NOISE IMPACT ASSESSMENT
WALPOLE BATTERY ENERGY STORAGE SYSTEM

VERSION 1.0

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1 INTRODUCTION

Metrica Environmental Consulting Ltd ('Metrica') was appointed by Envams on behalf of Hollygreen Energyfarm Limited ('the Applicant') to prepare a Noise Impact Assessment in relation to the proposed Walpole Battery Energy Storage System (BESS) development (hereafter referred to as 'the Proposed Development'). The Development is located on land 1.5 km north of Walpole Marsh ('the Site').

2 DEVELOPMENT OVERVIEW

The Development is in a predominantly rural area, approximately 500 m south-east of Sutton Bridge Power station and 1.5 km north of Walpole Marsh. The nearest large settlement is Kings Lynn, located approximately 13 km to the east. The nearest main road is the A17 which is 1.5km to the north. The Proposed Development is immediately south of the Sutton Bridge Power station. In addition, a number of food manufacturing / processing businesses are located in commercial units to the north.

The Proposed Development is surrounded by the consented Sutton Bridge Solar Farm, centred on grid reference 548402 319426.

A small number of individual noise sensitive receptors (NSRs) are located in the area of the Proposed Development, the closest being approximately 750 m south-east of the Proposed Development's nearest noise-emitting infrastructure. Figure 1 (Section 5) presents the Site location and closest NSRs. The Development's detailed layout is presented in Appendix 1.

3 GUIDANCE

The following guidance and standards are pertinent to the assessment:

- The National Planning Policy Framework (NPPF), 2024;
- The Noise Policy Statement for England (NPSE), 2010; and
- BS 4142:2014 +A1:2019 *Method for rating and assessing industrial and commercial sound* ('BS 4142').

3.1 THE NATIONAL PLANNING POLICY FRAMEWORK

The NPPF (2024) sets out the Government's planning policies for England, providing a framework within which local policies can be developed. The key principle of the NPPF is a presumption in favour of sustainable development. With regards to noise, the NPPF states that sustainable development can be achieved by:

- Avoiding noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigating and reducing to a minimum potential adverse impacts resulting from noise from new development, including through the use of conditions; and
- Identifying and protecting areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

3.2 THE NOISE POLICY STATEMENT FOR ENGLAND

The NPSE (2010) sets out the purpose of noise policy, together with the Government's Noise Policy Vision and Aims, consistent with the NPPF.

The aims of the NPSE require that:

- Significant adverse effects on health and quality of life are avoided, while taking into account the guiding principles of sustainable development;
- Adverse impacts on health and quality of life are mitigated or minimised; and
- Where possible, noise management should seek to improve health and quality of life within the context of Government policy on sustainable development.

Paragraph 2.24 of the NPSE states that in relation to minimising and mitigating adverse impacts:

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

3.3 BS 4142:2014+A1:2019 ('BS 4142')

BS 4142 provides a method for rating and assessing noise in order to provide an indication of it's likely impact on nearby noise-sensitive receptors (NSRs).

The standard provides advice for monitoring background noise and the subsequent derivation of an appropriate representative background level (dB L_{A90}).

The 'Specific' noise level at NSRs due to noise from a development (generally predicted using noise modelling software) is rated by applying corrections to account for the acoustic characteristics of the sound. Acoustic characteristics considered are tonality, impulsivity, intermittency, and distinctiveness. Each characteristic has its own penalty based on how noticeable the characteristic is at the NSR location. The resultant 'Rating' level is then assessed against the representative background sound level at the NSR to determine a likely level of impact.

An initial assessment is undertaken based on the level by which the Rating level exceeds the representative background sound level, as follows:

- A difference of 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; and
- Where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on context.

Once an initial estimate of the impact has been undertaken, the level of impact can be modified up or down, due to the site context, including the absolute level of noise, character of the sound and / or sensitivity of the NSR.

4 CONSULTATION AND ASSESSMENT CRITERIA

A consultation email was sent to the Environmental Health Officer (EHO) at South Holland Council ('the Council') on 8th January 2024 to agree the scope, methodology and assessment criteria for the noise assessment. The methodology and proposed assessment criteria are summarised below:

- The assessment will be undertaken in line with BS 4142;
- Representative background noise levels would be measured during the daytime and night-time periods at two locations representative of the nearest noise sensitive receptors; and
- Predicted Rating levels will be assessed against BS 4142 criteria, limiting the Rating levels to no more than 5 dB above the representative background level.

The EHO response confirmed that the proposed assessment methodology was acceptable.

5 BASELINE SURVEY

To establish the background sound environment in the locality of the Development, background noise monitoring was undertaken from 18th to 22nd January 2024 at two locations representative of the nearest NSR's.

Figure 1 shows the location of the background monitoring locations and the assessment locations.

Figure 1: Site Location and NSR Locations



Noise Monitoring Location (NML) 1 was selected as being representative of receptors located along King John Bank to the east of the Development. NML2 was selected as representative

of the receptor located directly adjacent to the River Nene to the west of the Development. Both NMLs are located slightly further from the A17 (the dominant noise source) than the nearest NSRs, and as such the background noise levels are considered conservative, as background levels would likely be higher at the NSRs in practice. The background monitoring locations were agreed with the Council, as discussed in Section 4.

The monitoring equipment consisted of two Class 1 sound level meters, calibrated to traceable standards and housed in all-weather cases with long life batteries. The microphones were placed at a height of 1.4 m above ground level, within suitable proprietary windshields. The meters were field calibrated at the start and end of the survey period; no significant calibration drift was found. Indices measured included $L_{A90,15mins}$ (i.e., the background sound level).

A weather station was set up to monitor weather conditions during the noise survey. Following the survey, it was found that periods of wind and rain were recorded from approximately 1200 on 21st January. As a worst case, all data measured from 1200 on 21st January has therefore been excluded from further analysis. Despite this exclusion, sufficient data was gathered for the survey.

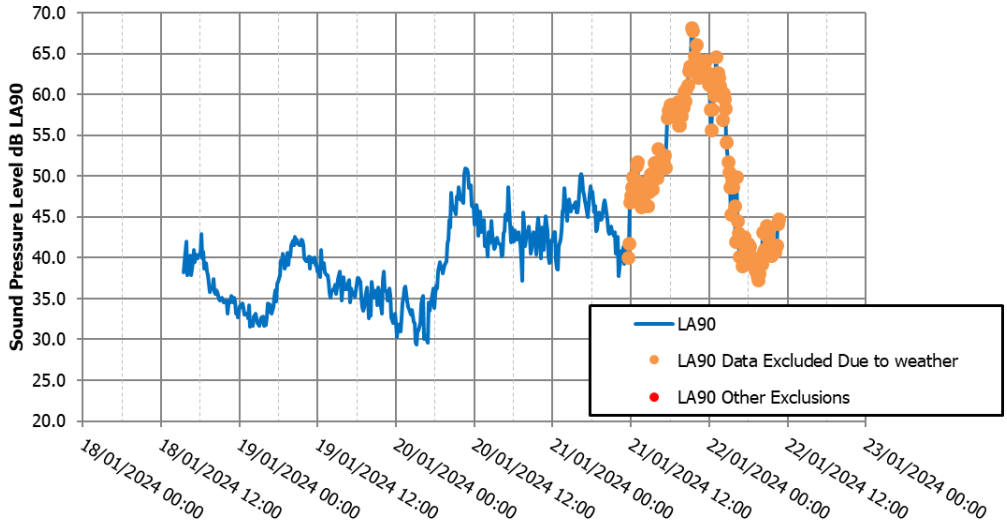
Survey record sheets, including photographs of the equipment in situ, are presented in Appendix 2.

6 SURVEY RESULTS

6.1 NOISE MEASUREMENT RESULTS – NML1

Chart 1 below provides a summary of background noise levels during the survey period at Noise Monitoring Location 1 (NML1), detailing $L_{A90,15min}$ sound levels.

Chart 1: Background Noise Survey Time History: NML1



As can be seen in Chart 1, background noise levels are considered typical of a semi-rural environment. The measurements confirm observations made onsite during equipment installation and collection, where it was noted that the acoustic environment was dominated by road traffic noise.

When determining typical daytime and night-time levels for assessment purposes, BS 4142 advises against assuming that it can be determined using any single approach (mean, median and mode etc.). To determine the prevailing background noise level for the purposes of this assessment, Charts 2 and 3 (over) present the range of $L_{A90,15min}$ noise levels recorded, along with the percentage of periods for which they occurred, for daytime (0700 – 2300) and night-time (2300 – 0700) periods respectively.

It should be noted that the $L_{A90,15min}$ parameter was used for both daytime and night-time periods. BS 4142 permits the use of longer (1 hour) measurements for daytime periods, however the use of $L_{A90,15min}$ for both daytime and night-time periods is a conservative approach, as $L_{A90,15min}$ values are more sensitive to short term noise events.

Chart 2: Daytime Background Statistical Analysis (0700 – 2300) – NML1

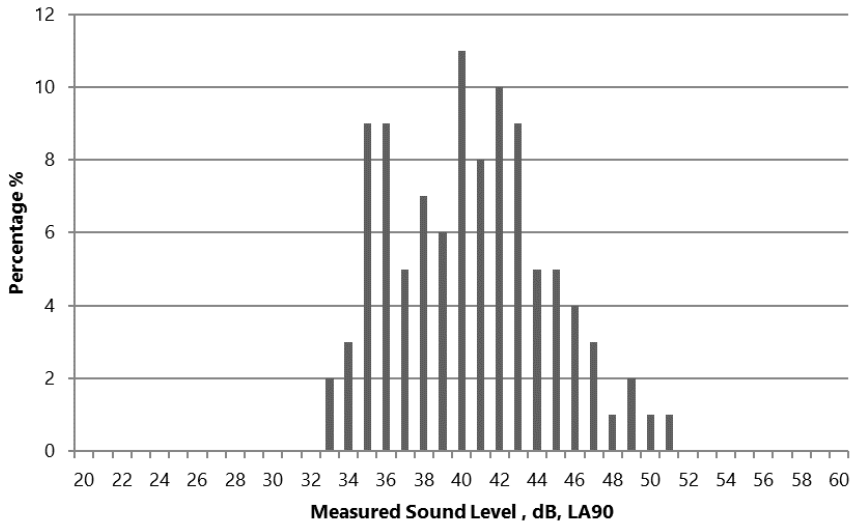


Table 1 presents the mean, median and mode averages of the above dataset.

Table 1: Daytime Background Noise Results – NML 1

Mode	Median	Mean	Representative
40	40	40	40

Based upon the results in Table 1, along with the spread of data in Chart 2, a daytime background noise level of 40 dB L_{A90} is considered representative for the purposes of this assessment.

Chart 3: Night-time Background Statistical Analysis (2300 - 0700) – NML 1

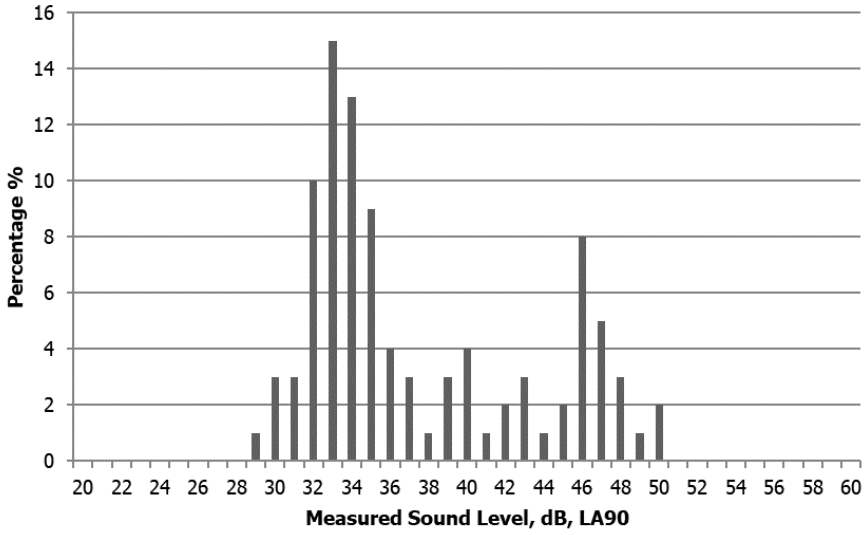


Table 2 presents the mean, median and mode averages of the night-time dataset.

Table 2: Night-time Background Noise Results – NML 1

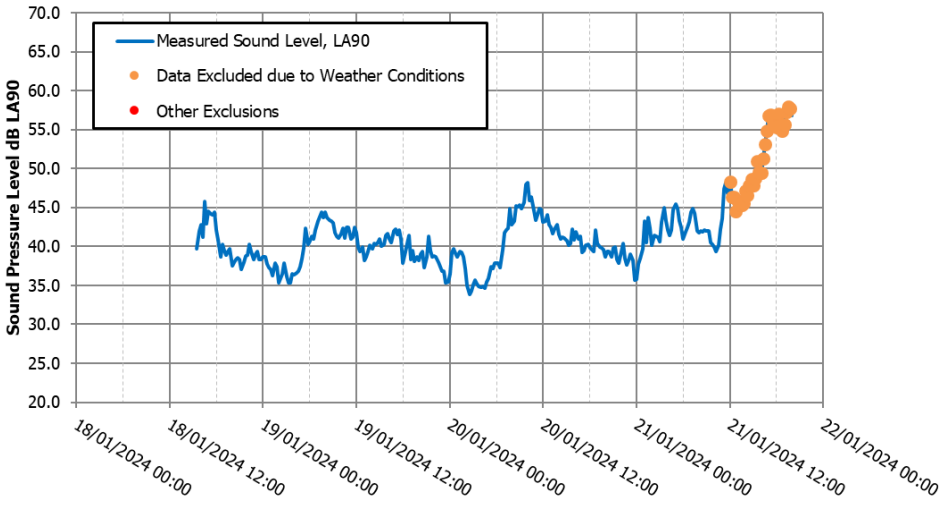
Mode	Median	Mean	Representative
33	35	38	33

Based upon the results in Table 2, along with the spread of data in Chart 3, a night-time background noise level of 33 dB L_{A90} is considered conservatively representative for the purposes of this assessment.

6.2 NOISE MEASUREMENT RESULTS – NML 2

Chart 4 below provides a summary of background noise levels during the survey period at Noise Monitoring Location 2 (NML2), detailing $L_{A90,15min}$ sound levels.

Chart 4: Background Noise Survey Time History: NML 2



As shown in Chart 4, background noise levels show a smaller variability between daytime and night-time periods than NML1. This is due to the presence of sound from industrial sources, specifically the Sutton Bridge power station and Bakkavor Meals food manufacturer, during night-time periods.

The charts below show the statistical spread during the daytime and night-time periods.

Chart 5: Daytime Background Statistical Analysis (0700 – 2300) – NML 2

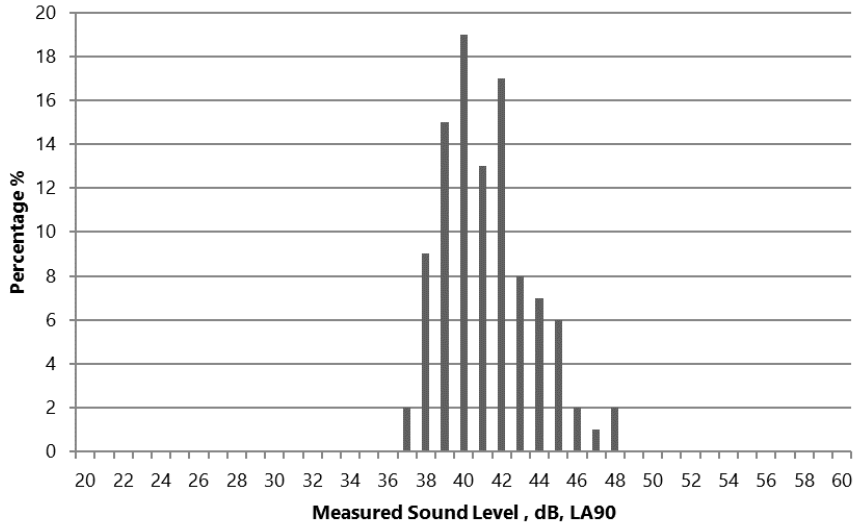


Chart 6: Night-time Background Statistical Analysis (2300 - 0700) – NML 2

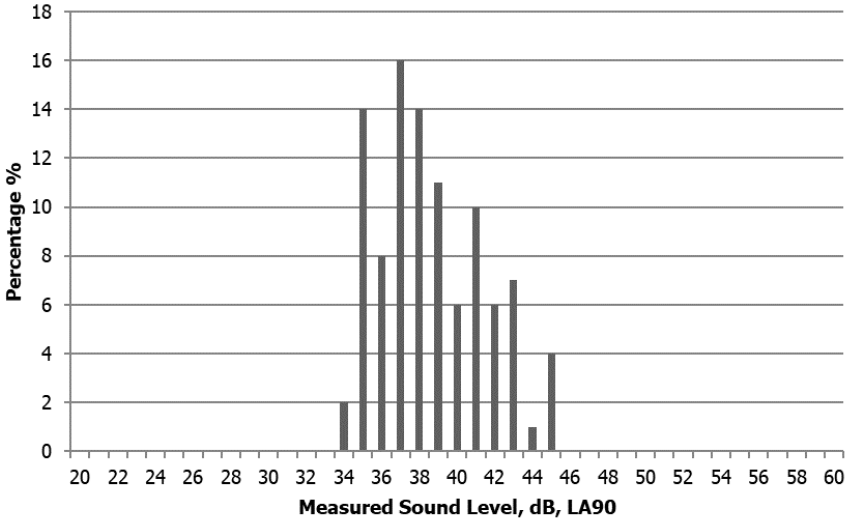


Table 3 presents the mean, median and mode averages of the above datasets.

Table 3 Daytime Background Noise Results – NML 2

Period	Mode	Median	Mean	Representative
Daytime	40	41	41	40
Night-time	37	38	39	37

Based upon the results in Table 3, along with the spread of data in Charts 5 and 6, a daytime background noise level of 40 dB L_{A90} and a night-time background noise level of 37 dB L_{A90} is considered conservatively representative for the purposes of this assessment.

7 NOISE MODELLING

The Development consists of the following noise sources:

- 48x Battery Storage Containers;
- 13x Power conversion system (PCS) inverters;
- 1x Earthing Transformer; and
- 1x Auxiliary BESS Transformer;

Additional infrastructure includes storage containers, switchgear and metering equipment. These elements will emit no / negligible levels of noise and therefore have not been considered further as part of this assessment.

The equipment modelled as part of this assessment is based on typical plant used on similar developments. The plant ultimately chosen for installation will be selected to comply with any noise limits specified in the Proposed Development's planning conditions.

As a worst-case approach, all plant is assumed to be operating simultaneously during both daytime and night-time periods. It is likely that during night-time periods fans will operate at lower (quieter) speeds, and as such the assessment applies a worst-case approach.

7.1 NOISE EMISSION DATA

The sound power levels of the plant included in the noise model are included in Table 4, as provided by the Developer.

Table 4: Equipment Sound Power Levels

	Sound Power Level, dB, LwA	Octave Band Centre Frequency, Hz, dBA							
		63	125	250	500	1000	2000	4000	8000
Battery Container	88	70	80	69	75	72	69	58	52
Inverter (Long side)	97	68	77	87	90	89	87	93	81
Inverter (Short side)	96	67	76	86	89	88	86	92	80
Earthing Transformer	73	52	58	65	68	68	63	57	51
Aux Transformer	73	52	58	65	68	68	63	57	51

7.2 MODELLING PARAMETERS

The Specific sound level at the nearest NSRs has been calculated in SoundPlan 9.1 software, using the environmental noise propagation model ISO 9613-2:2024 - "*Acoustics — Attenuation of sound during propagation outdoors — Part 2: Engineering method for the prediction of sound pressure levels outdoors.*" The ISO 9613-2 method predicts the level of sound at a receptor by taking the octave-band sound power level spectrum of the source and applying a number of attenuation factors that determine the resulting rating level at the receptor location. The following parameters were used in the prediction model and are considered to provide a conservative prediction of the noise levels likely to be experienced in practice:

- Atmospheric conditions of 10°C and 70% relative humidity;
- A ground factor of G= 0 (hard ground) for the BESS compound, and 1 (soft ground) for all other areas;

- A receiver height of 1.5 m in amenity spaces (approximating head height);
- All plant operating simultaneously at full capacity;
- Includes local terrain and buildings;
- Batteries containers have been inputted into the noise model as buildings;
- Inverters have been inputted into the noise model as buildings of the required dimensions;
- Earthing and Auxiliary transformers have been modelled as point sources at a height of 2 m;
- A 3.5 m acoustic barrier has been included on the western, southern and eastern boundaries.

Grid references for the nearest NSRs are provided in Table 3, as presented in Figure 1. On the basis that noise levels are found to be acceptable at these locations, they will also be acceptable at other NSRs located further from the Development.

Table 3: Assessed Receptors

Receptor Name	Easting	Northing
NSR 1	549117	319000
NSR 2	547484	319255

7.3 RATING LEVEL CORRECTIONS

BS 4142 states that corrections should be applied to account for certain acoustic features which have the potential to increase the level of noise impact at nearby dwellings.

The four acoustic features to be considered in the application of rating corrections are as follows:

- Impulsivity: No impulsive characteristics are anticipated from the Proposed Development;
- Tonal Elements: The main noise emitting plant in the Proposed Development will be the inverter cooling systems. Based upon substantial prior experience of operational BESS developments, this noise is broadband in nature, masking any potential tonality from other sources (e.g. transformers);
- Intermittency: While certain plant may operate on thermostats, there will be no synchronisation between the various units. The overall noise level change due to a single inverter or battery unit switching on / off would be negligible, and not distinguishable at the receptors. Therefore, when taken as a whole, the Proposed Development is highly unlikely to have "*identifiable on / off conditions*" in terms of BS 4142:2014, and no correction for intermittency is therefore required; and
- Distinctiveness: The development is situated in an area dominated by anthropogenic noise sources such as roads, aircraft and industrial activities such as the food processing and power station. As such, it is considered that the noise from the Proposed Development would not be distinctive against the existing acoustic environment. Therefore, no correction for distinctiveness has been applied.

Based on the above, the Rating Levels at the receptor locations are therefore the same as the Specific Levels.

8 ASSESSMENT OF IMPACT

An assessment of the likely impact has been made based upon the difference between the Rating Levels and representative background levels at each assessed NSR.

Table 4 presents an assessment of the impact at the closest NSRs based upon the difference between the predicted Rating and Background noise levels during daytime, evening and night-time periods.

Table 4: Assessment of Impact

	Specific Noise Level, dB(A)	Rating Level, dB	Background Noise Level, dB, LA90		Difference, dB	
			Daytime	Night-time	Daytime	Night-time
NSR 1	35	35	40	33	-5	2
NSR 2	31	31	40	37	-9	-6

As Table 8 shows, Rating levels do not exceed 5 dB above the representative background levels at any NSR. The Development is therefore below the level at which Adverse impacts will occur in terms of BS 4142 and is compliant with the assessment criteria of not exceeding 5 dB above background, as agreed with the Council.

8.1 CONTEXT

The acoustic environment around the Proposed Development is dominated predominantly by road traffic noise. In addition, there are a number of existing industrial sources including Sutton Bridge Power station and Bakkavor Meals, and therefore, the Development sits comfortably within the local context. It is also notable that the Development will be situated within the Sutton Bridge solar development.

Overall, it is considered that the Proposed Development is not out of context for the area and will not change the existing acoustic environment.

8.2 UNCERTAINTY

Modelling of the proposed plant has been undertaken on a worst-case basis, assuming all plant is operating simultaneously and at maximum power at all times. Given this highly conservative approach, any uncertainties inherent in the assessment will have no material effect on the findings of the assessment.

9 CONCLUSION

Metrica was commissioned to undertake a Noise Impact Assessment of the proposed Walpole BESS development.

The Proposed Development includes a number of mitigation measures, including a 3.5 m high acoustic fence around the noise-emitting equipment.

An assessment of noise has been undertaken in accordance with BS 4142. Worst case predicted noise levels due to the Development do not exceed more than 5 dB above the existing background noise levels at any time. In terms of BS 4142, this is below the level of adverse impact, and is compliant with the assessment criterion specified by the Council.

On this basis, noise due to the operation of the Development has been found to be acceptable.

10 GLOSSARY OF TERMS

Background Noise: The background noise level is the underlying level of noise present at a particular location for the majority (usually 90%) of a period of time.

Decibel (dB): The decibel is the basic unit of noise measurement. It relates to the cyclical changes in pressure created by the sound and operates on a logarithmic scale, ranging upwards from 0 dB. 0 dB is equivalent to the normal threshold of hearing at a frequency of 1000 Hertz (Hz). Each increase of 3 dB on the scale represents a doubling of the Sound Pressure, and is typically the minimum noticeable change in sound level under typical listening conditions.

dB(A): Environmental noise levels are usually discussed in terms of dB(A). This is known as the A-weighted sound pressure level, and indicates that a correction factor has been applied, which corresponds to the human ear's response to sound across the range of audible frequencies. The ear is most sensitive in the middle range of frequencies (around 1000-3000 Hz), and less sensitive at lower and higher frequencies. The A weighted noise level is derived by analysing the level of a sound at a range of frequencies and applying a specific correction factor for each frequency before calculating the overall level. In practice this is carried out automatically within noise measuring equipment by the use of electronic filters, which adjust the frequency response of the instrument to mimic that of the ear.

Frequency: The frequency of a sound is equivalent to its pitch in musical terms. The units of frequency are Hertz (Hz), which represents the number of cycles (vibrations) per second.

$L_{A90,t}$: This term is used to represent the A-weighted sound pressure level that is exceeded for 90% of a period of time, t. This is used as a measure of the background noise level.

$L_{Aeq,t}$: This term is known as the A-weighted equivalent continuous sound pressure level for a period of time, t. It is similar to an average, and represents the sound pressure level of a steady sound that has, over a given period, the same energy as the fluctuating sound in question.

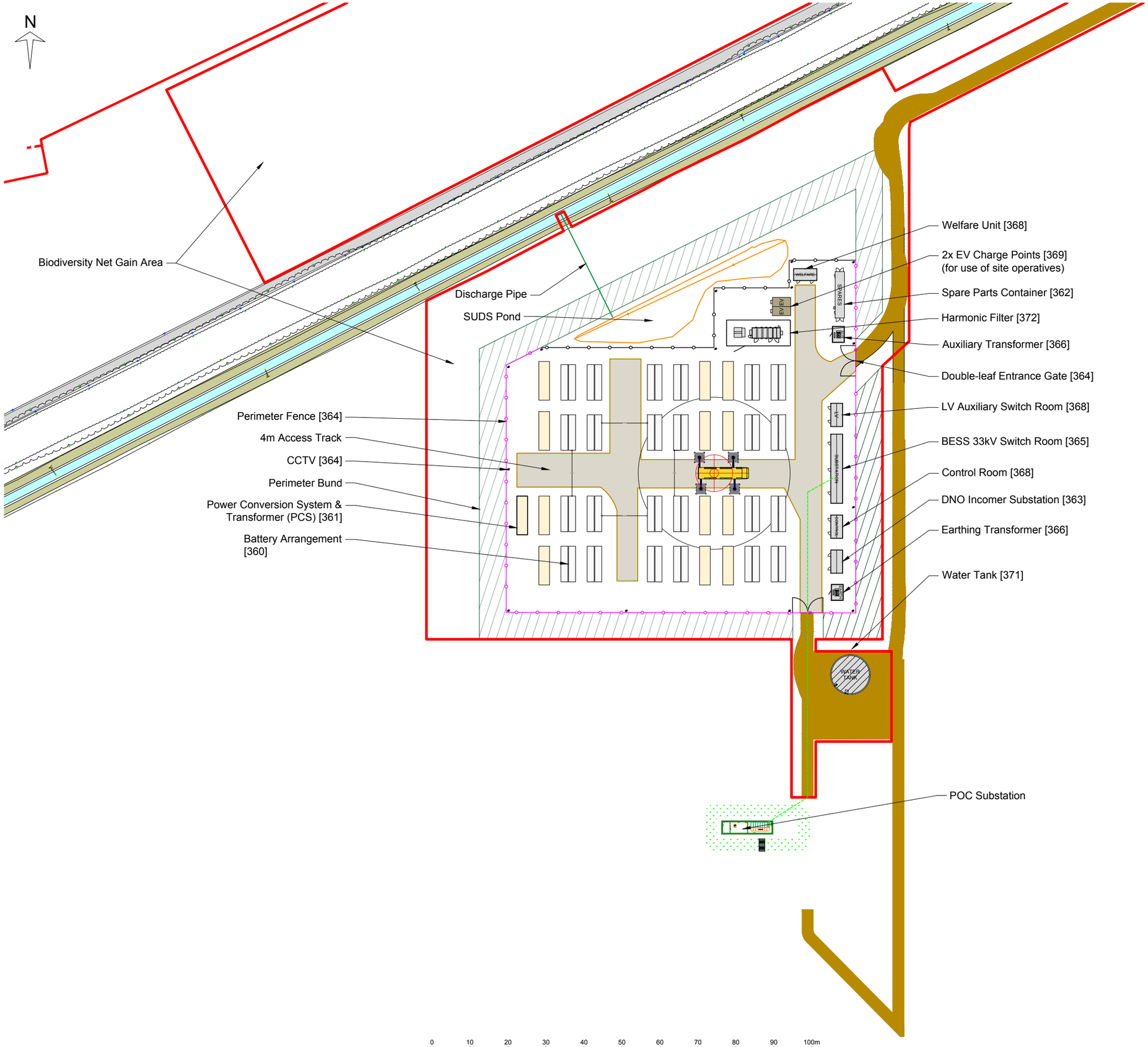
Rating Level: Noise levels which have been corrected for certain acoustic features, as required under BS4142 methodology.

Sound pressure (P): The fluctuations in pressure relative to atmospheric pressure, measured in Pascals (Pa).

Sound pressure level (L_p): Sound pressure measured on the decibel scale, relative to a sound pressure of 2 x 10-5 Pa.

Specific Level: In terms of BS4142 methodology, the specific level is the sound level produced by a source, without corrections for acoustic features.

APPENDIX 1: DEVELOPMENT LAYOUT



NOTES

1. Drawing details and dimensions for planning purposes only.

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LEGEND

- PLANNING APPLICATION BOUNDARY
- PERIMETER FENCE
- ACOUSTIC PERIMETER FENCE (3.5M)
- PERIMETER BUND
- HV CABLE ROUTE

Rev	Description	Date	Checked
04	Consultant comments	14.11.24	SRY
03	Consultant comments	13.11.24	SRY
02	RLB adjusted	13.11.24	SRY
01	Draft Issue	12.11.24	SRY

Drawing No.
WAL-EDFR-BESS-CIV-PLN-301.04

Project
Walpole BESS

Title
Site Layout Plan

Scale	Drawn by	Checked	Date
1:1000 @A3	JL	SY	05.01.24

W: www.edf-re.uk
A: Cardinal Place, 80 Victoria Street, London SW1E 5JL

APPENDIX 2: SURVEY RECORD SHEETS

Project No.	0259	**Project Name:**	Walpole BESS
Location Number	1 of 2	**Installed By:**	AM
Grid Reference	TF48962 18829	**Location Name**	NML1
Start Date	18/1/24	**Start Time**	14:30

Equipment Details	**Make/Model**	**Serial No.**
Sound Level Meter:	NL-52	00586906
Calibrator:	NC-75	5324443
Source of Equipment:		Metrica
Meter Timestamp (Start/End, GMT/BST):		Start BST

Description of Location	Adjacent to closest NSRs
Distance from Façade	>10m
Noise Sources Observed	Distant traffic noise, occasional local traffic, aircraft
Weather Conditions	Clear, dry, light breeze 4 deg C

Set-Up / Visit 1

Date	18/1/24	**Time**	14:30
Filename	0101	**Calibration Level**	94.0
Range	20-120	**Measurement Index**	LA90
Frequency Weighting	A	**Weather Monitoring?**	No
Lp Logging?	1sec leq	**Audio / Octave Bands?**	No
Additional Notes	No construction works. No noise audible from Bakkavor Factory or Power Station		

Visit 2

Date	2024/01/22	**Time**	10:44
Visited by	MS	**Calibration Level**	94.0
Level Pre-Calibration	94.0	**Batteries Replaced?**	No
Equipment Removed?			Yes
Additional Notes			









Project No.	0259	**Project Name:**	Walpole BESS
Location Number	2 of 2	**Installed By:**	AM
Grid Reference	TF47378 19085	**Location Name**	NML2
Start Date	18/1/24	**Start Time**	15:30

Equipment Details	**Make/Model**	**Serial No.**
Sound Level Meter:	SV307A	119167
Calibrator:	SV307A	119167
Source of Equipment:		Metrica
Meter Timestamp (Start/End, GMT/BST):		Start GMT

Description of Location	Adjacent to closest NSRs to north
Distance from Façade	>10m
Noise Sources Observed	Distant traffic noise, distant wind turbines, occasional local traffic, aircraft
Weather Conditions	Clear, dry, light breeze 4 deg C

Set-Up / Visit 1

Date	18/1/24	**Time**	15:30
Filename	0201	**Calibration Level**	94.0
Range	20-120	**Measurement Index**	LA90
Frequency Weighting	A	**Weather Monitoring?**	Yes
Lp Logging?	1sec leq	**Audio / Octave Bands?**	No
Additional Notes	No construction works. No noise audible from Bakkavor Factory or Power Station		

Visit 2

Date	2024/01/22	**Time**	10:44
Visited by	MS	**Calibration Level**	94.0
Level Pre-Calibration	94.0	**Batteries Replaced?**	No
Equipment Removed?			Yes
Additional Notes	Equipment stopped monitoring at 21/01 20:15		







