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A specialist energy consultancy

Environmental Noise Impact Assessment

Blackhillock Synchronous Compensator

ESB Asset Development (UK) Ltd.

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1 Introduction

1.1 Overview

TNEI has been commissioned by ESB Asset Development (UK) Ltd (ESB) to undertake an environmental Noise Impact Assessment (NIA) to support the planning application for the construction and operation of the Blackhillock Synchronous Compensator development (the 'Proposed Development').

The Proposed Development is to be located on land south of Blackhillock Substation, Keith, Moray, at approximate Ordnance Survey coordinates 343221, 848131.

The aims of this NIA are 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 noise impacts associated with the Proposed Development; and
- Indicate any requirements for mitigation measures, if required, in order to provide sufficient levels of protection for all noise sensitive receptors.

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;

- Ewan Watson, Tech IOA, BEng (Hons): **Baseline Survey, and noise propagation modelling;**
- Matthew Lambert, Tech IOA, BSc (Hons), MSc, IOA Certificate of Competence in Environmental Noise Measurement: **QA of noise model and report**; and
- Jim Singleton, MIOA, BSc (Hons), IOA Postgraduate Diploma in Acoustics and Noise Control: **Reporting**.

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;
- **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 which 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 E.

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

2.1 Proposed Development Description

The Proposed Development would consist of a synchronous compensator with associated cooling and electrical plant. A synchronous compensator is a rotating electrical machine that resembles a generator or motor in design. Unlike a generator or motor, a synchronous compensator is not coupled to a prime mover or load, hence the only real power flow is a small percentage of rated power imported to support its internal losses. The compensator will rotate continuously at a constant rpm and its purpose is to support the National Grid transmission system voltage by supplying or absorbing reactive power and providing synchronous inertia. This would allow for increased renewable energy generation connecting onto the National Grid, thereby supporting the network.

A Site layout plan and elevation drawings provide an overview of the proposed Site and are included as Appendix B.

The Proposed Development would introduce new sound sources to the local area in the form of the synchronous compensator housed within a building and some additional, externally located fixed plant. Specifically, the dominant sound sources will be:

- 300 to 400 MVA synchronous compensator (generator, flywheel, lube oil skid; air compressor and pumps) in building, 1 of;
- External cooling equipment;
- Generator step-up transformer, 1 of; and
- Auxiliary transformer, 1 of.

The sound level output of any other items, e.g. circuit breakers, would be insignificant in comparison to the primary sound sources detailed above. Accordingly, no other items of plant have not been considered within the assessment.

2.2 Study Area

Noise Sensitive Receptors (NSRs) are properties which 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, with the assumption that if sound levels at the closest receptors are within the defined limits, then sound levels at NSRs at greater distances from the Proposed Development should also be within acceptable levels.

The area immediately surrounding the Site is dominated by large scale electrical infrastructure in the form of the adjacent Blackhillock electrical substation, encompassing an area approximately 25 hectares in size to the north of the Site. Blackhillock and Cairdshill quarries lie within the vicinity of the site, approximately 300 m east of the Site boundary, covering an area approximately 21 hectares in size. Accordingly, there are not many NSRs in the area, although two residential properties,

Blackhillock Croft and Greens of Aucharties, are located to the east of the Proposed Development at approximately 190 m and 210 m east of the Proposed Development compound respectively.

Figure 1 (Appendix E) details the study area and the two 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. In particular, the TAN details the following guidance;

- British Standard (BS) 4142
- BS 8233
- World Health Organisation (WHO) *Guidelines for Community Noise*, (4) and,
- WHO *Night Noise Guidelines for Europe*. (5)

3.1.2 Moray Local Development Plan (July 2020)

The Moray Local Development Plan sets out overarching spatial planning policy for the Moray Council area (including Blackhillock).

DP 9: Renewable Energy states that all renewable energy proposals will be considered favourably where they meet the following criteria:

i. *"They are compliant with policies to safeguard and enhance the built and natural environment;*

ii. *They do not result in the permanent loss or permanent damage of prime agricultural land;*

iii. *They avoid or address any unacceptable significant adverse impacts including:*

- *Landscape and visual impacts.*
- ***Noise impacts.***
- *Air quality impacts.*
- *Electromagnetic disturbance.*
- *Impact on water environment.*
- *Impact on carbon rich soils and peat land hydrology.*
- *Impact on woodland and forestry interests.*
- *Traffic impact – mitigation during both construction and operation.*
- *Ecological impact.*
- *Impact on tourism and recreational interests."*

EP14 – Pollution, Contamination & Hazards

This policy states that proposals which may cause significant air, water, soil, light or **noise** pollution or exacerbate issues must be accompanied by a detailed assessment report on the levels, character and transmission of the potential pollution with measures to mitigate impacts.

3.2 EHO Consultation

In August and September 2020, TNEI undertook consultation with the Environmental Health Department at Moray Council to discuss the assessment methodology. At the time of the initial consultation it was assumed that background noise monitoring would not be appropriate due to COVID-19 restrictions and an assessment against fixed noise level limits, such as the setting of NR curve criterion was suggested by TNEI. Following discussions with the Environmental Health Officer (EHO) however, along with changes to COVID-19 restrictions, it was decided that it would be more appropriate to undertake a baseline noise survey.

The EHO was concerned in particular with the potential cumulative noise levels that could occur through the joint operation of the proposed development alongside the nearby Blackhillock substation and suggested that a number of assessment approaches be considered including the use of BS 4142, NAN-R-45 and / or NR Curves. Section 3.3 considers each of these approaches.

3.3 Assessment Method

The following section discusses how each of the documents detailed in Section 3.1.1 alongside the EHO's suggestions have been considered within this study.

Typically, the assessment of environmental noise is based on a comparison of likely noise levels against either 'context' based limits or a set of fixed limits.

Context based limits are set relative to the existing noise environment and can also consider the characteristics of the noise source(s), whilst fixed limits are usually set regardless of the existing noise environment or type of noise source(s).

3.3.1 Context Based Limits

BS 4142:2014 + A1:2019[1] *'Methods for Rating and Assessing Industrial and Commercial Sound'* (6) is commonly used to assess the potential impacts of new sound sources on nearby residential receptors.

This assessment method is based on the predicted or measured levels of an assessed source sound compared to the measured background sound levels without the specific sound source present and uses, *"outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident".*

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

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

[1] PAN 1/2011 actually refers to the 1997 version of BS4142, however, the 2019 version of the standard is referenced in this assessment, which we believe to be the most appropriate.

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

There is no pass or fail element to a BS4142 assessment, rather the assessment method requires the acoustician to determine the likelihood of adverse noise impacts through consideration of the context of the proposed development and the existing noise environment.

3.3.2 Fixed Guideline Levels (BS8233 & WHO Recommendations)

BS 8233 '*Guidance on sound insulation and noise reduction for buildings*' (7) presents single figure (broadband) guideline noise levels for daytime and night-time periods for a number of different building types; for residential developments these are based on the guideline levels provided in the WHO documents previously quoted (3.1.1). The guideline values provided by the WHO are, however, meant for use in urban and semi-urban settings where existing ambient sound levels will typically be higher than they are in the vicinity of the Proposed Development and across the study area. As such, we do not believe the use of these guideline levels would be appropriate for this location.

3.3.3 Alternative Approaches (NR Curves and NAN-R-45)

NR curves differ from other methods of environmental noise assessment in that they allow for the frequency content of noise levels to be assessed, rather than relying on a single figure 'broadband' value.

The NR limit values are based on a set of curves indicating sound pressure levels at various octave band frequencies. Subjectively, less annoyance is caused by a low frequency noise than a high frequency noise of the same SPL. Therefore, the shape of the NR curve is dictated by the highest levels at low frequencies and decreasing gradually with increasing frequency. The NR curves can be used for several types of assessment criteria, including the avoidance of annoyance, preservation of hearing and the prevention of speech interference. Although they can be used externally, NR curves are typically used to set appropriate internal noise level criteria, primarily in relation to the design of mechanical ventilation systems.

Whilst NR curves can sometimes used as an alternative noise limit where it is not possible to undertake baseline monitoring, it can be difficult in practice to enforce an NR noise level limit. Compliance monitoring, for example, would typically need to be taken inside of a resident's property where other noise sources, for example central heating systems, appliances etc. could have an

impact on the measured levels. In this particular case we feel that the use of NR curves is not justified as it is possible to carry out an assessment considering the existing noise environment through a baseline survey.

NAN-R-45 '*Procedure for the assessment of low frequency noise complaints'* details a procedure intended to assist in the evaluation of existing low frequency problems. The document states; "*It is not intended as a means of predicting when disturbance might occur, for example in a planning situation, and would not be reliable to use as such.*" Accordingly, it would not be appropriate to include the NAN-R-45within this assessment.

3.4 Assessment Criteria

With due regards to the above, this noise assessment will consider context-based limits set relative to the existing background noise levels in the form of a BS4142:2014 +A1:2019 assessment, as endorsed in the PAN/TAN.

3.5 Calculation Method

3.5.1 Noise Propagation Model (ISO 9613-2:2996)

In order to predict the noise immission levels attributable to the Proposed Development a noise propagation model was created using the propriety noise modelling software CadnaA. Within the software, complex models can be produced in order 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 '*Acoustics – Attenuation of sound during propagation outdoors* (4) 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, with specific areas of developed ground (including the proposed development area) modelled with a ground attenuation factor of 0 (hard ground); and
- Receiver heights are set to 1.5 m for daytime assessment locations and 4 m for night-time assessment locations.[2]

3.5.2 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 and 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;

[2] A height of 1.5 m is used for daytime as the assessment location considers use of gardens and amenity areas. A height of 4 m is used for night-time, which represents the typical height of a first floor bedroom window, when people are more likely to be sleeping.

- Table 5 of ISO 9613 estimates overall accuracy for broadband noise predictions of ± 3 dB, with average source to receiver heights <5 m, at distances of up to 1,000 m;
- 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 maximum noise output; and,
- Modelled sound sources represent candidate plant and a proposed site layout. Final plant specification and layout will be determined during the tendering stage.

4 Baseline Sound Level Monitoring

In order to inform the BS 4142 assessment, baseline sound level monitoring was undertaken on 29th and 30th September 2020. Noise monitoring equipment was installed at one location, in a field 65 m west of the Blackhillock Croft house next to the garden boundary, chosen to be suitably representative of both NSRs. Sound level measurements were logged continually in 15 mins and attended observations were made periodically during daytime, evening, and night-time periods. Table 4-1 details the Noise Monitoring Location (NML), which is also shown on Figure 1 (Appendix E) and Table 4-2 details the duration and monitoring periods for each NML.

Table 4-1: Baseline Noise Monitoring Locations

NML		Coordinates		Comments
NML01	Field to west of Blackhillock Croft	343416	848088	Representative of both NSRs to the east of the Proposed Development

Table 4-2: Baseline Monitoring Periods

NML		Start	Finish
NML01	Field to west of Blackhillock Croft	14:30 29th September	11:00 30th September

Subjective observation at NML01 during the survey periods noted the following;

- During the daytime, the soundscape was influenced predominantly by noise from the nearby Blackhillock Quarry to the north east, farming machinery ploughing fields to the south and east and distant traffic noise from the A96 to the east. Birdsong and planes passing overhead could also be heard on occasion.
- During the night-time, access to the NML was restricted; however, observations at nearby spot measurement locations indicated that the soundscape was influenced primarily from the noise of the movement of trees and bushes, despite the relatively low wind speeds, and also from wind turbines located to the south of the NML.

Table 4-3 details the typical background sound levels $L_{A90\,(15mins)}$, which have been determined after considering the distribution of data for each measurement period. Detailed measurement data including statistical analysis charts can be found in Appendix D.

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

NML ID	Daytime $L_{A90(15mins)}$	Night-time $L_{A90(15mins)}$

NML ID	Daytime $L_{A90(15mins)}$	Night-time $L_{A90(15mins)}$
NML01	40	36

In addition to the fixed monitoring location, additional attended short term monitoring was undertaken at two spot measurement locations, NML02 and NML03, to help understand the local noise environment and put into context the influence of the quarries and substation to the soundscape. NML02 was located to the north of the NSRs, close to the substation Site boundary and just west of the Blackhillock Quarry. NML03 was located to the south of the NSRs. Both spot measurement locations are detailed on Figure 1 and the measured sound level data is included in Appendix C.

At NML02 during the afternoon the soundscape was dominated by the quarry. No sound from the substation was identified. During the evening activity at the quarry had ceased and the soundscape was mostly influenced from distant road traffic to the east. Still no sound from the substation was identified. At night-time (02:00) the soundscape was mostly influenced by wind induced movement of vegetation.

At NML03 during the afternoon the soundscape was dominated by the farming activities as well as being influenced by noise from the quarries. During the evening some farming activity continued though the soundscape was mostly influenced from distant road traffic to the east. At night-time (02:00) the soundscape was mostly influenced by wind turbine noise from the south.

5 Operational Noise Impacts

5.1 Modelling of Individual Sound Sources

The noise model considers all of the sound sources detailed within Section 2.1.

The following sections describe how each element has been incorporated into the noise propagation model.

TNEI has received a confidential Siemens report detailing actual measured noise levels of plant for a similar development as that proposed here. We are unable to publish the detailed noise data here however we would be happy to discuss the modelling and noise source data in more detail with Moray Council if required. Broadband sound power levels have been provided here to provide an indication of noise levels modelled.

It should be noted that final plant specification and the building's noise attenuation performance will be undertaken at a later stage during the tendering process and may differ from that used within the noise model.

5.1.1 Synchronous Compensator

The synchronous compensator will be housed inside a building and consists of a generator, flywheel, lube oil skid, air compressor and pumps. Internal sound pressure levels within the building have been provided in the Siemens report. These levels have been calculated through the logarithmic addition of the octave band spectra of individual items of plant and an assumed internal reverberation time. The calculated overall sound pressure level inside the hall is stated as 94 dB(A).

The synchronous compensator building has been modelled as a series of individual area sources for each facade and the roof as well as the doors, roller shutter and louvres. The SRI data used for each building element is detailed in Table 5-1. It should be noted that SRI values used in the model have been selected in order for the building to provide appropriate levels of attenuation. The exact building specifications will not be made until the detailed design stage and it is noted that careful consideration will be required to ensure sufficient levels of attenuation are achieved from all building elements. In particular, the following should be noted;

- All vents will be required to be fitted with acoustic louvres or similar;
- An acoustic roller shutter door will need to be specified. It will not be sufficient to install a 'standard' roller shutter door and care must given to specify an appropriate Rw value for the entire doorset and not just the door panel.
- The model assumes that all facades are lined and insulated. Use of a standard steel wall panel without lining is unlikely to be sufficient.

It is not possible to specify minimum performance requirements at the stage, as that will also depend on the final plant specification, however, the Rw value detailed in Table 5-1 provides a reasonable starting point. It is recommended that further noise modelling is conducted during the detailed design stage to calculate more detailed minimum performance requirements.

Table 5-1: SRI Values used in the Noise Model

Building Element	Material used in model	Frequency (Hz)								Rw
		63	125	250	500	1000	2000	4000	8000	
Facades	Kingspan Panelling (AWP/60 wall panel type 7W)	18	24	37	48	53	55	63	-	47
Roof	Kingspan Panelling (KS1000 RW/80 roof panel 8R)	-	20	36	48	50	66	70	-	44
Personnel Doors	Door (According to DIN EN ISO 12354-4:2017-11)	10	16	17	21	24	30	32	28	25
Roller Shutter	Soundroll 31 RSD (adjusted to 25 Rw)	-	15	19.1	18.3	27.3	38.2	-	-	25
Louvres	GBL-2SL300 Acoustic Louvre	7	9	12	23	33	41	32	28	25

5.1.2 External cooling equipment

The external ground mounted outdoor cooling fans are arranged in a bank of 3 units, approximately 3 m high. Each unit has been modelled as an individual area source. Sound power levels have been provided for typical units for this type of development, with a sound power level of 87 dB(A) for each unit.

5.1.3 Transformers

The Proposed Development will include a step-up transformer (approximately 8 m high) and an auxiliary transformer (approximately 4 m high). While the final specification will be determined during tendering, source data had been provided as typical for this type of development. Each side and top of the transformers has been modelled as an individual area source with sound power levels of 83 dB(A) per side for the primary generator transformer and 61 dB(A) per side for the auxiliary transformer.

A 10 m high blast/fire wall has been included surrounding the primary transformer on three sides as per the drawings in Appendix B. This will also provide barrier attenuation to noise. Any change in height or location to this wall may require additional noise calculations to be undertaken.

5.2 Calculated Immission Levels

Noise immission levels have been calculated at four Noise Assessment Locations (NALs), which have been selected to represent the closest NSRs to the Proposed Development site. Each NSR has two NALs, which have been selected for separate daytime and night-time assessments. Daytime NALs have been specified at the curtilage of the property's amenity area and at a height of 1.5 m, whereas the night-time NALs have been set close the house and at a height of 4 m to represent the typical height of a first floor bedroom window. The NALs are detailed in Table 5-2 and shown on Figure 2 in Appendix E.

Table 5-2: Noise Assessment Locations

Noise Assessment Location			
NAL ID	**NAL Descriptor**	**Eastings**	**Northings**
NAL01a	At garden boundary of Blackhillock Croft	343423	848092
NAL01b	Blackhillock Croft house	343470	848065
NAL02a	At garden boundary of Greens of Aucharties	343471	848164
NAL02b	Greens of Aucharties house	343503	848185

The immission levels (Specific Sound Level) are calculated assuming all plant is operating continuously and concurrently at maximum operating capacities. The immission levels are detailed in Table 5-3 as dB $L_{Aeq(t)}$. No time period is specified as the model assumes that noise levels would not fluctuate and would remain the same for both daytime and night-time periods. A noise contour plot is provided as Figure 2, Appendix E.

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

Noise Assessment Location		Immission Level
NAL ID	**NAL Descriptor**	**dB $L_{Aeq(t)}$**
NAL01a	At garden boundary of Blackhillock Croft	26
NAL01b	Blackhillock Croft house	24
NAL02a	At garden boundary of Greens of Aucharties	24
NAL02b	Greens of Aucharties house	22

6 Noise Impact Assessment

6.1 BS4142:2014 +A1:2019 Assessment

The assessment considers the predicted immission levels, the character of the sound, the existing sound environment and the context of the development and its setting.

In order to assess the immission levels in accordance with BS 4142, the Specific Sound Levels must be converted into Rating Levels. The Rating Level allows for character corrections to be added to the Specific Sound Level in order to account for particular characteristics of the sound that may be perceived as more annoying. In particular the Rating Level considers the tonality, impulsivity and intermittency of the sound, as well any other sound characteristics that may be readily distinctive against the residual acoustic environment.

6.1.1 Tonality

With regards to tonality, BS4142:2014 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."

Transformers are inherently tonal in the region of 100 Hz at source, however the spectral noise level predictions at the receivers do not indicate a significant peak at this frequency. There is a slight rise in the 125 Hz octave band, as can be seen in Table 6-1, however the quietest $LAeq_{(15mins)}$ and $LA90_{(15mins)}$ values measured throughout the survey period was 33 dB $LAeq_{(15\ mins)}$ at 23:00 and 29 dB $LA90_{(15mins)}$ at 01:30. As such it is unlikely that any tonal characteristics will be perceptible at the nearest receptors.

Furthermore, during final selection of plant and noise control measures, all control elements (silencers, attenuated louvres etc) can be specified to ensure no tonal characteristics are present.

Table 6-1: Octave band noise predictions, dBA

NAL ID	31.5	63	125	250	500	1000	2000	4000	8000
NAL01a	4	16	21	17	20	17	12	1	*nil*
NAL01b	3	13	18	16	18	16	11	*nil*	*nil*
NAL02a	2	14	19	15	18	13	9	*nil*	*nil*
NAL02b	2	13	17	15	17	12	8	*nil*	*nil*

6.1.2 Impulsivity

With regards to impulsivity, BS4142:2014 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 synchronous compensators when operational. Once operational the noise is predictable and consistent.

6.1.3 Intermittency

With regards to intermittency, BS4142:2014 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, the development will be operational for extended durations. This is not considered to be intermittency. Once operational, the noise is predictable and consistent.

6.1.4 Other Sound Characteristics

With regards to other sound characteristics, BS4142:2014(+A1-2019) 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."

No other noise characteristics that would be '*readily distinctive against the residual acoustic environment*' are anticipated, especially when considering the measured ambient sound levels, which remained higher than the predicted noise levels for the entire of the survey.

6.1.5 Calculation of the Rating Level

With due regard to the above, no character corrections are required. Therefore, the Rating Level is equal to the Specific Sound Level.

6.1.6 Assessment of the Impacts

BS4142, 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. However, as a starting point 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."

Table 6-2 presents a comparison of the Rating Levels to the daytime and night-time background sound levels.

Table 6-2: Margin Above / Below (+/-) Background Sound Level, dB

Noise Assessment Location		Daytime			Night-time		
NAL ID	NAL Descriptor	Background Level, dB LA90	Rating Level, dBA	Margin, dB	Background Level, dB LA90	Rating Level, dBA	Margin, dB
NAL01	Blackhillock Croft	40	26	-14	36	24	-12
NAL02	Greens of Aucharties	40	23	-17	36	22	-14

At all locations and for both daytime and night-time the Rating Level is comfortably below the background sound level, which is *'an indication of the specific sound source having a low impact, depending on the context.'* The context in which this assessment is made is as follows;

- The assessment has modelled all sound sources operating continuously, simultaneously and at maximum noise output;
- The assessment considers candidate plant and the maximum sound level output for this type of plant. It also considers typical noise attenuation measures for some elements, such as the synchronous compensator building louvres, but does not consider further noise control measures that may be put into place as part of final design;
- Noise levels from the Site will be consistent and predictable i.e. little variation in noise level output will occur;
- Subjective observations on site noted that noise from the nearby operational substation was not audible in the vicinity of the NSRs; and
- Noise immission levels would be expected to be below the existing residual sound levels.

Consideration of the context of both the proposed development and the environment does not change the assessment outcome. Accordingly, the BS 4142 assessment concludes that the Proposed Development is expected to have a low impact in terms of noise.

7 Consideration of Potential Conditioned Limits

The assessment considers the likely noise level output of the Proposed Development based on typical plant specifications and the layout included in Appendix B. Source noise levels will vary with final plant specifications, along with any attenuation levels of noise control measures. As such, the source noise levels presented in this report should not be used to determine any particular noise level limits for the development.

Rather, it is more appropriate to set noise level limits based on the existing sound levels in the area (see Table 4-3), whilst considering the context of the development as discussed in the qualitative assessment. This would allow appropriate levels of protection to be allocated to the nearest NSRs, giving comfort to residents and the Local Planning Authority (LPA), whilst providing the developer with sufficient flexibility in the specification of plant during the tendering process.

8 Summary

In order to assess the impact of noise emissions from the Proposed Development, TNEI has produced a noise propagation model in accordance with ISO 9613 that predicts the noise immission levels at the nearest identified NSRs based on the layout included in Appendix B using candidate plant typical for this type of development.

The assessment has been made against BS 4142 and determines that for both of the nearest receptors during the daytime and night-time "*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*".

The EHO expressed concern with regards to potential cumulative noise impacts from the nearby Blackhillock Substation, however, subjective observations made onsite suggest that the noise output of the substation is low and was not audible at the NSRs. Furthermore, the predicted noise levels are at least 10 dB below the measure background noise level for both daytime and night-time and as such the predicted noise levels would not raise the existing background sound level at either receptor.

Taking into context the Proposed Development and the anticipated noise effects, the BS 4142 assessment concludes that the Proposed Development will not have an adverse noise impact on the local area.

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. **World Health Organization (WHO).** *WHO Guidelines for Community Noise.* Geneva : WHO, 1999.

4. —. *WHO Night Noise Guidelines for Europe.* Geneva : WHO, 2009.

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

6. —. *Guidance on Sound Insulation and Noise Reduction for Buildings.* UK : BSI, 2014. BS8233:2014.

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, 1996. ISO 9613-2:1996.

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

9. **The European Parliament and the Council of the European Union.** *Relating to the Assessment and Management of Environmental Noise.* s.l. : European Parliament, 2002. DIRECTIVE 2002/49/EC.

10. **(ISO), International Organization for Standardization.** *Acoustics – Attenuation of Sound during Propagation Outdoors: Part 1 – Method of Calculation of the Attenuation of Sound by Atmospheric Absorption.* Geneva : ISO, 1996. ISO9613-1:1996.

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

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).

Isopleth: a line on a map connecting points of equal value, for example air pressure, noise level etc.

Noise: unwanted sound.

Lw: 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.

Leq: 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).

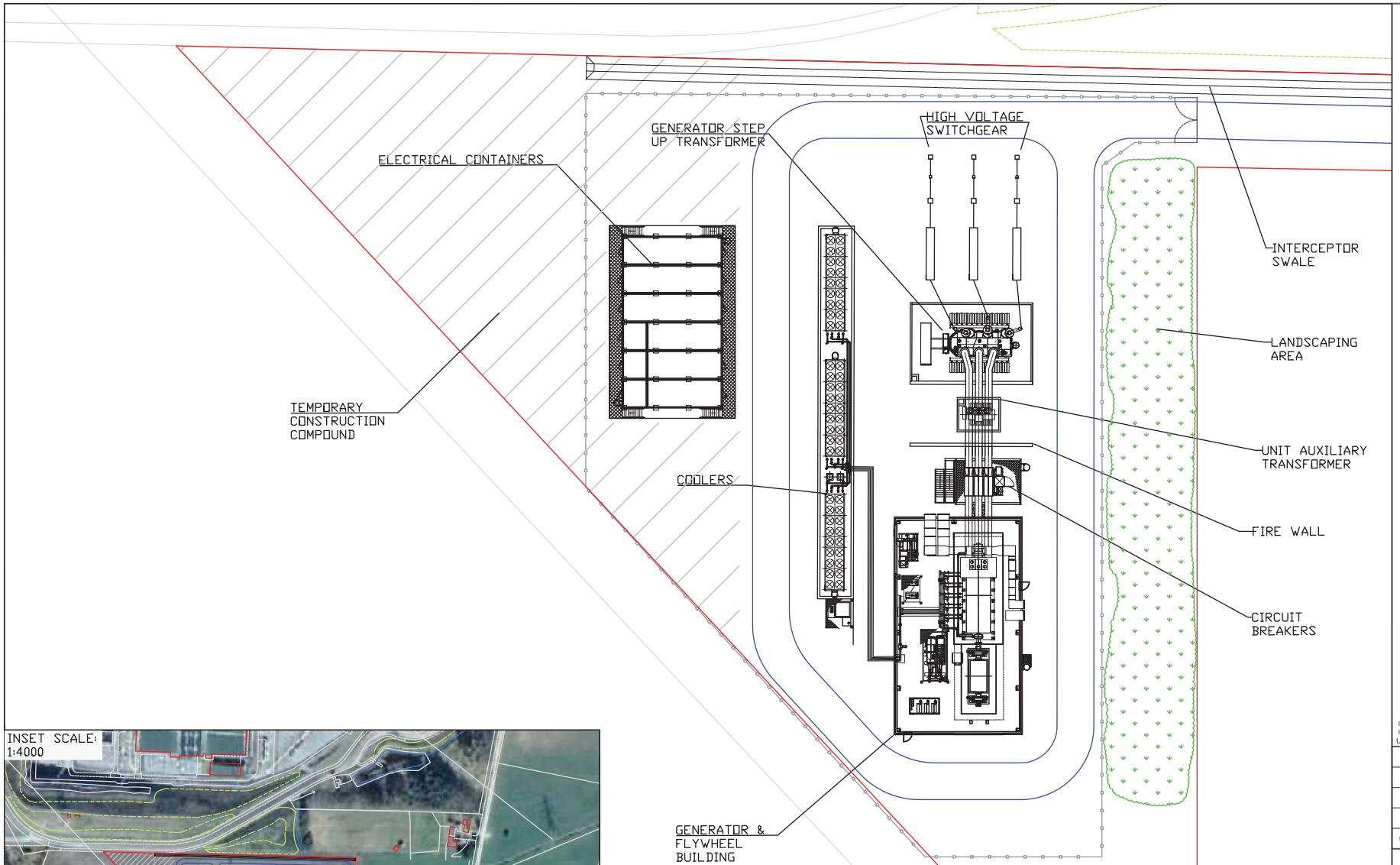
L90: index represents the sound level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is often used to measure the background sound level. The LA90,10min is the A-weighted background sound level over a ten-minute measurement sample.

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 – Proposed Site Layout



INSET SCALE: 1:4000

Legend

- Application Boundary
- Access Track
- Fenceline
- Screening / Landscaping Area
- Temporary Construction Compound / Laydown Area

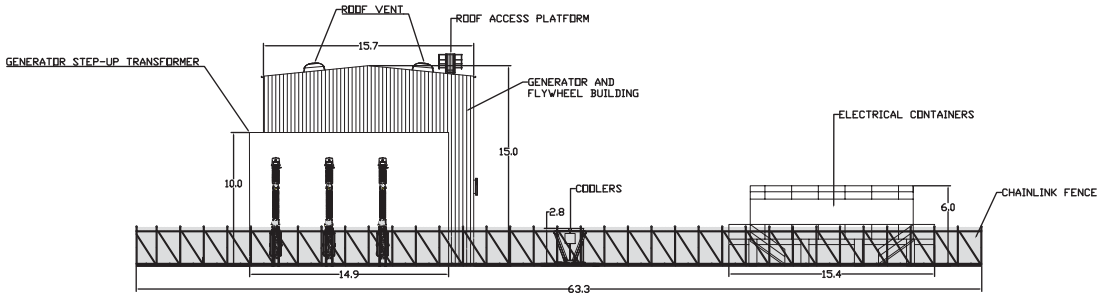
Site Centre Grid Reference:
NJ 43221 48131

Rev.	DETAILS	DRAWN	CHKD	APPD	DATE
R1	SECOND ISSUE	JR	JMc	JMc	30/11/2020
R0	FIRST ISSUE	JR	JMc	JMc	12/11/2020

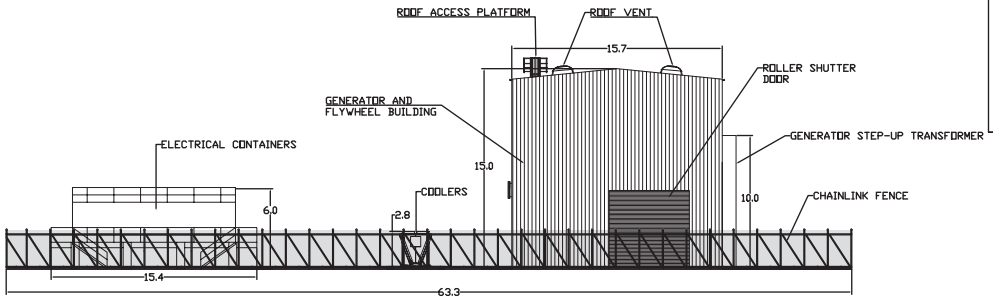
Project	Blackhillock Synchronous Compensator
Client	ESB
Title	Site Layout Plan
Figure No.	2.2
Scale	1:500 @A3
Doc Ref	13902-028

Energy for generations

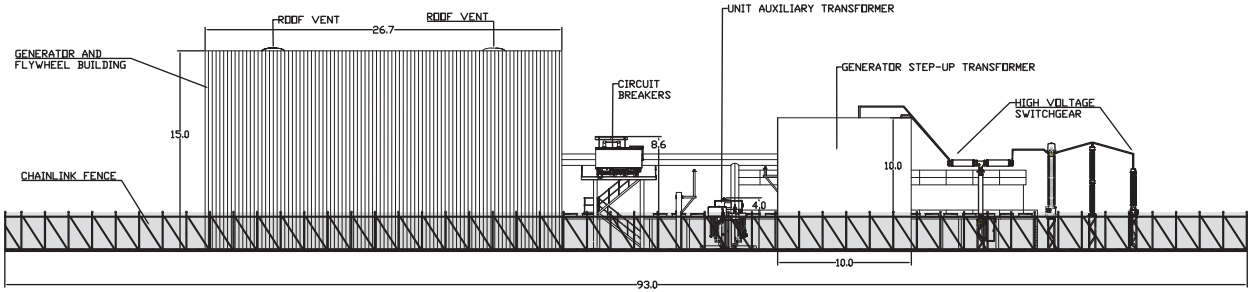
tnei



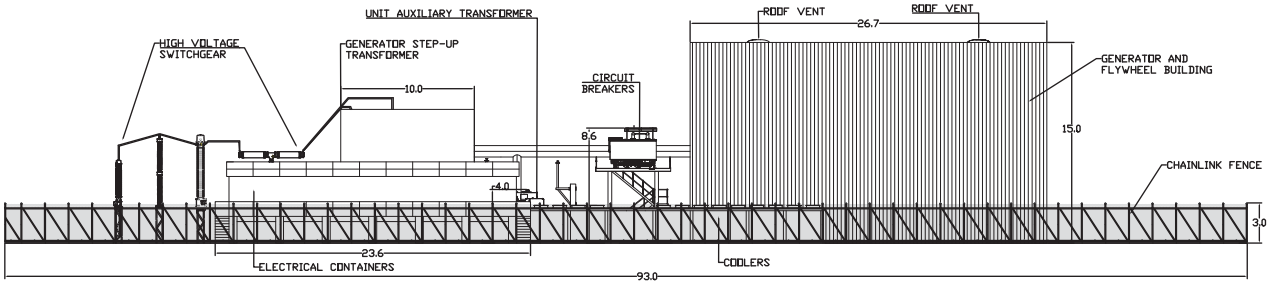
NORTH ELEVATION



SOUTH ELEVATION

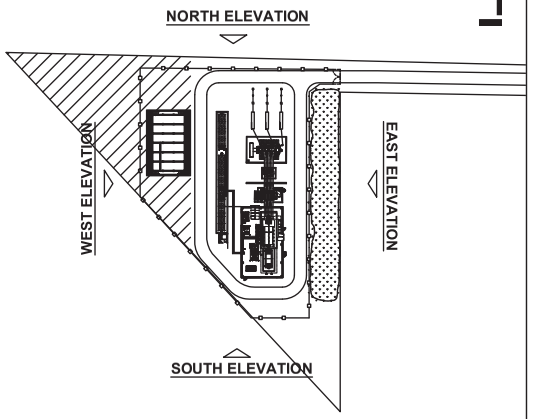


EAST ELEVATION



WEST ELEVATION

INSET SCALE:
1:2,000



Note

All dimensions in meters (m) unless stated otherwise.

Dimensions are indicative only.

Rev.	DETAILS	DRAWN	CHKD	APPD	DATE
R0	FIRST ISSUE	JR	JMc	JMc	30/11/2020

Project	Blackhillock Synchronous Compensator
Client	ESB
Title	Site Elevations
Figure No.	2.3
Scale	1:400 @A3
Doc Ref	13902-026

Energy for generations

tnei

Appendix C – Baseline Survey Data

Project Nb.& Name	13902 – Blackhillock Synch Comp
Client	ESB

MONITORING LOCATION DETAILS

NML Nb. and Name	NML01 – Field to West of Blackhillock Croft
NML Contact Details (Name, address, phone nb..)	N/A
Description/Reason for exact location and Grid Coordinates	Representative of the closest receptors located to the east of the proposed development. X: 343416 Y: 848088

MONITORING EQUIPMENT DETAILS

	TNEI Id Nb.	Model	Serial Number	Last Cal.
Sound Level Meter	SLM37	Cirrus	G078524	
Pre Amplifier				
Microphone				
Calibrator				

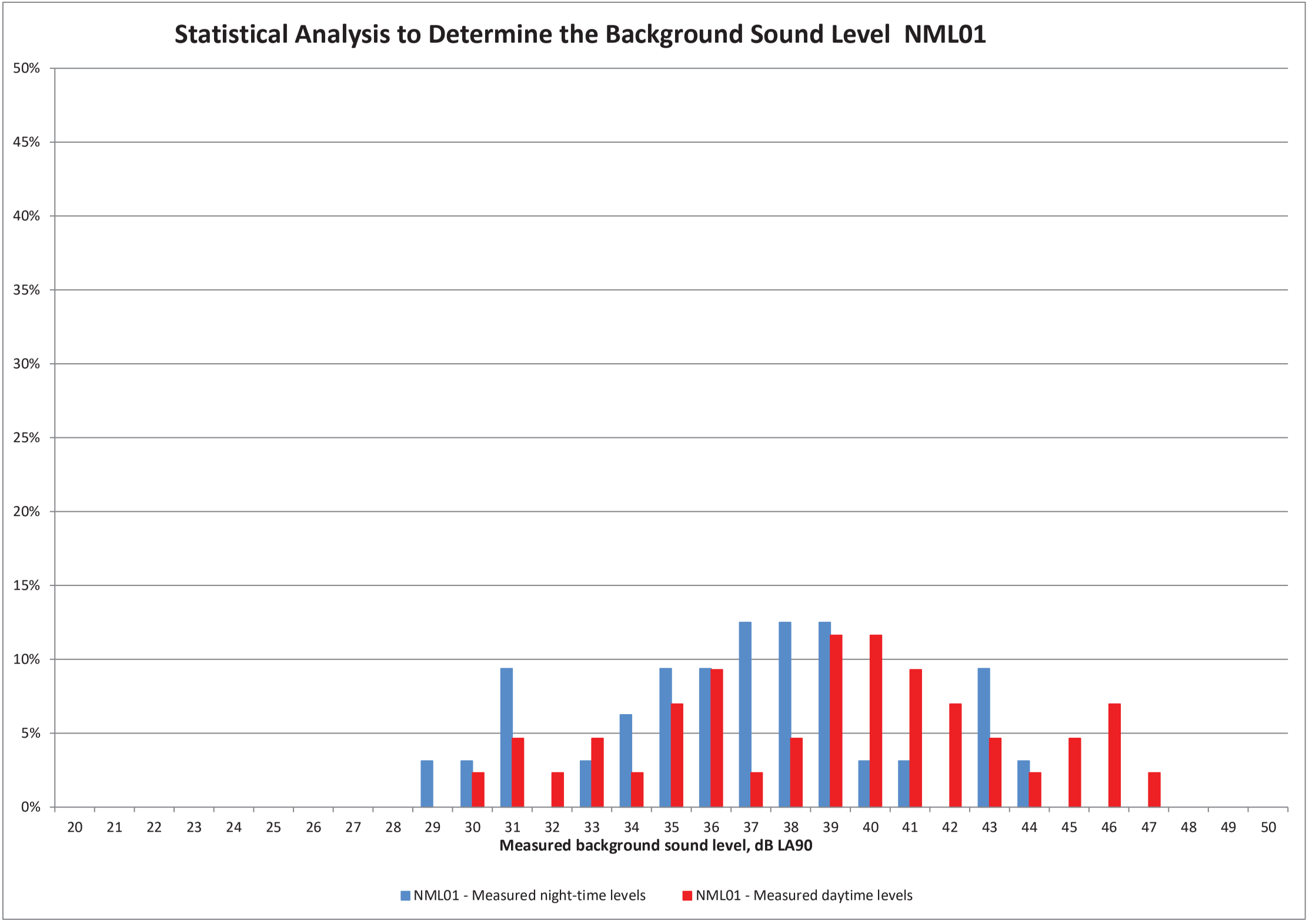
MONITORING EQUIPMENT SETTINGS AT START **(TO BE CHECKED AT EACH SITE VISITS)**

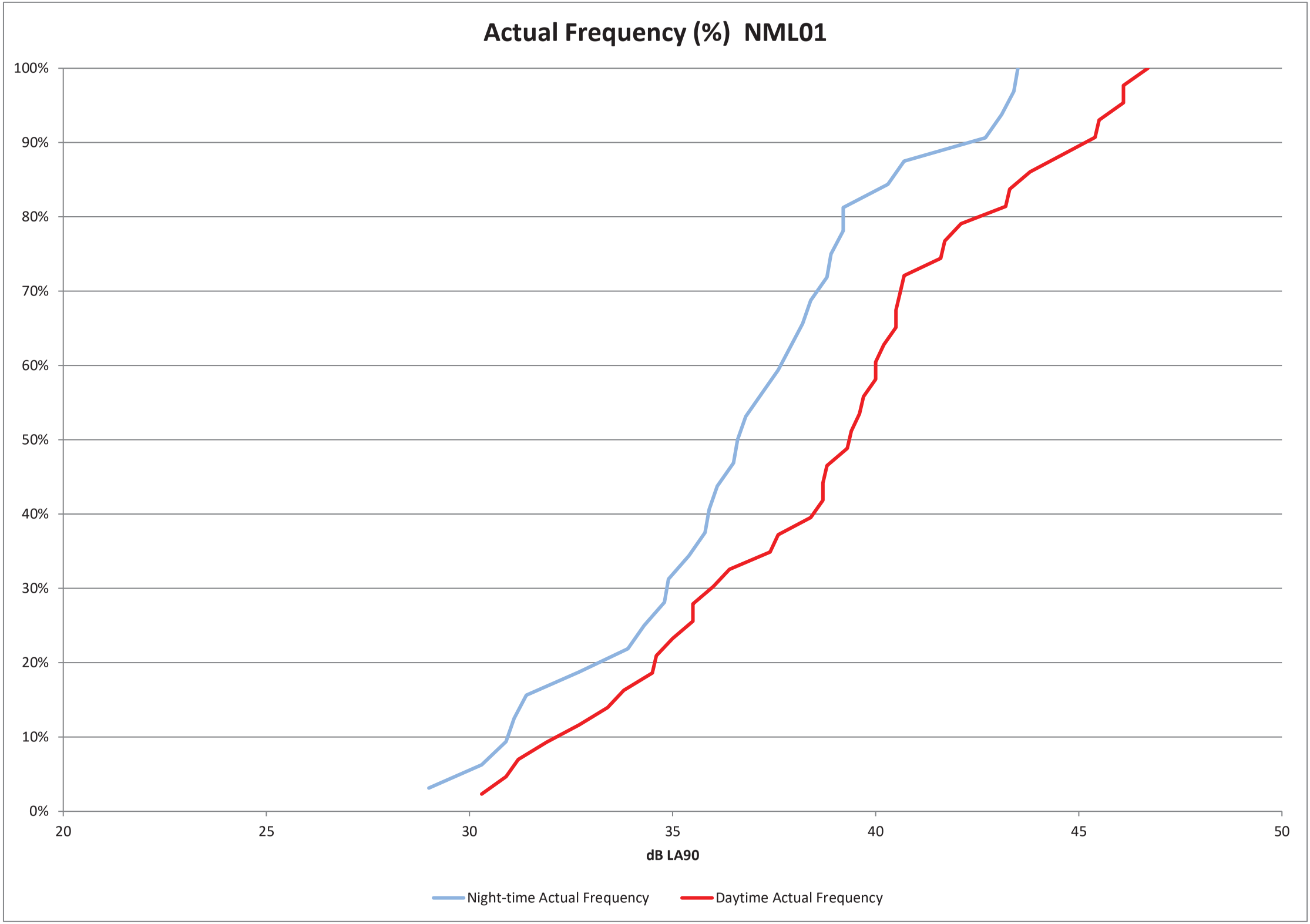
	Setting	Comment
Index (Leq,L90..)	Leq, L90…	
Network (A,B,Z)	A	
Time Interval (10min,10s..)	15 mins	
Time Weighting (Fast/Slow)	Fast	
Measurement Range (20-110 ..)	-	
Audio (No ,Yes 16Khz/16bit …)	Yes	
Other (GMT/BST)	-	
Resident Comments Sheet	-	
Resident consent to use photographs	-	

SITE VISIT HISTORY (VISITS 1 TO 4)

Visit Nb	Surveyor Initials	File Name (on SLM)	Start Date&Time (on watch)	End Date&Time (on watch)	Calibration at Start	Calibration at End	File Name	Index & Network (LAeq,LA90...)	Time Interval (10min,10s..)	Time Weighting (Fast ...)	Range (20-110 ...)	Batteries	Photographs (Kit+ SLM)	Write Notes on sound audible...	Snow/River Present?
1	EW	-	14:30 29.09.20	11:01 30.09.20	93.7	93.6	✓	✓	✓	✓	✓	✓	✓	✓	X
2															
3															
4															

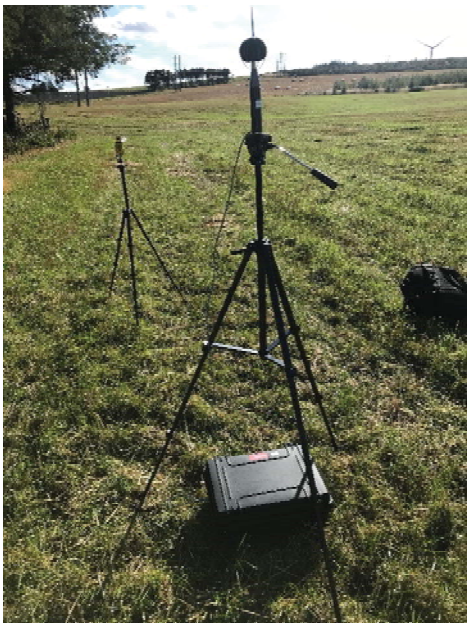
Visit Nb	NOTES / SITE OBSERVATIONS / Sounds Audible During Each Visits
1	INSTALLATION - Plant noise heard to the north east (quarry) and south (plowing field). - Distant road traffic noise heard faintly to the east. - Occasional Birdsong and plane overhead. - Additional farm plant heard to east toward quarry. - No noise heard from substation (unable to be discerned whilst other noise sources were present, so couldn't confirm if it was audible whilst on site). - Bright, warm, 15°C, 3-4 oktas, light wind, no rain.
	PICK UP - Dominated by local plant noise from nearby receptor (possibly a tractor). - Quarry plant noise to east also audible. - Wind induced tree/bush rustling audible. - Moderate breeze, cloudy (7-8 oktas), 10-12°C, no rain.


Statistical Analysis to Determine the Background Sound Level NML01
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
Measured background sound level, dB LA90
NML01 - Measured night-time levels
NML01 - Measured daytime levels


Actual Frequency (%) NML01
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
20
25
30
35
40
45
50
dB LA90
Night-time Actual Frequency
Daytime Actual Frequency

NML01 – Site Photos

Facing North



Facing South

Facing East

Facing West

NML02

Time	Duration	LAeq (dB)
29/09/2020 15:30	00:15:00	47.9
29/09/2020 20:15	00:15:00	41.7
30/09/2020 02:30	00:15:00	50.6

NML03

Time	Duration	LAeq (dB)
29/09/2020 15:00	00:15:00	45.4
29/09/2020 19:45	00:15:00	39.5
30/09/2020 02:00	00:15:00	37.1

Certificate of Calibration

Equipment Details

Instrument Manufacturer	Cirrus Research Plc
Instrument Type	CR:171B
Description	Sound Level Meter
Serial Number	G078524

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2013, IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001, IEC 61260:1995, IEC 60942:2003, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by substituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	GRAS 40AP	Serial Number	173198	Calibration Ref.	0170
Calibrator Type	B&K 4231	Serial Number	2564324	Calibration Ref.	A1914
Calibrator Type	B&K 4231	Serial Number	2564325	Calibration Ref.	A1915
Calibrator Type	B&K 4231	Serial Number	2594796	Calibration Ref.	A1916

Calibrated by [redacted]

Calibration Date 27 September 2019

Calibration Certificate Number 274858

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **17 August 2020** CERTIFICATE NUMBER **145070**

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

Approved signatory
M.Berry
Electronically signed:
[redacted]

Sound Level Meter : IEC 61672-3:2013

Instrument information

Manufacturer:	Cirrus Research plc	Notes:
Model:	CR:171B	
Serial number:	G056468	
Class:	1	
Firmware version:	3.2.2690	

Test summary

Date of calibration: 17 August 2020

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

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

Notes

CERTIFICATE OF CALIBRATION

Environmental conditions

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

Pressure: 100.07 kPa Temperature: 21.7 °C Humidity: 49.4 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334

Additional instrument information

Instruction manual:

Reference level range: Single range

Pattern approval: No

Source of pattern approval: -

Preamplifier

Model: MV:200F

Serial number: 0418F

Microphone

Model: MK:224

Serial number: 204031A

Test results summary

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

Appendix D – Noise Data

Acoustic Test Results Appendix A - Wall/Facade Panel Construction

Octave Band Sound Reduction Index (R) and Weighted Sound Reduction Index (R_w)

Wall	Panel and Lining	Octave Band Sound Reduction Index R								R_w	C_{tr}	Surface Weight Kg/m²
		63	125	250	500	1k	2k	4k	8k			
1W	AWP/60 + no lining	15	16	19	23	26	22	39	–	25	-3	18
2W	AWP/60 + F	12	19	32	42	50	52	60	–	43	-10	30
3W	AWP/60 + W15	14	17	31	40	48	46	56	–	41	-10	28
4W	AWP/60 + W15 + F	17	24	37	45	52	54	64	–	47	-9	40
5W	AWP/60 + P + W12	16	22	37	45	51	50	63	–	46	-10	41
6W	AWP/60 + P + W12	18	23	35	44	49	50	61	–	45	-8	41
7W	AWP/60 + I + P + W	18	24	37	48	53	55	63	–	48	-10	4
8W	KS1000 RW/40 + I + L	13	14	29	38	40	45	55	–	38	-9	20
9W	KS1000 RW/40 + I + L	12	16	30	40	44	51	64	–	40	-9	20
10W	AWP/70 + no lining	20	15	17	23	18	25	40	46	24	-4	12.5

Key

AWP = Architectural Wall Panel with various profiles (Optimo, MR, EB, FL, MM, CX, WV, Longspan)
F = 10mm dense particle board (11.7kg/m²)
W15 = 15mm plasterboard (10kg/m²)
W12 = 12.5mm wallboard (7.9kg/m²)
P = 19mm dense plasterboard plank (15.2kg/m²)
I = Insulation (see construction description for details)
L = 0.7mm profiled steel liner sheet
The figures after the forward slash refers to the panel thickness in mm (ie AWP/60 = panel thickness of 60mm)

Acoustic Test Results Appendix B - Roof Panel Construction

Octave Band Sound Reduction Index (R) and Weighted Sound Reduction Index (R_w)

Roof	Panel and Lining	Octave Band Sound Reduction Index R								R_w	C_{tr}	Surface Weight Kg/m²
		63	125	250	500	1k	2k	4k	8k			
1R	KS1000 LP/45 + I + 2 x SB	27	32	47	61	69	69	75	–	58	-11	–
2R	KS1000 RW/40 + I + L	8	17	32	43	48	54	60	–	43	–	2
3R	KS1000 RW/40 + I + L	11	19	36	48	54	61	73	–	46	–	19
4R	KS1000 RW/40 + I + Py	17	27	39	44	49	57	67	–	48	–	31
5R	KS1000 RW/30 + no lining	–	17	20	23	23	23	41	–	25	-3	–
6R	KS1000 RW/30 + I + L	–	18	35	50	55	59	60	–	44	-11	–
7R	KS1000 RW/50 + I + L	–	19	34	48	52	56	63	–	44	-10	–
8R	KS1000 RW/80 + I + L	–	20	36	48	50	66	70	–	46	-11	–
9R	KS1000 RW/80 + no lining	–	18	21	23	20	38	42	–	26	-4	–
10R	KS1000 RW/80 + no lining	20	18	20	24	20	29	39	47	25	-3	–
11R	KS1000 RW/80 + I + PL	18	19	22	29	31	40	58	49	32	-4	–
12R	KS1000 ZIP/90 + no lining	19	18	19	20	17	35	38	44	23	-4	–
13R	KS1000 LP/80 + no lining	19	19	19	22	19	35	39	46	24	-4	–
14R	KS1000 RT + no lining	20	19	21	22	22	32	38	44	25	-2	–
15R	KS1000 TS + no lining	20	16	15	23	29	39	45	53	27	-4	27

Key

I = Insulation (see construction description for details)

2 x SB = 2 x 12.5mm dense plasterboard (15.2kg/m²)

L = Profiled Steel Liner Sheet

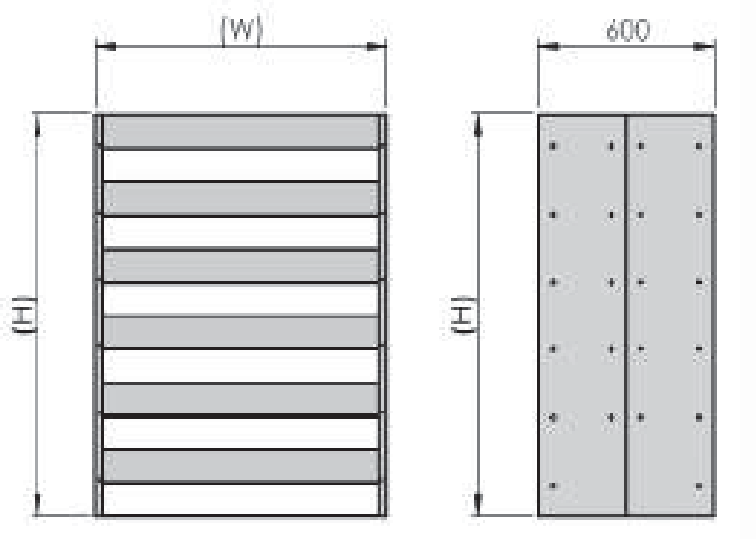
Py = 10mm thick dense particle board (11.7kg/m²)

PL = Profiled Perforated Steel Liner Sheet

The figures after the forward slash refers to the panel thickness in mm (ie LP/45 = panel thickness of 45mm)

GBL-2SL300
Acoustic Louvre

www.gilbertsblackpool.com



WIDTH **(W)** AND HEIGHT **(H)** DIMENSIONS GIVEN ON THE EQUIPMENT SCHEDULE ARE AS MANUFACTURED. ADEQUATE CLEARANCE MUST BE ALLOWED WHEN CONSTRUCTING THE BUILDERSWORK OPENING. A MINIMUM CLEARANCE OF 10 mm ALL ROUND IS RECOMMENDED. WHERE WINDPLATES ARE USED PLEASE CONSULT THE OFFICE FOR SPECIFIC RECOMMEDATIONS.
LOUVRES WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, CLEATS, BRACKETS, FIXINGS, FLASHING, MASTIC, OR OTHER SUCH ITEMS, UNLESS OTHERWISE STATED.
EXCESSIVELY LARGE OR HEAVY LOUVRES MAY BE MANUFACTURED AS MULTI MODULE SECTIONS FOR EASE OF HANDLING.
LOUVRES ARE MANUFACTURED TO STANDARD SHEET METAL TOLERANCES OF +/- 3mm.

SPECIFICATION
LOUVRES ARE CONSTRUCTED FROM FOLDED SHEET METAL AND HAVE A SERIES OF HORIZONTAL BLADES CONTAINED WITHIN TWO SIDE FRAMES.
THE MATERIAL OF CONSTRUCTION MAY BE PRE-GALVANISED STEEL, ALUMINIUM OR STAINLESS STEEL. LOUVRE BLADES HAVE LOWER/REAR FACES OF PERFORATED SHEET METAL, CONTAINING A FIBROUS SOUND ABSORBENT INFILL THAT IS NON-SHEDDING, NON-COMBUSTIBLE,NON-HYGROSCOPIC AND CHEMICALLY INERT. THE INFILL IS CAN BE FACED WITH GLASS CLOTH TO MINIMISE FIBRE MIGRATION.
GALVANISED BIRD SCREENS OR NYLON COATED INSECT MESH CAN BE FITED TO THE REAR OF THE LOURVE IF REQUIRED.
CASING SIDES ARE PROVIDED WITH 11mm DIA HOLES FOR FIXING ADJACENT SECTIONS TOGETHER, OR FIXING THE LOUVRE INTO THE BUILDERSWORK OPENING.
LOUVRES ARE SUPPLIED SELF FINISH AS STANDARD OR WITH AN OPTIONAL POLYESTER POWDER FINISH TO A STANDARD RAL/BS COLOUR.

Sound Reduction Indices (SRI's) obtained from test at Salford University to BS EN ISO 10140-2 : 2010.
SRI is equivalent to the Transmission Loss of the Louvre.

Frequency Hz	63	125	250	500	1k	2k	4k	8k	Rw
SRI dB	7	9	12	23	33	41	32	28	25
Face Velocity m/s	**0.5**	**0.75**	**1**	**1.25**	**1.5**	**1.75**	**2.0**	**2.25**	**2.5**
Pressure Drop Pa	6	13	23	35	51	69	90	115	141
Weight			82kg/m2						
Visual Free Area *			50%						
Actual Free Area			34%						

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Available Options :
Peripheral Flanges
Birdguard / Insect Mesh
Inclined or Sloping Louvres

Product reference: Soundroll 30 and Soundroll 31

DOC REF: SDS104C

Product application: Commercial and Industrial Sound Control

Key Features:

Operating speed:	Average speed of up to 150mm/s
Leaf format:	Single curtain vertical rolling
Support frame:	Heavy duty steel fabricated legs. Standard finish polyester powder coat RAL 3020 – Red. Other standard RAL colours are available.
Canopy:	Full width roller canopy finished to match the support frame
Motor Cover:	Included as standard in the door structure

Technical Data:

Curtain specification:	22mm thick galvanised steel profile complete with asymmetrically arranged acoustic attenuating core
Acoustic performance:	Choice of two cores, one to provide R_w30dB and a dense core to provide R_w31dB – see acoustic profiles overleaf
Fire resistance:	Up to 60 minutes EN 1634-1 (Soundroll 31 only)
U value:	Soundroll 30: 1.85W/m²K / Soundroll 31: 2.91W/m²K
Standard colour:	Natural galvanised steel finish. Polyester powder coat colours are available
Curtain features:	Wind end locked curtain to ensure a wind load category of Class 5 (1250Pa) Low friction lath end inserts to ensure a smooth running operation Roller anti-deflection system to ensure effective seal compression

Controls:

Controller type:	Microprocessor based control system with low voltage controls
Supply:	400V, 3ph, 50Hz, 16A (Class C MCB)
Local controls:	3-way pushbutton station (OPEN ~ STOP ~ CLOSE) to the drive side of the opening
Operation:	Momentary pushbutton to open and maintained pushbutton to close. Option available for full or partial automation
Cabinet:	IP54 ABS controller enclosure
Motor power:	High efficiency drives at up to 2.5kW dependant on door size

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DOC REF: SDS104C

Motor gearbox:	Specifically designed for use on rolling doors with an integrated safety gear with anti-fall device built in
Gearbox features:	Robust low maintenance drive unit with integrated limit switches for accurate positioning. Self-adjusting motor brake
Manual operation:	Low level manual disconnect complete with haul chain for emergency manual operation
Bottom Lath:	With integrated acoustic threshold seal
Standards:	The door complies with the requirements of EN 13241-1

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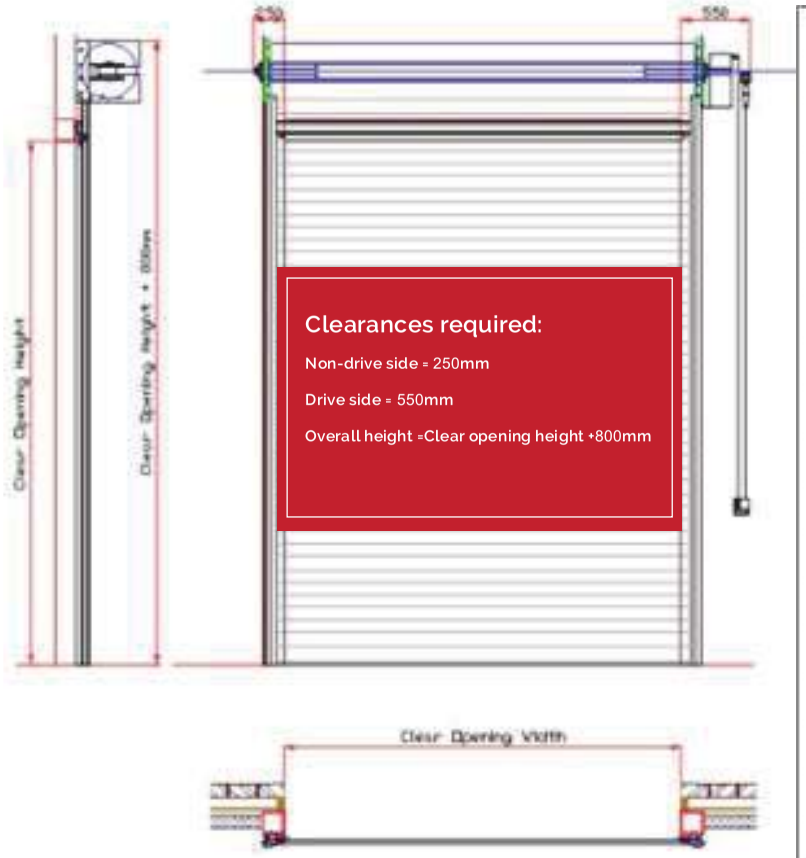
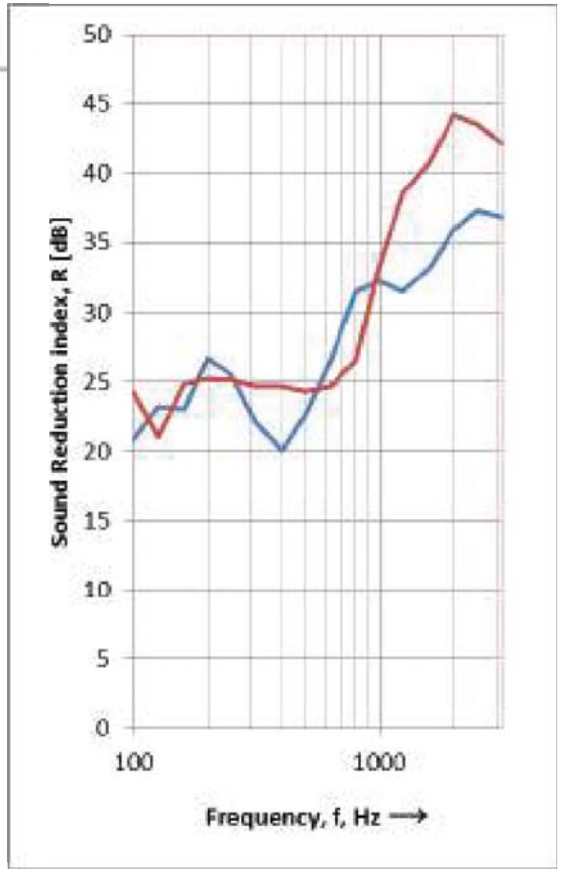
Outline dimensions

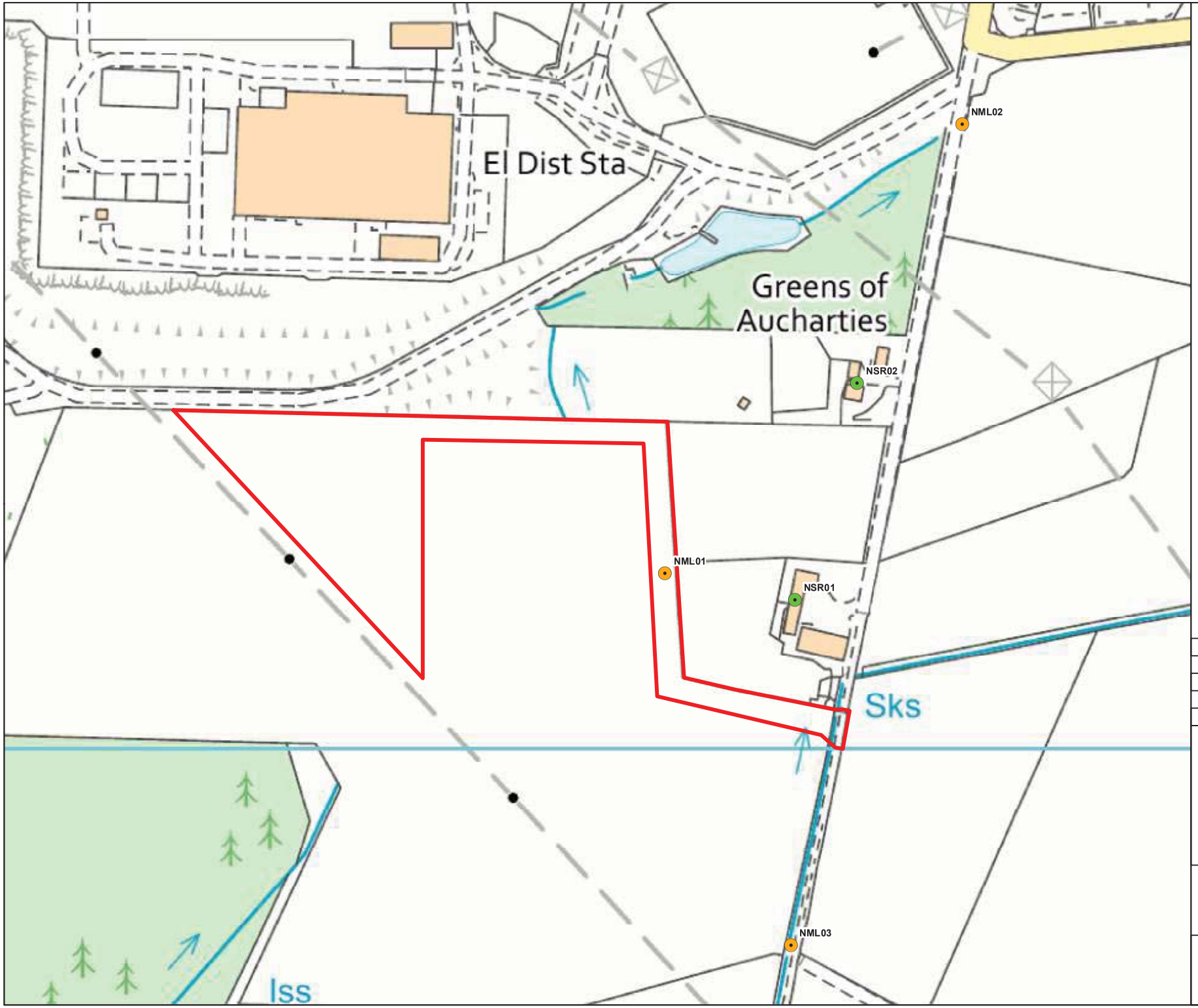


Acoustic performance data



Frequency f [Hz]	R 1/3 Octave [dB]	R 1/3 Octave [dB]
100	20.8	24.2
125	23.2	21
160	23	24.8
200	26.7	25.2
250	25.5	25.1
315	22	24.7
400	20	24.7
500	22.6	24.3
630	26.6	24.7
800	31.5	26.6
1000	32.2	33.3
1250	31.5	38.6
1600	33.2	40.8
2000	35.9	44.2
2500	37.3	43.6
3150	36.8	42.1
R_w	30	31
C	-1	-1
Ctr	-3	-3

Appendix E – Figures



Legend

- Noise Sensitive Receptors (NSRs)
- Noise Monitoring Locations (NMLs)
- Application Boundary

0 25 50 Metres

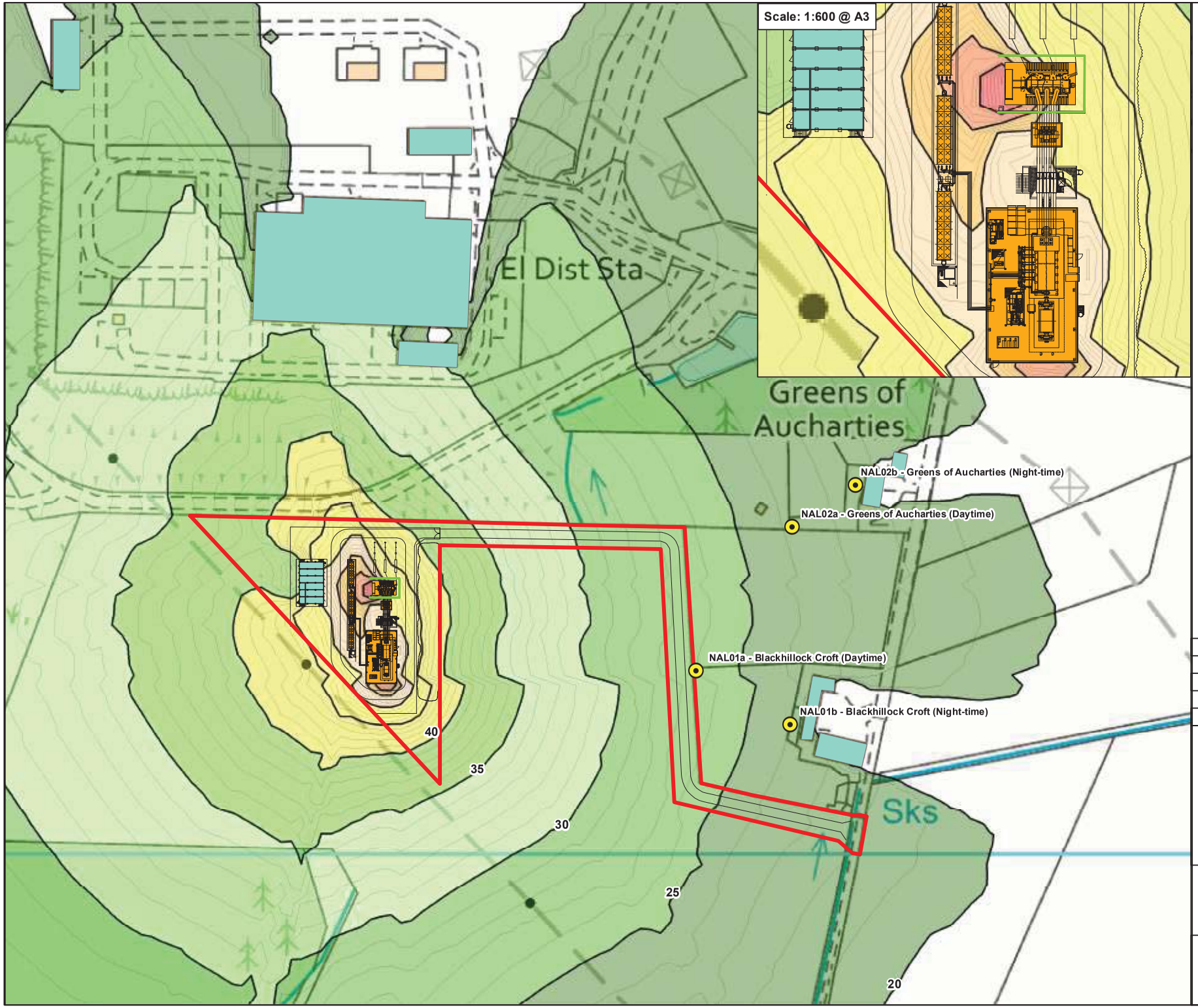
N

REV.	DETAILS	DRAWN	CHK'D	APP'D	DATE
R0	FIRST ISSUE	EW	JS	JS	26/11/2020

Project	Blackhillock Synchronous Compensator
Client	ESB
Title	Study Area
Figure No.	1
Scale	1:1,750 @A3
Doc. Ref.	13902-029

ESB Energy for generations

tnei



Legend

- Noise Assessment Locations (NALs)
- Modelled Area Noise Sources
- Modelled Barriers
- Modelled Buildings
- Application Boundary
- Site Layout
- Predicted Noise Contours (1 dB Increments)
- Predicted Noise Contours (5 dB Increments)

Predicted Noise Levels (dBA)

- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45
- 45 -50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 >

Noise contours modelled in accordance with ISO 9613 Part 2:1996 at a height of 4m and displayed on a 5m by 5m grid.
All noise sources assumed to be operating concurrently at typical noise level output.
All levels shown as dB $L_{Aeq(t)}$.

0 25 50 Metres

N

REV.	DETAILS	DRAWN	CHK'D	APP'D	DATE
R0	FIRST ISSUE	EW	JS	JS	26/11/2020

Project	Blackhillock Synchronous Compensator
Client	ESB
Title	Noise Contour Plot
Figure No.	2
Scale	1:1,750 @A3
Doc. Ref.	13902-030

ESB Energy for generations

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