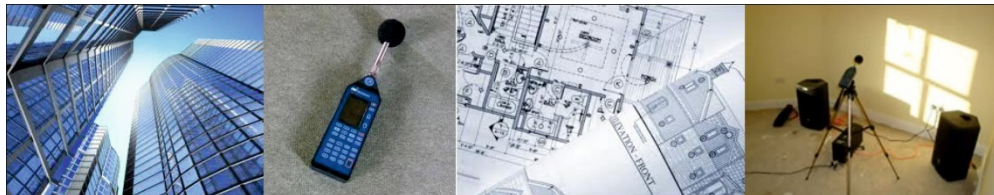


Ian Sharland LIMITED

Noise & Vibration Control Specialists

Ashfield House
Back Lane
Marlborough
Wiltshire SN8 1JJ
Telephone: (01672) 515761
Facsimile: (01672) 512761
Email: office@iansharland.co.uk



CELLERHEAD BATTERY SITE ROWNALL ROAD CHEDDLETON STAFFORDSHIRE ST9 0BT

NOISE IMPACT ASSESSMENT
v.2

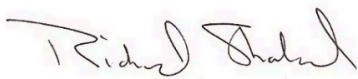
Client:
AVON UTILITIES AND GENERATION

Unit 1
Mouldings Green
Kenilworth Road
Meriden
West Midlands
CV7 7LJ

27th July 2021
Ref: M5041

CONTENTS

1. SUMMARY	2
2. INTRODUCTION	3
3. SURVEY OF AMBIENT NOISE LEVELS	4
4. PREDICTION OF FACILITY NOISE	6
5. PLANNING POLICY & CRITERIA OF ACCEPTABILITY.....	8
5.1 National Planning Policy Framework (July 2019)	8
5.2 Noise Policy Statement for England (March 2010)	10
5.3 DCLG Guidance Note, 2013 - 'Noise'	11
5.4 BS 4142:2014: Methods for Rating & Assessing Industrial & Commercial Sound.	14
5.5 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.....	16
5.6 World Health Organisation Guidelines	17
5.7 Local Authority Guidance.....	17
6. ASSESSMENT OF PREDICTED NOISE LEVELS	18
6.1 Residential Properties.....	18
6.2 Commercial Properties	19
7. UNCERTAINTY	19
FIGURE 1 – SITE LOCATION	20
FIGURE 2 – PROPOSED SITE LAYOUT	21
FIGURE 3 – SOUND LEVEL METER LOCATION	22
FIGURE 4 – UN-ATTENUATED NOISE MAP	23

Project Reference	M5041
Issue No.	2
Reviewed	Richard Sharland MA MSc CEng MIOA
Signature	
Author	Eddie Oxborough MSc MIOA
Signature	
Date	27 th July 2021

This report has been prepared by Ian Sharland Ltd with all reasonable skill, care and diligence, and taking account of the Services and the Terms agreed between Ian Sharland Ltd and the Client. This report is confidential to the client, and Ian Sharland Ltd accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Ian Sharland Ltd beforehand. Any such party relies upon the report at their own risk.
Ian Sharland Ltd disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the Services.

1. SUMMARY

- 1.1 An assessment of noise has been undertaken at Cellarhead, Rownall Road, Cheddleton, ST9 0BT to consider the acoustic impact of a new Battery Storage Facility.
- 1.2 Ambient noise levels have been measured, and this exercise indicates that the background noise level, $L_{A90,5mins}$, typically falls to a level of 32 dB(A) during the daytime period of (07.00 – 23.00 hrs), and 25 dB(A) during the night-time period (23.00 – 07.00 hrs).
- 1.3 Calculations of noise radiating from the attenuated equipment have predicted ground floor noise levels of 22 dB(A) and 1st floor noise levels of 23 dB(A) at 1m from the facade of the nearest residential properties, some 220m away to the east and south-east of the site.
- 1.4 Based on these attenuated noise levels, the BS4142 Rating Level of the emitted sound would not exceed the assessed Background Noise Levels measured on the site. The formal assessment for daytime and night-time would be **‘an indication of the specific sound source having a low impact, depending on the context’**, for daytime.
- 1.5 A further assessment of the predicted noise, in absolute terms, indicates that levels would be significantly below the British Standard 8233 guidelines for residential occupation during both the day and night.
- 1.6 Consideration of noise affecting adjacent commercial buildings indicates that residual levels from the battery storage facility would be comfortably below BS8233 guideline values.
- 1.7 It is therefore concluded that the proposed installation of the battery storage facility, with the attenuated noise sources detailed in Para. 4.4 - 4.6, would not have an adverse impact on the neighbouring properties.

2. INTRODUCTION

- 2.1 An assessment has been undertaken by Ian Sharland Limited on behalf of Avon Utilities and Generation, to assess the impact of noise emanating from a new Battery Storage Facility.
- 2.2 The proposed location of the facility is situated to the north and west of Rownall Road, Cheddleton, ST9 0BT. Figure 1 shows the location of the site and Figure 2 details the proposed plant layout within the compound.
- 2.3 The scheme will comprise the following noise sources:
- 104no Battery Inverters,
 - 208no Battery Storage Containers,
 - 52no 3Mw Transformers,
 - Substation.
- 2.4 Given the locality of residential properties to the site it is necessary to assess if emitted noise will have any adverse impact. Consideration should also be given to any adjacent commercial neighbours.
- 2.5 The objectives of the present exercise may therefore be summarised as follows:
- (a) To determine the existing ambient noise levels in the area,
 - (b) To determine the likely noise emitted from the new facility,
 - (c) Where appropriate, to recommend forms of noise control that will limit emissions to an acceptable level,
 - (d) To assess the emitted noise in accordance with relevant standards.
- 2.6 This report describes the work carried out on each of those objectives and summarises the conclusions that can be drawn from the results.

3. SURVEY OF AMBIENT NOISE LEVELS

- 3.1 To assess the ambient background noise levels, a Rion NL52 sound level meter was set up to the north of Rownall Road between the proposed site location and the nearest noise sensitive receptor (Figure 3 – Sound Level Meter Location).
- 3.2 The microphone of the sound level meter was attached to an extendable light stand and set up 2.5m above ground, in a free field position. The meter was calibrated before and after the survey and showed no significant variation.

Type	Manufacturer	Serial number	Last Calibration Date	Calibration Certificate No.
NL-52	Rion	620953	05.10.2020	2020-1006

Table 3.1 – Calibration Details

- 3.3 The survey ran from Friday 2nd until Thursday 8th July 2021.
- 3.4 The primary noise source during daytime hours would be road traffic noise travelling along Rownall Road.
- 3.5 The weather conditions during the survey were as follows:

Date	Ave Temp °C	Rainfall mm	Ave Wind Speed m/s	Prevailing Wind Direction
Friday 02/07	15	0.0	1.6 – 3.3	SW
Saturday 03/07	15	1.0	3.4 – 5.4	SE
Sunday 04/07	18	0.0	3.4 – 5.4	S
Monday 05/07	13	1.0	3.4 – 5.4	SW
Tuesday 06/07	13	8.0	3.4 – 5.4	W
Wednesday 07/07	17	2.0	3.4 – 5.4	W
Thursday 08/07	18	0.0	1.6 – 3.3	W

Table 3.2 – Weather conditions during the survey

- 3.6 The meter was configured to measure 5minute samples of the following acoustic parameters:
- L_{Aeq} The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.
- L_{Amax} The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).

L_{A90} A statistical parameter, representing the A-weighted noise level exceeded for 90% of each sample period. This gives a measure of the underlying noise and is commonly used to describe the ambient background noise.

3.7 The variation of measured noise levels is shown graphically in Figure 4.

3.8 The key measurement for this exercise is the minimum value of the background noise recorded. The levels were found to fall to the following minimum typical values:

Measure	Day Time, 07.00 – 23.00	Night Time, 23.00 – 07.00
Mean	36	34
Median	35	36
Modal	32	25
90% Percentile	30	23

Table 3.3 – Measured Levels of Background Noise, L_{A90}

3.9 From this data, the following assessed levels of background noise have been determined:

Period	Typical Value L _{A90}
07.00 – 23.00	32 dB(A)
23.00 – 07.00	25 dB(A)

Table 3.4 – Assessed Levels of Background Noise, L_{A90}

3.10 Section 6 of this report will discuss these noise levels, in respect of appropriate targets for limiting new noise emissions.

4. PREDICTION OF FACILITY NOISE

4.1 The proposal for the Battery Storage Facility involves the installation of the three main noise sources – inverters, transformers and A/C units for the battery containers.

4.2 It has been confirmed by the client (through the manufacturer's data) that the equipment will each generate the following Sound Power Levels:

- 104no Battery Inverters – 94 dB(A)
- 52no 3Mw Transformers – 91 dB(A)
- 208no Battery Containers – 91 dB(A)
- 1no Substation – 91 dB(A)

4.3 The frequency levels of sound power associated with each item are as follows:

Frequency	Hz	63	125	250	500	1000	2000	4000	8000
Inverters	dB	91	89	98	90	87	85	80	78
Transformers	dB	108	100	94	86	84	79	76	65
Battery Containers	dB	100	96	96	94	93	87	85	85

Table 4.1 – Source Sound Power Levels

4.4 The equipment would require the following levels of attenuation. This would be in the form of enclosure and/or attenuators, to be designed in conjunction with the manufacturers.

- Inverters – 35 dB
- Transformers – 35 dB
- Battery Containers – 38 dB

4.5 The equipment will be installed within an enclosed compound constructed as a boarded timber fence³ erected around the perimeter of the compound to a height of 4m (see Figure 2 – Proposed Layout).

4.6 The substation will require an attenuation of 13 dB(A) only, the means of which will be agreed with National Grid during detailed design of the scheme.

4.7 The distance from the compound to the nearest noise sensitive receptors (NSR), that of Rownall Stables and Rownall Hall Farm some 220m away. It is noted that there are commercial buildings within both areas, and the risk of disturbance here must also be considered.

4.8 INoise V2020 noise mapping software has then been used to provide predictions of noise emanating from the compound to the facade of both residential and commercial buildings.

³ The specification of the barrier would be 25mm thick timber boarded panels, butt-edged with a 25mm thick x 200mm wide sealing panel fixed behind each joint.

The software follows the methodology of BS EN ISO 9613: 2007 Acoustics - 'Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels'. Figure 4 provides an extract from the model for un-attenuated noise and Figure 5 is for attenuated noise.

4.9 The results of the predictions are as follows:

Receptor	Predicted Facade Noise Level (Attenuated) $L_{Aeq,T}$	
	Ground Floor	Upper Floor
R1 - Rownall Stables	22 dB(A)	23 dB(A)
R2 - Rownall Hall Farm	22 dB(A)	23 dB(A)

Table 4.2 – Predicted Noise Levels



5. PLANNING POLICY & CRITERIA OF ACCEPTABILITY

5.1 National Planning Policy Framework (July 2019)

- 5.1.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.
- 5.1.2 Planning law requires that applications for planning permission be determined in accordance with the development plan unless material considerations indicate otherwise. The National Planning Policy Framework must be taken into account in preparing the development plan and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.
- 5.1.3 The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.
- 5.1.4 Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):
- a) an economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.
 - b) a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
 - c) an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.
- 5.1.5 These objectives should be delivered through the preparation and implementation of plans and the application of the policies in this Framework; they are not criteria against which every decision can or should be judged. Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.

5.1.6 So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development.

5.1.7 Paragraph 180 of the NPPF states:

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 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 life⁴*
- 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.*

5.1.8 The Framework continues:

182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

183. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

⁴ Refers here to the NPSE, discussed in Section 4.2 of this report.

5.2 Noise Policy Statement for England (March 2010)

- 5.2.1 The document "Noise Policy Statement for England" sets out the following vision for on-going noise policy:

"Promote good health and quality of life through the effective management of noise within the context of Government policy on sustainable development."

This vision should be achieved through the following Noise Policy Aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

avoid significant adverse impacts on health and quality of life.

mitigate and minimise adverse impacts on health and quality of life.

and where possible, contribute to the improvement of health and quality of life".

- 5.2.2 To achieve these objectives the Noise Policy Statement sets out three noise levels to be defined by the assessor:

- **NOEL** - No Observed Effect Level

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 due to the noise.

- **LOAEL** - Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. Where levels lie between the LOAEL and SOAEL, the Statement requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, as set out in the NPPF.

- **SOAEL** - Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It notes, however, that "it is not possible to have a single objective noise-based measure that describes SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".

- 5.2.3 Paragraph 2.7 states that "... the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications".
- 5.2.4 This provides clear guidance that noise must not be considered in isolation but as part of the overall scheme, taking into account the overall sustainability and associated impacts of the proposed development; there is no benefit in reducing noise to an excessively low level if this creates or increases some other adverse impact. Similarly, it may be appropriate in some cases for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance to the development as a whole.
- 5.2.5 The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement requires that:

"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development... ... This does not mean that such adverse effects cannot occur."

- 5.2.6 Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change. An indication of the numerical definition of LOAEL may be derived from the following guidance.

5.3 DCLG Guidance Note, 2013 - 'Noise'

- 5.3.1 The Department of Communities and Local Government provided further guidance to support the NPPF. The section, Noise, published in August 2013 advises:

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Noise may override other planning concerns in certain circumstances, neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development.

Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur.*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

This would include identifying whether the overall effect of the noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the no observed effect level as it becomes noticeable. However, the noise has no adverse effect so long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.

5.3.2 The table below summarises the noise exposure hierarchy, based on the likely average response:

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Table 5.1 - Impact Assessment Criteria

5.3.3 The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. These factors include:

- *the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night.*
- *for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise.*

- *the spectral content of the noise (i.e., whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e., whether or not the noise contains particular tonal characteristics or other particular features). The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.*

5.3.4 The adverse effects of noise may be mitigated in one of the four broad approaches:

- *engineering:*
- *layout:*
- *using planning conditions/obligations to restrict activities; and*
- *mitigating the impact on areas likely to be affected by noise.*

5.3.5 The noise impact on residential developments may be partially offset if the residents of those dwellings have access to:

- *a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or.*
- *a relatively quiet external amenity space for their sole use, (e.g., a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or.*
- *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or.*
- *a relatively quiet, protected, external publicly accessible amenity space (e.g., a public park or a local green space designated because of its tranquillity) that is nearby (e.g., within a 5 minute walking distance).*

5.4 BS 4142:2014: Methods for Rating and Assessing Industrial and Commercial Sound.

5.4.1 Any formal assessment of commercial noise affecting residential properties would in all likelihood be based upon the recommendations of British Standard 4142:2014 "Methods for rating and assessing industrial and commercial sound".

5.4.2 In brief, this rating method determines "specific sound level" generated by the new plant, assessed immediately outside the residential properties most likely to be affected. For daytime (07.00 – 23.00) only operation of the new plant, this would be the equivalent continuous noise level of the new noise, evaluated over a 1-hour sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00) only the reference time interval is 15 minutes.

- 5.4.3 Corrections of up to + 9 dB (A) are then made to this “specific sound level” if the new noise has certain acoustic features such as tonality, impulsivity, intermittency and any other sound characteristics, to give the "rating level".
- 5.4.4 An assessment of the impact of the specific sound level can be determined by subtracting the measured background level from the rating level and consider the following.
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
 - d) 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.

*NOTE: Adverse impacts include, but are not limited to, annoyance and sleep disturbance.
Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.*

- 5.4.5 It is likely that the Local Authority would seek to avoid marginal situations at the planning stage and may try to ensure a positive likelihood that no complaints would be forthcoming. As such, they might recommend a noise target which limits the Rating Noise Level to a maximum which is as low as 5 - 10 dB(A) below the minimum background level currently experienced.
- 5.4.6 However, there are limitations to BS4142 if noise levels are very low, and in such circumstances, it may not be necessary to follow the normal guidance in order to achieve this aim. Indeed, within the Scope of the Standard, it is stated:

"The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low.

Note: for the purpose of this Standard, background noise levels below about 30 dB and rating noise level below about 35 dB are considered to be very low."

5.5 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

- 5.5.1 There is much guidance on the levels of intrusive noise which would be considered acceptable within residential accommodation such as this. Typical advice is found in British Standard 8233:2014 "Guidance on Sound Insulation and Noise Reduction for buildings". Following similar guidance in the 1999 World Health Organisation report "Guidelines for Community Noise", the Standard sets out the following limits for indoor ambient noise levels within living rooms and bedrooms. This suggests:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	40 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	35 dB(A) LAeq, 16 hr	30 dB(A) LAeq, 8 hr

Table 5.2 – BS8233 Residential Criteria, Internal

- 5.5.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)⁵. Therefore the 'good' internal standards quoted above would broadly equate to the following targets immediately outside the buildings:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	48 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	53 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	48 dB(A) LAeq, 16 hr	43 dB(A) LAeq, 8 hr

Table 5.3 – BS8233 Residential Criteria, Extrapolated External

- 5.5.3 BS8233 recognises that, 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 conditions will be achieved.
- 5.5.4 It should be noted that the levels quoted in BS8233 are intended to reflect the acceptability of steady, continuous noise. Sources of intermittent and tonal noise may generate greater annoyance for a similar overall magnitude. Whilst BS8233 does not explicitly state a correction for those circumstances, it may be appropriate to consider that the Good and Reasonable standards would be achieved with levels which are perhaps 5 dB lower than stated in the table above.
- 5.5.5 It is also noted that BS8233 was written from a view of designing new buildings to protect occupants from existing noise sources. This does necessarily infer, however, that the acceptability of an occupant to an absolute noise level within a building will be different if the introduction of the noise source post-dates the construction of the building. Other factors may be relevant in certain circumstances, and they are covered in large part by BS4142, discussed above.

⁵ Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

- 5.5.6 In respect of office buildings, BS8233 indicates that noise levels within private offices should not exceed 35 - 40 dB(A) L_{Aeq} . Adopting a typical loss of 13 dB(A) through an open window, this target equates to an equivalent level of 48 - 53 dB(A) L_{Aeq} externally.

5.6 World Health Organisation Guidelines

- 5.6.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise".
- 5.6.2 This indicates that the steady noise level in external amenity areas, such as gardens or outdoor living areas should not exceed 55 dB(A) $L_{Aeq, t}$, and should preferably be designed below 50 dB(A) $L_{Aeq, t}$.
- 5.6.3 The document also provides guidance on the impact of peak noise levels on sleeping conditions. This suggests that levels above 45 dB(A) L_{Amax} inside a bedroom would be disturbing to sleep. With windows open, this would equate to a level of approximately 58 dB(A) L_{Amax} externally.

5.7 Local Authority Guidance

- 5.7.1 Enquiries to the Staffordshire Moorlands District Council Environmental Health Department provided the following clarification on the levels of noise which would normally find favour within planning applications of this nature:

We would recommend a site-specific noise should be submitted in compliance with BS4142:2014 and in consideration of BS8233:2014. We would expect noise from the installation should not exceed background when measured in compliance with BS4142 at the nearest NSRs in each direction away from the site N, S, E, and W.

6. ASSESSMENT OF PREDICTED NOISE LEVELS

6.1 Residential Properties

- 6.1.1 Based on the attenuation recommendations stated in Paras 4.4, 4.5 & 4.6, the most onerous prediction of noise at the nearest residential receptor is 22 dB(A) on the ground floor (Living Room) and 23 dB(A) on the upper floor (Bedroom).
- 6.1.2 In absolute terms, it is confirmed that such levels are 26dB lower than the recommended standard indicated by BS8233 for daytime operation (ref. Para 5.5.2) and 20 dB lower than the equivalent night-time level. This is a strong indicator of negligible adverse impact.
- 6.1.3 In respect of the guidelines of BS4142, a formal assessment of the noise predicted noise would be as follows:

	Daytime Operation	Night-Time Operation
Predicted Facade Noise Level at nearest residential neighbours ⁶ , $L_{Aeq,t}$	22 dB(A)	23 dB(A)
Correction for Tonality ⁷	+2 dB	+2 dB
Rating Noise Level	24 dB(A)	25 dB(A)
Minimum Background Level, L_{A90}	32 dB(A)	25 dB(A)
RATING	-8 dB	0 dB

Table 6.1 – BS4142 Assessment for Nearest Residential Property (attenuated plant)

- 6.1.4 During the most sensitive, night-time operation it is confirmed that the assessment of noise under BS4142 would indicate ‘an indication of the specific sound source having a low impact, depending on the context’.
- 6.1.5 It should be noted that:
- (i) The predictions assume that all of the 365 noise sources are emitted the maximum level of noise simultaneously – a possibility, technically, but unlikely.
 - (ii) The absolute levels of predicted noise are so low that within the houses (allowing for open windows), the noise is likely to be of limited, if any audibility, and would be masked by any domestic activity of equipment.
- 6.1.5 Finally, it is confirmed that the predicted noise levels within amenity spaces linked to the NSR will fall well below the lower threshold values offered in the WHO guidance.

⁶ For daytime operation, a ground floor receiver is considered. For night-time operation, noise levels at 1st floor windows are assessed.

⁷ BS4142 Correction for tonality which is perceptible.

6.2 Commercial Properties

- 6.2.1 If there are commercial buildings linked to the NSRs, the predicted noise levels would be equivalent, 22 dB(A).
- 6.2.2 This level is significantly below the recommended guideline limits of 48 dB(A), as defined in BS8233 (para 5.5.6).
- 6.2.3 It would therefore be concluded that the operation of the new facility would have no adverse impact of any commercial neighbours.

7. UNCERTAINTY

- 7.1 The variability or uncertainty in each element of this noise assessment needs to be considered, the measurements themselves, the noise predictions and the assessment of likely impacts. Guidance and good practice are given within BS4142:2014 (Method of rating and assessing industrial and commercial sound) Annex B for reducing uncertainty.
- 7.2 The table below provides a discussion of the key points relating to uncertainty for this assessment:

Consideration	Comments
Complexity of the sound source and the residual acoustic environment	The noise sources emanate a relatively constant level of noise when operating, allowing for a secure assessment. As a predictive assessment, rather than an in-situ measurement, the source data provides a robust baseline for the calculation.
Measurements Location and Duration	Ambient background noise survey was conducted over a long period, including daytime and night-time.
Weather Conditions	In respect of the specific measurements, weather conditions were not less than perfect.
Instruments	All instruments used were Class 1 sound level meters, carrying valid third-party calibration. All instruments were calibrated before and after the surveys were undertaken.
Calculations	All calculations have been completed using an industry standard noise mapping software (INoise) which implements validated calculation methodologies. Open land has been modelled as soft, in line with a conservative approach in estimating ground absorption effects over distance.
Overall	It is considered that the assessment will be accurate to a level of +/- 3 dB



FIGURE 1 – SITE LOCATION

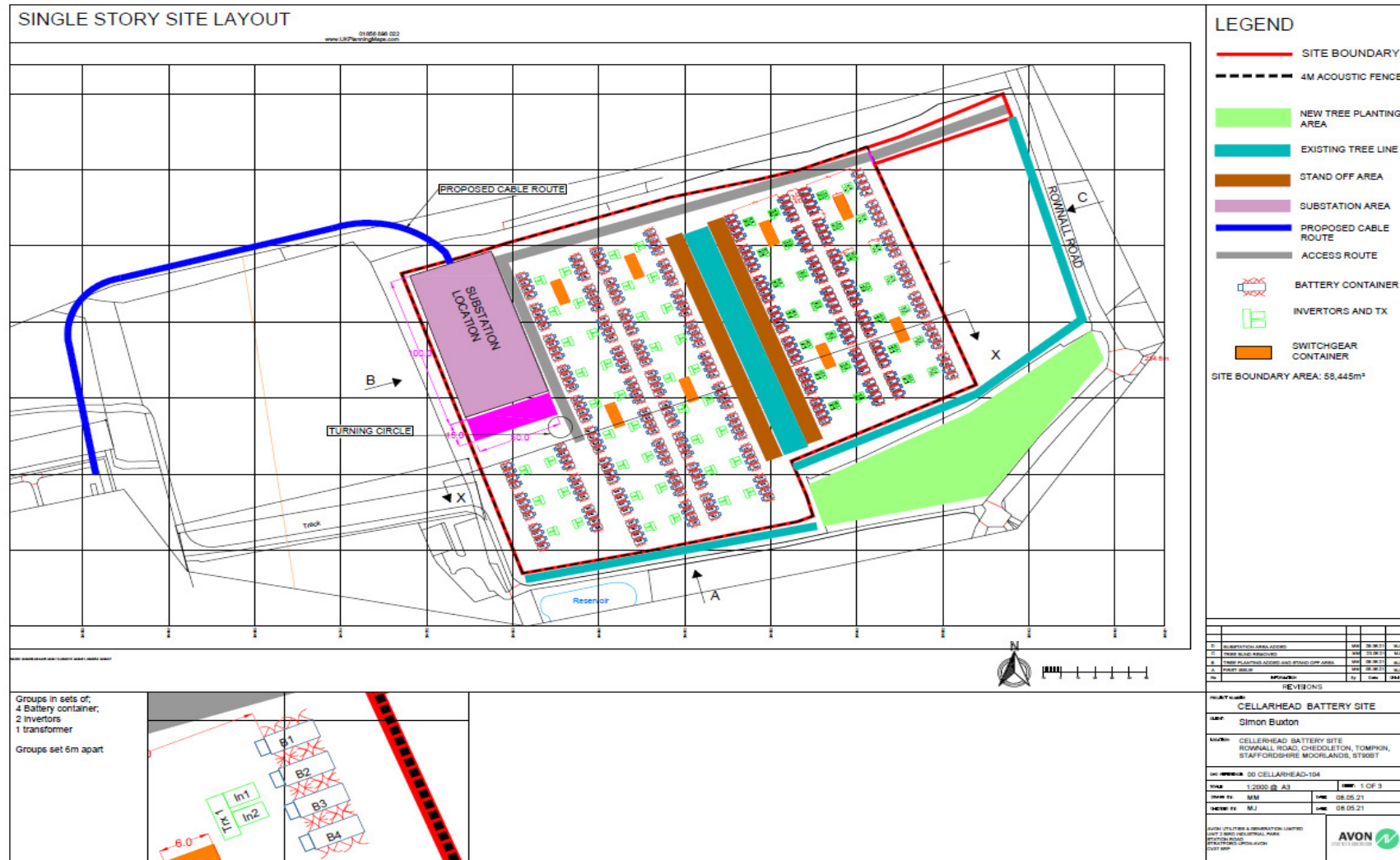


FIGURE 2 – PROPOSED SITE LAYOUT



FIGURE 3 – SOUND LEVEL METER LOCATION

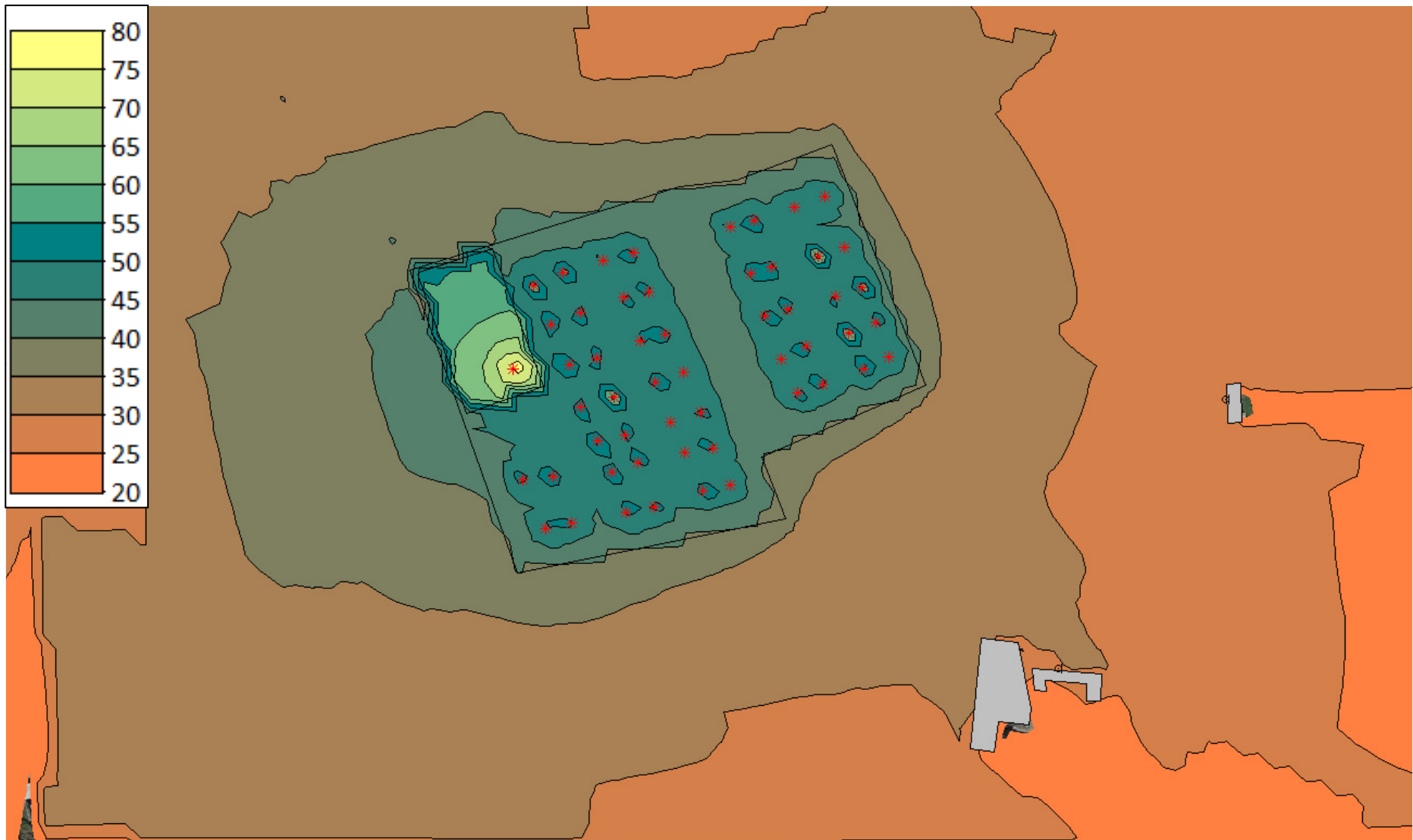


FIGURE 4 – UN-ATTENUATED NOISE MAP