

NOISE IMPACT ASSESSMENT

Allington Solar Farm, Eastleigh

VERSION 1.0

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TABLE OF CONTENTS

1	INTRODUCTION-----	1
2	Development Overview-----	1
3	Guidance -----	1
	3.1 The National Planning Policy Framework -----	1
	3.2 The Noise Policy Statement For England -----	2
	3.3 BS 4142:2014 -----	2
	3.4 Noise Rating Curves -----	3
4	Consultation -----	3
5	Baseline Survey-----	4
6	Survey Results -----	5
	6.1 Location 1 -----	5
	6.2 Location 2 -----	7
7	Noise Modelling -----	8
	7.1 Noise Emission Data -----	9
	7.2 Modelling Parameters -----	9
	7.3 Rating level Corrections -----	10
8	Assessment Of Impact -----	11
	8.1 BS4142 Assessment -----	11
	8.1.1 Context -----	11
	8.1.2 --- Uncertainty -----	11
	8.2 NR Assessment -----	12
	8.3 Discussion -----	13
9	Conclusion -----	14
10	GLOSSARY OF TERMS -----	15
	APPENDIX 1: DEVELOPMENT LAYOUT -----	16
	APPENDIX 2: SURVEY RECORD SHEETS-----	17

1 INTRODUCTION

Metrica Environmental Consulting Ltd ('Metrica') has been commissioned by Locogen Consulting Ltd ('the Client') to undertake a noise impact assessment in relation to the proposed Solar Farm and Battery Energy Storage System (BESS) ('the Development'), located on land off Allington Lane, Eastleigh ('the Site').

The aim of this assessment is to assess the noise generated by the Development against relevant guidance, and incorporating mitigation measures as necessary to ensure the amenity of residents surrounding the Development is not unreasonably impacted.

2 DEVELOPMENT OVERVIEW

The Development consists of a solar array and associated BESS, which will store electrical energy for export to the national grid during periods of peak demand to support a stable electrical supply. The Development therefore does not operate at full load continuously.

The Development is located on the outskirts of Southampton, close to Eastleigh and Fair Oak. The Site is located in an urban area, with a number of industrial operations located in close proximity, including Seddul Bahr Industrial Estate and various vehicle repair / servicing facilities. Several residential dwellings are located around the Site, approximately 140 m from the nearest noise emitting site infrastructure.

The acoustic environment is dominated by transportation noise, particularly from the M27 (located approximately 1.2 km south of the Development), a train line that intersects the Site, and Southampton Airport (located approximately 1.8 km east of the Development). Other noise sources include local road traffic, and anthropogenic activity associated with the Seddul Bahr Industrial Estate (located on the southern boundary of the Site), along with various vehicle repair / servicing facilities on the northern boundary.

The Development includes the installation of several potential sources of noise, including inverters, transformers and cooling systems associated with the BESS.

The Development layout is presented in Appendix 1.

3 GUIDANCE

The following guidance and standards are pertinent to the assessment:

- ◆ The National Planning Policy Framework (NPPF);
- ◆ The Noise Policy Statement for England (NPSE);
- ◆ BS 4142:2014 +A1:2019 Method for rating and assessing industrial and commercial sound ('BS 4142'); and
- ◆ NR Curves – ISO 1996-1:2016 (en) *Acoustics – Description, measurement, and assessment of environmental noise – Part 1: Basic quantities and assessment procedures*.

3.1 THE NATIONAL PLANNING POLICY FRAMEWORK

The NPPF 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 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

BS 4142:2014 provides a method for rating and assessing noise in order to provide an indication of its 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.

BS 4142 states that where the rating level and background levels at a receptor are low, changes in the absolute level should be taken into account. It states:

"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."

3.4 NOISE RATING CURVES

Noise Rating (NR) curves were developed by the International Organisation for Standardisation¹ (ISO) to determine acceptable indoor sound environment for hearing preservation, speech intelligibility, and annoyance. NR curves serve as a standardised way to measure and specify noise within buildings / occupied spaces, taking into account the frequency content of the noise.

To obtain an NR rating level, the noise spectrum is compared to a series of unweighted (dB) octave-band values. The resulting NR level is that which is entirely above the predicted noise level spectrum. Table 1 below presents the octave band levels for NR20, which is typically used for the assessment of internal noise within bedrooms during night-time periods.

Table 1: NR Curve Levels for NR 20

NR	Octave Band Frequencies (Hz)							
	63	125	250	500	1000	2000	4000	8000
	Octave Band Noise Level dB(Z)							
NR20	51	39	31	24	20	17	14	13

4 CONSULTATION

Consultation was carried out with the Environmental Health Department at Eastleigh Borough Council (EBC) to agree the scope, methodology and assessment criteria for the Development. It was agreed that:

- ◆ The assessment would be undertaken in line with BS 4142;
- ◆ Background monitoring would be undertaken at two locations representative of the nearest NSRs for a period of approximately 24 hours; and
- ◆ Noise modelling will be undertaken based on typical plant noise emission data for similar BESS developments, and noise levels predicted and assessed at the nearest NSRs.

It was stated that the Development would be assessed relative to background noise levels at each NSR to ensure that Rating levels are no greater than 5 dB above background, except where background levels are low, when assessment would consider absolute operational levels, in accordance with BS 4142.

¹ ISO 1996-1:2016(en) *Acoustics – Description, measurement, and assessment of environmental noise – Part 1: Basic quantities and assessment procedures.*

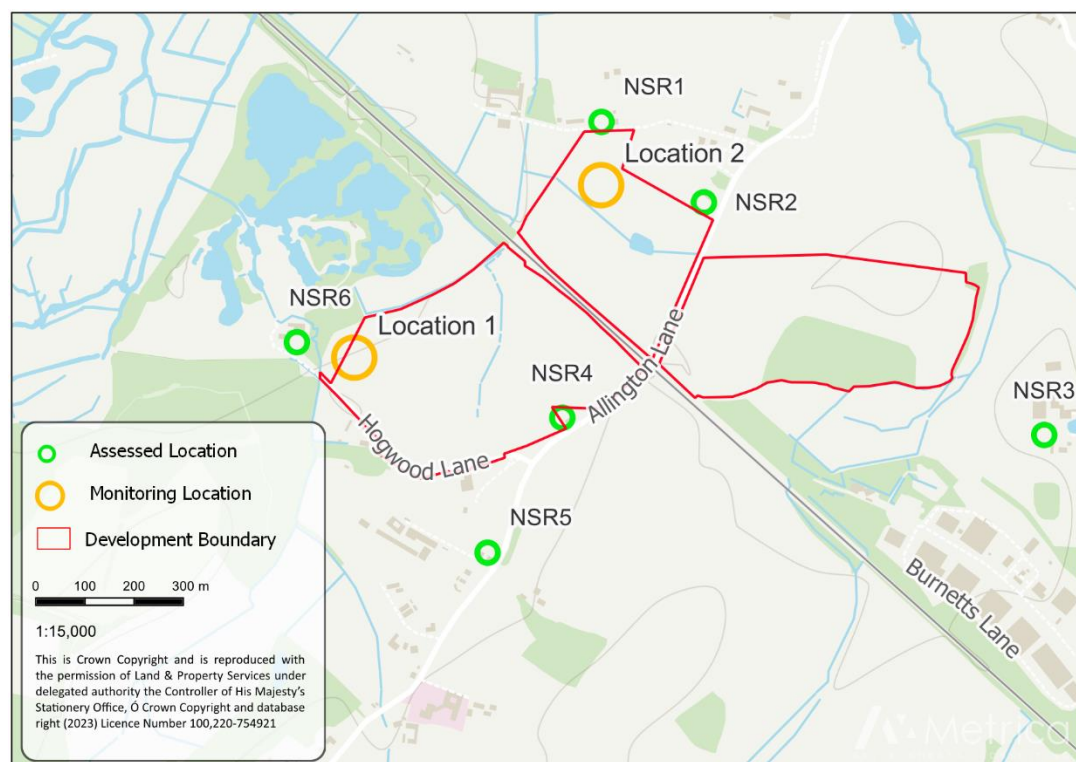
EBC's Environmental Health Officer (EHO) agreed that the assessment should be undertaken according to BS 4142 and the approach to the survey, however they suggested that their standard approach is for a target level of 10 dB below the background sound level.

5 BASELINE SURVEY

To establish the background noise environment in the locality of the Development, monitoring was undertaken at two locations representative of the nearest NSRs for a period of approximately 24 hours.

Figure 1 shows the location of the closest noise sensitive receptors, the background monitoring locations and the assessment locations.

Figure 1: Monitoring and Assessment Locations



With regard to Monitoring Location 1, in order to ensure background noise levels were conservatively representative of NSR 4, NSR 5 and NSR 6, monitoring equipment was installed at a similar or greater distance from the main noise sources. It is notable that NSR 4 and NSR 5 are closer to Allington Lane than the monitoring location, and as such in practice background noise levels will be higher at these locations than Monitoring Location 1.

The noise monitoring undertaken at Location 2 is representative of NSR 1, NSR 2 and NSR 3, being a similar distance from local noise sources.

The monitoring equipment consisted of two Class 1 sound level meters, calibrated to UKAS 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 $L_{A90,15\text{mins}}$ (i.e., the background sound level).

A weather station was installed at Location 2 to measure wind speeds and rain data throughout the survey period. No rain occurred during the survey, and wind speeds remained below 5 m/s throughout. As such no data has been omitted as part of the data analysis.

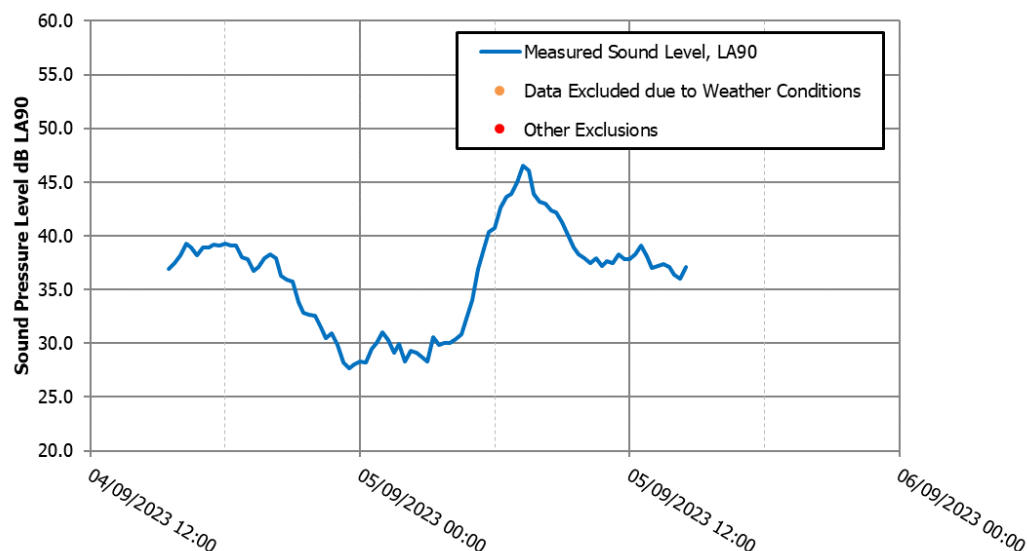
Survey record sheets, including photographs of the equipment in situ, are presented in Appendix 2.

6 SURVEY RESULTS

6.1 LOCATION 1

Chart 1 provides a summary of background noise levels during the survey period at Location 1, detailing $L_{A90,15\text{min}}$ sound levels.

Chart 1: Background Noise Survey Time History: Location 1



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, mode etc.). To determine the prevailing background noise level for the purposes of this assessment, Charts 2 -3 present the range of $L_{A90,15\text{min}}$ 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 $L_{A90,15\text{min}}$ 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 $L_{A90,15\text{min}}$ for both daytime and night-time periods is a conservative approach, as $L_{A90,15\text{min}}$ values are more sensitive to short-term noise events.

Chart 2: Daytime Background Statistical Analysis (0700 – 2300)– Location 1

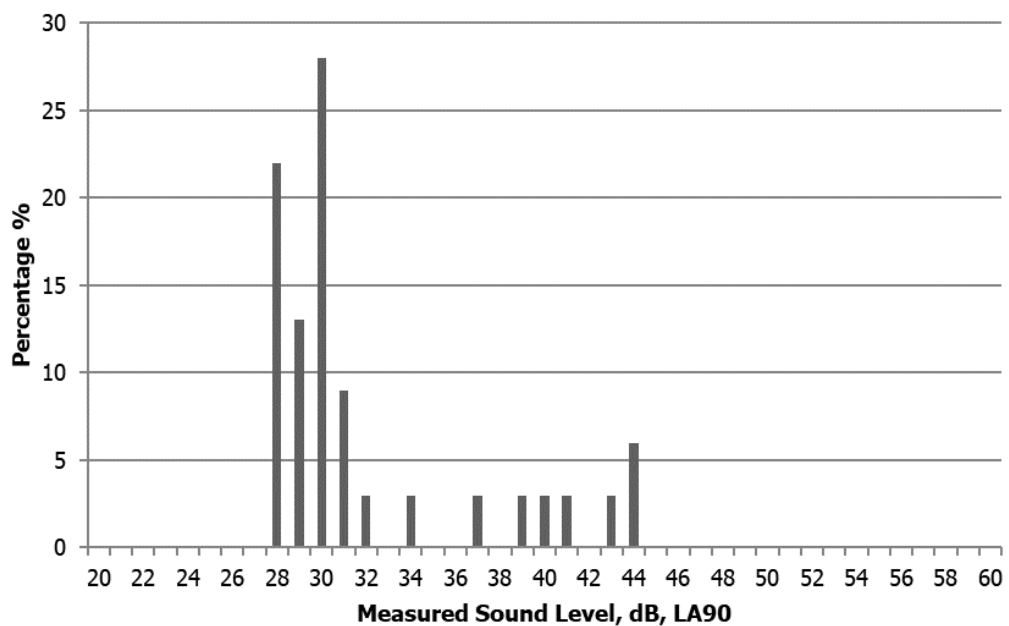


Table 2 presents the mean, median and mode averages of the above dataset.

Table 2: Daytime Background Noise Results

Mean	Median	Mode	Representative
38	38	38	38

Based upon the results in Table 2, along with the spread of data in Chart 2, a daytime background noise level of 38 dB L_{A90} is considered appropriate for the purposes of this assessment.

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

Table 3 presents the mean, median and mode averages of the night-time dataset.

Table 3: Night-time background noise results

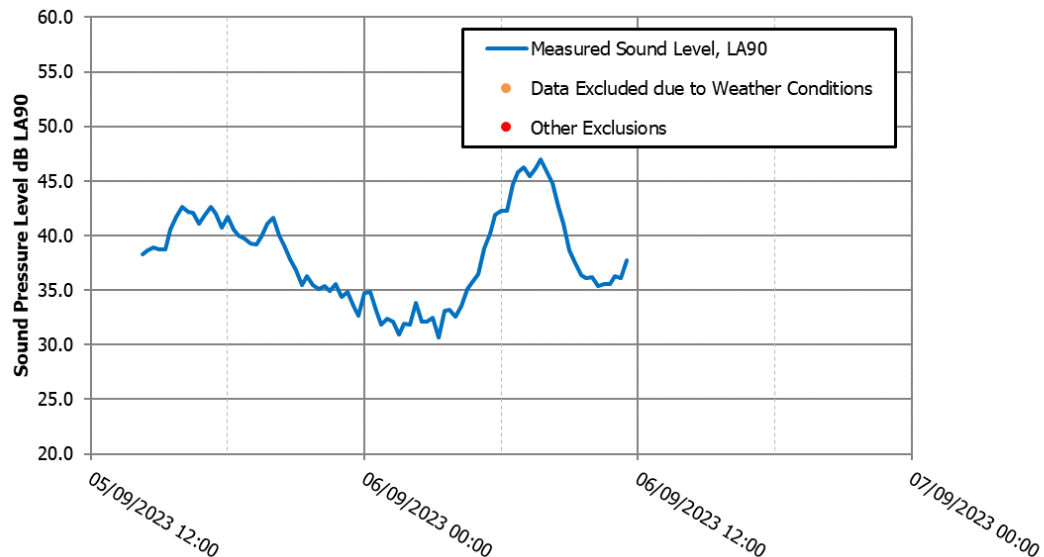
Mean	Median	Mode	Representative
30	36	32	30

Based upon the results in Table 3, along with the spread of data in Chart 3, a night-time background noise level of 30 dB L_{A90} is considered appropriate for the purposes of this assessment.

6.2 LOCATION 2

Chart 4 provides $L_{A90,15min}$ levels measured at Location 2.

Chart 4: Background Noise Survey Time History: Location 2



Charts 5 - 6 overleaf present the range of $L_{A90,15min}$ noise levels recorded at Location 2 during daytime and night-time periods.

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

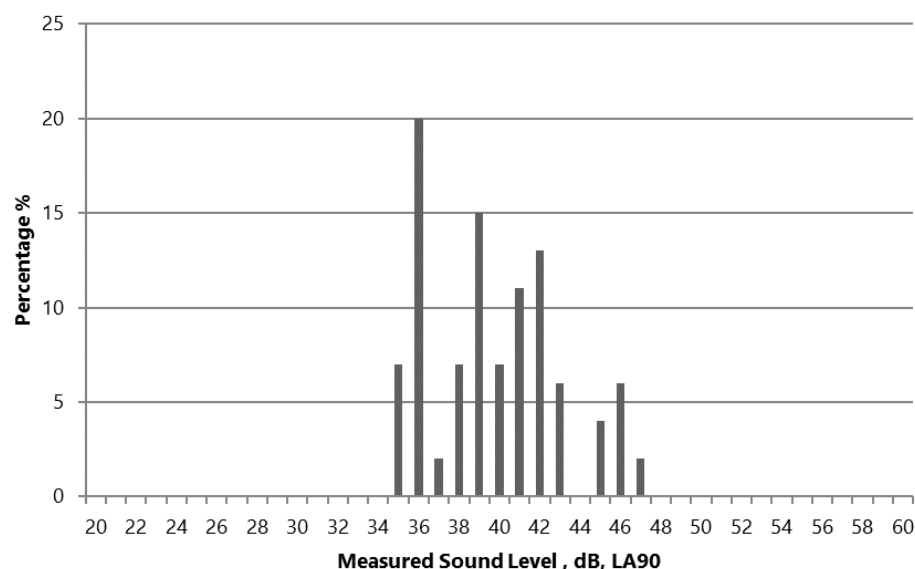


Table 4 presents the mean, median and mode averages of the above dataset.

Table 4: Daytime background noise results

Mean	Median	Mode	Representative
36	39	40	36

Based upon the results in Table 4, along with the spread of data in Chart 5, a daytime background noise level of 36 dB L_{A90} is considered appropriate for the purposes of this assessment.

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

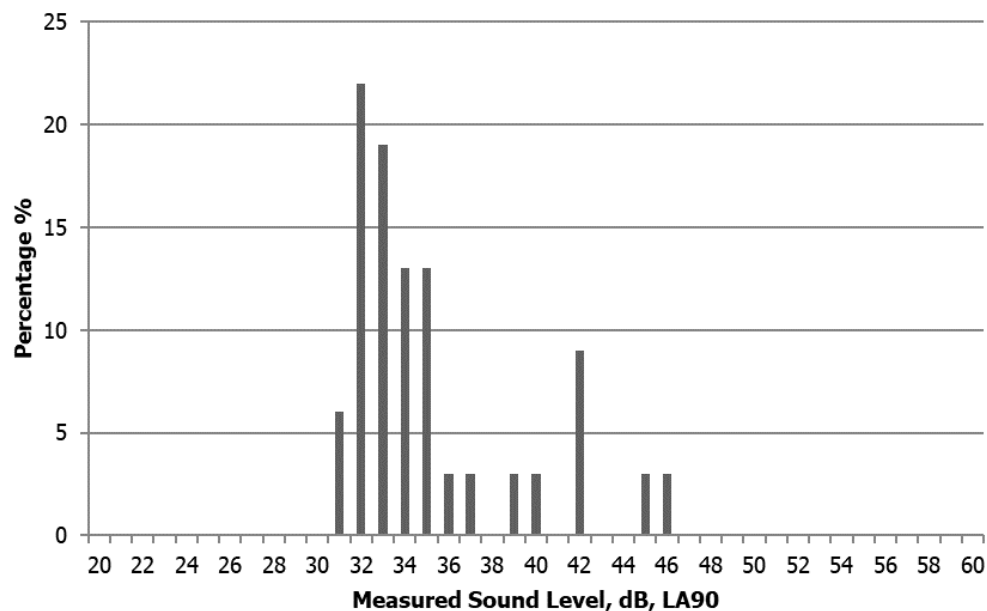


Table 5 presents the mean, median and mode averages of the above dataset.

Table 5: Night-time background noise results

Mean	Median	Mode	Representative
32	34	35	32

Based upon the results in Table 5, along with the spread of data in Chart 6, a night-time background noise level of 32 dB L_{A90} is considered appropriate.

7 NOISE MODELLING

The Development consists of the following noise sources:

- ◆ 1x Auxiliary Transformer;
- ◆ 16x Battery Storage Containers;
- ◆ 4x PCSK Inverter Units; and
- ◆ 6 x Array Inverter / Transformers.

Additional infrastructure includes customer and DNO substations, communication buildings, storage buildings and containers, battery interface cabinets and HV switchgear units. 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 has been specified by the Client, based on similar BESS / solar developments. The actual plant ultimately chosen for installation is yet

to be finalised, however these will be selected to comply with any noise limits specified in the Development's planning conditions.

The level of noise emitted by the Development will be related to both the intensity of light incident upon the solar panels and the air temperature. It is therefore anticipated that noise from the Development will be negligible for much of the time, particularly during night-time periods. However, as a worst-case approach, all plant is assumed to be operating simultaneously, at full power, during both daytime and night-time periods.

7.1 NOISE EMISSION DATA

The sound power levels of the plant included in the noise model are included in Table 6.

Table 6: Equipment Sound Power Levels

	Sound Power Level, dB, LwA	Octave Band Centre Frequency, Hz, dB(A)							
		63	125	250	500	1000	2000	4000	8000
Battery Container (long side)	74	42	61	58	65	65	68	69	62
Battery Container (short sides)	68	36	55	52	59	59	52	53	56
Auxiliary Transformer	76	55	55	68	73	70	67	61	52
PCSK Inverter	91	72	83	86	85	84	81	75	70
Solar Inverter	91	72	83	86	85	84	81	75	70

It should be noted that the sound power levels presented above are the maximum noise levels emitted from the plant operating at full capacity, which is unlikely to be the case in practice. While the batteries and PCSK inverters can operate at maximum capacity on demand, the typical operating mode is at around half-load capacity. As such, undertaking modelling based on the levels in Table 6 represents a worst-case scenario.

7.2 MODELLING PARAMETERS

The Specific sound level at the nearest NSRs has been calculated in SoundPlan software, using the environmental noise propagation model ISO 9613-2:1996 - Acoustics, 'Attenuation of sound during propagation outdoors – Part 2: General method of calculation'.

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 battery compound area, G=1 (soft ground) for all other areas;
- ◆ A receiver height of 1.5 m (approximating head height at the closest external façade of each assessed dwelling for BS 4142 assessment) and 4 m (on façade of NSRs for NR20 assessment);
- ◆ All plant operating simultaneously at full capacity;

- ◆ Includes local terrain and buildings;
- ◆ Transformer modelled as a point source at a height of 4 m;
- ◆ Inverters modelled as point sources at a height of 1.5 m; and
- ◆ Battery containers and inverters modelled as building area sources scaled to the respective dimensions of each unit.

In the interest of completeness, solar panels have been modelled as 2.2 m high noise barriers set 0.8 m above ground level. It should be noted that most panels will be larger than this, so the noise model is considered a worst case.

Grid references for the nearest NSRs are provided in Table 7 and can be seen in Figure 1. On the basis that noise is acceptable at these locations, it will also be acceptable at other NSRs located further from the Development.

Table 7: Assessed Receptors

Receptor Name	Easting	Northing	Representative Background
NSR1	447602	117223	Location 2
NSR2	447875	117064	Location 2
NSR3	448547	116600	Location 2
NSR4	447578	116648	Location 1
NSR5	447418	116353	Location 1
NSR6	447047	116787	Location 1

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 Development;
- ◆ Tonal Elements: Based upon substantial prior experience of operational BESS developments, the overall noise produced by such developments is broadband in nature and therefore non-tonal;
- ◆ Intermittency: While certain plant will 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 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 close to existing commercial and transportation noise sources. It is therefore considered that the Development will not be distinctive against the existing acoustic environment, and no correction for distinctiveness is required.

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

8 ASSESSMENT OF IMPACT

8.1 BS4142 ASSESSMENT

An assessment of the likely impact has been made based upon the difference between the Rating Levels and prevailing background levels for daytime periods and night-time periods, at each assessed NSR.

Table 8 presents an assessment of the impact at the six closest NSRs based upon the difference between the predicted Rating and Background noise levels detailed in Section 6.

Table 8: Assessment of Impact

Receptor	Specific Noise Level, dB(A)	Rating Level, dB(A)	Background Noise Level, dB, L _{A90}		Difference, dB	
			Day	Night	Day	Night
NSR1	31	31	36	32	-5	-1
NSR2	31	31	36	32	-5	-1
NSR3	22	22	36	32	-14	-10
NSR4	33	33	38	30	-5	3
NSR5	33	33	38	30	-5	3
NSR6	33	33	38	30	-5	3

As Table 8 shows, Rating levels do not exceed the representative background levels at any NSR during daytime periods, and do not exceed 5 dB above background (i.e the onset of Adverse Impacts in terms of BS4142) during night-time periods.

As noted in Section 3, BS 4142 states that the difference by which the Rating level exceeds the background level is an initial assessment which can be modified depending on the context of the Development.

8.1.1 Context

The Development is located in a semi-urban environment, and as demonstrated in Section 6, exiting noise levels during daytime periods in the area are dominated by transportation noise sources. In addition, there are a number of existing industrial noise sources surrounding the Development as noted in Section 2.

As such, it is considered that the Development is not out of context for the area and will not change the character of the existing acoustic environment. On this basis, the area is less sensitive to noise from the Development than would otherwise be the case.

8.1.2 Uncertainty

Background noise monitoring was undertaken at two locations conservatively representative of nearby receptors for a period of 24 hours to minimise uncertainty. As a worst-case assumption, background levels measured at Location 1 have been conservatively considered representative of NSR4 and NSR5, which are located closer to Allington Road. In practice it is anticipated that background levels at most receptors will be higher than those assumed as part of this assessment.

Modelling of the proposed plant has been undertaken on a worst-case basis, assuming all plant is operating simultaneously and at maximum power during both daytime and night-time

periods. Whilst this is theoretically possible, the maximum noise level for the solar inverter and PCSK inverter is only likely to occur if the ambient temperature exceeds 40 °C. Such high air temperatures are very unlikely to occur in practice, and fans are likely to operate at slower speeds or switched off altogether, particularly during night-time periods.

Given the conservative approach, any uncertainties inherent in the assessment will have no material effect on the findings of the assessment.

8.2 NR ASSESSMENT

An assessment relative to NR20 has been undertaken at all noise sensitive receptors.

The assessment accounts for an open window attenuation of 15 dB, which is taken from research undertaken by Napier University². The research shows that typical attenuation of slightly open or tilted windows ranges from 14 dB to 19 dB on average. A 15 dB attenuation has been applied for the purposes of this assessment.

Tables 9 – 16 (over) present the predicted noise level on the worst-case façade of each NSR, the resulting internal noise level accounting for a 15 dB reduction, and the headroom between the predicted internal noise levels and NR 20 values.

Table 9: NSR 1 NR Assessment

NSR1	Octave Band Centre Frequency, Hz, dB(A)							
	63	125	250	500	1000	2000	4000	8000
Predicted Façade Level, dB	44	40	31	26	24	19	8	0
Window Attenuation, dB	-15	-15	-15	-15	-15	-15	-15	-15
Resulting Internal Level	29	25	16	10	9	4	-	-
Difference to NR20	-22	-14	-15	-14	-11	-13	-	-

Table 10: NSR 2 NR Assessment

NSR2	Octave Band Centre Frequency, Hz, dB(A)							
	63	125	250	500	1000	2000	4000	8000
Predicted Façade Level, dB	47	39	30	23	24	19	6	0
Window Attenuation, dB	-15	-15	-15	-15	-15	-15	-15	-15
Resulting Internal Level	32	24	15	8	9	4	-	-
Difference to NR20	-19	-15	-16	-16	-11	-13	-	-

Table 11: NSR 3 NR Assessment

NSR3	Octave Band Centre Frequency, Hz, dB(A)							
	63	125	250	500	1000	2000	4000	8000
Predicted Façade Level, dB	42	31	24	18	18	12	0	0
Window Attenuation, dB	-15	-15	-15	-15	-15	-15	-15	-15
Resulting Internal Level	24	16	9	3	3	-	-	-
Difference to NR20	-24	-23	-22	-21	-17	-	-	-

² NANR116: 'Open/Closed Window Research – Sound Insulation Through Ventilated Domestic Windows: Napier University 2007

Table 12: NSR 4 NR Assessment

NSR4	Octave Band Centre Frequency, Hz, dB(A)							
	63	125	250	500	1000	2000	4000	8000
Predicted Façade Level, dB	48	43	35	29	28	23	11	0
Window Attenuation, dB	-15	-15	-15	-15	-15	-15	-15	-15
Resulting Internal Level	33	28	20	14	13	8	-	-
Difference to NR20	-18	-11	-11	-10	-7	-9	-	-

Table 13: NSR 5 NR Assessment

NSR5	Octave Band Centre Frequency, Hz, dB(A)							
	63	125	250	500	1000	2000	4000	8000
Predicted Façade Level, dB	49	43	36	31	29	26	16	0
Window Attenuation, dB	-15	-15	-15	-15	-15	-15	-15	-15
Resulting Internal Level	34	28	21	16	14	11	1	-
Difference to NR20	-17	-11	-10	-8	-6	-6	-13	-

Table 14: NSR 6 NR Assessment

NSR6	Octave Band Centre Frequency, Hz, dB(A)							
	63	125	250	500	1000	2000	4000	8000
Predicted Façade Level, dB	47	42	34	29	26	22	13	0
Window Attenuation, dB	-15	-15	-15	-15	-15	-15	-15	-15
Resulting Internal Level	32	27	19	14	11	7	-	-
Difference to NR20	-19	-12	-12	-10	-9	-10	-	-

As can be seen, the predicted noise levels at all receptors are substantially lower than NR20.

8.3 DISCUSSION

As discussed in Section 3.3, BS 4142 presents a methodology in which an initial assessment is undertaken by comparing the predicted Rating noise level and the representative background noise levels. This initial assessment can then be modified depending on the context of the Development.

The worst case predicted daytime noise level is 5 dB below the background noise level. As noted in BS 4142... *"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."* Given the presence of existing commercial noise sources, as well as nearby roads, rail and aircraft sound sources, it is considered that the Development is not out of context for the area.

During night-time periods, noise levels are up to 3 dB above the worst case (lowest) background noise levels. In terms of BS 4142, this is below the level of Adverse impact, depending on the context. As noted above, the Development is not out of context for the area. It is also important to note that the night-time predictions are worst case, assuming all plant is operating simultaneously and at maximum power during night-time periods, which is highly unlikely to occur in practice. In practice, it is likely that during night-time periods ambient temperatures will be such that cooling fans will operate at slower speeds or be switched off altogether.

Given the above, the impact of the Development on the nearest NSR is considered to be Low in terms of BS 4142 during both daytime and night-time periods.

BS 4142 states that where the background levels are low, alternative assessment methods can be used, particularly during night-time periods. As such, an internal assessment of noise within the NSRs has been undertaken. An internal level of NR20 is typically used to assess noise within bedrooms to ensure sleep disturbance is avoided. As indicated in Tables 9 – 14, the predicted noise levels are substantially (at least 6 dB) below NR20 at all receptors, assuming an open window for ventilation.

9 CONCLUSION

Metrica was commissioned by Locogen Consulting Ltd to undertake a Noise Impact Assessment in relation to the Allington Solar Farm development.

An assessment of noise has been undertaken in accordance with BS 4142. Noise due to the Development does not exceed more than 5 dB above background levels during daytime or night-time periods, and as such will result in a Low impact in terms of BS 4142.

As advocated by BS4142, an NR assessment of predicted internal noise levels was also undertaken during night-time periods. The assessment shows that predicted internal noise levels are comfortably compliant with NR20.

Based on the above, 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.

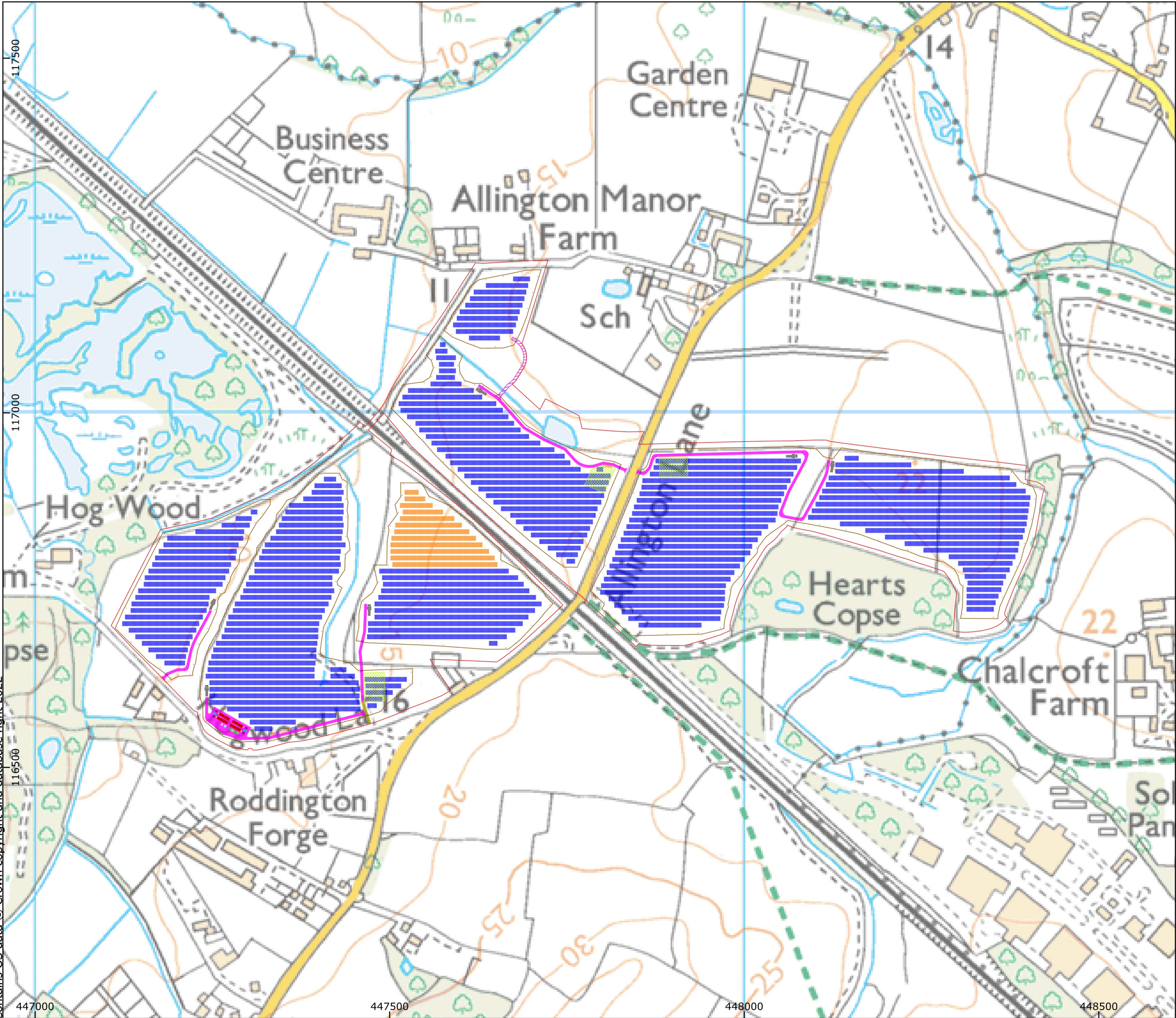
Sound pressure (P): The fluctuations in pressure relative to atmospheric pressure, measured in Pascals (Pa).

Sound pressure level (L_p): Sound pressure measured on the decibel scale, relative to a sound pressure of 2×10^{-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.

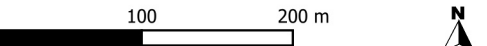
APPENDIX 1: DEVELOPMENT LAYOUT

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Company Number: SC521030; VAT Number: 228851291

- Legend
- Planning Boundary
 - Panels (3.2m)
 - Panels (3.6m)
 - Access Track
 - Temporary Access Track
 - Existing Access Track to be Upgraded
 - Security Fencing
 - Access Gates
 - CCTV
 - Customer Substation
 - DNO Substation
 - Storage Building
 - Communication Building
 - Storage Container
 - Inverter and Transformer Stations
 - Battery Container
 - Battery Interface Cabinet (BIC)
 - Transformer Switch Gear Unit
 - PCSK
 - HV Switchgear & Control Room
 - Auxiliary Transformer
 - Meter Box
 - Temporary Compound



A3 Horizontal Scale 1:5,000

CRS: British National Grid (EPSG:27700)

Produced: Emma Ballantyne
Reviewed: Brendan Mackinnon
Approved: Brendan Mackinnon

Date: 09/11/23 Revision: 5.0

8121-DRW-DES-0001-Layout Plan-v5.0

Allington Lane Solar Farm
Layout Plan

Locogen Consulting Ltd

APPENDIX 2: SURVEY RECORD SHEETS

Project No.	0170	Project Name:	Allington Solar
Location Number	1	Installed By:	MD
Grid Reference	447161 116784	Location Name	Hogwood Lane
Start Date	04/09/2023	Start Time	1530

Equipment Details	Make/Model	Serial No.
Sound Level Meter:	NL52	SN 721025
Calibrator:	NC 74	35024443
Source of Equipment:	MD	
Meter Timestamp (Start/End, GMT/BST):	BST	

Description of Location	In field close to Hogwood lane
Distance from Façade	N/A
Noise Sources Observed	Trains, road traffic noise, plant / activity on Hogwood Lane, aircraft
Weather Conditions	Warm, clear skies, very gentle breeze

Set-Up / Visit 1

Date	04/09/2023	Time	1530
Filename	0101	Calibration Level	94.0
Range	20-120	Measurement Index	15 min
Frequency Weighting	N	Weather Monitoring?	Y
Lp Logging?	Y	Audio / Octave Bands?	N
Additional Notes			

Visit 2

Date	05/09/2023	Time	1435
Visited by	MD	Calibration Level	94.0
Level Pre-Calibration	94.0	Batteries Replaced?	N
Equipment Removed?	Y		
Additional Notes			



Project No.	0170	Project Name:	Allington Solar
Location Number	2	Installed By:	MD
Grid Reference	447161 116784	Location Name	Allington Lane
Start Date	05/09/2023	Start Time	1415

Equipment Details	Make/Model	Serial No.
Sound Level Meter:	NL52	SN 721025
Calibrator:	NC 74	35024443
Source of Equipment:	MD	
Meter Timestamp (Start/End, GMT/BST):	BST	

Description of Location	In field close to Allington Lane. Representative of northern receptors
Distance from Façade	N/A
Noise Sources Observed	Trains, road traffic noise, aircraft
Weather Conditions	Warm, clear skies, very gentle breeze

Set-Up / Visit 1

Date	05/09/2023	Time	1415
Filename	0201	Calibration Level	94.0
Range	20-120	Measurement Index	15 min
Frequency Weighting	N	Weather Monitoring?	Y
Lp Logging?	Y	Audio / Octave Bands?	N
Additional Notes			

Visit 2

Date	06/09/2023	Time	1130
Visited by	MD	Calibration Level	94.0
Level Pre-Calibration	94.0	Batteries Replaced?	N
Equipment Removed?	Y		
Additional Notes			

