26. ONSHORE NOISE AND VIBRATION

26.1 Introduction

This chapter assesses the likely onshore airborne noise and vibration impacts (hereinafter referred to as noise and vibration) associated with the construction, operation and maintenance (O&M), and decommissioning phases of the Onshore Site.

A detailed description of the Project is provided in Chapter 5 of this EIAR. Where the Offshore Export Cable (OEC) comes ashore in the townland of Killard, it will terminate at a Transition Joint Bay (TJB). The TJB will be required to house the interface joint between the OEC and the Onshore Grid Connection (OGC). Upon exiting the TJB, the proposed OGC consists of two elements, with 220kV underground electrical cabling connecting from the TJB to a proposed new 220kV electrical compensation compound (OCC) in the townland of Ballymacrinan, Co. Clare and further 220kV underground electrical cabling connecting the OCC to the existing 220kV Substation at Moneypoint Power Station.

The onshore elements of the Project (i.e. the Onshore Site) considered by this chapter comprises several components:

- Onshore Landfall Location (OLL) where the Offshore Export Cable (OEC) will be brought ashore and meets the transition joint bay (TJB) – assessed for short-term construction / decommissioning noise and vibration impacts only;
- Onshore Grid Connection (OGC) from OLL to OCC and on to existing Moneypoint 220kV Substation – assessed for short-term construction / decommissioning noise and vibration impacts only; and
- Onshore Compensation Compound (OCC) – assessed for short-term construction / decommissioning noise and vibration and potential long-term operation and maintenance (O&M) phase operational noise impacts.

26.1.1 Statement of Authority

This chapter has been prepared by the following staff of AWN Consulting Ltd:

The assessment and write up for the airborne noise and vibration chapter was carried out by Dr. Aoife Kelly (Senior Acoustic Consultant) holds a BSc (Hons) in Environmental Health, a Diploma in Acoustics and Noise Control, a PhD in Occupational Noise and is a member of the Institute of Acoustics (MIOA). Aoife has specialised in acoustics since 2014 and has extensive knowledge in the field of occupational noise risk assessments, environmental noise and vibration effect assessment and inward effect assessments. She has seven years of experience as an acoustic consultant and in that time has gained extensive knowledge and experience in relation to impact assessment of wind farms and associated infrastructure as well as a detailed knowledge of acoustic standards and proprietary noise modelling software packages having completed noise impact assessments for numerous wind farm projects within Ireland, including Codling Offshore Wind Park, Castlebanny Wind Farm, Knockroe Wind Farm, Lyrenacarriga Wind Farm.

The baseline noise monitoring was carried out by Dominic Wright (Acoustic Consultant) who holds a Diploma in Music Technology and the Institute of Acoustics Diploma in Acoustics and Noise Control. With a background in audio engineering, he has over 2 years' experience working in the field of acoustics, contributing to various residential, industrial and infrastructure projects. He also has experience in both environmental noise surveying and modelling.

26.2 Legislation, Policy and Guidelines

26.2.1 Legislation

In addition to those previously outlined in Chapter 1, Section 1.2.2, the following legislation is applicable to the noise and vibration assessment.

- The Outdoor Noise Directive 2000/14/EC
- The Environmental Noise Directive (END), EC 2002/49/EC,
- EIA Directive;
- European Communities (EC) (Environmental Noise) Regulations 2018 (S.I. No. 549 / 2018) as amended by EC (Environmental Noise) Amendment) Regulations 2021 (S.I. No. 663/2021);
- EC (Noise Emission by Equipment For Use Outdoors) Regulations, 2001 (S.I. No. 632/2001) as amended by EC Noise Emission by Equipment for Use Outdoors (Amendment) Regulations (S.I. No. 241 / 2006);
- The Planning and Development Act, 2000 (as amended); and
- The Planning and Development Regulations, 2001 (as amended).

26.2.2 Policy

The key policy that is applicable to the assessment of the Onshore Site noise and vibration is the Clare County Development Plan 2023-2029 summarised below:

Noise Pollution Objective CDP 11.40

> *"It is an objective of Clare County Council:*
>
> *a) To promote the proactive management of noise where it is likely to have significant adverse impacts on health and the environment."*

The construction phase noise and vibration assessment has considered the impact of noise and vibration on sensitive locations using the noise and vibration thresholds outlined in the current best practice Transport Infrastructure Ireland (TII) *'Guidelines for the treatment of noise and vibration in national road schemes'* (TII 2004). These construction noise and vibration limits are shown in Section 26.4.1.

The O&M phase noise assessment has been undertaken in accordance with the principles in the relevant best practice British Standards as outlined in Section 26.4.2.

Where applicable, the potential adverse impacts associated with the construction and O&M phase noise will be mitigated (see Section 26.7) and reduced to a minimum, so to avoid noise giving rise to significant adverse effects at NSLs as per the aim of the Clare County Development Plan 2023-2029.

26.2.3 Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on noise and vibration are summarised below.

- BS 8233:2014 Sound Insulation and Noise Reduction for Buildings (hereafter referred to as BS 8233 (BSI 2014);
- BS 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (hereafter referred to as BS 5228 – 1) (BSI 2009 +A1 2014a);

- BS 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (hereafter referred to as BS 5228 – 2) (BSI 2009 +A1 2014b);
- British Standard (BS) European Standards (EN) 61672-1 (2013) Electroacoustics. Sound level meters – Specification (hereafter referred to as BS EN 61672-1)(BSI 2013);
- BS 6472 (2008) Guide to Evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (hereafter referred to as BS 6472 – 1). (BSI 2008);
- BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (hereafter referred to as BS 7385 – 2). (BSI 1993);
- Clare County Council, Clare County Development Plan 2023-2029 (Clare County Council, 2023);
- Department of Environment, Community and Local Government (2018). Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018);
- Environmental Protection Agency (EPA), Guidelines on the information to be contained in Environmental Impact Assessment Reports (hereafter referred to as EPA Guidelines) (EPA, 2022);
- EPA, Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (hereafter referred to as EPA NG4) (EPA, 2016);
- EPA, Advice notes on current practice in the preparation of Environmental Impact Statements (EPA, 2003);
- European Commission (2017). Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report;
- Institute of Environmental Management and Assessment (IEMA) Guidelines for environmental noise impact assessment (IEMA, 2014);
- International Organization for Standarization (ISO) ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels (hereafter referred to as ISO 1996 – 2) (ISO 2017);
- ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (hereafter referred to as ISO 1996 – 1) (ISO 2016);
- ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation (hereafter referred to as ISO 9613 – 2) (ISO 1996);
- Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1 (hereafter referred to as the TII Noise Guidelines 2004) (TII 2004); and
- United Kingdom Highways England (now National Highways) (UKHE) Design Manual for Roads and Bridges (DMRB) Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2 (hereafter referred to as DMRB Noise and Vibration) (UKHE 2020).

26.3 Consultation

Table 26-1 below lists the interested bodies and organisations that were issued the Scoping Report and invited to revert with any comments regarding to onshore airborne noise and vibration:

No direct responses in relation to onshore airborne noise and vibration were received in response to the Scoping Report.

Table 26-1 List of onshore airborne noise and vibration consultees and responses

Consultee	Comment	Addressed in Section
Clare County Council -	No response pertaining to onshore noise and vibration	No action required

Consultee	Comment	Addressed in Section
Environment Department		
Department of Communications, Climate and the Environment	No response pertaining to onshore noise and vibration	No action required
Environmental Protection Agency	No response pertaining to onshore noise and vibration	No action required
Health Service Executive	No response pertaining to onshore noise and vibration	No action required

26.4 Assessment Methodology

The following sections describe the methodology that has been adopted for the assessment of the construction, operation and maintenance, and decommissioning phases of the Onshore Site. This chapter only considers airborne noise and vibration impacts on sensitive human receptors arising from the Onshore Site.

Separately in Chapter 19: Offshore Air Quality and Airborne Noise, consideration has been given to the potential effects of the Wind Turbine Generators at the Offshore Site on noise sensitive locations in the vicinity of the turbines.

In accordance with the guidance documents outlined in Section 26.2.3, the following methodology has been adopted for the assessment of the Onshore Site:

- Review of the relevant guidance to identify appropriate criteria for the elements of the Onshore Site.
- Conduct a noise monitoring survey to identify the existing noise environment in the vicinity of the nearest noise sensitive locations (NSLs).
- Assess the potential levels of typical noise emissions at the nearest NSLs for both the construction, operation and maintenance, and decommissioning phases.
- Assess the potential relative change in noise levels at the nearest NSLs due to the expected increase in road traffic flow associated with the Onshore Site.
- Assess the impact by comparing the calculated levels against the relevant criteria.
- Where necessary, present ameliorative, remedial, or reductive measures to control the impacts to be within the criteria.
- Present the predicted impact of the Onshore Site including the ameliorative, remedial, or reductive measures.
- Assess and describe the significance of the residual noise and vibration effects associated with the Onshore Site.
- Undertake a cumulative assessment to identify whether there are any likely significant effects from the Onshore Site on the surrounding environment, when considered in combination with relevant permitted, proposed, and constructed projects in the vicinity.

This outline methodology is described in further detail in the following section below (Section 26.4.2).

26.4.1 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 (SPL) is 0 dB (for the threshold of hearing) to 120 dB (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 10 dB 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 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. To rank the SPL of various noise sources, the measured level is 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. SPL is 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 26-1.

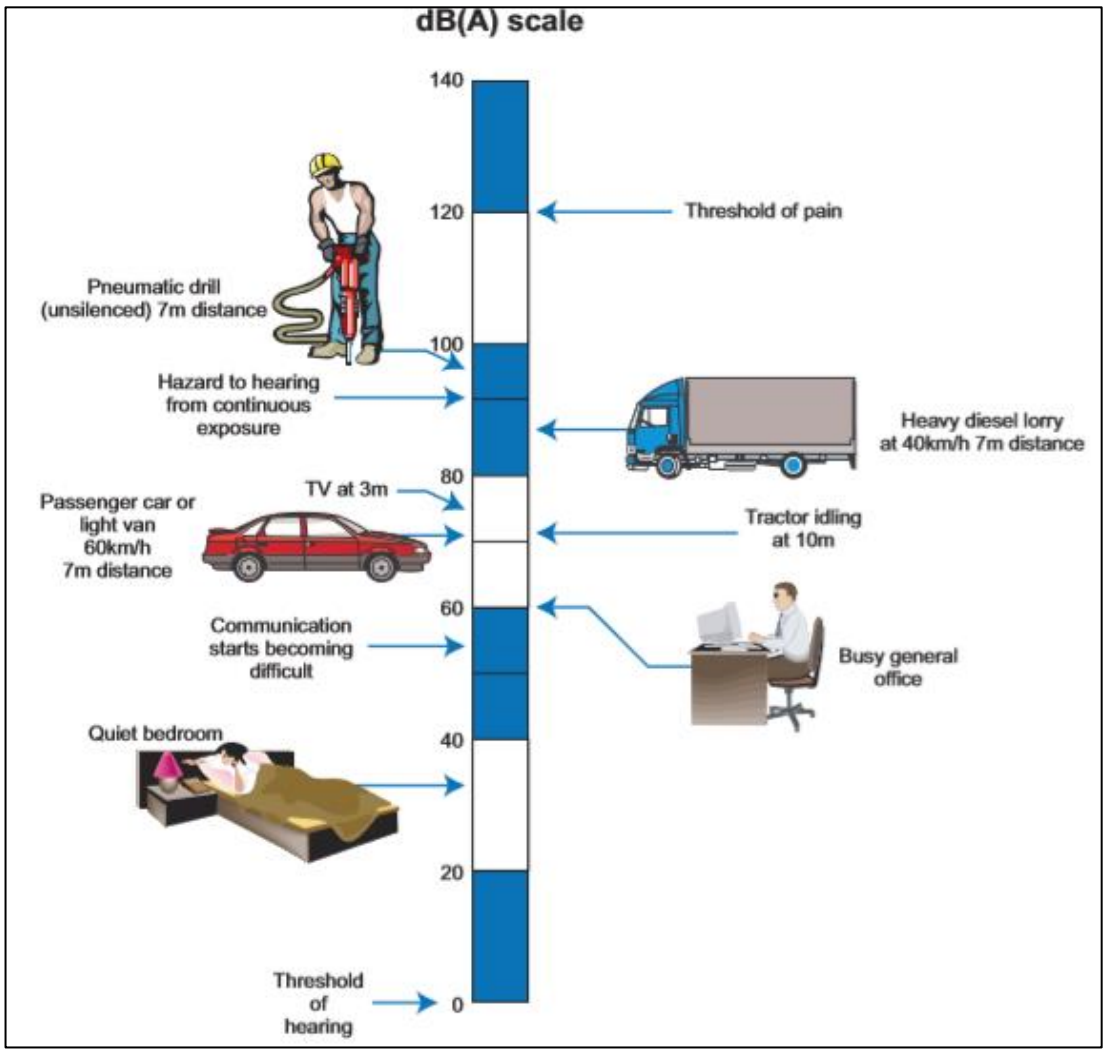

Figure 26-1 The level of typical common sounds on the dB(A) scale (NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004)

For a glossary of terms used in this chapter, please refer to Appendix 26-1.

26.4.2 Assessment Criteria

26.4.2.1 Construction Phase Noise

There is no Irish statute setting a maximum permissible noise level that may be generated during the construction phase of a project. Account must be taken of the technical feasibility of the Project, the trade-off between the noise level and the duration of the noise exposure when setting criteria for construction noise. Local authorities normally control construction activities by imposing limits on the hours of operation and may consider noise limits at their discretion.

The construction noise and vibration criteria outlined in the following sections also applies to any decommissioning works associated with the Onshore Site.

26.4.2.1.1 *Onshore Landfall Location and Onshore Compensation Compound – Fixed Site*

The construction of the TJB connection at the OLL and the OCC occurs at fixed locations within the Onshore Site. The duration for potential impacts is 29 months. This is longer than for the linear works associated with the construction of the proposed OGC. In the absence of Irish guidance, reference has been made to the British Standard 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise* to identify appropriate noise criteria.

The approach outlined in BS5228-1 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. Each category has a defined Construction Noise Threshold (CNT) that, if exceeded (construction noise only), indicates a potential significant noise effect is associated with the construction activities.

Table 26-2 presents the threshold values which, if exceeded, potentially signify a significant effect as recommended by BS 5228 – 1.

Table 26-2 Threshold of significant effect at dwellings

Assessment Category and Threshold Value Period (L_{Aeq})	Construction Noise Threshold (CNT) (dB)		
	Category A	Category B	Category C
Night-time (23.00 – 07.00)	45	50	55
Evening and Weekends[1]	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00-13.00)	65	70	75

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

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

Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are greater than Category A values.

This assessment method is valid for residential NSLs only. For the appropriate period (e.g., daytime) the ambient noise level is determined and rounded to the nearest 5 dB. In this instance the baseline

[1] *19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.*

noise survey (See Section 26.5.1) has identified daytime ambient noise levels that typically range from 40 to 54 dB $L_{Aeq,T}$ and therefore, for this assessment all NSLs shall be afforded a Category A designation.

Please refer to Section 26.6.2 for detail of the construction noise assessment of the Onshore Site. BS 5228-1 states that:

"If the site noise level exceeds the appropriate category value [the CNT], then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect."

26.4.2.1.2 Onshore Grid Connection- Linear Works

For the construction of the proposed OGC, reference has been made to the TII Guidance document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (TII, 2004) for appropriate criteria. The TII guidelines define construction noise limits to be applied to the facade of dwellings. Whilst this document is specifically intended for the purposes of New National Road Schemes, considering that the proposed OGC consists of a long linear scheme, and in the absence of other national guidelines relating to the specific development under consideration, the guidelines are relevant to determine the potential noise impacts of the proposed OGC. These maximum noise levels are set out in Table 26-3.

Table 26-3 Maximum permissible noise levels at the façade of dwellings during construction

Days and Times[2]	Noise Levels (dB re. $2x10^{-5}$ Pa)	
	LAeq(1hr)	LAmax
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60	65
Saturdays 08:00 to 16:30hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30hrs	60	65

In the event that out of hours work is required, the evening and weekend CNTs outlined in Table 26-2 would apply.

Assessment of Magnitude of Construction Phase Noise Impacts and EIAR Significance of Effects – Fixed and Linear Site Works

The criteria for defining magnitude of impact associated with a Construction Noise Level (CNL) and the EPA Guidelines (EPA 2022) significance of effects for the purpose of the construction / decommissioning noise assessment are provided in Table 26-4. In order to assist with interpretation of the significance of a CNL, guidance is included as to the likely magnitude of impact associated with construction activities, relative to the CNT. This guidance is taken from the UK document Design Manual for Roads and Bridges (2020) LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2 (DMRB: Noise and Vibration - UKHE 2020) and adapted to include the EPA Guidelines (EPA 2022) for significance of effect.

Table 26-4 Construction noise significance ratings

[2] *Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.*

Guidelines for Noise Impact Magnitude Assessment of Significance (DMRB Noise and Vibration (UKHE, 2020)	CNL per Assessment Category and Threshold Value Period	EPA EIAR Significance of Effects	Determination of Significance in EIAR terms
Negligible	Below or equal to baseline noise level	Not Significant	Not Significant
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	CNLs at the upper end of this range will result in higher potential effects, therefore this range is categorised as Slight to Moderate, acknowledging that values approaching the CNT are greater than Slight. In accordance with DMRB Noise and Vibration (UKHE 2020) and BS 5228-1 ((BSI 2009 +A1 2014a), noise levels below the CNT are deemed 'Not Significant'.
Moderate	Above CNT and below or equal to CNT +5dB	Moderate to Significant	Depending on CNT, duration and baseline noise level. In accordance with the DMRB Noise and Vibration (UKHE 2020), construction noise effects shall constitute a "Significant" effect where it is determined that a moderate or major magnitude of impact will occur for a duration exceeding: › Ten or more days or night in any 15 consecutive day or nights; and › A total number of days exceeding 40 in any six
Major	Above CNT +5 to +15 dB	Significant, to Very Significant	
	Above CNT +15 dB	Very Significant to Profound	

Guidelines for Noise Impact Magnitude Assessment of Significance (DMRB Noise and Vibration (UKHE, 2020)	CNL per Assessment Category and Threshold Value Period	EPA EIAR Significance of Effects	Determination of Significance in EIAR terms
			consecutive months.

The adapted DMRB Noise and Vibration (UKHE 2020) guidance outlined is used to assess the predicted construction noise levels at NSLs and comment on the likely effects during the construction stages.

26.4.2.1.3 Construction Vehicular Activity- Noise

Vehicular movement to and from the Onshore Site will make use of the existing road network. For the assessment of potential noise effects from construction related traffic along public roads and haul routes it is proposed to adopt guidance from DMRB Noise and Vibration (UKHE 2020) and the EPA Guidelines (EPA 2022). Table 26-5, taken from Section 13.7 of DMRB presents guidance as to the likely impact associated with any change in the background noise level ($L_{Aeq,T}$) at a noise sensitive location from construction traffic. This guidance is derived from Table 3.17 of DMRB Noise and Vibration (UKHE 2020) and adapted to include the relevant significance effects from the EPA Guidelines (EPA 2022).

Assessment of Magnitude of Construction Phase Noise Impacts and EIAR Significance of Effects – Construction Traffic

For construction traffic noise, due to the short-term period over which this impact occurs, the DMRB Noise and Vibration guidance (UKHE 2020) will be used to assess the predicted increases in traffic noise levels on public roads associated with the Onshore Site and comment on the likely impacts and significance of effects during the construction phase.

Table 26-5 Likely impacts and effects associated with change in traffic noise level (Source DMRB, 2019)

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact (Short-term)	EPA Significance of Effect
Less than 1	Inaudible	Negligible	Imperceptible
1 – 2.9	Barely Perceptible	Minor	Not Significant to Slight
3 – 4.9	Perceptible	Moderate	Moderate
≥ 5	Up to a doubling of loudness	Major	Significant

In accordance with the DMRB Noise and Vibration (UKHE 2020) document, construction traffic noise effects shall constitute a significant effect where it is determined that a major or moderate magnitude of effect will occur for a duration exceeding:

- Ten or more days or nights in any 15 consecutive days or nights, and
- A total number of days exceeding 40 in any six consecutive months.

26.4.2.2 Construction Phase – Vibration

Construction phase works requiring the use of HDD drilling and mechanical excavations have the potential to result in vibration impacts at vibration sensitive receptors (VSRs) if sufficiently close to the particular receptor.

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. With respect to this development, the range of relevant criteria used for building protection is expressed in terms of Peak Particle Velocity (PPV) in mm/s.

26.4.2.2.1 *Cosmetic Damage to Buildings*

There is no statute or published Irish guidance relating to maximum permissible vibration level. Guidance relevant to acceptable vibration within buildings is contained in the following documents:

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

BS 7385 – 2 (BSI 1993) 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 buildings.

BS 5228-2 (BSI 2009 +A1 2014b) 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 above 15 Hz. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage, these limits may be reduced by up to 50%. In addition, where continuous vibration is such that resonances are excited within structures the limits discussed above may need to be reduced by 50%.

The 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 26-6.

Table 26-6 Recommended transient vibration limits

Allowable vibration velocity (Peak Particle Velocity) at the closest part of any 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

The TII vibration limits are proposed for all construction activities associated with the Onshore Site including HDD drilling at the OLL and for the OGC works; compliance with these limits should ensure that there is little to no risk of any cosmetic damage to buildings.

26.4.2.2.2 *Human Perception*

Humans are sensitive to vibration stimuli, and perception of vibration at high magnitudes may cause concern to building occupants. BS5228-2 (BSI 2014b) notes that vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes. Higher

levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin of vibration is known.

Assessment of Magnitude of Construction Phase Vibration Impact and EIAR Significance of Effects

Table 26-7 presents the significance table relating to potential impacts to building occupants during construction based on guidance from BS5228-2 (BSI 2014b), the DMRB noise and vibration (UKHE 2020) document and the associated significance of effects ratings based on the EPA Guidelines (EPA 2022).

Table 26-7 Guidance on effects of human response to PPV magnitudes

PPV range	BS 5228-2	DMRB Impact Magnitude	EPA EIAR Significance of Effect
≥10 mm/s PPV	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.	Very High	Very Significant
≥1 mm/s PPV	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	High	Moderate to Significant
≥0.3 mm/s PPV	Vibration might be just perceptible in residential environments.	Medium	Slight to Moderate
≥0.14 mm/s PPV	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.	Low	Not significant to Slight
<0.14 mm/s PPV	Not perceptible	Very Low	Imperceptible to Not Significant

Expected vibration levels from the construction works are discussed further in Section 26.6.3.

26.4.2.3 Operational and Maintenance (O&M) Phase – Noise

There will be no noise emissions from the OLL or OGC components in the O&M phase of the Onshore Site, that are subject to that are subject of this assessment. Consequently, there is no requirement to assess O&M noise emissions further for the OLL and OGC.

The OCC will be assessed for the O&M phase of the Onshore Site and the applicable assessment criteria is outlined in the following sections.

26.4.2.3.1 *BS 8233*

BS 8233 (BSI 2014) provides guideline values for internal noise levels within residential dwellings. The BS8233 standard provides recommendations for indoor ambient noise levels as presented in Table 26-8.

Table 26-8 BS 8233 Recommended Indoor Noise Levels

Activity	Location	Day, dB $L_{Aeq, 16\text{-hour}}$	Night, dB $L_{Aeq, 8\text{hour}}$
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30
Notes: Daytime assessment period – 07:00 to 23:00 hrs Night-time assessment period – 23:00 to 07:00 hrs			

It is appropriate to derive external noise limits based on the recommended internal noise criteria. This is done by factoring in the degree of noise reduction afforded by a partially open window. Annex G in BS 8233:2014 states that,

> *"If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB"*

It is also acknowledged that the level difference through a window partially open for ventilation can vary depending on the window type and this is nominally deemed to fall in the range of 10 to 15 dB. Therefore, for this study and the assessment of the Onshore Site an inside-to-outside level difference in the range of between 10 to 15 dB is appropriate to define external operational noise criteria for the Onshore Site as follows:

- Daytime (07:00 to 23:00 hours): between 45 - 50 dB $L_{Aeq, 16hr}$.
- Night-time (23:00 to 07:00 hours): between 40 - 45 dB $L_{Aeq, 8hr}$.

However, given the low noise environment measured at the OCC site (see Section 26.5.1.4.1), it is deemed appropriate to reduce the operational noise criteria in line with the guidance outlined in the EPA document, *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*, which is discussed in further detail below.

26.4.2.3.2 EPA NG4

An assessment of noise under the EPA NG4 guidance requires a noise survey of baseline conditions and then derives appropriate criteria for noise due to the operation of the site. The criteria apply at the façades of the noise-sensitive locations.

As the OCC is not in a "quiet area" as defined by the EPA NG4 document, the derivation of Noise criteria according to NG4 is to test whether the site meets the criteria for an 'area of low background noise'.

For a noise-sensitive location (NSL) in the vicinity of the site to be considered an 'area of low background noise', the noise levels measured at that location during the environmental noise survey need to satisfy all three the following criteria:

- Arithmetic Average of L_{A90} During Daytime Period ≤40 dB L_{A90},
- Arithmetic Average of L_{A90} During Evening Period ≤35 dB L_{A90}, and;
- Arithmetic Average of L_{A90} During Night-time Period ≤30 dB L_{A90}.

Finally, depending on whether each location is considered an 'area of low background noise' Table 26-9 below outlines the noise emission limit criteria detailed in the NG4 document.

Table 26-9 NG4 approach for determining appropriate noise criteria

Scenario	Daytime Noise Criterion, dB $L_{Ar,T}$ (07:00 to 19:00 hrs)	Evening Noise Criterion, dB $L_{Ar,T}$ (19:00 to 23:00 hrs)	Night Noise Criterion, dB L_{Aeq} (23:00 to 07:00 hrs)
Areas of Low Background Noise	45 dB	40 dB	35 dB
All Other Areas	55 dB	50 dB	45 dB

The noise levels measured during the baseline noise surveys are presented in Section 0 of this chapter.

The OCC elements of the proposed development are expected to operate continuously. This implies that the night-time noise criterion, being the lowest, is critical to the assessment.

Section 0 presents the noise survey results and discusses applicable noise criteria according to NG4. In general, as the noise-sensitive locations are identified as areas of low background noise as per the NG4 guidance, a 35 dB $L_{Aeq,T}$ night time criterion applies during the most sensitive period of operation i.e. between 23:00 to 07:00 and if compliance can be demonstrated at this lowest noise criterion, then the daytime and evening time criterion will also be in compliance.

Assessment of Magnitude of Operation and Maintenance (O&M) Phase Noise Impact and EIAR Significance of Effects

The '*Guidelines for Environmental Noise Impact Assessment'* produced by the Institute of Environmental Management and Assessment (IEMA, 2014) have been referenced in order to categorise the potential effect of changes in the ambient noise levels during the O&M phases of the Onshore Site.

The guidelines state that for any assessment, the potential significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise. Due to varying factors which affect human response to environmental noise (prevailing environment, noise characteristics, time periods, duration and level etc.) assigning a subjective response must take account of these factors.

The scale adopted in this assessment is shown in Table 26-10 and is based on an example scale within the IEMA guidelines. The corresponding significance of effects presented in the associated EPA EIAR significance ratings is also presented.

Table 26-10 Noise impact and effects scale – operational noise sources

Noise Level Change (dB)	Subjective Response	Impact Classification (IEMA)	EPA EIAR Significance of Effect
<0	No Change	Negligible	Imperceptible
≥ 0 and < 3	Barely perceptible		Not Significant
≥ 3 and < 5	Noticeable	Minor	Slight
≥ 5 and < 10	Up to a doubling or halving of loudness	Moderate	Moderate
≥10	More than a doubling or halving of loudness	Major	Significant to Profound

The significance table reflects the key benchmarks that relate to human perception of sound. A change of 3 dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10 dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

A significant effect is distinguished as a change in noise level greater than 10 dB.

The IEMA document does not distinguish impacts beyond those categorised as 'Major'. For the purposes of distinguishing between Significant and Profound effects to align with EPA EIAR 2022 categorisation of effects, changes in noise levels greater than 20 dB are categorised Profound. Between 10 and 20 dB impacts are of increasing effect between Significant and Very Significant.

26.4.2.4 Operation and Maintenance (O&M) Phase – Vibration

There will be no vibration emissions from the O&M phase of the Onshore Site components (export cables and/or onshore compensation compound) that are subject of this assessment. Consequently, there is no requirement to assess O&M vibration emissions further.

26.4.3 Study Area

26.4.3.1 Construction Noise Study Areas

The construction noise and vibration study area is outlined in the DMRB Noise and Vibration (UKHE 2020) which states:

> *"A construction noise study area shall be defined, where the need for further assessment has been established to include all noise sensitive receptors:*
>
> *a. that are potentially affected by construction noise;*
>
> *b. in areas where there is a reasonable stakeholder expectation that a construction noise assessment will be undertaken."*

Noise and Vibration (UKHA 2020) further qualifies that:

> *" a study area of 300m from the closest construction activity is normally sufficient to encompass noise sensitive receptors."*

26.4.3.2 Construction Vibration Study Areas

Research into levels of vibration from various construction activities, reported by the Transport and Road Research Laboratory (now the Transport Research Laboratory (TRL)) in Supplementary Report 328 'Ground vibrations caused by road construction activities' (TRL Limited, 1997), concluded that:

> *"at distances greater than 20m, the vibration levels measured were below the level of human perception because of attenuation in the ground and that it is unlikely that people would be disturbed by vibration from general construction activities at distances of 20m or more."*

Given the research carried out by TRL, it is not anticipated that there would be any vibration impacts on sensitive receptors from general construction activities at distances beyond 20m from standard works. However, vibration impacts from mechanical excavations have the potential to result in vibration impacts at vibration sensitive receptors (VSRs) if sufficiently close to the respective receptor and are considered within the scope of the construction noise and vibration assessment.

Vibration study areas are defined in accordance with DMRB Noise and Vibration (UKHE 2020) which states:

> *"Where the need for further assessment has been established, a vibration study area shall be defined to include all:*
>
> *a. vibration sensitive receptors that are potentially affected by construction vibration;*
>
> *b. vibration sensitive receptors in areas where there is a reasonable stakeholder expectation that a construction vibration assessment will be undertaken."*

Noise and Vibration (UKHE 2020) further qualifies that:

> *"A study area of 100m from the closest construction activity with the potential to generate vibration is normally sufficient to encompass vibration sensitive receptors."*

Therefore, vibration impacts from the construction of the Project have been assessed at receptors within 100m (DMRB Noise and Vibration (UKHE 2020)) of any construction requiring mechanical excavation activities.

26.4.3.3 Operational Study Area

Once operational, noise impacts from fixed plant will be limited to the operation of the OCC. A 1 km study area has been identified from the OCC site boundary to include the closest NSLs in all directions. Due to the propagation of sound over distance NSLs at a greater distance to the OCC than 1km will have a lower predicted noise level from the OCC than those at a closer distance. .

26.5 Existing Environment

An environmental noise survey has been conducted to quantify the existing baseline noise environment in the vicinity of the Onshore Site. The survey was carried out in general accordance with ISO 1996-1*:2016 Description, measurement, and assessment of environmental noise*. Specific details are presented in the following sections.

26.5.1 Baseline Noise Survey Measurement Locations

In accordance with best practice and ISO 1996-1 (2016) the noise measurement locations were selected to represent the noise environment at the NSLs in the vicinity of the proposed OLL, OGC, and OCC.

Figure 26-2 identifies the measurement locations and Table 26-11 describes the measurement locations.

Table 26-11 Noise monitoring locations – A denotes attended survey, U denotes unattended survey

Location Reference	Coordinates ITM		Description
	Easting	Northing	
AN1	494518	667449	Located approximately 5m north of the Killard road and representative of noise sensitive locations in proximity to the OLL site along Killard Road.
AN2	495065	665167	Located approximately 70m north of the N67 Road to capture noise levels at residential NSLs on a local road along the Grid Connection Route.
AN3	497704	659742	Located approximately 5m west of the L2034 Road to capture the noise level near a set of noise sensitive locations close to Monmore Church along the Grid Connection Route.
AN4	500458	655822	Located approximately 5m west of Monvana Road to capture the noise levels at noise sensitive locations along the Grid Connection route at Monvana Road.
AN5	502367	654219	Located approximately 5m from the local road carriage way to capture the noise levels at noise sensitive locations along the Grid Connection route.
UN1	502287	653290	Located approximately 200m from the local road carriage way to capture the noise levels at the proposed OCC.

490000
500000
510000
670000
660000
650000
N
AN1
AN2
AN3
AN4
AN5
UN1

SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Noise Monitoring Locations
- Onshore Grid Connection
- Project EIAR Site Boundary

0 2.5 5 km

Kilometres

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Attended (AN) and Unattended (UN) Noise Monitoring Locations

VER	REMARKS	DATE	Drawn	Approved
V1		12/09/2024	AK	AK

DRAWING NO

Figure 26-2

SCALE	PAPER SIZE	DATUM	PROJECTION
1:90,000	A4	IRENET95	Transverse Mercator

26.5.1.1 Survey Periods

Noise measurements were carried out during the following periods:

- Attended daytime at AN1, AN2: from 10:09 hrs to 12:35 hrs on 24 August 2023
- Attended daytime at AN3, AN4 and AN5: from 13:50 hrs to 17:31 hrs on 23 August 2023;
- Unattended at UN1: from 13:15 hrs on 23 August to 14:15 on 29 August 2023.

The weather during the survey periods was mainly dry with varying cloud cover. Wind speeds were generally below 5m/s.

26.5.1.2 Personnel and Instrumentation

AWN Consulting carried out the noise surveys. Both the attended and unattended noise measurements were performed using a Rion NL52 Sound Level Meter, as detailed in Table 26-12.

Before and after the survey the measurement apparatus was calibrated using a Bruel & Kjaer Type 4231 Sound Level Calibrator.

Table 26-12 Instrumentation details

Equipment	Type	Serial Number	Calibration Date
Sound Level Meter	Rion NL-52	01076328	02 September 2022
Sound Level Meter	Rion NL-52	01076330	13 January 2023
Calibrator	Bruel & Kjaer Type 4231	2394086	25 May 2023

Attended measurements were carried out on a cyclical basis with each measurement duration of 15 minutes over three rotation periods.

The unattended noise measurements were set to log continuously over a 15 minute log period, for a 6-day period. The microphone was protected using a proprietary windshield. The sound level meter was mounted on a tripod approximately 1.5 metres above ground level and at least 4m away from any reflective surfaces other than the ground.

Factory calibration certificates for the noise level meter and acoustic calibrator, detailing equipment serial numbers are presented in Appendix 26-2 of this report. The survey results were noted onto a Survey Record Sheet immediately following each sample and were also saved to the instrument memory for later analysis. Survey personnel noted the primary sources contributing to noise build-up during the survey.

26.5.1.3 Measurement Parameters

Several parameters were measured 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 period.
L_{Amax}: Maximum A-weighted noise level measured.
L_{A10}: Noise level exceeded for 10% of measurement period. It is typically a descriptor of traffic noise.

L_{A90}: Noise level exceeded for 90% of measurement period (steady underlying noise level).

The "A" suffix denotes that the sound levels have been "A-weighted" to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pascal (Pa).

26.5.1.4 Survey Results

26.5.1.4.1 *Attended Survey Results*

The daytime attended survey results are summarised in Table 26-13.

Table 26-13 Summary of attended results - Daytime

Loc. Ref.	Date	Measurement Period (hrs)	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. 2x10-5 Pa)			
				$L_{Aeq,15min}$	L_{AFMax}	L_{AF10}	L_{AF90}
AN1	24/08/2023	10:37 – 10:52	Dominant noise from wave noise at OLL with foliage noise, bird song and intermittent distant farm noise and cars passing by on local road also contributing.	52	78	42	33
		11:30 – 11:45		54	84	42	35
		12:20 – 12:35		50	78	43	34
AN2	24/08/2023	10:09 – 10:24	Dominant noise from N67 with intermittent agriculture noises, foliage noise and cars passing by on local road also contributing.	51	77	52	38
		11:05 – 11:20		52	76	52	40
		11:54 – 12:09		51	75	52	42
AN3	23/08/2023	14:43 – 14:58	Dominant noise from L2034 with intermittent agriculture noises, foliage noise.	60	82	58	37
		15:59 – 16:14		63	83	60	39
		17:16 – 17:31		61	82	59	40
AN4	23/08/2023	14:16 – 14:31	Dominant noise from N68 with intermittent agriculture noises, foliage noise and cars passing by on local road also contributing.	56	80	50	36
		15:34 – 15:49		55	77	48	36
		16:50 – 17:05		58	84	52	38
AN5	23/08/2023	13:50 – 14:05	Ambient noise from distant road traffic, wind foliage and crickets chirping. Intermittent cars passing by on local road also contributing.	40	69	38	30
		15:11 – 15:26		42	69	38	29
		16:28 – 16:43		43	75	41	32

At AN1, which is representative of NSLs in the OLL area, the ambient noise levels were in the range between 50 to 54 dB $L_{Aeq,15min}$ and background noise levels were in the range between 33 to 35 dB $L_{A90,15min}$.

Along the Grid and Export Cable routes (AN2 to AN4), the ambient noise levels were in the range between 51 to 63 dB $L_{Aeq,15min}$ and background noise levels were in the range between 36 to 42 dB $L_{A90,15min}$.

At AN5, which is representative of NSLs in the OCC area, the ambient noise levels were in the range between 40 to 43 dB $L_{Aeq,15min}$ and background noise levels were in the range between 29 to 32 dB $L_{A90,15min}$. The unattended noise survey results for UN1 are presented in Table 26-14.

26.5.1.4.2 Unattended Survey Results

Table 26-14 Summary of unattended results at UN1

Date	Period	Measured Noise Levels (dB re. 2x10-5 Pa)	
		$L_{Aeq,15min}$	$L_{A90,15min}$
23 August 2023	Day	38	33
	Evening	34	26
	Night	30	19
24 August 2023	Day	41	33
	Evening	37	29
	Night	43	23
25 August 2023	Day	43	33
	Evening	36	28
	Night	39	22
26 August 2023	Day	44	36
	Evening	40	32
	Night	38	27
27 August 2023	Day	43	35
	Evening	35	26
	Night	26	19
28 August 2023	Day	37	30
	Evening	34	29
	Night	30	24
29 August 2023	Day	39	33
	Evening	–	–
	Night	–	–
Average	Average Day	41	33
	Average Evening	36	29
	Average Night	38	23

The noise environment at the location of UN1 was noted to be influenced by wind rustle, bird song and occasional agricultural works from neighbouring farmlands. Gun shots were noted as the only apparent noise source of significance upon installation.

Ambient day time L_{Aeq} values were in the range between 37 to 44 dB L_{Aeq}. Evening ambient levels were in the range between 34 to 40 dB L_{Aeq}. Night-time ambient levels were in the range between 30 to 43 dB L_{Aeq}

Background day time noise levels were in the range between 30 to 36 dB $L_{A90,}$ Evening background levels were in the range between 26 to 32 dB $L_{A9,}$. Night time background levels were in the range between 19 to 27 dB $L_{A90.}$

A visual representation of the measured background levels (L_{AF90}) is presented below in Figure 26-3.

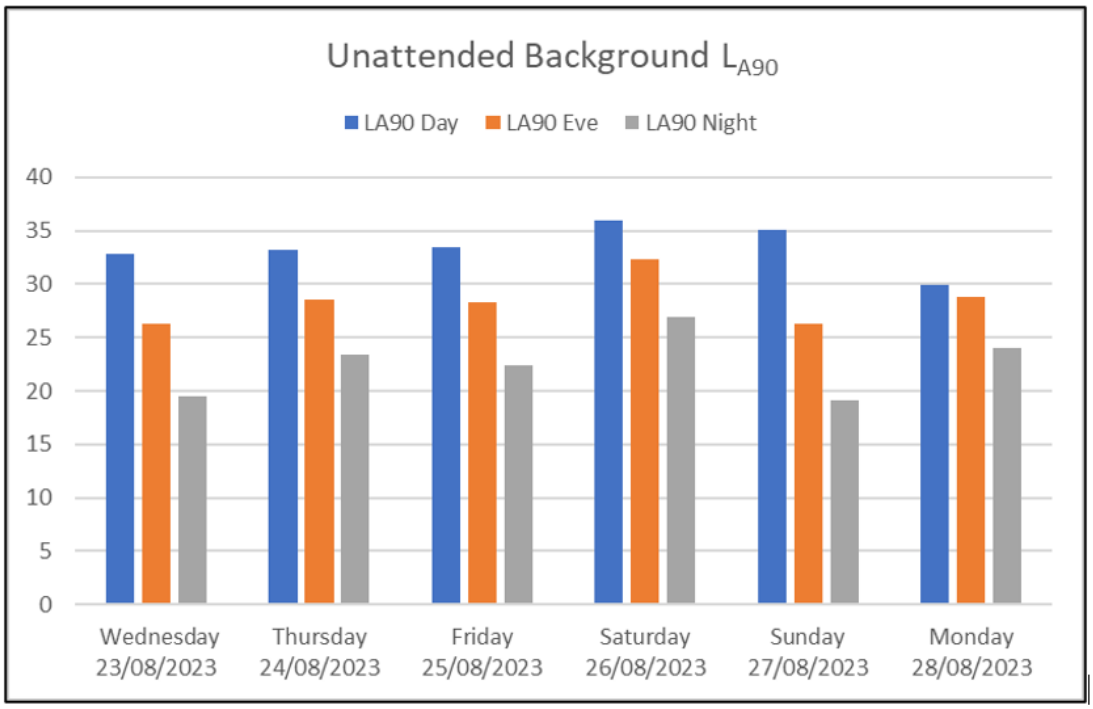

Figure 26-3 Unattended measured background L_{A90} levels

26.5.1.5 Summary of Construction Noise Thresholds

At AN1, which is representative of NSLs in the OLL area, the ambient noise levels were in the range between 50 to 54 dB $L_{Aeq,15min}$. Based on these measured levels at AN1, the Construction Noise Threshold (CNT) for OLL works is classed as Category A, as previously discussed in Section 26.4.2.1.1. Therefore the daytime CNT is 65 dB $L_{Aeq,T}$ at the OLL NSLs.

Along the OGC, due to the linear nature of these works, the weekday daytime CNT is 70 dB $L_{Aeq,T}$ and Saturday daytime CNT is 65 dB $L_{Aeq,T}$.

At AN5, which is representative of NSLs in the OCC area, the ambient daytime noise levels were in the range between 40 to 43 dB $L_{Aeq,15min}$. Based on these measured levels at AN5, the CNT for OCC works is classed as Category A, as previously discussed in Section 26.4.2.1.1. Therefore the daytime CNT is 65 dB $L_{Aeq,T}$ at the OCC NSLs.

26.5.1.6 Summary of Onshore Compensation Compound Operational Noise Criterion

At UN1, which is representative of NSLs in the OCC area, the background noise levels were below the NG4 thresholds for a low background noise environment, as outlined in Section 26.4.2.3.2. Therefore the night-time criterion is 35 dB $L_{Aeq,T}$ and no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.

26.5.2 Baseline Vibration

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

26.6 Likely Significant Effects and Associated Mitigation Measures

26.6.1 Do Nothing Scenario

If the Project were not to proceed, no changes would be made to the current land-use practice of low-intensity agriculture, transport along the public road corridor, and recreational amenity. The existing noise environment in the vicinity of the Onshore Site will remain largely unchanged. In areas where traffic noise is a significant source, increases in traffic volumes on the road network would be expected to result in slight increases in overall ambient and background noise in the area over time.

26.6.2 Construction Phase Noise

26.6.2.1 Onshore Landfall Location and Onshore Compensation Compound

26.6.2.1.1 *Onshore Landfall Location Construction*

Details of the proposed OLL where the OEC will be brought ashore and meet the TJB are described in Chapter 5. Table 26-2 of Section 26.4.2.1 identifies appropriate construction noise criteria for the proposed OGC. The baseline noise survey results (See Section 26.5.1.5) identified the daytime CNT as 65 dB $L_{Aeq,T}$, evening CNT as 55 dB $L_{Aeq,T}$,and nighttime CNT as 45 dB $L_{Aeq,T}$, at the OLL and OCC NSLs.

The HDD OLL compound boundary is approximately between 230 m to 350 m from the nearest noise-sensitive locations (as shown in Figure 26-4. The proposed works at this location include a high voltage (220 kV) alternating current offshore export cable laid underground via horizontal directional drilling (HDD) or direct pipe from the high-water mark to the TJB in the townland of Killard.

494100 494400 494700

N

667800

667500

NSL161

NSL133

NSL094

AN1

NSL121

SCEIRDE ROCKS WINDFARM
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LEGEND

- Noise Monitoring Locations
- NSLs within 300m of OLL Compound
- OLL Temporary Construction Compound
- Landfall Transition Joint Bay
- Project EIAR Site Boundary

0 100 m
Meters

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Noise Sensitive Locations (NSLs) within 300m of OLL

VER	REMARKS	DATE	Drawn	Approved

DRAWING NO

Figure 26-4

SCALE	PAPER SIZE	DATUM	PROJECTION
	A4	IRENET95	Transverse Mercator

Table 26-15 presents outline noise calculations, considering the typical anticipated methods of construction and plant items required. Calculations have been prepared taking account of the distances to the nearest NSL and assume that there is no acoustic screening in place between the site works and the NSL. This calculation also assumes that the plant will operate a full 8-hour shift over the proposed 12 hour working period which equates to a 66% on time over a daytime period or 40 minutes over a 1-hour period. The dynamic nature of construction sites is such that this is deemed to be a conservative estimate, particularly for drilling works.

Table 26-15 Indicative noise calculations for construction – OLL HDD construction works

Plant Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance (dB $L_{Aeq,T}$) [3]	Calculated Construction Noise Levels dB $L_{Aeq,T}$ at reference distance from works	
		225m	350m
HDD drilling machine (C.4:92)	87	57	52
Directional drill (generator) (C.4:96)	77	47	42
Telehandler (C.4:54)	79	49	44
Dumper 3t Table (C.4:9)	77	47	42
Tractor (towing trailer) (C.4.75)	79	49	44
Tipper Lorry (Average of C.11:4-20)	82	49	44
Combined L_{Aeq} from all works		**59**	**55**

At the closest NSL, within 225m (NSL094) of the closest works boundary, the predicted CNL is 6 dB below the daytime CNT value of 65 dB $L_{Aeq,1hr}$. A significant effect is therefore not predicted in relation to the nearest NSLs at these distances in terms of this aspect of potential construction noise.

At the closest NSLs the associated effect is negative, not significant to slight and No Likely Significant Effects will arise during daytime periods. This effect is considered Not Significant.

No specific mitigation measures are required during OLL compound construction daytime works as the CNT is not exceeded at the closest NSLs and therefore there is no likely significant effects. In the event that the construction works were to take place over the evening or night-time period the CNT would be exceeded at the closest NSLs in the absence of suitable mitigation measures. Section 26.7.1 of this EIAR outlines suitable mitigation measures in the event that evening or night-time works are proposed at the OLL.

26.6.2.1.2 Onshore Compensation Compound Construction

[3] *All plant noise levels are derived from BS 5228: Part 1*

The OCC boundary is approximately 220 m from the nearest NSL (NSL60) and 315 m from the second closest NSL (NSL 16), as shown in Figure 26-5. Construction noise levels at these set-back distances from areas of construction works have been calculated to assess the impact at NSLs situated at the closest distances from the works.

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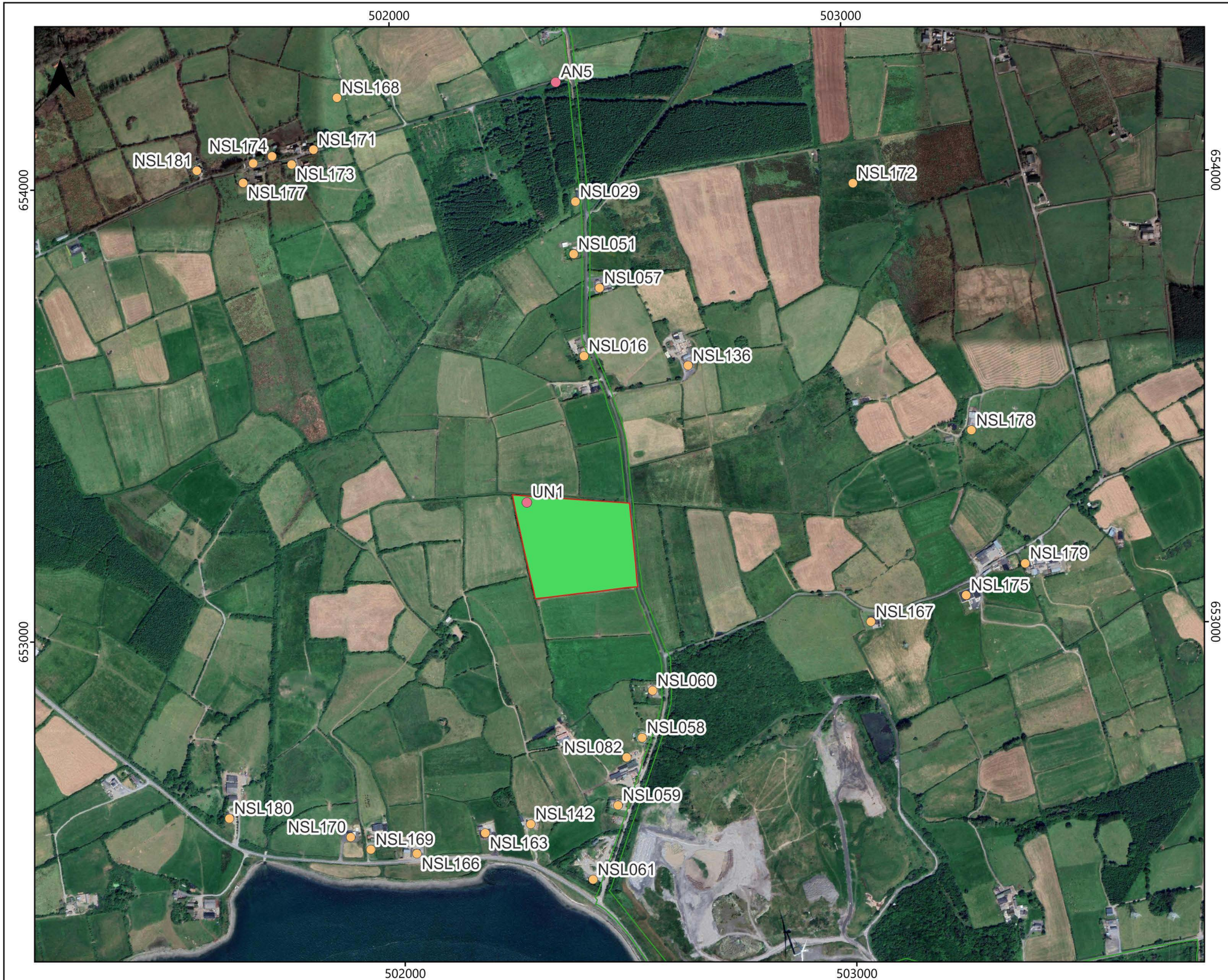

LEGEND

- Noise Monitoring Location
- NSLs within 1km of OCC Site Boundary
- OCC Site Boundary
- Project EIAR Site Boundary

0 250 m
Meters

Data Source

PROJECT TITLE
Sceirde Rocks

MAP TITLE
Noise Sensitive Locations (NSLs) within 1km of OCC

VER	REMARKS	DATE	Drawn	Approved

DRAWING NO
Figure 26-5

SCALE	PAPER SIZE	DATUM	PROJECTION
	A4	IRENET95	Transverse Mercator

Table 26-16 presents outline noise calculations, considering the typical anticipated methods of construction. Calculations have been prepared taking account of the distances to the nearest NSL and that there is no acoustic screening in place between the site works and the NSL. This calculation also assumes that the plant will operate a full 8-hour shift over the proposed 12 hour working period which equates to a 66% on time over a daytime period or 40 minutes over a 1-hour period. The dynamic nature of construction sites is such that this is deemed to be a conservative estimate, particularly for breaking works.

Table 26-16 Typical noise emission levels for typical construction activities

Plant Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance	Predicted CNL at 220 m (dB $L_{Aeq,T}$)	Predicted CNL at 315 m (dB $L_{Aeq,T}$)
HGV Movement (C.2.30)	79	49	45
Excavator mounted rock breaker (C.1.9)	90	60	56
Tracked Excavator (C.4.64)	77	47	43
General Construction (Various)	84	54	50
Dewatering Pumps (D.7.70)	80	50	46
JCB (D.8.13)	82	49	45
Crane (C.4.38)	78	45	41
Vibrating Rollers (D.8.29)	77	31	27
Combined L_{Aeq} from all works		**62**	**59**

At the closest NSL, within 220m of the closest works boundary, the predicted CNL is below the daytime CNT value of 65 dB $L_{Aeq,1hr}$. A significant effect is therefore not predicted in relation to the nearest NSLs at these distances in terms of this aspect of potential construction noise.

The short-term period considers that the noisiest works (rock breaking) occurs over greater than a 12 month period, which is highly unlikely. Nonetheless in a highly conservative assessment at the closest NSLs, the associated effect is negative, slight to moderate and short-term and No Likely Significant Effects will arise during daytime periods. This effect is considered Not Significant.

At all other NSLs at greater distances from the works the associated effect is negative, not significant to slight and short-term and No Likely Significant Effects will arise during daytime periods. This effect is considered Not Significant.

No specific mitigation measures are required during OCC construction daytime works as the CNT is not exceeded at the closest NSLs and therefore there is no likely significant effects. In the event that the construction works were to take place over the evening or night-time period the CNT would be exceeded at the closest NSLs in the absence of suitable mitigation measures. Section 26.7.1 of this EIAR

outlines suitable mitigation measures in the event that evening or night-time works are proposed at the OCC.

26.6.2.2 OGC from OLL to OCC to the 220kV Moneypoint Substation

Details of the proposed OGC route are described in Chapter 5, Section 5.3.2.2. Table 26-2 of Section 26.4.2.1.2 identifies appropriate construction noise criteria for the proposed OGC.

The OGC will be laid underground for approximately 22.3 km between the TJB in the townland of Killard, Co. Clare to the new OCC in the townland of Ballymacrinan, Co. Clare, and for approximately 3km from the OCC to the 220kV Moneypoint Substation, as illustrated in Figure 26-6.

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496000 504000 664000 656000

N

NSL121 NSL161 NSL157 NSL117 NSL162 NSL123 NSL023 NSL138 NSL134 NSL139 NSL020 AN2 NSL019 NSL152 NSL124 NSL140 NSL012 NSL076 NSL077 NSL073 NSL102 NSL021 NSL010 NSL043 NSL065 NSL155 NSL039 NSL144 NSL048 NSL115 NSL008 NSL063 NSL004 NSL072 NSL030 NSL007 NSL028 NSL099 NSL034 NSL031 NSL001 NSL150 NSL085 NSL122 NSL040 NSL062 NSL017 NSL091 NSL086 NSL096 NSL041 NSL068 NSL090 NSL160 NSL159 NSL153 NSL066 NSL112 NSL154 NSL056 NSL113 NSL151 NSL084 NSL081 AN5 NSL057 NSL051 NSL136 UN1 NSL060 NSL082 NSL058 NSL114 NSL142 NSL116 NSL132

LEGEND

- Noise Monitoring Locations
- Proposed OGC Route
- NSLs within 300m of OGC Route
- Project EIAR Site Boundary

0 1
Kilometres

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Noise Sensitive Locations (NSLs) within 300m of OGC Route

VER	REMARKS	DATE	Drawn	Approved

DRAWING NO

Figure 26-6

SCALE	PAPER SIZE	DATUM	PROJECTION
1:85,000	A4	IRENET95	Transverse Mercator

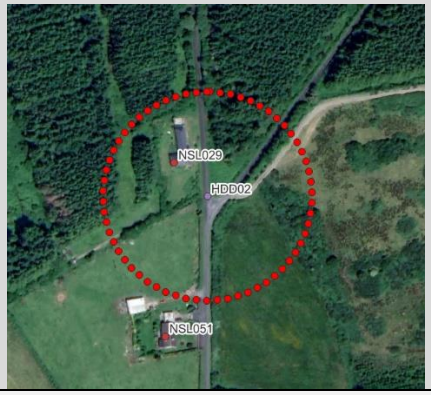
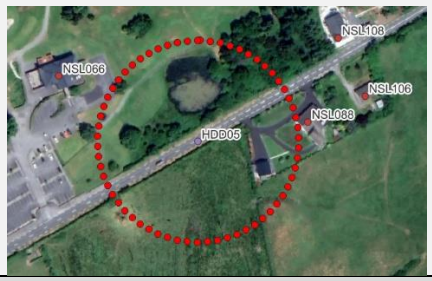
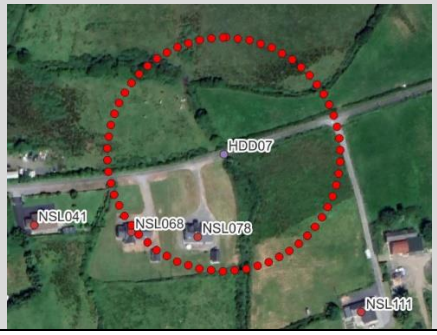
26.6.2.2.1 HDD Works

Open-cut trenching for cables laid in ducts will be the primary installation method. HDD will be required where obstacles are encountered, including sensitive features such as water courses, major roads, sensitive environmental areas, etc.

Utilising the same HDD plant noise data as presented in Table 26-14 the CNT of 70 dB $L_{Aeq,1hr}$ is not exceeded at locations at distances greater than 70m from the HDD works boundaries and therefore no significant effect is expected during the daytime period beyond these distances.

Review of the proposed HDD works outlined in Table 2.1 of the Outline Construction Methodologies Report indicates that there are four locations where the HDD works are within 70m of the closest NSLs as summarised in Table 26-17 below. In total there are seven NSLs within 10m to 70m from the HDD works boundaries.

Table 26-17 Location of HDD Works within 70m of NSLs

HDD ID	Crossing No.	Description	NSLs within 70m of HDD Works Boundary (distance to site boundary)	Figure Indicating Location of NSLs along OGC Route
HDD02	LF-C-02	Stone Culvert	NSL029 (15m)	
HDD05	LC-C05	N68	NSL088 (70m)	
HDD07	LF-C-13	Pipe Crossing	NSL078 (30m), NSL068 (50m)	

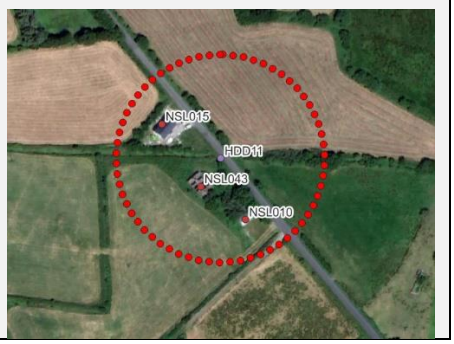
HDD ID	Crossing No.	Description	NSLs within 70m of HDD Works Boundary (distance to site boundary)	Figure Indicating Location of NSLs along OGC Route
HDD11	LF-C-22	Concrete Pipes	NSL010 (25m), NSL015 (25m), NSL043 (10m)	

Table 26-18 presents outline noise calculations, considering the typical anticipated methods of construction. Calculations have been prepared taking account of the distances to the nearest NSL and that there is no acoustic screening in place between the site works and the NSL. This calculation also assumes that the plant will operate a full 8-hour shift over the proposed 12 hour working period which equates to a 66% on time over a daytime period or 40 minutes over a 1-hour period. The dynamic nature of construction sites is such that this is deemed to be a conservative estimate, particularly for drilling works.

Table 26-18 Typical noise emission levels for typical HDD construction plant

Plant Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance (dB $L_{Aeq,T}$) [4]	Calculated Construction Noise Levels dB $L_{Aeq,T}$ at reference distance from works					
		10m	15m	25m	30m	50m	70m
Cumulative HDD plant as per Table 26-14	89	89	85	80	78	73	70

The CNL presented in Table 26-18 is above the daytime CNT value of 70 dB $L_{Aeq,1hr}$ when works are taking place simultaneously within 70m from the HDD works boundary in the absence of any noise mitigation. The predicted CNL, at distances of 70m and greater from the works, are all below the daytime construction noise criteria set out in Table 26-3. It should be noted that as the works progress along the route the worst-case predicted impacts will reduce as the distance from the works increases.

It is envisioned that they will be at the closest position to the nearest NSLs for no more than 5 days. In line with DMRB Noise and Vibration (UKHE 2020) document, a significant effect relating to construction noise is deemed to occur where a moderate or major impact is likely to occur for a period of greater that 10 days/nights over 15 consecutive day/nights, or greater than 40 days over 6 consecutive months. In the case of this HDD activity, the durations for significant effects will not be exceeded and hence the overall significance of effects are categorised as moderate but Not Significant and temporary. This effect is considered Not Significant.

At all other NSLs at a greater distance than 70m to the works the associated effect is negative, not significant to moderate and temporary and No likely Significant effects will arise during daytime periods. This effect is considered Not Significant.

[4] *All plant noise levels are derived from BS 5228: Part 1*

The construction phase will be controlled through the use of construction noise threshold values which the contractor will be required to work within. In this regard, the choice of plant, scheduling of works on site, and other best practice control measures will be employed. Further discussion on construction noise control measures is included in Section 26.7.1.

26.6.2.2.2 Open Cut Trenching Works

The proposed route lies in proximity of a number of residential NSLs along the local roads from Killard to Ballymacrinan, with the closest distances ranging from less than 10 m to 50 m. Table 26-19 presents outline noise calculations, considering the typical anticipated methods of construction. Calculations have been prepared taking account of the distances to the nearest NSL and that there is no acoustic screening in place between the site works and the NSL. This calculation also assumes that the plant will operate a full 8-hour shift over the proposed 12 hour working period which equates to a 66% on time over a daytime period or 40 minutes over a 1-hour period. The dynamic nature of construction sites is such that this is deemed to be a conservative estimate, particularly for excavation works.

Table 26-19 Indicative noise calculations for construction – Grid Connection Route

Plant Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance (dB $L_{Aeq,T}$) [5]	Calculated Construction Noise Levels (CNL) dB $L_{Aeq,T}$ at reference distance from works					
		<10m	15m	20m	30m	40m	50m
Tracked Excavator (C.4.64)	77	76	73	70	66	64	61
Wheeled Loader Lorry (C2.28)	76	75	72	69	65	63	60
Dump Truck (C.4.2)	78	77	74	71	67	65	62
Vibratory Roller (C5.25)	75	74	71	68	64	62	59
HGV Movements (10 per hour)	61	60	57	54	50	48	45
Generator (C.2.44)	77	73	70	67	63	61	58
Combined L_{Aeq} from all works		**83**	**79**	**77**	**73**	**70**	**68**

The CNL presented in Table 26-19 is above the daytime CNT value of 70 dB $L_{Aeq,1hr}$ when works are taking place simultaneously within 40m from the OGC works boundary in the absence of any noise mitigation. The predicted CNL, at distances of 40m and greater from the works, are all below the daytime construction noise criteria set out in Table 26-3. It should be noted that as the works progress along the route the worst-case predicted impacts will reduce as the distance from the works increases. It must be stated that for most of the time, plant and equipment will be a greater distance from the nearest NSLs than those used within the calculations and consequently will have lower impact. The assessment is therefore representative of a conservative scenario representing construction activities at a minimum distance from the NSLs.

[5] *All plant noise levels are derived from BS 5228: Part 1*

For NSLs within 40m of the OGC it is envisioned that the proposed works will be at the closest position to the nearest NSLs for no more than one week. In line with DMRB Noise and Vibration (UKHE 2020) document, a significant effect relating to construction noise is deemed to occur where a moderate or major impact is likely to occur for a period of greater that 10 days/nights over 15 consecutive day/nights, or greater than 40 days over 6 consecutive months. In the case of this activity, the durations for significant effects will not be exceeded and hence the overall significance of effects are categorised as moderate, but Not Significant and temporary. This effect is considered Not Significant.

At all other NSLs at a greater distance than 40m to the works the associated effect is negative, not significant to moderate and temporary and No likely Significant effects will arise during daytime periods. This effect is considered Not Significant.

Further discussion on construction noise control measures is included in Section 26.7.1.1

26.6.2.2.3 *Connection at Moneypoint 220kV Substation*

Connection works will be required at the Moneypoint 220kV Substation site as part of the works, a detailed description is provided in Chapter 5.

The open cut trenching and HDD works associated with the OGC from the OCC to the Moneypoint 220kV Substation has been assessed in the previous sections. The works related to the vehicle underpass to fly ash disposal area at Moneypoint Generating Station (ref. MP-C-03) take place at 220m distance to the closest NSL.

With reference to BS 5228-1 excavators, dozers, cranes, dumper trucks, lorries, rollers and concreting equipment, are typically in the range of 70 to 83 dB L_{Aeq} at 10m. For structural activities, a total construction noise level of 85 dB L_{Aeq}, at 10m has been used for the purposes of indicative calculations. This would include, for example two items of plant at 80dB L_{Aeq} and three items of plant at 75dB L_{Aeq} operating simultaneously within one work area.

At the closest NSL, approximately 220m (NSL132) from the closest works boundary, the predicted CNL is 55 dB $L_{Aeq,1hr}$, which is 10 dB below the daytime CNT value of 65 dB $L_{Aeq,1hr}$. A significant effect is therefore not predicted in relation to the nearest NSLs at these distances in terms of this aspect of potential construction noise.

At the closest NSLs the associated effect is negative, not significant to slight and No likely Significant effects will arise during daytime periods. This effect is considered Not Significant.

No specific mitigation measures are required during connection works to the Moneypoint 220kV Substation as the CNT is not exceeded at the closest NSLs and therefore there is no likely significant effects. In the event that the construction works were to take place over the evening or night-time period the CNT would be exceeded at the closest NSLs in the absence of suitable mitigation measures. Section 26.7.1 of this EIAR outlines suitable mitigation measures in the event that evening or night-time works are proposed at Moneypoint.

26.6.2.3 Temporary Construction Compound

The temporary construction compounds at the OLL and OCC have been considered in Section 26.6.2.1. The Golf Club temporary construction compound located to the north of the N68 is located 60m from the closest NSL (NSL066).

For construction work areas with lower noise levels such as site construction compounds (for storage, offices and material handling, generators etc.), a total construction noise level of 78 dB L_{Aeq} at 10m has been used for the purposes of indicative calculations. This would include, for example one item of plant at 75 dB L_{Aeq} and three items of plant at 70 dB L_{Aeq} operating simultaneously within one work area. Given the variations of on-site activities and noise levels over any one day and considering that all

activities will not operate simultaneously, the values noted above are considered robust for the purposes of assessing potential construction impacts.

At the closest NSL, within 60m (NSL066) of the closest site boundary, the predicted CNL is 61 dB $L_{Aeq,1hr}$, which is 4 dB below the daytime CNT value of 65 dB $L_{Aeq,1hr}$. A significant effect is therefore not predicted in relation to the nearest NSLs at these distances in terms of this aspect of potential construction noise.

At the closest NSLs the associated effect is negative, not significant to slight and No Likely Significant Effects will arise during daytime periods. This effect is considered Not Significant.

No specific mitigation measures are required.

26.6.2.4 Construction Vehicular Activity

This section has been prepared in order to assess likely significant noise effects associated with construction traffic using the local road network. Information presented in Chapter 29, regarding vehicle types and predicted traffic volumes, have been used to inform this assessment.

The DMRB Noise and Vibration (UKHE 2020), Volume 11, Section 3, Part 7) states that it takes a 25% increase or a 20% decrease in traffic flows in order to get a 1dB(A) change in traffic noise levels. Given that the construction traffic is likely to move along the existing local road network, construction phase traffic movements will be less than 25% on the existing roads, based on the estimated 30 additional vehicle movements per day during the UGC installation. On this basis, traffic noise levels associated with the construction phase will be significantly less than 1 dB(A).

The construction traffic noise impact will be neutral, imperceptible and is Not a likely Significant effect. This effect is considered Not Significant.

26.6.3 Construction Phase Vibration

Accounting for the distance between the closest Vibration Sensitive Receptors (VSR) and the assumed location of construction activities (at their closest approach), it is unlikely that the construction phase of the Onshore Site works will give rise to significant vibration effects as levels of vibration are known to decrease rapidly with distance.

Furthermore, ground level plant is not considered to generate significant levels of vibration, with levels below those which would be likely to cause cosmetic damage.

Some construction phase activities associated with the onshore works have the potential to result in vibration impacts at VSR if sufficiently close to the respective receptor. Activities included in the construction phase that have the potential to result in vibration impacts include:

- HDD drilling at OLL, OGC route installation from OLL to OCC to the existing Moneypoint 220kV Substation; and
- Mechanical excavation at OLL, OCC and for OGC cable duct installation from OLL to OCC to the Moneypoint 220kV Substation.

26.6.3.1 HDD Vibration Assessment

HDD is a cable duct installation option at OLL to bring the offshore export cables onshore. It is also proposed for sections of the OGC route from the OLL to OCC to the Moneypoint 220kV Substation as a method alongside open-cut trenching to cross significant environmental and physical features such as bridge structures and roads. Considering both of these activities, the closest VSRs are between 10m to 70m distance, as previously outlined in Section 26.6.2.2.1 and Table 26-17.

BS 5228–2 (BSI 2009 +A1 2014b), states that the mechanisms which give rise to the propagation of vibration through media such as soil are complex. The magnitude of vibration is determined by the characteristics of the vibration source, the properties of the excavated ground, and the ground between the vibration source and VSR. Multi-layered soils and/or the presence of deep-piled building foundations can further complicate and modify magnitudes and estimates. Calculating groundborne noise and vibration is highly specialised and outside the scope of this assessment.

Nonetheless all HDD works will be required to operate below the recommended guideline criteria e.g. 8 mm/s PPV at 10 Hz as outlined in Table 26-6. Provided the recommended vibration criteria is not exceeded and with regard to building response, the significance of effects is not significant.

The following assessment refer to the human response to vibration only. The HDD works will be required to operate below 8 mm/s PPV in line with the TII guidance, the vibration impacts during HDD works have the potential to generate a negative, moderate to significant and temporary effects at distances up to 70 m from the activity for human perception (outlined in Table 26-7) i.e. likely to cause complaint, but can be tolerated if prior warning and explanation has been given to residents. Beyond 70 m from this type of activity, effects are reduced to not significant to slight and temporary. For all other works, vibration effects will be below those associated with perceptible vibration and will be imperceptible to not significant and temporary. This effect is considered Not Significant.

Any construction activities undertaken on the site will be required to operate below the recommended vibration criteria set out in Table 26-5 and further vibration mitigation measures are discussed in Section 26.7.1.

26.6.3.2 Mechanical Excavation Vibration Assessment

During surface breaking and open cut activities, there is potential for vibration to be generated through the ground. Empirical data for this activity is not provided in BS 5228–2 (BSI 2009 +A1 2014b), however the likely levels of vibration from this activity is expected to be significantly below the vibration criteria for building damage on experience from other sites. AWN Consulting have previously conducted vibration measurements under controlled conditions, during trial construction works on a sample site where concrete slab breaking was carried out. The trial construction works consisted of the use of the following plant and equipment when measured at various distances:

- 3 tonne hydraulic breaker on small CAT tracked excavator; and
- 6 tonne hydraulic breaker on large Liebherr tracked excavator.

Vibration measurements were conducted during various staged activities and at various distances.

Peak vibration levels during staged activities using the 3 tonne breaker ranged from 0.48 to 0.25 PPV (mm/s) at distances of 10m to 50m respectively from the breaking activities. Using a 6 tonne breaker, measured vibration levels ranged between 1.49 to 0.24 PPV (mm/s) at distances of 10m to 50m respectively. Whilst these measurements relate to the breaking of a solid concrete slab, the range of values recorded provides some context in relation typical ranges of vibration generated by construction breaking and open cut activity.

This assessment is considered as a highly conservative scenario as there are no concrete roads or slabs known to be required to be broken during the construction phase. Nonetheless, the distance is 5m to 50m between the areas where mechanical excavations are to occur(see Table 26-18) and the nearest VSRs are such that all vibration transmission would be orders of magnitude below recommended guideline criteria e.g. 8 mm/s PPV (Refer to Table 26-6). With regard to building response, the significance of effects is not significant. No vibration mitigation measures based on building response are required during the construction works.

The following assessment refer to the human response to vibration only. During the OGC works the closest VSRs are within 5m to 50m of the EIAR Site Boundary. Referring to the vibration magnitudes

above and the human response to vibration outlined in Table 26-7 (i.e. likely to cause complaint, but can be tolerated if prior warning and explanation has been given to residents), vibration impacts during ground breaking activities using heavy breakers have the potential to generate negative, moderate to significant, temporary effects at distances between 5m to 50m from the activity. Beyond 50m from this type of activity, effects are reduced to not significant to slight and temporary, but Not Significant. For all other works, vibration effects will be below those associated with perceptible vibration and will be imperceptible to not significant and temporary.

Any construction activities undertaken on the site will be required to operate below the recommended vibration criteria set out in Table 26-6 and further vibration mitigation measures are discussed in 26.7.1.

26.6.4 Operation and Maintenance Phase

The primary sources of outward noise from the Onshore Site in the operational context are deemed long term and will involve the fixed plant at the OCC. This is assessed in the following section with respect to the assessment criteria that have been presented in Section 26.4.2.3. There are a number of plant items associated with the operation of the Onshore Site. Most of this plant will be capable of generating noise to some degree. Noisy plant items located externally will potentially have the greatest impact on the receiving environment. The following assessment is based upon the existing information at the planning stage. The specific plant and sound power levels will be further confirmed and reviewed during the detailed design phase to ensure adherence in accordance with the requisite operational noise criteria.

A series of computer-based prediction models have been prepared to quantify the potential plant noise level associated with the O&M phase of the Onshore Site on the receiving environment. This section discusses the methodology behind the noise modelling process and presents the results of the modelling exercise. See Appendix 26-3 for details of the noise modelling undertaken for this assessment and associated input information.

As shown in Table 26-20 and illustrated in Figure 26-5 previously, there are 28 no. NSLs within the 1 km study area of the OCC site boundary.

Table 26-20 Assessment locations

Location Reference	Coordinates ITM		Location Reference	Coordinates ITM	
	Easting	Northing		Easting	Northing
NSL016	502,419	653,612	NSL168	501,882	654,193
NSL029	502,406	653,954	NSL169	501,928	652,528
NSL051	502,400	653,838	NSL170	501,884	652,556
NSL057	502,456	653,762	NSL171	501,828	654,079
NSL058	502,533	652,765	NSL172	503,021	653,984
NSL059	502,477	652,616	NSL173	501,779	654,047
NSL060	502,558	652,869	NSL174	501,736	654,066
NSL061	502,419	652,453	NSL175	503,256	653,068
NSL082	502,498	652,722	NSL176	501,694	654,051

Location Reference	Coordinates ITM		Location Reference	Coordinates ITM	
	Easting	Northing		Easting	Northing
NSL136	502,649	653,587	NSL177	501,671	654,008
NSL142	502,283	652,578	NSL178	503,274	653,433
NSL163	502,182	652,560	NSL179	503,388	653,136
NSL166	502,030	652,517	NSL180	501,616	652,602
NSL167	503,044	653,013	NSL181	501,569	654,037

Predicted noise levels are presented in Table 26-21 for the ten closest NSLs. The predicted noise levels at all 28 no. NSLs within the study area are presented in Appendix 26-4. The noise contours for the operational scenarios at 1.5m (applicable to bungalow residences) and 4m (applicable to two storey dwellings) are presented in Appendix 26-5.

Table 26-21 Predicted noise levels compared to noise criteria EPA NG4 low background noise criterion

Ref.	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
NSL016	36	Day	45	–	✓
		Evening	40	–	✓
		Night	35	1 dB	x
NSL136	35	Day	45	–	✓
		Evening	40	–	✓
		Night	35	–	✓
NSL057	31	Day	45	–	✓
		Evening	40	–	✓
		Night	35	–	✓
NSL060	28	Day	45	–	✓
		Evening	40	–	✓
		Night	35	–	✓
NSL173	28	Day	45	–	✓
		Evening	40	–	✓
		Night	35	–	✓
NSL058	28	Day	45	–	✓

Ref.	Predicted Noise Level dB(A)	Period	EPA NG4 Criterion dB $L_{Aeq,15min}$	Excess	Complies?
		Evening	40	–	✓
		Night	35	–	✓
NSL171	28	Day	45	–	✓
		Evening	40	–	✓
		Night	35	–	✓
NSL174	28	Day	45	–	✓
		Evening	40	–	✓
		Night	35	–	✓
NSL177	28	Day	45	–	✓
		Evening	40	–	✓
		Night	35	–	✓
NSL029	27	Day	45	–	✓
		Evening	40	–	✓
		Night	35	–	✓

The EPA NG4 low background noise criterion is not exceeded at any of the closest NSLs during any time period, with the exception of NSL016 located approximately 300m immediately to the north of the EIAR Site Boundary which is 1 dB above the night-time NG4 criterion of 35 dB $L_{Aeq,15min}$.

The predicted noise levels are below of 35 dB $L_{Aeq,T}$ which corresponds to the EPA NG4 night-time criterion for low background noise areas. As 35 dB L_{Aeq} remains a low level of noise, and is 5 dB below the BS8233 external night-time criterion of 40 dB $L_{Aeq, 8hr}$, the significance of effects are therefore considered 'Not Significant'.

The exception to the statement above is NSL016 located to the north of the site which in the absence of noise mitigation measures is marginally above the EPA NG4 night-time criterion for low background noise areas of 35 dB L_{Aeq}, the significance of effects are therefore considered 'Significant'. Taking the above into account the above further mitigation is outlined in Section 26.7.2.

26.6.5 Decommissioning Phase

In relation to the decommissioning phase of the Onshore Site, similar overall noise levels as those calculated for the construction phase would be expected, as similar tools and equipment will be used, with the exclusion of the HDD.

In all instances the total decommissioning noise levels are expected to be below the recommended noise and vibration criteria set out in Section 26.4.2 and therefore a significant effect is not predicted in relation to the nearest noise sensitive locations during the decommissioning phase.

With respect to the EPA's guidance for description of effects as described in Table 26-4 the potential worst-case associated effect at the nearest NSL associated with decommissioning activity is expected to be negative, not significant to moderate and temporary but Not Significant.

These effects should be considered in terms that the effect is variable, and that this assessment considers the locations of the greatest potential effects.

26.6.6 Summary of Potential Significant Effects

The assessment of potential impact and significance of effects has demonstrated that the proposed development is largely expected to comply with the identified criteria for the construction phases. However, to ameliorate any significant noise and vibration effects, as summarised in Table 26-22 below, a schedule of noise control measures has been designed for both construction/decommissioning and operation and maintenance phases.

Table 26-22: Summary of Construction and O&M Phase Likely Significant Effects in the Absence of Mitigation Measures

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Construction noise from OLL	Negative	Significant to Very Significant during evening or night-time works	Closest NSLs within 350m during evening works and 900m during night-time works	Likely	Temporary	Direct / Worst-Case
Construction noise from OCC	Negative	Significant to Very Significant during evening or night-time works	Closest NSLs within 450m during evening works and 1250m during night-time works	Likely	Temporary	Direct / Worst-Case
Construction noise from connection at Moneypoint	Negative	Significant to Very Significant during night-time works	Closest NSLs within 600m during night-time works	Likely	Temporary	Direct / Worst-Case
Construction vibration human perception during HDD works	Negative	Moderate to Significant	Closest VSRs within 70m of HDD plant	Likely	Temporary	Direct / Worst-Case
Construction vibration human perception during Mechanical excavation works	Negative	Moderate to Significant	Closest VSRs within 50m of mechanical excavator (concrete breaking) plant	Likely	Temporary	Direct / Worst-Case
Operational Noise from OCC	Negative	Significant	NSL016 during night-time period	Likely	Long-term	Direct / Worst-Case

26.7 Mitigation Measures

26.7.1 Construction Phase

Construction noise mitigation is not required for any construction activity if the construction occurs for periods less than those outlined in the DMRB document i.e. a period no greater than 10 days/nights over 15 consecutive day/nights, or greater than 40 days over 6 consecutive months. In the event that evening or night-time works are proposed in excess of the periods outlined above suitable mitigation measures outlined below are applicable in order to reduce potential impacts as far as practicable to within the adopted design goals for evening or night-time periods.

On review of the likely vibration levels associated with construction activities, it is concluded that the construction of the proposed development is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or cosmetic damage to adjacent buildings. In the case of vibration levels giving rise to human discomfort during HDD and mechanical excavation within 70m and 50m distances respectively, in order to minimise such impacts, Section 26.7.1.2 outlines mitigation measures that shall be implemented during the construction period.

26.7.1.1 Evening and Night-Time Period Noise Mitigation Measures

Best practice noise control measures will be employed by the contractor during the construction phase in order to avoid exceedance of the adopted construction noise threshold values at the nearest NSLs. The best practice measures set out in BS 5228 (2009 +A1 2014) Part 1 will be complied with. This includes guidance on several aspects of construction site noise mitigation measures, including, but not limited to:

- Selection of quiet plant
- Control of noise sources
- Screening
- Hours of work
- Liaison with the public

Further comment is offered on these items in the following paragraphs.

Noise control measures that will be implemented where required include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise monitoring.

26.7.1.1.1 *Selection of Quiet Plant*

This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item will be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action will be to identify whether said item can be replaced with a quieter alternative.

26.7.1.1.2 *Noise Control at Source*

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control at source. This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

The following best practice migration measures will be implemented where required:

- Site compounds will be located away from noise sensitive locations within the site constraints.
- The use of lifting bulky items, dropping and loading of materials within these areas will be restricted to normal working hours.
- For mobile plant items such as cranes, dump trucks, excavators and loaders, maintaining enclosure panels closed during operation can reduce noise levels over normal operation. Mobile plant will be switched off when not in use and not left idling.
- For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system.
- For percussive tools such as pneumatic breakers, a number of noise control measures include fitting muffler or sound reducing equipment to the breaker tool and ensuring any leaks in the air lines are sealed.
- Erecting localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling, ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

26.7.1.1.3 Screening

Typically screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver.

The length of the screen should in practice be at least five times the height, however, if shorter sections are necessary then the ends of the screen will be wrapped around the source. BS 5228 -1:2009+A1 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier will be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice, screens constructed of materials with a mass per unit of surface area greater than 10kg/m^2 will give adequate sound insulation performance.

Residual construction noise calculations have assumed a partial line of sight (-5dB) is achieved using a solid 2.4m high standard construction site hoarding for fixed sites e.g. OLL, OCC and connection to the existing Moneypoint 220kV Substation.

Annex B of BS 5228-1:2009+A1:2014 (Figures B1, B2 and B3) provide typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on site from standard materials.

In addition, careful planning of the site layout will also be considered. The placement of temporary site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening during the phasing of works.

26.7.1.1.4 Liaison with the Public

A designated Community Liaison Officer (CLO) will be appointed to site during construction works. Any noise complaints will be logged and followed up in a prompt fashion by the CLO. In addition, prior to particularly noisy construction activity the CLO will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

26.7.1.1.5 Reduction in Number of Plant Items Operating

In the event that evening or night-time construction works in excess of the DMRB document guidance occur, the mitigation measures outlined in the preceding sections of Section 26.7.1.1 would be expected to achieve a 10 dB reduction in predicted CNLs. However the CNL would still exceed the night-time CNT in the following scenarios if all plant items worked simultaneously while adjacent to the closest boundary to the site (which is unlikely to occur if at all):

- Exceedance of night-time CNT at NSLs within 350m of the OLL site boundary (NSL094, NSL121,NSL133 and NSL161); and
- Exceedance of night-time CNT at NSLs within 450m of the OCC site boundary (NSL016, NSL136, NSL060, NSL058, NSL082).

Therefore additional mitigation measures in the form of strict adherence to the night-time CNT at the closest NSLs during the OLL and OCC night-time works are required (see Section 0 for further details). This can be achieved with the reduction of the number of plant items operating at the closest site boundaries, for example if the HDD does not operate during night-time works at the OLL and breakers do not operate during night-time works at the OCC.

26.7.1.1.6 Noise Monitoring

During the construction phase in the event of evening or night-time works taking place that exceed the durations outlined in the DMRB document, the appointed contractor will monitor noise at representative NSLs to evaluate and inform the requirement and / or implementation of noise management measures. Noise will be monitored in accordance with ISO 1996–1 (ISO 2016) and ISO 1996–2 (ISO 2017).

The selection of monitoring locations will be based on the closest NSLs to the proposed works which have the potential to exceed the CNT, see Table 26-22 for distances based on construction activity.

Any Noise Monitoring Terminal (NMT) to be installed will have the following specifications (or similar approved):

- Logging of two concurrent periods, e.g., 15-minute & hourly.
- Daily automated Charge Injection Calibration (CIC).
- E-mail alert on threshold exceedance.
- E-mail alert on low battery and low memory.
- Remote access to measured data.
- Live display of noise levels.

In addition, it is recommended that spot-check noise measurements are conducted on a monthly basis. These spot checks can be organised to coincide with works that have the potential to generate high levels of noise on site in order to confirm the potential extent of effects.

A monthly noise-monitoring report should be prepared by the contractor. Reports should identify any exceedances above nominal limit values and attempts to clarify the causes. Where remedial measures are required and identifiable, these should also be clearly stated.

26.7.1.2 Vibration Mitigation Measures

In the case of vibration levels giving rise to human discomfort during HDD and mechanical excavation within 70m and 50m distances respectively the following measures in line with BS 5228 (2009 +A1 2014) Part2 shall be implemented during the construction period:

- A clear communication programme will be established to inform adjacent building occupants in advance of any potential intrusive works which may give rise to vibration levels likely to exceed perceptible levels. The nature and duration of the works will be clearly set out in all communication circulars;
- Appropriate vibration isolation shall be applied to plant, where feasible;
- Monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values.

26.7.1.2.1 *Vibration Monitoring*

Where the HDD works take place within 70m of the closest VSRs and mechanical excavations (concrete breaking) take place within 50m of the closest VSRs vibration monitoring shall be installed, with the number and locations to be agreed with Local Authority.

Vibration monitoring stations should continually log vibration levels using the Peak Particle Velocity parameter (PPV, mm/s) in the X, Y and Z directions, in accordance with ISO 4866: 2010: Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures.

The mounting of the transducer to the vibrating structure will need to comply with BS ISO 5348: 2021: Mechanical vibration and shock – Mechanical mounting of accelerometers.

In summary, the following ideal mounting conditions apply:

- The transducer and its mountings should be as rigid as possible;
- The mounting surfaces should be as clean and flat as possible;
- Simple symmetric mountings are best;
- The mass of the mounting should be small in comparison to that of the structure under test;
- The monitoring equipment should be set to monitor vibration in 5-minute periods;
- E-mail alert on threshold exceedance;
- E-mail alert on low battery and low memory;
- Remote access to measured data;
- Live display of vibration levels.

Spot-check vibration measurements will be conducted on a monthly basis. These spot checks can be organised to coincide with works that have potential to generate high levels of vibration on site in order to confirm the potential extent of effects.

A monthly vibration monitoring report will be prepared by the contractor. Reports will identify any exceedances above nominal limit values and attempts to clarify the causes. Where remedial measures are required and identifiable, these will also be clearly stated.

No vibration monitoring is required for the operation and maintenance phase.

26.7.2 Operation and Maintenance Phase

26.7.2.1 Fixed Plant at the OCC

For the OCC plant to achieve the EPA NG4 criteria for areas of low background noise as outlined in Table 26-9 in Section 26.4.2.3.2 i.e. 35 dB $L_{Aeq,T}$ night time at NSL016, the following mitigation measures in respect of OCC plant items are as summarised below and are included in the design of the Onshore Site:

- Adherence to the maximum sound power levels for each item, as presented in Appendix 26-3;
- Installed plant at the OCC will have no audible tonal or impulsive characteristics when in operation, during the night-time period.
- A 7.5m high acoustic screening barrier has been included as per the site layout plan to the immediate north and east of the harmonic filter compound in order for NSL016 to achieve a predicted operational noise level of 35 dB during the night-time period.
- Any alterations to the noise source data, building, plant or 7.5m acoustic screening layouts associated with OCC O&M phase of the Project will be designed such that the operational noise criteria outlined in this chapter are achieved and associated noise impacts are no greater than those discussed above and summarised in Appendix 26-4.

During the detailed design of the OCC, the selection and location of mechanical and electrical plant will be undertaken in order to ensure the relevant noise emission limits set out in Section 26.4.2.3.2 are not exceeded.

26.7.3 Decommissioning Phase

The mitigation measures that will be implemented in relation to any decommissioning of the site are the same as those set out for the construction phase of the Onshore Site outlined in Section 26.7.1.1 with the exception of the HDD for vibration, which will not be required during decommissioning works.

26.8 Residual Effects

26.8.1 Construction Phase

The construction noise assessment has shown that in accordance with the 'significance' thresholds presented in the BS 5228-1 there is negative, not significant and temporary to short-term effect at noise-sensitive locations in terms of ambient noise levels subject to appropriate management of the issues on the site as presented in Section 26.7.1 which is Not Significant.

Provided the recommended vibration criteria is not exceeded and with regard to building response, the residual significance of effects is negative, not significant and temporary which is Not Significant. With regard to human perception the residual significance of effects is negative, moderate and temporary, but Not Significant.

These effects should be considered in terms that the effect is variable, and that this assessment considers the locations and likely noise sources of the greatest potential effect which is a conservative approach.

26.8.2 Operation and Maintenance Phase

Proprietary noise control measures will be employed as part of detailed design in order to ensure that noise emissions from OCC plant do not exceed the adopted design criterion at any nearby noise sensitive locations. In addition, noise emissions will be broadband in nature and will not contain any tonal or impulsive elements. The residual effect from building services and plant noise is predicted to be negative, not significant to moderate and long-term, which is Not Significant.

26.8.3 Decommissioning Phase

The residual effects associated with the decommissioning of the Project are the same as those outlined for the construction phase of the Onshore Site outlined in Section 26.8.1. These effects are Not Significant.

26.9 Cumulative Effects

A fundamental component of the EIA is to consider and assess the potential for cumulative effects of the Project with other projects, plans and activities (hereafter referred to as 'other developments'). There is potential for cumulative effects to occur during both the Construction / Decommissioning and O&M of the Project. The study areas for the cumulative effects are assessed at distances of 300m for construction noise and 1km for operational noise as set out within Section 26.4.3. Table 26-23 below presents the other developments assessed against the Project for cumulative effects in relation to noise and vibration at the closest shared NSLs.

Any other developments which relate to one off house building or extensions have been excluded from the cumulative assessment as these are expected to have noise levels at least 10 dB below the predicted noise levels from the Project construction activities and therefore will have no cumulative effect on the closest NSLs within 300m of the Project construction works.

Table 26-23 Developments Proposed in the Local Area with 300m of Construction Works and 1km of OCC Site

Planning Authority	Planning Application Reference	Description	Potential Cumulative Effects?	
			Construction	Operational
An Board Pleanála	307798	Proposed 400kV electricity transmission cables, extension between the existing Moneypoint 400kV Electrical Substation in the townland of Carrowdoita South County Clare and existing Kilpaddoge and a 220/110kV Electrical Substation in the townland of Kilpaddoge County Kerry.	Yes - Minimum of 215m distance from NSLs (NSL132) along southern section of OGC route from OCC to Moneypoint 220kV Substation.	Yes – Moneypoint Generating Station will be required to operate under an Industrial Emissions Licence (IEL).
An Board Pleanála	319080	Proposed transition and conversion of the existing 900MW electricity generating station from coal to heavy fuel oil and associated ancillary development at Moneypoint Generating Station, Moneypoint, Co. Clare.	Yes - Minimum of 45m from NSLs (NSL059, NSL061) along southern section of OGC route from OCC to Moneypoint 220kV Substation.	Yes – Moneypoint Generating Station will be required to operate under an Industrial Emissions Licence (IEL).
Clare County Council	2332	Development within the EPA Licensed Moneypoint Generating Station, Carrowdotia North and Carrowdotia South, Kilimer, County Clare (Eircode V15 R963). Licence (Ref P0605-04)	Yes - Minimum of 45m from NSLs (NSL059, NSL061) along southern section of OGC route from OCC to Moneypoint 220kV Substation.	Yes – Moneypoint Generating Station will be required to operate under an Industrial Emissions Licence (IEL).
Clare County Council	19746	Development within the EPA Licensed Moneypoint Generating Station, Carrowdotia North and Carrowdotia South, Kilimer, County Clare (Eircode V15 R963). Licence (Ref P0605-04)	Yes - Minimum of 45m from NSLs (NSL059, NSL061) along southern section of OGC route from OCC to Moneypoint 220kV Substation.	Yes – Moneypoint Generating Station will be required to operate under an Industrial Emissions Licence (IEL).
Clare County Council	20318	Development within the EPA Licensed Moneypoint Generating Station, Carrowdotia North and Carrowdotia South, Kilimer, County Clare (Eircode V15 R963). Licence (Ref P0605-04)	Yes - Minimum of 45m from NSLs (NSL059, NSL061) along southern section of OGC route from OCC to	Yes – Moneypoint Generating Station will be required to operate under an Industrial Emissions Licence (IEL).

Planning Authority	Planning Application Reference	Description	Potential Cumulative Effects?	
			Construction	Operational
			Moneypoint 220kV Substation.	

26.9.1 Cumulative Construction Impacts

The residual noise effect from the Project construction phase is not significant in EIAR terms as the construction noise threshold is not exceeded during daytime periods.

If construction activities at nearby (within 300m) other development sites are taking place concurrently with the construction of the Project, there is potential for cumulative noise impacts to occur. However, due to the nature of construction works associated with the Project, noise levels from this site will dominate the noise environment when occurring in proximity to the NSLs along its immediate site boundary for the OGC, OCC and at Moneypoint.

The noise contribution from other construction sites would need to be equal to those associated with the proposed development in order to result in any cumulative effect i.e. to increase the predicted noise levels by at least 3 dB. While a 3 dB increase is a doubling of sound energy, subjectively any change in noise level below 3 dB would be barely perceptible.

As outlined in Table 26-23 there are other developments in the local area screened into the cumulative construction assessment e.g. those proposed at the Moneypoint sites. Each of the closest NSLs to the sites are considered in the text below:

- The closest NSLs at the OCC site is located at 220m (NSL60) and has a predicted cumulative CNL of 65 dB, which does not exceed the daytime CNT of 65 dB $L_{Aeq,1hr}$)
- The closest NSLs along the OGC to the southern section of the route (NSL059 and NSL061) are located at 20m from the OGC works. The predicted residual cumulative daytime CNL is 70 dB, which does not exceed the daytime CNT of 70 dB $L_{Aeq,1hr}$ for linear works.
- The closest NSLs at the connection at the existing Moneypoint 220kV Substation is located at 220m (NSL132) and has a predicted cumulative CNL of 58 dB, which is below the daytime CNT of 65 dB $L_{Aeq,1hr}$)

Given the explanation above, due to the distance between the proposed development and the granted/proposed developments in the local area it is not anticipated that there will be any significant cumulative effects on noise and vibration at nearby NSLs during the construction phase of the developments as the CNT will not be exceeded at the closest NSLs.

It is understood that the noise from the decommissioning scenarios do not exceed that of the construction phase. Noise effects are likely to be similar to construction, but more limited in extent and shorter in duration.

Cumulative noise effects at the construction and decommissioning stages will be negative, not significant to moderate and temporary, and no likely significant effects will arise during daytime periods.

26.9.2 Cumulative Operational Impacts

The Project OCC site has been designed so that the cumulative noise emissions from the plant are within the relevant noise criteria set out in Section 26.4.2.3.2. In the same way, other developments will in turn be designed in order to comply with appropriate noise criteria. Any large-scale development in close proximity to the Project OCC site will be required to prepare an EIAR wherein cumulative

impacts will also be considered. During the O&M phase any cumulative impacts will be due to plant noise operating from the granted sites in the night time period.

The proposed Moneypoint Generating Station (ABP ref. 307798 and 319080, Clare County Council ref. 2332, 19746 and 20318) is required to operate under an IEL, which has been identified in planning conditions with a 45 dB NG4 night-time criterion. As the OCC plant is required to operate under a 35 dB $L_{Aeq,T}$ night time criterion, it is at least 10 dB below the Moneypoint operation plant noise at the closest NSLs and therefore there will be no increase in noise levels as a result of the Moneypoint plant and OCC plant operating simultaneously on the closest NSLs. Cumulative noise effects at the O&M stage will be negative, not significant to moderate and long-term, which is Not Significant.

26.10 Conclusion

This noise and vibration impact assessment of the Onshore Site has been undertaken for both the long-term operational and the temporary construction and decommissioning phases. The main elements of the Onshore Site that were considered in this assessment are components with a likely potential to generate noise and vibration impacts e.g. construction phases for the OLL, OGC, OCC and connection to the existing Moneypoint 220kV Substation, and the O&M phase of the OCC.

A range of mitigation measures have been specified for the construction stages in the event of works taking place during evening or night-time periods, and OCC O&M stage. Noise and vibration monitoring has been identified during the construction phase to ensure the construction and vibration thresholds are not exceed at the closest NSL and VSRs.

Provided the construction works take place within the proposed criteria thresholds and the DMRB document guidance for linear OGC works does not exceed a period of ten or more days or night in any 15 consecutive day or nights; and a total number of days exceeding 40 in any six consecutive months, no significant noise and vibration residual effects are predicted during the construction or O&M phases of the Project or taking into account cumulative development.