tnei

A specialist energy consultancy

# Environmental Noise Impact Assessment

## Rigifa Battery Energy Storage (BESS) Development

Field

16369-004-R0

24 September 2024

COMMERCIAL IN CONFIDENCE

FIELD

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**TNEI Services Ltd**
**Company Registration Number: 03891836** **VAT Registration Number: 239 0146 20**

| Registered Address | | |
|---|---|---|
| Bainbridge House | 7th Floor West One | 7th Floor |
| 86-90 London Road | Forth Banks | 80 St. Vincent Street |
| Manchester | Newcastle upon Tyne | Glasgow |
| M1 2PW | NE1 3PA | G2 5UB |
| Tel: +44 (0)161 233 4800 | Tel: +44 (0)191 211 1400 | Tel: +44 (0)141 428 3180 |

**TNEI Ireland Ltd**
**Registered: 104 Lower Baggot Street, Dublin 2, DO2 Y940**
**Company Registration Number: 662195** **VAT Registration Number: 3662952IH**

Unit S12, Synergy Centre
TU Dublin Tallaght Campus
Tallaght
D24 A386
Tel: +353 (0)190 36445

**TNEI Africa (Pty) Ltd**
**Registered: Mazars House, Rialto Rd, Grand Moorings Precinct,7441 Century City, South Africa**
**Company Number: 2016/088929/07**

Unit 514 Tyger Lake
Niagara Rd & Tyger Falls Blvd
Bellville, Cape Town
South Africa, 7530

**TNEI Inc.**
**Registered Address: 9319 Robert D/ Snyder Rd. PORTAL Building Mecklenburg County**
**Charlotte, NC 228223-0001 USA**
**Certification Number: C202305805696-1**

Unit 216 PORTAL Building,
9319 Robert D. Snyder Road
Charlotte, Mecklenburg County,
North Carolina 28223
Tel: +1 (980) 245-4024

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# 1 Introduction

TNEI was commissioned by Field (henceforth referred to as 'the Client') to undertake an environmental Noise Impact Assessment (NIA) in support of the Section 36 planning application for the proposed Rigifa Battery Energy Storage System (BESS) development (henceforth referred to as 'the Proposed Development').

The Proposed Development is located approximately 18 km east of the town of Thurso in the Scottish Highlands, at approximate Ordnance Survey coordinates 329441, 970987. The Proposed Development will have a storage capacity of 200 MW and will connect to the adjacent planned and consented 132 kV Gills Bay National Grid Substation. The Proposed Development site is currently undeveloped agricultural/pastural land.

The local area around the site is rural in nature, predominantly consisting of agricultural and pastural land, but with a number of residential properties located nearby to the north and northeast.

The purpose of this NIA is to:

- Identify the noise sensitive receptors in the vicinity of the Proposed Development;
- Identify the dominant sound sources associated with the operation of the Proposed Development;
- Calculate the likely levels of operational noise at the identified receptors to determine the likely noise impacts associated with the Proposed Development; and,
- Indicate any requirements for mitigation measures, if applicable, to provide sufficient levels of protection for all noise sensitive receptors.

For clarity, this NIA considers the operational phase of the development only and does not include an assessment of construction noise. Typically, construction noise for this type of development is temporary in nature and usually dealt with at the post-consent phase via best practice mitigation measures during construction.

All work undertaken to produce this report has been carried out by members of the TNEI Environment and Engineering Team, all of whom are affiliated with the Institute of Acoustics (IOA). Specifically, the following members of staff have been involved in the project:

- Will Conway, Tech IOA, BSc (Hons): Baseline Sound Level Survey;
- Ewan Watson, AMIOA, BEng (Hons), IOA Postgraduate Diploma in Acoustics and Noise Control: Noise Propagation Modelling, Assessment and Reporting; and,
- Moise Coulon, Member IOA (MIOA), BSc Information Technology, IOA Postgraduate Diploma in Acoustics and Noise Control: Reporting and quality assurance.

## 1.1 Nomenclature

Please note the following terms and definitions, which are used throughout this report:

- **Emission** refers to the noise level emitted from a noise source, expressed as either a sound power level or a sound pressure level;
- **Immission** refers to the sound pressure level received at a specific location from a noise source;
- **SWL** indicates the sound power level in decibels (dB);
- **SPL** indicates the sound pressure level in decibels (dB);

- **NML** (Noise Monitoring Location) refers to any location where baseline noise levels have been measured;
- **NSRs** (Noise Sensitive Receptors) are all identified receptors that are sensitive to noise; and
- **NAL** (Noise Assessment Location) refers to any location where the noise immission levels are calculated and assessed.

A Glossary of Terms is also provided as Appendix A of this report.

All figures referenced within the report can be found in Appendix F.

Unless otherwise stated, all sound levels refer to free field levels i.e., sound levels without influence from any nearby reflective surfaces.

All grid coordinates refer to the Ordnance Survey grid using Eastings and Northings.

# 2 Project Description

The Proposed Development principally comprises a battery energy storage system (BESS) that will charge and discharge electricity from the adjacent proposed Gills Bay 132 kV National Grid Substation. It includes a single battery compound comprising battery storage units arranged into rows, medium-voltage (MV) skids (each skid comprising a MV transformer and two Power Conversion System (PCS) units) and associated ancillary equipment including low voltage (LV) cabinets and auxiliary transformers; a substation compound which accommodates high-voltage grid transformers, switchgear and a control building, as well as site-wide supporting infrastructure including an interface substation, underground cabling, access tracks, fencing and landscape and biodiversity mitigation and enhancement measures. Whilst the exact specifications of the Proposed Development are subject to detailed design, the principal components described form the basis of the planning application to allow environmental assessments and mitigation to be appropriately scoped.

Considering the above, the Proposed Development would introduce new sound sources to the local area. Specifically, the dominant sound sources considered within the assessment are:

- Battery Storage (DC) Unit Rows (400 of);
- MV Skid (AC) Units (50 of); and
- High-Voltage Grid Transformer Units (2 of).

The layout assessed here is for a BESS with a storage capacity up to 200 MW, as included in Appendix B.

The sound level output of the ancillary infrastructure (e.g. interface substation, switchgear, control building, auxiliary transformers etc.) of the Proposed Development is considered insignificant in comparison to the primary sound sources detailed above. Accordingly, no other items of plant have been considered within the assessment.

## 2.1 Study Area

Noise Sensitive Receptors (NSRs) are properties that are sensitive to noise and, therefore, require protection from nearby noise sources. The study area for the assessment of environmental noise is usually defined through the identification of the closest NSRs to the development.

The assessment of noise attributable to the Proposed Development considers the nearest NSRs only, on the assumption that if sound levels at the closest receptors are deemed acceptable, then sound levels at NSRs at greater distances from the Proposed Development should also be within acceptable levels.

The nearest identified NSRs, which have a high level of sensitivity, are existing residential properties located to the north and northeast of the Proposed Development. The curtilage of the closest residential receptor is approximately 900 m to the northeast of the nearest noise emitting plant. Other residences are located approximately between 1,200 m and 1,800 m away.

Figure 1 within Appendix F details the study area and the closest NSRs considered within the assessment.

# 3 Assessment Methodology

## 3.1 Legislation and Policy Context

### 3.1.1 PAN 1/2011

At a national level, the relevant policy is PAN 1/2011 (PAN) *Planning and Noise* [1] and the associated Technical Advice Note (TAN) *Assessment of Noise* [2]. With regards to the assessment of environmental noise, Appendix 1 of the TAN describes a number of standards and guidelines that may be referred to and details British Standard (BS) 4142 as appropriate for use.

## 3.2 Assessment Method

### 3.2.1 BS 4142:2014 +A1:2019

BS 4142:2014 *'Methods for Rating and Assessing Industrial and Commercial Sound'* [3] is commonly used to assess the potential impacts of new sound sources on nearby receptors. The BS 4142 form of assessment is based on the predicted or measured levels of an assessed sound source compared to the measured background sound levels without the specific sound source present and uses, *'outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident'.*

Specifically, the assessment is made by subtracting the measured background sound level from a calculated or measured 'Rating Level'.

BS 4142 uses the following definitions:

**Ambient Sound**: Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far. Described using the metric, $L_{Aeq\ (t)}$.

**Specific Sound Level**: Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, *Tr*. Described using the metric $L_{Aeq\ (t)}$. Also referred to in this report as the *Immission Level*.

**Residual Sound Level**: Equivalent continuous A-weighted sound pressure level of the residual sound without the specific sound source(s) present at the assessment location over a given time interval, *T*. Described using the metric $L_{Aeq\ (t)}$.

**Background Sound Level**: A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, *T*, measured using time weighting *F* and quoted to the nearest whole number of decibels. Described using the metric $L_{A90\ (t)}$.

**Rating Level**: The Specific Sound Level adjusted for the characteristics of the sound. The Rating Level is calculated by adding a penalty or penalties (if required) to the Specific Sound Level when the sound source contains audible characteristics such as tonal, impulsive or intermittent components. Described using the metric, $L_{Aeq\ (t)}$.

Supplementary information regarding the application of BS 4142 is provided within the Association of Noise Consultants' (ANC) BS 4142 Technical Note (March 2020) [4]. The technical note provides guidance on the appropriate interpretation and application of the standard, including clarifying the methodology for the derivation of representative background sound levels.

The BS4142 standard require two key steps, at first an initial estimate (i.e. comparison of Rating Levels with Background Sound Levels) is undertaken and secondly an assessment of the context is required to conclude on potential noise impacts.

To inform some element of the context assessment, the technical note states the following with regards to the application of the standard in the event measured background sound levels and predicted Rating Levels are low:

'*… the absolute level of sound can be of significance, where the residual values are low and where they are high, and should be taken into account when determining the overall impact of a particular specific sound source. The second paragraph* [of BS 4142] *notes that absolute levels may be as, or more, important than relative outcomes where background and rating levels are low. It is important to note that both background and rating levels would need to be low for this particular caveat to apply. BS 4142 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low, only that the absolute levels may be more important than the difference between the two values. It is likely that where the background and rating levels are low, the absolute levels might suggest a more acceptable outcome than would otherwise be suggested by the difference between the values. For example, a situation might be considered acceptable where a rating level of 30dB is 10dB above a background sound level of 20dB, i.e. an initial estimate of a significant adverse impact is modified by the low rating and background sound levels.'*

With regards to what constitutes 'low', the technical note goes on to state:

'*BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB LA90, and low rating levels as being less than about 35 dB LAr,Tr. The WG suggest that similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate.'*

**Extracts underlined by TNEI for emphasis.**

The additional information provided within the ANC technical note has informed TNEI's approach to the NIA assessment criteria with regards to the application of BS 4142. This is discussed further in Section 3.3.

## 3.3 EHO Consultation and Agreed Criteria

To agree a set of operational noise assessment criteria, TNEI undertook extensive consultation with an Environmental Health Officer (EHO) from The Highland Council (THC). All formal EHO consultation correspondence has been included within Appendix C of this report.

Initially, TNEI issued a letter to THC dated 8th February 2024 (document reference 16369-002-R0) to provide detail of the assessment and proposed noise monitoring locations for the baseline sound level survey. THC responded via email and agreed with the assessment approach and proposed monitoring locations, but also commented that background levels observed within the area would likely be very low (i.e. below 30 dBA) and that a main concern particular to the area is that of creeping background sound levels.

After having undertaken the baseline sound level survey (detail of which is included in Section 4 of this report), TNEI wrote to THC once again (document reference 16369-003-R1, dated 2nd August 2024) to discuss the baseline data and the potential for cumulative considerations to be included within the assessment. Primarily, TNEI explained within the letter that the prevailing background sound levels measured were not as low as expected and, through reference to existing baseline sound level survey data collected in the area as part of noise impact assessments for neighbouring energy developments, reasoned that the levels measured by TNEI were actually quite typical and reflective of the soundscape. Ultimately, the letter summarised the revised approach to the assessment as follows:

- The representative background sound level for all NSRs in the area is 35 dB $L_{A90\ (15\ minutes)}$ for both the daytime and night-time periods;

- An assessment will be undertaken in accordance with BS 4142, with a target for the Proposed Development's Rating Level to not exceed the representative background sound level at all NSRs;
- An assessment of the predicted noise level in the 100 Hz one-third octave frequency band will be undertaken to assess frequency content at the request of the EHO, and;
- A cumulative noise assessment will be presented, considering the nearby developments of Mey BESS, Gills Bay National Grid Substation and Hollandmey Renewable Energy Development.

The EHO confirmed (via email on 9th August 2024) that the above approach is deemed acceptable.

## 3.4 Calculation Method

### 3.4.1 Noise Propagation Model (ISO 9613-2)

In order to predict the noise immission levels attributable to the Proposed Development, a noise propagation model was created using the propriety noise modelling software, CadnaA [5]. Within the software, complex models can be produced to simulate the propagation of noise according to a range of international calculation standards.

For this assessment noise propagation was calculated in accordance with ISO 9613 '*Acoustics – Attenuation of sound during propagation outdoors* [6] using the following input parameters:

- Temperature is assumed to be 10 °C and relative humidity as 70%;
- A ground attenuation factor of 1 (soft ground) has been used except for the developed ground of the Proposed Development area and the adjacent consented Gills Bay Substation area, which has been modelled with a ground attenuation factor of 0 (hard ground); and
- Receiver heights have been set to 4 m.

### 3.4.2 Uncertainties and Limitations

The noise propagation model is designed to give a good approximation of the specific sound level and the contribution of each individual sound source; however, it is expected that measured levels are unlikely to be matched exactly with modelled values. As such, the following limitations in the model should be considered:

- In accordance with ISO 9613, all assessment locations are modelled as downwind of all sound sources and propagation calculations are based on a moderate ground-based temperature inversion, such as commonly occurs at night. These conditions are favourable to noise propagation;
- The predicted barrier attenuation provided by local topography, embankments, walls, buildings and other structures in the intervening ground between source and receiver can only be approximated and not all barrier attenuation will have been accounted for;
- The model assumes all sound sources are operating continuously and simultaneously; and,
- Modelled sound sources represent candidate plant only and a proposed site layout. The noise output of individual items of plant may vary from what is presented in this report after final plant specification.

# 4 Baseline Sound Level Monitoring

To inform the BS 4142 assessment, an unattended baseline sound level survey was undertaken at two Noise Monitoring Locations (NMLs) over a 12-day period between the 8th and 20th of February 2024. The noise monitoring equipment logged in 15-minute averaging intervals and measured continually for the entire survey period at NML02, but for only 7 days at NML01, stopping unexpectedly on the 15th February due to battery failure.

Table 4-1 details the unattended NMLs which are shown on Figure 1 in Appendix F. The NMLs were selected to be representative of the NSRs in the vicinity of the Proposed Development.

**Table 4-1: Unattended Baseline Noise Monitoring Locations**

| NML | | Coordinates | | Comments |
|---|---|---|---|---|
| NML01 | Located within the field to the north of Phillips Mains | 329842 | 972029 | Was installed to be representative of the nearest NSRs located to the north of the Proposed Development |
| NML02 | Located within the field to the southwest of Rigifa | 330348 | 972559 | Was installed to be representative of the nearest NSRs located to the northeast of the Proposed Development |

All measurements were made with the sound level meters (SLMs) mounted approximately 1.2 m above the ground and away from nearby reflective surfaces i.e. building façades, fences etc. as practically possible.

The noise monitoring equipment consisted of two Cirrus Optimus Green SLMs fitted with appropriate environmental wind shields. All noise monitoring equipment (calibrator, SLM and microphones) used for the study is categorised as Class 1, as specified in IEC 61672-1 *'Electroacoustics. Sound level meters. Specifications'* [7]. The equipment was calibrated onsite at the beginning and end of the measurement period with no significant deviations noted. Appendix D contains the equipment and laboratory calibration details for the SLMs and Calibrator.

Subjective observations made during the installation and collection of the survey equipment noted the following:

- At NML01, the soundscape consisted of wind induced foliage rustle, watercourse noise from nearby drainage ditch, resident's dogs barking and occasional bird calls. The watercourse noise was constant.
- At NML02, the soundscape was dominated by wind-induced vegetation and foliage rustle. There were no other significant sources of noise identified at this location.

Meteorological data was collected onsite with a Kestrel portable weather station and a tipping bucket rain gauge, which were installed alongside the SLMs. All sound level data recorded during (as well as 20 minutes before and 60 minutes after) a recorded precipitation event was removed to reduce the potential influence of raised sound levels from rainfall. The data was also filtered for periods when wind speeds were above 5 m/s, to remove any data when noise levels could be atypically increased due to wind induced noise. In addition to this, data measured between the 8th and 11th of February

was manually excluded from the dataset due to atypically high measured $L_{Aeq}$ values, which likely indicated that a noise source was present that was not representative of the typical background sound level. This manually excluded period is represented by the red crosses seen on the time-history graphs presented within Appendix D.

The representative background sound level for each NML was determined with reference to the time-history charts, statistical analysis charts and distribution analysis charts included in Appendix D, following the guidance in presented within the ANC technical note and BS 4142, which states:

*'A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value.'*

With due consideration of the above, Table 4-2 details the representative background sound levels $L_{A90\ (15mins)}$ at each of the NMLs for the daytime and night-time periods.

**Table 4-2: Representative Background Sound Level, dB $L_{A90}$, Derived Through Statistical Analysis**

| Noise Monitoring Location | Daytime $L_{A90\ (15\text{-}mins)}$ | Night-time $L_{A90\ (15\text{-}mins)}$ |
|---|---|---|
| NML01 | 48 | 48 |
| NML02 | 35 | 35 |

Subjective observations on site noted that the soundscape at NML01 was influenced by water flowing from a nearby drainage ditch. The influence of the watercourse is clearly visible in the time-history graph included within Appendix D. It was therefore agreed with the EHO that the data measured at NML02 was representative of the soundscape surrounding the Proposed Development in the absence of watercourse noise.

At NML02, the measured background sound levels were somewhat higher than originally anticipated by the EHO, given the rural nature of the surrounding environment. However, having analysed the measured data at this location, there was no evidence to suggest that the data is invalid for use. In order to validate the use of this representative background sound level within the assessment, TNEI reviewed similar baseline datasets presented within the noise impact assessments for some nearby energy developments. It was found that 35 dB $L_{A90}$ is a typical representative level for both daytime and night-time periods in the surrounding area and this was agreed with the EHO during consultation. As such, 35 dB $L_{A90}$ is considered an appropriate representative background sound level value for all NSRs during both the daytime and night-time periods.

# 5 Operational Noise Impacts

## 5.1 Modelling of Individual Sound Sources

The noise model considers all of the sound sources detailed within Section 2 of the report. The following section describes how each sound source has been incorporated into the noise model. All items of plant have been modelled as area sources i.e. each side and top of each unit are modelled as individual sound sources and are assumed to be operating concurrently, continually and with a constant sound level output.

Noise modelling is based on candidate plant typical for the size and class of the Proposed Development. It should be noted that final plant specifications may vary during the tendering process. Where possible, noise modelling data is shown within Appendix E, however, where data cannot be published due to confidentiality reasons, TNEI would be happy to discuss this data in more detail with the Local Authority, if required.

[redacted]

### 5.1.1 Battery Storage (DC) Unit Rows

[redacted]

**Table 5-1: One-Third Octave Band SWL (dBA) values used to model the Battery Storage Unit Rows**

| | Frequency (Hz) | | | | | |
|---|---|---|---|---|---|---|
| [redacted] | 50 | 63 | 80 | 100 | 125 | 160 |
| | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | 200 | 250 | 315 | 400 | 500 | 630 |
| | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | 800 | 1000 | 1250 | 1600 | 2000 | 2500 |
| | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | 3150 | 4000 | 5000 | 6300 | 8000 | 10000 |
| | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |

### 5.1.2 MV Skid (AC) Units

[redacted]

**Table 5-2: One-Third Octave Band SWL (dBA) values used to model the MV Skid (AC) Unit (30% Load)**

| | Frequency (Hz) | | | | | |
|---|---|---|---|---|---|---|
| [redacted] | 50 | 63 | 80 | 100 | 125 | 160 |
| | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | 200 | 250 | 315 | 400 | 500 | 630 |
| | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | 800 | 1000 | 1250 | 1600 | 2000 | 2500 |
| | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| | 3150 | 4000 | 5000 | 6300 | 8000 | 10000 |
| | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |

### 5.1.3 High-Voltage Grid Transformer Units

Two High Voltage (HV) grid transformers have been included within the noise model. In the absence of provided data form the Client, TNEI have used in-house One-Third Octave Band SWL data for a representative ABB candidate within the noise model. The data for the unit, which has an overall SWL of 88 dBA, is included within Appendix E and is shown below in Table 5-3:

**Table 5-3: One-Third Octave Band SWL (dBA) values used to model the HV Grid Transformers**

| Frequency (Hz) | | | | | | |
|---|---|---|---|---|---|---|
| **HV Grid Transformer** ABB Candidate | **50** | **63** | **80** | **100** | **125** | **160** |
| | 64 | 48 | 55 | 72 | 69 | 78 |
| | **200** | **250** | **315** | **400** | **500** | **630** |
| | 74 | 77 | 80 | 77 | 77 | 79 |
| | **800** | **1000** | **1250** | **1600** | **2000** | **2500** |
| | 79 | 77 | 75 | 72 | 70 | 69 |
| | **3150** | **4000** | **5000** | **6300** | **8000** | **10000** |
| | 68 | 67 | 65 | 62 | 60 | 58 |

## 5.2 Additional Mitigation Measures

No specific noise mitigation measures (i.e. implementation of acoustic barriers or bunds) have been incorporated within the model. The only measures applicable are those embedded within the layout design due to other constraints outside of noise.

## 5.3 Calculated Immission Levels

Noise immission levels have been calculated at five Noise Assessment Locations (NALs), which have been selected to represent the closest NSRs to the Proposed Development. Each NAL has been set on the side of the property facing the Proposed Development, with the exception of NALs 02 and 03, which represent the front and rear amenity areas of Philps Mains respectively as both face the Proposed Development. The NALs are detailed in Table 5-4 and on Figure 2 in Appendix F:

**Table 5-4: Noise Assessment Locations**

| Noise Assessment Location | | OS Grid Reference | |
|---|---|---|---|
| **NAL ID** | **NAL Descriptor** | **Eastings** | **Northings** |
| NAL01 | Phillips Mains A | 329823 | 971979 |
| NAL02 | Phillips Mains B | 329847 | 971952 |
| NAL03 | West Lodge | 328916 | 972267 |
| NAL04 | East Lodge | 330067 | 972714 |
| NAL05 | Rigifa | 330428 | 972642 |

The immission levels (Specific Sound Level) were calculated assuming all plant is operating continuously and concurrently. The model assumes, as a worst case, that noise levels do not fluctuate

and remain the same for both daytime and night-time periods. The noise immission levels at the NALs are detailed in Table 5-5 below. The immission levels are also illustrated as a noise contour plot shown in Figure 2 of Appendix F.

**Table 5-5: Predicted Immission Levels, dB $L_{Aeq(t)}$**

| Noise Assessment Location | | Immission Level, dB $LA_{eq(t)}$ |
|---|---|---|
| NAL ID | NAL Descriptor | |
| NAL01 | Phillips Mains A | 20 |
| NAL02 | Phillips Mains B | 18 |
| NAL03 | West Lodge | 21 |
| NAL04 | East Lodge | 18 |
| NAL05 | Rigifa | 15 |

# 6 Noise Impact Assessment

## 6.1 BS 4142 Rating Level

To assess the immission levels against the agreed criteria, the Specific Sound Level must be converted into a Rating Level. The Rating Level allows for character corrections to be added to account for particular characteristics of the sound that may be perceived as more annoying. In particular, the Rating Level considers tonality, impulsivity and intermittency of the sound, as well other sound characteristics that are neither tonal, impulsive, or intermittent, but are otherwise readily distinctive against the residual acoustic environment.

#### 6.1.1.1 Tonality

With regards to tonality, BS 4142 states:

*'For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.'*

Electrical plant, such as power transformers, are often tonal at source, typically in the 100 Hz frequency band. BS 4142 corrections, however, are only applied if the noise characteristics are present at the receptor location, not at the source location.

Consideration of the predicted one-third octave band levels at the identified receptors against the assessment criteria presented in BS 4142's informative 'One-Third Octave Band Objective Method of Assessment' indicates that no tonality is likely to be present. Details of the informative tonal analysis is presented in Appendix G. As such, given the results of the informative analysis and TNEI's experience of noise assessments for BESS sites, no tonal character correction has been applied.

#### 6.1.1.2 Impulsivity

With regards to impulsivity, BS 4142 states:

*'A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible.'*

Impulsivity is not considered to be a relevant sound characteristic of a BESS as when operational, the noise level will be predictable and consistent.

#### 6.1.1.3 Intermittency

The intermittency of the sound source needs to be considered when it has identifiable on/off conditions with regards to intermittency, BS 4142 states:

*'If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.'*

As with impulsivity, intermittency is not considered to be a relevant sound characteristic in this case. Once operational, noise levels may fluctuate by a small amount over long periods of time, but no step changes in noise level are anticipated.

#### 6.1.1.4 Other Sound Characteristics

With regards to other sound characteristics, BS 4142 states:

*'Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.'*

Based on TNEI's understanding and experience of this type of plant, we do not anticipate any additional sound characteristics that would be considered readily distinctive against the residual acoustic environment.

### 6.1.2 Calculation of the Rating Level

With due regard to the above, no character corrections are required. Therefore, the BS 4142 Rating Levels are equal to the Specific Sound Levels.

### 6.1.3 Assessment of the Impacts

Table 6-1 presents the initial estimate of BS 4142, a comparison of the Rating Levels to against the representative background sound, which in this case are applicable to both daytime and night-time periods:

**Table 6-1: BS4142 initial estimate for daytime and night-time**

| Noise Assessment Location | | Rating Level, dBA | Representative Background Sound Level (Daytime and Night-time), dBA | Margin Above/Below (+/-) Fixed Rating Level Limit, dB |
|---|---|---|---|---|
| NAL ID | NAL Descriptor | | | |
| NAL01 | Phillips Mains A | 20 | 35 | -15 |
| NAL02 | Phillips Mains B | 18 | 35 | -17 |
| NAL03 | West Lodge | 21 | 35 | -14 |
| NAL04 | East Lodge | 18 | 35 | -17 |
| NAL05 | Rigifa | 15 | 35 | -20 |

As shown in Table 6-1, the Rating Levels are considerably below the representative background sound level at all NALs during both the daytime and night-time period, which is *'an indication of the specific sound source having a low impact, depending on the context'* according to the initial estimate of BS 4142.

The context in which the assessment is made is as follows:

- The assessment considers candidate plant and the typical sound level output for this type of plant. As part of the procurement process, plant will be specified in order to minimise noise output.
- The noise model assumes all plant is operating concurrently, however not all cooling units will necessarily be required to operate at the same time and as such, overall noise levels are likely to be lower than predicted.

It is considered that the context does not change the initial estimate outcome and as such the full BS 4142 assessment indicates that the specific sound source will have a low impact, when considering the context**.**

### 6.1.4 Consideration of 100 Hz frequency

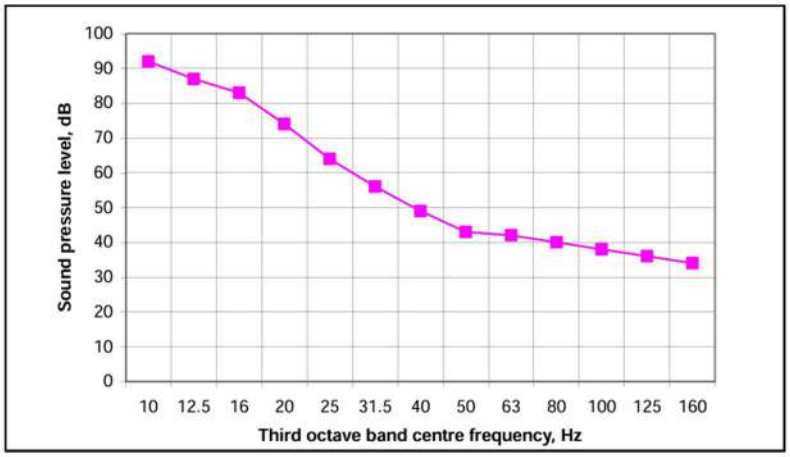
With due regard to the EHO concern regarding the noise level specifically at a frequency of 100 Hz, it is helpful to look at the absolute level of the noise predicted within this frequency band, (as opposed to relying solely on an assessment of tonality), and the DEFRA approved study by Salford University; '*NAN-R-45 Procedure for the assessment of low frequency noise complaints'* [8] is helpful in this regard.

NAN-R-45 presents guidance with the aim of developing a method for the assessment of low frequency noise for use by Environmental Health practitioners in the UK. It provides a criterion curve to aid such an assessment, suggesting that if any particular frequency exceeds the curve this may indicate a source of low frequency noise that could cause disturbance.

The dB levels that define the curve are for noise levels measured inside a dwelling. This is reproduced as Figure 6-1 below.

**Figure 6-1: NAN-R-45 Assessment Criterion Curve**

| Hz | 10 | 12.5 | 16 | 20 | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| dB, Leq | 92 | 87 | 83 | 74 | 64 | 56 | 49 | 43 | 42 | 40 | 38 | 36 | 34 |




At 100 Hz, the internal NAN-R-45 criterion curve level is 38 dBZ. Appendix G presents the external calculated one third octave band noise levels at the closest NAL to provide an indicative comparison. The maximum external predicted noise level attributable to the Proposed Development within the 100 Hz band has been calculated as 26 dBZ, which is considerably below the internal NAN-R-45 criteria of 38 dBZ. Given the internal 100 Hz level is likely to be even lower than the predicted external level, it is considered highly unlikely that noise levels from the Proposed Development within the 100 Hz frequency band will cause any disturbance to residents.

# 7 Cumulative Impacts

## 7.1 Nearby Cumulative Developments

As discussed within the EHO letter included within Appendix C of this NIA report (document reference 16369-003-R1), there are a number of consented and proposed developments located near to the Proposed Development that require cumulative consideration in terms of operational noise output. The nearby cumulative developments considered are summarised within Table 7-1 below:

**Table 7-1: Summary of Nearby Cumulative Developments**

| Development Name | Planning Reference | Planning Status | Approximate Site Centre OS Coordinates | | Approximate bearing and distance from Proposed Development centre point | Approximate bearing and distance from nearest NALs |
|---|---|---|---|---|---|---|
| | | | Eastings | Northings | | |
| Mey BESS | ECU00004838 | Decision Pending | 329634 | 972319 | 1300 m to the north | 350 m to the north west of NAL01 |
| Gills Bay National Grid Substation | 21/05536/FUL | Consented | 329215 | 971984 | 1000 m to the north | 430 m to the southeast of NAL04 |
| Hollandmey Renewable Energy Development | ECU00003353 | Consented | 329020 | 969944 | 1100 m to the south | 2100 m to the southwest of NAL02 |

## 7.2 Cumulative Assessment

With regards to the above, a cumulative assessment was undertaken against the representative background sound levels presented within this NIA for both the daytime and night-time periods. Table H-1 within Appendix H of this NIA report shows the results of the cumulative assessment, in which the Proposed Development's Rating Levels have been logarithmically added together with the Rating Levels presented for the surrounding schemes.

As can be seen from Table H-1, the maximum cumulative Rating Level may be up to +5 dB above the daytime and night-time representative background sound level of 35 dB, in regard to BS 4142 initial estimate this would be an indication of a low impact depending on the context. Furthermore, the Rating Level from the Proposed Development on its own are very low at all NALs and are at least 10 dB below the cumulative predictions of the other schemes which means there are no differences in cumulative predictions with or without the Proposed Development. This is demonstrated within Table H-1.

As such, it is anticipated that the Rating Levels from the Proposed Development will not materially contribute to the cumulative noise levels.

# 8 Summary

To predict the noise immission levels of the Proposed Development, TNEI has produced a noise propagation model in accordance with ISO 9613 based on candidate plant typical for this type of development. The noise model assumes that all plant will be operating continuously and concurrently, however, this is unlikely to occur for the majority of the time. Accordingly, the noise assessment is inherently conservative. The noise model does not include any additional mitigation measures in the form of acoustic barriers or bunds.

The background levels were measured at 2 locations and results were presented and agreed with the Environmental Health Officer (EHO) at the Highland Council, along with an outline methodology and criteria which was also agreed.

The assessment shows that the Proposed Development's Rating Levels are very low at nearby receptors (below 20 dB) and the full BS 4142 assessment indicates that the specific sound source will have a low impact, when considering the context.

Operational noise from the Proposed Development is also not expected to have any tonal characteristics present in any frequency band (100 Hz or otherwise) when incident at the receptors. Additionally, the Rating Levels from the Proposed Development are so low that they are expected to be at least 10 dB below the cumulative noise levels of 3 other nearby proposed schemes in the surrounding area and will not materially contribute to the cumulative noise levels.

**As such, the Proposed Development is expected to have a low noise impact on the local area and no specific noise mitigation measures are anticipated to be required.**

Should the Scottish Ministers be minded to grant consent, TNEI would welcome continued consultation with THC and the Energy Consents Unit to help draft an appropriate set of planning conditions relating to operational noise, prior to a decision notice being issued.

# Appendix A – Glossary of Terms

**Attenuation:** the reduction in level of a sound between the source and a receiver due to any combination of effects including: distance, atmospheric absorption, acoustic screening, the presence of a building façade, etc.

**Background Sound Level:** the sound level rarely fallen below in any given location over any given time period, often classed according to daytime, evening or night-time periods. The LA90 indices (see below) are typically used to represent the background sound level.

**Broadband Noise:** noise with components over a wide range of frequencies.

**Decibel (dB):** the ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. A logarithmic scale is used in sound level measurements because of this wide range. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound level.

**dB(A):** the ear has the ability to recognise a particular sound depending on its pitch or frequency. Microphones cannot differentiate sound in the same way as the ear, and to counter this weakness the sound measuring instrument applies a correction to correspond more closely to the frequency response of the human ear. The correction factor is called 'A Weighting' and the resulting measurements are written as dB(A). The dB(A) weighting is internationally accepted and has been found to correspond well with people's subjective reaction to sound levels and noise. Some typical subjective changes in sound levels are:

- a change of 3dB(A) is just perceptible;
- a change of 5dB(A) is clearly perceptible; and
- a change of 10dB(A) is twice (or half) as loud.

**Directivity:** the property of a sound source that causes more sound to be radiated in one direction than another.

**Emission:** the sound energy emitted by a sound source (e.g. a wind turbine).

**Frequency:** the pitch of a sound in Hz or kHz. See Hertz.

**Ground Effects:** the modification of sound at a receiver location due to the interaction of the sound waves with the ground along its propagation path from source to receiver. Described using the term 'G', and ranges between 0 (hard ground), 0.5 (mixed ground) and 1 (soft ground).

**Hertz (Hz):** sound frequency refers to how quickly the air vibrates, or how close the sound waves are to each other (in cycles per second, or Hertz (Hz)).

**Immission:** the sound pressure level detected at a given location (e.g. the nearest dwelling).

**Noise:** unwanted sound.

**$L_w$:** is the sound power level. It is a measure of the total sound energy radiated by a sound source and is used to calculate sound levels at a distant location. The *LWA* is the A-weighted sound power level.

**$L_{eq}$:** is the equivalent continuous sound level, and is the sound level of a steady sound with the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. The LAeq, T is the A-weighted equivalent continuous sound level over a given time period (T).

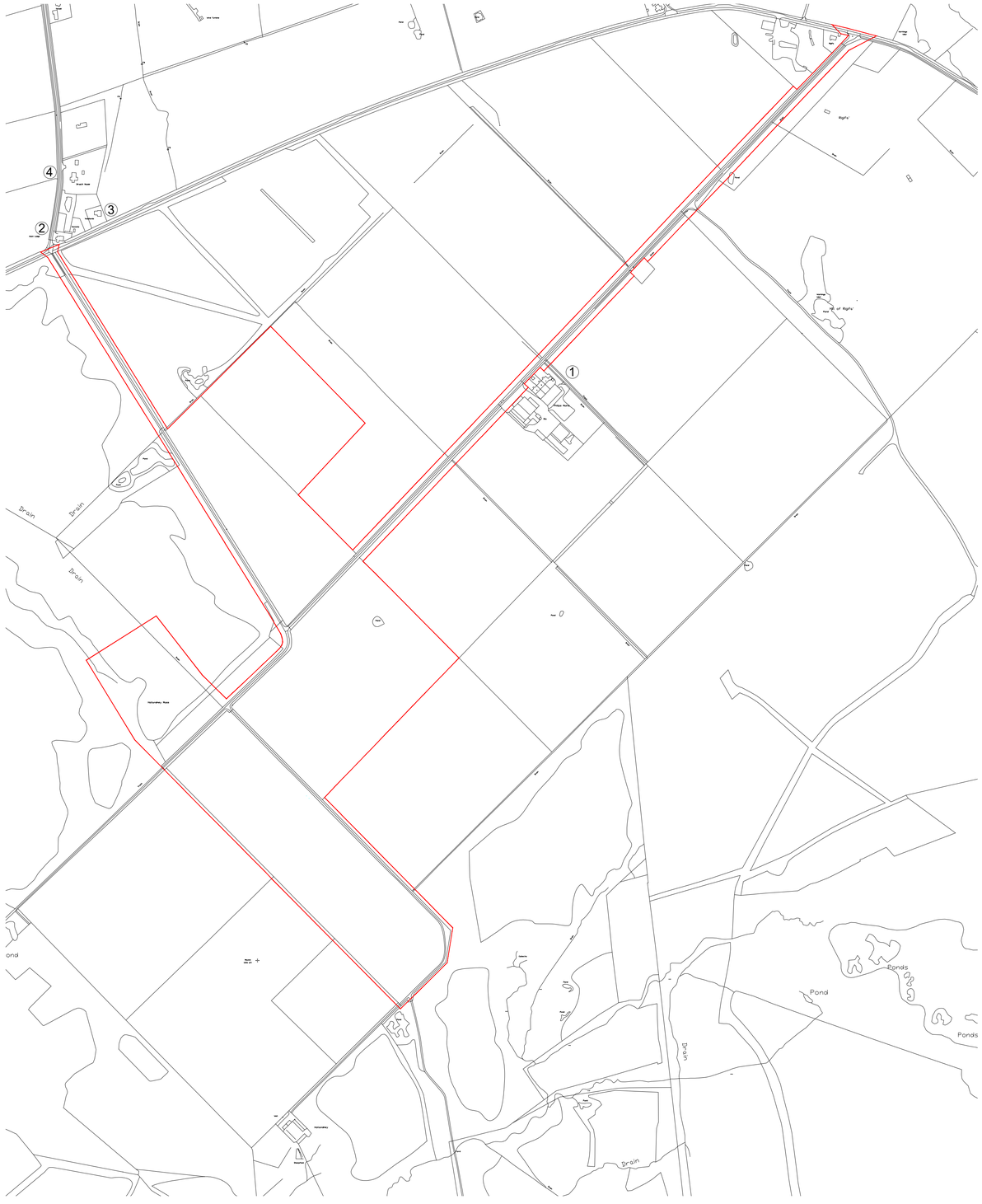
**$L_{90}$:** index represents the sound level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is often used to measure the background sound level. The LA90,10min is the A-weighted background sound level over a ten-minute measurement sample.

**Sound Level Meter:** an instrument for measuring sound pressure level.

**Sound Pressure Level:** a measure of the sound pressure at a point, in decibels.

**Tonal Noise:** noise which covers a very restricted range of frequencies (e.g. a range of ≤20 Hz). This noise is subjectively more annoying than broadband noise.

# Appendix B – Development Information




1 Site Location Plan
Scale 1:5000 @ A1

**Drawing Notes:**

1. All dimensions are shown in metres unless noted otherwise.
2. Do not scale from this drawing.
3. Planning boundary area = 45.381ha
4. Landlord's property is unregistered and the area shown is the area within the landlord's property where construction work will be carried out. Refer to drawing number BTGBRIG01-008.1 for the landownership plan.

| List of Addresses | |
|---|---|
| 1 | 2 Phillips Mains, Mey, Thurso, KW14 8XH |
| 2 | West Lodge, Mey, Thurso, KW14 8XH |
| 3 | Woodlands, Mey, Thurso, KW14 8XH |
| 4 | Bruach House, Mey, Thurso, KW 14 8XH |

**Legend**

Planning Boundary

| REV | DATE | DESCRIPTION | BY | CHK'D |
|---|---|---|---|---|
| 5 | 12.09.2024 | PLANNING BOUNDARY AREA AMENDED | JH | AP |
| 4 | 19.04.2024 | LANDLORD'S PROPERTY REMOVED, 1:5000 SCALE ADDED TO SCALE BAR. | JH | AP |
| 3 | 18.04.2024 | LANDLORD'S PROPERTY AND PLANNING BOUNDARY AMENDED | JH | JM |
| 2 | 04.04.2024 | LANDLORD'S PROPERTY AMENDED | JH | RS |
| 1 | 25.01.2024 | DETAILS ADDED TO SITE LOCATION PLAN | JH | AP |
| 0 | 18.01.2024 | SITE LOCATION PLAN - ORIGINAL | WL | JH |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1:10 | 0 | 100mm | 200mm | 300mm | 400mm | 500mm | 600mm | 700mm | 800mm | 900mm | 1m |
| 1:20 | | | 0.5m | | | 1m | | | 1.5m | | 2m |
| 1:25 | | 0.5m | | 1m | | 1.5m | | 2m | | | 2.5m |
| 1:50 | | 1m | | 2m | | 3m | | 4m | | | 5m |
| 1:100 | 1m | 2m | 3m | 4m | 5m | 6m | 7m | 8m | 9m | 10m | |
| 1:200 | | 5m | | | 10m | | | 15m | | | 20m |
| 1:250 | | 5m | | 10m | | 15m | | 20m | | | 25m |
| 1:500 | | 10m | | 20m | | 30m | | 40m | | | 50m |
| 1:1000 | 10m | 20m | 30m | 40m | 50m | 60m | 70m | 80m | 90m | 100m | |
| 1:2000 | | 50m | | | 100m | | | 150m | | | 200m |
| 1:2500 | | 50m | | 100m | | 150m | | 200m | | | 250m |
| 1:5000 | | 100m | | 200m | | 300m | | 400m | | | 500m |

Field
Fora - Montacute Yards
186 Shoreditch High Street
London
E1 6HU

PROJECT
RIGIFA

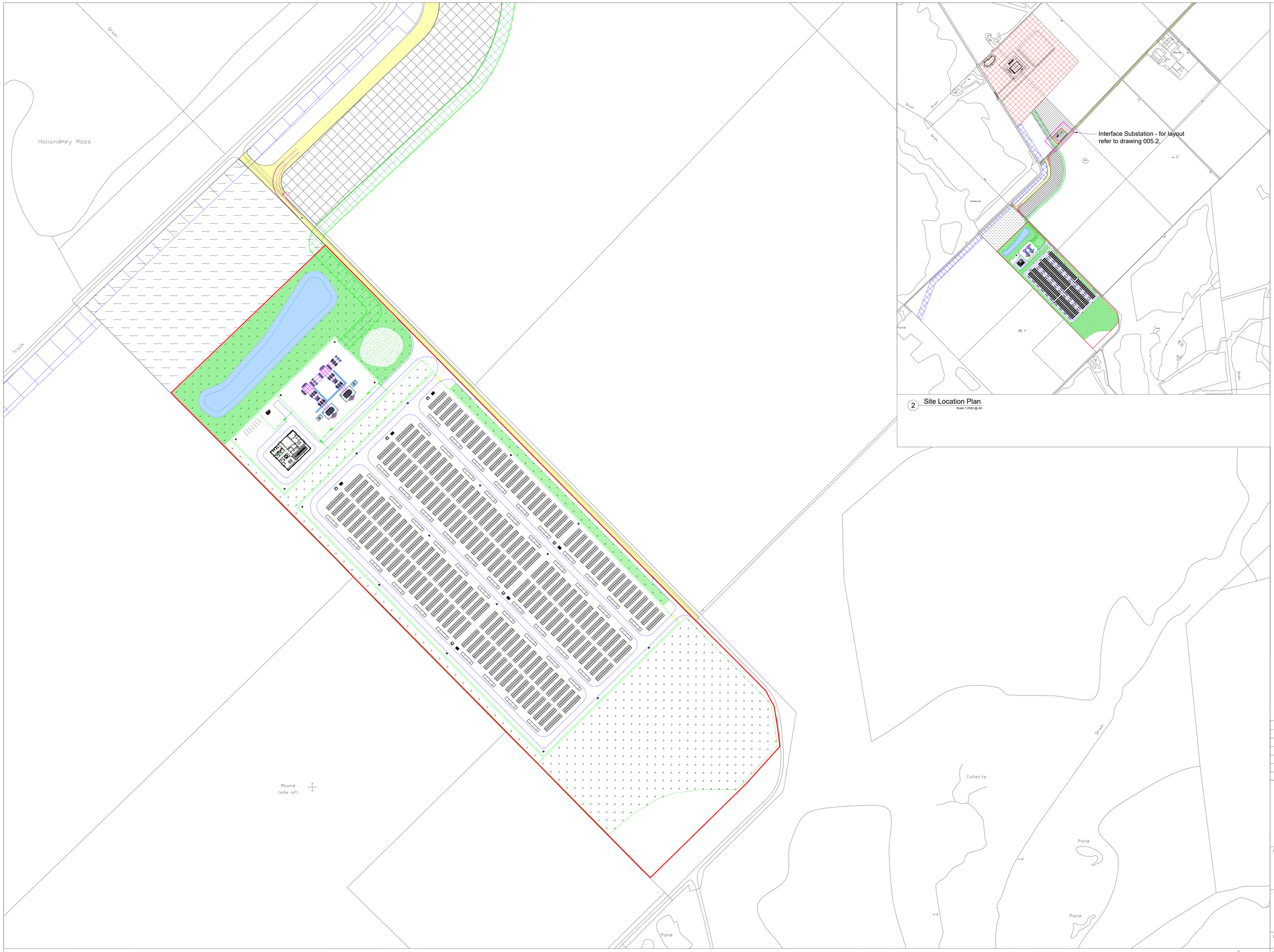
TITLE
SITE LOCATION PLAN

DISCIPLINE
PLANNING

DRAWING STATUS
FOR PLANNING

| SCALE | DATE | DRAWN BY | CHECKED BY | APPROVED BY |
|---|---|---|---|---|
| 1:5000 @A1 | 25.01.2024 | JH | JH | AP |

| PROJECT NO. | DRAWING NO. | REV. |
|---|---|---|
| BTGBRIG01 | 002.1 | 5 |




1 Detailed Site Layout Plan
Scale 1:1000 @ A0

2 Site Location Plan
Scale 1:2500 @ A0

**Drawing Notes:**

1. All dimensions are shown in metres unless noted otherwise.
2. Do not scale from this drawing.

**Legend**

- Exclusivity Area
- Interface Substation Exclusivity Area
- Illustrative Access Route
- Illustrative Cable Route
- New SSE Substation Compound
- SSE Proposed Cable Route
- Temporary Construction Compound
- Temporary Construction Working Area
- Temporary Laydown Area
- Access Road
- Fencing
- Attenuation Basin
- Planting/Landscaping
- Indicative 1.5m High Bund (Landscaping)

| | | | | |
|---|---|---|---|---|
| 1:10 | 0 | 100mm 200mm 300mm 400mm 500mm 600mm 700mm 800mm 900mm | | 1m |
| 1:20 | | 0.5m | 1m | 1.5m 2m |
| 1:25 | | 0.5m | 1m 1.5m | 2m 2.5m |
| 1:50 | | 1m | 2m 3m | 4m 5m |
| 1:100 | 1m | 2m 3m 4m 5m 6m 7m 8m 9m | | 10m |
| 1:200 | | 5m | 10m 15m | 20m |
| 1:250 | | 5m | 10m 15m | 20m 25m |
| 1:500 | | 10m | 20m 30m | 40m 50m |
| 1:1000 | 10m | 20m 30m 40m 50m 60m 70m 80m 90m | | 100m |
| 1:2000 | | 50m | 100m 150m | 200m |
| 1:2500 | | 50m | 100m 150m | 200m 250m |
| 1:5000 | | 100m | 200m 300m | 400m 500m |

| REV | DATE | DESCRIPTION | BY | CHK'D |
|---|---|---|---|---|
| 5 | 12.09.2024 | BESS compound amended and planting/landscaping area increased. Interface substation position amended. | JH | AP |
| 4 | 22.07.2024 | Site layout amended with reduced number of BESS blocks | JH | AP |
| 3 | 12.07.2024 | Site layout amended for larger attenuation basin. | JH | AP |
| 2 | 15.04.2024 | Site layout amended | JH | JM |
| 1 | 04.04.2024 | Construction compound amended and temporary construction working area added | JH | RS |
| 0 | 13.03.2024 | Detailed Site Layout Plan - Original | JH | JM |


Field
Fora - Montacute Yards
186 Shoreditch High Street
London
E1 6HU


PROJECT
RIGIFA

TITLE
Detailed Site Layout Plan
Envision Twinskid
200MW/1200MWh

DISCIPLINE
DESIGN

DRAWING STATUS
FOR INFORMATION

| SCALE | DATE | DRAWN BY | CHECKED BY | APPROVED BY |
|---|---|---|---|---|
| As Shown | 13.03.2024 | JH | JM | RS |

| PROJECT NO. | DRAWING NO. | REV. |
|---|---|---|
| BTGBRIG01 | 005.1 | 05 |

# Appendix C – EHO Consultation Data

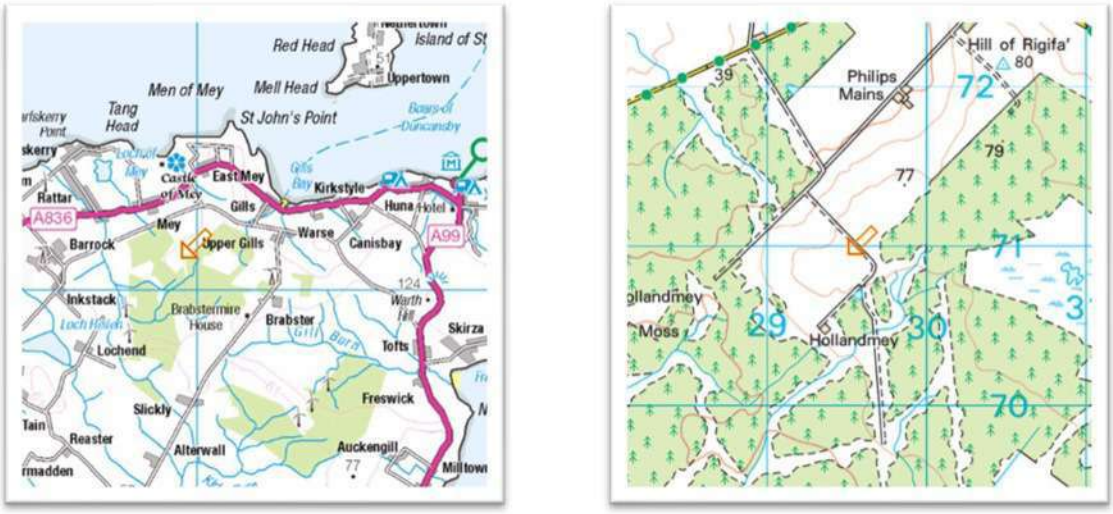
# Rigifa Battery Energy Storage System: Noise Impact Assessment

| | | | |
|---|---|---|---|
| To: | [redacted] | Planning Authority: | The Highland Council |
| Address: | By Email | TNEI Ref.: | 16369-001-R0 |
| Date: | 8 February, 2024 | | |

Dear [redacted]

TNEI Services Ltd (TNEI) have been commissioned by Field Energy to undertake a Noise Impact Assessment to support the planning application for a Battery Energy Storage System (BESS) located in Rigifa, Caithness, at approximate coordinates, 329496, 970942. Image 1 details the approximate location.

**Image 1: Approximate site location**




The proposed development will introduce new sound sources into the area in the form of externally located battery banks, inverters and transformers.

Figure 1 (appended) details an indicative red line boundary and the nearest identified Noise Sensitive Receptors (NSRs), which are residential properties to the northeast and northwest of the Proposed Development.

## Proposed Assessment Method

TNEI propose to undertake an assessment in line with BS 4142:2014+A1-2019 Methods for Rating and Assessing Industrial and Commercial Sound (BS 4142), however, we recognise there are a number of alternative methods of assessment available, such as the use of fixed guideline levels e.g. BS 8233:2014, Noise Rating (NR) curves and other criteria specific to The Highland Council. Accordingly, if you would like us to consider any alternative approaches, then please advise and we would be happy to incorporate this into our assessment.

## Proposed Baseline Survey

In order to inform the BS 4142 assessment, TNEI are currently in the process of undertaking a baseline sound level survey at three locations. These are shown on the appended Figure 1, the NMLs have been coloured to match the NSRs that they will represent e.g. the data measured at the yellow NML will be used to represent all of the NSRs marked as yellow.

Continuous unattended monitoring will be undertaken for a period of at least 7 days and the noise levels will be logged in 15-minute intervals. A rain gauge and a small wind speed monitor have also been installed at one of the NMLs. All periods measured during periods of precipitation will be removed from the dataset. Similarly, all data will be removed during periods of high windspeeds.

Following the conclusion of the survey, a representative background sound level will be determined for each NML following the guidance presented in both BS 4142 and the Association of Noise Consultants' (ANC) BS 4142 Technical Note, March 2020. The assessment will predict operational noise levels from the Proposed Development at the nearest identified NSRs, on the assumption that if noise is within acceptable levels at these locations, it will also be acceptable at more distant locations. We will aim to conclude on potential impact and mitigation requirements at the closest NSRs identified.

If background sound levels are very low, the initial estimate of BS 4142 (comparing rating levels against the background sound level) may not be an appropriate assessment methodology. Where background sound levels are determined to be very low i.e. below 30 dB $L_{A90(t),}$ and predicted Rating Levels are also likely to be low (less than 35 dB $L_{Aeq(t)}$) then, as detailed within the ANC Technical Note, it may be more appropriate to undertake the assessment against an absolute noise level limit. Should this be the case, we will write to you beforehand to confirm these details.

## Summary

We hope the above provides you with a clear explanation as to the approach that we intend to adopt for this assessment. We would be very grateful if you could confirm your acceptance of this approach, or otherwise. If there is any aspect of the proposed survey or assessment method you would like to discuss in more detail, or if you would like further information with regards to the nature of the development, then please do not hesitate to get in touch.

Yours sincerely,

Ewan Watson

Senior Consultant

TNEI Services Ltd

## Document Control

| Revision | Status | Prepared by | Checked by | Approved by | Date |
|---|---|---|---|---|---|
| R0 | FIRST ISSUE | WC | EW | MC | 08/02/2024 |
| | | | | | |
| | | | | | |
| | | | | | |


**TNEI Services Ltd**
**Company Registration Number: 03891836** **VAT Registration Number: 239 0146 20**

| | | |
|---|---|---|
| Registered Address | | |
| Bainbridge House | 7th Floor West One | 7th Floor |
| 86-90 London Road | Forth Banks | 80 St. Vincent Street |
| Manchester | Newcastle upon Tyne | Glasgow |
| M1 2PW | NE1 3PA | G2 5UB |
| Tel: +44 (0)161 233 4800 | Tel: +44 (0)191 211 1400 | Tel: +44 (0)141 428 3180 |

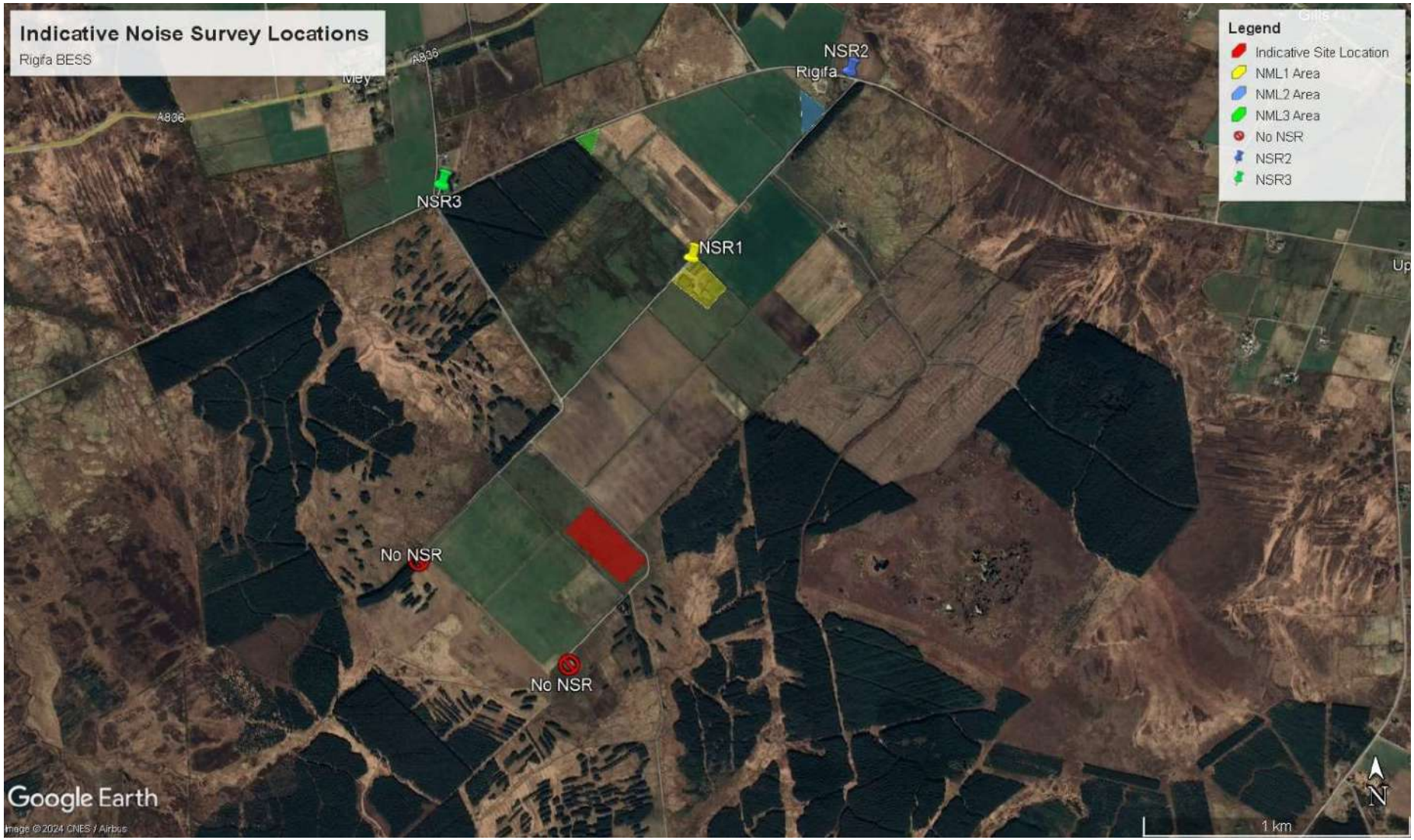
**TNEI Ireland Ltd**
**Registered Address: 104 Lower Baggot Street, Dublin 2, DO2 Y940**
**Company Registration Number: 662195** **VAT Registration Number: 3662952IH**

Unit S12, Synergy Centre
TU Dublin Tallaght Campus
Tallaght
D24 A386
Tel: +353 (0)190 36445

**TNEI Africa (Pty) Ltd**
**Registered: Mazars House, Rialto Rd, Grand Moorings Precinct,7441 Century City, South Africa**
**Company Number: 2016/088929/07**

Unit 514 Tyger Lake
Niagara Road & Tyger Falls Blvd
Belville
Cape Town7530
South Africa,
Tel: +27 (0)72 855 6999

*Appended: Figure 1 – NIA Study Area*



A specialist energy consultancy

# Rigifa Battery Energy Storage System (BESS) Development: Noise Impact Assessment – Further Correspondence

| | | | |
|---|---|---|---|
| To: | [redacted] | Planning Authority: | The Highland Council |
| Address: | The Highland Council,<br>Community Services,<br>38 Harbour Road,<br>Inverness, IV1 1UF | TNEI Document Ref.: | 16369-003-R1 |
| Date: | 2 August, 2024 | | |

Dear [redacted]

As you are aware, TNEI Services Ltd (TNEI) have been commissioned by Field to carry out a Noise Impact Assessment (NIA) to support the Section 36 planning application for a proposed Rigifa Battery Energy Storage System (BESS) development (the Proposed Development) located approximately 22 km to the east of the town of Thurso, Highlands. The proposed site location and the nearest identified residential Noise Sensitive Receptors (NSRs) are shown in Figure 1 overleaf.

TNEI sent a letter to The Highland Council (THC) (Document Reference 16369-002-R0) on the 8th of February 2024, detailing our proposed methodology and baseline noise survey locations and to invite feedback on our proposed assessment methodology. We received a prompt response from yourself on 13th February 2024, confirming your acceptance of TNEI's proposed methodology and highlighting concern regarding the likelihood of low background sound levels in the area, inviting further discussion regarding the assessment upon completion of the baseline survey.

The noise impact assessment is now in a position to progress (with a target planning submission date of September 2024) and our baseline survey is now complete. As such, the purpose of this letter is to discuss the results of the baseline survey, the potential need for cumulative considerations, and to agree upon an appropriate methodology that will help us deliver a robust NIA report in line with THC's requirements.

## Baseline Sound Level Survey

The baseline survey was undertaken from the 8th to the 20th of February 2024. Monitoring was undertaken continually at two Noise Monitoring Locations (NMLs) and logged in 15-minute periods. The

derived representative background sound levels, which have been chosen by TNEI with reference to the appended statistical and distribution analysis graphs, are detailed in Table 1 below:

**Table 1 – TNEI's Chosen Representative Background Sound Levels, dB $L_{A90(15\ minutes)}$**

| Noise Monitoring Location (NML) | Daytime $L_{A90}$ | Night-time $L_{A90}$ |
|---|---|---|
| NML01 | 48 | 48 |
| NML02 | 35 | 35 |

The NMLs are detailed within Figure 1 below:

**Figure 1 – Nearest Noise Sensitive Receptors (NSRs) and Noise Monitoring Locations (NMLs)**


At both NMLs, a measurement period of around 2 days has been excluded from the beginning of the datasets due to an undefined and atypical increase in noise levels. This can be seen in the time history plots as 'manual exclusions' and are represented as red crosses.

At NML01, subjective observations made during collection of the equipment noted that the soundscape was influenced by water flowing from a nearby drainage ditch. The influence of this can clearly be seen on the appended time-history graph, where background sound levels remain high (between approx. 45 and 50 dBA) throughout the survey, even at night. As such, we have decided that the data measured at this location is not appropriate for use to inform the assessment. It should also be noted for completeness that data was obtained at this location for a shorter duration due a battery failure after approximately 7 days (as seen in the NML01 time-history graph).

At NML02, background sound levels are somewhat higher than was originally anticipated, given the rural nature of the surrounding environment, however, there is nothing immediately obvious within the dataset to suggest that the data is invalid for use. Table 2 presents the calculated levels:

**Table 2: Background Sound Levels at NML02, dB $L_{A90\ (15\ minutes)}$**

| NML | Time Period | Mean | Median | TNEI Representative Level |
|---|---|---|---|---|
| NML02 | Day | 35 | 35 | 35 |
| | Night | 37 | 37 | 35 |

To seek validation of this background sound level, TNEI have reviewed similar baseline datasets presented within the noise impact assessments for some other nearby schemes.

**Mey BESS (ECU00004838):** Monitoring was undertaken at Philips Main, which is the nearest NSR to the Rigifa BESS development. The representative background sound levels at this location were reported as 35 dB $L_{A90\ (t)}$* during the daytime and 34 dB $L_{A90\ (t)}$* at night, which is very similar to the levels measured by TNEI.

***Logging periods were not disclosed within the NIA report**

**Gills Bay Substation (21/05536/FUL):** Long-term monitoring was also undertaken at Philips Main, as well as at two additional locations (West Lodge and Woodlands) located approximately 950 m west/northwest of Philips Mains. With regards to measured levels, the NIA report states:

*'The noise impact assessment provided in this report is an update to a previous noise impact assessment, following on from comments received from THC. The previous impact assessment used background noise data collected over one clear night on the night of 18/19 April 2016, with the lowest measured value of 28.2 dBA used in the subsequent assessment. The analysis of long-term noise data collected from 10 to 23 February 2016 has indicated that the majority of background noise levels at Phillips Main and West Lodge/Woodlands occur in the 30 - 40 dBA range.'*

Again, this dataset indicates similar background sound levels to the TNEI dataset.

Consideration of both TNEI's measured data (discussed above and appended) and the review of data contained within the NIA's for the neighbouring schemes gives confidence that a value of **35 dB $L_{A90\ (15\ minutes)}$** is representative of the surrounding area's soundscape during the daytime and night-time, and appropriate for use within our assessment for all nearby NSRs.

## Assessment Criteria

TNEI understand, from extensive experience of consulting with THC's Environmental Health Officers, that the standard set of assessment criteria required by THC for BESS developments is as follows:

1. *'Noise arising from the development when measured and/or calculated as an $L_{Zeq\ (5\text{-}minutes)}$, in the 100 Hz one third octave frequency band must not exceed 30 dB, at noise sensitive premises; and*
2. *The Rating Level of noise arising from the use of plant, machinery, or equipment as a result of the development must not exceed the current background noise levels at noise sensitive premises. The Rating Level should be calculated in accordance with BS 4142: 2014+A1:2019: Methods for rating and assessing industrial and commercial sound.'*

With regards to the 100 Hz limit of 30 dB $L_{Zeq\ (5\text{-}minutes)}$, TNEI have recently discussed this in depth with [redacted] (EHO at THC) also on behalf of Field regarding another of their BESS developments just outside of Inverness (Knocknagael).

TNEI understand that the limit has been imposed in the past by THC due to concerns regarding tonality within the 100 Hz band for electrical plant, most specifically for substations, however, we discussed how 30 dBZ is an extremely low level (approximately 11 dBA) and presented evidence as to why this could be unduly restrictive and not appropriate for a BESS development. Therefore, to demonstrate that tonality (at 100 Hz) would not be problematic, Robin agreed an alternative approach to the assessment and TNEI demonstrated that no tonal characteristics were expected in the immission levels in the 100 Hz One-Third Octave frequency band. This was achieved through a combination of the BS 4142 *'One-Third Octave Band Objective Method of Assessment'* and comparison of the predicted levels against; *'NAN-R-45 Procedure for the assessment of low frequency noise complaints' (DEFRA)*, which presents guidance with the aim of developing a method for the assessment of low frequency noise for use by Environmental Health practitioners in the UK.

TNEI propose to adopt the same approach to the consideration of operational noise levels within the 100 Hz frequency band for the Proposed Development. If required, we can provide copies of the correspondence with Robin Fraser regarding the 100 Hz assessment approach at Knocknagael.

With regards to a Rating Level limit of 0 dB above background, TNEI are happy to comply with this request, which effectively sets a Rating Level limit of 35 dB $L_{Aeq(t)}$ at all nearby residential receptors.

**Cumulative Considerations**

As discussed above, there are a number of proposed renewable energy/BESS schemes in the area surrounding the Proposed Development, and these may require cumulative consideration within our assessment. Table 3 summarises the developments that we intend to include within our assessment.

**Table 3: Proposed Neighbouring Schemes to be Considered within NIA**

| Neighbouring Scheme | Planning Reference Number |
|---|---|
| Mey BESS | ECU00004838 |
| Gills Bay Substation | 21/05536/FUL |
| Hollandmey Renewable Energy Development | ECU00003353 |

Cumulative noise levels will be calculated at each receptor using the predicted noise levels presented in the NIA reports submitted for the May BESS and Gills Bay Substation.

For the Hollandmey Renewable Energy Development (which consists of a wind farm, as well as substation, BESS and solar farm), the NIA does not include a BS 4142 assessment, background sound levels or predicted noise levels from the substation, BESS or solar farm. However, the assessment states; *"It is therefore proposed that combined noise levels from electrical plant at this facility should be limited to a rated noise level of no more than 30 dB $L_{Aeq}$ at the nearest residential property."* As such, we will assume that the BS 4142 Rating Levels from this development are 30 dB $L_{Aeq(t)}$ at all of the nearest receptors.

Our cumulative assessment will consider the likely cumulative noise levels from the operation of all of the above developments and seek to demonstrate that the cumulative noise level will either not exceed the background sound level i.e. 35 dBA, or that the site-specific noise levels from the Proposed Development will be at least 10 dB below the cumulative noise level of the neighbouring developments. For clarity, whilst we do agree that a cumulative noise assessment is necessary, TNEI do not believe that a cumulative noise condition is appropriate and would expect that any noise limits that are imposed would be site specific only.

We hope the above provides you with requisite additional information to allow us to agree upon an appropriate assessment methodology and progress with the assessment. To summarise;

- We have determined that the representative background sound level for all NSRs in the area is 35 dB $L_{A90\ (15\ minutes)}$ for both the daytime and night-time periods;
- The site will be designed to ensure the Rating Level does not exceed the background sound level at all NSRs;
- An assessment of the predicted noise level in the 100 Hz one-third octave frequency band will be undertaken to ensure no tonality is present;
- A cumulative noise assessment will be presented, considering each of the developments as detailed within Table 3; and,
- The site will be assessed to ensure the cumulative level does not exceed the background sound level or, where this already occurs due to the existing cumulative levels from the neighbouring schemes, the site-specific noise level will be at least 10 dB below the existing cumulative noise level.

We would welcome any feedback you may have on the above, particularly with regards to the cumulative approach. If you feel that a call would be beneficial to discuss matters further, please do not hesitate to get in touch and we can look to arrange this.

[redacted]

Document Control

| Revision | Status | Prepared by | Checked by | Approved by | Date |
|---|---|---|---|---|---|
| R0 | FIRST ISSUE | EW | JS | JS | 31/07/2024 |
| R1 | CLIENT COMMENTS | EW | JS | JS | 02/08/2024 |
| | | | | | |


**TNEI Services Ltd**

**Company Registration Number: 03891836** **VAT Registration Number: 239 0146 20**

| | | |
|---|---|---|
| Registered Address | | |
| Bainbridge House | 7th Floor West One | 6th and 7th Floor |
| 86-90 London Road | Forth Banks | 80 St. Vincent Street |
| Manchester | Newcastle upon Tyne | Glasgow |
| M1 2PW | NE1 3PA | G2 5UB |
| Tel: +44 (0)161 233 4800 | Tel: +44 (0)191 211 1400 | Tel: +44 (0)141 428 3180 |

**TNEI Ireland Ltd**

**Registered Address: 104 Lower Baggot Street, Dublin 2, DO2 Y940**

**Company Registration Number: 662195** **VAT Registration Number: 3662952IH**

Unit S12, Synergy Centre
TU Dublin Tallaght Campus
Tallaght
D24 A386
Tel: +353 (0)190 36445

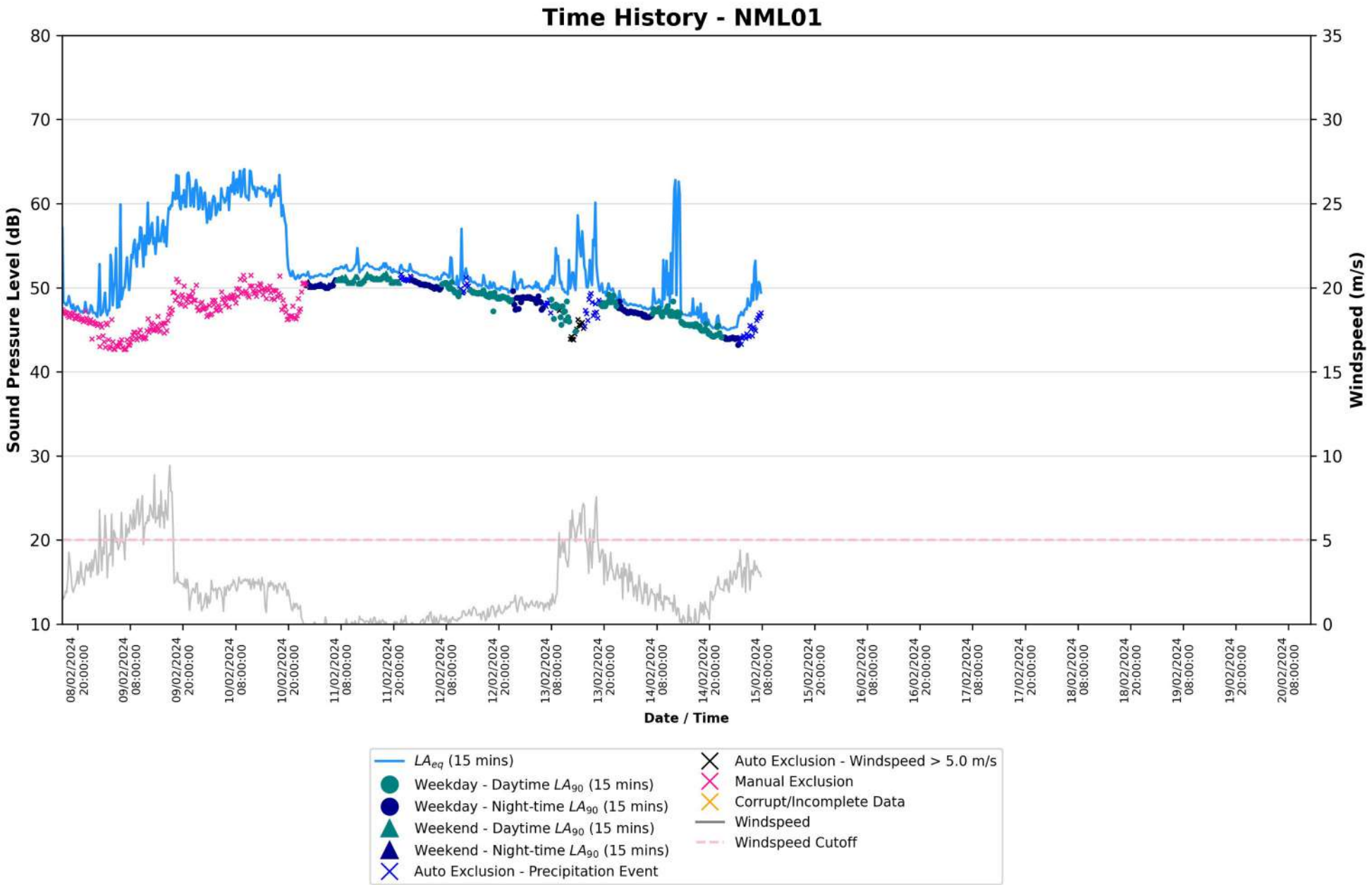
**TNEI Africa (Pty) Ltd**

**Registered: Mazars House, Rialto Rd, Grand Moorings Precinct,7441 Century City, South Africa**

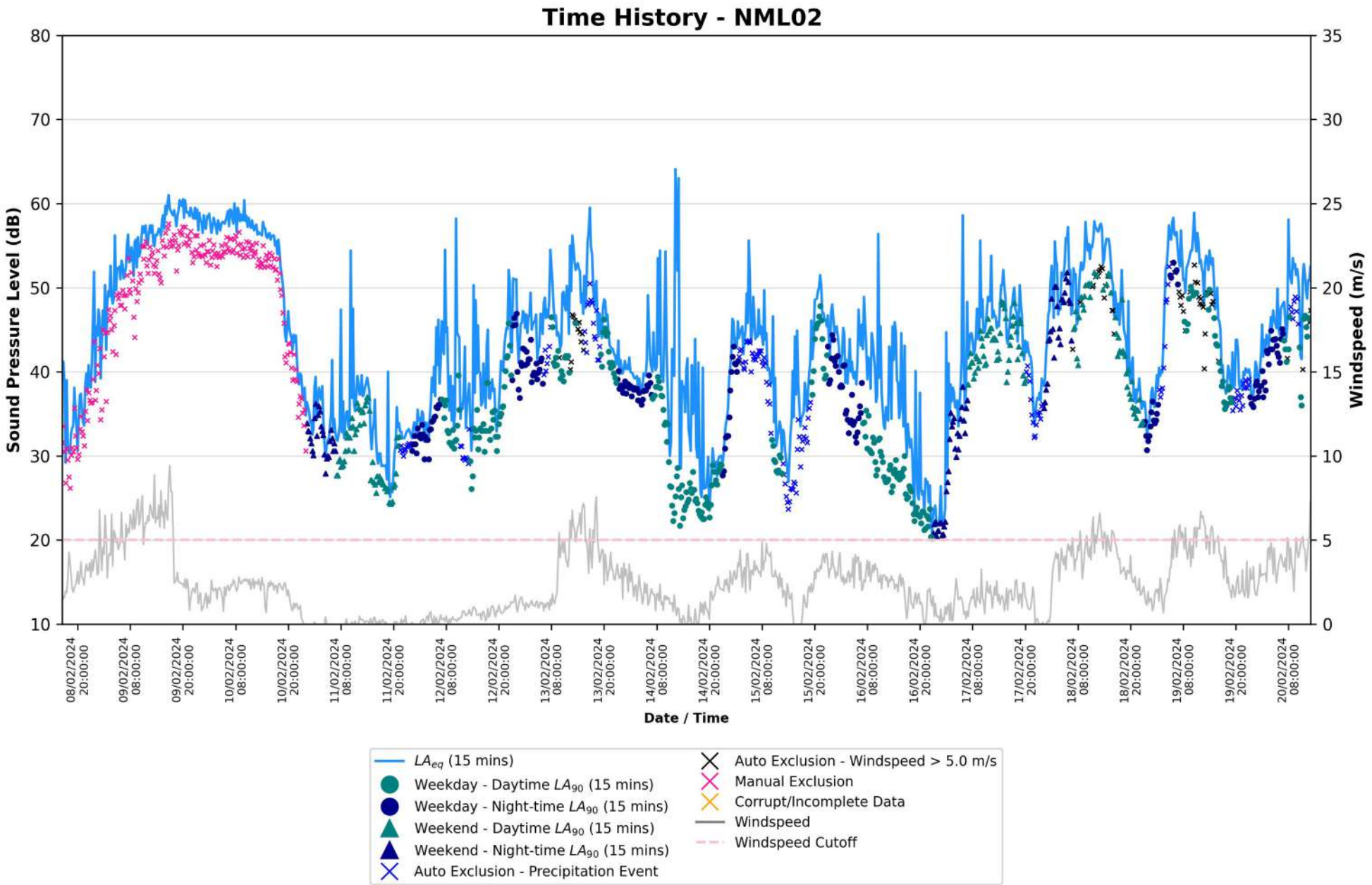
**Company Number: 2016/088929/07**

Unit 514 Tyger Lake
Niagara Road & Tyger Falls Blvd
Belville
Cape Town7530
South Africa,
Tel: +27 (0)72 855 6999

## 16369 - Rigifa BESS - Measured Sound Levels:



## 16369 - Rigifa BESS - Measured Sound Levels:



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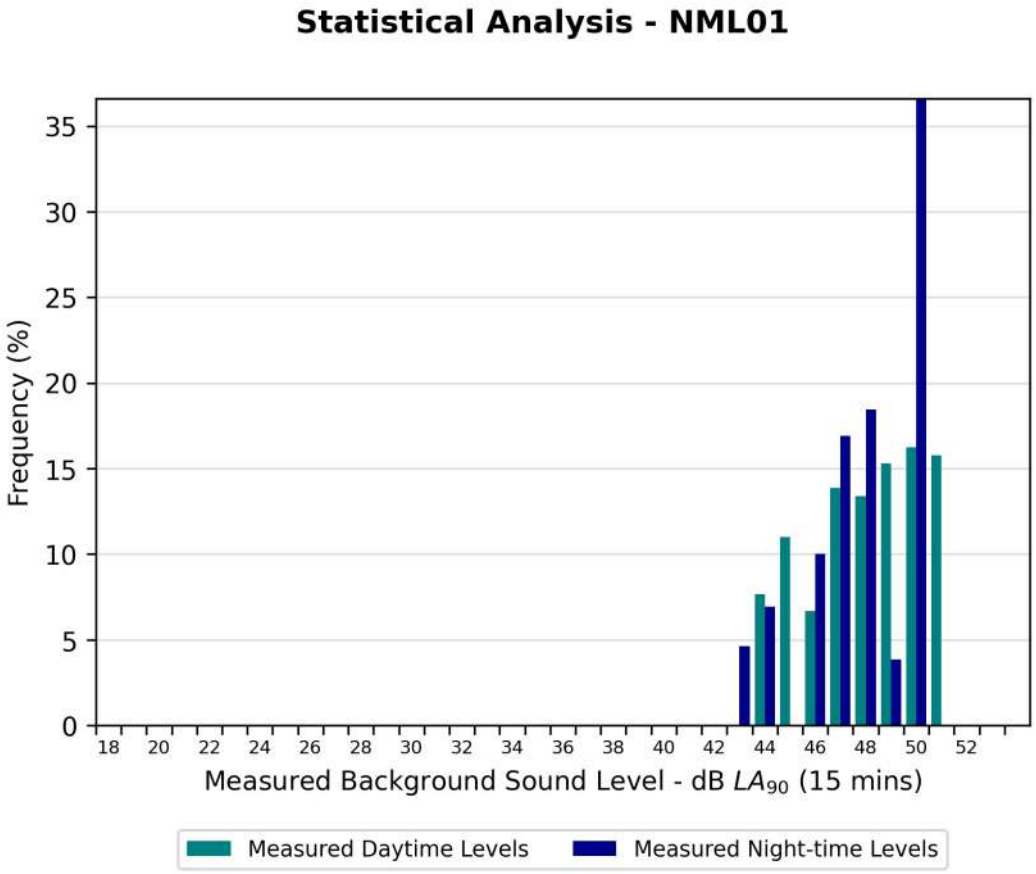
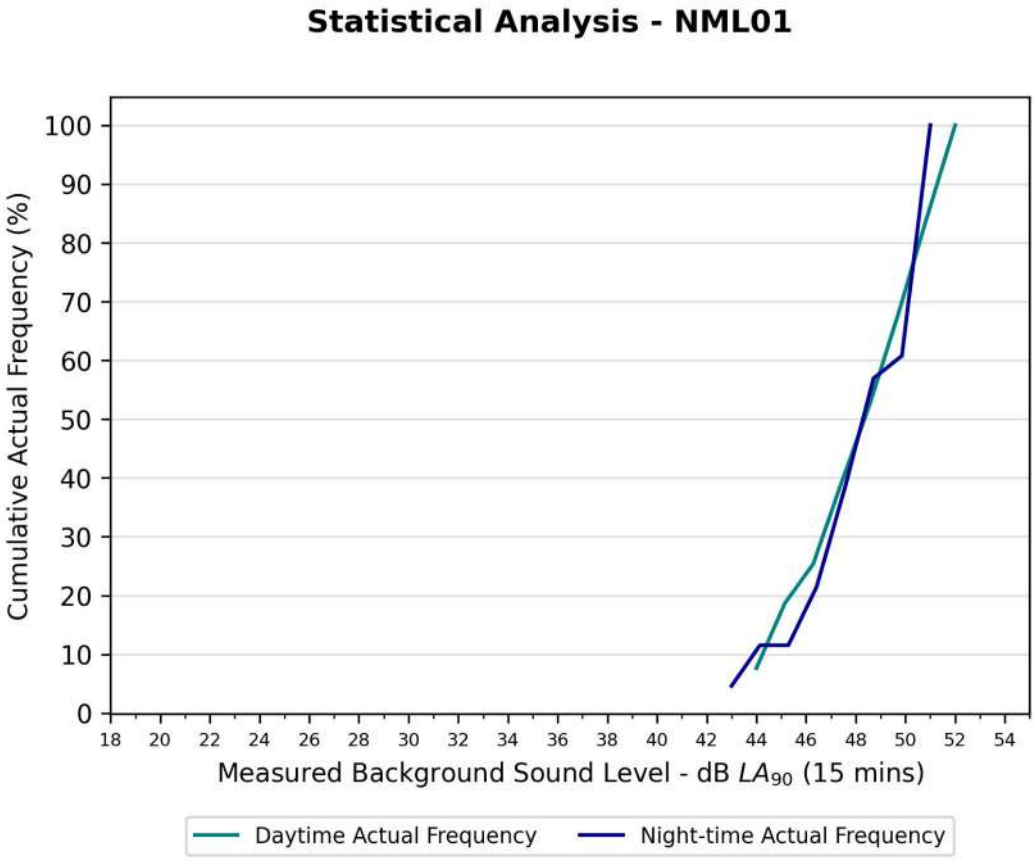
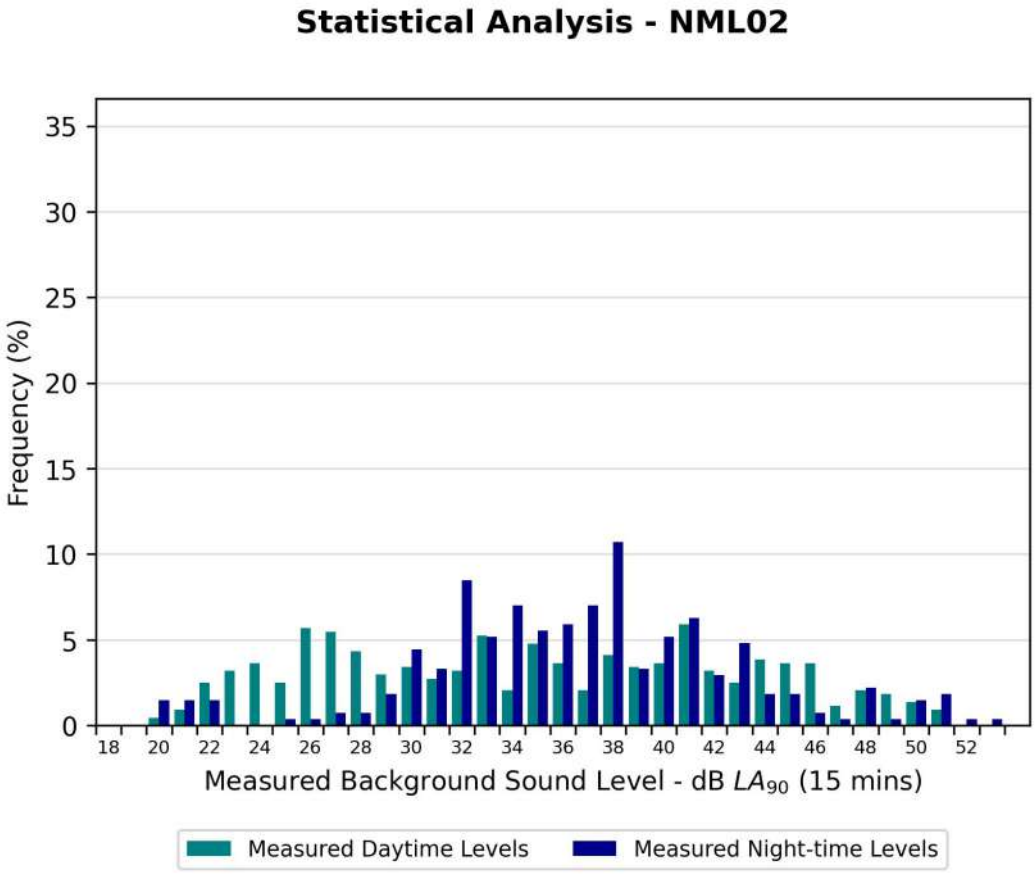
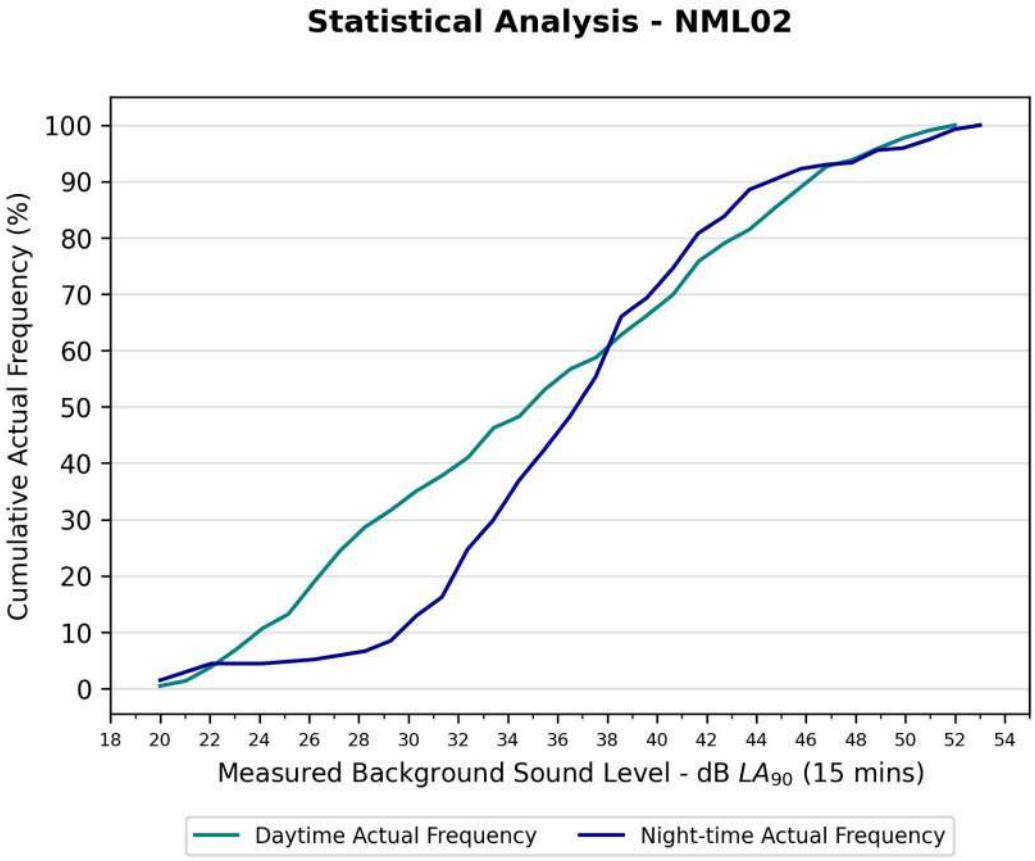


# 16369 - Rigifa BESS - Measured Sound Levels:



# 16369 - Rigifa BESS - Measured Sound Levels:

## Relevant Statistics

### NML01

| | | COUNT | MEAN | MEDIAN | RANGE |
|---|---|---|---|---|---|
| DAYTIME | LA90 (15 MINS) | 209 | 48 | 49 | 44 - 52 |
| | LAEQ (15 MINS) | 209 | 50 | 50 | 45 - 63 |
| NIGHT-TIME | LA90 (15 MINS) | 130 | 48 | 49 | 43 - 51 |
| | LAEQ (15 MINS) | 130 | 50 | 50 | 45 - 52 |

### NML02

| | | COUNT | MEAN | MEDIAN | RANGE |
|---|---|---|---|---|---|
| DAYTIME | LA90 (15 MINS) | 439 | 35 | 35 | 20 - 52 |
| | LAEQ (15 MINS) | 439 | 41 | 42 | 21 - 64 |
| NIGHT-TIME | LA90 (15 MINS) | 271 | 37 | 37 | 20 - 53 |
| | LAEQ (15 MINS) | 271 | 41 | 41 | 22 - 59 |

**Ewan Watson**

**From:** Ewan Watson
**Sent:** 09 August 2024 08:59
**To:** [redacted]
**Cc:**
**Subject:** Re: Rigifa BESS Development - Noise Impact Assessment

Good Morning [redacted]

Thank you very much for your response.

Thanks for confirming - we will proceed with the NIA as per the suggested assessment criteria set out within our letter, and will ensure that the potential cumulative effects are sufficiently considered within our assessment, as per your request.

Kind regards,

Ewan

Sent from Outlook for iOS

tnei

**Ewan Watson**
Principal Consultant
+44 1414283182
ewan.watson@tneigroup.com
www.tneigroup.com

---

**From:** [redacted]
**Sent:** Friday, August 9, 2024 8:55:28 AM
**To:** Ewan Watson <ewan.watson@tneigroup.com>
**Subject:** RE: Rigifa BESS Development - Noise Impact Assessment

Good afternoon,

Further to the NIA submitted last week I have now had a chance to read through and there is nothing that stands out of concern.

I did think the background level was quite high considering the location but as you have shown historic and current measurements do not show much variation , it can be accepted.

I am satisfied with the suggested approach and would be keen to see the outcome of the accumulative effect form the other nearby sites. This is the main concern for the area being a rise in background or a creeping background effect with any new developments. There is a need to ensure that developers are not examining any monitoring in isolation.

Any further questions please do not hesitate to get in touch.

Regards

[redacted]

**From:** [redacted]
**Sent:** Friday, August 2, 2024 10:37 AM
**To:** [redacted]
**Cc:** [redacted]
**Subject:** RE: Rigifa BESS Development - Noise Impact Assessment



Hi [redacted]

Hope you are well, and sorry for the delayed response on this.

TNEI are now in a position to progress the NIA report for the proposed Rigifa BESS development, and further to the below would like to provide you with an update in terms of the progress of the assessment (baseline survey etc.) and also our proposed assessment methodology.

The letter attached (16369-003-R1) summarises all the above. Please can you look to review the attached and provide feedback, confirming whether you are satisfied with our suggested assessment approach?

As mentioned in the letter, if you feel a Teams meeting would be usefully to discuss this further, please indicate this and we can look to get something organised.

Kind regards,

Ewan

tnei

**Ewan Watson**
Principal Consultant
+44 1414283182
ewan.watson@tneigroup.com
www.tneigroup.com

**From:** [redacted]
**Sent:** Tuesday, February 13, 2024 3:12 PM
**To:** [redacted]
**Subject:** FW: Rigifa BESS Development - Noise Impact Assessment

Good afternoon,

Further to you email below, [redacted] has forwarded to me as I am based in the Caithness area and mor appropriate for me to comment.

There are no comments regarding the methodology and I am satisfied with your proposals. It is likely that the background level observed would be below 30dB and a main concern in the area is that of creeping background.

We can discuss further as you state once data has been collated and a background level established.

Regards

[redacted]

**From:** [redacted]
**Sent:** Thursday, February 8, 2024 11:57 AM
**To:** [redacted]
**Subject:** FW: Rigifa BESS Development - Noise Impact Assessment

Hi [redacted] are you ok to deal with this?

Regards,
[redacted]
Environmental Health Officer
Highland Council, 38 Harbour Road, Inverness, IV1 1UF
Telephone: [redacted]

**From:** [redacted]
**Sent:** Thursday, February 8, 2024 11:50 AM
**To:** [redacted]
**Cc:** [redacted]
[redacted]
**Subject:** Rigifa BESS Development - Noise Impact Assessment



Good Morning [redacted]

TNEI have been commissioned to undertake a Noise Impact Assessment in support of the proposed Rigifa Battery Energy Storage System (BESS) development, near to Rigifa, Caithness.

Please find attached a letter delineating our proposed NIA methodology and chosen baseline noise survey locations. I would invite feedback regarding the attached and am happy to address any queries you may have regarding the proposed methodology.

Kind regards,

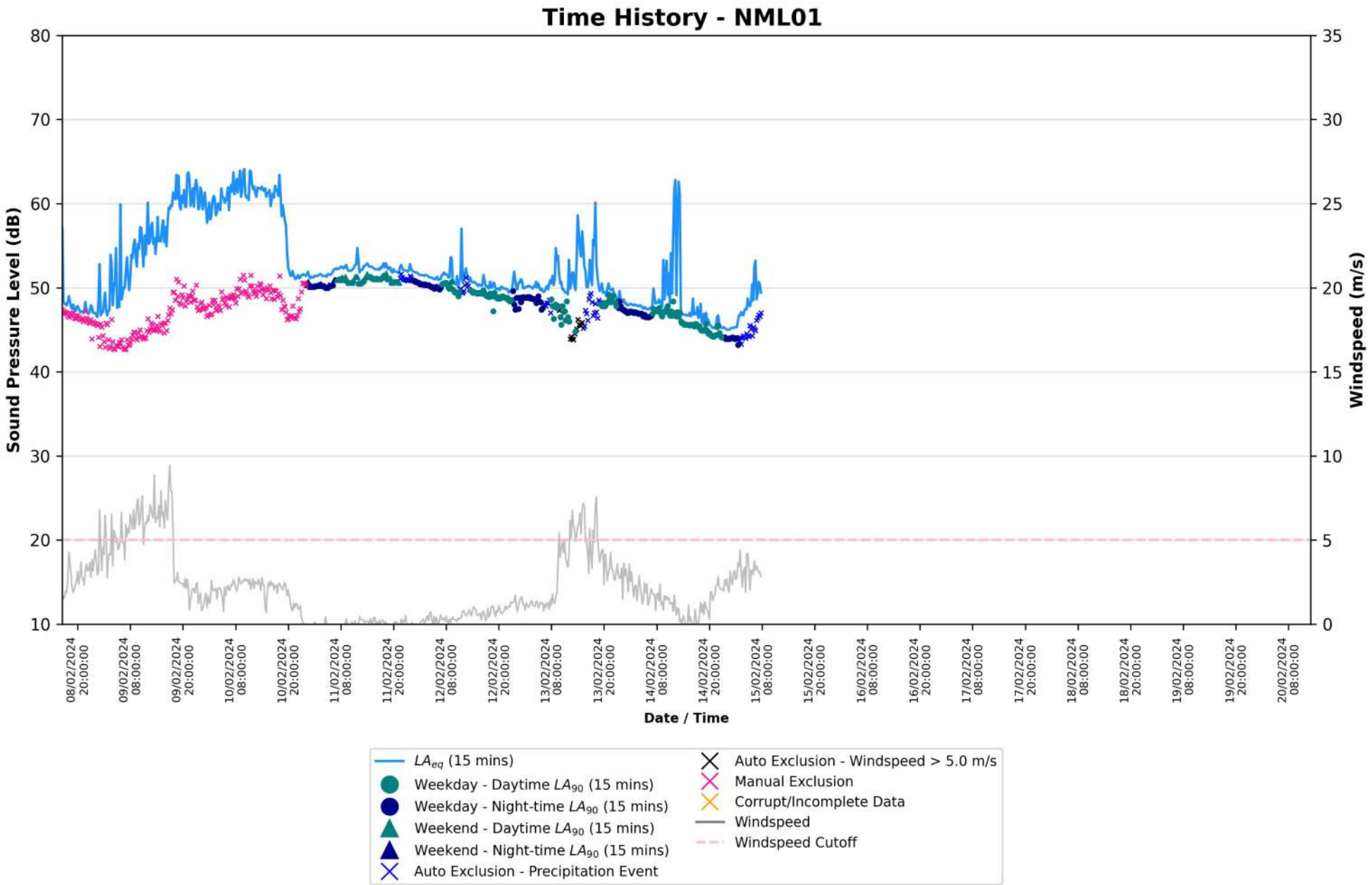
[redacted]

tnei

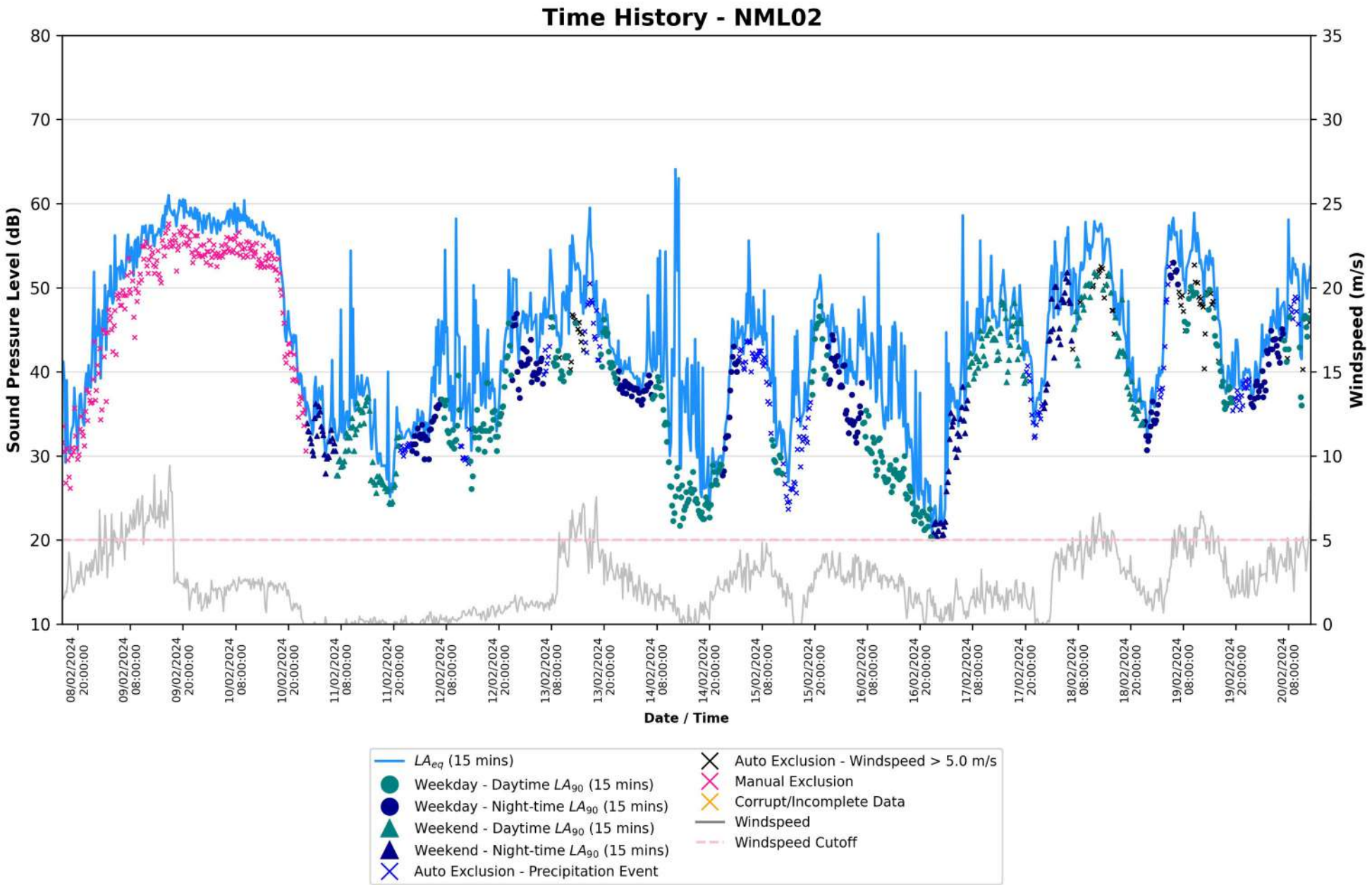
Tel: +44(0)141 4283182
Email: [redacted]
Address: TNEI, 7th Floor, 80 St Vincent Street, Glasgow, G2 5UB

# Appendix D – Baseline Survey Data

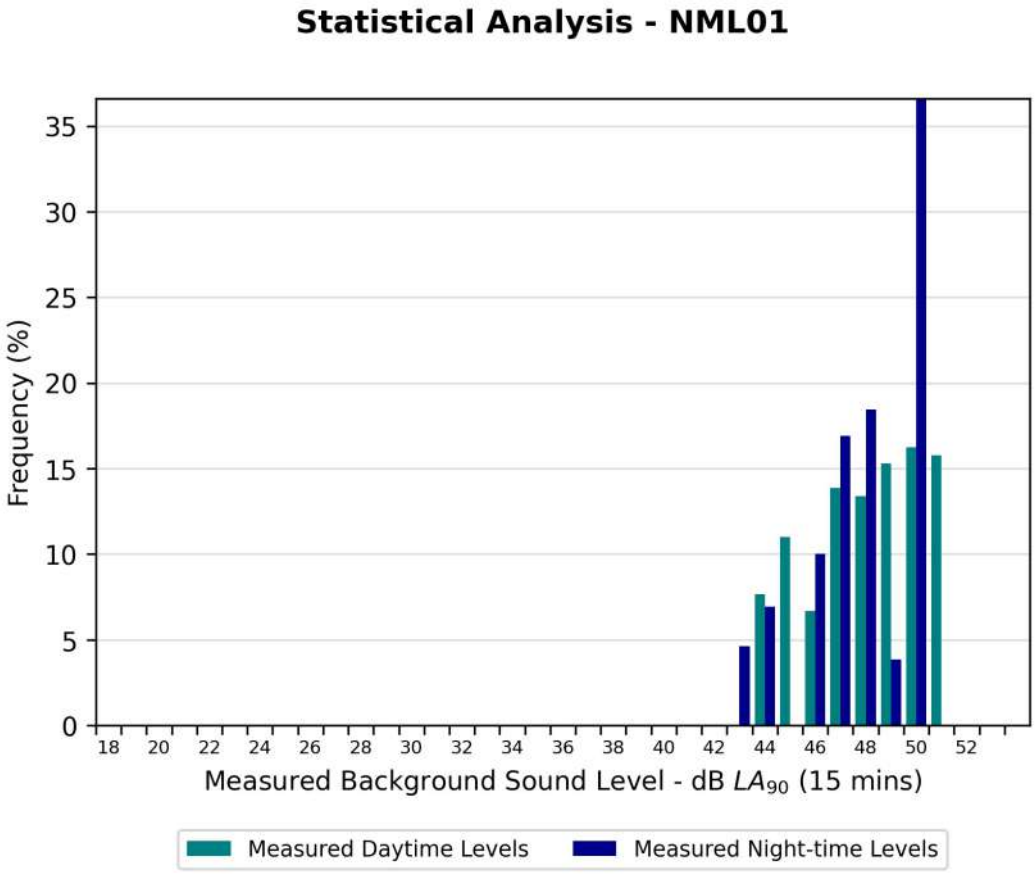
## 16369 - Rigifa BESS - Measured Sound Levels:

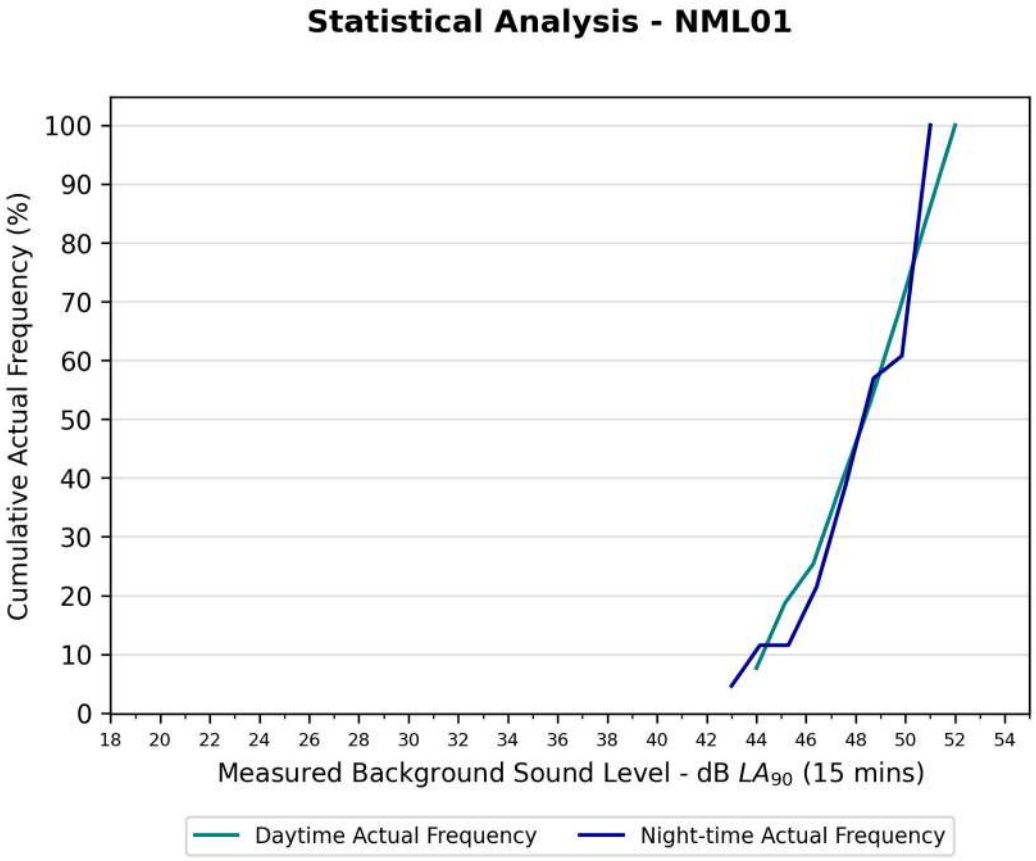


## 16369 - Rigifa BESS - Measured Sound Levels:

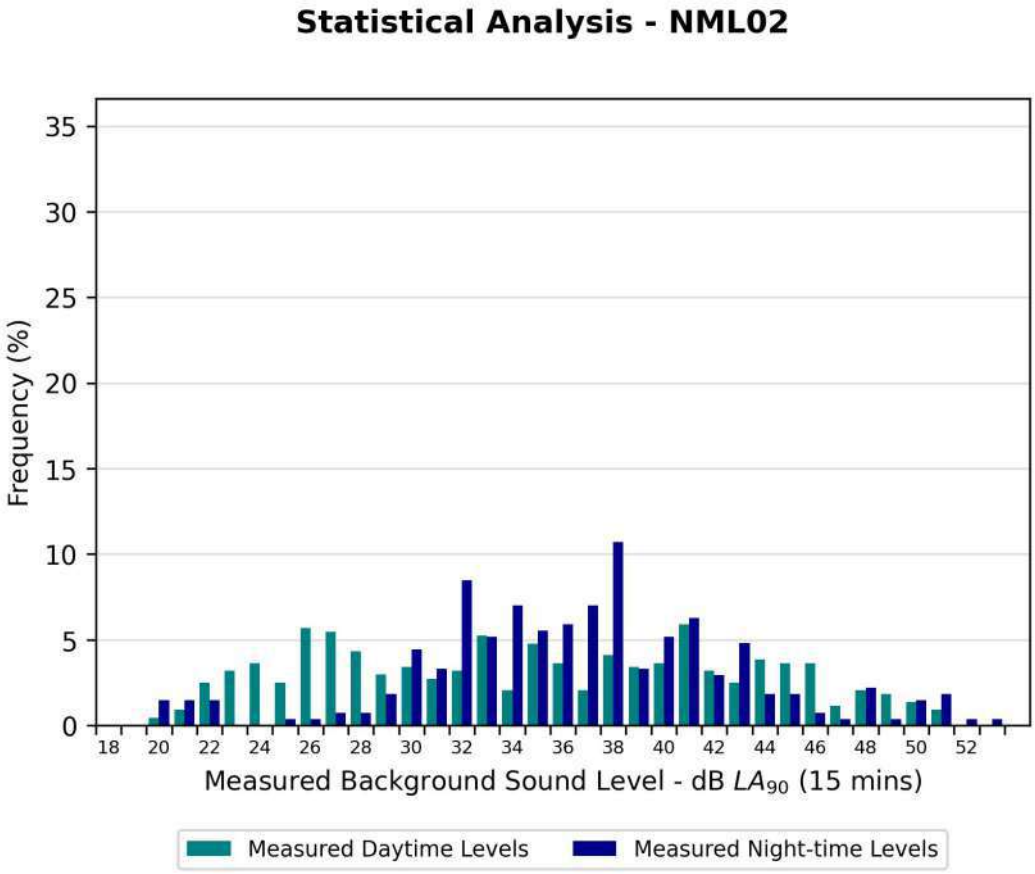


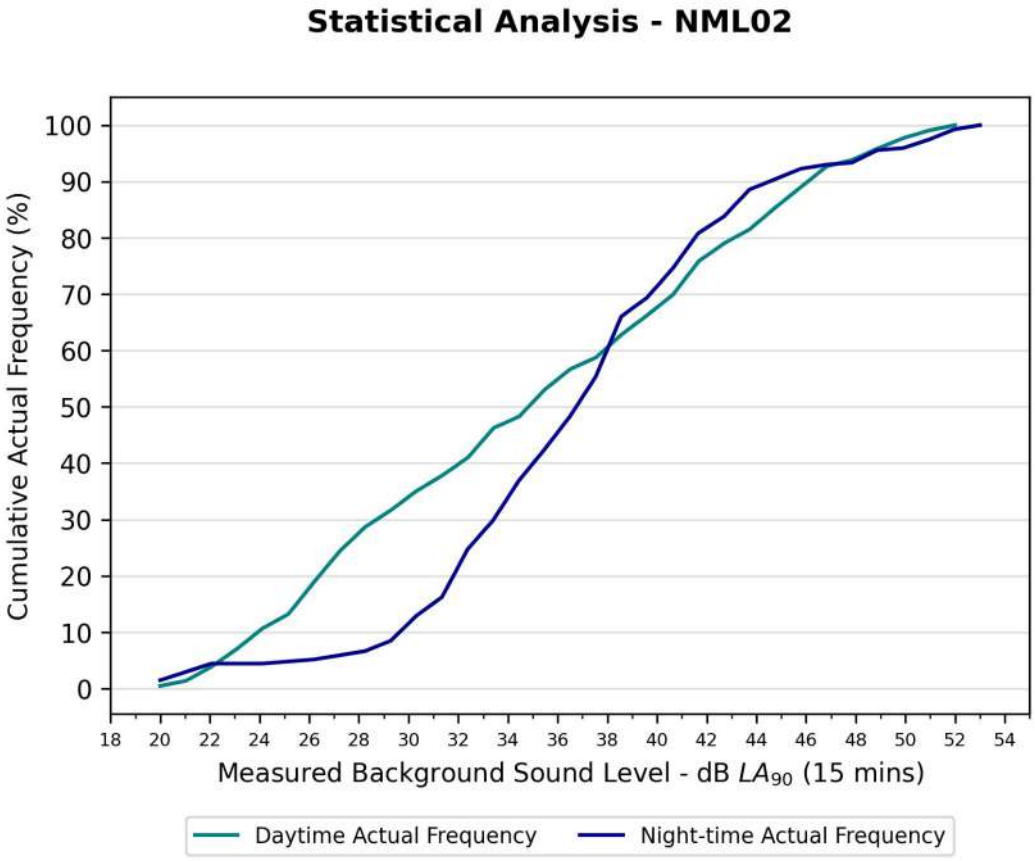
## 16369 - Rigifa BESS - Measured Sound Levels:



# 16369 - Rigifa BESS - Measured Sound Levels:



# 16369 - Rigifa BESS - Measured Sound Levels:

## Relevant Statistics

### NML01

| | | COUNT | MEAN | MEDIAN | RANGE |
|---|---|---|---|---|---|
| DAYTIME | LA90 (15 MINS) | 209 | 48 | 49 | 44 - 52 |
| | LAEQ (15 MINS) | 209 | 50 | 50 | 45 - 63 |
| NIGHT-TIME | LA90 (15 MINS) | 130 | 48 | 49 | 43 - 51 |
| | LAEQ (15 MINS) | 130 | 50 | 50 | 45 - 52 |

### NML02

| | | COUNT | MEAN | MEDIAN | RANGE |
|---|---|---|---|---|---|
| DAYTIME | LA90 (15 MINS) | 439 | 35 | 35 | 20 - 52 |
| | LAEQ (15 MINS) | 439 | 41 | 42 | 21 - 64 |
| NIGHT-TIME | LA90 (15 MINS) | 271 | 37 | 37 | 20 - 53 |
| | LAEQ (15 MINS) | 271 | 41 | 41 | 22 - 59 |

| | |
|---|---|
| Project Nb.& Name | 16369 – Rigifa BESS |
| Client | Field |

**MONITORING LOCATION DETAILS**

| | |
|---|---|
| NML Nb. and Name | NML01 |
| NML Contact Details<br>(Name, address, phone nb..) | [redacted] |
| Description/Reason for exact location and Grid Coordinates | Within landowner's field, adjacent to residential property at Phillip's Mains.<br><br>X: 329842<br>Y: 972029 |

**MONITORING EQUIPMENT DETAILS**

| | TNEI Id Nb. | Model | Serial Number | Last Cal. |
|---|---|---|---|---|
| Sound Level Meter | SLM 038 | CR171B | G078532 | 26/10/2023 |
| Pre Amplifier | | | | |
| Microphone | | | | |
| Calibrator | | | | |

**MONITORING EQUIPMENT SETTINGS AT START** **(TO BE CHECKED AT EACH SITE VISITS)**

| | Setting | Comment |
|---|---|---|
| Index<br>(Leq,L90..) | Leq, L90 | |
| Network<br>(A,B,Z) | A | |
| Time Interval<br>(10min,10s..) | 15 minutes | |
| Time Weighting<br>(Fast/Slow) | Fast | |
| Measurement Range<br>(20-110 ..) | 20-110 | |
| Audio<br>(No ,Yes 16Khz/16bit ...) | No | |
| Other (GMT/BST) | GMT | |
| Resident Comments Sheet | N/A | |
| Resident consent to use photographs | N/A | |

## SITE VISIT HISTORY (VISITS 1 TO 4)

| Visit Nb | Surveyor Initials | File Name (on SLM) | Start Date&Time (on watch) | End Date&Time (on watch) | Calibration at Start | Calibration at End | File Name | Index & Network (LAeq,LA90...) | Time Interval (10min,10s..) | Time Weighting (Fast ...) | Range (20-110 ...) | Batteries | Photographs (Kit+ SLM) | Write Notes on sound audible... | Snow/River Present? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WC | - | 08/02/2024 16:30 | 15/02/2024 14:34 | 93.6 | 93.7 | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |

| Visit Nb | NOTES / SITE OBSERVATIONS / Sounds Audible During Each Visits |
|---|---|
| 1 | **Installation**<br><br>- Some snow on ground,<br>- 2/3 oktas, cold, mild to moderate breeze.<br>- Quiet soundscape, wind induced noise is dominant stream close by audible but very windy during installation. |
| | **Decommissioning**<br><br>- Bright clear day. 1/2 Oktas, moderate to strong wind.<br>- Stream audible near NML, resident pet dogs barking, occasional bird call (geese overhead) |

| | |
|---|---|
| Project Nb.& Name | 16369 – Rigifa BESS |
| Client | Field |

**MONITORING LOCATION DETAILS**

| | |
|---|---|
| NML Nb. and Name | NML02 |
| NML Contact Details<br>(Name, address, phone nb..) | [redacted] |
| Description/Reason for exact location and Grid Coordinates | Located within landowner's field to the southwest of the Residential property at Rigifa.<br><br>X: 330348<br>Y: 972559 |

**MONITORING EQUIPMENT DETAILS**

| | TNEI Id Nb. | Model | Serial Number | Last Cal. |
|---|---|---|---|---|
| Sound Level Meter | SLM 043 | CR171B | G056468 | 27/06/2023 |
| Pre Amplifier | | | | |
| Microphone | | | | |
| Calibrator | | | | |

**MONITORING EQUIPMENT SETTINGS AT START** **(TO BE CHECKED AT EACH SITE VISITS)**

| | Setting | Comment |
|---|---|---|
| Index<br>(Leq,L90..) | Leq, L90 | |
| Network<br>(A,B,Z) | A | |
| Time Interval<br>(10min,10s..) | 15 minutes | |
| Time Weighting<br>(Fast/Slow) | Fast | |
| Measurement Range<br>(20-110 ..) | 20-110 | |
| Audio<br>(No ,Yes 16Khz/16bit ...) | No | |
| Other (GMT/BST) | GMT | |
| Resident Comments Sheet | N/A | |
| Resident consent to use photographs | N/A | |

## SITE VISIT HISTORY (VISITS 1 TO 4)

| Visit Nb | Surveyor Initials | File Name (on SLM) | Start Date&Time (on watch) | End Date&Time (on watch) | Calibration at Start | Calibration at End | File Name | Index & Network (LAeq,LA90...) | Time Interval (10min,10s..) | Time Weighting (Fast ...) | Range (20-110 ...) | Batteries | Photographs (Kit+ SLM) | Write Notes on sound audible... | Snow/River Present? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WC | - | 08/02/2024 17:45 | 15/02/2024 14:15 | 93.7 | 93.6 | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |

| Visit Nb | NOTES / SITE OBSERVATIONS / Sounds Audible During Each Visits |
|---|---|
| 1 | **Installation**<br><br>- Some snow on ground, 2/3 oktas, cold. Mild to moderate breeze.<br>- Quiet, noise induced foliage rustle is dominant.<br><br>**Decommissioning**<br><br>- Bright clear day, 1/2 oktas, Moderate to strong breeze, snow has melted.<br>- Noise induced wind noise and foliage rustle is dominating the soundscape |

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **26 October 2023** CERTIFICATE NUMBER **201431**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:
[redacted]

# Outdoor Kit Calibration Information

**Instrument information**

| | |
|---|---|
| Manufacturer: | Cirrus Research plc |
| Model: | CK:675 |
| Preamp Model | MK:172 |
| Microphone Serial Number | 2026 |
| Primary Calibration Certificate Number | 201431 |

**Summary**

Date of calibration: 25 October 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
This information is in addition to the primary calibration certificate for the sound level meter. The calibration certificate number is shown above and should be used in conjunction with this additional information.

The sound level meter detailed above has been calibrated to the published test and calibration data as detailed in the instrument handbook, using the techniques recommended in the standards to which the instrument has been designed.

All calibration procedures were carried out by substituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

The microphone capsule was calibrated using an electrostatic calibration system to produce the frequency response and a reference acoustic source for the final sensitivity testing.

In addition to the calibration of the complete sound level meter in its standard configuration, (instrument, MV:200 series preamplifier and microphone capsule), the sound level meter and microphone capsule were tested with the MK:172 preamplifier in place of the MV:200 series.

**The sound level meter, G078532 , has been tested with Outdoor Microphone/Preamplifier Type MK:172 Serial Number 2026 and conforms to the requirements of the standards stated in the instrument user manual.**

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **26 October 2023** CERTIFICATE NUMBER **201431**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:
[redacted]

# Sound Level Meter : IEC 61672-3:2013

**Instrument information**

| | | |
|---|---|---|
| Manufacturer: | Cirrus Research plc | Notes: |
| Model: | CR:171B | |
| Serial number: | G078532 | |
| Class: | 1 | |
| Firmware version: | 3.2.3254 | |

**Test summary**

Date of calibration: 25 October 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61672-3:2013.

**The sound level meter submitted for testing successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.**

However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to determine that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

**Notes**

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **26 October 2023** CERTIFICATE NUMBER **201432**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:
[redacted]

# Octave-band filter : IEC 61260:1995

**Instrument information**

| | | |
|---|---|---|
| Manufacturer: | Cirrus Research plc | Notes: |
| Model: | CR:171B | |
| Serial number: | G078532 | |
| Class: | 1 | |
| Firmware version: | 3.2.3254 | |

**Test summary**

Date of calibration: 25 October 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260 for the environmental conditions under which the test was performed.

**Notes**

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **26 October 2023** CERTIFICATE NUMBER **201430**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:
[redacted]

# Third-octave-band filter : IEC 61260:1995

**Instrument information**

| | | |
|---|---|---|
| Manufacturer: | Cirrus Research plc | Notes: |
| Model: | CR:171B | |
| Serial number: | G078532 | |
| Class: | 1 | |
| Firmware version: | 3.2.3254 | |

**Test summary**

Date of calibration: 25 October 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260 for the environmental conditions under which the test was performed.

**Notes**

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **11 October 2023** CERTIFICATE NUMBER **201433**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Test engineer:
D.Swalwell
Electronically signed:
[redacted]

## Microphone

**Microphone capsule**

Manufacturer: Cirrus Research plc

Model: MK:224

Serial Number: 211155D

**Calibration procedure**

Date of calibration: 11 October 2023

Open circuit: 43.9 mV/Pa

Sensitivity at 1 kHz: -27.2 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

**Environmental conditions**

Pressure: 99.94 kPa

Temperature: 23.4 °C

Humidity: 54.7 %

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **26 October 2023** CERTIFICATE NUMBER **201434**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:
[redacted]

# Sound Calibrator : IEC 60942:2003

**Instrument information**

**Manufacturer:** Cirrus Research plc

**Model:** CR:515

**Serial number:** 78219

**Class:** 1

**Notes:**

**Test summary**

**Date of calibration:** 25 October 2023

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

As public evidence was available, from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the Class 1 requirements of IEC 60942:2003.

The manufacturer's product information indicates that this model of sound calibrator has been formally pattern approved to IEC60942_2003 Annex A to Class 1. This has been confirmed by Laboratoire National d'Essais (LNE), PhysikalischTechnische Bundesanstalt (PTB) and APPLUS (APPLUS).

**Notes:**

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **28 June 2023** CERTIFICATE NUMBER **194370**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:
[redacted]

# Sound Level Meter : IEC 61672-3:2013

**Instrument information**

| | | |
|---|---|---|
| Manufacturer: | Cirrus Research plc | Notes: |
| Model: | CR:171B | |
| Serial number: | G056468 | |
| Class: | 1 | |
| Firmware version: | 3.2.3254 | |

**Test summary**

Date of calibration: 27 June 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61672-3:2013.

**The sound level meter submitted for testing successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.**

However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to determine that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

**Notes**

# CERTIFICATE OF CALIBRATION



**Environmental conditions**

The following conditions were recorded at the time of the test:

| | | | | | | |
|---|---|---|---|---|---|---|
| **Before** | Pressure: | 101.24 kPa | Temperature: | 20.8 °C | Humidity: | 41.4 % |
| **After** | Pressure: | 101.21 kPa | Temperature: | 20.8 °C | Humidity: | 40.9 % |

**Test equipment**

| Equipment | Manufacturer | Model | Serial number |
|---|---|---|---|
| Signal Generator | KEYSIGHT | 33511B | MY58001553 |
| Attenuator | Cirrus Research | ZE:952 | 52200 |
| Environmental Monitor | Comet | T7510 | 16966334 |

**Additional instrument information**

Instruction manual:

Reference level range: Single range

Pattern approval: No

Source of pattern approval: -

**Preamplifier**

Model: MV:200F

Serial number: 0418F

**Microphone**

Model: MK:224

Serial number: 204031A

**Test results summary**

| Test | Result |
|---|---|
| Toneburst response | Complies |
| Electrical noise-floor | Complies |
| Linearity | Complies |
| Electrical Frequency weightings | Complies |
| Frequency and time weightings at 1 kHz | Complies |
| C-weighted peak | Complies |
| Overload indication | Complies |
| High level stability | Complies |
| Long-term stability | Complies |
| Acoustic Frequency weightings | Complies |

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **28 June 2023** CERTIFICATE NUMBER **194369**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:
[redacted]

# Octave-band filter : IEC 61260:1995

**Instrument information**

| | | |
|---|---|---|
| Manufacturer: | Cirrus Research plc | Notes: |
| Model: | CR:171B | |
| Serial number: | G056468 | |
| Class: | 1 | |
| Firmware version: | 3.2.3254 | |

**Test summary**

Date of calibration: 27 June 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260 for the environmental conditions under which the test was performed.

**Notes**

# CERTIFICATE OF CALIBRATION



**Environmental conditions**

The following conditions were recorded at the time of the test:

| | | | | | | |
|---|---|---|---|---|---|---|
| **Before** | Pressure: | 101.24 kPa | Temperature: | 20.8 °C | Humidity: | 41.4 % |
| **After** | Pressure: | 101.21 kPa | Temperature: | 20.8 °C | Humidity: | 40.9 % |

**Test equipment**

| Equipment | Manufacturer | Model | Serial number |
|---|---|---|---|
| Signal Generator | KEYSIGHT | 33511B | MY58001553 |
| Attenuator | Cirrus Research | ZE:952 | 52200 |
| Environmental Monitor | Comet | T7510 | 16966334 |

**Filters information**

Filter class: 1

Filter base: 2

Reference attenuation: 0.0 dB

**Additional instrument information**

Instruction manual:

Pattern approval: No

Source of pattern approval: -

Reference level range: Single range

**Laboratory uncertainties**

| Requirement | Value (dB) |
|---|---|
| Relative Attenuation High | 0.41 |
| Relative Attenuation Mid | 0.18 |
| Relative Attenuation Low | 0.12 |

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **28 June 2023** CERTIFICATE NUMBER **194371**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:

[redacted]

# Third-octave-band filter : IEC 61260:1995

**Instrument information**

| | | |
|---|---|---|
| Manufacturer: | Cirrus Research plc | Notes: |
| Model: | CR:171B | |
| Serial number: | G056468 | |
| Class: | 1 | |
| Firmware version: | 3.2.3254 | |

**Test summary**

Date of calibration: 27 June 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61260:1995.

The filter submitted for testing successfully completed the Relative Attenuation test of IEC 61260 for the environmental conditions under which the test was performed.

**Notes**

# CERTIFICATE OF CALIBRATION



**Environmental conditions**

The following conditions were recorded at the time of the test:

| | | | | | | |
|---|---|---|---|---|---|---|
| **Before** | Pressure: | 101.24 kPa | Temperature: | 20.8 °C | Humidity: | 41.4 % |
| **After** | Pressure: | 101.21 kPa | Temperature: | 20.8 °C | Humidity: | 40.9 % |

**Test equipment**

| Equipment | Manufacturer | Model | Serial number |
|---|---|---|---|
| Signal Generator | KEYSIGHT | 33511B | MY58001553 |
| Attenuator | Cirrus Research | ZE:952 | 52200 |
| Environmental Monitor | Comet | T7510 | 16966334 |

**Filters information**

Filter class: 1

Filter base: 2

Reference attenuation: 0.0 dB

**Additional instrument information**

Instruction manual:

Pattern approval: No

Source of pattern approval: -

Reference level range: Single range

**Laboratory uncertainties**

| Requirement | Value (dB) |
|---|---|
| Relative Attenuation High | 0.41 |
| Relative Attenuation Mid | 0.18 |
| Relative Attenuation Low | 0.12 |

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **28 June 2023** CERTIFICATE NUMBER **194370**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:
[redacted]

# Outdoor Kit Calibration Information

**Instrument information**

| | |
|---|---|
| Manufacturer: | Cirrus Research plc |
| Model: | CK:675 |
| Preamp Model | MK:172 |
| Microphone Serial Number | 2348 |
| Primary Calibration Certificate Number | 194370 |

**Summary**

Date of calibration: 27 June 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
This information is in addition to the primary calibration certificate for the sound level meter. The calibration certificate number is shown above and should be used in conjunction with this additional information.

The sound level meter detailed above has been calibrated to the published test and calibration data as detailed in the instrument handbook, using the techniques recommended in the standards to which the instrument has been designed.

All calibration procedures were carried out by substituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

The microphone capsule was calibrated using an electrostatic calibration system to produce the frequency response and a reference acoustic source for the final sensitivity testing.

In addition to the calibration of the complete sound level meter in its standard configuration, (instrument, MV:200 series preamplifier and microphone capsule), the sound level meter and microphone capsule were tested with the MK:172 preamplifier in place of the MV:200 series.

**The sound level meter, G056468 , has been tested with Outdoor Microphone/Preamplifier Type MK:172 Serial Number 2348 and conforms to the requirements of the standards stated in the instrument user manual.**

# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **22 June 2023** CERTIFICATE NUMBER **194372**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Test engineer:
D.Swalwell
Electronically signed:
[redacted]

## Microphone

**Microphone capsule**

Manufacturer: Cirrus Research plc

Model: MK:224

Serial Number: 204031A

**Calibration procedure**

Date of calibration: 22 June 2023

Open circuit: 43.9 mV/Pa

Sensitivity at 1 kHz: -27.2 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

**Environmental conditions**

Pressure: 101.20 kPa

Temperature: 21.0 °C

Humidity: 55.0 %

# CERTIFICATE OF CALIBRATION

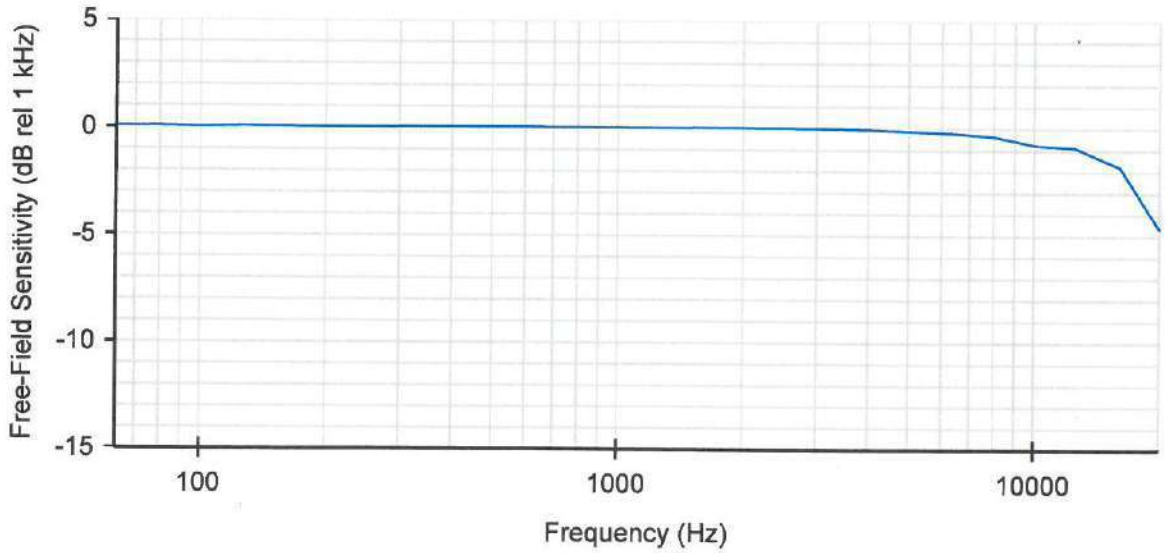
Certificate Number: **194372**



**Free-Field Frequency Response : Tabular**

| Frequency (Hz) | Free-Field Sensitivity (dB rel 1 kHz) | Actuator Response (dB) |
|---|---|---|
| **63** | **0.02** | **-0.17** |
| 80 | 0.03 | -0.06 |
| 100 | -0.01 | 0.00 |
| **125** | **0.03** | **0.04** |
| 160 | 0.02 | 0.05 |
| 200 | 0.00 | 0.04 |
| **250** | **0.01** | **0.06** |
| 315 | 0.02 | 0.05 |
| 400 | 0.01 | 0.05 |
| **500** | **0.02** | **0.05** |
| 630 | 0.02 | 0.04 |
| 800 | 0.00 | 0.02 |
| **1 000** | **0.00** | **0.00** |
| 1 250 | -0.01 | -0.05 |
| 1 600 | 0.00 | -0.12 |
| **2 000** | **0.00** | **-0.21** |
| 2 500 | -0.01 | -0.35 |
| 3 150 | -0.03 | -0.59 |
| **4 000** | **-0.07** | **-0.99** |
| 5 000 | -0.14 | -1.52 |
| 6 300 | -0.21 | -2.33 |
| **8 000** | **-0.38** | **-3.58** |
| 10 000 | -0.77 | -5.46 |
| 12 500 | -0.90 | -7.35 |
| **16 000** | **-1.81** | **-9.64** |
| 20 000 | -4.71 | -13.75 |

**Free-Field Frequency Response : Graphical**



# CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research**

DATE OF ISSUE **28 June 2023** CERTIFICATE NUMBER **194373**

**Cirrus Research**
**Acoustic House**
**Bridlington Road**
**Hunmanby**
**North Yorkshire**
**YO14 0PH**
**United Kingdom**



Approved signatory
R.Thomas
Electronically signed:

[redacted]

# Sound Calibrator : IEC 60942:2003

**Instrument information**

**Manufacturer:** Cirrus Research plc

**Model:** CR:511E

**Serial number:** 038873

**Class:** 1

**Notes:**

**Test summary**

**Date of calibration:** 27 June 2023

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC60942_2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The sound calibrator has been shown to conform to the Class 1 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of sound calibrator conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the sound calibrator to the requirements of IEC 60942:2003.

**Notes:**

# CERTIFICATE OF CALIBRATION



**Environmental conditions**

The following conditions were recorded at the time of the test:

Pressure: 100.94 kPa
Temperature: 22.8 °C
Humidity: 49.1 %

**Test equipment**

| Equipment | Manufacturer | Model | Serial number |
|---|---|---|---|
| Distortion Meter | Keithley | 2015 | 0994818 |
| Acoustic Calibrator | Bruel and Kjaer | 4231 | 2610257 |
| Environmental Monitor | Comet | T7510 | 21962628 |

**Results**

| | Expected | Sample 1 | Sample 2 | Sample 3 | Average | Deviation | Tolerance | Uncertainty |
|---|---|---|---|---|---|---|---|---|
| Level (dB) | 94.00 | 94.06 | 94.05 | 94.08 | **94.06** | 0.06 | ±0.40 | 0.11 dB |
| Distortion (%) | < 3.00 | 0.36 | 0.36 | 0.34 | **0.35** | 0.35 | +3.00 | 0.13 % |
| Frequency (Hz) | 1000.0 | 993.9 | 993.9 | 993.9 | **993.9** | -6.1 | ±10.0 | 0.1 Hz |
| Level (dB) | 104.00 | 104.01 | 104.01 | 104.00 | **104.01** | 0.01 | ±0.40 | 0.11 dB |
| Distortion (%) | < 3.00 | 0.31 | 0.31 | 0.30 | **0.31** | 0.31 | +3.00 | 0.13 % |
| Frequency (Hz) | 1000.0 | 993.9 | 993.9 | 993.9 | **993.9** | -6.1 | ±10.0 | 0.1 Hz |

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

**End of results**

# Appendix E – Noise Modelling Data

# TEST REPORT



## Sound Level

Serial No. : 1ZPL001134582

### Combination of sound level measurements

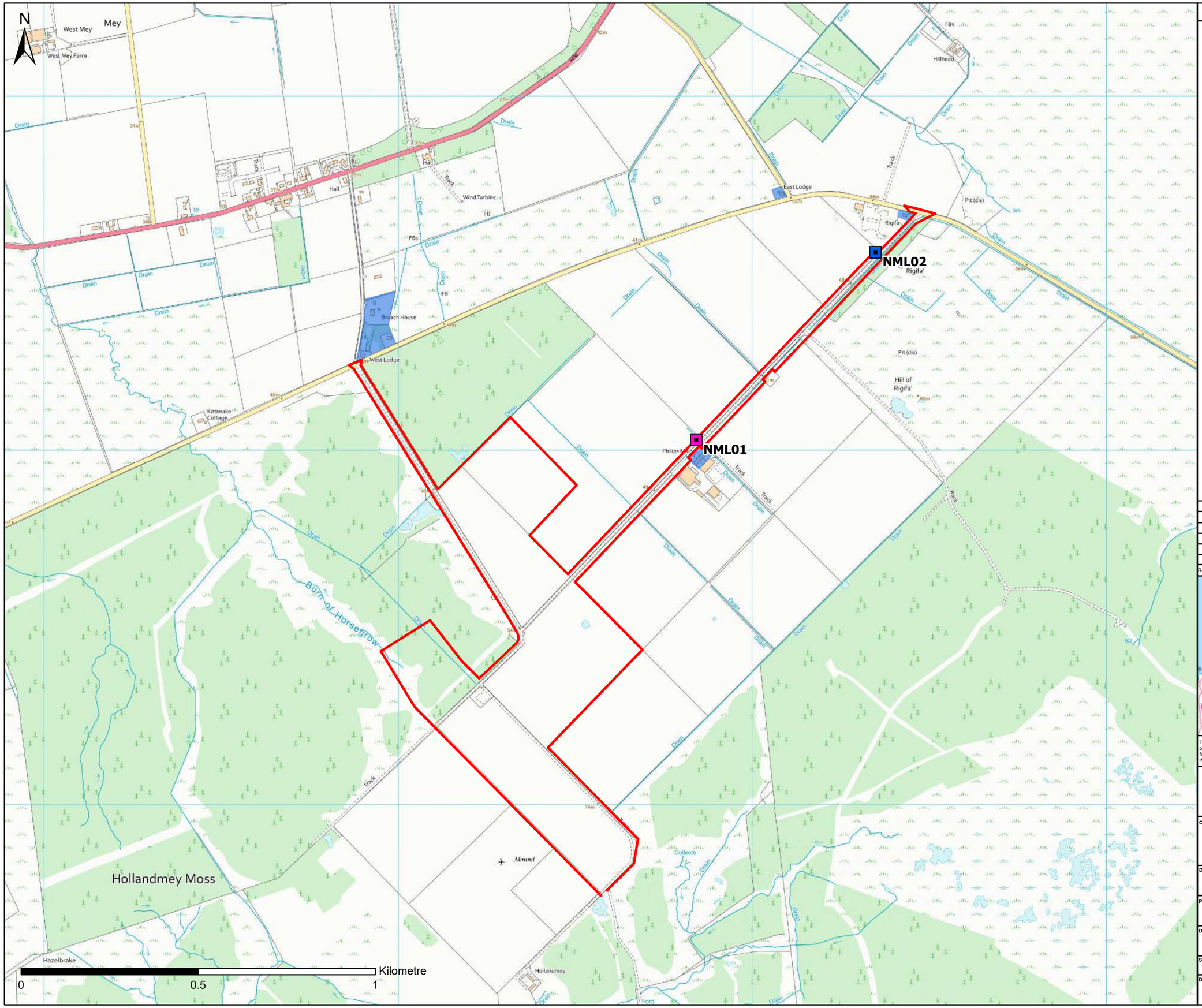
| Rated voltage | Applied voltage | Rated current | Applied current | Tap position | Fans in operation | Pumps in operation |
|---|---|---|---|---|---|---|
| [%] | [kV] | [%] | [A] | | | |
| 100 | 33 | 100 | 262.43 | | 8 | |

| Rated voltage | Applied voltage | Rated current | Applied current | Tap position | Fans in operation | Pumps in operation |
|---|---|---|---|---|---|---|
| [%] | [kV] | [%] | [A] | | | |
| | | | | | | |

| | Frequency | Measurement 1 Sound Power Level | Measurement 4 Sound Power Level | | Combined Sound Power Level |
|---|---|---|---|---|---|
| | [Hz] | [dB(A)] | [dB(A)] | | [dB(A)] |
| **Total Sound Level** | | 76.9 | 87.8 | | **88.2** |
| **Octave Band** | 63 | 39.6 | 64.4 | | **64.4** |
| | 125 | 59.5 | 79.6 | | **79.6** |
| | 250 | 76.1 | 81.2 | | **82.3** |
| | 500 | 67.3 | 82.6 | | **82.7** |
| | 1000 | 56.3 | 81.7 | | **81.7** |
| | 2000 | 51.6 | 75.4 | | **75.4** |
| | 4000 | 54.1 | 71.3 | | **71.4** |
| | 8000 | 57.4 | 64.2 | | **65.0** |
| **⅓ Octave Band** | 50 | 36.1 | 63.8 | | **63.8** |
| | 63 | 37.0 | 47.4 | | **47.8** |
| | 80 | 0.0 | 55.1 | | **55.1** |
| | 100 | 58.4 | 71.9 | | **72.1** |
| | 125 | 47.5 | 68.5 | | **68.6** |
| | 160 | 51.3 | 78.4 | | **78.4** |
| | 200 | 63.1 | 73.7 | | **74.1** |
| | 250 | 60.9 | 76.4 | | **76.5** |
| | 315 | 75.8 | 78.0 | | **80.1** |
| | 400 | 61.2 | 77.0 | | **77.1** |
| | 500 | 63.7 | 76.9 | | **77.1** |
| | 630 | 62.5 | 79.2 | | **79.3** |
| | 800 | 53.7 | 78.6 | | **78.6** |
| | 1000 | 51.4 | 76.7 | | **76.7** |
| | 1250 | 47.1 | 74.5 | | **74.5** |
| | 1600 | 47.0 | 72.4 | | **72.4** |
| | 2000 | 46.7 | 70.2 | | **70.2** |
| | 2500 | 46.9 | 68.5 | | **68.5** |
| | 3150 | 48.4 | 67.5 | | **67.6** |
| | 4000 | 49.6 | 66.9 | | **67.0** |
| | 5000 | 49.9 | 64.8 | | **64.9** |
| | 6300 | 51.2 | 61.5 | | **61.9** |
| | 8000 | 52.9 | 58.8 | | **59.8** |
| | 10000 | 53.6 | 56.4 | | **58.2** |

| | Frequency | | | | Combined Sound Power Level |
|---|---|---|---|---|---|
| | [Hz] | | | | [dB(A)] |
| **Total Sound Level** | | | | | |
| **Octave Band** | 63 | | | | |
| | 125 | | | | |
| | 250 | | | | |
| | 500 | | | | |
| | 1000 | | | | |
| | 2000 | | | | |
| | 4000 | | | | |
| | 8000 | | | | |
| **⅓ Octave Band** | 50 | | | | |
| | 63 | | | | |
| | 80 | | | | |
| | 100 | | | | |
| | 125 | | | | |
| | 160 | | | | |
| | 200 | | | | |
| | 250 | | | | |
| | 315 | | | | |
| | 400 | | | | |
| | 500 | | | | |
| | 630 | | | | |
| | 800 | | | | |
| | 1000 | | | | |
| | 1250 | | | | |
| | 1600 | | | | |
| | 2000 | | | | |
| | 2500 | | | | |
| | 3150 | | | | |
| | 4000 | | | | |
| | 5000 | | | | |
| | 6300 | | | | |
| | 8000 | | | | |
| | 10000 | | | | |

# Appendix F – Figures




## LEGEND

- Red Line Boundary
- Noise Sensitive Receptors (NSRs)

Noise Monitoring Locations (NMLs)

- NML01
- NML02

Note: The measured noise levels at NML02 have been used to represent all NSRs and NML01 measured levels were not used. The main reason is that NML01 levels found to be high and unrepresentative because of water course noise.

| Rev. | Date | Amendment Details | Drawn | Approved |
|---|---|---|---|---|
| 1 | 25/09/2024 | SECOND ISSUE | ST | EW |
| 0 | 28/08/2024 | FIRST ISSUE | FU | MC |






tnei

**Client**

FIELD

**Drawing Status:**

FOR INFORMATION

**Project Title:**

RIGIFA BESS

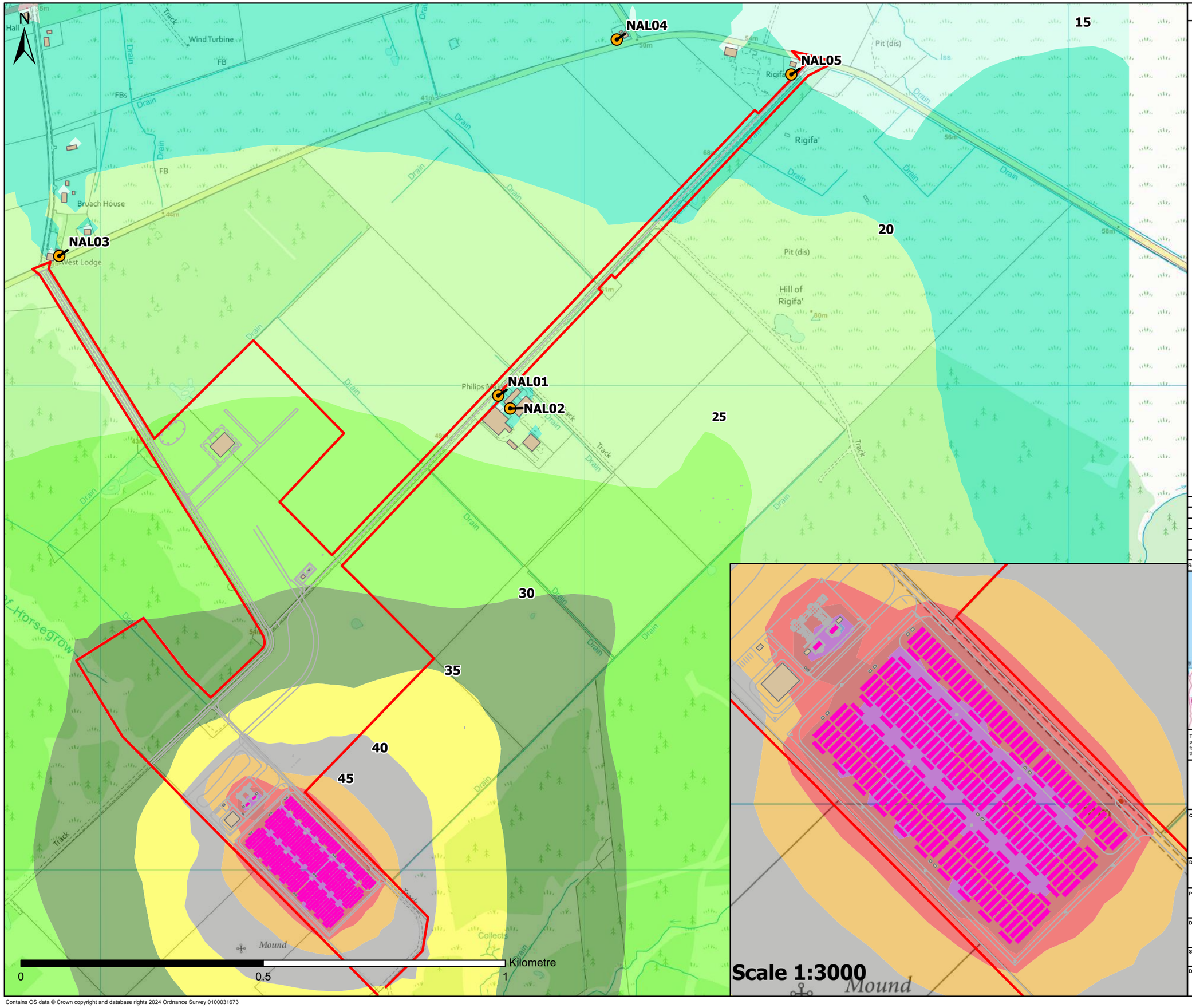
**Drawing Title:**

FIGURE 01 - NOISE STUDY AREA

| Scale: | Original Size: | Spatial Reference: |
|---|---|---|
| 1:10,000 | A3 | British National Grid |

**Drawing Number:**

16369-005







## LEGEND

- Red Line Boundary
- Noise Assessment Locations
- Modelled Noise Sources
- Modelled Buildings
- Site Layout

**Predicted Noise Levels (dBA)**

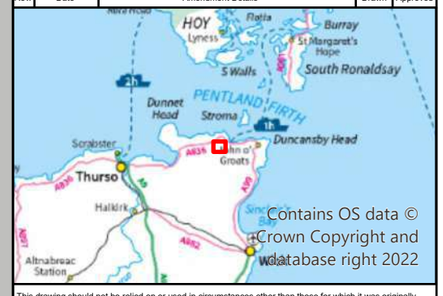
| | |
|---|---|
| 10 -15 | 40 - 45 |
| 15 - 20 | 45 - 50 |
| 20 - 25 | 50 - 55 |
| 25 - 30 | 55 - 60 |
| 30 - 35 | 60 - 65 |
| 35 - 40 | 65 - 70 |

Noise contours modelled in accordance with ISO 9613 Part 2 at a height of 4 m and displayed on a 10 m by 10 m grid.

All noise sources assumed to be operating concurrently.

All levels shown as dB LAeq(t).

| Rev. | Date | Amendment Details | Drawn | Approved |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| 1 | 25/09/2024 | SECOND ISSUE | ST | EW |
| 0 | 28/08/2024 | FIRST ISSUE | FU | MC |








tnei

**Client**

FIELD

**Drawing Status:**

FOR PLANNING

**Project Title:**

RIGIFA BESS

**Drawing Title:**

FIGURE 02 - NOISE CONTOUR PLOT

| Scale: | Original Size: | Spatial Reference: |
|---|---|---|
| 1:7,250 | A3 | British National Grid |

**Drawing Number:**

16369-006

# Appendix G – One-Third Octave Band Predicted Levels (dBZ)

| Noise Assessment Location (NAL) | External Predicted Noise Levels, dB(Z) | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | 10000 |
| NAL01 – Phillips Mains A | 36 | 34 | 33 | 32 | 28 | 26 | 26 | 21 | 21 | 18 | 17 | 17 | 14 | 13 | 12 | 12 | - | - | - | - | - | - | - | - | - | - | - |
| NAL02 – Phillips Mains B | 36 | 34 | 32 | 31 | 28 | 25 | 25 | 20 | 20 | 17 | 16 | 15 | 12 | 11 | 10 | 11 | 7 | 2 | - | - | - | - | - | - | - | - | - |
| NAL03 – West Lodge | 36 | 34 | 32 | 31 | 28 | 26 | 26 | 21 | 21 | 19 | 18 | 17 | 15 | 14 | 13 | 15 | 12 | 7 | - | - | - | - | - | - | - | - | - |
| NAL04 – East Lodge | 33 | 31 | 29 | 28 | 26 | 24 | 23 | 18 | 18 | 16 | 15 | 14 | 11 | 11 | 10 | 11 | 8 | - | - | - | - | - | - | - | - | - | - |
| NAL05 – Rigifa | 32 | 30 | 28 | 27 | 24 | 22 | 21 | 17 | 16 | 14 | 13 | 11 | 9 | 8 | 7 | 9 | 5 | - | - | - | - | - | - | - | - | - | - |

**Where a dash (-) is presented, predicted values were negligibly low (0 dB or below), and as such were not included within the table.**

# Appendix H – Cumulative Assessment Table

**Table H-1: Cumulative BS 4142 Assessment**

| Noise Assessment Location (NAL) | | | | A - Proposed Development Rating Level, dBA by TNEI | B - Mey BESS Rating Level, dBA by third party other than TNEI | C - Gills Bay Substation Rating Level, dBA by third party other than TNEI | D - Hollandmey Renewable Energy Development Rating Level, dBA by third party other than TNEI | Cumulative Rating Level excluding Proposed Development (B+C+D) | Cumulative Rating Level including Proposed Development (A+B+C+D) | Representative Background Sound Level, dBA |
|---|---|---|---|---|---|---|---|---|---|---|
| Proposed Development | Equivalent Mey BESS | Equivalent Gills Bay Substation | Equivalent Hollandmey Renewable Energy Development | | | | | | | |
| NAL01 - Phillips Mains A | NSR1 | Phillips Mains | Not Named | 20 | 39 | 20 | 30† | 40 | 40 | 35 |
| NAL02 - Phillips Mains B | NSR1 | Phillips Mains | Not Named | 18 | 39 | 20 | 30† | 40 | 40 | 35 |
| NAL03 - West Lodge | NSR2 | West Lodge | Not Named | 21 | 33 | 25 | 30† | 35 | 35 | 35 |
| NAL04 - East Lodge | NSR4 | *N/A | Not Named | 18 | 35 | - | 30† | 36 | 36 | 35 |
| NAL05 - Rigifa | *N/A | *N/A | Not Named | 15 | - | - | 30† | 30 | 30 | 35 |

* Noise Rating Levels were not predicted (or presented) at these locations within respective NIAs

† The NIA report for the Hollandmey Renewable Energy development does not present BS 4142 Rating Levels, rather it states that the site will be designed to meet 30 dBA at all nearby receptors. As such, this value has been assumed to inform the cumulative assessment.

# 9 References

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5. **Datakustik GmbH.** CadnaA. 2024.

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