



Misslebrook Battery Energy Storage Site

Noise Impact Assessment

Client:	Boom Developments Ltd via Lighthouse Development Consulting
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1. Introduction

1.1 Background

Boom Developments Ltd ('the Applicant') is seeking planning permission to develop a Battery Energy Storage Site (BESS) and 33kV DNO substation at Misslebrook, North Baddesley, Hampshire, SO52 9LY. ITP Energised has been appointed by the Applicant to undertake an assessment of potential noise impacts associated with operation of the BESS. Drawings showing the red line boundary and proposed layout are included at the end of this report.

The facility will comprise batteries and associated electrical infrastructure, including inverters and transformers, in an open-air layout. The batteries will store electrical energy at times of high supply/low demand and release energy at times of low supply/high demand.

The immediate surrounding area comprises a mixture of agricultural land and residential properties. The nearest residential dwelling is approximately 200 m to the north of the proposed BESS.

1.2 Scope of Assessment

The scope of this assessment has comprised the following:

- Characterisation of the baseline noise environment by noise survey;
- Modelling prediction of operational noise using proprietary software CadnaA; and
- Evaluation of predicted noise levels in accordance with British Standard BS4142:2014+A1 2019 *Methods for rating and assessing industrial and commercial noise* and other relevant guidance.

Additional traffic flows associated with the construction phase of the facility will be minimal and of short duration and will occur during weekday daytimes only. Construction noise can be minimised through adoption of best practice methods and appropriate techniques. Noise associated with construction of the facility has therefore been scoped out of the noise assessment.

1.3 Study Area and Noise Sensitive Receptors

Maps, aerial imagery and a site visit informed the selection of an appropriate study area for the assessment. The closest noise sensitive receptors (NSRs) in each direction were identified, and a study area adopted which included these NSRs.

Noise levels due to the proposed BESS at more distant NSRs will be lower than at the closest NSRs, therefore compliance with criteria at the closest NSRs will entail compliance at those more distant. The identified representative NSRs are provided in **Table 1** and shown in **Drawing 1**.

Table 1 – NSRs considered in this assessment

NSR ID	NSR Name	Rationale for selection
NSR1	Castle Lane	Closest dwelling to the north
NSR2	Misslebrook Lane	Closest dwelling to the east
NSR3	Botley Road	Closest dwelling to the south

We note that there are no residential dwellings within the study area to the west of the proposed BESS.



2. Relevant Guidance and Advice

2.1 National Planning Policy Framework (NPPF)¹

The NPPF (Department for Communities and Local Government, 2021) provides planning guidance for local planning authorities in England. The NPPF states that planning policies and decisions should aim to:

- *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;*
- *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;*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;*
- *Avoid noise from giving rise to significant adverse noise impacts on health and quality of life as a result of new development; and*
- *Mitigate and reduce to a minimum adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.*

Regarding the avoidance of significant adverse effects on quality of life, the NPPF references the Noise Policy Statement for England (2010).

2.2 Noise Policy Statement for England (NPSE)²

The NPPF noise aims widely reflect those in NPSE. The NPSE does however include some context within the explanatory note to assessing noise impact and uses established concepts from toxicology currently being applied to noise impacts, these include:

- **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.
- **SOAEL – Significant Observed Adverse Effect Level.** This is the level above which significant adverse effects on health and quality of life occur.
- **LOAEL – Lowest Observed Adverse Effect Level.** This is the level above which adverse effects on health and quality of life can be detected.

It is not possible to have a single objective noise-based measure that defines 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.

The NPSE provides the following guidance regarding the SOAEL:

“It is not possible to have a single objective noise-based measure that defines 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.”

¹ National Planning Policy Framework (2021): <https://www.gov.uk/guidance/national-planning-policy-framework>

² Noise Policy Statement for England (2010): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf



And:

“Increasing noise exposure will at some point cause the SOAEL 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.”

2.3 BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound³

BS4142:2014 describes methods for rating and assessing sound from industrial or commercial premises. The methods detailed in the standard use outdoor sound⁴ levels to assess the likely effects on people inside or outside a residential dwelling upon which sound is incident.

The standard provides methods for determining the following:

- Rating levels for sources of industrial and commercial sound;
- Ambient, background and residual sound levels; and
- The audibility of tones in sound: 1/3 octave method.

These may be used for assessing sound from proposed, new, modified or additional sources of sound of a commercial or industrial nature or to assess the suitability of introducing a receptor near an existing commercial or industrial site.

The standard makes use of the following terms:

- **Ambient sound level, $L_a = L_{Aeq,T}$** – the equivalent continuous sound pressure level of the totally encompassing sound in a given situation at a given time, usually from multiple sources, at the assessment location over a given time interval, T.
- **Background sound level, $L_{A90,T}$** – the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90 percent of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
- **Specific sound level, $L_s = L_{Aeq,Tr}$** – the equivalent continuous sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.
- **Rating level, $L_{Ar,Tr}$** – the specific sound level plus any adjustment for the characteristic features of the sound.
- **Residual sound level, $L_r = L_{Aeq,T}$** – the equivalent continuous sound pressure level at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound, over a given reference time interval, T.

The standard determines the degree of noise impact by comparison of the background noise level at noise sensitive receptors (NSRs) in the absence of the industrial or commercial facility (the specific source) with the ambient sound level when the specific source is operational.

³ BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound (2019)

⁴ The standard refers to sound levels, rather than noise levels, however, these terms can be used interchangeably, as noise is defined as “unwanted sound”. This assessment uses the term “noise”.



Where particular characteristics such as tones, intermittency or impulsivity are present in the noise emissions of the specific source and perceptible at the receptor, the standard requires that “penalties” be added to the specific sound level to account for the increased annoyance that these can cause.

The following evaluation impact significance identifiers are provided in the standard, in which the difference between the specific sound level and measured background level are considered:

- The greater the difference, the greater the magnitude of impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact;
- A difference of around + 5 dB is likely to be an indication of a low adverse impact;
- The lower the rating level, relative to the measured background level, the less likely that the specific sound source will have an adverse (or significant adverse) impact; and
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

The standard also makes the followings comments:

1. *“Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.*

The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2. *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.*
3. *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
 - i) *facade insulation treatment;*
 - ii) *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
 - iii) *acoustic screening.”*



2.4 ISO 9613; Attenuation of sound during propagation outdoors, Part 1 and Part 2⁵

ISO 9613 1&2 describe a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions.

2.5 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

BS8233:2014 provides guidance on the control of noise in and around buildings. The standard sets out acceptable noise levels for new and refurbished buildings and amenity areas according to their use.

For external amenity areas BS8233:2014 specifies a “desired” level of 50 dBL_{Aeq,T} and an “upper guideline level” of 55 dBL_{Aeq,T}.

The standard provides noise limits for rooms within buildings by type of use; (bedroom, living room, office) and by time of day. Target noise levels within habitable rooms (bedrooms and living rooms) are 35 dB during the daytime period and 30 dB during the night-time period.

Methods are provided for simplified calculation of internal noise levels from external levels, and for detailed calculations. The simplified method relies on a reduction to façade levels provided either by open or closed windows, which are assumed to provide attenuation of approximately 15 dB and 33 dB respectively.

3. Method

3.1 Characterisation of Baseline Noise Environment

A baseline noise survey was undertaken by ITP Energised at two representative locations close to the proposed BESS (‘Monitoring Location 1’ and ‘Monitoring Location 2’). Monitoring was undertaken in accordance with the requirements of BS4142 and BS7445 over the period 24th August 2022 to 28th August 2022.

The weather conditions at the time of the survey were predominantly dry with light winds and therefore meet the requirements of BS4142. Although occasional light rain showers and wind speeds elevated slightly above 5 m/s were present at times during the survey, the monitoring period between 10am on the 25th and 10am on the 27th provided conditions that met the requirements of BS4142 completely. This 48-hour period has therefore been adopted within this assessment representative of baseline noise levels.

We note that the measured noise levels recorded outside the period of dry, still weather conditions does not vary substantially from data captured during the 48-hour period and therefore provides confidence that the baseline noise environment has been appropriately characterised.

The baseline survey locations are shown in **Drawing 1**. Monitoring Location 1 is representative of the noise environment at NSR1 and NSR2, while Monitoring Location 2 is representative of the noise environment at NSR3.

⁵ ISO 9613: Attenuation of sound during propagation outdoors, Part 1 and Part 2. ISO, December 1996.



3.2 Prediction of Operational Noise Levels

3.2.1 General prediction method

Noise levels due to the BESS have been predicted at the NSRs within noise modelling software CadnaA, using the propagation method set out in ISO9613. The model assumes soft ground conditions, with absorption set to $G=1.0$, representative of vegetated ground.

The noise model considers items of electrical plant, specified by the Applicant, which comprise one transformer and six inverters per pair of batteries. We note that the final technology supplier may differ, however, the Applicant has proposed the use of Huawei LUNA2000 2MW batteries and associated transformers and inverters. These items have all been modelled as point sources within CadnaA.

We note that noise from the BESS plant will predominantly arise from cooling fans, which will operate at their highest output during times when the BESS is charging or discharging. A table showing patterns of BESS operation from an existing BESS plant is included in [Appendix 1](#) for reference; we note that while the technology provider considered in this assessment is different from that considered in the table, the patterns of usage are likely to be representative of a typical BESS. For much of the daytime and night-time periods the fans will not operate and the BESS will be quiet or silent. Therefore, the sound power levels considered in the model are likely to be higher than those produced by the BESS for the majority of the time.

This assessment assumes that the BESS will operate during the daytime and night-time, with operational periods having a duration of the entire reference period of 1 hour (daytime) or 15 minutes (night-time), such that no 'on-time' corrections will apply. During charging/discharging cycles the BESS will operate continuously, such that it will not be considered an intermittent source, as defined in BS4142.

The effective heights of the noise sources considered in the model are as follows:

- battery units – 2.9 m;
- transformer – 2.9 m; and
- inverter – 2.4 m.

From a review of schematics of the proposed plant, we note that the fan louvres are on the sides of the units. The effective heights assumed in the noise model may therefore be considered conservative and the actual effective height will likely be lower.

The predictions at the NSRs have been assessed at 4 m above local ground level, representative of the height of a first-floor window.

The battery units are the noisiest items of plant within the facility, with broad-band noise originating from cooling fans within the units. When determining whether any character corrections should apply to the Specific Level for deriving the Rating Level, in accordance with BS4142, this assessment notes the following:

- The third octave spectral data used in the model has been tested for potential tonal components in accordance with the third octave method referenced in BS4142 and found to be non-tonal; and
- Operation of the Proposed Development will likely not result in impulsive or intermittent characteristics.

On the basis of the above, no correction has been applied and the Rating Level is therefore equal to the predicted Specific Level. We note however that the spectral data used in the model, while representative, may differ slightly from the spectral characteristics of the proposed items of plant, for which spectral data could not be obtained.

A typical air temperature of 10°C and relative humidity of 70% have been assumed within the model. Ground absorption between the site and receptors has been assumed to be $G=1.0$, representative of acoustically soft surfaces such as agricultural land.



3.2.2 Source data

Details of the facility were provided by the Applicant, including the proposed layout (shown in **Drawing 1**). As noted above, the eventual technology provider is unknown at this stage, but the assessment has been undertaken on the basis of the initial proposal that Huawei LUNA2000 battery units will be used.

Sound power levels for the proposed items of plant have utilised spectral data for batteries, inverters and transformers held on file by ITP Energised, and these have been normalised to the quoted sound pressure levels at a distance of 1 metre provided by the Applicant. These spectra and broad-band levels applied in the model are provided in **Table 2**.

Table 2 – Applied broad-band sound power data and assumed spectral values

Item	Sound power level, dB								Applied A-weighted broad-band level, dBA
	63	125	250	500	1k	2k	4k	8k	
Battery	-	63	76	72	69	70	68	57	79
Transformer	63	65	60	60	54	49	44	37	60
Inverter	87	82	84	73	82	83	93	89	97

The model assumes that noise from the facility will be from the battery units, inverters, and transformers only. All other components of the facility will have a sound power level at least 10 dB lower than the fans and transformers and will therefore have a negligible contribution to the total noise emission of the facility.

ITP Energised has undertaken an assessment of potential tonality of BESS noise sources and determined that they are non-tonal. This assessment assumes that the Huawei equipment will be similarly non-tonal.

4. Method of Evaluation

The specific noise level resulting from the operation of the facility has been predicted at the identified representative NSRs. As required by BS4142, the derived levels have been rounded to the nearest integer.

In accordance with the BS4142 evaluation method, rated noise levels up to 5 dB above the background level are representative of a low adverse impact and are “not significant”.

Rated noise levels 10 dB or more above the background level are representative of a significant adverse impact.

Supplementary consideration has been given to fixed limits provided in BS8233 for preservation of residential amenity, specifically within habitable rooms of the residential property.

This assessment considers that meeting noise limits derived in accordance with BS4142 and, where appropriate, fixed criteria provided in BS8233, will demonstrate noise impacts which do not exceed the SOAEL as defined in the NPSE.



5. Results

5.1 Summary of Baseline Noise Environment

The dominant noise source during the baseline was road traffic. A summary of measured baseline noise levels is provided in **Table 3**.

Table 3 – Results of baseline noise survey

Date/period	Period average, dB	
	Ambient, $L_{Aeq,T}$	Background, $L_{A90,t}$
Location 1		
24/08/22 - day	49.9	44.5
24/08/22 - night	45.8	35.9
25/08/22 - day	47.7	43.4
25/08/22 - night	42.0	32.6
26/08/22 - day	48.2	43.7
26/08/22 - night	41.2	27.4
27/08/22 - day	46.9	42.0
27/08/22 - night	40.0	32.0
28/08/22 - day	45.2	39.6
Location 2		
24/08/22 - day	56.9	45.7
24/08/22 - night	50.3	35.6
25/08/22 - day	57.8	46.6
25/08/22 - night	51.0	34.3
26/08/22 - day	56.8	45.2
26/08/22 - night	49.2	31.8
27/08/22 - day	55.6	43.1
27/08/22 - night	48.6	35.0
28/08/22 - day	55.5	42.0

Charts showing the variation in noise levels over the measurement period are provided as **Figure 1** and **Figure 2** for Monitoring Location 1 and Monitoring Location 2, respectively.

Figure 1 – Measured noise levels at Monitoring Location 1

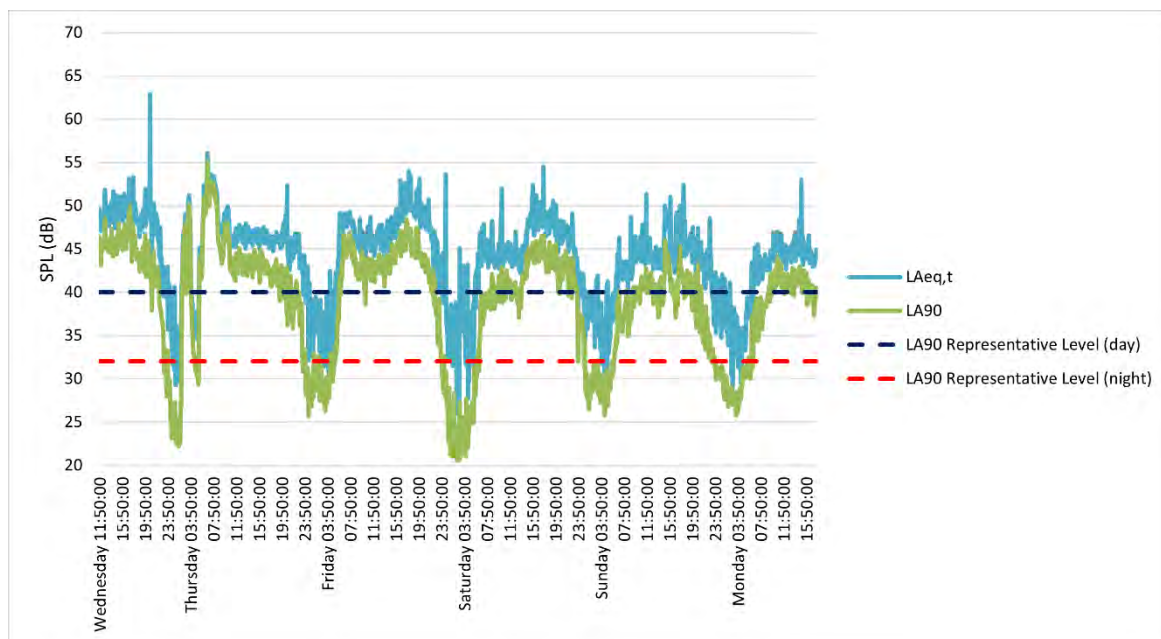
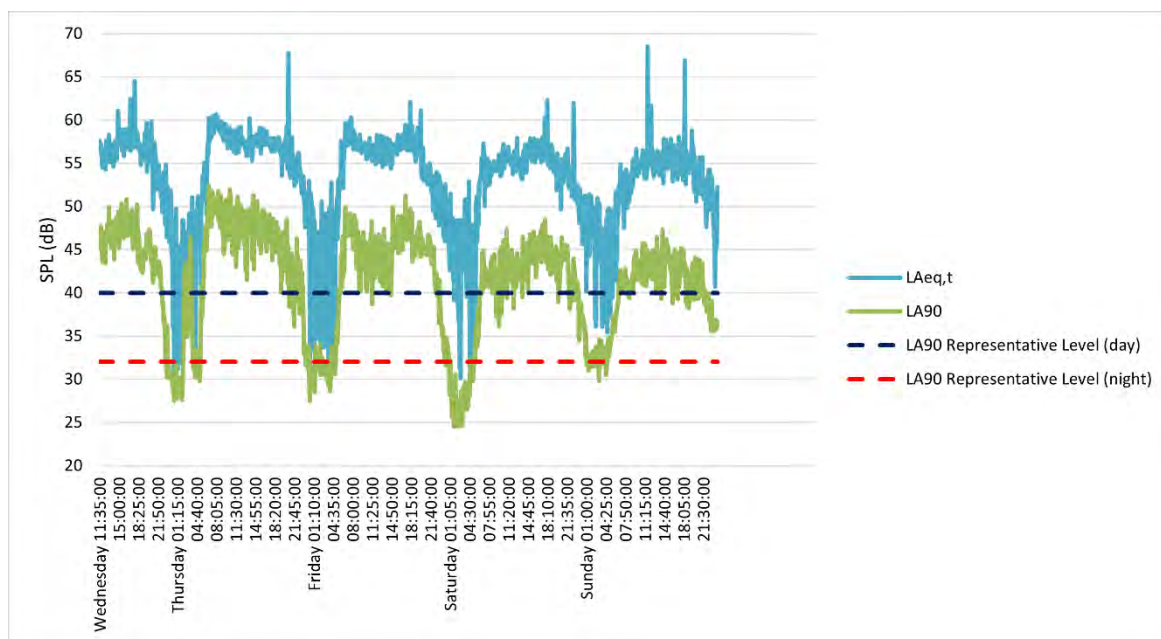


Figure 2 - Measured noise levels at Monitoring Location 2



Measured baseline noise levels showed a similar repeating pattern of diurnal variation, with noise levels rising steadily in the morning, attributed to increasing traffic flows, and decreasing throughout the evening to low levels during the night-time period.

There is a considerable difference between the ambient and background levels during the daytime period at Monitoring Location 2. This is indicative of variable noise levels, consistent with a noise environment dominated by non-continuous road traffic, as expected from a rural A-road such as Botley Road. During the night-time period the difference between the ambient level and background is much smaller, consistent with lower traffic flows in the middle of the night.



The difference between ambient and background levels at Monitoring Location 1 is less pronounced, due to the greater distance from the A-road and close proximity to a wooded area, meaning the noise environment at this location is under greater influence from wind, the rustling of vegetation and (during the daytime) bird calls.

A 'representative background' level has been adopted for both monitoring locations for the daytime and night-time periods, indicated by the dotted lines, respectively in **Figure 1** and **Figure 2**. A robust approach has been adopted in setting the representative background; the measured background level throughout the majority of the survey duration was substantially above the adopted level. Consideration has been given to the mean and modal values of the measured background, for both daytime and night-time, and in relation to the period where weather conditions met the BS4142 standard completely.

The adopted representative background levels are as follows:

- Monitoring Location 1:
 - 40 dBL_{A90} daytime
 - 32 dBL_{A90} night-time
- Monitoring Location 2:
 - 40 dBL_{A90} daytime
 - 32 dBL_{A90} night-time

5.2 Predicted operational noise levels

The specific noise level resulting from the operation of the facility has been predicted at the relevant NSRs. The predicted specific levels are presented in **Table 4**.

Table 4 – Predicted noise levels at NSRs

NSR	Predicted operational specific noise level dBL _{Aeq,T}
NSR1	37.7
NSR2	31.0
NSR3	26.5

Noise contours showing predicted levels, applicable during the daytime and the night-time period, are provided in **Drawing 2**.



5.3 Evaluation of Impacts – BS4142:2014+A12019 Assessment

Noise associated with operation of the facility at NSR1 has been evaluated in **Table 5**.

Table 5 – Evaluation of Impacts at NSR1

NSR1	Level	Notes
Daytime period (07:00 – 23:00)		
Daytime period background level	40 dBL _{A90}	Background level consistent over multiple days of monitoring, representative level defined according to measured levels on day with lowest measured background level. Rounded to nearest integer dB.
Predicted specific level	38 dBL _{Aeq,T}	Predicted level for assumed maximum/worst-case operation.
Rating correction	0 dB	No corrections for tonality, intermittency or impulsivity apply. The dominant noise source is road traffic, which is broad-band in character and will mask similar broad-band noise arising from the proposed BESS.
Rating level	38 dBL _{Ar,Tr}	Rating level equal to Specific Level
Excess of rating level over daytime background	-2 dB	Rating level is below representative background level by 2 dB
Uncertainty	-	Background level measured under appropriate conditions and repeatable over multiple days of monitoring. Robust approach taken to characterisation of representative background noise level; average background noise levels during the daytime period were substantially higher on all days monitoring was undertaken. Predicted levels at 4 m above ground level considers potential noise levels at first-floor bedroom window – actual noise levels in garden areas likely to be lower given increased ground absorption. Actual source levels of chosen technology may vary, however, maximum sound power level may be confirmed prior to purchase of equipment to confirm compliance with derived noise limits. Uncertainty therefore unlikely to affect the findings of the assessment.
Significance	-	Low impact during daytime period
Night-time period (23:00 – 07:00) – weekday/weekend		
Night-time period background level	32 dBL _{A90}	Background level consistent over multiple days of monitoring, representative level defined according to mean and modal values of measured levels during the night-time period. Rounded to nearest integer dB.
Predicted specific level	38 dBL _{Aeq,T}	Predicted level for assumed maximum/worst-case operation.
Rating correction	0 dB	No corrections for tonality, intermittency or impulsivity apply. The dominant noise source is road traffic, which is broad-band in character and will mask similar broad-band noise arising from the proposed BESS, albeit traffic noise will be lesser and more intermittent during the night-time.
Rating level	38 dBL _{Aeq,T}	Rating level equal to Specific Level



NSR1	Level	Notes
Excess of rating level over night-time background	6 dB	Rating level is above representative background level by more than 5 dB but substantially less than 10 dB.
Uncertainty	-	Background level measured under appropriate conditions and repeatable over multiple days of monitoring. Robust approach taken to characterisation of representative background noise level; average background noise levels during the night-time period were substantially higher on 4 of the 5 days monitoring was undertaken. Predicted levels at 4 m above ground level considers potential noise levels at first-floor bedroom window – actual noise levels in garden areas likely to be lower given increased ground absorption. Actual source levels of chosen technology may vary, however, maximum sound power level may be confirmed prior to purchase of equipment to confirm compliance with derived noise limits.
Significance	-	Low to moderate adverse impact during night-time period, depending on context; refer to Section 5.4 for supplementary consideration of predicted levels against fixed BS8233 criteria, which are relevant to the context of the BESS operation.

Noise impacts at NSR1 have been determined to be low during the daytime and low/moderate adverse during the night-time period.

Noise associated with operation of the facility at NSR2 has been evaluated in **Table 6**.

Table 6 – Evaluation of Impacts at NSR2

NSR2	Level	Notes
Daytime period (07:00 – 23:00)		
Daytime period background level	40 dBL _{A90}	Background level consistent over multiple days of monitoring, representative level defined according to measured levels on day with lowest measured background level. Rounded to nearest integer dB.
Predicted specific level	31 dBL _{Aeq,T}	Predicted level for assumed maximum/worst-case operation.
Rating correction	0 dB	No corrections for tonality, intermittency or impulsivity apply. The dominant noise source is road traffic, which is broad-band in character and will mask similar broad-band noise arising from the proposed BESS.
Rating level	31 dBL _{Ar,Tr}	Rating level equal to Specific Level
Excess of rating level over daytime background	-9 dB	Rating level is below representative background level by more than 5 dB



NSR2	Level	Notes
Uncertainty	-	Background level measured under appropriate conditions and repeatable over multiple days of monitoring. Robust approach taken to characterisation of representative background noise level; average background noise levels during the daytime period were substantially higher on all days monitoring was undertaken. Predicted levels at 4 m above ground level considers potential noise levels at first-floor bedroom window – actual noise levels in garden areas likely to be lower given increased ground absorption. Actual source levels of chosen technology may vary, however, maximum sound power level may be confirmed prior to purchase of equipment to confirm compliance with derived noise limits. Uncertainty therefore unlikely to affect the findings of the assessment.
Significance	-	Low/very low impact during daytime period
Night-time period (23:00 – 07:00) – weekday/weekend		
Night-time period background level	32 dBL _{A90}	Background level consistent over multiple days of monitoring, representative level defined according to measured levels on day with lowest measured background level. Rounded to nearest integer dB.
Predicted specific level	31 dBL _{Aeq,T}	Predicted level for assumed maximum/worst-case operation.
Rating correction	0 dB	No corrections for tonality, intermittency or impulsivity apply. The dominant noise source is road traffic, which is broad-band in character and will mask similar broad-band noise arising from the proposed BESS, albeit traffic noise will be lesser and more intermittent during the night-time.
Rating level	31 dBL _{Aeq,T}	Rating level equal to Specific Level
Excess of rating level over night-time background	-1 dB	Rating level is below representative background level by less than 5 dB
Uncertainty	-	Background level measured under appropriate conditions and repeatable over multiple days of monitoring. Robust approach taken to characterisation of representative background noise level; average background noise levels during the night-time period were substantially higher on 4 of the 5 days monitoring was undertaken. Predicted levels at 4 m above ground level considers potential noise levels at first-floor bedroom window – actual noise levels in garden areas likely to be lower given increased ground absorption. Actual source levels of chosen technology may vary, however, maximum sound power level may be confirmed prior to purchase of equipment to confirm compliance with derived noise limits.
Significance	-	Low impact during night-time period

Noise impacts at NSR2 have been determined to be low/very low during the daytime and low during the night-time period.



Noise associated with operation of the facility at NSR3 has been evaluated in **Table 7**.

Table 7 – Evaluation of Impacts at NSR3

NSR3	Level	Notes
Daytime period (07:00 – 23:00)		
Daytime period background level	40 dBL _{A90}	Background level consistent over multiple days of monitoring, representative level defined according to measured levels on day with lowest measured background level. Rounded to nearest integer dB.
Predicted specific level	27 dBL _{Aeq,T}	Predicted level for assumed maximum/worst-case operation.
Rating correction	0 dB	No corrections for tonality, intermittency or impulsivity apply. The dominant noise source is road traffic, which is broad-band in character and will mask similar broad-band noise arising from the proposed BESS.
Rating level	27 dBL _{Ar,Tr}	Rating level equal to Specific Level
Excess of rating level over daytime background	-13 dB	Rating level is below representative background level by more than 10 dB
Uncertainty	-	Background level measured under appropriate conditions and repeatable over multiple days of monitoring. Robust approach taken to characterisation of representative background noise level; average background noise levels during the daytime period were substantially higher on all days monitoring was undertaken. Predicted levels at 4 m above ground level considers potential noise levels at first-floor bedroom window – actual noise levels in garden areas likely to be lower given increased ground absorption. Actual source levels of chosen technology may vary, however, maximum sound power level may be confirmed prior to purchase of equipment to confirm compliance with derived noise limits. Uncertainty therefore unlikely to affect the findings of the assessment.
Significance	-	Negligible impact during daytime period
Night-time period (23:00 – 07:00) – weekday/weekend		
Night-time period background level	32 dBL _{A90}	Background level consistent over multiple days of monitoring, representative level defined according to measured levels on day with lowest measured background level. Rounded to nearest integer dB.
Predicted specific level	27 dBL _{Aeq,T}	Predicted level for assumed maximum/worst-case operation.
Rating correction	0 dB	No corrections for tonality, intermittency or impulsivity apply. The dominant noise source is road traffic, which is broad-band in character and will mask similar broad-band noise arising from the proposed BESS, albeit traffic noise will be lesser and more intermittent during the night-time.
Rating level	27 dBL _{Aeq,T}	Rating level equal to Specific Level



NSR3	Level	Notes
Excess of rating level over night-time background	-5 dB	Rating level is below representative background level by 5 dB
Uncertainty	-	Background level measured under appropriate conditions and repeatable over multiple days of monitoring. Robust approach taken to characterisation of representative background noise level; average background noise levels during the night-time period were substantially higher on 4 of the 5 days monitoring was undertaken. Predicted levels at 4 m above ground level considers potential noise levels at first-floor bedroom window – actual noise levels in garden areas likely to be lower given increased ground absorption. Actual source levels of chosen technology may vary, however, maximum sound power level may be confirmed prior to purchase of equipment to confirm compliance with derived noise limits.
Significance	-	Low/very low impact during night-time period

Noise impacts at NSR3 have been determined to be negligible during the daytime and low/very low during the night-time period.

5.4 Additional Context

The proposed BESS has been evaluated based on its worst-case operation; for the majority of the daytime and night-time periods the BESS will operate at a low level and the associated cooling fan noise will be substantially lesser than the predicted levels considered in this assessment. As such, the BESS may be considered to have a lower impact than an alternative plant or process which operates continuously.

Measured data on the monthly average utilisation of an existing BESS is included in **Appendix 1**. We note that while this data is from a BESS using a different technology provider and the actual quoted utilisation percentages may vary, the usage pattern is likely to be representative of a typical BESS. This data indicates that the BESS is likely to only produce significant noise levels during the early morning, between the hours of 1am and 5am, and early evening, between 3pm and 7pm. These periods correspond to when electricity is cheapest (BESS charging up) and when demand on the grid is greatest (BESS discharging). During these early morning hours most people are likely to be sleeping and noise levels within bedrooms will be considerably lower than outside. Predicted operational noise levels are considered in the context of BS8233 fixed criteria in **Table 8**.

Table 8: Predicted Indoor Noise Levels Due to Open Window Attenuation

Night-time Limit (dB)	Outdoor Level (dB)	Attenuation (dB)	Indoor Level (dB)
30	38	15	23

As demonstrated above, the operation of the BESS meets the BS8233 fixed criteria for a night-time indoor noise limit of 30 dB when using the simplified method for open window attenuation, which assumes a 15 dB reduction from outdoor noise levels. Therefore, it is considered likely that noise from the operation of the BESS during this period will be of low impact.

In the early evening the noise from the BESS is not predicted to exceed background. Furthermore, the broadband nature of the fan noise arising from the BESS will be similar in character to road traffic noise at NSRs and it is therefore likely that it will not be discernible against the residual noise environment.



5.5 Findings

At the closest representative NSR the predicted noise level due to operation of the BESS is 2 dB below the background level during the daytime and exceeds the 'background +5 dB' criterion by 1 dB during the night-time period. When considering the criteria and methods outlined in BS8233, we note that noise levels within habitable rooms are likely to drop to 7 dB below the night-time fixed criteria and thus will be of low impact.

NSR2 and NSR3 are exposed to a rating level below the background level and thus the impacts at these NSRs will be negligible.

The resultant noise impact of the facility has therefore been assessed as low/very low during the daytime and low during the night-time.

6. Conclusion

ITP Energised has undertaken an assessment of potential noise impacts associated with a battery energy storage facility at Misslebrook, North Baddesley, Hampshire, SO52 9LY. The assessment has comprised characterisation of the baseline noise environment using survey data, prediction of operational noise levels, and evaluation all in accordance with BS4142, and BS8233 where appropriate.

Predicted operational noise levels meet BS4142 baseline-derived criteria, and BS8233 fixed criteria where appropriate, such that noise impacts will be low/very low at the closest NSRs during the daytime period and the night-time period. Operation of the proposed BESS therefore meets the LOAEL.

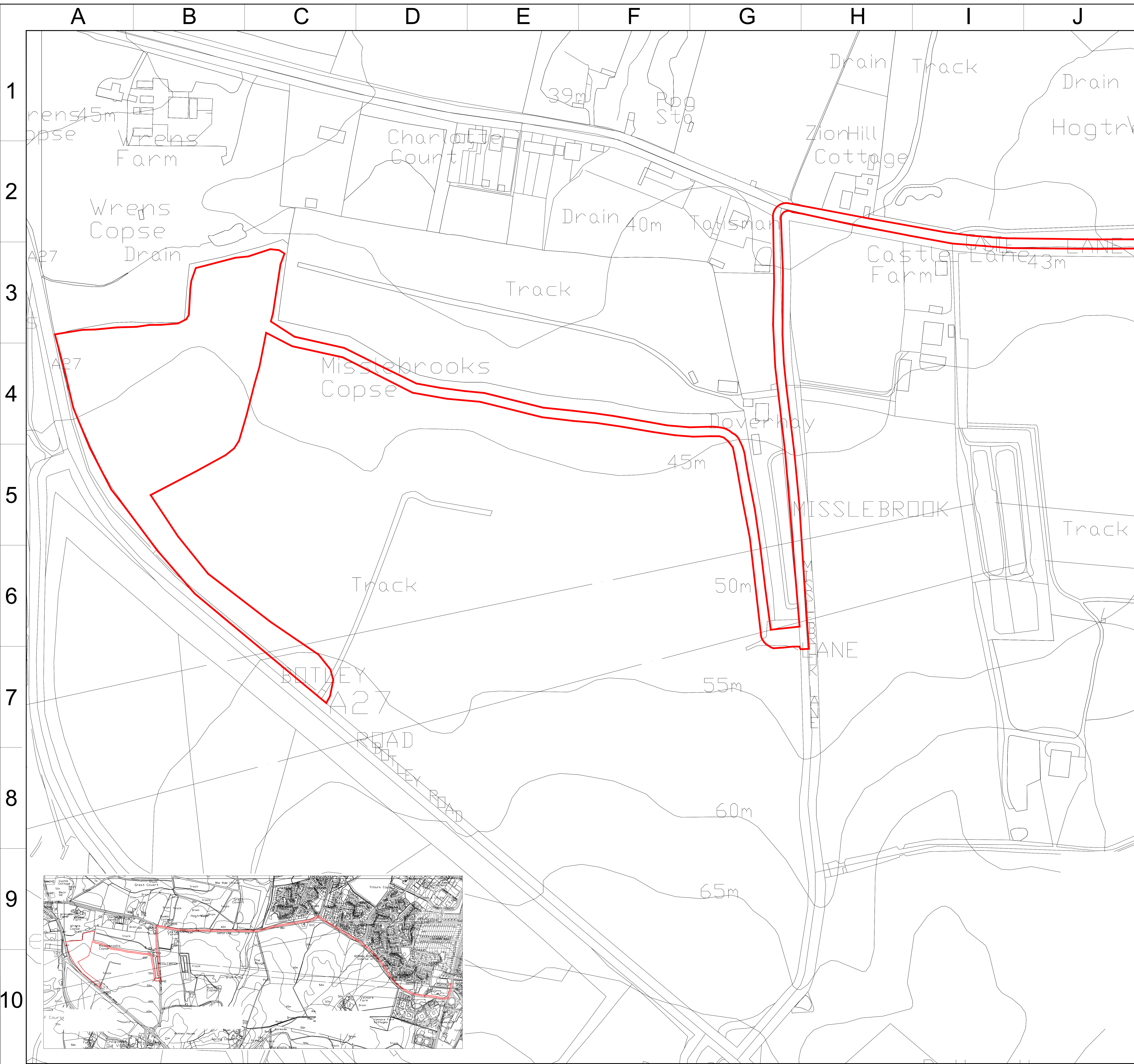


Appendix 1

	00:00:00	00:30:00	01:00:00	01:30:00	02:00:00	02:30:00	03:00:00	03:30:00	04:00:00	04:30:00	05:00:00	05:30:00	06:00:00	06:30:00	07:00:00	07:30:00
Aug-21	0%	0%	7%	0%	5%	4%	0%	0%	0%	0%	0%	3%	1%	3%	2%	2%
Sep-21	0%	2%	37%	35%	34%	32%	24%	8%	1%	1%	1%	0%	1%	0%	4%	4%
Oct-21	2%	3%	15%	15%	51%	44%	39%	37%	14%	6%	1%	1%	1%	1%	11%	13%
Nov-21	1%	3%	3%	1%	1%	7%	38%	39%	37%	32%	21%	17%	1%	1%	1%	1%
Dec-21	1%	2%	2%	1%	2%	3%	26%	27%	31%	24%	22%	22%	0%	0%	6%	5%
Jan-22	0%	1%	0%	4%	0%	0%	25%	28%	25%	30%	26%	20%	0%	0%	0%	0%
Feb-22	1%	1%	1%	4%	6%	3%	16%	16%	14%	18%	13%	13%	1%	1%	5%	4%
Mar-22	1%	1%	2%	1%	3%	3%	9%	6%	8%	9%	5%	1%	0%	2%	4%	4%
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May-22	4%	4%	5%	3%	3%	3%	3%	2%	4%	3%	3%	3%	6%	2%	5%	7%
Jun-22	8%	7%	4%	6%	6%	6%	4%	8%	4%	3%	7%	6%	8%	6%	3%	5%
Jul-22	3%	2%	2%	3%	3%	3%	2%	2%	2%	1%	2%	2%	5%	5%	9%	6%
Aug-22	3%	3%	4%	6%	7%	7%	6%	7%	7%	6%	3%	3%	29%	27%	6%	5%

08:00:00	08:30:00	09:00:00	09:30:00	10:00:00	10:30:00	11:00:00	11:30:00	12:00:00	12:30:00	13:00:00	13:30:00	14:00:00	14:30:00	15:00:00	15:30:00	16:00:00	16:30:00
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13%	14%	33%	28%	11%	12%	11%	13%	8%	7%	5%	6%	4%	8%



MISSLEBROOKS
SOLAR FARM
PROJECT INFOBOX

Application Boundary	
Site Area	16.91 Acres

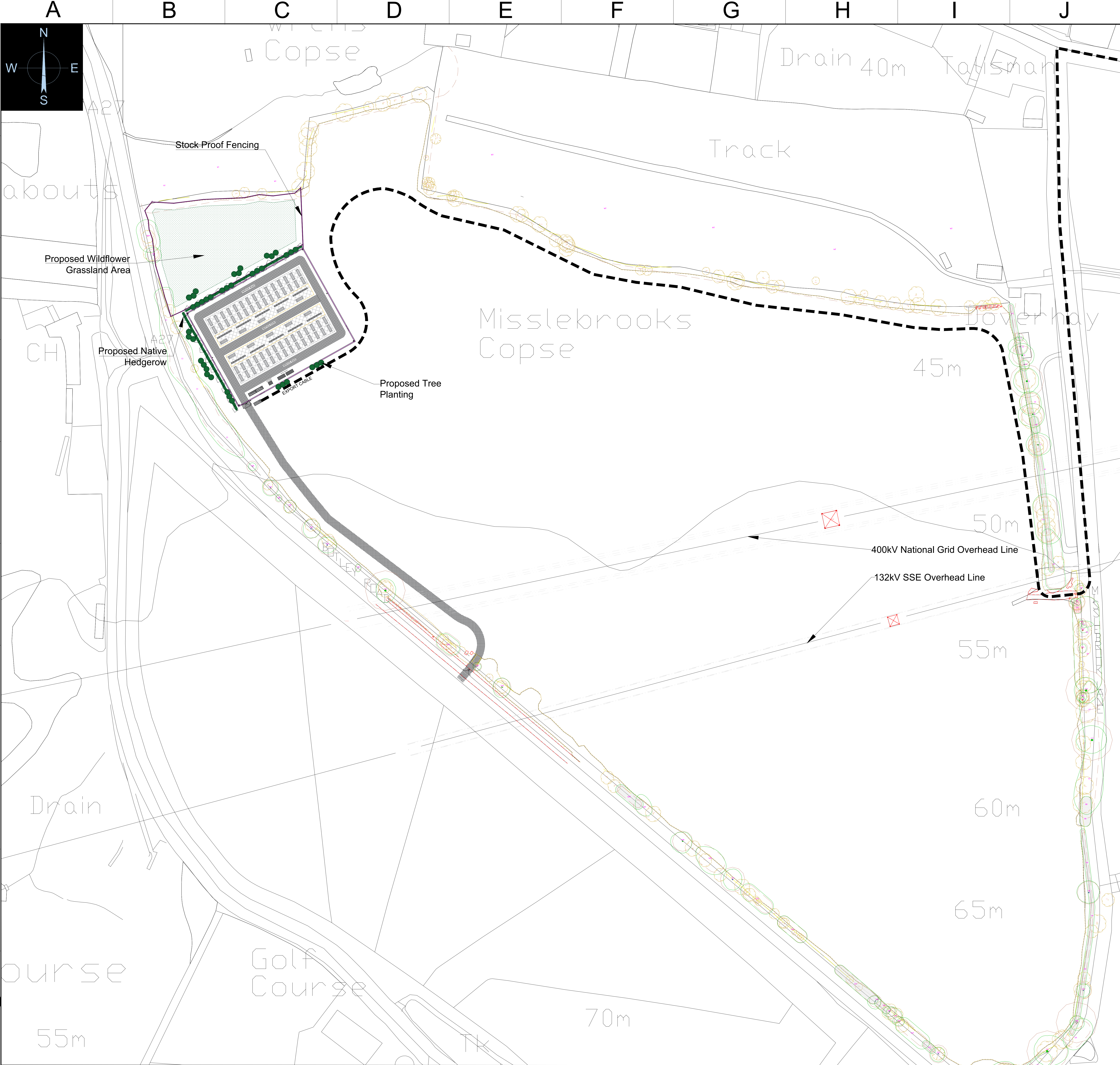
Boom Power Ltd. Address	Project Address
Boom Power Ltd. Unit 5E Park Farm Chichester Road Arundel West Sussex BN18 0AG	Land at Misslebrook North Baddesley Hampshire SO52 9LY

Drawing Infomation			
V No	Revision Note	By	Date
1.0	Initial Drawing	SF	01/08/2022
2.0	Amended	SF	01/11/2022

Drawing Infomation	
Scale When Printed	1:1250 @ A0
Stage	ISSUED FOR REVIEW
Drawing Name	Location Plan
Drawing Number	A001.1
Designed By	Sian Fay
Sheet 1 of 1	



BUILD | OWN | OPERATE | MAINTAIN
BOOM-POWER.CO.UK



MISSLEBROOKS
BATTERY STORAGE OVERALL LAYOUT
PROJECT INFOBOX

- SITE BOUNDARY
- INVERTERS
- TRANSFORMERS
- LOCAL SUPPLY TRANSFORMER
- BATTERY CONTAINERS
- SUBSTATIONS
- INTERNAL SERVICE ROAD
- PROPOSED ACCESS TRACK
- EXPORT CABLE ROUTE
- 400kV National Grid OHL
- 132kV SSE OHL

Boom Power Ltd. Address	Project Address
Boom Power Ltd. Unit 5E Park Farm Chichester Road Arundel West Sussex BN18 0AG	Land Between: Botley Road A27, Castle Lane & Misslebrooks Lane. SO52 9LY

Drawing Information			
V No	Revision Note	By	Date
2.1	FINAL	SH	13/12/2022

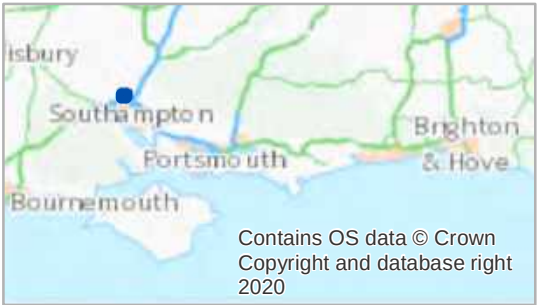
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Stage	FINAL
Drawing Name	Battery Storage Overall Layout
Drawing Number	B201
Designed By	Sam Hogan
Sheet 1 of 1	



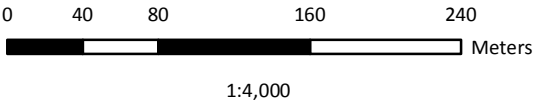
BUILD | OWN | OPERATE | MAINTAIN
BOOM-POWER.CO.UK



- KEY**
- Proposed Site Boundary
 - NMP1
 - NMP2
 - NSR1
 - NSR2
 - NSR3



Coordinate System: British National Grid
Projection: Transverse Mercator

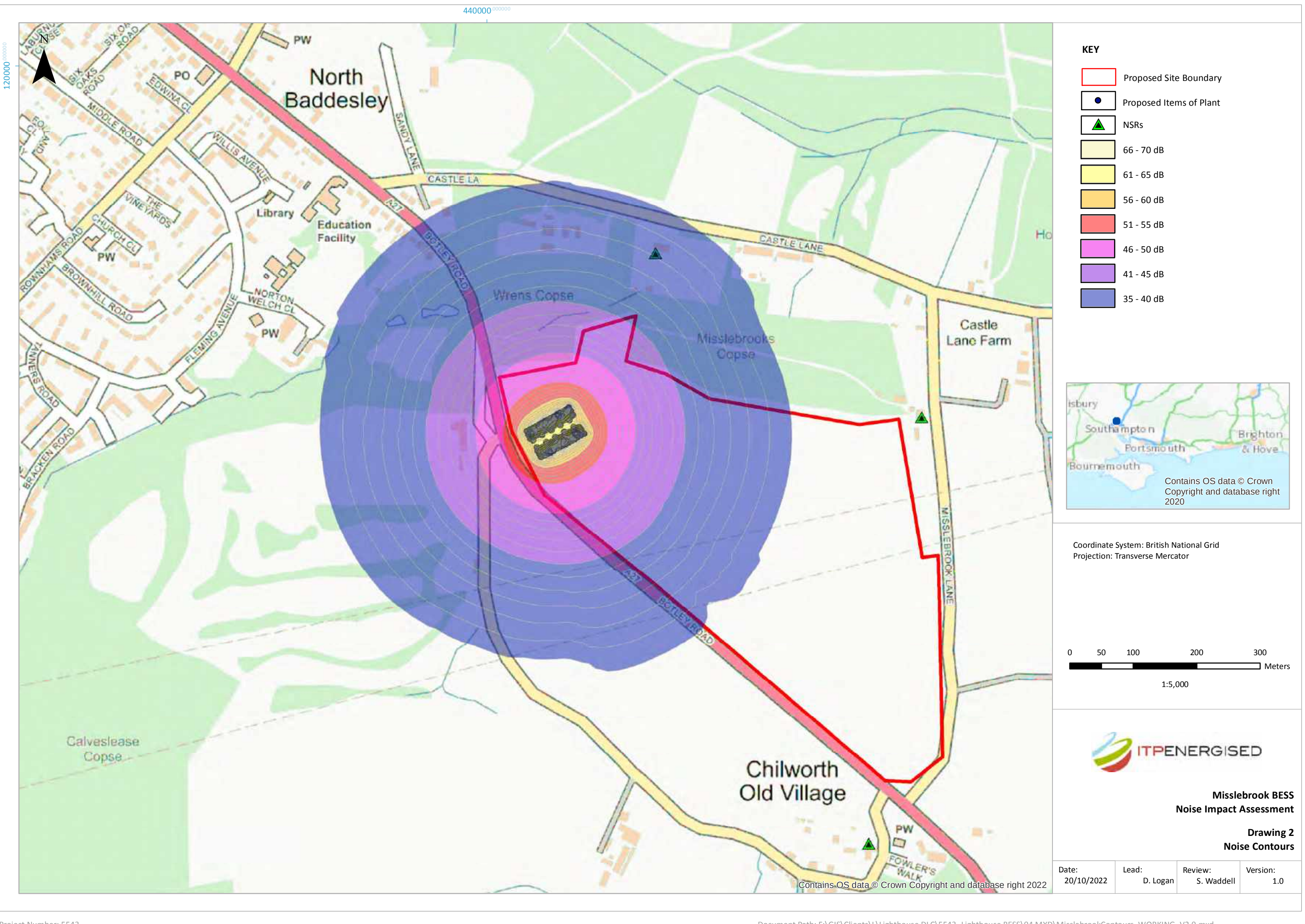


**Misslebrook BESS
Noise Impact Assessment**

**Drawing 1
Noise Sensitive Receptors & Monitoring Locations**

Date: 20/10/2022	Lead: D. Logan	Review: S. Waddell	Version: 1.0
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