Burnside to Greens 400kV Connection

Environmental Appraisal Appendix F: Noise and Vibration

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1 Introduction

1.1 Purpose of this Document

RPS TetraTech (RPSTT) has been commissioned by the Applicant to carry out a noise and vibration impact assessment in support of a planning permission in principle (PPP) application for the construction and operation of up to four 400 kilovolt (kV) underground cable circuits, connecting Caledonia Offshore Wind Farm Burnside Onshore Substations to the Scottish and Southern Energy Networks Transmission (SSEN-T) Greens Substation, together with associated works ('the Proposed Development').

This noise and vibration assessment has considered the following:

- Construction phase – an evaluation of the temporary effects from construction noise and vibration; and the
- Operation phase – The operational phase of the Proposed Development will have no associated sources of noise or vibration and, as such operational noise and vibration impacts have been scoped out of this assessment.

This report begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential noise and vibration effects have then been described. The results of the assessment of noise and vibration impacts have been presented. A conclusion has been drawn on the significance of the residual construction-phase effects.

1.2 Site Location

The Proposed Development is located approximately 6km southeast of Turriff and 4km southwest of New Deer. The area is predominantly agricultural land used for pasture and arable farming, with commercial forestry to the northwest. The site location is illustrated in Figure 1-1.

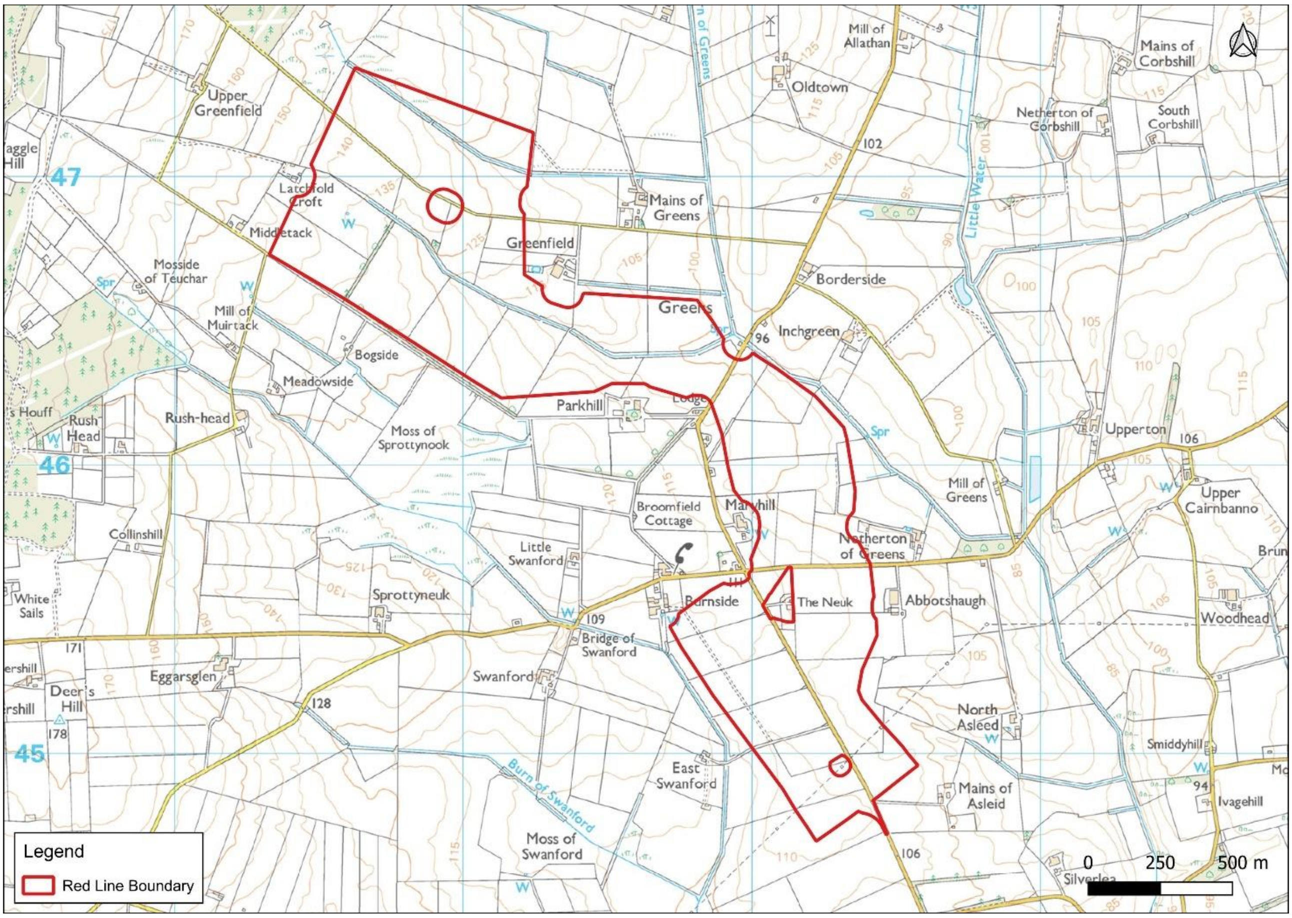

Figure 1-1: Site Location

1.3 Site Surroundings

Surrounding land uses are primarily rural with agricultural fields bounded by field boundary treatments, farmsteads including Burnside, the Neuk and Abbotshaugh, and isolated dwellings nearby. The character of the area is predominantly agricultural with some isolated residential properties in proximity to site.

The Site benefits from a relatively rural and open landscape with commercial forestry to the northwest and agricultural activities dominating the surroundings. The site extent avoids settlements and has been informed in response to an approach which minimises environmental and technical conflicts with existing infrastructure, such as the Moray East cable route, overhead lines, and underground cables and avoiding environmental sensitivities.

1.4 Proposed Development

The Proposed Development comprises up to four 400kV underground cable circuits connecting the Burnside Substation to the Greens Substation. At this stage the exact route is unknown, and it is the principle of a cable connecting the substations that planning permission in principle (PPP) is sought for.

The detail design of the Proposed Development is yet to be finalised and will be brought forward for consideration at Matters Specified by Condition (MSC) stage. Consequently, the red line boundary(RLB) takes in an area within which the finalised cable route and related works will be contained.

The cable circuits will be arranged within a corridor of up to 100m wide. This is designed to provide appropriate electrical separation between the cable circuits. In addition, two haul roads and temporary top-soil/subsoil mound areas will be included.

The main aspects of the Proposed Development are:

- A working cable corridor up to 100 metres wide, accommodating all temporary works areas required for installation;
- Up to four 400 kV cable circuits installed in trenches;
- Up to two temporary haul roads;
- Haul road access points;
- Up to 4 Joint bays for each cable circuit;
- Up to two Satellite construction compounds; and
- Temporary crossing infrastructure for haul road(s), road, watercourse and utilities.

Should PPP be granted, the details of the final design of each component of the Proposed Development will be agreed with Aberdeenshire Council through the approval of Matters Specified by Condition (MSC).

2 Policy Context

2.1

2.2 National and Local Policy and Guidelines

2.2.1 Planning Advice Note [PAN] PAN1/2011: Planning and Noise

The Planning Advice Note (PAN) published by the Scottish Government provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. It includes details of the legislation, technical standards and codes of practice for specific noise issues.

On noise impact assessment, the PAN states the following:

The preparation and consideration of planning applications that raise significant noise issues can be greatly assisted by a Noise Impact Assessment (NIA). Planning authorities can require a NIA either as part of an Environmental Impact Assessment or separately. The need for NIA is best identified during pre-application discussions. The purpose of a NIA is to demonstrate whether any significant adverse noise impacts are likely to occur and if so, identify what effective measures could reduce, control and mitigate the noise impact. Before a NIA is commissioned, planning authorities and applicants are advised to:

- *Agree any potential representative limits of noise and /or the relevant NIA methodology in the context of the proposed development, its location and the surrounding area, and*
- *Establish criteria for assessing any significant adverse noise impact or predict and describe ambient noise levels (including noise from transport sources) that the proposed development is likely to generate and/or is likely to be subjected to.*

Information and advice on NIA methods is provided in the associated Technical Advice Note (see Section 2.2.2).

2.2.2 Technical Advice Note TAN to PAN1/20111

The basic principle of any NIA is to assess the change in the acoustic environment that will be brought about by the Proposed Development. It is important to appreciate that the assessment of change can, and should be, both qualitative and quantitative. The TAN aims to provide guidance on the assessment of significance of noise impacts for various common situations.

The assessment methodology within the TAN consists of five stages

- Stage 1: Initial Process;
- Stage 2: Quantitative Assessment;
- Stage 3: Qualitative Assessment;
- Stage 4: Level of Significance; and
- Stage 5: The Decision Process.

Details of each stage of the process are included in the TAN, with examples and suggested approach for various assessment types.

2.2.3 Aberdeenshire Local Development Plan 2023

The Local Development Plan 2023 was formally adopted on 13th January 2023 and sets out the land use plan for the area, outlining the vision for its future development. It guides decisions on issues like housing, commercial and industrial areas and protecting the environment.

The local development plan places renewable energy within its climate change aims; reducing energy use, promoting energy generation from renewables and sustaining carbon stores are explicit objectives. The plan supports renewable energy developments where they are sited and designed appropriately, requiring that proposals demonstrate acceptability with respect to impacts on communities.

3 Assessment Methodology

The methodology and associated impact assessment has been completed with reference to the following noise and vibration specific guidance:

- British Standard BS 8233:2014 Sound Insulation and Noise Reduction for Buildings – Code of Practice;
- British Standard BS5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites. Part 1: Noise;
- British Standard BS5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites. Part 2: Vibration;
- Design Manual for Roads and Bridges Volume 11, Section 3, Part 7, LA 111 Noise and Vibration;
- UK Department of Transport (Welsh Office) – Calculation of Road Traffic Noise (CRTN);
- British Standard BS 8233:2014 Sound Insulation and Noise Reduction for Buildings – Code of Practice, and;
- World Health Organisation (WHO) – Guidelines for Community Noise (1999).

3.1 British Standard BS5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites Part 1: Noise

Part 1 of the standard provides a method of calculating noise from construction plant, including:

- Tables of source noise levels;
- Methods for summing up contributions from intermittently operating plant;
- A procedure for calculating noise propagation;
- A method for calculating noise screening effects; and
- A way of predicting noise from mobile plant, such as haul roads.

The standard also provides guidance on legislative background, community relations, training, nuisance, project supervision and control of noise and vibration.

3.1.1 ABC Method

The 'ABC' Method within Annex E of BS5228:2009 Part 1 has been used in the construction noise assessment to establish construction noise threshold values and determine significance. This method provides a threshold value based on the existing ambient noise level, rounded to the nearest 5dB. The resultant threshold value indicates the noise level at which the total noise level, including construction noise, constitutes a significant effect. Table 3-1 outlines the applicable noise threshold values that apply at the nearest noise sensitive receptors.

The most stringent construction noise category (A) is generally applicable to rural locations. This threshold is usually applied where baseline data has not been gathered and/or where baseline levels are known to be 'low', as it is the most conservative threshold for construction noise. Construction noise threshold categories B and C apply to receptors with higher existing noise levels, for example, urban environments, or locations close to significant existing noise sources such as major roads, airports or industrial developments.

For this project, receptors are located in a rural environment with no significant noise sources in the surrounding area. As such, it is appropriate to apply the construction noise thresholds withing Category A.

Table 3-1: Noise Threshold Limits at Nearest Sensitive Receptors

Assessment Category and Threshold Value Period (LAeq)	Threshold Value [dB(A)]		
	Category A[1]	Category B[2]	Category C[3]
Night-time (23:00 - 07:00)	45	50	55
Evening and Weekends4	55	60	65
Weekday daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
NOTE 1: A significant effect has been deemed to occur if the total LAeq noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.			
NOTE 2: If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total LAeq noise levels for the period increases by more than 3 dB due to construction activity.			
NOTE 3: Applied to residential receptors only.			

3.1.2 5 dB(A) Change Method

Another methodology within BS 5228-1:2009 is the '5dB(A) Change' method, which provides evaluative criteria which are generally applicable to residential housing, but also:

- Hotels and hostels;
- Buildings in religious use;
- Buildings in educational use, and;
- Buildings in health and/or community use.

Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5dB or more, subject to lower cut-off values of 65dB, 55dB and 45dB from construction noise alone, for the daytime, evening and night-time periods,

[1] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
[2] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
[3] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

3.2 British Standard BS5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites Part 2: Vibration

Part 2 of the standard gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels, including industry-specific guidance. Guidance is provided concerning methods of measuring vibration, predicting vibration and assessing its effects on the environment.

Humans are known to be very sensitive to vibration, the threshold of perception being typically in the Peak Particle Velocity (PPV) range of $0.14mm{\cdot}s^{-1}$ to $0.3mm{\cdot}s^{-1}$. Vibrations above these values can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful. In residential accommodation, vibrations can promote anxiety lest some structural mishap might occur. Guidance of effects of vibration levels are illustrated in Table 3-2 below.

Table 3-2: Guidance on Effects of Vibration Levels

Vibration Level	Effect
$0.14mm{\cdot}s^{-1}$	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.
$0.3mm{\cdot}s^{-1}$	Vibration might be just perceptible in residential environments.
$1.0mm{\cdot}s^{-1}$	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.
$10mm{\cdot}s^{-1}$	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Limits of transient vibration, above which cosmetic damage could occur, are given numerically in Table 3-3 (Ref: BS5228-2:2009+A1:2014). Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 3-3, and major damage to a building structure can occur at values greater than four times the tabulated values.

Table 3-3: Transient Vibration Guide Values for Cosmetic Damage

Type of Building	PPV (mm/s) in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	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.

3.3 Design Manual for Roads and Bridges Volume 11, Section 3, Part 7, LA 111 Noise and Vibration

This document sets out the requirements for noise and vibration assessments from road projects, applying a proportionate and consistent approach using best practice and ensuring compliance with relevant legislation. Although Design Manual for Roads and Bridges (DMRB LA 111) pertains to road schemes, its methodologies can also be applied to the construction phase of other types of schemes, where construction traffic is potentially significant. The impact of changes in road traffic noise during construction works on other developments can be assessed with reference to the calculation and assessment methodologies within DMRB LA 111 and Calculation of Road Traffic Noise (CRTN) (see Section 3.4)

The effect of noise from construction traffic on the local road network is assessed by calculating changes in Basic Noise Level (BNL) on affected roads. The DMRB LA 111 definition of the construction traffic study area (a 50m width from the kerb-line of public roads where a BNL increase of 1dB(A) or more may occur) and the requirement to calculate BNL increases for roads within that study area have been applied to the project’s local roads and temporary haul/access routes. Impacts on the local road network have been classified using the DMRB LA 111 magnitude categories and duration thresholds to determine whether effects are significant. A summary of the assessment criteria for construction traffic noise is presented in Table 3-4.

Table 3-4: DMRB LA 111 Construction Traffic Noise Assessment Criteria

Magnitude category	Increase in Basic Noise Level (BNL) at receptor (dB)	Significance criteria
Major	≥ 5.0	Considered a significant effect where a Major (or Moderate) magnitude occurs for either: (a) 10 or more days or nights in any 15 consecutive days or nights; or (b) a total number of days exceeding 40 in any 6 consecutive months.
Moderate	≥ 3.0 and < 5.0	As for Major: regarded as significant if the duration thresholds above are exceeded.

Minor	≥ 1.0 and < 3.0	Not considered significant under the DMRB LA 111 duration thresholds (significance tests apply to Major/Moderate magnitudes).
Negligible	< 1.0	Not considered significant under the DMRB LA 111 duration thresholds.

3.4 UK Department of Transport (Welsh Office) – Calculation of Road Traffic Noise (CRTN)

This Calculation of Road Traffic Noise (CRTN) guidance document outlines the procedures to be applied for calculating noise from road traffic.

The document consists of three different sections, covering a general method for predicting noise levels at a distance from a highway, additional procedures for more specific situations and a measurement method for situations where the prediction method is not suitable. The prediction method constitutes the preferred calculation technique but in a small number of cases, traffic conditions may fall outside the scope of the prediction method and it will then be necessary to resort to measurement.

3.5 British Standard 8233:2014 Sound Insulation and Noise Reduction for Buildings

BS 8233:2014 provides guidance values for a range of ambient noise levels within residential properties. The noise and vibration impact assessment will ensure that the appropriate internal noise levels at the nearest noise-sensitive properties to the proposal are not exceeded as a result of activities associated with the Proposed Development. BS 8233:2014 internal ambient noise levels are illustrated in Table 3-5 below.

Table 3-5: Internal Ambient Noise Levels

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB $_{LAeq,16hr}$	-
Dining	Dining Room/Area	40dB $_{LAeq,16hr}$	-
Sleeping (Daytime Resting)	Bedroom	35dB $_{LAeq,16hr}$	30dB $_{LAeq, 8hr}$

3.6 World Health Organisation (WHO) Guidance (1999, 2009, 2018)

Relevant World Health Organisation (WHO) guidance includes the following publications:

- WHO Guidelines for Community Noise (1999);
- WHO Night Noise Guidelines for Europe (2009); and
- WHO Environmental Noise Guidelines for the European Region (2018).

The WHO Guidelines for Community Noise (1999) advises an L_{Aeq} threshold daytime noise limit of 55dB for outdoor living areas to protect the majority of people from being seriously annoyed. A second daytime limit of 50dB is also given as a threshold limit for moderate annoyance. They also indicate that an internal L_{Aeq} not greater than 30dB for continuous noise is needed to prevent negative effects on sleep. This is equivalent to a façade level of 45dB L_{Aeq}, assuming open windows. If the noise is not continuous, then the indoor sound pressure level should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night, for a good sleep.

The WHO Night Noise Guidelines for Europe (2009), which can be seen as an extension to the 1999 Guidelines for Community Noise, combines study data on noise, sleep and health with recommended thresholds/guidance noise levels for health protection.

The 2018 WHO Environmental Noise Guidelines for the European Region provides specific guidance for daytime and night-time noise due to road traffic, railways, aircraft, wind turbines, and leisure activities.

4 Baseline Environment

4.1 Study Area

The study area for the construction noise assessment has been defined with reference to BS5228: 2009+A1:2014 as follows:

- Construction Noise - 300m from the RLB.
- Construction Traffic Noise – 50m from roads expected to experience a change in BNL of >1 dB.

4.2 Noise Sensitive Receptors

Noise-sensitive receptors within 300m of the RLB have been identified using Ordnance Survey (OS) databases and receptors have been cross-checked using mapping software (QGIS). A map of noise-sensitive receptors can be found in Figure F1 in Annex A.

A total of 38no. residential receptors were identified within 300m of the RLB, as detailed in Table 4-1 below. In addition, several non-residential receptors were identified within the 300m 'buffer', however these comprise commercial premises and are not considered to be sensitive to noise. Table 4-1 also indicates the distance from each receptor to the Proposed Development centreline (see Figure F1 in Annex A).

Table 4-1: Noise-Sensitive Receptors within Study Area and Distance to RLB and Proposed Development Centreline

Receptor ID	Eastings(m)	Northings (m)	Distance to RLB (m)	Distance to Development Centreline Boundary (m)
1	381191	846843	170	495
2	381406	847003	72	227
3	381940	846897	55	139
4	382261	846913	90	417
5	382342	846713	115	313
6	382418	846751	155	323
7	382563	846840	252	405
8	382599	846859	273	425
9	382960	846425	55	142
10	383044	846492	112	244
11	383353	846402	211	388
12	383388	845786	54	210
13	383555	845776	184	378
14	383565	845755	183	388
15	383585	845763	204	408
16	383566	845750	181	388
17	383587	845746	198	410
18	383555	845730	162	377
19	383577	845721	179	400
20	383638	845707	234	461

Receptor ID	Eastings(m)	Northings (m)	Distance to RLB (m)	Distance to Development Centreline Boundary (m)
21	383469	845505	53	292
22	383649	844860	124	591
23	383687	844751	220	684
24	382829	844979	162	162
25	383130	845531	11	47
26	382697	845528	65	480
27	382670	845571	114	507
28	382688	845626	147	489
29	382752	845636	118	425
30	382904	845661	69	273
31	382946	845648	49	232
32	382969	845765	54	208
33	382860	845983	58	256
34	382836	846069	66	224
35	382795	846146	83	182
36	382810	846186	55	140
37	382565	846162	121	273
38	381588	846437	118	417

4.3 Baseline Noise Environment

The study area is predominantly agricultural land used for pasture and arable farming, with commercial forestry to the northwest. The site location is illustrated in Figure 1-1. The existing noise environment is likely to be characterised as a low-noise environment, particularly during the night-time period, as local noise sources are limited but likely to include road traffic noise and agricultural activities.

5 Impact Assessment

The noise impact assessment has considered the following aspects:

- Construction noise;
- Construction vibration, and;
- Construction traffic noise.

The operational phase of the project will have no associated sources of noise or vibration and, as such operational noise and vibration impacts have been scoped out of this assessment.

5.1 Construction Noise Assessment

Construction noise predictions assume that all construction equipment is operating at the centreline of the Proposed Development, which is considered to be a realistic assumption.

The construction noise assessment will be updated at MSC stage, once the design detail of the cable route design has been finalised. At MSC stage, it will be possible to identify actual separation distances between sources and receptors and appropriate mitigation measures can be updated where necessary.

5.1.1 Construction Noise Criteria.

The study area is within a rural location and receptors within the study area have been assumed to experience an existing ambient noise level below the most stringent threshold within BS4142 Table ABC method (see Table 3-1) As such, category A construction noise thresholds have been applied at all noise-sensitive receptors. Applying the category A noise threshold at all receptors is the most conservative approach using this methodology.

Table 5-1: BS5228-1 ABC method Construction Noise Thresholds

Time Period	Construction Noise Threshold, dB $L_{Aeq, period}$
Night-time (23:00 - 07:00)	45
Evening and Weekends[5]	55
Weekday daytime (07:00-19:00) and Saturdays (07:00-13:00)	65

Construction is not expected to take place outside of the daytime period (weekdays 07:00-19:00hrs and Saturdays 07:00-13:00hrs), therefore the predicted construction noise levels at residential sensitive receptors will be assessed against the category A daytime threshold of 65 dB $L_{Aeq, period}$.

5.1.2 Construction Noise Sources

Likely construction plant for cable route and installation are detailed in Table 5-2. The sound pressure level at 10m/sound power level for each item of construction plant and equipment has been designated from the tables within Annex C of BS5528-1. Where no

[5] 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

relevant item is presented in Annex C of BS5528-1, reference has been made to the historical data within BS5228-1 Annex D.

Table 5-2: Construction Noise Sources and Associated BS5228-1 Sound Power Levels

Equipment	BS5228 Table Ref	Sound Pressure Level @10m, dBA	Sound Power Level, dBA Lw
360 Excavators	C.2.5	76	104
Dump truck (25Te Moxy)	C.2.31	87	115
Breaker on excavator	C.1.1	92	120
Dozer	C.2.12	81	109
Dozer and ripper tooth	D.10.224	86	114
Small excavator	C.2.5	76	104
Compressor	D.8.10	94	122
Asphalt spreader	D.8.22	82	110
Vibrating Roller	C.5.26	77	105
Tractor/trailer	D.9.49	85	113
Dumper	C.2.12	81	109
Crusher	C.9.15	96	124
Material Grading machine	D.9.11	83	111
Concrete batching plant	C.4.18	75	103
Cement silo	C.4.19	71	99
Delivery Lorries	C.6.21	80	108
Fence post driver	D.8.19	86	114

The equipment likely to be associated with each stage of construction is shown in Table 5-3. It should be noted that these are indicative at the PPP stage, with progressed construction methodology and phasing to be presented at MSC stage and exact methodology and phasing to be confirmed by the contractor, once appointed. These indicative combinations of construction plant and equipment enable an initial assessment of likely construction noise impacts, as presented within this appendix.

Table 5-3: Indicative Construction Stages and Associated Equipment

Construction Stage	Indicative Construction Equipment
Stage 1 – Site Preparation & Access.	360 Excavators Dozer Fence post driver Delivery Lorries Dump truck (25Te Moxy) Dumper Tractor/trailer
Stage 2 – Compounds.	360 Excavators Dozer Small excavator Delivery Lorries Asphalt spreader Tractor/trailer Vibrating roller (likely required for satellite compounds) Dumper (for stone deliveries)

Construction Stage	Indicative Construction Equipment
Stage 3 – Cable Route (circuits, trenches & ducts).	360 Excavators Breaker on excavator Crusher Delivery Lorries Dozer and ripper tooth Dump truck (25Te Moxy) Dumper Tractor/trailer Vibrating Roller
Stage 4 – Cable Installation (circuits, trenches & ducts).	360 Excavators Material Grading machine Cement silo Compressor Concrete batching plant Delivery Lorries Dumper Tractor/trailer Vibrating Roller
Stage 5 – Haul Road Decommissioning.	360 Excavators Dozer Small excavator Delivery Lorries
Stage 6 – Testing & Commissioning.	Delivery Lorries

An equivalent total sound power level for each construction stage has been calculated using the source data within Table 5-3. The number of each item and combined sound power levels are shown in Table 5-4.

Table 5-4: Sound Power Level per Construction Stage

Construction Stage	Indicative Construction Equipment	Number Assumed	Sound Power Level per Item	Sound Power Level (100% On-time)	Sound Power Level (50% On-time)
Stage 1 – Site Preparation & Access.	360 Excavators	2	104	107	104
	Dozer	1	109	109	106
	Fence post driver	1	114	114	111
	Delivery Lorries	5	108	115	112
	Dump truck (25Te Moxy)	1	115	115	112
	Dumper	1	109	109	106
	Tractor/trailer	1	113	113	110
	Stage 1 Total			**121**	**118**
Stage 2 – Compounds.	360 Excavators	2	104	107	104
	Dozer	1	109	109	106
	Small excavator	1	104	104	101
	Delivery Lorries	5	108	115	112
	Asphalt spreader	1	110	110	107
	Tractor/trailer	1	113	113	110
	Vibrating roller	1	105	105	102
	Dumper	1	109	109	106
	Stage 2 Total			**119**	**116**
Stage 3 – Cable Route (circuits, trenches & ducts).	360 Excavators	2	104	107	**104**
	Breaker on excavator	1	120	120	**117**
	Crusher	1	124	124	**121**
	Delivery Lorries	5	108	115	**112**
	Dozer and ripper tooth	1	114	114	**111**
	Dump truck (25Te Moxy)	1	115	115	**112**

Construction Stage	Indicative Construction Equipment	Number Assumed	Sound Power Level per Item	Sound Power Level (100% On-time)	Sound Power Level (50% On-time)
	Dumper	1	109	109	**106**
	Tractor/trailer	1	113	113	**110**
	Vibrating Roller	1	105	105	**102**
	Stage 3 Total			**127**	**124**
Stage 4 – Cable Installation (circuits, trenches & ducts).	360 Excavators	2	104	107	**104**
	Material Grading machine	1	111	111	**108**
	Cement silo	1	99	99	**96**
	Compressor	1	122	122	**119**
	Concrete batching plant	1	103	103	**100**
	Delivery Lorries	5	108	115	**112**
	Dumper	1	109	109	**106**
	Tractor/trailer	1	113	113	**110**
	Vibrating Roller	1	105	105	**102**
	Stage 4 Total			**124**	**121**
Stage 5 – Haul Road Decommissioning.	360 Excavators	2	104	107	**104**
	Dozer	1	109	109	**106**
	Small excavator	1	104	104	**101**
	Delivery Lorries	5	108	115	**112**
	Stage 5 Total			**117**	**114**
Stage 6 – Testing & Commissioning.	Delivery Lorries	5	108	115	**112**

5.1.3 Noise Propagation Predictions

Construction noise predictions have been carried out using the BS5528-1 Annex F Method for plant sound power level. Predictions assume soft ground, which is representative of the ground conditions between source and receptor for the Proposed Development. The distance allowance *K*s' for soft ground is calculated using the equation below:

*K*s' = (25log10*R*) + 1 (BS5228-1 Equation F.4)

Where R = Distance between source and receptor in metres

The sound pressure level at receptors is calculated by subtracting the distance allowance calculated for each receptor from the sound power level arising from construction activities. Predicted sound pressure levels at receptors are shown in the tables below for the six construction stages. Table 5-5 shows the results of the predictions assuming a 100% on-time for all equipment and Table 5-6 shows the results of the predictions assuming a 50% on-time for all equipment.

Construction noise predictions have assumed that all works take place along the centreline of the Proposed Development, with separation distances between the centreline and noise-sensitive receptors taken for the value of R. In addition, a table of predictions considering a range of values of R has been provided, to indicate the drop-off of construction noise with distance (Table 5-7 and Table 5-8**Error! Reference source not found.**).

It should be noted that these predictions assume that all construction equipment is operating simultaneously. These results represent a worst case, as construction plant and equipment will not operate simultaneously in one place however the, the results in the tables below can be used to identify those construction phases most likely to give rise to significant construction noise effects.

The receptors most likely to be adversely affected by construction noise can also be identified using these predictions. This will assist in the targeting of mitigation measures for maximum benefit during each stage of the construction programme.

Table 5-5: Predicted Sound Pressure Levels at Receptors (100% On-Time)

Receptor ID	Distance to Proposed Development Centreline, m	Distance Attenuation for Soft Ground, Ks dBA	Predicted Sound Pressure Level, dB $L_{Aeq, period}$					
			Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
1	495	68	53	51	58	55	48	47
2	227	60	61	60	67	64	57	55
3	139	55	67	65	72	69	62	60
4	417	66	55	53	60	57	50	48
5	313	63	58	56	63	60	53	52
6	323	64	57	56	63	60	53	51
7	405	66	55	53	61	58	51	49
8	425	67	54	53	60	57	50	48
9	142	55	66	65	72	69	62	60
10	244	61	60	59	66	63	56	54
11	388	66	55	54	61	58	51	49
12	210	59	62	60	68	65	58	56
13	378	65	56	54	61	58	51	50
14	388	66	55	54	61	58	51	49
15	408	66	55	53	61	58	50	49
16	388	66	55	54	61	58	51	49
17	410	66	55	53	60	58	50	49
18	377	65	56	54	61	58	51	50
19	400	66	55	53	61	58	51	49
20	461	68	54	52	59	56	49	47
21	292	63	58	57	64	61	54	52

Receptor ID	Distance to Proposed Development Centreline, m	Distance Attenuation for Soft Ground, Ks dBA	Predicted Sound Pressure Level, dB $L_{Aeq, period}$					
22	591	70	51	49	56	54	46	45
23	684	72	49	48	55	52	45	43
24	162	56	65	63	71	68	60	59
25	47	43	78	77	84	81	74	72
26	480	68	53	51	59	56	49	47
27	507	69	52	51	58	55	48	46
28	489	68	53	51	59	56	48	47
29	425	67	54	53	60	57	50	48
30	273	62	59	58	65	62	55	53
31	232	60	61	59	67	64	57	55
32	208	59	62	60	68	65	58	56
33	256	61	60	58	66	63	56	54
34	224	60	61	60	67	64	57	55
35	182	58	64	62	69	66	59	57
36	140	55	66	65	72	69	62	60
37	273	62	59	58	65	62	55	53
38	417	67	55	53	60	57	50	48

Table 5-6: Predicted Sound Pressure Levels at Receptors (50% On-Time)

Receptor ID	Distance to Proposed Development Centre Line, m	Distance Attenuation for Soft Ground, Ks dBA	Predicted Sound Pressure Level, dB $L_{Aeq, period}$					
			Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
1	495	68	50	48	55	52	45	44
2	227	60	58	57	64	61	54	52
3	139	55	64	62	69	66	59	57
4	417	66	52	50	57	54	47	45
5	313	63	55	53	60	57	50	49
6	323	64	54	53	60	57	50	48
7	405	66	52	50	58	55	48	46
8	425	67	51	50	57	54	47	45
9	142	55	63	62	69	66	59	57
10	244	61	57	56	63	60	53	51
11	388	66	52	51	58	55	48	46
12	210	59	59	57	65	62	55	53
13	378	65	53	51	58	55	48	47
14	388	66	52	51	58	55	48	46
15	408	66	52	50	58	55	47	46
16	388	66	52	51	58	55	48	46
17	410	66	52	50	57	55	47	46
18	377	65	53	51	58	55	48	47
19	400	66	52	50	58	55	48	46
20	461	68	51	49	56	53	46	44
21	292	63	55	54	61	58	51	49

Receptor ID	Distance to Proposed Development Centre Line, m	Distance Attenuation for Soft Ground, Ks dBA	Predicted Sound Pressure Level, dB $L_{Aeq, period}$					
22	591	70	48	46	53	51	43	42
23	684	72	46	45	52	49	42	40
24	162	56	62	60	68	65	57	56
25	47	43	75	74	81	78	71	69
26	480	68	50	48	56	53	46	44
27	507	69	49	48	55	52	45	43
28	489	68	50	48	56	53	45	44
29	425	67	51	50	57	54	47	45
30	273	62	56	55	62	59	52	50
31	232	60	58	56	64	61	54	52
32	208	59	59	57	65	62	55	53
33	256	61	57	55	63	60	53	51
34	224	60	58	57	64	61	54	52
35	182	58	61	59	66	63	56	54
36	140	55	63	62	69	66	59	57
37	273	62	56	55	62	59	52	50
38	417	67	52	50	57	54	47	45

Table 5-7: Predicted Sound Pressure Level at Fixed Distances (100% 'on-time')

Source to Receptor Distance, m		10	20	50	100	200
Distance Attenuation, dBA:		26	34	43	51	59
	Sound Power Level of Construction Works, dBA	Sound Pressure Level at Receptor, dB $L_{Aeq, period}$				
Stage 1	121	95	88	78	70	63
Stage 2	119	93	86	76	68	61
Stage 3	127	101	93	83	76	68
Stage 4	124	98	90	80	73	65
Stage 5	117	91	83	73	66	58
Stage 6	115	89	81	72	64	56

Table 5-8: Predicted Sound Pressure Level at Fixed Distances (50% 'on-time')

Source to Receptor Distance, m		10	20	50	100	200
Distance Attenuation, dBA:		26	34	43	51	59
	Sound Power Level of Construction Works, dBA	Sound Pressure Level at Receptor, dB $L_{Aeq, period}$				
Stage 1	118	92	85	75	67	60
Stage 2	116	90	83	73	65	58
Stage 3	124	98	90	80	73	65
Stage 4	121	95	87	77	70	62
Stage 5	114	88	80	70	63	55
Stage 6	112	86	78	69	61	53

5.1.4 Construction Noise Impact

Table 5-5 to **Error! Reference source not found.** illustrate that the construction noise impact is variable depending on separation distance between source and receptors. The majority of receptors are not likely to experience a significant construction noise impact, with the receptors closest to construction works more likely to experience some temporary adverse construction noise impacts, particularly without mitigation in place.

As shown in Table 5-5 and Table 5-6, the predictions assuming works at the Proposed Development centreline identified some exceedances of the daytime construction noise threshold of 65 dBA (marked in red). The majority of receptors will not experience a significant construction noise impact when works are carried out at the Proposed Development centreline.

Receptors located close to the RLB at the 'narrowest' points of the Proposed Development are the most sensitive, due to the lower levels of distance attenuation. Table 5-7 and Table 5-8**Error! Reference source not found.** provide an indication of effects at various distances from construction works, showing that any exceedance of the daytime construction noise threshold of 65 dBA is most likely to occur where works take place with no mitigation within 100m of receptors (assuming a 50% on-time of construction plant and equipment) and within 200m of construction works (assuming a 100% on-time).

With no mitigation in place, significant adverse noise impacts are possible. The receptors most likely to experience construction noise impacts are located 'within' the RLB (Receptor 25) and those receptors located within 200m of construction works.

Noise predictions are shown for each stage of construction works, showing the effect of construction noise at various receptor distances from the location of the works. The noise impact is predicted to be highest during Stage 3 of construction: Cable Route (circuits, trenches & ducts).

Construction noise impacts for receptors may vary even within each construction phase, as the work progresses along the cable route. Potential adverse construction noise impacts at any given receptor will be temporary, and the duration of works will determine the significance of impacts. Construction noise constitutes a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

1) 10 or more days or nights in any 15 consecutive days or nights, or;

2) a total number of days exceeding 40 in any 6 consecutive months.

As such, careful consideration should be given to sensitive receptors when scheduling the works.

In summary, with no mitigation in place, there is potential for temporary significant adverse construction noise impacts at some receptors, depending on the final cable route location. The receptors most likely to experience adverse construction noise effects are those located within 200m of the construction works and those located within the RLB.

5.2 Construction Vibration

A review of construction techniques and equipment has identified vibratory ground compaction as a potential source of groundborne vibration, which may impact upon sensitive receptors.

The construction vibration assessment has assumed that vibration sources will be operational at the RLB, which in reality will not be the case. As such, this represents a conservative approach resulting in higher predictions of received vibration levels than will actually occur. At MSC stage, when the cable route has been defined, the construction vibration assessment will be refined/updated as necessary.

5.2.1 Vibration Propagation Predictions

The prediction of received vibration levels during vibratory compaction has been carried out using the empirical formulae within BS5228-2 Annex E.

Vibration due to steady-state and 'start up and run down' vibratory compaction can be predicted as per the calculation in Figure 5-1, which is taken from BS5228-2 Table E.1. This is an empirical calculation which is derived within the Transport Research Laboratory (TRL) report 'Groundborne Vibration Caused by Mechanised Construction Works'.

Operation	Prediction question	Scaling factors (and probability of predicted value being exceeded)	Parameter range
Vibratory compaction (steady state)	$v_{res} = k_s \sqrt{n_d} \left[\frac{A}{x + L_d} \right]^{1.5}$	$k_s = 75$ (50%) $k_s = 143$ (33.3%) $k_s = 276$ (5%)	$1 \leqslant n_d \leqslant 2$ $0.4 \leqslant A \leqslant 1.72$ mm $2 \leqslant x \leqslant 110$ m
Vibratory compaction (start up and run down)	$v_{res} = k_t \sqrt{n_d} \left[\frac{A^{1.5}}{(x + L_d)^{1.3}} \right]$	$k_t = 65$ (50%) $k_t = 106$ (33.3%) $k_t = 177$ (5%)	$0.75 \leqslant L_d \leqslant 2.2$ m

A	maximum amplitude of drum vibration, in millimetres (mm)	v_{res}	resultant PPV, in millimetres per second ($mm \cdot s^{-1}$)
L	pile toe depth, in metres (m)	W	nominal hammer energy, in joules (J)
L_d	vibrating roller drum width, in metres (m)	W_c	energy per cycle, in kilojoules (kJ)
L_p	room octave band sound pressure level, in decibels (dB)	W_h	potential energy of a raised tamper, in joules (J)
n_d	number of vibrating drums	x	distance measured along the ground surface, in metres (m)
r	slope distance from the pile toe, in metres (m)		

Figure 5-1: BS5228 Calculation of Resultant Vibration Levels Due to Vibratory Roller Compactor

The following assumptions have been made within the calculations:

- k_s=75 (50% probability of the predicted value being exceeded)
- k_t=65 (50% probability of the predicted value being exceeded)
- n_d=2
- A=0.8mm
- L_d=2m

Calculation of vibration at various distances has been calculated from the closest distance from the site boundary to receptor and at various greater distances. The results of the calculation of PPV are shown in Table 5-9.

Table 5-9: Resultant Vibration Levels (PPV) at Various Distances from Vibratory Roller Compactor

Distance along ground from roller, m	10	15	20	25	30	50	100
Steady-State PPV, mms^{-1}	2.0	1.2	0.8	0.6	0.4	0.2	0.1
Start up and run down PPV, mms^{-1}	2.8	1.8	1.2	0.9	0.8	0.4	0.2

All predicted vibration levels are significantly below the transient vibration guide values for cosmetic damage to structures (see Table 3-3).

Any impact on human receptors would be most likely to occur at the closest receptor to the Proposed Development; Receptor ID 25 located approximately 47m from the centreline. At this distance, use of a vibration compactor at the boundary position would be expected to give rise to PPV of approximately 0.8 mm/s during start up and run down. As per Table 3-2, at this level *'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*.'

At the same distance, the received vibration level during steady-state operation of a vibratory compaction roller is predicted to be 0.4 mm/s, which as per Table 3-2, at this level, vibration might be just perceptible in residential environments.

The received vibration will therefore be temporary, will fluctuate while compaction takes place close to the property, and will subside when machinery moves to another part of the Proposed Development site. For the vast majority of receptors within the 100m construction vibration study area, received vibration during vibratory ground compaction will be negligible.

5.3 Construction Traffic Noise

The effect of noise from construction traffic on the local road network is assessed in accordance with DMRB LA 111 Revision 2, using BS 5228-1 prediction methods to calculate changes in BNL on affected roads. The DMRB LA 111 definition of the construction traffic study area (a 50m width from the kerb line of public roads where a BNL increase of 1 dB(A) or more may occur) and the requirement to calculate BNL increases for roads within that study area have been applied to the local road network and the possible temporary haul/access routes. Appendix G of this Environmental Appraisal (Traffic and Transport) presents the future baseline traffic the predicted traffic volumes during the most onerous month of the construction period. The traffic assessment predicts that the most onerous construction period is estimated to generate an average of 58 HGV movements and 120 other vehicle movements per day (178 vehicle movement in total).

The change in BNL has been estimated based on the predicted flows due to the Proposed Development construction works, in the context of the future baseline. The change in BNL is estimated using 10*log of the ratios of the predicted to existing traffic flows, which reflects the logarithmic relationship between noise sources and resultant noise levels[6]. A summary of the construction traffic noise predictions is shown in Table 5-10. For locations of the Automatic Traffic Counts (ATC) loops, please see Figure 5-2: Location of ATC Loops.

[6] This is detailed in the now superseded DMRB HD 213/11 (The Highways Agency et al., 2011) although is based on fundamental principal of logarithmic characteristic of noise

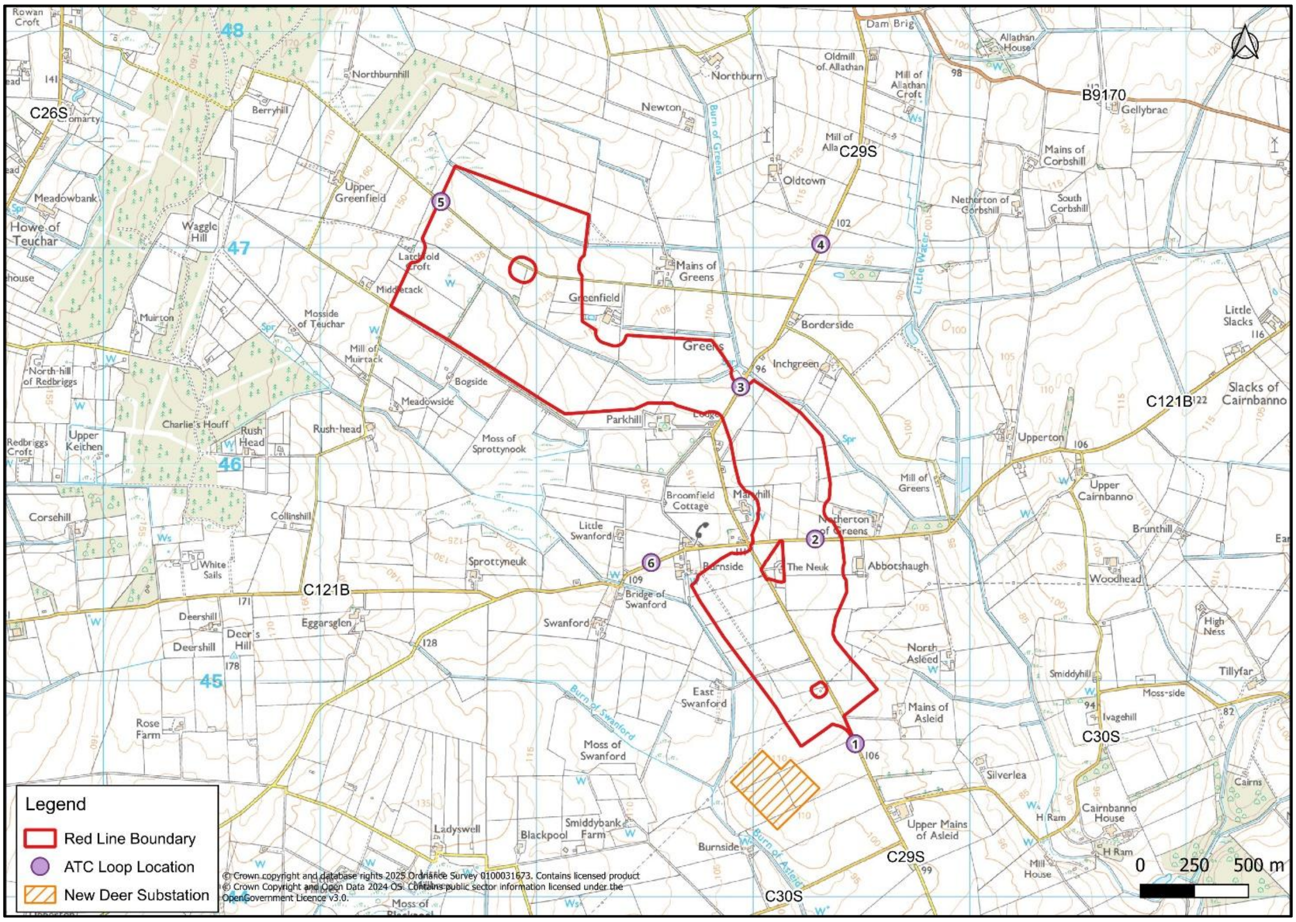

Figure 5-2: Location of ATC Loops

Table 5-10: Construction Traffic Noise Calculations

	ATC 1	ATC 2	ATC 3	ATC 4	ATC 5	ATC 6
	Tot Veh	Tot Veh	Tot Veh	Tot Veh	Tot Veh	Tot Veh
0600 - 0000 hrs	323	446	186	186	50	296
Total Additional Vehicles (Daily)	178	178	178	178	178	178
% Increase in vehicle movements	55	40	96	96	356	60
Estimated Increase in BNL (18hr), dB	2	1	3	3	7	2

Table 5-10 indicates the change in BNL associated with the increase in traffic movements during the construction phase. The calculation for each road assumes that all traffic will travel along that route, which enables a worst-case to be calculated for each road. The BNL is expected to increase by between 1 and 7 dB, depending upon the final construction traffic route(s) determined for the construction works.

DMRB provides some context for these figures, as shown in Table 3-4. As shown in Table 5-10, should the construction traffic access the site via ATC 5 only, there is the potential for a significant noise impact, depending on the duration.

Should one or more of the other roads (ATC1-4 or ATC6) be used to access the site, then the noise impact would not be significant, with the change in BNL < 3 dB.

6 Mitigation

6.1 Construction Noise and Construction Traffic Noise

A Noise and Vibration Management Plan (NVMP) will be produced post-consent, prior to construction and included within the detail Construction Environmental Management Plan (CEMP). The NVMP will detail the construction noise measures to be adhered to and consulted on with relevant stakeholders and approved as a separate standalone document.

The key mitigation for noise receptors would be the consideration of noise sensitive receptors and careful design of the final cable route and associated construction infrastructure i.e. haul road position within the cable corridor and location of plant.

Additionally, a range of secondary measures will be taken to ensure that noise and vibration impacts are managed appropriately. Examples of this includes mechanical plant and equipment checks, use of sound reduced models, implementation of noise barriers and engagement with impacted residents.

Examples of mitigation and some of the construction best practice measures included in BS5228 guidance for noise are provided within the Outline CEMP (oCEMP) appended to this application and outlined below.

- Ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order.
- Careful selection of quiet plant and machinery to undertake the required work where available.
- Use of 'sound-reduced' models of compressors, fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use.
- Use of ancillary pneumatic percussive tools fitted with mufflers or silencers of the type recommended by the manufacturers.
- Machines in intermittent to be shut down in the intervening periods between work.
- Ancillary plant such as generators, compressors and pumps to be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines will be placed away from sensitive locations, in order to cause minimum noise disturbance. Where possible, in potentially sensitive areas, temporary construction barriers or enclosures will be utilised around noisy plant and equipment.
- Handling of all materials could to take place in a manner which minimises noise emissions.
- Audible warning systems to be switched to the minimum setting required by the Health & Safety Executive.
- Forewarning potentially affected residents of the works to be carried out and of any proposals for work outside normal hours.
- Scheduling construction activities with the highest potential noise impact on receptors to be carefully scheduled to reduce the significance of effect to individual receptors.

Where the above measures are insufficient for individual receptors, the project shall utilise strategic placement of noise barriers to reduce the noise impact of construction works where detailed design (micrositing) of the final cable route alone is insufficient at mitigating noise. Noise barriers would likely be crucial at the locations where works are carried out in close proximity to residential properties. The optimal locations for use of construction noise barriers shall be identified within the final CEMP. The CEMP will outline where noise measurements should be carried out during construction works to closely monitor the noise levels at the affected receptors and effectiveness of the mitigation.

Additionally, mitigation measures to control construction traffic are included in the outline Construction Traffic Management Plan (oCTMP), and the detailed mitigation measures in relation to noise mitigation will be provided in the final CTMP (Construction Traffic Management Plan).

6.2 Construction Vibration

The vibration impact assessment contained within this Appendix indicates that ground compaction works undertaken at the Proposed Development centreline would give rise to levels of vibration likely to cause complaint, but that can be tolerated if prior warning and explanation has been given to residents. Relevant construction best practice guidance for management of vibration impacts will be considered within the final CEMP.

It is important that residents are kept informed of works involving vibratory compaction equipment and made aware that there may be some temporary low-level vibration perceptible should the works fall within 25m of receptors. This will be refined and assessed in more detail at MSC stage, where necessary.

No specific engineering or operational control measures are deemed necessary for the control of construction vibration.

7 Residual Impact

7.1 Construction Noise

It is expected that, with mitigation, the noise impact due to construction noise will be low to negligible for the majority of receptors within the study area, and therefore non-significant.

For individual receptors located close to construction works, there is potential for temporary moderate/major noise effects, which require careful alignment between location of the works, the combination of activities underway, and the duration of the works to ensure the significant effect does not occur over 10 or more days or night in any 15 consecutive days or night, or a total number of days exceeding 40 in any 6 consecutive months.

A noise and vibration management plan (NVMP) would therefore be submitted alongside the CEMP at MSC stage, which will consider the detailed design, the mitigations which will be applied, where they will be applied, and the monitoring and enforcement actions that will be undertaken through the works for specific receptors to ensure that a significant effect does not materialise for those individual properties

7.2 Construction Vibration

The construction methodology involves some activities which may temporarily give rise to groundborne vibration which may be perceptible at residential properties. Where vibratory compaction takes place at the site boundary, individual receptors may experience low level vibration which can be tolerated if prior warning and explanation is been given to residents.

Any received vibration at receptors will be temporary, will fluctuate while compaction takes place close to the property, and will subside when machinery moves to another part of the Proposed Development site. For the vast majority of receptors received vibration during vibratory ground compaction is likely to be negligible.

7.3 Construction Traffic Noise

The residual noise impact of construction traffic noise will be dependent upon the selected haul route(s), however the majority of access roads into the Proposed Development site may be used without a significant construction traffic noise impact. Examples of mitigation measures to control construction traffic are included in the oCTMP, and the detailed mitigation measures will be provided in the final CTMP.

8 Cumulative Impact

8.1 Relevant Projects

8.1.1 Greens Substation (Approved)

APP/2024/1927 - National for Erection of 400kV AC Substation and Associated Infrastructure - Land At Mains Of Greens Cuminestown Aberdeenshire AB53 5YQ

It is anticipated that construction of the Proposed Development would take place over a three-year programme, following the granting of consents. Construction is expected to begin in late 2025 / early 2026, although detailed programming of the works would be the responsibility of the Principal Contractor in agreement with SSEN Transmission.

Working hours are currently anticipated seven days a week between approximately 07:00 to 19:00 March to September and 07:30 to 17:30 (or within daylight hours) October to February. Any out of hours working would be agreed in advance with Aberdeenshire Council. During the commissioning phase there may be a requirement for 24 hours a day, seven days a week working. Working hours are subject to the agreement with Aberdeenshire Council.

There is potential for the construction phases of the Proposed Development and Greens Substation to occur at the same time and therefore the cumulative noise impact of the construction phases needs to be considered.

8.1.2 Caledonia's Onshore Transmission Infrastructure (OnTI) (Approved)

APP/2024/1812 - Onshore Transmission Infrastructure for Caledonia Offshore Wind Farm including Formation of Onshore Landfall Point, Laying of Underground Cables, Erection of 2 Co-Located Substations, and Associated Works to connect to the Transmission Grid

The Client intends to integrate the construction programme for the Proposed Development with the wider OnTI project works. While it is acknowledged that there is potential for cumulative impacts, these will be managed under a single, overarching Construction Traffic Management Plan (CTMP), and a single, overarching construction Phasing Plan which will effectively mitigate any potential significant cumulative effects..

8.1.3 Abbotshaugh BESS (Under Consideration)

ECU00005224 - A battery energy storage system (BESS) substation and associated electrical equipment, drainage, access, landscaping, underground cable route, fencing and other ancillary infrastructure

The estimated construction period for the Proposed Development is 18-24 months and it is expected to commence in 2030. A detailed construction programme will be developed by the contractor when appointed and this will be provided to the Council as part of a CEMP prior to commencement of construction. It is expected that this will form a condition to any consent. Normal construction hours will be between 07.00 and 18.00 Monday to Friday and 08.00 to 13.00 on Saturdays.

There is potential for the construction phases of the Proposed Development and Abbotshaugh BESS to occur at the same time and therefore the cumulative noise impact of the construction phases needs to be considered.

8.1.4 New Deer 2 BESS (Under Consideration)

EECU00006067 - A battery energy storage system (BESS) substation and associated electrical equipment, drainage, access, landscaping, underground cable route, fencing and other ancillary infrastructure

The New Deer 2 BESS development is located 0.5km from the Proposed Development, although there is overlap with the public road access (which New Deer 2 BESS have included within their red line boundary) and the Proposed Development.

The estimated construction period for the New Deer 2 BESS is up to 24 months and it is reported to commence in 2028. A detailed construction programme will be developed by the construction contractor when appointed and this will be provided to the Council as part of a CEMP prior to commencement of construction. It is expected that this will form a condition to any consent. Normal construction hours will be between 07.00 and 18.00 Monday to Friday and 08.00 to 13.00 on Saturdays.

It is understood that the New Deer 2 BESS construction works will take place a minimum of 600m from construction of the Proposed Development. As such, there will be no shared receptors between the two construction sites and therefore no cumulative construction noise impact should the construction programmes overlap temporally.

8.2 Construction Noise

8.2.1 Greens Substation

The environmental statement relating to the Greens Substation identified that with mitigation, there is not likely to be a noise impact from construction noise or construction traffic noise. There are 4no. shared common noise receptors which fall within both the Greens Substation study area and the Proposed Development (receptors 2,3,5 and 6).

With mitigation in place, these receptors 2 ,5 and 6 are not expected to experience a significant construction noise impact during construction phase of the Proposed Development.

Should the construction of the Greens Substation coincide temporally with the construction of the Proposed Development, or occur within 6 months of the construction of the Proposed Development, noise monitoring at receptor 3 should be employed to ensure this receptor does not experience excessive noise impacts, with additional organisational or physical mitigation measures applied as necessary.

8.2.2 Caledonia’s Onshore Transmission Infrastructure (OnTI)

The environmental statement relating to the OnTI identified that with mitigation, there is not likely to be a noise impact from construction noise or construction traffic noise.

There are 3no. noise receptors which fall within both the Greens Substation study area and the Proposed Development (Proposed Development receptors 22,25 and 26).

With mitigation in place, receptors 22 and 26 are not expected to experience significant noise impacts during construction phase of the Proposed Development. Receptor 25 will potentially experience temporary significant noise impacts in combination with the construction of OnTI.

Should the construction of the OnTI be identified as likely to coincide, or occur within 6 months of the construction of the Proposed Development, noise monitoring at receptor

25 should be employed to ensure this receptor does not experience excessive noise impacts, with additional operational or physical mitigation measures applied as necessary.

8.2.3 Abbotshaugh BESS

The Abbotshaugh BESS development and the Proposed Development are located in close proximity to one another and, with 13no. common receptors, have the greatest potential for cumulative construction noise impacts.

The noise impact assessment for the Abbotshaugh BESS development found that construction noise impacts were expected only for two receptors ('R15' and 'R16' which are the same receptor ID 33 and 34 for the Proposed Development) and only during the cable route construction works and only for 'short periods of time'.

Although no significant construction noise effects were identified in the noise impact assessment for construction of the Abbotshaugh BESS and substation, construction noise predictions were highest at receptors 'R12' and 'R13' (receptor ID 25 and 21 for the Proposed Development). Predicted levels were 14dB below the construction noise 65dB threshold at R12 and 17dB below the threshold at R13.

Should the construction programmes for the Proposed Development and Abbotshaugh BESS be identified as likely to coincide, or occur within 6 months of one another, detailed assessment should be undertaken of the cumulative noise impact of the construction works at the common receptors identified. The requirement for additional mitigation measures and/or noise monitoring at receptors should also be reviewed if full cumulative assessment is deemed necessary.

8.2.4 New Deer 2 BESS

No construction noise assessment has been provided by the New Deer 2 BESS project and it is therefore expected that construction noise effects were deemed not significant and screened out. Given also the distance between developments, there is no potential cumulative significant impact predicted either for noise.

It is understood that the New Deer 2 BESS construction works will take place a minimum of 600m from construction of the Proposed Development. As such, there will be no shared receptors between the two construction sites and therefore no cumulative construction noise impact should the construction programmes overlap temporally.

8.3 Construction Vibration

There is unlikely to be a cumulative vibration impact on the only one receptor identified as potentially experiencing elevated levels of vibration (receptor ID 25) during the construction phase of the Proposed Development. Although this receptor is common to the OnTI development, the noise and vibration assessment for OnTI did not identify any significant construction vibration impacts for this receptor, going as far as to scope construction vibration out of their assessment.

Although the noise impact assessment for the Abbotshaugh BESS identified the use of vibratory compactor during construction, it did not consider construction vibration effects. The Abbotshaugh BESS noise impact assessment has a common receptor with the Proposed Development which was also the receptor with highest likelihood of construction vibration impacts for the Proposed Development. Non-significant construction vibration impacts were predicted for the Greens substation site.

Although it is theoretically possible for vibration to be experienced from other projects, should they overlap temporally, the use of vibratory sources will be transient and unlikely to cause a cumulative effect at receptors.

8.4 Construction Traffic Noise

Without mitigation, there is potential for significant cumulative construction traffic impacts, if the construction programme for the Proposed Development and any of the four projects identified overlap temporally, and if common haul routes are in use. A detailed cumulative construction traffic assessment should be undertaken if there is likely to be a temporal overlap between the Proposed Development construction works with any of the four projects identified, to identify any requirement for additional mitigation measures.

Additionally, the Applicant would look to participate in a forum with other developments in the locality of the Proposed Development to share detailed information on topics with potential for cumulative interest. The Applicant considers that this may be a future vehicle to share information on specific traffic matters, and allow mitigation to be developed which avoid cumulative impacts on the local traffic network. The Applicant would look to provide information to this forum, and include the resulting measures within the final CTMP, to provide the Planning Authority the security that cumulative impacts can be mitigated, monitored and enforced.

9 Conclusion

This report was prepared to assess the potential noise and vibration impacts arising from construction of the proposed 400kV cable route between Burnside and Greens substations. The assessment addresses temporary, construction phase impacts only; operational noise and vibration were scoped out because the cable route will not generate ongoing operational sound or vibration. The purpose of the document is to identify likely impacts on nearby receptors, to set out appropriate good practice mitigation, and to indicate what further refinement is required at the MSC/ detailed design stage.

Predicted construction noise levels, without mitigation in place, indicate the potential for temporary, significant noise impacts at nearby sensitive receptors during certain activities. The final impacts are dependent on the final corridor alignment, compound and access locations, the selection of plant and working methods, and the construction schedule.

Construction vibration is not anticipated to give rise to significant impacts across the study area. Worst-case vibration predictions identified one receptor which may experience elevated vibration levels which can be tolerated with prior warning. Information available for other developments identified for cumulative impact assessment, did not identify significant vibration impacts at that receptor, and therefore there is no likely cumulative vibration impact.

Construction traffic noise could contribute to temporary noise increases, depending on the selected haul route associated with the construction works. Only one of the six potential haul routes assessed has the potential for significant adverse construction traffic noise effects.

Four relevant projects have been identified with the potential to cause cumulative impacts in combination with the Proposed Development, due to spatial overlaps and shared receptors. Cumulative construction noise impacts are possible for isolated receptors, where project construction programs coincide or occur within 6 months of one another. It is recommended that the noise predictions and any conclusions on cumulative impacts should be refined once the corridor and access arrangements are finalised and detailed programmes for this and other nearby developments are available.

Without mitigation, there is potential for significant cumulative construction traffic impacts, if the construction programme for the Proposed Development and any of the four projects identified overlap temporally, and if common haul routes are in use. A detailed cumulative construction traffic assessment should be undertaken if there is likely to be a temporal overlap between the Proposed Development construction works with any of the four projects identified, to identify any requirement for additional mitigation measures.

Additionally, the Applicant would look to participate in a forum with other developments in the locality of the Proposed Development to share detailed information on topics with potential for cumulative interest. The Applicant considers that this may be a future vehicle to share information on specific traffic matters, and allow mitigation to be developed which avoid cumulative impacts on the local traffic network. The Applicant would look to provide information to this forum, and include the resulting measures within the final CTMP, to provide the Planning Authority the security that cumulative impacts can be mitigated, monitored and enforced.

With implementation of the mitigation and good practice measures recommended in the assessment, including compliance with relevant standards and robust site management controls, the residual noise and vibration impacts of the Proposed Development are expected to be temporary and localised.

10 Annex A – Noise Sensitive Receptors