8. NOISE ASSESSMENT

8.1 Introduction

8.1.1 Bureau Veritas has been appointed by Scottish and Southern Electricity Networks (SSEN) Transmission to undertake a noise impact assessment for the proposed substation development at Crarae.

8.1.2 The purpose of this Noise Impact Assessment (NIA) Report is to support the Town and Country Planning and Section 37 applications 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 Crarae Project is located approximately 2 km northwest of the A83 Trunk Road, and the village of Minard. The site is located in a rural area and currently covered by managed forestry.

8.2.2 The nearest residential premises are approximately 450 m to the southeast of the site. Other properties are located at further distance to the east (approximately 800 m from the site), southeast (dwellings in Minard), and east (dwellings in Crarae).

8.2.3 A site location plan, the locations of NSR are provided in **Appendix A** (**Annex S)**.

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 in the region of 1.43 ha at a height of 173 AOD;
- Gas insulated Switchgear (GIS) substation building, maximum height 22 m and single storey control building annexe;
- 275/33 kV grid transformer (SGT), rated at 120 MVA located in a ventilated building of maximum height 16 m;
- Two gantries and electrical apparatus to connect the OHL and the proposed substation;
- A temporary works area (TWA) adjacent to the Proposed Development Site, of approximately 0.67 ha.;
- Diesel generator;
- Borehole for water;
- Turning and parking areas;
- Use of existing forestry access track, approximately 4.7 km in length;
- Construction of a new access track, approximately 350 m long;
- A 2.4 m high security fence of palisade construction around the substation platform perimeter and
- Foul and surface water drainage including Sustainable Urban Drainage (SUDS) pond and outfall pipe.

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 two new terminal lattice steel towers to support the connection into the new 275 kV Crarae substation including new downlead terminations;

- Construction of one angle lattice steel tower to replace the existing terminal tower at the existing 132 kV Crarae substation including realignment of the OHL;
- Five temporary towers or masts and associated temporary OHL diversion to facilitate the build of the new towers to avoid long network outages;
- Approximately 622 m of temporary access tracks providing access to the existing Inveraray to Crossaig overhead line (OHL);
- Dismantling of one lattice steel tower located between the two new terminal towers at the new 275 kV Crarae substation.

Tree felling will also be required.

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 divert the Inveraray to Crossaig 275 kV OHL into and out of 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 250m (based on a prevailing background sound level of 22 dB L_{A90}, ref. **Table 3.2**). The nearest noise-sensitive receptor is situated approximately 500m 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. Although localised blasting of the bedrock may be required during the site preparation works, the vibration magnitudes would be well below the threshold criteria for the onset of cosmetic building damage. In the event that blasting vibration may be perceptible at the nearest residential properties, the actual impact would not be significant with the implementation of best practice which would include prior notification of blasting operations.

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]
- Design Manual for Roads and Bridges - LA 111 Noise and Vibration, Revision 2[3];

[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.

[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

- BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound[4]; and

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 2.1**.

Table 2.1 – Construction Noise Impact Assessment Criteria Assessment

Assessment **category and threshold value period**	Threshold value, $L_{A,eq}$ (dB)		
	Category A	**Category B**	**Category C**
Night-time	45	50	55

[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.

Assessment **category and threshold value period**	Threshold value, $L_{A,eq}$ (dB)		
	Category A	**Category B**	**Category C**
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 L10,18h 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 2.2** and have been applied for the construction and operational phases of the proposed development.

Table 2.2 – 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
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 2.3** drawing on the guidance within TAN 1/2011.

Table 2.3 – 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

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

8.4.28 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 NSR to the Project. Full data and analysis of the baseline noise surveys are included in **Annex S** of this report. A summary of the baseline noise survey work is included below.

8.5.2 The survey was undertaken over a period of 10 days to determine the current prevailing noise environment at the nearest NSRs 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 afternoon of Wednesday 6 October 2021 and concluded on the afternoon of Friday 15 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 **Annex S**. The measurement location is described below:

- Crarae Substation – Measurement Location 2 (ML2) – To the northwest of Crarae NSR (at an approximately 250 m distance), 1.5m above ground level.

Meteorological Conditions

8.5.5 Meteorological data was used to filter the noise data when the wind speed was higher than 5 ms-1 and rain occurred. The wind speed measured was mostly lower than 5 ms-1 and the dominant wind direction was from the southeast.

Measurement Equipment

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

Table 3.1 – Noise measurement equipment

Equipment Type	Manufacturer	Model	Serial Number
Sound Level Meter	Rion	NL-52	00253699
Microphone	Rion	UC-59	43729
Calibrator	Rion	NC-74	34536109
Met-Station	Davis	Pro-D	N/A

8.5.7 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

8.5.8 A summary of the noise levels measured during the noise survey are presented in **Table 3.2.**

Table 3.2 – Measurement results filtered by meteorological data, free-field dB

Location	Time Period	Sound Pressure Level, dB			
		$L_{Aeq,15min}$	$L_{Amax,15min}$	$L_{A10,15min}$	$L_{A90,15min}$
ML2 Crarae	Day	22 – 57 Average 37 Mode 34	27- 82 Average 50 Mode 53	23 – 60 Average 39 Mode 35	21 – 51 Average 32 Mode 32
	Night	22 – 52 Average 31 Mode 27	25 – 77 Average 41 Mode 36	22 – 47 Average 33 Mode 31	21 – 41 Average 28 Mode 22

8.5.9 Based on the calculated average and mode sound levels in **Table 3.2** and the sound level distributions shown in **Appendix B.5 and B.6 (Annex S)**, the representative L_{Aeq} and typical L_{A90} at ML2 are **37 dB** and **32 dB** during daytime, and **31** dB and **22** dB during night-time. These levels are typical of a rural location.

8.6 Noise emission data

Construction Noise

8.6.1 The sources presented in **Table 4.1** 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 4.1 – Static Construction Activities and Associated Noise Levels

Activity	Plant Item	No.	BS 5228 reference	Utilisation %	L_{Aeq} at 10m (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
Tensioning	Winder	1	Manufacturer supplied	60%	77
	Rear Winder	1	Manufacturer supplied	60%	77

Construction Traffic Noise

8.6.2 Estimated traffic data for substation construction has been provided by Transport team, as shown in **Table 4.2** 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 4.2 – Estimate of Construction Vehicle Numbers

Construction Task	Vehicle Type	Approximate No. of Loads
• **HGV**		
• Forestry Machine Delivery	• Low loader lorry	• 4
• Forestry Operations	• Fuel lorry	• 4
• Earthworks Substation Platform	• 20T Tipper lorry	• 840
• Earthworks Site Compound	• 20T Tipper lorry	• 250
• Concrete for all work	• Concrete wagon (6m^3 carry capacity)	• 228
• Building & External civils deliveries (steelwork,	• HGV Trailer	• 90

Construction Task	Vehicle Type	Approximate No. of Loads
cladding, drainage, fencing etc)		
• Electrical equipment deliveries	• HGV Trailer	• 198
• Transformer delivery	• Abnormal indivisible load	• 1
• Transformer removal	• Abnormal indivisible load	• 1
• **Car/ Light Goods Vehicle (LGV)**		
• Personnel to and from site	• Car/ Light Goods Vehicle	• 26,400
• **Total No. of HGVs and LGVs (Two-way trips)**		• **28,016**

8.6.3 **Table B.1** (**see Appendix B, Annex S**) presents the one-way movements of the baseline traffic data of A83 in 2019. For the purpose of the assessment, impacts are presented for HGVs and light good vehicles (LGVs). The following number of two-way baseline traffic movements are assumed i.e., half the number of one-way movements:

- HGVs: 139 two-way movements, comprising of HGV movements only; and
- LGVs: 1,292 two-way movements, comprising of two wheeled motor vehicles, cars and taxis, buses and coaches and light goods vehicles.

8.6.4 As show in **Table B.2** (**see Appendix B, Annex S**), the monthly maximum two-way HGV movements during construction is 280 per month for a period of three months during earthworks. This equates to approximately 13 HGV movements per day (based on 22 working days per month).

8.6.5 This represents a 9% increase in the average number of HGVs on the A83 per day for the three months, which have the monthly highest traffic volume increase.

8.6.6 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 <3% increase in the number of cars/LGVs on the A83.

8.6.7 Considering HGV and cars/LGVs combined the maximum number of monthly two-way movements is approximately 1,160 during months 7, 8 and 9 which equates to 53 two-way movements per day (assumes 22 working days per month). This represents a 3% daily increase in total vehicle movements on the A83 during months 7, 8 and 9 of construction.

8.6.8 The Associated Development will be constructed in a single-phase delivery, lasting 2 months in duration between months 13 and 14 of the Project's overall construction programme. The estimated number of vehicle movements during construction, including both light and heavy vehicles is summarised in Table B.3 Appendix B in Annex S. Additional car/LGV two-way movements are 12.7 per day and represent an additional 0.9% increase, 2.8% increase in total (assumes 26 working days per month).

8.6.9 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.

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

Construction Vibration

8.6.11 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.

8.6.12 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.

8.6.13 The nearest residential receptor lies approximately 450 m from the Project. Therefore, construction vibration activities at the nearest receptor will not be perceptible (negligible adverse impact).

Operational Substation Noise

8.6.14 Detail of the fixed plant items associated with the proposed substation development has been provided by SSEN Transmission. **Table 4.3** below details the specific plant items and their noise emission levels based on the SSEN Transmission specification. Details of assumed sound spectrum of the plant items are provided in **Appendix C** (**Annex S)**.

Table 4.3 – Noise emission data for proposed plant items, L_W (dB)

Plant Item	Source	Assumed Sound Power Level, dBA L_W
1no. 120 MVA 275/33 kV Grid Transformer	SSEN Transmission Specification SP-NET-SST504	78 (at 50% load)
1no. Transformer Cooler	SSEN Transmission Specification SP-NET-SST-504	83

8.6.15 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 4.3** above. The sound emission of the transformers was modelled as area sources. The height of the

transformers was assumed to be 3.9 m. The source emission of the transformer cooler was modelled as a 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 2021), which considered geometric spreading, topography, screening, ideal meteorological conditions and detailed information regarding the sources of noise. Noise propagation is calculated in accordance with ISO 9613-2: 1996[6].

8.7.3 The following assumptions were used in the model:

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

8.7.4 The sound sources are modelled as per the data shown in **Table 4.3**. The sources of 1no. new 120MVA 275/33kV grid transformer and transformer cooler 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[7]. Given the noise break from the louvres on the building envelope for cooling needs, 20 dB attenuation by the entire building envelope is conservatively assumed at this stage.

8.7.5 Based on the operation conditions provided by SSEN engineers, the worst-case scenario was modelled as below:

- Operation of 1no. transformers at 50% load, with 1no. cooler on

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

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 its closest tower. Propagation has been modelled over soft ground, given the dominance of soft ground in the area surrounding the proposed development. The effects of barriers or topographical screening has not been considered. Table below shows the results of construction noise calculation results at the nearest receptor.

Table 6.1 – Construction Noise Levels of activities at the nearest receptor

Activity	Noise Level L_{Aeq} (dB)
Forestry	45
Site Preparation	35
Topsoil Strip	35
Access Road	34
Tower Construction	44

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

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

Tensioning	29
Total construction noise level	**48**

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 and 55 dB evening, the potential impact to the nearest NSR is negligible during these periods.

8.8.3 As such, no noise mitigation is required for the construction activities. 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 the noise sources, as detailed in **Table 4.3**, and the noise modelling methodology detailed in **Section 8.7** of this report, noise level predictions have been undertaken to establish the likely specific sound levels at the NSR to the proposed substation.

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 likely impact, depending on context.

8.8.7 The results of the modelling indicate that the specific sound level from the substation would be below 0 dB $L_{Aeq,T}$ at Crarae NSR at night.

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, it is inaudible at the NSR, and therefore no penalty has been applied.

8.8.9 Therefore, the sound rating level from the substation would be below 0 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 3.2** 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 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, below 0 dB $L_{Ar,T}$, with no acoustic character penalty. The typical background sound level during night-time periods was determined as being 22 dB $L_{A90,15min}$. Therefore, the assessment level is -22 dB. As such, the assessment level indicates no impact.

Cumulative impacts

8.8.12 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.

8.8.13 As discussed in **Sections 8.6.2-8.6.10**, the maximum number of total vehicle movements per day is less than an increase of 25% of baseline traffic data on the A83 and predicted as no significant traffic noise impacts. Given vehicle movements regarding the Associated Development will occur during months 13 and 14, there is no change to the worst-case scenario assessed. For cars/LGVs there will be a cumulative increase of 3.4% during peak construction and an increase in total vehicle movements of 6% (assumes 20 day working days per month), which is still much lower than an increase of 25% of baseline traffic data on A83.

8.8.14 SSEN Transmission are proposing similar substation and OHL developments across Argyll that will likely run in parallel with the Project's construction period. SSEN Transmission's other substation projects, including An Suidhe, west of Inveraray and Craig Murrail, north east of Lochgilphead will likely also use the same transportation route from Grangemouth Docks during construction. An Suidhe is located to the north of the Project, therefore no traffic associated with An Suidhe will impact on the Project cumulatively and has therefore been scoped out of the cumulative assessment. Craig Murrail has been considered as part of the cumulative scenario below.

8.8.15 Maximum vehicle movements will occur during months 7 to 9 of the construction schedule. During these months, Craig Murrail and the Project will require a total of 1,080 HGVs and 2,200 cars/LGVs per month to service construction. As such, cumulative worst case traffic movements for a period of three months are 49 HGVs (assuming a 22 day month) and 85 LGVs (assuming a 26-day month) representing a 9% increase in total vehicles, which is lower than an increase of 25% of baseline traffic data on A83.

8.8.16 During the operational phase, the operation of the substation is very unlikely to result in significant increase in traffic volume, which will be cumulative with the impacts from other developments. The noise impact, based on the potential traffic noise change, is therefore assessed as negligible.

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 show 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 long 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, BS8233 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 for a period of three months 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, which will be cumulative with the impacts from other developments. 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.