8. INTRODUCTION

8.1 Introduction

8.1.1 Bureau Veritas has been appointed by SSEN Transmission to undertake a noise impact assessment for the proposed substation development at Crossaig North.

8.1.2 The purpose of this Noise Impact Assessment (NIA) Report is to support applications under the Town and Country Planning (Scotland) Act 1997, as amended and the Electricity Act 1989 for the Project and identify any noise related impacts associated with the scheme, during construction and once operational.

8.2 Site Descriptions

8.2.1 The proposed Crossaig North site is approximately 120 m to the west of the existing Crossaig substation and approximately 400 m from B842 which is to the east. The site is located in a rural area and currently comprises mainly woodlands.

8.2.2 The nearest residential dwelling is identified as “South Crossaig” approximately 730 m to the northeast of the site. Other properties are located at a further distance to the northeast (North Cottage and Crossaig Lodge) and to the south (dwelling approximately 1.4 km by B842).

8.2.3 A site location plan is provided in **Annex S** (**Appendix A).**

8.3 Development Proposals

8.3.1 Components of the Proposed Development that will be subject to an application for consent under the Town and Country Planning (Scotland) Act 2007 (as amended) are as follows:

- A substation platform of approximately to 2.4 ha for the new Crossaig North substation;
- A 275 kV Gas Insulated Switchgear (GIS) Building, maximum height 16m;
- A 132 kV Gas Insulated Switchgear (GIS) Building, maximum height 16m;
- Installation of two 275/132 kV supergrid transformers (SGT), rated at 480 MVA, each located in a ventilated building of maximum height 18m;
- Installation of two gantries and electrical equipment to connect the OHL and the proposed substation;
- A temporary works area (TWA) adjacent to the substation site, of approximately 3 ha and areas for temporary peat storage;
- Diesel Generator and 2 automatic voltage regulators;
- Borehole for water and septic tank;
- Turning and parking areas;
- Use of existing access tracks (the existing Cross Kintyre Haul Road and Cour Estate track), approximately 25 km in length to enable access to the existing Crossaig substation. Ongoing maintenance of this track will be required;
- Construction of a section of permanent access track, approximately 660 m in length between the existing Crossaig substation and the proposed Crossaig North substation and for access to the SuDS pond;
- A 2.4 m high security fence of palisade construction around the substation perimeter;
- Foul and surface water drainage (Sustainable Drainage System (SuDS) pond and outfall pipe);
- An extension to the south of the substation platform at the existing Crossaig substation of approximately 0.13ha to support electrical equipment and associated access and
- Tree and vegetation clearance.

8.3.2 Components of the Associated Development subject to an application for consent under Section 37 of the Electricity Act 1989 comprise:

- Construction of one new terminal lattice steel tower and one new lattice steel angle tower to support a new OHL connection from the existing Inveraray to Crossaig OHL into the new 275 kV Crossaig North substation including new downlead terminations from the terminal tower to the substation gantries;
- Four temporary towers or masts and associated temporary OHL diversion to facilitate the build of the new towers to avoid double-circuit network outages;
- A new section of permanent access track approximately 225 m long connecting the Crossaig North substation to the southern most proposed permanent (terminal) tower and a 25 m long track connecting the northern most proposed permanent (angle) tower to the existing track;
- A temporary access track 134 m long, connecting existing private forestry tracks to the northern most proposed temporary tower;
- A temporary access track 22.7m long connecting existing private forestry tracks to the most southerly proposed temporary tower;
- Dismantling of three redundant lattice steel towers near the existing Crossaig substation and
- Tree and vegetation clearance.

8.4 Legislation and Guidance

Scope of the Assessment

8.4.1 This assessment considers effects of noise on noise-sensitive receptors (NSRs) due to:

- potential construction noise effects (including construction traffic noise) on NSRs in the vicinity of the substation site and the new overhead line (OHL); and
- the potential effects of noise emissions from the operational substation.

8.4.2 Given the separation distances between the proposed sections of OHL, required to connect the Inveraray to Crossaig 275 kV OHL into the proposed substation, and the nearest noise sensitive receptors, detailed assessment of the potential noise impacts of the new OHL route once operational has been scoped out. Calculations, based on the proposed conductor and tower design, in accordance with TR(T)94 'A Method for Assessing the Community Response to Overhead Line Noise', indicate that during worst case (audible noise induced by rainfall) conditions noise impacts would be negligible beyond 140 m (based on a prevailing background sound level of 27 dB L_{A90}, ref. **Table 8.5**). The nearest noise-sensitive receptor is situated more than 730m from the project.

8.4.3 Likewise, the potential impacts of vibration during construction and operation are not expected to be significant due to the separation distances. At this stage, there has been no final blast design, and therefore an accurate prediction cannot be undertaken. Assumed maximum instantaneous charge M of 100 kg will be used in the assessment. Rock blasting will always be carefully designed to maximize its efficiency and reduce the noise and vibration, and the actual impact would not be significant with the implementation of best practice which would include prior notification of blasting operations. Impacts are discussed further in sections 8.6.2-8.6.9.

8.4.4 The scope of the assessment has been informed by the following guidelines/policies:

- Planning Advice Note (PAN) 1/2011 - Planning and Noise[1]
- BS 5228-1: 2009+A1: 2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise;[2]

[1] The Scottish Government, Planning Advice Note 1/2011: planning and noise, 3 Mar 2011. Reviewed from https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/documents/

[2] BSI Standards Publication, BS 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, December 2008.

- Design Manual for Roads and Bridges - LA 111 Noise and Vibration, Revision 2[3]; and
- BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound[4].

Consultation

8.4.5 Consultation was undertaken with the Environmental Health Officer at Argyll & Bute Council (ABC) to agree the survey and assessment methodology to be adopted for this NIA. This included agreement on the location and scope of baseline noise surveys, and assessment criteria.

8.4.6 The construction noise and vibration assessment, as described in more detail below, follows the guidance presented in BS5228:2009+A1:2014 Parts 1: Noise and 2: Vibration.

8.4.7 The assessment criteria are broadly in line with the following assessment methodology, with the sound rating level of the operational substation being required to not exceed the existing background sound level, in line with British Standard 4142:2014+A1:2019.

Policy

8.4.8 A summary of the relevant planning policy, guidance documents and British Standards is included in the following sections.

Planning Advice Note (PAN) 1/2011: 'Planning and Noise'

8.4.9 Published in March 2011, this document provides advice on the role of the planning system in helping to prevent and limit adverse effects of noise (Scottish Government, 2011). Information and advice on noise assessment methods are provided in the accompanying Technical Advice Note (TAN): Assessment of Noise. Included within the PAN document and the accompanying TAN are details of the legislation, technical standards and codes of practice for specific noise issues.

8.4.10 Of relevance to the assessment of development generated road traffic noise, it is stated that a change of 3 dB(A) is the minimum perceptible under normal conditions, and that a change of 10 dB(A) corresponds roughly to a halving or doubling of the perceived loudness of a sound.

8.4.11 Neither PAN 1/2011 nor the associated TAN provide specific guidance on the assessment of noise from fixed plant, but the TAN includes an example assessment scenario for 'New noisy development (incl. commercial and recreation) affecting a noise sensitive building', which is based on BS 4142:1997: Method for rating industrial noise affecting mixed residential and industrial areas. This British Standard has been replaced with BS 4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound.

British Standard 5228-1: 2009+A1: 2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise.

8.4.12 BS5228 details the ABC method for construction noise assessment[5], which is shown in **Table 8.1**.

[3] The Highway Agency, Transport Scotland, Welsh Government and the Department for Infrastructure, Design Mannual for Roads and Bridges - LA 111 Noise and Vibration, Revision 2, May 2020. Reviewed from https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364?inline=true

[4] BSI Standards Publication, BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound, October 2014.

[5] BSI Standards Publication, BS 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, December 2008, pp119-120.

Table 8.1 – Construction Noise Impact Assessment Criteria Assessment

Assessment category and threshold value period	Threshold value, L_{Aeq} (dB)		
	Category A	**Category B**	**Category C**
Night-time	45	50	55
Evenings and weekends	55	60	65
Daytime and Saturdays	65	70	75

Night-time is considered between 23:00 and 07:00. Evenings and weekends are considered to be 19:00 – 23:00 on weekdays, 13:00 – 23:00 on Saturdays and 07:00 – 23:00 on Sundays. Daytime is considered to be 07:00 – 19:00 on weekdays and Saturdays 07:00 – 13:00.

The NSR is defined as Category A if the ambient noise levels (rounded to the nearest 5 dB) are less than those stated for category A.

The NSR is defined as Category B if the ambient noise levels (rounded to the nearest 5 dB) are equal to those stated for category A.

The NSR is defined as Category C if the ambient noise levels (rounded to the nearest 5 dB) are greater than those stated for category A.

8.4.13 For the purpose of this assessment, noise levels are assessed with reference to the 5 dB(A) Change method presented in Annex E of BS 5228-1. Subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,T}$ from site noise alone, for the daytime, evening and night-time periods, respectively, any increase over 5 dB is deemed as medium or high magnitude of change (depending on the excess), while under 5 dB change is deemed to be a low or negligible magnitude of change (depending on the margin).

Design Manual for Roads and Bridges - LA 111 Noise and Vibration, Revision 2

8.4.14 The Design Manual for Road and Bridges (DMRB) LA 111 'Noise and Vibration' 2020 provides a method of evaluating both the immediate and long-term impact of abrupt changes in the 18-hour traffic flow (06.00-24.00) in terms of the effects on people and, principally, occupiers of residential property.

8.4.15 Individuals vary widely in their response to traffic noise, although the average or community response from a large number of people to the same level of traffic noise is fairly stable.

8.4.16 Consequently, a community average degree of annoyance can be related to the $L_{10,18h}$ traffic noise level. The annoyance caused by the existing traffic noise and the predicted future traffic noise is calculated, enabling the increase, or decrease in the percentage of people likely to be annoyed to be determined.

8.4.17 DMRB requires that an assessment is undertaken where an increase in a road traffic flow of 25% or greater is predicted (equivalent to an increase or decrease in road traffic noise of approximately 1 dB(A)). This implies that road traffic flow increases of up to 25% offer no significant impact in environmental noise terms.

British Standard 4142: 2014+A1:2019: Methods for rating and assessing industrial and commercial sound (BS 4142)

8.4.18 British Standard 4142 describes methods for rating and assessing the following:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises

- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site

8.4.19 The methods use 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.

8.4.20 In accordance with the assessment methodology, the specific sound level ($L_{Aeq,T}$) of the noise source being assessed is corrected, by the application corrections for acoustic features, such as tonal qualities and/or distinct impulses, to give a "rating level" ($L_{Ar,Tr}$).The British Standard effectively compares and rates the difference between the rating level and the typical background sound level ($L_{A90,T}$) in the absence of the noise source being assessed.

8.4.21 The British Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) when the noise source in question is likely to operate or is proposed to operate in the future.

8.4.22 Comparing the rating level with the background sound level, BS 4142 states:

> "*Typically, the greater this difference, the greater the magnitude of impact.*
>
> *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *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.*"

8.4.23 In this assessment consideration has been given to both BS 4142 and BS 8233, in order to ensure that the development proposals are considered in context of the prevailing noise environment.

Criteria for Assessing Sensitivity of Receptors

8.4.24 The guidance contained within Technical Advice Note to PAN 1/2011 has been drawn upon in the generation of an appropriate set of receptor sensitivity criteria. These criteria are presented in **Table 8.2** and have been applied for the construction and operational phases of the proposed development.

Table 8.2 – Construction Noise Impact Assessment Criteria Assessment

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.	Residential, quiet outdoor recreational areas, schools and hospitals

Sensitivity	Description	Examples
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.
Negligible	Receptors where noise would have a negligible impact.	Areas which are not considered to be noise sensitive e.g. vacant land.

Criteria for Assessing Magnitude of Change

8.4.25 In accordance with relevant technical guidance above, the potential impact during the proposed construction and operation phases have been assessed using the following criteria:

Construction Phase - Site Works

- High: Predicted short-term (<8 weeks) construction noise level more than 75 dB $L_{Aeq,1hour}$ at a residential property.
- Medium: Predicted short-term (<8 weeks) construction noise level more than or equal to 65 dB $L_{Aeq,1hour}$ and less than 75 dB $L_{Aeq,1hour}$ at a residential property.
- Low: Predicted short-term (<8 weeks) construction noise level more than or equal to 60 dB $L_{Aeq,1hour}$ and less than 65 dB $L_{Aeq,1hour}$ at a residential property.
- Negligible: Predicted short-term (<8 weeks) construction noise level less than 60 dB $L_{Aeq,1hour}$ at a residential property.

Construction Phase - Offsite Road Traffic

- High: Increase in local road traffic noise of more than 5 dB(A)
- Medium: Increase in local road traffic noise of 3 - 4.9 dB(A)
- Low: Increase in local road traffic noise of 1 - 2.9 dB(A)
- Negligible: Increase in local road traffic noise of less than 1 dB(A)

Operation Phase

- High: Predicted operational rating noise level +10 dB or greater above the existing background L_{A90} level.
- Medium: Predicted operational rating noise level +5 to +9 dB above the existing background L_{A90} level.
- Low: Predicted operational rating noise level +2 to +4 dB above the existing background L_{A90} level.
- Negligible: Predicted operational rating noise level less than 2 dB above the existing background L_{A90} level.

8.4.26 The assessment has been undertaken using 'worst-case' noise levels to predict the potential 'worst-case' noise impact on the principal receptors in the area.

Significance Criteria

8.4.27 The significance of effect has been determined with consideration to both the receptor sensitivity and the magnitude of change according to the matrix detailed in **Table 8.3** drawing on the guidance within TAN 1/2011.

Table 8.3 – Significance of Effect Matrix

Magnitude of Change	Receptor Sensitivity			
	High	**Medium**	**Low**	**Negligible**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Moderate	Minor	Negligible
Low	Minor	Negligible	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

8.4.28 Effects have been categorised as either 'adverse' (e.g., noise level increases) or 'beneficial' (e.g. noise level decreases).

8.4.29 The residual effects are assessed for individual NSRs as follows:

- negligible and minor effects are considered to be 'not significant'; and
- moderate and major effects are considered to be 'significant'.

8.5 Baseline Noise Survey

8.5.1 To inform the assessment, a baseline noise survey was undertaken at the nearest NSRs to the project. Full data and analysis of the baseline noise surveys are included in **Annex S**. A summary of the baseline noise survey work is included below.

8.5.2 The survey was undertaken over a period of 7 days to determine the current prevailing noise environment at the nearest noise sensitive receptors in the vicinity of the site. Measurements were conducted over this duration in order to capture sufficient data under representative meteorological conditions, with all data obtained under unsuitable conditions excluded from the final dataset.

8.5.3 The noise survey commenced in the noon of Friday 8th October 2021 and concluded on the evening of Thursday 14th October 2021.

Measurement Locations

8.5.4 The measurements were made within free-field conditions, i.e., at least 3.5 m from any acoustically reflective surfaces other than the ground. The measurement location adopted during the baseline noise survey is labelled in **Appendix A (**see **Annex S)**. The measurement location is described below:

- Crossaig North – Measurement Location 3 (ML3) – To the south of South Crossaig NSR (at an approximately 5.4 km distance from the substation boundary), adjacent to B842.

Meteorological Conditions

8.5.5 Meteorological conditions were monitored at the monitoring location ML3. Conditions at ML3 during the survey were relatively windy, with wind speeds ranging from approximately 3 to 12 ms^{-1} and the wind directions are mainly from the northwest (see **Appendix A.3, Annex S**). BS4142 states that measurements in poor weather conditions such as wind speeds greater than 5 ms^{-1} should be treated with caution. A review of the data, as detailed in **Appendix A.5** (**Annex S**) indicates that an increase in background sound level occurred at wind speeds above approximately 8 ms^{-1}. This increase will be due, at least in part, to the subsequent increase in background noise due to the increased wind speed (i.e., more noise from foliage etc.) but also potentially due to wind on the microphone and windshield which is artificial. As such, for the purposes of this assessment,

measurement periods during wind speeds greater than 8 ms^{-1} have been excluded. Periods with rainfall have also been excluded, together with the subsequent three periods (one hour in total).

8.5.6 The RenSmart Wind Data Archive[6] indicates that, at the Campbeltown meteorological station, wind speeds were below 8 ms^{-1} for approximately 87% of the time (year 2000 to 2010). This suggests that baseline noise measurements under the wind speed range of 0-8 ms^{-1} are representative of conditions typically experienced at the receptors.

Measurement Equipment

8.5.7 The baseline noise survey measurements were undertaken using the following Class 1 specification noise measuring equipment:

Table 8.4 – Noise measurement equipment

Equipment Type	Manufacturer	Model	Serial Number
Sound Level Meter	Rion	NL_52	00253716
Microphone	Rion	UC-59	07545
Calibrator	Rion	NC-74	34536109
Met-Station	Davis	6250UK	N/A

8.5.8 The sound level meter and associated measurement chain was calibrated to traceable standards within the preceding two years and the portable calibrator within the preceding 12 months. The sound level meter was calibrated both prior to and upon completion of the survey. No significant drift was noted to have occurred.

Measurement Results

8.5.9 A summary of the noise levels measured during the noise survey are presented in **Table 8.5**.

Table 8.5 – Measurement results filtered by meteorological data, free-field dB

Location	Time Period	Sound Pressure Level, dB			
		$L_{Aeq,15min}$	$L_{Amax,15min}$	$L_{A10,15min}$	$L_{A90,15min}$
ML3 South Crossaig	Day	25 - 62 Average 46 Mode 52	27 - 85 Average 68 Mode 74	25 - 62 Average 37 Mode 40	25 - 43 Average 29 Mode 28
	Night	25 – 54 Average 33 Mode 31	27 – 82 Average 42 Mode 34	25 – 51 Average 32 Mode 32	24 – 49 Average 30 Mode 27

[6] http://www.rensmart.com/Weather/WindArchive#monthlyLayer

8.5.10 Based on the calculated average and mode sound levels in **Table 8.5** and the sound level distributions showed in **Appendix A.6 and A.7**. (**Annex S**) At ML3, the representative L_{Aeq} and typical L_{A90} are **46 dB** and **28 dB** during daytime, and **33** dB and **27** dB during night-time.

8.6 Noise emission data

Construction Noise

8.6.1 The sources presented in **Table 8.6** have been used to determine static construction noise levels. To ensure a worst-case assessment, it has been assumed that all phases of works will take place simultaneously.

Table 8.6 – Static Construction Activities and Associated Noise Levels

Activity	Plant Item	No.	BS 5228 reference	Utilisation %	L_{Aeq} at 10 m (dB)
Forestry	Harvester	1	Manufacturer supplied	5%	86
	Forwarder	1	Manufacturer supplied	50%	87
	Petrol Driven Chainsaw	1	Table D2 No. 14	80%	83
	Wheeled loader	1	Table C2 No. 27	20%	80
	Lorry	1	Table C2 No. 34	100%	80
Site Preparation	Tracked Excavator	2	Table C2 No. 3	50%	78
	Dozer	3	Table C2 No. 1	50%	75
Topsoil Strip	Tracked Excavator	2	Table C2 No. 3	50%	78
	Dozer	3	Table C2 No. 1	50%	75
Access Road	Wheeled Backhoe	1	Table C2 No. 8	50%	68
	Dumper	2	Table C4 No. 7	50%	78
	Vibratory Roller	1	Table C2 No. 40	50%	73
Tower Construction	Excavator	1	Table C2 No. 14	50%	79
	Steel Tube Piling Rig	1	Table C3 No. 8	50%	88
	Concrete Pump	1	Table C3 No. 25	50%	78
	Crane	1	Table C3 No. 29	40%	70
	Rock breaker	1	Table C9 No. 12	50%	85

Tensioning	Winder	1	Manufacturer supplied	60%	77
	Rear Winder	1	Manufacturer supplied	60%	77

Blast Noise and Vibration Assessment

8.6.2 Whenever blasting is carried out, energy is transmitted from the blast site in the form of airborne pressure waves. These pressure waves comprise energy over a wide range of frequencies, some of which are higher than 20 Hz and therefore perceptible as sound, whereas the majority are below 20 Hz and hence inaudible but can be sensed as concussion. It is the combination of the sound and concussion that is known as air overpressure.

8.6.3 The other major sources of air overpressure from blasting are the reflection of stresses from a free face of an unbroken rock mass and also from the physical movement of a rock mass around the shot holes and at other free faces. Routine blasting can regularly generate air overpressure levels at adjacent premises of around 120 dB (lin). This level corresponds to an excess air pressure which is equivalent to that of a steady wind speed of 5 ms^{-1} and is likely to be above the threshold of perception.

8.6.4 The attenuation effects due to the topography, either natural or manufactured, between the blast and the receiver are much greater on the audible component of the pressure wave, whereas the effects are relatively slight on the lower frequency concussive component. The energy transmitted in the audible part of the pressure wave is much smaller than that in the concussive part and therefore it is very unlikely the audible blast noise is loud at the NSRS, given the 730 m distance between the NSRs and the site.

8.6.5 There are particular characteristics of blasting which require specific consideration of vibration issues. As it is stated in the Scottish Government's Planning Advice Note: "Maximum instantaneous charges are, in the absence of any restrictions, typically of the order of 20 to 40 kg in opencast coal site blasts and 100 to 200 kg at quarries. Whilst reductions in instantaneous charges by factors of 2 to 3 by means of decking and/or reductions in hole depths and diameters may be practicable on certain sites, depending upon the initial blast designs, these reductions are only possible whilst maintaining the required blast ratio. In practice this has the effect of significantly increasing the number of boreholes required in order to dislodge the same volume of material. This increase will in turn significantly increase the drilling and detonator costs."

8.6.6 According to the prediction method of vibration from a blasting site (Figure E.1) in BS5228-2, for instance, with a distance of 730 m and assumed maximum instantaneous charge M of 100 kg, 95% of blasts to be approximately 3 mms^{-1}. The vibration can be tolerated if prior warning and explanation has been given to residents. However, for site levelling and construction preparation works, blast operations are expected to use much smaller charges

for more localised and precise rock clearance. Resulting vibration levels are therefore expected to be significantly lower than 3mms^{-1}.

8.6.7 At this stage, there has been no final blast design, and therefore an accurate prediction cannot be undertaken. However, rock blasting will always be carefully designed to maximize its efficiency and reduce the noise and vibration.

8.6.8 Wherever possible, the operator will inform residents of the proposed times of blasting and of any deviation from this programme in advance of the operations. On each day that blasting takes place it should be restricted as far as practicable to regular periods.

8.6.9 Blast noise and vibration is scoped out of further assessment at this stage. The final design will be provided to ABC by the contractor.

Construction Traffic Noise

8.6.10 Estimated traffic data for substation construction is shown in **Table 8.7** below. The Proposed Development will be constructed over a 30-month period. Forestry felling works are likely to commence several months in advance of substation earthworks / construction and have therefore been included within this assessment.

Table 8.7 – Estimate of Construction Vehicle Numbers for the Proposed Development

Construction Task	Vehicle Type	Approximate No. of Loads
• **HGV**		
• Forestry Removal	Timber lorry, low loader, fuel lorry	94
• Earthworks Substation Platform	20T Tipper lorry	2547
• Substation Access Tracks	20T Tipper lorry	125
• Earthworks Site Compound	20T Tipper lorry	569
• Concrete for all work	Concrete wagon (6m^3 carry capacity)	463
• Building & External civils deliveries (steelwork, cladding, drainage, fencing etc)	HGV Trailer	114
• Electrical equipment deliveries	HGV Trailer	238
• Transformer delivery	Abnormal indivisible load	2
• **Car/ Light Goods Vehicle (LGV)**		
• Personnel to and from site	• Car/ Light Goods Vehicle	26,400
• **Total No. of HGVs and LGVs (Two-way return movements)**		**30,431**

8.6.11 **Table B.1** (see **Annex S**) presents the one-way movements of the baseline traffic data of A83 in 2021. For the purpose of the assessment, impacts are presented for HGVs and LGVs. The following number of two-way baseline traffic movements are assumed i.e., half the number of one-way movements:

- HGVs: 125 two-way movements, comprising of HGV movements only; and
- LGVs: 1,992 two-way movements, comprising of two wheeled motor vehicles, cars and taxis, buses and coaches and light goods vehicles.

8.6.12 The Project considers both the Proposed Development and Associated Developments. As shown in **Table B.2** (see **Annex S**), the monthly maximum two-way HGV movements during construction is 425 per month for a period of three months during earthworks. This equates to approximately 19 HGV movements per day (based on 22 working days per month).

8.6.13 This represents a 16% increase in the average number of HGVs on the A83 per day for the six months, which have the monthly highest traffic volume increase.

8.6.14 In terms of car and LGV movements construction will result in approximately 880 movements each month, assuming an even distribution across the construction period. This would result in approximately 34 two-way movements per day (assuming 26 working days per month), resulting in a 1.7% increase in the number of cars/LGVs on the A83. This is assumed for the A83 to the north of the junction with the B8001 (Redhouse Junction). After this point cars and LGVs are likely to turn east on the B8001 then the B842.

8.6.15 Considering HGV and cars/LGVs combined the maximum number of monthly two-way movements is approximately 1,305 during months 7 to 12 which equates to 59 two-way movements per day (assumes 22 working days per month). This represents a 2.8% daily increase in total vehicle movements on the A83 during months 7 to 12 of construction.

8.6.16 As stated above, DMRB requires that an assessment is undertaken where an increase in a road traffic flow of 25% or greater is predicted (equivalent to an increase or decrease in road traffic noise of approximately 1 dB(A). This implies that road traffic flow increases of up to 25% offer no significant impact in environmental noise terms.

8.6.17 Construction traffic noise is therefore assessed as no significant and scoped out of further assessment.

Construction Vibration

8.6.18 Ground borne and airborne vibration should be considered in relation to site preparation, piling and construction activities (e.g., rock breaking). Due to the complex relationship between the source of vibration, forcing frequency, the distance and geological characteristics between source and receiver and the construction of the receiving structure, it is very difficult to predict the degree of vibration which may occur.

8.6.19 However, the level of vibration required to cause structural damage is very high and unlikely to be reached in the construction of the Project. Most construction activities are not significant sources of ground borne vibration. Activities, such as earth-working and vibratory compaction produce relatively low levels of ground borne vibration. Piling activities can produce perceptible levels of vibration, and adverse effects of vibration would be expected only within approximately 10 m of such works.

8.6.20 The nearest residential receptor lies approximately 730 m from the Project. Therefore, construction vibration activities at the nearest receptor will not be perceptible (negligible adverse impact).

Operational Substation Noise

8.6.21 Detail of the fixed plant items associated with the proposed substation development has been provided by SSEN Transmission. **Table 8.8** below details the specific plant items and their noise emission levels based on the SSEN Transmission Specification and the measured data by Bureau Veritas. Details of assumed sound spectrum of the plant items are provided in **Annex S** (**Appendix C).**

Table 8.8 – Noise emission data for plant items, L_W (dB)

Plant Item	Source	Assumed Sound Power Level, dBA L_W
2no. new 480MVA 275/132kV Supergrid Transformer	SSEN Transmission Specification SP-NET-SST-520	87 per unit (50% load) 98 per unit (100% load)
2no. Transformer Coolers	SSEN Transmission Specification SP-NET-SST-520	85 per unit
2no existing (existing Crossaig substation) 240MVA Quadrature boosters (QB1 and QB2)	Measured data	72
1no. existing (existing Crossaig substation) 90MVA 132/33kV grid transformer (GT1)	Measured data	74
Existing SGT1 (North of the existing substation)	Measured data	80
Existing SGT2 (South of the existing substation)	Measured data	84
Existing Reactor 1 (North of the existing substation)	Measured data	85
Existing Reactor 2 (South of the existing substation)	Measured data	89

8.6.22 The above noise emission data was used in a detailed noise model of the site to predict the noise levels from the proposed substation at the nearest noise sensitive receptors. The following section details the modelling methodology and the assessment work undertaken.

8.7 Noise modelling

8.7.1 Noise emissions from the Substation were based on specification and library sound power levels as detailed in **Table 8.8**. The sound emission of the transformers was modelled as area sources. The height of the transformers was assumed to be 6.5 m. The sound emission of the transformer coolers was modelled as point source.

8.7.2 A computational noise model of the site and surrounding area has been created using the CadnaA Noise Prediction Software (Version 2022), which considered geometric spreading, topography, screening, meteorological conditions and detailed information regarding the sources of noise. Noise propagation is calculated in accordance with ISO 9613-2: 1996[7].

8.7.3 The following assumptions have been used in the model:

- All sound propagation assumes 10°C and 70% relative humidity.
- A ground absorption value of 0.7 has been used for areas outside of the substation, with the exception of roads which were set to 0.0 (hard). Areas within the substation have been assumed to be hard ground.

[7] ISO 9613-2: 1996, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, International Organization for Standardization, 1996

8.7.4 The sound sources are modelled as per the data shown in **Table 8.8.** The 2no. new 480MVA 275/132kV supergrid transformers and transformer coolers will be located internally. A wall panel, such as QuadCore KS1000RW, will be used as the building envelop material, of which the Rw is 25 dB according to its technical information[8]. Given the noise break from the louvres on the building envelope for cooling needs, 20 dB attenuation by the building envelope is conservatively assumed at this stage.

8.7.5 Based on the operation options provided by SSEN engineers, two scenarios are modelled to inform the worst cases as follow:

- Scenario 1: Operation of 2no. transformers both at 50% load, both with 1 no. coolers on (normal operation condition)
- Scenario 2: Operation of 1no. transformer at 100% load, with 1no. cooler on (typically less than 10% of total operation time)

8.7.6 The results of the modelling are shown graphically in **Annex S (Appendix D)**.

8.8 Assessment

Construction Noise

8.8.1 The static noise level at the nearest receptor has been calculated based on the distance between that receptor and the substation site or the closest tower. Propagation has been modelled over soft ground, given the dominance of soft ground in the area surrounding the Project. The effects of barriers or topographical screening has not been considered. **Table 8.9** below shows the results of construction noise calculation results at the nearest receptor.

Table 8.9 – Construction Noise Levels of activities at the nearest receptor

Activity	Predicted Construction Noise Level, dB $L_{Aeq,T}$
Forestry	55
Site Preparation	33
Topsoil Strip	33
Access Road	32
Tower Construction	55
Tensioning	39
Total construction noise level	**58**

8.8.2 As mentioned above, noise levels are assessed with reference to the 5 dB(A) Change method, and subject to lower cut-off levels, as presented in Annex E of BS 5228-1. As the worst-case construction noise level is below the lower threshold of 65 dB day but may exceeds 55 dB evening. It is recommended to avoid forestry and

[8] https://www.kingspan.com/gb/en/products/insulated-panels/wall-panels/quadcore-ks1000rw-wall-panel/?s=t

construction activities during the evening period, as such the potential impact to the nearest NSR is negligible during these periods.

8.8.3 No specific noise mitigation is required for the construction activities, beyond standard good practice. However, in any case, any mitigation required for noise generated by rock breaking will be agreed with Argyll and Bute Council, for inclusion in the Construction Noise Management Plan.

8.8.4 No construction works are proposed to take place during the night-time period without prior written agreement from ABC in exceptional circumstances.

Operational Substation Noise

8.8.5 Based on the noise emission data provided for each of these noise sources, as detailed in **Table 8.8**, and the noise modelling methodology detailed in **Section 8.7** of this report, predictions have been undertaken to establish the likely specific sound levels at the nearest NSR to the proposed substation site.

8.8.6 The specific sound level then has an acoustic character penalty applied as a worst-case assumption in order to determine the sound rating level. The sound rating level is then compared with the typical background sound level during the night-time (worst case) period at the receptor in order to determent the potential impact, depending on context.

8.8.7 The results of the modelling indicate that the specific sound level from the substation would be 25 dB $L_{Aeq,T}$ at the nearest NSR in both Scenario 1 and Scenario 2.

8.8.8 The sound rating is the sum of the specific sound level, as detailed above, and any required acoustic character corrections. In practice, the penalty applied would range from 0 dB to 6 dB depending on the level of tonality at the receptor. A penalty of 2 dB would apply where a tone is just perceptible at the receptor, 4 dB where the tone is clearly perceptible, and 6 dB where it is highly perceptible. As such a low plant sound level is predicted, relative the pre-existing and typical representative ambient sound levels, it is unlikely to be audible at the NSR and therefore no penalty has been applied.

8.8.9 Therefore, the sound rating level is predicted to be 25 dB $L_{Ar,T}$ at the nearest NSR, which is the worst-case receptor. The sound level from the substation would be expected to be similar during both daytime and night-time periods.

8.8.10 The assessment is conducted by subtracting the background sound level (modal values shown in **Table 8.5**) from the sound rating level. As such, the assessment takes account of night-time periods when the typical background sound level is lower and hence the potential impact is at its highest. The impact during daytimes (due to the higher background sound level) would therefore be expected to be lower.

8.8.11 The sound rating level is therefore predicted to be 25 dB $L_{Ar,T}$. The typical background sound level during night-time periods was determined as being 27 dB $L_{A90,15min}$. As such, the assessment level is -2 dB which indicates a negligible impact.

8.8.12 The Project will be unmanned with regular site inspections undertaken and visits required for switchgear operation. A LGV is expected to visit the Proposed Development once per week during normal operation. In addition, it is likely that maintenance would be completed for approximately one week each year. During a maintenance period four or five vehicles per day would attend the Proposed Development. Additional visits to the

substation would be required in the event of faults. Traffic to the associated development will be infrequent and are considered negligible.

8.8.13 The noise impact, based on the potential traffic noise change in the operation phase of the substation, is therefore assessed as negligible.

Cumulative impacts

8.8.14 It is not anticipated that there will be any cumulative impacts, in terms of noise and vibration associated with the construction phase and the completion of the Development.

8.8.15 Other Projects that may be constructed in parallel with the substation include Earraghail, Eascairt, Sheirdrim, Alrigh, High Constellation and Tangy IV wind farms. The Environmental Statement for Tangy IV indicates that most construction traffic will be experienced in the south of the Mull of Kintyre and cumulative effects are therefore scoped out.

8.8.16 **Table 8.10** shows the worst-case cumulative impact of an increase in HGVs against baseline total traffic. In the unlikely scenario that this maximum was to coincide with peak HGV movements for the Crossaig North substation there would be an additional 256 HGV return movements (512 two-way movements) on the A83 representing a worst case increase of 23% in total traffic. DMRB requires that an assessment is undertaken where an increase in a road traffic flow of 25% or greater is predicted (equivalent to an increase or decrease in road traffic noise of approximately 1 dB(A)). This implies that road traffic flow increases of up to 25% offer no significant impact in environmental noise terms. The cumulative impacts of the construction traffic noise is therefore assessed as negligible.

Table 8.10 – Maximum Cumulative Impact Assessment (2 way return movements)

Location	High Constellation	Earraghail	Alrigh	Eascairt	Sheirdrim	Crossaig North	Total Cumulative	Total two-way movements	Baseline total traffic	% Increase in total traffic
A83 (north of junction with B8001) Site ref. 77107	37	47	37	31	85	19	256	512	2241	23%

Mitigation Measures

8.8.17 The assessment indicates that an adverse impact would not be expected. As such, no specific mitigation measures, above those which are embedded as part of the Project are required. It should also be noted that the assessment is based on specification data which is expected to be worst-case and the actual plant used would be expected to be quieter.

8.9 Summary

8.9.1 This report has considered the potential noise effects that could arise due to the Project at the closest NSR to the Project. The assessment has taken account of applicable planning policy and current guidance.

8.9.2 An assessment of construction noise and vibration from the Project has been undertaken. The results indicate that as the worst-case construction noise level is below the lower threshold of 65 dB day and 55 dB evening, the

potential impact to the nearest NSR is negligible during these periods. Given the large separation distance from the Project to the nearest NSR, construction vibration activities will not be perceptible (negligible adverse impact).

8.9.3 An assessment of noise emissions from the proposed substation has been undertaken based on specification and assumed library noise emission data and a computer-based noise model. The results of this modelling exercise were compared against the existing noise environment on the site in accordance with BS 4142 and against the requirements of ABC. The assessment indicates that the proposed substation would not cause an adverse impact at nearby receptors.

8.9.4 It is not anticipated that there will be any cumulative impacts, in terms of noise and vibration associated with the construction phase and the completion of the Development. During construction, the cumulative worst-case traffic movements is lower than an increase of 25% of baseline traffic data on A83. During the operational phase, the operation of the substation is very unlikely to result in significant increase in traffic volume. The noise impact, based on the potential traffic noise change, is therefore assessed as negligible.

8.9.5 In light of the findings of the assessment, it is considered that no specific mitigation measures are required above those which are embedded within the proposed development. However, it is recommended the impact is reassessed by acoustic consultants as manufacturers' data become available.