Environmental Impact Assessment Report

NISA

North Irish Sea Array

Volume 5: Wider Scheme Aspects

Chapter 30

Noise and Vibration

Statkraft

CIP Copenhagen Infrastructure Partners

GoBe APEM Group

ARUP

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30. Noise and Vibration

30.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) presents an assessment of noise and vibration likely significant effects from the North Irish Sea Array (NISA) Offshore Wind Farm (hereafter referred to as the 'proposed development') during the construction, operation and decommissioning phases.

The chapter sets out the methodology followed (Section 30.2), describes the baseline environment (Section 30.3) and summarises the main characteristics of the proposed development which are of relevance to noise and vibration (Section 30.4). The evaluation of the potential noise and vibration effects of the proposed development are described (30.5). Measures are proposed to mitigate and monitor these effects (Section 30.6) and any residual effects are described (Section 30.7). Transboundary effects are considered (Section 30.8). Cumulative effects are summarised in Section 30.9 and detailed in full in Chapter 38 Cumulative and Inter-Related Effects. The chapter then provides a reference section (Section 30.10).

The EIAR also includes the following:

- Detail on the competent experts that have prepared this chapter is provided in Appendix 1.1 Competent Experts of Chapter 1: Introduction
- Detail on the extensive consultation that has been undertaken with a range of stakeholders during the development of the EIAR including those relating to noise is set out in Appendix 1.2 Consultation report
- A glossary of terminology, abbreviations and acronyms is provided at the beginning of Volume 2 of the EIAR.

A detailed description of the proposed development including construction, operation and decommissioning is provided in Volume 2, Chapter 6: Description of the Proposed Development – Offshore (hereafter referred to as the 'Offshore Description Chapter') and Volume 2, Chapter 7: Description of the Proposed Development – Onshore (hereafter referred to as the 'Onshore Description Chapter').The Construction methodology is described in Volume 2, Chapter 8: Construction Strategy – Offshore (hereafter referred to as the 'Offshore Construction Chapter') and Volume 2, Chapter 9: Construction Strategy – Onshore (hereafter referred to as the 'Onshore Construction Chapter').

This assessment considers potential likely significant effects from noise and vibration on people. Potential noise effects on ecological receptors are discussed in Volume 4, Chapter 23: Biodiversity.

An assessment of underwater noise generated by the construction of the offshore wind turbines (offshore meaning seaward of the high-water mark) has also been carried out to inform the assessment of effects of underwater noise on offshore receptors i.e. aquatic fauna. The underwater noise assessment is included as Volume 9, Appendix 14.1: Underwater Noise Modelling Report and the effects on fauna resulting from underwater noise during construction are reported in Volume 3, Chapter 13: Fish and Shellfish Ecology (hereafter referred to as the 'Fish and Shellfish Chapter') and Volume 3, Chapter 14: Marine Mammal and Megafauna Ecology (hereafter referred to as the 'Marine Mammal Chapter').

30.2 Methodology

The assessment of Noise and Vibration is consistent with the EIA methodology presented in Volume 2, Chapter 2: EIA and Methodology for the preparation of an EIAR.

30.2.1 Introduction

This section outlines the methodology for the noise and vibration assessment for the proposed development. It includes an outline of the study area, reference to relevant guidance and policy, discussion of baseline data collection, and the assessment method for impacts on surrounding sensitive communities.

30.2.2 Study Area

The study area has been defined to ensure all potential effects from noise and vibration are assessed and is shown on Figure 30.1.

For potential effects arising from the construction and operation of onshore infrastructure, the study area for potential onshore noise and vibration effects is 300m from the onshore development area, in accordance with TII Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004. In addition, the Design Manual for Roads and Bridges (DMRB): LA111 Noise and vibration, 2022, states that a study area of 300m from the closest construction activity is normally sufficient to encompass noise sensitive receptors.

Examples of noise sensitive receptors include dwellings, hospitals, healthcare facilities, education facilities, community facilities, international and national or statutorily designated sites, public rights of way and cultural heritage assets.

Potential effects from the construction and operation of offshore infrastructure (specifically the foundation piling for, and the operation of, offshore wind turbine generators (WTG)) on noise-sensitive receptors close to the shoreline are also assessed. For the assessment of these potential effects, the closest noise-sensitive receptors to the WTG – those on Red Island, Skerries, are considered.

The assessment provides a full assessment of all potential noise and vibration effects within this study area.

30.2.3 Relevant Guidance and Policy

This section outlines guidance and policy specific to noise and vibration, including best practice guidelines. Overarching guidance on EIAR is presented in Volume 2, Chapter 2: EIA and Methodology for the preparation of an EIAR. Furthermore, policy applicable to the proposed development is detailed in Volume 2, Chapter 3: Legal and Policy Framework.

The assessment of potential noise and vibration effects has been made with specific reference to the following identified relevant guidelines and guidance.

Table 30.1 Relevant guidance and policy

Name	Publisher	Date	Relevance to assessment
Guidance Note for Noise: Licence Applications, Survey, and Assessments in Relation to Scheduled Activities (NG4)	EPA Office of Environmental Enforcement	2016	Although activities related to the proposed development do not fall within the NG4 schedule of activities, the noise limit criteria are considered as relevant upper thresholds for EIAR operational noise assessments.
Guidelines on the information to be contained in Environmental Impact Assessment Reports	Environmental Protection Agency	2022	Defines the magnitudes of effect to be used in assessments
Guidelines for Environmental Noise Impact Assessment	Institute of Environmental Management and Assessment	2014	Guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur.
Calculation of Road Traffic Noise (CoRTN)	The Department of Transport	1988	Describes procedures for assessing traffic noise
BS 7445-1:2003 Description and environment of environmental noise – Part 1	British Standards Institute	2003	Defines the parameters, procedures, and instrumentation requirements for noise measurement and analysis.
BS4142:2014+A1:2019 Methods for Rating Industrial Sound Affecting Mixed Residential and Industrial Areas	British Standards Institute	2019	The method used for determining the 'rating level' of a new sound source and the 'background level' at a receptor position can be used to assess the impact of noise on a receptor.

Name	Publisher	Date	Relevance to assessment
BS 5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites (Parts 1 and 2)	British Standards Institute	2014	Provides best practice for noise and vibration control from construction and open sites to nearby noise-sensitive receptors. Part 1 includes sound power levels of common construction equipment and Part 2 includes guidance to the human response to vibration and a library of measured vibration source levels.
TRL Report 429 Groundborne Vibration Caused by Mechanised Construction Works	Transport Research Laboratory	2000	Provides methods for predicting the environmental impact of vibration caused by the operation of mechanised construction plant.
ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation	International Organization for Standardization	1996	Used for noise assessment calculations.
ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures	International Organization for Standardization	2016	Used to inform noise measurement methodology
ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels	International Organization for Standardization	2017	Used to inform noise measurement methodology
TII Guidelines for the Treatment of Noise and Vibration in National Road Schemes	Transport Infrastructure Ireland	2004	Used to inform noise assessment methodology, specifically for traffic noise calculations
Good Practice Guide for the Treatment of Noise during the Planning of National Road Schemes	Transport Infrastructure Ireland	2014	Used to inform noise assessment methodology, specifically for traffic noise calculations
WHO Environmental Noise Guidelines for the European Region	World Health Organization	2018	Used to inform noise assessment methodology
IOA ProPG: Planning and Noise. Professional Practice Guidance on Planning and Noise. New Residential Development	Institute of Acoustics	2017	Used to inform noise assessment methodology
Design Manual for Roads and Bridges (DMRB): LA111 Noise and vibration	National Highways, England	2020	Used to inform noise assessment methodology
ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2 – General method of calculation	International Standards Organisation	1996	Used to inform noise assessment methodology
ETSU R-97: The assessment and rating of noise from wind farm	UK Department for Trade & Industry	1997	Used to inform noise assessment methodology

General guidance for environmental assessments is presented in Volume 2, Chapter 2: EIA and Methodology for the preparation of an EIAR, and general policy related to the proposed development is presented in Chapter 3: Legal and Policy Framework.

30.2.4 Baseline Noise Survey

In order to characterise the existing acoustic environment at noise-sensitive receptors within the study area, noise monitoring has been undertaken. Noise surveys have been undertaken following the guidance in BS7445-1 and BS4142.

Attended, short-term noise measurements were undertaken between 9 May and 11 May 2022. Taking into account the extent and nature of construction works to be employed, the location of sensitive fauna, and the proximity of noise-sensitive receptors to permanent noise sources, noise monitoring was undertaken in two main areas to inform the construction and operational noise assessments. The two areas are as follows:

- The area surrounding the landfall/grid facility area, with measurements representative of nearby noise-sensitive receptors
- The area adjacent to the Malahide Estuary (designated as SPA/SAC), providing measurements representative of the local residential and ecological receptors

For noise-sensitive receptors alongside the onshore cable route and for receptors considered in the assessment of noise from the offshore infrastructure, no noise surveys were undertaken as the assessment of construction noise adopts a precautionary assumption for baseline noise levels – that is, an assumption of low existing noise levels – and so surveyed noise levels were not required.

A more detailed discussion of the noise-sensitive receptors and representative noise measurements can be found in Section 30.3.2.

A list of the noise monitoring (NM) locations is presented in Table 30.2, and the locations presented in Image 30.1 and Image 30.2.

Table 30.2 Noise monitoring locations

Location Number	Description	Coordinates, [ITM Easting, Northing] (m)
NM1	In field in line with the back of adjacent residential receptor	718971, 765006
NM2	Next to local road behind adjacent residential receptor	718869, 765262
NM3	Adjacent to R132 directly outside residential receptor	718833, 765220
NM4	Adjacent to local road and representative of residential receptors further from main road (R132)	718966, 765340
NM5	Adjacent to R132 in line with façade of residential receptor	719056, 765011
NM6	Adjacent to Malahide Estuary, close to the M1	719411, 747454
NM7	Adjacent to Malahide Estuary, close to Swords Sailing and Boating Club	720684, 746960

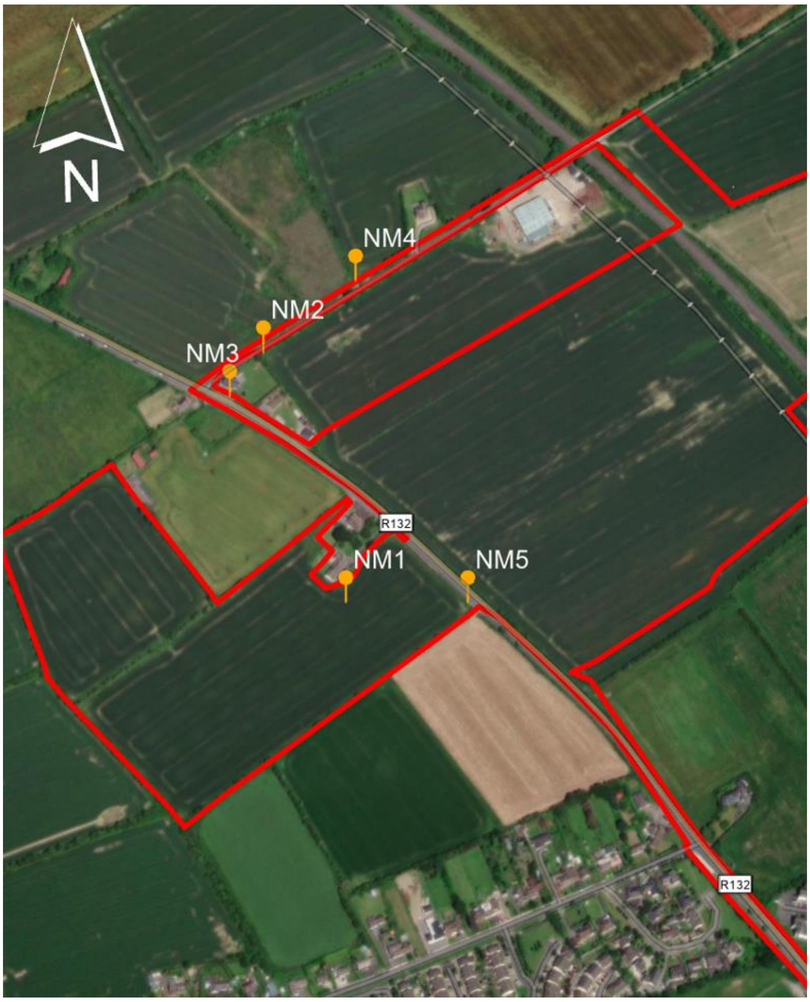

Image 30.1 Noise monitoring (NM) locations north of Balbriggan around the landfall and grid facility locations with the onshore development area shown in red

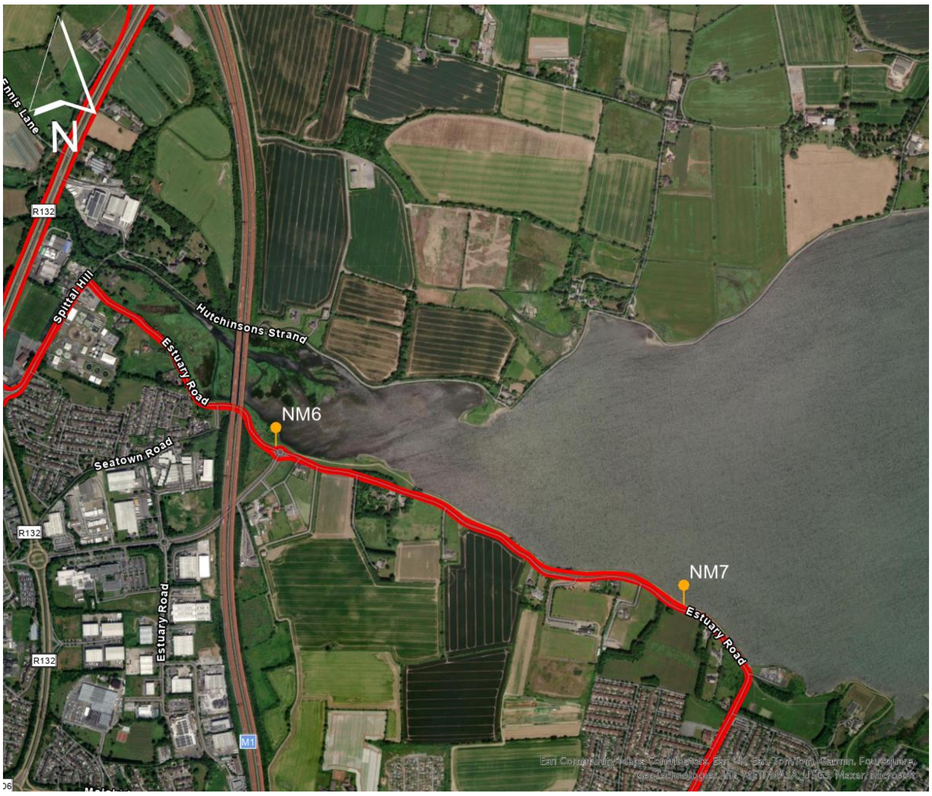

Image 30.2 Malahide Estuary noise monitoring (NM) locations with the onshore development area shown in red

Noise measurements were undertaken with the equipment listed in Table 30.3.

Table 30.3 Measurement equipment details

Equipment Manufacturer	Equipment Type	Serial Number	Calibration Date
Bruel & Kjaer	2250 Sound Level Meter	3028791	9-11-2021
Bruel & Kjaer	2250 Light Sound Level Meter	2620746	10-06-2021
Bruel & Kjaer	4231 Calibrator	3011816	9-11-2021

The sound level meters logged environmental noise measurement parameters including $L_{Aeq,T}$, L_{A90}, and L_{A10} (definitions of these parameters are included in the Glossary of Terms). The parameters and results of the baseline noise measurements are presented in Section 30.3.

30.2.5 Assessment Methodology

30.2.5.1 Construction

Information relating to the construction activities for the proposed development is provided in the Onshore Construction Chapter and the Offshore Construction Chapter.

This information informs the assessment of construction noise and vibration effects. The assessment of construction effects considers estimated noise levels at noise-sensitive receptors.

30.2.5.2 Construction Noise

An assessment of the predicted construction noise has been carried out for noise-sensitive receptors based on the construction methodology and noise source levels in BS 5228:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites (Parts 1 and 2)*. This is considered an appropriate method to assess construction noise prior to the appointment of a contractor and confirmation of work methods and plant/equipment to be used. The impact assessment methodology is discussed below.

There are no published statutory guidelines on noise levels from construction sites in Ireland. The construction noise assessment therefore makes reference to guidance from BS 5228:2009+A1:2014 listed in Table 30.1. This standard provides methods for predicting receptor noise levels from construction works based on the number and type of construction plant and activities operating on site, with corrections to account different situations such as ground type and distances from source to receptor. Annex E of BS5228-1 provides example criteria for the assessment of construction noise impacts, presented in Table 30.4. These criteria have been used to assess the potential significant effects from construction noise.

Table 30.4 BS 5228:2009+A1:2014 Construction noise categories and thresholds based on measured noise levels

Assessment category and threshold value period	Threshold value, $L_{Aeq,T}$ dB		
	Category A[A]	Category B[B]	Category C[C]
Day time (07:00 – 19:00 on weekdays, 07:00 – 13:00 on Saturdays)	65	70	75
Evening time (19:00 – 23:00 on weekdays, 13:00 – 23:00 on Saturdays, and 07:00 – 23:00 on Sundays)	55	60	65
Night-time (23:00 – 07:00 on all days)	45	50	55

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

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

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

Based on the baseline noise levels assumed (i.e. noise levels in the absence of construction noise) at nearby noise-sensitive receptors, potential likely significant effects will be assessed against the threshold values presented in Table 30.5.

Table 30.5 BS5228-1 threshold of potential significant effects at dwellings (BS5228-1+A1:2014)

Time period	Day and times	Threshold value ($L_{Aeq,T}$) dB
Day	Weekdays 07:00 – 19:00 Saturday 07:00 – 13:00	65
Evening	Weekday 19:00 – 23:00 Saturday 13:00 – 23:00 Sunday 07:00 – 23:00	55
Night	All days 23:00 – 07:00	45

The assessment of likely significant effects is carried out by firstly quantifying the magnitude of noise impacts, determined by the noise levels arising from the proposed development and any exceedances of these over the defined thresholds for construction noise, then by considering the likely duration of these impacts.

Where an exceedance of the construction noise criteria, as outlined in Table 30.5, is predicted, the likely impact associated with the noise increase is rated in accordance with Table 30.6.

Table 30.6 Likely impact associated with the exceedance of construction noise criteria

Extent of Noise Impact (Exceedance of construction noise level above threshold value in Table 30.5)	Noise Impact Magnitude	EPA 2022 Guidelines magnitude of impacts	Determination of a likely significant effect
Less than 3 dBA	No significant change/ imperceptible	Neutral to Slight Impact	No significant effect
3 – 5 dBA	Slight increase	Slight to Moderate Impact	Likely significant effect dependent on impact duration (see further details below)
6 – 10 dBA	Moderate increase	Moderate to Significant Impact	
more than 10 dBA	Substantial increase	Very Significant Impact	

Table 30.7 outlines the duration and frequency of effects, based on EPA 2022 Guidelines: this terminology referring to duration of effects is used when describing effects, with most construction effects assessed being temporary.

Table 30.7 Duration and frequency of effects

Effect type	Duration
Momentary effect	Effects lasting from seconds to minutes
Brief effect	Effects lasting less than a day
Temporary effect	Effects lasting less than a year
Short-term effect	Effects lasting one to seven years
Medium-term effect	Effects lasting seven to fifteen years
Long-term effect	Effects lasting fifteen to sixty years
Permanent effect	Effects lasting over sixty years

In line with advice provided in the Design Manual for Roads and Bridges (DMRB), construction noise and construction traffic noise impacts constitute a likely significant effect where it is determined that a moderate or worse magnitude of impact is likely to occur for a duration exceeding:

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

Noise impacts of durations of less than these are not considered as likely significant effects.

30.2.5.3 Construction Vibration

An assessment of construction vibration has been carried out based on information about proposed construction methods.

BS5228-2 provides guidance on the impacts on humans from vibration. Table 30.8 presents the PPV (peak particle velocity) vibration levels and provides a semantic scale for the description of construction vibration impacts on human receptors based on guidance in BS5228-2.

Table 30.8 BS5228-2 threshold of potential significant effect at dwellings (BS5228-2:2009+A1:2014)

PPV Level	Description
0.14 to < 0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 to < 1.0 mm/s	Vibration might be just perceptible in residential environments.
1.0 to < 5.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
>= 5.0 mm/s	Vibration at this level is likely to be intolerable for any more than a very brief exposure.

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

In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance and it is highly unlikely that buildings in the vicinity of the onshore infrastructure will be damaged by construction vibration.

30.2.5.4 Noise from Offshore Turbine Construction

An assessment of the impacts of noise from offshore piling activities on onshore residential receptors has been carried out using the outdoor noise propagation method in ISO 9613-2, which provides a calculation method suitable for such predictions. The method considers geometric spreading, atmospheric (air) absorption and the effect of hard ground/water on noise propagation.

The predicted noise levels have been assessed against the construction noise criteria set out in 30.2.5.2.

30.2.5.5 Construction Traffic Noise

Road traffic noise levels have been calculated with reference to methodology within CoRTN (UK Department of Transport, 1988), which gives methods to calculate traffic noise based on the 18-hour AADT (Average Annual Daily Traffic).

The magnitude of the noise impact due to changes in road traffic noise levels during the construction phase is assessed with reference to criteria outlined in the Design Manual for Roads and Bridges (DMRB): LA111 Noise and vibration (reference in Table 30.1). DMRB contains advice and information on transport-related noise and vibration, and the criteria set out in Table 30.9 are used here in lieu of detailed Ireland-specific guidance.

Table 30.9 Construction traffic noise significance criteria (DMRB Noise and Vibration)

Magnitude Impact	Increase in noise level due to traffic, dB
Very low	Less than 1.0
Low	Greater than or equal to 1.0 and less than 3.0
Medium	Greater than or equal to 3.0 and less than 5.0
High	Greater than or equal to 5.0

The basis of these criteria (from Design Manual for Roads and Bridges (DMRB): LA111 Noise and vibration) is that changes in noise levels of 1 dBA or less are imperceptible, and changes of 3 dBA are perceptible to the average human ear for comparable noise sources outside of a controlled laboratory environment. Consequently, the onset of a negative effect is set at a change in traffic noise of +1 dBA and the onset of a significant negative effect is set at +3 dBA.

Construction road traffic noise has been assessed by considering the change in traffic due to construction activities between the following scenarios:

- Scenario 1 – Future year baseline. This represents the scenario without additional construction traffic in the year when construction of the proposed development will commence; and
- Scenario 2 – Future year baseline plus construction traffic associated with the proposed development.

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

30.2.5.6 Operational Noise from grid facility

The grid facility is the only onshore element of the proposed development that could result in operational noise impacts, as the underground cable route will not result in any associated operational noise.

Reference has been made in Table 30.10 to the EPA's *Guidance Note for Noise: Licence Applications, Survey, and Assessments in Relation to Scheduled Activities*, (NG4) and BS4142:2014+A1:2019 *Methods for Rating Industrial Sound Affecting Mixed Residential and Industrial Areas*, to assess operational noise from the grid facility to nearby residential receptors.

NG4 noise limits are presented in Table 30.10 have been used to define the onset of a potential significant negative effect. Following the screening criteria in Section 4.4.2 of NG4, receptors are not considered to be 'Quiet Areas', as all areas along the onshore cable route are within 3 km of an urban area with a population of more than 1,000 people, or in 'Areas of Low Background Noise', as all measured daytime background noise levels in the vicinity which are considered representative are above 40 dBL_{A90}.

Table 30.10 NG4 operational noise limits

Time period	Noise limit (dB)
Day time	55 $L_{Ar,T}$
Evening time	50 $L_{Ar,T}$
Nighttime	45 $L_{Aeq,T}$

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

- Background noise level, $L_{A90,T}$ – defined in BS4142 as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting 'F' (i.e., fast) and quoted to the nearest whole number of decibels'

- Specific noise level – $L_{Aeq,Tr}$ – the equivalent continuous ‘A’ weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr; and
- Rating level – $L_{Ar,Tr}$ – the specific sound level plus any adjustment made for the characteristic features of the noise (in this case a +5 dB penalty is applied for tonality, following NG4).

The rating level and background noise level are compared and the difference between them assessed using the following guidance from BS4142:

a. *“Typically, the greater the difference, the greater the magnitude of impact.*

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

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

d. *The lower the rating level is to the measured background noise level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background noise level, this is an indication of the specific sound source having a low impact, depending on the context.”*

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

Based on guidance in NG4, noise from emergency operations can exceed permissible limits as long as this equipment will only operate in urgent situations (e.g., grid power failures). It is proposed, based on this guidance, that a 10 dBA allowance be made for emergency situations as they will be temporary by their nature.

The grid facility operational noise levels have been predicted using the 3-dimensional computer modelling software SoundPLAN (version 8.2) at the nearest noise sensitive receptors, which are most likely to be affected by operational noise. Operational noise levels at more distant receptors will be substantially lower such that no negative effect will occur. Details of the noise modelling assumptions and source data are presented in Section 30.5.7.

30.2.5.7 Operational noise from offshore wind turbines

An assessment of operational noise from the offshore wind turbines to onshore residential receptors has been carried out using the outdoor noise propagation method ISO 9613-2, which provides a calculation method suitable for such predictions. The method considers geometric spreading, atmospheric (air) absorption and the effect of hard ground/water on noise propagation.

The calculated noise levels have been assessed against both the thresholds set out in NG4 and against the thresholds set out in ETSU R-97.

30.3 Baseline Environment

30.3.1 Baseline Noise Monitoring Results

The current baseline noise environment at receptor locations within the surrounding area, based on measured noise data is presented in this section.

Table 30.11 presents a summary of the noise monitoring results from the monitoring undertaken in May 2022. Noise monitoring locations are presented above in Image 30.1 and Image 30.2.

Table 30.11 Baseline noise monitoring results

Location number	Day time		Evening time		Night time	
	$L_{Aeq,T}$ dB	L_{A90}, dB	$L_{Aeq,T}$ dB	L_{A90}, dB	$L_{Aeq,T}$ dB	L_{A90}, dB
NM1	50 – 51	44 – 45	47	43	49	43
NM2	54 – 55	46 – 47	55	46	52	43
NM3	72	46 – 49	72	46	68	46
NM4	50 – 51	43 – 44	54	44	55	45
NM5	60 – 61	47 – 48	60	45	55	43
NM6	66	63	61	57	67	63
NM7	56 – 57	50 – 51	56	47	54	49

30.3.2 Noise Sensitive Receptors

Whilst the onshore noise study area is set as 300m from the onshore development area, noise sensitive receptors (NSRs) for the assessment have been defined for those properties closest to the construction and operational noise sources in order to identify any potential effects.

For the area around the grid facility and landfall site, receptors representative of the residences nearest to the proposed development have been defined. These receptors (NSR) are displayed in image 30.4 below and listed in Table 30.12.

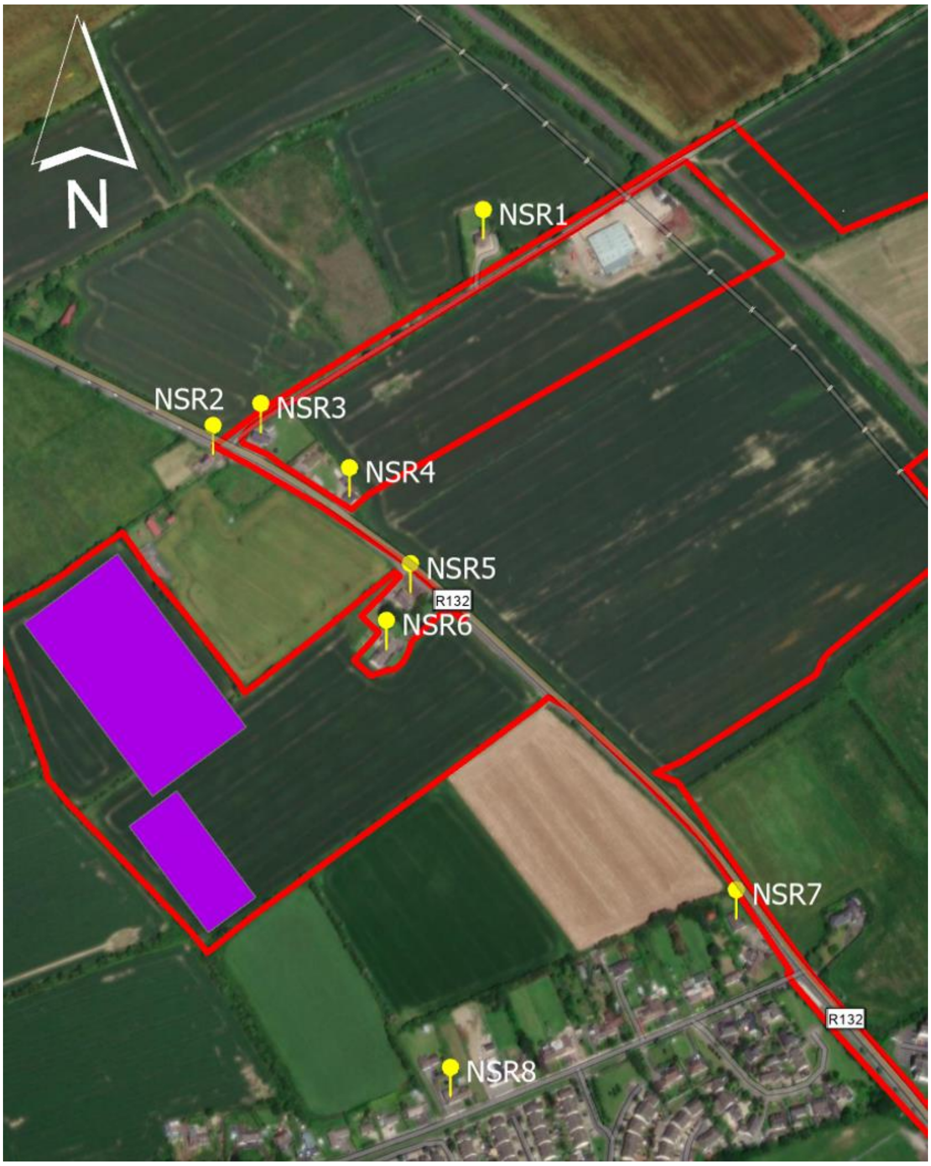

Image 30.3 Noise sensitive receptors (NSR) in proximity to grid facility and landfall site, with footprint of the proposed grid facility shown in purple and the onshore development area shown in red

Table 30.12 Noise sensitive receptors (NSR) in proximity to the grid facility and landfall site

Receptor no.	Address	Corresponding noise measurement (NM) location
NSR1	Sandfield, Bremore, Balbriggan, Co. Dublin	NM4
NSR2	Bremore, Co. Dublin	NM3
NSR3	Bremore, Co. Dublin	NM3
NSR4	Bremore, Co. Dublin	NM3
NSR5	Bremore, Co. Dublin	NM5
NSR6	Molyneaux, Bremore, Balbriggan, Co. Dublin	NM1
NSR7	1A Bremore Cottages, Bremore, Balbriggan, Co. Dublin	NM3

Receptor no.	Address	Corresponding noise measurement (NM) location
NSR8	Bremore, Co. Dublin	NM2

For the onshore cable route assessment, specific receptors for individual residential dwellings have not been defined: but noise impacts have been quantified for all noise-sensitive receptors facing directly onto the cable route and have been reported in Section 30.5.2.4.

Four noise-sensitive non-residential receptors have been identified near to the onshore cable route:

- Corduff National School: a primary school on the R132 in Corduff,
- St Nicholas of Myra National School, Kinsealy on the R107 Malahide Road,
- St Molagas National School on the R132 Dublin Road, Balbriggan, and
- Malahide/Portmarnock Educate Together National School on the R107

The assessment of potential effects at these schools is presented in Section 30.5.6

30.4 Characteristics of the Proposed Development

This section describes the elements of the proposed development relevant to noise and vibration.

30.4.1 Onshore Infrastructure

The onshore infrastructure comprises three areas: the landfall site, the grid facility and the onshore cable route. These are described in further detail in the Onshore Description Chapter and the works associated with their construction in the Onshore Construction Chapter. The onshore features relevant to noise and vibration are summarised below.

30.4.1.1 Landfall Site

The landfall site is displayed on Figure 7.2. Made up of arable fields and intersecting hedgerows, the landfall site will accommodate three temporary HDD compounds – one larger compound where the offshore export cables come to shore and two smaller compounds where the cable crosses underneath the Dublin to Belfast railway line. Onshore export cables will be installed in trenches from the landfall HDD compound to the railway HDD exit site compound, then from the railway HDD entry site to the grid facility site. The landfall site will also feature the temporary Bremore cable contractor compound adjacent to the R132.

As described in the Onshore Construction Chapter, it is expected that construction works at the landfall site will take approximately 10 months to complete. The offshore export cable landfall HDD drilling and duct pull-back will take up to eight weeks - working 24 hours a day - for each of the two cables. The railway HDD drilling and duct pull-back will take up to three weeks for each of the two cables, working 24 hours a day for each circuit. These activities may take place consecutively or in parallel at certain times.

30.4.1.2 Grid Facility

The grid facility site is shown on Figure 7.3 and will be the site of two new substations – the compensation substation and the Bremore substation – with associated permanent above ground infrastructure (buildings, electrical equipment) covering approximately 3.5 ha (35,000 m2). Between the R132 and the grid facility there will be access tracks and a temporary contractor compound. The construction of the grid facility will likely last approximately 24 months.

30.4.1.3 Onshore Cable Route

The onshore cable route will run 33-35km from the grid facility to the grid connection point at Belcamp and is shown on Figure 7.4. For most of its route the cable route will feature either all cables contained in one trench or with the cables contained in two narrower trenches: in some locations the cables will be installed with HDD to negotiate watercourses or major roads. Most of the route is within public roads, with seven locations where the route may deviate offline from the road to cross watercourses or major roads:

- An offline section where the onshore cable route crosses water crossing Wx10 (Aldrumman Stream)
- An offline section at Blakes Cross North where the onshore cable route crosses water crossing Wx11 (Ballough Stream)
- An offline section at Blakes Cross South where the onshore cable route crosses water crossings Wx12 (Deanstown Stream) and Wx13 (Ballyboghill Stream)
- An offline section where the onshore cable route crosses under the M1
- An offline section where the onshore cable route crosses Water crossing Wx20 (Gaybrook Stream)
- An offline section where the onshore cable route crosses Water crossing Wx22 (Sluice Stream)
- An offline section where the onshore cable route crosses Water crossing Wx25 (Mayne River)

For all of the offline sections listed above bar the M1 and the crossing of Wx11 at Blakes Cross North, there is also the option for the cable route to be continued within the road. All of the water crossing options are set out in the Onshore Description Chapter.

The construction of the onshore cable route will last approximately 24 months in total. For most of the onshore cable route, the cables will be installed in backfilled trenches underneath the road surface. The construction process includes breaking out of the road surface, excavation and backfilling of a trench and re-instatement of the road surface: these works will progress at a rate of approximately 30-60m per day, equating to approximately 180m-360m per week.

Along the onshore cable route, there will be multiple locations where a cable joint bay is constructed inline with the trench and will be installed at intervals of between 300m and 800m along the onshore cable route. There will also be multiple locations where the HDD drilling technique may be used within the road - known as 'inline HDD'- to install the cables under watercourses or other structures. The HDD technique will also be used to cross some watercourses or major roads in the offline sections.

Changes in traffic flows on local roads during the construction period will occur, namely:

- Additional traffic associated with the construction of the proposed development including deliveries to construction compounds and construction traffic serving the works along the onshore cable route,
- Traffic changes resulting from temporary road closures during the construction of the onshore cable route, including increases in traffic flows along associated diversion routes.

The cable route will either connect into the existing substation at Belcamp or it will connect into both the existing substation and the proposed Belcamp extension (F23A/0040) (refer to the Onshore Description chapter for further details).

30.4.2 Offshore infrastructure

The offshore infrastructure will include between 35 and 49 Wind Turbine Generators (WTGs) on either monopole or jacket foundations, an offshore substation platform (OSP) also on either monopole or jacket foundations, inter-array cables and export cables. The closest WTG will be located approximately 12km from the nearest onshore residential community, namely the houses on the Red Island headland in Skerries.

The WTG and OSP foundations will be installed using either drilling or percussive piling techniques, with WTG foundation installation lasting approximately eight months.

The WTGs, OSP, cables, and the associated construction techniques are described in further detail in the Offshore Description Chapter and the Offshore Construction Chapter.

30.4.2.1 Project Options

Two project options for the offshore WTG are described in the Offshore Description Chapter and displayed on Figures 6.1 and 6.2.

Project Option 1 comprises 49 WTGs distributed within the array area each with a 250m rotor diameter and Project Option 2 comprises 35 WTGs distributed within the array area each with a 276m rotor diameter.

The parameters of the two project options that are relevant to the assessment presented in this chapter include piling of foundations during construction and operation of WTG during the operational phase.

30.5 Potential Effects

This section describes the likely significant noise and vibration effects from the proposed development in the absence of any specific mitigation measures. The assessment generally considers all noise sensitive receptors as defined in Section 30.2.2, however, specific consideration is given to ecological receptors and schools in Sections 30.5.5 and 30.5.6 respectively.

30.5.1 Do-Nothing Scenario

In the scenario where the proposed development does not proceed as planned, none of the effects set out in this chapter would occur. Under the 'do nothing' scenario, the existing baseline presented in Section 30.3 is likely to persist, and no likely significant effects would arise in the absence of other developments.

30.5.2 Construction Phase Noise

30.5.2.1 Offshore Construction Noise

Offshore piling works, as part of the installation of the offshore WTG foundations, may take place at any time of the day. Receptors are most sensitive to noise during the night-time and so an assessment of piling noise to onshore receptors has been undertaken during this time period.

A calculation of noise levels from offshore WTG piling activities under metrological conditions favourable to noise propagation has been carried out. The calculation has been carried out for the residential receptors closest to the array area, namely the houses on the Red Island headland in Skerries: the location of the town of Skerries relative to the proposed development is shown on Volume 7, Figure 1.1. The distance from these houses to the nearest proposed turbine location is 12km. The WTG locations are shown on Figures 6.1 and 6.2.

The assessment of offshore piling noise focussed on the closest WTG to the mainland (Red Island headland) as this has the potential to result in the greatest magnitude of impact to onshore receptors. For Project Option 1 the closest WTG is 12km to the mainland at Skerries Island, at the nearest point within the limit of deviation[1] in the WTG layout. For Project Option 2 the closest WTG is 13km to Skerries Island incorporating the limit of deviation. Therefore, a distance of 12km was assessed in relation to airborne noise from piling of foundations which is representative of the maximum effect of both project options.

A piling source level of 139dBA,$L_{Aeq,1s}$ @1m, representative of the loudest 1-second noise level during monopile piling at full hammer energy has been assumed. This source level was derived using the mean of two source levels.

Firstly, a source level of 139dBA for a 5000kJ hammer[2], scaled up to the proposed hammer energy of 5500kJ (the maximum hammer energy of the proposed development), giving a level of 139.4dBA and secondly, a value of 127dBA for a 375kJ hammer[3], scaled up to the proposed hammer energy of 5500kJ, giving a level of 138.6dBA. The mean of these two values (139dBA) has been used in the calculations.

[1] A 500m limit of deviation from the WTG locations in the layouts for Project Option 1 and 2 is included in the assessment is applied to each individual WTG location and OSP location. The limit of deviation has been assessed within this EIAR.

[2] Value of 139dBA from the Awel y Mor Offshore wind farm assessment , para 320 of Vol 3, Chapter 10: Noise & Vibration Assessment report: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010112/EN010112-000211-6.3.10_AyM_ES_Volume3_Chapter10%20_Noise_and_Vibration_Final.pdf

[3] Value of 127dBA from Mason TI, Collett AG, Barham RJ, Miller JH, Gallien D, Khan AA. (2018). Field Observations During Wind Turbine Foundation Installation at the Block Island Wind Farm, Rhode Island Appendix C: Airborne Noise Monitoring Report. Subacoustech Report no. E494R0202. Prepared under BOEM Award Contract No. M15PC00002, Task Order No. M16PD00031.

Corrections for geometrical spreading, ground correction and atmospheric (air) absorption were applied in line with the guidance in ISO9613 over the propagation distance of 12km (12km being the closest distance from onshore residential properties to the array area). The ISO9613 standard gives predictions assuming favourable wind conditions to sound propagation i.e. downwind propagation. The ground conditions are assumed to be hard ground (representative of water) and the source and receiver heights are assumed to be 20m and 2m respectively.

The calculation assumes that one complete pile is driven in one night-time (23:00-07:00), comprising 10,548 piling strikes (the number of piling strikes required to install one monopile foundation). Details of the piling construction methodology and assumptions are included in the Offshore Construction Chapter.

The predicted night-time noise level at the nearest receptor on Red Island during the closest piling works to shore is 47dB(A),$L_{Aeq,2300-0700.}$ This is 2dB(A) above the threshold level set out in BS5228:2009+A1:2014 of 45dBA and would result in neutral to slight adverse impacts, which in accordance with the criteria set out in Table 30.6 would not result in any likely significant effects. For piling during the daytime or evening, piling noise levels would be the same but the relevant threshold levels for impacts during these time periods is higher than that for night-time noise and therefore noise impacts would be less likely than during the night-time and so no likely significant effects are predicted during the daytime or evening time periods.

It should be noted that noise propagation over large distances is sensitive to wind direction and metrological conditions and the noise levels assessed above are predicted assuming metrological conditions favourable to noise propagation. When conditions are less favourable to noise propagation, noise levels will be lower than those reported above.

An assessment of underwater noise generated by the construction of the offshore infrastructure has been carried out to inform the assessment of effects of underwater noise on marine receptors. The underwater noise assessment is included as Volume 9, Appendix 14.1: Underwater Noise Modelling Report and the effects on marine receptors resulting from underwater noise during construction are reported in in the Fish and Shellfish Chapter and the Marine Mammal Chapter.

Noise that may arise from offshore construction vessels is expected to be minimal due to the irregular nature of the use and the vessels' ability to transfer large loads at any one time. The use of helicopters is expected to be minimal and only in the event of an emergency.

30.5.2.2 Onshore Construction Activities, Phasing, and Plant

Construction activities at the landfall area and grid facility include the installation of the offshore export cables by Horizontal Directional Drilling (HDD), which includes an HDD compound for the offshore export cable, HDD contractor compound, the construction of the cable transition joint bays, HDD compound at the railway crossing, excavation of trench in R132 road, installation of onshore export cables, and construction of the grid facility.

Along the onshore cable route, construction activities will include cable trench excavation activities, including breaking out of the existing road surface, construction of joint bays and HDD works.

It is not possible at this stage to predict the exact equipment that will be used by the contractor(s) during construction: however, informed assumptions about likely plant and their associated 'on-times' (the percentage of the time that they are active) have been made in order to present an assessment of likely significant effects, in line with guidance note NG4.

The following construction activities have been assessed:

- The landfall site and grid facility north of Balbriggan:
  - Site preparation
  - Horizontal Directional Drilling (HDD) at landfall and at the railway
  - Cable trenching of the onshore export cables across the R132 from the landfall site to the grid facility site
  - Cable Transition Joint Bay (TJB) activities

– General site activities such as vehicle movements

– Construction of the grid facility

- The onshore cable route:

– Cable route trench excavation, including breaking of the road surface

– Joint bay and HDD activities

The calculations assume that plant items are operating simultaneously, as outlined in the sections below.

Standard construction hours will be from 07:00 – 19:00, Monday to Saturdays. An indicative programme and phasing are described in the Onshore Construction Strategy Chapter.

It is anticipated that there will be times, due to exceptional circumstances, that construction works will be necessary outside of the standard hours (e.g., for HDD operations). This will be agreed in advance with the relevant local authority and communicated to the affected noise-sensitive receptors with an estimate of timing and duration of the activities.

Typical noise levels for construction plant are given in BS5228-1. The assumed construction plant items for the phases listed above are presented in Table 30.13 and Table 30.14.

Table 30.13 Assumed construction plant for landfall site, grid facility and onshore cable route

Item of Plant	BS 5228-1 data reference	Sound Power Level (dB(A)) (from BS 5228)	% on-time (i.e., proportion of working hours operating)	No. of plant items
Wheeled Loader	C.2.26	107	50	2
Mobile Telescopic Crane	C.4.39	105	50	1
Compressor for Hand-held Pneumatic Breaker	C.5.5	93	50	2
Diesel Generator	C.4.76	89	50	2
Large Concrete Mixer	C.4.22	104	50	1
Tractor (Towing trailer)	C 4-75	107	50	1
Tracked Crusher	C 1-14	110	50	1
Breaker Mounted on Excavator	C 1-9	118	50	1
Tracked Excavator	C.2.3	106	50	2
Articulated Dump Truck	C.4.2	106	50	3
Dozer	C.2.12	109	50	1
Roller	C.2.38	101	50	1
Pre-cast Concrete Piling – Hydraulic Hammer	C.3.1	112	50	1

Item of Plant	BS 5228-1 data reference	Sound Power Level (dB(A)) (from BS 5228)	% on-time (i.e., proportion of working hours operating)	No. of plant items
Asphalt Paver (+Tipper Lorry)	C.5.30	103	50	1
Crawler Mounted Rig	C.3.21	107	50	1
Tracked Excavator	C.3.23	96	50	1
Concrete Pump	C.3.25	106	50	1
Directional drill (generator)	C 2-44	106	100	1
Water pump	C 2-45	93	100	1

Table 30.14 Assumed construction plant for onshore cable route excavation, HDD, and joint bay activities

Item of Plant	BS 5228-1 data reference	Sound Power Level (dB(A)) (from BS 5228)	% on-time (i.e., proportion of working hours operating)	Number of plant items
Breaking of the existing road surface				
Hand-held Circular Saw (Petrol)	C 5-36	115	5	1
Mini Excavator with Hydraulic Breaker	C 5-2	111	10	1
Road Breaker (Hand-held Pneumatic)	C 5-3	110	10	1
Mini Tracked Excavator	C 4-68	93	10	1
Dumper (Idling)	C 4-8	84	40	1
Diesel water pump	C 11-2	99	5	1
Concrete Pump + Cement Mixer Truck (Discharging)	C 4-24	95	10	1
Dump Truck (Tipping Fill)	C 2-30	107	20	1
Telescopic Handler	C 2-35	99	10	1
Diesel Generator	C 4-82	84	100	1
Vibratory Roller	C 5-27	95	10	1
Dump Truck (Tipping Fill)	C 2-30	107	5	1
Cable trench excavation/trench backfilling				
Mini Tracked Excavator	C 4-68	93	10	1
Dumper (Idling)	C 4-8	84	40	1
Diesel water pump	C 11-2	99	5	1
Concrete Pump + Cement Mixer Truck (Discharging)	C 4-24	95	10	1
Dump Truck (Tipping Fill)	C 2-30	107	20	1
Telescopic Handler	C 2-35	99	10	1
Diesel Generator	C 4-82	84	100	1
Road resurfacing				
Asphalt Paver (+Tipper Lorry)	C.5-32	109	10	1
Tracked Excavator	C.4-17	103	20	1
Hydraulic Vibratory Compactor (Tracked Excavator)	C.2-42	102	10	1

Item of Plant	BS 5228-1 data reference	Sound Power Level (dB(A)) (from BS 5228)	% on-time (i.e., proportion of working hours operating)	Number of plant items
Joint Bay activities				
Hand-held Circular Saw (Petrol)	C 5-36	115	5	1
Mini Excavator with Hydraulic Breaker	C 5-2	111	10	1
Tracked Excavator	C 4-65	99	40	1
Vibratory Plate (Petrol)	C 2-41	108	40	1
Concrete Pump + Cement Mixer Truck (Discharging)	C 4-24	95	20	1
Diesel Generator	C 4-82	84	100	1
Horizontal Directional Drilling				
Directional Drill (Generator)	C 2-44	106	100	1
Water Pump	C 2-45	93	100	1

30.5.2.3 Potential construction noise effects – landfall site and grid facility

For the construction of the landfall site and grid facility (including site preparation, main construction activities at the grid facility and HDD drilling at the landfall site), predicted noise levels and noise impacts in the absence of mitigation are presented in Table 30.15. The predicted levels have assumed a scenario of all plant listed in Table 30.13 operating simultaneously 50% of the time (refer to Image 30.4 for noise sensitive receptor locations).

Table 30.15 Predicted unmitigated construction noise levels at noise-sensitive receptors near landfall site and grid facility

Noise-sensitive receptor	Distance from receptor to construction works areas [m]	Predicted noise level, L_{Aeq} [dB]	Exceedance of construction noise level above threshold value in table 30.5, dB	EPA EIAR magnitude of impacts
NSR1	400	56	0	Neutral to Slight Impact
NSR2	100	68	3	Slight to Moderate Impact
NSR3	150	65	0	Neutral to Slight Impact
NSR4	170	64	0	Neutral to Slight Impact
NSR5	70	71	6	Moderate to Significant Impact
NSR6	30	74	9	Moderate to Significant Impact
NSR7	260	60	0	Neutral to Slight Impact
NSR8	190	63	0	Neutral to Slight Impact

In the absence of noise mitigation during the construction phase, NSR2 would be subject to slight to moderate adverse impacts and NSRs 5 and 6 subject to moderate to significant magnitude impacts.

The duration of the works would be more than 40 days over six consecutive months and so in the absence of mitigation, the noise impacts at NSRs 2, 5 and 6 would constitute a likely significant effect in the absence of mitigation.

30.5.2.4 Potential construction noise effects – onshore cable route

Construction noise levels have been predicted along the onshore cable route for the different phases of works. These are presented in Table 30.16. The noise levels have been predicted assuming the plant listed in Table 30.14.

Calculations have been carried out representative of noise-sensitive receptors closest to the works – that is, facing directly onto the onshore cable route.

The onshore cable route trenching works will consist of the following phases:

1. Breaking of the existing road surface
2. Cable trench excavation
3. Cable trench backfilling; and
4. Road resurfacing

The works will progress linearly along the onshore cable route – which primarily follows existing roads – at the following approximate rates:

- 80 m/day in farmland and on road sections with full closure
- 60 m/day on roads with single lane closure
- 30 m/day on roads maintaining two-way traffic; and
- 5 m/day at watercourse crossings (depending on span, flow, access, and seasonal restrictions)

The typical construction rates for most of the onshore cable route along public roads – the sections of route with the closest noise-sensitive receptors - are 30-60m per day, equating to 180m-360m of construction work progress per week. As a precautionary assumption for the assessment, a distance from works to receptors of 20m was selected for noise calculations, representing the higher levels of noise impact expected during a typical week of works. This approach is reasonable on the basis that although properties may be located in closer proximity to the works boundary, the individual plant items will be positioned at greater distances to receptors over a typical week of construction works.

Approximately every 300-800m along the onshore cable route, joint bays will be installed to facilitate cable pulling through pre-installed ducts. These will be underground chambers which will "joint" consecutive lengths of cables into one continuous overall cable.

At several locations where the onshore cable route crosses watercourses, Horizontal Direct Drilling (HDD) may be used. Most of these will be inline HDD, where the drilling is in line with the road; there are also a small number of locations where HDD will be used offline, including under the M1 motorway.

For the drilling sites for HDD works (either inline or offline HDD sites), HDD entry and exit pits will be dug, followed by the drilling of the underground cable routes under the watercourse or major road.

The noise levels and noise impacts predicted for each phase of the onshore cable route works (in the absence of noise mitigation) are presented below.

Table 30.16 Predicted daytime construction noise impacts at noise-sensitive receptors along the onshore cable route

Cable trenching construction phase	Daytime noise level at 20m from works, LAeq dB	Level above threshold value in table 30.5, dB	EPA EIAR magnitude of impacts
Breaking of the existing road surface	73	8	Moderate to Significant Impact
Cable trench excavation	67	2	Neutral to Slight Impact
Cable trench backfilling	67	2	Neutral to Slight Impact
Road resurfacing	68	3	Slight to Moderate Impact

Cable trenching construction phase	Daytime noise level at 20m from works, LAeq dB	Level above threshold value in table 30.5, dB	EPA EIAR magnitude of impacts
Joint bay construction	74	9	Moderate to Significant Impact
Inline HDD drilling works	72	7	Moderate to Significant Impact
Offline HDD drilling works	72	7	Moderate to Significant Impact

As the construction activities progress along the onshore cable route, they will result in the following temporary adverse impacts:

- Breaking out of the existing road surface: moderate to significant magnitude temporary impacts
- Cable trench excavation and backfilling: neutral to slight magnitude temporary impacts
- Road resurfacing: slight to moderate temporary impacts.

The impacts set out above are predicted at all residences alongside and facing onto the onshore cable route.

Construction works associated with the joint bays and HDD locations are predicted to produce temporary, moderate to significant magnitude impacts.

As the total duration of the noise impacts will be less than 40 days in any six consecutive months at any one location along the onshore cable route, no likely significant effects are predicted as a result.

Night-time HDD operations

Some HDD activities may occur during the night-time in addition to daytime. Such operations will be limited to those where the closest noise-sensitive receptors are more than 150m from the HDD drilling site. The potential noise impacts associated with these sites in the absence of mitigation are set out below in Table 30.17:

Table 30.17 Potential impacts from night-time HDD works

HDD sites	Approximate distance to nearest noise-sensitive receptor	Noise level from HDD activities, dBA	Potential noise impacts
Landfall HDD at landfall site; HDD at water crossings 5, 6, 7	>500m	<45	No impact
Railway HDD at landfall site; HDD at water crossings 9, 10, 16, 17, 18	Between 150m and 500m	>45	Potential temporary adverse impacts in the absence of mitigation

The potential impacts are based on the night-time threshold value for impacts of 45dBA set out in table 30.5. Where predicted night-time noise levels are below this threshold, no impacts are predicted: where they are above this threshold, temporary potential adverse impacts are predicted.

30.5.3 Construction Phase Vibration

There is potential for vibration impacts to occur during the construction phase, particularly in association with excavation activities.

30.5.3.1 Landfall Site and Grid Facility

At the landfall site and grid facility, excavation activities will be undertaken in order to construct the cable transition joint bay (landfall) and the substation buildings (grid facility). The method of excavation is not yet agreed, however, the scenario most favourable to vibration propagation to nearby noise-sensitive receptors is excavation of rock, so this is assumed here.

The level of vibration at nearby sensitive receptors that is likely to result from excavation activities through hard rock is approximately 0.1 mm/s PPV at 10 m from the works area, based on measured levels from previous projects.

BS5228-2 notes that complaints are likely to occur where vibration levels are above 1.0 mm/s PPV at residential receptors. It is possible that vibration generated by construction activities may be perceptible to nearby sensitive receptors, however, there is a low likelihood of complaints.

Given the low level of predicted vibration, no likely significant effects are predicted.

30.5.3.2 Cable Routing

The highest vibration generation along the onshore cable route is likely to result from surface breaking activities, during which there is the potential for vibration to be generated through the ground. Empirical data for this activity is not provided in BS5228-2, however, the likely levels of vibration from this activity will be significantly below any vibration criteria for building damage (based on experience from other sites).

Data from previous projects with similar activities shows that for breaker activities, a vibration level of between 1.5 and 0.25 mm/s PPV can be expected between 10 and 50 m away, respectively.

These measurements are for a breaker working on a concrete slab. It is expected that for breakers working on road surfaces, the vibration levels will be less than these measured levels due to the isolation provided at the road surface/soil interface and intervening soft ground.

BS5228-2 notes that complaints are likely to occur where vibration levels are above 1.0 mm/s PPV at the nearest residential receptors. It is unlikely that vibration levels would exceed this value and hence there is a low likelihood of complaints during these temporary works.

Given the low level of predicted vibration, no likely significant effects are predicted.

30.5.4 Construction Traffic

30.5.4.1 Noise from Construction Traffic Along the Cable Route

Predicted annual average daily traffic (AADT) flows have been presented in Volume 4, Chapter 24: Traffic and Transportation. These values have been used to calculate the change in traffic noise along the onshore cable route due to the proposed construction works. For receptors adjacent to these roads, the additional noise from construction traffic over and above the noise from existing traffic on the roads will be very small (1dBA or less) and hence the magnitude of impact from construction traffic is considered to be very low and no likely significant effects are predicted.

The predicted changes in traffic noise levels are presented in Table 30.18. The road sections referred to are detailed in Volume 4, Chapter 24: Traffic and Transportation.

Table 30.18 Predicted change in traffic noise level due to construction traffic with and without development

Section	Road	Existing traffic flow, AADT	Existing proportion of heavy vehicles	Traffic flow with addition of construction traffic, AADT	Proportion of heavy vehicles including construction traffic	Change in noise level from additional construction traffic, dB(A)
1	R132	10540	3%	10809	4.2%	0.1
2	Harry Reynolds Road	12571	3%	12769	3.5%	0.1
3.1	R132	10693	5%	10723	5.2%	0.0
3.2	R132	8515	10%	8666	10.5%	0.1
5	R129	9563	9%	9678	9.7%	0.1
6	R132	37144	7%	38006	8.4%	0.1
7	R132	37155	7%	38024	8.4%	0.1

Section	Road	Existing traffic flow, AADT	Existing proportion of heavy vehicles	Traffic flow with addition of construction traffic, AADT	Proportion of heavy vehicles including construction traffic	Change in noise level from additional construction traffic, dB(A)
8	R132	36546	2%	37256	3.2%	0.1
9	Spittal Hill	3461.083301	2.7%	3602	5.7%	0.2
10.1	Estuary Road	7848	2%	7916	2.6%	0.0
10.2	Estuary Road	5659.778089	2.7%	5698	3.2%	0.0
11	Estuary Road	12999	2%	13070	2.5%	0.0
12	R106 Swords Road	14755	3%	14802	3.2%	0.0
13	R107 Malahide Road	14826	3%	14952	3.5%	0.0
14A	R107 Malahide Road	17854	4%	17980	4.4%	0.0
14B	Chapel Road / R124 / Hole In The Wall Road	10629	2%	10688	2.4%	0.0
15	R139	21746	7%	22023	7.8%	0.1

30.5.4.2 Noise from Diverted Traffic During Onshore Cable Route Construction

A number of local road closures will be required in order to install the onshore cable route where the width of the road is not sufficient to keep one lane open to traffic whist installing the cable. In these cases, existing traffic will be diverted along other roads. These road closures are detailed in Volume 4, Chapter 24: Traffic and Transportation.

The diversions will result in an increase in traffic along the diversion routes with associated increases in traffic noise whilst the diversion is in place. The anticipated increases in traffic flows along the strategic diversion route set out in Volume 4, Chapter 24: Traffic and Transportation are presented below in Table 30.19 along with the associated increase in traffic noise levels.

Table 30.19 Noise level changes associated with road closures & diversions

Road Section	Road	Current two-way traffic	Additional diverted traffic	Total traffic with diversion in place	Decibel increase in noise from addition of diverted traffic, dB(A)	Duration of road closure and associated diversion
1	R122	13557	10299	23856	2.5	1-2 Weeks
	Harry Reynolds Road	7616	10299	17915	3.7	
5	R132	9563	6293	15856	2.2	2 Weeks
	R125	7244	6293	13537	2.7	
	R108	4576	6293	10869	3.8	
9	Estuary Road	3358	3836	7194	3.3	1-2 Weeks
	Mantua Road	5638	3836	9474	2.3	
	R132	31532	3836	35368	0.5	
10.1	Mantua Road	5638	3281	8919	2	2-3 Weeks
	R132	31532	3281	34813	0.4	

Road Section	Road	Current two-way traffic	Additional diverted traffic	Total traffic with diversion in place	Decibel increase in noise from addition of diverted traffic, dB(A)	Duration of road closure and associated diversion
	Spittal Hill	3926	3281	7207	2.6	
10.2	Estuary Road	5660	7669	13329	3.7	3-4 Weeks
	R106	13148	7669	20817	2	
	R132	30969	7669	38638	1	
	Mantua Road	5638	7669	13307	3.7	
12	R106	13148	9746	22894	2.4	3-4 Weeks
	R132	26248	9746	35994	1.4	
	R125	11100	9746	20846	2.7	
	R139	50033	9746	59779	0.8	
	R107	20996	9746	30742	1.7	
13	R106	9974	9852	19826	3	3-4 Weeks
	R132	26248	9852	36100	1.4	
	R125	11100	9852	20952	2.8	
	R139	33899	9852	43751	1.1	
14A	R106	9974	14487	24461	3.9	1-2 Weeks
	R132	26248	14487	40735	1.9	
	R125	11100	14487	25587	3.6	
	R139	33899	14487	48386	1.5	
14B.1	R107	16122	8799	24921	1.9	2-3 Weeks
	R123	10496	8799	19295	2.6	
	R124	9906	8799	18705	2.8	
14B.2	R106	11685	10386	22071	2.8	2-3 Weeks
	R107	10083	10386	20469	3.1	
	R123	10496	10386	20882	3	
14B.3	R123	9535	N/A	9535	0	1 Week
	Hole in the Wall Road	7336	N/A	7336	0	
	Belmayne	6368	N/A	6368	0	

Based on the noise change criteria set out in Table 30.6, changes of between 3dB(A) and 5dB(A) are rated as slight to moderate magnitude noise impacts. Noise-sensitive receptors close to the following roads are likely to experience temporary slight to moderate magnitude noise impacts during the diversions:

- Route section 1: Harry Reynolds Road through Balbriggan
- Route section 9: Estuary Road
- Route section 10.2: Estuary Road

- Route section 13: R106
- Route section 14A: R106 and R125
- Route section 14B.2: R107 and R123

In addition to the diversion routes set out above, there are likely to be some increases in traffic flows of 25% or greater on the local diversion routes detailed in Volume 4, Chapter 24: Traffic and Transportation. Temporary adverse noise impacts may result along these local diversion routes as a result of these increases in flow.

As the duration of the above impacts will be less than 40 days in any six months, no likely significant effects are predicted.

30.5.5 Ecological Receptors

Potential noise effects on ecological receptors are discussed in Volume 4: Chapter 23 – Biodiversity.

30.5.6 Non-residential receptors

Four schools are located along the onshore cable route:

- Corduff National School: a primary school on the R132 in Corduff,
- St Nicholas of Myra National School, Kinsealy on the R107 Malahide Road
- St Molagas National School on the R132 Dublin Road, Balbriggan, and
- Malahide/Portmarnock Educate Together National School on the R107

Noise levels in the absence of mitigation at the schools listed above during onshore cable route construction are set out in Section 30.5.2.4. During breaking out of the road surface and road resurfacing works, the unmitigated predicted noise levels would result in temporary moderate to significant magnitude noise impacts. However, temporary noise barriers will be provided alongside the school to minimise noise during the works. The residual noise impacts on the schools are set out in Section 30.7.1.

30.5.7 Operational Phase

30.5.7.1 Operational WTG noise

A calculation of noise levels from the operation of the offshore WTG under metrological conditions favourable to noise propagation has been carried out.

The calculation has been carried out for the residential receptors closest to the array area, namely the houses on the Red Island headland in Skerries. The distance from these houses to the nearest potential turbine location is 12km.

For operational WTG noise, on a precautionary basis the assessment assumes that all WTG noise originates from the same distance of 12km offshore as set out in section 30.5.2.1 which is representative of both project options described in section 30.4.2.1. A noise source level which is representative of either scale of WTG has been used in the assessment and therefore it would not vary between project options. The only parameter which differs between the two project options is that of the assumed number of WTG and, in order to provide an assessment of the greatest magnitude of impact, the higher number of turbines (49) has been assumed.

A noise source sound power level of 115dBALw for each WTG – a source level representative of large offshore WTG of the type proposed for the proposed development, with all 49 turbines (the highest number of WTG proposed) assumed to be operating at once.

Corrections for geometrical spreading, ground correction and atmospheric (air) absorption were applied in line with the guidance in ISO9613 over the propagation distance of 12km (12km being the closest distance from onshore residential properties to the array area). The ISO9613 standard gives predictions assuming favourable wind conditions to sound propagation i.e. downwind propagation.

The ground conditions are assumed to be hard ground (representative of water) and the source and receiver heights are assumed to be 200m and 2m respectively.

The predicted noise level from the WTG operations to shore is 32dB(A),L_{Aeq}/29dB(A)L_{A90}. This is below the threshold levels set out in NG4 (45dBL_{Aeq}) and ETSU R-97 (35dBL_{A90}). No likely significant effects from operational WTG noise are therefore predicted.

30.5.7.2 Onshore Cable Route

There will be no operational noise effects from the onshore cable route. The occasional maintenance and testing of the cable will not give rise to any likely significant noise or vibration effects.

30.5.7.3 Grid facility

The grid facility, which will be located at the landfall site, will be operational 24 hours a day, 7 days a week. Nearby noise-sensitive receptors have been modelled to the north, east, and south of the site (see Table 30.12).

3D modelling of the noise has been undertaken in SoundPLAN (version 8.2), which uses the ISO 9613-2 Propagation Method for the propagation of outdoor noise.

The following assumptions have been included in the modelling:

- Terrain has been modelled as flat ground
- Ground absorption areas have been input into the model as follows:
  - Soft ground for fields/agricultural areas
  - Hard ground for roads and concrete hardstands
- A static VAR compensator (SVC) cooler have been selected as the low noise option
- The SVC transformer and shunt reactors will be within an enclosure that provides acoustic attenuation; alternatively, lower-noise units which achieve the same reduction in noise level as an enclosure would be used
- Emergency diesel generators are only used in urgent situations (e.g., grid power failures) and only tested for one day in the month, during the daytime period

The three operational scenarios which have been modelled include the following:

- Normal operation
- Emergency operation, which includes all noise sources from the 'normal operation' scenario as well as back-up emergency diesel generators that will be operational during a power failure to ensure the continued operation of the proposed development through power failures and the like.
- Emergency generator testing, which will include all noise sources from the 'normal operation' scenario as well as the emergency back-up diesel generators but assessed against daytime noise limits.

The plant modelled at the grid facility is presented in Table 30.20 below. Octave band sound power levels have been presented where they are available, and only broadband sound power levels where octave band data is not available.

Table 30.20 Operational noise source sound power levels for modelling

Equipment	Operational Scenario	No. units on site	Height of source above ground, m	% on time	Lw per unit, dBA	Octave band centre frequency, Hz							
						63	125	250	500	1k	2k	4k	8k
220/58kV 450MVA SVC transformer in enclosure	Normal and Emergency	1	1	100	75								
SVC Transformer Cooler Bank (with silencer)	Normal and Emergency	1	1	100	77								
Oil filled shunt reactor	Normal and Emergency	1	1	100	92								
D01 220kV shunt reactor	Normal and Emergency	1	1	100	92								
D04 220kV SVC	Normal and Emergency	1	1	100	90								
Reactor L1 for filter bank	Normal and Emergency	3	1	100	79								
SVC phase reactor	Normal and Emergency	3	2	100	76								
130MVAr mechanical switched reactor	Normal and Emergency	6	1	100	79								
SVC plus low noise cooler unit	Normal and Emergency	2	1	100	70								
SVC Building air conditioning unit	Normal and Emergency	3	0.4	100	72								
Diesel generator BS5228-1 Table C 4-84	Emergency only	2	0.2	100	102	103	100	104	98	97	93	84	75

Predicted noise levels associated with the operation of the proposed development according to the above methodology are presented in Table 30.21, Table 30.22, and Table 30.23.

As per guidance in guidance document NG4 (full reference in Table 30.1), a +5 dBA penalty has been applied to account for potential tonal features, as the transformer's low frequency tonal noise components are the most likely source of annoyance to nearby residents from substation noise. This, in the context of BS4142, is a conservative feature correction as it assumes that tonality was at least "clearly perceptible". This correction has been added as there is no octave band noise data available for the transformer at this time, and therefore an objective analysis of the tonal components of the noise cannot be done.

The predicted rating noise levels have been compared to the relevant NG4 noise limits as well as the existing background noise levels at each receptor.

Table 30.21 Predicted operational noise levels - normal operational scenario

Noise Sensitive Receptor	Existing night time background noise level, L90, dBA	Predicted operational noise level, Leq,T, dBA	BS4142 correction, dBA	Predicted rating level, Lr,Tr, dBA	Exceeds NG4 limit of 45dBA?*	Excess of rating level over background (BS41242)
NSR1	45	30	5	36	No	0
NSR2	46	36	5	43	No	0
NSR3	46	35	5	41	No	0
NSR4	46	36	5	41	No	0
NSR5	43	37	5	42	No	0
NSR6	43	38	5	43	No	0
NSR7	46	33	5	39	No	0
NSR8	43	32	5	39	No	0

*NG4 limit for night-time operation is 45 dBA

No exceedance in the noise limit is predicted under normal operating conditions and no likely significant effect predicted.

As discussed in Section 30.2.5.6, the limit for emergency situations is higher than that for normal operations as diesel generators would be active during these situations. This is reflected in the assessment in Table 30.22 below.

Table 30.22 Predicted operational noise levels - emergency operational scenario

Noise Sensitive Receptor	Existing night time background noise level, L90, dBA	Predicted operational noise level, Leq,T, dBA	BS4142 correction, dBA	Predicted rating level, Lr,Tr, dBA	Exceeds NG4 limit of 55dBA?*	Excess of rating level over background (BS41242)
NSR1	45	38	5	42	No	0
NSR2	46	42	5	48	No	2
NSR3	46	45	5	49	No	3
NSR4	46	44	5	47	No	1
NSR5	43	44	5	48	No	5
NSR6	43	46	5	49	No	6
NSR7	46	39	5	45	No	0
NSR8	43	38	5	45	No	2

*Limit for emergency operations = NG4 limit + 10 dBA = 55 dBA

No exceedance of the NG4 limit is predicted in the emergency situation.

There is an excess noise level of between 1 and 6 dBA (above the measured background noise level) at 5 receptors, which would indicate a slight to moderate negative impact on overall noise levels at those receptors. It should be noted, however, that this is only for emergency situations, and will be temporary and no significant effect is predicted.

Emergency diesel generator testing is limited to the daytime period, so the excess of the predicted rating level over the measured background level is assessed against the measured day time background noise level in Table 30.23.

Table 30.23 Predicted operational noise levels - emergency testing operational scenario

Noise Sensitive Receptor	Existing day time background noise level, L90, dBA	Predicted operational noise level, Leq,T, dBA	BS4142 correction, dBA	Predicted rating level, Lr,Tr, dBA	Exceeds NG4 limit of 45dBA?*	Excess of rating level over background (BS41242)
NSR1	44	38	5	42	No	0
NSR2	49	42	5	48	No	2
NSR3	49	45	5	49	No	3
NSR4	49	44	5	47	No	1
NSR5	48	44	5	48	No	5
NSR6	45	46	5	49	No	6
NSR7	49	39	5	45	No	0
NSR8	47	38	5	45	No	2

*Day time NG4 limit = 55 dBA

No exceedance of the NG4 limit is predicted, however an excess of between 1 and 6 dBA is predicted above existing daytime background noise levels at 3 receptors which would constitute a slight to moderate negative effect on the overall noise environment at these receptors. It should be noted, however, that this is only for emergency situations, and will be temporary and so no likely significant effect is predicted.

The overall effect from operational noise at the grid facility is identified as long-term, negative, and not significant.

30.5.7.4 Belcamp substation

At the southern end of the onshore cable route, the cable will connect underground into the existing Belcamp substation, an extension to which is likely to be in place prior to the construction of the proposed development. No additional operational noise will be generated at Belcamp substation as a result of the proposed development and therefore no noise impacts will result to nearby receptors.

30.5.8 Decommissioning

Once the proposed development has reached the end of its operational life, it is anticipated parts of it will be decommissioned. The compensation substation at the grid facility will be decommissioned, however, the Bremore substation will not as it will form part of the wider transmission network owned by EirGrid. The onshore cable route from the Bremore substation to the Belcamp substation will form part of the wider transmission system and will not be decommissioned. The operational life of these assets will be approximately 40 years.

When it becomes appropriate to decommission the onshore cable route infrastructure, all above ground structures (i.e. access track, marker posts, link) between the TJB and the grid facility will be removed, and the sites will be returned to their previous state. It is not proposed to remove any planting. The cabling will be removed but below ground ducting will remain in place.

It is anticipated that the decommissioning process will involve similar activities as the construction process, but these will be undertaken in reverse with the removal of above ground structures between the landfall site and grid facility. As the removal of the underground structures may have more of an environmental impact if they were to be removed, these features will remain in-situ.

It is anticipated that the decommissioning process for the remainder of the infrastructure will produce similar noise impacts and effects to that of the construction phase.

30.6 Mitigation and Monitoring Measures

This section describes the measures required to prevent, reduce, or offset any likely significant negative noise and vibration effects arising as a result of the proposed development. These measures will be taken to minimise the potential for noise and vibration disturbance to the surrounding area during the construction and operational phases of the proposed development.

30.6.1 Construction Phase

This section sets out the good industry practice which will be employed to minimise, control and manage potential construction noise and vibration impacts at nearby noise-sensitive receptors.

30.6.1.1 Temporary Noise Barriers

It has been assumed that along with the good industry practice measures set out in Section 30.6.1.2 below, temporary noise barriers/site hoarding will be erected around the works at the main compounds and static construction worksites to reduce noise to nearby residences and/or key ecological receptors. Barriers will be erected around the following sites as follows:

- Grid facility, barriers to be provided (bar at access gates and adjacent to the R132) along the site perimeter where residential dwellings lie within 200m of the onshore development area
- Grid facility contractor compound (whole perimeter bar at access gates)
- Bremore cable contractor compound: barriers to be provided along the parts of the compound perimeter (bar at access gates) where residential dwellings lie within 200m of the compound
- Along the eastern edge (bar at access gates) of the Blakes Cross cable contractor compound
- Railway HDD entry site contractor compound at the landfall site (whole perimeter bar at access gates)
- Landfall HDD contractor compound at the landfall site (whole perimeter bar at access gates)
- M1 HDD entry site contractor compound (northern, eastern and southern edges of the compound perimeter, bar at access gates)
- If night-time HDD works are to be carried out at the following sites, barriers will be erected at the HDD entry contractor compounds (whole perimeter bar access gates) at water crossings WX9, WX10, WX16, WX17 and WX18

Noise barriers have been assumed to provide 10dB(A) of noise mitigation for the above works.

The onshore cable route works will progress relatively quickly and will be primarily carried out on roads where the works need to be kept to a minimum of working width to minimise the need for road closures. Therefore, no noise barriers have been assumed for the onshore cable route works other than at the following specific locations:

Temporary noise barriers will be provided between the onshore cable route construction working area and the following four schools:

- Corduff National School: a primary school on the R132 in Corduff
- St Nicholas of Myra National School, Kinsealy on the R107 Malahide Road
- St Molagas National School on the R132 Dublin Road, Balbriggan, and
- Malahide/Portmarnock Educate Together National School on the R107

At the Malahide Estuary, which is separated from the works area by, in most parts, 20-50m, the first measure of avoidance will be to avoid works along the Estuary Road during the period September to March when wintering birds are present. Where this is not practicable, for works at Malahide Estuary during the period of September to March, noise barriers will line the works area within Estuary Road on the estuary side to protect wintering birds utilising the nearest estuarine habitats..

30.6.1.2 Good Industry Practice

Good industry standards, guidance and practice procedures will be followed in order to minimise noise and vibration effects during construction, and these are documented within the Construction Environmental Management Plan (CEMP) Volume 11, Appendix 9.1. The following provisions, although not exhaustive, will be adhered to where practicable throughout the construction programme:

- Vehicles and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, maintained in good and efficient working order, and operated in such a manner as to minimise noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements.
- Machines in intermittent use will be shut down or throttled down to a minimum when not in use.
- Compressors will be fitted with properly lined and sealed acoustic covers which will be kept closed whenever in use. Pneumatic percussive tools will be fitted with mufflers or silencers.
- Equipment which breaks concrete, brickwork, or masonry by bending, bursting, or “nibbling” will be used in preference to percussive tools. Where possible, the use of impact tools will be avoided where the site is close to occupied premises.
- Rotary drills and bursters activated by hydraulic, chemical, or electrical power will be used for excavating hard or extrusive material.
- Wherever possible, equipment powered by mains electricity will be used in preference to equipment powered by internal combustion engine or locally generated electricity.
- No part of the works nor any maintenance of plant will be carried out in such a manner as to cause unnecessary noise except in the case of an emergency when the work is absolutely necessary for the saving of life or property or the safety of the works.
- Plant will be maintained in good working order so that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum; and
- Noise emitting machinery which is required to run continuously will be housed in a suitable acoustically lined enclosure.

30.6.1.3 Communications

Community Liaison will be led by the Developer, however, the Contractor will also take all reasonable steps to engage with stakeholders in the local community, focusing on those who may be affected by the construction works including residents, businesses, community resources and specific vulnerable groups.

Communication with the local community and other relevant stakeholders will be undertaken at an appropriate level and frequency throughout construction.

The Contractor will follow the Community Liaison Plan as provided by the Developer, which will include details of how the local community, road users and affected residents will be notified in advance of the scheduling of major works, any temporary traffic diversions and the progress of the construction works. A dedicate website will be established for the proposed development, which will describe the progress and will be kept up to date by the Developer.

Further detail of the community liaison and environmental management measures to be applied during the construction period can be found in Volume 8, Appendix 9.1: Onshore CEMP.

30.6.1.4 *Noise and Vibration Monitoring*

Monitoring of noise and vibration levels at the construction site boundary will be undertaken at noise-sensitive receptors near the working areas to identify where work procedures need to be modified. In the event of a valid complaint a noise monitoring protocol will be submitted to the relevant local authority prior to commencement of any noise monitoring. The protocol will include details of:

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

30.6.2 Operational Phase

For the operation of the grid facility, the following operating parameters have been assumed:

- A static VAR compensator (SVC) cooler have been selected as the low noise option
- The SVC transformer and shunt reactors will be within an enclosure that provides acoustic attenuation; alternatively, lower-noise units which achieve the same reduction in noise level as an enclosure would be used.

30.6.3 Decommissioning

The mitigation measures described for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase.

30.7 Residual Effects

30.7.1 Construction Phase

A summary of the residual effects of construction noise on residential receptors for each of the construction stages considered is presented in Table 30.24 and Table 30.25.

Table 30.24 Summary of residual effects at residential receptors from daytime construction noise – landfall site and grid facility

Assessment Topic/Receptor	Predicted Noise Level (Pre Mitigation), L_{Aeq} [dB]	Potential Effect (Pre Mitigation)	Predicted Noise Level (Post Mitigation), L_{Aeq} [dB]	Predicted Effect (Post Mitigation)
NSR1	56	No significant effect	46	No significant effect
NSR2	68	Slight to moderate magnitude of noise impact. Temporary, but a likely significant effect	58	No significant effect
NSR3	65	No significant effect	55	No significant effect
NSR4	64	No significant effect	54	No significant effect
NSR5	71	Moderate to significant magnitude of noise impact. Temporary, but a likely significant effect	61	No significant effect
NSR6	74	Significant magnitude of noise impact. Temporary, but a likely significant effect	64	No significant effect
NSR7	60	No significant effect	50	No significant effect
NSR8	63	No significant effect	53	No significant effect

Table 30.25 Summary of residual effects from daytime construction noise at residential noise-sensitive receptors – onshore cable route

Assessment Topic/Receptor	Predicted Noise Level (Pre Mitigation), L_{Aeq} [dB]	Potential Effect (Pre Mitigation)	Predicted Noise Level (Post Mitigation), L_{Aeq} [dB]	Predicted Effect (Post Mitigation)
HDD works	72	Moderate to significant magnitude of noise impacts. Temporary. No likely significant effects due to short duration	72	Moderate to significant magnitude of noise impacts. Temporary. No likely significant effects due to short duration
Onshore cable route: Joint bay works	74	Moderate to significant magnitude of noise impacts. Temporary. No likely significant effects due to short duration	74	Moderate to significant magnitude of noise impacts. Temporary. No likely significant effects due to short duration
Onshore cable route: breaking of existing road surface	73	Moderate to significant magnitude of noise impacts. Temporary. No likely significant effects due to short duration	73	Moderate to significant magnitude of noise impacts. Temporary. No likely significant effects due to short duration
Onshore cable route: cable trench excavation and backfilling	67	Neutral to slight magnitude of noise impacts. Temporary. No likely significant effects due to short duration	67	Neutral to slight magnitude of noise impacts. Temporary. No likely significant effects due to short duration
Onshore cable route: road resurfacing	68	Neutral to slight magnitude of noise impacts. Temporary. No likely significant effects due to short duration	68	Neutral to slight magnitude of noise impacts. Temporary. No likely significant effects due to short duration

For this phase of works, there is the potential for temporary negative effects at noise-sensitive receptors during the onshore cable works, but as the noise impacts will last for less than 40 days, they do not constitute a likely significant effect at any receptor.

Construction noise at four schools along the onshore cable route will be mitigated with noise barriers during construction works:

- Corduff National School: a primary school on the R132 in Corduff
- St Nicholas of Myra National School, Kinsealy on the R107 Malahide Road
- St Molagas National School on the R132 Dublin Road, Balbriggan, and
- Malahide/Portmarnock Educate Together National School on the R107

The mitigation will limit construction noise levels to 63dBA, 57dBA and 58dBA for breaking out of the existing road surfaces, trench excavation and backfilling, and road resurfacing works respectively. No likely significant effects are predicted.

Due to the low level of predicted vibration levels, no likely significant effects are predicted for construction vibration.

No likely significant effects are predicted to onshore noise-sensitive receptors due to offshore piling works.

30.7.1.1 Night-time HDD operations

No likely significant effects from HDD operations outside of daytime working hours are predicted, as summarised below in Table 30.26:

Table 30.26 Summary of residual effects at residential receptors from night-time HDD operations

HDD sites	Approximate distance to nearest noise-sensitive receptor	Noise level pre-mitigation, dBA	Potential effect pre-mitigation	Noise level post-mitigation, dBA	Predicted effect post-mitigation
Landfall HDD at landfall site; HDD at water crossings 5, 6, 7	>500m	<45	No significant effect as below night-time threshold level of 45dBA without noise barriers	<45	No likely significant effects as noise levels will be below threshold level for night-time impacts
Railway HDD at landfall site; HDD at water crossings 9, 10, 16, 17, 18	Between 150m and 500m	>45	Potential exceedances of night-time threshold level of 45dBA	<45	No likely significant effects as noise levels will be below night-time threshold level of 45dBA with noise barriers
M1 crossing; HDD at water crossings 2, 3, 4, 8, 11, 12, 13, 14, 15, 19, 20, 21, 22, 23, 24	<150m	N/A (no works proposed)	N/A (no works proposed)	N/A (no works proposed)	No likely significant effects as no HDD works will take place outside daytime hours

Likely significant effects from night-time HDD operations will be avoided through a combination of distance from works to noise-sensitive receptors and the provision of noise barriers. At HDD sites where the distance to noise-sensitive receptors is less than 150m, no night-time HDD operations will be carried out.

30.7.2 Operational Phase

30.7.2.1 Grid Facility

A summary of the residual effects on noise-sensitive receptors is presented in Table 30.27, Table 30.28, and Table 30.29. No additional mitigation beyond what has been included in the modelling is proposed for the operational scenarios.

Negative impacts are based on whether the predicted operational noise level exceeds the criteria as well as whether the predicted noise level is in excess of the existing measured background noise level. If the predicted operational noise level exceeds both the criteria and the measured background noise level, then a negative effect is predicted.

Table 30.27 Summary of residual effects from the operational phase noise – normal operating scenario

Assessment Topic/Receptor	Potential Effect (Pre-Mitigation)	Predicted Effect (Post-Mitigation)
NSR1	No significant effect	No significant effect
NSR2	No significant effect	No significant effect
NSR3	No significant effect	No significant effect
NSR4	No significant effect	No significant effect
NSR5	No significant effect	No significant effect
NSR6	No significant effect	No significant effect
NSR7	No significant effect	No significant effect
NSR8	No significant effect	No significant effect

The normal operating scenario has been assessed against the nighttime noise limit as well as the existing background noise level at nearby noise-sensitive receptors. No likely significant effect are predicted from this scenario.

Table 30.28 Summary of residual effects from the operational phase noise – emergency operating scenario

Assessment Topic/Receptor	Potential Effect (Pre-Mitigation)	Predicted Effect (Post-Mitigation)
NSR1	No significant effect	No significant effect
NSR2	No significant effect	No significant effect
NSR3	No significant effect	No significant effect
NSR4	No significant effect	No significant effect
NSR5	No significant effect	No significant effect
NSR6	No significant effect	No significant effect
NSR7	No significant effect	No significant effect
NSR8	No significant effect	No significant effect

The emergency operating scenario has been assessed against the night-time noise limit (plus emergency allowance) and existing background noise level at nearby noise-sensitive receptors. No likely significant effect are predicted from this scenario.

Table 30.29 Summary of residual effects from the operational phase noise – emergency testing operating scenario

Assessment Topic/Receptor	Potential Effect (Pre-Mitigation)	Predicted Effect (Post-Mitigation)
NSR1	No significant effect	No significant effect
NSR2	No significant effect	No significant effect
NSR3	No significant effect	No significant effect
NSR4	No significant effect	No significant effect
NSR5	No significant effect	No significant effect
NSR6	No significant effect	No significant effect
NSR7	No significant effect	No significant effect
NSR8	No significant effect	No significant effect

The emergency testing operating scenario has been assessed against the daytime noise limit and existing background noise level at nearby noise-sensitive receptors. No likely significant effect are predicted from this scenario.

30.7.2.2 Operational noise from WTGs

No likely significant effects are predicted from the offshore WTGs.

30.7.3 Decommissioning

The Bremore substation within the grid facility and the onshore cable route will not be decommissioned as these will form part of the wider National Electricity Transmission Network (NETN) owned by EirGrid. It is anticipated that the decommissioning process for the remainder of the infrastructure will produce similar noise impacts and effects to that of the construction phase.

30.8 Transboundary Effects

Considering the nature and location of the proposed development, no transboundary noise or vibration effects are predicted.

Effects due to underwater noise are assessed in Volume 3, Chapter 13: Fish and Shellfish Ecology and Volume 3, Chapter 14: Marine Mammal Ecology, based on data contained in Volume 9, Appendix 14.1 Underwater Noise Modelling Report. Neither chapter concluded any likely significant transboundary effects.

30.9 Cumulative Effects

A long list of" other projects" which were deemed to be potentially relevant to be included in the cumulative impact assessment was compiled (see Volume 6, Chapter 38: Cumulative and Inter-related Effects (hereafter referred to as the 'Cumulative and Interrelated Effects Chapter')). A screening exercise of the "long list" was carried out in order to determine whether each of those other projects have the potential to give rise to likely significant cumulative effects from a Noise and Vibration perspective with the proposed development. Many of the other projects were screened out for a number of reasons including the location, scale and nature of the project. Those projects which were "screened in" were carried forward for assessment. The results of the assessment are presented in the Cumulative and Interrelated Effects chapter. The assessment concluded that there are no likely significant direct or indirect cumulative noise and vibration effects predicted during the construction, operation, or decommissioning phases of the proposed development.

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