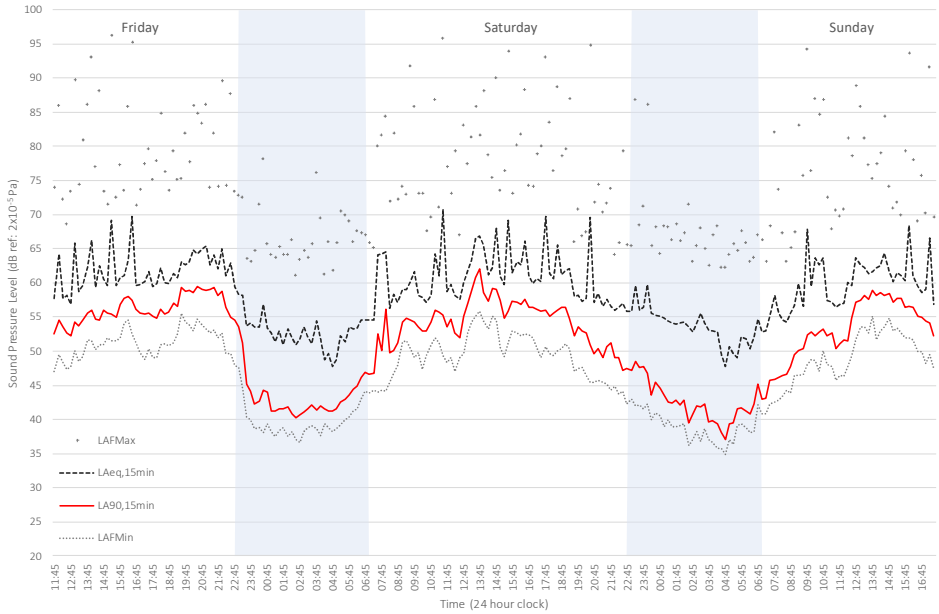


*Figure 3-3 Measured noise level history*

3.4.3 Noise levels are notably higher during the daytime and evening periods, with a sharp drop-off late at night (presumably as traffic flows reduce). There is no obvious flattening out of the noise levels, as may be expected if dominated by constant building services noise or similar. The noise level history accords with the subjective impressions of the various sources of noise observed during the periods of attendance.

3.4.4 Background noise levels typically reduce to about 40 dB $L_{A90,15mins}$ overnight, with a dip to 37 dB $L_{A90,15mins}$ at around 5am measured during one 15-minute period overnight on Saturday to Sunday. Noise levels start to increase from about 5am, presumably as traffic flows start to increase for the day.

# 4 Noise emission assessment

## 4.1 Plant proposals

4.1.1 One Toshiba MMY-MAP1606FT8P air conditioning (AC) unit is proposed to be installed to the front elevation of the Head of the River pub. The unit is to be located in place of an existing timber housing (which will be replaced), just behind the main staircase leading up to the timber walkway.

4.1.2 A drawing showing the location of the AC unit enclosure is shown below. This is an early sketch and may be subject to change as the design develops.

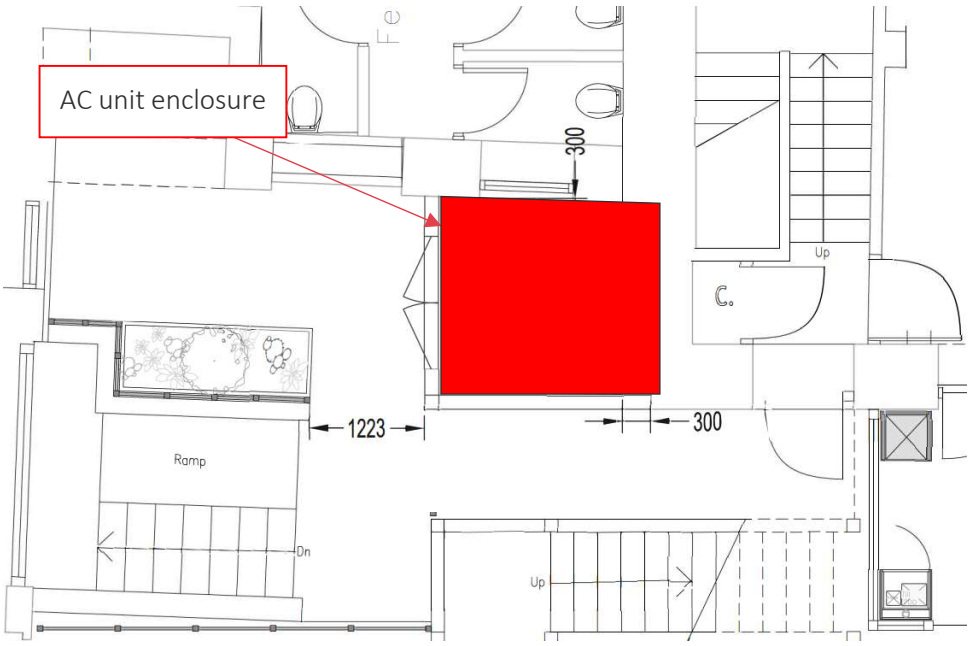


*Figure 4-1 Sketch drawing showing location of new AC units*

4.1.3 The sound pressure levels for the AC unit have been provided by the manufacturer and are presented in Table 4-1. Both the daytime operating noise levels and (assumed) night-time set-back mode noise levels are presented. The assumed night-time levels are based on data provided by the manufacturer for a similar unit.

| Operating mode | Frequency, Hz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Daytime | 58 | 62 | 63 | 61 | 57 | 50 | 38 | 35 |
| Night-time (assumed) | 53 | 55 | 49 | 47 | 43 | 38 | 30 | 28 |

*Table 4-1: Manufacturer provided sound pressure levels (dB ref 20 µPa at of 1m from the unit)*

## 4.2 Noise mitigation measures

4.2.1 To reduce the noise emissions of the AC units to an acceptable level, an acoustic enclosure is proposed to be installed around the unit. The enclosure should meet the following minimum sound insertion loss performances. Alternative specifications may be suitable, subject to further design development.

| Frequency, Hz | | | | | | | |
|---|---|---|---|---|---|---|---|
| 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| 4 | 5 | 7 | 12 | 16 | 16 | 16 | 18 |

*Table 4-1: Minimum sound insertion loss (SIL) requirements for the acoustic enclosure, in decibels*

4.2.2 A lidded enclosure with acoustically attenuated louvres of 150mm in depth should be able to achieve the sound insertion losses provided in Table 4-1. Final design of the enclosure should be undertaken by a suitable mechanical engineer. For reference, Allaway and Caice are suppliers that should be able to provide acoustic louvres that can meet the above performances, or suitable equivalent.

4.2.3 In an effort to further reduce the noise impact of the proposed AC unit, it is proposed that the unit will be operated in "night-time set back mode" during the hours of 23:00 and 07:00.

## 4.3 Nearest noise-sensitive receivers

4.3.1 The assumed nearest noise sensitive receivers (NNSRs) are presented below.

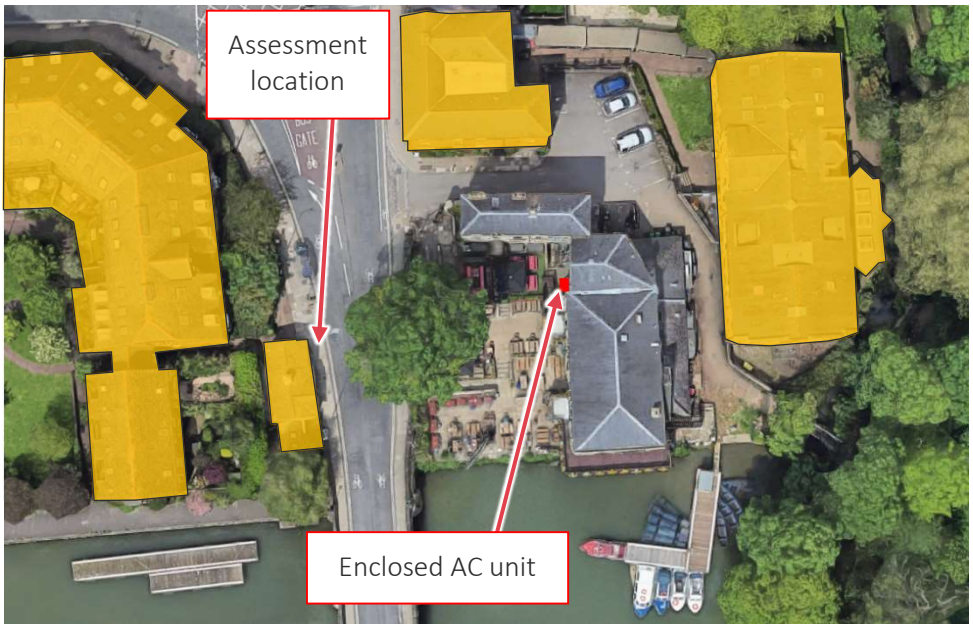


*Figure 4-2 Assumed NNSRs (highlighted orange) relative to the proposed new AC unit*

4.3.2 An assessment location of 1m in front of the nearest window of the most affected NNSR has been assumed, based on a theoretical free-field point. The assessment location is shown in Figure 4-2.

4.3.3 The distance between the AC unit and the assessment location of the nearest and most exposed NNSR across Abingdon Road is 32m. Other NNSRs on Abingdon Road will be further away from the AC unit, or benefit from the effects of screening more so than the assessed location.

4.3.4 Other surrounding NNSRs (e.g. those properties to the north and east of the Head of the River pub) will be fully screened from the new AC unit and therefore benefit from high levels of acoustic screening.

4.3.5 Controlling noise emission to suitable levels at the assessment location can therefore be expected to result in suitable levels at other, surrounding NNSRs.

4.3.6 The Head of the River pub has bedrooms on the upper levels that overlook the location of the enclosed AC unit. As a worst-case estimate, it has been assumed that the nearest bedroom window will be c. 2m from the AC unit. An elevation sketch showing the existing area where the AC enclosure is proposed is shown below.

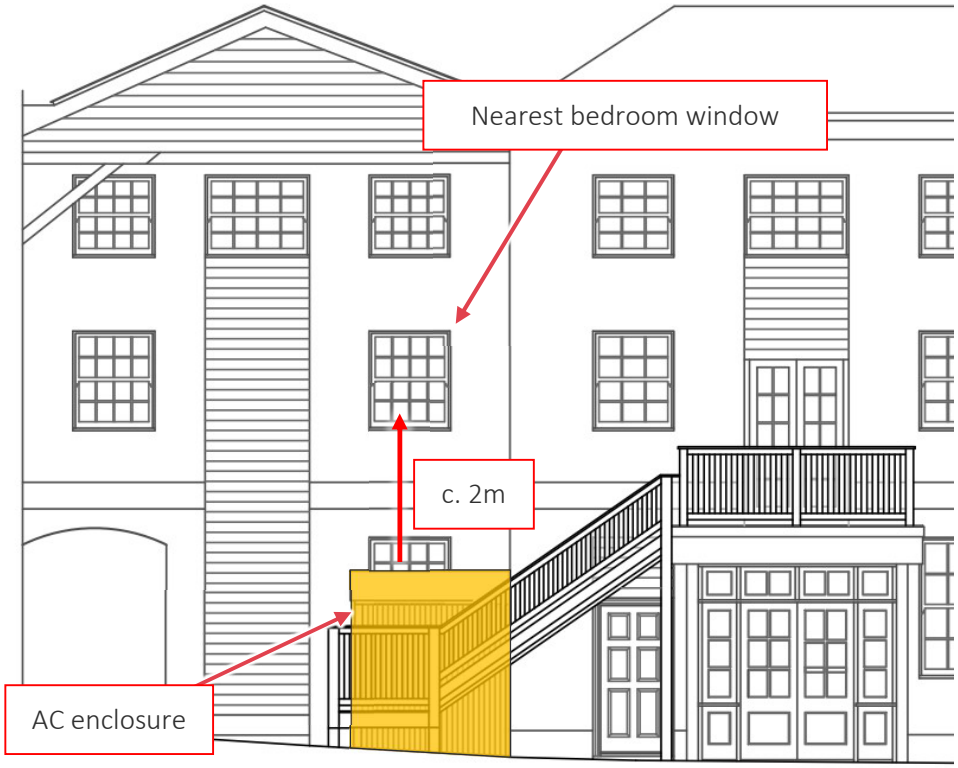


*Figure 4-3 Elevation showing proposed location of AC enclosure in proximity to guest bedrooms*

## 4.4 Background sound level

4.4.1 The background noise levels assumed for the assessment have been based on the lowest measured during the survey, which are 43 dB $L_{A90,15mins}$ during the daytime (08:00 – 23:00) and 37 dB $L_{A90,15mins}$ during the night-time (23:00 – 07:00). This is considered a robust approach, as background noise levels are typically higher than assumed.

## 4.5 Specific sound level

4.5.1 The levels of noise emission predicted from the AC unit, when taking into account the recommended acoustic enclosure, have been predicted at the assessment location. The following are the predicted specific noise levels, based on the two modes of operation the AC unit is capable of:

- Daytime operation 19 dB $L_{Aeq}$
- Night-time set back mode 7 dB $L_{Aeq}$

## 4.6 Rating level

4.6.1 As discussed in Section 2.2, BS 4142 requires consideration be given to any specific character the emitted noise may have and include suitable corrections. The corrected specific sound level is then called the rating level.

4.6.2 The AC unit is expected to be running at a constant duty and the equipment is not expected to operate with any particular character. Regardless, a precautionary 4 dB penalty has been assumed within the assessment to account for any tonality being perceptible.

4.6.3 The calculated BS 4142 rating level of the AC unit at the assessment location of the NNSR would therefore be:

- Daytime operation 23 dB $L_{Ar}$
- Night-time set back mode 11 dB $L_{Ar}$

## 4.7 British Standard 4142 assessment

4.7.1 A BS 4142 assessment has been carried out and it has been found that the rating level will be no higher than the background sound level at the nearest noise sensitive receiver, during both the daytime (rating level 17 dB below) and night-time (rating level 26 dB below).

4.7.2 BS4142 requires the consideration of the context and uncertainty of the assessment. In regard to the context, the noise source is considered to have a differing character to the dominant noise source in the area. A 4 dB penalty has therefore been added to the assessment to account for any distinguishable character the noise emitted by the AC unit may have against the prevailing ambient noise climate.

4.7.3 In regard to the uncertainty of the assessment, due to the complexity of noise propagation there is some uncertainty in using a simplified model to predict noise emission. In addition, there is uncertainty in considering the noise measurements captured during the survey reflect typical noise levels experienced in the surrounding area throughout the year. To account for this, the lowest measured background sound levels have been used in the assessment. Therefore, the conservative approach to the assessment is considered to be sufficient to account for any inherent uncertainty.

4.7.4 Therefore, no adjustment to a BS 4142 “low impact” is considered necessary.

## 4.8 Assessment to bedrooms of the Head of the River pub

4.8.1 Noise levels within the nearest affected bedrooms, assuming windows closed, are expected to be just in line with the proposed NR20 criterion during normal daytime operation.

4.8.2 Within bedrooms at night, levels will naturally be lower as the unit is set to operate in the quieter night-time set back mode.

# 5 Conclusion

5.1 A noise impact assessment of the proposed air conditioning unit has been undertaken. Consideration has been given to guidance from the Oxford City Council on noise.

5.2 As the Council does not set down specific objective standards for noise emission, the assessment of predicted noise emission impact on neighbouring noise sensitive receivers has been based on the good practice guidance set down in *BS 4142:2014+A1 2019*.

5.3 A lidded enclosure will house the AC unit to reduce noise emission to an acceptable level. The minimum sound insertion losses the enclosure should achieve have been provided and are expected to be achieved with a 150mm acoustic louvre.

5.4 The assessment has shown that noise emission from the installed AC unit can be controlled to not exceed the lowest background sound level at the closest noise sensitive receiver. It is concluded that this would be an indication of a 'low impact' according to BS 4142 and therefore show compliance with the requirements of Oxford City Council.

5.5 Noise levels inside bedrooms of the Head of the River pub are also expected to be well controlled with the proposed enclosure. Calculations indicate that noise levels within bedrooms are expected to be below NR20 when in normal operation. This is in line with onerous criteria from other hotel operators, as a point of interest.

# Appendix – Terminology

| | |
|---|---|
| **A-weighting**<br>**$L_A$ or $L_{pA}$, $L_{WA}$,** | Within its operating limits a precision measurement microphone measures all frequencies the same so the output it produces does not reflect what we would actually hear. The A-weighting is an electronic filter that matches the response of a sound level meter to that of the human ear. When A-weighted the Sound Pressure Level $L_p$ becomes $L_{pA}$ (or $L_A$) and the Sound Power Level $L_W$ becomes $L_{WA}$. |
| **$L_p$** | *The instantaneous sound pressure level* ($L_p$) |
| **$L_{pA}$ (or $L_A$)** | *The A-weighted instantaneous sound pressure level* ($L_{pA}$ or $L_A$). This is the root mean square size of the pressure fluctuations in the air. This level can fluctuate wildly even for seemingly steady sounds. To make sound level meters easier to read the values on the display are smoothed or damped out. This is effectively done by taking a rolling average of the previous 0.125s (FAST time constant) or the previous 1s (SLOW time constant). |
| **$L_{AF}$, $L_{AS}$** | The letters F or S are added to the subscripts in the notation to indicate when the FAST or SLOW time constant has been used. These are often omitted but it is good practice to include them. |
| **$L_{max}$** | *The maximum instantaneous sound pressure level* ($L_{max}$), |
| **$L_{Amax}$** | *The A-weighted maximum instantaneous sound pressure level ($L_{Amax}$)* |
| **$L_{AFmax}$** | *The A-weighted maximum instantaneous sound pressure level with a FAST time constant ($L_{AFmax}$).* |
| **$L_{N,T}$** | *The percentage exceedance sound pressure level ($L_{N,T}$),* |
| **$L_{AN,T}$ $L_{AFN,T}$**<br>**$_N$ = %age value, 0-100**<br>**$_T$ = measurement time**<br>**eg. $L_{A90}$, $L_{A10}$, $L_{AF90,\ 5\ min}$** | *The A-weighted percentage exceedance sound pressure level ($L_{AN,T}$), the A-weighted percentage exceedance sound pressure level with a FAST time constant ($L_{AFN,T}$).* This is the sound pressure level exceeded for *N*% of time period *T*. e.g. If an A-weighted level of x dB is exceeded for a total of 6 minutes within one hour, the level will have been above x dB for 10% of the measurement period. This is written as $L_{A10,1hr}$ = x dB. $L_{A0}$ (the level exceeded for 0 % of the time) is equivalent to the $L_{Amax}$ and $L_{A100}$ (the level exceeded for 100 % of the time) is equivalent to the $L_{Amin}$. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value. |
| **$L_{eq,T}$** | The *equivalent continuous sound pressure level over period T ($L_{eq,T}$),* |
| **$L_{Aeq,T}$**<br>**$_T$ = measurement time**<br>**eg. $L_{Aeq,5min}$** | *The A-weighted equivalent continuous sound pressure level over period T ($L_{Aeq,T}$).* This is effectively the average sound pressure level over a given period. As the decibel is a logarithmic quantity the $L_{eq}$ is not a simple arithmetic mean value. The $L_{eq}$ is calculated from the raw sound pressure data. It is not appropriate to include a reference to the FAST and SLOW time constants in the notation. |

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