

# Noise Impact Assessment

## *Gresley Rovers Development*

**Site address:** Land West of Main Street, Albert Village, Swadlincote, Derbyshire

**Local planning authority:** North West Leicestershire District Council

**Applicant:** Pete Robinson

**Planning Agent:** Aida McManus, 17 Derwent Road, Stapenhill, Burton-upon-Trent  
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## 1 Introduction and Summary

Walnut Acoustics have been instructed to carry out a noise impact assessment on behalf of the applicant and planning consultant as part of a planning application for the proposed Gresley Rovers development.

The purpose of this assessment is to provide baseline levels of the existing noise climate at the site and to assess the potential for impacts from new noise sources associated with the proposed development on nearby residential noise sensitive receptors (NSRs).

The site was attended on two visits between the 13<sup>th</sup> and 20<sup>th</sup> April 2021 to survey the area and to carry out the required noise measurements. The tables below provide a summary of these new sources, their potential noise impacts and mitigation.

| Noise Source                                                  | Noise impact assessment at residential NSRs                                                                                                                                                                                                                                                                                                                                                                               | Mitigation                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Five-a-side sports pitches</b><br><i>six in total</i>      | <p>No or low impact is expected in the context of the existing noise climate and Sport England/WHO external daytime noise level guidelines.</p> <p>Noise levels after additional proposed fence mitigation will create a negligible change with none or not significant impacts for highly sensitive NSRs (IEMA guidance).</p> <p>BS8233 criteria for internal noise levels will not be exceeded with an open window.</p> | <p>Additional acoustic fence barrier proposed to reduce noise levels to Main Street and Sankey Drive residences.</p> <p>Existing and current design proposed walls/fencing and topography of noise sources relative to NSRs should be reviewed when applicable.</p> |
| <b>Car parks</b><br><i>Main and boxing club parking areas</i> | <p>No or low impact is expected in the context of the existing noise climate and WHO external daytime noise level guidelines.</p> <p>Noise levels after additional proposed fence mitigation will create a negligible change with none or not significant impacts for highly sensitive NSRs (IEMA guidance).</p> <p>BS8233 criteria for internal noise levels will not be exceed with an open window.</p>                 | <p>Additional acoustic fence barrier proposed to reduce noise levels to Main Street and Sankey Drive residences.</p> <p>Existing and current design proposed walls/fencing and topography of noise sources relative to NSRs should be reviewed when applicable.</p> |

Table 1: Sports pitches and car parks - source, impact and mitigation summary

| Noise Source                                                         | Noise impact assessment at residential NSRs                                                                                                                                                                                                  | Mitigation                                                                                                                                                                                                                                                                                                                                                         |     |               |        |       |                  |        |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------|--------|-------|------------------|--------|
| <b>Hospitality and leisure venues</b><br><i>External plant noise</i> | <p>At the M&amp;E design stage, BS 4124 assessment levels of background noise level or below need to be achieved.</p> <p>This would indicate low or no noise impacts in the context of the local noise climate.</p>                          | <p>External plant and machinery installation designs to achieve noise rating levels of background noise or lower</p> <p>Maximum combined total daytime rating noise levels at an NSR</p> <table> <tr> <td>Day</td> <td><math>L_{Ar, 1hr}</math></td> <td>37 dBA</td> </tr> <tr> <td>Night</td> <td><math>L_{Ar, 15mins}</math></td> <td>31 dBA</td> </tr> </table> | Day | $L_{Ar, 1hr}$ | 37 dBA | Night | $L_{Ar, 15mins}$ | 31 dBA |
| Day                                                                  | $L_{Ar, 1hr}$                                                                                                                                                                                                                                | 37 dBA                                                                                                                                                                                                                                                                                                                                                             |     |               |        |       |                  |        |
| Night                                                                | $L_{Ar, 15mins}$                                                                                                                                                                                                                             | 31 dBA                                                                                                                                                                                                                                                                                                                                                             |     |               |        |       |                  |        |
| <b>Hospitality and leisure venues</b><br><i>Internal noise</i>       | <p>Entertainment noise (EN) is assessed as a worst-case scenario with internal average noise levels of 95 dBA (<math>L_{Aeq, 15mins}</math>).</p> <p>Criteria recommended – EN at background noise levels or less at the façade of NSRs.</p> | <p>Sound insulation of building construction to achieve sufficient noise reduction of internal noise levels when measured at NSRs.</p> <p>Consideration of breakout noise and egress from open windows/doors and mechanical inlets/outlets.</p> <p>Event and noise management strategies.</p>                                                                      |     |               |        |       |                  |        |

Table 2: Hospitality and leisure venues – source, impact and mitigation summary

This assessment shows that with some additional acoustic fencing and a review of the existing and current design proposed boundary wall and fence structures, the noise levels predicted from the proposed sports pitches and car parks are expected to have low impacts on nearby NSRs.

BS4142 rating levels for external plant and criteria for high level internal noise sources in the proposed hospitality and leisure venues have been detailed for use at later design stages.

The football club main pitch has not been specifically assessed for match day noise on the basis that this is a re-location of an existing sound source which will be generally acceptable to the local community.

A design and modelling assessment for maximum noise levels from a future PA system in the Main and East stands has been carried out for reference purposes and to aid in the setting of noise limits should these be required.

*This document should be read in conjunction with all other relevant planning documentation provided for the application.*

## 2 Policy, Guidance and Standards

### 2.1 National policy and guidance

#### NPSE 2010 – Noise policy statement for England

| Noise effect levels                                              | Description                                                                                                                                              |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOEL</b><br><i>No Observed Effect Level</i>                   | This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life. |
| <b>LOAEL</b><br><i>Lowest Observed Adverse Effect level</i>      | This is the level above which adverse effects on health and quality of life can be detected.                                                             |
| <b>SOAEL</b><br><i>Significant Observed Adverse Effect level</i> | This is the level above which significant adverse effects on health and quality of life occur.                                                           |

Table 3: Summary of NPSE noise effect levels

Aims of the Noise Policy Statement for England:

- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise.

These aims are all within the context of Government policy on sustainable development.

#### NPPF 2019 – National Policy Planning Framework

##### 15. Conserving and enhancing the natural environment - extracts from paragraph 180

*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

## 2.2 Specific guidance, criteria and assessment standards

### **Sport England: Artificial Grass Pitch (AGP) Acoustics – Planning implications (2015 Guidance)**

The representative average noise level over a *typical* 1 hr game being played provided by the guidance is 58 dBA ( $L_{Aeq,1 \text{ hour}}$ ) at 10 metres from the half-way line of an AGP. This is considered to be a robust figure and includes data from a range of games activities with adults and children playing rugby, football and hockey.

*It is suggested an appropriate assessment time period is for one hour,  $L_{Aeq, 1 \text{ hour}}$  as this is typically the time period for a community sports session on an AGP.*

*The determining noise criteria for AGPs proximity to residential properties, to avoid moderate annoyance in the daytime and evenings, as set by The World Health Organisation's 'Guidelines for Community Noise': = 50 dB  $L_{Aeq, 1 \text{ hour}}$  upper noise limit external to residential properties and within external living areas*

### **World Health Organisation (WHO) – Guidelines for Community Noise (1999)**

The WHO guidelines advise an internal  $L_{AFmax}$  of 45 dB for bedrooms which “for good sleep...should not be exceeded more than 10-15 times per night”.

WHO guidelines also state that external amenity areas should not be subjected to daytime averaged noise levels of greater than **55dB  $L_{Aeq}$** , and ideally **50dB** or less.

### **IEMA/IOA – Guidelines for Environmental Impact Assessment – November 2014**

This document provides industry guidance for assessing the impact of noise within an environmental impact assessment.

In addition to overall methodology and assessment strategies criteria are high-lighted for the impact of increases in ambient noise levels on noise sensitive receptors (NSR).

The table below provides a summary of effect descriptors for an NSR of high sensitivity (e.g. residential). This is principally related to increase in noise levels due to new transportation sources.

| Relative change in noise level | Scale of change in noise level | Effect Descriptor on NSR<br><i>Highly Sensitive - Residential</i> |
|--------------------------------|--------------------------------|-------------------------------------------------------------------|
| Greater than 10 dB(A)          | Large                          | Very Substantial                                                  |
| 5 to 9.9 dB(A)                 | Medium                         | Substantial                                                       |
| 3 to 4.9 dB(A)                 | Small                          | Moderate                                                          |
| 2.9 dB(A) or less              | Negligible                     | None/Not Significant                                              |

Table 4: IEMA/IOA – scale of change and effect descriptor on NSR

**BS8233:2014** - *Guidance on sound insulation and noise reduction in buildings*

This standard provides guidelines on limits for internal ambient noise levels for residential living spaces which should not be exceeded.

| Activity                        | Location    | Day<br>07:00 to 23:00<br>L <sub>Aeq</sub> , 16hr | Night<br>23:00 to 07:00<br>L <sub>Aeq</sub> , 8hr |
|---------------------------------|-------------|--------------------------------------------------|---------------------------------------------------|
| Resting                         | Living Room | 35 dB                                            | -                                                 |
| Dining                          | Dining Room | 40 dB                                            | -                                                 |
| Sleeping<br>(daytime – resting) | Bedroom     | 35 dB                                            | 30 dB                                             |

Table 5: BS8233:2014 Indoor ambient noise levels for dwellings

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

**BS 4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound**

In line with current government guidance, the Noise Policy Statement of England (NPSE 2010) and the National Planning Policy Framework (NPPF 2018) this standard assesses whether industrial and commercial sound sources can potentially affect the health and well-being of those exposed to them.

*This British standard describes methods 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 methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.*

The standard provides a method for creating a rating level for the commercial or industrial sound source under scrutiny and then compares this to representative background noise levels ( $L_{A90}$ ) at nearby Noise Sensitive Receptors (NSRs), usually dwellings.

The standard compares the average noise levels ( $L_{Aeq}$ ) for a one-hour assessment period during the day (0700 – 2300 hours) and a fifteen-minute period during the night (2300 – 0700 hours) for the noise source in operation, the “Specific Noise Level”, with the existing background noise level ( $L_{A90}$ ) when the noise source is not operating.

As part of the assessment, consideration is also given to the character or acoustic features of the noise in terms of:

#### 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 NSR, +4 dB where it is clearly perceptible and +6 dB where it is highly perceptible.*

#### Impulsivity

*A correction of up to +9 dB 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 NSR, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.*

### 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.*

### Other sound characteristics

*Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.*

The difference between the rating level and the background level (assessment level) is then assessed in terms of the potential effect of the noise source on the health and well-being of residents within the context of the local noise climate and the site under assessment.

This ranges from no observed effect to possible adverse or significantly adverse impacts from noise levels on NSRs which may require mitigation. The table below summarises the BS 4142 guidance on assessment levels.

| Assessment Level                 | Likely impact on health and well-being                                                                                                                                                           |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Around + 10 dB or more</b>    | Likely to be an indication of a significant adverse impact, depending on the context.                                                                                                            |
| <b>Around + 5 dB</b>             | Likely to be an indication of an adverse impact, depending on the context.                                                                                                                       |
| <b>Below + 5 dB</b>              | The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. |
| <b>Background level or lower</b> | Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.                             |

*Table 6: BS 4142 Assessment levels – likely impact descriptions as described in the standard*

## Noise from Pubs and Clubs Phase I – October 2005 – NANR 92

| Location                                            | Measured noise levels<br>A-weighted<br>$L_{Aeq, T}$<br>dB | Measured noise levels<br>Unweighted<br>$L_{eq, T}$<br>dB |
|-----------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------|
| <b>Bars and restaurants</b><br><i>quiet periods</i> | 65 - 70                                                   | -                                                        |
| <b>Bars</b><br><i>busy periods no music</i>         | up to 88 dB                                               | -                                                        |
| <b>Bars</b><br><i>busy periods with music</i>       | 90 - 95                                                   | -                                                        |
| <b>Night Clubs</b><br><i>dance floors</i>           | up to 105                                                 | 63 Hz – up to 115 dB<br>125 Hz – up to 110 dB            |

Table 7: Noise levels for bars and clubs – noise from pubs and clubs phase 1

The table above contains a summary of data detailed in section 2 and shows noise level information taken from a wide selection of venues over a period of years. Average A-weighted noise levels are shown for different situations and unweighted data for night clubs is shown in the lower octave bands 63 and 125 Hz as bass levels are particularly significant in amplified music.

**Institute of Acoustics - Good Practice Guide on the Control of Noise from Pubs and Clubs. 2003 – Annex - details summarised in Noise from Pubs and Clubs Phase 1 (see above)**

Objective criteria can be summarised as follows:

- *for premises where entertainment takes place on a regular basis, noise is inaudible inside noise sensitive premises at all times*
- *if entertainment takes place on a less frequent basis, the music should be inaudible inside noise sensitive property between the hours of 23:00 and 07:00. Noise is considered to be inaudible when it is at a sufficiently low level such that is not recognizable as emanating from the source in question and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question.*

The IOA Annex provides numerical limits for entertainment noise (EN) as detailed in the table below.

| Frequency of entertainment in venue                                     | Suggested criteria                                                                                                                                                                           | Outcome if criteria met                                                                   |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| More than 30 times per year not more than once a week and ends by 23:00 | $L_{Aeq,15mins} (EN)$ should not exceed $L_{A90} (WEN)$ by more than 5dB                                                                                                                     | EN will generally be audible but not overly obtrusive inside the noise sensitive property |
| Less than 30 times per year not more than once a week and ends by 23:00 | $L_{Aeq,15mins} (EN)$ should not exceed $L_{A90} (WEN)$ by more than 5dB and the $L_{10} (EN)$ should not exceed $L_{90} (WEN)$ by more than 5dB in any 1/3 octave band between 40 and 160Hz | EN will generally be audible but not overly obtrusive inside the noise sensitive property |
| Entertainment more than once per week or continues beyond 23:00         | $L_{Aeq,15mins} (EN)$ should not exceed $L_{A90} (WEN)$ and $L_{10} (EN)$ should not exceed $L_{90} (WEN)$ in any 1/3 octave band between 40 and 160Hz                                       | EN will be virtually inaudible inside noise sensitive property.                           |

Table 8: Noise limits at Noise Sensitive Receptors – IOA Good Practice Guide 2003 - Annex

EN = Entertainment noise level

WEN = Representative background noise level without the entertainment noise

Measured at 1m from the façade of the noise-sensitive premises

## 2.3 Local guidance

North West Leicestershire local plan: Adopted: November 2017

### Policy D2 – Amenity

*Proposals for development should be designed to minimise their impact on the amenity and quiet enjoyment of both existing and future residents within the development and close to it. As such, development proposals will be supported where:*

*2) They do not generate a level of activity, noise, vibration, pollution or unpleasant odour emission, which cannot be mitigated to an appropriate standard and so, would have an adverse impact on amenity and living conditions.*

### 3 Site details and operational summary



Picture 1: Gresley Rovers proposed development site, existing site and principal local noise sources

The picture above shows the wider location context for this proposed development with principal sound sources of the local main road network, and local industrial and commercial businesses.



Picture 2: Gresley Rovers proposed development site – principal elements

The proposed development layout can be seen in the picture above overlaid on to the site location with the principal elements of the design layout indicated. The site layout document be found in Appendix 1.

## **Operational hours**

### Leisure facilities

Monday to Sunday 09:00 to 22:00

### Conference and function facilities

Monday to Saturday 09:00 to 23:30

Sunday 10:00 to 23:00

### Outdoor pitches

Monday to Sunday 09:00 to 22:00

*Note: the information above has been provided by the applicant. Further details should be referenced from other application documents.*

## **4 Measurement Details**

### **4.1 Personnel and Equipment**

All testing, calculation and evaluation was conducted by Nick Myerscough of Walnut Acoustics. Nick is an Associate Member of the Institute of Acoustics.

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| Equipment Type                                                | Serial Number | Calibration Date | Calibration Certificate No. |
|---------------------------------------------------------------|---------------|------------------|-----------------------------|
| Castle Mirus GA117 Class 1 Integrating Sound Level Meter      | 34260         | 27/05/2020       | 34260/77324                 |
| Castle GA607 Acoustic Calibrator                              | 043479        | 27/05/2020       | 043479/77324                |
| Cirrus Research CR:822C Class 2 Integrating Sound Level Meter | D20378FB      | 17/07/2020       | 143737                      |
| Cirrus Research CR:514 Acoustic Calibrator                    | 47720         | 17/07/2020       | 143736                      |

Table 9: Measurement equipment details

Copies of current equipment calibration certificates can be found in Appendix 5.

## 4.2 Noise Climate

The noise climate at the NSRs comprised of the following principal noise sources:

- Local road network – Main Street and Common Road - dominant sources
- Industrial and commercial noise sources – Tarmac site just to the North was prominent and other sources further away to the East were noted

The following noise sources were also observed:

- resident garden activity noise – occasional lawnmower
- Bird noise

## 4.3 Weather Conditions

| Measurement             | Date                       | Temperature Range | Windspeed - direction   | Visibility              | Cloud Cover<br>Precipitation |
|-------------------------|----------------------------|-------------------|-------------------------|-------------------------|------------------------------|
| Site noise measurements | 13/04/21<br>to<br>14/04/21 | 1 to 9°C          | 2 to 4 m/s<br>NNE to NE | Good to<br>Very<br>Good | 5 to 15%<br>No rain          |
| Site noise measurements | 19/04/21<br>to<br>20/04/21 | 2 to 16°C         | 1 to 3 m/s NE<br>to N   | Very<br>Good            | 0 to 10%<br>No rain          |

Table 10: Weather conditions during site measurements

## 4.4 Topography

Mixed use residential/industrial/commercial. Development site is predominantly situated at a lower level to the surrounding residential properties to the West and a similar or higher level to the East.

## 4.5 Methodology



Picture 3: Site measurement and NSR measurement positions



Picture 4: Site measurement position – MP1 to MP3 from left to right

Cirrus Research and Svantek/Castle sound level meters were deployed at three suitable (and safe) locations near the site boundaries to measure the existing ambient and background noise levels for minimum 24 hour periods. Care was taken to eliminate external influences on the measurements by the application of a windshield to the sound level meter, and wind speeds and weather conditions were observed for external measurements.

All measurements were taken at an angle of approximately 60 degrees from horizontal with the measuring device between 1.2m to 1.5m above the ground unless otherwise stated.

Calibration was performed before and after each measurement or set of measurements with no notable drift. A drift of up to 0.5dB is considered reasonable and is generally the cause of gradients in variables such as temperature, humidity and battery power.

## 5 Measurement Summary

| Measurement Position<br>MP1<br><i>Monday – Tuesday</i> | Time period   | Noise Level<br>dB |
|--------------------------------------------------------|---------------|-------------------|
| <b>Average Daytime</b><br><i>L<sub>Aeq, 16h</sub></i>  | 07:00 – 23:00 | <b>48</b>         |
| <b>Background Noise Level</b><br><i>Day</i>            | 07:00 – 23:00 | <b>42</b>         |

Table 11: Position 1 – daytime average and background noise levels – Monday - Tuesday

| Measurement Position<br>MP2<br><i>Tuesday - Wednesday</i> | Time period   | Noise Level<br>dB |
|-----------------------------------------------------------|---------------|-------------------|
| <b>Average Daytime</b><br><i>L<sub>Aeq, 16h</sub></i>     | 07:00 – 23:00 | <b>49</b>         |
| <b>Background Noise Level</b><br><i>Day</i>               | 07:00 – 23:00 | <b>41</b>         |

Table 12: Position 2 – daytime average and background noise levels - Tuesday - Wednesday

| Measurement Position<br>MP3<br><i>Monday – Tuesday</i> | Time period   | Noise Level<br>dB |
|--------------------------------------------------------|---------------|-------------------|
| <b>Average Daytime</b><br><i>L<sub>Aeq, 16h</sub></i>  | 07:00 – 23:00 | <b>49</b>         |
| <b>Background Noise Level</b><br><i>Day</i>            | 07:00 – 23:00 | <b>42</b>         |

Table 13: Position 3 – daytime average and background noise levels – Monday - Tuesday

| Average 1hr daytime<br>Noise Levels<br>$L_{Aeq, 1hr}$ | MP1  | MP2  | MP3  |
|-------------------------------------------------------|------|------|------|
| 07:00 – 08:00                                         | 49.8 | 52.0 | 51.4 |
| 08:00 – 09:00                                         | 49.1 | 48.1 | 49.2 |
| 09:00 – 10:00                                         | 48.4 | 50.8 | 51.1 |
| 10:00 – 11:00                                         | 49.9 | 48.2 | 54.1 |
| 11:00 – 12:00                                         | 49.6 | 51.7 | 47.5 |
| 12:00 – 13:00                                         | 47.9 | 49.6 | 47.7 |
| 13:00 – 14:00                                         | 44.6 | 44.0 | 45.5 |
| 14:00 – 15:00                                         | 44.5 | 46.9 | 45.2 |
| 15:00 – 16:00                                         | 47.9 | 46.2 | 45.5 |
| 16:00 – 17:00                                         | 49.8 | 51.9 | 44.4 |
| 17:00 – 18:00                                         | 48.0 | 47.7 | 48.1 |
| 18:00 – 19:00                                         | 47.8 | 47.4 | 47.8 |
| 19:00 – 20:00                                         | 48.4 | 48.7 | 47.5 |
| 20:00 – 21:00                                         | 47.5 | 41.8 | 49.0 |
| 21:00 – 22:00                                         | 43.4 | 40.5 | 44.9 |
| 22:00 – 23:00                                         | 39.0 | 39.6 | 40.5 |
| 23:00 – 24:00                                         | 36.6 | 39.8 | 38.9 |

Table 14: NSR noise measurement summary – average noise levels – 1 hour intervals

| Representative background noise levels | Daytime<br>L <sub>A90</sub><br>dB | Night-time<br>L <sub>A90</sub><br>dB |
|----------------------------------------|-----------------------------------|--------------------------------------|
| NSR 1                                  | 40                                | 32                                   |
| NSR 2                                  | 37                                | 31                                   |
| NSR 3                                  | 41                                | 34                                   |

Table 15: representative daytime background noise levels

*Covid-19 note: lockdown conditions occurring at this time will inevitably mean lower than normal background and ambient noise levels.*

*See Appendix 4 for site measurement summaries. Further information on the data presented above can be provided on request.*

## 6 Noise Assessments

A series of noise assessments have been carried out to evaluate the potential for noise impacts from the proposed Gresley Rovers development on nearby residential noise sensitive receptors (NSRs).

The proposed car parks and five-a-side sports pitches have been modelled using SoundPLAN 8.2 software. Based on the topography detailed in the location plan in Appendix 2 and from information gathered during site visits, an assumption has been made that the development site will be 4 metres lower than the surrounding residential properties.

With the unusual topography at the site this will need to be reviewed at a later stage based upon further development design information.

The close boarded fencing and walls that are marked on the location plan are assumed as noise barriers for modelling purposes. The existing fence and wall structures that were noted on site match this in most areas except for the eastern and south-eastern NSRs on Main Street and Sankey Drive.

Modelled barriers (fences and walls) have been assumed as effective barriers in terms of build integrity and this should be reviewed in detail as part of any ongoing layout designs. Any new boundary fencing or wall plans should be reviewed at the same time to ensure maximum benefit for local residents from any noise reduction provided.

The main football pitch and specifically match day noise has not been assessed. Based on the current information, this is difficult to quantify. The facility of this local league football club already exists and as such is a noise source that local residents will be familiar with.

The potential noise levels generated from a PA system in the Main and East stand have been modelled for information purposes and to provide a basis for discussion on noise limits and design.

The proposed main club house, modular leisure and conference facility and boxing/gym facilities have been assessed based on the initial design information provided.

External plant rating levels for the development as a whole have been provided. Internal high level noise sources have been considered with guidance and recommended NSR noise levels to be achieved with building insulation designs.

## 6.1 Noise sensitive receptors – NSRs

The following assessments consider the potential for noise impacts at three specific residential receptors.

Where sound sources have been modelled in SoundPLAN the predicted specific noise levels presented have been calculated to these locations. The noise maps also provide noise contour levels for all surrounding residential NSRs.

The table below details the specific NSRs used and NSR type. The location for calculation purposes is assumed to be in the rear gardens of properties at 3.5 metres from the rear façade.

| NSR | Address      | NSR<br><i>Description - Sensitivity</i> |
|-----|--------------|-----------------------------------------|
| 1   | Main Street  | Residential - High                      |
| 2   | Sankey Drive | Residential - High                      |
| 3   | Uldale Grove | Residential - High                      |

Table 16: NSRs – location, description and sensitivity

## 6.2 Five-a-side sports pitches

The noise levels from the six proposed sports pitches have been modelled and assessed based on the Sport England guidance on artificial grass pitches issued in 2015.

The representative average noise level over a *typical* 1 hr game being played provided by the guidance is 58 dBA ( $L_{Aeq,1 \text{ hour}}$ ) at 10 metres from the half-way line of an AGP. This is considered to be a robust figure and includes measured data from a range of games activities with adults and children playing rugby, football and hockey.

The principal noise sources noted in the guidance are human voice and certain high level noise events, specifically hockey balls hitting goal back boards which are assumed to be mitigated for the average noise level suggested. Details of this and other mitigation recommendations can be found in section 7 below.

A SoundPLAN model has been designed to provide a worst-case scenario for the sports pitches with all six assumed to have games playing, with each pitch emitting noise at the representative noise level of 58 dBA. Predicted sports pitch noise levels have been modelled using area source calculations.

The contour maps below show the noise levels emanating from the sports pitches and its propagation to the NSRs in the surrounding areas.

Five-a-side football pitches (all in use) - NSR height 1.5m - 1 hour average noise level

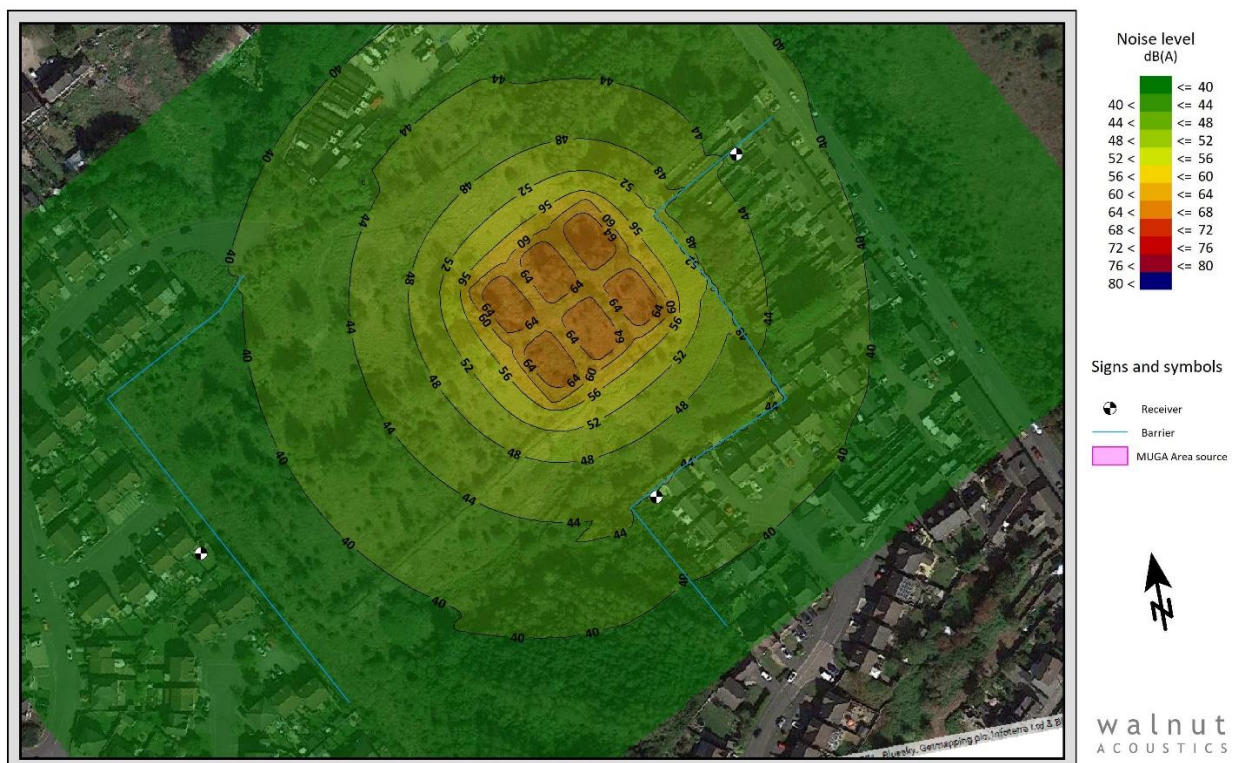


Figure 1: Sports pitches – NSR height 1.5m – all six in use

Five-a-side football pitches (all in use) - NSR height 4m - 1 hour average noise level

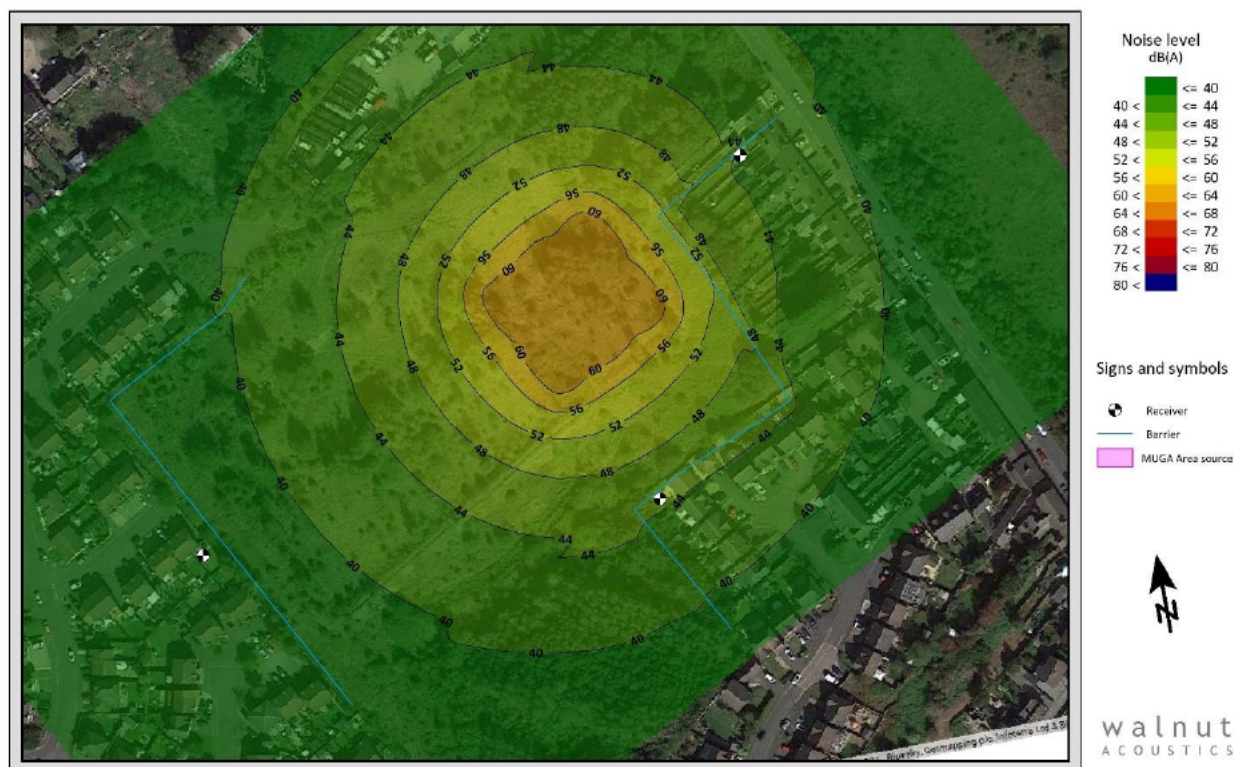


Figure 2: Sports pitches – NSR height 4m – all six in use

Specific noise values for the NSR locations and impact assessments are presented in the tables below.

| NSR | Noise Level at 1.5m<br><i>Living room – garden amenity</i><br>$L_{Aeq,1\text{ hour}}$ dB | Noise Level at 4m<br><i>Bedroom</i><br>$L_{Aeq,1\text{ hour}}$ dB |
|-----|------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1   | 42.8                                                                                     | 43.3                                                              |
| 2   | 43.3                                                                                     | 46.0                                                              |
| 3   | 36.7                                                                                     | 37.7                                                              |

Table 17: NSRs – predicted noise levels from sports pitches at 1.5m and 4m –  $L_{Aeq,1\text{ hour}}$

| NSR | WHO – Sport England guidance<br>50 dBA | IEMA<br><i>Relative change in noise levels compared to 1 hr average noise levels – descriptor</i>             | BS 8233:2014<br><i>Internal noise level in houses - daytime 35 dBA with open window</i> |
|-----|----------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1   | All predicted levels below 50 dBA      | 09:00 to 21:00<br>Negligible change<br>None/Not significant<br><br>21:00 to 22:00<br>Small change<br>Moderate | All predicted internal levels below 35 dBA                                              |
| 2   | All predicted levels below 50 dBA      | 09:00 to 20:00<br>Negligible change<br>None/Not significant<br><br>20:00 to 22:00<br>Small change<br>Moderate | All predicted internal levels below 35 dBA                                              |
| 3   | All predicted levels below 50 dBA      | 09:00 to 22:00<br>Negligible change<br>None/Not significant                                                   | All predicted internal levels below 35 dBA                                              |

Table 18: Criteria and assessment summary for sports pitch noise levels at NSRs

Note: a façade with an open window has been assumed to have a noise reduction value of 12 dB

All predicted noise levels are below the Sport England (WHO) guidance of 50 dBA for external noise levels. The BS8233:2014 recommended maximum daytime noise levels of 35 dBA have not been exceeded.

In general the changes in external noise levels at the NSRs as a result of all six sports pitches being used are assessed as negligible when compared with IEMA guidance. The descriptor for the noise impact at a high sensitivity NSR (residential) is none or not significant.

As ambient levels drop in the late evening the increase in external noise levels at NSR 1 and 2 (Main Street and Sankey Drive) is assessed as a small change and the descriptor for noise impacts is moderate.

Additional barrier mitigation has been proposed (see section 7) in order to reduce the noise impact at the nearest residential locations and to mitigate for higher noise level events that could be associated with sports being played on the pitches.

## 6.3 Car parks

Main and boxing club car parks - NSR height 1.5m - 3000 visits - 16 hr day - 0700 to 2300



Figure 3: Main and boxing club car parks – NSR height 1.5m

Main and boxing club car parks - NSR height 4m - 3000 visits - 16 hr day - 0700 to 2300



Figure 4: Main and boxing club car parks – NSR height 4m

The noise levels from the proposed car parks have been modelled based on 300 car parking spaces of which 10% are located at the boxing-gym club building. SoundPLAN car parking data with 3000 parking events during a 16 hour daytime period forms the basis of the model with the resulting contour maps shown above.

Specific noise values for the NSR locations and impact assessments are presented in the tables below.

| NSR | Noise Level at 1.5m<br><i>Living room – garden amenity</i><br>L <sub>Aeq,16 hour</sub> dB | Noise Level at 4m<br><i>Bedroom</i><br>L <sub>Aeq,16 hour</sub> dB |
|-----|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 1   | 45.8                                                                                      | 51.0                                                               |
| 2   | 34.0                                                                                      | 38.1                                                               |
| 3   | 31.8                                                                                      | 34.6                                                               |

Table 19: NSRs – predicted noise levels from car parks at 1.5m and 4m – L<sub>Aeq, 16 hour</sub> - daytime

| NSR | WHO guidance for<br>external noise levels<br>50 dBA                                         | IEMA<br><i>Relative change in noise<br/>levels compared to 16 hr<br/>daytime average noise<br/>levels – descriptor</i> | BS 8233:2014<br><i>Internal noise level in<br/>houses - daytime 35 dBA<br/>with open window</i>                |
|-----|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 1   | NSR 1 predicted levels<br>marginally above at 51<br>dBA at 4m<br><br>NSR 2 and 3 much lower | Small change at 4m<br>Moderate<br><br>Negligible change at 1.5m<br>None/Not significant                                | All predicted internal levels<br>below 35 dBA<br>4m level indicates first<br>floor bedroom levels at 39<br>dBA |
| 2   | All predicted levels below<br>50 dBA                                                        | Negligible change<br>None/Not significant                                                                              | All predicted internal levels<br>below 35 dBA                                                                  |
| 3   | All predicted levels below<br>50 dBA                                                        | Negligible change<br>None/Not significant                                                                              | All predicted internal levels<br>below 35 dBA                                                                  |

Table 20: Criteria and assessment summary for car park noise levels at NSRs

Note: an open window has been assumed to have noise reduction value of 12 dB

All predicted noise levels are below the WHO guidance of 50 dBA for external noise levels except for a 1 dB exceedance at NSR 1. It should be noted that this is the closest NSR to the main car park and is also the predicted noise level is at 4m (bedroom). The BS8233:2014 internal daytime noise level has also been exceeded at this location but is significantly lower at the other NSRs.

In general the changes in external noise levels at the NSRs as a result of the proposed car parking are assessed as negligible when compared with IEMA guidance. The descriptor for the noise impact at a high sensitivity NSR (residential) is none or not significant.

The exception is the 4m noise level at NSR 1 where the increase in external noise levels is assessed as a small change and the descriptor for noise impacts is moderate.

Additional barrier mitigation has been proposed (see section 7) in order to reduce the noise impact at the nearest residential locations (Main Street) and to mitigate for higher noise level events from the car parking areas.

.

Night-time traffic movements have not been assessed as the latest operational time provided is for the conference facilities at 23:30, only half an hour into this noise assessment period (23:00 to 07:00). The impact of this is likely to be small when considering the location of the conference facilities and will be further reduced by the proposed acoustic fencing for properties on Main Street.

*Note: transportation report details are not currently available and parking event data from an existing Walnut Acoustics assessment for a sports and leisure centre has been used.*

## 6.4 Hospitality and leisure venues: external plant noise

This section considers any new external plant or machinery that would be installed as part of the proposed new development. Designed installations will need to be assessed for potential noise impacts at the nearby residential NSRs.

These assessments should be made in line with the latest local authority noise guidance and commercial and industrial noise rating methodologies, currently BS 4142:2014+A1:2019. Further details are available in the guidance section above.

Some examples of the type of new external plant that will need to be considered are:

- air conditioning and air handling plant
- refrigeration plant
- extract and supply air plant – kitchens and catering areas
- other externally mounted ventilation plant - heat recovery systems etc

- other mechanical equipment - heating pumps, air source fan units etc
- external plant room noise – water handling plant
- rubbish compactors and other waste processing equipment

*Note: this is not an exhaustive list and other noise sources may need consideration and assessment.*

#### 6.4.1 Rating levels at NSRs

In the absence of a detailed mechanical and electrical specification for the development at this stage of the design and planning application process, a total rating level has been specified in relation to noise arising from new externally mounted plant installed in any area of the proposed new development.

The rating levels should be calculated at 1m from the façade of the nearest NSR bedroom window for night-time (23:00 – 07:00), and 1m from the façade of the nearest living room window or free-field in an external amenity area for daytime (07:00 – 23:00).

Each noise source should be evaluated during their hours of operation at the nearest residential NSR with acoustic feature and distance propagation corrections applied as per BS4142 guidance.

Rating levels for multiple noise sources at individual NSRs should be considered as a combined noise level for all sources that could impact on that location.

Local authority guidance generally recommends that external plant rating levels at NSRs should produce an assessment level of 0 dB or less when compared to representative day and night-time background noise levels. This would indicate low or no noise impacts on the health and quality of life local residents from the installation of new plant.

As suggested in the measurement summary *business as usual* background noise levels in a non-Covid-19 environment are likely to be higher than the levels measured for this assessment.

To provide a robust assessment the required total noise rating level of external plant noise incident on a particular NSR is the same as the current representative background noise levels. This will mean that final rating levels should be below background levels as activity levels return to normal.

The table below indicates the maximum rating levels ( $L_{Ar, T}$ ) for external plant at the nearest NSR. If these rating levels are achieved the BS4142 assessment level would be 0 dB or lower when compared to background noise levels (*or below as noted above, when activity levels pick up post Covid-19*).

The representative background noise levels detailed in the measurement summary for NSR 2 have been used as maximum rating levels as these were the lowest measured and will provide the most robust assessment criteria.

| Assessment Period                                                 | Noise source   | Maximum Rating level at NSRs<br>$L_{Ar, T}$ |
|-------------------------------------------------------------------|----------------|---------------------------------------------|
| 07:00 – 23:00<br><i>Daytime – <math>L_{Aeq, 1hr}</math></i>       | External Plant | 37                                          |
| 23:00 – 07:00<br><i>Night-time – <math>L_{Aeq, 15mins}</math></i> | External Plant | 31                                          |

Table 21: Recommended total rating levels for all new external plant installed at the nearest NSRs

Uncertainties in this BS 4142 assessment do exist in terms of variance in background levels as highlighted already with the Covid-19 situation. Further details on uncertainty can be found in Appendix 6.

#### 6.4.2 Mitigation summary

The M&E designs for the development should include consideration of the following:

- selection of low noise units for installations where possible
- location of all external plant in relation to nearest residential NSRs
- use of equipment enclosures and acoustic barriers for noise level attenuation
- assessments of new plant for potential noise impacts at the NSRs (rating levels)
- robust maintenance and replacement policies for installed systems

### 6.5 Hospitality and leisure venues: Internal noise

The proposed clubhouse, modular sports and conference buildings both have function rooms for events which can create high levels of internal noise. The most significant of these will be entertainment and music noise which has been assessed below.

*Note: detailed design and internal layout plans for the buildings are shown in Appendix 3.*

### 6.5.1 Entertainment and music noise

The dominant source of noise inside the function rooms will be entertainment noise, from live music or DJ and playback sources during functions .

The Institute of Acoustics (IOA) and *pubs and clubs* guidelines detailed in the guidance section have been used to assess the potential impact of internal entertainment noise on nearby residential NSRs.

With the proposed event usage likely to be more than once a week and/or to continue beyond 23:00 the appropriate IOA criteria is recommended as detailed in the table below.

| Frequency of entertainment in venue                             | Suggested criteria                                                                                                                                     | Outcome if criteria met                                         |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Entertainment more than once per week or continues beyond 23:00 | $L_{Aeq,15mins}$ (EN) should not exceed $L_{A90}$ (WEN) And $L_{10}$ (EN) should not exceed $L_{90}$ (WEN) in any 1/3 octave band between 40 and 160Hz | EN will be virtually inaudible inside noise sensitive property. |

Table 22: EN noise frequency, suggested criteria and outcomes – IOA guidance

15 minute average entertainment noise levels (EN) should not exceed the background noise level at the façade of the nearest NSR without entertainment noise (WEN). Lower frequencies between 40 and 160 Hz should also not have an  $L_{10}$  level with entertainment noise higher than the  $L_{90}$  level without EN in each third octave band (*unweighted*).

The aim of this criteria is to ensure that music noise levels are inaudible inside residential NSRs even with windows open.

| EN Noise Internal<br>$L_{Aeq, 15mins}$ | Maximum EN noise level at NSRs<br>External at 1 metre from facade<br>$L_{Aeq, 15mins}$ |
|----------------------------------------|----------------------------------------------------------------------------------------|
| Recommended maximum 95 dB              | 37 dB                                                                                  |

Table 23: Entertainment noise – maximum noise level at NSRs

From the *pub and club* guidance and other existing data a function room will experience maximum average internal noise levels of around 95 dBA over a 15 minute period. This is also a useful recommended maximum figure to use when considering limiting options for music sources.

The maximum EN noise level at NSRs indicated above is the representative daytime background noise level measured at NSR 2, and as discussed earlier this is likely be higher in a non Covid-19 future environment.

The target noise level at NSR facades is therefore considered to be robust, although decreasing background noise levels during the evening period (19:00 to 23:00) may also need to be considered. It is assumed that entertainment and music noise sources will have stopped by 23:00.

When final designs for construction purposes are being created it is recommended that background levels are re-measured and that third octave data to assess the IOA lower frequencies band requirements is available from this.

### 6.5.2 Boxing Club and Gym noise

The highest noise levels in this type of facility are usually generated by the following:

- Amplified Music Noise
- Fitness Classes especially large spin training classes
- Impact Noise from Free Weights Areas especially heavy duty free-weights
- Impact Noise from weight-training and other gym machines

It is considered that the building insulation design criteria utilized for the main clubhouse and modular building should be sufficient to mitigate for internal noise source in the boxing club and gym facility.

However, the loudest elements of gym noise should be included in sound insulation calculations at the building make up design stage to achieve the IOA entertainment noise criteria of background noise level or lower at the nearest residential NSRs.

### 6.5.3 Mitigation Summary

To achieve the NSR levels specified for internal entertainment noise the sound insulation characteristics of the buildings needs to be considered. Internal noise levels have to be reduced sufficiently by the building envelope, with particular attention given to attenuation at low frequencies, to achieve the NSR levels specified.

A detailed design for the building make-up will be needed to assess this performance across all frequencies, specifically the 40 to 160Hz range of bass frequencies. Some areas which will need specific consideration in terms of noise reduction performance are as follows:

- the roof structures and internal ceiling design
- composite walls – walls with glazing or doors
- glazing designs
- potential for noise breakout from open windows – suitable ventilation scheme
- noise break out from access points and noise egress from mechanical inlets/outlets

The potential for noise breakout from open windows or doors should be addressed through noise sensitive ventilation designs and noise management plans especially for function and gym spaces.

## 6.6 Football Club: external noise – PA system

Noise from the main pitch in the form of match day noise has not been assessed as this is difficult to model without having access to specific data for the existing football club. It is also considered that this is the re-location of an existing local noise source and one which is part of the community as a whole. In this regard noise impacts that do result from match days could well be acceptable to the majority of the local residents.

An assessment of the potential maximum noise levels that could be created by PA systems in the crowd stands has been carried out to give an indication of impact at nearby residences. This can also be used for reference purposes in system design and for setting any limits recommended by the local authority.

A basic system design has been used to model the maximum PA noise level in Sound PLAN using the following loudspeaker elements and noise level assumptions:

- Main stand – 4 x JBL AW266 – flown in the roof pointing to the middle of the seating
- East stand – 2 x JBL AW266 – flown in the roof pointing to the middle of the seating
- Maximum sound pressure level at 1m – 116 dBA

Lower frequency and sub bass elements have not been included in this model but should be considered for noise impacts in final system designs.

Main stand and east stand PA system - NSR height 1.5m - max sound level

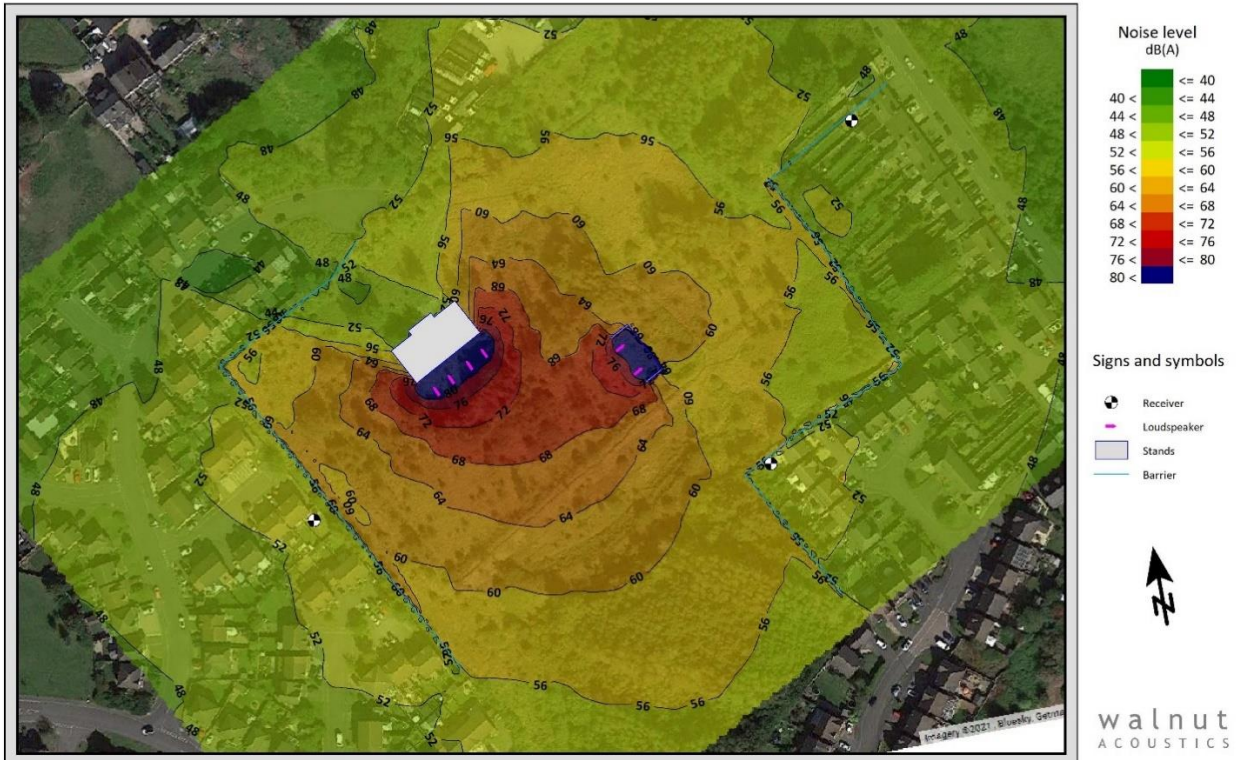


Figure 5: Main and East stand PA system – NSR height 1.5m

Main stand and east stand PA system - NSR height 4m - max sound level

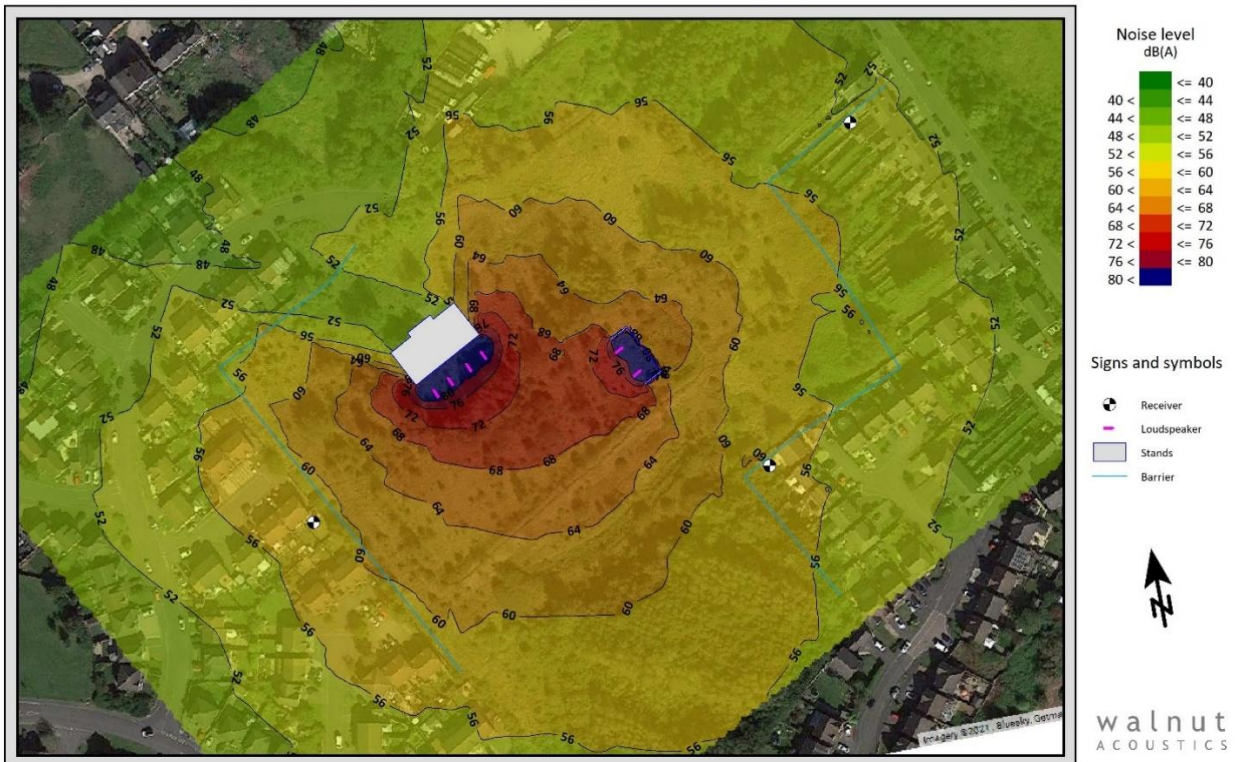


Figure 6: Main and East stand PA system – NSR height 4m

| NSR | Noise Level at 1.5m<br><i>Living room – garden amenity</i><br>L <sub>Amax</sub> dB | Noise Level at 4m<br><i>Bedroom</i><br>L <sub>Amax</sub> dB |
|-----|------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 1   | 50.2                                                                               | 53.3                                                        |
| 2   | 53.4                                                                               | 57.9                                                        |
| 3   | 53.2                                                                               | 57.9                                                        |

Table 24: NSRs – predicted noise levels from Main and East stand PA systems at 1.5m and 4m – L<sub>Amax</sub>

In summary these maximum noise levels are considered acceptable in the context of the PA system usage for match day announcements, advertising and music playback.

## 7 Mitigation: sports pitches and main car park

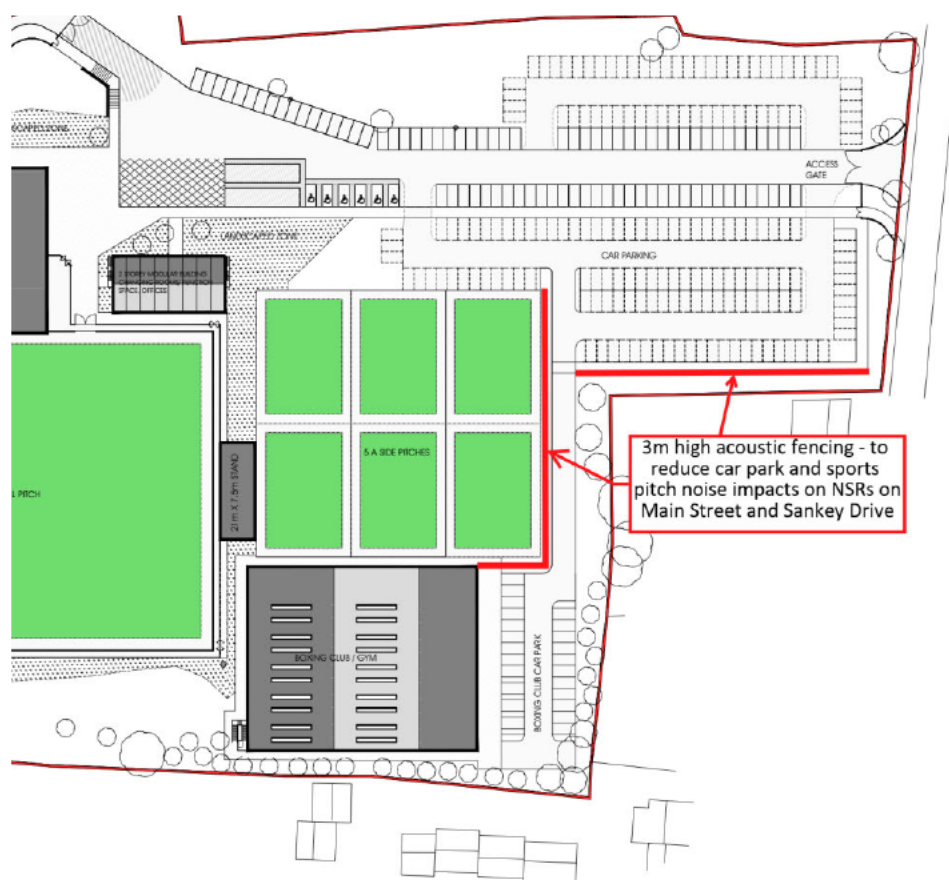


Figure 7: barrier mitigation for car park and sports pitches – NSRs on Main Street and Sankey Drive

In the assessments above some predicted levels show the potential for moderate noise impacts from the sports pitches and the main car parking area. To mitigate for this and to reduce noise impacts in general an additional acoustic fencing design is proposed.

This will benefit residences on Main Street which are the nearest to the noise sources and also have long garden amenity areas to the rear. Noise levels in residential properties on Sankey Drive will also be reduced and they will also benefit from significant acoustic shielding from the boxing and gym club building.

The proposed acoustic fencing solution (Figure 7) will reduce noise levels to below Sport England, WHO and BS8233:2014 criteria levels at NSR 1 and NSR 2. IEA guidance on noise level change will be in the negligible category for all NSRs and the descriptor for noise impacts will be none or not significant.

Further sports pitches mitigation options as recommended by Sport England should be considered as follows:

- Impact of hockey balls or similar on strike boards, goal boards – use of insulated boards to mitigate
- Impact of balls on perimeter fencing – use of mesh fencing solutions designed for low impact noise using resilient fixings – for example neoprene isolators from panels to fence posts and dampers in the fence posts.
- Use of netting to reduce impact occurrence on the perimeter fencing
- Consideration of sheet metal advertising panels and shelter design and location to reduce the potential of impact noise
- Usage plans and monitoring to control unwanted noise from non-players
- Access routes to pitches to consider location of residential NSRs

Further car park mitigation options should be considered as follows:

- Traffic calming, speed limits, flow control design and noise reduction signage
- Use of low noise access road and car park surface construction materials
- Parking management – design and layout to consider location of residential NSRs

## 8 Conclusion

This assessment shows that with some additional acoustic fencing and a review of the existing and current design proposed boundary wall and fence structures, the noise levels predicted from the proposed sports pitches and car parks are expected to have low impacts on nearby NSRs.

BS4142 rating levels for external plant and criteria for high level internal noise sources in the proposed hospitality and leisure venues have been detailed for use at later design stages.

The football club main pitch has not been specifically assessed for match day noise on the basis that this is a re-location of an existing sound source which will be generally acceptable to the local community.

A design and modelling assessment for maximum noise levels from a future PA system in the main and east stands has been carried out for reference purposes and to aid in the setting of noise limits should these be required.





## Appendix 3: Gresley Rovers development building designs

### Proposed main clubhouse building and stand





## Appendix 4: Site measurement summaries

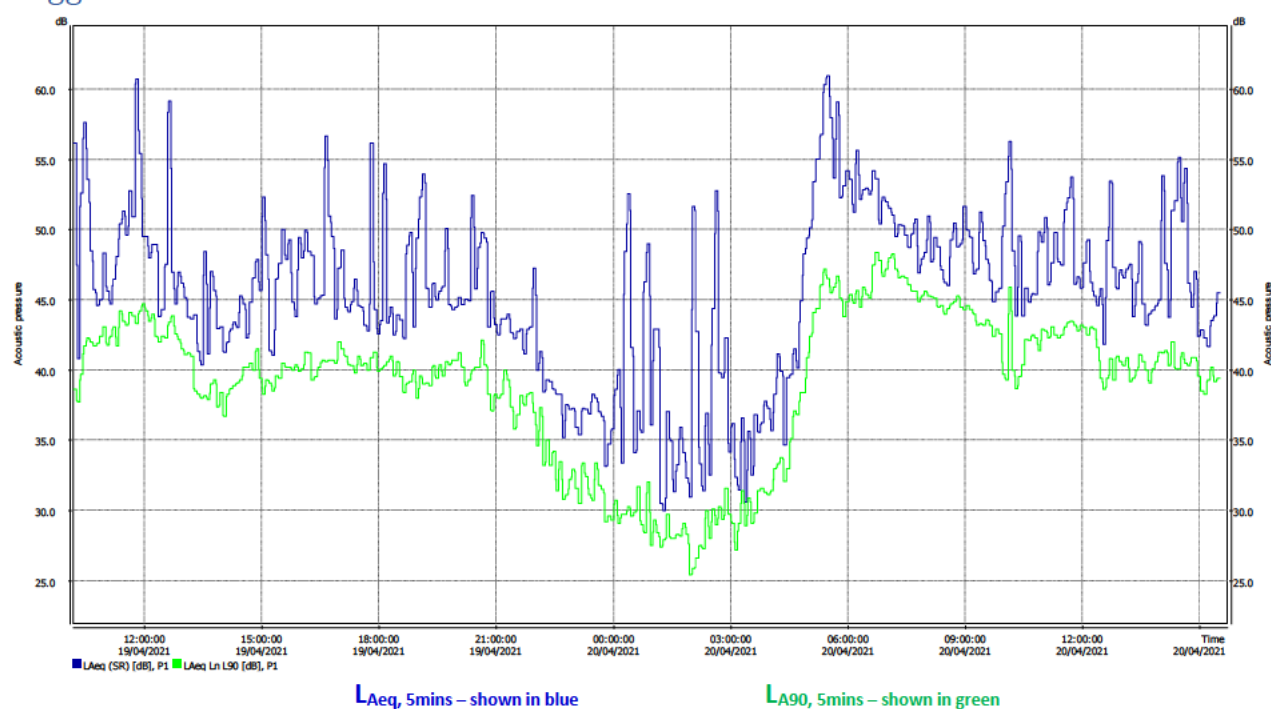
### Proposed development site – measurement position 1

|              |                                                                      |
|--------------|----------------------------------------------------------------------|
| Project name | Gresley Rovers development                                           |
| Author name  | Nick Myerscough – Walnut Acoustics                                   |
| Location     | Land West of Main Street, Albert Village,<br>Swadlincote, Derbyshire |

### Instrument configuration

|                                        |                     |       |
|----------------------------------------|---------------------|-------|
| Measurement start                      | 19/04/2021 10:10:54 |       |
| Measurement stop                       | 20/04/2021 15:33:28 |       |
| Measurement elapsed time<br>[HH:MM:SS] | 29:22:34            |       |
| Unit type                              | Castle Mirus GA 117 |       |
| Unit S/N                               | 34260               |       |
| Software version                       | 1.05                |       |
| Integration period                     | 5 m                 |       |
| Logger step                            | 1 s                 |       |
| Calibration drift                      | 0.02 dB             |       |
| Mic field correction                   | Free                |       |
| Windscreen                             | ON                  |       |
| Description                            | Profile             | Value |
| Filter                                 | 1                   | A     |
| Detector                               | 1                   | Fast  |

### Logger results



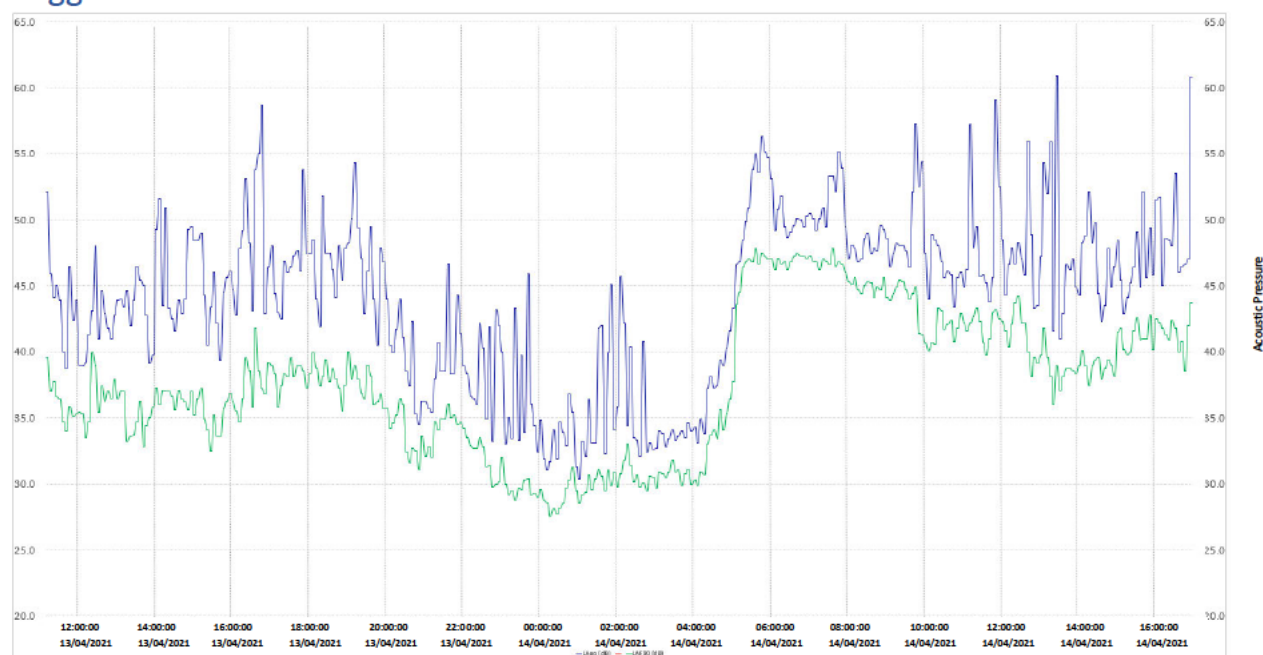
### Proposed development site – measurement position 2

|              |                                                                   |
|--------------|-------------------------------------------------------------------|
| Project name | Gresley Rovers development                                        |
| Author name  | Nick Myerscough – Walnut Acoustics                                |
| Location     | Land West of Main Street, Albert Village, Swadlincote, Derbyshire |

### Instrument configuration

|                                     |                      |       |
|-------------------------------------|----------------------|-------|
| Measurement start                   | 13/04/2021 11:18:46  |       |
| Measurement stop                    | 14/04/2021 17:01:45  |       |
| Measurement elapsed time [HH:MM:SS] | 28:38:39             |       |
| Unit type                           | Cirrus Research 822C |       |
| Unit S/N                            | D20378FB             |       |
| Software version                    | 1.05                 |       |
| Integration period                  | 5 m                  |       |
| Logger step                         | 1 s                  |       |
| Calibration drift                   | 0.8 dB               |       |
| Mic field correction                | Free                 |       |
| Windscreen                          | ON                   |       |
| Description                         | Profile              | Value |
| Filter                              | 1                    | A     |
| Detector                            | 1                    | Fast  |

### Logger results



LAeq, 5mins – shown in blue

LA90, 5mins – shown in green

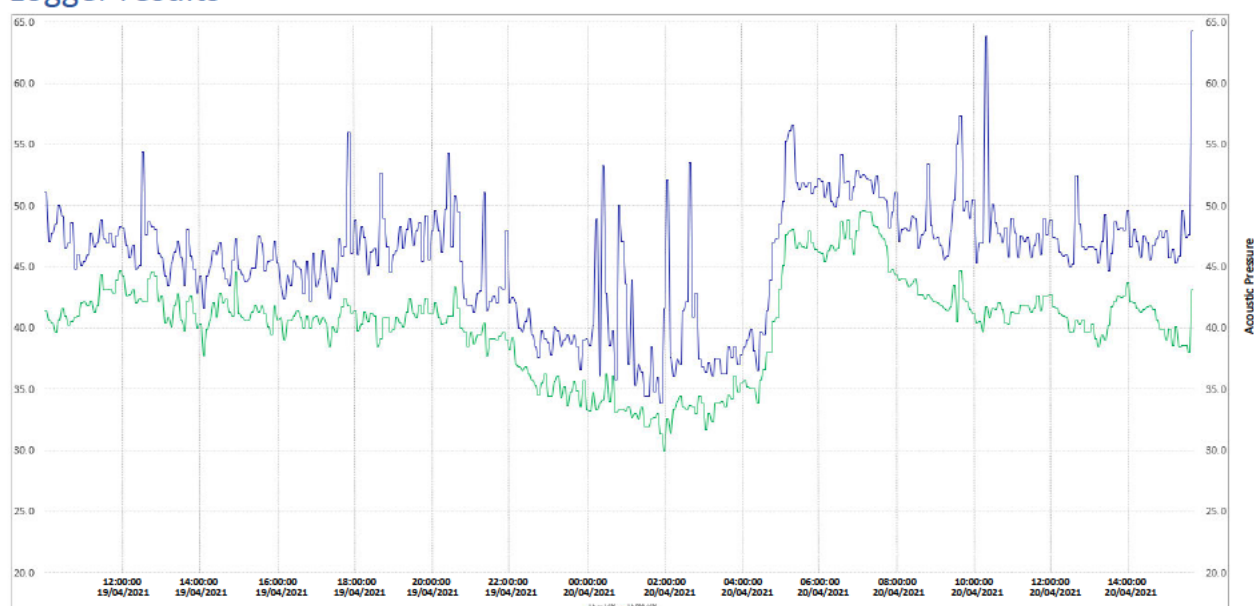
### Proposed development site – measurement position 3

|              |                                                                      |
|--------------|----------------------------------------------------------------------|
| Project name | Gresley Rovers development                                           |
| Author name  | Nick Myerscough – Walnut Acoustics                                   |
| Location     | Land West of Main Street, Albert Village,<br>Swadlincote, Derbyshire |

### Instrument configuration

|                                        |                      |       |
|----------------------------------------|----------------------|-------|
| Measurement start                      | 19/04/2021 10:00:32  |       |
| Measurement stop                       | 20/04/2021 15:40:00  |       |
| Measurement elapsed time<br>[HH:MM:SS] | 29:39:28             |       |
| Unit type                              | Cirrus Research 822C |       |
| Unit S/N                               | D20378FB             |       |
| Software version                       | 1.05                 |       |
| Integration period                     | 5 m                  |       |
| Logger step                            | 1 s                  |       |
| Calibration drift                      | 0.4 dB               |       |
| Mic field correction                   | Free                 |       |
| Windscreen                             | ON                   |       |
| Description                            | Profile              | Value |
| Filter                                 | 1                    | A     |
| Detector                               | 1                    | Fast  |

### Logger results



LAeq, 5mins – shown in blue

LA90, 5mins – shown in green

## Appendix 5: Measurement equipment calibration certificate

|                                  |             |
|----------------------------------|-------------|
| <h1>Calibration Certificate</h1> |             |
| With Results                     |             |
| Issued By: Castle Group Ltd      |             |
| Date Of Issue : 27/05/20         | Page 1 of 5 |
| Certificate No : 34260/77324     |             |



All instruments are tested to check compliance with particular specifications. These may be an appropriate British or International Standard, or if the instrument was not originally designed to meet any such Standard, or when the instrument was originally manufactured a relevant Standard did not exist, the instrument will be tested to the manufacturer's original specification.

Absolute acoustic calibration of acoustic calibrators and sound level meters is checked at one or more standard frequencies against an independent sound source with calibration directly traceable to a National Standards Laboratory. The applicable reference for the calibration of the test equipment is shown below.

The performance of the instrument was determined by comparison with the manufacturers' specification as found in the instrument handbook or other technical publication. Any significant uncertainty of the measuring system will also be included.

The instrument was allowed to stabilise for a period of 30 minutes prior to measurements made.

The ambient temperature and relative humidity throughout calibration were  $23 \pm 2$  °C and 38% RH respectively.

Instruments used to carry out this calibration are as follows: -  
Multifunction Calibrator 4226 Serial No: 2019693  
Applicable Reference: CDK1905910.

Subject of Calibration: GA117  
Instrument: Integrating 1/1 Octave Band SLM  
Serial No: 34260

Preamplifier Data  
Preamplifier Type: SV18  
Preamplifier Serial No: 32089

Microphone Data  
Microphone Type: 7052E  
Microphone Serial No: 54378

Basis Of Test: Compliance to IEC 61672-1 : 2002 Class 1, & IEC 61260: 1995 Class 1

Calibrated By:  
D. L. Wrightson  
(Approved Signatory)

Checked By:  
M. Mann  
(Approved Signatory)

Date of Calibration: 27 May 2020

Recalibration Due: 01 Jul 2021

Completed Status: Pass

Client: Walnut Acoustics  
Address: 3 Furrow Way  
Mickleton  
Gloucestershire  
GL55 6TW

Client Reference:

**Castle Group Ltd**  
Salter Road, Scarborough Business Park, Scarborough, North Yorkshire YO11 3UZ United Kingdom  
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# Calibration Certificate

Issued By: Castle Group Ltd

Date Of Issue : 27/05/20

Certificate No : 043479/77324

All instruments are tested to check compliance with particular specifications. These may be an appropriate British or International Standard, or if the instrument was not originally designed to meet any such Standard, or when the instrument was originally manufactured a relevant Standard did not exist, the instrument will be tested to the manufacturer's original specification.

Absolute acoustic calibration of acoustic calibrators and sound level meters is checked at one or more standard frequencies against an independent sound source with calibration directly traceable to a National Standards Laboratory. The applicable reference for the calibration of the test equipment is shown below.

The performance of the instrument was determined by comparison with the manufacturers' specification as found in the instrument handbook or other technical publication. Any significant uncertainty of the measuring system will also be included.

The instrument was allowed to stabilise for a period of 30 minutes prior to measurements made.

The ambient temperature and relative humidity throughout calibration were  $23 \pm 2$  °C and 38% RH respectively.

Instruments used to carry out this calibration are as follows: -

Multifunction Calibrator 4226 Serial No: 2019693

Applicable Reference: CDK1905910.

Sound Level Meter 2260 Serial No: 1875415

Applicable Reference: 08277

Subject of Calibration: GA607

Instrument: Dual level Calibrator with Barometer

Serial No: 043479

Supplied Barometer Data (if applicable)

Barometer Type: GA690

Barometer Serial No: 069353

Output Data Corrected for test conditions at 1kHz.

Reference Level (dB) : 94.0 & 103.9

Refer to calibrator handbook for any applicable microphone cavity insertion correction.

Basis Of Test: Compliance to IEC 60942: 2003 Class 1/C

Calibrated By:

O. L. Wrightson  
(Approved Signatory)

Checked By:

M. Mann  
(Approved Signatory)

Date of Calibration: 27 May 2020

Recalibration Due: 01 Jul 2021

Completed Status: Pass

Client: Walnut Acoustics

Address: 3 Furrow Way  
Mickleton  
Gloucestershire  
GL55 6TW

Client Reference:

— Indicates item or information not available

**Castle Group Ltd**

Salter Road, Scarborough Business Park, Scarborough, North Yorkshire YO11 3UZ United Kingdom

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[www.castlegroup.co.uk](http://www.castlegroup.co.uk)

## CERTIFICATE OF CALIBRATION

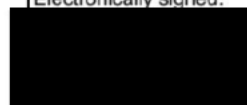
ISSUED BY                      **Cirrus Research plc**  
DATE OF ISSUE              **17/07/20**                      CERTIFICATE NUMBER **143735**



**Cirrus Research plc**  
**Acoustic House**  
**Bridlington Road**  
**Hunmanby**  
**North Yorkshire**  
**YO14 0PH**  
**United Kingdom**

Page 1 of 2

Test engineer:  
D.Swalwell  
Electronically signed:



## Microphone

### Microphone capsule

Manufacturer: Cirrus Research plc  
Model: MK:216  
Serial Number: 112123

### Calibration procedure

Date of calibration: 07 July 2020  
Open circuit: 41.1 mV/Pa  
Sensitivity at 1 kHz: -27.7 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

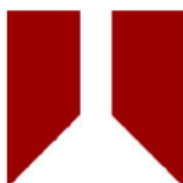
The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

### Environmental conditions

Pressure: 101.00 kPa  
Temperature: 22.0 °C  
Humidity: 46.0 %

## CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**  
DATE OF ISSUE **17 July 2020** CERTIFICATE NUMBER **143737**



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2

Approved signatory

C.Scott

Electronically signed:



## Sound Level Meter : BS 7580-2:1997

### Instrument information

|                   |                     |        |
|-------------------|---------------------|--------|
| Manufacturer:     | Cirrus Research plc | Notes: |
| Model:            | CR:822C             |        |
| Serial number:    | D20378FB            |        |
| Class:            | 2                   |        |
| Firmware version: | 04.00               |        |

### Test summary

Date of calibration: 17 July 2020

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

Periodic tests were performed in accordance with procedures from BS 7580-2:1997.

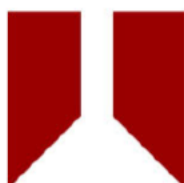
The sound level meter submitted for testing has successfully completed the class 2 periodic tests of BS 7580-2:1997, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of BS 7580-2:1997 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in BS 7580-2:1997 and because the periodic tests of BS 7580-2:1997 cover only a limited subset of the specifications in BS 7580-2:1997.

### Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.

## CERTIFICATE OF CALIBRATION

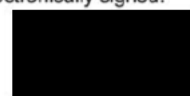
ISSUED BY **Cirrus Research plc**  
DATE OF ISSUE **17 July 2020** CERTIFICATE NUMBER **143736**



**Cirrus Research plc**  
**Acoustic House**  
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**Hunmanby**  
**North Yorkshire**  
**YO14 0PH**  
**United Kingdom**

Page 1 of 2

Approved signatory  
C.Scott  
Electronically signed:



## Sound Calibrator : IEC 60942:2003

### Instrument information

**Manufacturer:** Cirrus Research plc **Notes:**  
**Model:** CR:514  
**Serial number:** 47720  
**Class:** 2

### Test summary

**Date of calibration:** 17 July 2020

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC 60942:2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The manufacturer's product information indicates that this model of sound calibrator has been formally pattern approved to IEC 60942:2003 Annex A to Class 2. This has been confirmed with the Physikalisch-Technische Bundesanstalt (PTB).

As public evidence was available, from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the Class 2 requirements of IEC 60942:2003.

### Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a coverage probability of approximately 95%.

## Appendix 6: Uncertainty

This report relies on ambient noise level measurements. Ambient noise at a given location can vary substantially from day to day with variations in road traffic and other sources, and propagation of noise can be strongly affected by weather and atmospheric conditions. We believe our assessment to be representative of typical conditions, but only very long-term noise monitoring could establish the range of variation in these conditions.

BS 4142:2014+A1:2019 section 10 states that uncertainty in the calculation of sound levels during the assessment process can arise from both the measured values and calculation methods. To ensure the accuracy of the assessment consideration has been taken for the level of uncertainty in the measured data and associated calculations in the proposed methodology used to undertake the assessment.

Where the level of uncertainty could affect the conclusion, reasonably practicable steps have been taken to minimise the level of uncertainty. Where the level of uncertainty is excessive, additional measurements and site visits have been conducted to increase the confidence in the results. In all instances the following steps have been taken to address the uncertainty:

1. Measured Values: A detailed understanding of the source of noise under investigation has been conducted including consideration for the complexity, variability over time and location, the character and effect of the residual sound level in comparison with the source, the measurement location, quantity of measurements and distance/intervening ground conditions, measurement time interval and the range of times measurement were taken, the suitability of weather conditions, the level of rounding and the classification of the instrumentation used to conduct the assessment.

2. Calculation Methods: Consideration has been taken for the accuracy of the measured sound levels, the character of the sound emissions in question, the calculation method and the simplification of the real situation to “fit” the modelled situation. Recognised standards and validated methods and processes have been used to establish accurate values during the calculation process.

For the avoidance of doubt, the level of uncertainty will not be quantified. If appropriate consideration is taken for points 1 and 2 during the collection of data and analysis thereof, then the influence of uncertainty in the final result is at its lowest practical value.

## Appendix 7: Glossary of terms

**Ambient Noise:** Total sound level in a given situation at a given time usually composed of sounds from many sources near and far.

**Assessment Level:** the difference between a rating level and the background noise level in a BS 4142 assessment.

**Attenuation:** A reduction in the intensity (and level) of a sound signal.

**Background Noise Level:** The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval T, measured using the time weighting F, and quoted to the nearest number of whole decibels.

**Decibel (dB):** a unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 Pa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

**dBA:** decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dBA broadly agree with people's assessment of loudness. A change of 3 dBA is the minimum perceptible under normal conditions, and a change of 10 dBA corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).

**Distance Correction:** a theoretical measure of how levels from sound sources reduce over distance through propagation.

### Free Field:

1. A free sound field is a field in a homogeneous, isotropic medium free from boundaries. In practice it is a field in which the effects of the boundaries are negligible over the region of interest. The actual pressure impinging on an object (e.g., a microphone) placed in an otherwise free sound field will differ from the pressure which would exist at the point with the object removed, unless the acoustic impedance of the object matches the acoustic impedance of the medium.

2. An environment in which there are no reflective surfaces within the frequency region of interest.

3. A region in which no significant reflections of sound occur.

4. [BS 4142] suggests that free-field environmental noise measurements need to be made at least 3.5m from any reflecting structure.

**$L_{A90,T}$**  : the A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142:2019 it is used to define background noise level.

**$L_{Aeq,T}$**  : the A-weighted equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T).

**$L_{Amax}$**  : the highest A weighted noise level recorded during a noise event. The time weighting used (F or S) should be stated.

**Rating Level** : The specific noise level plus any adjustment for the characteristic features of the noise in a BS 4142 assessment

**Residual Noise** : The ambient noise remaining at a given position in a given situation when the specific noise level is suppressed to a degree such that it does not contribute to the ambient noise.

**Specific noise source** : The noise source under investigation for a BS 4142 assessment.

**Specific noise level**: the A-weighted equivalent continuous sound level of the noise source under investigation for a BS 4142 assessment.

**Steady Noise**: Noise that gives fluctuations over a range of not more than 5 dB on a sound level meter set to frequency weighting A and time weighting S.

## Appendix 8: Disclaimer

Recommendations in this report are for acoustics purposes only, and it is the responsibility of the client, project manager, construction company or architect to ensure that all other requirements are met including (but not limited to) structure, fire and Building Controls.

The calculations within this report are based upon sourced and/or calculated data. It should be understood that complex flanking transmission paths through structures can lead to excessive vibration transmission. Also, build quality can greatly affect final sound levels and Walnut Acoustics takes no responsibility for the integrity of any physical work carried out. All reasonable and practicable installation techniques should be employed with noise reduction in mind including the use of isolation and anti-vibration materials in the mounting of all parts of any mechanical systems.

The opinions and interpretations presented in this report represent our best technical interpretation of the data made available to us. However, due to uncertainty inherent in the estimation of all parameters, we cannot, and do not, guarantee the accuracy or correctness of any interpretation. We shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees.

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. If additional information becomes available which may affect our comments, conclusions or recommendations, the author reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

Except for the provision of professional services on a fee basis, Walnut Acoustics does not have a commercial arrangement with any person or company involved in the interests that are the subject of this report.

Walnut Acoustics cannot accept any liability for the correctness, applicability or validity for the information they have provided, or indeed for any consequential costs or losses in this regard. Our efforts have been made on a “best endeavours” basis and no responsibility or liability is warranted or accepted by Walnut Acoustics.

All data and mathematical content in this report has been checked thoroughly and is believed to be accurate at the time of issue. Errors and Omissions excepted.