Annex 7 Noise Impact Assessment

Mey BESS

Annex 7: Noise Impact Assessment

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1. Introduction

1.1 Background

ITPEnergised has been appointed by Simec Atlantis ('the Applicant') to undertake a noise assessment of a proposed Battery Energy Storage System ('BESS') at Philips Mains, near Mey in The Highland Council ('THC') administrative area.

ITPEnergised has substantial experience of assessing noise from BESS developments, including measurement of noise from two operational sites and we note the following:

- BESSs typically operate a limited number of charge/discharge cycles during any 24-hour period;
- the batteries are restricted in the number of daily cycles to preserve battery health and reach their design life of approximately 20 years;
- charging cycles often occur during the middle of the night (i.e. between 02:00 and 06:00) at times of low demand/low cost and discharge cycles often occur during the early evening (i.e. between 17:00 and 19:00) at times of high demand/high cost;
- while typical operation will often fall into these periods, the BESS will require the ability to operate at any time of day or night, depending on the particular role it fulfils;
- the duration of individual operational events will vary; however, these are likely to be in the region of 30 minutes to 2 hours; and
- when not charging/discharging, the BESS will produce little or no noise.

There is a consented application for an electrical substation adjacent to the BESS. The development of the BESS is contingent on the construction of the substation. This assessment therefore considers that the substation will comprise part of the future baseline noise environment, however, baseline noise levels have been determined based on the existing noise environment. We have reviewed the noise assessment provided in support of the substation planning application, and note that no specific noise predictions have been provided for the substation, and that the main noise source is expected to be moisture related crackling from overhead transmission lines.

1.2 Scope of Assessment

The scope of this assessment comprised the following:

- Consultation with The Highland Council (THC) to agree the scope and approach of the assessment;
- Characterisation of baseline noise environment by undertaking a baseline noise survey at a location representative of the closest Noise-Sensitive Receptors (NSRs);
- Modelling prediction of operational noise using proprietary software CadnaA;
- Evaluation of predicted noise levels in accordance with British Standard BS4142:2014+A1 2019 Methods for rating and assessing industrial and commercial sound; and
- Specification of mitigation, where required.

Additional traffic flows associated with the construction phase of the facility will be minimal and of short duration and will occur during weekday daytimes and Saturday mornings only ('weekday daytime' as defined in BS5228). Construction noise can be minimised through adoption of best practice methods and appropriate techniques. Noise associated with construction of the facility has therefore been scoped out of the noise assessment.

1.3 Study Area and Noise Sensitive Receptors

Maps, aerial imagery and a site visit have informed the selection of an appropriate study area for the assessment. The closest noise sensitive receptors (NSRs) in each direction have been identified, and a study area adopted which includes these NSRs.

Noise levels due to the facility at more distant NSRs will be lower than at the closest NSRs, therefore compliance with criteria at the closest NSRs will entail compliance at those more distant. The identified NSRs are provided in Table 1 and shown on Drawing 1.

Table 1 NSRs considered in this assessment

NSR ID	NSR Type	Distance and direction from BESS
NSR1	Cluster of residential properties (Nos. 1, 2 and 3 Phillips Mains)	300 m to the south-east of the BESS
NSR2	Residential property (West Lodge)	500 m to the west of the BESS
NSR3	Residential property (Mey Hall Cottage)	460 m to the west of the BESS
NSR4	Residential property (East Lodge)	400 m to the north-east of the BESS

2. Relevant Guidance and Advice

2.1 Planning Advice Note PAN1/2011: Planning and Noise ('PAN1/2011')[1]

PAN1/2011 and its accompanying Technical Advice Note (TAN) sets out a series of noise issues for planning authorities to consider when making decisions on planning applications.

The TAN recommends that the daytime period includes the hours 07:00 – 23:00 and the night-time period 23:00 – 07:00.

The TAN suggests that equivalent continuous noise level over a time period, T ($L_{Aeq,T}$), is a good general purpose index for environmental noise; this index is commonly referred to as the 'ambient' noise level. It further notes that road traffic noise is commonly evaluated using the $L_{A10,18hr}$ level, and the $L_{A90,T}$ index is used to describe the 'background' noise level.

Table 2.1 of the TAN (reproduced in Table 2) provides the criteria to define levels of sensitivity for each type of NSR.

[1] Planning Advice Note PAN1/2011: Planning and Noise. Scottish Government, 2011. Assessment of noise: technical advice note. Scottish Government, 2011.

Table 2 – (TAN Table 2.1) Level of Sensitivity According to NSR Type

Sensitivity	Description	Example of NSR
High	Receptors where people or operations are particularly susceptible to noise	• Residential, including private gardens where appropriate • Quiet outdoor areas used for recreation • Conference facilities • Theatres/Auditoria/Studios • Schools during the daytime • Hospitals/residential care homes • Places of worship
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	• Offices • Bars/Cafes/Restaurants where external noise may be intrusive • Sports grounds when spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf, bowls)
Low	Receptors where distraction or disturbance from noise is minimal	• Buildings not occupied during working hours • Factories and working environments with existing high noise levels • Sports grounds when spectator noise is a normal part of the event

Table 2.4 of the TAN (reproduced in Table 3) provides an example method for identifying magnitudes of effect for a new noise-sensitive residential development, using the $L_{Aeq,16hr}$ noise index. This assessment considers the example magnitudes to be appropriate for determining the magnitude of impact of the existing noise environment upon proposed receptors of the proposed development.

Table 3 - TAN Table 3.4: Assigning Magnitudes of Noise Impact

Magnitude	Change in noise level, $dBL_{Aeq,t}$ (after minus before)
Major	= 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	0.1 to 0.9
No change	0.0

Table 2.6 of the TAN (reproduced in Table 4) provides a matrix for determining the impact significance from magnitude of effect and receptor sensitivity.

Table 4 - TAN Table 3.5: Significance of Effects

Magnitude of Impact	Level of Significance Relative to Sensitivity of Receptor		
	Low	Medium	High
Major	Slight/Moderate	Moderate/Large	Large/Very Large
Moderate	Slight	Moderate	Moderate/Large
Minor	Neutral/Slight	Slight	Slight/Moderate
Negligible	Neutral/Slight	Neutral/Slight	Slight
No Change	Neutral	Neutral	Neutral

2.2 BS4142:2014+A1:2019 – Methods for Rating and Assessing Industrial and Commercial Sound ('BS4142')[2]

BS4142:2014 describes methods for rating and assessing sound[3] from industrial or commercial premises. The methods detailed in the standard use outdoor sound levels to assess the likely effects on people inside or outside a residential dwelling upon which sound is incident.

The standard provides methods for determining the following:

- Rating levels for sources of industrial and commercial sound;
- Ambient, background and residual sound levels; and
- The audibility of tones in sound: 1/3 octave method.

These may be used for assessing sound from proposed, new, modified or additional sources of sound of a commercial or industrial nature or to assess the suitability of introducing a receptor near an existing commercial or industrial site.

The standard makes use of the following terms:

- **Ambient sound level, La = $L_{Aeq,T}$** – the equivalent continuous sound pressure level of the totally encompassing sound in a given situation at a given time, usually from multiple sources, at the assessment location over a given time interval, T.
- **Background sound level, $L_{A90,T}$** – the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90 percent of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
- **Specific sound level, Ls = $L_{Aeq,Tr}$** – the equivalent continuous sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.
- **Rating level, $L_{Ar,Tr}$** – the specific sound level plus any adjustment for the characteristic features of the sound.
- **Residual sound level, Lr = $L_{Aeq,T}$** – the equivalent continuous sound pressure level at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound, over a given reference time interval, T.

[2] BS4142:2014+A12019 Methods for Rating and Assessing Industrial and Commercial Sound (2019). The British Standards Institution. 2019.

[3] The standards refers to 'sound', however, this assessment adopts the term 'noise'.

The standard determines the degree of noise impact by comparison of the background noise level at NSRs in the absence of the industrial or commercial facility (the specific source) with the ambient sound level when the specific source is operational.

The standard sets out methods by which a representative background level may be determined, noting the following:

> *"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods"*

Where particular characteristics such as tones, intermittency or impulsivity are present in the noise emissions of the specific source and perceptible at the receptor, the standard requires that 'penalties' be added to the specific sound level to account for the increased annoyance that these can cause.

The following evaluation impact significance identifiers are provided in the standard, in which the difference between the specific sound level and measured background level are considered:

- The greater the difference, the greater the magnitude of impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact;
- A difference of around + 5 dB is likely to be an indication of a low adverse impact;
- The lower the rating level, relative to the measured background level, the less likely that the specific sound source will have an adverse (or significant adverse) impact; and
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

The standard also makes the followings comments:

1. *"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:*

   The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

   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.

   Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2. *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/ or commercial nature is likely to be perceived and how people react to it.*

3. *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*

i. facade insulation treatment;

ii. ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

iii. acoustic screening."

Earlier versions of the BS4142 standard recommended that a background level of 30 dBL_{A90} (or lower) and a rating level of 35 $dBL_{Ar,Tr}$ (or lower) may be considered 'objectively low'.

2.3 ISO 9613; Attenuation of sound during propagation outdoors, Part 1 and Part 2[4]

ISO 9613 1&2 describe a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions.

2.4 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings[5]

BS8233:2014 provides guidance on the control of noise in and around buildings. The standard sets out acceptable noise levels for new and refurbished buildings and amenity areas according to their use.

For external amenity areas BS8233:2014 specifies a 'desired' level of 50 $dBL_{Aeq,T}$ and an 'upper guideline level' of 55 $dBL_{Aeq,T}$.

The standard provides noise limits for rooms within buildings by type of use; (bedroom, living room, office) and by time of day. Target noise levels within habitable rooms (bedrooms and living rooms) are 35 dB during the daytime period and 30 dB during the night-time period.

Methods are provided for simplified calculation of internal noise levels from external levels, and for detailed calculations. The simplified method relies on a reduction to façade levels provided either by open or closed windows, which are assumed to provide attenuation of approximately 15 dB and 33 dB respectively.

3. Method

3.1 Consultation with The Highland Council

ITPEnergised consulted with THC Environmental Health on 12th September 2023 to agree the scope and approach of the noise assessment. The following approach was agreed:

- Background noise levels in the area to be characterised by baseline noise monitoring for approximately one week at one location, representative of the closest NSRs;
- Derivation of operational noise limits in accordance with BS4142 for the daytime and night-time periods, whereby a rating level of 'background plus 5 dB' would be indicative of the BESS having a low impact; and

4 ISO 9613-2:1996 Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation. International Organization for Standardization. 1996.
ISO 9613-1:1993 Acoustics Attenuation of sound during propagation outdoors Part 1: Calculation of the absorption of sound by the atmosphere. International Organization for Standardization. 1993.

5 BS8223:2014 Guidance on sound insulation and noise reduction for buildings. The British Standards Institution. 2014.

- ITPEnergised further proposed that where background levels were at or below 30 $dBL_{A90,T}$, and therefore 'objectively low', then a rating level of 35 dB would be indicative of an objectively low impact.

Records of correspondence are shown in Appendix 1.

3.2 Characterisation of Baseline Environment

ITPEnergised measured the baseline noise environment from 17 September to 22 September 2023.

The chosen measurement location was representative of the noise environment within external amenity areas of the closest identified representative NSRs to the proposed BESS. The noise monitoring position (NMP) used was representative a terrace of residential dwellings identified as NSR1 in Drawing 1.

ITPEnergised undertook monitoring in accordance with the requirements of BS4142, using a Rion NL-52 Class I integrating sound level meter (SLM). The SLM was within its two-year laboratory calibration period and a calibration check was performed before and after each measurement with no drift in calibration noted. Photographs of the SLM in position at NMP1 are provided in Appendix 2.

During the survey we measured the noise indices L_{Aeq}, L_{A90} and L_{Amax} at a resolution of 5 minutes. One-third octave band data was recorded throughout.

A weather station was installed adjacent to the SLM and wind speed, precipitation, temperature and relative humidity were recorded on a 15-minute averaging period. We used the weather station data to screen out noise data from periods when weather conditions were outside the requirements of BS4142.

Measured noise levels from the survey are provided as charts in Appendix 2.

3.3 Prediction of Operational Noise Levels

3.3.1 Data sources

This assessment considers data from two sources:

- Data provided by the Applicant for the likely technology provider for the facility; and
- Operational noise levels measured by ITPEnergised at an equivalent recently commissioned BESS site.

The data provided by the Applicant is commercially confidential, therefore only summaries of reported levels are provided in this assessment.

3.3.2 General prediction method

Noise levels due to the facility have been predicted at identified representative NSRs within noise modelling software CadnaA, using the propagation method set out in ISO9613. The model assumes soft ground conditions, with absorption set to G=1.0. The model considers screening provided by local topography in the form of 50 m digital terrain mapping.

From a review of information provided by SunGrow, the likely battery supplier, noise from the batteries predominantly issues from vents on either end of the battery containers. The batteries have therefore been modelled as point sources at either end of 3D objects. A representative spectrum for batteries has been applied and this has been normalised to a level such that predicted levels at test locations within the model meet the reported A-weighted sound pressure level at reference distances of 1, 3 and 5 m from the ends of the battery container.

Noise from the inverters will also predominantly issue from cooling vents. The supplier has provided data for an attenuated inverter unit, which includes an acoustic cowl over the vent outlet. Octave band data has been provided for the inverters; this excludes the benefit of the attenuation. The inverters have been modelled as point sources on top of a 3D object, with spectral levels normalised to the quoted A-weighted sound power level for the attenuated item.

The transformer has been modelled using a representative spectrum and a sound power level derived from measurements of a transformer on an operational site measured by ITPEnergised.

The effective heights of the noise sources considered in the model were as follows:

- battery units – 2.5 m;
- inverters – 3 m; and
- grid transformer – 7 m.

NSRs have been modelled at 4 m representative of a first-floor bedroom window.

A typical air temperature of 10°C and relative humidity of 70% have been assumed within the model.

3.3.3 Source data applied

The applied sound power levels for the inverters and the battery units are provided Table 5 as octave-band data and the broad-band A-weighted level to which the noise spectrum has been normalised within the model.

Table 5 Sound power data for BESS equipment

Item	Sound power level (dB) by octave band (Hz)									A-weighted overall broad-band level, dBA
	31.5	63	125	250	500	1k	2k	4k	8k	
Battery	59.3	52.6	55.5	44.8	44.1	48.6	34.4	26.4	19.5	79.0
Inverter (including attenuation)	78.3	78.7	74.3	76.1	83.8	74.4	75.1	85.3	81.3	85.0
Grid transformer	51.5	49.4	53.5	47.7	42.3	36.4	32.1	30.4	26.1	74.4

The model assumes that noise from the facility will be from the battery units, inverters and transformer only. All other components of the facility will have a sound power level at least 10 dB lower than the batteries and transformers and will therefore have a negligible contribution to the total noise emission of the facility.

3.4 Method of Evaluation

The specific noise level resulting from the operation of the facility has been predicted at identified representative NSRs. In accordance with the requirements of BS4142 the derived levels have been rounded to the nearest integer.

When determining whether any character corrections should apply to the Specific Level for deriving the Rating Level, in accordance with BS4142, this assessment notes the following:

- Noise from the BESS will be broad-band in character, similar to that of the existing dominant noise source (road traffic) and therefore will not stand out against the residual noise environment;
- Our surveyors' subjective observations of noise from visiting operational BESS sites indicated that audible noise from the site was broad-band/non-tonal in character;
- The third octave spectral data predicted at the closest NSR, NSR1, has been tested for potential tonal components in accordance with the third octave method referenced in BS4142 (refer to Appendix 2) and found to be non-tonal; and
- Operation of the facility is not expected to result in impulsive or intermittent characteristics.

In addition to evaluation in accordance with BS4142 this assessment has determined noise impacts in accordance with PAN1/2011, considering the potential change in ambient levels as a result of operation of the BESS as per Table 3 and Table 4.

4. Results

4.1 Summary of Baseline Noise Environment

A summary of the measured baseline levels is provided in Table 6. In accordance with the BS4142 method the levels have been rounded to the nearest integer value. Data affected by weather conditions outside the requirements of BS4142 (wind speed above 5 m/s, rainfall) has been screened out of the reported levels.

Table 6 Results of baseline noise survey at NMP1

Description	Monitoring duration, T	Measured level, dB	
		Ambient, $L_{Aeq,T}$	Representative Background, $L_{A90,t}$
Daytime period (07:00 – 23:00)			
Range of measured levels	16 hours x 5	Logarithmic mean: 48 Mode: 41 Max: 62 Min: 29	Arithmetic Mean: 35 Mode: 35 Max: 49 Min: 24
Adopted representative level		41	35
Night-time period (23:00 – 07:00)			
Range of measured levels	8 hours x 5	Logarithmic mean: 39 Mode: 36 Max: 50 Min: 31	Arithmetic Mean: 34 Mode: 34 Max: 43 Min: 25
Adopted representative level		36	34

The dominant noise source observed during commissioning and decommissioning visits was wind noise. Based on our observations, we expect that the wind, bird calls and livestock will be the dominant noise sources in the vicinity of the BESS, with occasional contributions from road traffic and use of farm equipment.

Measured noise levels during the baseline survey showed substantial variation, however this did not fit a diurnal profile. The variation is attributed to the wind conditions at the time of survey, and this holds true even during times when wind speeds were within the range required by BS4142.

As discussed in Section 2.2, BS4142 notes that the adopted background should provide a representative level, rather than necessarily choosing the lowest measured level. With reference to charts provided in Appendix 2, we note that the typical background level was substantially above the lowest measured level for most of the monitoring period. Our adopted representative values therefore consider a conservative background level, typical of the lower end of the range of measured data.

4.2 Predicted Operational Noise Levels

The specific noise level resulting from the operation of the facility has been predicted at NSRs. The predicted specific levels at the nearest receptors are presented in Table 7. In accordance with the requirements of BS4142 the levels have been rounded to the nearest integer value. An image showing the predicted noise contours for the BESS during operation is provided in Drawing 2.

Table 7 Predicted noise levels at NMPs using supplied data and data from operational BESS site

NSR	Predicted operational specific noise level – operational BESS data, $dBL_{Aeq,T}$
NSR1	39
NSR2	33
NSR3	33
NSR4	35

4.3 Evaluation of Impacts

4.3.1 BS4142:2014+A12019 Assessment

As shown in Table 7, the highest noise associated with operation of the BESS occurs at NSR1, the closest property. This assessment assumes that the baseline noise environment at NMP1 will be representative of all NSRs within the study area, therefore noise impacts may be assessed for all NSRs by consideration of NSR1 only. Operational noise impacts are assessed in accordance with BS4142 in Table 8.

Table 8 BS4142 Evaluation of Impacts at NSR1

NSR1	Level	Notes
Daytime period (07:00 – 23:00) – weekday/weekend		
Daytime period background level	35 dBL_{A90}	Background variable throughout measurement period, attributed to changeable weather conditions. Quiet location representative of amenity area of representative dwelling. Moderate level of confidence measurement is representative of noise environment, robust approach taken to determining representative value for assessment of impacts. Rounded to nearest integer dB.
Predicted specific level	39 $dBL_{Aeq,T}$	Predictions consider likely candidate battery and inverter technology and attenuation to the inverter. No additional mitigation (e.g. barriers) included.
Rating correction	0 dB	Tonality is not expected at NSRs (refer to Appendix 3). No intermittency or impulsivity Future baseline noise environment will include a substation, therefore noise from electrical infrastructure and overhead transmission lines will be present, therefore no additional correction for noise of industrial character has been included.
Rating level	39 $dBL_{Ar,Tr}$	Rating level equal to specific level.
Excess of rating level over daytime background	+4 dB	Adverse noise impacts can arise above background +5 dB, depending on context.

NSR1	Level	Notes
Uncertainty	-	Background and ambient levels variable throughout measurement period, however, robust approach taken to adoption of a representative value. Possible that lower levels will occur on particularly still days. Prediction uncertainty associated with ISO9613 method limited given comparatively small distance of propagation and limited influence of topography. Assessment completed on the basis of candidate technology; actual installed plant may vary.
Significance	-	Low adverse impact during daytime period during operation.
Night-time period (23:00 – 07:00) – weekday/weekend		
Night-time period background level	34 dBL_{A90}	Background variable throughout measurement period, attributed to changeable weather conditions. Quiet location representative of amenity area of representative dwelling. Moderate level of confidence measurement is representative of noise environment, robust approach taken to determining representative value for assessment of impacts. Rounded to nearest integer dB.
Predicted specific level	39 $dBL_{Aeq,T}$	Predictions consider likely candidate battery and inverter technology and attenuation to the inverter. No additional mitigation (e.g. barriers) included.
Rating correction	0 dB	Tonality is not expected at NSRs (refer to Appendix 3). No intermittency or impulsivity Future baseline noise environment will include a substation, therefore noise from electrical infrastructure and overhead transmission lines will be present, therefore no additional correction for noise of industrial character has been included.
Rating level	39 $dBL_{Ar,Tr}$	Rating level equal to specific level.
Excess of rating level over night-time background	+5 dB	Adverse noise impacts can arise above background +5 dB, depending on context.
Uncertainty	-	Background and ambient levels variable throughout measurement period, however, robust approach taken to adoption of a representative value. Possible that lower levels will occur on particularly still days. Prediction uncertainty associated with ISO9613 method limited given comparatively small distance of propagation and limited influence of topography. Assessment completed on the basis of candidate technology; actual installed plant may vary.
Significance	-	Low adverse impact during daytime period during operation.

Noise impacts at NSR1 during operation of the facility have been determined to be low adverse during the daytime and the night time period. The rating level of the BESS at more distant NSRs is lower (refer to Table 7), therefore impacts at these NSRs will be lesser.

4.3.2 PAN1/2011 Evaluation

The effect significance of predicted operational noise from the BESS is evaluated in accordance with the example criteria provided in PAN1/2011 in Table 9. This assessment considers that noise impacts of slight/moderate or below are 'not significant'.

Table 9 Consideration of impact magnitude and effect significance

Item	Predicted operational specific noise level – operational BESS data, $dBL_{Aeq,T}$
Daytime period	
Representative daytime ambient level, $dBL_{Aeq,T}$	41.0
Predicted operational level, $dBL_{Aeq,T}$	39.0
Resultant daytime ambient level, $dBL_{Aeq,T}$	42.2
Change due to BESS	+1.2 dB
Impact magnitude according to PAN1/2011	Minor
Effect significance according to PAN1/2011	Slight/moderate
Noise effects significant?	**Not significant**
Night-time period	
Representative night-time ambient level, $dBL_{Aeq,T}$	36.0
Predicted operational level, $dBL_{Aeq,T}$	39.0
Resultant night-time ambient level, $dBL_{Aeq,T}$	40.8
Change due to BESS	+4.8 dB
Impact magnitude according to PAN1/2011	Moderate
Effect significance according to PAN1/2011	Moderate/Large
Effect significance considering modifying context (see Section 4.3.3)	Slight/moderate
Noise effects significant?	**Not significant**

4.3.3 Further relevant context

As discussed in Section 1.1, most of the time the facility will operate at a very low level such that it will be inaudible for the majority of any given 24-hour period. The BS4142 and PAN1/2011 evaluations therefore considers worst-case operation only. For the majority of any given daytime or night-time period the BESS will be inaudible at NSRs and noise impacts will therefore be nil outside of charging/discharging cycle operations.

As discussed above, operational times will be of limited duration and are most likely occur during the night-time period, when people will be inside and asleep or during the early evening period. At dwellings represented by NSR1, assuming a 15 dB attenuation to external noise levels for transmission via a partially open window, the internal noise levels due to the BESS will be 24 dB. PAN1/2011 notes that sleep disturbance may be avoided at internal night-time noise levels of below 30 $dBL_{Aeq,8hr}$.

This assessment considers that the context of the nature of BESS operations modifies the night-time impacts, such that these are lesser than as evaluated in Table 9, and that the noise impact of the BESS will be slight/moderate both during the daytime and the night-time period.

5. Potential Mitigation

This assessment has determined that noise impacts associated with operation of the BESS are likely to be slight/moderate and therefore no specific mitigation, beyond attenuated inverters, has been proposed. The applicant is committed to the BESS meeting appropriate noise limits.

While the final technology and number of battery units will only be confirmed at the procurement stage, we have considered the potential benefit of supplementary mitigation:

- Based on the current candidate battery, where noise primarily arises from vents at the ends of the battery containers, a 4 m high acoustic barrier along the would attenuate the noise from the BESS at NSR1 by 2 dB. Depending on the type of battery installed and the location of the noise sources, the reduction from a barrier may be lesser. On this basis, no acoustic barrier is proposed.
- Excluding the row of battery units closest to NSR1 (the southern-eastern row) would reduce the noise level by 1 dB. Excluding the closest two rows of batteries to NSR1 would result in a reduction of 3 dB.

The Applicant will undertake a noise assessment of the final site iteration, considering the chosen battery and inverter technology and the number of units, and will confirm compliance with the criteria.

6. Conclusion

ITPEnergised has undertaken an assessment of the potential noise impacts associated with the development of a BESS at Philips Mains, near Mey.

The assessment has comprised consultation with THC, characterisation of the baseline noise environment, and evaluation against relevant criteria and consideration of appropriate mitigation.

We have determined that the proposed BESS can meet criteria derived using BS4142, such that during operation, noise impacts will be low.

Supplementary evaluation to determine effect significance, referring to PAN1/2011, has determined that noise effects associated with operation of the site will be not significant.

Drawing 1

330000

N

NSR3

NSR4

NSR2

NSR1

East Lodge

Philips

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45

47

48

49

58

09

45

50

972000

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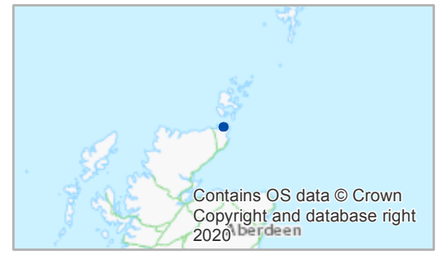
KEY

- Site Boundary
- Noise Sensitive Receptors (NSRs)
- Noise sources modelled
- Noise Monitoring Position (NMP)
- 3D objects



Coordinate System: British National Grid
Projection: Transverse Mercator

0 0.025 0.05 0.1 0.15 0.2 0.25 Kilometres

1:4,500

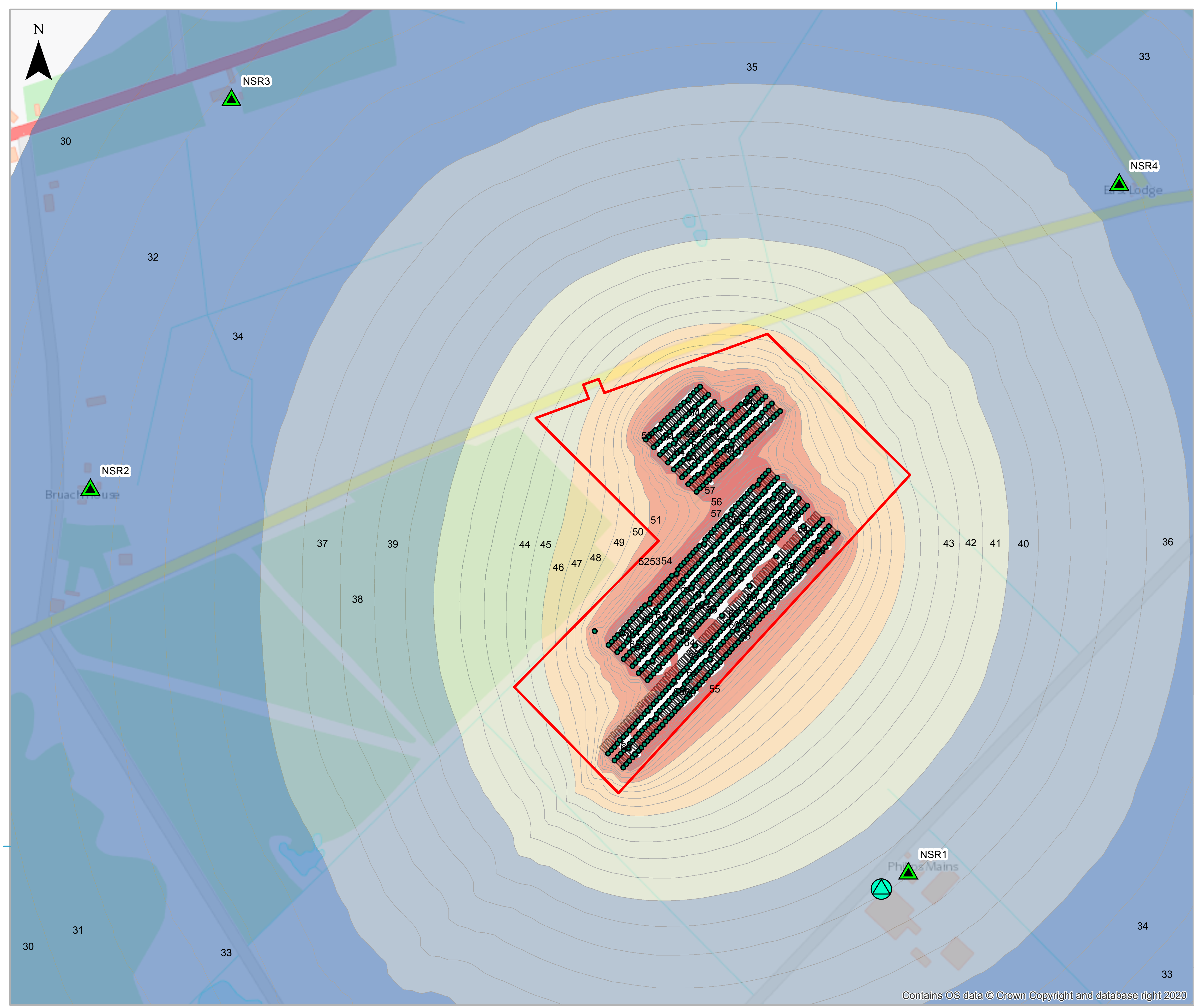
ITPENERGISED

Mey BESS
Supporting Environmental Information Report

Drawing 1
Study Area, NSRs, NMP and modelled noise sources

Date:	Lead:	Review:	Version:
23/11/2023	YD	GS	1.0

Drawing 2

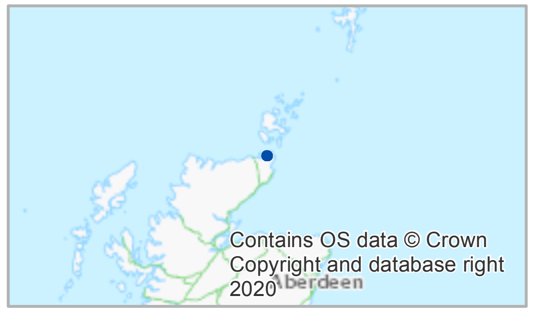


KEY

- Site Boundary
- Noise Monitoring Position (NMP)
- Noise Sensitive Receptors (NSRs)
- noise sources modelled

Operational noise contours (dB)

- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- >55



Coordinate System: British National Grid
Projection: Transverse Mercator

0 0.0225 045 0.09 0.135 0.18 0.225 Kilometres

1:4,000

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Supporting Environmental Information Report

Drawing 2
Noise Contours

Date:	Lead:	Review:	Version:
23/11/2023	YD	GS	1.0

Appendix 1 – Record of Correspondence with THC Environmental Health

From: Simon Waddell <
Sent: Tuesday, September 12, 2023 10:10 AM
To: Robin Fraser (Environmental Health (Mid 3)) < >
Cc: Yasmin Dennis < >
Subject: Philips Mains BESS - 23/00635/PREMAJ - Noise assessment

Good morning Robin,

I hope this finds you well.

ITPEnergised has been appointed to undertake a noise assessment in support of a proposed Battery Energy Storage System (BESS) at Land 500M West Of Philips Mains, Mey (this description is now out of date, the current layout is predominantly to the north of Philips Mains).

We would therefore seek to agree with you our proposed approach to the assessment, summarised as follows:

- The construction phase will be of relatively short duration, and construction phase noise impacts can be controlled by restriction of operating hours and implementation of good practice; these can be a condition of a planning consent. We therefore propose to scope out consideration of construction noise.
- We expect background noise levels in the study area, particularly during the night-time period, will be low.
- As such we propose to evaluate noise impacts against an 'objectively low' criterion of 35 dB (as discussed in supplementary guidance to BS4142) for the rating level of the BESS, including for any appropriate character corrections.
- **Please can you confirm whether you would accept such an approach, or if you require a baseline survey to be completed?**

Should you require a baseline survey to be completed we suggest that the following would be appropriate:

- attended and unattended measurements of up to 24 hours' duration at one location, representative of the closest noise sensitive receptors (NSRs);
- supplementary short-duration attended spot measurements where appropriate and depending on the noise environment encountered at site; and
- we have identified the closest representative NSRs (blue pins) and a proposed noise monitoring position (NMP – yellow pin), these are shown in Figure 1.

Figure 1 – Approximate site outline, NSRs and NMP

I hope that the above will be sufficient information for you to respond, however, should you need anything further please don't hesitate to get in touch. Should you require a survey I would likely be undertaking this next week (subject to suitable weather), so if you could confirm by response by **Friday afternoon** that would be greatly appreciated. I'm available for a call if you would like to discuss by phone.

With thanks and regards,

Simon

Simon Waddell *(he/him)* **| Associate | ITPEnergised**

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4th Floor | Centrum House | 108-114 Dundas Street | Edinburgh | EH3 5DQ

www.itpenergised.com

From: Philip Dent (Environmental Health (North)) < >
Sent: Friday, September 15, 2023 9:04 AM
To: Simon Waddell < >
Subject: FW: Philips Mains BESS - 23/00635/PREMAJ - Noise assessment

Good Morning,

I have been forwarded your email from Robin as I am based in the North (Caithness area) so will more likely be involved in any future applications etc.

The main issue we are concerned with is “creeping background” so we would be looking for a baseline survey. The area around here can be very quiet and other noise surveys have suggested background levels to be below 35dB

Location wise is satisfactory as is number of receptors chosen. However we would prefer a longer monitoring period. In the case battery storage sites, once operational they cannot be easily turned off and it may not be possible to obtain an accurate background measurement once operational. Therefore, to ensure that values are reliable and suitably represent the periods of interest a minimum of 1 week’s continuous background monitoring should be conducted. This should comprise of continuous measurements of normally not less than 15 min intervals which can be continuous or disaggregated.

If one week is not practical or possible we can look to reduce that but would request that it is more than 24 hour.

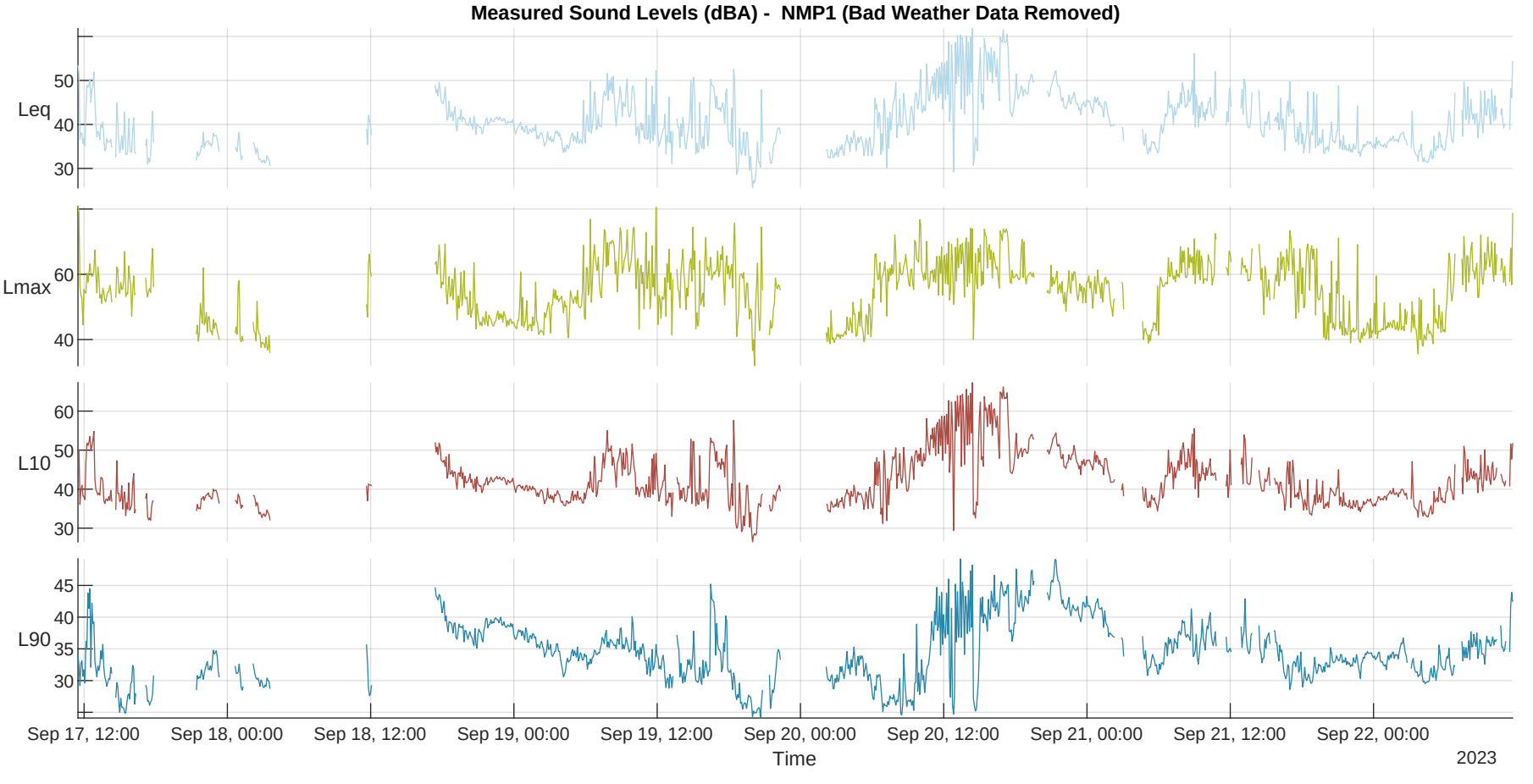
Regards

Philip Dent

Appendix 2 – Record and Results of Noise Survey

Photos of NMP1

Charts Showing Measured Baseline Data

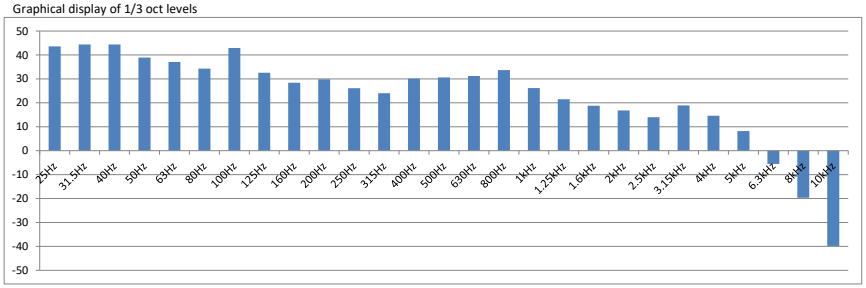

Measured Sound Levels (dBA) - NMP1 (Bad Weather Data Removed)
Leq
50
40
30
Lmax
60
40
L10
60
50
40
30
L90
45
40
35
30
Sep 17, 12:00
Sep 18, 00:00
Sep 18, 12:00
Sep 19, 00:00
Sep 19, 12:00
Sep 20, 00:00
Sep 20, 12:00
Sep 21, 00:00
Sep 21, 12:00
Sep 22, 00:00
Time
2023

Appendix 3 - Evaluation of Tonality – BS4142 1/3 Octave Reference Method

	15dB								8dB					5dB												
	25 to 125								160 to 400					500 to 10,000												
	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
Predicted level at NSR1	43.6	44.4	44.4	38.9	37.1	34.3	42.9	32.6	28.4	29.8	26.1	24	30.1	30.6	31.2	33.7	26.2	21.5	18.8	16.8	14	18.9	14.6	8.2	-5.5	-19.7	-39.8
left		0.8	0	-5.5	-1.8	-2.8	8.6	-10.3	-4.2	1.4	-3.7	-2.1	6.1	0.5	0.6	2.5	-7.5	-4.7	-2.7	-2	-2.8	4.9	-4.3	-6.4	-13.7	-14.2	-20.1
right	-0.8	0	5.5	1.8	2.8	-8.6	10.3	4.2	-1.4	3.7	2.1	-6.1	-0.5	-0.6	-2.5	7.5	4.7	2.7	2	2.8	-4.9	4.3	6.4	13.7	14.2	20.1	
Tonality present?	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz

TONES

Graphical display of 1/3 oct levels



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