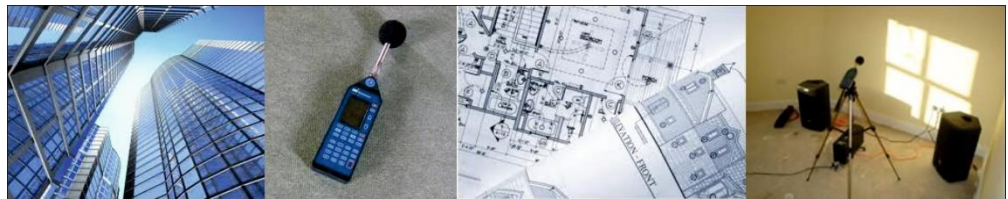


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**BATTERY ENERGY STORAGE SYSTEM
BUXTON AND WATERSWALLOWS 2
(HARDYBARN LANE)
WATERSWALLOWS ROAD / HARDYBARN LANE
BUXTON
SK17 7JB**

ACOUSTIC DESIGN SPECIFICATION
v.2

Client:
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29th April 2026
Ref: M5850

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Project Reference	M5850
Issue No.	v.2
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1. SUMMARY

- 1.1 An assessment of noise has been undertaken at Buxton and Waterswallows 2 (Hardybarn Lane), Waterswallows Road / Hardybarn Lane, Buxton, SK17 7JB to consider the potential impact of a proposed Battery Energy Storage System.
- 1.2 Ambient noise levels have been measured close to the nearest noise sensitive properties, and this exercise indicates that the background noise level, $L_{A90,5mins}$, typically falls to a level of 51 dB(A) during the daytime period of (07.00 – 23.00 hrs), and 41 dB(A) during the night-time period (23.00 – 07.00 hrs).
- 1.3 Calculations of noise radiating from the equipment (as described in Section 5) have predicted the most onerous night-time noise levels of 52 dB(A) at the property on the junction of Waterswallows Road and Longridge Lane.
- 1.4 In order to achieve a further reduction, it will be necessary to attenuate emissions from the proposed equipment, by the following degree (a matter which will be considered during detailed design development with the manufacturers):

Equipment	Required Attenuation dB(A)
Battery Containers	14
Inverter & MVS Skids	9

Table 1.1 – Equipment Attenuation Requirements

- 1.5 With these measures in place, the highest predicted noise level will be 38 dB(A), equating to a BS4142 Rating level of 41 dB(A). This allows a 3 dB correction to reflect the tonal character of the emitted noise
- 1.6 The Rating Level would be considered to be an indication that there would be a low impact on the residential neighbours.
- 1.7 Consideration of noise affecting adjacent commercial buildings concludes that residual levels from the Battery Energy Storage System would be comfortably below BS8233 guideline values.
- 1.8 It is therefore concluded that the proposed installation of the Battery Energy Storage System, with attenuated equipment 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 GJJ Associates, to assess the impact of noise emanating from a proposed Battery Energy Storage System on neighbouring properties.
- 2.2 The proposed location of the facility is located south of Waterswallows Road at the junction with Hardybarn Lane. Figure 1 shows the location of the site and Figure 2 details the proposed plant layout within the compound.
- 2.3 The facility will comprise the following noise sources (as shown in Figure 2):
- 48no ST5015kWh PowerTitan 2.0 BESS Containers,
 - 24no MVS3200 / MVS4480-LV Inverter & MVS Skids,
 - 1no Substation.
- 2.4 There are residential dwellings close to the proposed compound and the distances from the centre of the compound to the nearest noise sensitive receptors (NSR) are shown in Table 2.1.

Receptor	Distance from Nearest Noise Source (m)
R1 – Junction of Waterswallows Rd and Longridge Lane	320
R2 – Breezemount Farm	585
R3 – Lady Low View Farm	560
R4 – Daisymere Farm	960
R5 – Commercial	340

Table 2.1– Distances of NSRs to the nearest noise source (m).

- 2.5 Given the proximity 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. PLANNING POLICY & CRITERIA OF ACCEPTABILITY

3.1 National Planning Policy Framework (December 2024)

- 3.1.1 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.
- 3.1.2 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 considered 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.
- 3.1.3 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.
- 3.1.4 Paragraphs 187, 198 & 200 of the NPPF states:

187. *Planning policies and decisions should contribute to and enhance the natural and local environment by:*

- (a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan).*
- (b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland.*
- (c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate.*
- (d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures and incorporating features which support priority or threatened species such as swifts, bats and hedgehogs.*
- (e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
- (f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

198. 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.*

200. 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.

3.2 National Policy Statement for England (March 2010)

- 3.2.1 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."

- 3.2.2 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."*

- 3.2.3 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."

3.2.4 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 policy, development or other activity may not have been given adequate weight when assessing the noise implications."

3.2.5 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.

3.2.6 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 considering the guiding principles of sustainable development.... This does not mean that such adverse effects cannot occur."

3.2.7 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.

3.3 Planning Practice Guide 'Noise' (July 2019)

- 3.3.1 The Ministry of Housing Communities and Local Government provided further guidance to support the NPPF. The section, Noise, published in July 2019, provides the following advice:

When is noise relevant to planning?

Noise needs to be considered when development may create additional noise or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

What are the observed effect levels?

- *Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur.*
- *Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*
- *No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.*

Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.

How can it be established whether noise is likely to be a concern?

At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a 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 predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the 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 avoided.

3.3.2 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			
<i>Not Present</i>	<i>No Effect</i>	<i>No Observed Effect</i>	<i>No specific measures required</i>
<i>Present and not intrusive</i>	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.	<i>No Observed Adverse Effect</i>	<i>No specific measures required</i>
Lowest Observed Adverse Effect Level			
<i>Present and intrusive</i>	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.	<i>Observed Adverse Effect</i>	<i>Mitigate and reduce to a minimum</i>
Significant Observed Adverse Effect Level			
<i>Present and disruptive</i>	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	<i>Significant Observed Adverse Effect</i>	<i>Avoid</i>
<i>Present and very disruptive</i>	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.	<i>Unacceptable Adverse Effect</i>	<i>Prevent</i>

Table 3.1 – Noise Exposure Hierarchy

3.3.3 The guidance further advises:

What factors influence whether noise could be a concern?

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 a new noise making source, how the noise from it relates to the existing sound environment.
- 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), and
- the local arrangement of buildings, surfaces and green infrastructure, and the extent to which it reflects or absorbs noise.

More specific factors to consider when relevant include:

- the cumulative impacts of more than one source of noise.
- whether any adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations;
- In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.
- Noise Action Plans (where these exist), and, in particular the Important Areas identified through the process associated with the Environmental Noise Directive and corresponding regulations should be taken into account. Defra's website has information on Noise Action Plans and Important Areas. Local authority environmental health departments will also be able to provide information about Important Areas.
- the effect of noise on wildlife. Noise can adversely affect wildlife and ecosystems. Particular consideration needs to be given to the potential effects of noisy development on international, national and locally designated sites of importance for biodiversity.
- where external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

- some commercial developments including restaurants, hot food takeaways, night clubs and public houses can have particular impacts, not least because activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the noise that may be made by customers in the vicinity.

When proposed developments could include activities that would be covered by the licensing regime, local planning authorities will need to consider whether the potential for adverse noise impacts will be addressed through licensing controls (including licence conditions). Local planning authorities should not however presume that licence conditions will provide for noise management in all instances and should liaise with the licensing authority.

Are there further considerations relating to mitigating the impact of noise on residential developments?

Noise impacts may be partially offset if residents have access to one or more of:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling.
- 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 if this area is exposed to noise levels that result in significant adverse effects.
- 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 publically 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).

3.3.4 The noise impact on residential developments may be partially off-set 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 publically 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).*

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

- 3.4.1 Any formal assessment of commercial noise affecting residential properties would likely be based upon the recommendations of British Standard 4142:2014+A1:2019 "Methods for rating and assessing industrial and commercial sound".
- 3.4.2 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 – 23.00hrs) only operation of the new plant, this would be the equivalent continuous noise level of the new noise, evaluated over a 1hr sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00hrs) only the reference time interval is 15mins.
- 3.4.3 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".
- 3.4.4 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,
- Typically, the greater this difference, the greater the magnitude of the impact.
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - A difference of around +5 dB 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.

*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.*

- 3.4.5 The following information regarding "assessment context" is derived from the BS 4142:2014+A1:2019 Technical Note as written by the Association of Noise Consultants Good Practice Working Group. Context includes:
- Aspects of the absolute level,
 - Aspects of character, and,
 - Aspects of the receptor, including physical measures designed to reduce noise.

3.4.6 With regards to aspects of the absolute level, the following is stated:

The standard states that the absolute level of sound can be of significance, where the residual values are low and where they are high, and should be taken into account when determining the overall impact of a particular specific sound source.

The second paragraph notes that absolute levels may be as, or more, important than relative outcomes where background and rating levels are low. It is important to note that both background and rating levels would need to be low for this particular caveat to apply.

BS 4142 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low, only that the absolute levels may be more important than the difference between the two values. It is likely that where the background and rating levels are low, the absolute levels might suggest a more acceptable outcome than would otherwise be suggested by the difference between the values. For example, a situation might be considered acceptable where a rating level of 30dB is 10dB above a background sound level of 20dB, i.e. an initial estimate of a significant adverse impact is modified by the low rating and background sound levels.

There may be situations where the opposite is true, and it is for the assessor to justify any modifications to the initial estimate of impact.

BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB LA90, and low rating levels as being less than about 35 dB LAr,Tr.

The WG suggests that similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate.

The third paragraph states that "where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts". In the ordinary application of BS 4142 the residual sound level is not compared with the background sound level to determine the level of impact. The third paragraph is therefore taken to mean that the level of impact caused by the residual level has been determined by professional judgement or with reference to another document, such as the Noise Insulation Regulations 1975 (as amended 1988).

Where professional judgement is used, it should be appropriately justified. Where the residual sound levels are very high, a significant adverse impact might be declared in a situation where the rating level exceeds the background sound level by, say, 4dB, i.e. since the residual sound levels are already considered to cause a significant impact, any worsening of the situation would be considered a significant adverse impact, even if the difference between the rating level and background sound level would not suggest this to be the case.

3.4.7 With regards to aspects of character, the following is stated:

The second aspect of context described in BS 4142 relates to the character and level of the specific sound. In essence, whether or not the character of the sound is distinguishable from the character of the ambient or residual acoustic environment, or is incongruous.

BS 4142 does not provide instruction as to how to treat the assessment outcomes in these circumstances, nor does it explain how to distinguish between this contextual consideration and the process for applying rating penalties. The latter is itself informed by the distinctive characteristics of the specific sound in the context of the residual sound environment.

It is the WG's view that where character-based contextual matters are taken into account, the assessor should make it clear how these matters are distinct from those that informed the rating level corrections, and what the implications of these further character assessments should be.

3.4.8 Finally, with regards to aspects of the receptor, the following is stated:

The third contextual matter described in Clause 11 relates to the receptor itself. It is important to note that the reference at the start of this section of BS 4142 to 'the sensitivity of the receptor' refers to a generic receptor type, i.e. a dwelling, and not to the particular attitudes or responses of a particular person (although if the residential receptor type is specific it may have a bearing e.g. student accommodation). The WG notes that this part of BS 4142 allows the internal noise environment to be considered, despite BS 4142 excluding such matters from its Scope (Subclauses 1.1, 1.2 and 1.3).

The WG considers that the consideration of the internal noise environment is only valid in a BS 4142 assessment where it relates to the contextual elements of the assessment. It is not necessarily required to refer to other standards or guidance to inform this issue.

However, where other standards or guidelines are referenced, e.g. BS8233: 2014 or WHO Guidelines, the assessor should make clear any limitations of those documents and the extent to which they can be relied upon.

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

- 3.5.1 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 3.2 – BS8233 Residential Criteria, Internal

- 3.5.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)¹. 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 3.3 – BS8233 Residential Criteria, Extrapolated External

- 3.5.3 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.
- 3.5.4 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.
- 3.5.5 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.

¹ Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

- 3.5.6 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.

3.6 World Health Organisation Guidelines

- 3.6.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise".
- 3.6.2 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) $L_{Aeq, t}$.
- 3.6.3 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.

4. SURVEY OF AMBIENT NOISE LEVELS

- 4.1 To assess the ambient background noise levels, a noise survey was undertaken at a representative location of the nearest residential properties.
- 4.2 The noise survey was undertaken as close to the nearest residential properties as possible. In this case, this were deemed to be the property some 270m northeast of the proposed compound on the corner of Waterswallows Road and Longridge Lane.
- 4.3 A Rion NL-52 sound level meter was set up near to the junction of Waterswallows Road and Hardybarn Lane in line with the NSR.
- 4.4 The equipment was calibrated before and after the measurements were taken and showed no significant variation.
- 4.5 The survey ran from Thursday 22nd to Friday 23rd February 2024.
- 4.5 The weather conditions during the survey were as follows:

Date	Ave Temp °C	Rainfall mm	Ave Wind Speed m/s	Prevailing Wind Direction
Thursday 21/03	9	0.0	3.4 – 5.4	S
Friday 22/03	10	0.6	3.4 – 5.4	W

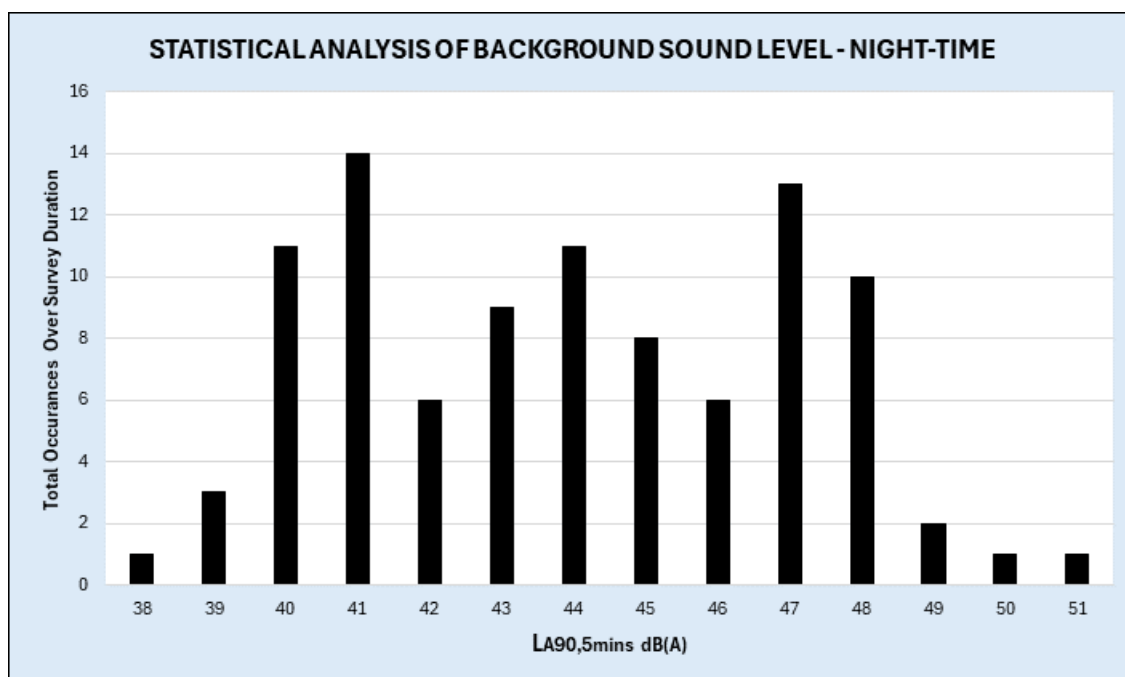
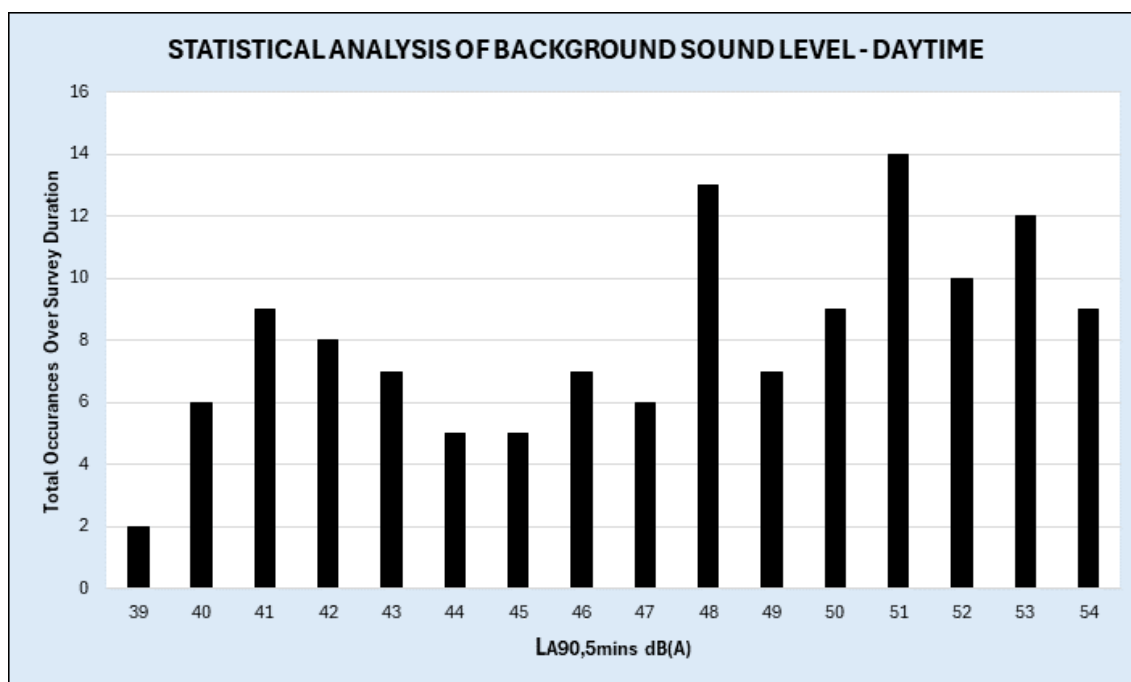
Table 4.1 – Summary of Weather Conditions.

- 4.6 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.
- 4.7 The variation of measured noise levels is shown graphically in Figure 3.
- 4.8 Table 4.2 provides a statistical analysis of the measured background noise levels at each location across each day of the survey, offering values for the mean, modal, median and 90th percentile.

Day	Period	Mean	Modal	Median	90 th Percentile
Thursday 21/03 to Friday 22/03	Day*	48	51	48	41
	Night	44	41	44	40

**Part measurements*

Table 4.2 – Summary of Background Noise Levels



- 4.9 With due consideration for the aim of obtaining the representative background noise, this project will adopt the following background noise levels:

Daytime 07.00 – 23.00	51 dB(A) L_{A90}
Night-time 23.00 – 07.00	41 dB(A) L_{A90}

- 4.10 Table 4.3 confirms the measured levels during each of the standard daytime and night-time periods.

Period		Day Time L _{Aeq} , 07.00 – 23.00	Night-Time L _{Aeq} , 23.00 – 07.00
Thursday 21/03	dB(A)	58.9*	56.9
Friday 22/03	dB(A)	60.5*	

**Part measurements*

Table 4.3 - Summary of Measured Noise Levels

- 4.11 The absolute levels of ambient noise may also be used as an alternative means of assessment. From the results shown in Table 4.3, this assessment will consider these to be as follows:

Receptors	Day Time L _{Aeq} , 07.00 – 23.00	Night-Time L _{Aeq} , 23.00 – 07.00
All	59 dB(A)	57 dB(A)

Table 4.4 – Assessed Levels of Ambient Noise

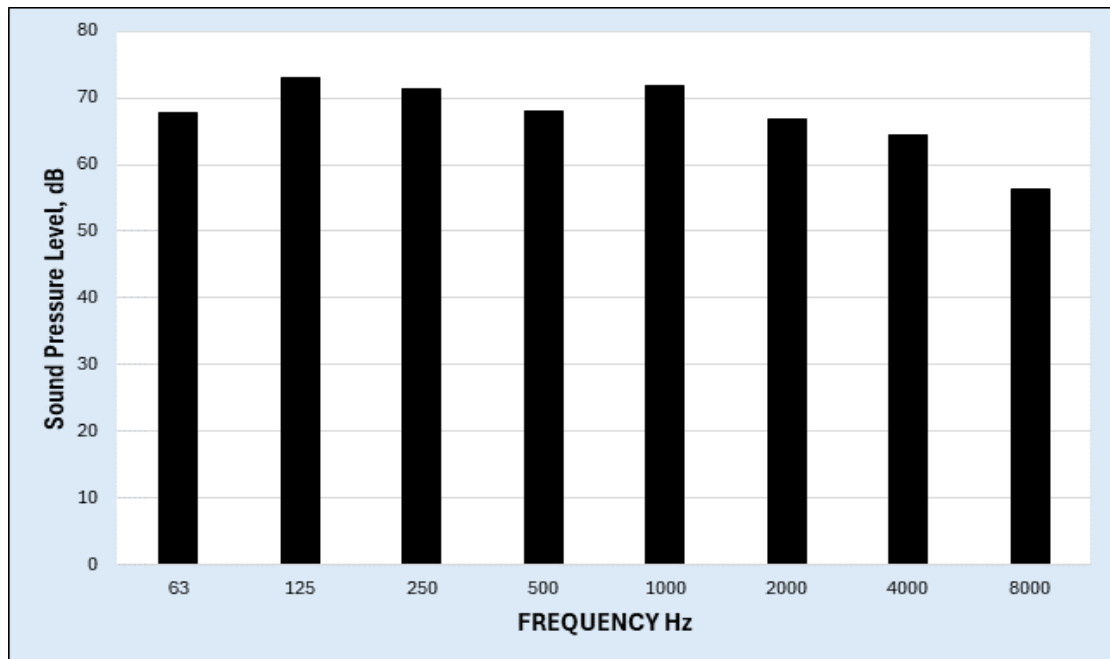
- 4.12 Section 6 of this report will discuss these noise levels, in respect of appropriate targets for limiting new noise emissions.

5. NOISE PREDICTIONS

- 5.1 The objective of this assessment is to demonstrate that the noise will have a low impact on the amenity of adjacent occupiers.
- 5.2 As indicated in BS 4142:2014+A1:2019, the specific sound levels may be predicted using appropriate noise propagation modelling software.
- 5.3 Ian Sharland Limited has taken the source data acquired and developed a computer model of the site using the DGMR iNoise 2026 rev1 software.
- 5.4 For determining receptor noise levels, this simulation software calculates sound wave propagation in accordance with ISO 9613-2:2024. This standard considers the following aspects when determining noise levels from distant sources:
- The octave/third-octave banded sound power level (LW) of each equipment utilised as part of the Proposed Development,
 - The directivity of each noise source in relation to the receptor under assessment,
 - The attenuation due to geometrical divergence (related to distance between source and receiver),
 - The attenuation due to atmospheric absorption,
 - The attenuation due to the ground effect,
 - The attenuation incurred by barriers, including buildings, walls, berms, and acoustic barriers,
 - Miscellaneous attenuation effects such as those caused by foliage.
- 5.5 The proposal for the Battery Energy Storage System involves the installation of the three main noise sources – Battery Containers, Inverter & MVS Skid Containers and Substation.
- 5.6 It should be noted that the modelling has been based on indicative equipment and the acoustic data supplied for that specific equipment.

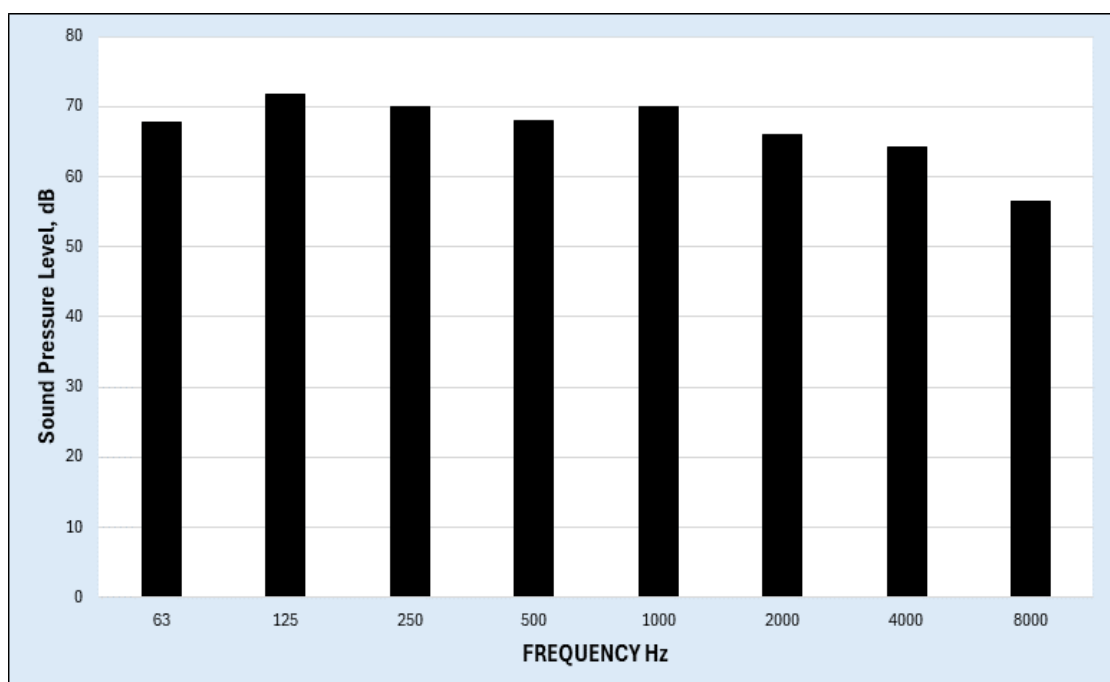
BATTERY CONTAINER

- 5.7 The modelling has been based using the data for the ST5015kWh PowerTitan 2.0 BESS containers, (see Figure 4 – BESS Container)
- 5.8 Within iNoise the battery containers have been modelled as a building with emitting facades and roofs.
- 5.9 The figure below shows the representative octave frequency profile of the ST5015kWh PowerTitan 2.0 BESS containers with a Sound Pressure Level of 75 dB(A) at 1m.



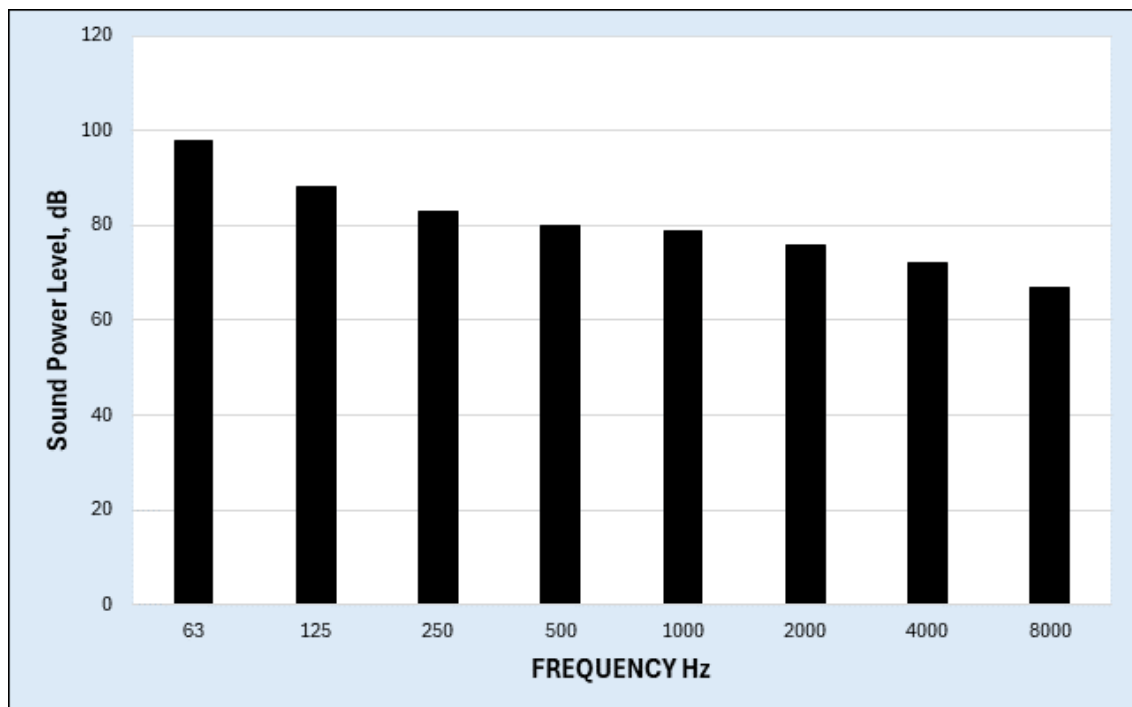
INVERTER & MVS SKIDS

- 5.10 Modelling has been based using the measured data for the MVS3200 / MVS4480-LV Inverter & MVS Skids. (see Figure 5 – Inverter & MVS Skids)
- 5.11 Within iNoise the TX & Inverter containers have been modelled as a building with emitting facades and roofs.
- 5.12 The following figure shows the representative octave frequency profile of the MVS3200 / MVS4480-LV Inverter & MVS Skids with a Sound Pressure Level of 74 dB(A) at 1m.



SUBSTATION

- 5.13 There is little information regarding the substation and modelling has been based on a 132KV Transformer.
- 5.14 Within iNoise the Substation has been modelled as a building with emitting facades and roofs.
- 5.18 The following figure shows the representative octave band frequency profile of the Substation with an overall sound power level of 84 dB(A).



6. NOISE IMPACT ASSESSMENT

- 6.1 For reference, each point receptor (calculation point) has been located 3.5m away from its assigned building. Both a ground floor and 1st floor have been considered for all receptors.
- 6.2 BS4142:2014+A1:2019 provides additional information regarding the location of measurement positions.
- 6.3 BS 4142:2014+A1:2019 states the following:

Where practical, minimize the influence of reflections by making the measurements at least 3.5 m from any reflecting surface other than the ground, and;

When measurements for distant sources are made at 1 m from a façade, then the measured level can be adjusted to an equivalent free-field level by subtracting a 3 dB correction factor. For sources that are relatively close or not perpendicular to the façade the correction may be 1 dB or 2 dB, in which case the reasons for not using a correction of 3 dB should be explained.

- 6.4 The Association of Noise Consultants Good Practice Working Group Technical Note also elaborates on this:

Free-field equivalent levels are preferred at the assessment location but 'façade' position measurements may be necessary in some circumstances and the note provides advice for adjusting these values. In some circumstances, different adjustments might be appropriate for different sound sources and or measurement locations.

Care must be taken so that comparisons are made between equivalent sound levels, such as between free-field values. Some situations where this might apply include:

- *Where a proxy background sound measurement is in free-field conditions and the rating level is derived from a specific sound measured at a façade location; or,*
- *Where a background sound level is measured as a façade value but the specific sound level is derived from free-field measurements or manufacturer's data.*

In which case one of the values should be adjusted so they are equivalent.

- 6.5 Since it is necessary to compare like-for-like (as noted above), and since the background sound level measurement has been taken in free-field conditions, the specific sound levels shall also be calculated at free-field locations.

- 6.6 The distances from the centre of the compound to the nearest noise sensitive receptors (NSR) are shown in Table 6.1.

Receptor	Distance from Nearest Noise Source (m)
R1 – Junction of Waterswallows Rd and Longridge Lane	320
R2 – Breezemount Farm	585
R3 – Lady Low View Farm	560
R4 – Daisymere Farm	960
R5 – Commercial	340

Table 6.1– Distances of NSRs to the nearest noise source (m).

- 6.7 The nearest non-residential buildings that potentially have offices are approximately 300m away to the west along Waterswallows road.
- 6.8 Table 6.2 confirms the predicted un-attenuated noise levels of the standard equipment at nearest residential and commercial properties to the proposed compound.

Receptor	Predicted Façade Noise Level (Attenuated) $L_{Aeq,t}$ dB(A)	
	Ground Floor	1 st Floor
R1 – Junction of Waterswallows Rd and Longridge Lane	50	49
R2 – Breezemount Farm	43	43
R3 – Lady Low View Farm	41	41
R4 – Daisymere Farm	34	37
R5 – Commercial	48	47

Table 6.2 – Predicted Noise Levels dB(A).

- 6.9 The impact of these noise levels could be assessed in one of three common methods:
- (i) BS4142 (see Para 3.4) which compares the predicted noise level (PNL), including any corrections for character, against the assessed background noise levels,
 - (ii) The existing ambient noise levels, which takes a wider view of the noise climate experienced by the neighbouring occupiers, rather than the BS4142 method, which is limited to the quietest periods only,
 - (iii) BS8233 (see Para 3.5) which provides a fixed criteria of acceptability based on steady anonymous noise sources).

- 6.10 In most circumstances, BS4142 would be the default assessment method. However, the standard notes that ‘where background sound levels are low, the absolute levels might be as, or more relevant than the margin by which the rating level exceed backgrounds. This especially true at night.’ The current version of BS4142 does not give a numerical value for a low background sound level, but the preceding 1997 edition did confirm that a value of 30 dB(A) L_{A90} may be considered low.
- 6.11 In this location, night time background sound levels were found to drop to 41 dB(A), and it is therefore considered that these are not low background noise levels.
- 6.12 On that basis, if the Rating level of the new noise was limited to 41 dB(A), that would be a strong indication of a low impact.
- 6.13 The highest predicted noise level from Table 6.2 is 49 dB(A) at first floor (bedroom) windows. The noise signature from the equipment does not indicate any tonal component, however it is possible that there will be some content at low frequency, which is likely to make the emitted noise clearly distinguishable from the existing ambient soundscape. On that basis, a BS4142 character correction of +4dB is appropriate.
- 6.14 The highest Rating level is therefore 53 dB(A), some 12 dB above an ideal target for night time operation, and 2 dB above the assessed background noise level during the day.
- 6.15 In order to mitigate this excess, consideration has been given to the perimeter screening. It is often the case that the main compound and the substation compound would have a perimeter acoustic fence installed, and this is shown on the proposed site layout drawing (see Figure 2)
- 6.16 The development has been remodelled with a 4m high acoustic fence around the main compound. Table 6.5 confirms the results, and confirms there would be no reduction at the critical receptor (R1) but there would be between 1 – 4dB reduction at the others.

Receptor	Predicted Façade Noise Level (Attenuated) LAeq,t dB(A)	
	Ground Floor	1 st Floor
R1 – Junction of Waterswallows Rd and Longridge Lane	49	49
R2 – Breezemount Farm	41	41
R3 – Lady Low View Farm	40	41
R4 – Daisymere Farm	30	36
R5 – Commercial	44	44

Table 6.5 – Predicted Noise Levels dB(A) with acoustic fences.

- 6.17 Table 6.6 shows the level of additional attenuation required for each piece of equipment to meet each of the assessment criteria during the night-time period as this is the most onerous and the daytime criteria will automatically be met. Figures 6 & 7 shows the daytime and night-time noise maps respectively.

Equipment	Contribution from Proposed Equipment (with Perimeter Fencing in place)	Required Attenuation to achieve 37 dB(A) cumulative ²
Containers	47	14
Twin Skids	42	9
Substation	28	0

Table 6.6 – Additional attenuation requirements to meet respective criteria (dB)

- 6.18 With these attenuations achieved, the Rating level at the worst affected property would be 41 dB(A) at first floor rooms.
- 6.19 This would be judged to have a low impact on the residential neighbours.
- 6.20 As previously stated there are probably some commercial buildings adjacent to the proposed site.
- 6.21 After attenuation is applied, the most onerous predicted daytime noise level would be 30 dB(A), and this level is well below the recommended guideline limits of BS8233 (para 5.5.6). There would therefore be no adverse impacts on commercial activities locally.

² And therefore a 41 dB(A) Rating Level

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 an extensive period, including daytime and night-time. Previous data has also been assessed and, as such, this should reflect all situations experienced by the residents.
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 hard, 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

Table 7.1 – Uncertainty Assessment

FIGURE 1 – SITE LOCATION

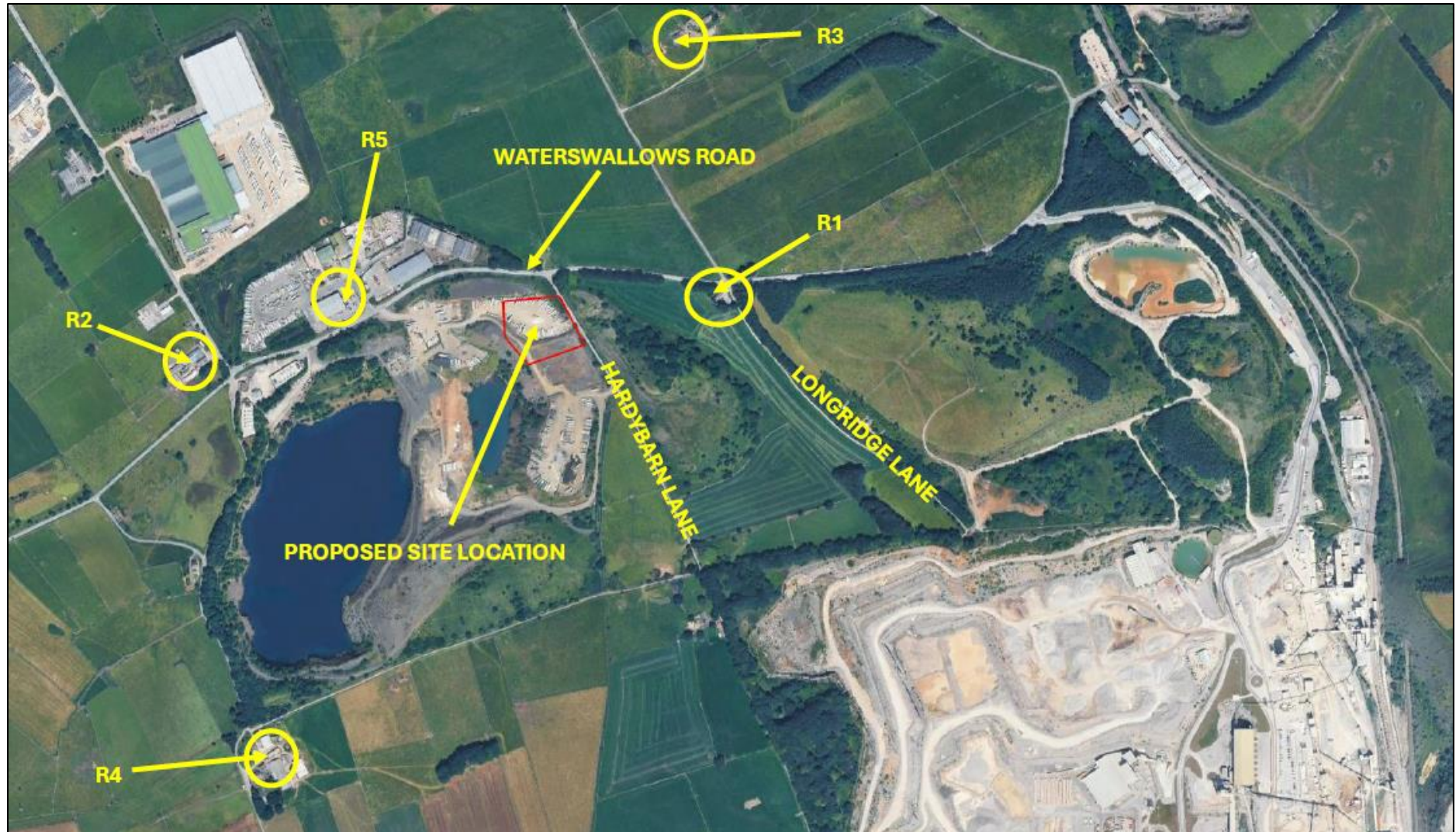


FIGURE 2 – PROPOSED COMPOUND LAYOUT

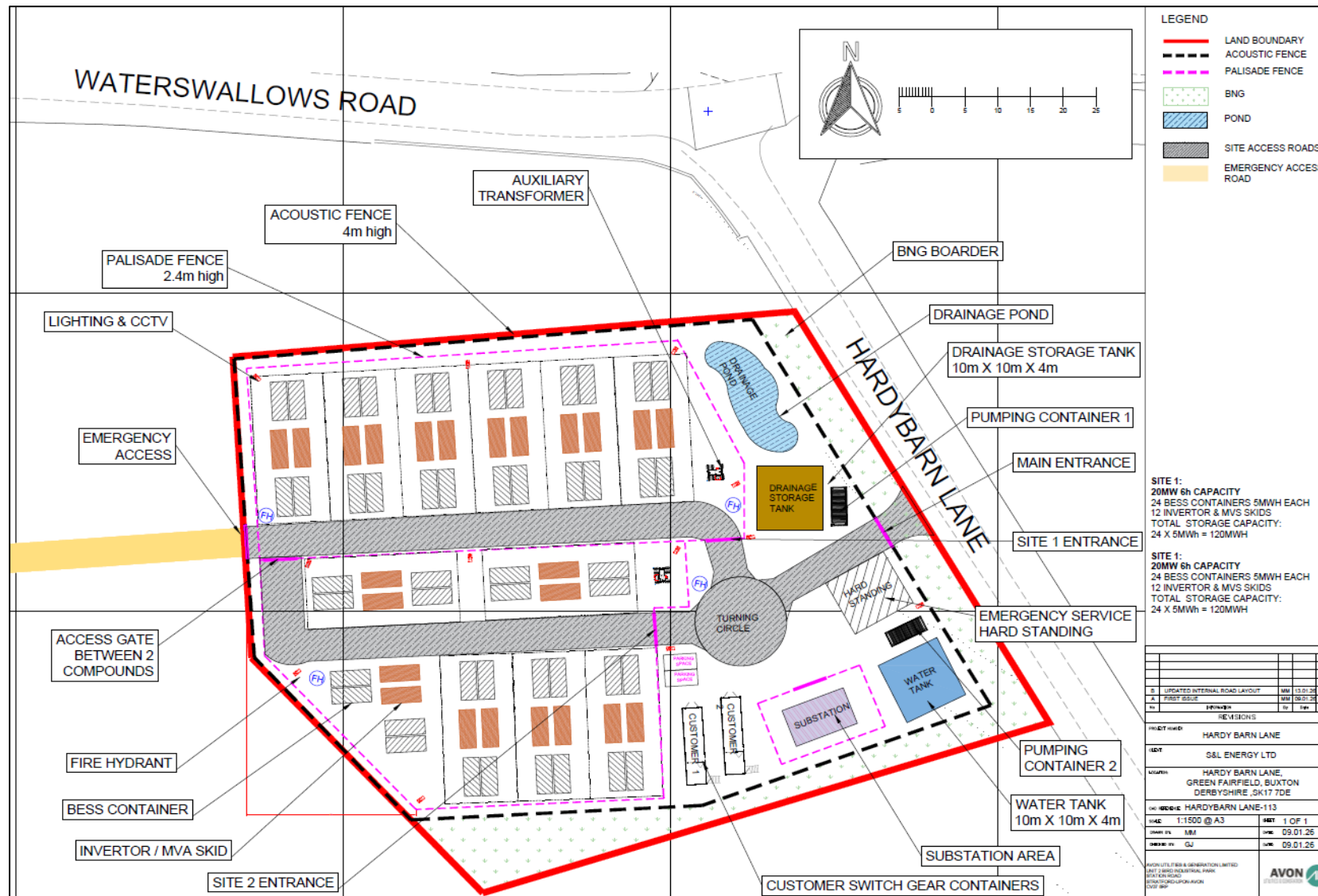


FIGURE 3 – VARIATION OF AMBIENT NOISE LEVELS

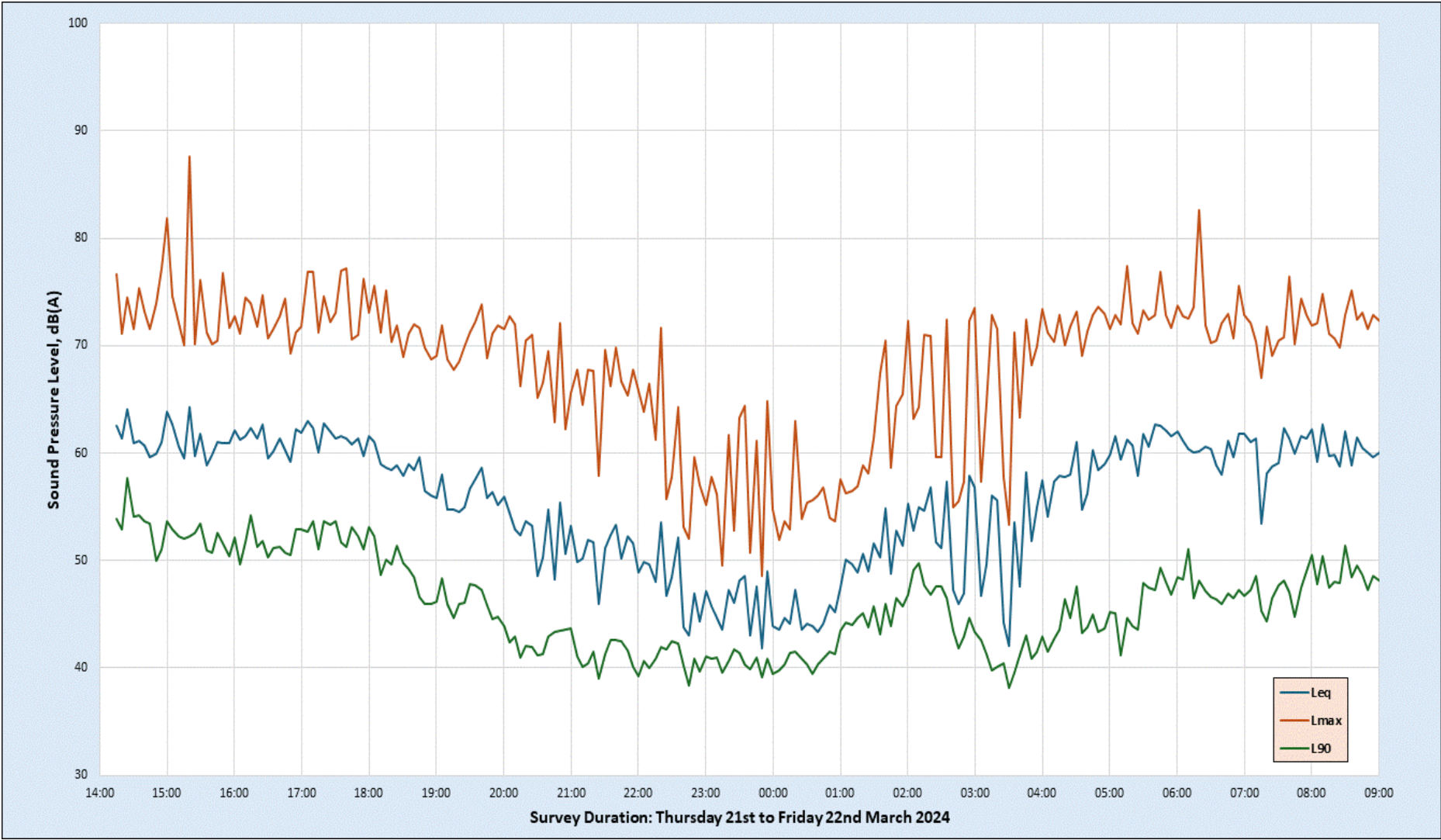


FIGURE 4 – BESS CONTAINER

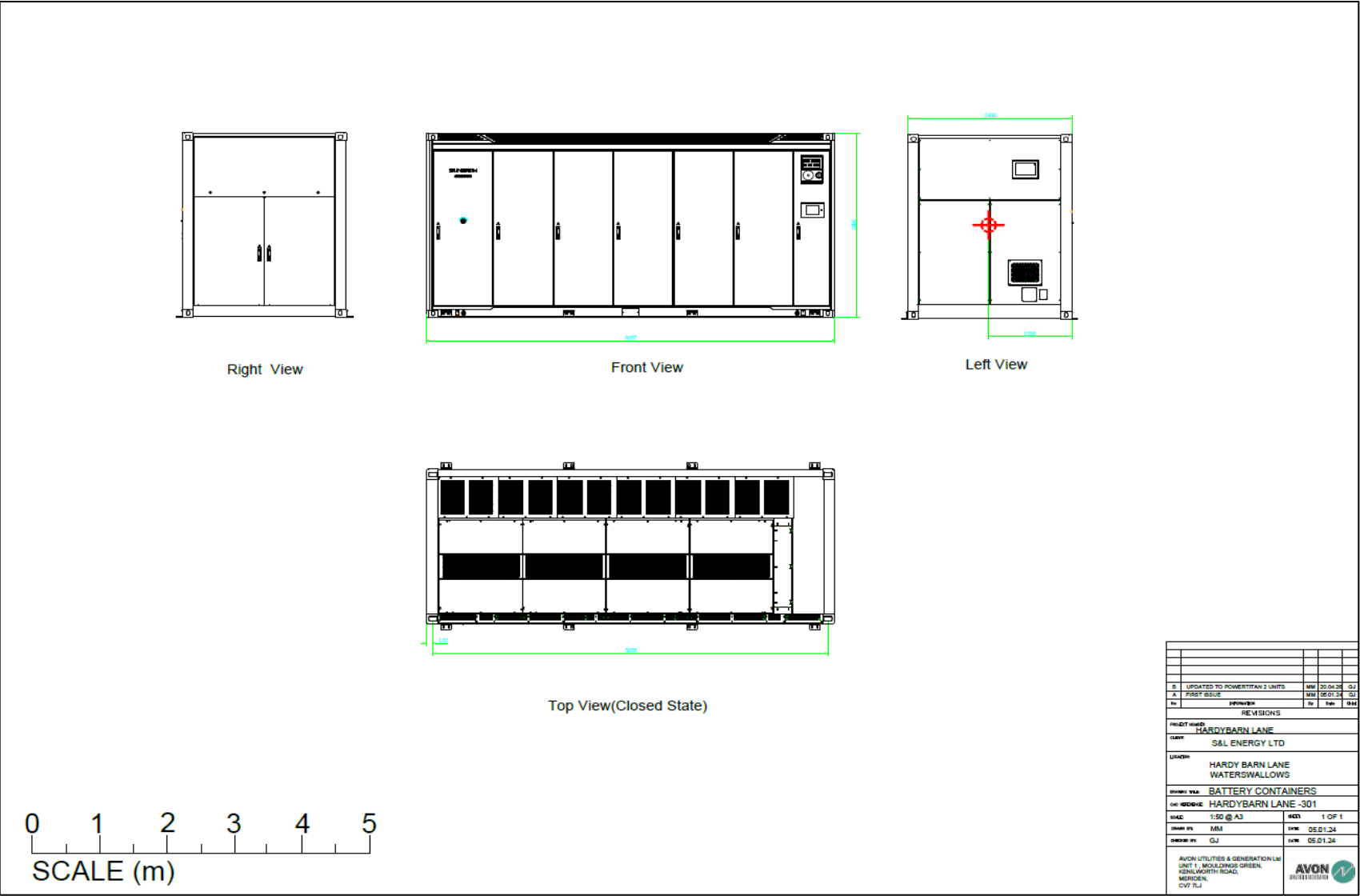


FIGURE 5 – INVERTER & MVS SKID CONTAINER

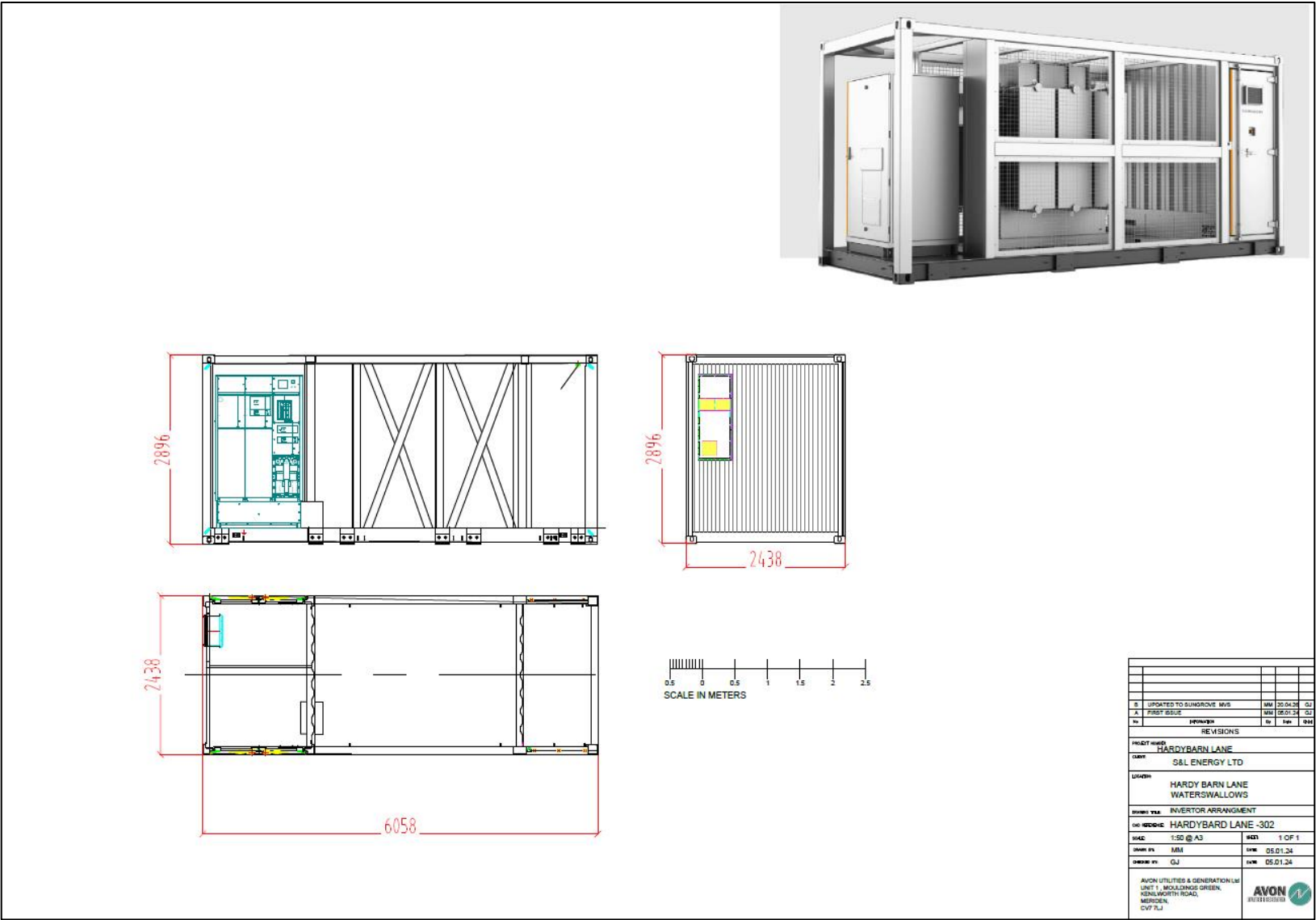


FIGURE 6 – ATTENUATED DAYTIME NOISE MAP

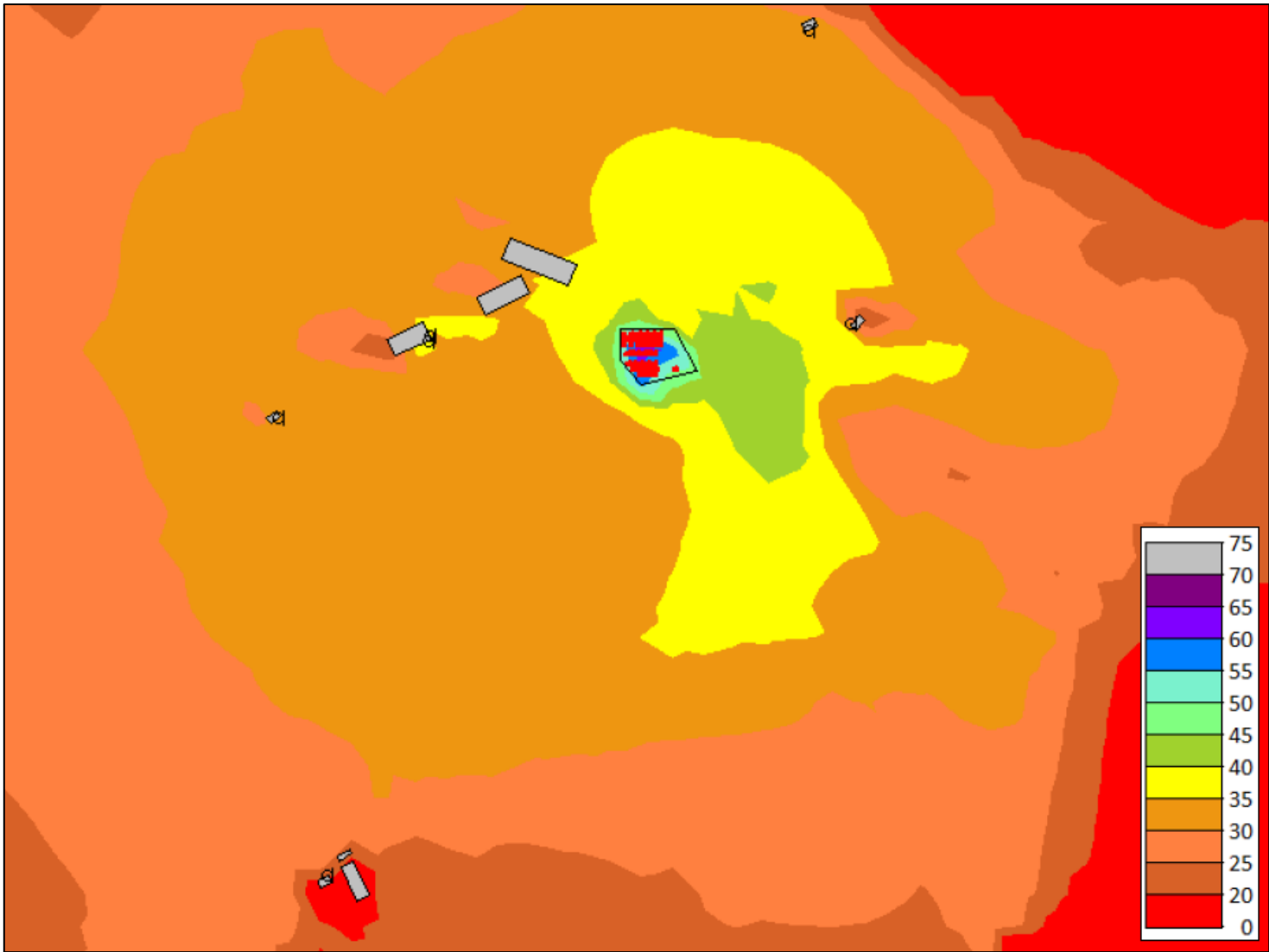


FIGURE 7 – ATTENUATED NIGHT-TIME NOISE MAP

