



APPENDIX 12-3

**BATTERY ENERGY STORAGE
SYSTEM (BESS) NOISE REPORT**



A specialist energy consultancy

Battery Energy Storage System (BESS) Noise Report

Cooloo Wind Farm

Neoen

IE00015-019-R0
19 September 2025

COMMERCIAL IN CONFIDENCE

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1 Introduction

1.1 Overview

TNEI Ireland Ltd was commissioned by MKO on behalf of Neoen ('the Applicant') to undertake a Noise Impact Assessment (NIA) for the operation of a Battery Energy Storage System (BESS) and 110kV Substation, which forms part of the Proposed Project. For the purposes of this Technical Appendix, the term 'the Proposed Grid Connection' will pertain to the BESS and Substation element of the Proposed Project only.

The Proposed Grid Connection is located within a rural, agricultural setting in east Galway, approx. 12 km southeast of Tuam, at approximate ITM coordinates 554926, 748223. There are a small number of residential properties located in the vicinity of the Proposed Grid Connection, the nearest of which is located approximately 225 m to the northwest.

The method of assessing operational noise from a BESS development is very different from that which is used to assess operational wind turbine noise and, as such, the two assessment types cannot be combined. Accordingly, the assessment of operational noise attributable to the BESS and 110kV Substation is presented separately in this report, and the operational wind farm noise assessment is provided in Technical Appendix 12-2.

It should be noted that whilst the BESS and 110kV Substation element of the Proposed Project is being assessed in full within this Technical Appendix as part of this EIAR, it does not form part of the planning application for Cooloo Wind Farm at this stage as outline in Section 4.1 of Chapter 4. As part of a later application, it is anticipated that a revised NIA will be required, therefore the purpose of this NIA is to provide an initial assessment of the likely noise impacts associated with the BESS and 110kV Substation.

Accordingly, the aims of this NIA are to:

- Identify potential noise sensitive receptors in the vicinity of the Proposed Grid Connection;
- Describe the existing noise environment around the noise sensitive receptors;
- Identify the dominant sound sources associated with the operation of the Proposed Grid Connection;
- Calculate the likely levels of operational noise at the nearest noise sensitive receptors to determine the noise impacts associated with the Proposed Grid Connection; and,
- Indicate any requirements for mitigation measures, if required, to provide sufficient levels of protection for nearby receptors.

1.2 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;
- **Rating Level** refers to the immission level after consideration of the character of the sound. The Rating Level is the Immission Level plus any required character corrections, if this is deemed necessary.
- **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 noise levels have been measured;
- **NSRs** (Noise Sensitive Receptors) are all identified receptors that are sensitive to noise; and;
- **BNAL** (Noise Assessment Location) refers to any location where the immission levels are calculated and assessed.

All figures referenced within the report can be found in Annex 4.

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

All grid coordinates refer to the Irish Transverse Mercator grid, using Eastings and Northings.

2 Project Description

A BESS principally consists of three main elements: batteries, inverters, and Medium Voltage (MV) transformers. Groups of batteries are connected into an inverter, which converts between Direct Current (DC) and Alternating Current (AC). The inverter is then connected to a Medium Voltage (MV) transformer.

A BESS development is made up of several battery, inverter and MV Transformer units. Sometimes the inverter and MV transformers can be combined into a single unit. Collectively the inverter and MV transformer is referred to as a Power Conversion System (PCS).

The MV transformers will ultimately be connected to the grid network, typically through one or two High Voltage (HV) transformers, although these are not always located within the BESS site itself, sometimes utilising existing HV transformers located within a nearby substation.

2.1 Proposed Layout

A high level, indicative layout for the Proposed Grid Connection is included in Annex 1 as well as Appendix 4-4 of the EIAR. The candidate plant for the layout is based on a CATL solution, which uses a layout configuration consisting of battery containers, and separate inverter/MV transformer units. Additionally, a single HV transformer unit is included in the Proposed Grid Connection as a part of the substation.

Based on the candidate plant layout, the primary sound sources considered within this assessment are:

- CATL EnerC+ Battery Storage Container Units, 15 of;
- SMA UP Inverter/MV Transformer Units, 6 of; and
- ABB HV Transformer Unit, 1 of (included as part of the adjacent substation area).

The sound level output of any auxiliary infrastructure included as part of the Proposed BESS, for example, switch gear, auxiliary transformers or substation buildings, will be insignificant in comparison to the primary sound sources detailed above. Accordingly, no other items of plant have been considered within this assessment.

2.2 Study Area

Noise Sensitive Receptors (NSRs) are properties that are sensitive to noise and, therefore, require protection from nearby noise sources. The study area has been defined through the identification of the closest NSRs within 2.5 km of the Proposed Wind Farm site. The closest NSR to the BESS is located approximately 225 m to the northwest, with further clusters of NSRs located at a further distance in the same direction. To the southwest, the closest NSR is approximately 720 m. There are also receptors at greater distances in other directions.

The assessment of noise attributable to the Proposed Grid Connection considers the nearest and most sensitive NSRs only, on the assumption that if sound levels at these receptors are within the defined limits, then sound levels at NSRs located at greater distances should also be within acceptable levels.

Figure A4.1 in Annex 4 details the location of the BESS in context of the closest NSRs considered within the assessment. Figures A4.1a – A4.1d detail the location of the BESS in the context of all of the surrounding NSRs.

3 Methodology

Legislation, Policy Context and Guidelines

There is no specific Irish guidance that contains a detailed method for the assessment of environmental noise, however, to address this gap and try to bring consistency across Local Authorities, the Association of Acoustic Consultants of Ireland have published '*Environmental Noise Guidelines (ENG) for Local Authority Enforcement and Planning Sections*'⁽¹⁾, which states (in relation to Industrial developments):

"Useful guidance is additionally presented in British Standard BS 4142:2014 Methods for rating and assessing industrial and commercial sound (2014), which provides an assessment methodology based on existing background levels."

The ENG also refers to the Environmental Protection Agency Office of Environmental Enforcement's (OEE) '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*', stating:

"Industrial installations regulated by the EPA are typically subject to noise limits drawn from EPA document NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities (2016). On this basis, NG4 is also arguably the most relevant guidance document with respect to industrial facilities regulated by Local Authorities."

It is acknowledged that the Proposed Project is **not an EPA licensed site**, however some of the principles contained within NG4 could prove useful in the context of the assessment of operational noise from the BESS, so is included here for completeness.

3.1 Assessment Method

3.1.1 BS 4142 Assessment Method

The British Standard (BS) 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* BS 4142⁽²⁾ (hereafter referred to as BS 4142) form of assessment is based on the predicted or measured levels of an assessed sound source compared to the measured background sound levels without the specific sound source present and uses, "*outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*".

In reference to the existing baseline conditions i.e. before any proposed development, BS 4142 uses the following terms:

- **Residual Sound Level:** The sound level of all noise sources in an area, except the sound source to be assessed, over a given time interval, t . Described using the metric $L_{Aeq}(t)$.
- **Background Sound Level:** This is also the sound level of all noise sources in an area except the sound source to be assessed, however, it is quantified by determining the sound level that is exceeded for 90% of the given time interval. Described using the metric $L_{A90}(t)$.

The next two noise metrics (below) represent noise attributable to the proposed development only:

- **Specific Sound Level:** The equivalent continuous A-weighted sound pressure level (SPL) produced by the specific sound source at the assessment location over a given reference time interval, i.e. the sound level of just the sound source to be assessed. Described using the metric $L_{Aeq}(t)$.

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

The final noise metric represents the future noise level during the operational phase of a proposed development and can be thought of as the 'Total Sound' i.e. the existing baseline + the proposed development:

- **Ambient Sound Level:** Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far i.e. the sound level of all noise sources in an area, including the sound source to be assessed. 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.

Additional guidance on the BS 4142 assessment methodology is provided in the Association of Noise Consultants' (ANC) BS 4142: Technical Note ⁽³⁾, which has been authored by the ANC Good Practice Working Group (ANC, 2020). The guide is "*designed to assist readers with a reasonable interpretation and application of BS 4142 as a whole*".

The BS 4142 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 list¹, which is not exhaustive, gives some examples that could be relevant to the assessment:

- the absolute level of sound;

¹ Examples of contextual issues to consider can be found in the BS 4142 standard, the ANC BS 4142 Technical Note and Method Implementation Document (MID) for BS 4142 ⁽⁷⁾

- 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.

3.1.2 NG4 Guideline Noise Level Limits

Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) ⁽⁴⁾ provides a structured framework for the management of noise from licensed activities, as well proposing consistent methods for measuring, assessing, and reporting environmental noise at EPA-licensed and industrial use sites.

The guidance note details typical noise limits used for ‘Licenced Sites’ which range between 45 and 55 dB LAeq(t), depending on the time of day/night. In addition, recommendations are made for additional noise criteria to use in areas of low background noise levels, which initially requires the location to be assessed to determine whether it is classed as a “Quiet Area”.

The site screening criteria, to determine whether it is a Quiet Area, is as follows:

- At least 3 km from urban areas with a population >1,000 people;
- At least 10 km from any urban areas with a population >5,000 people;
- At least 15 km from any urban areas with a population >10,000 people;
- At least 3 km from any local industry;
- At least 10 km from any major industry centre;
- At least 5 km from any National Primary Route, and;
- At least 7.5 km from any Motorway or Dual Carriageway.

The site is classed as a Quiet Area if ALL of the above criteria are met, in which case, NG4 suggests “...very stringent noise criterion may be considered appropriate”. Where the area is not classified as a “Quiet Area,” a survey is required in order to ascertain the existing baseline sound levels. In this regard the document states;

“For all areas not identified as Quiet Areas in Step 1, the existing background noise levels measured during the environmental noise survey should be examined to determine if they satisfy the following criteria:

- *Average Daytime Background Noise Level $\leq 40\text{dB } L_{AF90}$, and;*
- *Average Evening Background Noise Level $\leq 35\text{dB } L_{AF90}$, and;*
- *Average Night-time Background Noise Level $\leq 30\text{dB } L_{AF90}$.”*

Where the three bullet points above are satisfied, the area can be considered an “Area of Low Background Noise”.

Once the area has been classified, the noise criteria detailed in Table 3-1, can be applied.

Table 3-1: NG4 Recommended Noise Limit Criteria

Scenario	Daytime Noise Criterion, dB $L_{A,T}$ (07:00 to 19:00hrs)	Evening Noise Criterion, dB $L_{A,T}$ (19:00 to 23:00hrs)	Night-time Noise Criterion, dB $L_{Aeq,t}$ (23:00 to 07:00hrs)
Quiet Area	Noise from the licensed site to be at least 10 dB below the average daytime background noise level measured during the baseline noise survey.	Noise from the licensed site to be at least 10 dB below the average evening background noise level measured during the baseline noise survey.	Noise from the licensed site to be at least 10 dB below the average night-time background noise level measured during the baseline noise survey.
Areas of Low Background Noise	45 dB	40 dB	35 dB
All Other Areas	55 dB	50 dB	45 dB

3.2 Assessment Criteria

Considering all of the above, the assessment is made as follows:

- The BS 4142 assessment is undertaken, in accordance with the guidance; and,
- For the second stage of the BS 4142 assessment, the relevant noise criteria that would be set using NG4 is considered as a relevant contextual element.

3.3 Calculation Method

3.3.1 ISO 9613-2:2024

To predict the noise immission levels attributable to the BESS, a noise propagation model was created using the propriety noise modelling software, CadnaA. 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 ISO9613-2:2024 *Acoustics — Attenuation of sound during propagation outdoors: Engineering method for the prediction of sound pressure levels outdoors* ⁽⁵⁾, using the following input parameters:

- Temperature is assumed to be 10°C and relative humidity as 70%;
- A ground attenuation factor of 1 (soft ground) has been used except for specific areas of developed ground (including the BESS and 110kV Substation area) which is modelled with a ground attenuation factor of 0 (hard ground); and
- Receiver heights have been set to 4 m to represent the height of a first-floor bedroom window.

3.3.2 Uncertainties and Limitations

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

- In accordance with ISO 9613, all assessment locations are modelled as downwind of all sound sources and propagation calculations are based on a moderate ground-based temperature inversion, such as commonly occurs at night. These conditions are favourable to noise propagation;
- The predicted barrier attenuation provided by local topography, embankments, walls, buildings and other structures in the intervening ground between source and receiver can only be approximated and not all barrier attenuation will have been accounted for;
- The model assumes all sound sources are operating continuously, simultaneously and at a typical operating capacity.

Note that the modelled sound sources represent candidate plant and an associated site layout. The location, operating conditions, number of, and noise output of individual items of plant may vary from what is presented in this report after final plant specification, which cannot be undertaken without a tendering process that would occur after planning consent has been granted. As such, it is expected that an additional noise impact assessment will be undertaken upon final specification of layout and plant.

4 Baseline Sound Level Survey

4.1 Monitoring Locations

TNEI undertook an operational wind turbine noise assessment for the Proposed Cooloo Wind Farm. As part of the study, continuous background sound level monitoring was undertaken at seven neighbouring properties over the period 7th October 2022 – 31st December 2022 for NMLs 1-6, and to the 5th January 2023 for NML7. Table 4-1 details all seven Noise Monitoring Locations (NMLs), which are being used in this assessment. The NMLs are also shown in Figure A4.1 included within Annex 4.

Table 4-1: Noise Monitoring Locations

NML		Coordinates	
ID	Approximate Distance and Bearing to BESS and Substation plant (m)	Eastings	Northings
NML1	2,200m, east	557141	748275
NML2	3,130m, northeast	557535	749999
NML3	2,920 m, north	555042	751218
NML4	1,570 m, north	554814	749877
NML5	960 m, northwest	554010	748665
NML6	1,370 m, southeast	554262	746953
NML7	1,400 m, southwest	556015	747381

4.2 Survey Equipment and Meteorological Conditions

The noise monitoring equipment consisted of Rion NL-31's, Rion NL-32's and a Rion NL-52 Sound Level Meter (SLM), fitted with appropriate environmental wind shields. All noise monitoring equipment (calibrator, SLM and microphones) used for the study are categorised as Class 1, as specified in IEC 61672-1 'Electroacoustics. Sound level meters. Specifications' ⁽⁶⁾. The equipment was calibrated onsite at the beginning and end of each measurement period with no significant deviations noted.

Wind speed and direction data was measured continuously during the noise survey using a LIDAR unit, which was temporarily installed within the Proposed Wind Farm site for the purposes of background noise collection. For wind farm operational noise assessments, the measured noise data is organised into wind speed 'bins' to determine wind-speed specific noise limits. In contrast, BS 4142 states:

"Exercise caution when making measurements in poor weather conditions, such as wind speeds greater than 5 m/s."

Accordingly, the noise data was filtered to remove any data points that were measured during periods of high wind speeds and rain. In this particular case, all noise data measured with wind speeds at or above 5 m/s has been removed. Time series charts are provided in Annex 2 for each of the NMLs, which present the measured 10-minute L_{Aeq} and L_{A90} , the wind speed (m/s) and any periods where data has been removed, including for precipitation events.

It should be noted that the wind speed data used in this assessment is based on measurements made at wind speeds at 10 m height (standardised). BS 4142 suggest that wind speed measurements should be undertaken at the NMLs, at comparable measurement heights to the Sound Level Meters. Therefore, the approach undertaken here in using wind speed measurements captured by a LiDAR unit on the Proposed Wind Farm site, measuring at the turbine hub height and then standardising to 10 m, is a more cautious approach. This is due to the resulting higher wind speeds than if measurements were undertaken at each NML at a height of 1.5 m.

4.3 Existing Noise Environment

Subjective observations made during the installation and collection of equipment, and during 2 site visits for equipment maintenance, noted the following:

- At NML01 agricultural noise, cattle lowing, birdsong, distant road traffic noise and wind through the vegetation were all noted during the survey.
- At NML02 agricultural noise, birdsong, cars passing the property, and wind through the vegetation were all noted during the survey.
- At NML03 agricultural noise, cattle lowing, birdsong, cars frequently passing the property, and wind through the vegetation were all noted during the survey.
- At NML04 agricultural noise, cattle lowing, birdsong, cars frequently passing the property, and wind through the vegetation were all noted during the survey. A workshop was noted at the property and the occasional power hose was heard.
- At NML05 birdsong, cars passing the property, and wind through the vegetation were all noted during the survey. A neighbour undertaking constriction work was also noted on one of the site visits.
- At NML06 agricultural noise, cattle lowing, birdsong, cars frequently passing the property (due to the national road), and wind through the vegetation were all noted during the survey.
- At NML07 agricultural noise (particularly tractor noise), birdsong (particularly from crows), distant road traffic noise and dogs barking were all noted during the survey.

Documentation relating to the survey (including calibration certificates), and full field data sheets which detail information and observations on each location are also provided in Appendix 12-2 as part of the Operational Wind Farm noise survey for the Proposed Wind Farm.

Table 4-2 presents the derived representative Background Sound Level and the Residual Sound Level for the daytime and night-time periods at each NML.

The Background Sound Levels were determined with reference to the time-history charts, statistical analysis charts and distribution analysis charts included in Annex 2, following the guidance 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.”

The Residual Sound Levels were determined through consideration of the range, mean and median values of the daytime and night-time measured LAeq values, which are detailed in Annex 2.

Table 4-2: Measured Sound levels

Noise Monitoring Location (NML)	Background Sound Level, dB L _{A90} (10mins)		Residual Sound Level, dB L _{Aeq} (10mins)	
	Day	Night	Day	Night
NML1	31	28	37	29
NML2	28	19	43	25
NML3	26	17	36	23
NML4	35	33	42	36
NML5	30	19	40	27
NML6	32	20	42	32
NML7	37	23	45	31

4.4 NG4 Baseline Characterisation

TNEI can confirm that the study area cannot be classed as a Quiet Area, as it does not comply with all of the requirements presented in 3.1.2. For example, the nearest National Primary Route is within 5 km.

Consideration of the BS 4142 derived background sound levels, however, does indicate that the area can be classified as an “Area of Low Background Noise”.

5 Operational Noise Impacts

5.1 Modelling of Noise Sources

The noise model considers the primary 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 sound sources 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 Grid Connection. It should be noted that final plant specifications may vary during the final tendering process.

Where possible, noise modelling data is shown within Annex 3, however, where data cannot be published due to confidentiality reasons, TNEI would be happy to discuss this data in more detail with the Planning Authority (or any other relevant stakeholders), if required.

5.1.1 CATL EnerC+ Battery Storage Container Units

The noise model considers 15 CATL EnerC+ battery storage units, with each unit being modelled as a building with one façade (where the air outlet is situated) modelled as an area source. Each area source has a broadband Sound Power Level (SWL) of 79 dBA which is the maximum SWL reported within the product datasheet for the CATL EnerC+ unit with a sound attenuation cover.

5.1.2 SMA UP Inverter/MV Transformer Units

The noise model assumes that 6 inverter/ MV transformer units, known as a Power Conversion Systems (PCS), will be installed at the Proposed Grid Connection. The candidate PCS modelled in this assessment is the SMA 3950 UP-XT 3 stack device with a silencer kit. Each PCS has been modelled as a cube with five area sources (one for each façade) and the broadband SWL for each area source has been reduced by 7 dB such that the overall SWL of one PCS unit equates to 86 dBA.

The one-third octave frequency band noise data for both the candidate BESS and Inverter/MV transformer unit has been provided to TNEI under a Non-Disclosure Agreement (NDA) and as such the spectral data cannot be provided in this report. However, TNEI would be happy to discuss this data in more detail with the relevant Planning Authority, if required.

5.1.3 ABB HV Transformer Unit

A single HV Grid Transformer Unit has been modelled using TNEI's in-house data for a candidate ABB HV transformer with a broadband SWL value of 88 dBA. Each transformer has been modelled as a box consisting of five area sources (four facades and the roof). Each area source has been modelled with 7 dB of attenuation such that the logarithmic sum of the five sources equates to the overall sound power level of 88 dBA. The relevant data sheets for the candidate plant used are included within Annex 3.

5.1.4 Source Noise Levels

Table 5-1 presents the octave band sound power levels (SWL) used in the noise model for each noise source.

Table 5-1: Octave Band Sound Power Levels of Modelled Noise Sources, dBA

Noise Source	Broadband	Octave band							
	dBA	63	125	250	500	1000	2000	4000	8000
CATL Battery Unit*	79	Spectral data covered by NDA - confidential							
SMA UP MV Inverter*	86	Spectral data covered by NDA - confidential							
ABB Grid Transformer*	82	58	73	76	77	75	69	65	59
* Indicates a noise source that has been modelled using one third octave band data									

5.2 Incorporation of Additional Mitigation Measures

An acoustic fence has been included within the design to reduce noise immission levels at the most sensitive NSRs, which are located to the northwest of the Proposed Grid Connection. The fencing has been modelled at a height of 4 m around the northwestern perimeter of the Site. The location of the fencing is shown within Figure A4.2 of Annex 4.

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 7 BESS Noise Assessment Locations (termed BNALs), which have been selected to represent the closest NSRs to the Proposed Grid Connection. Each BNAL has been set on the side of the property facing the Proposed Grid Connection. The BNALs are detailed in Table 5-2 alongside its associated representative NML. BNALs are also shown on Figure A4.1a-d in Annex 4. Additional residential receptors i.e. all those identified within a 2.5 km study area, were also included in the noise model and these are detailed in Annex 5.

Table 5-2: Noise Assessment Locations (NALs)

Noise Assessment Location		OS Grid Reference		Representative NML
BNAL ID	BNAL Descriptor	Eastings	Northings	
BNAL01	225 m, northwest	554717	748406	05
BNAL02	330 m, northwest	554626	748450	05

Noise Assessment Location		OS Grid Reference		Representative NML
BNAL ID	BNAL Descriptor	Eastings	Northings	
BNAL03	375 m, north	554786	748627	05
BNAL04	1,460 m, east	556385	747820	07
BNAL05	1,350 m, southeast	556020	747382	07
BNAL06	720 m, southwest	554571	747565	06
BNAL07	350 m, west	554540	748329	05

The immission levels (Specific Sound Level) have been 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 throughout the daytime and night-time assessment periods.

The noise immission levels are detailed in Table 5-3 and are also illustrated as a noise contour plot shown in Figure A4.2 of Annex 4.

Table 5-3: Calculated Immission Levels, dB L_{Aeq(t)}

BESS Noise Assessment Location (BNAL)		Immission Level	
BNAL	BNAL Descriptor	Daytime	Night-time
BNAL01	225 m, northwest	31	31
BNAL02	330 m, northwest	28	28
BNAL03	375 m, north	31	31
BNAL04	1,460 m, east	17	17
BNAL05	1,350 m, southeast	18	18
BNAL06	720 m, southwest	19	19
BNAL07	350 m, west	26	26

6 Noise Impact Assessment (BS 4142)

6.1 BS 4142 Rating Level

To assess the immission levels in accordance with BS 4142, 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.

Note: Character corrections consider the noise at the receiver location, not the source location.

6.1.1 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.'

Consideration of the predicted one-third octave band levels against the residual sound levels indicates that tonality may be just perceptible at BNALs 01, 02 and 03 during the night-time, and as such, a 2 dB character correction needs to be applied for these receptors. At all other receptors, and at BNAL 01, 02 and 03 during the daytime, tonality is not likely to be perceptible, and the one-third octave band noise levels are lower than the residual sound levels, so no character corrections have been applied.

6.1.2 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.

6.1.3 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.

6.1.4 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.

6.1.5 Calculation of the Rating Level

With due regard to the above, the calculated BS 4142 Rating Levels are displayed in Table 6-1 below:

Table 6-1: BS 4142 Rating Levels

NAL		Specific Sound Level		Character Corrections		Rating Level	
ID	Descriptor	Day	Night	Day	Night	Day	Night
BNAL01	225 m, northwest	31	31	0	2	31	33
BNAL02	330 m, northwest	28	28	0	2	28	30
BNAL03	375 m, north	31	31	0	2	31	33
BNAL04	1,460 m, east	17	17	0	0	17	17
BNAL05	1,350 m, southeast	18	18	0	0	18	18
BNAL06	720 m, southwest	19	19	0	0	19	19
BNAL07	350 m, west	26	26	0	0	26	26
BNAL01	225 m, northwest	31	31	0	0	31	31
BNAL02	330 m, northwest	28	28	0	0	28	28
BNAL03	375 m, north	31	31	0	0	31	31

6.2 BS 4142 Stage 1 Assessment – Initial Estimate of Impact

Stage 1 of the assessment compares the Rating Levels against the Background Sound Level, as detailed in Table 6-2 below:

Table 6-2: BS 4142 Initial Estimate of Impact

NAL		Rating Level		Background Sound Level		Difference (+/-)	
ID	Descriptor	Day	Night	Day	Night	Day	Night
BNAL01	225 m, northwest	31	33	30	19	1	14

NAL		Rating Level		Background Sound Level		Difference (+/-)	
ID	Descriptor	Day	Night	Day	Night	Day	Night
BNAL02	330 m, northwest	28	30	30	19	-2	11
BNAL03	375 m, north	31	33	30	19	1	14
BNAL04	1,460 m, east	17	17	37	23	-20	-6
BNAL05	1,350 m, southeast	18	18	37	23	-19	-5
BNAL06	720 m, southwest	19	19	32	20	-13	-1
BNAL07	350 m, west	26	26	30	19	-4	7

During the daytime, the Rating Level is:

- Below or equal to the Representative Background Sound Level at NALs 02, 04-07. This is an *"indication of the specific sound source having a low impact, depending on the context."*
- Above the Representative Background Sound Level at NALs 01 and 03 by a margin of 1 dB, which is below the level that may be considered *"an indication of an adverse impact, depending on the context."*

During the night-time, the Rating Level is:

- Below or equal to the Representative Background Sound Level at NALs 04-06. This is an *"indication of the specific sound source having a low impact, depending on the context."*
- Above the Representative Background Sound Level at NAL07 by a margin of 7 dB, which is approaching the level that may be considered *"an indication of a significant adverse impact, depending on the context."*
- Above the Representative Background Sound Level at NALs 01, 02 and 03 by a margin of 11-14 dB which is considered *"an indication of a significant adverse impact, depending on the context"*.

To summarise, the initial estimate of impact suggests that there are no adverse impacts anticipated during the daytime but during the night-time, an adverse or significant adverse impact may occur at some receptors, depending on the context.

6.3 BS 4142 Stage 2 Assessment – Consideration of Context

Although there are additional elements of context that may be relevant to the assessment, BS 4142 requires the following three contextual elements to be considered for all assessments:

- the absolute level of the sound;

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

Each of these is considered in turn below, alongside other contextual elements that are relevant for this particular assessment.

6.3.1 Context: Absolute Level of 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 of impact. The standard states:

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

The ANC BS 4142 Technical Note provides additional guidance on this, providing indicative values that could be used to describe ‘low’ background sound levels and ‘low’ rating levels. Specifically, the Technical Note states:

“BS 4142 does not define ‘low’ in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB LA90, and low rating levels as being less than about 35 dB LAr,Tr”.

In the area surrounding the Proposed Grid Connection, which can be described as rural in nature, the measured existing residual levels cannot be described as “very high”.

As the background sound levels are not below 30 dBA, the background level cannot be defined as “very low” during the daytime for any BNALs, however for the night-time, background noise levels could be considered “very low” at all NALs (23 dBA or below).

It is therefore during the night-time where absolute levels are potentially most consequential, especially at NALs 01, 02, 03, and 07, where the low Rating Levels (the highest of which is 31 dB, calculated at BNAL 01) exceed the very low background sound levels by 12 dB, 9 dB 12 dB, and 7 dB respectively. The absolute values at night-time 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).

Consideration of the absolute level of the sound suggests that the initial estimate of potential impact would be reduced. This is particularly pertinent at NALs 01, 02, 03 & 07 during the night-time, where an initial estimate of “significant adverse impact” would be reduced given the low absolute levels of sound.

6.3.2 Context: Character and Level of Residual Sound

The level of the residual sound is variable during both daytime and night-time periods at all NMLs, ranging from 27 – 45 dB LAeq (10 mins) across the different NMLs. Table 6-3 compares the Specific Sound Levels with the Residual Sound Level and also indicates the estimated level of change.

Table 6-3: Residual (Existing) and Ambient (Future) Sound Levels, dB L_{Aeq} (10 mins)

BNAL		a) Specific Sound Level		b) Residual Sound Level		c) Ambient Sound Level (a+b)		Change (+/-)	
ID	Descriptor	Day	Night	Day	Night	Day	Night	Day	Night
BNAL 01	225 m, northwest	31	31	40	27	41	32	+1	+5
BNAL 02	330 m, northwest	28	28	40	27	40	31	0	+4
BNAL 03	375 m, north	31	31	40	27	41	32	+1	+5
BNAL 04	1,460 m, east	17	17	45	31	45	31	0	0
BNAL 05	1,350 m, southeast	18	18	45	31	45	31	0	0
BNAL 06	720 m, southwest	19	19	42	32	42	32	0	0
BNAL 07	350 m, west	26	26	40	27	40	30	0	+3

The highest predicted specific sound level attributable to the development is 31 dBA at NAL01, which is in-keeping with the range (27 – 45 dB) of residual levels measured at the various NMLs during the daytime and night-time periods.

During the night-time, the residual sound levels are notably below the ANC's classification of what is considered "very low" in terms of background sound level, with the exception of NALs 04, 05 and 06. The highest ambient sound level at for all BNALs at night is calculated to be 32 dB L_{Aeq} (10 mins), which is a 5 dB increase compared to the existing residual sound level, however, is still 2 dB below what is considered a "low" Rating Level by the ANC.

The character of the residual sound is consistent at all NMLs, influenced mostly by wind induced noise, with a small contribution from intermittent sound sources, such as passing road traffic, industrial/forestry/farming activity and birdsong. The Proposed Grid Connection would operate with a continuous and relatively low sound level, which is not expected to be readily distinctive against the residual acoustic environment.

No noticeable change in noise level is anticipated during the daytime (with a maximum increase of 1dB indicated) and, although a noise level increase of around 3-5 dB is indicated at four BNALs during the night, the absolute levels remain low, and the steady state of the noise level and character will not be incongruous with the existing sound environment. As such, **consideration of the level and character of operational noise against the residual sound suggests that the initial estimate of impact could be reduced.**

6.3.3 Context: Sensitivity of 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 this contextual element does not materially affect the initial estimate of impacts.**

6.3.4 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.**

6.3.5 Context: Consideration of NG4 Guideline Levels

NG4 has defined the area as an “*Area of Low Background Noise*”. Accordingly, noise limit criteria recommended in NG4 (see Table 3-1) is 35 dBA for night-time, 40 dBA for evening and 45 dBA for daytime.

The predicted noise levels are below 35 dBA at all receptors and for all time periods, which is another indication that the absolute level of sound from the Proposed Grid Connection is within acceptable levels. Therefore, **consideration of this contextual element would further reduce the initial estimate of impact.**

6.4 BS 4142 Assessment Conclusion

The Stage 1 Initial Estimate of Impact indicated there could be a low impact at all receptors during the daytime. At night-time the Initial Estimate of Impact indicated there could be a significant adverse impact at three receptors and an adverse impact at one receptor, depending on the context.

The Stage 2 qualitative assessment, however, clearly indicated that the impacts associated with the operation of the Proposed Development would be less than the initial estimate, particularly when considering the absolute sound levels, and the level and character of the residual sound levels; as well as the comparison against the NG4 guideline noise level limits. Accordingly, **the full BS 4142 assessment concludes that there would be a low impact at all residential receptors during both the daytime and night-time.**

7 Summary

In order to assess the impact of noise emissions from the BESS and 110kV Substation development within the Proposed Project, TNEI has produced a noise propagation model in accordance with ISO 9613-2:2024 that predicts the noise immission levels at the nearest identified residential receptors. Predictions are based on an indicative layout and candidate plant that is typical for this type and class of BESS and Substation development.

A number of residential properties were identified and assessed as part of the main assessment presented within this report, ranging between 225 m and 720 m from the proposed BESS and Substation compound. Additional residential receptors within a 2.5 km study area were also considered, and these are detailed in Annex 5.

As part of the BS 4142 assessment, an initial estimate predicted that, depending on the context, there would be a low impact at all BESS Noise Assessment Locations (BNALs) during the daytime, and the potential for an adverse or significant adverse impact during the night-time at some BNALs.

Detailed consideration of the context clearly indicates that the impacts associated with the operation of the Proposed Grid Connection 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.

8 References

1. **Association of Acoustic Consultants of Ireland.** *Environmental Noise Guidelines for Local Authority Enforcement and Planning Sections.* AACI. Dublin : AACI, 2021.
2. **British Standards Institution (BSI).** *Methods for rating and assessing industrial and commercial sound.* London : BSI, 2019. BS 4142:2014+A1:2019.
3. **Association of Noise Consultants (ANC).** *BS 4142:2014+A1:2019 Technical Note. Version 1.0.* London : ANC, 2020.
4. **Environmental Protection Agency.** *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).* Wexford : Environmental Protection Agency (EPA), 2016.
5. **International Organization for Standardization (ISO).** *Acoustics — Attenuation of sound during propagation outdoors — Part 2: Engineering method for the prediction of sound pressure levels outdoors.* Geneva : ISO, 2024. ISO 9613-2:2024.
6. **International Electrotechnical Commission (IEC).** *Electroacoustics – Sound level meters – Part 1: Specifications.* Geneva : IEC, 2013. IEC 61672-1:2013.
7. **Environment Agency, Natural Resources Wales and Northern Ireland Environment Agency,.** *Method Implementation Document (MID) for BS 4142.* London : Environment Agency, 2023.

Annex 1 – Proposed Grid Connection Details

- Indicative Site Layout Drawing

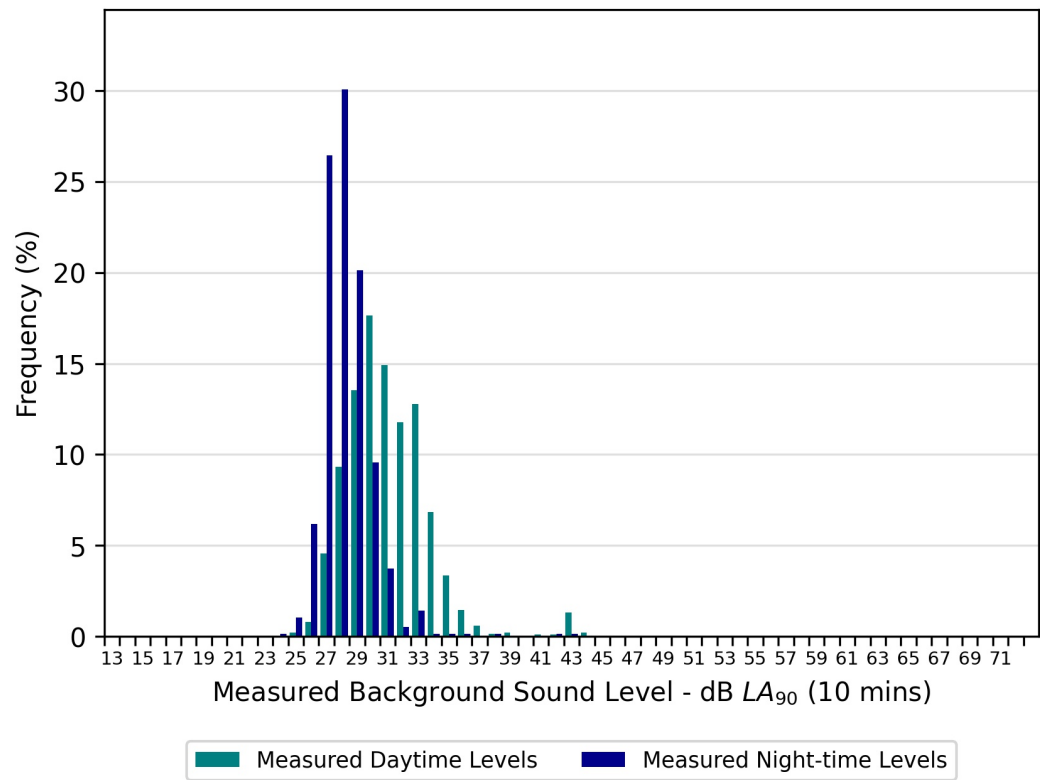


Annex 2 – Baseline Survey Data

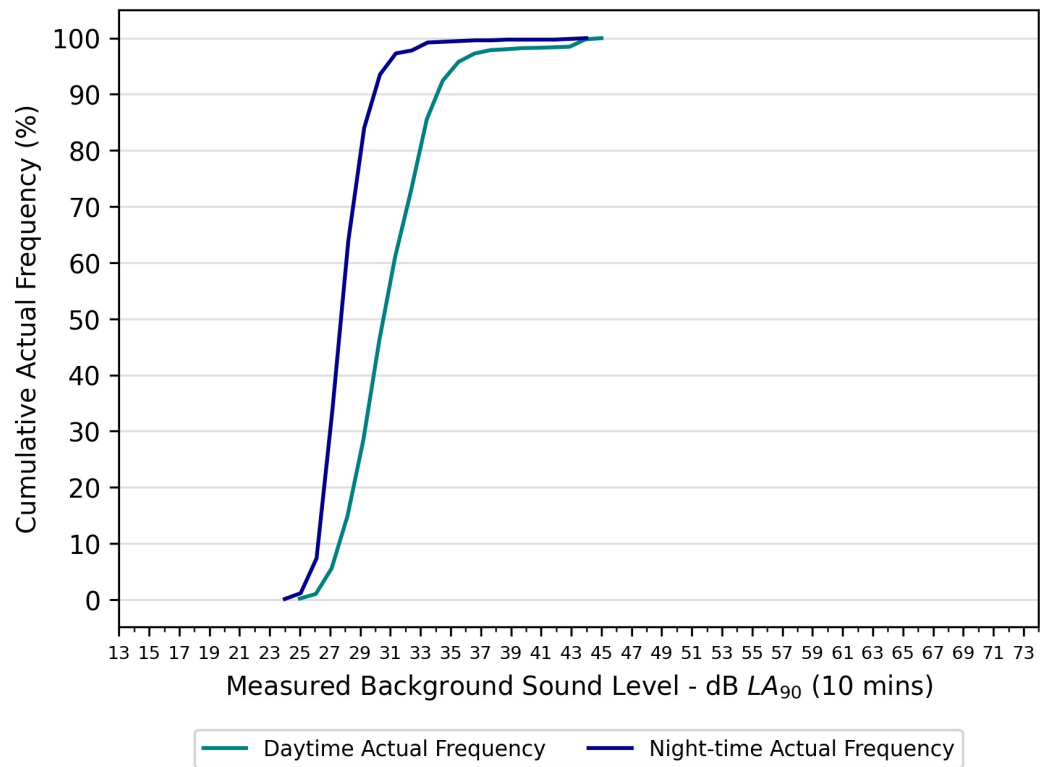
- BS 4142 Baseline Analysis Charts
- SLM Calibration Certificates

15 - Cooloo - Measured Sound Levels:

Statistical Analysis - NML1

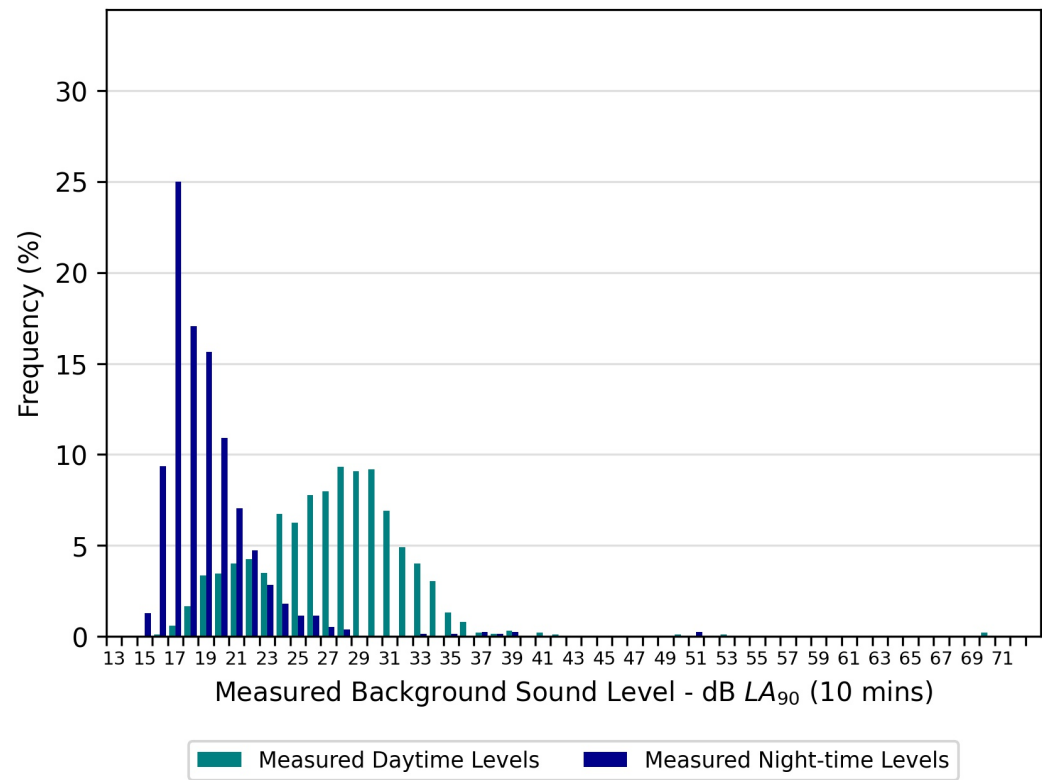


Statistical Analysis - NML1

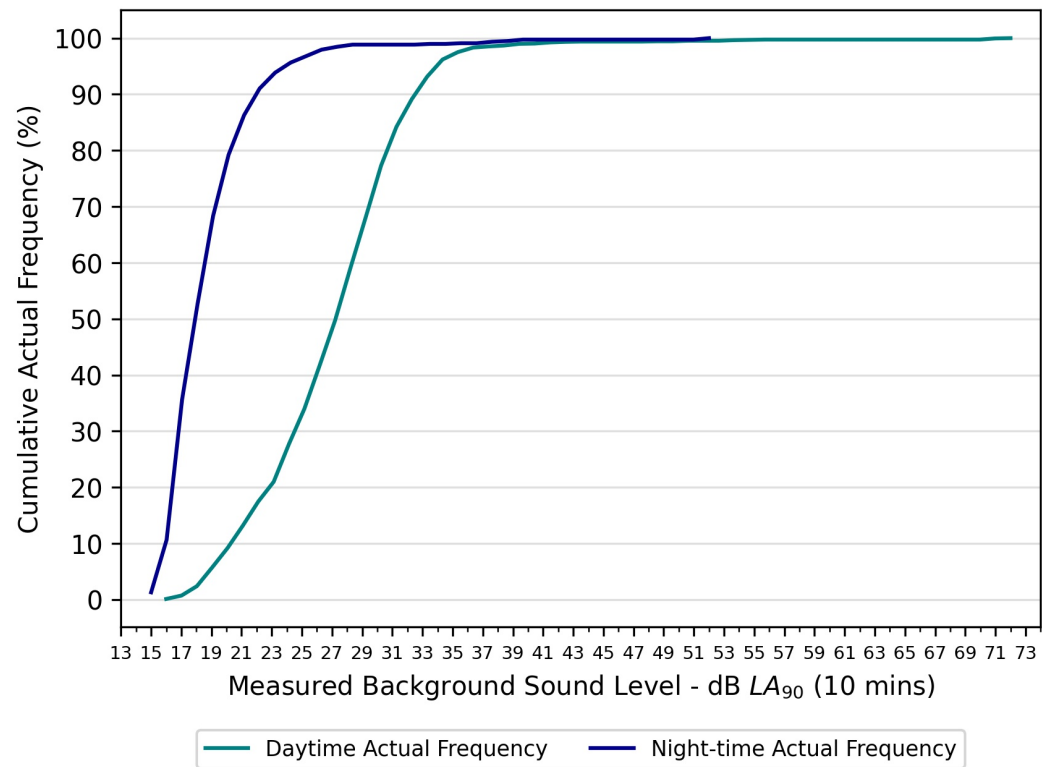


15 - Cooloo - Measured Sound Levels:

Statistical Analysis - NML2

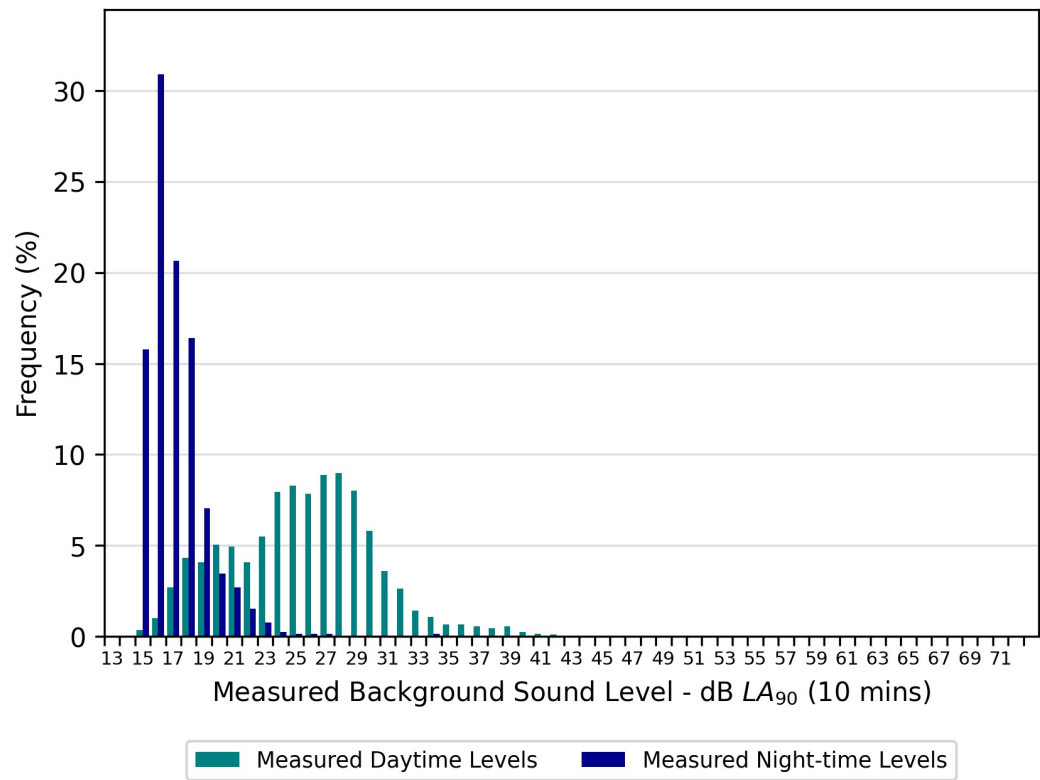


Statistical Analysis - NML2

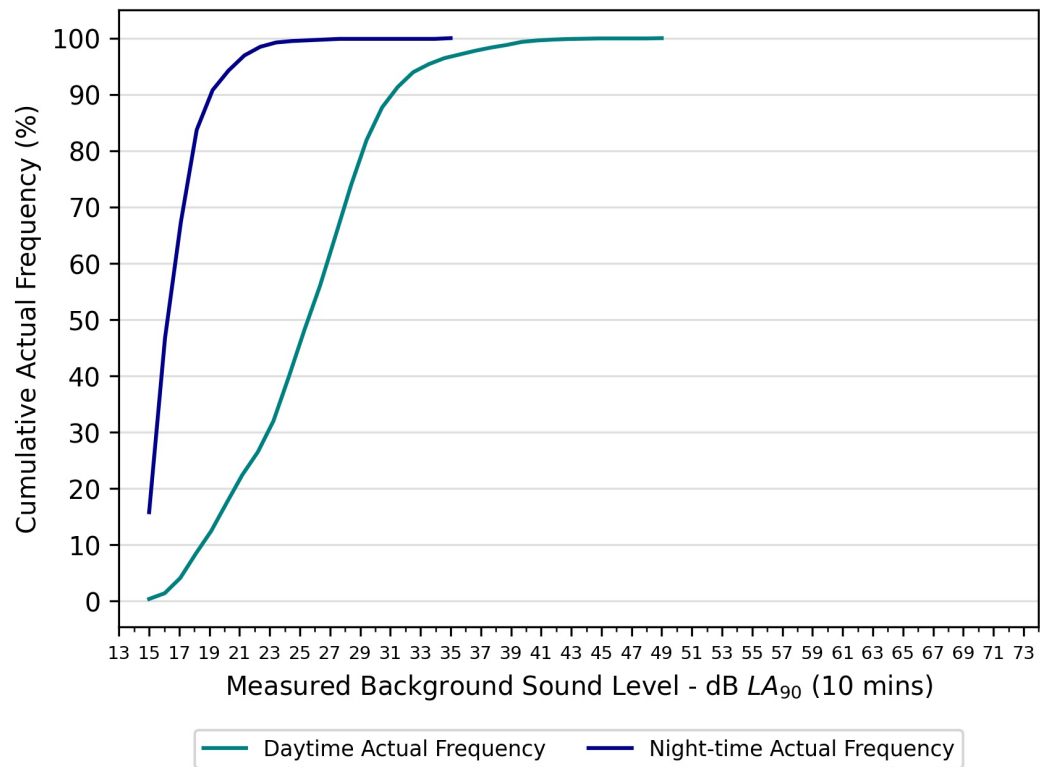


15 - Cooloo - Measured Sound Levels:

Statistical Analysis - NML3

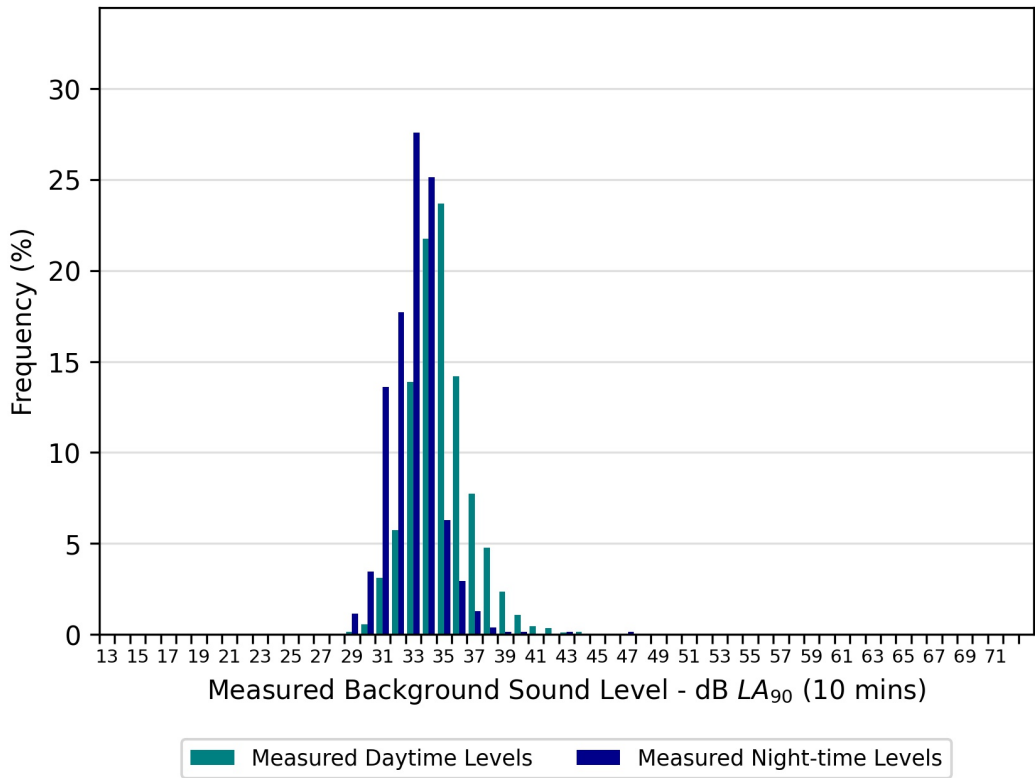


Statistical Analysis - NML3

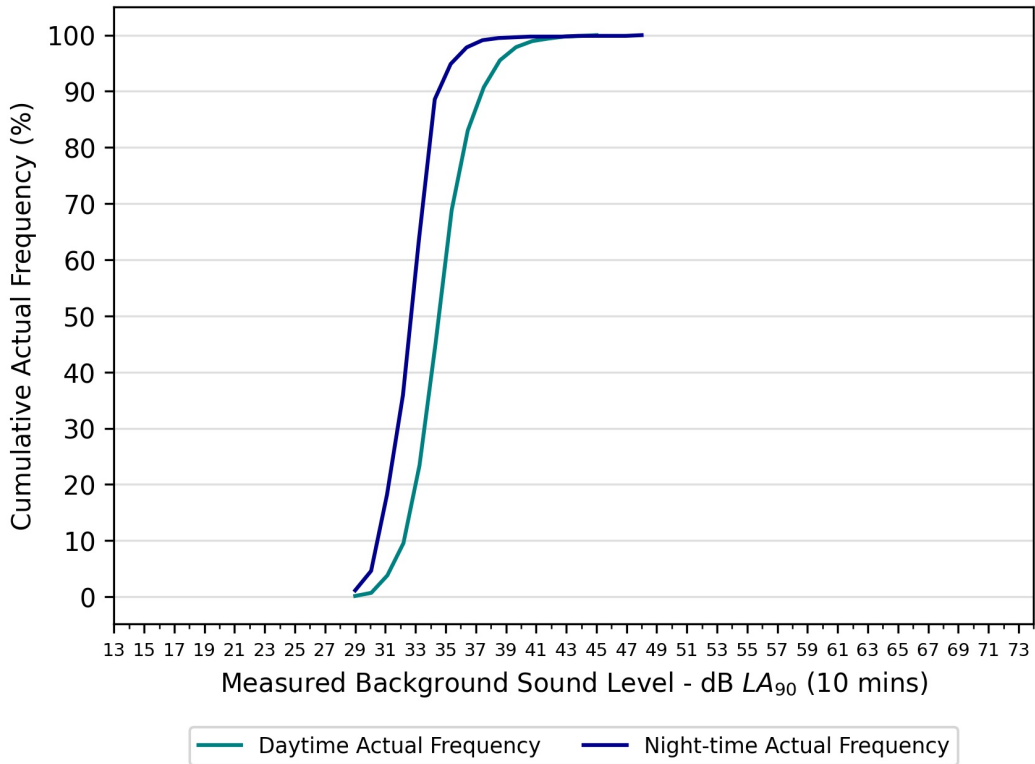


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Statistical Analysis - NML4

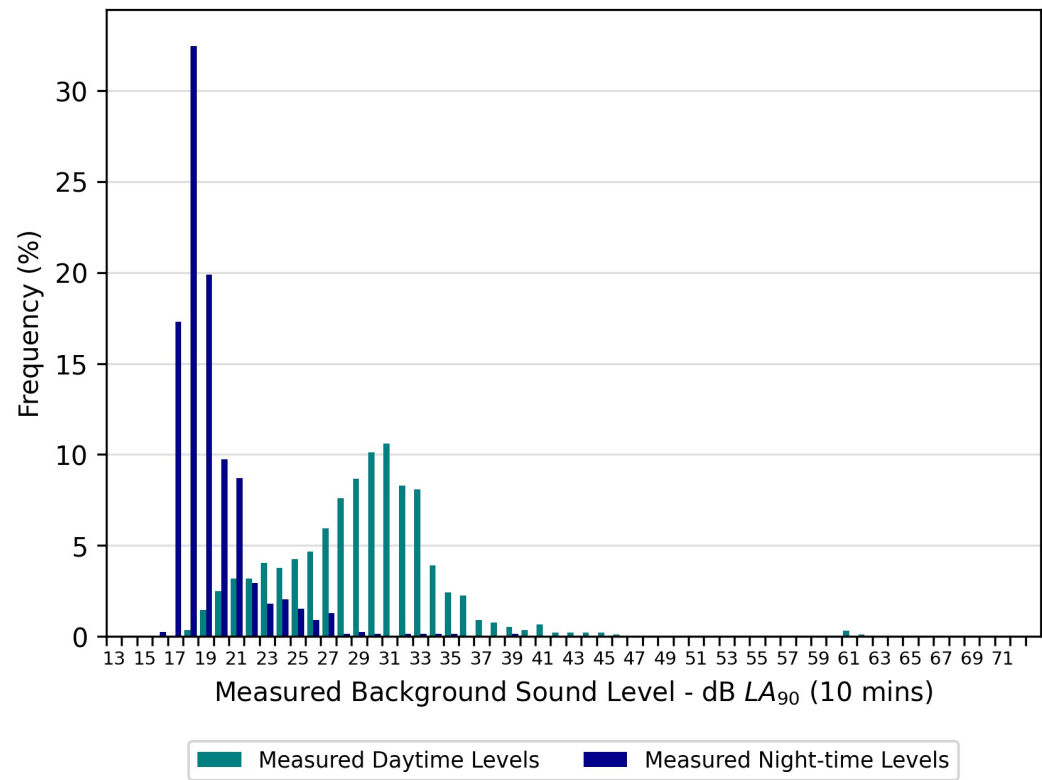


Statistical Analysis - NML4

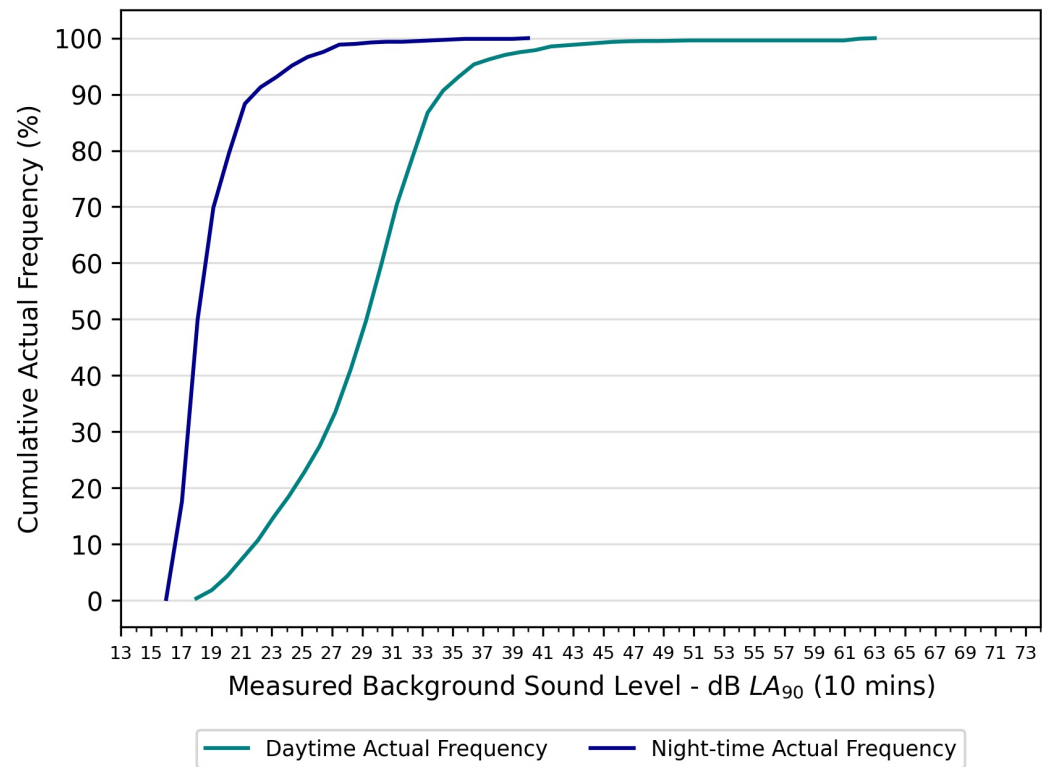


15 - Cooloo - Measured Sound Levels:

Statistical Analysis - NML5

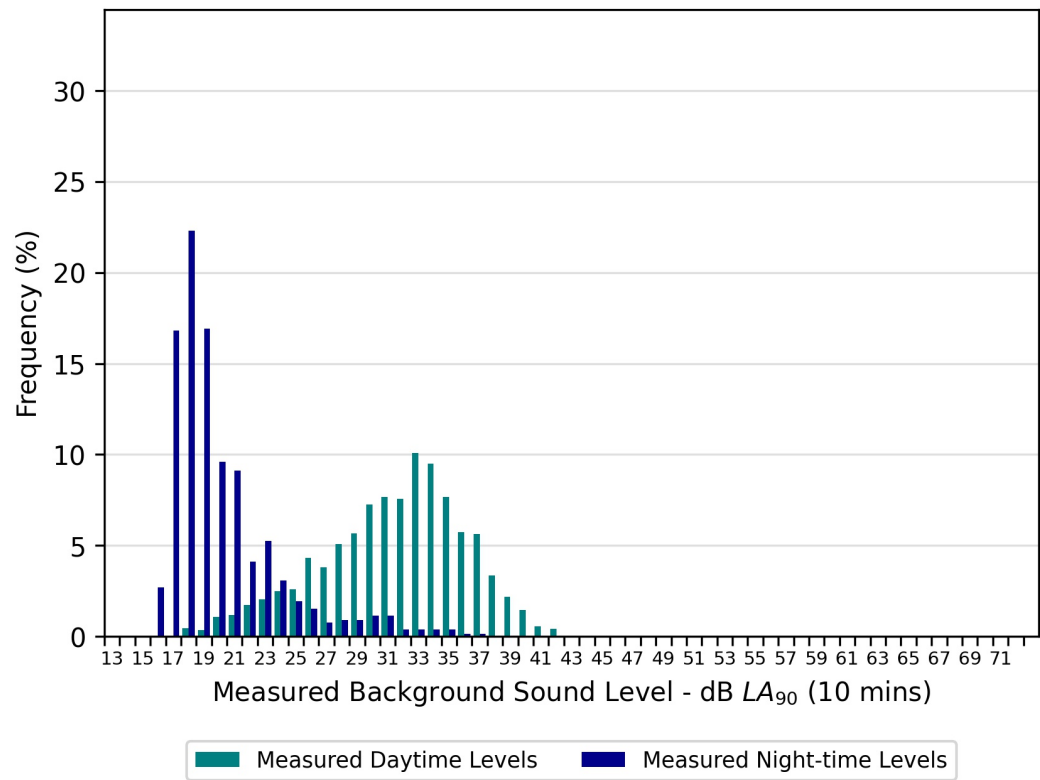


Statistical Analysis - NML5

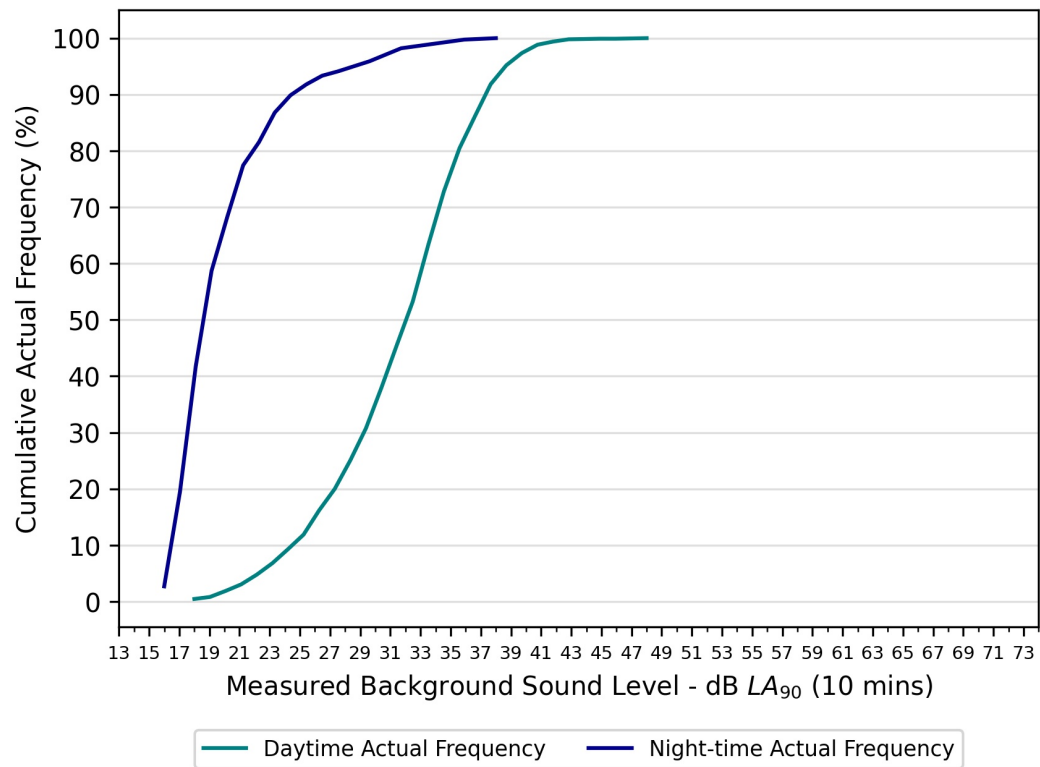


15 - Cooloo - Measured Sound Levels:

Statistical Analysis - NML6

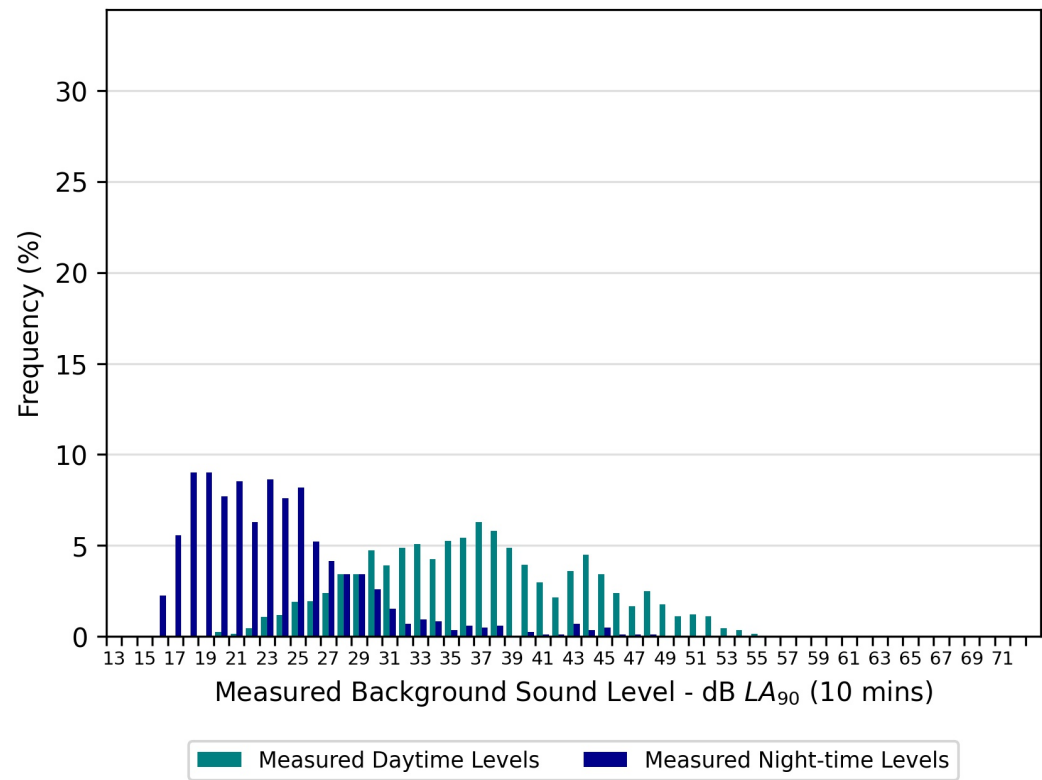


Statistical Analysis - NML6

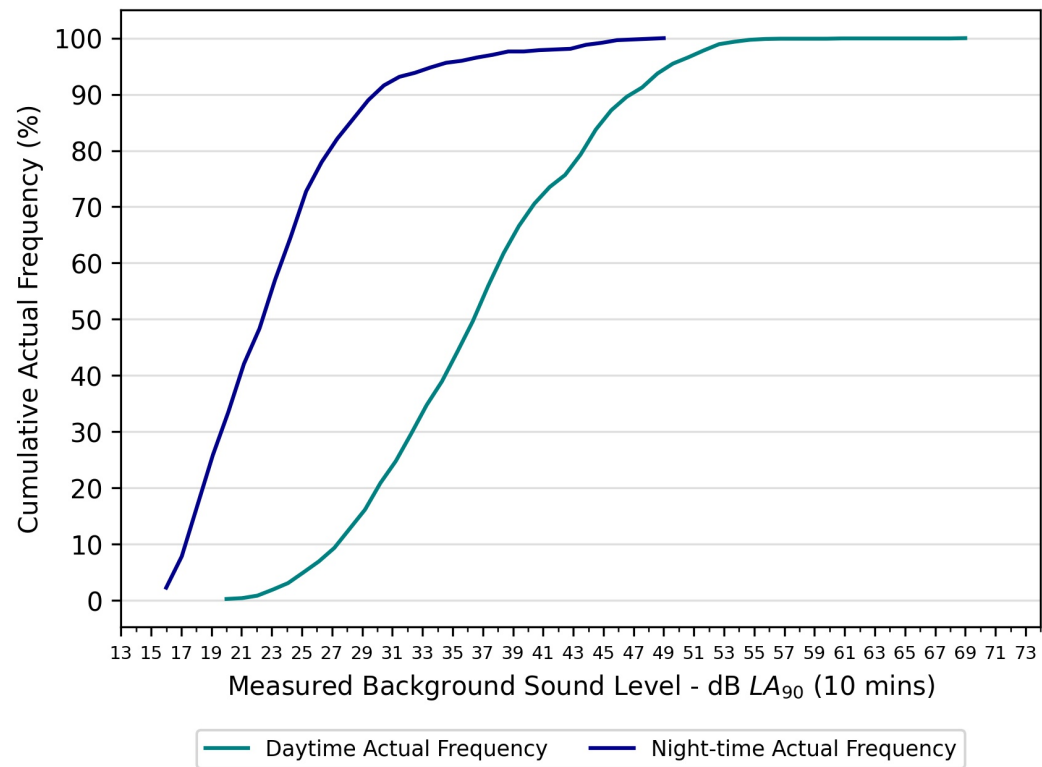


15 - Cooloo - Measured Sound Levels:

Statistical Analysis - NML7



Statistical Analysis - NML7



15 - Cooloo - Measured Sound Levels:

Relevant Statistics

NML1

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (10 MINS)	1969	32	31	26 - 45
	LAEQ (10 MINS)	1969	37	37	27 - 64
NIGHT-TIME	LA90 (10 MINS)	775	29	28	25 - 44
	LAEQ (10 MINS)	775	30	30	26 - 50

NML2

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (10 MINS)	1965	28	28	17 - 72
	LAEQ (10 MINS)	1965	45	43	20 - 81
NIGHT-TIME	LA90 (10 MINS)	778	20	19	16 - 52
	LAEQ (10 MINS)	778	27	24	17 - 57

15 - Cooloo - Measured Sound Levels:

Relevant Statistics

NML3

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (10 MINS)	1963	26	26	15 - 48
	LAEQ (10 MINS)	1963	36	36	18 - 62
NIGHT-TIME	LA90 (10 MINS)	778	18	17	15 - 35
	LAEQ (10 MINS)	778	24	22	16 - 42

NML4

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (10 MINS)	1963	35	35	29 - 45
	LAEQ (10 MINS)	1963	43	42	32 - 58
NIGHT-TIME	LA90 (10 MINS)	778	33	34	29 - 48
	LAEQ (10 MINS)	778	36	36	31 - 61

15 - Cooloo - Measured Sound Levels:

Relevant Statistics

NML5

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (10 MINS)	1967	30	30	18 - 63
	LAEQ (10 MINS)	1967	40	40	21 - 77
NIGHT-TIME	LA90 (10 MINS)	778	20	19	17 - 39
	LAEQ (10 MINS)	778	28	27	18 - 58

NML6

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (10 MINS)	1971	32	33	18 - 47
	LAEQ (10 MINS)	1971	42	42	27 - 66
NIGHT-TIME	LA90 (10 MINS)	780	21	19	17 - 37
	LAEQ (10 MINS)	780	31	32	17 - 63



15 - Cooloo - Measured Sound Levels:

Relevant Statistics

NML7

		COUNT	MEAN	MEDIAN	RANGE
DAYTIME	LA90 (10 MINS)	2051	37	37	20 - 69
	LAEQ (10 MINS)	2051	46	45	26 - 73
NIGHT-TIME	LA90 (10 MINS)	844	24	23	16 - 48
	LAEQ (10 MINS)	844	31	31	20 - 56

Annex 3 – Noise Modelling Data

- HV Transformer Noise 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 11el	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 11el	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

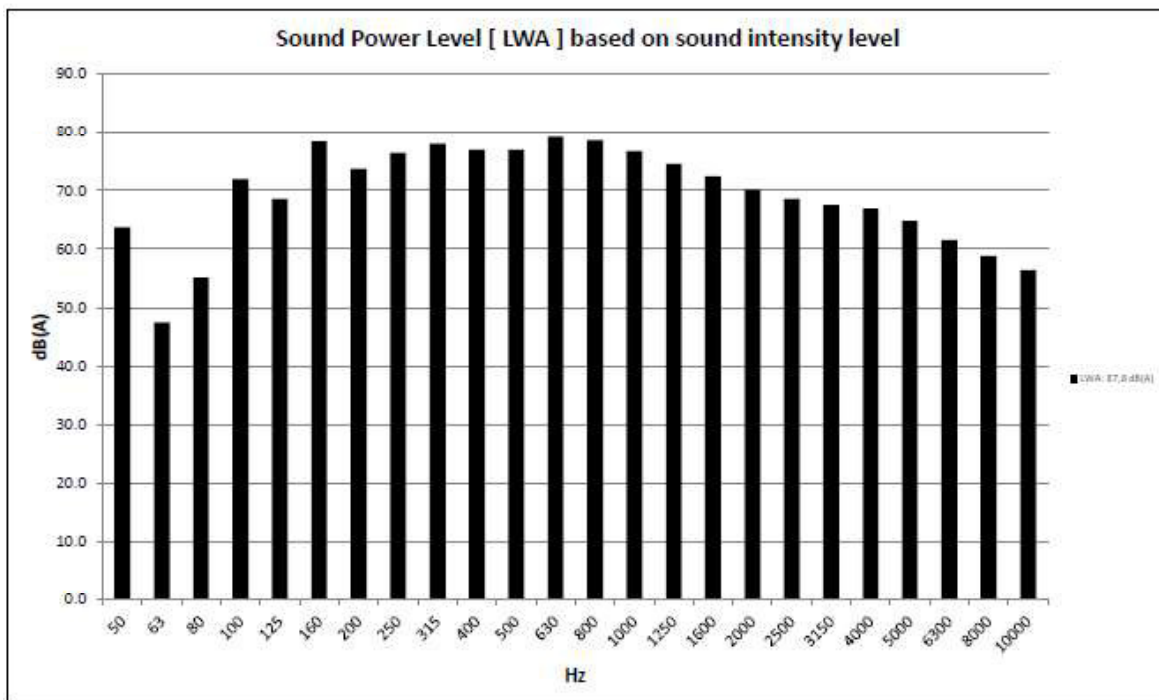
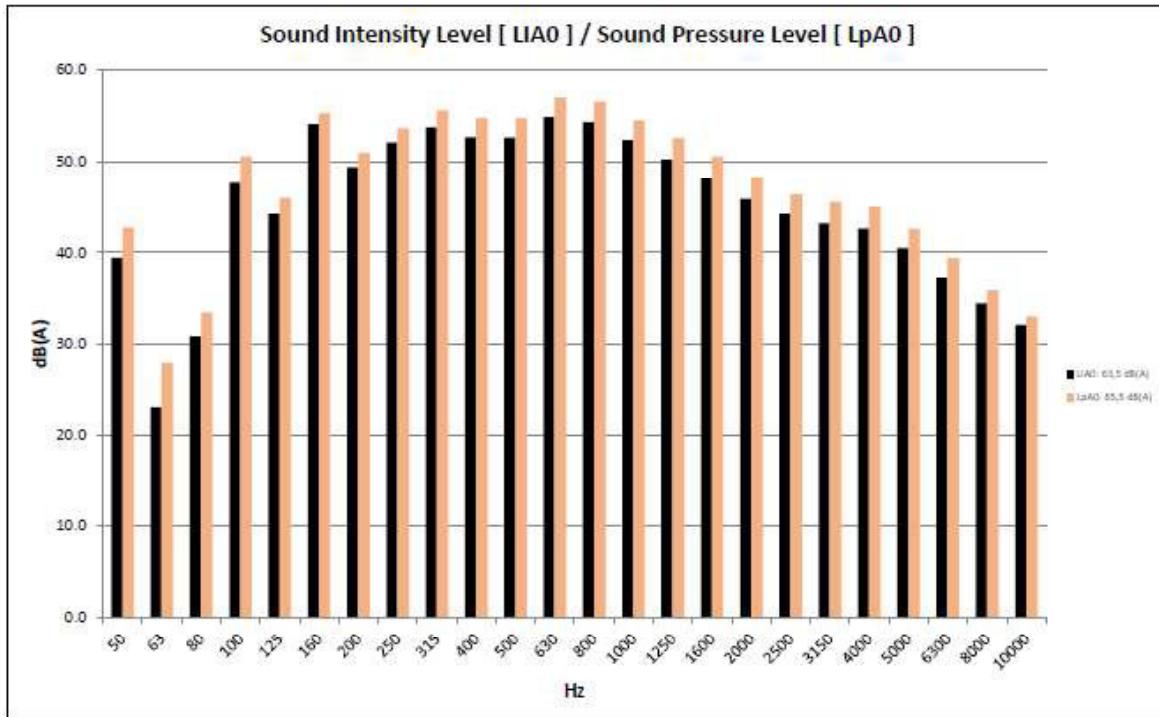


Tank and Fittings	GE Transformer
Tank material	Mild Steel
Sheet thickness (mm) Bottom Sides Top	25 10 25
Tank external dimensions L/W/H (m)	Refer to Tender General Arrangement Drawing Enclosure 12.1
High/Low kerb?	Low
Tank vacuum withstand (mm of Hg)	0.75 inside tank
Tank overpressure withstand (kPa)	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



Issue Date
29/09/2021

Test Engineer
Kamil Maliński

Test Department
Test Field

Sound Level

Serial No. : 1ZPL001134582

Combination of sound level measurements

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

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

Frequency	Measurement 1 Sound Power Level	Measurement 4 Sound Power Level	Combined Sound Power Level
[Hz]	[dB(A)]	[dB(A)]	[dB(A)]

Frequency				Combined Sound Power Level
[Hz]				[dB(A)]

Total Sound Level		76.9	87.8	88.2
-------------------	--	------	------	------

Total Sound Level				
-------------------	--	--	--	--

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

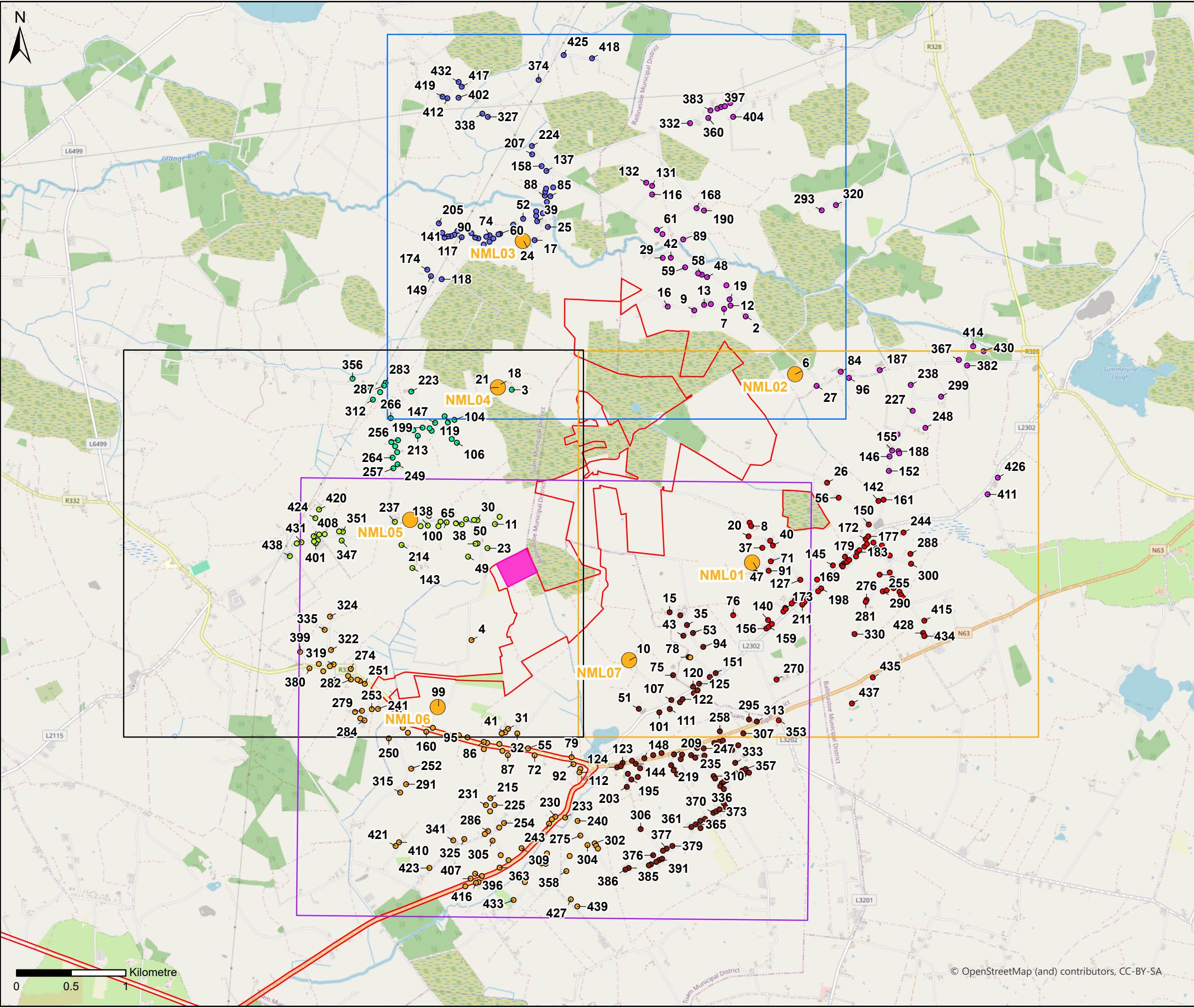
Octave Band	63			
	125			
	250			
	500			
	1000			
	2000			
	4000			
	8000			

1/3 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

1/3 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			

Annex 4 – Figures

- A4.1: BESS Noise Assessment Study Area
- A4.1a-e: BESS Noise Assessment Study Area (Detailed)
- A4.2: Noise Contour Plot - BNALs



LEGEND

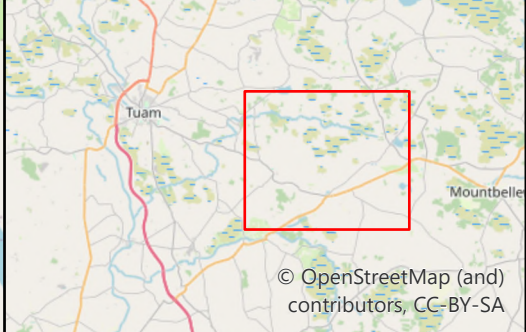
Figure Locations

- Figure 4.1b
- Figure 4.1c
- Figure 4.1e
- Figure 4.1d
- Noise Monitoring Locations (NMLs)
- EIAR Site Boundary
- Indicative BESS Development Area

Noise Sensitive Receptors (NSRs)
Represented By:

- NML1
- NML2
- NML3
- NML4
- NML5
- NML6
- NML7

0	16/09/2025	FIRST ISSUE	FL	JB
Rev.	Date	Amendment Details	Drawn	Approved



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FOR INFORMATION

Project Title:

COOLOO WIND FARM

Drawing Title:

FIGURE A4.1A - BESS NOISE ASSESSMENT STUDY AREA (DETAILED)

Scale:

1:32,500

Original Size:

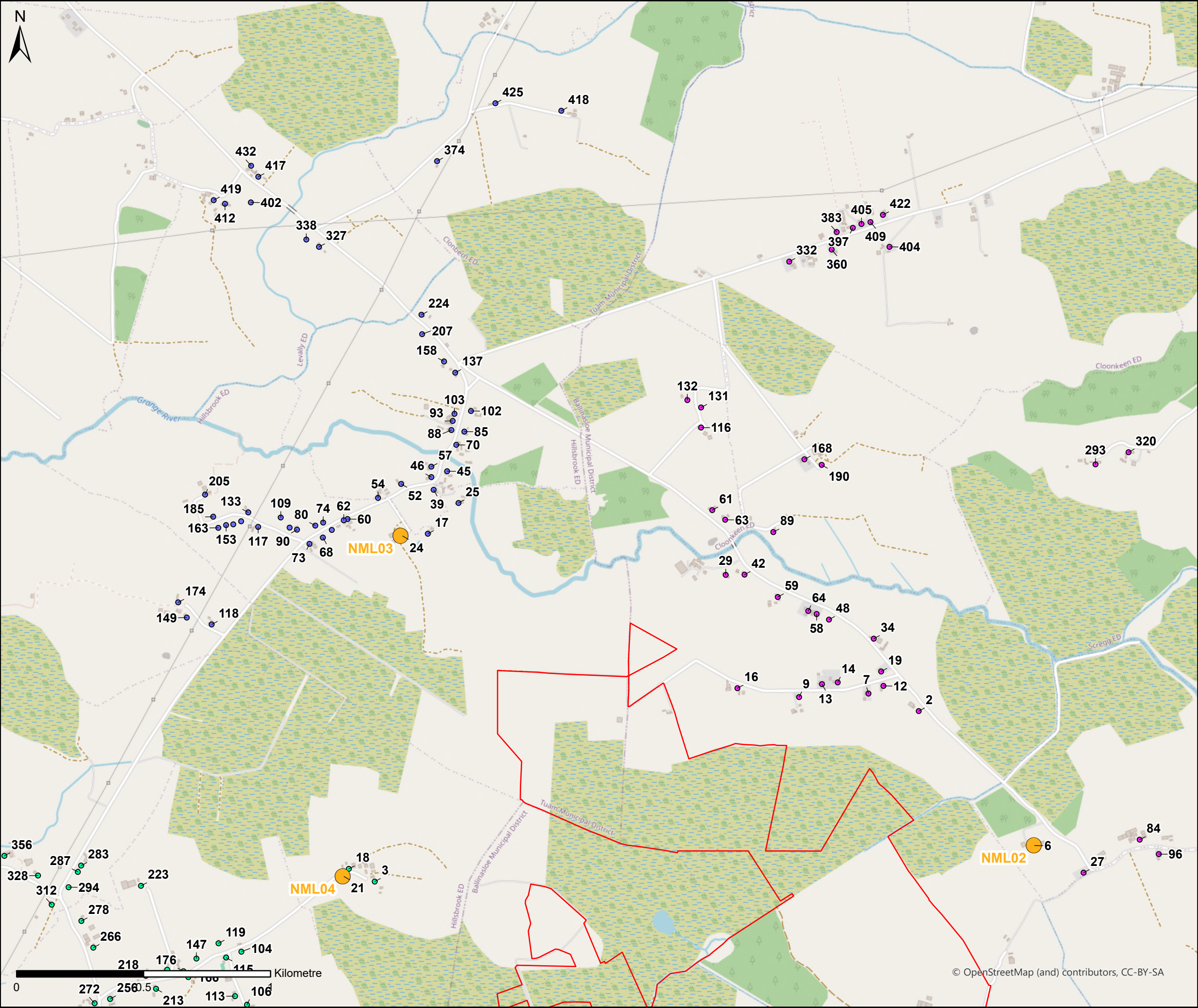
A3

Spatial Reference:

IRENET95 Irish Transverse Mercator

Drawing Number:

IE00015-015



LEGEND

Noise Monitoring Locations (NMLs)

EIAR Site Boundary

Noise Sensitive Receptors (NSRs)
Represented By:

NML2

NML3

NML4

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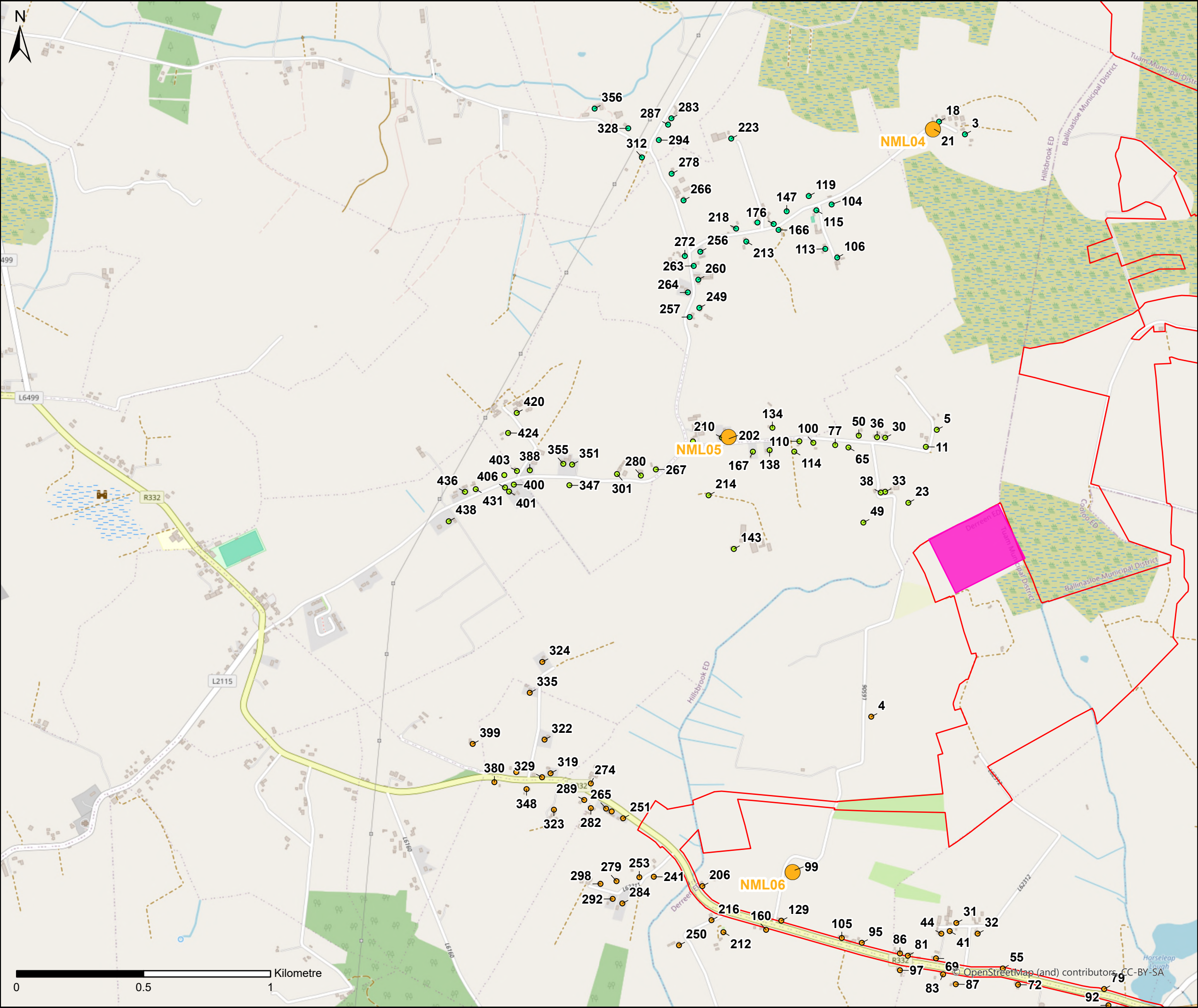
Drawing Title:

FIGURE A4.1B - BESS NOISE ASSESSMENT STUDY AREA (DETAILED)

Scale:	1:14,000	Original Size:	A3	Spatial Reference:	IRENET95 Irish Transverse Mercator
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Drawing Number:

IE00015-0015



LEGEND

Noise Monitoring Locations (NMLs)

EIAR Site Boundary

Indicative BESS Development Area

Noise Sensitive Receptors (NSRs)
Represented By:

NML4

NML5

NML6

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FIGURE A4.1E - BESS NOISE ASSESSMENT STUDY AREA (DETAILED)

Scale:

1:14,000

Original Size:

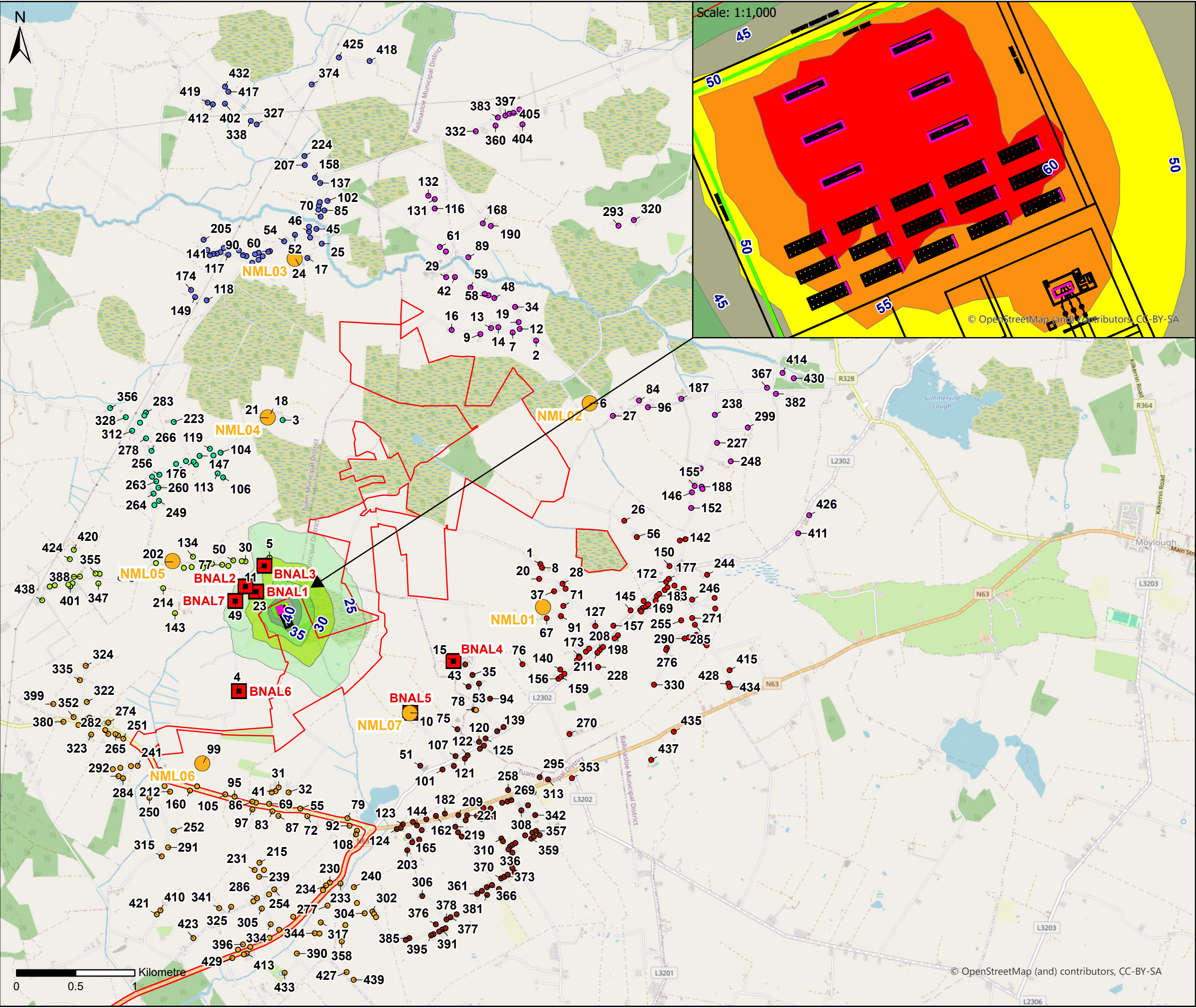
A3

Spatial Reference:

IRENET95 Irish Transverse Mercator

Drawing Number:

IE00015-0015



LEGEND

- Indicative Site Layout
- Acoustic Barrier
- Modelled Noise Sources
- BESS Noise Assessment Locations (BNALs)
- Noise Monitoring Locations (NMLs)
- EIAR Site Boundary

Predicted Noise Levels (dB LAeq(t))

25-30
30-35
35-40
40-45
45-50
50-55
55-60
60-65

Noise Sensitive Receptors (NSRs)
Represented By:

NML1
NML2
NML3
NML4
NML5
NML6
NML7

Noise contours modelled in accordance with ISO 9613 Part 2:2024 at a height of 4 m and displayed on a 10 m x 10 m grid.

All noise sources assumed to be operating concurrently.

All levels shown in dB LAeq(t).

Rev.	Date	Amendment Details	Drawn	Approved
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Project Title: COOLOO WIND FARM

Drawing Title: FIGURE A4.2 - NOISE CONTOUR PLOT

Scale: 1:30,000	Original Size: A3	Spatial Reference: IRENET95 Irish Transverse Mercator
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Drawing Number: IE00015-0016

Annex 5 – Noise Level Predictions

- Noise Level predictions for all residential receptors within 2.5 km.

Table A5.1

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR23 (BNAL1)	31	30	1	19	12
NSR33 (BNAL2)	28	30	-2	19	9
NSR11 (BNAL3)	31	30	1	19	12
NSR15 (BNAL4)	17	37	-20	23	-6
NSR10 (BNAL5)	18	37	-19	23	-5
NSR4 (BNAL6)	19	32	-13	20	-1
NSR49 (BNAL7)	26	30	-4	19	7
NSR1	11	31	-20	28	-17
NSR2	8	28	-20	19	-11
NSR3	17	35	-18	33	-16
NSR5	30	30	0	19	11
NSR6	7	28	-21	19	-12
NSR7	9	28	-19	19	-10
NSR8	11	31	-20	28	-17
NSR9	9	28	-19	19	-10
NSR12	8	28	-20	19	-11
NSR13	9	28	-19	19	-10
NSR14	9	28	-19	19	-10
NSR16	10	28	-18	19	-9
NSR17	9	26	-17	17	-8
NSR18	16	35	-19	33	-17
NSR19	8	28	-20	19	-11
NSR20	11	31	-20	28	-17
NSR21	17	35	-18	33	-16
NSR22	16	37	-21	23	-7
NSR24	9	26	-17	17	-8
NSR25	9	26	-17	17	-8
NSR26	8	31	-23	28	-20
NSR27	7	28	-21	19	-12
NSR28	10	31	-21	28	-18
NSR29	8	28	-20	19	-11
NSR30	22	30	-8	19	3
NSR31	12	32	-20	20	-8
NSR32	11	32	-21	20	-9
NSR34	8	28	-20	19	-11
NSR35	16	37	-21	23	-7
NSR36	22	30	-8	19	3
NSR37	11	31	-20	28	-17

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR38	27	30	-3	19	8
NSR39	8	26	-18	17	-9
NSR40	10	31	-21	28	-18
NSR41	11	32	-21	20	-9
NSR42	8	28	-20	19	-11
NSR43	16	37	-21	23	-7
NSR44	11	32	-21	20	-9
NSR45	8	26	-18	17	-9
NSR46	8	26	-18	17	-9
NSR47	13	31	-18	28	-15
NSR48	8	28	-20	19	-11
NSR50	21	30	-9	19	2
NSR51	16	37	-21	23	-7
NSR52	8	26	-18	17	-9
NSR53	15	37	-22	23	-8
NSR54	9	26	-17	17	-8
NSR55	10	32	-22	20	-10
NSR56	8	31	-23	28	-20
NSR57	8	26	-18	17	-9
NSR58	8	28	-20	19	-11
NSR59	8	28	-20	19	-11
NSR60	9	26	-17	17	-8
NSR61	8	28	-20	19	-11
NSR62	9	26	-17	17	-8
NSR63	8	28	-20	19	-11
NSR64	8	28	-20	19	-11
NSR65	21	30	-9	19	2
NSR66	9	26	-17	17	-8
NSR67	13	31	-18	28	-15
NSR68	9	26	-17	17	-8
NSR69	11	32	-21	20	-9
NSR70	8	26	-18	17	-9
NSR71	12	31	-19	28	-16
NSR72	10	32	-22	20	-10
NSR73	9	26	-17	17	-8
NSR74	9	26	-17	17	-8
NSR75	15	37	-22	23	-8
NSR76	13	31	-18	28	-15
NSR77	20	30	-10	19	1

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR78	15	37	-22	23	-8
NSR79	10	32	-22	20	-10
NSR80	9	26	-17	17	-8
NSR81	10	32	-22	20	-10
NSR82	15	32	-17	20	-5
NSR83	10	32	-22	20	-10
NSR84	6	28	-22	19	-13
NSR85	7	26	-19	17	-10
NSR86	10	32	-22	20	-10
NSR87	10	32	-22	20	-10
NSR88	7	26	-19	17	-10
NSR89	7	28	-21	19	-12
NSR90	9	26	-17	17	-8
NSR91	12	31	-19	28	-16
NSR92	10	32	-22	20	-10
NSR93	7	26	-19	17	-10
NSR94	14	37	-23	23	-9
NSR95	9	32	-23	20	-11
NSR96	6	28	-22	19	-13
NSR97	10	32	-22	20	-10
NSR98	9	26	-17	17	-8
NSR99	10	32	-22	20	-10
NSR100	19	30	-11	19	0
NSR101	15	37	-22	23	-8
NSR102	7	26	-19	17	-10
NSR103	7	26	-19	17	-10
NSR104	18	35	-17	33	-15
NSR105	9	32	-23	20	-11
NSR106	19	35	-16	33	-14
NSR107	14	37	-23	23	-9
NSR108	10	32	-22	20	-10
NSR109	9	26	-17	17	-8
NSR110	18	30	-12	19	-1
NSR111	14	37	-23	23	-9
NSR112	10	32	-22	20	-10
NSR113	18	35	-17	33	-15
NSR114	18	30	-12	19	-1
NSR115	18	35	-17	33	-15
NSR116	6	28	-22	19	-13

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR117	9	26	-17	17	-8
NSR118	11	26	-15	17	-6
NSR119	17	35	-18	33	-16
NSR120	14	37	-23	23	-9
NSR121	14	37	-23	23	-9
NSR122	14	37	-23	23	-9
NSR123	14	37	-23	23	-9
NSR124	14	37	-23	23	-9
NSR125	13	37	-24	23	-10
NSR126	14	37	-23	23	-9
NSR127	10	31	-21	28	-18
NSR128	14	37	-23	23	-9
NSR129	9	32	-23	20	-11
NSR130	13	37	-24	23	-10
NSR131	6	28	-22	19	-13
NSR132	6	28	-22	19	-13
NSR133	9	26	-17	17	-8
NSR134	16	30	-14	19	-3
NSR135	9	26	-17	17	-8
NSR136	13	37	-24	23	-10
NSR137	7	26	-19	17	-10
NSR138	17	30	-13	19	-2
NSR139	13	37	-24	23	-10
NSR140	12	31	-19	28	-16
NSR141	9	26	-17	17	-8
NSR142	6	31	-25	28	-22
NSR143	19	30	-11	19	0
NSR144	14	37	-23	23	-9
NSR145	9	31	-22	28	-19
NSR146	6	28	-22	19	-13
NSR147	13	35	-22	33	-20
NSR148	14	37	-23	23	-9
NSR149	10	26	-16	17	-7
NSR150	7	31	-24	28	-21
NSR151	13	37	-24	23	-10
NSR152	6	28	-22	19	-13
NSR153	9	26	-17	17	-8
NSR154	8	31	-23	28	-20
NSR155	6	28	-22	19	-13

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR156	12	31	-19	28	-16
NSR157	10	31	-21	28	-18
NSR158	6	26	-20	17	-11
NSR159	11	31	-20	28	-17
NSR160	8	32	-24	20	-12
NSR161	6	31	-25	28	-22
NSR162	14	37	-23	23	-9
NSR163	9	26	-17	17	-8
NSR164	11	31	-20	28	-17
NSR165	14	37	-23	23	-9
NSR166	11	35	-24	33	-22
NSR167	16	30	-14	19	-3
NSR168	6	28	-22	19	-13
NSR169	9	31	-22	28	-19
NSR170	9	31	-22	28	-19
NSR171	13	37	-24	23	-10
NSR172	7	31	-24	28	-21
NSR173	11	31	-20	28	-17
NSR174	10	26	-16	17	-7
NSR175	11	31	-20	28	-17
NSR176	11	35	-24	33	-22
NSR177	7	31	-24	28	-21
NSR178	9	31	-22	28	-19
NSR179	8	31	-23	28	-20
NSR180	11	31	-20	28	-17
NSR181	9	31	-22	28	-19
NSR182	13	37	-24	23	-10
NSR183	7	31	-24	28	-21
NSR184	7	31	-24	28	-21
NSR185	9	26	-17	17	-8
NSR186	5	28	-23	19	-14
NSR187	5	28	-23	19	-14
NSR188	5	28	-23	19	-14
NSR189	8	31	-23	28	-20
NSR190	6	28	-22	19	-13
NSR191	7	31	-24	28	-21
NSR192	11	31	-20	28	-17
NSR193	5	28	-23	19	-14
NSR194	7	31	-24	28	-21

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR195	13	37	-24	23	-10
NSR196	11	31	-20	28	-17
NSR197	13	37	-24	23	-10
NSR198	10	31	-21	28	-18
NSR199	10	35	-25	33	-23
NSR200	10	31	-21	28	-18
NSR201	7	31	-24	28	-21
NSR202	14	30	-16	19	-5
NSR203	13	37	-24	23	-10
NSR204	10	31	-21	28	-18
NSR205	8	26	-18	17	-9
NSR206	8	32	-24	20	-12
NSR207	6	26	-20	17	-11
NSR208	10	31	-21	28	-18
NSR209	13	37	-24	23	-10
NSR210	13	30	-17	19	-6
NSR211	10	31	-21	28	-18
NSR212	8	32	-24	20	-12
NSR213	10	35	-25	33	-23
NSR214	14	30	-16	19	-5
NSR215	6	32	-26	20	-14
NSR216	8	32	-24	20	-12
NSR217	7	31	-24	28	-21
NSR218	9	35	-26	33	-24
NSR219	13	37	-24	23	-10
NSR220	6	31	-25	28	-22
NSR221	13	37	-24	23	-10
NSR222	7	31	-24	28	-21
NSR223	8	35	-27	33	-25
NSR224	6	26	-20	17	-11
NSR225	5	32	-27	20	-15
NSR226	13	37	-24	23	-10
NSR227	5	28	-23	19	-14
NSR228	10	31	-21	28	-18
NSR229	7	31	-24	28	-21
NSR230	5	32	-27	20	-15
NSR231	5	32	-27	20	-15
NSR232	12	37	-25	23	-11
NSR233	5	32	-27	20	-15

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR234	5	32	-27	20	-15
NSR235	12	37	-25	23	-11
NSR236	12	37	-25	23	-11
NSR237	13	30	-17	19	-6
NSR238	4	28	-24	19	-15
NSR239	5	32	-27	20	-15
NSR240	6	32	-26	20	-14
NSR241	8	32	-24	20	-12
NSR242	12	37	-25	23	-11
NSR243	5	32	-27	20	-15
NSR244	6	31	-25	28	-22
NSR245	12	37	-25	23	-11
NSR246	7	31	-24	28	-21
NSR247	12	37	-25	23	-11
NSR248	4	28	-24	19	-15
NSR249	10	35	-25	33	-23
NSR250	7	32	-25	20	-13
NSR251	9	32	-23	20	-11
NSR252	6	32	-26	20	-14
NSR253	8	32	-24	20	-12
NSR254	5	32	-27	20	-15
NSR255	7	31	-24	28	-21
NSR256	9	35	-26	33	-24
NSR257	10	35	-25	33	-23
NSR258	12	37	-25	23	-11
NSR259	12	37	-25	23	-11
NSR260	10	35	-25	33	-23
NSR261	12	37	-25	23	-11
NSR262	8	32	-24	20	-12
NSR263	9	35	-26	33	-24
NSR264	10	35	-25	33	-23
NSR265	8	32	-24	20	-12
NSR266	8	35	-27	33	-25
NSR267	12	30	-18	19	-7
NSR268	4	32	-28	20	-16
NSR269	11	37	-26	23	-12
NSR270	10	31	-21	28	-18
NSR271	7	31	-24	28	-21
NSR272	9	35	-26	33	-24

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR273	11	37	-26	23	-12
NSR274	8	32	-24	20	-12
NSR275	5	32	-27	20	-15
NSR276	8	31	-23	28	-20
NSR277	4	32	-28	20	-16
NSR278	7	35	-28	33	-26
NSR279	7	32	-25	20	-13
NSR280	11	30	-19	19	-8
NSR281	8	31	-23	28	-20
NSR282	8	32	-24	20	-12
NSR283	7	35	-28	33	-26
NSR284	7	32	-25	20	-13
NSR285	7	31	-24	28	-21
NSR286	4	32	-28	20	-16
NSR287	7	35	-28	33	-26
NSR288	6	31	-25	28	-22
NSR289	8	32	-24	20	-12
NSR290	7	31	-24	28	-21
NSR291	5	32	-27	20	-15
NSR292	7	32	-25	20	-13
NSR293	4	28	-24	19	-15
NSR294	7	35	-28	33	-26
NSR295	11	37	-26	23	-12
NSR296	7	31	-24	28	-21
NSR297	4	32	-28	20	-16
NSR298	7	32	-25	20	-13
NSR299	4	28	-24	19	-15
NSR300	6	31	-25	28	-22
NSR301	11	30	-19	19	-8
NSR302	5	32	-27	20	-15
NSR303	7	31	-24	28	-21
NSR304	5	32	-27	20	-15
NSR305	3	32	-29	20	-17
NSR306	11	37	-26	23	-12
NSR307	11	37	-26	23	-12
NSR308	11	37	-26	23	-12
NSR309	3	32	-29	20	-17
NSR310	11	37	-26	23	-12
NSR311	5	32	-27	20	-15

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR312	7	35	-28	33	-26
NSR313	10	37	-27	23	-13
NSR314	11	37	-26	23	-12
NSR315	5	32	-27	20	-15
NSR316	11	37	-26	23	-12
NSR317	3	32	-29	20	-17
NSR318	5	32	-27	20	-15
NSR319	8	32	-24	20	-12
NSR320	4	28	-24	19	-15
NSR321	7	31	-24	28	-21
NSR322	8	32	-24	20	-12
NSR323	7	32	-25	20	-13
NSR324	9	32	-23	20	-11
NSR325	4	32	-28	20	-16
NSR326	4	32	-28	20	-16
NSR327	5	26	-21	17	-12
NSR328	6	35	-29	33	-27
NSR329	7	32	-25	20	-13
NSR330	8	31	-23	28	-20
NSR331	7	31	-24	28	-21
NSR332	4	28	-24	19	-15
NSR333	10	37	-27	23	-13
NSR334	3	32	-29	20	-17
NSR335	8	32	-24	20	-12
NSR336	10	37	-27	23	-13
NSR337	6	31	-25	28	-22
NSR338	5	26	-21	17	-12
NSR339	10	37	-27	23	-13
NSR340	10	37	-27	23	-13
NSR341	4	32	-28	20	-16
NSR342	10	37	-27	23	-13
NSR343	10	37	-27	23	-13
NSR344	3	32	-29	20	-17
NSR345	3	32	-29	20	-17
NSR346	3	32	-29	20	-17
NSR347	9	30	-21	19	-10
NSR348	7	32	-25	20	-13
NSR349	10	37	-27	23	-13
NSR350	10	37	-27	23	-13

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR351	9	30	-21	19	-10
NSR352	7	32	-25	20	-13
NSR353	10	31	-21	28	-18
NSR354	10	37	-27	23	-13
NSR355	9	30	-21	19	-10
NSR356	5	35	-30	33	-28
NSR357	10	37	-27	23	-13
NSR358	3	32	-29	20	-17
NSR359	10	37	-27	23	-13
NSR360	4	28	-24	19	-15
NSR361	10	37	-27	23	-13
NSR362	10	37	-27	23	-13
NSR363	2	32	-30	20	-18
NSR364	10	37	-27	23	-13
NSR365	10	37	-27	23	-13
NSR366	10	37	-27	23	-13
NSR367	3	28	-25	19	-16
NSR368	10	37	-27	23	-13
NSR369	3	32	-29	20	-17
NSR370	10	37	-27	23	-13
NSR371	10	37	-27	23	-13
NSR372	10	37	-27	23	-13
NSR373	10	37	-27	23	-13
NSR374	4	26	-22	17	-13
NSR375	10	37	-27	23	-13
NSR376	10	37	-27	23	-13
NSR377	10	37	-27	23	-13
NSR378	10	37	-27	23	-13
NSR379	10	37	-27	23	-13
NSR380	6	32	-26	20	-14
NSR381	10	37	-27	23	-13
NSR382	3	28	-25	19	-16
NSR383	3	28	-25	19	-16
NSR384	10	37	-27	23	-13
NSR385	8	37	-29	23	-15
NSR386	6	37	-31	23	-17
NSR387	10	37	-27	23	-13
NSR388	8	30	-22	19	-11
NSR389	10	37	-27	23	-13

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR390	2	32	-30	20	-18
NSR391	9	37	-28	23	-14
NSR392	9	37	-28	23	-14
NSR393	9	37	-28	23	-14
NSR394	9	37	-28	23	-14
NSR395	9	37	-28	23	-14
NSR396	2	32	-30	20	-18
NSR397	3	28	-25	19	-16
NSR398	2	32	-30	20	-18
NSR399	7	32	-25	20	-13
NSR400	8	30	-22	19	-11
NSR401	8	30	-22	19	-11
NSR402	4	26	-22	17	-13
NSR403	8	30	-22	19	-11
NSR404	3	28	-25	19	-16
NSR405	3	28	-25	19	-16
NSR406	8	30	-22	19	-11
NSR407	2	32	-30	20	-18
NSR408	8	30	-22	19	-11
NSR409	3	28	-25	19	-16
NSR410	3	32	-29	20	-17
NSR411	3	28	-25	19	-16
NSR412	4	26	-22	17	-13
NSR413	2	32	-30	20	-18
NSR414	2	28	-26	19	-17
NSR415	6	31	-25	28	-22
NSR416	1	32	-31	20	-19
NSR417	4	26	-22	17	-13
NSR418	3	26	-23	17	-14
NSR419	4	26	-22	17	-13
NSR420	8	30	-22	19	-11
NSR421	3	32	-29	20	-17
NSR422	3	28	-25	19	-16
NSR423	2	32	-30	20	-18
NSR424	8	30	-22	19	-11
NSR425	3	26	-23	17	-14
NSR426	3	28	-25	19	-16
NSR427	3	32	-29	20	-17
NSR428	6	31	-25	28	-22

Noise Sensitive Receptor	Rating Level (dBA)	Daytime		Night-time	
		Representative Background Sound Level (dBA)	Margin (dB)	Representative Background Sound Level (dBA)	Margin (dB)
NSR429	1	32	-31	20	-19
NSR430	2	28	-26	19	-17
NSR431	7	30	-23	19	-12
NSR432	4	26	-22	17	-13
NSR433	2	32	-30	20	-18
NSR434	6	31	-25	28	-22
NSR435	7	31	-24	28	-21
NSR436	7	30	-23	19	-12
NSR437	7	31	-24	28	-21
NSR438	6	30	-24	19	-13
NSR439	2	32	-30	20	-18