BAILLIE GREENER GRID PARK

APPENDIX 6: NOISE IMPACT ASSESSMENT

STATKRAFT UK LTD

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Prepared By:

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1 INTRODUCTION

Arcus Consultancy Services Ltd (Arcus) has been commissioned by Statkraft UK LTD to undertake a noise assessment in relation to the development of a Greener Grid Park ('the Development') on land within Baillie Wind Farm, Highland ('the Site').

The aim of this assessment is to determine the existing acoustic climate, predict the sound levels due to the operation of the Development, and to assess these levels against relevant guidance.

Where appropriate, mitigation measures have been recommended to ensure that the amenity of residents in the locality of the Development is not unreasonably impacted by the Development.

2 DEVELOPMENT OVERVIEW

The Development is located within Baillie Wind Farm near Westfield, Highland. The nearest sensitive receptor is located approximately 450 m from the Development.

The Development is designed to support the flexible operation of the National Grid and decarbonisation of electricity supply. The Development would be for a Greener Grid Park comprising synchronous compensators and a battery storage area designed to adjust and support frequency and voltage conditions on the electrical grid and other associated ancillary electrical infrastructure.

A figure detailing the Development layout is presented in Appendix 1.

3 CONSULTATION AND ASSESSMENT CRITERIA

A consultation email was sent to Highland Council on 21st July 2021 outlining our proposed methodology and assessment criteria. Our approach consisted of:

- One monitoring location in a position considered to be conservatively representative of the nearest receptors: Hillcrest Cottage, and Bardnaheigh Bungalow, to capture day and night background levels over approximately 24 hours;
- BS 4142 assessment methodology with criteria of '*Rating level no more than 5 dB above background*'; and
- NR assessment for internal levels: NR 30 for daytime (0700 – 2300) and NR 20 for night-time (2300 – 0700).

Confirmation was not received from the Council and therefore, the above approach has been adopted in this assessment.

4 RELEVANT GUIDANCE

The following guidance and standards are pertinent to the assessment:

- Planning Advice Note 1/2011: Planning and Noise (PAN 1/2011)[1];
- Technical Advice Note: Assessment of Noise (TAN)[2];
- BS 4142:2014+A1:2019 '*Method for Rating and Assessing Industrial and Commercial Sound*'; and
- NR Curves – ISO 1996-1:2016 (en) *Acoustics – Description, measurement, and assessment of environmental noise – Part 1: Basic quantities and assessment procedures*;

[1] The Scottish Government 2011, Planning Advice Note 1/2011: planning and noise

[2] The Scottish Government 2011, Technical Advice Note: Assessment of Noise

4.1 Planning Advice Note (PAN) 1/2011: Planning and Noise

PAN 1/2011 provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise, with information and advice on assessment methods provided in the associated TAN.

The PAN promotes the principles of good acoustic design and the appropriate location of new noise-generating development. The selection of a site, the design of a development and conditions which may be attached to a planning permission can all play a part in preventing, controlling and mitigating the effects of noise.

4.2 Technical Advice Note (TAN): Assessment of Noise

The TAN provides guidance which may assist in the technical assessment of noise, although it is neither prescriptive nor exhaustive. It provides a summary of relevant and current (at the time of publication) technical standards, guidance and codes of practice. For a noise generating development (such as industrial, commercial or recreational developments) affecting a noise sensitive building, the TAN assesses the noise impact based on the principals described in BS 4142, as described in Section 4.3, below.

4.3 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019 ('BS 4142') describes methods for rating and assessing sound in order to provide an indication of its likely impact upon nearby premises (typically residential dwellings).

The specific sound emitted from the Development (dB, L_{Aeq}) is rated by taking into account both the level and character (i.e., tonal elements, impulsivity, intermittency and distinctiveness) of the sound. This is achieved by applying appropriate corrections to the specific sound level externally at the receptor location, which gives the rating level of the sound in question. This is then assessed against the existing prevailing background sound level (dB, L_{A90}) at that location in order to determine a likely level of impact.

The level by which the rating level exceeds the prevailing background sound level indicates the following potential impacts:

- 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 the context.

When considering the level of impact, BS 4142 emphasises the importance of the context in which a sound occurs. BS 4142 states that where the background levels at the receptor is very low (i.e., less than 30[3] dB, L_{A90}) changes in absolute level should be taken into context. 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*".

4.4 NR Curves

Noise Rating ('NR') curves were developed by the International Organisation for Standardisation[4] (ISO) to determine acceptable indoor sound environment for hearing

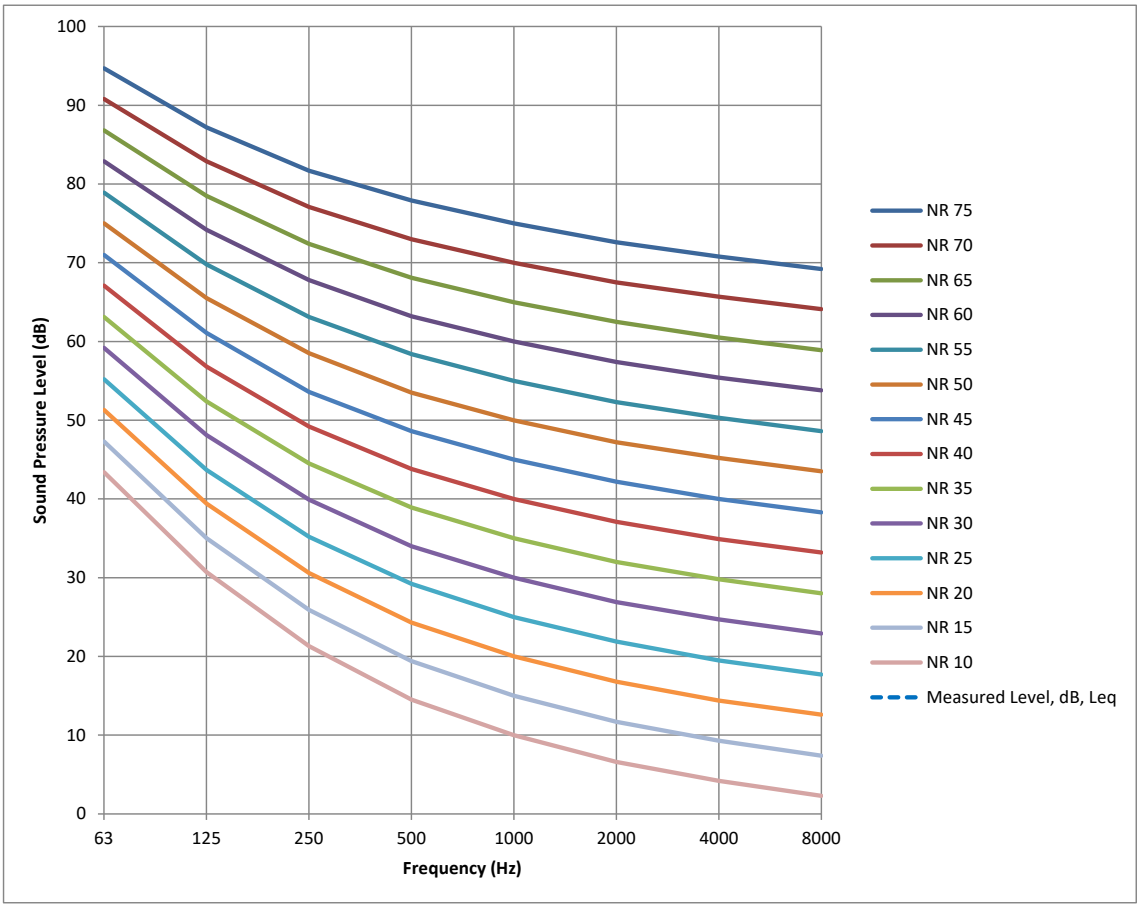
[3] BS4142:1997 defines a 'very low background' level to be 30 dB(A) or lower.

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

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. They are regularly used to specify the maximum acceptable level in each octave band of a frequency spectrum, or to assess the acceptability of a noise spectrum for a particular application.

To obtain an NR rating level, the noise spectrum is compared to a series of unweighted (dB) octave-band values, as shown in Chart 1, overleaf. The resulting NR level is that which is entirely above the predicted noise level spectrum.

Chart 1: NR Curves



NR curves are regularly used by Local Authorities to assess noise levels due to electrical plant, and is therefore a suitable methodology for the purposes of this assessment. Some examples of maximum NR values[5] typically specified for a range of applications are shown in Table 1, overleaf.

[5] ISO Recommendation ISO/R 1996-1971

Table 1: NR Curve Criteria

NR Curve	Application
NR 20	Broadcasting and recording studios
NR 25	Concert halls, churches
NR 30	Private dwellings, hospitals, theatres, cinemas, conference rooms
NR 35	Libraries, museums, court rooms, schools, hospital operating theatres and wards, flats, hotels, executive offices
NR 40	Halls, corridors, cloakrooms, restaurants, night clubs, offices, shops
NR 45	Department stores, supermarkets, canteen, general offices
NR 50	Typing pools, offices with business machines
NR 60	Light engineering works
NR 70	Foundries, heavy engineering works

As can be seen from Table 1, a criterion of NR 30 is typically applied for private dwellings.

The curves can range from NR0 to NR130, presented as octave band values. Table 2 below presents the octave band limits for NR30 and NR20, to the nearest dB, which are applicable to this assessment. It should be noted that NR curves are relative to Z-weighted (i.e., un-weighted) noise levels, rather than the A-weighted levels used in the majority of other assessments. Further detail is provided in the Glossary.

Table 2: NR Curve Limits for NR30 and NR20

NR	Octave Band Frequencies (Hz)							
	63	125	250	500	1000	2000	4000	8000
	Octave Band Noise Level dB (Z- weighted)							
NR30	59	48	40	34	30	27	25	23
NR20	51	39	31	24	20	17	14	13

5 BACKGROUND NOISE SURVEY

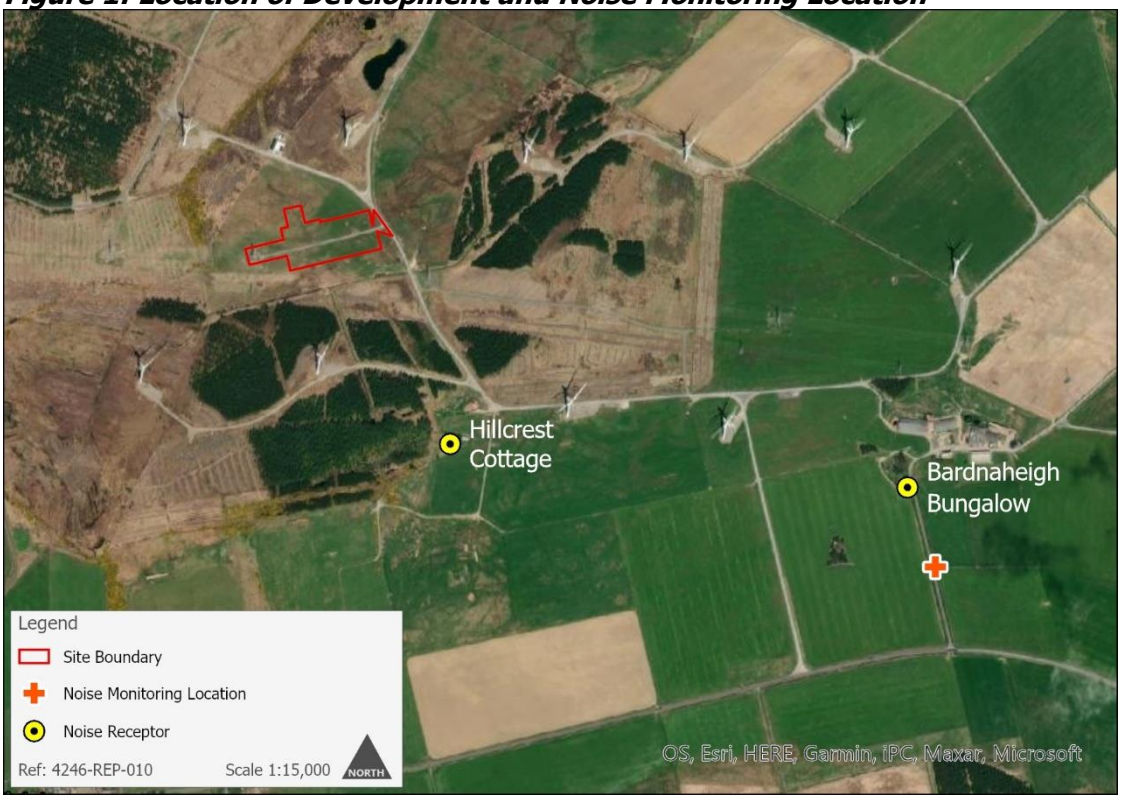
In order to establish the background sound environment in the locality of the Development, a background sound survey was undertaken over 24 hours from 10th to 11th August 2021 at a location representative of the closest residential receptors.

Figure 1 below shows the location of the closest noise-sensitive receptors to the Development, as well as the noise monitoring location. The closest receptors to the Development are Hillcrest Cottage (approximately 450 m to the southeast), Bardnaheigh Bungalow approximately 1000 m to the southwest, and scattered residential dwellings 1000 m to the south in Shebster.

Hillcrest Cottage is surrounded by wind turbines of the Baillie Wind Farm, with the nearest turbines 200 m in distance, measurement at this location would therefore present elevated background levels unrepresentative of the other receptors in the area which are at further distances from the wind farm.

Therefore, noise monitoring was undertaken at a location near Bardnaheigh Bungalow at an appropriate distance from the turbines in order to capture background levels that would be representative of all nearby receptors as well as conservative levels for Hillcrest Cottage.

Figure 1: Location of Development and Noise Monitoring Location



The monitoring equipment consisted of a Class 1 sound level meter, calibrated to traceable standards and housed in an all-weather case with long-life batteries. The microphone was positioned at a height of 1.4 m above ground level, with suitable proprietary windshield.

The meter was field-calibrated at the start and end of the survey period; no significant calibration drift was found. Indices measured included $L_{A90,\ 15mins}$ (i.e., the background sound level).

Weather information was taken from the weather forecasting website wunderground.com, with data from the nearest weather station (ITHURS5[6]) used to monitor wind speed and rainfall for the duration of the monitoring period. Weather conditions were found to be suitable throughout the survey period, with very low wind speeds. A brief period of rain was recorded on the morning of the 11th August which has been excluded from the data as a conservative approach.

Survey records along with photographs of monitoring equipment in situ are presented in Appendix 2.

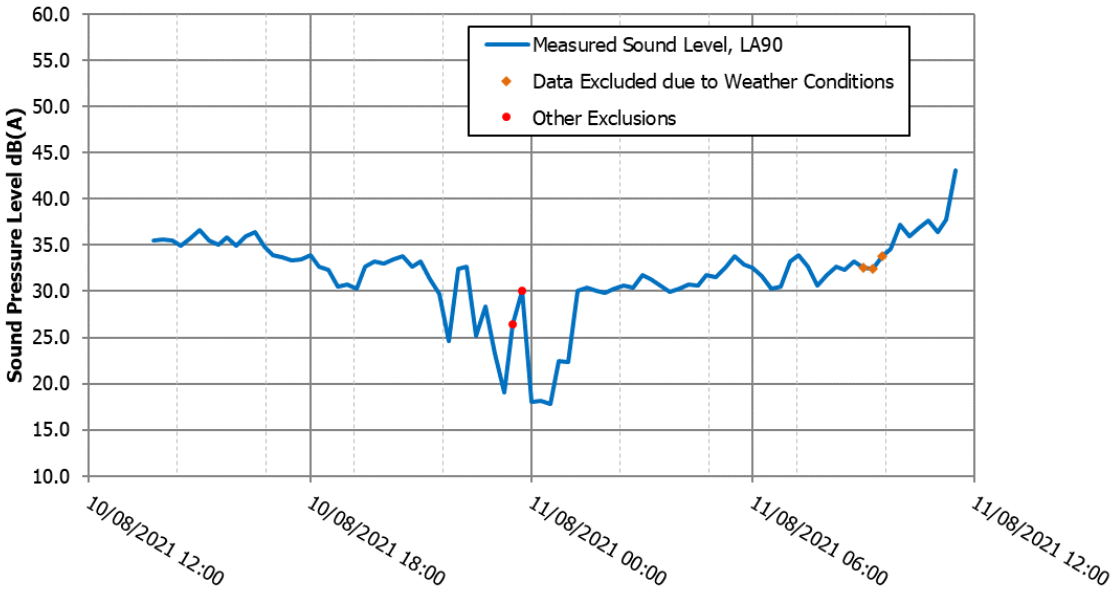
[6] https://www.wunderground.com/dashboard/pws/ITHURS5/table/2021-08-11/2021-08-11/daily - accessed 18/08/2021.

6 MEASUREMENT RESULTS

6.1 Survey Measurements

Chart 2 provides a summary of the background sound levels measured during the survey period, detailing $L_{A90,\ 15min}$ sound levels.

Chart 2: Measured Sound Level vs Time History



The measured sound levels show a steady profile at around 30 to 35 dB, L_{A90} during the day, dropping to around 20 dB during the quietest period of the night. The low levels are typical of a rural area with scarce anthropogenic activity or road traffic.

An increase in the night-time noise level was observed at from 2330 to 0000, which appears to be inconsistent with background sound levels before and after this period. As such, this is considered an atypical event, and has been excluded from data analysis as a conservative measure.

6.2 Background Levels

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 (e.g., mean, median, mode etc.). To determine the prevailing background noise levels for the purposes of the assessment, Charts 3 and 4 therefore present the range of $L_{A90,15min}$ noise levels recorded, along with the percentage of periods for which they occurred, for daytime (0700-2300) and night time (2300-0700) periods respectively.

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

Chart 3: Daytime Background Statistical Analysis (0700-2300)

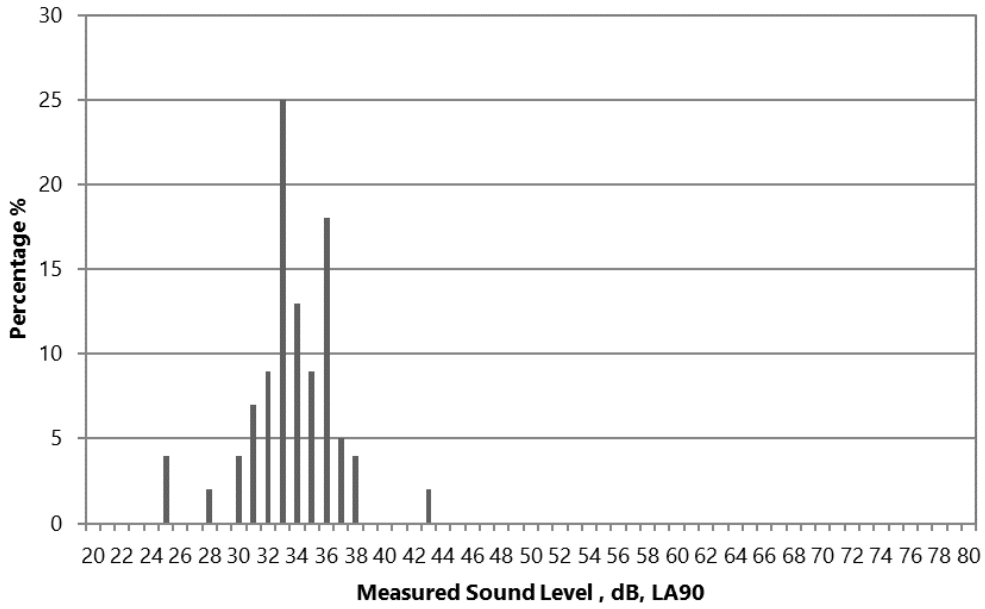


Table 3 presents the mode, median and mean averages of the above dataset.

Table 3: Background Sound Survey Results (Daytime)

Period	Mode	Median	Mean	Representative
Day	33	34	34	33

Based upon the results presented in Table 3, along with the spread of data presented in Chart 3, a daytime background noise level of 33 dB, L_{A90} is considered appropriate for the purposes of this assessment.

Chart 4: Night-time Background Statistical Analysis (2300-0700)

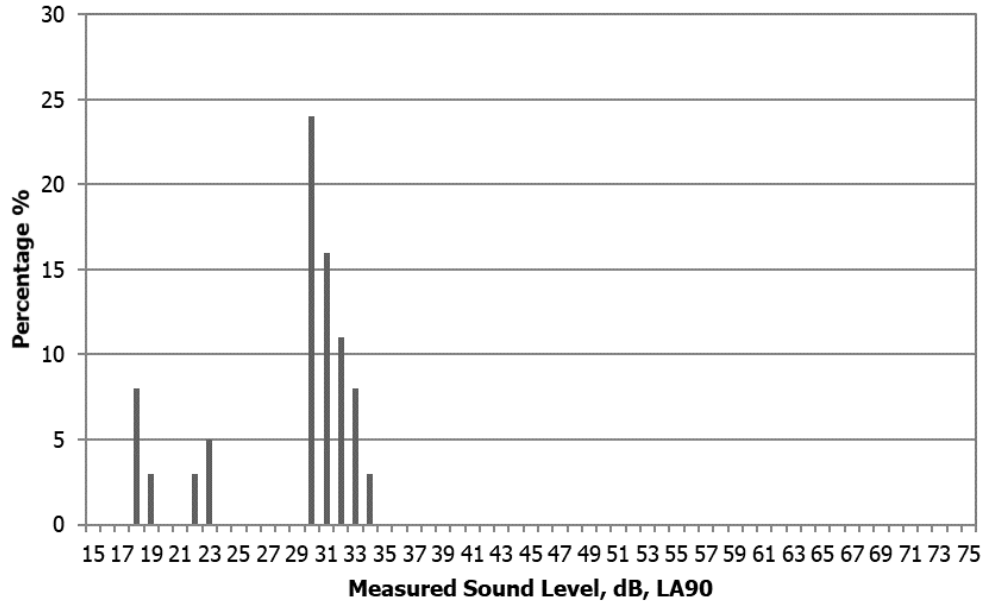


Table 4 presents the mode, median and mean averages of the above dataset.

Table 4: Background Sound Survey Results (Night-time)

Period	Mode	Median	Mean	Representative
Night	30	30	29	30

Based upon the results presented in Table 4, along with the spread of data presented in Chart 4, a night-time background noise level of 30 dB, L_{A90} is considered an appropriate representation of the night-time background sound level, and has been adopted for the purposes of this assessment.

7 NOISE MODELLING

7.1 Noise Emission Levels

The Specific sound level[7] at the nearest noise-sensitive receptors has been calculated in SoundPlan 8.2, using the environmental noise propagation model ISO 9613-2:1996[8].

The Development comprises of the following noise sources:

- Energy Management Buildings, each housing a Synchronous Compensator and flywheel;
- Cooler / Chiller units;
- Energy Management Building HVAC Unit;
- 275kV Primary Transformers;
- Auxiliary Transformers;
- Battery Containers each with two external wall-mounted HVAC units;
- Inverters; and
- LV to MV Inverter-Transformers.

Some additional plant is located within containers, such as LV Room, distribution containers, and COMMS House, as well as other generic plant in the Development such as pumps etc., however noise from these sources is negligible and has not been included as part of the modelling process.

The sound power levels of the plant included in the noise model are presented in Table 5 below. The octave band spectrum for the inverters, HVAC units, synchronous compensators, transformers, and coolers was taken from respective manufacturer datasheets or noise test reports provided by the Client.

[7] The sound level produced by a source, without corrections for acoustic features as discussed in Section 4.3.

[8] ISO 9613-2:1996 Acoustics; Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

Table 5: Sound Power Levels

Plant	Sound Power Level, L_{WA}, dB(A)	Octave Band Centre Frequency, Hz in dB(A)							
		63	125	250	500	1k	2k	4k	8k
Synchronous Compensator	85	72	76	78	81	71	74	67	54
Primary Transformer	85	64	70	78	80	80	75	69	64
Coolers	92	78	81	84	87	86	81	76	69
Synchronous Compensator building HVAC system	69	64	63	61	60	58	54	55	46
BESS Inverters (with Silencer)	85	60	70	77	80	77	77	76	69
LV to MV Inverter-Transformers	73	52	58	66	68	68	63	57	52
Battery HVAC Unit	75	58	68	62	66	68	68	66	59
Auxiliary Transformer	78	57	63	71	73	73	68	62	57

The above sources were modelled at their respective positions as detailed in Appendix 1. The acoustic performance of the synchronous compensator buildings themselves were modelled as detailed in Table 6, with appropriate sound reduction indices taken from the SoundPlan library of building materials.

Table 6: Reduction Index of Building Envelope

Item	SRI, dB, R_W	Octave Band Centre Frequency, Hz					
		125	250	500	1k	2k	4k
Roof (Double steel corrugated sheet cladding)	36	18	23	33	43	48	39
Walls[9] (Double steel corrugated sheet cladding with mineral wool)	42	20	29	43	48	56	57

7.2 Model Parameters

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:

- All plant operating simultaneously at full capacity (highly unlikely in practice);
- Includes local terrain and buildings with respective heights above ground level;
- Ground absorption of G=0 (hard) for all areas of hardstanding, and G=1 (soft) for other areas; and
- Receivers placed at the external façade of receptors at 1.5 m height (equivalent to head height).

7.3 Mitigation Measures

The following mitigation measures were included in the model:

- Acoustic fences (3 m of height) surrounding the two compounds of cooler units;

[9] For the purposes of this assessment, it is assumed that any doors will have the same acoustic specification as the wall cladding.

- All inverters and LV to MV Transformers placed north of each battery compound; and
- All HVAC units located on the northern facade of each battery container (i.e., facing away from NSRs).

A noise map showing predicted Specific levels (i.e., noise levels prior to any rating corrections) is presented in Appendix 3.

7.4 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: The sound emitted by the Development is likely to be characterised by the external chillers / HVAC units. These are broadband in character, and non-tonal.
- Intermittency: Whilst each individual cooling unit may turn on/off in isolation, the chillers would not operate in synchronisation. Therefore, when taken as a whole, the Development is highly unlikely to have *"identifiable on / off conditions"* in terms of BS 4142; no correction for intermittency is therefore required.
- Distinctiveness: The primary sources of noise are broadband in nature, and as such will not be distinctive.

Based on the above, no corrections for acoustic features are required; the Rating Levels at the receptor locations are therefore the same as the Specific Levels.

8 ASSESSMENT OF IMPACT

An assessment of the likely impact has been made based upon the difference between the Rating Levels and prevailing background levels for daytime and night-time periods, as detailed in Section 6, and taking account of the mitigation measures detailed in Section 7.3.

It should be noted that the modelling assumes all plant operating simultaneously and at maximum power as a worst case. As such, noise levels in practice are likely to be substantially lower than presented during typical operation.

Table 7: Assessment of Impact

Receptor Location	Specific Level, dB, L_{Aeq}	Rating Level, dB(A)	Background Sound Level, dB, LA90		Difference, dB	
			Day	Night	Day	Night
Hillcrest Cottage	33	33	33	30	0	3
Bardnaheigh Bungalow	21	21			-12	-9

As Table 7 above shows, subject to the implementation of the mitigation specified in Section 7.3, Rating Levels do not exceed more than 5 dB above the background sound levels during the day and night at the nearest, and therefore all noise-sensitive receptors.

The Development was modelled operating continuously at full capacity which will not be the case in practise, as the Development will not be in operation at all times.

With regards to context, the Development is surrounded by turbines comprising the Baillie Wind Farm; therefore, Hillcrest Cottage in particular is subject to relatively elevated levels

of ambient noise from the turbines which will serve to mask any noise due to the Development for the majority of the time.

8.1 NR Assessment

An assessment relative to the appropriate NR curves has also been made at the sensitive receptors. The results are detailed in Tables 8 and 9.

The assessment accounts for an open window attenuation of 15 dB, this value is taken from research results undertaken by Napier University[10] and supporting research findings in the Environmental Research and Public Health journal[11]. The research shows that typical attenuation of slightly open or tilted windows ranges from 14 to 19 dB on average, and as such a 15 dB attenuation has been taken as representative for slightly open windows.

Table 8: NR Assessment of Impact – Hillcrest Cottage

Hillcrest Cottage	**Octave Band Frequencies (Hz) (Un-weighted)**							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Un-weighted Sound pressure level at receiver façade, dB	48	41	34	32	27	22	10	-
Attenuation for open window, dB	-15	-15	-15	-15	-15	-15	-15	-
Resulting internal spectrum	33	26	19	17	12	7	-5	-
Headroom to NR30, dB	-26	-22	-21	-17	-18	-20	-30	-
Headroom to NR20, dB	-18	-13	-12	-7	-8	-10	-19	-

As seen above, the resulting internal spectrum for Hillcrest Cottage meets NR30 and NR20 for day and night respectively.

Table 9 below presents the predicted sound levels at Bardnaheigh Bungalow, the predicted noise levels at 8000 Hz were very low and negligible to the overall sound specific level.

Table 9: NR Assessment of Impact – Bardnaheigh Bungalow

Bardnaheigh Bungalow	**Octave Band Frequencies (Hz) (Un-weighted)**							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Un-weighted Sound pressure level at receiver façade, dB	37	31	23	19	12	3	-29	-
Attenuation for open window, dB	-15	-15	-15	-15	-15	-15	-15	-
Resulting internal spectrum	22	16	8	4	-3	-12	-44	-
Headroom to NR30, dB	-37	-32	-32	-30	-33	-39	-69	-
Headroom to NR20, dB	-29	-23	-23	-20	-23	-29	-58	-

The internal spectrum for Bardnaheigh Bungalow meets NR30 and NR20 for day and night respectively.

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

[11] Barbara et al. 'Difference between Outdoor and Indoor Sound Levels for Open, Tilted, and Closed windows': International Journal of Environmental Research and Public Health.

8.2 Uncertainty

Noise monitoring was undertaken during a period of very low wind speeds, during which time, no noise was likely being produced by Baillie Wind Farm. Typically, noise from Bailie Wind Farm is likely to increase the background noise level and mask any noise due to the Development.

Modelling of the proposed plant has been undertaken on a worst-case basis, and assuming all plant is operating simultaneously and at maximum power which is very unlikely. Regarding the cooling plant, these items are likely to be speed / thermostat-controlled; noise levels during typical operation are therefore likely to be substantially lower than those presented, especially at night when temperatures are lower.

Given the conservative approach, this assessment is likely to overestimate the level of impact in practice, and the uncertainties inherent in the assessment will not have a significant effect on the outcome.

9 CONCLUSION

Arcus was commissioned by Statkraft UK LTD to undertake a noise assessment in relation to the development of a Greener Grid Park located within Baillie Wind Farm.

An assessment of noise impact has been undertaken in accordance with BS 4142. It has been found that, subject to the implementation of the mitigation specified in Section 7.3, Rating levels do not exceed more than 5 dB above the background sound levels during the day and night periods at the nearest receptors.

An NR assessment was also undertaken to absolute internal levels. The assessment shows all receptors to meet NR30 and NR20 during daytime and night-time respectively.

As such, the Development meets the applicable criteria and is considered acceptable in terms of noise.

10 GLOSSARY OF TERMS

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.

A-Weighting: 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.

Noise: Unwanted sound. May refer to both natural (e.g. wind, birdsong etc.) and artificial sounds (traffic, industrial noise, aircraft etc.).

Z-Weighting: A dB noise level, with no weightings (e.g. A-weighting) applied.

Noise sensitive receptors: Locations that may potentially be adversely affected by the addition of a new source of noise, such as residential properties.

Sound power level (Lw): Sound power measured on the decibel scale, relative to a reference value (Wo) of 10-12 W.

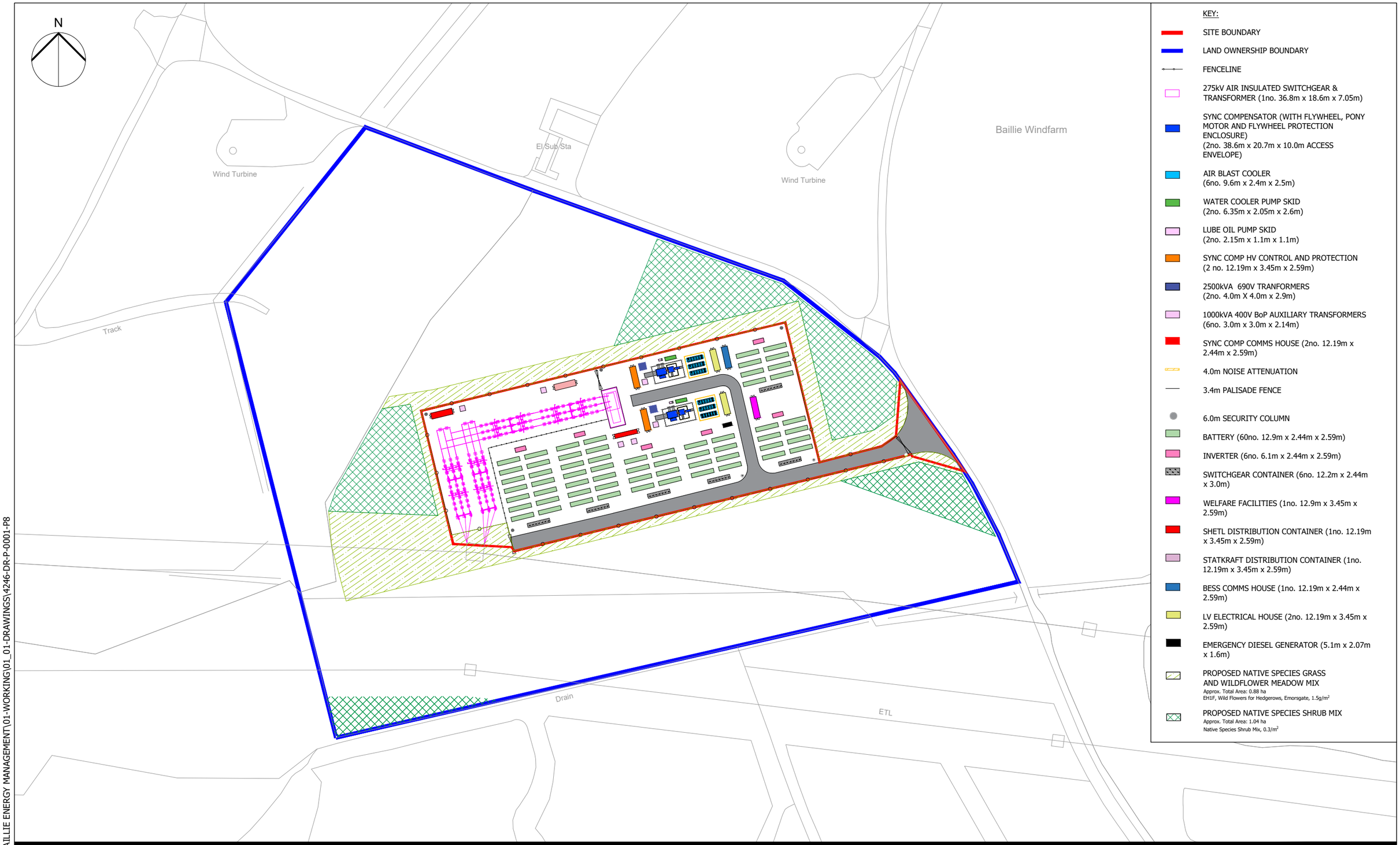
Background Sound: The background sound level is the underlying level of noise present at a particular location for the majority (usually 90%) of a period of time.

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

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

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

APPENDIX 1: DEVELOPMENT LAYOUT



KEY:

- SITE BOUNDARY
- LAND OWNERSHIP BOUNDARY
- FENCELINE
- 275kV AIR INSULATED SWITCHGEAR & TRANSFORMER (1no. 36.8m x 18.6m x 7.05m)
- SYNC COMPENSATOR (WITH FLYWHEEL, PONY MOTOR AND FLYWHEEL PROTECTION ENCLOSURE) (2no. 38.6m x 20.7m x 10.0m ACCESS ENVELOPE)
- AIR BLAST COOLER (6no. 9.6m x 2.4m x 2.5m)
- WATER COOLER PUMP SKID (2no. 6.35m x 2.05m x 2.6m)
- LUBE OIL PUMP SKID (2no. 2.15m x 1.1m x 1.1m)
- SYNC COMP HV CONTROL AND PROTECTION (2 no. 12.19m x 3.45m x 2.59m)
- 2500kVA 690V TRANFORMERS (2no. 4.0m X 4.0m x 2.9m)
- 1000kVA 400V BoP AUXILIARY TRANSFORMERS (6no. 3.0m x 3.0m x 2.14m)
- SYNC COMP COMMS HOUSE (2no. 12.19m x 2.44m x 2.59m)
- 4.0m NOISE ATTENUATION
- 3.4m PALISADE FENCE
- 6.0m SECURITY COLUMN
- BATTERY (60no. 12.9m x 2.44m x 2.59m)
- INVERTER (6no. 6.1m x 2.44m x 2.59m)
- SWITCHGEAR CONTAINER (6no. 12.2m x 2.44m x 3.0m)
- WELFARE FACILITIES (1no. 12.9m x 3.45m x 2.59m)
- SHETL DISTRIBUTION CONTAINER (1no. 12.19m x 3.45m x 2.59m)
- STATKRAFT DISTRIBUTION CONTAINER (1no. 12.19m x 3.45m x 2.59m)
- BESS COMMS HOUSE (1no. 12.19m x 2.44m x 2.59m)
- LV ELECTRICAL HOUSE (2no. 12.19m x 3.45m x 2.59m)
- EMERGENCY DIESEL GENERATOR (5.1m x 2.07m x 1.6m)
- PROPOSED NATIVE SPECIES GRASS AND WILDFLOWER MEADOW MIX
  Approx. Total Area: 0.88 ha
  EH1F, Wild Flowers for Hedgerows, Emorsgate, 1.5g/m²
- PROPOSED NATIVE SPECIES SHRUB MIX
  Approx. Total Area: 1.04 ha
  Native Species Shrub Mix, 0.3/m²

Project Title: BAILLIE ENERGY MANAGEMENT

Client: Statkraft

Drawing Title: PLANNING DRAWING 2 PROPOSED SITE LAYOUT

Purpose of issue: PLANNING

Designed	Drawn	Checked	Approved
KB	SR	KB	DB

Arcus Internal Project No.: 4246

Date: 10/09/21

Scale @ A3: 1:500

Drawing Number: 4246-DR-P-0001

Rev: 8

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ARCUS

Plot Date : 12 November 2021 14:28:08
File Name P:\CAD\4246 BAILLIE ENERGY MANAGEMENT\01-WORKING\01_01-DRAWINGS\4246-DR-P-0001-P8

4246-DR-P-0001-P8

APPENDIX 2: SURVEY RECORD SHEETS

Arcus Consultancy Services 7th Floor, 144 West George Street, Glasgow, G2 2HG

Noise Survey Record Sheet

Project No.	4246	**Project Name:**	Baillie BESS
Location (x of y)	1	**Installed By:**	BA
Lat/Long	58.55702, -3.65789	**Location Name**	Bardnaheigh Bungalow
Start Date	10/08/2021	**Start Time**	1345

Equipment Details	**Make/Model**	**Serial No.**
Sound Level Meter:	Rion NL-31	593611
Calibrator:	Rion NC-74	35105087
Source of Equipment:		Arcus
Meter Timestamp (Start/End, GMT/BST):		Start BST

Location / Source:	At access road side
Distance from façade::	Free field
Noise sources observed:	Farm activity, livestock, and road traffic passing
Weather Conditons:	Windy 2.3m/s, overcast
Additional notes:	24 hour measurement with 15 min intervals

Installation (Visit 1)

Date:	10/08/2021	**Time:**	1345
Filename:	Auto_0101	**Calibration level:**	94
Range setting:	20-100	**Meas. period:**	15min
Freq weighting:	A	**Weather Station:**	No
Lp Logging?	No	**Audio / Octave?**	No
Notes:	24 hour measurement with 15 min intervals		

Visit 2

Date:	11/08/2021	**Time:**	13:00
Visited by:	BA	**Calibration level:**	94
Level pre-calibration	94	**Batts replaced?**	No
Equipment Removed?			Yes
Notes:	None		

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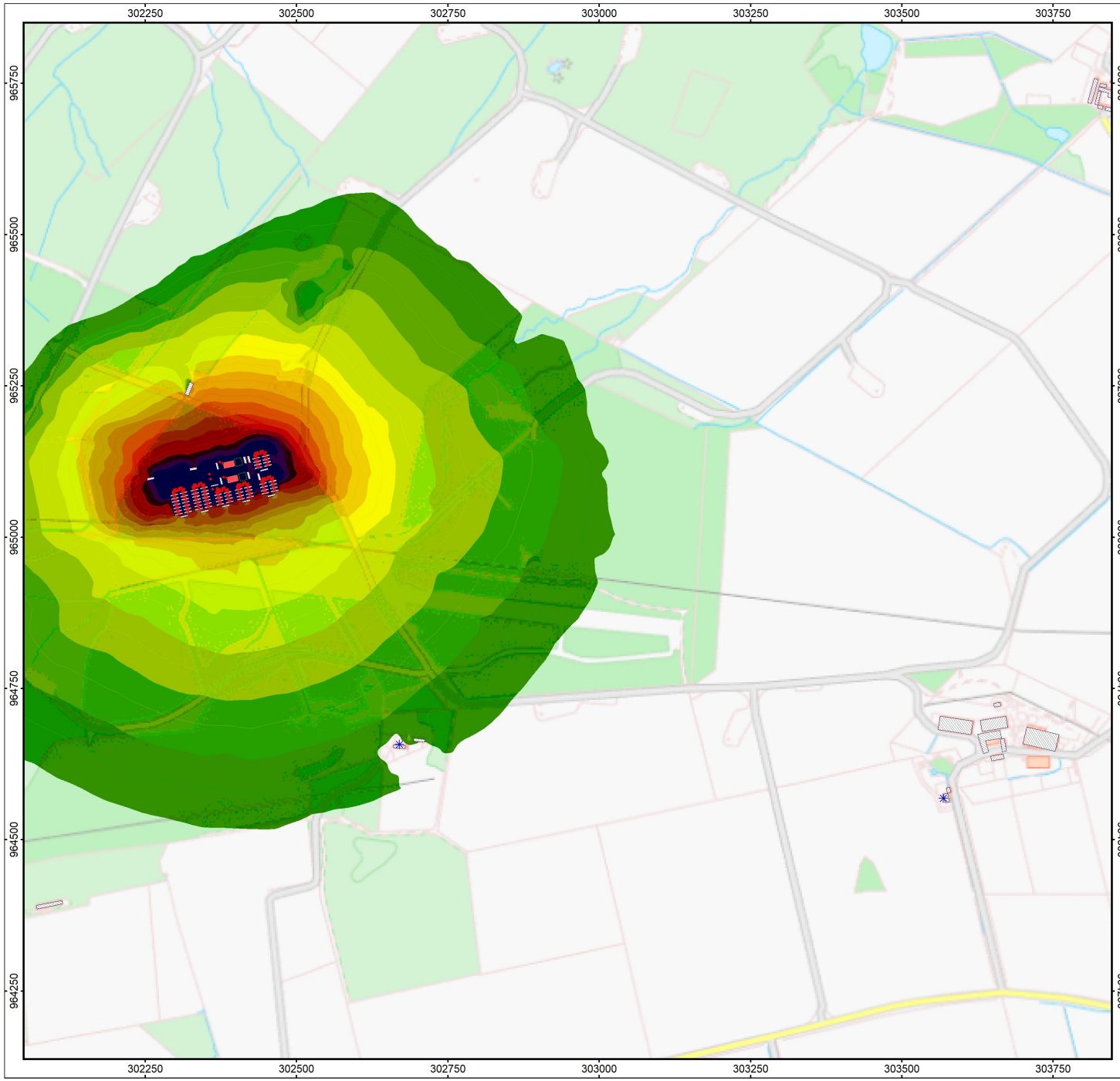
Noise Survey Record Sheet - Photos

Project No.	4246	Location (x of y)	1

APPENDIX 3: NOISE GRID MAPS



Customer: Statkraft UK Ltd
Project: Baillie BESS
Project-No. 4246

Appendix

3

Revised_V3_NoiseMap
Result number 11
Calculation in 1.5 m above ground

Project engineer: BA
Created: 04/10/2021
Processed with SoundPLAN 8.1, Update 27/04/2020

Specific Level
in dB(A)

<	32
32 -	34
34 -	36
36 -	38
38 -	40
40 -	42
42 -	44
44 -	46
46 -	48
48 -	50
50 -	52
52 -	54
54 -	56
56 -	58
58 -	60
>=	60

Signs and symbols

- Main building
- Base line
- Wall
- Point receiver
- Point SOurce
- Area Source
- Industrial building/Roc
- Plant as source

N

Length scale 1:6414
0 50 100 200 300 400 m

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G:\Projects\4246 Baillie Energy Management\Noise\Model\4246 Baillie BESS\Sheet1.sgs