tnei

A specialist energy consultancy

Environmental Noise Impact Assessment

New Deer 2 Battery Energy Storage (BESS) Development

Field New Deer Ltd

17127-014-R1

01 April 2025

COMMERCIAL IN CONFIDENCE

FIELD

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1 Introduction

TNEI were commissioned by Field New Deer Ltd (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 New Deer 2 Battery Energy Storage System (BESS) development (henceforth referred to as 'the Proposed Development').

The Proposed Development is to be located on land at Wagglehill North and South, Cuminestown, Turriff, AB53 8JJ, at approximate Ordnance Survey coordinates 380892, 848150. The Proposed Development would be located on land currently in forestry use (the Site), , and would connect to the proposed Greens (New Deer 2) National Grid Substation.

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

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 required, to provide sufficient levels of protection for all noise sensitive receptors.

For clarity, this NIA considers the operational phase of the Proposed Development only and does not include an assessment of construction noise. Construction noise for this type of development is temporary in nature and usually dealt with at the post-consent phase, with details of best practice mitigation measures and construction hours provided within a Construction Environmental Management Plan (CEMP) or similar.

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/AES, BSc (Hons): Baseline Sound Level Survey and Noise Propagation Modelling;
- 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: 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 proposed adjacent Greens (New Deer 2) National Grid Substation. It includes a single battery compound comprising battery storage units, medium-voltage (MV) skids (each skid comprising a MV transformer and two Power Conversion System (PCS) units) and high-voltage (HV) 400 kV grid transformers. Also included is associated ancillary equipment such as air-insulated switchgear, a substation building comprising welfare facilities, a switch room and control room. It also includes an underground 400 kV grid connection cable route to substation and site-wide supporting infrastructure including cabling, access tracks, fencing, attenuation basins, and landscaping 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 Units (768 of);
- MV Skid Units (192 of); and
- 400 kV Grid Transformer Units (4 of).

The layout assessed is included within Appendix B of this NIA report.

The sound level output of the ancillary infrastructure (e.g. substation, switchgear, control room 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, south, and west of the Proposed Development. The curtilage of the closest residential receptor is approximately 300 m to the south of the nearest noise emitting plant. Other residences are located approximately between 330 m and 650 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 EHO Consultation

To agree a set of operational noise assessment criteria as well as noise monitoring locations, TNEI undertook consultation with an Environmental Health Officer (EHO) from Aberdeenshire Council (AC). All formal EHO consultation correspondence has been included within Appendix C of this report.

TNEI issued a letter to AC dated 18th February 2024 (document reference 17127-006-R0, included within Appendix C) to provide detail of the assessment and proposed noise monitoring locations for the baseline sound level survey. AC responded via email and acknowledged the proposed methodology and provided the following additional detail with regards to required assessment methodology:

"…We would ask that the assessment is undertaken in accordance with BS 4142:2014+A1:2019 for external noise with the aim of achieving a low impact depending on context when compared to background LA90 and NR 25 and NR20 Curve assessment for internal noise during the daytime and night-time, respectively. We would also ask that a cumulative noise impact is considered, demonstrating that it will not cause significant adverse impact on nearby residential amenity."

3.3 BS 4142:2014 +A1:2019

The BS 4142:2014 '*Methods for Rating and Assessing Industrial and Commercial Sound*' [3] form of assessment is based on a comparison of the predicted or measured levels of a sound source to the measured background sound levels, without the specific sound source present. It 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*".

BS4142 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, $L_{Aeq(t)}$.

BS 4142, Section 11, requires that the assessment considers the context in which the sound occurs, and as such there is no definitive pass/fail element to the standard. Rather, the assessment outcome is an indication as to the likelihood for adverse impact.

The assessment is a two-stage process. Initially, an estimate of the impact is made by subtracting the measured background sound level from the calculated or measured 'Rating Level'. The second part of the assessment is to then consider the context in which the sound occurs, which may modify the findings of the initial estimate.

The standard states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following…

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

For the second stage of the assessment there are many elements of context that can be considered. The following list, which is not exhaustive, gives some examples that could be relevant to the assessment:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound;
- Whether specific sound insulation and noise control measures have already been incorporated into a receptor (which would lower the sensitivity of the receptor);
- Former uses, at or close to the site;
- The legitimacy of the industrial use, e.g. planning permissions or environmental permits;
- Implementation of best practicable means for a given process or activity; and,
- Whether the Rating Level represents typical levels, realistic worst case, unlikely worst case etc.

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 and is "*designed to assist readers with a reasonable interpretation and application of BS 4142 as a whole"*, including clarifying the methodology for the derivation of representative background sound levels. 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.

3.4 Noise Rating (NR) Curves, NR 20 and NR 25

As described within BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' [5], Noise Rating (NR) curves were originally proposed for use in assessing environmental noise, but are now used in the UK mainly for describing noise from mechanical ventilation systems in buildings. NR curves can also be used for other types of noise criteria, including for the avoidance of annoyance, preservation of hearing and prevention of speech interference. The curves range from NR 0 through to NR 130, with the lower NR curves indicating the requirement for quieter noise environments.

NR curves allow for the frequency content of noise levels to be assessed, rather than relying on a single figure broadband value. This can be useful as, subjectively, less annoyance is caused by a low frequency noise than a high frequency noise of the same SPL. Accordingly, the shape of a NR curve is dictated by the highest levels at low frequencies and decreases gradually with increasing frequency.

AC has requested that the NIA includes a *'NR 25 and NR20 Curve assessment for internal noise during the daytime and night-time, respectively'.* It should be noted that, as the NR curves are being used to assess noise levels **internally**, the spectral content of the sound measured within a building is not something that can be fully controlled by the developer/operator as any spectral characteristics occurring internally will likely be influenced by receptor-specific glazing configurations, internal room shape and size, wall and floor finishes etc, all of which are outside the control of the developer/operator.

Realistically, the developer/operator can only control the noise up to the point of the external façade and cannot control how or if it passes through that façade, or how the sound interacts with the rooms on the inside of the property. Accordingly, it is necessary to derive an equivalent external value that can be more easily calculated and, if required, assessed against during any future noise monitoring or assessment.

Considering the above, it is appropriate to undertake an assessment against the night-time (2300 – 0700) limit of NR 20 only, as it is the more stringent of the two limits. This is on the basis that if levels are acceptable when assessed against this criterion, they will also be acceptable when assessed against the less-stringent daytime (0700 – 2300) NR 25 limits as the assessment assumes predicted operational noise levels are the same during both daytime and night-time periods.

3.5 Assessment Criteria

Considering the above, the following assessments are made at the nearest identified NSRs:

- An assessment in accordance with BS 4142, taking into consideration the context;
- An assessment against the fixed internal NR 20 noise level limit; and,
- A cumulative assessment quantifying the impact of any nearby relevant developments and demonstrating that any cumulative effects will not be significantly adverse.

3.6 Calculation Method

3.6.1 Noise Propagation Model (ISO 9613-2)

In order to predict the noise immission levels attributable to the development, a noise propagation model was created using the propriety noise modelling software, CadnaA [6]. 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 9613-2: 2024 '*Acoustics – Attenuation of sound during propagation outdoors* [7] 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 globally, with specific areas of 0 (hard ground) added to account for the BESS hardstanding area; and,
- Receiver heights have been set to 4 m.

3.6.2 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; and,
- The model assumes all sound sources are operating continuously and simultaneously, at expected operating capacity.

4 Baseline Sound Level Monitoring

To inform the BS 4142 assessment, an unattended baseline sound level survey was undertaken at three Noise Monitoring Locations (NMLs) over a total period of 15 days, between the 25th of February and 13th of March 2025. Due to an equipment fault at NML01, data was not recorded between the 25th of February to the 4th of March. The equipment fault can be seen on the time-history graph for NML01, which is included within Appendix D, as a blank period of no recorded data. The fault was rectified, and the equipment was redeployed at NML01 for an additional 8 days on the 4th and measured correctly until the 13th of March. The equipment deployed at NMLs 02 and 03 operated as expected and therefore measured data from the beginning of the survey on the 25th of February until the 4th of March. The noise monitoring equipment logged in 15-minute averaging intervals and measured continually for the entirety of the respective survey periods.

Table 4-1 details the unattended NMLs which are also 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	Within landowner's field (west of Proposed Development), approximately 150 m east of Boghead	380510	848073	Location representative of the NSR located to the west of the Proposed Development (Boghead)
NML02	Within landowner's field (south of Proposed Development), approximately 150 m west of Berryhill	380566	847722	Location representative of the NSR located to the south of the Proposed Development (Berryhill)
NML03	Within landowner's field (north of Proposed Development), approximately 375 m south of Rashypants	381103	848536	Location representative of the NSR located to the north of the Proposed Development (Rashypants)

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 four Rion NL-52 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'* [8]. 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, farm animals and faint road traffic noise. Ground investigation works were audible whilst onsite during redeployment, but these did not last for the duration of the survey and were not continuous when observed.
- At NML02, the soundscape consisted primarily of wind-induced vegetation and foliage rustle. Faint traffic noise and agricultural/forestry machinery noise also noted during installation. Ground investigation works not audible at this location.
- At NML03, the soundscape consisted predominantly of wind induced foliage rustle and birdsong. Other sounds of note were planes overhead, dogs barking and unidentified machinery noise heard faintly to the north. The ground investigations work was audible at this location upon collection, but again, these did not last for duration of the survey and were not continuous when observed.

Meteorological data was collected onsite with a tipping bucket rain gauge, which was 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 using publicly available online wind speed data measured at a nearby weather station in Turriff. This was used to remove any measured noise data when levels could be atypically increased due to wind induced noise. Table 4.2 below presents an overview of the measured baseline levels:

Table 4.2: Overview of the Measured Baseline Sound Levels

NML	Mean Residual Sound $L_{Aeq\ (15\text{-}mins)}$		Median Residual Sound $L_{Aeq\ (15\text{-}mins)}$		Range of Residual Sound $L_{Aeq\ (15\text{-}mins)}$		Range of Background Sound Levels $L_{A90\ (15\text{-}mins)}$	
	Day	Night	Day	Night	Day	Night	Day	Night
NML01	38	32	38	32	19-75	19-53	17-48	17-48
NML02	35	28	36	26	21-54	21-43	19-48	20-39
NML03	36	26	36	23	20-68	17-50	17-45	16-40

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 4-3 details the representative background sound levels $L_{A90\ (15mins)}$ at each of the NMLs for the daytime and night-time periods.

Table 4-3: Representative Background Sound Level, dB L_{A90}, Derived Through Statistical Analysis

NML Id	Daytime $L_{A90\ (15\text{-}mins)}$	Night-time $L_{A90\ (15\text{-}mins)}$
NML01	32	27
NML02	30	24
NML03	28	22

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 final 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 THC (or any other relevant stakeholders), if required.

The source noise data for the candidate BESS plant assumed within the noise model has been provided directly from the manufacturer.

5.1.1 Battery Storage Units

The Battery Storage Units have been represented within the noise propagation model using the specifications and noise source data for a candidate item of plant provided by the battery manufacturer, Envision; more specifically, the Gen 7 DC Unit. TNEI have been provided with 1/3 Octave Band Sound Power Level (SWL) data for this unit operating in a low-noise mode. Following discussions with the client, TNEI have assumed use of data that represents the sound output of the unit operating at 20% cooling load, which is deemed to be representative of the expected cooling requirements for typical operation in the ambient temperatures (which has conservatively been assumed as 20-25 °C) expected to be applicable to the Proposed Development.

The noise data for the unit has been provided to TNEI from the manufacturer under NDA and cannot be provided in this report. However, we can report the equivalent broadband SWL used to model each façade of the unit, equating to an overall SWL of 68 dBA per unit, as shown in Table 5-1 below:

Table 5-1: SWL Data Used to Model the Envision Gen 7 Battery Storage Containers

Envision Generation 7 DC Unit (20% Cooling Load)	SWL, dBA
Top Façade	57
Right Façade	65
Left Façade	53
Front Façade	60
Rear Façade	57

5.1.2 MV Skid Units

The MV Skid Units have been represented within the noise propagation model using the specifications and noise source data for an item of plant again provided by Envision; the Gen 7 AC Unit. Again, TNEI

have been provided with 1/3 Octave Band SWL data for a low-noise version of this unit. Following recommendations made by the client, TNEI have assumed use of data that represents the sound output of the unit operating at 26% Cooling Load. Again, this is deemed to be representative of expected typical operation for the assumed ambient temperatures applicable to the Proposed Development.

As with the Battery Storage Unit data, the noise data for the unit has been provided to TNEI from the manufacturer under NDA and cannot be provided in this report. However, we can report the equivalent broadband SWL used to model each façade of the unit, equating to an overall SWL of 73 dBA per unit, as shown in below in Table 5-2:

Table 5-2: SWL Data Used to Model the Envision Gen 7 MV Skid Units

Envision Generation 7 AC Unit (26% Cooling Load)	SWL, dBA
Top Façade	70
Right Façade	56
Left Façade	63
Front Façade	67
Rear Façade	67

5.1.3 400 kV Grid Transformer Units

The MV Skid Units will be connected to four 400 kV Grid Transformers. As the client has not yet specified the exact model of transformer, TNEI have used suitable in-house noise data for a unit provided by the manufacturer GE, which is considered representative of this size and specification of transformer. The candidate unit has a broadband SPL value of 68 dBA @ 2 m (inclusive of cooler noise), which is approximately equivalent to 82 dBA SWL.

No spectral data is available for this candidate and therefore typical transformer 1/3 Octave Band spectral data obtained from the datasheet of a similar candidate transformer, provided by the manufacturer ABB, has been input into the noise model and transposed to equal a broadband SWL of 82 dBA. Table 5-3 details the resulting SWL used within the noise model and the relevant data sheets are included within Appendix E.

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

	Frequency (Hz)								
HV Transformer GE Candidate (using ABB Candidate spectral shape)	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
	-	-	-	58	42	49	66	62	72
	200	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
	68	70	74	71	71	73	72	71	68
	1600	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**

	66	64	62	61	61	59	56	54	52

5.2 Mitigation Measures

Landscaping bunds, of up to 4 m high, are included within the Proposed Development's design (as shown on the Site layout drawing within Appendix B) and will provide a degree of barrier attenuation. In addition to this, an acoustic fence has been included within the design to reduce noise immission levels at the most sensitive NSR, which is located to the south of the Proposed Development. The fencing has been modelled at a height of 4.5 m around the southern perimeter of the Site. The location of the fencing is shown within Figure 2 of Appendix F.

The fencing is assumed to be reflecting and of sufficient density to prevent sound passing through the structure. It should be sufficiently robust and maintained so as to achieve the level of attenuation required throughout the lifetime of the development. Fencing must be installed with no air gaps between the panels and floor.

5.3 Calculated Immission Levels

Noise immission levels have been calculated at three 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. 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	Berryhill	380712	847712
NAL02	Boghead	380409	848219
NAL03	Rashypants	381109	848911

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 $L_{Aeq(t)}$
NAL ID	**NAL Descriptor**	
NAL01	Berryhill	33
NAL02	Boghead	25

Noise Assessment Location		Immission Level, dB $L_{Aeq(t)}$
NAL ID	NAL Descriptor	
NAL03	Rashypants	26

6 Noise Impact Assessment

6.1 BS 4142 Assessment

6.1.1 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. 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.

6.1.1.5 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.

6.1.2 Stage 1 – Initial Estimate

Stage 1 of the BS 4142 assessment is the initial estimate which compares the Rating Level to the Representative Background Sound Levels, and this is detailed in Table 6-1.

Table 6-1: BS 4142 Initial Estimate of Impacts

Noise Assessment Location		Rating Level	Daytime		Night-time	
NAL ID	NAL Descriptor		Background, dB L_{A90} (15 mins)	Margin, dB	Background, dB L_{A90} (15 mins)	Margin, dB
NAL01	Berryhill	33	30	3	24	9
NAL02	Boghead	25	32	-7	27	-2
NAL03	Rashypants	26	28	-2	22	4

With regard to the data presented in Table 6-1, the initial estimate of impacts is as follows:

- During the daytime, the Rating Level is below the representative background sound levels at NALs 02 and 03 which "… is an indication of the specific sound source having a low impact, depending on the context". At NAL01, the Rating Level is 3 dB above the representative background sound level, which is around or just below the margin that is "*…likely to be an indication of an adverse impact, depending on the context.*"

- During the night-time, the Rating Level is below the representative background sound levels at NAL02 which *"…is an indication of the specific sound source having a low impact, depending on the context."* At NAL03, the Rating Level is 4 dB above the representative background sound level which around the margin that is *"likely to be an indication of adverse impact, depending on the context".* At NAL01 the Rating Level is 9 dB above the representative background sound level which is around the margin that is *"likely to be an indication of significant adverse impact, depending on the context".*

6.1.3 Stage 2 – Assessment of Context

BS 4142 requires the following contextual elements to be considered:

- the absolute level of the sound;
- the level and character of the residual sound compared to the level and character of the specific sound; and,
- the sensitivity of the receptor.

Each of these is considered in turn below alongside other relevant contextual elements.

6.1.3.1 Context: Absolute Level of the Sound

BS 4142 suggests that in instances where the existing sound environment is considered either particularly low or particularly high then absolute levels may be more relevant than the initial estimate. The standard state:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background This is especially true at night.

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

Furthermore, the ANC 2020 BS 4142 Guidance 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 30 dB is 10 dB above a background sound level of 20 dB, 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 L_{A90}, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$. 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.

In the area surrounding the Proposed Development, which can be described as rural in nature, the measured existing residual levels cannot be described as *"very high*". However, the background sound levels may be defined as *"low"* during the daytime at NALs 01 and 02, and *"very low"* during the night-time at all NALs, as well as at NAL03 during the daytime. During the daytime, the absolute levels could be considered as an important factor which may reduce the initial estimate findings; however, it is during the night-time where absolute levels are potentially most consequential, especially at NALs 01 and 03, where the relatively low Rating Levels of 33 dB and 26 dB exceeds the very low background sound level of 24 dBA and 22 dBA by 9 dB and 4 dB respectively. As such, at night-time the absolute sound levels are considered more relevant than the margin by which the rating level exceeds the background (i.e. more relevant than the initial estimate findings which only compares the Rating Level with the representative background sound level).

As such, consideration of the absolute level of the sound suggests that the initial estimate potential impact would be reduced. This is particularly pertinent at NAL01 during the night-time, where an initial estimate nearing a *"significant adverse impact"* would expect to be reduced given the low absolute value of 33 dBA.

6.1.3.2 Context: Level and Character of Residual Sound

As presented in Table 4.2, the level of the residual sound is variable during both daytime and night-time periods at all NMLs, ranging from 17 – 75 dB $L_{Aeq\ (15\ mins)}$. The highest predicted specific sound level attributable to the development is 33 dBA at NAL01, which is in-keeping with range of ambient levels measured in the surrounding environment.

Additionally, the character of the residual sound is fairly consistent at all NMLs, and sound levels are influenced mostly by wind induced noise with small contribution from intermittent sound sources such as passing road traffic, industrial/forestry/farming activity and birdsong. The Proposed Development is not anticipated to have distinguishing character features and is considered a fairly continuous and relatively low-level sound source. As such, it is not anticipated that the Proposed Development will be readily distinctive against the residual acoustic environment at the NALs.

As such, consideration of the level and character of operational noise with the residual sound suggests that the initial estimate potential impact would be marginally reduced.

6.1.3.3 Context: Sensitivity of the Receptor

BS 4142 suggests that the sensitivity of the receptor may be lessened if design measures that secure good internal and/or outdoor acoustic conditions are already implemented within the receptor. An example of this could be where a residential building has been fitted with non-openable windows in an already high noise environment. This is not relevant to this assessment, where it is assumed that all nearby NSRs do not incorporate any specific noise control measures. As such, the sensitivity of the receptor remains high and does not materially affect the initial estimate of impacts.

6.1.3.4 Context: Operational Scenarios and Calculation of the Rating Level

The calculated Rated Level assumes that all plant will be operating continually and concurrently and with cooling plant running at anticipated operational capacity, as informed by the client with reference to data supplied by the manufacturer of the candidate plant assumed. In reality, not all cooling plant will be required to run concurrently at all times of the day. Consideration of the conservative nature

in the way the plant is assumed to be running in the noise model suggests that contextually the impact would be reduced.

6.1.4 BS 4142 Assessment Conclusion

The Stage 1 - Initial estimate predicted that depending on the context there could be a low impact at most receptors in both daytime in night-time and that there could be an adverse or significant adverse impact at night at some NALs. Detailed considerations of the context clearly indicate that the impacts associated with the operation of the Proposed Development would be less than that found in the initial estimate, particularly with regards to the very low background and low Rating Level incident at NAL01 during the night-time. Accordingly, the full BS 4142 assessment process concludes that there would be a low impact at all residential receptors, with the possible exception of NAL01 at night-time. However, due to the contextual factors described above, it is expected that impact at this receptor would be significantly reduced from the initial estimate and would be expected to have a low impact.

6.2 Noise Rating (NR) Curve Assessment

The assessment against NR 20 is carried out as follows:

- External noise levels are calculated in octave bands for each of the NALs delineated within Table 5-4;
- To obtain an equivalent external level, the levels detailed in Table 6-2 are subtracted from each of the NR 20 octave band level limits to consider the level of attenuation provided by a partially open window; and,
- The calculated external levels will be compared to the external equivalent values of the NR 20 criteria, named *"NR 20 EXT".*

Table 6-2: Assumed Octave Band Levels of Attenuation from Partially Open Window

Frequency (Hz)	63	125	250	500	1000	2000	4000	Overall, dB
Attenuation (dBZ)	17	11	11	13	11	14	16	13

The values detailed in Table 6-2 were obtained with reference to the Octave band attenuation levels for a partially open window detailed within Table 5-6 of NANR 116: *'Open/Closed Window Research' Sound Insulation Through Ventilated Domestic Windows* [9]. The image below, which is taken from *NANR116*, shows average levels of attenuation at different frequencies after considering multiple window types. The data from the largest opening size of 200 mm^2 is assumed, which equates to a single figure outside-to-inside level difference of 16 dB.

	Octave Band Centre Frequency (Hz)							
Opening size	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	$D_{n,e,W}$ ($C;C_{tr}$)
50k (mm^2)	23	17	19	20	16	21	23	19 (0; -1)
100k (mm^2)	22	16	17	18	15	19	21	18 (-1; -1)
200k (mm^2)	20	14	14	16	14	17	19	16 (0; -1)

Table 5-6. Statistically Derived $D_{n,e}$ insulation ratings for window openings (dB)

The *Acoustics, Ventilation and Overheating Guide (AVO), Appendix C* [10], however, suggests a single figure outside-to-inside level difference of 13 dB. Therefore, the above values are reduced in each frequency band so that the equivalent single figure value equals 13 dB. TNEI believe this offers a conservative approach to the assessment but also offers a realistic approach as to how sound will be attenuated in octave bands through a window, as opposed to simply adopting a single figure value.

Considering the above, Table 6-3 below delineates the equivalent external noise level limit adopted for the NR 20 assessment:

Table 6-3: NR 25 Curve Limits Adopted for Assessment

NR Curve	Descriptor	Frequency (Hz), dB(Z)						
		63	125	250	500	1000	2000	4000
NR 20	Internal Levels	51	39	31	24	20	17	14
NR 20 EXT	**External Equivalent Levels**	**68**	**50**	**42**	**37**	**31**	**31**	**30**

The table and graphs provided in Appendix G presents the operational noise levels predicted at each NAL as Octave Band Linear (dB(Z)) $L_{eq(t)}$ values against the NR 20 EXT limit values shown in Table 6-3. It can be seen from the table and graphs that the predicted external noise levels remain below the derived noise level limits for all NALs. Accordingly, the Proposed Development noise levels are predicted to be below the NR20 curve criteria suggested by AC during the night-time. As the predictions are presented as the same during daytime and night-time periods, the less stringent NR25 curve criteria suggested by AC for daytime is also predicted to be met.

6.3 Noise Impact Conclusion

Considering the outcomes of both assessments presented above, it can be concluded that **the likely anticipated impact of operational noise from the Proposed Development on the nearby residential receptors will be low.** At NAL01 during the night-time, the initial BS 4142 estimate will be significantly reduced from the initial estimate, and given noise levels have additionally been shown to be below the NR20 internal amenity limit, it is expected that impacts will also be low at this receptor.

7 Cumulative Considerations

TNEI is aware of a number of operational and consented electrical infrastructure developments located within 10 km of the Proposed Development. The cumulative developments identified are reproduced within Table 7-1 below:

Table 7-1: Summary of Cumulative Developments (within 10 km)

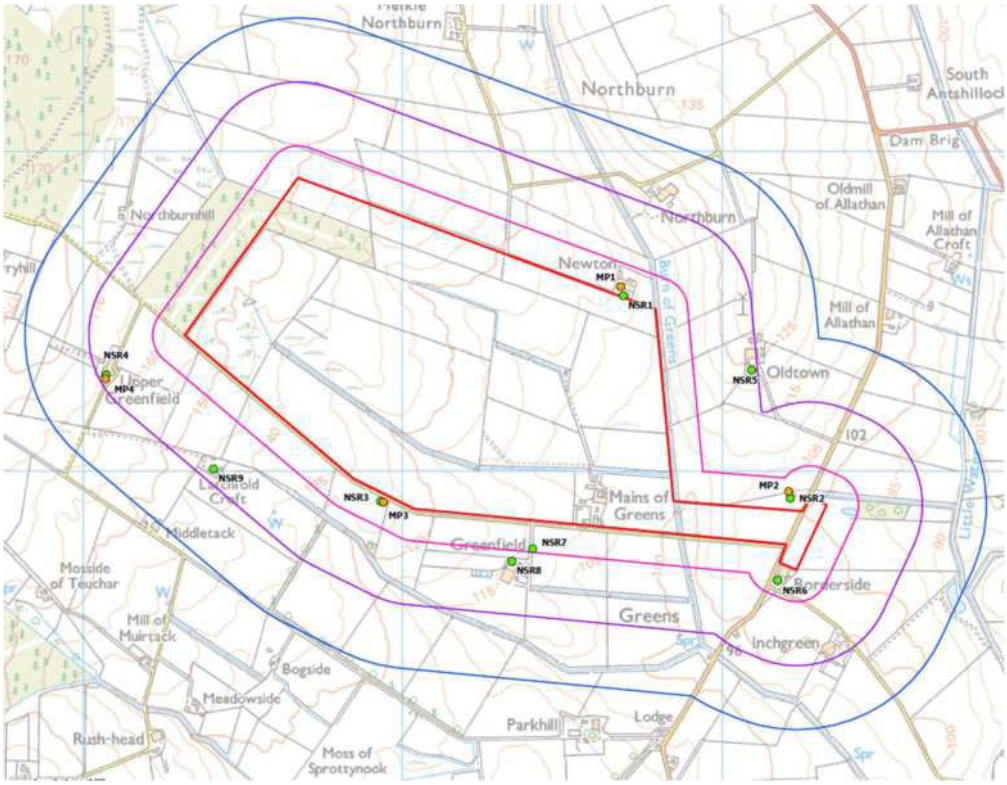
Development Name	AC/ECU Planning Reference	Planning Status	Operational NIA Report	Approximate Distance from Proposed Development
Green Volt Offshore Wind Farm (Onshore Substation)	APP/2023/1454	Consented	Yes	4,500 m
Caledonia Offshore Wind Farm (Onshore Substation)	APP/2024/1812	In Planning	Yes	3,500 m
Greens (New Deer 2) Substation	APP/2024/1927	In Planning	Yes	1,200 m
North East 400 kV OHL Reinforcement Works	ECU00000677	Completed	No	3,500 m
Beauly to Peterhead OHL	ECU00005165	EIA Scoping	No	0 m

For clarity, TNEI has only considered developments where appropriate operational noise assessment documentation (NIA Report or ES Chapter) has been submitted in support of the development and is publicly available to review. Developments that are at an early planning stage (i.e. screening) have not been included due to lack of required noise impact assessment documentation.

With regards to the consented overhead line (OHL) developments (ECU00000677 and ECU00005165), no operational noise assessments have been provided, likely due to the negligible operational noise output from the respective developments. As such, these have not been considered. Similarly, although operational NIA documentation is available for the Green Volt (APP/2023/1454) and Caledonia (APP/2024/1812) Offshore Wind Farm onshore substation developments, the distances between these developments and any receptors relevant to the Proposed Development are such that the cumulative contributions will be negligible.

The most applicable scheme to consider in terms of potential cumulative effects is the Greens (New Deer 2) substation (APP/2024/1927), which is located approximately 1,200 m to the east and is the proposed point of connection for the Proposed Development. Review of the associated NIA shows the following identified NSRs:

Figure 7-1: NSRs identified within Greens (New Deer 2) Substation NIA



To clarify, there are no identified receptors common to both the Proposed Development's NIA and the NIA for the Greens (New Deer 2) Substation, and such no mathematical calculation of a cumulative Rating Level is possible. It is noted that the nearest identified receptor to the Proposed Development included within the Greens NIA is NSR4 – Upper Greenfields (as shown above). At this location, a specific sound level of 30 dBA is predicted, with a BS 4142 Rating Level of 33 dBA calculated to account for a 3 dB tonal character correction. When considering these values have been calculated at a location that is approximately 500 m further to the east of closest NSR identified within this assessment (Berryhill), it is unlikely that any cumulative effects will occur.

It should also be noted that the Rating Level values presented within the Greens NIA do not account for the potential attenuation provided by the inclusion of the proposed noise mitigation scheme, described within the NIA as follows:

"A Noise Mitigation Scheme will be based on a robust acoustic design process and will identify the most cost-effective measures including for example localised noise barriers, acoustic enclosures, cladding with enhanced acoustic specification on buildings containing noisy plant, acoustically attenuated louvres, or a combination of these measures, where required. The scheme would be prepared during detailed design in close liaison with the Council's environmental health team, to ensure their requirements are fully considered".

With due consideration of the above, **no material cumulative operational noise effects are anticipated.** If any cumulative effects do arise, they would most likely be attributable to the Greens (New Deer 2) Substation but are extremely unlikely to result in a *"significant adverse impact"*, as stipulated by AC (as stated within Section 3.2), due to the separation distances between the respective developments and associated receptors.

8 Summary

To predict the noise immission levels of the Proposed Development, TNEI has produced a noise propagation model 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 at all times. Accordingly, the noise assessment is inherently conservative. Three nearby residential properties were identified and assessed. The noise model includes mitigation measures in the form of acoustic fencing and landscaping bunds.

Through consultation with AC, it was requested that operational noise from the Proposed Development be assessed in accordance with BS 4142, as well as against a fixed internal operational noise limit of NR 20 at the closest identified residential properties.

As part of the BS 4142 assessment, an initial estimate predicted that, depending on the context, there could be a low impact at most receptors in the daytime, an adverse impact during the night-time at NAL03 and the potential for a significant adverse impact during the night-time at NAL01. Detailed considerations of the context clearly indicate that the impacts associated with the operation of the Proposed Development would be less than that found in the initial estimate, accordingly, the full BS 4142 assessment process concludes that there would be a low impact at all residential receptors, with the possible exception of NAL01 at night-time. However, it is expected that impact at this receptor would be significantly reduced from the initial estimate due to appropriate consideration of the context.

It was shown that operational noise from the Proposed Development is predicted to be below the external equivalent of the fixed internal NR 20 (NR 20 EXT) noise level limits at all identified residential receptors and is therefore expected to have a low impact on internal residential amenity.

With consideration of both of the assessments presented above (BS 4142 and NR 20), the Proposed Development is expected to have an overall low noise impact at all nearby receptors during both the daytime and night-time, with appropriate mitigation in place.

Additionally, an appraisal of cumulative noise with other nearby schemes was undertaken. There are no significant adverse cumulative impacts anticipated as a result of operational noise from the Proposed Development and nearby identified energy infrastructure schemes.

It should be noted, due to the rapidly evolving nature of BESS technology and the variability in operational noise output applicable to differing types of plant, it is a possibility that the candidate plant assumed within this NIA is not the technology that is ultimately deployed. As such, TNEI believe that appropriately worded conditions that stipulate suitable noise level limits are more appropriate than conditions that may tie a developer to a particular technology or design mitigation scheme that may not be suitable (or even available) by the time of construction. This affords both flexibility to developers and appropriate protection to residents.

Based upon the details presented within this NIA report, we would likely propose the adoption of limits which fully consider the context as requested by BS 4142, or fixed noise level limits due to the previously discussed low background sound level. Should the Scottish Ministers decide to grant consent to the Proposed Development, TNEI would welcome continued consultation with both AC 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.

9 References

1. **The Scottish Government.** *PAN 1/2011 Planning and Noise.* Scotland : The Crown, 2011.

2. —. *Technical Advice Note (TAN) 'Assessment of Noise'.* Scotland : The Crown, 2011.

3. **British Standards Institute.** *Methods for Rating and Assessing Industrial and Commercial Sound.* UK : BSI, 2014. BS4142:2014 + A1:2019.

4. **The Association of Noise Consultants (ANC).** *BS 4142:2014+A1:2019 - Technical Note.* s.l. : The Association of Noise Consultants (ANC), 2020.

5. **British Standards Institute.** *Guidance on Sound Insulation and Noise Reduction for Buildings.* UK : BSI, 2014. BS8233:2014.

6. **Datakustik GmbH.** CadnaA. 2025.

7. **(ISO), International Organization for Standardization.** *Acoustics – Attenuation of Sound During Propagation Outdoors: Part 2 – General Method of Calculation.* Geneva : (ISO), International Organization for Standardization, 2024. ISO 9613-2:2024.

8. **Commission Electrotechnique Internationale (IEC).** *Electroacoustics - Sound level meters - Part 1: Specifications.* Geneva : IEC, 2013. IEC 61672-1:2013.

9. **University, Napier.** *NANR116: 'Open/Closed Window Research' Sound Insulation Through Ventilated Domestic Windows – Research Study Conducted for Department for Environment, Food and Rural Affairs (Defra).* The Building Performance Centre, School of the Built Environment. 2007.

10. **(ANC), Institute of Acoustics (IOA) and the Association of Acoustics & Noise Consultants.** *Acoustics, Ventilation and Overheating, Residential Design Guide, Appendix C, "Sound Insulation of a Partially Open Window".* 2020.

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 Detailed Site Layout Plan
Scale 1:2,500 @ A1

Drawing Notes:

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

Legend:

- Planning Boundary
- SSE's Proposed Greens (New Deer 2) Substation Boundary (APP/2024/1927).
- Cable Route
- Palisade Fencing
- 4.5m Acoustic Fencing
- Stock Proof Fencing
- Attenuation Basin
- Access Road - Unbound Finish
- Access Road - Bound Finish
- Landscaping Bunds
- Landscaping - refer to Landscape Mitigation Plan (1005-SHRSK-XX-XX-DR-L-1000)
- Existing Forestry (to be retained)
- Indicative Construction Compound

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
04	01.04.2025	Access bellmouth amended for AIL's. Indicative construction compound added.	JH	AP
03	31.03.2025	Scale labels amended	JH	AP
02	27.03.2025	Stock proof fencing added	JH	AP
01	21.03.2025	Amendments to planning boundary, drainage, landscaping and cable route.	JH	AP
00	25.02.2025	Site Layout Plan - Original	JH	AP

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

PROJECT
New Deer

TITLE
Detailed Site Layout Plan

DISCIPLINE: PLANNING

DRAWING STATUS: FOR PLANNING

SCALE	DATE	DRAWN BY	CHECKED BY	APPROVED BY
1:2,500 @A1	25.02.2025	JH	AP	RS

PROJECT NO.	DRAWING NO.	REV
BTGBNDE02	001.1.1	04

Appendix C – EHO Consultation

New Deer Battery Energy Storage System (BESS): Noise Impact Assessment

To:	Aberdeenshire Council	Planning Authority:	Aberdeenshire Council
Address:	Aberdeenshire Council Buchan House St Peter Street Peterhead AB42 1QF	TNEI Ref.:	17127-006-R0
Date:	18 February, 2025		

Dear Sir/Madam,

TNEI Services Ltd (TNEI) have been commissioned by Field Energy to undertake a Noise Impact Assessment to support the planning application for the proposed New Deer Battery Energy Storage System (BESS) development located east of Turriff near Northburnhill in Aberdeenshire, at approximate OS coordinates, 380800, 848300. 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 located to the north, northeast, southeast, south and west 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. Noise Rating (NR) curves. 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 will be undertaking a baseline survey, which we anticipate will occur late February/early March. We apologise for the short notice; ideally, we seek to give local authorities ample response time where possible, however due to time constraints for the proposed application, it is critical that we attend site as soon as possible. If you would like to comment on the survey

requirements then it would be much appreciated if you could come back to us as soon as practicable. Due to the aforementioned time constraints, we may have to begin the survey in the absence of provided feedback.

The assessment will consider the closest NSRs only, on the assumption that if noise is within acceptable levels at these locations, it will also be acceptable at more distant receptors. Figure 1 details the closest residential NSRs that we have identified to the Proposed Development. The NSRs are grouped together by colour.

We propose to monitor at three Noise Monitoring locations (NMLs). 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. Whilst every effort will be made to install equipment at the locations shown in Figure 1, exact locations may vary due to unforeseen circumstances, and therefore this will be determined during the installation site visit.

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. We will install a rain gauge and a small wind speed monitor 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 winds.

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. In instances, 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 we may undertake the assessment against an absolute limit, as opposed to against the background sound level, as detailed within the ANC document.

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

Principal Consultant

TNEI Services Ltd

Appended: Figure 1 – NIA Study Area

Document Control

Revision	Status	Prepared by	Checked by	Approved by	Date
R0	FIRST ISSUE	MR	EW	EW	18/02/2025

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

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

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TU Dublin Tallaght Campus
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Company Number: 2016/088929/07

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

Figure 1: NIA Study Area

Ewan Watson

From: [redacted]
Sent: 19 February 2025 13:12
To: Ewan Watson
Cc: Ben Parkins; Mathew Robinson; Anthony Pollifrone
Subject: proposed New Deer Battery Energy Storage System (BESS) development, located east of Turriff near Northburnhill in Aberdeenshire

Follow Up Flag: Follow up
Flag Status: Flagged

[redacted]

Good afternoon,

Thank you for consulting Environmental Health on the proposed noise assessment methodology.

Could you please confirm the planning enquiry/application reference number, if there is on?

The proposed monitoring locations and duration appear reasonable. However, we would ask that the assessment is undertaken in accordance with BS4142:2014+A1:2019 for external noise with the aim of achieving a low impact depending on context when compared to background LA90 and NR 25 and NR20 Curve assessment for internal noise during the daytime and night-time, respectively. We would also ask that a cumulative noise impact is considered, demonstrating that it will not cause significant adverse impact on nearby residential amenity.

Please note that should further details emerge that renders the agreed approach insufficient, a revised methodology shall be required.

[redacted]
Senior Environmental Health Officer (Tue-Wed)

Environment and Infrastructure
Aberdeenshire Council

Gordon House
Blackhall Road
Inverurie
AB51 3WA

[redacted]

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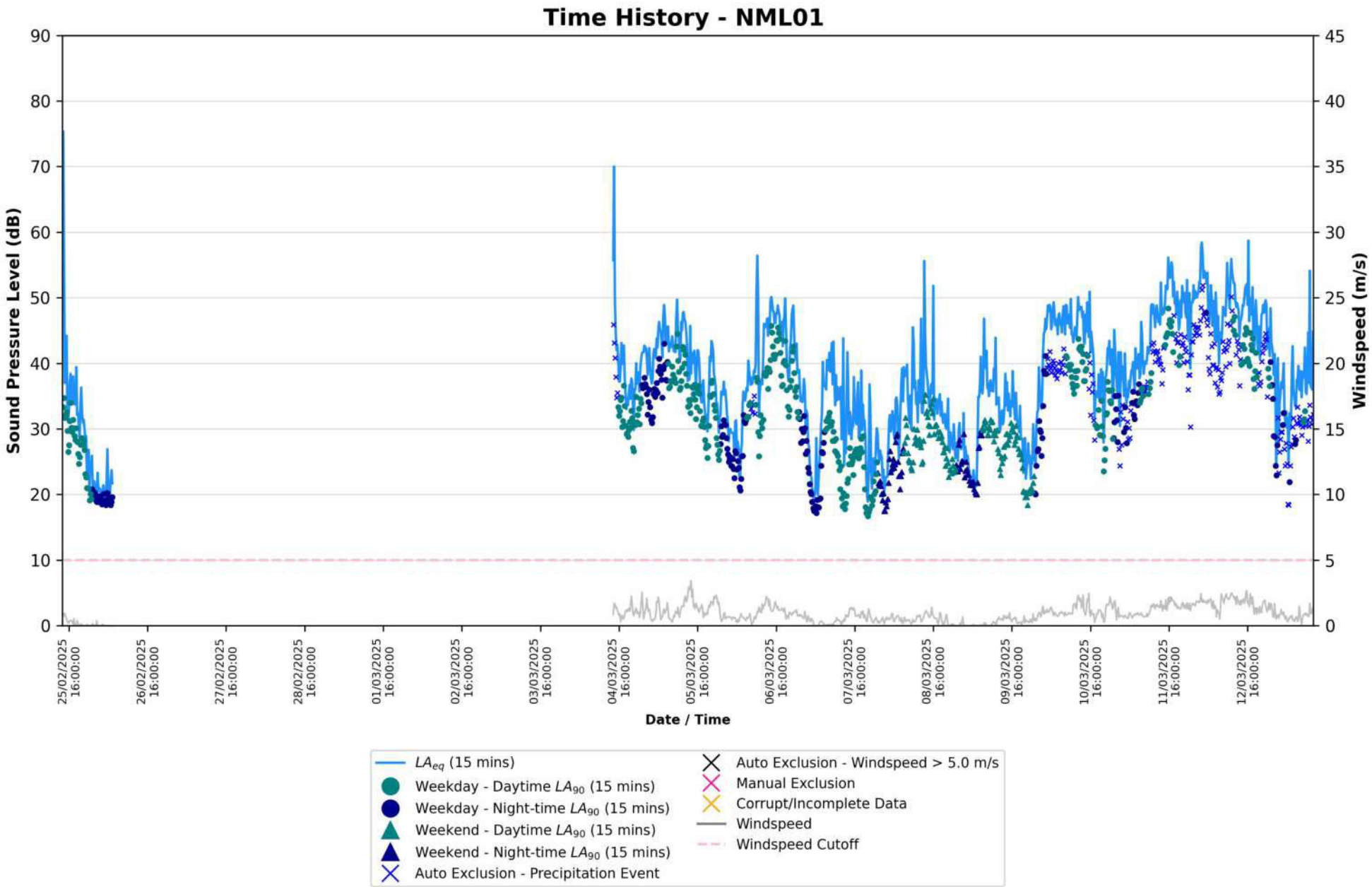
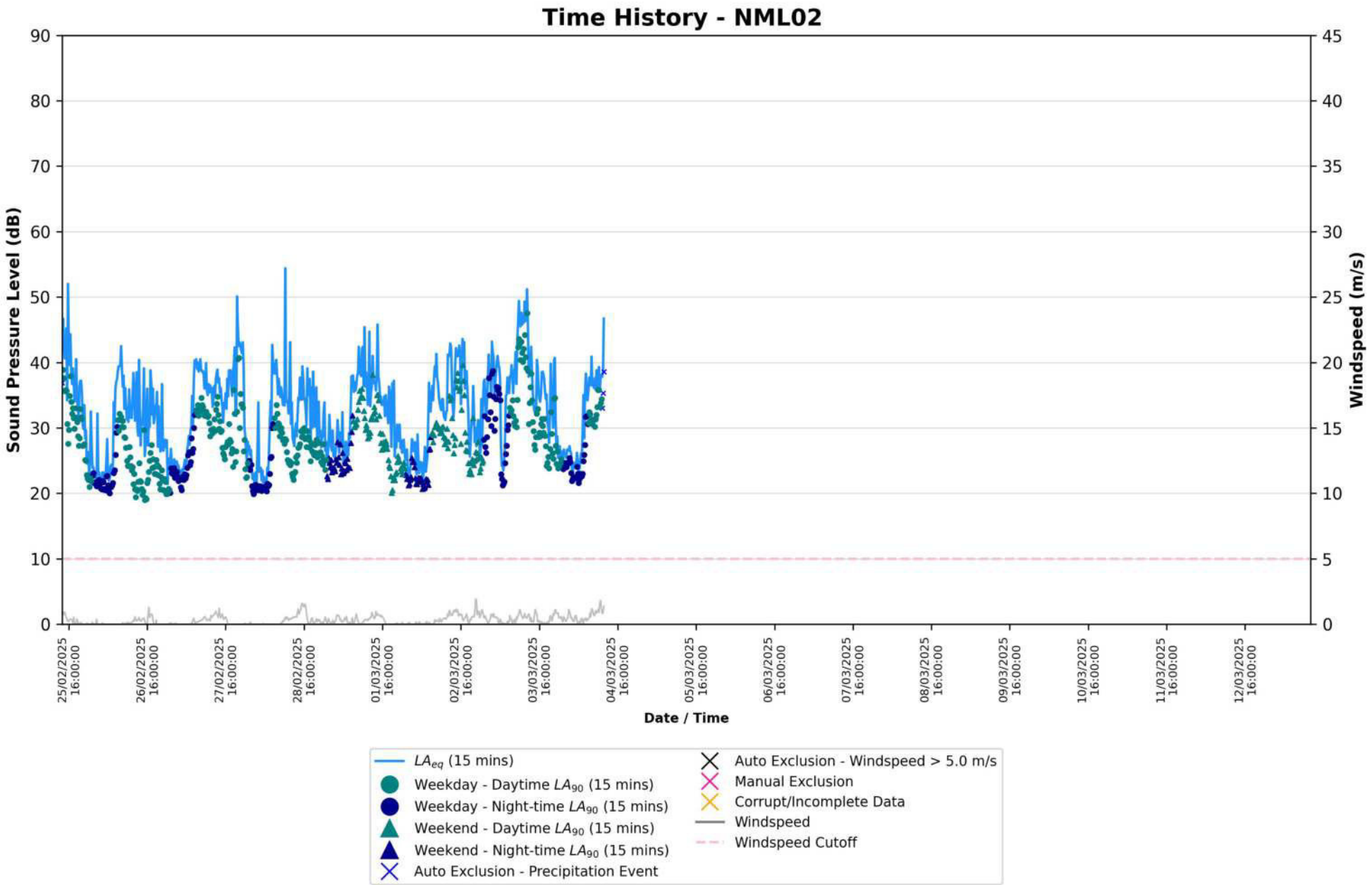
Appendix D – Baseline Survey Data

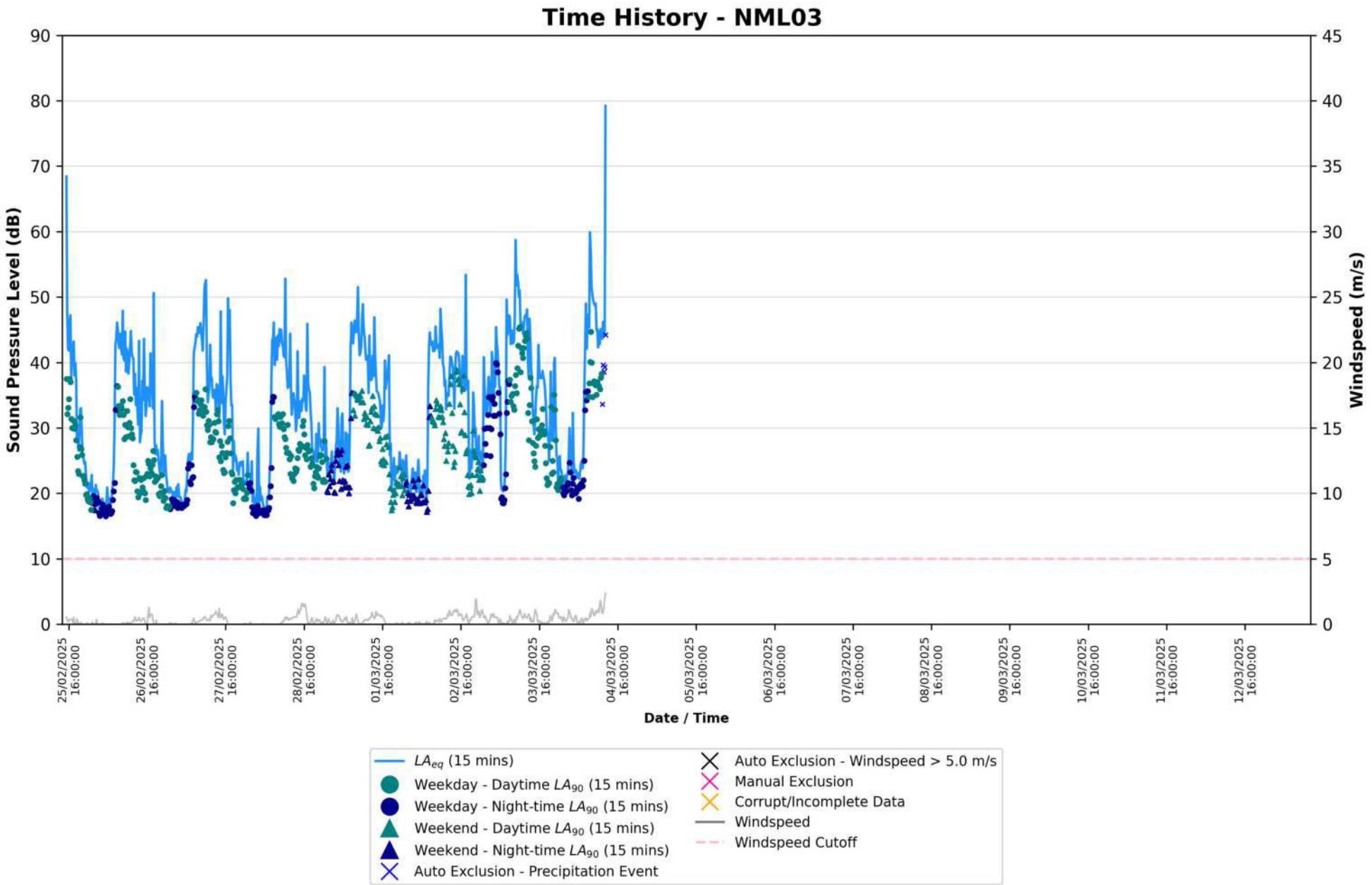
17127 - New Deer - Measured Sound Levels:



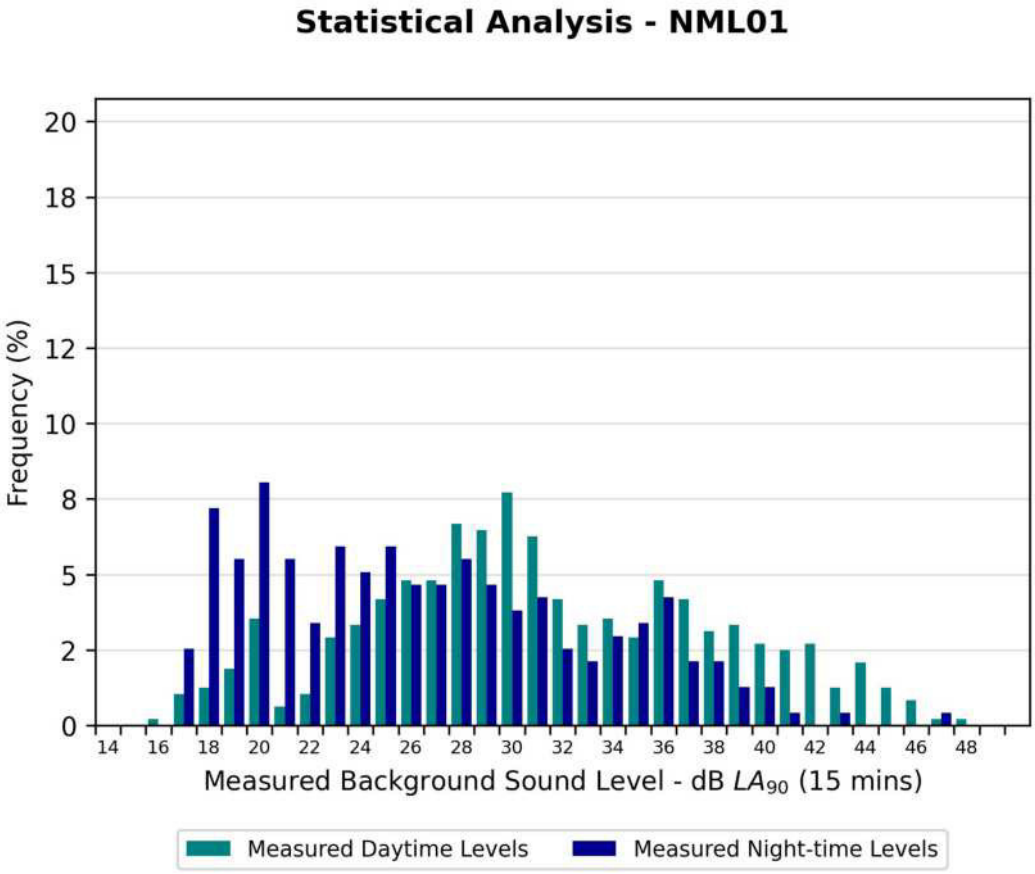
17127 - New Deer - Measured Sound Levels:

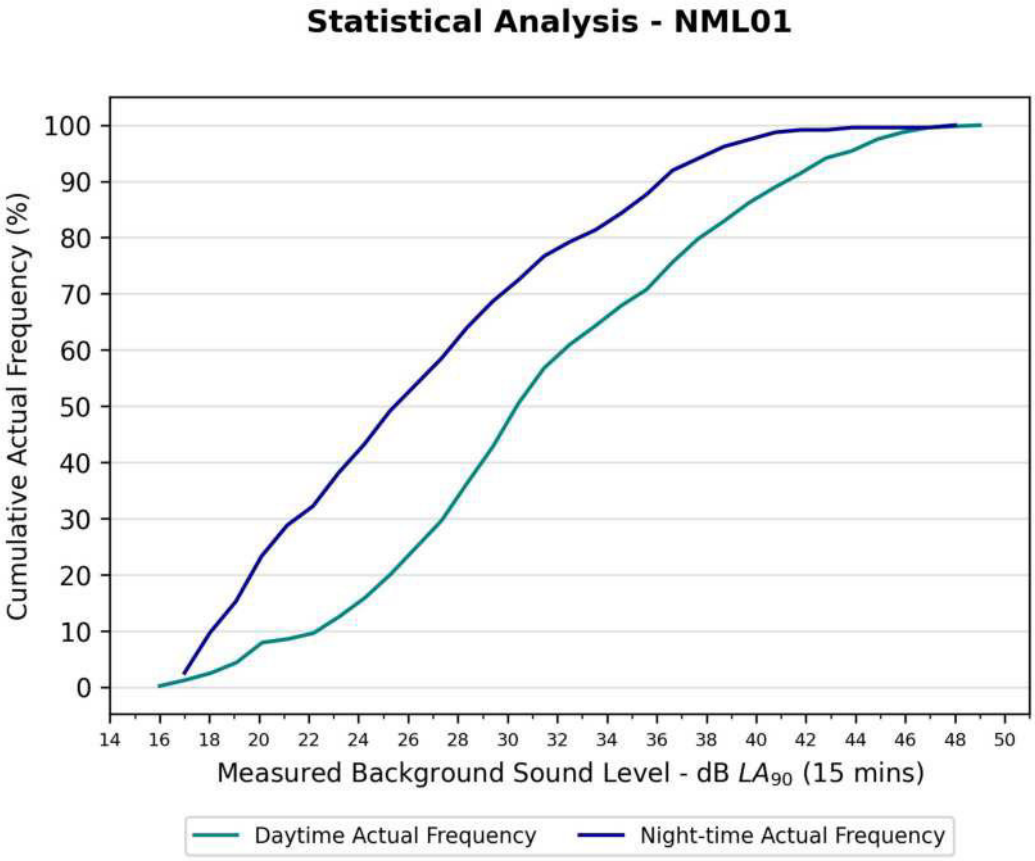


17127 - New Deer - Measured Sound Levels:

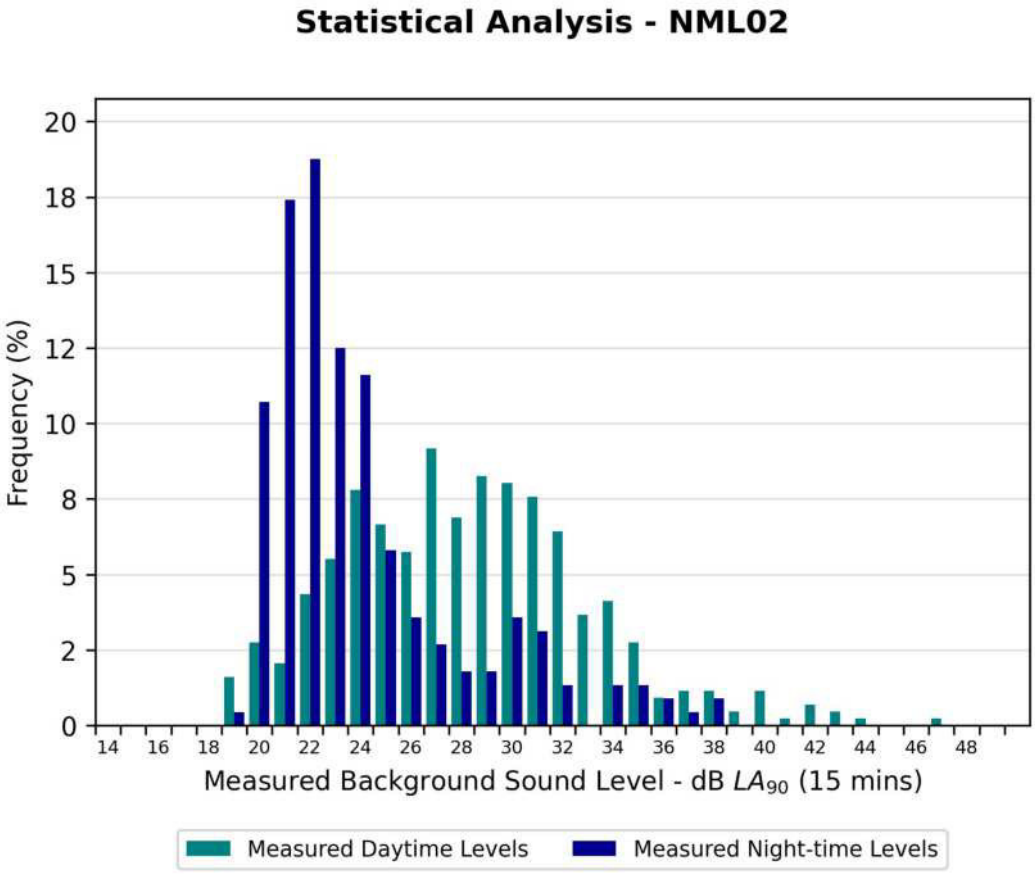


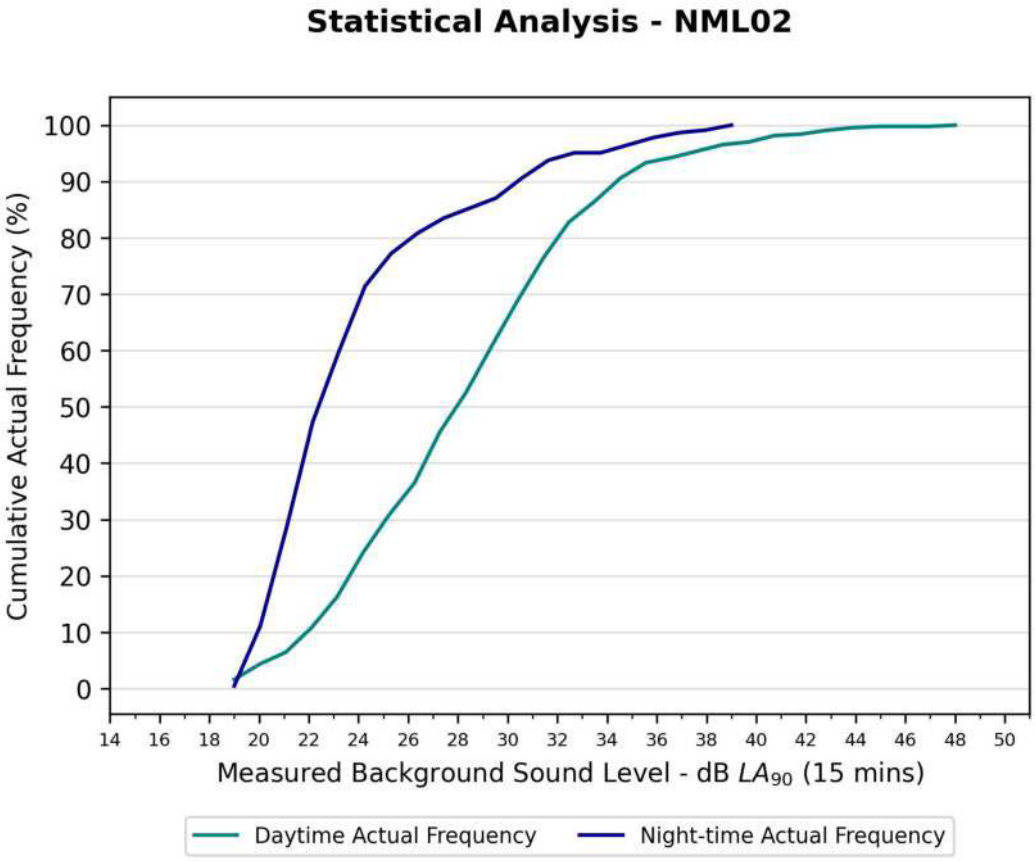
17127 - New Deer - Measured Sound Levels:



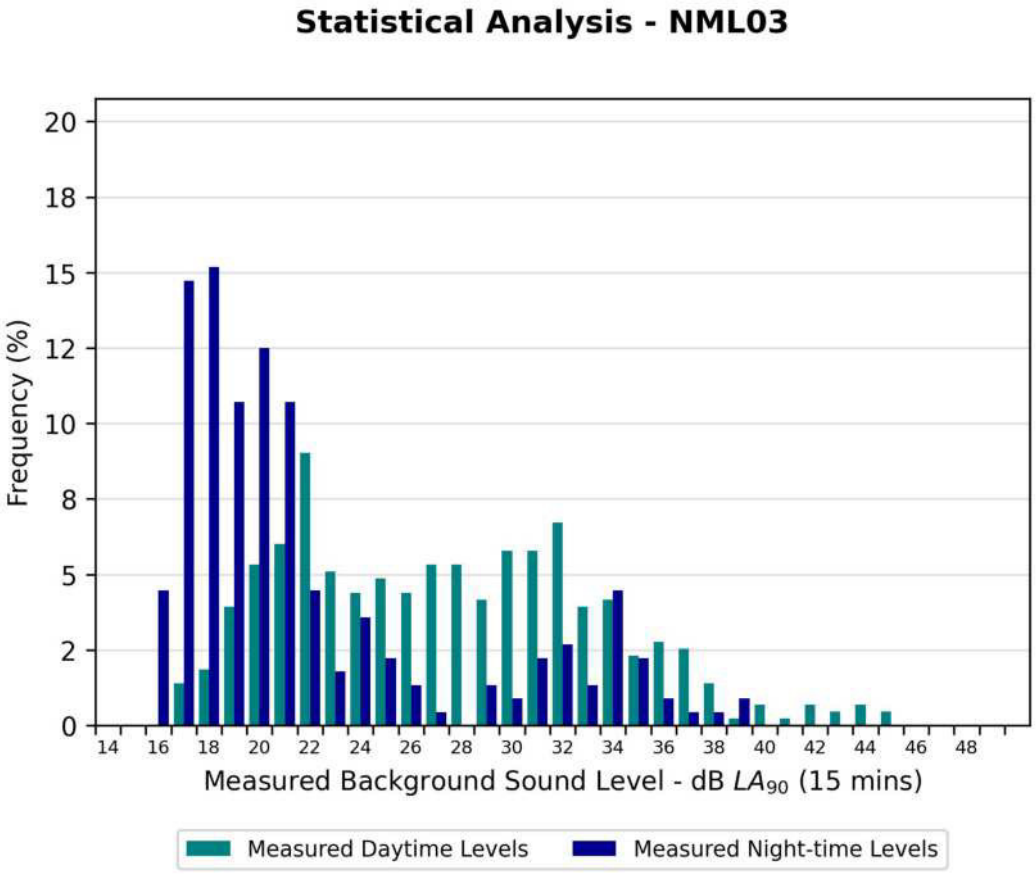


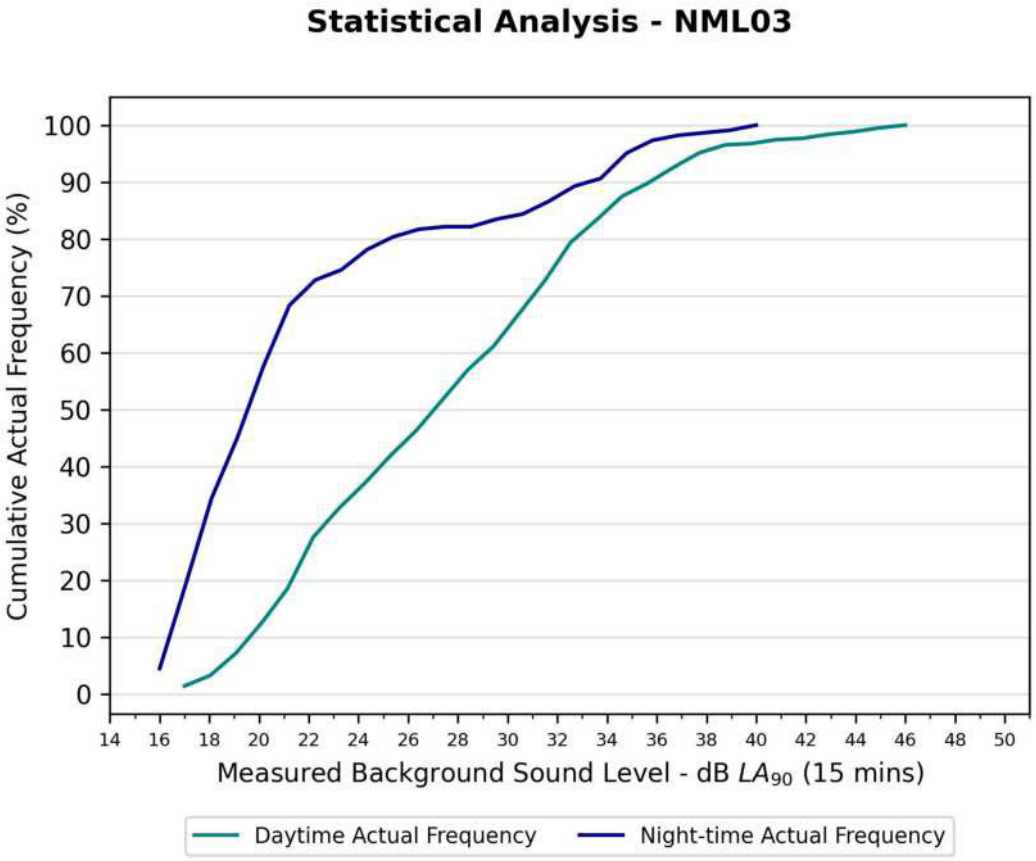
17127 - New Deer - Measured Sound Levels:





17127 - New Deer - Measured Sound Levels:





17127 - New Deer - Measured Sound Levels:

Relevant Statistics

NML01

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (15 MINS)	479	32	31	17 - 48
	LAEQ (15 MINS)	479	38	38	19 - 75
NIGHT-TIME	LA90 (15 MINS)	236	27	26	17 - 48
	LAEQ (15 MINS)	236	32	32	19 - 53

NML02

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (15 MINS)	436	29	29	19 - 48
	LAEQ (15 MINS)	436	35	36	21 - 54
NIGHT-TIME	LA90 (15 MINS)	224	24	23	20 - 39
	LAEQ (15 MINS)	224	28	26	21 - 43

17127 - New Deer - Measured Sound Levels:

Relevant Statistics

NML03

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (15 MINS)	432	28	27	17 - 45
	LAEQ (15 MINS)	432	36	36	20 - 68
NIGHT-TIME	LA90 (15 MINS)	224	22	20	16 - 40
	LAEQ (15 MINS)	224	26	23	17 - 50

Noise Monitoring Record - NML01

Project Title	New Deer 2 BESS	**Project Number**	17127
Client	Field Energy	**Surveyor(s)**	WC

MONITORING LOCATION

Location Number	NML01
Location Name	NML01
Location Description	Landowners field, west of Proposed Development Equipment located >3.5m from nearby facades or reflective surfaces.
Latitude	57.522395
Longitude	-2.327054
Noise sources noted during installation, weekly inspection and removal	**Installation** - Wind induced noise was dominant, the trees around were conifers and were not making much noise even in strong gusts of wind. There was traffic faintly audible towards the west of the monitoring location. It was damp underfoot, there were 3 oktas of cloud cover, no precipitation during the visit and there was a moderate to strong breeze, the temperature was 1 degree. **2nd Visit** – Very windy; wind induced noise is dominant. Some of the trees were audible but the conifers were still quiet, consistent with previous site visit. The sky was overcast, it was damp underfoot, the temperature was 7 degrees. There was a ground investigation team out with a drilling rig on the day of collection which was faintly audible at this location. Spoke to drilling team who confirmed they had only started works that morning. The noise kit appeared to have failed after around 15 hours of measurements., this Kit was redeployed with the sound level meter from the kit at nml03. **Collection** – the sound scape is quiet again, there is a moderate breeze causing some wind induced noise, there were some farm animals audible from the property towards the northwest. Wind induced noise was dominant again. Mostly dry underfoot, no precipitation, the cloud cover was 1/2 oktas, the temperature was 7 degrees.

NOISE MONITORING EQUIPMENT DETAILS

	Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 051	Rion NL-52	00410237	13/07/2023
Calibrator	CAL 008	Rion NC-75	35002724	15/03/2024

Weather Measurement	Rain Gauge (redeployment)
Equipment Notes	Rain gauge installed for the second week of the survey following redeployment and removal of kit with error.

NOISE MONITORING EQUIPMENT SETTINGS

	Frequency Weighting	Index	Interval	Time Weighting	Range	Audio Recording
Parameters Recorded	A	LAEQ, LA90	15 Mins	Fast	20-110	No

MEASUREMENTS

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0101	25/02/2025 14:15	26/02/2025 05:41	94.0	93.8	0.2	Noise and weather conditions consistent with other 2 NMLs. Kit appears to have failed after around 15 hours of measurements. Kit redeployed with meter from NML03.
0102	04/03/2025 14:15	13/03/2025 12:11	94.0	93.6	0.4	Quiet again, breeze, animals audible towards the north west. Wind induced noise is dominant

NML01 Photographs

Noise Monitoring Record - NML02

Project Title	New Deer 2 BESS	**Project Number**	17127
Client	Field Energy	**Surveyor(s)**	WC

MONITORING LOCATION

Location Number	NML02
Location Name	NML02
Location Description	Landowners field, south of Proposed Development Equipment located >3.5m from nearby facades or reflective surfaces.
Latitude	57.519247
Longitude	-2.326083
Noise sources noted during installation, weekly inspection and removal	**Installation** – it was quiet at this location, there was some noise towards the north that could have been agricultural or forestry machinery. Wind induced noise was dominant, occasionally a vehicle passed along the road which was dominant while they were present. It was damp underfoot, there were 3 oktas of cloud cover, no precipitation during the visit and there was a moderate to strong breeze the temperature was 1 degree. **Collection** –Wind induced noise is dominant. Some of the trees are audible but the conifers are still quiet, consistent with the previous site visit and other NMLs. The sky was overcast, it was damp underfoot, the temperature was 7 degrees. There was a ground investigation team out with a drilling rig on the day of collection which was not audible at this location.

NOISE MONITORING EQUIPMENT DETAILS

	Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 030	Rion NL-52	00643022	14/02/2024
Calibrator	CAL 008	Rion NC-75	35002724	15/03/2024

Weather Measurement	Rain Gauge and Kestrel Weather Station
Equipment Notes	Rain gauge and kestrel installed at this location

NOISE MONITORING EQUIPMENT SETTINGS

	Frequency Weighting	Index	Interval	Time Weighting	Range	Audio Recording
Parameters Recorded	A	LAEQ, LA90	15 Mins	Fast	20-110	No

MEASUREMENTS

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0201	25/02/2025 14:00	04/03/2025 11:57	94.0	94.0	0.0	Very windy, wind induced noise is dominant, some trees audible but conifers still quiet. Overcast damp underfoot, 7 degrees, ground investigation team out with rig on the day of collection.

NML02 Photographs

NML02 Photographs

Noise Monitoring Record - NML03

Project Title	New Deer 2 BESS	**Project Number**	17127
Client	Field Energy	**Surveyor(s)**	WC

MONITORING LOCATION

Location Number	NML03
Location Name	NML03
Location Description	Landowners field, north of Proposed Development Equipment located >3.5m from nearby facades or reflective surfaces.
Latitude	57.526582
Longitude	-2.317193
Noise sources noted during installation, weekly inspection and removal	**Installation** – There was a small aircraft overhead, some machinery towards the north was audible but difficult to identify, possibly saws. There were dogs barking in the distance towards the north and distant traffic audible towards the northwest. Wind induced noise and birdsong were dominant, no noise from foliage at this location during installation. It was damp underfoot, there were 3 oktas of cloud cover, no precipitation during the visit and there was a moderate to strong breeze the temperature was 1 degree. **Collection** – Wind induced noise is dominant at this location, the trees were surprisingly quiet again. On the day of collection there was a ground investigation team out with a drilling rig less than 100 m away from the noise kit location, the noise from the rig and the team talking/shouting was audible from the kit but not dominant. The sky was overcast, it was damp underfoot, the temperature was 7 degrees.

NOISE MONITORING EQUIPMENT DETAILS

	Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM 44	Rion NL-52	00386739	14/02/2024
Calibrator	CAL 8	Rion NC-75	35002724	15/03/2024

Weather Measurement	None
Equipment Notes	None

NOISE MONITORING EQUIPMENT SETTINGS

	Frequency Weighting	Index	Interval	Time Weighting	Range	Audio Recording
Parameters Recorded	A	LAEQ, LA90	15 Mins	Fast	20-110	No

MEASUREMENTS

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0301	25/02/2025 15:15	26/02/2025 12:28	94.0	93.9	0.1	Quiet, wind induced noise is dominant trees still surprisingly quiet. Ground team out with rig, the noise from the rig and the team talking/shouting was audible from the kit but not dominant.

NML03 Photographs

NML03 Photographs

CERTIFICATE OF CALIBRATION

Date of Issue: 13 July 2023 **Certificate Number: TCRT23/1514**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory [redacted]

K. Mistry

Customer	TNEI Floor 7 West One Forth Banks Newcastle upon Tyne NE1 3PA
Order No.	5001
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	00410237
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	10679
Rion	Microphone	UC-59	19119
Rion	Calibrator	NC-74	34536109
	Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 10. SLM 61672-3:2013

Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2013 Yes

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013

Date Received 12 July 2023 ANV Job No. TRAC23/07313

Date Calibrated 13 July 2023

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT23/1514

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1		
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion
Date provided or internet download date	19 March 2021		

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES

Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Lab Calibrator		
Calibrator adaptor type if applicable	NC-74-002		
Calibrator cal. date	03 July 2023		
Calibrator cert. number	UCRT23/1863		
Calibrator cal cert issued by Lab	ANV Measurement Systems		
Calibrator SPL @ STP	93.99	dB	Calibration reference sound pressure level
Calibrator frequency	1002.01	Hz	Calibration check frequency
Reference level range	Single	dB	

Accessories used or corrected for during calibration - Extension Cable (No Wind Shield)
Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.

Environmental conditions during tests	Start	End	
Temperature	23.80	23.70	± 0.30 °C
Humidity	38.7	35.9	± 3.00 %RH
Ambient Pressure	100.56	100.51	± 0.03 kPa

Indication at the Calibration Check Frequency				
Initial indicated level	94.3	dB	Adjusted indicated level	94.0 dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10 dB

Self Generated Noise				
Microphone installed -	Less Than	18.3	dB	A Weighting
Microphone replaced with electrical input device -				UR = Under Range indicated

Weighting	A			C			Z		
	11.6	dB	UR	16.3	dB	UR	21.2	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the Guide to the Expression of Uncertainty in Measurement published by ISO.

Additional Comments

None

…… END ……

Calibrated by: C. Hirlav

CERTIFICATE OF CALIBRATION

Date of Issue: 14 February 2024

Certificate Number: TCRT24/1150

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

[redacted]

Customer

TNEI
7th Floor West One
Forth Banks
Newcastle Upon Tyne
NE1 3PA

Order No. 5001

Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	00643022
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	43050
Rion	Microphone	UC-59	06802
Rion	Calibrator	NC-74	34762316
	Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 13 February 2024 ANV Job No. TRAC24/02069

Date Calibrated 14 February 2024

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	17 November 2021	214286	NSAI National Metrology Lab

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT24/1150

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52
SLM instruction manual ref / issue		11-03
SLM instruction manual source		Manufacturer
Internet download date if applicable		N/A
Case corrections available		Yes
Uncertainties of case corrections		Yes
Source of case data		Manufacturer
Wind screen corrections available		Yes
Uncertainties of wind screen corrections		Yes
Source of wind screen data		Manufacturer
Mic pressure to free field corrections		Yes
Uncertainties of Mic to F.F. corrections		Yes
Source of Mic to F.F. corrections		Manufacturer
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes
Specified or equivalent Calibrator		Specified
Customer or Lab Calibrator		Customers Calibrator
Calibrator adaptor type if applicable		NC-74-002
Calibrator cal. date		14 February 2024
Calibrator cert. number		UCRT24/1237
Calibrator cal cert issued by		ANV Measurement Systems
Calibrator SPL @ STP	94.03 dB	Calibration reference sound pressure level
Calibrator frequency	1002.41 Hz	Calibration check frequency
Reference level range	25 - 130 dB	

Accessories used or corrected for during calibration - None
Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	23.03	22.89	± 0.30 °C
Humidity	52.9	49.8	± 3.00 %RH
Ambient Pressure	100.03	100.07	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.0	dB	Adjusted indicated level	94.0	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10	dB

Self Generated Noise — This test is currently not performed by this Lab.

Microphone installed (if requested by customer) = Less Than	N/A	dB	A Weighting
Uncertainty of the microphone installed self generated noise ±	N/A	dB	

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	12.9	dB	UR	16.7	dB	UR	22.3	dB	UR
Uncertainty of the electrical self generated noise ±							0.12	dB	

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the Guide to the Expression of Uncertainty in Measurement published by ISO.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END .....

Calibrated by: K. Zablocki

R 1

Additional Comments

The instrument was realigned due to 1.4dB drift in calibration mode.

CERTIFICATE OF CALIBRATION

Date of Issue: 14 February 2024

Certificate Number: TCRT24/1157

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory [redacted]

K. Mistry

Customer
TNEI
7th Floor West One
Forth Banks
Newcastle Upon Tyne
NE1 3PA

Order No. 5001

Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	00386739
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	76889
Rion	Microphone	UC-59	12362
Rion	Calibrator	NC-74	34762316
	Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 10. SLM 61672-3:2013

Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2013 Yes

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013

Date Received 13 February 2024 ANV Job No. TRAC24/02069

Date Calibrated 14 February 2024

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013; for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	17 November 2021	214287	NSAI National Metrology Lab

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT24/1157

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1		
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion
Date provided or internet download date	19 March 2021		

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES	
Specified or equivalent Calibrator	Specified	
Customer or Lab Calibrator	Customers Calibrator	
Calibrator adaptor type if applicable	NC-74-002	
Calibrator cal. date	14 February 2024	
Calibrator cert. number	UCRT24/1237	
Calibrator cal cert issued by Lab	ANV Measurement Systems	
Calibrator SPL @ STP	94.03 dB	Calibration reference sound pressure level
Calibrator frequency	1002.41 Hz	Calibration check frequency
Reference level range	Single dB	

Accessories used or corrected for during calibration - None

Environmental conditions during tests	Start	End	
Temperature	22.89	22.82	± 0.30 °C
Humidity	49.4	48.7	± 3.00 %RH
Ambient Pressure	100.10	100.11	± 0.03 kPa

Indication at the Calibration Check Frequency			
Initial indicated level	94.4 dB	Adjusted indicated level	94.0 dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±			0.10 dB

Self Generated Noise

Microphone installed - Less Than 19.2 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	10.8	dB	UR	16.3	dB	UR	22.9	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the Guide to the Expression of Uncertainty in Measurement published by ISO.

Additional Comments

None

..... END .....

Calibrated by: B. Bogdan

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 15 March 2024

Certificate Number: UCRT24/1425

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

[redacted]

K. Mistry

Customer	TNEI Services Ltd 7th Floor West One Forth Banks Newcastle Upon Tyne NE1 3PA
Order No.	5001
Test Procedure	Procedure TP 14 Calibration of Sound Calibrators (60942:2017)
Description	Acoustic Calibrator

Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Rion	Calibrator	NC-75	35002724

Public evidence of Type Approval Yes Approved by PTB

The calibrator has been tested as specified in Annex B of IEC 60942:2017. 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 60942:2017, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2017.

ANV Job No.	UKAS24/03232
Date Received	14 March 2024
Date Calibrated	15 March 2024

Previous Certificate		
	Dated	28 March 2023
	Certificate No.	UCRT23/1424
	Laboratory	0653

Measurements

The sound pressure level generated by the calibrator (averaged over a 20 to 25 second period) in its WS2 configuration was measured five times (rotating the calibrator on the microphone each time) by the Insert Voltage Method using a microphone as detailed below. The mean of the results obtained is shown below.

The frequency of the sound from the calibrator was measured five times over a 20 to 25 second period and the average frequency calculated.

The total distortion + noise of the sound from the calibrator was measured, using a rejection filter distortion factor meter, five times over a 20 to 25 second period and the average distortion + noise calculated.

Test Microphone — *Manufacturer*: Brüel & Kjær — *Type*: 4134

Nominal Setting dB / Hz	Mean Level dB rel 20 µPa	Frequency	Distortion + Noise
94 / 1000	94.03 ± 0.10	1000.00 ± 0.12Hz	(0.12 ± 0.02) %

Environmental conditions during tests	Start	End		
Temperature	22.91	22.98	± 0.30	°C
Humidity	50.0	51.0	± 3.0	%RH
Ambient Pressure	99.299	99.294	± 0.030	kPa

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainties refer to the measured values only with no account being taken of the ability of the instrument to maintain its calibration.

A small correction factor may need to be applied to the sound pressure level quoted above if the device is used to calibrate a sound level meter which is fitted with a free-field response microphone. See manufacturers handbook for details.

Note: Calibrator adjusted prior to calibration? NO

Additional Comments: The results on this certificate only relate to the items calibrated as identified above.
None

Calibrated by: B. Bogdan

R 2

END

Appendix E – Noise Modelling Data

Transformer Data Sheet 275/13.8/13.8 kV, 140/70/70 MVA, ONAN/ONAF, 3 phase

Transformer Details

Continuous Maximum Rating		
HV – LV1 and HV – LV2	MVA	47/70 – 47/70
HV – (LV1 + LV2)	MVA	94/140
HV Voltage	(kV)	275
LV1 – LV2 Voltage	(kV)	13.8 – 13.8
Tapping Range (OLTC)		275 kV -19.5% to +25.5% 31 positions, 30 x 1.5% steps Principal tap shall be position 18
Impedance at principal tap – position 18 (%)		
HV – LV1 and HV – LV2 @ 70 MVA		14.0%
HV – (LV1 + LV2) @ 140 MVA		15.6%
LV1 – LV2 @ 70 MVA		25.0%
Vector Group		YNd11-d11
Cooling		ONAN/ONAF
Maximum Top Oil Rise	(°C)	60
Maximum Average Winding Rise	(°C)	65
Frequency	(Hz)	50
Connections:		
HV		Oil/air bushings
HVN		Oil/air bushing
LV		Oil/air bushing
Finish Shade		BS 381C – 632 Dark Admiralty Grey
Maximum Sound Pressure Level		
Transformer only	dB(a)	65
Transformer plus coolers	dB(a)	68
BIL HV/LV	kVp	1050/125
BIL HVN	kVp	125
SIL HV (kVp)	kVp	850
IVPD enhanced level		1.8
IVPD one-hour level		1.58
Applied Voltage		
HV to LV and earth	kV_{rms}	395
LV to HV and earth	kV_{rms}	38

Guaranteed Losses		Transformer losses shall be such as to comply with EU 548/2014, Tier 2 July 2021.
Minimum efficiency		99.770%.

Technical Schedules

Item	Units	Specified by Company	Guaranteed by GE
Continuous Maximum Rating			
HV – LV1 and HV – LV2	MVA	47/70 – 47/70	47/70 – 47/70
HV – (LV1 + LV2)	MVA	94/140	94/140
HV Voltage	(kV)	275	275
LV1 – LV2 Voltage	(kV)	13.8 – 13.8	13.8 – 13.8
Tapping Range (OLTC)		275 kV -19.5% to +25.5% 31 positions, 30 x 1.5% steps Principal tap position 18	275 kV -19.5% to +25.5% 31 positions, 30 x 1.5% steps Principal tap position 18.
Impedance at principal tap – position 18			
HV – LV1 and HV – LV2 @ 70 MVA		14.0%	14% (IEC tolerance +/- 7.5%)
HV – (LV1 + LV2) @ 140 MVA		15.6%	15.6% (IEC tolerance +/10%)
LV1 – LV2 @ 70 MVA		25.0%	25% (IEC tolerance +/-10%)
Impedance at maximum tap position 1			
HV – LV1 and HV – LV2 @ 70 MVA		-	16.4% (IEC tolerance +/10%)
HV – (LV1 + LV2) @ 140 MVA		-	17% (IEC tolerance +/10%)
LV1 – LV2 @ 70 MVA		-	TBA
Impedance at minimum tap position 31			
HV – LV1 and HV – LV2 @ 70 MVA		-	15.2% (IEC tolerance +/10%)
HV – (LV1 + LV2) @ 140 MVA		-	15.9% (IEC tolerance +/10%)
LV1 – LV2 @ 70 MVA		-	TBA
Vector Group		YNd11-d11	YNd11-d11
Cooling		ONAN/ONAF	ONAN/ONAF
Maximum Top Oil Rise	(°C)	60	60k
Maximum Average Winding Rise	(°C)	65	65k
Frequency	(Hz)	50	50
Connections:			
HV		Oil/air bushings	Oil/air bushings
HVN		Oil/air bushing	Oil/air bushings
LV		Oil/air bushing	Oil/air bushings
Finish Shade		BS 381C – 632 Dark Admiralty Grey	BS 381C – 632 Dark Admiralty Grey
Maximum Sound Pressure Level			
Transformer only	dB(a)	65	65 @1m. Sound Intensity method
Transformer plus coolers	dB(a)	68	68 @2m. Sound Intensity method
BIL HV/LV	kVp	1050/125	1050/125
BIL HVN	kVp	125	125
SIL HV (kVp)	kVp	850	850 (IEC60076-3 – Table 2)
IVPD enhanced level		1.8	1.8

IVPD one-hour level		1.58	1.58
Applied Voltage			
HV to LV and earth	kV_{rms}	395	395
LV to HV and earth	kV_{rms}	38	38
Guaranteed Losses			
No load	kW	EU 548/2014, Tier 2 July 2021	54 @1pu rated Voltage.
Full load	kW	EU 548/2014, Tier 2 July 2021	440 @ 140MVA, both LV's loaded on Nom Tap Pos 18
Minimum efficiency		99.770%.	99.78%

Core Detail	GE Transformer
Core construction, step-lap etc.	Core type, step lap.
Type of core - 3 limb, 5 limb, etc.	3 Limb.
Core plate material type	M105-30P5.
Core plate material thickness (mm)	0.3
Core diameter (mm)	773
Core area (mm^2)	432400
Flux density at 100% volts & 50 Hz (Tesla)	1.65
Core weight excluding clamps (kg)	51000
Core weight including clamps (kg)	Approximately 55850.
Clamping type, tie-rod, flitch plate	Flitch Plate.
Tie rod diameter, flitch plate thickness (mm)	10
Top/Bottom clamp thickness (mm)	70 / 50
Method of securing (bands, belts etc.)	Bands.

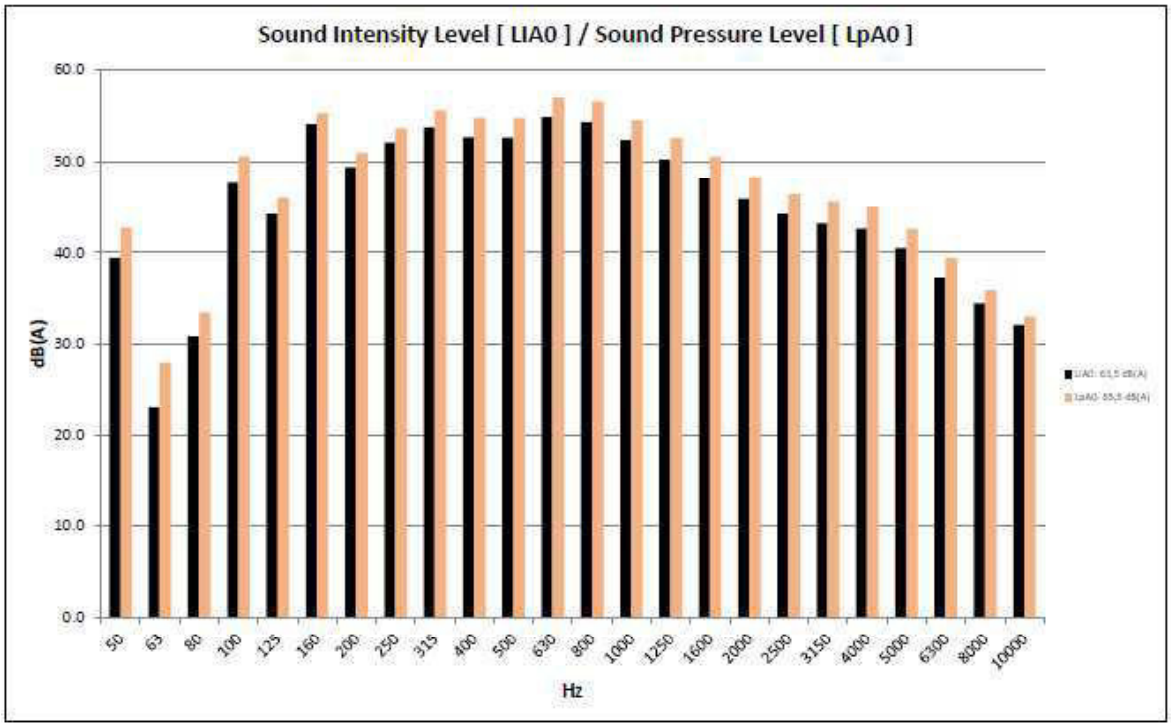
Winding Detail	GE Transformer			
Winding disposition core/__/__/__	LV1 Bottom - LV2 Top / HV / Taps			
Winding name	LV1 Bottom	LV2 Top	HV	Taps
Winding type - spiral/disc etc.	Layer	Layer	Shielded Disc	Disc
Total turns	87	87	1031	240
Total no. of discs/sections	2 layers	2 layers	2 x 70	2 x 32
Turns/disc or section	43.5 T/layer	43.5 T/layer	15	7.5
Min cooling gap between discs/sects (mm)	3	3	4	4
Copper hardness	80MPA	80MPA	80MPA	140MPA
Conductor type	Netted/mylar CTC	Netted/mylar CTC	CTC	Strip
For CTC - No. strips in llel	37	37	9	N/A
Bare conductor size (mm)	4.35 x 1.7	4.35 x 1.7	4.8 x 1.3	9 x 2.6
No. conductors in llel	2	2	1/half stack	2/half stack
Epoxy bonded Y/N	Y	Y	Y	N
Conductor ins - radial enamel/paper (mm)	0.04/0.075 mylar	0.04/0.75 mylar	0.04/0.55	N/A / 0.55
Conductor area (mm^2)	520.4	520.4	108.5	91.4
Max current density @ CMR (A/mm^2)	3.25	3.25	2.71	3.22
Wdg ID/OD (mm)	807 / 977	807 / 977	1109 / 1377	1507 / 1625
Wdg pressed height (mm)	2130 over LV1 + LV2	2130 over LV1 + LV2	2090	1518
Final clamping pressure (kN/mm^2). Based on worst case end force.	3.7	3.7	3.7	3.7
Shield wire used Y/N	N	N	Y	N
Dimensions and ins of shield wire	N/A	N/A	9.7x1 with 0.55 rad PC	N/A
Winding gradient to oil (°C) (ONAF)	13k calc	13k calc	15k calc	17k calc
Max winding hotspot temperature (°C) (ONAF)	69k rise	69k rise	72k rise	74k rise
Position of max wdg hotspot	Top 2 turns	Top 2 turns	Top 2 discs	Top 2 discs

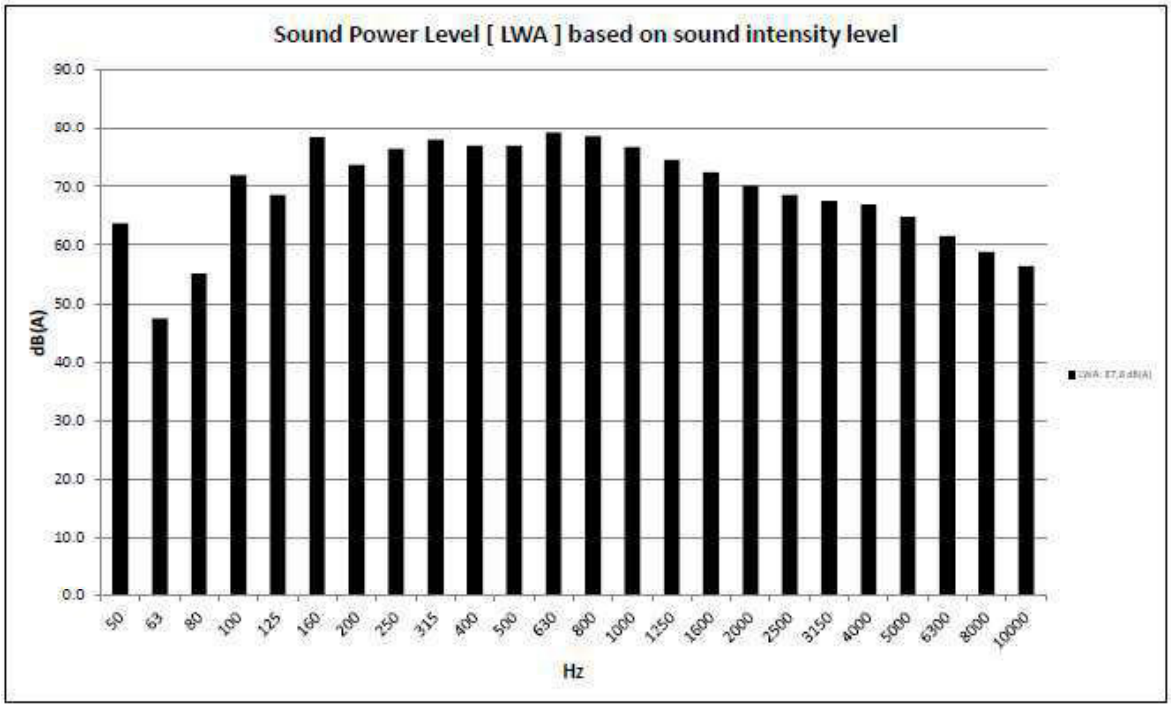
Tank and Fittings	GE Transformer
Tank material	Mild Steel
Sheet thickness (mm) Bottom Sides Top	 25 10 25
Tank external dimensions L/W/H (m)	Refer to Tender General Arrangement Drawing Enclosure 12.1
High/Low kerb?	Low
Tank vacuum withstand (mm of Hg)	0.75 inside tank
Tank overpressure withstand (kPa)	Normal head plus 35 kPa
Tank suitable for skidding in both axes?	Yes
Detail tank wall shunt/flux rejectors	Tank magnetic shunts 15mm thick
Conservator thickness (mm)	8
Conservator size - diameter x length (mm)	Refer to Tender General Arrangement Drawing
Volume between high/low levels (litres)	Refer to Tender General Arrangement Drawing
No. of radiators	20
Radiator height (m)	2.5
No. of radiator elements	28

Sound Level

Serial No. : 1ZPL001134582

Measurement 4





Sound Level

Serial No. : 1ZPL001134582

Combination of sound level measurements

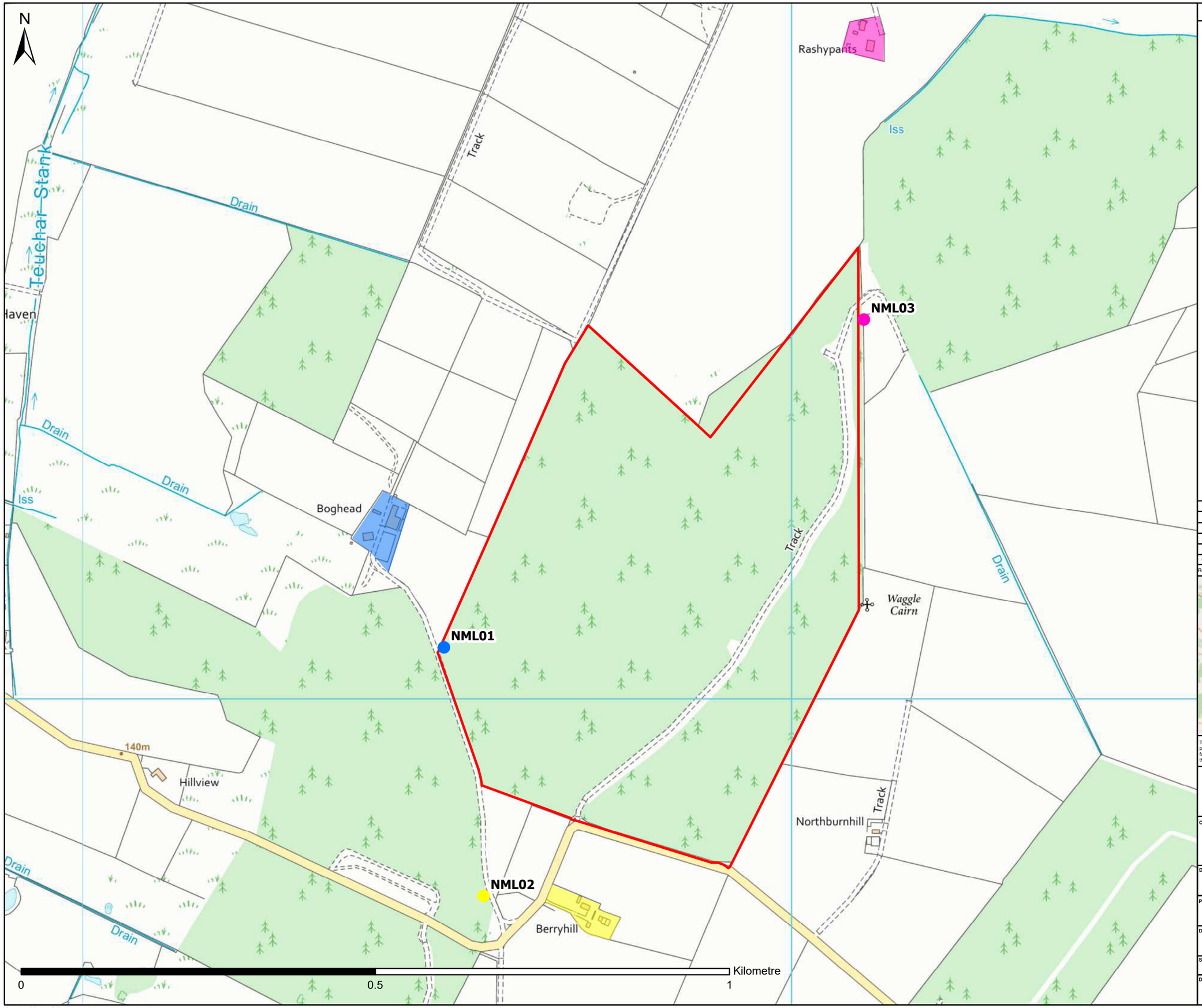
Rated voltage	Applied voltage	Rated current	Applied current	Tap position	Fans in operation	Pumps in operation
[%]	[kV]	[%]	[A]			
100	33	100	262.43		8	

	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**

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

	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

- Redline Boundary (Option Site)

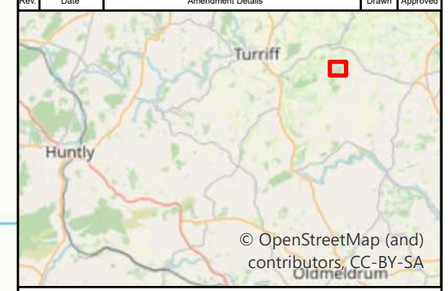
Noise Monitoring Locations (NMLs)

- NML01
- NML02
- NML03

Noise Sensitive Receptors (NSRs)

- NSRs represented by NML01
- NSRs represented by NML02
- NSRs represented by NML03

Rev.	Date	Amendment Details	Drawn	Approved
0	27/03/2025	FOR INFORMATION	ST	EW



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Client: FIELD

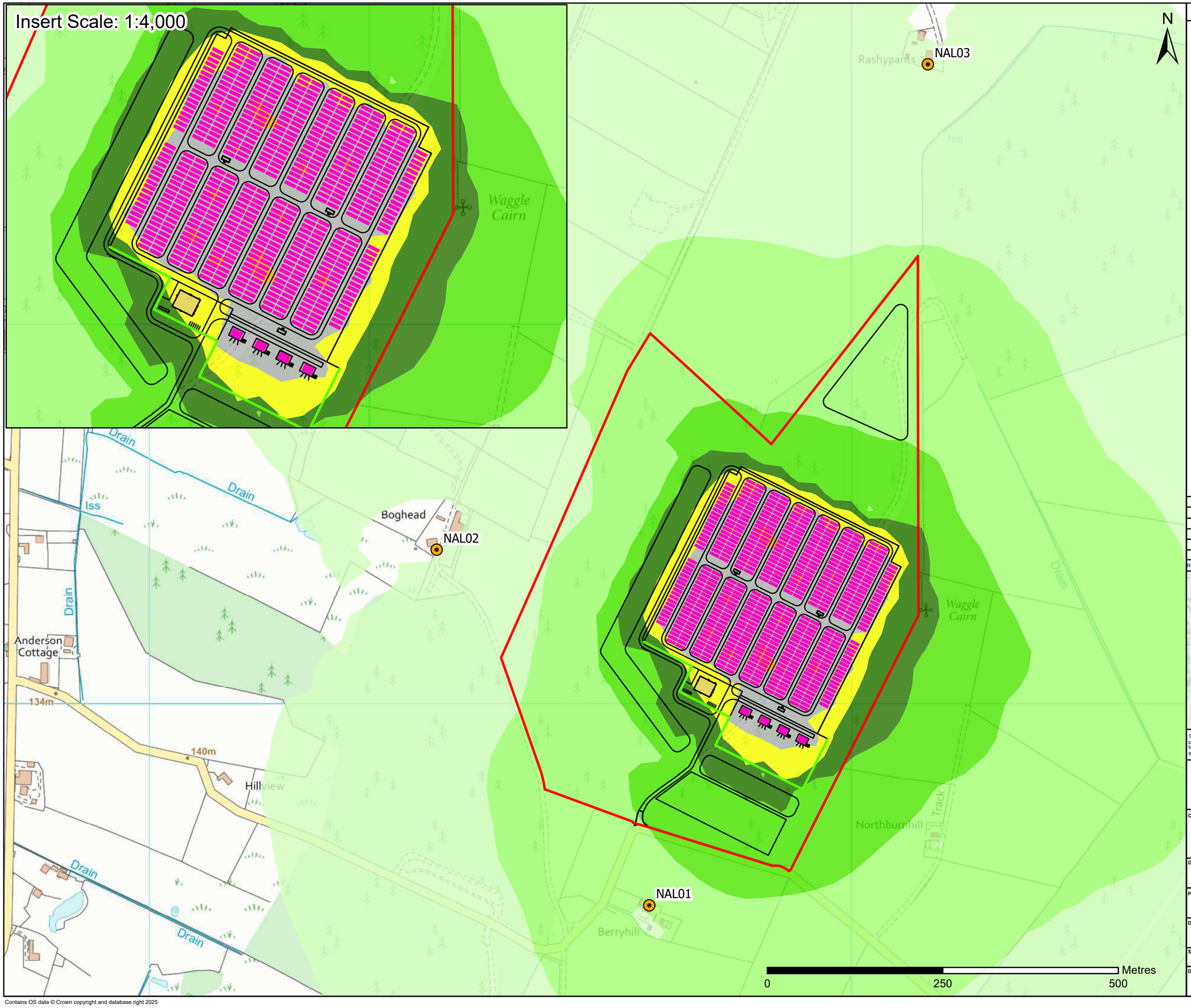
Drawing Status: FOR INFORMATION

Project Title: NEW DEER 2 BESS

Drawing Title: FIGURE 1: STUDY AREA

Scale:	Original Size:	Spatial Reference:
1:5,000	A3	British National Grid

Drawing Number: 17127-015



LEGEND

- Site Layout
- Noise Assessment Locations (NALs)
- Modelled Noise Sources
- Modelled Buildings
- Acoustic Barrier

Predicted Noise Levels (dBA)

- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60

Noise contours modelled in accordance with ISO 9613 Part 2:2024 at a height of 4 m and displayed on a 25 m by 25 m grid. All noise sources assumed to be operating concurrently. All levels shown as dB LAeq(t).

Rev.	Date	Amendment Details	Drawn	Approved
0	27/03/2025	FOR INFORMATION	ST	EW

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Client: FIELD

Drawing Status: FOR INFORMATION

Project Title: NEW DEER 2 BESS

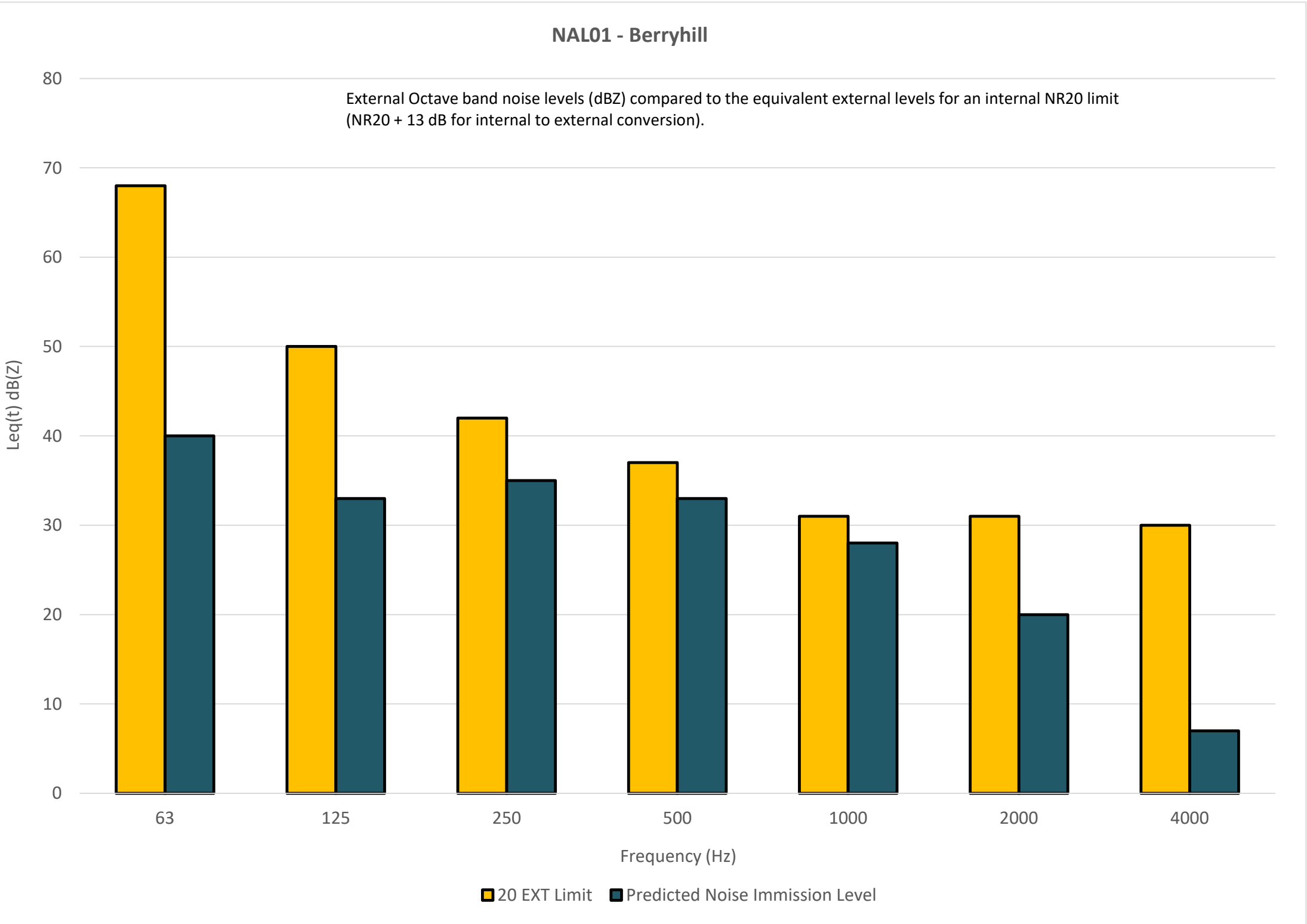
Drawing Title: FIGURE 2: NOISE CONTOUR PLOT

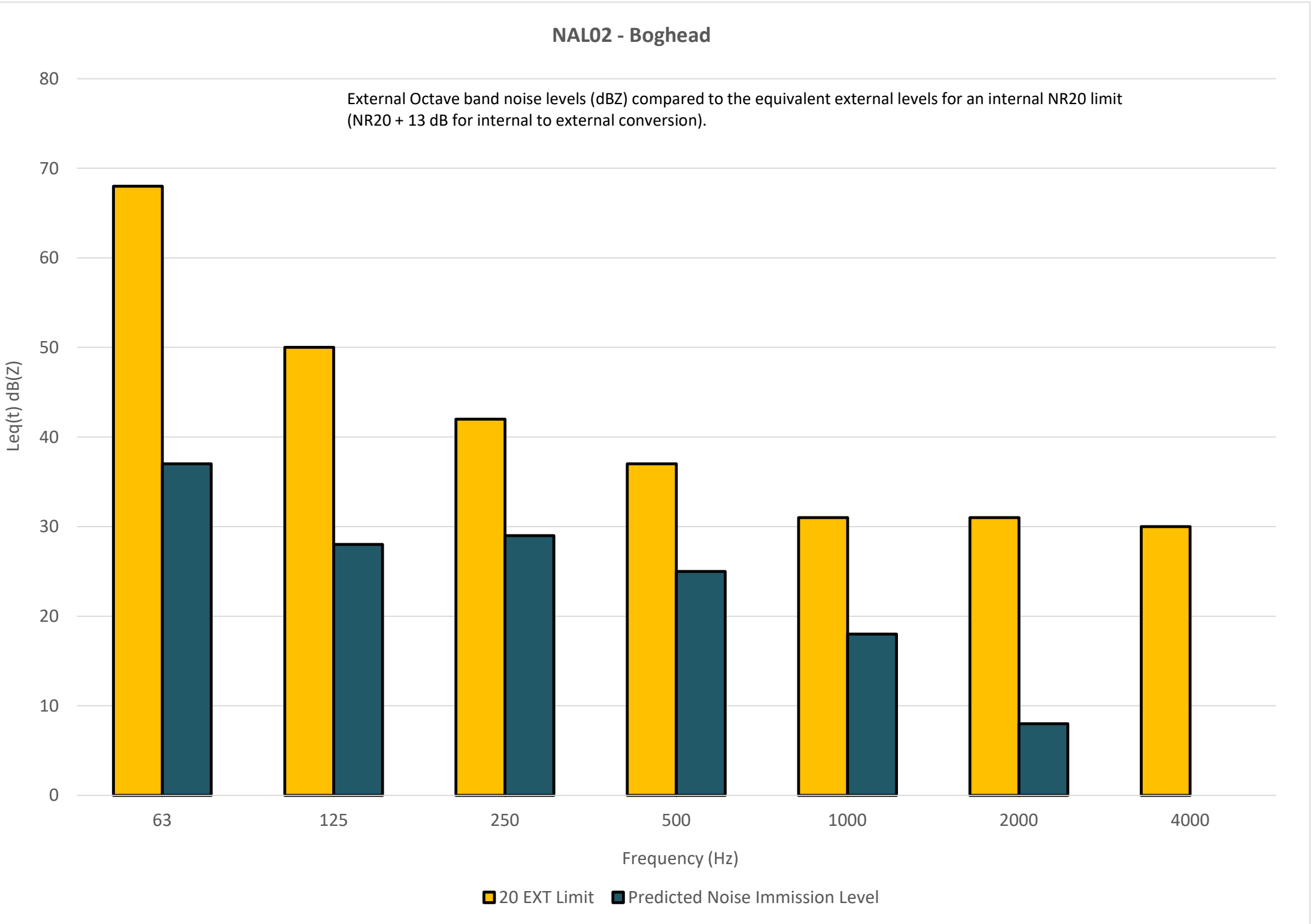
Scale:	Original Size:	Spatial Reference:
1:5,000	A3	British National Grid

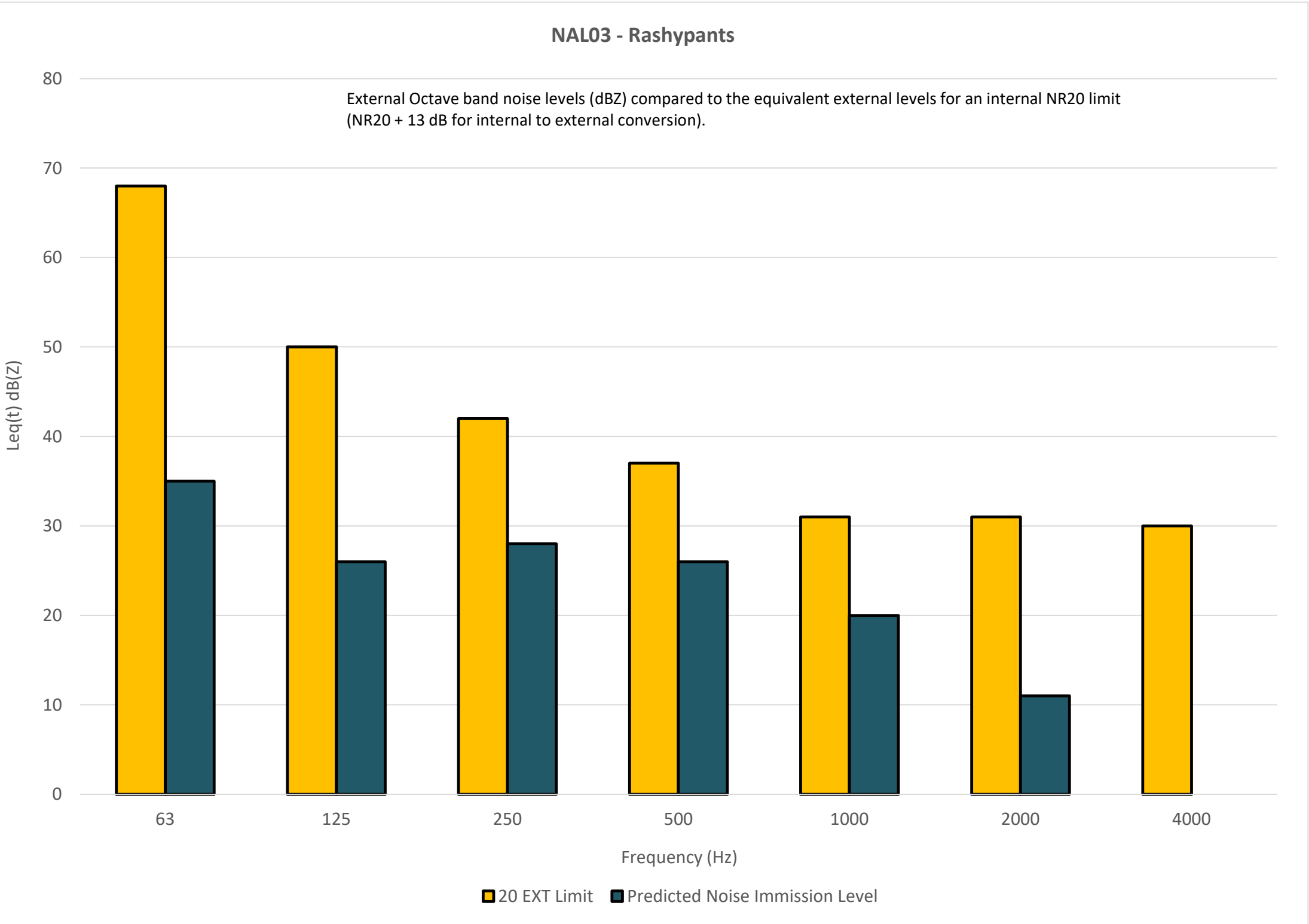
Drawing Number: 17127-016

Appendix G – NR Curve Assessment Table and Graphs

Noise Assessment Location (NAL)	Descriptor	Frequency (Hz), dBZ						
		63	125	250	500	1000	2000	4000
Night-time Limit (NR 20 EXT)		**68**	**50**	**42**	**37**	**31**	**31**	**30**
NAL01	Berryhill	40	33	35	33	28	20	7
NAL02	Boghead	37	28	29	25	18	8	0
NAL03	Rashypants	35	26	28	26	20	11	0


NAL01 - Berryhill
External Octave band noise levels (dBZ) compared to the equivalent external levels for an internal NR20 limit (NR20 + 13 dB for internal to external conversion).
80
70
60
50
40
30
20
10
0
Leq(t) dB(Z)
63
125
250
500
1000
2000
4000
Frequency (Hz)
20 EXT Limit
Predicted Noise Immission Level


NAL02 - Boghead
External Octave band noise levels (dBZ) compared to the equivalent external levels for an internal NR20 limit (NR20 + 13 dB for internal to external conversion).
80
70
60
50
40
30
20
10
0
Leq(t) dB(Z)
63
125
250
500
1000
2000
4000
Frequency (Hz)
20 EXT Limit
Predicted Noise Immission Level


NAL03 - Rashypants
External Octave band noise levels (dBZ) compared to the equivalent external levels for an internal NR20 limit (NR20 + 13 dB for internal to external conversion).
80
70
60
50
40
30
20
10
0
Leq(t) dB(Z)
63
125
250
500
1000
2000
4000
Frequency (Hz)
20 EXT Limit
Predicted Noise Immission Level