Stoneworthy Battery Storage Project

Acoustic Impact Assessment

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Date	29th May 2024
Ref	05197-7902756

Contents

Revision History

Issue	Date	Name	Latest Changes	File References
01	29/05/2024	Mike Craven	Finalised	05197-7902757 05197-7902758

1 Introduction

This report provides an acoustic assessment of the proposed Stoneworthy Energy Storage System, referred to as 'the Proposed Development' herein, in terms of operational impacts. One Associate and two Members of the Institute of Acoustics (MIOA) have been involved in its production and details of their experience and qualifications can be found in **Appendix A** of this report.

Stoneworthy Energy Storage System is a proposed battery energy storage system (BESS) comprising approximately 32 battery enclosures, 16 PCS (power conversion systems), 16 MV skids (PCS transformer and switchgear), a 33 kV substation building with a high voltage area containing auxiliary transformer and grid compliance equipment, a 132/33kV grid transformer with associated equipment and a grid connection to a National Grid Electricity Distribution (NGED) overhead line.

An assessment of the sound generated by the site has been undertaken in accordance with BS 4142:2014 + A1:2019 'BS 4142 Methods for Rating and Assessing Industrial & Commercial Sound'. The assessment has been put into further context in terms of guidance published by the World Health Organisation and BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'.

2 Planning Policy, Guidance & Standards

2.1 National Planning Policy Framework (NPPF)

The treatment of noise is defined in the context of planning by the National Planning Policy Framework (NPPF) [1] which details the Government's planning policies and how these are expected to be applied. The NPPF provides advice on the role of the planning system in helping to prevent and limit potential adverse effects of noise, stating that planning policies and decisions should aim to avoid noise giving rise to significant adverse impacts, whilst at the same time mitigating and reducing other adverse impacts on health and quality of life to a minimum. The NPPF refers to the Noise Policy Statement for England (NPSE) which provides guidance on the categorisation of impact levels.

2.2 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE) [2] sets out the long-term vision of Government noise policy which is to '… promote good health and quality of life through effective noise management within the context of sustainable development'. In order to weigh noise impacts against the economic and social benefits of the activity under consideration, the NPSE defines three categories of effect levels:

- No Observed Effect Level (NOEL) - noise levels below this have no detectable effect on health and quality of life;
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and,
- Significant Observed Adverse Effect Level (SOAEL) - the level above which effects on health and quality of life become significant.

2.3 National Planning Practice Guidance (NPPG): Noise

National Planning Practice Guidance (NPPG) [3] on noise puts the effect levels defined by the NPSE into greater context by explaining how such noise levels might be perceived, providing examples of outcomes based on likely average response, and advising on appropriate actions. These are reproduced at **Table 1**.

Table 1 - Noise Exposure Hierarchy

Response	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
	No Observed Effect Level (NOEL)		
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
	Lowest Observed Adverse Effect Level (LOAEL)		
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level (SOAEL)		
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

In addition to this guidance, which is applicable to all forms of environmental sound, specific guidance relating to nationally significant energy infrastructure has been published by the Department of Energy and Climate Change (DECC). Whilst the proposed development is not of a scale that would be deemed nationally significant, the relevant National Policy Statements (NPS) are informative in that they suggest an assessment methodology that would be considered appropriate for the type of development being proposed.

2.4 The Overarching National Policy Statement for Energy (EN-1)

The Overarching National Policy Statement for Energy (EN-1) [4] outlines the need for new electricity capacity from renewable sources as the country transitions to a low carbon electricity system. However, when referring to the NPSE, EN-1 recognises the potential for energy infrastructure to impact on health and quality of life if it results in excessive noise. The report goes on to state that where noise impacts are likely to arise, they should be assessed according to the principles of the relevant British Standards. Of the examples provided, the standards BS 4142 (see **Section 2.7**) and BS 8233 (see **Section 2.9**) relate to operational sound.

2.5 National Policy Statement for Renewable Energy Infrastructure (EN-3)

The National Policy Statement for Renewable Energy Infrastructure (EN-3) [5] refers back to EN-1 for the purposes of addressing sound impacts from renewable energy development on sensitive residential locations and provides additional general advice as to potential mitigation measures for additional specific instances.

2.6 The National Policy Statement for Electricity Networks Infrastructure (EN-5)

The National Policy Statement for Electricity Networks Infrastructure (EN-5) [6], relevant to the transmission and distribution parts of the electricity network along with any associated infrastructure, such as substations and converter stations, again points to the appropriateness of standards such as BS 4142 (see **Section 2.7**) or similar in assessing the operational acoustic impacts of such projects.

2.7 BS 4142 Methods for Rating and Assessing Industrial & Commercial Sound

BS 4142 [7] describes methods for rating and assessing sound of an industrial or commercial nature. Outdoor sound levels are used to assess the likely effects on people who might be inside or outside a residential property via the comparison of the pre-existing background sound levels with the predicted/modelled sound associated with the introduction of a particular development, known as the 'rating' level, which also accounts for any distinguishing characteristics of the emitted sound.

To determine a value for the background sound level at a specific assessment point, a series of measurements are made at a location at, or representative of, a dwelling or receptor of interest. The standard requires that that the background sound measurements (dB $L_{A90,\,T}$ – the sound level exceeded for 90% of the time, or the lowest 10 % of sound, for the reference time-period, T) should be measured during times when the sound

source in question could or will be operating and that the individual measurement intervals should not normally be less than 15-minuites in length. The objective is then to determine a justifiable representative background sound level for time periods of interest via statistical analysis and/or observations of the data set collected. The standard states that the representative background sound level '… should not automatically be assumed to be either the minimum or modal value'.

The 'rating' level is defined as the 'specific' sound level (dB L_{Aeq} – the average sound level) plus any adjustment for the characteristic features of the sound generated by the source in question. In instances where the source is unlikely to have a specific character at the assessment location then the 'rating' level can be assumed to equal to the 'specific' sound level. Where tones are present a correction of 2 to 6 dB can be added to the 'specific' sound level to determine the 'rating' level and further adjustments may be added where the source has other applicable characteristics.

The defined representative background sound level(s) and rating level(s) are then compared to determine the possible impact but with consideration of the context in which the industrial or commercial sound source to be introduced presents itself in respect of other sound sources and the existing character of the area. **Table 2** provides a summary of expected impacts when comparing background and rating levels.

Table 2 – BS 4142 Assessment Criteria

Rating Level	BS 4142 Assessment Criteria
Equal to or below background	'…an indication of the specific sound source having a low impact, depending on the context'.
Approximately +5 dB greater than the background sound level	'…an indication of an adverse impact, depending on the context'.
Approximately +10 dB or more greater than the background sound level	'…an indication of a significant adverse impact, depending on the context'.

Further to the above, it may not be appropriate or proportionate to undertake a full assessment in accordance with the BS 4142 standard, particularly when the sound level associated with the new source is particularly low at neighbouring receptors and/or is expected to be much lower than the existing background sound levels. The previous version of BS 4142 [8] stated that this version of the standard is not appropriate for use in instances where background and rating levels are very low and that '… background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low'.

2.8 World Health Organisation (WHO)

The WHO document Guidelines for Community Noise [9] provides guideline values for overall desirable internal and external noise levels for a variety of situations which are intended to minimise health impacts for certain environments. The guidance informs much of the standards and guidance relating to the protection of external and internal amenity in relation to the impacts of sound on residences such as BS 8233 (as discussed at **Section 2.9**).

The guidelines state that overall internal night-time sound levels should not be above 30 dB L_{Aeq} within bedrooms such that people may sleep with minimal disturbance while the windows are open and it is stated that this corresponds to an external night-time noise level of 45 dB L_{Aeq}, when assuming a 15 dB attenuation

in sound levels externally to internally. Furthermore, the guidance recommends that daytime external levels should not exceed 50 dB L_{Aeq} to protect the majority of people from being moderately annoyed.

The Night Noise Guidelines for Europe [10] are described as complementary to the Guidelines for Community Noise and recommend a limit of 40 dB L_{night}, outside. This is a yearly average night-time sound level which could potentially be exceeded on some nights of the year such that it is not necessarily inconsistent with the Guidelines for Community Noise if the sound levels do not exceed 45 dB L_{Aeq} on those nights.

The WHO Environmental Noise Guidelines for the European Region [11] was published in 2018 and provides '… recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise' and make a series of strong or conditional noise exposure recommendations for each based on the weight of evidence available at the time the report was being drafted. The document does not consider noise from industrial sources as the specific features of these sources are usually very localised and vary between different kinds of development.

2.9 BS 8233 Guidance on Sound Insulation and Noise Reduction for Buildings

BS 8233 [12] provides guidance on the control of noise for new buildings or those undergoing refurbishment rather than providing guidance on assessing the effect of changes in external noise levels on occupants of existing buildings. The document provides a range of desirable internal average noise levels for dwellings which may be achieved via appropriate design where necessary. The levels are provided at **Table 3** of this report for reference and include additional detail as provided within the ProPG: Professional Practice Guidance on Planning & Noise document discussed below.

2.10 ProPG: Professional Practice Guidance on Planning & Noise

The ProPG: Professional Practice Guidance on Planning & Noise document [13], similarly to BS 8233, is intended to provide guidance in terms of assessment and design of new or newly refurbished housing development in terms of pre-existing airborne sound sources impacting on them (typically from transportation) and the requirements to achieve a suitable internal sound environment for potential inhabitants. **Table 3** shows the desirable sound levels referenced within BS 8233 for reference and with the additional detail and notes the ProPG provides.

The guideline internal values specified are based on values specified within the Guidelines for Community Noise, published by the World Health Organisation (WHO) [9].

Table 3 - Internal Noise Criteria

Activity	Location	Daytime	Night-time
		07:00 - 23:00 hrs	23:00 - 07:00 hrs
Resting	Living room	35 dB $L_{Aeq,\ 16\ hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,\ 16\ hr}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,\ 16\ hr}$	30 dB $L_{Aeq,\ 8\ hr}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 4: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

2.11 Local Guidance & Consultation

Torridge District Council (TDC) do not have any specific prescriptive planning guidance relating to operational sound impacts. However, the Environmental Health Officer (EHO) representing the council was consulted as to the extent of assessment required for the Proposed Development.

A representative of RES contacted the EHO with details of the proposed assessment methodology, as set out within the documents referenced above, suggesting that due to the presence of low background sound levels in the area, an assessment against fixed limits would likely be necessary and that cumulative impacts would also be addressed. In response, the EHO representing TDC requested that the assessment should follow the requirements of BS 4142 (see **Section 2.7**) in the first instance, as per the usual requirements for developments of this kind, and that supplementary information may be provided with reference to BS 8233 and WHO guidelines (see **Sections 2.8 & 2.9**), further confirming the requirement for a cumulative operational sound impact assessment.

3 Baseline Environment

There are several scattered dwellings neighbouring the Proposed Development. A list of locations considered representative of those closest to the site is provided in **Table 4** below, as also shown in **Figures 1 & 2** of this report.

Table 4 - Assessment Locations

Name	ID	Co-ordinates	
		Easting	Northing
Crinacott Farm	H1	230459	101510
New Park	H2	229851	102002
The Old Rectory	H3	231015	102147

The current sound environment at properties surrounding the site is typical of a quiet rural environment, the sound environment includes farm stock, farm works and activities, localised human and animal activities, wind induced sound in the trees and foliage, birdsong and occasional aircraft passing overhead.

A survey of the existing ambient (dB L_{Aeq}) and background (dB L_{A90}) sound levels at two locations near to the Proposed Development was undertaken in support of a planning application for the neighbouring and consented Derril Water Solar Farm (Planning Reference 1/0499/2022/FULM) which is to be located on land directly to the western boundary of the Proposed Development.

The results of the survey are provided within a report [14] attached to the application which demonstrates that the measured sound levels are indicative of all locations in the area. The lower of the adopted background sound levels have been used as representative of the sound environment at locations neighbouring the Proposed Development as a result.

The relevant derived background and ambient sound levels are shown in **Table 5**. The survey measurement locations are also shown in **Figures 1 & 2** of this report.

Table 5 - Background & Ambient Sound Levels

ID	Co-ordinates		Background Sound Level, dB L_{A90}		Ambient Sound Level, dB L_{Aeq}	
	Easting	Northing	Daytime	Night-time	Daytime	Night-time
L1	229376	101490	26	21	34	26
L2	229888	102151	25	21	30	24

Background sound levels at both the measurement locations are low to the point where the 1997 version of the BS 4142 standard states that an assessment against such low levels would not be appropriate. Furthermore, the measurements minimised any contribution of sound from Crinacott Solar Farm to the east of the Proposed Development and Pyworthy Substation to the north, which were existent at the time the measurements were undertaken, and do not account for sound to be generated by the consented Derril Water Solar Farm. All these sites would serve to increase the background/baseline sound levels during the daytime when any installed inverters/transformers would be operational. The use of the background sound levels listed therefore represents a particularly conservative basis of assessment. This aspect is discussed further in **Section 5**.

4 Predictions

A model of the proposed battery storage facility, consented Derril Water Solar Farm, existing Crinacott Solar Farm and Pyworthy Substation has been developed using CadnaA[1] software. The ISO 9613-2 [15] propagation methodology has been employed to predict the sound levels resulting from the development and cumulative schemes at nearby residential properties, incorporating various assumptions and factors which are considered appropriate for use here:

[1] https://www.datakustik.com/

- The various plant to be installed as part of the Proposed Development and that associated with neighbouring solar sites has been modelled as point sources with a height of 2 m;
- Soft ground conditions have been assumed (i.e. G=1) as representative of the farmland surrounding the Proposed Development. The ISO 9613-2 standard allows for a range of ground conditions to be applied, from porous ground conditions (G=1), which includes surfaces suitable for the growth of vegetation (i.e. farmland), to hard ground (G=0), such as paving, water and concrete;
- The receptors have been assigned a height of 1.5 m;
- Atmospheric attenuation corresponding to a temperature and relative humidity of 10 °C and 70 % respectively, as defined within ISO 9613-1 [16], which represents relatively low levels of sound absorption in the atmosphere;
- A 4 m high barrier of suitable mass and density next to the battery storage facility at the southeastern and southwestern fence line;
- Inclusion of the topography of the site and surroundings within the model; and,
- The photovoltaic panels that exist at the Crinacott Solar Farm and those to be introduced as part of the consented Derril Water Solar Farm have also been included within the prediction model as 'floating barriers', 0.75 m from the ground and with an overall height of 3 m. This provides some shielding of sound generated by the equipment to be installed at these sites, where certain panels are located directly between residences and the respective plant.

Furthermore, ISO 9613-2 is a downwind propagation model. Where conditions less favourable to sound propagation occur, such as when the assessment locations are upwind of the Proposed Development, the levels would be expected to be less and the downwind predictions presented as part of this report would be regarded as conservative, i.e. greater than those likely to be experienced in practice.

The predominant sources of sound to be introduced as part of the Proposed Development are the inverters (PCS units), linked transformers, battery storage containers and substation transformer.

The predominant sources of sound to be associated with the Crinacott and Derril Water solar schemes are the ancillary inverters (PCS units) and transformers attached to the photovoltaic panels, as located at several positions across the sites, and the proposed Derril Water substation. The inverters (PCS units) at these sites are assumed not to be operational during night-time periods. However, these sites may start becoming operational in early hours of the morning during particularly bright summer months, although this will occur very rarely and this equipment will be operating under a much-reduced electrical load during these periods, substantially reducing the expected sound levels as compared with the daytime scenario.

The main source of noise associated with the Pyworthy substation are the 3 transformers which are assumed to be operational during both daytime and night-time periods. The corresponding assumed source noise levels are taken from historical information for similar equipment available at the time the site was built.

The source levels associated with the inverter/PCS and BESS units at the Proposed Development are based on the expected maximum sound output for anticipatory units, as advised as appropriate by candidate manufacturers. The source levels for the inverter/PCS units at Crinacott Solar Farm are based on typical

levels for inverter units that were available at the time the site become operational in 2013. The Derril Water inverter/PCS units use the same assumption as for the Crinacott site as a conservative basis of assessment.

The Proposed Development has been designed on an iterative basis with a view to minimising, as far as practicably possible, the projected operational sound levels with due regard to the relative sensitivity of neighbouring premises and all other site constraints.

The assumed sound power data for the assessment are provided in **Table 6**. The overall levels correspond to the expected maximum sound output for each of the respective plant, as advised by the candidate manufacturers, and/or historical source information where appropriate. The propagation modelling therefore represents a conservative scenario and the actual sound levels would be less when the respective sites are not operating at their maximum expected capacity.

Table 6 - Overall Sound Power Levels, dB L_{WA}

Equipment & ID	Sound Power Level, dB L_{WA}
Power Conversion System (PCSNA) – Crinacott & Derril Water	96
Power Conversion System (PCS) – Stoneworthy	80
Battery Energy Storage System (BESS)	68
Transformer (TRA)	76
Substation (SUB)	90
Substation (SUBPY) – Pyworthy Substation	95

The combination of assumptions detailed above are considered to provide a conservative prediction/modelling basis overall. The various equipment has been located at the associated hard standings relating to each inverter/transformer combination and BESS location. The results of the predictions at the various residences surrounding the Proposed Development are shown in **Section 5**.

The sound emitted by the various equipment to be introduced as part of the Proposed Development can have distinctive tonal character (i.e. a whine, whistle or hum). Under the subjective method described in BS 4142, a correction of 2 dB has been applied to account for this feature. However, the assessed specific and rating sound levels detailed in **Section 5** are particularly low and, in most instances, potential tonal component in the sound emitted from the various plant may well be masked by existing sources of background/ambient sound in the area.

5 Assessment

The predicted daytime and night-time specific sound and corresponding rating levels (i.e. including a 2 dB penalty for tones) at the properties located nearest to the Proposed Development are shown in **Table 7**. The rating level is compared to the adopted background levels for daytime and night-time periods to provide the associated impact at each residential location.

The lowest background levels, as taken from the assessment in support of the consented Derril Water Solar Farm to the west of the Proposed Development, have been used to represent each residential location referenced herein and is considered to provide a conservative basis of assessment (see **Section 3**).

The resultant impact is described as 'negligible' if the rating level is 10 dB or more below the background sound level; 'low' if less than or equal to the background sound level; 'minor' if not more than 5 dB above; 'moderate' if not more than 10 dB above and 'major' if more than 10 dB above. These criteria compare to the categories defined by the NPSE (see **Section 2.2**), with rating levels less than or equal to background sound level representing the NOEL, 5 dB above background representing the LOAEL and 10 dB above background the SOAEL, notwithstanding the caveats regarding the appropriateness of BS 4142 as an assessment approach (i.e. in instances where existing background and rating levels are low, see **Section 2.7**).

Table 7 - BS 4142 Assessment

House ID	Specific Level, dB L_{Aeq}	Rating Level, dB L_{Ar}	Background Level, dB L_{A90}	L_{Ar} - L_{A90}, dB	Potential Impact
Daytime					
H1	26	28	25	3	Minor
H2	21	23	25	-2	Low
H3	17	19	25	-6	Low
Night-time					
H1	26	28	21	7	Moderate
H2	21	23	21	2	Minor
H3	17	19	21	-2	Low

The assessment indicates that the predicted impacts from the Proposed Development at the nearest neighbouring residences are low-to-minor during the day and low-to-moderate during the night. However, the predicted sound levels and adopted background sound levels are particularly low, to the point at which the 1997 version of BS 4142 considered the standard was not appropriate for use. As a result, a further assessment has been undertaken by comparing the overall expected external and internal ambient sound levels with guidance provided by the WHO (see **Section 2.8**) and criteria supplied within BS 8233 (see **Section 2.9**) to provide further context and basis of assessment.

The predicted specific sound levels due to the Proposed Development shown in **Table 7** are added to the adopted ambient/residual sound levels for daytime and night-time periods to determine the total external ambient sound level at each residence. The projected internal sound levels are determined by assuming a 15 dB reduction externally to internally for a room with an open window, as assumed within the guidance provided by the World Health Organisation.

The resultant levels, as shown in **Table 8**, indicate that overall sound levels are greater than 10 dB below the WHO/BS 8233 values (i.e. 50 & 45 dB L_{Aeq} externally and 35 & 30 dB L_{Aeq} internally for daytime and night-time periods respectively).

Table 8 - WHO & BS 8233 Assessment

House ID	Specific Level, dB L_{Aeq}	Existing Ambient Sound Level, dB L_{Aeq}	Total External Ambient Sound Level, dB L_{Aeq}	Total Overall Internal Sound Level, dB L_{Aeq}
Daytime				
H1	26	30	31	16
H2	21	30	30	15
H3	17	30	30	15
Night-time				
H1	26	24	28	13
H2	21	24	26	11
H3	17	24	25	10

Based on the modelling assumptions and assessment results presented here, the sound emitted by the Proposed Development can be considered 'present and not intrusive' in terms of government policy and guidance provided within the NPSE and NPPG (see **Sections 2.2 & 2.3** respectively). This corresponds to the 'No Observed Effect Level' (NOEL) and no specific action is required to further mitigate operational sound associated with the introduction of the site.

A further assessment has been undertaken to establish the overall impact of the Proposed Development operating at the same time as the neighbouring solar farms and substation (i.e. cumulatively). The specific sound levels from the Pyworthy Substation, Derril Water Solar Farm and Crinacott Solar Farm have been established by incorporating the respective site designs into the prediction model (see **Section 4**).

The predicted specific sound levels from each site have been added logarithmically, an overall 2 dB penalty has been applied and the overall rating level is compared with the adopted background sound levels in the same manner as for the isolative assessment.

Table 9 shows the specific sound level from the Proposed Development, the neighbouring operational and consented solar farms and the combined total. The resultant assessment is provided in **Table 10**.

Table 9 - Specific Sound Levels, dB L_{Aeq}

House ID	Proposed Development		Derril Water Solar Farm		Crinacott Solar Farm		Pyworthy Substation		Total	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
H1	26	26	29	17	35	16	24	24	37	28
H2	21	21	35	23	24	5	25	25	36	28
H3	17	17	23	10	29	10	23	23	31	24

Table 10 – BS 4142 Cumulative Assessment

House ID	Specific Level, dB L_{Aeq}	Rating Level, dB L_{Ar}	Background Level, dB L_{A90}	L_{Ar} – L_{A90}, dB	Potential Impact
Daytime					
H1	37	39	25	14	Major
H2	36	38	25	13	Major
H3	31	33	25	8	Moderate
Night-time					
H1	28	30	21	9	Moderate
H2	28	30	21	9	Moderate
H3	24	26	21	5	Minor

The cumulative assessment indicates that the predicted impacts are moderate-to-major during the day and minor-to-moderate during the night when considering the site in comparison with the pre-existing background sound level in the absence of any other development (see **Section 3**). However, under the strict application of the BS 4142 assessment methodology, the existing Pyworthy Substation, existing Crinacott Solar Farm and consented Derril Water Solar Farm sites could be considered to be part of the existing baseline/background sound levels. The prediction values indicate that the introduction of the Proposed Development would increase overall daytime ambient cumulative levels by less than 1 dB and the resultant daytime impact from the introduction of the Proposed Development could be considered low on this basis.

Similarly to the discussion of the site operating in isolation, a further assessment has been undertaken by comparing the overall expected external and internal ambient sound levels with guidance provided by the WHO and criteria supplied within BS 8233.

The resultant levels, as shown in **Table 11**, indicate that overall levels remain greater than 10 dB below the WHO/BS 8233 values (i.e. 50 & 45 dB L_{Aeq} externally and 35 & 30 dB L_{Aeq} internally for daytime and night-time periods respectively).

Table 11 – WHO & BS 8233 Cumulative Assessment

House ID	Specific Level, dB L_{Aeq}	Existing Ambient Sound Level, dB L_{Aeq}	Total External Ambient Sound Level, dB L_{Aeq}	Total Overall Internal Sound Level, dB L_{Aeq}
Daytime				
H1	37	30	37	22
H2	36	30	37	22
H3	31	30	33	18
Night-time				
H1	28	24	30	15
H2	28	24	30	15
H3	24	24	27	12

Overall, based on the modelling assumptions and assessment results presented here, the sound emitted by the Proposed Development, operating in isolation and in a cumulative context, can be considered 'present and not intrusive' in terms of government policy and guidance provided within the NPSE & NPPG (see **Sections 2.2 & 2.3** respectively). This corresponds to the 'No Observed Effect Level' (NOEL) and no specific action is required to further mitigate operational sound associated with the introduction of the Proposed Development. As a result, it is considered that the site should not be refused planning permission on the grounds of potential sound levels emitted by the development proposals.

Illustrative sound contour plots for the Proposed Development and the neighbouring operational and consented solar schemes showing the predicted specific sound levels (dB L_{Aeq}) for daytime and night-time periods respectively are provided in **Figures 1 & 2** of this report.

The wording for a suggested planning condition that would restrict sound associated with the introduction of the Proposed Development, should the site gain planning consent, is provided in **Appendix B** of this report.

The proposed 35 dB L_{Ar} limit is intended to ensure that the overall increase in daytime sound levels due to the introduction of the Proposed Development are minimised, the limiting requirements of the BS 4142 (1997) standard are met (see **Section 2.7**) and that both daytime and night-time cumulative levels are well below WHO/BS 8233 guideline external and internal values (see **Sections 2.8 & 2.9**).

6 Conclusions

An assessment of the acoustic impact of the proposed Stoneworthy Battery Storage Project has been undertaken. The results indicate that sound from the site, operating in isolation and cumulatively with the neighbouring operational and consented solar farms can be considered 'present and not intrusive' in terms of government policy and guidance provided within the NPSE & NPPG during the daytime and night-time.

Figure 1 – Daytime Cumulative Sound Contour Plot, dB L_{Aeq}

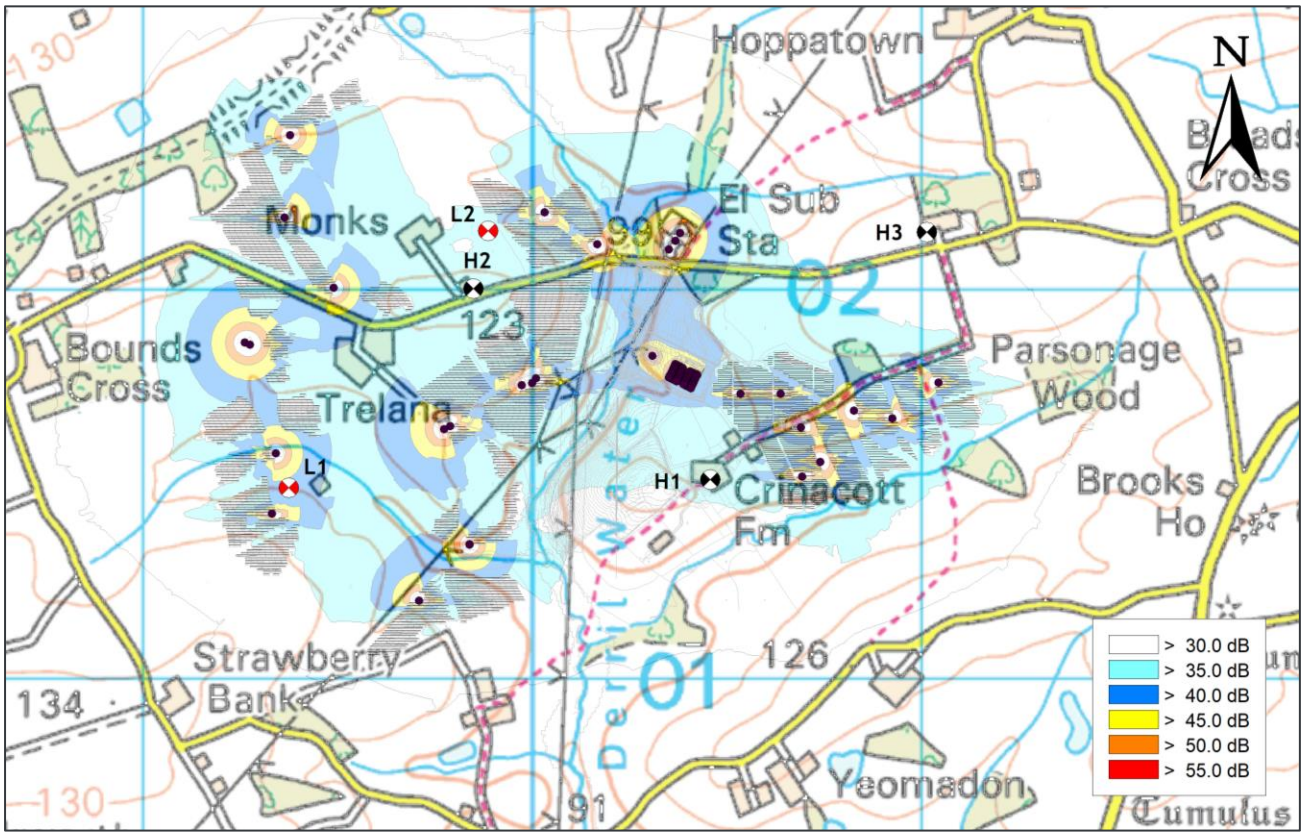
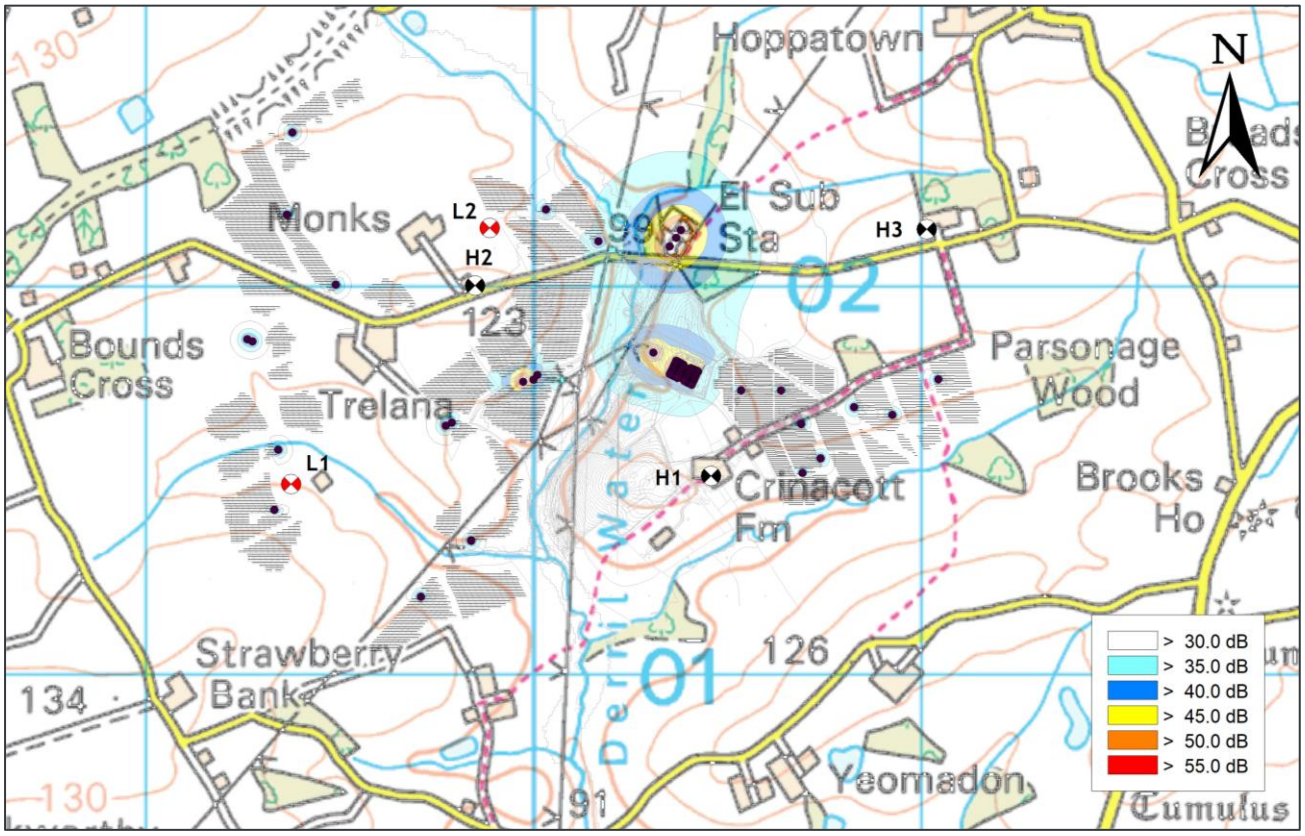


Figure 2 – Night-time Cumulative Sound Contour Plot, dB L_{Aeq}



7 References

[1] Department for Levelling Up, Housing and Communities (September 2023) National Planning Policy Framework

[2] Department for Environment, Food and Rural Affairs (March 2010) Noise Policy Statement for England

[3] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (July 2019) National Planning Practice Guidance: Noise

[4] Department for Energy Security & Net Zero (November 2023) Overarching National Policy Statement for Energy (EN-1)

[5] Department for Energy Security & Net Zero (November 2023) National Policy Statement for Renewable Energy Infrastructure (EN-3)

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Appendix A – Experience & Qualifications

Table A.1 - Author

Name	Mike Craven
Experience	Senior Acoustic Specialist, Renewable Energy Systems (RES), 2023-Present Principal Acoustic Consultant, Hayes McKenzie Partnership Limited (HMPL), 2019-2022 Senior Acoustic Consultant, HMPL, 2013-2019 Acoustic Consultant, HMPL, 2011-2013 Acoustic Consultant, URS/Scott Wilson, 2008-2011 Acoustic Consultant, HMPL, 2004-2008
Qualifications	MIOA, Member of the Institute of Acoustics BSc Audio Technology, University of Salford

Table A.2 - Checker

Name	Stuart Hill
Experience	Senior Acoustic Specialist, RES, 2024-Present Senior Acoustic Consultant, Mabbett, 2022-2024 Senior Environmentalist (Acoustics), Amey, 2021-2022 Associate Consultant – Acoustics, Noise & Vibration, SLR Consulting, 2017-2020 Technical Analyst/Senior Acoustic Analyst, RES, 2013-2017
Qualifications	AMIOA, Associate Member of the Institute of Acoustics MInstP, Member of the Institute of Physics MSc Principles and Applications of Radiation in Industry, the Environment and Medicine, University of St Andrews BEng Electronics Engineering, University of Aberdeen

Table A.3 - Approver

Name	Dr Jeremy Bass
Experience	Head of Specialist Services/Senior Technical Manager, RES, 2000-Present Technical Analyst/Senior Technical Analyst, RES, 1990-2000 Foreign Exchange Researcher, Mechanical Engineering Laboratory, Tsukuba, Japan, 1989-1990 Research Associate, Energy Research Unit, Rutherford Appleton Laboratory, 1986-1989
Qualifications	MIOA, Member of the Institute of Acoustics MInstP, Member of the Institute of Physics PhD, The Potential of Combined Heat & Power, Wind Power & Load Management for Cost Reduction in Small Electricity Supply Systems, Department of Applied Physics, University of Strathclyde BSc Physics, University of Durham

Appendix B – Suggested Planning Condition Wording

The battery storage facility shall be designed and operated to ensure that the rating sound level, determined using the BS 4142:2014 methodology external to a property, shall not exceed 35 dB L_{Ar} for both daytime and night-time periods.