Sure Partners Limited

ARKLOW BANK WIND PARK PHASE 2
ONSHORE GRID INFRASTRUCTURE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

VOLUME II

Chapter 11 Noise and Vibration

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Contents

11 Noise and Vibration

11.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) reports the findings of an assessment of the likely significant effects due to noise and vibration as a result of the proposed 'Arklow Bank Wind Park Phase 2 Onshore Grid Infrastructure' (hereafter referred to as 'the proposed development') in County Wicklow.

The following are described within this chapter:

- The methods used to assess the likely significant noise and vibration effects associated with the proposed development;
- The current baseline noise environment at receptor locations within the surrounding area based upon measured noise data;
- Mitigation measures required to prevent, reduce or offset any likely significant adverse noise and vibration effects arising as a result of the proposed development;
- The likely cumulative noise and vibration effects of the proposed development and nearby developments; and
- The likely residual noise and vibration effects of the proposed development after these mitigation measures have been adopted and a statement of significance of the residual effects.

The potential for significant noise and vibration effects is considered during the construction (and decommissioning) and operational phases of the proposed development. In particular, this assessment considers the potential effects on identified receptors, in terms of:

- Predicted noise and vibration levels from the construction and decommissioning works (including traffic); and
- Predicted noise from the proposed development once operational.

Definitions of terminology relevant to this chapter are provided in **Appendix 11.1 of Volume 3**.

11.2 Methodology

11.2.1 Planning and Guidance Context

The National Planning Framework 2040 (2018)

The National Planning Framework (NPF) (GoI, 2018) is the Irish Government's high-level strategic plan for future growth and planning. This includes Policy Objective 65 which states the following with regards to noise:

"Promote the pro-active management of noise where it is likely to have significant adverse impacts on health and quality of life and support the aims of the Environmental Noise Regulations through national planning guidance and Noise Action Plans".

Environmental Protection Agency (EPA) Office of Environmental Enforcement (OEE) 'Guidance Note for Noise: Licence Applications, Survey and Assessments in Relation to Scheduled Activities' (NG4).

The EPA *'Guidance Note for Noise: Licence Applications, Survey and Assessments in Relation to Scheduled Activities'* (EPA, 2016) provides guidance for licensed sites with the assessment of their potential and actual noise impact on the local environment and sets out recommended noise limit criteria at noise sensitive locations. While the onshore 220kV substation does not fall within the NG4 schedule of activities, the noise limit criteria have been considered as relevant upper thresholds for the EIAR operational noise assessment.

Institute of Environmental Management and Assessment (IEMA) 'Guidelines for Environmental Noise Impact Assessment' (2014)

IEMA's *'Guidelines for environmental noise impact assessment'* (IEMA, 2014) provides guidelines to address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur.

Calculation of Road Traffic Noise (1988)

The Department of Transport/Welsh Office Memorandum *'Calculation of Road Traffic Noise'* (CRTN) (DoT, 1988) describes procedures for traffic noise calculation and is suitable for environmental assessments of schemes where road traffic noise may have an effect.

British Standard 7445-1:2003

BS 7445-1:2003 *'Description and environment of environmental noise – Part 1'* (BSI, 2003) defines the parameters, procedures and instrumentation requirements for noise measurement and analysis.

British Standard 4142:2014+A1:2019

BS 4142 *'Method for Rating Industrial Sound Affecting Mixed Residential and Industrial Areas' (*BSI, 2019) can be used for assessing the effect of noise from industrial sites. The method compares the difference between the 'rating level' of the new sound source, with the 'background level' at the receptor position.

British Standard 5228:2009+A1:2014

BS 5228-1 *'Code of practice for noise and vibration control on construction and open sites. Noise'* (BSI, 2014) provides a 'best practice' guide for noise control and includes Sound Power Level (Lw) data for individual plant as well as a calculation method for noise from construction activities. BS 5228-2 *'Code of practice for noise and vibration control on construction and open sites. Vibration'* (BSI, 2014) provides comparable 'best practice' for vibration control, including guidance on the human response to vibration.

Transport Research Laboratory (TRL) Report 429 'Groundborne Vibration Caused by Mechanised Construction Works' (2000)

TRL Report 429 *'Groundborne Vibration Caused by Mechanised Construction Works'* (TRL, 2000) provides methods for predicting the environmental impact of vibration caused by the operation of mechanised construction plant.

11.2.2 Assessment Methodology

Study Area

The study area that has been considered for the noise and vibration assessment encompasses the proposed development and nearby sensitive receptors that may be affected during construction (and decommissioning) and operation of the proposed development.

Locations of sensitive receptors, the redline boundary of the proposed development and baseline noise monitoring positions are illustrated in **Figure 11.1**.

Figure 11.1 Locations of Noise and Vibration Sensitive Receptors, Source: Google Earth

Baseline Noise Monitoring Methodology

Baseline noise surveys were undertaken to establish the existing noise environment around the site, at locations representative of existing receptors that may be affected by noise from the proposed development. Surveys were undertaken following guidance from BS 7445-1 and BS 4142.

Unattended long-term noise measurements were carried out at ten locations between 12 August 2020 and 22 September 2020. Attended daytime short-term noise measurements were also obtained at three locations on 14 September 2020. The noise monitoring locations are described in **Table 11.1**.

Additional details on the noise monitoring methodology are presented in **Appendix 11.2 of Volume 3**.

Table 11.1 Noise Monitoring Locations

Location	Attended/Unattended	Coordinates
NM1	Unattended	52°48'45.3"N 6°10'53.1"W
NM2	Unattended	52°48'55.2"N 6°10'13.7"W
NM3	Unattended	52°48'19.1"N 6°10'34.9"W
NM4	Unattended	52°48'55.3"N 6°11'08.2"W
NM5	Unattended	52°49'41.7"N 6°07'02.1"W
NM6	Unattended	52°49'58.5"N 6°07'24.3"W
NM7	Attended	52°49'26.4"N 6°07'20.5"W
NM8	Unattended	52°49'18.1"N 6°07'48.4"W
NM9	Unattended	52°48'47.9"N 6°08'47.6"W
NM10	Unattended	52°48'59.4"N 6°08'43.1"W
NM11	Unattended	52°48'47.5"N 6°09'44.4"W
NM12	Attended	52°48'38.7"N 6°08'59.7"W
NM13	Attended	52°48'42.7"N 6°09'06.3"W

Noise measurements were undertaken using 01dB DUO Type 1 sound level meters. Calibration of the meters was carried out using a BK 4231 field calibrator. The sound level meters logged environmental noise measurement parameters including average ambient (L_{Aeq}) and background (L_{A90}) noise levels.

During lockdown measures for the coronavirus outbreak (which were first announced on 12 March 2020), ambient noise levels may have been affected by travel restrictions, social distancing and changes in operating patterns at surrounding premises. Long-term noise monitoring was undertaken from August to September 2020, although these noise measurements were undertaken as lockdown measures were eased and nearby industrial/commercial operations and road traffic would have increased and returned to more typical levels. As such the results of the noise surveys are considered to be conservative (i.e. may be slightly lower than before any restrictions) although representative of the baseline once temporary lockdown effects come to an end.

Sensitivity of Receptors

The effect of noise and vibration generated during construction and during the operational phase of the proposed development are considered at nearby sensitive receptors. A number of receptors that may potentially be affected have been considered in this assessment. The sensitive receptors considered are those receptors nearest to the site, i.e. the receptors that are likely to experience the highest levels of noise and vibration. Although noise and vibration may be perceivable at other receptors in the area around the site, the effects are unlikely to be significant if they are suitably controlled at the identified receptors.

Sensitive receptors have been classed based on professional judgement and previous experience depending on their use and subsequent sensitivity to noise and vibration. The sensitivity of receptors to noise and vibration has been defined in **Table 11.2**.

Table 11.2 Criteria Used to Define Sensitivity of Noise and Vibration Receptors

Sensitivity	Description	Receptor
High	Receptors where noise will significantly affect the function of a receptor	Auditoria/studios; and Specialist medical/teaching centres.
Medium	Receptors where people or operations are particularly susceptible to noise	Residential properties; Places of worship; Conference facilities; Libraries; Schools in daytime; and Hospitals/residential care homes.
Low	Receptors of low sensitivity to noise, where it may cause some distraction or disturbance	Offices; Restaurants; and Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf).
Very Low	Receptors where distraction or disturbance from noise is minimal	Residences and other buildings not occupied during working hours; Factories and working environments with existing high noise levels; and Sports grounds when spectator or noise is a normal part of the event.

11.2.3 Impact Assessment Methodology

11.2.3.1 Construction

Information relating to the construction activities for the proposed development is provided in **Chapter 5** *Description of the Development* and **Chapter 6** *Construction Strategy* of this EIAR. This information has informed the assessment of construction noise and vibration effects. The assessment of construction effects considers estimated noise levels at receptors and their sensitivity to noise where relevant.

Construction Noise

An assessment of construction noise has been carried out based on previous experience of construction sites, professional judgement and information about the proposed construction methods (as set out in **Chapter 6** *Construction Strategy*) to provide indicative predictions of construction noise levels. This is considered a robust and appropriate method to assess construction noise effects at this stage, prior to contractor appointment and actual work methods and plant/equipment to be used are finalised. Reference to baseline noise levels and assessment thresholds as listed below has been made to inform the discussion of likely construction noise effects.

There are no published statutory guidelines on noise levels from construction sites in Ireland. The construction noise assessment therefore makes reference to guidance from BS5228-1. Annex E of BS5228-1 provides example criteria for the assessment of construction noise impacts, presented in **Table 11.3,** which has been used to assess the potential significant effects from construction noise.

A negative, but not significant effect, may be experienced at receptors for construction noise levels above the baseline ambient noise levels but below the BS5228-1 thresholds.

Table 11.3 BS5228-1 threshold of potential significant effect at dwellings. Source: BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites: noise (2014)

Period description	Day & Times	Threshold value ($L_{Aeq,T}$) – over one month
'Daytime'	Weekday 07:00 – 19:00 Saturday 07:00 – 13:00	65
'Evenings and Sundays'	Weekday 19:00 – 23:00 Saturday 13:00 – 23:00 Sunday 07:00 – 23:00	55
'Night'	Night: 23:00 – 07:00	45

Although a significant effect due to construction activities may be determined through an assessment based on exceedances of the defined criteria for construction noise, additional consideration of the significance for temporary construction activities has been undertaken in the assessment through qualitative discussion of the following:

- Duration of activities;
- Frequency of events; and
- Sensitivity of receptors.

Construction Vibration

A qualitative assessment of the construction vibration has been carried out based on previous experience of construction sites, professional judgement and information about the proposed construction methods.

BS5228-2 provides guidance on the impacts on humans from vibration. **Table 11.4** details PPV (Peak Particle Velocity) vibration levels and provides a semantic scale for the description of construction vibration impacts on human receptors based on guidance contained in BS 5228-2.

Table 11.4 BS5228-2 threshold of potential significant effect at dwellings. Source: BS5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites: vibration (2014)

PPV Level	Description
0.14 to < 0.3 mm/s	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
0.3 to < 1.0 mm/s	Vibration might be just perceptible in residential environments
1.0 to < 5.0 mm/s	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.
>= 5mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level

For residential receptors and other medium sensitivity receptors, a negative effect has been defined as a PPV of 0.3 mm/s or higher during the daytime. The onset of a significant negative effect has been defined as a PPV of 1.0 mm/s or higher during the daytime. It is likely that residential receptors are more sensitive to vibration at night and therefore a significant negative effect is likely to occur at a PPV of 0.3 mm/s or higher during night-time.

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

Construction Traffic Noise

Road traffic noise levels have been calculated with reference to methodology within the CRTN which contains an equation for the calculation of the Basic Noise Level (BNL) from a road in terms of the 18-hour AAWT (Average Annual Weekday Traffic) flow from 06:00 to 24:00.

The magnitude of a noise impact due to changes in road traffic noise levels during the construction phase has been assessed with reference to criteria outlined in the IEMA Guidelines for Environmental Noise Impact Assessment and are provided in **Table 11.5**.

Table 11.5 Construction Road Traffic Noise Assessment Criteria. Source: IEMA Guidelines for Environmental Noise Impact Assessment (2014)

Magnitude of impact	Increase in BNL of closest public road used for construction traffic (dB)
Very Low	Less than 1.0
Low	Greater than or equal to 1.0 and less than 3.0
Medium	Greater than or equal to 3.0 and less than 5.0
High	Greater than or equal to 5.0

It is generally accepted that changes in noise levels of 1 dB(A) or less are imperceptible, and changes of 3 dB(A) are perceptible to the average human ear for comparable noise sources outside of a controlled laboratory environment. Consequently, the onset of a negative effect is set at a change in traffic noise of +1dB(A) and the onset of significant negative effect is set at +3 dB(A).

Construction road traffic noise has been assessed by considering the change in traffic due to construction activities at the site, calculated following CRTN guidance, between the following scenarios:

- Scenario 1 – Future 2023 baseline. This represents the year when construction of the proposed development will commence and is expected to be the busiest construction year; and
- Scenario 2 – Future 2023 baseline + construction.

Comparison of calculated road traffic noise for Scenario 1 and Scenario 2 allows the impact due to changes in road traffic noise as a result of the construction of the proposed development to be derived.

11.2.3.2 Operation

The onshore 220kV substation is the only operational noise impact of the proposed development assessed, as there will be minimal operational traffic and the underground cable route, landfall site and connection to the National Electricity Transmission Network (NETN) will not have any associated operational noise impacts. No major vibration sources are envisaged to be introduced as part of the proposed development and as such there will be no associated operational vibration effects.

The Environmental Protection Agency's *'Guidance Note for Noise: Licence Applications, Survey and Assessments in Relation to Scheduled Activities'* (NG4), hereafter referred to as 'NG4' and BS4142 guidance has been used to undertake the assessment of operational impacts of the substation. The assessment of likely operational effects considers residential receptors as well as receptors of different sensitivity where relevant.

NG4 sets appropriate noise criteria for new licence applications with the Environmental Protection Agency (EPA) Office of Environmental Enforcement (OEE). While the onshore 220kV substation does not fall within the NG4 schedule of activities, the noise limit criteria have been considered as relevant upper thresholds for the EIAR operational noise assessment. Furthermore, elements of NG4 are derived from BS4142, which provides the context within which to assess the impact of industrial noise on sensitive receptors.

NG4 noise limits are presented in **Table 11.6**, which have been used to define the onset of a significant negative effect. Following the screening criteria in Section 4.4.2 of NG4 receptors surrounding the proposed substation site are not considered to be 'Quiet Areas' or 'Areas of Low Background Noise' and are considered to be 'All other Areas' (further detail is presented in **Appendix 11.2 of Volume 3**).

Table 11.6 NG4 Recommended Noise Limit Criteria – 'All other Areas'

Daytime Noise, dB $L_{Ar,T}$ (07:00 – 19:00)	**Evening Noise, dB $L_{Ar,T}$ (19:00-23:00)**	**Night Noise, dB $L_{Aeq,T}$ (23:00-07:00)**
55	50	45

The BS4142 assessment methodology has been used to provide context to the assessment of operational noise. A key aspect of the BS4142 assessment method is a comparison between the background sound level in the vicinity of receptor locations and the rating level of the noise source under consideration. The relevant parameters in this instance are as follows:

- background sound level – $L_{A90,T}$ – defined in the Standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels;
- specific sound level – $L_{Aeq,Tr}$ – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr; and
- rating level – $L_{Ar,Tr}$ – the specific sound level plus any adjustment made for the characteristic features of the noise (in this case a +5 dB penalty is applied for tonality, following NG4).

Once any adjustments have been made, the background sound level and the rating levels are compared. The standard states that:

a) *"Typically, the greater the difference, the greater the magnitude of impact.*

b) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.*

c) *A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.*

d) *The lower the rating level is to the measured background sound level, the less likely it is that the specific sound 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 upon the context."*

The guidance on the magnitude of impact above has been used to provide context to the assessment of operational noise impacts.

Modelling methodology and assumptions

Onshore 220kV substation operational noise levels have been predicted using 3-dimensional computer modelling software at the nearest noise-sensitive receptors (i.e. R1-R6) which are most likely to be affected by operational noise. Operational noise levels at more distant receptors (i.e. R7-R13) will be substantially lower such that no negative effects will occur. Details of the noise modelling assumptions and source data are presented in **Appendix 11.3 of Volume 3.**

A cumulative operational noise assessment has also been undertaken to include noise modelling results from the adjacent Crag Digital Avoca Ltd Data Centre that will be located south of the proposed substation. This development has been chosen to be assessed in detail due to the large size of the Data Centre development and the proximity to the onshore 220kV substation. The cumulative operational assessment takes into account the two planning submissions for the Crag Digital Avoca Ltd Data Centre to Wicklow Country Council: consented application ref. 18940, decision 20 February 2019 and amended application ref. 201285, submitted 15 December 2020.

For the Crag Digital Avoca Ltd Data Centre planning application ref. 18940, the potential cumulative effects have been assessed through noise modelling. Should the proposed development and the Data Centre be built the northern data hall of the Data Centre will not be built as it is within the boundary of the onshore 220kV substation. Noise modelling allows the northern-most data hall to be removed in order to provide a cumulative operational noise scenario where both the onshore 220kV substation and the Data Centre are built.

The noise model of the consented Crag Digital Avoca Ltd Data Centre, application ref. 18940, has been based on 'Scenario 1 – Standard Operation' from the Crag Digital Avoca Ltd Data Centre EIAR. The model has been based on noise model information within the Data Centre EIAR and calibrated to the results presented in the Data Centre EIAR.

For the Crag Digital Avoca Ltd Data Centre planning application ref. 201285, the noise model for the 'Standard Operation' scenario has been used directly with permission from the applicant.

The mitigation assumptions within the 'Standard Operation with Mitigation' scenario have then also been applied, to reproduce this scenario. As above, the northern-most data hall is within the boundary of the onshore 220kV substation and has been removed from the noise model, as it will not be built if the proposed development proceeds.

The method of creating a new model and calibrating to recreate results of another planning application is more accurate than a qualitative assessment, and is considered appropriate for this assessment given the proximity of the proposed development and the Data Centre development. Further details of the noise modelling assumptions and source data are presented in **Appendix 11.3 of Volume 3.**

11.2.4 Limitations and Assumptions

The following assumptions have been made in this assessment:

- To assess the potential noise and vibration effect of the proposed development, it was necessary to determine the baseline conditions. It is considered that the baseline noise measurements, which were undertaken at the site in August - September 2020, are representative of the typical noise environment of identified receptors at the time of submission of this assessment. There may have been reduced road traffic during this time period due to the lockdown measures for the coronavirus outbreak, however it is very likely that this provides a more conservative assessment and therefore is considered appropriate for use for the assessment of noise and vibration effects.
- The construction noise and vibration assessments have been undertaken based on information presented in **Chapter 6** *Construction Strategy*, previous experience of construction sites and professional judgement. As a contractor is yet to be appointed and actual work methods and plant/equipment to be used are not yet finalised, indicative noise and vibration level predictions have been undertaken at this stage to represent the potential worst-case construction noise and vibration sources throughout the works programme.
- Noise and vibration effects during the decommissioning phase of the proposed development will be similar to or less than noise effects during the construction phase. The noise assessment presented for the construction phase is therefore considered representative (or an overestimate) of the decommissioning phase. As such a separate assessment for noise from the decommissioning phase is not included.

11.3 Baseline Environment

This section describes the baseline environmental characteristics for the proposed development and surrounding areas with specific reference to noise and vibration.

11.3.1 Baseline Noise Monitoring Results

Table 11.7 below presents a summary of noise monitoring results from the noise surveys undertaken in August and September 2020. The results of noise measurements and the noise monitoring locations are presented in more detail in **Appendix 11.2 of Volume 3** and in **Figure 11.1**.

Table 11.7 Noise Monitoring Results

Location	Day 07:00-19:00 T = 12h		Evening 19:00-23:00 T = 4h		Night 23:00-07:00 T = 8h	
	dB $L_{Aeq,T}$	dB Mode $L_{A90,,15min}$	dB $L_{Aeq,T}$	dB Mode $L_{A90,15min}$	dB $L_{Aeq,T}$	dB Mode $L_{A90,15min}$
NM1	54	44	48	38	46	35
NM2	50	42	48	39	44	29
NM3	62	58	59	56	54	42
NM4	44	36	41	36	40	31
NM5	51	49	49	47	45	38
NM6	55	52	51	48	47	29
NM7	63	46	N/A	N/A	N/A	N/A
NM8	50	48	47	46	46	33
NM9	58	51	52	43	49	40
NM10	48	42	46	37	42	27
NM11	53	46	50	40	47	27
NM12	70	58	N/A	N/A	N/A	N/A
NM13	57	41	N/A	N/A	N/A	N/A

11.3.2 Sensitive Receptors

The nearest noise sensitive receptors to the site have been selected for the assessment and the sensitivity of these receptors has been identified in accordance with the criteria in **Table 11.2**. The receptors identified are listed in **Table 11.8**. Each receptor location has been assigned an appropriate measurement location for the purposes of defining baseline noise levels. This is an accepted methodology as per guidance in BS4142.

It should be noted that NM9, NM12 and NM13 have not been assigned to receptors. These noise measurement locations were chosen to cover an alternative cable route not taken forward for the proposed development. The long-term measurements undertaken at NM5 have also been used as representative of receptors R11 and R12 due to their similar proximity to road traffic noise sources and the coastline; measurements at NM7 have not been assigned to R11 as the NM5 measurements are more conservative.

Table 11.8 Locations of Noise and Vibration Sensitive Receptors

Receptor	Receptor Address	Corresponding Measurement Location	Receptor Type	Sensitivity
R1	Avoca River Business Park Industrial Estate	NM1	Offices/ Industrial	Low
R2	Forest Road	NM2	Residential	Medium
R3	Forest Road	NM2	Residential	Medium
R4	Halting Site, Vale Road	NM3	Residential	Medium
R5	Shelton Abbey	NM4	Residential	Medium
R6	Glenhart Castle	NM4	Residential	Medium
R7	L6179	NM11	Residential	Medium
R8	L2180	NM11	Residential	Medium
R9	R772	NM10	Residential	Medium
R10	R750, Seabank	NM8	Residential	Medium
R11	R750, Johnstown South	NM5	Residential	Medium
R12	R750, Johnstown South	NM5	Residential	Medium
R13	R750, Johnstown North	NM6	Residential	Medium

11.4 Characteristics of the Proposed Development

The proposed development will include noise and vibration generating activities associated with the construction of the landfall site, the cable route, flood defences, connection to the NETN and the substation site, including construction traffic. The operation of the substation will also generate noise from stationary plant.

11.5 Likely Significant Effects

11.5.1 'Do-Nothing' Effects

In the absence of the proposed development the noise and vibration levels have potential to change due to the construction and operation of other schemes in the surrounding area. Schemes that have potential to have an effect on identified receptors have been considered in Section 11.7 – Cumulative Effects.

11.5.2 Construction Noise

As discussed in Section 11.2.4, the assessment of construction noise (and vibration) has considered construction activities that have the potential to result in significant effects on identified receptors, although do not cover all activities that could take place.

It is not considered that activities associated with connection to the NETN will result in any negative noise effects, and the following activities have been assessed:

- Sheet piling works at the landfall at Johnstown North;
- Horizontal directional drilling (HDD) and duct pull-back at the landfall at Johnstown North;
- Cable route trenching;
- Sheet piling works at the HDD option across the M11;
- HDD drilling and duct pull-back at the HDD option across the M11;
- Sheet piling works at the HDD across the R772 crossing;
- HDD drilling and duct pull-back at the HDD across the R772 crossing;
- Piling at the substation site; and
- Sheet piling works at the flood defences location in Shelton Abbey.

Construction noise predictions for the above activities have been carried out following methodologies from BS5228-1 Annex F.2.2.2. BS5228-1 provides example noise level data for different construction activities which have been used for the predictions.

Section 6.8.3 'Hoarding and Fencing' of **Chapter 6** *Construction Strategy* advises that temporary hoarding will be established around each of the temporary construction compounds before any significant construction activity commences. It is assumed that site hoarding will provide a 10 dB reduction of noise levels, as per guidance in BS5228-1 Annex F.2.2.2.

Sheet piling works at the landfall at Johnstown North

While exact methods for sheet pile installation are not finalised, noise levels have been assessed for either the use of a vibratory piling rig or by the use of hydraulic jacking.

Section 6.8.2 'Working Hours' of **Chapter 6** *Construction Strategy* advises that the normal construction working hours for the proposed development will be 07:00-19:00 hours Monday to Saturday.

The nearest receptor R12 is approximately 300m away from proposed sheet piling activities. **Table 11.9** presents predicted noise levels at R12 during sheet piling and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out in **Table 11.3.**

Table 11.9 Construction Noise Assessment – Sheet piling works at the landfall at Johnstown North

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R12	Sheet piling – vibratory rig	Table C.3-8	88	300	48	51 (daytime)	65 (daytime)	No negative effect
						49 (evening)	55 (evening)	
	Sheet piling – hydraulic jacking	Table C.3-10	68	300	28	51 (daytime)	65 (daytime)	No negative effect
						49 (evening)	55 (evening)	

Noise levels from sheet piling works at the landfall site are estimated to be below the baseline ambient noise levels at R12 as well as at all other more distant receptors. Noise from sheet piling works at the landfall site is not considered to result in any negative effects.

HDD drilling and duct pull-back at the landfall at Johnstown North

Table 6.1 'Outline Construction Program – Landfall' of **Chapter 6** *Construction Strategy* advises that HDD works at the landfall site are scheduled for an approximate duration of 5 months, with the actual HDD drilling and duct pull-back taking up to 14 days for each cable circuit. Once commenced, the HDD drilling and duct pull-back is expected to operate continuously over a 24-hour period until each bore is complete.

The nearest receptor R12 is approximately 300m away from proposed HDD activities. **Table 11.10** presents predicted noise levels at R12 during HDD drilling and duct pull-back and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out in **Table 11.3**.

Table 11.10 Construction Noise Assessment – HDD drilling and duct pull-back at the landfall at Johnstown North

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R12	HDD drilling and duct	Table C.2-44	75 (1)	300	35	51 (daytime)	65 (daytime)	No negative effect
						49 (evening)	55 (evening)	

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
	pull-back					45 (night)	45 (night)	

Note 1: BS5228 advises an activity noise level of 77 dB for generators associated with directional drilling however this is based on historic data collated in 2005. Newer generators are quieter therefore an activity noise level of 75 dB has been used for this assessment.

Noise levels from HDD drilling and duct pull-back at the landfall site are estimated to be below the baseline ambient noise levels at R12 during day, evening and night periods. Noise from HDD drilling and duct pull-back at the landfall site is not considered to result in any negative effects.

Cable route trenching

The majority of the cable route works will be undertaken by open cut cable trenching, and the noisiest works are likely to be during the use of excavators (including for the potential removal of shale rock for two watercourse crossings).

The nearest receptors to the proposed cable route construction activities are at R8, R9, R10, R11 and R12. The closest receptors at R8 and R12 are within 10m and 15m of the planning (red line) boundary respectively. Receptors at R9, R10, R11 are each at distances greater than 30m from the planning (red line) boundary (with the exception of the route of the HDD at R9 which is assessed separately below). It has been assumed that cable trenching will be undertaken during core construction hours (07:00 – 19:00 Monday to Saturday) only.

Table 11.11 presents predicted noise levels at R8 to R12 during cable route trenching and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out in **Table 11.3.**

Table 11.11 Construction Noise Assessment – Cable route trenching

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R8	Excavator	Table C.5-35	74	10	74	53 (daytime)	65 (daytime)	Negative, potentially significant
						50 (evening)	55 (evening)	
R9	Excavator	Table C.5-35	74	30	64	48 (daytime)	65 (daytime)	Negative, not significant
						46 (evening)	55 (evening)	Negative, potentially significant

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R10	Excavator	Table C.5-35	74	30	64	50 (daytime)	65 (daytime)	Negative, not significant
						47 (evening)	55 (evening)	Negative, potentially significant
R11	Excavator	Table C.5-35	74	30	64	51 (daytime)	65 (daytime)	Negative, not significant
						49 (evening)	55 (evening)	Negative, potentially significant
R12	Excavator	Table C.5-35	74	15	70	51 (daytime)	65 (daytime)	Negative, potentially significant
						49 (evening)	55 (evening)	

During the daytime working hours (i.e. Monday to Friday 07:00 -19:00 and Saturday 07:00 – 13:00), noise levels from the use of excavators are estimated to exceed baseline ambient levels at R9, R10 and R11 but are below the daytime noise level threshold. This will result in a negative but not significant effect.

During the evening working hours (i.e. Saturday 13:00 – 19:00), noise levels from the use of excavators are estimated to exceed baseline ambient levels at R9, R10 and R11 and the evening noise level threshold. Therefore, these receptors are likely to experience a negative effect.

The use of excavators is estimated to exceed baseline ambient levels at R8 and R12 as well as the noise level thresholds during both daytime and evening periods. Therefore, these receptors are likely to experience a negative effect.

However, these works will only occur in close proximity to receptors for a limited number of days, as cable trenching works progress along the cable route. It is not expected that high noise levels would be experienced for a period greater than one month. At distances of 100m, noise from cable route activities will reduce to be below the evening thresholds. The negative effect caused by cabling works is therefore considered to be not significant.

Sheet piling works at the HDD option across the M11

Sheet piling noise levels have been assessed for either the use of a vibratory piling rig or by the use hydraulic jacking. The duration of piling at the M11 is likely to only last a few days and take place during core construction hours (07:00 – 19:00 Monday to Saturday) only.

The nearest receptor R2 is approximately 180m away from proposed sheet piling activities. **Table 11.12** presents predicted noise levels at R2 during sheet piling and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out in **Table 11.3.**

Table 11.12 Construction Noise Assessment – Sheet piling works at the HDD option across the M11

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, , dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R2	Sheet piling – vibratory rig	Table C.3-8	88	180	53	50 (daytime)	65 (daytime)	Negative, not significant
						48 (evening)	55 (evening)	
	Sheet piling – hydraulic jacking	Table C.3-10	68	180	33	50 (daytime)	65 (daytime)	No negative effect
						48 (evening)	55 (evening)	

Noise levels from use of vibratory piling methods at the M11 HDD option site are estimated to exceed baseline ambient levels at R2 but are below the noise level thresholds. This will result in a negative but not significant effect.

Noise levels from use of hydraulic jacking piling methods at the M11 HDD option site are estimated to be below baseline ambient levels at R2. This is not considered to result in any negative effects.

HDD drilling and duct pull-back at the HDD option across the M11

HDD locations are proposed for crossing the M11. **Table 6.2** 'Outline Construction Program – Onshore Cable Route' of **Chapter 6** *Construction Strategy* advises that HDD works at the M11 are scheduled for an approximate duration of 4 months. HDD drilling and duct pull-back are expected to operate continuously over a 24-hour period, however this would only last up to a week per cable circuit.

The nearest receptor R2 is approximately 180m away from proposed HDD activities. **Table 11.13** presents predicted noise levels at R2 during HDD drilling and duct pull-back and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out in **Table 11.3**.

Table 11.13 Construction Noise Assessment – HDD drilling and duct pull-back at the HDD option across the M11

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, , dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R2	HDD drilling and duct pull-back	Table C.2-44	77	180	42	50 (daytime)	65 (daytime)	No negative effect
						48 (evening)	55 (evening)	
						44 (night)	45 (night)	

Noise levels from HDD drilling and duct pull-back at the M11 option site are estimated to be below the baseline ambient noise levels at R2 during day, evening and night periods. Noise from HDD drilling and duct pull-back at the M11 option site is not considered to result in any negative effects.

Sheet piling works at the HDD across the R772 crossing

Sheet piling noise levels have been assessed for either the use of a vibratory piling rig or by the use hydraulic jacking. The duration of piling at the R772 is likely to only last a few days and take place during core construction hours (07:00 – 19:00 Monday to Saturday) only.

The nearest receptor R9 is approximately 115m away from proposed sheet piling activities. **Table 11.14** presents predicted noise levels at R9 during sheet piling and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out **Table 11.3.**

Table 11.14 Construction Noise Assessment – Sheet piling works at the HDD across the R772 crossing

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, , dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R9	Sheet piling – vibratory rig	Table C.3-8	88	115	57	48 (daytime)	65 (daytime)	Negative, not significant
						46 (evening)	55 (evening)	Negative, potentially significant
	Sheet piling – hydraulic jacking	Table C.3-10	68	115	37	48 (daytime)	65 (daytime)	No negative effect
						46 (evening)	55 (evening)	

Noise levels from use of vibratory piling methods at the R772 HDD site are estimated to exceed daytime baseline ambient levels at R9 but are below the daytime noise level thresholds. This will result in a negative but not significant effect.

Noise levels from use of vibratory piling methods are estimated to exceed both evening baseline ambient levels and evening noise level thresholds. However, as sheet piling at this location will only last for a few days this will result in a negative but not significant effect.

Noise levels from use of hydraulic jacking piling methods are estimated to be below baseline ambient levels at R9. This is not considered to result in any negative effects.

HDD drilling and duct pull-back at the HDD across the R772 crossing

HDD locations are proposed for crossing the R772. HDD works at the R772 is scheduled for an approximate duration of 4 months. The HDD drilling and duct pull-back activities are expected to operate continuously over a 24-hour period, however this would only last up to a week per cable circuit.

The nearest receptor R9 is approximately 115m away from proposed HDD activities. **Table 11.15** presents predicted noise levels at R9 during HDD drilling and duct pull-back and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out in **Table 11.3.**

Table 11.15 Construction Noise Assessment – HDD drilling and duct pull-back at the HDD option across the R772

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, , dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R9	HDD drilling and duct pull-back	Table C.2-44	77	115	46	48 (daytime)	65 (daytime)	No negative effect
						46 (evening)	55 (evening)	
						42 (night)	45 (night)	Negative, potentially significant

Noise levels from HDD drilling and duct pull-back at the R772 site are estimated to be below the daytime baseline ambient noise levels at R9, and equal to the evening baseline ambient levels. During these time periods, noise from HDD drilling and duct pull-back is not considered to result in any negative effects.

Noise levels from HDD drilling and duct pull-back are estimated to exceed both night-time baseline ambient levels and night-time noise level thresholds. However as drilling works will only last for up to a week per cable circuit this will result in a negative but not significant effect.

Piling at the substation site

While exact methods for pile installations at the substation site are not finalised, noise levels have been assessed for either the use of a hydraulic hammer piling rig or the use of continuous flight auger (CFA) methods. This will take place during core construction hours (07:00 – 19:00 Monday to Saturday) only.

The closest receptor is R1 (non-residential receptor with a lower sensitivity to noise), which is approximately 100m from the proposed substation site.

The next nearest receptor is R2, residential properties approximately 300m from the proposed substation site.

Table 11.16 presents predicted noise levels at R1 and R2 during piling at the substation site and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out in **Table 11.3.**

Table 11.16 Construction Noise Assessment – Piling at the substation site

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, , dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R1	Hydraulic hammer	Table C.3-1	89	100	59	54 (daytime)	65 (daytime)	Negative, not significant
						48 (evening)	55 (evening)	Negative, potentially significant
	CFA	Table C.3-22	80	100	50	54 (daytime)	65 (daytime)	No negative effect
						48 (evening)	55 (evening)	Negative, not significant
R2	Hydraulic hammer	Table C.3-1	89	300	49	50 (daytime)	65 (daytime)	No negative effect
						48 (evening)	55 (evening)	Negative, not significant
	CFA	Table C.3-22	80	300	40	50 (daytime)	65 (daytime)	No negative effect
						48 (evening)	55 (evening)	

Noise levels from use of hydraulic hammer piling methods are estimated to exceed daytime baseline ambient levels at R1 but are below the daytime noise level thresholds. Noise levels are estimated to exceed both evening baseline ambient levels and the evening noise level thresholds.

However, as R1 is an office/industrial facility with a lower sensitivity to noise and unlikely to be occupied during evenings or weekends, this is not considered to result in any negative effects.

Noise levels from use of hydraulic hammer piling methods are estimated to be below daytime baseline ambient levels at R2. This is not considered to result in any negative effects.

Noise levels from use of hydraulic hammer piling methods are estimated to exceed the evening baseline ambient levels at R2 but not the evening noise level thresholds. This will result in a negative but not significant effect.

Sheet piling works at the flood defences location in Shelton Abbey

Sheet piling works are proposed for flood embankment works. Sheet piling noise levels have been assessed for either the use of a vibratory piling rig or by the use of hydraulic jacking. This will take place during core construction hours (07:00 – 19:00 Monday to Saturday) only.

The nearest receptor R5 is approximately 150m away from proposed sheet piling activities. **Table 11.17** presents predicted noise levels at R5 during sheet piling and assesses the potential for negative effects in comparison to baseline ambient levels (per **Table 11.7**) and using the criteria set out in **Table 11.3.**

Table 11.17 Construction Noise Assessment – Sheet piling works at the flood defences location in Shelton Abbey

Receptor	Activity	BS5228-1 data source reference	Activity noise level at 10m, dB $L_{Aeq,T}$	Separation distance, m	Activity noise level at receptor, , dB $L_{Aeq,T}$	Baseline ambient level, dB $L_{Aeq,T}$	Threshold value, dB $L_{Aeq,T}$	Effect
R5	Sheet piling – vibratory rig	Table C.3-8	88	150	54	44 (daytime)	65 (daytime)	Negative, not significant
						41 (evening)	55 (evening)	
	Sheet piling – hydraulic jacking	Table C.3-10	68	150	34	44 (daytime)	65 (daytime)	No negative effect
						41 (evening)	55 (evening)	

Noise levels from use of vibratory piling methods are estimated to exceed baseline ambient levels at R5 but are below the noise level thresholds. This will result in a negative but not significant effect.

Noise levels from use of hydraulic jacking piling methods are estimated to be below baseline ambient levels at R5. This is not considered to result in any negative effects.

11.5.3 Construction vibration

For proposed substation works, landfall works and M11 HDD works, receptors are at least 50m away from vibration-generating works. Vibration levels at this distance are likely to be below 0.14 mm/s and imperceptible at all identified receptors.

During the excavation and backfill for the cable route close to receptors at R8 and R12 (within 10m and 15m of the planning (red line) boundary respectively) vibration may be perceptible for short periods of time and cause a negative effect, for instance during compaction of backfilled material. However, these works are likely to last for short periods at close distances and are unlikely to cause a significant effect. At receptors R9, R10 and R11 (within 30m of the planning (red line) boundary) and as works move away at greater distances from R8 and R12, vibration levels will reduce such that they are below 0.14 mm/s and imperceptible.

Construction vibration will result in a negative but not significant effect at R8 and R12. For all other receptors construction vibration is not considered to result in any negative effects.

For HDD drilling at R772 the red line boundary for the HDD route is about 25 m from the nearest residential property at R9; however, it is expected that the drilling and duct pull-back would occur at approximately 50m from the property with a depth of approximately 15m. Based on tunnelling vibration level predictions (considered comparable to HDD) from TRL (2000) Report 429 and example piling vibration levels from BS5228-2, this could lead to a vibration level of just above 1 mm/s. Therefore, these works are likely to cause a negative effect, which is not likely to be significant during daytime, but has the potential to cause a significant effect during night-time. However as the HDD drilling and pull-back will only last for up to a week per cable circuit this will result in a negative but not significant effect.

11.5.4 Construction Traffic Noise

The predicted construction road traffic effects on affected road links are presented in **Table 11.18**. For the receptors adjacent to these roads the magnitude of impact from construction traffic is considered to be very low and not significant.

AAWT traffic flows have been provided as part of the assessments undertaken in **Chapter 13** *Traffic and Transportation*.

AAWT flows of lower than 1,000 are below the limit at which CRTN noise calculations are valid and so roads affected by the temporary HDD compound at the landfall (R750, L95115) have not been presented in **Table 11.18**, nor has L6179, a road affected by the substation temporary construction compound.

The L95115 is not to be used as a construction traffic delivery route so there is no negative effect for receptors on this road.

For R750, traffic is predicted to increase from 399 vehicles (7 HGVs) AAWT to 573 vehicles (63 HGVs) AAWT. For L6179, traffic is predicted to increase from 885 vehicles (92 HGVs) AAWT to 1121 vehicles (148 HGVs) AAWT.

It is considered that the change in light vehicles is unlikely to noticeably alter the ambient noise environment; however, noise may be affected by the increase in HGVs.

For a 12-hour working day (07:00 – 19:00) the increase in HGVs would be equivalent to approximately five movements per hour.

Five movements an hour may result in a negative effect; however, due to the frequency and duration of a HGV movement affecting a receptor, this is not considered to be significant.

Table 11.18 Construction Traffic Noise Assessment

Compound	Location	2023 BNL Baseline BNL $L_{A10,18h}$ dB	2023 BNL Baseline and Construction BNL $L_{A10,18h}$ dB	Difference, dB	Magnitude of Impact
Substation Compound	R772	68.2	68.4	+0.2	Very Low
	Beech Road North	63.6	64.0	+0.4	Very Low
	Beech Road South	63.6	63.8	+0.2	Very Low

11.5.5 Operation Phase

Predicted noise levels at receptor R1 to R6 are presented in **Table 11.19**. As receptor R1 is not a residential receptor, only daytime periods have been considered. Daytime, evening and night periods have been considered at receptors R2 to R6.

A +5dB penalty has been applied to account for potential tonal features, as the transformer's low frequency tonal noise components are the most likely source of annoyance to nearby residents from substation noise. This, in the context of BS4142, is a conservative feature correction as it would imply that tonality was at least “clearly perceptible”. The predicted levels have been compared to the NG4 criteria as well as the pre-existing background noise levels representative of each receptor.

Table 11.19 Operational assessment – substation noise

Location	Background level $L_{A90,15min}$, dB	Predicted substation operational noise, dB			Exceeds NG4? (Day: 55 dB $L_{Ar,T}$ / Evening: 50 dB $L_{Ar,T}$ / Night: 45 dB $L_{Aeq,T}$)	Excess of rating level over background level (BS4142)
		Specific level dB $L_{Aeq,Tr}$	BS4142 correction dB	Rating level dB $L_{Ar,Tr}$		
R1 day	44	43	5	48	No	+4
R2 day	42	35	5	40	No	-2
R2 evening	39	35	5	40	No	+1

Location	Background level $L_{A90,15min}$, dB	Predicted substation operational noise, dB			Exceeds NG4? (Day: 55 dB $L_{Ar,T}$ / Evening: 50 dB $L_{Ar,T}$ / Night: 45 dB $L_{Aeq,T}$)	Excess of rating level over background level (BS4142)
		Specific level dB $L_{Aeq,Tr}$	BS4142 correction dB	Rating level dB $L_{Ar,Tr}$		
R2 night	29	37	5	42	No	+13
R3 day	42	35	5	40	No	-2
R3 evening	39	35	5	40	No	+1
R3 night	29	37	5	42	No	+13
R4 day	58	32	5	37	No	-21
R4 evening	56	32	5	37	No	-19
R4 night	42	32	5	37	No	-5
R5 day	36	32	5	37	No	+1
R5 evening	36	32	5	37	No	+1
R5 night	31	34	5	39	No	+8
R6 day	36	33	5	38	No	+2
R6 evening	36	33	5	38	No	+2
R6 night	31	34	5	39	No	+8

The operational noise predictions above show that noise levels at all nearby sensitive receptors are below the NG4 criteria.

The BS4142 assessment shows that there are some cases where the rating level is higher than the pre-existing background noise level, notably during night-time at R2, R3, R5 and R6 and therefore may lead to an adverse impact on the residential receptors identified. At these locations, the background noise levels are low (29 – 31 dB L_{A90}). BS 4142 states that *'Where background sound levels and rating levels are low, absolute levels might be as, or more relevant than the margin by which the rating level exceeds the background. This is especially true at night.'* In the context of the low background noise levels (29 – 31 dB L_{A90}), low ambient noise levels (40 – 44 dB $L_{Aeq,8h}$), and low predicted operational noise levels (37 – 42 dB $L_{Ar,Tr}$), the negative effect is not considered to be significant.

Operational substation noise is a permanent and long-term duration effect and is identified as a negative effect that is not significant.

11.6 Cumulative Effects

Cumulative noise effects at noise-sensitive receptors may occur during the overlapping and interaction of construction and operation phases of nearby schemes.

It is expected that each individual scheme is required to minimise negative/significant effects on surrounding sensitive receptors, however where a sensitive receptor is subject to noise from multiple schemes then there is the potential that the cumulative effect of these developments together, might be more significant in terms of effect or duration of effect.

A tiered approach to the cumulative assessment has been adopted to provide an assessment of the ABWP Phase 2 Project as a whole and cumulatively with other projects. Further information on cumulative schemes is presented in **Chapter 21** *Summary of Cumulative Effects.*

The main common traffic routes for the Tier 1 and 2 schemes and the proposed development is the M11 which is also one of the dominant sound sources in the local area. It is not expected that the interaction of cumulative traffic, during either the construction or operational phases of these schemes together with the proposed development, would be sufficient to result in significant increases in road traffic noise levels along these roads (a +3dB change would require an overall doubling in existing road traffic flows). Therefore, it is considered there will be no cumulative traffic noise effects greater than the residual effects identified for the either of the Tier 1 and 2 schemes.

11.6.1 Cumulative Effects During Construction

Tier 1 Cumulative Schemes

The following Tier 1 schemes have been scoped into the assessment of cumulative construction noise and vibration effects:

- ABWP Phase 2 Operations and Maintenance Facility;
- ABWP Phase 2 Offshore Infrastructure;
- EirGrid Grid Upgrade Works; and
- Irish Water Upgrade Works.

The ABWP Phase 2 Operations and Maintenance Facility (OMF) is approximately 2.5 km from the nearest receptor considered in the assessment of the proposed development. Noise and vibration emissions from the ABWP Phase 2 OMF at a distance of 2.5 km are unlikely to result in a negative effect at receptors near to the proposed development. Consequently, the ABWP Phase 2 OMF is not considered to cause any cumulative construction noise or vibration effects greater than the residual construction noise and vibration effects identified for the proposed development.

The ABWP Phase 2 Offshore Infrastructure will be located approximately 6 to 13 km from the shore. There is likely to be overlap with the construction programmes for this scheme and the proposed development such that there will be interactive construction noise effects at common receptors, in particular during night-time offshore piling and onshore HDD activities affecting residential properties near to the landfall site at Johnstown (represented by receptor R12).

The ABWP Phase 2 Offshore Infrastructure estimates downwind noise levels of up to 45 dB $L_{Aeq, 8\ hour}$ at receptor R12 during night-time offshore piling operations. Night-time construction noise levels during onshore landfall HDD works are estimated to be up to 35 dB L_{Aeq} (**Table 11.10**). Combined noise levels of onshore HDD works and offshore piling taking place at the same time is therefore 45 dB L_{Aeq} at R12. Cumulative noise levels are equal to but do not exceed the night-time ambient noise level at R12 or the night-time noise threshold for construction works, and therefore are also below the evening and daytime thresholds. Under upwind conditions the noise from offshore piling will be up to 10 dB lower and under crosswind conditions up 5 dB lower. Measurements have shown that upwind and crosswind conditions usually occur more than 90% of the time. There will be no negative cumulative effect from these activities.

Daytime construction noise levels for the ABWP Phase 2 Offshore Infrastructure are constrained to a limit of 65 dB $L_{Aeq, 8\ hour}$. Daytime construction noise levels at R12 during sheet piling works at the landfall at Johnstown North are estimated to be up to 48 dB L_{Aeq} (**Table 11.9**). Should offshore piling noise levels of up to 65 dB L_{Aeq} be experienced at R12, the addition of onshore piling noise would not result in any additive effect to this limit. There will be no negative cumulative effect from these activities.

Cable installation for the ABWP Phase 2 Offshore Infrastructure scheme will not be taking place cumulatively with either the proposed development piling or HDD activities so there will be no cumulative impact during these activities.

The EirGrid Grid Upgrade Works will install 220kV overhead lines on existing pylons. In addition, there may be the need for an additional tower so the 220kV circuit can bypass the Arklow 220kV substation. Construction works required for the EirGrid Grid Upgrade Works that will occur in proximity to the proposed development will not involve significant noise sources due to the nature of the work (stringing of overhead lines). Consequently, EirGrid Upgrade works are not considered to cause any cumulative construction noise or vibration effects greater than the residual construction noise and vibration effects identified for the proposed development.

The new substation at Ballybeg associated with the EirGrid Grid Upgrade Works is located approximately 20 km to the north of Arklow, so there will be no cumulative impact.

The small-scale construction works required for the Irish Water watermain upgrade will not involve significant noise and vibration effects due to the nature of the work. Therefore, it is not expected that the Irish Water upgrade works will cause any significant cumulative noise or vibration effects in combination with the proposed development during the construction phase.

Tier 2 Cumulative Schemes

Tier 2 projects have been screened assuming that negative noise and vibration effects are unlikely if cumulative project sites are at least 200m from sensitive receptors. The following cumulative projects have been scoped into the assessment of cumulative construction noise and vibration effects:

- Flood Defence Embankment Works in the Avoca River Business Park;
- BNRG Solar Farm Johnstown;
- Crag Digital Avoca Ltd Data Centre;
- Rappel Enterprises Industrial Unit; and
- Harmony Timber Solutions Office and Factory.

Cumulative construction noise and vibration effects on receptors identified in the proposed development assessment may result in the event that construction works take place simultaneously at both the proposed development and the cumulative projects listed above. The potential cumulative effect is dependent on the location of the receptor relative to the site and other cumulative projects considered which are under construction. The precise scale of additional noise effects will be dependent on the exact works taking place at each location at any one time.

There will be possible maintenance and repair works to the existing flood embankment around the Avoca River Business Park as part of a regular inspection, maintenance and repair programme, to manage residual risk of flooding from a potential breach of the embankment.The nature and extent of these maintenance and repair works will be confirmed by further investigation, but if required, these works will be undertaken in advance of the proposed development substation construction, with ongoing maintenance and repair thereafter (during the operation of the proposed development). The construction duration will not overlap with the construction of the proposed development, so there will be no cumulative effect.

The BNRG Solar Farm Johnstown development is due to be constructed between 2021 and 2024. The development is closest to receptor R12. Construction works for the BNRG Solar Farm Johnstown development close to residential dwellings are predicted to have a negative effect but will only occur at close distances for a short duration (up to a week) and therefore will not have a significant effect. Consequently, it is considered that cumulative effects due to construction noise and vibration are unlikely to be greater than the residual construction noise and vibration effects identified for the proposed development.

The Crag Digital Avoca Ltd Data Centre will be part of Avoca River Business Park so cumulative construction effects may affect R1 receptors that are also located in the Avoca River Business Park. The EIAR noise chapter prepared for the permitted scheme concludes that construction phase noise and vibration will result in no significant effects on nearby sensitive receptors. The use of the mitigation measures detailed within the noise chapter and those proposed for the proposed development would reduce any cumulative effects as far is reasonably practicable. Consequently, it is considered that cumulative effects due to construction noise and vibration are unlikely to be greater than the residual construction noise and vibration effects identified for the proposed development.

Rappel Enterprises Industrial Unit project is proposed to have a building located between the onshore 220kV substation site and receptor R2, approximately 150m away from R2. Due to likely construction activities, noise is unlikely to be an issue from this scheme.

Consequently, it is considered that cumulative effects due to construction noise are unlikely to be greater than the residual construction noise and vibration effects identified for the proposed development.

The Harmony Timber Solutions Office and Factory is located to the southwest of the onshore 220kV substation site and in close proximity to receptor R6. As R6 is approximately 600m from the onshore 220kV substation site, it is considered to be sufficiently separated such that negative effects due to construction works are unlikely. As such, negative cumulative construction noise and vibration effects due to the Harmony Timber Solutions Office and Factory are unlikely.

11.6.2 Cumulative Effects During Operation

Cumulative projects have been screened assuming that negative noise effects are unlikely if cumulative project sites are at least 1 km from sensitive receptors R1-R6. The conservative screening distance of 1 km has been chosen to account for the potential for low frequency noise from other schemes generated by fixed plant travelling long distances.

Tier 1 Cumulative Projects

The EirGrid Grid Upgrade Works has been screened into the cumulative operational noise assessment. The only operational noise from the EirGrid Grid Upgrade Works will be an intensification of noise from overhead lines, and this is unlikely to change the character or magnitude of noise in the area. Therefore, the EirGrid Grid Upgrade Works is unlikely to result in any cumulative effect to the operational noise at selected receptors of the proposed development.

There will be no operational noise associated with the Irish Water upgrade works, therefore there is no cumulative operational noise and vibration effects expected in combination with the proposed development.

Tier 2 Cumulative Projects

The following developments have been screened into the cumulative operational noise assessment:

- Rappel Enterprises Industrial Unit (ref. 138823);
- Harmony Timber Solutions Office and Factory (ref. 1954);
- Crag Digital Avoca Ltd Data Centre (ref. 18940 – permitted);
- Crag Digital Avoca Ltd Data Centre – amended application (ref. 201285 – permitted); and
- 110kV GIS Substation – Crag Digital (ref. PL27.307256 pending approval).

Noise modelling has been undertaken to assess cumulative effects of the two Crag Digital Avoca Ltd Data Centre projects as discussed in **Section 11.2.3**. The other cumulative projects are assessed qualitatively based on information provided in their relevant planning applications.

Rappel Enterprises Industrial Unit project is proposed to have a building located between the onshore 220kV substation site and receptor R2, approximately 150m away from R2. Due to likely operational activities (light industry), noise is unlikely to be an issue from this scheme. Consequently, it is considered that cumulative effects due to operational noise are unlikely to be greater than the residual operational effects identified for the proposed development.

Harmony Timber Solutions Office and Factory development is proposed to be located approximately 200m away from R6. Due to likely operational activities (timber frame assembly), noise is unlikely to be an issue from this scheme. Consequently, it is considered that cumulative effects due to operational noise are unlikely to be greater than the residual operational effects identified for the proposed development.

The 110kV GIS Substation – Crag Digital project is not currently permitted and is pending approval. A new 110kV GIS Substation has been included in the modelling and cumulative assessment as part of the Crag Digital Avoca Ltd Data Centre (ref. 18940), detailed below. The standalone planning application for an alternative location for this 110kV GIS substation is for a location to the west of what is assessed in this model and this alternate location will not notably change noise levels experienced at noise receptors. Consequently, it is considered that cumulative effects due to operational noise will not be greater than the residual operational effects identified for the proposed development.

Crag Digital Avoca Ltd Data Centre (ref. 18940 – permitted)

To address cumulative noise effects with the Crag Digital Avoca Ltd Data Centre permitted application, noise mitigation is required as part of the onshore 220kV substation detailed design in order to avoid exceeding the NG4 criteria at surrounding receptors. A proposed reduction of 5 dB of the sound power levels for the harmonic filters and the 33kV STATCOM reactors can be achieved by selecting quieter plant than assumed in the assessment (dependant on manufacturer) or if required by the use of integrated noise control design measures such as: enclosures; louvres; sound shields, reactor top hats, dynamic vibration absorbers; or active noise cancelling.

Predicted cumulative noise levels at receptors R1 to R6 due to the proposed development in combination with the Crag Digital Avoca Ltd Data Centre, with additional noise reduction to the harmonic filters and the 33kV STATCOM reactors, are presented in **Table 11.20**.

Table 11.20 Cumulative Operational Assessment – Onshore 220kV Substation + Data Centre

Location	Background level $L_{A90,15min}$, dB	Predicted cumulative operational noise rating level $L_{Ar,Tr}$, dB			Exceeds NG4? (Day: 55 dB $L_{Ar,T}$ / Evening: 50 dB $L_{Ar,T}$ / Night: 45 dB $L_{Aeq,T}$)	Excess of rating level over background level (BS4142)
		Substation (with additional mitigation)	Data Centre	Cumulative		
R1 day	44	44	52	53	No	+9
R2 day	42	36	42	43	No	+1

Location	Background level $L_{A90,15min}$, dB	Predicted cumulative operational noise rating level $L_{Ar,Tr}$, dB			Exceeds NG4? (Day: 55 dB $L_{Ar,T}$ / Evening: 50 dB $L_{Ar,T}$ / Night: 45 dB $L_{Aeq,T}$)	Excess of rating level over background level (BS4142)
		Substation (with additional mitigation)	Data Centre	Cumulative		
R2 evening	39	36	42	43	No	+4
R2 night	29	38	43	44	No	+15
R3 day	42	36	41	42	No	0
R3 evening	39	36	41	42	No	+3
R3 night	29	38	42	43	No	+14
R4 day	58	33	41	42	No	-16
R4 evening	56	33	41	42	No	-14
R4 night	42	33	41	42	No	0
R5 day	36	33	43	43	No	+7
R5 evening	36	33	43	43	No	+7
R5 night	31	35	45	45	No	+14
R6 day	36	34	43	44	No	+8
R6 evening	36	34	43	44	No	+8
R6 night	31	35	44	45	No	+14

It can be seen from the results in **Table 11.20** that the predicted noise levels at receptors from the onshore 220kV substation are lower than the predicted noise levels from the Crag Digital Avoca Ltd Data Centre.

The BS4142 assessment shows that there are some cases where the cumulative levels are higher than the pre-existing background noise level, notably during night-time at R2 (+15 dB), R3 (+14 dB), R5 (+14 dB) and R6 (+14 dB) and, therefore, may lead to an adverse impact at these receptors. Consequently, cumulative operational noise from the onshore 220kV substation and the Crag Digital Avoca Ltd Data Centre is predicted to cause a negative effect at R2, R3, R5 and R6. As outlined in the operational assessment, given the context of low background levels (29 – 31 dB L_{A90}), low ambient noise levels (40 – 44 dB L_{Aeq}), and low predicted operational noise levels (33 – 38 dB $L_{Ar,Tr}$), the negative effect is not considered to be significant.

The cumulative operational noise predictions above show that noise levels are likely to be at or below the NG4 criteria at all receptors during all periods and therefore are unlikely to lead to a significant negative effect.

Crag Digital Avoca Ltd Data Centre – amended application (ref. 201285 – permitted)

Predicted cumulative noise levels at receptors R1 to R6 due to the proposed development in combination with the Crag Digital Avoca Ltd Data Centre are presented in **Table 11.21**.

Table 11.21 Cumulative Operational Assessment – Onshore 220kV Substation + Data Centre amended application

Location	Background level $L_{A90,15min}$, dB	Predicted cumulative operational noise rating level $L_{Ar,Tr}$, dB			Exceeds NG4? (Day: 55 dB $L_{Ar,T}$ / Evening: 50 dB $L_{Ar,T}$ / Night: 45 dB $L_{Aeq,T}$)	Excess of rating level over background level (BS4142)
		Substation	Data Centre	Cumulative		
R1 day	44	48	51	53	No	+9
R2 day	42	40	41	44	No	+2
R2 evening	39	40	41	44	No	+5
R2 night	29	42	42	45	No	+16
R3 day	42	40	38	42	No	0
R3 evening	39	40	38	42	No	+3
R3 night	29	42	38	43	No	+14
R4 day	58	37	40	42	No	-16
R4 evening	56	37	40	42	No	-14
R4 night	42	37	41	42	No	0
R5 day	36	37	37	40	No	+4
R5 evening	36	37	37	40	No	+4
R5 night	31	39	37	41	No	+10
R6 day	36	38	39	42	No	+6
R6 evening	36	38	39	42	No	+6
R6 night	31	39	40	43	No	+12

It can be seen from the results in **Table 11.21** that the predicted cumulative noise levels at receptors are similar to those presented in **Table 11.20**. However, it is noted that the predicted Data Centre night-time noise levels at R2 and R5 are 1 dB lower and 5 dB lower respectively in the amended application and therefore there is no exceedance of the NG4 night-time limit. Consequently, cumulative noise levels due to the Data Centre and the proposed development are not predicted to exceed NG4 criteria.

The BS4142 assessment shows that there are some cases where the cumulative level is up to 12-16 dB higher than the pre-existing background noise level, notably during night-time at R2, R3, R5 and R6 and therefore may lead to an adverse impact on the residential receptors identified. Consequently, cumulative operational noise from the onshore 220kV substation and the Crag Digital Avoca Ltd Data Centre is predicted to cause a negative effect at these receptors.

Given the context of low background levels (29 – 31 dB L_{A90}), low ambient noise levels (40 – 44 dB $L_{Aeq,8h}$), and low predicted operational noise levels (37 – 42 dB $L_{Ar,Tr}$), the negative effect is not considered to be significant.

The cumulative operational noise predictions above show that noise levels are likely to be at or below the NG4 criteria at all receptors at all times and therefore are unlikely to lead to a significant negative effect.

11.7 Mitigation Measures and Monitoring

11.7.1 Construction Phase

While no significant effects have been found due to noise and vibration from the construction phase, the below mentioned good industry practice will be employed to minimise, control and manage potential construction noise and vibration impacts at nearby sensitive receptors.

Good Industry Practice

Good industry standards, guidance and practice procedures will be followed in order to minimise noise and vibration effects during construction and are documented within the CEMP (**Appendix 6.1 of Volume 3**). The following provisions, although not exhaustive, will be adhered to where practicable throughout the construction programme:

- Vehicles and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, maintained in good and efficient working order, and operated in such a manner as to minimise noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements;
- Machines in intermittent use will be shut down or throttled down to a minimum when not in use;
- Compressors will be fitted with properly lined and sealed acoustic covers which will be kept closed whenever in use. Pneumatic percussive tools will be fitted with mufflers or silencers;
- Equipment which breaks concrete, brickwork or masonry by bending, bursting or “nibbling” will be used in preference to percussive tools. Where possible, the use of impact tools will be avoided where the site is close to occupied premises;
- Rotary drills and bursters activated by hydraulic, chemical, or electrical power will be used for excavating hard or extrusive material;

- Wherever possible, equipment powered by mains electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity;
- No part of the works nor any maintenance of plant will be carried out in such a manner as to cause unnecessary noise except in the case of an emergency when the work is absolutely necessary for the saving of life or property or the safety of the works;
- Plant will be maintained in good working order so that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum; and
- Noise emitting machinery which is required to run continuously will be housed in a suitable acoustically lined enclosure.

Communications

The effect of noise and vibration on nearby sensitive receptors can be minimised through a good communication strategy. This is particularly relevant to night-time activities, which have the potential to disturb occupants of nearby properties.

Sometimes a greater noise level may be acceptable if the duration of the construction activity, and therefore length of disruption, is reduced. A good communication strategy may allow a preferred drilling methodology to be determined through residents' preferences for either increased noise levels but for limited duration, or controlled noise for longer durations.

Prior to construction works being undertaken, liaison will be undertaken with occupiers of properties that may be adversely affected by construction noise and vibration. Providing information on the timing and durations of construction works at night and why they are required to be undertaken at night can reduce adverse effects. All communications will contain contact details to direct any questions or complaints to. A Community Liaison Plan is provided in the CEMP (**Appendix 6.1 of Volume 3**).

Noise and Vibration Monitoring

Monitoring of noise and vibration levels at the construction site boundary will be undertaken to identify where work procedures need to be modified. In the event of a valid complaint a noise monitoring protocol will be submitted to Wicklow County Council prior to commencement of any noise monitoring. The protocol will include details of:

- A description of the complaint;
- Construction activities taking place at the time of the complaint;
- Noise monitoring methodology and results; and
- Any actions taken.

11.7.2 Operation Phase

No significant effects have been found due to noise from the operational phase of the proposed development and therefore no additional mitigation or specific plant noise control measures are required.

To address cumulative noise effects with the Crag Digital Avoca Ltd Data Centre permitted application (ref. 18940), noise mitigation is required as part of the onshore 220kV substation. A proposed reduction of sound power levels for the harmonic filters and the 33kV STATCOM reactors (e.g. selection of quieter plant; enclosures; louvres; sound shields, reactor top hats; dynamic vibration absorbers; or active noise cancelling) will be employed by the manufacturer as part of the onshore 220kV substation detailed design so as to avoid cumulative noise levels exceeding the NG4 criteria at surrounding receptors.

Noise generated from the operational substation site will be periodically reviewed. This will include the following:

- Examination of noise sources on site;
- Examination of noise propagation factors;
- Operational noise monitoring; and
- Review of any complaints.

It is proposed that operational noise emissions due to the proposed development are subject to a planning condition that covers the most onerous cumulative assessment. This is the assessment of the proposed development with the permitted application for the Crag Digital Avoca Ltd Data Centre at Shelton Abbey (**ref. 18940**). As the predicted noise levels in **Table 11.20** (the cumulative assessment with required mitigation to meet NG4 guidance) do not exceed 38 dB $L_{Ar,Tr}$ at surrounding residential properties, suggested wording for the planning condition is provided as follows:

- *"The rated noise level due to the Proposed Development, shall not exceed 38 dB $L_{Ar,Tr}$ at any existing residential Noise Sensitive Locations (NSL)."*

11.8 Residual Effects

11.8.1 Construction Phase

Temporary negative effects due to construction noise have been identified at the closest receptors to landfall works, cabling works and substation works. Construction noise levels will not result in any negative effects for receptors at distances greater than 750m from the works.

Temporary negative effects due to construction vibration have been identified at closest receptors to cabling works. Construction vibration levels will not result in any negative effects for receptors at distances greater than 50m from the works.

No significant residual effects due to construction noise and vibration are predicted.

11.8.2 Operation Phase

A long-term negative, but not significant, residual effect has been identified at nearby receptors R2, R3, R5 and R6 due to the operational substation.

11.8.3 Cumulative effect

Cumulative Construction Effects

The potential for cumulative construction noise and vibration effects due to projects in the area has been considered. Due to the distance between the proposed development sites and identified tier 1 and tier 2 projects, it has been identified that significant cumulative construction noise and vibration effects are unlikely.

Cumulative Operational Effects

The potential for cumulative operational noise effects due to projects in the area has been considered. Cumulative operational noise due to the interaction of the onshore 220kV substation with the Crag Digital Avoca Ltd Data Centre (ref. 18940 – permitted and ref. 201285 – amended) is unlikely to lead to a significant negative effect.

11.9 References

British Standards Institute (BSI) (2003) *British Standard 7445-1:2003 'Description and environment of environmental noise – Part 1'*

British Standards Institute (BSI (2019) *British Standard 4142:2014 + A1:2019 'Method for Rating Industrial Sound Affecting Mixed Residential and Industrial Areas'*

British Standards Institute (BSI (2014) *British Standard 5228:2009 + A1:2014 'Code of practice for noise and vibration control on construction and open sites. Noise'*

Department of Transport/Welsh Office (1988) *'Calculation of Road Traffic Noise'*

Environmental Protection Agency Office of Environmental Enforcement (OEE) (2016) *'Guidance Note for Noise: Licence Applications, Survey and Assessments in Relation to Scheduled Activities (NG4)'*

Government of Ireland (2018) *The National Planning Framework 2040*

Institute of Environmental Management & Assessment (2014) *Guidelines for environmental noise impact assessment*

Transport Research Laboratory (2000) *Report 429 'Groundborne Vibration Caused by Mechanised Construction Works'*