CONTENTS

13. NOISE AND VIBRATION

13.1 Executive Summary

13.1.1 The potential for construction and operational noise impacts has been assessed for the Proposed Development, as well as for the provision of two 400 / 132 kV Super Grid Transformers (SGT) and associated plant in the future, which would be installed under permitted development rights. The methodology of the assessment has been agreed with Aberdeenshire Council as per their requirements of the scoping report, and has been informed by relevant policy, British Standards (BS) and guidance.

13.1.2 A baseline noise survey was undertaken to establish the background sound level at the nearest 'noise sensitive receptors' (NSRs). An assessment in accordance with BS 5228-1[1] has been undertaken, to determine the likely impact arising from the construction phase of the Proposed Development upon NSRs, near the construction phase activities. A noise model of the Proposed Development was created, to predict the operational impact on the nearest NSR and assessed in accordance with the BS 4142:2014 +A1:2019[2].

13.1.3 Noise from construction of the Proposed Development has been predicted for the daytime and weekend periods at the NSRs. With the adoption of the specific mitigation highlighted in this chapter and the implementation of the CEMP, the level of construction noise would be below both the BS5228 daytime and weekend thresholds at all receptors. The noise impact from the construction of the Proposed Development is therefore considered to be of low magnitude. Assuming a high sensitivity receptor, it is predicted that at worst **Minor Adverse** effects would occur. It is therefore concluded that noise relating to the construction of the Proposed Development would be **Not Significant**.

13.1.4 Predicted noise levels from the operation of the Proposed Development in accordance with BS 4142 lead to an initial estimate resulting in an impact of high magnitude at the nearest high sensitivity residential receptor, resulting in a **Major Adverse** and **Significant** effect. Although in context, internal noise levels during this time are predicted to be not significant. The Applicant is committed to meeting the noise limits that no significant effects are predicted, therefore additional mitigation is required to achieve this.

13.1.5 An acoustically optimised design will be progressed during the detailed design phase of the project. Compliance with appropriately derived sound level limits will be ensured by use of an appropriately worded planning condition.

13.2 Introduction

13.2.1 This chapter considers the potential noise and vibration effects that could arise as a result of the Proposed Development at the nearest NSRs, during both the construction and operational phases.

13.2.2 This chapter describes the assessment methodology, the baseline conditions at the Site (i.e. the area which encompasses the Proposed Development) and in the surrounding area, any embedded mitigation adopted for the purposes of the assessment, a summary of the likely environmental effects taking into account national legislation, the further mitigation measures required to prevent, reduce or offset any environmental risks and the likely residual effects after these measures have been employed.

13.2.3 This chapter is accompanied by **Volume 3, Figure 13.1: Baseline Measurement Position and Noise Sensitive Receptors** and **Volume 4, Appendix 13.1: Noise and Vibration**, which contains:

- Glossary of Acoustic Terms;
- Policy; and
- Baseline Noise Survey Details.

[1] British Standards Institute (2014) *BS 5228: Code of Practice for noise and vibration control on construction and open sites. Part 1: Noise*. London. BSI

[2] British Standards Institution (2014), BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. London: BSi.

13.2.4 This chapter is necessarily technical in nature and, therefore, a glossary of terms is presented in **Volume 4, Appendix 13.1: Noise and Vibration**.

13.2.5 The assessment has been undertaken with reference to relevant noise and vibration policy and guidance such as relevant BS have been described at the appropriate points in this chapter. The following policy and guidance have informed the assessment of effects within this chapter:

- Planning Advice Note (PAN) 1/2011: Planning and Noise[3];
- Technical Advice Note (TAN): Assessment of noise 2011[4];
- BS 5228-1:2009+A1:2014;
- BS 5228-2:2009+A1:2014[5];
- BS 7385-2:1993[6];
- BS 7445 part 1:2003, part 2:1991, part 3:1991[7];
- BS 4142: 2014+A1:2019;
- BS 8233: 2014[8]; and
- ISO 9613-2[9].

13.2.6 The noise assessment has been based on the following information sources:

- Ordnance Survey (OS) information of the assessment study area (as set out in **Section 13.4**).
- A baseline noise survey undertaken to determine the prevailing ambient and background noise levels at locations considered representative of the nearest NSRs to the Proposed Development.
- Details of the construction activities and associated plant as set out in **Section 13.4**. The measured sound pressure level data for the construction plant has been based on the database of information for similar plant contained in BS 5228-1.
- Source sound power data for the operational plant, based on professional judgement and experience in other projects.

13.3 Scope of the Assessment

Consultation and Scoping

13.3.1 The scope of the assessment has been determined through a combination of professional judgement, reference to the relevant guidance documents and consultation with stakeholders, through a formal EIA scoping process and pre-application advice.

13.3.2 Prior to the noise survey, contact was made with the Environmental Health Department of Aberdeenshire Council and the proposed scope of the baseline noise survey and assessment methodology was agreed. **Table 13-1** provides a summary of the consultation activities undertaken in support of the preparation of this assessment.

[3] Scottish Government (2011) *Planning Advice Note 1/2011: planning and noise*. Available at: https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/

[4] Scottish Government (2011) *Technical Advice Note: Assessment of noise*. Available at: https://www.gov.scot/publications/technical-advice-note-assessment-noise/pages/1/

[5] British Standards Institute (2014) *BS 5228: Code of Practice for noise and vibration control on construction and open sites. Part 2: Vibration*. London. BSI

[6] British Standards Institution (1993) *BS 7385-2 Evaluation and measurement for vibration in buildings – Guide to damage levels from ground borne vibration.* London: BSi

[7] British Standards Institute Multi-part document *BS 7445: Description and measurement of environmental noise*. London. BSI

[8] British Standards Institution (2014) *Guidance on Sound Insulation and Noise Reduction for Buildings*. London. BSI

[9] International Standards Organisation (2024). ISO 9613-2. *Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors.*

Table 13-1 Summary of consultation undertaken

Body / Consultation	Type of Consultation	Date Received	Summary of outcome of discussions	Actions
Aberdeenshire Council, Environmental Health Department	Email correspondence with Environmental Health Officer (EHO) to advise on the baseline noise survey and assessment methodology	2 May 2024	With regards to the operational noise assessment the EHO requested for the assessment to be undertaken in accordance with BS4142:2014+A1:2019 for external noise with the aim of achieving a low impact depending on context when compared to background LA90 and NR25 and NR20 Curve assessment for internal noise during the daytime and night time respectively. In cases of both low background noise levels (<30 dB LA90) and low rating levels (<35 dB LA_{rTr}) subclause 11(1) of 4142:2019 standard allows the setting aside the results of normal comparison of the rating level with the background level and instead attaches more importance to the absolute noise rating levels. Whilst low Rating levels i.e. <35 dB L_{ArTr} may not be obvious cause for concern itself, there could however be a clearly perceptible change in the soundscape for the residents, representing some impact. If this is the case, the EHO requested that measures are introduced to reduce the difference between the rating level and the low background.	See **Section 13.5** (Baseline Conditions) and **Section 13.6** (Operational Phase)
Environment and Infrastructure Services – Environmental Health	Scoping Opinion	1 October 2024	The applicant is required to provide a Noise Impact Assessment to predict the impact on sensitive receptors and specify any necessary control measures. The assessment should be undertaken in accordance with BS4142:2019 for external noise to achieve a low impact when compared to background LA90 and NR25 and NR20 Curve assessment for internal noise during the daytime and night time respectively. The specific methodology must be agreed with the Environmental Health Service prior to the undertaking of the noise impact assessment. Once the noise impact assessment has been submitted, it will be	See **Section 13.5** (Baseline Conditions) and **Section 13.6** (Operational Phase)

Body / Consultation	Type of Consultation	Date Received	Summary of outcome of discussions	Actions
			subject to review by the Environmental Health Service to consider the potential impact of the development on nearby receptors. Only then, will suitable planning conditions be considered. A 'Low level of Impact' with a Rating Level Limit of <5 dB above background L_{A90} in all settings is envisaged to ensure adverse impacts are minimised.	

Issues Scoped Out

13.3.3 There are no expected vibration significant effects associated with the operation of the Proposed Development at nearby NSRs. Therefore, operational vibration is scoped out of this assessment.

13.4 Assessment Methodology and Significance Criteria

Construction Noise

13.4.1 An assessment has been undertaken to determine the likely impact arising from the construction phase of the Proposed Development, upon residential NSRs near the construction phase activities. This assessment follows guidance in BS 5228-1 described below. Distance to receptors and construction plant scenarios have been considered, to carry out noise level predictions.

13.4.2 BS 5228-1 provides guidance on appropriate methods for minimising noise from construction activities. Techniques for predicting the likely noise effects from construction works are given; these are based on detailed information on the type and number of plant items being used, their location and the length of time they are in operation. Noise prediction methods are used to establish likely noise levels in terms of the $L_{Aeq,T}$ over a seven day working week (including Public Holidays), from 07:00 to 19:00 . A database of information is also provided, including measured sound pressure level data for a variety of different construction plant, undertaking various common activities, which can be used to estimate levels of noise generated by typical construction works.

13.4.3 The assessment criteria for construction noise have been determined based on 'The ABC Method' outlined in Table E1, included in Annex E of BS 5228-1:2009 + A1:2014. The ABC method provides threshold noise levels which indicate a potential adverse effect from site specific construction noise on residential properties. The threshold values are derived based on the existing ambient noise levels at the receptor, L_{Aeq} (dB), during the periods when construction is expected to occur (day, evening, night), and are shown in **Table 13-2.**

Table 13-2 Threshold of potential adverse effect at dwellings in accordance with the ABC Method (BS 5228-1)

Assessment Category and Threshold Value Period	Threshold Values, in Decibels (dB), $L_{Aeq,T}$		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23:00 – 07:00)	45	50	55
Evenings and Weekends [D]	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. NOTE 3: Applies to residential receptors only.			
A) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values. B) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values. C) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values. D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.			

13.4.4 Construction noise arising from the Proposed Development has been assessed at selected NSRs within a study area of approximately 300 m from the Site. A series of construction noise level predictions have been undertaken in accordance with BS 5228-1, with the results compared against criteria also derived from BS 5228-1. These predictions have been undertaken to establish the potential noise levels applicable to the proposed construction stage activities at the NSRs.

13.4.5 Following the BS 5228-1 ABC Method (set out in **Table 13-2**) and given the baseline noise environment at the nearest NSRs (see **Section 13.5**), it is considered appropriate that the predicted construction noise levels are assessed against the Category A noise threshold criteria, i.e. 65 dB $L_{Aeq,T}$ (façade level) during the weekday daytime period and 55 dB $L_{Aeq,T}$ (façade level) during the weekend daytime period (excluding 08:00 to 13:00 hours on Saturdays).

13.4.6 Working hours are anticipated seven days a week between approximately 07:00 to 19:00. Any out of hours working would be agreed in advance with Aberdeenshire Council.

13.4.7 It can be seen that Note 1 to **Table 13-2** states “a potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.”

13.4.8 On this basis, and continuing the theme of 5 dB step widths, **Table 13-3** has been drawn-up for the initial determination of the potential for significant effects in relation to construction noise.

Table 13-3 - Significance scale for the assessment of noise during construction works

Significance	Magnitude of impact	BS 5228-1 threshold level (dB $L_{Aeq,T}$), according to category and period					
		Day (07:00-19:00 Monday to Friday and 07:00-13:00 Saturday)			Weekends (13:00-19:00 Saturday and 07:00-19:00 Sunday)		
		Cat A	Cat B	Cat C	Cat A	Cat B	Cat C
Significant	High	>70	>75	>80	>60	>65	>70
	Medium	65 – 70	70 – 75	75 – 80	55 – 60	60 – 65	65 – 70
Not significant	Low	60 – 65	65 – 70	70 – 75	50 – 55	55 – 60	60 – 65
	Negligible	<60	<65	<70	<50	<55	<60

13.4.9 The thresholds in **Table 13-3** indicate where there could be potential for significant effects as a result of the level of construction noise. However, the context and duration of the impact also needs to be considered when determining the significance of effect. In this regard it is noteworthy that where the existing ambient noise level is already high, threshold levels may be permitted to be higher (see the Note 2 to **Table 13-2**).

13.4.10 In terms of the duration of the impact, Annex E of BS5228-1 provides criteria for the assessment of potential significance of construction noise effects. Annex E.4 provides example thresholds used to determine the eligibility of noise insulation and temporary rehousing, which are identified in Table E.2 of the standard. For a property to be eligible, the noise level must be exceeded for: "*a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.*"

13.4.11 Construction noise shall constitute a significant effect where it is determined that a high or medium magnitude of impact will occur for a duration exceeding these durations, stated above. Therefore, for this assessment a significant effect is triggered where a sensitive receptor exceeds the relevant noise and/or vibration threshold for longer than a period of 10 or more days of working in any 15 consecutive days, or for a total number of days exceeding 40 in any 6 consecutive months.

Construction Vibration

13.4.12 Vibration from construction activities may impact on adjacent buildings. The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receptor and the activities being undertaken. BS 5228-2 provides data on measured levels of vibration for various construction works. Impacts are considered for both damage to buildings and annoyance to occupiers.

13.4.13 Likely levels of vibration at given distances can be predicted using empirical methods and existing piling vibration data. Due to the distances involved between the site and nearest sensitive receptors, vibration from construction activities is unlikely to be subjectively noticeable and would not approach the threshold limits where structural damage to buildings may occur.

13.4.14 **Table 13-4** details Peak Particle Velocity (PPV) vibration levels and provides a semantic scale for the description of construction vibration effects on human receptors, based on guidance contained in BS 5228-2.

Table 13-4 Construction vibration criteria for human receptors (annoyance)

Peak Particle Velocity Level, millimetres per second (mm/s)	Description
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.
1.0	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
0.3	Vibration might be just perceptible in residential environments.
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.

13.4.15 On this basis, **Table 13-5** has been drawn-up for the initial determination of the potential for significant effects in relation to construction vibration.

Table 13-5 - Significance scale for the assessment of vibration during construction works

Significance	Magnitude of impact	BS 5228-2 threshold level (PPV mm/s)
Significant	High	>3.0
	Medium	1.0 – 3.0
Not significant	Low	0.3 – 1.0
	Negligible	<0.3

13.4.16 A PPV vibration level of 3mm/s has been identified as the threshold between medium and high impacts. Whilst this figure is acknowledged as arbitrary, it is considered more realistic than a value of, say, 10 mm/s, which would only be tolerated for very brief exposures, as **Table 13-4** notes.

13.4.17 In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels within buildings are controlled to those relating to annoyance (i.e. 1.0 mm/s), then it is highly unlikely that buildings would be damaged by construction vibration.

13.4.18 BS 7385 establishes the basic principles for carrying out vibration measurements and processing the data with regard to evaluating vibration impacts on buildings. **Table 13-6** provides recommended PPV vibration limits for transient excitation for different types of buildings (as set out in BS 7385: Part 2, 1993). The PPV values in **Table 13-6** are given in two ranges as very low frequency vibration (between 4 Hz to 15 Hz) is potentially more damaging to light framed building structures, and therefore has a lower threshold.

Table 13-6 Peak Particle Velocity (PPV) Limits for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings (1)	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Un-reinforced or light framed structures. Residential or light commercial type buildings (2)	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
(1) Values referred to are at the base of the buildings 2 At frequencies below 4 Hz a maximum displacement of 0.6 mm (zero to peak should not be exceeded)		

13.4.19 Construction vibration arising from the Proposed Development has been assessed at a selected representative sample of vibration sensitive receptors within a study area of approximately 100 m of the Site. Beyond this distance, significant construction vibration effects are considered unlikely and are not considered.

Proposed Construction Works

13.4.20 Details related to the typical construction activities works associated with the proposed construction phase are provided in **Chapter 3: Project Description**. The key noise-generating activities are likely to include the following:

- enabling works and site clearance;
- substation platform construction;
- building construction; and
- installation of electrical plant.

13.4.21 Construction working hours are currently anticipated between 07:00 to 19:00 Monday to Sunday . Any requirement to work outside of the agreed working hours will only occur with prior written agreement with Aberdeenshire Council.

Proposed Plant, Noise Levels and Programme

13.4.22 At this stage, the type and number of construction plant items and working methodologies to be applied are not known; these would be determined by the Principal Contractor, who would typically be appointed after planning approval. To inform this assessment, it has been necessary to make assumptions regarding the plant likely to be used, their number and 'on-time' (i.e. the percentage of time in operation). These assumptions are based on information provided by the Applicant and professional experience of similar developments.

13.4.23 The sound power levels for each item of plant have been adjusted based on the assumed percentage on-time. Where plant is not operational 100% of the time, the reduced sound power level has been calculated using the following formula:

$$L_{WA\ (adjusted)} = L_{WA\ (stated)} - [10 \times \log(\frac{maximum\ on-time,100\%}{Assumed\ percentage\ on-time})]$$

13.4.24 Indicative plant for use during the construction phase of the Proposed Development is shown in **Table 13-7.**

Table 13-7 Indicative construction plant

Construction Activity	Plant Type	No. of Plant	Assumed percentage on-time during working hours	Sound Pressure Level @ 10m dB $L_{Aeq,T}$	Overall corrected Sound Pressure Level for all plant units @10m dB(A)
Monday to Sunday 07:00 to 19:00					
Enabling works and site clearance	35T Tracked excavator	1	83	79	86
	20T Tracked excavator	2	83	71	
	D5 bulldozer	1	83	80	
	13T single drum roller	1	83	75	
	A35 dump trucks	2	83	74	
	Rock breaker	1	50	85	
Substation platform construction	20T tracked excavator	1	83	71	80
	13T tracked excavator	1	83	69	
	8T tracked excavator	2	83	69	
	8T dumpers	2	42	74	
	Bomag 1350 vibratory roller	1	83	75	
	Telehandler	1	83	70	
	Road wagons for imported stone	1	42	74	
Building construction	13T tracked excavator	1	83	76	81
	6T dumper	1	42	74	
	18m concrete pump	1	42	67	
	Concrete mixer wagons	1	50	80	
	Flat bed delivery trucks with 40ft trailers	1	17	74	
	100T crane	1	42	71	
	Lifting Platform	2	42	67	
	Telehandler	1	83	70	
Installation of electrical plant	Telehandler	2	42	70	74
	40T mobile crane	1	42	71	
	Lifting Platform	3	58	67	

13.4.25 In practice, the plant items identified for each stage will move around the Site, operating at different times, for different durations and at different locations. As a consequence, noise levels at any receptor may vary day-on-day. Hence, it is necessary to rationalise the geographic and temporal spread of activities (and subsequent assessment) and to this end, various assumptions have necessarily been made as described in the following paragraphs.

13.4.26 The most important assumptions relate to the location of construction plant and their operational 'on-time' during the period of interest. With respect to the geographical location of the plant for each activity, it has been

assumed to be situated on the edge of the substation platform, except at some locations where earthworks are at a closer distance to a receiver, where a midpoint in that area has been adopted (shown in **Table 13-12**).

13.4.27 Other assumptions which have been made with respect to the construction noise predictions are:

- no barriers have been included;
- acoustically soft ground cover has been assumed between the noise source and receptor;
- no atmospheric absorption has been included;
- 3 dB has been added to all predictions to account for façade reflections;
- sources and receptors have both been taken to be 1.5 m high; and
- all distance between source and receivers are horizontal distances.

13.4.28 In addition to the construction noise predictions, groundborne vibration calculations have been performed for construction activities typically required for similar developments. The calculations are based on the empirical prediction procedures presented within BS 5228-2.

Operational Noise

13.4.29 The adopted assessment methodology agreed with Aberdeenshire Council draws from the guidance of BS 4142. The standard compares a calculated Rating Level with the existing background sound level at potentially affected NSRs. The difference between these noise levels is taken as an indication of the magnitude of the noise impact, subject to 'context' considerations. Terms relating to BS 4142 are defined in **Volume 4, Appendix 13.1: Noise and Vibration**.

13.4.30 The procedure contained in BS 4142 compares the measured or predicted sound level from the source in question, the 'specific sound' level, at the assessment location with the 'background sound' level. Where the noise contains acoustic features (tonality, impulsivity, intermittency etc) a character correction is to be added to the 'specific sound' level to obtain the 'Rating Level'. Corrections for acoustic features can be determined subjectively or objectively, with a range of correction factors applied depending on the assessed character of the specific sound.

13.4.31 As the sound source is not yet present, the specific sound level is established by calculation. The representative background sound level is established by measurement at the receptor location in the absence of the noise source.

13.4.32 To derive a Rating Level for the Proposed Development, the specific sound level can be adjusted, by adding feature corrections for one or more distinctive characteristics. The feature corrections are summarised below:

- Tonality up to 6 dB;
- Impulsivity up to 9 dB;
- Other sound characteristics up to 3 dB; and
- Intermittency 3 dB.

13.4.33 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the Rating Level. The results of this comparison are assessed against the following guidance in BS 4142:

"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; and

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."

13.4.34 It is noted that the 'context' of an assessment is an important consideration in an assessment. The examples included in BS 4142 Annex A illustrate the contextual factors that may be of importance, for example:

- the character of the existing noise environment at receptors;
- the history of noise issues (e.g. complaints) associated with the operator or the site of the specific source under assessment;
- the diurnal period during which impacts are identified, and the relevance to the type of receptor; and
- the location at which actual impacts on the receptor could occur, i.e. indoor or outdoor.

13.4.35 BS 4142 provides guidance on minimising and reporting factors likely to contribute to uncertainty in the assessment. This includes following best practice guidance with regards to measurement and calculation of sound levels.

13.4.36 A level 0dB above background would correspond to the situation described as being '*an indication of the specific sound source having a low impact*', in BS 4142. Accordingly, the impact magnitude scale presented in **Table 13-8** has been adopted in the assessment of noise from commercial sources and activities.

Table 13-8 Impact Magnitude Scale Applicable to Noise from Fixed Plant Items

Impact Magnitude	Rating Level minus the Background Sound Level, dB*
Negligible	< -10.0
Low	0.0 to +4.9
Medium	+5.0 to +9.9
High	> +10.0
Subject to a lower cut-off of 35 dB as a rating noise level *Depending on the context	

13.4.37 In addition to BS 4142, BS 8233 recommends design levels for the control of noise in and around buildings. Of significance to this assessment, the guidance states:

> "….it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB which would be acceptable in noisier environments."

13.4.38 BS 8233 provides information on the noise rating (NR) system, a graphical method described in Annex B of this document. Although there is no direct relationship between dBA and NR, the following approximate relation applies in the absence of strong low frequency noise:

$$NR \approx dBA - 6$$

13.4.39 NR is a graphical method for assigning a single-number rating to a noise spectrum. It can be used to specify the maximum acceptable level in each octave band of a frequency spectrum, or to assess the acceptability of a noise spectrum for a particular application. The method was originally proposed for use in assessing environmental noise, but it is now used in the UK mainly for describing noise from mechanical ventilation systems in buildings. To obtain a rating, the noise spectrum is superposed on a family of NR contours. The NR of the spectrum corresponds to the value of the first NR contour that is entirely above the spectrum.

Proposed Substation

13.4.40 To predict the sound levels from the Proposed Development, a 3D noise model has been created using CadnaA (MR1 2024) noise modelling software. The software allows for complex conditions / scenarios to be considered and implements the prediction algorithms in ISO 9613-2 (2024); which contains methods for calculating sound attenuation during outdoor propagation. Operational noise from the Proposed Development has been assessed at selected NSRs within a study area of approximately 500 m from the Site. This incorporates the existing topography from OS information along with proposed topography for the Proposed Development.

13.4.41 The following assumptions have been adopted in the noise model:

- Ground absorption: 0 (acoustically reflective ground) for the substation platform, platform for OHL towers, and access roads and 0.5 (acoustically absorptive ground) for other areas of the site and surrounding rural land.
- The shell of the substation building will be composed of a single skin of composite cladding, that there will be two large entrances for the installation of equipment.
- The transformer building is assumed to be constructed of single skin of composite cladding with sound reduction properties of 24 dB(A) for the walls and roof and 11 dB(A) for the roller shutter doors.
- The internal absorption of the transformer building is assumed to be 0.05 across all octave bands.f
- Building facades are set to be acoustically reflective and the model includes second order reflections from solid structures.
- Noise levels calculated for NSRs at ground floor (1.5 m) and first floor level (4.0 m).

Noise Source Data

13.4.42 The Applicant has provided “worst case” broadband sound power levels for some of the proposed substation plant. Other plant sound power levels are based on data from similar schemes or professional judgement. It is likely that mitigation will be required to some plant items to achieve the required levels (enclosures, higher specification cladding etc.) and this will be embedded in the design. When assessing transformers in a BS4142 assessment it is important to consider tonality, as transformers typically output a tonal hum at 100 Hz. The 1/1 octave sound power levels for the substation plant used in the noise model are shown in **Table 13-9**.

Table 13-9 Sound Power Levels used in the Noise Model, Figures in dB

Plant Item	Sound Power Level	Z-weighted Sound Power Levels, Octave Bands (Hz)							
	L_w dB(A)	63	125	250	500	1k	2k	4k	8K
Chiller 1	80	108	95	85	80	78	74	68	63
Chiller 2	80	108	95	85	80	78	74	67	63
Synchronous condenser Transformer 1	89	87	93	104	85	76	69	63	58

Plant Item	Sound Power Level	Z-weighted Sound Power Levels, Octave Bands (Hz)							
	L_w dB(A)	63	125	250	500	1k	2k	4k	8K
Chiller 3	79	107	94	84	79	77	73	66	62
Chiller 4	79	107	94	84	79	77	72	66	61
Synchronous condenser Transformer 2	86	85	91	102	83	74	67	61	56
Shunt reactor 1	83	81	87	98	79	70	63	57	52
Super Grid Transformer (SGT) 1*	83	81	87	98	79	70	63	57	52
Cooler 1 to SGT1*	82	110	97	87	82	80	76	70	65
Shunt reactor 2	81	80	86	97	78	69	62	56	51
SGT2*	81	80	86	97	78	69	62	56	51
Cooler 2 to SGT2*	80	108	95	85	81	78	74	68	63

* To be delivered in the future post completion of the Proposed Development and will be installed under permitted development rights

Significance Criteria

13.4.43 The assessment of likely significant environmental effects as a result of the Proposed Development has taken into account the construction and operational phases of the Proposed Development. The following sections define the approach adopted within the assessment for the determination of sensitivity (or value/importance), magnitude of impact, the level of effect and significance.

Determining the Impact Magnitude

13.4.44 The impact magnitude has been determined on a scale of negligible, low, medium, and high. The impact magnitude has been determined drawing upon the applicable guidance in each case.

Determining Sensitivity of Receptor

13.4.45 The sensitivity of affected receptors has been considered on a scale of high, medium, low or negligible. These criteria are presented in **Table 13-10** and have been applied for the construction and operational phases of the proposed development.

Table 13-10 – Criteria for Assessing the Sensitivity of Receptors

Sensitivity	Description	Examples
High	Receptors where people or operations are particularly susceptible to noise and/or vibration	Residential, quiet outdoor recreational areas, schools and hospitals.
Medium	Receptors moderately sensitive to noise and/or vibration, where it may cause some distraction or disturbance.	Place of worship, community facility, offices or similar.
Low	Receptors where distraction or disturbance from noise and/or vibration is minimal.	Unoccupied buildings or factories and working environments with existing levels of noise.

13.4.46 The closest NSRs to the Proposed Development (see **Section 13.5**) have been identified to be of 'High' sensitivity, as these are dwellings.

Determining the Level of Effect

13.4.47 The level of effect has been informed by the impact magnitude due to the Proposed Development and the evaluation of the sensitivity of the affected receptor. The matrix used to determine the significance of effects is set out in **Table 13-11** and it is noted that is a variation to the matrix provided in **Table 5-1**, in **Volume 2, Chapter 5: EIA Methodology.**

Table 13-11 – Significance of Effects

		Receptor Sensitivity		
		High	**Medium**	**Low**
Impact Magnitude	**High**	Major	Moderate	Minor
	Medium	Moderate	Minor	Negligible / Minor
	Low	Minor	Negligible / Minor	Negligible
	Negligible	Negligible / Minor	Negligible	Negligible

13.4.48 An effect of Moderate or Major is considered to be 'Significant' in EIA terms, with effects of Minor and Negligible considered to be 'Not Significant'.

13.5 Baseline Conditions

13.5.1 The nearest NSRs to the Site are isolated dwellings surrounding the Site. The NSRs within the assessment study area are those closest to the Site and which therefore have the greatest potential to be subject to impacts

from the Proposed Development. The details of the nearest NSRs relevant to this assessment are summarised in **Table 13-12** and shown in **Volume 3, Figure 13.1: Baseline Measurement Position and Noise Sensitive Receptors**.

Table 13-12 Nearby Sensitive Receptors

Noise Sensitive Receptor	ID	X	Y	Distance to the Red Line Boundary (m)	Distance to Earthworks location (m)	Distance to the Edge of the Substation Platform (m)
Newton of Northburn, dwelling to the north of the Site	NSR1	382689	847548	5	175	340
Torridon, to the east of the Site	NSR2	383212	846914	25	250	1000
Greenford, dwelling to the south of the Site	NSR3	381930	846905	25	175	340
Upper Greenfield, dwelling to the west of the Site	NSR4	381072	847300	270	450	560
Oldtown Farmhouse, dwelling to the east of the Site	NSR5	383091	847315	275	400	750
Borderside Farmhouse, dwelling to the south-east of the Site	NSR6	383172	846658	55	250	1050
Greenfield – New House, dwelling to the south of the Site	NSR7	382406	846756	35	250	435
Greenfield Farmhouse, dwelling to the south of the Site	NSR8	382341	846717	130	275	460
Latchfold Croft, dwelling to the south-west of the Site	NSR9	381408	847006	250	340	430

13.5.2 For the construction noise assessment, works have been assumed to be situated on the edge of the substation platform, except at some locations where earthworks are at a closer distance to a receiver, where a midpoint has been adopted (shown in **Table 13-12**).

Baseline Noise Survey

13.5.3 Baseline noise surveys have been undertaken at four measurement locations considered to be representative of the receivers described in **Table 13-12** as described below and shown in **Volume 3, Figure 13.1: Baseline Measurement Position and Noise Sensitive Receptors**:

- **Measurement Position 1 (MP1):** The measurement position was situated within the land adjacent to Newton (i.e. NSR1). Continuous measurements were carried out between 09:30 on Tuesday 19 March 2024 until 11:15 on Tuesday 26 March 2024.
- **Measurement Position 2 (MP2):** The measurement position was situated within the land adjacent to Torridon (i.e. NSR2). Continuous measurements were carried out between 10:00 on Tuesday 19 March 2024 until 10:30 on Tuesday 26 March 2024.
- **Measurement Position 3 (MP3):** The measurement position was situated within the land adjacent to the Greenford (i.e. NSR3). Continuous measurements were carried out between 10:45 on Tuesday 19 March 2024 until 09:45 on Tuesday 26 March 2024.
- **Measurement Position (MP4):** The measurement position was situated within the land adjacent to the Upper Greenfield (i.e. NSR4). Continuous measurements were carried out between 11:00 on Tuesday 19 March 2024 until 09:30 on Tuesday 26 March 2024.

13.5.4 The measurements were carried out in accordance with BS 7445:2003 as defined in BS 61672:2023[10]. The meters were installed on tripods approximately 1.5 m in height from the ground and in free field conditions.

13.5.5 The noise climate at the measurement positions was noted to be influenced by road traffic noise during the daytime at a low level, typical of a rural context.

Meteorological Conditions

13.5.6 A Davis Vantage Vue Weather Station was installed at MP1. The weather conditions were measured for the duration of the survey and are deemed representative of the weather conditions observed at the site.

13.5.7 The weather conditions over the measurement period were varied. Noise measurements recorded during dry conditions with wind speeds lower than or equal to 5 m/s were included for analysis and all other data was omitted. Temperature during the measurement period ranged from 0 °C to 13 °C.

Noise Monitoring Equipment

13.5.8 **Table 13-13** presents the details of the measurement equipment.

Table 13-13 Measurement Equipment Details

Measurement Position	Equipment Description	Manufacturer & Type No.	Serial No.
MP1	Sound Level Meter	01dB-METRAVIB Black Solo 'Datalogging Integrating Sound Level Meter'	65303
	Pre-amplifier	01dB-Metravib PRE 21 S	15976
	Microphone	01dB Metravib MCE 212 Microphone	142812
	Calibrator	01dB-Stell Cal 21	34213780
MP2	Sound Level Meter	01dB-METRAVIB Blue Solo 'Datalogging Integrating Sound Level Meter'	61332
	Pre-amplifier	01dB-Metravib PRE 21 S	12495
	Microphone	01dB Metravib MCE 212 Microphone	65593
	Calibrator	01dB-Stell Cal 21	1120240

[10] British Standards Institution (2023) BS 61672 – Electroacoustics. Sound level meters. Parts 1 to 3. London: BSi

Measurement Position	Equipment Description	Manufacturer & Type No.	Serial No.
MP3	Sound Level Meter	01dB-Stell Duo 'Datalogging Integrating Sound Level Meter'	10618
	Pre-amplifier	01dB-Stell PRE 22 Preamplifier	10627
	Microphone	G.R.A.S Type 40CD Condenser Microphone	331635
	Calibrator	01dB Cal 21	34924047
MP4	Sound Level Meter	01dB-METRAVIB Blue Solo 'Datalogging Integrating Sound Level Meter'	060845
	Pre-amplifier	01dB-MATRAVIB PRE 21 S Preamplifier	13164
	Microphone	01dB MCE212 Condenser Microphone	182024
	Calibrator	01dB-Stell Cal 21	51031216

Results

13.5.9 **Table 13-14** presents a summary of the measured daytime and night-time noise levels at MP1.

Table 13-14 MP1 Baseline Noise Survey Results

Measurement Period	Logarithmic Average $L_{Aeq,T}$ dB	Range of $L_{Aeq,T}$ dB	Range of $L_{A90,T}$ dB	Typical Background Sound Level $L_{A90,T}$ dB
Daytime (07:00 – 23:00)	48	24 – 58	21 – 36	29
Night-Time (23:00 – 07:00)	47	18 - 60	18 – 38	22

13.5.10 **Table 13-15** presents a summary of the measured daytime and night-time noise levels at MP2.

Table 13-15 MP2 Baseline Noise Survey Results

Measurement Period	Logarithmic Average $L_{Aeq,T}$ dB	Range of $L_{Aeq,T}$ dB	Range of $L_{A90,T}$ dB	Typical Background Sound Level $L_{A90,T}$ dB
Daytime (07:00 – 23:00)	47	24 - 61	35 - 45	41
Night-Time (23:00 – 07:00)	42	20 - 51	19 - 44	21

13.5.11 **Table 13-16** presents a summary of the measured daytime and night-time noise levels at MP3.

Table 13-16 MP3 Baseline Noise Survey Results

Measurement Period	Logarithmic Average $L_{Aeq,T}$ dB	Range of $L_{Aeq,T}$ dB	Range of $L_{A90,T}$ dB	Typical Background Sound Level $L_{A90,T}$ dB
Daytime (07:00 – 23:00)	42	25 – 60	22 – 39	28

Measurement Period	Logarithmic Average $L_{Aeq,T}$ dB	Range of $L_{Aeq,T}$ dB	Range of $L_{A90,T}$ dB	Typical Background Sound Level $L_{A90,T}$ dB
Night-Time (23:00 – 07:00)	34	19 - 44	18 - 38	23

13.5.12 **Table 13-17** presents a summary of the measured daytime and night-time noise levels at MP4.

Table 13-17 MP4 Baseline Noise Survey Results

Measurement Period	Logarithmic Average $L_{Aeq,T}$ dB	Range of $L_{Aeq,T}$ dB	Range of $L_{A90,T}$ dB	Typical Background Sound Level $L_{A90,T}$ dB
Daytime (07:00 – 23:00)	45	24 - 57	20 – 48	29
Night-Time (23:00 – 07:00)	41	22 - 56	17 - 33	20

13.5.13 Full details of the obtained measurement results are provided in **Volume 4, Appendix 13.1: Noise and Vibration**.

Future Baseline

13.5.14 Given the rural nature of the site, it is not anticipated that existing noise levels within the vicinity of the Site would be subject to significant changes. Therefore, existing and future baseline noise levels have assumed to be the same and are hereafter referred to as “the baseline”.

13.6 Assessment of Effects, Mitigation and Residual Effects

Mitigation by Design and Best Practice Measures

13.6.1 Several safeguards exist to minimise the effects of construction noise, these include:

- EC Directives and UK Statutory Instruments that limit noise emissions of a variety of construction plant;
- guidance set out in BS 5228-1 which covers noise control on construction sites; and
- the powers that exist for local authorities under Sections 60 and 61 of the Control of Pollution Act 1974 to control noise from construction sites.

13.6.2 It is expected that the Principal Contractor and its sub-contractors will at all times apply the principle of Best Practicable Means, as defined in Section 72 of the Control of Pollution Act 1974, which is usually the most effective means of controlling noise from construction sites. Such measures, where appropriate, may include the following:

- any compressors brought onto the site to be silenced or sound reduced models fitted with acoustic enclosures;
- all pneumatic tools to be fitted with silencers or mufflers;
- care to be taken when erecting or striking scaffolds to avoid impact noise from banging steel. All operatives undertaking such activities to be instructed on the importance of minimising noise;
- deliveries to be programmed to arrive during normal working hours only;
- care to be taken when unloading vehicles to minimise noise;
- delivery vehicles to be routed so as to minimise disturbance to local residents;
- delivery vehicles to be prohibited from waiting within or in the vicinity of the site with their engines running;

- all plant items to be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive noise;
- electrically powered plant should be preferred, where practicable, to mechanically powered alternatives. All mechanically powered plant should also be fitted with suitable silencers, as appropriate;
- all plant to be sited so that the effect of noise at nearby noise sensitive properties is minimised;
- local hoarding, screens or barriers to be erected as necessary to shield particularly noisy activities; and
- problems concerning noise from construction works can often be avoided by taking a considerate and neighbourly approach to relations with the local residents. A mechanism for interaction with local residents to be devised and implemented.

13.6.3 A Noise Management Plan would be prepared with recommendations related to noise and vibration for the construction phase of the Proposed Development. The Principal Contractor will apply BPM and adhere to the Applicants G Construction Environmental Management Plan (CEMP).

Description of Effects (Construction)

Noise

13.6.4 Construction activity inevitably leads to some degree of noise disturbance at locations in close proximity. It is, however, a temporary source of noise. Noise levels at any one location will vary as different combinations of plant machinery are used. Noise levels will also vary throughout the construction period of the Proposed Development as the construction activities and phases change.

13.6.5 **Table 13-18** presents the noise levels associated with each of the typical construction activities at a sample of the nearest NSRs during weekday and weekend daytime periods.

Table 13-18 Predicted construction noise levels, Façade, $L_{Aeq,T}$

Phase of Construction	Sound pressure level at NSR dB L_{Aeq}								
	NSR1	NSR2	NSR3	NSR4	NSR5	NSR6	NSR7	NSR8	NSR9
Weekday Daytime (including 08:00 to 13:00 hours on Saturdays) Weekend Daytime (excluding 08:00 to 13:00 hours on Saturdays)									
Enabling works and site clearance	60	56	60	50	51	56	56	55	53
Substation platform Construction	47	35	47	41	38	34	44	43	44
Building Construction	47	36	47	42	39	35	45	44	45
Installation of electrical plant	40	29	40	35	32	28	38	37	38

13.6.6 As seen in **Table 13-18** the predicted noise levels for the typical construction activities associated with the Proposed Development at the nearest NSRs fall below the Category A threshold of 65 dB for weekday daytime hours. During the weekend daytime (excluding 08:00 to 13:00 hours on Saturdays), the Category A threshold of 55 dB is predicted to be exceeded during enabling works by up to 5dB. The noise impact from the construction of the Proposed Development is therefore considered to be of medium magnitude. Assuming a high sensitivity receptor, there would be **Moderate Adverse** effects at most, which is considered **Significant**. Consideration is given to mitigation measures in **paragraphs 13.6.10** to **13.6.12**

Vibration

13.6.7 **Table 13-19** presents the distances at which vibration levels are predicted to meet the criteria thresholds set out in **Table 13-4**, based on a specified confidence limit (where applicable). It should be noted that the data presented in are general in nature and not site specific.

Table 13-19 Predicted ground borne vibration levels

Vibration generating activity	Confidence Limit	PPV (mm/s)	Minimum distance between receptor and works (m) before PPV (mm/s) exceeded.
Vibratory Rollers - start & end(1)	95	0.3	80
	95	1.0	30
	95	10	4
Vibratory Rollers - Steady State(1)	95	0.3	60
	95	1.0	25
	95	10	5
HGV Movement(2)	N/A	0.3	7
	N/A	1.0	2
	N/A	10	N/A
Excavation	N/A	0.3	9
	N/A	1.0	3
	N/A	10	N/A
(1) Assumes 2 rollers, 0.5 mm amplitude, drum width of 1.3 m, e.g. heavy-duty ride on roller.			
(2) Assumes PPV of 1 mm/s at 2 m, referenced within TRL Report 53.			

13.6.8 Taking into account the distances between construction activities associated with the substation platform and the nearest NSR,

13.6.9 **Table** 13-19 indicates the predicted vibration levels are well below limits at which cosmetic building damage becomes likely (15 mm/s) and, at worst, at which construction vibration is likely to perceptible in residential environments (0.3 mm/s). The vibration impact from the construction of the Proposed Development is therefore considered to be of low magnitude. Assuming a high sensitivity receptor, there would be **Minor Adverse** effects at most. It is therefore concluded that vibration relating to the construction of the Proposed Development would be **Not Significant**.

Mitigation During Construction

13.6.10 Further scrutiny of the predicted noise levels during enabling works, and in particular the breakdown showing the contribution of each individual plant item to the predicted overall noise level of 60 dB $L_{Aeq,T}$ at NSR1 and NSR3, reveals that the key plant items are the rock breaker, 35T tracked excavator and bulldozer.

13.6.11 BS 5228-1 notes the following with regard to the likely performance of a noise barrier or screen:

"…as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10dB when the noise screen completely hides the sources from the receiver."

13.6.12 Due to the large working area, portable barriers would need to be placed strategically to mitigate a larger area for the mobile plant. This will require further assessment and planning of activities to provide effective mitigation. Further options for mitigation include the reduction of on-time of the plant and organising the programme to carry out the noisiest activities close to these receptors during the weekday period. Significant adverse effects would only occur if the noise levels exceed the durations outlined in **paragraph 13.4.10** (10 out of any 15 days or 40 days in 6 months).

Residual Effects (Construction)

13.6.13 With the adoption of the specific mitigation highlighted for the weekend period and the implementation of the CEMP, the level of construction noise would be below BS5228-1 limits for Category A limit of 65 dB for work during the daytime and 55 dB for the weekend daytime (65dB limit applies between 07:00 to 13:00 on Saturdays). The noise impact from the construction of the Proposed Development is therefore considered to be of low magnitude. Assuming a high sensitivity receptor, there would be **Minor Adverse** effects at most. It is therefore concluded that noise relating to the construction of the Proposed Development would be **Not Significant**.

Design Solutions and Assumptions (Operation)

13.6.14 The proposed fixed plant to be installed and operated as part of the Proposed Development has been designed such that the derived Rating Level for the operational plant does not exceed 35 dBA and an internal noise level of NR20 during the night-time is met, as required by the Environmental Health department at Aberdeenshire Council.

Description of Effects (Operation)

13.6.15 The predicted noise levels arising from the Proposed Development at the nearest NSRs are set out in **Table 13-20**.

Table 13-20 Predicted noise levels at NSR, dB

NSR	Ground Floor Daytime, $L_{Aeq,T}$	First-Floor Night-time, $L_{Aeq,T}$
NSR1	31	31
NSR2	26	27
NSR3	32	32
NSR4	30	30
NSR5	27	28
NSR6	24	24
NSR7	29	29
NSR8	29	29
NSR9	32	32

13.6.16 The results in **Table 13-20** indicate the predicted noise levels are generally below the prevailing L_{Aeq} noise levels noise at the nearest NSRs set out in **Table 13-14** to **Table 13-17**.

13.6.17 Based on BS 4142 if a noise source is considered tonal a penalty is to be applied. Due to the tonality present in the SGTs at 100 Hz a penalty of 3 dB has been applied to the predicted operational sound level. Other sound characteristics which can incur a penalty include intermittent and impulsive noise. These have been discounted from this assessment as the substation will produce a steady noise.

13.6.18 **Table 13-21** shows the initial estimate for the BS 4142 assessment at the worst affected NSRs, i.e. NSR1, NSR3, NSR4 and NSR9 during the night-time. This takes account of the acoustic feature correction, which when added to the predicted noise level, gives the combined noise level, referred to as the Rating Level for the night-time period. Note, an assessment for just the night-time period is provided, given that the operations are the same during the daytime and night-time. The night-time has a lower background noise level, which will result in a worst case assessment, given that the background noise level is lower.

Table 13-21 BS 4142 Assessment – Initial Estimate

	BS 4142 Assessment Period			
	First Floor Night-time NSR1	First Floor Night-time NSR3	First Floor Night-time NSR4	First Floor Night-time NSR9
Predicted Operational Noise Level, L_{Aeq} dB	31	32	30	32
Acoustic feature correction	+3	+3	+3	+3
Rating Level dB(A)	34	35	33	35
Background Noise Level, L_{A90} dB	22	23	20	23*
Difference, dB	+12	+12	+13	+12
*Adopting the night-time background noise level at MP3				

13.6.19 The results in **Table 13-21** show that the predicted Rating Level from the Proposed Development would, at most, be 13 dB above the background sound levels at the nearest NSRs. In accordance with the impact magnitude scale in **Table 13-8** the initial estimate is an impact of high magnitude at the nearest high sensitivity residential receptor, giving a **Major Adverse (Significant)** effect. This exceeds the target noise levels proposed by Aberdeenshire Council, within the Scoping Opinion, aiming for excess below 5dB. However, as requested by Aberdeenshire Council, a Rating Level that does not exceed 35 dBA has been achieved. Contextual considerations for the BS4142 assessment are provided below, along with the final significance, to determine whether NR20 is met during the night-time.

BS 4142 Assessment - Contextual Considerations – Internal Noise Assessment Curves

13.6.20 Internal noise levels have been calculated based on BS8233: 2014, Annex G, which states that a partially open window, which accounts for ventilation, provides approximately 15 dBA attenuation. For the purposes of this assessment, 15 dBA attenuation is assumed.

13.6.21 Since the plant is considered to operate continuously, the assumption is that there will be no change in operational noise level during the daytime and night-time periods. The calculated internal noise levels at the worst affected receptor, NSR3 are provided in **Table 13-22.**

Table 13-22 Internal Plant Noise Calculation

	Octave band centre frequency, dB								
	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2KHz	4KHz	8KHz
Façade noise level at Greenford (First floor)	66	53	42	28	25	22	13	0	0
Partially open window	-15	-15	-15	-15	-15	-15	-15	-15	-15
Internal level	51	38	27	13	10	7	0	0	0
NR20 criterion	69	51	39	31	24	20	17	14	13
Criteria met	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

13.6.22 As shown in **Table 13-22**, the noise arising from the plant associated with the Proposed Development is predicted to meet the internal noise criterion of NR20 (and therefore NR25 during the daytime). With a closed window this is expected to reduce further. The proposed fixed plant to be installed and operated as part of the Proposed Development will be designed such that the derived Rating Level for the operational plant does not exceed 35 dBA and an internal noise level of NR20 during the night-time is met as required by the Environmental Health department at Aberdeenshire Council.

13.6.23 Taking into consideration context, although the external noise levels do not meet the requirements of a BS4142 assessment during the night-time, the internal noise levels are acceptable and a likely indicator of a low magnitude of impact that is a **Minor Adverse (Not Significant)** effect.

Mitigation During Operation

13.6.24 As mentioned, a high magnitude and therefore potential **Major Adverse (Significant)** effect is predicted in the BS4142 assessment during night-time conditions. Although in context, internal noise levels during this time are predicted to be **Minor Adverse (Not Significant)**. The Applicant is committed to meeting noise limits where no significant residual effects are predicted, therefore additional mitigation is required.

13.6.25 The Applicant would support a planning condition that requires the preparation of a noise mitigation scheme to demonstrate that the operation of the scheme will not lead to significant adverse effects in accordance with BS4142:2014+A1:2019. The mitigation scheme will be based on a robust acoustic design process and it will identify the most cost-effective measures including for example localised noise barriers, acoustic enclosures, cladding with enhanced acoustic specification on buildings containing noisy plant, acoustically attenuated louvres, or a combination of these measures, where required. The scheme would be prepared during detailed design in close liaison with the Council's environmental health team, to ensure their requirements are fully considered.

13.6.26 **Table 13-23** shows a summary of the mitigation measures suggested for both the construction and operation phases.

Table 13-23 Summary of Mitigation

ID	Title	Description
NV1	Noise Barriers	Portable noise barriers are to be placed strategically to mitigate noise from mobile plant (rock breakers, track excavator and bulldozer). The Principal Contractor will be responsible for planning construction activities and movement of the portable barriers to provide effective noise screening.
NV2	Construction Timings	The Principal Contractor will be responsible for reducing the "on-time" of any mobile plant. They will also be responsible for organising the programme so that

ID	Title	Description
		the noisiest activities are only carried out close to noise sensitive receptors (NSR) NSR1 and NSR3 during the weekday period and not during the weekends.
NV3	Noise Mitigation Scheme	A Noise Mitigation Scheme will be based on a robust acoustic design process and will identify the most cost-effective measures including for example localised noise barriers, acoustic enclosures, cladding with enhanced acoustic specification on buildings containing noisy plant, acoustically attenuated louvres, or a combination of these measures, where required. The scheme would be prepared during detailed design in close liaison with the Council's environmental health team, to ensure their requirements are fully considered.

Residual Effects (Operation)

13.6.27 Following implementation of a noise mitigation scheme, the noise impact from the operation of the Proposed Development is considered to be of low magnitude. Assuming a high sensitivity receptor, there would be **Minor Adverse** effects at most. It is therefore concluded that noise relating to the operation of the Proposed Development would be **Not Significant** and no residual effects are expected.

Cumulative Effects

13.6.28 There is the potential for cumulative effects to occur as a result of the Proposed Development and cumulative schemes identified in the surrounding area. Cumulative effects may arise during both the demolition and construction phase and the operational phase.

13.6.29 A review of the Cumulative Schemes identified in **Table 5-2** of **Volume 2, Chapter 5: EIA Methodology** has been undertaken to determine the potential for in-combination effects to arise. **Table 13-24** below presents the cumulative appraisal of in-combination effects and, where necessary, the control or mitigation measures which will be employed to manage potential cumulative effects. As stated in **Volume 2, Chapter 5: EIA Methodology**, developments marked with an asterisk are a Stage 1 cumulative development.

Table 13-24 In-combination Effects

Development	Planning Reference and Description	Potential In-Combination Effects
BBNP 400 kV OHL (Pre-Application)*	Ref: ECU00005165. Section 37 application for the construction of a new double circuit steel structure 400 kV OHL between Beauly, Blackhillock, New Deer and Peterhead, approximately 194 km in length, including the diversion of an existing 400kV OHL into a proposed new Coachford 400kV substation near Blackhillock, removal of the existing 132 kV OHL from Beauly to Knocknagael substations, and rationalisation and crossings of the existing transmission network.	Documents are only available for the pre-application stage. The scoping report highlights that there are possible effects associated with construction and operation of the proposed substation and OHL. • noise and vibration during the construction phase; and • operational effects of noise from the OHL, including: – operational effects of noise from the 'corona discharge' during damp weather along the OHL; – operational effects of noise from potential 'aeolian noise' where wind passing over OHL components creates a tonal noise; and – noise from operational maintenance. Given that the route of the OHL is proposed to be sited in proximity to the same receptors as the substation site, it is considered a cumulative effect may occur if they are constructed concurrently. Where the construction activities for each development occur concurrently, the Principal Contractor should apply construction good practice measures and best practicable means to reduce the potential for in-combination effects. The exact location of the OHL has yet to be defined. However, the operational noise section of the scoping report states that noise limits will be agreed with Aberdeenshire Council. Appropriate mitigation measures will be implemented where required to ensure these limits will be met. This should minimise any cumulative operational noise impacts at NSRs. No operational cumulative effects are anticipated from the proposed underground cable. No construction phase assessment is available. However, it is considered a cumulative effect for construction noise may occur if the Proposed Development and Permitted Development Works are constructed concurrently. Where the construction activities for each development occur concurrently, the Principal Contractor should apply construction good practice measures and best practicable means to reduce the potential for in-combination effects.
Greens Underground Cable Connection*	Will be Permitted Development. An SSEN Transmission underground cable connection from the Proposed Development to the existing New Deer Substation. This will be a 400 kV cable, approx. 3 km long.	
Transmission Infrastructure Comprising Transition Joint Bays, Underground Cable Circuits Within a Cable Corridor, Substation and Ancillary Works	Decided- PAC Agreed as Specified in Notice (ENQ/2023/0739). National development application for electrical transmission infrastructure comprising transition joint bays, underground cable circuits within a cable corridor, substation and ancillary works. Landing at location between Portsoy and Banff, travelling south to substation location in the vicinity of New Deer.	No construction or operational phase assessment is available. However, it is considered a cumulative effect may occur if the Proposed Development and Permitted Development Works are constructed concurrently. Where the construction activities for each development occur concurrently, the Principal Contractor should apply construction good practice measures and best practicable means to reduce the potential for in-combination effects.

Development	Planning Reference and Description	Potential In-Combination Effects
	This development overlaps with the Proposed Development.	
Installation of Underground Cable	Awaiting decision (ENQ/2022/1845) Installation of Underground Cable at substation near New Deer, Peterhead, Aberdeenshire. This development is approximately 1.4 km south-east of the Proposed Development.	No construction or operational phase assessment is available. However, it is considered a cumulative effect may occur if the Proposed Development and Permitted Development Works are constructed concurrently. Where the construction activities for each development occur concurrently, the Principal Contractor should apply construction good practice measures and best practicable means to reduce the potential for in-combination effects.
Formation of Onshore Landfall Point, Laying of Underground Cable and Erection of Substation	Approved (APP/2023/1454). National development application for formation of onshore landfall point, laying of underground cable and erection of substation. This development is approximately 2.3 km south-east of the Proposed Development.	Taking into consideration the distance between the Proposed Development and the substation (2.3 km), no construction or operational phase cumulative effects are expected.
Erection of a Synchronous Compensator	PAC Agreed as Specified in Notice (ENQ/2021/1180). Erection of a Synchronous Compensator to provide grid stability services and associated works. This development is approximately 1.6 km south of the Proposed Development.	Taking into consideration the distance between the Proposed Development and the synchronous connectors (1.6 km), no construction or operational phase cumulative effects are expected.
Formation of Forestry Private Way	Decided- Prior Approval Required (APP/2023/2102). Prior Notification is sought for a forestry private way formation at the land at Callies Wood, Fyvie. The site is located north of Lethenty settlement and is accessed from a local road. The proposal is for a new private forestry way for woodland maintenance, alteration and timber extraction. This development is approximately 4.9 km south-west of the Proposed Development.	Taking into consideration the distance between the Proposed Development and the forestry private way (4.9 km), no construction or operational phase cumulative effects are expected.
Formation of Footpaths	Approved (APP/2022/2571). Full planning permission is sought for the formation of a footpath around Lendrum, Turriff. Approximately 3 km of semi-bound finished path is proposed over an area of approximately 73 hectares centred on Lendrum Farm and its memorial to the Turra Coo. The path has three access points to the public road network, two onto the road between South Redbriggs and Birkenhill and one	Taking into consideration the distance between the Proposed Development and the proposed footpaths (4.8 km), no construction or operational phase cumulative effects are expected.

Development	Planning Reference and Description	Potential In-Combination Effects
	opposite Lendrum Farm, where parking next to the memorial is available for approximately 3 cars. This development is approximately 4.8 km south-west of the Proposed Development.	
Formation of Footpath	Approved (APP/2021/2773). A path circuit of approximately 982 m is proposed to run inside the perimeter of a triangular 6 ha field immediately north of Moss Side Farm, which lies on the single-track public road between Monquhitter School in Cuminestown and the B9170 public road. This development is approximately 1.3 km north of the Proposed Development.	Taking into consideration the distance between the Proposed Development and the proposed footpaths (1.3 km), no construction or operational phase cumulative effects are expected.
Formation of Footpath	Approved (APP/2022/0034). Approximately 1 km of path over an area of 2.9 ha would be formed at Hillhead of Teuchar, around the perimeter of the farm's northernmost field. This development is approximately 1.4 km north-west of the Proposed Development.	Taking into consideration the distance between the Proposed Development and the proposed footpaths (1.4 km), no construction or operational phase cumulative effects are expected.
Installation of Footpath and Associated Post and Wire Fencing	Approved (APP/2022/0076). This application seeks full planning permission for the formation of a 2 km foot/cycle path on land to the west of the Cuminestown to Crudie road, approximately 1 km north of Cuminestown. The path will run west along the line of an agricultural field, turn north along the eastern side of the Aultan Burn then head east along another field boundary finishing at the public road. This development is approximately 4.1 km north-west of the Proposed Development.	Taking into consideration the distance between the Proposed Development and the proposed footpaths (4.1 km), no construction or operational phase cumulative effects are expected.
Smiddybank Battery Energy Storage System (BESS)	Pre Application (ECU00005004). The application comprises the construction and operation of an energy storage facility with a capacity greater than 50 MW. This development is approximately 4.9 km east of the Proposed Development.	Taking into consideration the distance between the Proposed Development and the battery energy storage system (4.9km), no construction or operational phase cumulative effects are expected.
Monquhitter BESS	Pre Application (ECU00005129). The project involves the development of a 480 MW BESS site, on a parcel of	Taking into consideration the distance between the Proposed Development and the battery energy storage

Development	Planning Reference and Description	Potential In-Combination Effects
	land measuring 37 Ha within the vicinity of Cuminestown and New Deer, Aberdeenshire. BESS schemes are designed to assist the national electricity network in terms of stabilising supply, effectively storing excess energy when not being used by the electricity grid and then sending this back to the grid when it is needed. This development is approximately 1.9 km north of the Proposed Development.	system (1.9km), no construction or operational phase cumulative effects are expected.

13.7 Summary

13.7.1 The assessment approach has been designed to identify and evaluate construction noise and vibration, and operational noise impacts of the Proposed Development on the nearest noise sensitive receptors. This has been undertaken using a process of baseline monitoring and noise modelling.

13.7.2 The effects of noise from the Proposed Development on NSRs have been assessed and mitigation measures, where appropriate, have been identified. There are no significant effects identified during the construction phase at the NSRs from the Proposed Development.

13.7.3 The results of the external BS4142 assessment **Major Adverse (Significant)** effects are predicted for nearby NSRs during the night-time. Considering context, an internal noise assessment was conducted for the operational noise from the Proposed Development and the NR20 criteria is predicted to be met leading to **Minor Adverse (Not Significant)** effects.

13.7.4 An updated noise impact assessment should be conducted during detailed design, following further refinement of the assessment data and the implementation of further mitigation, it is expected that operational noise levels at NSRs would be in line with the limits proposed by the Council. Therefore, with the Applicant committed to meeting the noise limits, No Significant residual effects are predicted.