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BRC Manufacturing Limited

Manufacturing Facility at Whaley Road, Barnsley

Technical Report

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Project Revision Sheet

Revision No	Date	Status	Changes	Author	Approved
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1 Introduction

MLM Acoustics has been commissioned by BRC Manufacturing Limited to assess the impact of noise arising from its steel production facility at Whaley Road in Barnsley, in relation to an application that has been lodged with the Local Planning Authority (LPA) for residential development on the adjacent open fields.

It is understood that the LPA has granted outline permission (reference 2013/0280) and reserved matters (2015/0891) and it is now considering an application to vary a condition of the reserved matters (2016/1159). It is unclear whether a noise mitigation strategy has been approved by the LPA (conditions 12 and 13 of the reserved matters). In any event the information provided with the outline permission and reserved matters is not considered sufficient to fully consider the adjacent industrial noise sources. This application should consider these sources and conditions should be attached to a permission, if granted, to ensure that any future noise mitigation strategy properly considers industrial noise sources and that the planned residential development does not constrain their operation.

Consequently, an objective assessment has been carried out at the boundary of the manufacturing facility with the proposed residential site, in order to quantify and assess the current levels of industrial noise generation affecting the adjacent site and understand their significance against British Standard criteria.

Whilst every effort has been made to ensure that this report is easily understood, it is technical in nature; a glossary of terms is included in Appendix A to assist the reader.

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2 Policy and Assessment Methodology

British Standard 4142

BS 4142[1] sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS 4142 for assessing the effect of sound on residential receptors is to compare the measured or predicted noise level from the source in question, the $L_{Aeq,T}$ 'specific noise level', immediately outside the dwelling with the $L_{A90,T}$ background noise level.

Where the noise contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific noise level to obtain the $L_{Ar,Tr}$ 'rating noise level'. A correction to include the consideration of a level of uncertainty in noise measurements, data and calculations can also be applied when necessary.

BS 4142 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs"*. An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

- "Typically, the greater this difference, 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 on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."
- "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. 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."

For the daytime, the assessment is carried out over a reference time period of one (1) -hour, but at night-time it is carried out over a 15-minute period. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

25/10/2016

[1] British Standard 4142: 2014: Method for Rating and Assessing Industrial and Commercial Sound. BSI

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3 Site and Description of Proposed Development

General Description

BRC Limited are producers of engineered steel products and have been operating at their site in Barnsley since 1975. The site comprises internal production operations, plus external storage and distribution activities, linked to the production area via in-to-out conveyers and forklift movements within an established industrial area, some 150 metres from the closest residential properties to the north and 110 metres from the closest properties to the south-west. The activities; while acoustically sympathetic to those existing receptors, are relatively unconstrained in noise terms, due to the distant nature of the closest receptors in the area. The activities do, however, as with any other manufacturing process, emit some noise to the environment.

The site relative to the existing receptors in the area is shown in Figure 1, below.

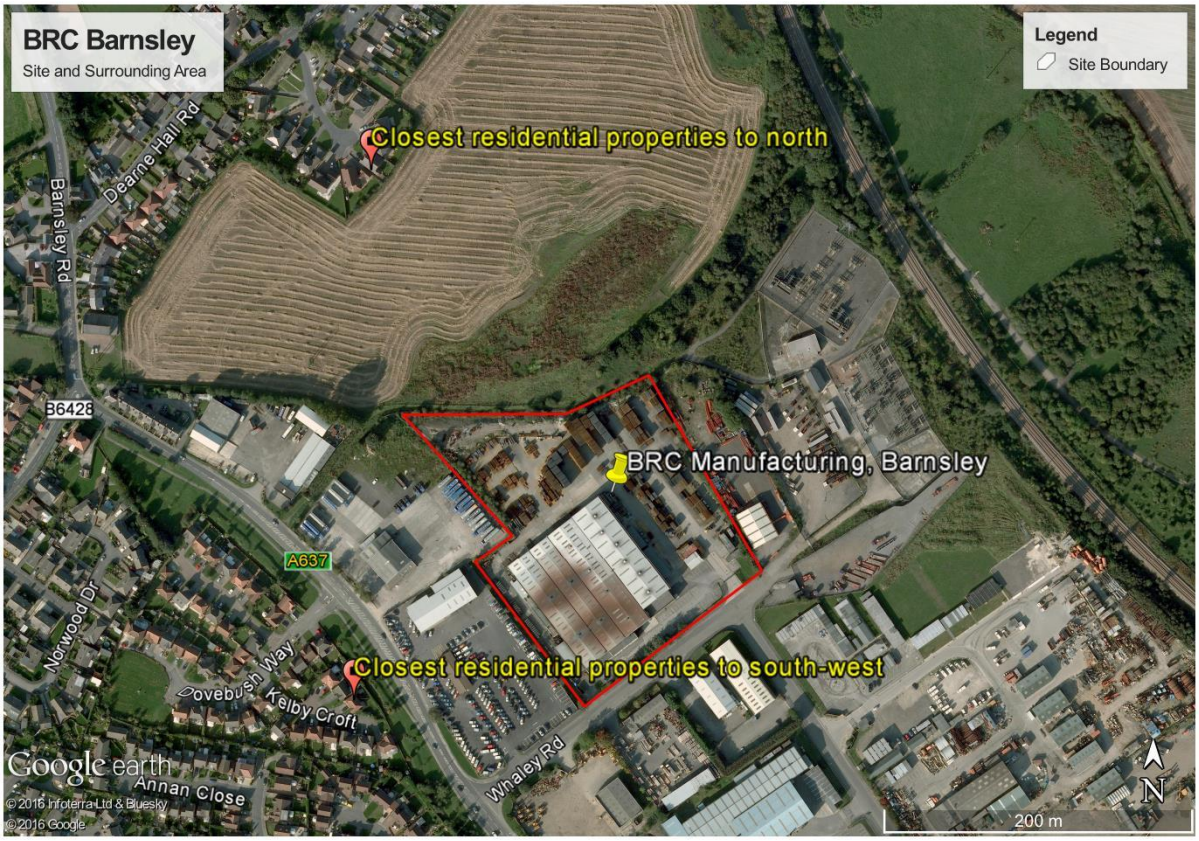


Figure 1: Site Location and Surrounding Area

The Dearne Hall Road residential proposals aim to bring forward 170 residential units on the land to the immediate north of the BRC site; bringing residential dwellings to within 30 metres of the site boundary. Revision A of the submitted planning layout for the site is set out in Figure 2. This does not clearly identify the site in relation to BRC Manufacturing; however, for clarity, plot numbers 118 to 125, plus 136, 137, 146 and 147 are situated along the northern extent of the active site boundary. The planned *showhome* dwellings, in the vicinity of plot numbers 46 to 48 are shown close to the north-east corner of the site.

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Figure 2: Dearne Hall Road Planning Layout (Revision A)

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4 Overview of Submitted Noise Assessments

Report 13/0190/R1 // Revision 6 – Planning Noise Assessment

The above-named noise assessment, produced by Cole Jarman and dated 13 June 2013 assesses the noise environment at key points around the Dearne Hall Road site, in accordance with British Standard 8233: 1999 *Sound insulation and noise control for buildings – Code of practice*, with reference to the historic guidance in Planning Policy Guidance 24 (PPG24): Planning and Noise 1994.

PPG24 had been replaced at the time of writing by the National Planning Policy Framework (March 2012), as identified in the report; however, it is worth noting that PPG24 does advocate the use of BS 4142 where commercial noise is a consideration.

Since the time of preparation of the report, both BS 8233 and BS 4142 have been updated (in 2014), so the noise report is now considered out-of-date and inadequate for a planning application that is occurring now.

Furthermore, the noise report does not present a specific assessment of noise contributions from the BRC site, in accordance with either the 1997 or 2014 versions of BS 4142, which is now considered to be a core requirement of any noise assessments for residential development near industrial or commercial noise sources.

Consequently, and on the basis of this report, the LPA has not been presented with sufficient information with which to make an informed judgement on whether the industrial noise present in the area will unduly affect the amenity of the proposed residences and consequently; due to the way that statutory nuisance legislation works in the UK, whether the operations within BRC, which are currently unconstrained, could be constrained under a scenario where noise-sensitive receptors are located immediately adjacent to their operations.

Report 14/0561/R01 – Garden Noise Assessment

The above-named report, produced by Cole Jarman and dated 16th December 2014 (after the date of implementation of the revised versions of BS8233 and BS4142), focusses purely on the overall noise level in proposed garden spaces, in respect of noise arising from the operation of the nearby electricity substation.

No specific consideration is given to the noise generated by the BRC facility.

Report 14/0561/M01-2 – Additional Note on Commercial Noise

The above-named report, produced by Cole Jarman and dated 3rd February 2016 (after the date of implementation of the revised versions of BS8233 and BS4142), focusses purely on the overall ambient noise level across the site and does not set out how noise from the adjacent commercial operations has been considered. It also, and notably does not consider the noise from the BRC plant in isolation, in accordance with BS 4142: 2014, which is a basic and fundamental planning requirement of any proposed residential use adjacent to industry.

The assessment focusses entirely on the façade insulation requirements and at no point identifies the relative contribution of noise sources, other than unattributed $L_{Aeq,16\text{-hour}}$ daytime and L_{AFMax} levels *"near the industrial area"*. It is presumed that an assessment in accordance with BS4142: 2014 has been deliberately omitted, as this would provide a very different narrative conclusion, which identifies a significant adverse impact at the proposed residential development.

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This assessment does not appropriately consider commercial noise and is not fit-for-purpose.

Report 14/0561/M02-2 – Additional Note on Internal Criteria and Mitigation

The above-named report, produced by Cole Jarman and dated 22nd February 2016 (after the date of implementation of the revised versions of BS8233 and BS4142), focusses purely on general ambient noise levels and mitigation requirements to achieve appropriate amenity levels. At no point is the distinction made between anonymous sources, such as transport and the distinct sources within the BRC site.

Again, this report fails to appropriately consider the relative contribution of the BRC site to the noise climate and consider the risks of such an adjacency in accordance with BS 4142: 2014, which has already been identified as a fundamental and basic requirement.

Summary

The submitted noise reports do not present an appropriate level of consideration of the specific noise arising from BRC and consideration is not given to current planning requirements.

They are, therefore, not considered fit for the purpose of assisting the determination of a planning application at this time and should be updated to consider the current standards; particularly BS 4142: 2014. Such an assessment would identify that a significant amendment to the masterplan layout is required in order to avoid neighbour conflict and a constraint to the business of BRC Manufacturing at their Barnsley site.

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5 Baseline Conditions

The noise conditions in the area have been determined by a fully attended environmental noise survey conducted during both daytime and night-time periods on Thursday 9th June and Friday 10 June 2016.

Noise Measurement

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[2].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[3]. A full inventory of this equipment is shown in Table 1 below:

Table 1: Inventory Of Noise Measurement Equipment

Item	Make & Model	Serial Number
1 - Sound Level Meter	Rion NA-28	00370297
1 - Preamplifier	Rion NH-23	60306
1 - Microphone	Rion UC-59	00386
Calibrator	Rion NC-74	34315165

The noise measurement equipment used during the survey was calibrated at the start and end of the measurement period. The calibrators used had been calibrated by an accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on any sound level meter.

The noise survey was undertaken by Adrien Vinay MEng MSc AMIOA. Adrien is an Acoustic Consultant with 3 years' experience of working in specialist Acoustic Consultancy, and is experienced in a wide range of noise measurement, prediction and assessment methods. Adrien is an associate member of the Institute of Acoustics and has undertaken a number of BS4142 assessments during his career to-date.

The microphones were fitted with protective windshields for the measurements. The weather conditions during the survey were conducive to noise measurement; it being dry with very low wind speeds, although it is noted that some rain was experienced at the very start of the survey and a northerly breeze had picked up on the last day of the survey.

The measurement location is set out on Figure 3 and described in detail below.

- Position 1 – The sound level meter was located at the northern boundary of the site adjacent to the proposed development. The microphone was mounted on a tripod, at a height of 1.5m above local ground floor under free field conditions. Attended monitoring of the prevailing noise climate was undertaken with the microphone, recording multiple acoustic parameters including L_{Aeq}, L_{A90}, and L_{Amax} over continuous 15 minute sample periods.

25/10/2016

[2] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI
[3] British Standard 61672: 2003: *Electroacoustics. Sound level meters*. Part 1 *Specifications.* BSI.

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This position was selected as being representative of the noise climate at the northern boundary of the site; in appropriately close proximity to the closest proposed dwelling of the Dearne Hall Road scheme to the BRC site.
The noise climate at this position was noted to have been dominated during the daytime and night-time periods by activities associated with the BRC Manufacturing site, comprising the operation of the metal mesh production line internally and forklift movements within the outdoor storage area. Noise from production lines was noted to have broken-out through the apertures of the production building and was identified as being continuous, with an impulsive characteristic. Tonality characters were identified for reversing alarms used by forklifts. Noise conditions due to activity on the BRC Manufacturing site was noted to be higher during the daytime period, due to the higher intensity of operations, with night-time operations being less intensive, with audibly lower noise levels as a result.

However, it understood that more intensive night-time operating patterns, comparable to those existing during the daytime operations have occurred in the past and are likely to occur in the future.
Background noise conditions at the site (during inactive periods within BRC) were dominated by natural sources, such as birdsong, noise from overhead power cables (corona discharge), distant road traffic noise, distant noise associated with lorry movements and idling vehicles at the adjacent car retail site.

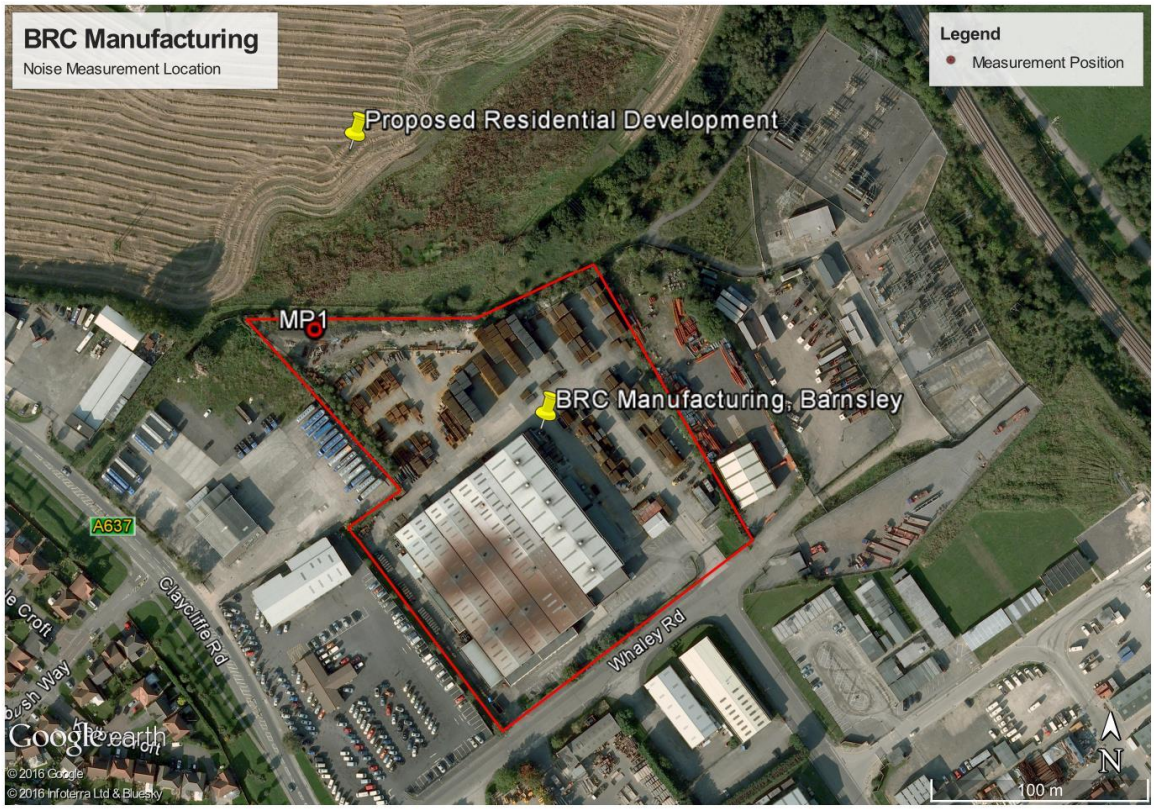


Figure 3 - Noise Measurement Location

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The summarised results of the environmental noise measurements are presented in Table 2 below.

Table 2: Summary Of Noise Measurement Results

Position & Description	Period	Noise Level, dB			
		$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{AFmax}
1 – Source On	Daytime – 10:42 to 10:57	60.4	56.1	63.2	73.1
	Night-time – 23:25 to 23:40	52.0	48.6	54.0	68.2
	Night-time – 23:41 to 23:56	55.9	53.2	57.5	71.5
1 – Source Off	Daytime – 14:21 to 14:36	46.0	40.0	47.3	63.4
	Daytime – 14:42 – 14:57	45.6	41.4	48.6	66.0
	Night-time – 01:06 to 01:21	34.2	32.9	35.4	48.8
	Night-time – 01:24 to 01:39	38.6	37.4	39.5	54.4
	Night-time – 01:40 to 01:55	35.8	33.7	36.4	60.4

For the purposes of a BS4142 assessment, the typical background noise level (without source noise) has been taken to be 40 dB(A) during the daytime period and 33 dB(A) during the night-time period.

Also for the purposes of a BS4142 assessment, the specific noise level of the operations has been taken to be 60 dB(A) during the daytime period and 56 dB(A) during the night-time period.

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6 Noise Assessment

A BS 4142 assessment has been carried out to determine the potential noise impact of the existing BRC operations on the proposed noise-sensitive receivers.

The assessment has been undertaken based on the measurement data presented in Table 2 of this report.

As a result of the proximity of the closest noise-sensitive receptor to the measurement position, the assessment has been based on the measured levels without any distance loss adjustments applied. This is considered to be representative and robust.

In accordance with BS 4142: 2014 methodology, a correction should be applied to the source to account for the tonality, noted audibly while on-site; impulsivity, due to the handling of sonorous materials; and the potential for intermittency, as the plant has the potential to run in cycles.

Consequently, the following corrections have been applied, taking account of the close proximity of the proposed dwellings to the site activities, meaning that any features will remain clearly audible:

- Tonality: +4dB, as the distinctive sounds of reversing alarms and the "hum" of the processing activities would be clearly audible at the receptor;
- Impulsivity: +6dB, as the sounds arising from the handling of sonorous materials would be clearly perceptible at the receiver; and
- Intermittency: +3dB as the plant does have the potential to run in cycles, heightening the awareness of receptors to its presence, by its occasional absence.

Table 3 sets out the BS4142 assessment, taking account of the above factors.

Table 3: BS 4142 Assessment		
Daytime		
Specific Noise Level	L_{Aeq} = 60 dB	Noise level from existing site activities
Acoustic Correction	+13 dB	Tonality, Impulsivity and Intermittency
Rating Level	$L_{Ar,Tr}$ = 73 dB	L_{Aeq} + Correction
Background Level	$L_{A90,15\text{-}Min}$ = 40 dB	Typical 15-minute period during the day
Excess of rating level over background noise level	+33 dB	Indication of significant adverse impact
Night-time		
Specific Noise Level	L_{Aeq} = 56 dB	Noise level from existing site activities
Acoustic Correction	+13 dB	Tonality, Impulsivity and Intermittency
Rating Level	$L_{Ar,Tr}$ = 69 dB	L_{Aeq} + Correction
Background Level	$L_{A90,15\text{-}Min}$ = 33 dB	Typical 15-minute period during night

Excess of rating level over background noise level	+36 dB	Indication of significant adverse impact

The BS 4142 assessment shown in Table 3 clearly identifies that commercial noise has a very high potential to have a significant adverse impact the amenity of residential dwellings located adjacent to the boundary of the BRC site. Consequently, it is felt that such a development would give rise to neighbour conflict and consequently, unduly constrain the operation of the BRC business, which is currently free of such a level of constraint.

Uncertainty

BS4142 requires that a statement of any uncertainty in assessment and what measures have been put into place to reduce the impact of the uncertainty.

The uncertainty within the assessment has been reduced significantly by undertaking a direct measurement of noise from the operations at a location immediately adjacent to the proposed receptor location, meaning that the actual impact has been quantified.

The night-time assessment was undertaken during a period where activities were not running at peak levels, meaning that there is the potential for night-time impacts to be higher than those included within the assessment. As the operator has stated that night-time activities have the potential to equal the intensity of those carried out during the daytime, it is felt that this part of the assessment could potentially increase to +40 dB.

Comparison with Cole Jarman Levels

The above levels differ considerably from those contained within the Cole Jarman reports. While some variation in day-to-day noise levels is considered normal, it is clear from comparing the methodology and approach taken to this assessment, that the differences occur due to Cole Jarman not specifically considering noise generated within the BRC site and, consequently, not measuring commercial noise at the most affected part of the planned development site. This is difficult to comment on categorically, due to the highly ambiguous nature of the February 2016 *Report 14/0561/M01-2 – Additional Note on Commercial Noise*.

Summary

In summary, the assessment identifies that industrial noise at the closest point of the proposed residential development to the BRC Manufacturing site has the potential to unduly constrain the commercial operations, existing the site since 1975 and permission should not be granted to the residential proposals in their current form.

Consequently, any progress on works associated with the planned residential development should be halted, until such time as a revised form of development is considered and approved. This amended form of development should incorporate the following features, in order to ensure that future residents of the planned development are not exposed to excessively high levels of commercial noise, which in all likelihood, would result in complaints to the Local Authority's Environmental Health Department and the potential for nuisance litigation and abatement notices:

- No private external amenity spaces (rear gardens) in close proximity to the boundary between the planned development and BRC Manufacturing;
- Significant development massing i.e. flats or terraced town houses, at the closest part of the site to BRC Manufacturing; and

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- A single aspect form of development, whereby no habitable rooms overlook the BRC site, and that only kitchen, bathroom or corridor windows (preferably sealed) would be located on the closest façade.

If the above measures were deemed to not be viable for any reason; planning context, development aspirations, etc, then an approach should be taken where no area of the site should be developed for residential purposes where the commercial noise from BRC Manufacturing exceeds a rating level of more than 5 dB above the prevailing background noise level, once corrected for acoustic feature and assessed in accordance with the methodology set out in BS 4142: 2014.

In short, a significant quantum of focussed acoustic works need to be undertaken at the site that don't just consider the overall noise levels and insulation requirements, against BS 8233 amenity levels, but also specifically and appropriately consider the component parts of the noise climate. Such an assessment will result in a very different conclusion and development profile to that currently being brought forward and presented as acceptable within the supporting planning documents.

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7 Conclusion

MLM Acoustics has been commissioned by BRC Manufacturing Limited to assess the impact of noise arising from its steels production facility at Whaley Road in Barnsley, in relation to an application that has been lodged with the Local Planning Authority (LPA) for residential development on the adjacent open fields.

It is understood that the LPA has granted outline permission (reference 2013/0280) and reserved matters (2015/0891) and it is now considering an application to vary a condition of the reserved matters (2016/1159). It is unclear whether a noise mitigation strategy has been approved by the LPA (conditions 12 and 13 of the reserved matters). In any event the information provided with the outline permission and reserved matters is not considered sufficient to fully consider the adjacent industrial noise sources. This application should consider these sources and conditions should be attached to a permission, if granted, to ensure that any future noise mitigation strategy properly considers industrial noise sources and that the planned residential development does not constrain their operation.

Consequently, an objective assessment has been carried out at the boundary of the manufacturing facility with the proposed residential site, in order to quantify and assess the current levels of industrial noise generation affecting the adjacent site and understand their significance against British Standard criteria.

A brief review of the submitted noise assessment documentation has identified that at no point is the noise from BRC Manufacturing specifically or appropriately assessed. The assessment documentation does not, therefore, accord with current planning requirements, so is not fit for the purpose of providing adequate information upon which to base a planning decision.

The measurement-based assessment of noise arising from the BRC operations at the closest point of proposed residential development within the adjacent site has identified that industrial noise would have a significant adverse impact upon the amenity of proposed future residential uses. Consequently, the introduction of noise-sensitive receptors in such close proximity to the existing industrial activities would unduly constrain BRC's operations.

It is therefore considered that based upon the above factors, the residential development planned for the Dearne Hall Road site needs to be reconsidered in terms of its quantum, massing and orientation, in order to ensure that neighbour conflicts do not arise and that the commercial operation of BRC Manufacturing is appropriately protected.

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Appendices

Appendix A – Glossary of Acoustic Terminology

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Appendix A

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Appendix A – Glossary of Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

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In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A1: Typical Sound Levels Found In The Environment	
Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

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This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.