RSK Acoustics

Econergy International Ltd.

Solar Farm on Land South of Berrington, Shrewsbury (Solar PV Development)

Report 2061013-RSK-RP-001(02)

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Solar Farm on Land South of Berrington, Shrewsbury (Solar PV Development)

Introduction

1 Overview

1.1 RSK Acoustics (RSKA) has been instructed by ADAS Planning, on behalf of Econergy International Ltd. to undertake a noise assessment to evaluate the operational and construction impact of a proposed 30 MW solar photovoltaic (PV) development on two adjacent fields south of the village of Berrington, Shrewsbury.

1.2 The assessment benefits from a baseline noise survey, undertaken at positions representative of nearest noise sensitive receptors, to determine typical background noise levels during both daytime and night-time periods.

1.3 This report describes the assessment methodology and the baseline conditions currently prevailing across the application site to evaluate the suitability of the proposed development.

2 Objectives

2.1 The aim of this noise assessment is to:

a. Quantify and report the prevailing noise climate at nearest receptors to the development;

b. Present relevant impact assessment thresholds from local and national guidelines;

c. Predict the construction and operational noise from the development at nearest receptors;

d. Assess predicted noise levels against the relevant noise impact thresholds; and

e. Specify noise mitigation measures where necessary.

3 Exclusions

3.1 Operational traffic movements from the development have not been determined; however, given the type of operation, operational traffic movements from vehicles entering and exiting the site are not likely to have a significant impact on existing flows across the local network. Impacts from development related traffic have therefore not been quantified.

3.2 Vibration generation from the development (operational and construction) and its impact on nearby residents would be minimal and therefore has been discounted from the assessment.

4 Noise Policy Statement for England (NPSE): 2010

4.1 The Noise Policy Statement for England is published by the Department for Environment, Food and Rural Affairs (Defra) and sets out the approach to noise within the Government's sustainable development strategy.

4.2 The significance of impacts from noise within the NPSE are defined as follows:

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

4.3 The three aims of the NPSE are stated as:

"Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

"Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

"Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

5 National Planning Policy Framework (NPPF): 2021

5.1 Since its publication by the Department for Environment, Food and Rural Affairs in 2010 the Noise Policy Statement for England (NPSE) has been the Central Government noise policy that has been available to inform the consideration of environmental noise in relation to the consenting of everything from small scale residential development to national infrastructure. The National Policy Planning Framework (NPPF), as updated by the Ministry of Housing, Communities and Local Government in 2021, has noise aims that are consistent with NPSE.

5.2 The noise policy aims as stated in NPSE are:

Noise Policy Aims

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

- **avoid significant adverse impacts on health and quality of life;**
- **mitigate and minimise adverse impacts on health and quality of life; and**
- **where possible, contribute to the improvement of health and quality of life.**

5.3 In order to translate these aims into practical guidance the NPSE uses the same terminology as used by the World Health Organisation (WHO), in the Night Noise Guidelines for Europe, 2009 by referring to the Lowest Observed Adverse Effect Level (LOAEL). The NPSE extends this concept to define the level above which significant adverse effects on health and quality of life can be detected, hence the Significant Observed Adverse Effect Level (SOAEL).

5.4 The NPSE notes "*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 second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

5.5 Not having quantified effect thresholds in the NPSE means that relevant standards and guidance are used to put forward values for the LOAEL and SOAEL for the proposed development under consideration.

5.6 The NPPF states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by […] preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

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

6 BS 7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'

6.1 The three-part standard BS 7445 provides the framework within which environmental noise should be quantified. Part 1 provides a guide to quantities and procedures and Part 2 provides a guide to the acquisition of data pertinent to land use. Part 3 provides a guide to the application of noise limits.

6.2 BS 7445 also refers to a further standard, BS EN 61672, which prescribes the equipment necessary for such measurements. Whilst BS 7445 does not prescribe the meteorological conditions under which noise measurements should or should not be taken, it does (part 2, paragraph 5.4.3.3) recommend that in order:

"…to facilitate the comparison of results (measurements of noise from different sources), it may be necessary to carry out measurements under selected meteorological conditions which are reproducible and correspond to quite stable propagation conditions."

6.3 These conditions include:

- Wind speed not exceeding 5 m/s (measured at a height of 3 to 11 m above the ground);
- No strong temperature inversions near the ground; and
- No heavy precipitation.

7 BS5228-1:2009 + A1:2014 'Code of practice for noise and vibration control on construction and open sites - Noise'

7.1 This Standard sets out techniques to predict and assess the likely noise effects from construction works, based on detailed information on the type and number of plant items being used, their location, and the length of time they are in operation.

7.2 The standard provides example criteria for the assessment of the significance of noise effects. Such criteria are concerned with fixed noise limits and changes in ambient noise levels. Annex E of BS 5228 provides guidance on how to assess the significance of construction noise on residential and commercial sensitive receptors. Section E.3 details 'The ABC Method', which describes criteria for assessment based on noise being of significant level when exceeding absolute limit levels.

Assessment category and threshold value period (L_{Aeq})	Threshold value (dB(A))		
	Category A (A)	Category B (B)	Category C (C)
Night-time (23.00 – 07.00)	45	50	55
Evening and weekends (D)	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00)	65	70	75

NOTE 1 A significant effect has been deemed to occur if the L_{Aeq} noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise levels is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due site noise.

NOTE 3 Applied to residential receptors only.

A Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB(A)) are less than these values

B Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as the category A values

C Category C: Threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D 19.00 – 23.00 weekdays, 13.00-23.00 Saturdays and 07.00 – 23.00 Sundays.

Table 7.1 – Threshold of significance effect at dwellings (BS 5228 Table E.1)

8 BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

8.1 BS 4142:2014+A1:2019 describes the methods for rating and assessing noise of an industrial or commercial nature applicable for the purpose of assessing sound at existing dwellings, through the determination of a rating level of an industrial or commercial noise source. The standard includes the following:

- Sound for industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from the premises or processes, such as that from forklift trucks, or that from train of ship movements on or around an industrial and/or commercial site.

8.2 Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment. The difference between the background noise level and the noise rating (including any penalties) is then calculated.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of adverse impact depending on the context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

8.3 As indicated above, the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. BS4142 states than '*An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context*'.

8.4 Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level;

- The character and level of the residual sound; and
- The sensitivity of the receptor and whether dwellings will already (or likely) to incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as: i) façade insulation treatments, ii) ventilation and/or cooling, and iii) acoustic screening.

9 World Health Organisation Guidelines for Community Noise, 1999

9.1 The World Health Organisation (WHO) Guidelines for Community Noise was published in 1999 as a response to a need for action together with a generic need for improvements in legislation at a national level. Although not legislation, this document provides general guidance and guidelines which have been set for different health effects, using the lowest noise level that produces an adverse health effect in specific human environments.

9.2 The guideline levels which are relevant to this assessment are set out in Table 9.1 below:

Specific Environment	Critical health effect(s)	$L_{Aeq,T}$ (dB)	Time base, T (hours)	$L_{AF,max}$ (dB)
Outdoor Living Area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50		
Dining	Speech intelligibility and moderate annoyance, daytime and evening	35	-	-
Dwelling, indoors	Sleep disturbance, night-time	30	16	-
Inside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	45[(a)]

(a) Should not exceed 45 dB L_{AFmax} more than 10-15 times a night

Table 9.1 – WHO Guidelines for community noise levels

10 Local Council Criteria

10.1 Pre-application planning advice has been provided by Shropshire Council, under reference PREAPP/22/00002. Section 8 of the document provides criteria relating to noise:

"A number of residential properties are located within 500m of the site boundary though these are generally screened by topography and / or vegetation. It is recommended that stand offs between inverters and these properties are maximised. Any application should include an

assessment of the potential impact of inverter / cooling fan noise on residential amenities. The objective should be to ensure that such noise does not exceed a level of background plus 5 decibels at any sensitive receptor location at any time. This is the threshold below which BS4142 suggests that noise complaints would be less likely. Inverter vents should ideally be oriented away from the nearest properties. The inverters should be positioned behind solar arrays relative to nearest properties to maximise acoustic attenuation."

Proposed Development

11 Site Location and Description

11.1 The proposed development site is located just outside the village of Berrington, approximately 1.2 km southwest from Cross Houses in the rural outskirts of Shrewsbury. The site currently comprises agricultural fields which are bounded by Cliff Hollow road to the north of the site and small country lanes around the east and west perimeter. Cound Brook flows approximately 100 m south of the southern boundary and continues under Cantlop Bridge and into Boreton where it boarders the existing Condover Solar Farm approximately 800 m to the west. East of the proposed development is currently occupied by further agricultural land and farms with the nearest busy road being the A458 that is approximately 1.4 km northeast from the eastern boundary.

11.2 The town centre of Shrewsbury is approximately 6.2 km north-west from the boundary of the proposed development.

12 Development Proposals

12.1 The proposals include the installation of photovoltaic (PV) panels with a total capacity up to 30 MW, mounted to frames which would have a maximum height above ground level of 2.6 m. Appendix A presents the proposed site layout.

12.2 The plant shall be capable of operating for a continuous period, with the potential to operate for 24 hours. The proposals consist of the following elements:

- Inverter stations positioned within the solar panel arrays;
- MV Power Stations;
- A sub-station;
- Storage containers;
- Temporary welfare cabins; and
- Security fencing.

13 Existing Receptors

13.1 Based on aerial imagery and site attendance, the following receptors have been used for assessment purposes. Receptors have been chosen based on their proximity to the development and where necessary, representative of a wider series of receptors within a settlement.

13.2 A table and map showing the wider site boundary and location of the sensitive receptors considered in the assessment are presented in Table 13.1 and Figure 13.1 overleaf.

Ref.	Receptor Name	Receptor type	Distance from development boundary (metres approx.)
R1	1 & 2 Smithy	Residential	215 north-east
R2	The Rectory	Residential	310 north
R3	Newman's Hall Cottage	Residential	135 south-east
R4	Cantlop Mill	Residential	45 south
R5	Boreton Lodge	Residential	475 west
R6	Cliffe House	Residential	115 north-west

Table 13.1 – Assessment receptor locations

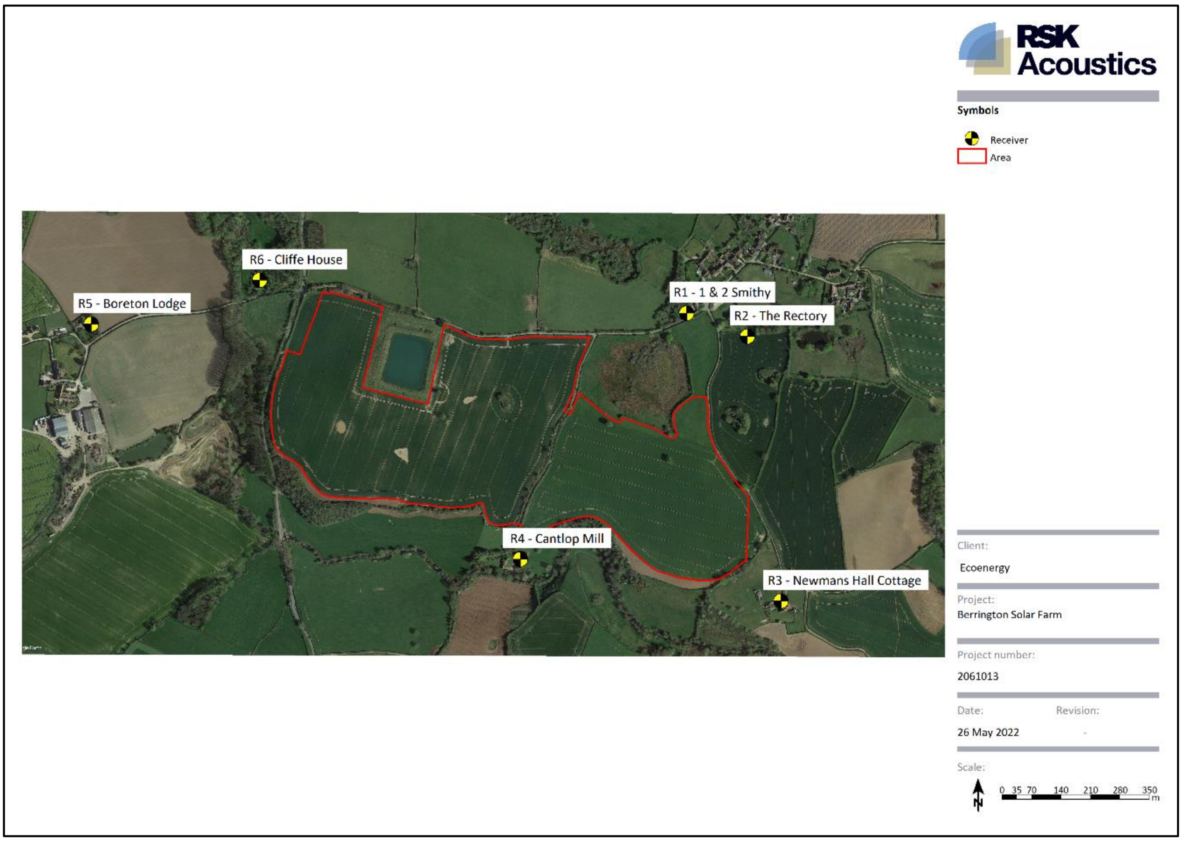


Figure 13.1 – Site location map and assessment receptors

14 Survey Measurement Details

14.1 A baseline noise survey was undertaken from Thursday 21 April to Tuesday 26 April 2022 with the collection of continuous data at three unattended monitoring locations namely UL2, UL3 and UL4. Due to site restrictions at the time of the assessment period consisting in the presence of cattle, a further noise survey was undertaken between Friday 13 May and Wednesday 18 May 2022 to capture background levels at a fourth location namely UL1. The survey was undertaken over a representative midweek and weekend period to address typical fluctuations of the local noise environment.

14.2 Positions were selected by considering the site constraints, security and accessibility of the monitoring equipment. It was not possible to install the noise meters within the demise of the nearest sensitive receptors and therefore positions were chosen based on their proximity to the receptors. Observations made during installation and collection determined that the noise environment at the monitoring positions was consistent with the nearest receptor locations. A description of the measurement position and rationale is provided in Table 14.1 below:

Measurement Location ref.	Type	Location	Rationale
UL1	Unattended	North-east of the site	To quantify existing ambient and background noise from surrounding transportation sources and agricultural activity.
UL2	Unattended	South-east boundary of the site	
UL3	Unattended	South boundary of the site	
UL4	Unattended	North-west of the site	

Table 14.1 – Measurement Location Details

14.3 Table 14.2 below describes the chosen representative measurement location to each receptor considering the surrounding noise sources, with Figure 14.1 showing the locations of the measurement locations.

Reference	Receptor Name	Representative unattended measurement location
R1	1 & 2 Smithy	UL1
R2	The Rectory	UL1
R3	Newman's Hall Cottage	UL2
R4	Cantlop Mill	UL3
R5	Boreton Lodge	UL4
R6	Cliffe House	UL4

Table 14.2 – Representative measurement location to each receptor

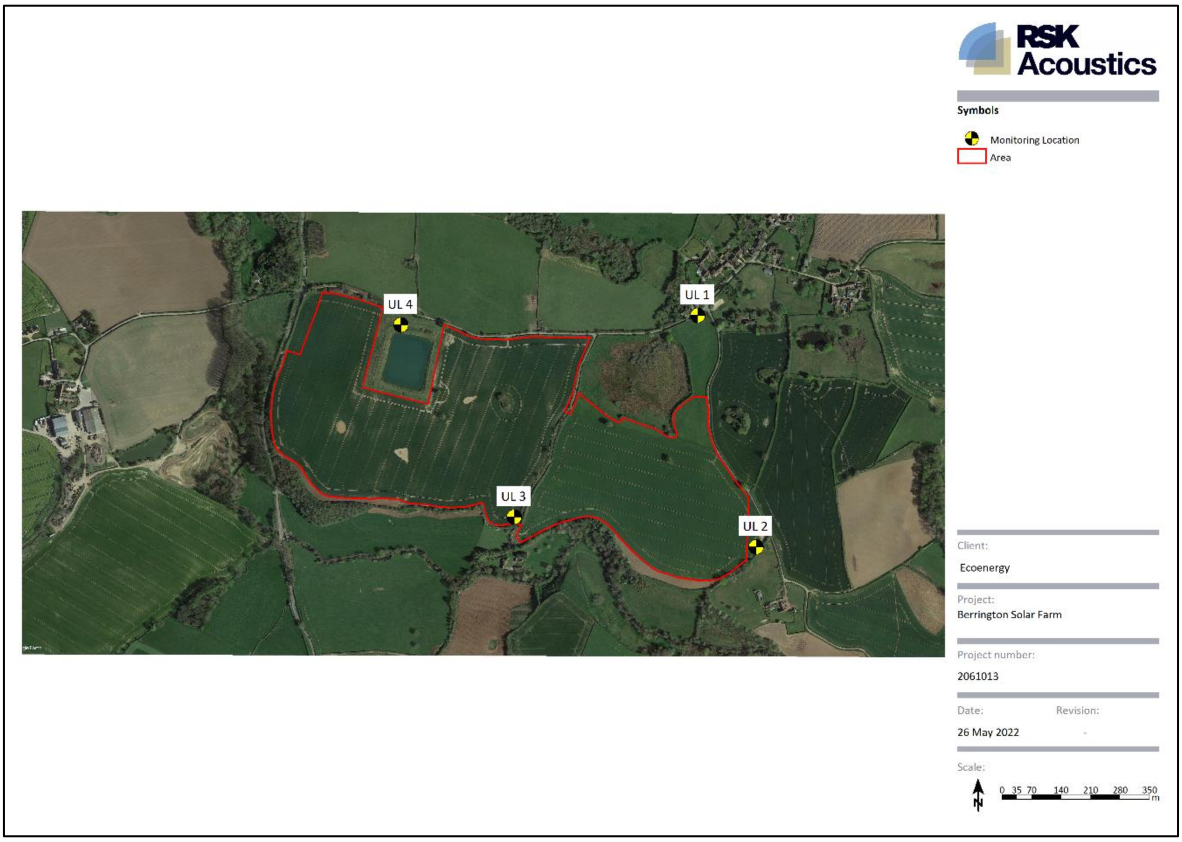


Figure 14.1 – Baseline monitoring locations

15 Survey Observations

15.1 The noise environment across the site was observed and comprised the following during the equipment installation and retrieval:

- Distant road noise along the local road network;
- Occasional overhead aircraft;
- Wind through surrounding trees and shrubbery;
- Bird song; and
- Agricultural plant in nearby fields.

16 Survey Equipment

16.1 Noise monitoring was undertaken using the following equipment, detailed in Table 16.1:

Equipment	Type	Serial Number	Calibration due date
Class 1 sound level meter	01dB Fusion	14023	15 June 2023
Class 1 sound level meter	Rion NL-52	00876025	16 November 2023
Class 1 sound level meter	Rion NL-52	00976251	20 September 2023
Class 1 sound level meter	Rion NL-52	01043374	19 April 2023
Acoustic calibrator	Rion NC-74	35270127	7 September 2022

Table 16.1 – Monitoring equipment

16.2 All measurements were undertaken with the microphone positioned away from reflecting surfaces and at a height of 1.5 m above the ground, considered to be under free-field conditions, to the requirements of BS 7445.

16.3 The calibration of each sound level meter was checked before and after the measurements, using the acoustic calibrator at 94 dB at 1 kHz; no significant calibration drift was noted (+/- 0.3 dB).

16.4 The sound level meters used conform to the Class 1 requirements of BS EN 61672-1: 2013 *'Electroacoustics. Sound level meter, Specifications'*. The calibrator used conforms to the requirements of BS EN 60942: 2018 *'Electroacoustics, Sound calibrators'*. The equipment used has a calibration history that is traceable to a certified calibration institution.

17 Weather Conditions

17.1 Weather conditions during the first unattended measurement period in April 2022 were obtained from Wunderground (www.wunderground.com), using the weather station closest to the proposed development site (with available historical data), which was judged to be at Shrewsbury (Mirp-ISHREW33). The analysis of the continuous weather data indicates that there was no rainfall and highest windspeeds remained below 5 m/s. The weather data representative of monitoring positions UL2, UL3 and UL4 is summarised in Table 17.1 below.

Date	Temperature High (ºC)	Temperature Low (ºC)	Wind Speed High (m/s)	Dominant Wind Direction	Accum. Precipitation (mm)
21.04.22	19	6	4	NW	0.0
22.04.22	19	6	5	NNW	0.0
23.04.22	17	8	5	NNW	0.0
24.04.22	20	6	4	NNW	0.0
25.04.22	18	6	3	NW	0.0
26.04.22	20	5	2	NW	0.0

Table 17.1 – Summarised weather data during April 2022 noise monitoring period

17.2 Based on the above data, weather conditions during the survey carried out in April are deemed suitable for environmental noise monitoring.

17.3 Weather conditions during the second monitoring period in May 2022 were also obtained from Wunderground (www.wunderground.com), using the aforementioned weather station at Shrewsbury (Mirp-ISHREW33). Further analysis of the continuous data indicates several periods of unfavourable weather conditions (i.e. precipitation, and/ or high winds above 5 m/s) during the monitoring period. As such, these periods have subsequently been removed from the analysis and have not been used to inform the assessment. The data omitted from the analysis is as follows:

- Data between 15 and 16 May 2022

17.4 The weather data from the second noise survey conducted at monitoring position UL1, is summarised in Table 17.2 below.

Date	Temperature High (ºC)	Temperature Low (ºC)	Wind Speed High (m/s)	Dominant Wind Direction	Accum. Precipitation (mm)
13.05.22	19	11	5	S	0.0
14.05.22	27	9	2	SW	0.0
15.05.22	23	12	2	WNW	4.3
16.05.22	23	13	3	SW	5.0
17.05.22	22	12	3	SW	1.5
18.05.22	22	10	4	SSW	1.0

Table 17.2 – Summarised weather data during May 2022

18 Long Term Measurements

18.1 Analysis of the dataset accounting for the 16-hour daytime period (07:00 – 23:00) and 8-hour night-time period (23:00 – 07:00) is provided in Tables 18.1 to 18.4.

Noise Monitoring Position – UL1 (north-east of the site)

18.2 A summary of the measured noise levels at position UL1 is presented in Table 18.1.

Date	Time period (T)	Measured Noise Levels [b]			
		$L_{Aeq,T}$ dB	$L_{AFmax,T}$ dB	$L_{A90,T}$ dB	$L_{A10,T}$ dB
13.05.22[a]	20:00 – 23:00	42	70	29	42
13.05.22	23:00 – 07:00	42	71	25	34
14.05.22	07:00 – 23:00	47	83	32	46
14.05.22	23:00 – 07:00	44	78	27	37
15.05.22[c]	07:00 – 23:00	48	76	35	48
15.05.22[c]	23:00 – 07:00	45	71	26	39
16.05.22[c]	07:00 – 23:00	49	81	34	48
16.05.22	23:00 – 07:00	43	77	27	35
17.05.22	07:00 – 23:00	49	81	36	48
17.05.22	23:00 – 07:00	43	68	27	39
18.05.22[a]	07:00 – 13:00	48	81	37	48

(a) Measurements not taken throughout a full 16hr period
(b) $L_{Aeq,T}$ values are the logarithmic average of $L_{Aeq,15min}$ samples, the $L_{A10,T}$ and $L_{A90,T}$ are the arithmetic average of the $L_{A10,15min}$ and $L_{A90,15min}$ samples, and the $L_{Amax,T}$ is the maximum singular noise level in any 15-minute period
(c) Data removed from the dataset due to unrepresentative weather conditions

Table 18.1 – Noise measurement results – UL1

Noise Monitoring Position – UL2 (south-east boundary of the site)

18.3 A summary of the measured noise levels at position UL2 is presented in Table 18.2.

Date	Time period (T)	Measured Noise Levels [b]			
		$L_{Aeq,T}$ dB	$L_{AFmax,T}$ dB	$L_{A90,T}$ dB	$L_{A10,T}$ dB
21.04.22[a]	17:45 – 23:00	40	72	30	38
21.04.22	23:00 – 07:00	37	71	24	31
22.04.22	07:00 – 23:00	44	75	35	44
22.04.22	23:00 – 07:00	36	75	24	31
23.04.22	07:00 – 23:00	43	79	33	42
23.04.22	23:00 – 07:00	44	72	24	33
24.04.22	07:00 – 23:00	45	81	31	41
24.04.22	23:00 – 07:00	47	74	21	32
25.04.22	07:00 – 23:00	46	82	27	40
25.04.22	23:00 – 07:00	47	68	22	32
26.04.22[a]	07:00 – 11:15	49	70	27	48

(a) Measurements not taken throughout a full 16hr period
(b) $L_{Aeq,T}$ values are the logarithmic average of $L_{Aeq,15min}$ samples, the $L_{A10,T}$ and $L_{A90,T}$ are the arithmetic average of the $L_{A10,15min}$ and $L_{A90,15min}$ samples, and the $L_{Amax,T}$ is the maximum singular noise level in any 15-minute period

Table 18.2 – Noise measurement results – UL2

Noise Monitoring Position – UL3 (south boundary of the site)

18.4 A summary of the measured noise levels at position UL3 are presented in Table 18.3.

Date	Time period (T)	Measured Noise Levels [b]			
		$L_{Aeq,T}$ dB	$L_{AFmax,T}$ dB	$L_{A90,T}$ dB	$L_{A10,T}$ dB
21.04.22[a]	18:00 – 23:00	44	69	31	42
21.04.22	23:00 – 07:00	49	78	27	35
22.04.22	07:00 – 23:00	50	80	37	50
22.04.22	23:00 – 07:00	49	75	26	34
23.04.22	07:00 – 23:00	49	78	35	49
23.04.22	23:00 – 07:00	50	82	26	36
24.04.22	07:00 – 23:00	51	81	33	48
24.04.22	23:00 – 07:00	49	76	24	33
25.04.22	07:00 – 23:00	50	81	29	49
25.04.22	23:00 – 07:00	46	78	24	31
26.04.22[a]	07:00 – 10:45	54	84	33	56

(a) Measurements not taken throughout a full 16hr period
(b) $L_{Aeq,T}$ values are the logarithmic average of $L_{Aeq,15min}$ samples, the $L_{A10,T}$ and $L_{A90,T}$ are the arithmetic average of the $L_{A10,15min}$ and $L_{A90,15min}$ samples, and the $L_{Amax,\ T}$ is the maximum singular noise level in any 15-minute period

Table 18.3 – Noise measurement results – UL3

Noise Monitoring Position – UL4 (north-west of the site)

18.5 A summary of the measured noise levels at position UL4 are presented in Table 18.4.

Date	Time period (T)	Measured Noise Levels [b]			
		$L_{Aeq,T}$ dB	$L_{AFmax,T}$ dB	$L_{A90,T}$ dB	$L_{A10,T}$ dB
21.04.22[a]	18:45 – 23:00	37	65	32	38
21.04.22	23:00 – 07:00	38	63	27	34
22.04.22	07:00 – 23:00	46	86	38	46
22.04.22	23:00 – 07:00	37	62	27	34
23.04.22	07:00 – 23:00	43	83	36	43
23.04.22	23:00 – 07:00	37	71	27	34
24.04.22	07:00 – 23:00	42	76	34	42
24.04.22	23:00 – 07:00	37	69	24	31
25.04.22	07:00 – 23:00	41	80	30	41
25.04.22	23:00 – 07:00	35	61	23	30
26.04.22[a]	07:00 – 10:30	42	78	30	42

(a) Measurements not taken throughout a full 16hr period
(b) $L_{Aeq,T}$ values are the logarithmic average of $L_{Aeq,15min}$ samples, the $L_{A10,T}$ and $L_{A90,T}$ are the arithmetic average of the $L_{A10,15min}$ and $L_{A90,15min}$ samples, and the $L_{Amax,T}$ is the maximum singular noise level in any 15-minute period

Table 18.4 – Noise measurement results – UL4

18.6 Based on the analysis of full daytime periods, noise levels across the site ranged between 41 – 51 dB $L_{Aeq,16hr}$, with the highest ambient levels measured at location UL3 (south boundary). Night-time noise levels ranged between 35 – 50 dB $L_{Aeq,8hr}$ with the highest measured levels assessed at location UL3. Hourly continuous noise levels are graphically provided in Appendix C.

19 Derivation of Background Noise Levels

19.1 Given the development is scheduled to operate 24 hours, 7 days a week, the representative background noise levels are provided for day and night-time periods.

19.2 Analysis of the lowest representative baseline data to inform the assessment of fixed plant noise, has considered the context of the hourly noise levels ($L_{A90,1hour}$) measured during the daytime period (07:00 – 23:00) and those 15-minute samples ($L_{A90,15min}$) measured during the night-time period (23:00-07:00). Such an approach is in line with the requirements of BS 4142 and is considered to suitably provide a representative value for the background noise in the local environment.

19.3 A summary of the representative daytime and night-time background levels at the assessment locations is provided in Table 19.1. A graphical representation of the statistical analysis undertaken at the unattended monitoring positions UL1 to UL4 is included in Appendix C.

Receptor	Representative measurement location	Representative Daytime Background Noise Level, $L_{A90, 1hr}$	Representative Night-time Background Noise Level, $L_{A90, 15min}$
R1 – 1 & 2 Smithy	UL1	35	21
R2 – The Rectory	UL1	35	21
R3 – Newman's Hall Cottage	UL2	26	18
R4 – Cantlop Mill	UL3	26	20
R5 – Boreton Lodge	UL4	30	22
R6 – Cliffe House	UL4	30	22

Table 19.1 – Receptor background levels

20 Methodology

20.1 The predicted noise levels likely to be generated during the operational phase of the proposed solar PV development have been calculated using a noise prediction model. These predictions realise the noise propagation of any plant noise in isolation at the nearest sensitive receptors to the site taking terrain and local topographical features into consideration.

20.2 The noise predictions (specific sound levels at noise sensitive receptors) are based on International Standard ISO 9613-2:1996 '*Attenuation of sound during propagation outdoors – general method of calculation*'. ISO 9613 provides a method for the prediction of noise levels in the community from sources of known sound emission.

20.3 The ISO 9613-2 method predicts noise levels under meteorological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

21 Overview

21.1 A computer noise model of the proposed development has been constructed using SoundPLAN v8.2, based on the indicative site layout presented in Appendix A.

21.2 Input data in the form of noise emission levels has been assigned to the proposed plant items, adjusted to the geometry and nature of the site operations for the site, with the noise data obtained from similar solar panel planning applications, in agreement with the client.

21.3 The noise predictions are based on International Standard ISO 9613-2:1996 '*Attenuation of sound during propagation outdoors – general method of calculation*'. ISO 9613 provides a method for the prediction of noise levels in the community from sources of known sound emission.

21.4 The noise prediction method described in ISO 9613 is suitable for a wide range of engineering applications where the noise level outdoors is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect;

- Reflection from surfaces; and
- Screening by obstacles, barriers and buildings.

22 Modelling Parameters

22.1 An overview of the modelling parameters is given in Table 21.1.

Item	Setting
Algorithms	International Standard: ISO 9613-2
Ground Absorption	Acoustically hard (assumed 0.1 coefficient) – built-up areas and water surface. Acoustically soft (assumed 0.75 coefficient) – undeveloped and vegetation areas.
Meteorological Conditions	10 degrees Celsius; 70% humidity; and Wind from source to receiver.
Façade Corrections	Calculations are free-field. No façade corrections have been applied
Receptor Height	Ground floor 1.5 metres and first floor 4 metres above ground.
Source Modelling	See Section 23 and 24
Terrain	LiDAR DTM with a 2-metre resolution has been imported into the model.
Site Layout	Digitised based on site layout no. PL.00, R3 dated 15.06.22 included in Appendix A

Table 21.1 – Modelling parameters

23 Construction Source Noise Data

23.1 The following construction activities are considered to be those with the potential to result in adverse noise effects; plant details used for these activities is presented in Appendix D:

- Construction of haul road;
- Installation of mounting frames and panels;
- Construction of inverter stations and substation compounds.

Item	Task	Total Noise Level (L_p) at 10 m dB(A)
1	Construction of haul road	79
2	Installation of mounting frames and panels	75
3	Construction of inverter station and substation compounds	76

Table 23.1 – Construction source noise levels

23.2 Distance attenuation was calculated based on the noise emission levels presented in Table 23.1 between the receptors and construction areas across the development (e.g. the closest proposed work extents to each receptor).

23.3 In the absence of construction traffic flows, an estimate of 5 HGVs (10 movements) per hour (truck pass-by sound power level of 108 L_{WA}) operating at 15 mph, has been utilised for the assessment of construction related traffic noise.

23.4 It is deemed that there would not be sufficient levels of vibration generated during construction works to significantly impact on those nearest receptors (both human and ecological). Potential vibration generating activities would produce negligible levels and as such, have been discounted for the purposes of this assessment.

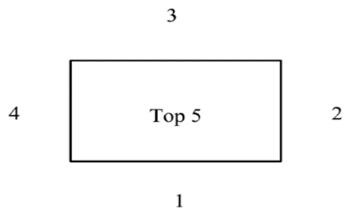
24 Operational Source Noise Data

Inverter Stations (Array Location)

24.1 Previous solar panel planning applications completed by RSK Acoustics concluded that the primary source of noise emission is the operation of the inverter stations, which are proposed to be positioned at a variety of locations across this development. The role of an inverter station is to convert DC (direct current) generated from a cluster of solar panels into AC (alternating current) for National Grid and domestic use.

24.2 The following noise levels have been assigned to the inverter stations:

Type	Total Noise Level (Lp) at 1 m dB(A)
Huawei SUN2000-185KTL (5-sided emitter)	65



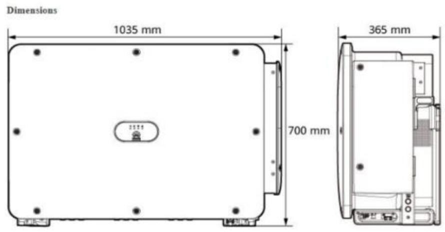


Table 24.1 – Inverter Reference Noise Level

24.3 The inverter element has been calibrated using a receiver positioned at 1 m distance from each of the five emitting surfaces (horizontally and vertically) and at 1.5 m height relative to the ground level to achieve the reference noise levels summarised above. All plant items have been incorporated as an outdoor source continuously in operation (steady state regime with 100% operational capacity).

PV Power Stations and Sub-Station

24.4 Previous solar panel planning applications from RSK have also assessed noise from associated power stations and sub-stations. Noise data relating to these items has been calibrated as a 5-sided emitting container using a receiver positioned at 1 m distance from each emitting surface and at 1.5 m from ground level for any vertical area source and 1 m above roof level (roof source). The elements have been incorporated as outdoor sources continuously in operation (steady state regime with 100% operational capacity). Reference noise levels are reproduced below in Table 24.2.

Item	Total Noise Level (Lp) at 1 m dB(A)
MV Power Station and Sub-station	70

Table 24.2 –Substation Reference Noise Levels

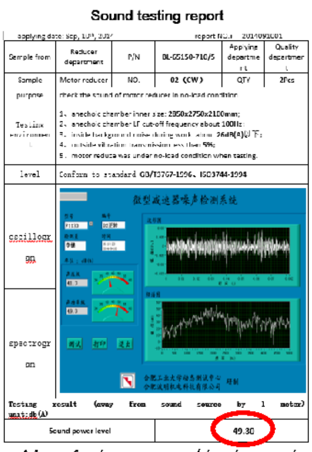
Panel Tracking System

24.5 Tracking motors for the solar panels have not been assessed, due to their intermittent operation adjusting the angle of the panels for only a few seconds and having a low sound power level of around 50dB, details of indicative levels presented in Figure 24.1 below

NEXTracker
A Flex Company

NEXTracker Motor Sound Test Summary

Each NEXTracker row uses a small 24V DC motor powered by a NEXTracker controller. To track the row, the motor runs for five to ten seconds every few minutes. The noise level of the motors is tested by the manufacturer. Test reports from the manufacturer show that the sound power level is ~50dB. The sound level produced is very low and essentially inaudible to surrounding site noises such as wind or generators.


Sound testing report

applying date: Sep, 10th, 2017 report NO.: 2014091001

Sample from	Reducer department	P/N	DL-GS150-710/5	Applying department	Quality department
Sample	Motor reducer	NO.	02 (CW)	QTY	2Pcs
purpose	check the sound of motor reducer in no-load condition				
Testing environment	1、anechoic chamber inner size: 2050x2750x2100mm; 2、anechoic chamber LF cut-off frequency about 100Hz; 3、inside background noise during work [illegible] 26dB(A)以下; 4、outside vibration transmission less than 5%; 5、motor reducer was under no-load condition when testing.				
level	Conform to standard GB/T3767-1996、ISO3744-1994				
oscillogram					
spectrogram					

Testing result (away from sound source by 1 meter) unit: db(A)

Sound power level	49.30

Manufacturer sound test report

Inverse distance law for acoustics shows sound decrease with distance:

Distance	Sound Level	Equivalent sound
3 m (9.8 ft)	~ 40 dB	Library
30 (98 ft)	~20 dB	Rustling leaves
300 m (980 ft)	~0 dB	Inaudible

Figure 24.1 – Indiciatve tracker motor sound power level

25 Predicted Noise Levels

25.1 A construction noise impact assessment has been undertaken adopting the calculations for mobile plant items and the movement of lorries along the haul road, to the requirements of BS 5228-1: 2009+ A1: 2014 '*Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*'.

25.2 Individual tasks and plant items likely to be required in order to construct the development have been derived from RSK's experience of similar projects. At this stage, the exact type and number of plant items is unknown however, the total noise levels are not expected to deviate significantly from those assumed within this assessment. Plant lists to inform the noise predictions are provided in Appendix D.

25.3 Construction noise predictions for those individual task items for a full daytime period (construction core hours) are provided in Table 25.1.

		Predicted Noise Level, dB $L_{Aeq, T}$		
Ref.	**Receptor**	**Task 1**	**Task 2**	**Task 3**
R1	1 & 2 Smithy	47	47	46
R2	The Rectory	47	47	46
R3	Newman's Hall Cottage	47	51	47
R4	Cantlop Mill	50	53	49
R5	Boreton Lodge	46	45	45
R6	Cliffe House	52	52	50

Task 1. Construction of haul road
Task 2. Installation of mounting frames and panels
Task 3. Construction of inverter stations and substation compounds
Integration period T assume standard core hours Mon-Fri 08:00-18:00 and Sat 08:00-13:00.

Table 25.1 – Construction Noise Assessment – Individual Tasks

25.4 Predicted noise levels using the appropriate BS 5228 methodology indicate that the installation of mounting frames and panels, including HGV movements would likely create a worse-case noise level of 53 dB $L_{Aeq, T}$ at Cantlop Mill (R4).

26 Construction Assessment

26.1 The assessment of construction noise against the threshold criteria has adopted the principles of the 'ABC Method' within the BS 5228 standard. The baseline noise levels indicate that all receptors would fall within the lowest Category A criteria, subject to a noise threshold of 65 dB $L_{Aeq,\,T}$ for construction work during standard core hours (Monday to Friday 08:00 – 18:00 and Saturday 08:00 – 13:00).

26.2 Predictions indicate that all construction tasks would create a predicted noise level which is within the noise criteria at all nearest sensitive receptors.

26.3 Calculations have been undertaken to a worse-case scenario, assuming that all items of plant operate simultaneously at the closest possible point to each of the receptor locations, with direct line of sight between source and receiver. In reality, this is unlikely to be the case and absolute worst case predicted levels may only last for a short period of time due to the transient nature of the works.

26.4 The most exposed receptors classified above will in reality not experience high noise levels for a continuous duration of time or days (note that applicable criteria also consider averaged noise levels throughout a 10-hour period 08:00-18:00 Monday to Friday and a 5-hour period 08:00-13:00 Saturdays). The predicted noise levels can be treated as the maximum possible levels in discrete intervals rather than an overall average period i.e. midweek / weekend day with the noise levels presented representative of neighbouring properties.

26.5 Although predicted construction noise levels fall below the category A criteria of the 'ABC method' as detailed within BS 5228, it is recommended that the contractor shall, in so far as is reasonably practicable, control and limit noise levels. Best Practicable Means (BPMs) shall be employed at all times.

27 Acoustic Correction

27.1 According to BS 4142:2014+A1: 2019, where certain features of the specific noise level can increase the significance of impact of a sound level, a character correction is applied to provide a rated noise level. The characteristics of a sound that are likely to cause an increase in the significance of impact are tonality, impulsivity, intermittency or other characteristic features such as an identifiable 'hiss'.

27.2 Taking the above acoustic features into consideration, the application of rating penalties is as follows:

- Tonality - Octave band data is not available for the plant items. Due to the nature of the electrical and mechanical components to be installed however, it is likely that tonal elements may be 'just perceptible' at the nearest noise sensitive receptors. As such, a +2 dB penalty for tonal characteristics has been applied;

- Impulsivity - The character of the sound from plant items will generally be of a low level and constant, with no rapid change in the level or character of noise. It is therefore considered unnecessary to apply an impulsive correction; and

- Intermittency - It is considered that the plant items will not have identifiable on/off conditions, with many items operating at varying loads relative to both the intensity of light incident upon the solar panels and the air temperature. It is therefore considered unnecessary to apply an intermittency correction.

27.3 Based on the information provided by the client and the lack of octave band data to reference potential tones, the subjective method has been applied to correct the specific noise by +2 dB for a tone which is 'just perceptible' at the noise receptor. The inverter stations, power stations or the sub-stations are unlikely to emit sources of noise which are either impulsive or intermittent in nature and therefore no further corrections have been applied.

28 Operational Assessment

28.1 The rated noise level (inclusive of penalty corrections) from site activity has been predicted as the contribution (energetic sum) of all active sources within the proposed development. This scenario provides a conservative interpretation of the resulting noise levels at receptor.

28.2 An assessment of predicted rated noise levels, against the representative background noise at closest residential receptors are summarised in Table 28.1 and 28.2. Operational noise contours are provided in Appendix B.

Receptor	Rated Noise Level, $L_{Ar,Tr}$, dB	Representative Background Noise Level, $L_{A90, 1hr}$	Excess over Background, dB
R1 – 1 & 2 Smithy	34	35	-1
R2 – The Rectory	34	35	-1
R3 – Newman's Hall Cottage	34	26	+8
R4 – Cantlop Mill	37	26	+11
R5 – Boreton Lodge	32	30	+2
R6 – Cliffe House	37	30	+7

Table 28.1 – Daytime fixed plant noise assessment

Receptor	Rated Noise Level, $L_{Ar,Tr}$, dB	Representative Background Noise Level, $L_{A90, 15min}$ dB	Excess over Background, dB
R1 – 1 & 2 Smithy	34	21	+13
R2 – The Rectory	34	21	+13
R3 – Newman's Hall Cottage	34	18	+16
R4 – Cantlop Mill	37	20	+17
R5 – Boreton Lodge	32	22	+10
R6 – Cliffe House	37	22	+15

Table 28.2 – Night-time fixed plant noise assessment

28.3 The highest rated noise level of 37 dB $L_{Ar,Tr}$ has been predicted at Cantlop Mill and Cliffe House; this is the result of the sensitive receptors positioned closest to proposed plant along the western and southern portions of the site.

28.4 A rating excess of up to 11 dB(A) has been predicted during the daytime period at Cantlop Mill, with an excess of 17 dB(A) predicted at this receptor during the night-time period. Rated operational noise levels ($L_{Ar,Tr}$) at the remaining residential receptors would also exceed the adopted background levels during the night-period.

28.5 In line with BS 4142, the contextual nature of the absolute sound level and the existing environment should also be taken into account. This is particularly relevant in a context of measured low background levels. The standard states that "*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*".

28.6 The lowest night-time measured ambient noise level of 46 dB(A) representative of Cantlop Mill already exceeds the predicted rating level by 9 dB(A). This is a positive indication that although the initial assessment indicates an exceedance above the background levels, the proposals would have a low impact at nearest receptors due to the likely masking effect of the prevailing environment.

28.7 In addition, the context of the noise during night-time operations should also reasonably include the existing design measures of the building fabric which should be taken into consideration to account for residents sleeping (and therefore not outside). WHO recognises the impact of an open window in reducing noise levels (from external to internal) and specifies a widely accepted reduction of 15 dB(A). By adopting a scenario with windows open, internal noise levels in bedrooms at the assessment receptors would still remain within the recommended internal criteria within WHO of 30 dB(A) for sleeping conditions as external operational noise levels would be below the 45 dB(A) target at the assessed receptor locations.

28.8 Furthermore, fixed plant noise from the solar farm is unlikely to contribute to an increase of the existing night ambient noise that could lead to an exceedance of the recommended internal criteria for residential use. By accounting for context within the assessment of night-time operations, this is a positive indication that although the initial assessment indicates an exceedance above the night-time background noise level, the proposals would have a low impact.

29 Conservatism in the Assessment

29.1 Whilst the solar panels emit no noise, they would likely act as a partial noise barrier in reducing plant emission levels from the inverters and substations across the site. The actual level of noise reduction would be dependent on the positioning and angle of the panels and for this reason, the panels were not included in the noise model.

29.2 Operation of the inverters, power stations and the sub-station would be dependent on the level of sunlight incident on the panels. Noise is therefore unlikely to be emitted from these items during much of the night-time period. However, full operation of the plant items at night has still been included within the assessment. Furthermore, the assessment accounts for operation of all fixed plant items simultaneously.

29.3 RSK's experience of similar projects and power generation schemes would indicate that operation of the power stations and sub-stations is only likely after discharge to the grid. For the purposes of the assessment however, these items have been modelled as a continuous operation.

29.4 Given the conservatism outlined above, it is reasonable to assume that operational noise levels associated with the development are likely to be an over-prediction of the realistic noise levels experienced at sensitive receptors.

30 Uncertainty

30.1 BS 4142:2014+A1: 2019 requires that the assessment considers the level of uncertainty in the data and associated calculations. Consideration of the uncertainty can enable a more informed decision regarding the likely significance of impact, within the context of assessment.

30.2 It is accepted that uncertainty may arise from all levels of measurement and assessment and reasonably practicable steps have been made at all stages with the aim of reducing uncertainty.

30.3 The following measures have been taken to reduce uncertainty:

- Background sound level measurements have been obtained at representative assessment locations over a duration of between 5 to 6 days to fully characterise the existing residual environment during the intended operational hours of the proposed development;
- The assessment has considered a full operational scenario, with all plant items operating 24 hours a day during daytime and night. Representative background levels obtained at daytime and night have been utilised to inform the assessment;
- Use of monitoring equipment in accordance with section 5 of BS 4142: 2014+A1: 2019, using Class 1 instrumentation;
- Measurement procedures followed in accordance with section 6 of BS 4142: 2014+A1: 2019 with all precautions taken to minimise interference; and
- Specific sound levels have been calculated to the requirements of ISO 9613-2: 1996 which is the widely accepted procedure for the calculation of sound propagation (including favorable wind conditions from source to receiver). The development has yet to be built therefore, the assessment is informed by comparison of the predicted rated noise levels against the representative background levels at each receptor in accordance with section 7 of BS 4142: 2014+A1: 2019.

30.4 Given the measures outlined above and the magnitude of predicted operational levels in the context of the existing local noise environment, it is considered that the uncertainty does not have any significance on the outcome of the assessment.

Conclusions

31 Conclusions

31.1 A noise impact assessment has been undertaken based on the proposed solar photovoltaic (PV) development south of Berrington, Shrewsbury. The assessment focuses on the construction and operational impact of the development at nearest residential receptors to the requirements of BS 5228-1:2009+ A1: 2014 and BS 4142: 2014+A1: 2019.

31.2 A baseline noise survey encompassing the analysis of continuous data (5 days) has been used to determine representative background noise levels at those closest existing receptors to the site, through statistical analysis.

31.3 A computer noise model has been developed which incorporates the proposed operational plant items, including a number of inverters, power stations and a sub-station. Predictions account for the cumulative operation of all plant items simultaneously during a worse-case night-time assessment period. Similarly, construction noise levels have been predicted incorporating a number of construction tasks and HGV movements along the haul road.

31.4 Predicted noise levels from construction activity would remain within the adopted noise criteria at all receptor locations.

31.5 Predicted rated noise levels during daytime and night-time operation of the development would likely exceed the representative background sound level at nearby sensitive receptors. In accordance with BS 4142, the context of the development within its locality, the absolute noise levels and mitigation afforded by the building envelope, predicted noise levels would not exceed the existing ambient noise level, nor exceed the criteria for internal noise levels for residential property within WHO guidelines. This is a positive indication that noise from the development would have a low impact.

31.6 In summary, the assessment concludes that the development is considered acceptable within the relevant standards and guidance for construction and operational noise.

End of Section

References

1. British Standard 4142: 2014+A1:2019, 'Methods of rating industrial and commercial sound' British Standards Institution.

2. British Standard 5228-1: 2009+ A1: 2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise'. British Standards Institution

3. British Standard 7445-1: 2003, 'Description and measurement of environmental noise – Part 1: Guide to quantities and procedures'. British Standards Institution.

4. ISO 9613-2:1996 'Attenuation of sound during propagation outdoors – general method of calculation'. International Organization for Standardization.

5. National Planning Policy Framework – Department for Communities and Local Government. March 2012 (as amended February 2019)

6. Noise Policy Statement for England (NPSE). DEFRA, 2010.

7. World Health Organization (WHO), 'Guidelines for Community Noise', 1999.

End of Section

Glossary of Acoustic Terms

Lp - Sound Pressure Level

The basic unit of sound measurement is the sound pressure level, which is measured on a logarithmic scale and expressed in decibels (dB). The logarithmic scale makes it easier to manage the large range of audible sound pressures, and also more closely represents the way the human ear responds to differences in sound pressure:

Lp = 20 log10 (p/po)

where p = RMS (root mean square) sound pressure; and

p0 = reference sound pressure 2 x 10-5 Pa.

Frequency Weighting Networks

Frequency weighting networks, which are generally built into sound level meters, attenuate the signal at some frequencies and amplify it at others. The A-weighting network approximately corresponds to human frequency response to sound. Sound levels measured with the A-weighting network are expressed in dB(A). Other weighting networks also exist, such as C-weighting which is nearly linear (i.e. unweighted) and other more specialised weighting networks. Variables such as L_p and L_{eq} that can be measured using such weightings are expressed as L_{pA} / L_{pC}, L_{Aeq} / L_{Ceq} etc.

Time Weighting

Sound level meters use various averaging times for the measurement of RMS sound pressure level. The most commonly used are fast (0.125 s averaging time), slow (1 s averaging time) and impulse (0.035 s averaging time). Variables that are measures with time weightings are expressed as LAFmax etc.

LAeq – Equivalent Continuous Sound Pressure Level

Sound levels tend to fluctuate, and as such an 'instantaneous' measurement like sound pressure level cannot fully describe many real-world situations. A summation can be made of the measured sound energy over a certain period, and a notional steady level can be calculated which would contain the same total energy as the fluctuating sound. This notional level is termed the equivalent continuous sound level Leq. Leq can be determined over any time period, which is indicated as Leq,T where T is the time period (e.g. Leq,24h).

Lmax - Maximum Sound Pressure Level or Maximum Noise Level

This is the maximum RMS sound pressure level occurring within a specified period. The time weighting is usually specified, such as in L_{max}.

Ln - Percentile or Statistical Levels

It is useful to calculate the level which is exceeded for a certain percent of a total period. Background noise is often defined as the A-weighted sound pressure level exceeded for 90% of the specified period T, expressed L90,T. Road traffic noise is often characterised in terms of LA10

T - Reference Time Interval

The specified interval over which the specific sound level is determined.

Ambient sound

totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. The ambient sound comprises the residual sound and the specific sound when present.

Residual sound

Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

Specific sound source

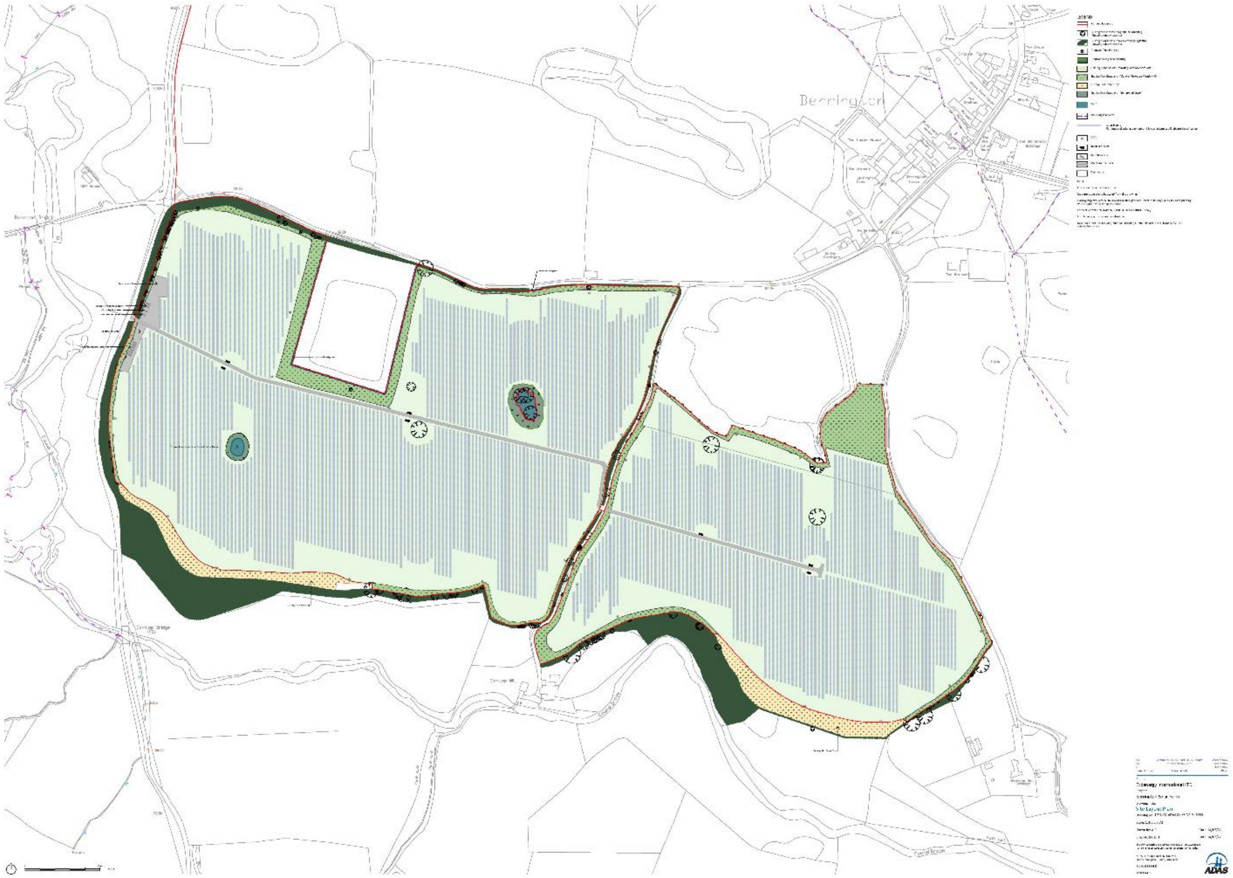
Sound source being assessed.

LAr,Tr – Rating level

Specific sound level plus any adjustment for the characteristic features of the sound as per BS 4142:2014+A1:2019. Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level, for example: tonality, impulsivity, intermittency or other sound characteristics that are readily distinctive against the residual acoustic environment.

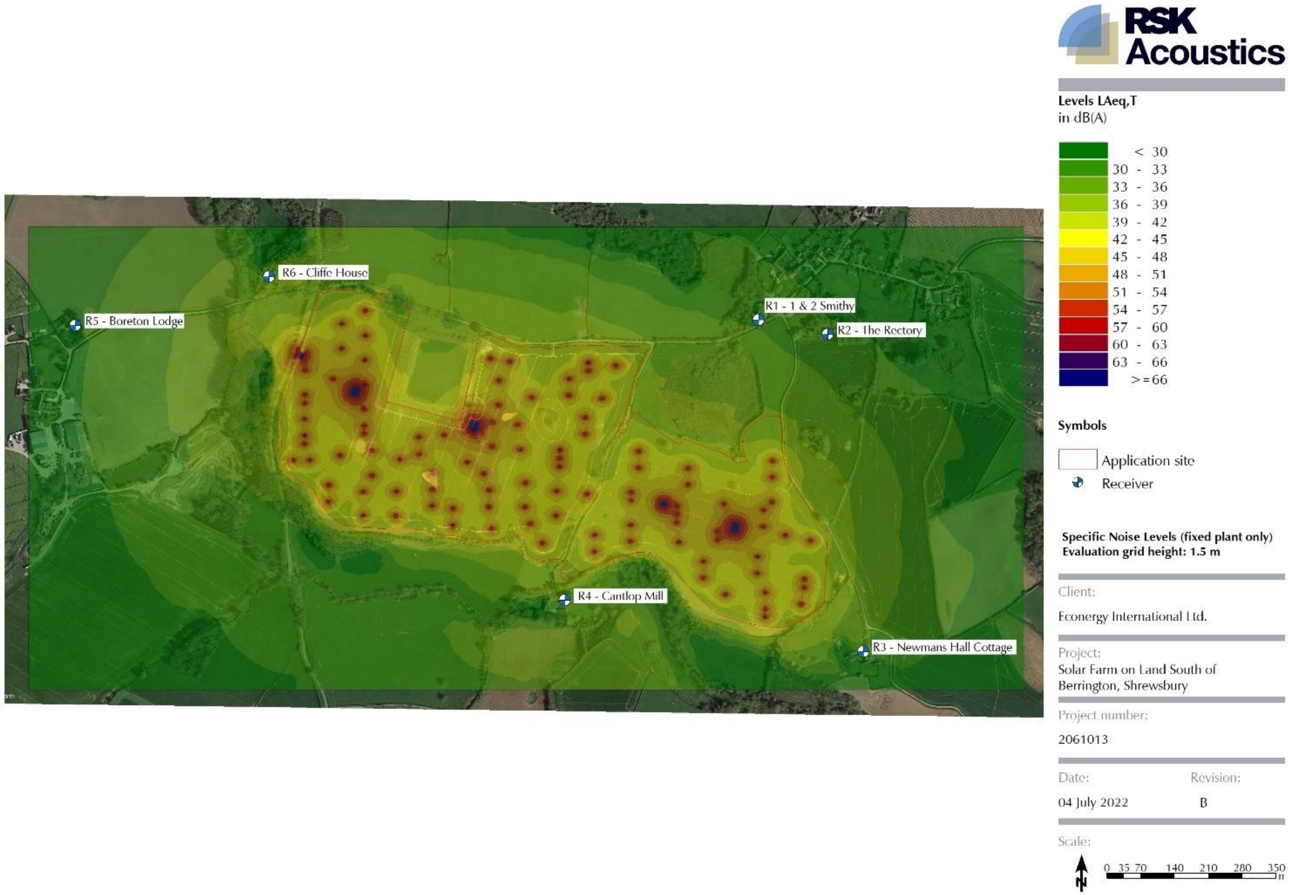
End of Section

Appendix A: Proposed Site Layout



Solar Farm on Land South of Berrington, Shrewsbury (Solar PV Development)

Appendix B: Operational Noise Contour Map (1.5 m Calculation Height)



Appendix C: Measured Noise Levels and Background Noise Level Graphs

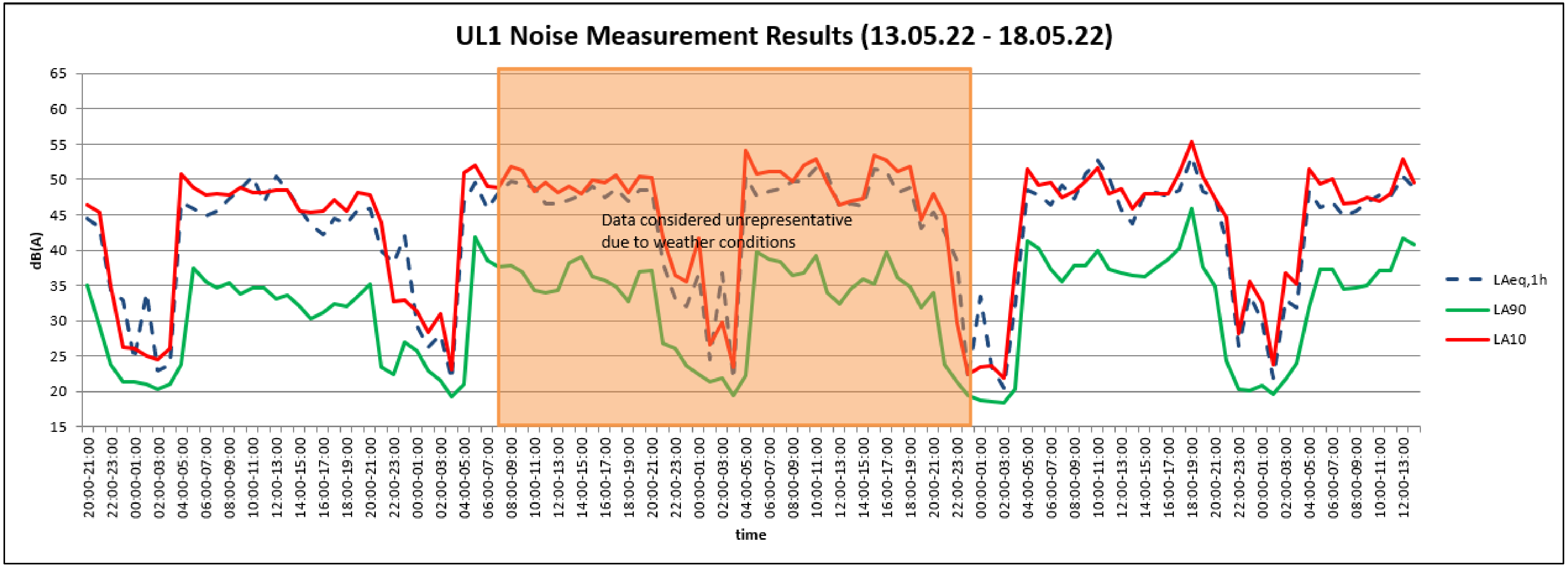


Figure C.1 – Graphical output, baseline data at UL1

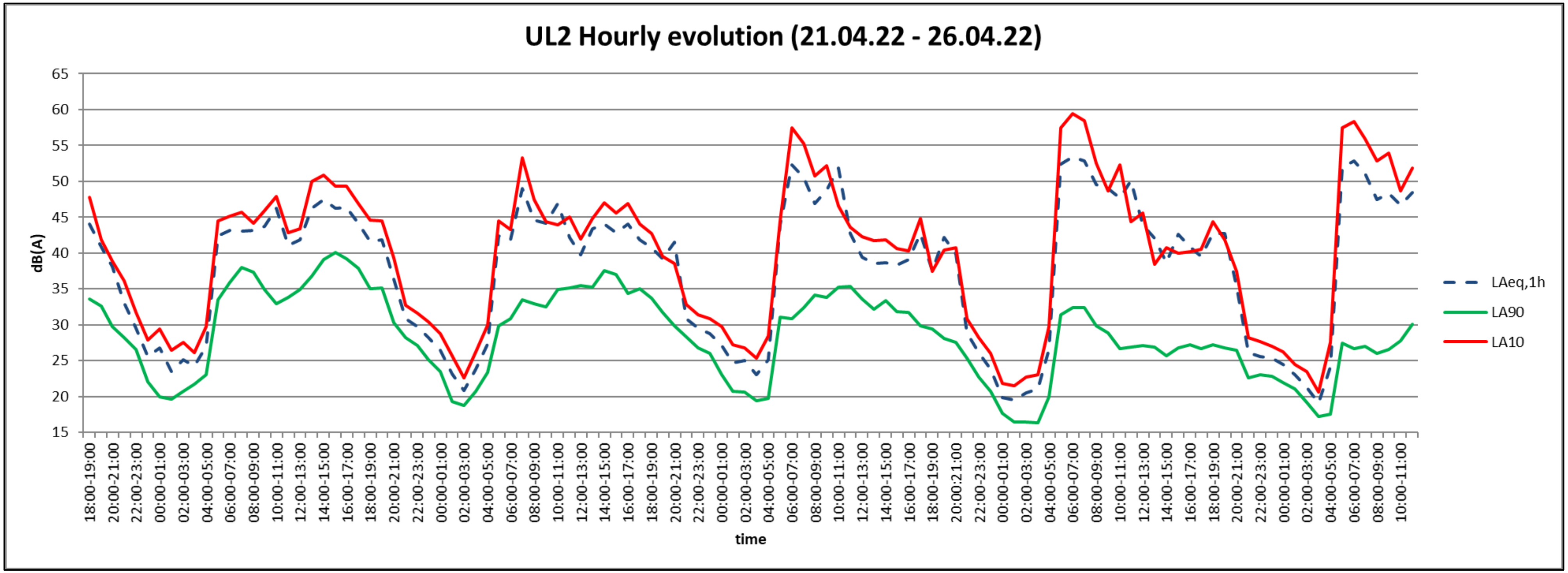


Figure C.2 – Graphical output, baseline data at UL2

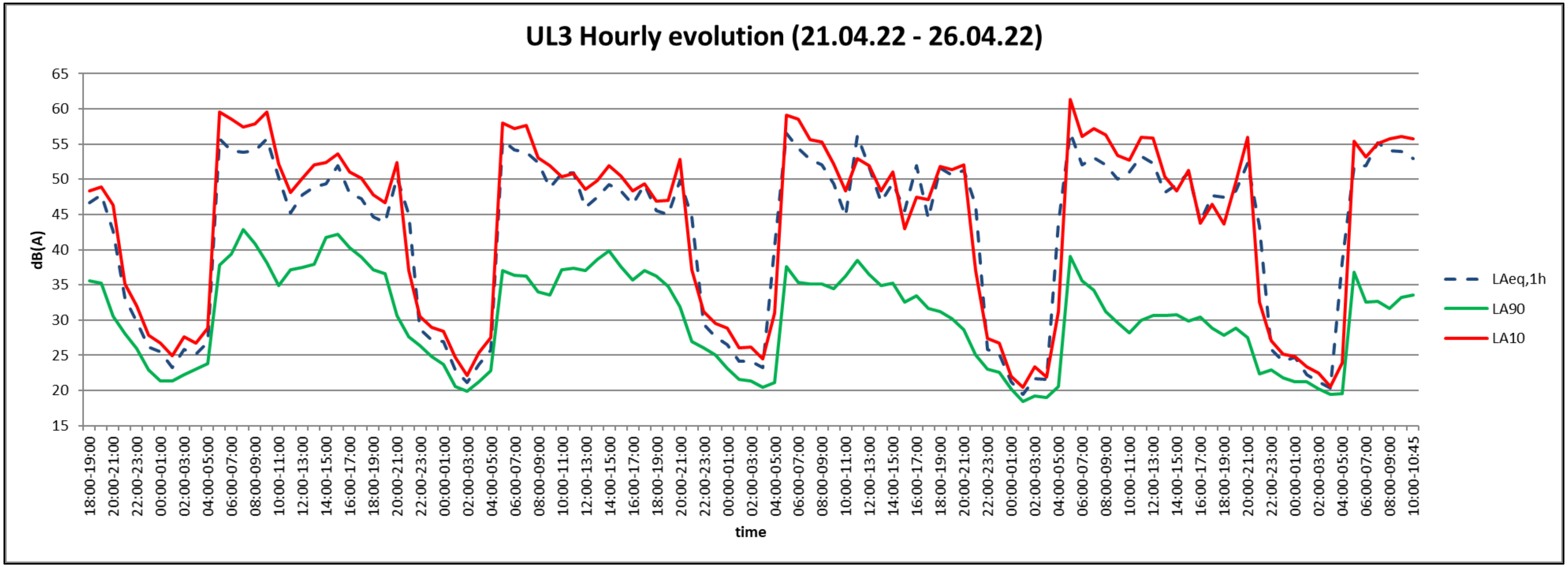


Figure C.3 – Graphical output, baseline data at UL3

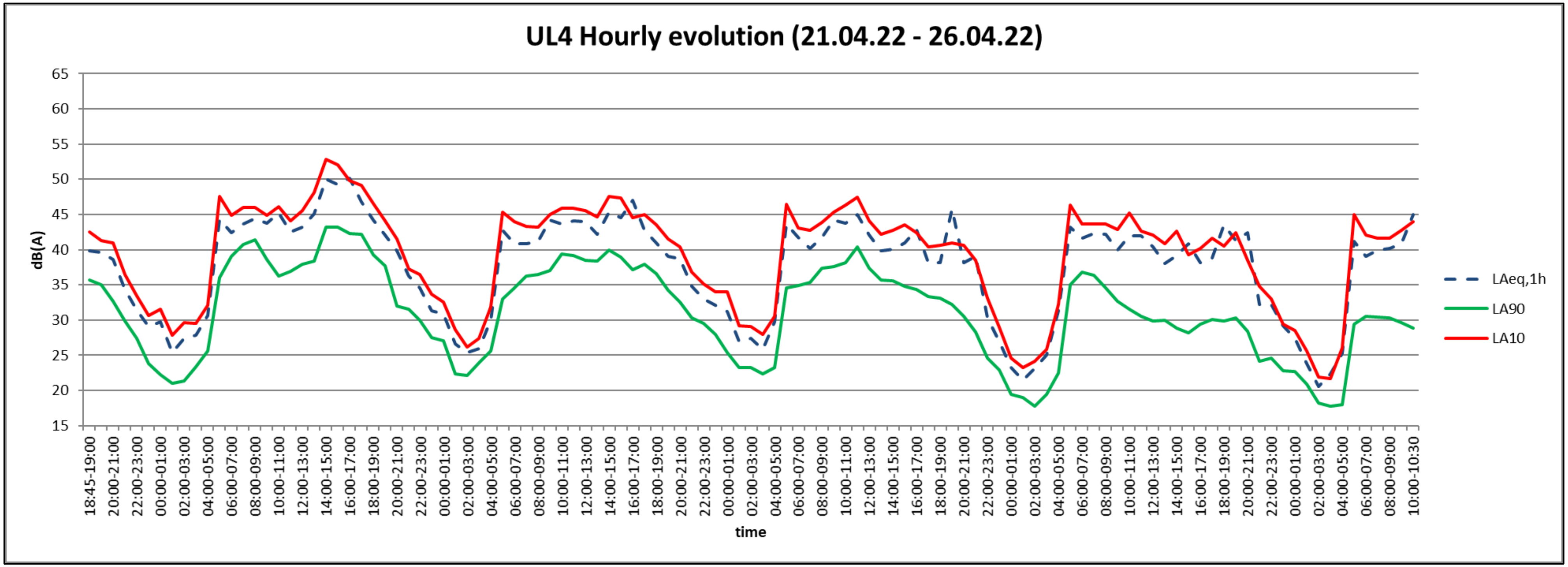


Figure C.4 – Graphical output, baseline data at UL4

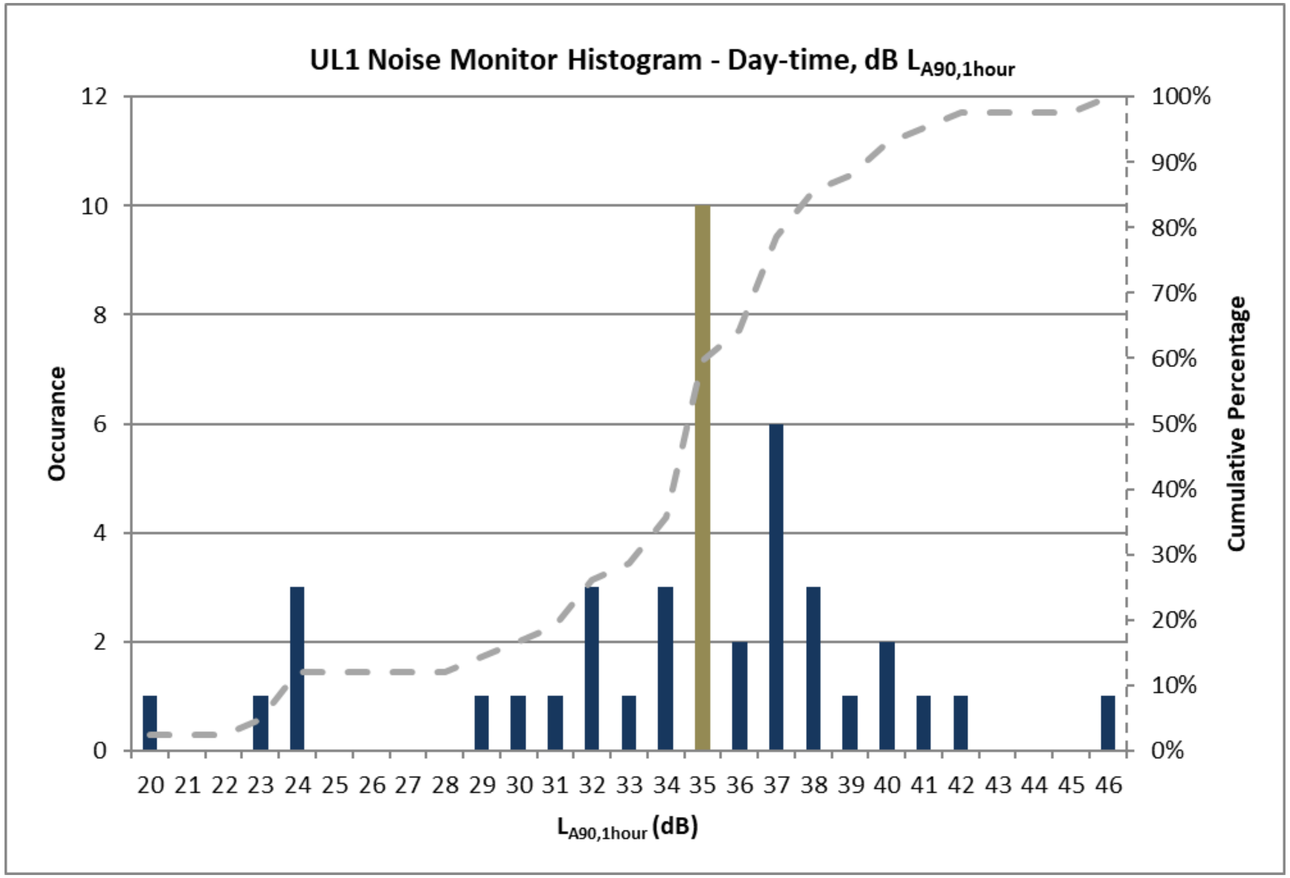


Figure C.5 – Statistical analysis of daytime background noise levels – UL1

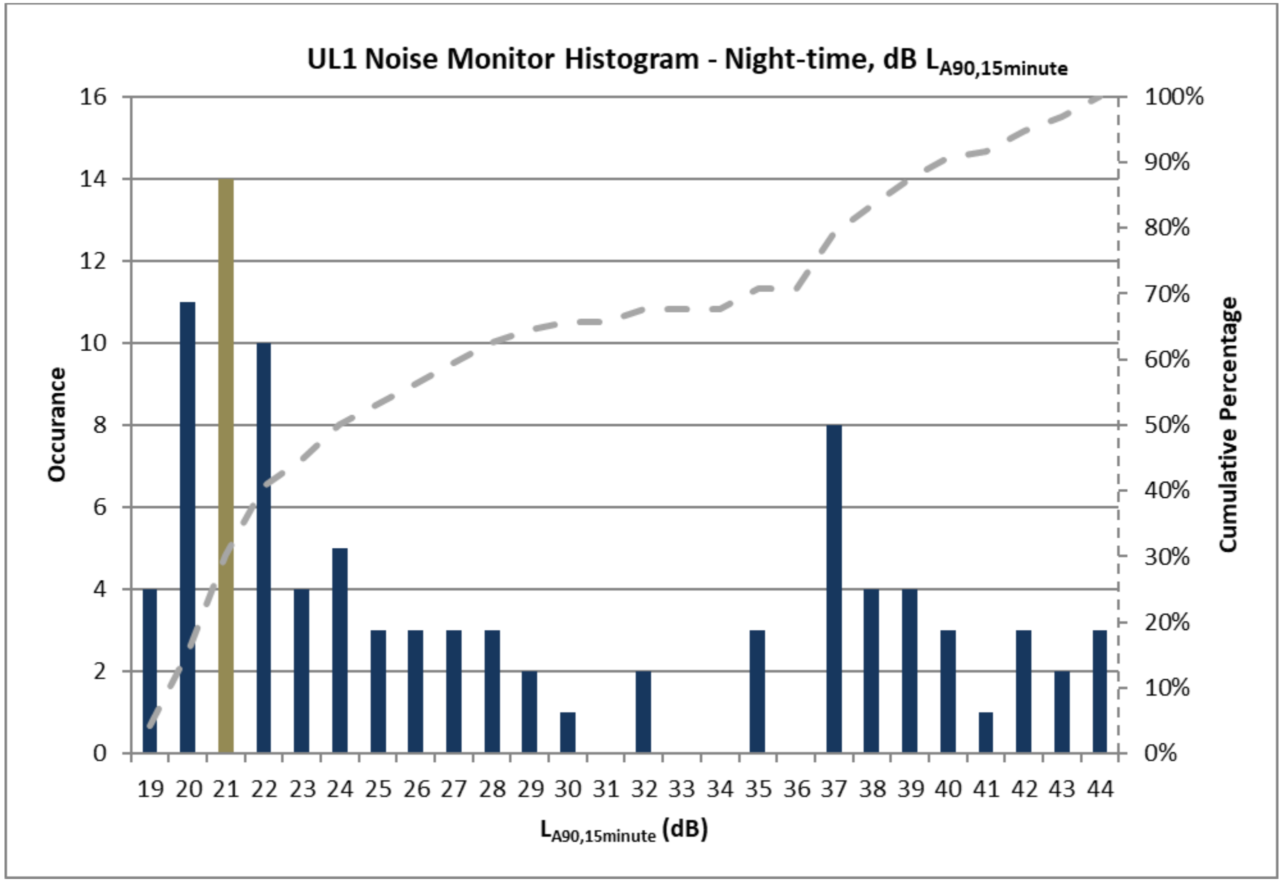


Figure C.6 – Statistical analysis of night-time background noise levels – UL1

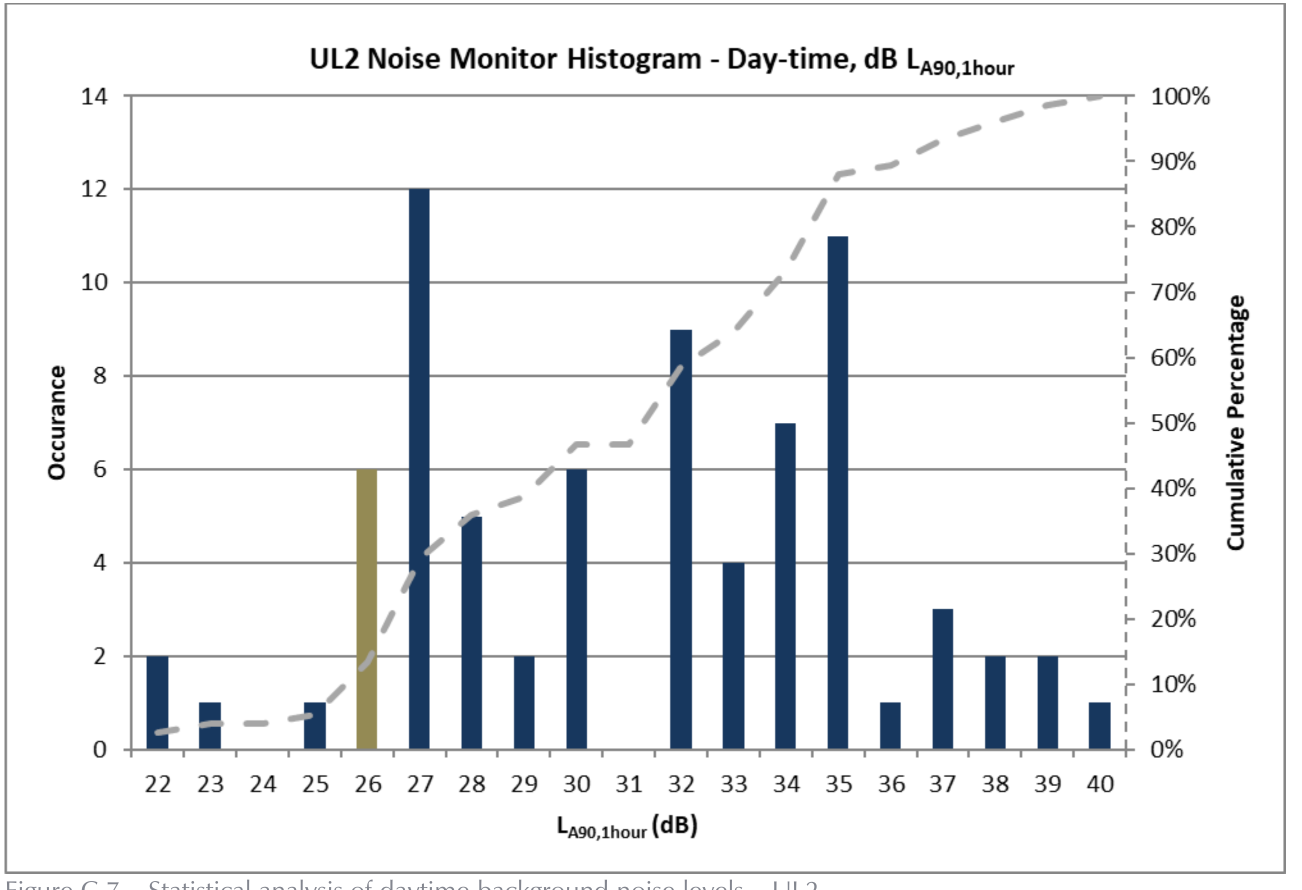


Figure C.7 – Statistical analysis of daytime background noise levels – UL2

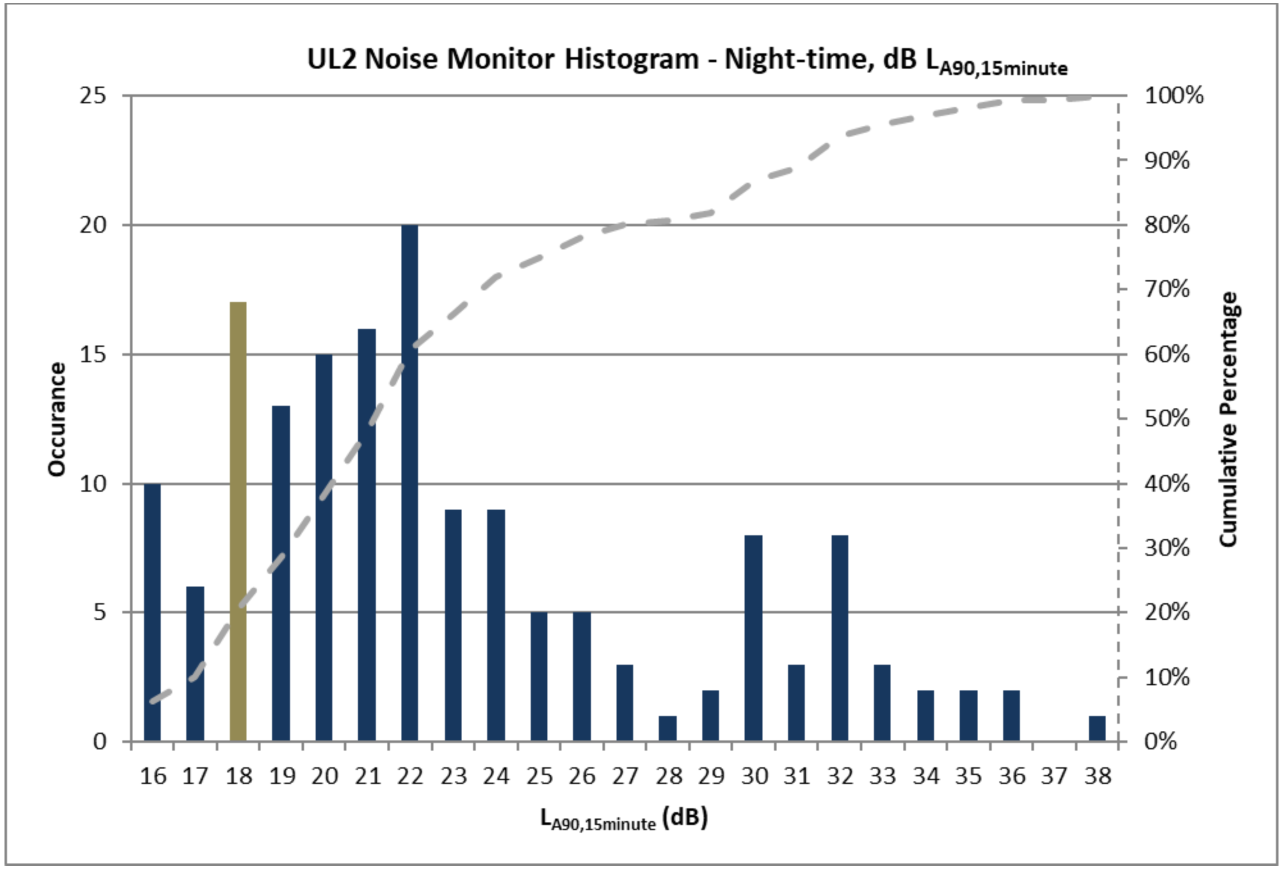


Figure C.8 – Statistical analysis of night-time background noise levels – UL2

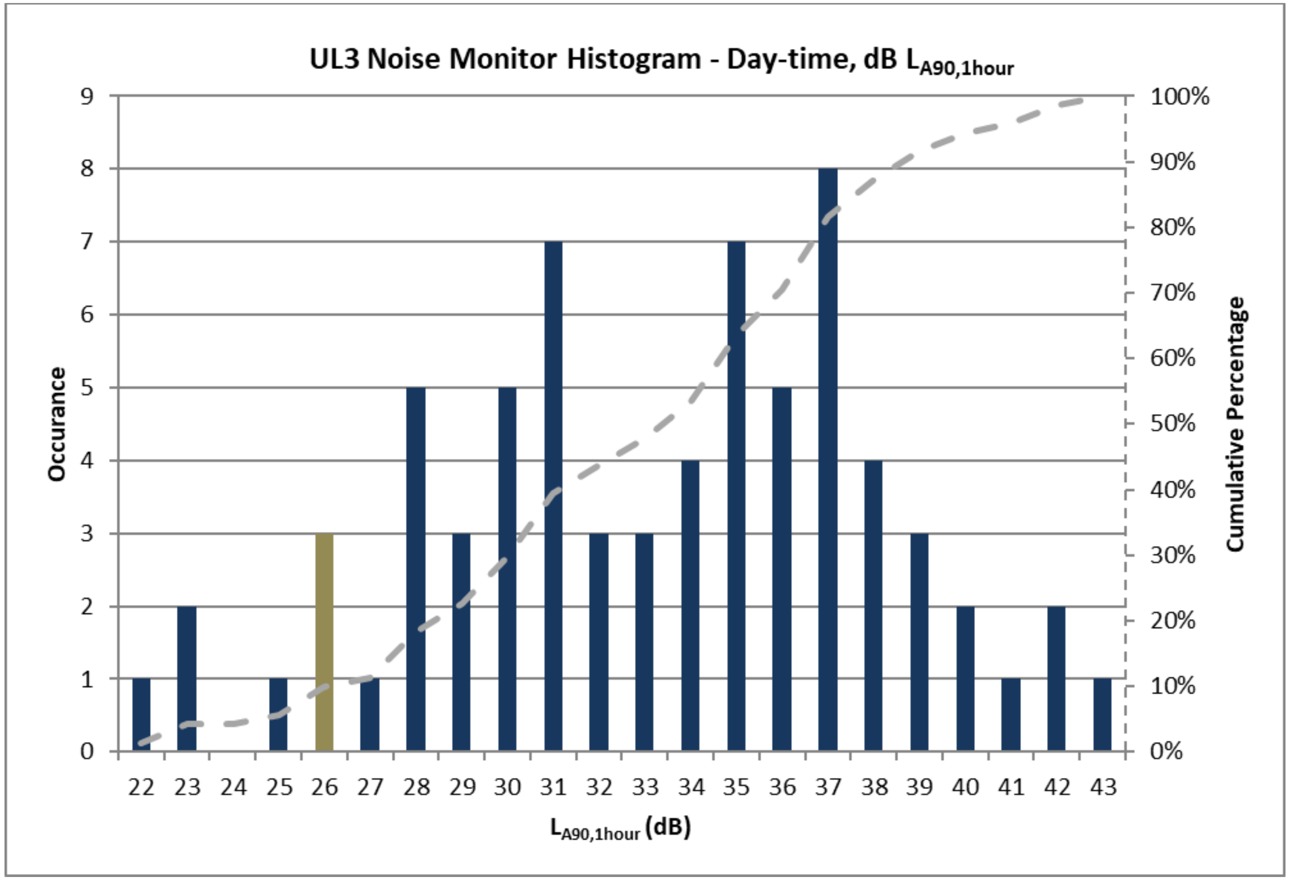


Figure C.9 – Statistical analysis of daytime background noise levels – UL3

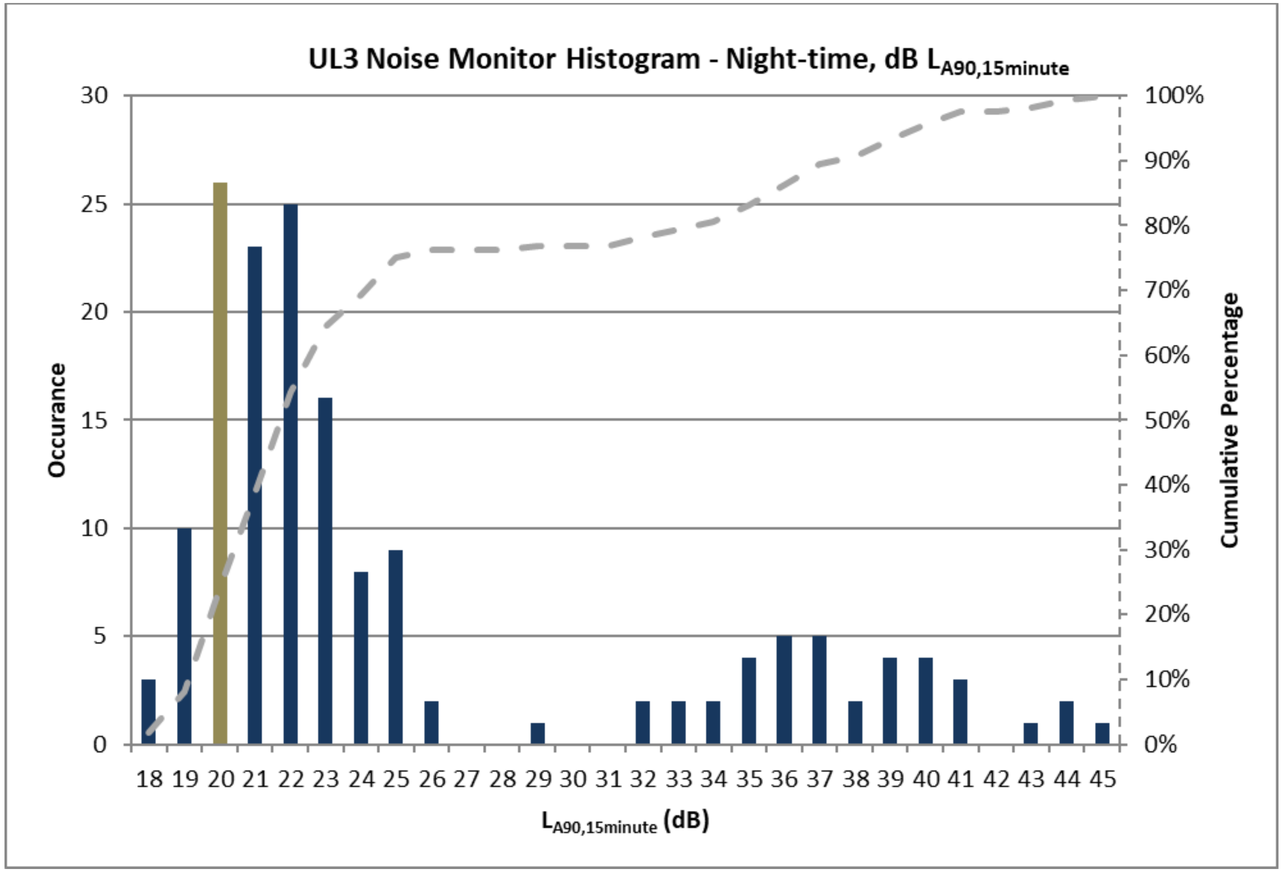


Figure C.10 – Statistical analysis of night-time background noise levels – UL3

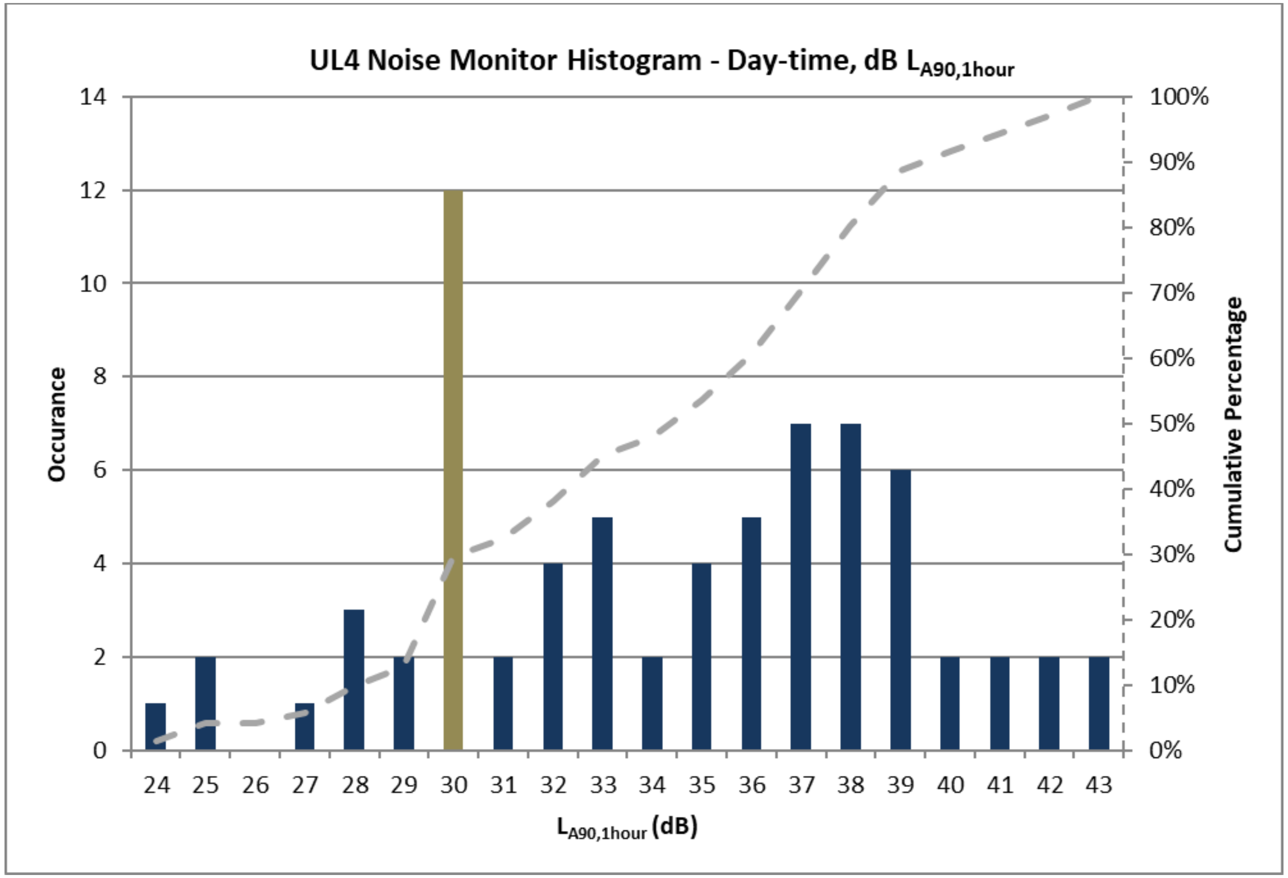


Figure C.11 – Statistical analysis of daytime background noise levels – UL4

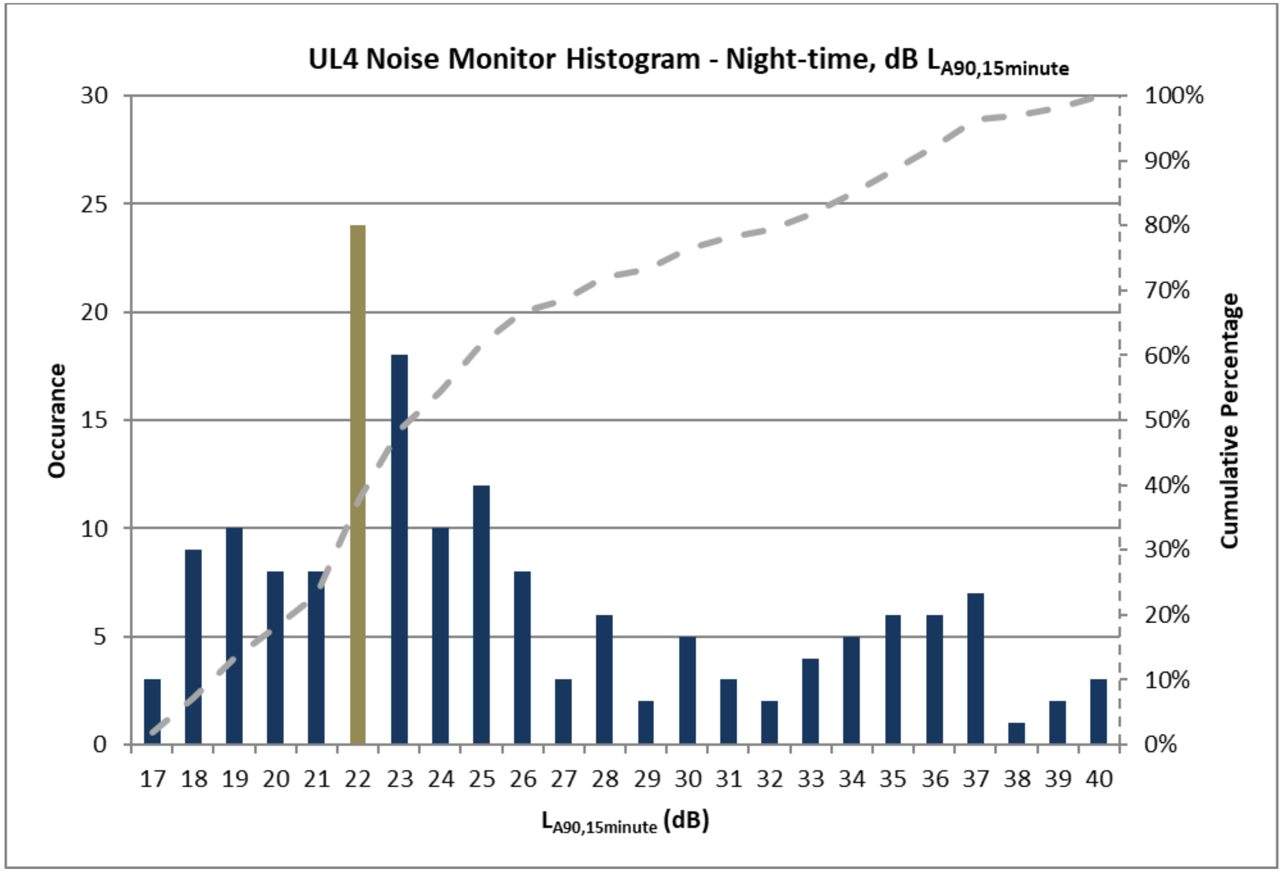


Figure C.12 – Statistical analysis of night-time background noise levels – UL4

Appendix D: Construction Plant Lists

	Plant	Noise Data reference and Type	Lp at 10m	On time	Number of plant items	Correction	Total Lp at 10m
Task 1 – Construction of Haul Road	Excavator	C5.18, 35t	80	20	1	-7	73
	Dozer	C5.15, 24t	83	20	1	-7	76
	Tipper truck	C11.17	78	10	1	-10	68
	Roller	C5.20	75	20	1	-7	68
						Task 1 – Total Lp at 10 m	**79**
Task 2 - Installation of Mounting Frames and Panels	Excavator	C5.18, 35t	80	20	1	-7	73
	Delivery lorry	C2.34, 4-axle	80	10	1	-10	70
	Telehandler	C2.35	71	20	1	-7	64
	Impact wrench	Manufacturers Makita – 1.5kg	73	10	1	-10	63
						Task 2 – Total Lp at 10 m	**75**
Task 3 – Construction of Inverters and Substation Compounds	Excavator	C5.18, 35t	80	20	1	-7	73
	Roller	C5.20	75	20	1	-7	68
	Delivery lorry	C2.34, 4-axle	80	10	1	-10	70
	Wheeled crane	C4.43	70	10	1	-10	60
						Task 3 – Total Lp at 10 m	**76**

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