



Pinewoods Wind Farm Substation & Grid Connection

Chapter 11: Noise & Vibration

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11.1 Introduction

11.1.1 Background and Objectives

This chapter describes the assessment undertaken of the likely noise and vibration effects arising from the proposed Pinewoods Wind Farm Substation and Grid Connection. A full description of the proposed development is provided in **Chapter 3** of this EIAR.

11.1.2 Statement of Authority

This chapter has been prepared by Mike Simms BE MEngSc MIOA MIET, Senior Acoustic Consultant at AWN Consulting Ltd. Mike has worked in the field of acoustics for over 19 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, wind energy, industrial, commercial and residential.

The baseline noise monitoring was undertaken by Cormac McPhillips, Project Technician at Galetech Energy Services (GES). Cormac has extensive experience of undertaking noise monitoring programmes in accordance with relevant standards and best practice methods.

11.2 Methodology

11.2.1 Proposed Approach

The following methodology has been adopted for this assessment:-

- Review appropriate guidance in order to identify appropriate noise and vibration criteria for the site operations;
- Carry out baseline noise monitoring at a location representative of nearest sensitive properties to identify existing levels of noise in the vicinity; and,
- Comment on predicted noise levels against the appropriate construction and operational phase criteria and outline required mitigation measures (if any).

Annex 11.1 (Volume II) presents a glossary of the acoustic terminology used throughout this document. In the first instance it is considered appropriate to review some fundamentals of acoustics.

11.2.2 Fundamentals of Acoustics

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. To take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0dB (for the threshold of hearing) to 120dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3 dB.

The frequency of sound, which is the rate at which a sound wave oscillates, is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as

frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level must be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. The 'A-weighting' system, defined in the international standard BS ISO 226:2003 Acoustics - Normal Equal-loudness Level Contours, has been found to provide the best correlations with human response to perceived loudness. SPLs measured using 'A-weighting' are expressed in terms of dB(A).

An indication of the level of some common sounds on the dB(A) scale is presented in **Figure 11.1** and shows a quiet bedroom at around 35 dB(A), a nearby (at 7m) noisy HGV at 90 dB(A) and a pneumatic drill (at 7m) at about 100 dB(A).

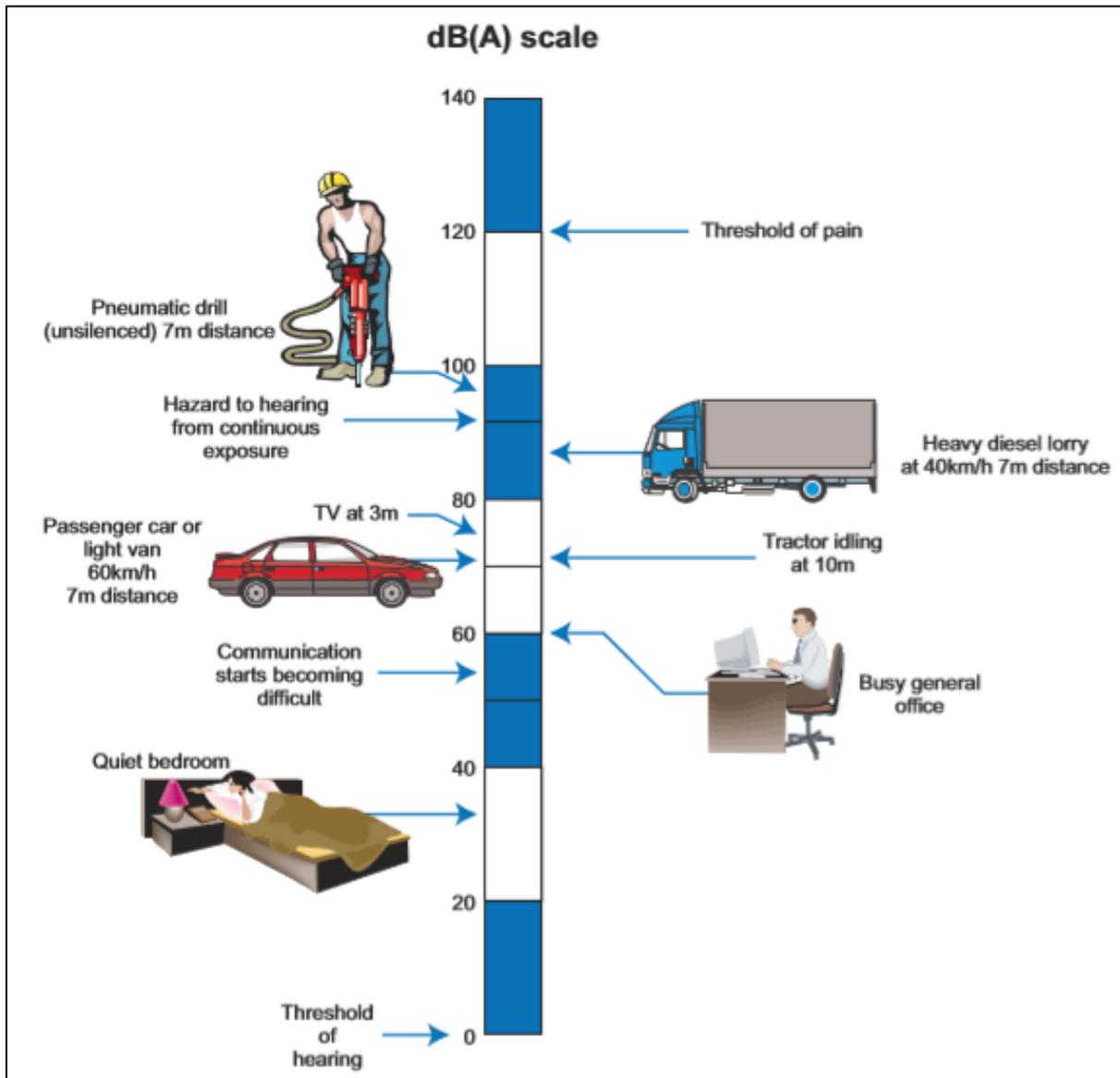


Figure 11.1: The level of typical common sounds on the dB(A) scale (NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004)

11.3 Guidance Documents and Assessment Criteria

The following sections review best practice guidance that is commonly adopted in relation to developments such as the subject proposed development.

11.3.1 Construction Phase

11.3.1.1 Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and may consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded (construction noise only), may indicate that a significant noise impact is associated with the construction activities.

Table 11.1 sets out the values which, when exceeded, may signify a significant effect at the facades of residential receptors as recommended by *BS 5228 – 1*. These levels relate to construction noise only.

Assessment category and threshold value period (T)	Threshold values, $L_{Aeq,T}$ dB		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends ^{Note D}	55	60	65
Daytime (07:00 – 19:00hrs) and Saturdays (07:00 – 13:00hrs)	65	70	75

Table 11.1: Example Threshold of Significant Effects at Dwellings

Note A Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

Note B Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

Note C Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

Note D 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

The following assessment method is only valid for residential properties.

For the appropriate period (e.g. daytime), the ambient noise level is determined and rounded to the nearest 5 dB. In this instance, given the rural nature of the site, properties near the proposed development have daytime ambient noise levels that typically range from 45 to 55 dB $L_{Aeq,1hr}$. Therefore, all properties will be afforded a Category A designation.

If the specific construction noise level exceeds the appropriate category value (i.e. 65 dB $L_{Aeq,T}$ during daytime periods) then a significant effect is assessed as likely to have occurred.

11.3.1.2 Vibration

Vibration standards come in two varieties; those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. With respect to the

proposed development, the range of relevant criteria used for building protection is expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:-

- *British Standard BS 7385 – Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration (1993); and*
- *British Standard BS 5228 – Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (2009+A1:2014).*

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical or sensitive buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 15 mm/s for transient vibration at frequencies below 15 Hz and 20 mm/s at frequencies greater than 15 Hz.

Transport Infrastructure Ireland (TII) (formerly National Roads Authority (NRA)) document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (NRA, 2004) also contains information on the permissible construction vibration levels during the construction phase, as shown in **Table 11.2**.

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Table 11.2: Allowable Transient Vibration at Properties

11.3.2 Operational Phase

11.3.2.1 Noise

Laois City Council Guidance

Laois County Council Noise Action Plan 2019-2022 gives general advice in relation to environmental noise, although it does not provide specific noise criteria or limits for individual developments. Relevant extracts from the Noise Action Plan are reproduced below:-

“It is the policy of the Council to:

ES12 Require an assessment of impact of the developments on noise levels, having regard to the provisions of the Environmental Protection Agency (EPA) Acts 1992 and 2003 and the EPA Noise Regulations 1994 when assessing planning applications;

ES13 Ensure that relevant planning applications comply with the provisions of any Noise Action Plan or noise maps relating to the area;

ES14 Restrict development proposals causing noise pollution in excess of best practice standards;

ES15 Regulate and control activities likely to give rise to excessive noise, other than those activities which are regulated by the EPA;

ES16 Ensure new development does not cause an unacceptable increase in noise levels affecting noise sensitive properties. Proposals for new development with the potential to create excessive noise will be required to submit a construction and/or operation management plan to control such emissions;

ES17 Require activities likely to give rise to excessive noise to install noise mitigation measures and monitors. The provision of a noise audit may be required where appropriate."

As such, specific guidance on appropriate noise limits in relation to infrastructural developments (such as the proposed development) are not provided in the Noise Action Plan. In the absence of specific local guidance, reference is made to other recognised methodologies for the rating and assessment of environmental noise.

Other Guidance

British Standard BS 8233:2014 provides guideline values for internal noise levels within residential dwellings. The following guideline values for indoor noise levels are presented in the standard:-

Activity	Location	Daytime	Night-time
Resting	Living room	35 dB LAeq, 16hour	-
Dining	Dining room/area	40 dB LAeq, 16hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16hour	30 dB LAeq, 8hour

Table 11.3: BS 8233 Indoor Noise Levels

Notes Daytime assessment period – 07:00 to 23:00hrs
Night-time assessment period – 23:00 to 07:00hrs

The BS 8233:2014 values are broadly in-line with the values as presented in the WHO Guidelines for Community Noise 1999, which are also presented below:-

Specific Environment	Critical Health Effect(s)	dB LAeq, T	dB LAmax, F
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35 dB LAeq, 16hour	-
Inside bedrooms	Sleep disturbance, night-time	30 dB LAeq, 8hour	45

Table 11.4: WHO Indoor Noise Levels

The 45 dB LA_{Fmax} criterion applies to "single sound events" within bedrooms at night. This guideline is generally interpreted as the value that individual noise events should not normally exceed.

Making reference to the above documents, the following daytime and night-time internal noise criteria are proposed for residential dwellings in the vicinity of operational phase plant items:-

- 35 dB LAeq, 16 hr within living rooms and dining rooms during daytime periods (07:00 to 23:00hrs);
- 30 dB LAeq, 8 hr within bedrooms during the night-time period (23:00 to 07:00hrs), and;
- A value of 45 dB LA_{Fmax} is not normally exceeded in bedrooms at night.

It is appropriate to derive external noise limits based on the internal criteria noted above. This is carried out by factoring in the degree of noise reduction afforded by a partially open window. Annex G in BS 8233:2014 comments that, if partially open windows were relied upon for background ventilation, the noise insulation would be reduced to approximately 15 dB.

Recommended Criteria

Following the evaluation of relevant guidance, the following noise criteria are proposed at the façades of residential properties in the vicinity of the proposed development:-

- Daytime (07:00 to 23:00 hours): 50 dB $L_{Aeq, 16hr}$;
- Night time (23:00 to 07:00 hours): 45 dB $L_{Aeq, 8hr}$; and
- Night time (23:00 to 07:00 hours): 60 dB L_{AFmax} .

It should be noted that equipment and plant noise emissions are designed such that they are not tonal and do not have impulsive characteristics at noise sensitive locations.

11.3.2.2 Additional Vehicular Traffic Activity on Public Roads

Once operational, the proposed development will be visited periodically for maintenance purposes, with a total of 1-2 trips per week. The vehicle used will typically be a light goods vehicle (LGV) or van. The number of vehicles trips is not such that any likely significant additional noise would be generated.

11.3.2.3 Vibration

Reference is made to British Standard BS 6472-1:2008 which provides the following vibration dose value (VDV) ranges which result in various probabilities of adverse comment within residential buildings.

Place and Time	Low probability of adverse comment $m s^{-1.75}$ (Note 1)	Adverse comment possible $m s^{-1.75}$	Adverse comment probable $m s^{-1.75}$ (Note 2)
Residential buildings, 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings, 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Table 11.5: BS 6472 VDV Ranges and associated Probabilities

Note 1 Below these ranges adverse comment is not expected.

Note 2 Above these ranges adverse comment is very likely.

Any vibration emissions from operational phase plant items, while considered highly unlikely, will be designed so as not to exceed the VDV values that result in low probability of adverse comment i.e. $VDV \leq 0.2 m s^{-1.75}$ (daytime) and $\leq 0.1 m s^{-1.75}$ (night-time).

11.3.2.4 EPA Description of Effects

The significance of effects of the proposed development shall be described in accordance with the EPA guidance document *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports Draft, August 2017*. Details of the methodology for describing the significant of the effects are provided in **Chapter 1**.

11.4 Description of the Existing Environment

As outlined above, prior to undertaking noise prediction modelling, it is crucial to understand the typical background noise levels at the nearest NSLs to the development site. The background noise survey was conducted by installing an unattended sound level meter at a location representative of the quiet noise environment of the noise-sensitive receptor locations.

The installation, retrieval and management of all measurement instrumentation detailed in this section has been carried out by GES. GES has confirmed that all measurement data collected during the baseline noise surveys has been carried out in accordance with ISO 1996-2:2007 "Acoustics -- Description, measurement and assessment of environmental noise -- Part 2: Determination of environmental noise levels".

The analysis and assessment of the survey data has been carried out by AWN Consulting.

11.4.1 Noise Measurement Location

The noise measurement location was selected by AWN Consulting. As the proposed electricity substation operates continuously, it is important to capture the quietest daytime and night-time periods, free of influence from noise generated at the noise-sensitive locations themselves, for example by heating systems. The selected noise monitoring location was chosen to reflect the noise environment at the nearest dwelling, located to the east and being a similar distance from the local road. Coordinates for the noise monitoring location are detailed in **Table 11.6**.

Coordinates (ITM)	
Easting	Northing
650377	682450

Table 11.6: Measurement Location Coordinates

Significant noise sources in this area were noted to be distant traffic movements and wind generated noise from local foliage and other typical anthropogenic sources typically found in such rural settings. There was no perceptible source of vibration noted at the survey location.

Figure 11.2 illustrates the installed noise monitoring apparatus. The location of the unattended noise monitor is shown in **Figure 11.3**



Figure 11.2: Noise Measurement Equipment



Figure 11.3: Noise Survey Location

11.4.2 Measurement Period

Noise measurements were conducted over the period outlined in **Table 11.7**

Start Date	End Date
19:40hrs on 19 March 2020	11:30hrs on 27 March 2020

Table 11.7: Measurement Period

Wind speeds were generally low and the lowest background noise levels are selected as the basis for assessment as discussed at **Section 11.4.6**

11.4.3 Personnel and Instrumentation

All noise monitoring apparatus was installed and removed by, with the following instrumentation being used:

Equipment	Serial Number
Svantek 977	46437

Table 11.8: Instrumentation Details

Prior to and after the survey, the measurement apparatus was checked and calibrated using a sound level calibrator where appropriate. Relevant calibration

certificates are presented in **Annex 11.2**.

11.4.4 Procedure

Measurements were conducted at the measurement location outlined in **Table 11.6** and over the time period outlined at **Table 11.7**. Noise levels were logged continuously at 10-minute interval periods for the duration of the survey.

11.4.5 Measurement Parameters

Several parameters were measured in order to interpret the noise levels. These included the following:-

- L_{Aeq} : This is the equivalent continuous A weighted sound pressure level. It is an average of the total sound energy (noise) measured over a specified time period;
- $L_{Aeq,T}$: This is the equivalent continuous sound pressure level over a time interval;
- L_{A90} : Noise level exceeded for 90% of measurement period (steady underlying noise level);
- L_{A10} : Noise level exceeded for 10% of measurement period. It is typically a descriptor of traffic noise;
- L_{Amax} : Maximum A weighted noise level measured; and
- L_{Amin} : Minimum A weighted noise level measured.

The "A" suffix denotes that the sound levels have been "A-weighted" to account for the non-linear nature of human hearing. The "F" suffix denotes that the parameter has been measured with 'Fast' time-weighting applied. All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pascal (pa).

11.4.6 Results of Unattended Noise Survey

On review of the measured data, it is confirmed that the typical noise levels were as follows:-

- Daytime ambient noise levels of between 29 and 48dB $L_{Aeq,T}$;
- Daytime background noise levels of between 23 and 38dB $L_{A90,T}$;
- Night time ambient noise levels of between 31 and 45dB $L_{Aeq,T}$; and
- Night time background noise levels of between 22 and 35dB $L_{A90,T}$.

Date	$L_{Aeq,16hr}$	L_{A90} (Arithmetic Average)
Thu 19 March	29	23
Fri 20 March	38	29
Sat 21 March	38	29
Sun 22 March	37	27
Mon 23 March	41	34
Tue 24 March	48	38
Weds 25 March	39	30
Thu 26 March	40	28
Fri 27 March	38	29

Table 11.9: Daytime Measured Noise Levels

Date	LAeq,8hr	LA90 (Arithmetic Average)
Thu 19 March to Fri 20 March	31	24
Fri 20 March to Sat 21 March	35	27
Sat 21 March to Sun 22 March	38	28
Sun 22 March to Mon 23 March	45	35
Mon 23 March to Tue 24 March	39	32
Tue 24 March to Weds 25 March	36	22
Weds 25 March to Thu 26 March	33	22

Table 11.10: Night-time Measured Noise Levels

11.4.7 Vibration

There are no significant sources of vibration present in the receiving environment and, therefore, it is not necessary to measure baseline vibration as part of this assessment.

11.5 Description of Likely Effects

11.5.1 Do Nothing Scenario

If the proposed development is not progressed, the existing noise environment in the vicinity of the subject site and noise sensitive receptors will remain unchanged.

11.5.2 Construction Phase

A variety of items of plant and machinery will be in use for the purposes of site preparation and construction of the proposed development. There will be vehicular movements to and from the site that will make use of existing roads. Due to the nature of these activities, the generation of significant levels of noise is possible.

11.5.2.1 Noise

As per TII guidance, noise levels associated with construction may be calculated in accordance with the methodology set out in BS 5228-1:2009+A1:2014. This standard sets out sound power and sound pressure levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels at selected locations. However, it is often not possible to conduct detailed prediction calculations for the construction phase of a project due to the fact that the noise emission levels for the assumed plant items are indicative, the programme for construction works has not been established fully and may change as the project develops (i.e. in the event that the construction contractor identifies alternative working methods or procedures). Noise predictions are therefore presented in outline form to highlight typical expected noise levels at noise sensitive receivers and to discuss the typical noise mitigation measures that can be utilised to reduce effects as far as is reasonably practicable.

The anticipated construction hours are 08:00 to 20:00hrs Monday to Friday and 08:00 to 18:00hrs on Saturday.

Table 11.1 of **Section 11.3.1.1** identifies appropriate construction noise criteria for the proposed development site. With reference to the measured noise levels at the nearest NSL's discussed in **Section 11.4.6**, ambient noise levels were in the range of 29 and 48dB LAeq,T. In accordance with the relevant criteria, if the specific

construction noise level exceeds the appropriate category threshold value of 65dB $L_{Aeq,T}$ during daytime periods then a significant effect is deemed to occur.

Several noise sources that would be expected on a construction site of this nature have been identified and predictions of the likely noise emissions calculated at the closest sensitive receptor. In this scenario, the closest sensitive receptor is located approximately 100m east of the proposed development.

Table 11.11 presents outline noise calculations, considering the anticipated methods of construction. The calculations assume that plant items are operating for 66% of the time and that there is no acoustic screening (i.e. barriers) in place between the site works and the NSL.

Plant Item (BS 5228 Ref.)	Activity/Notes	Plant Noise level at 10m Distance (dB $L_{Aeq,T}$)	Predicted Noise Level at 100 m (dB $L_{Aeq,T}$)
HGV Movement (C.2.30)	Removing spoil and transporting fill and other materials.	79	56
Tracked Excavator (C.4.64)	Removing soil and rubble in preparation for foundation.	77	54
General Construction (Various)	All general activities plus deliveries of materials and plant	84	61
Mobile Telescopic Crane (C4.64)	Lifting	75	54
Dewatering Pumps (D.7.70)	If required.	80	57
JCB (D.8.13)	For services, drainage and landscaping.	82	59
Vibrating Rollers (D.8.29)	Road surfacing.	77	54
Combined L_{Aeq} from all works			65

Table 11.2 Indicative Noise Calculations for Construction of Substation

The predicted noise levels at the nearest dwelling are just within the criterion of 65dB $L_{Aeq,T}$. Following a similar method of calculation the next nearest dwellings, at 180m and 390m southwest of the proposed development, are predicted to experience noise levels of 62dB $L_{Aeq,T}$ and 55dB $L_{Aeq,T}$ respectively.

With respect to guidance for the description of effects, the likely worst-case effect at the nearest NSL is assessed to be negative, temporary and not significant.

11.5.2.2 Vibration

While there are some activities proposed to be undertaken during the construction phase which will result in the generation of vibration effects (e.g. compaction of access track aggregates), due to the localised nature of these works and the distance to nearby receptors, there are no vibration effects anticipated at sensitive locations during the construction phase. Notwithstanding the above, all construction activities undertaken on the site will be required to operate below the

recommended vibration criteria set out in **Table 11.2**.

11.5.3 Operational Phase

11.5.3.1 Noise

The following extract from the *EirGrid Evidence Based Environmental Studies Study 8: Noise – Literature review and evidence-based field study on the noise effects of high voltage transmission development* (May 2016) states the following in relation to noise effects associated with 110kV substation installations:-

“The survey on the 110kV substation at Dunfirth indicated that measured noise levels (LAeq) were less than 40dB(A) at 5m from each of the boundaries of the substation. This is below the WHO night-time free-field threshold limit of 42dB for preventing effects on sleep and well below the WHO daytime threshold limits for serious and moderate annoyance in outdoor living areas (i.e. 55dB and 50dB respectively). Spectral analysis of the data recorded at this site demonstrated that there were no distinct tonal elements to the recorded noise level. To avoid any noise impacts from 110kV substations at sensitive receptors, it is recommended that a minimum distance of 5m is maintained between 110kV substations and the land boundary of any noise sensitive property.”

The proposed development has comparable noise emissions to the 110kV unit discussed above and considering the distance between the proposed development and the nearest noise sensitive location (i.e. 100m), noise from the proposed substation is not assessed as likely to result in significant adverse noise effects. It is predicted, therefore, that the expected noise levels experienced at the nearest dwelling will be less than 25dBA.

It is concluded, therefore, that there will be no significant noise emissions from the operation of the proposed development.

With respect to the EPA's guidance for description of effects, likely effects at the nearest NSL as a result of the operation of the proposed development are assessed to be negative, not significant and long term.

11.5.4 Decommissioning Phase

As set out at **Chapter 3 (Sections 3.2 and 3.8)**, the proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, decommissioning phase effects will not occur.

11.5.5 Cumulative Effects

This assessment has considered the likely cumulative effects for the construction, operational and decommissioning phases of the proposed development in combination with the permitted Pinewoods Wind Farm. Following a detailed evaluation, it is considered that there are no other existing, permitted or proposed developments in the local area capable of contributing to cumulative noise or vibration effects. Other developments have been discounted from further assessment due to their specific type or nature or due to the separation distances involved.

Construction Phase

It is anticipated that the proposed development will be constructed concurrently with the permitted Pinewoods Wind Farm. With reference to the predicted noise levels associated with the construction of the proposed development outlined in **Section 11.5.2.1**. (i.e. 65 dB LAeq at the nearest NSL), given the similarities between the

plant and machinery to be used in the construction of the proposed and permitted developments and the increased separation distance between receptors and Pinewoods Wind Farm construction activities, there is no likelihood of the total construction noise level increasing.

Therefore, should construction of the proposed development occur simultaneously with the construction of the Pinewoods Wind Farm, it is assessed that there will be no cumulative effects that would give rise to significant effects at the nearest NSL's.

Operational Phase

Once the proposed development is completed, the likelihood of noise effects in the surrounding environment is not significant. The operation of the proposed development is not expected to generate any noise over or above the existing background noise environment at the nearest NSL.

The local environment has been re-evaluated to assess for any alterations to baseline conditions since the preparation of the Pinewoods Wind Farm EIAR/EIS (see **Chapter 10, Volume III**). The evaluation confirms that no significant noise-generating developments have been introduced to the local environment which could alter the findings and conclusions of the EIAR/EIS previously prepared or which could conflict with the EIA undertaken by An Bord Pleanála or the conclusions reached therein.

The evaluation of the existing baseline environment also indicates that 3 no. dwellings have been permitted (and/or constructed) since the preparation of the EIAR/EIS. To fully evaluate the likelihood of significant noise effects resulting from the entire development, it has been considered prudent to re-assess predicted noise levels at all existing, permitted and proposed dwellings within 1,030m of a permitted wind turbine.

Table 11.12 presents the predicted noise levels at all dwellings based on the results of the assessment undertaken in respect of the then-proposed, and now permitted, Pinewoods Wind Farm (see **Chapter 10, Volume III**) (totalling 33 no. dwellings) and also presents a full evaluation of all 36 no. dwellings currently located within 1,030m of a permitted wind turbine (see **Annex 11.3, Volume II**).

Dwelling ID	Predicted Noise Levels (dB(A) L ₉₀)		
	2016 EIAR/EIS Predictions	2020 EIAR Predictions	Difference (+/-)
H001	36.5	36.5	0.0
H002	37.9	37.9	0.0
H003	38.7	38.7	0.0
H004	40.5	40.5	0.0
H005	38.7	38.7	0.0
H006	39.8	39.8	0.0
H007	39.2	39.2	0.0
H008	39.2	39.2	0.0
H009	39.0	39.0	0.0
H010	40.0	40.0	0.0
H011	38.6	38.6	0.0

H012	39.1	39.1	0.0
H013*	43.5	43.5	0.0
H014*	43.3	43.3	0.0
H015	39.9	39.9	0.0
H016	39.9	39.9	0.0
H017	38.7	38.7	0.0
H018	38.5	38.5	0.0
H019	37.6	37.6	0.0
H020	36.8	36.8	0.0
H021	37.2	37.2	0.0
H022	40.8	40.8	0.0
H023	37.9	37.9	0.0
H024	36.6	36.6	0.0
H025*	38.0	38.0	0.0
H026*	40.2	40.2	0.0
H027*	41.4	41.4	0.0
H028	39.4	39.4	0.0
H029	38.7	38.7	0.0
H030	40.6	40.6	0.0
H031	41.2	41.2	0.0
H032	37.9	37.8	0.0
H033	38.6	38.6	0.0
H034	-	41.4	-
H035	-	43.6	-
H036	-	38.1	-

Table 11.12: Noise Prediction Model Results

**Economically Involved Dwellings/Landowners*

It should be noted that no changes are proposed to the permitted Pinewoods Wind Farm in terms of turbine positions, turbine type, dimensions or sound power levels, i.e. no change to the inputs to the noise model.

In completing the above evaluation, regard has also been had to Condition No. 19 of An Bord Pleanála's Decision Order for the Pinewoods Wind Farm specifying noise limits to which the permitted wind farm must comply. It is noted that H035 exceeds the specified limit of 43db(A), by 0.6dB; however, mitigation measures, which may include the implementation of noise reduced operations, will ensure that the prescribed noise limit will not be exceeded. On the basis of the above assessment and following the implementation of noise mitigation measures where necessary, it can be confirmed that the permitted development remains fully capable of complying with all prescribed noise limits.

Therefore, given the assessments undertaken in the preceding sections, it is

concluded that any cumulative effects with the operational Pinewoods Wind Farm will not be significant.

Decommissioning Phase

As set out at **Chapter 3 (Sections 3.2 and 3.8)**, the proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, cumulative decommissioning phase effects will not occur.

11.6 Mitigation and Monitoring Measures

11.6.1 Construction Phase

Typical construction noise thresholds are not expected to be exceeded and therefore no specific mitigation measures are proposed. Notwithstanding this, the contractors completing the construction works will be required to undertake noise abatement measures where necessary and comply with the recommendations of *BS5228-1:2009+A1:2014*.

It is proposed that various practices will be adopted during construction as required, including the following:-

- Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- Establishing channels of communication between the contractor/developer, local authority and residents;
- Appointing a site representative responsible for matters relating to noise and vibration;
- Monitoring typical levels of noise and vibration during critical periods and at sensitive locations; and
- Keeping site access tracks even to mitigate the likelihood of vibration from HGVs.

Furthermore, a variety of practical noise control measures will be employed. These include:-

- Selection of plant with low inherent likelihood of generation of noise and/or vibration;
- Placing of noisy/vibratory plant as far away from sensitive properties as permitted by site constraints, and;
- Regular maintenance and servicing of plant items.

11.6.1.1 Noise

The contractors involved in the construction phase will be obliged, under contract, to undertake specific noise abatement measures and comply with the recommendations of *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise*. The following list of measures will be implemented, as relevant, to ensure compliance with the relevant construction noise criteria:-

- No plant or machinery will be permitted to cause a public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract;
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use

and all ancillary pneumatic tools shall be fitted with suitable silencers;

- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use;
- Any plant, such as generators or pumps, which may be required to operate outside of general construction hours will be surrounded by an acoustic enclosure or portable screen;
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in **Table 11.1** using methods outlined in *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise*;
- The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 08:00 and 20:00 Monday to Friday and between 08:00hrs and 18:00hrs on Saturdays, with no operations on Sundays or public holidays.

Based on assessment of the geological composition of the site, it is concluded that rock-breaking will not be required. In the unlikely event that rock breaking is necessary, the following measures will be implemented to mitigate noise emissions:-

- Fit suitably designed muffler or sound reduction equipment to the rock breaking tool to reduce noise without impairing machine efficiency;
- Ensure all air lines are sealed;
- Use a dampened breaking bit to eliminate a 'ringing' sound; and
- Erect an acoustic screen around breaking activities. Where possible, line of sight between top of machine and reception point should be obscured.

11.6.1.2 Vibration

Vibration from construction activities shall be limited to the values set out in **Table 11.3**. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

Considering the substantial distances between locations where vibration may be generated and the nearest sensitive locations, no likely significant effect will be experienced. Therefore, no mitigation measures are proposed.

11.6.2 Operational Phase

Noise emissions associated with the proposed development during the operational phase will not be significant and are predicted to be well within the criteria set out in **Section 11.3.2**. Therefore, no mitigation measures are required.

11.6.3 Decommissioning Phase

As set out at **Chapter 3 (Sections 3.2 and 3.8)**, the proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, no decommissioning phase mitigation measures are required.

11.6.4 Monitoring

11.6.4.1 Construction Phase

No monitoring of noise levels during the construction phase is proposed.

11.6.4.2 Operational Phase

No monitoring of noise levels during the operational phase is proposed.

11.6.4.3 Decommissioning Phase

As set out at **Chapter 3 (Sections 3.2 and 3.8)**, the proposed development will form part of the national electricity network and decommissioning of the substation is not proposed. Therefore, no decommissioning phase monitoring is required.

11.7 Residual Effects

This section outlines the likely residual noise and vibration effects associated with the proposed development taking account of the proposed mitigation measures.

11.7.1 Do Nothing Scenario

If the proposed development were not to proceed then the existing noise environment will remain unchanged.

11.7.2 Construction Phase

During the construction phase, there will likely be some effect on nearby noise sensitive locations due to noise emissions from site traffic and other activities. However, given that the construction phase of the development is temporary in nature and the distances between the main construction works and nearby noise sensitive properties, it is assessed that the noise generated will not be excessively intrusive. Furthermore, the application of noise limits, in accordance with best practice standards, and construction hours, along with implementation of appropriate noise and vibration mitigation measures, will ensure that noise and vibration effects are unlikely to be significant. The residual effects are assessed to be likely, negative, slight, temporary; and unlikely to be significant.

11.7.3 Operational Phase

11.7.3.1 Noise

The effects of the day to day operation of the proposed development, in combination with the operational Pinewoods Wind Farm, have been assessed and no likely significant residual effects are assessed as likely.

11.7.3.2 Vibration

There is no anticipated source of vibration related with the operational phase of the proposed development and therefore no residual effect is assessed as likely.

11.7.4 Cumulative Effects

There are no existing, permitted or proposed developments which have the likelihood of resulting in a significant cumulative effect on the noise sensitive locations in the study area.

11.8 Summary

This noise and vibration impact assessment of the proposed development has been undertaken for both the long-term operational and short-term construction phases.

The predicted noise and vibration levels associated with the construction phase are expected to be well within criteria thresholds. Notwithstanding the above, all construction activities will incorporate noise abatement measures where necessary and comply with the recommendations of *BS5228-1:2009+A1:2014*.

The assessment has concluded that there are no likely significant noise and vibration

effects associated with the operational phase of the proposed development.

The likely cumulative effects for both the construction and operational phases of the proposed development with the permitted Pinewoods Wind Farm have been assessed and have been determined not to be significant.

