MWP

# Environmental Impact Assessment Report (EIAR)

## Chapter 09 Noise and Vibration

**Dernacart Windfarm**
**110kV Substation and Grid Connection**

**Statkraft Ireland**

**October 2024**

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| Project No. | Doc. No. | Rev. | Date | Prepared By | Checked By | Approved By | Status |
|---|---|---|---|---|---|---|---|
| 23268 | 6011 | A | 01/10/2024 | KB | CF | CF | Final |
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# 9. Noise and Vibration

## 9.1 Introduction

This chapter considers the potential effects on noise and vibration sensitive receptors arising from the Proposed Development. A full description of the Proposed Development is provided in Chapter 2 of this Environmental Impact Assessment Report (EIAR).

The nature and probability of effects on noise and vibration sensitive receptors arising from the Proposed Development has been assessed in this chapter. The assessment comprises:

- A review of the existing receiving environment;
- Prediction and characterisation of likely impacts;
- Evaluation of effects significance as a standalone project and cumulatively with other projects; and
- Consideration of mitigation measures, where appropriate.

### 9.1.1 Noise and Vibration Characteristics of the Proposed Development

A full description of the proposed development is provided as part of Chapter 2 of this EIAR. The proposed development comprises the following main elements:

- One (1) 110kV substation with associated compound, including Two (2) single storey control and operational buildings, electrical plant, equipment, cabling, lighting, CCTV, lightning masts, diesel generator and diesel tank, security palisade fencing,
- 2.45km underground electric cabling systems between the wind farm site and the proposed 110kV substation overlain with 5.5m wide stone access track
- 10.85km of 110kV underground electrical cabling from the proposed 110kV substation to the consented Bracklone 110kV substation including enabling works, services diversions, joint bays, along the grid route
- New entrance and access road to substation site from the R423.
- New clear span and box culvert /piped water crossings
- Peat/spoil deposition areas

The following sections provide a brief overview of type of noise main noise associated with the proposed development.

#### 9.1.1.1 Substations and Noise Emissions

The main noise source from a substation during the operational phase is from the transformer(s). The noise is generally recognisable as a steady hum which arises from electric and magnetic forces within the transformer. Infrequent noise may also arise from voltage changes (tap changer) and cooling fans under high loads.

Other noise sources from electrical infrastructure include Aeolian noise (wind through power lines), Corona noise (hiss or crackling from high voltage power lines) and potentially noise from faulty equipment, although these are not considered significant (EirGrid, 2016).

Construction noise will occur during excavation and earth moving, laying of roads and hard standings, and transportation of materials. The construction phase will be phased and temporary.

Noise assessments were undertaken for the operational and construction phases of the proposed development. Consideration was also given to potential cumulative impacts with the permitted consented Dernacart Wind Farm, as well as other developments in surrounding vicinity of the proposed development.

#### 9.1.1.2 Grid Connection Noise Emissions

Noise emissions from the grid connection will only occur during the construction phase. The construction phase will be phased and temporary.

Once operational there will be no further noise emissions associated with the Proposed grid connection as it will be buried underground and has no inherent noise generating capacity. There may be service and maintenance requirements, but it is not possible to say when, where, and how often this will occur.

#### 9.1.1.3 Wind Farm Underground Collector Cable and Access Track Noise Emissions

Noise emissions from the wind farm underground collector cable and access track construction will be similar to noise emissions generated from the grid connection construction.

During the operational phase, the underground collector cable will not introduce any new permanent noise source into the receiving environment.

During the operational phase, vehicles will occasionally cross the access track however the low volume will not be discernible from existing traffic on the surrounding local roads.

### 9.1.2 Competency of Assessor

The assessment has been prepared by Kieran Barry (BEng, PG Dip).

Kieran is an experienced environmental consultant with 8 years experience working on environmental projects, including three years experience in the measurement, prediction, assessment, and control of environmental noise He has completed the Institute of Acoustics (IOA) Certificate of Competence in Environmental Noise Measurement course and is currently undertaking the Institute of Acoustics' Diploma in Acoustics and Noise Control.

## 9.2 Methodology

The methodology adopted for this assessment is in accordance with best practice, experience and professional judgement and is outlined in the following sections. A useful brief guide to fundamentals of environmental noise and a comparative decibel scale is provided below toa assist with the interpretation of the assessment.

### 9.2.1 Fundamentals of Noise

Fundamentally, noise is vibrations of the air which are detectable by the ear. Sound waves radiate out spherically from a sound source in three dimensions.

The human ear can detect a very wide range of pressure variations. In order to cope with this wide range, a logarithmic scale (decibel (dB) scale) is used to translate pressure values into manageable numbers from 0dB to 140 dB. 0 dB is the threshold of hearing and 120 dB is the threshold of pain.

Measuring in decibels means that a 3 dB increase is equivalent to a doubling of the sound energy and a 10 dB increase in a tenfold increase in energy. For broadband sounds which are very similar in all but magnitude, a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions and a 10 dB increase generally appears twice as loud.

A healthy human ear is also sensitive to a large range of frequencies (approximately 20 Hz to 20,000 Hz) and varies in sensitivity depending on the frequency.

The human ear is not equally sensitive to sound at all frequencies and is less sensitive to sound at low frequencies and high frequencies. A -weighting (dB A) is the main way of adjusting measured sound pressure levels (noise) to take account of the uneven human response to frequencies.

Figure 9.1 illustrates some everyday sounds on the dB(A) scale. A quiet bedroom is around 35 dB(A), a busy office around 60dB(A) and a rock concert around 100 dB(A). The illustration is extracted from draft Wind Energy Development Guidelines 2019.

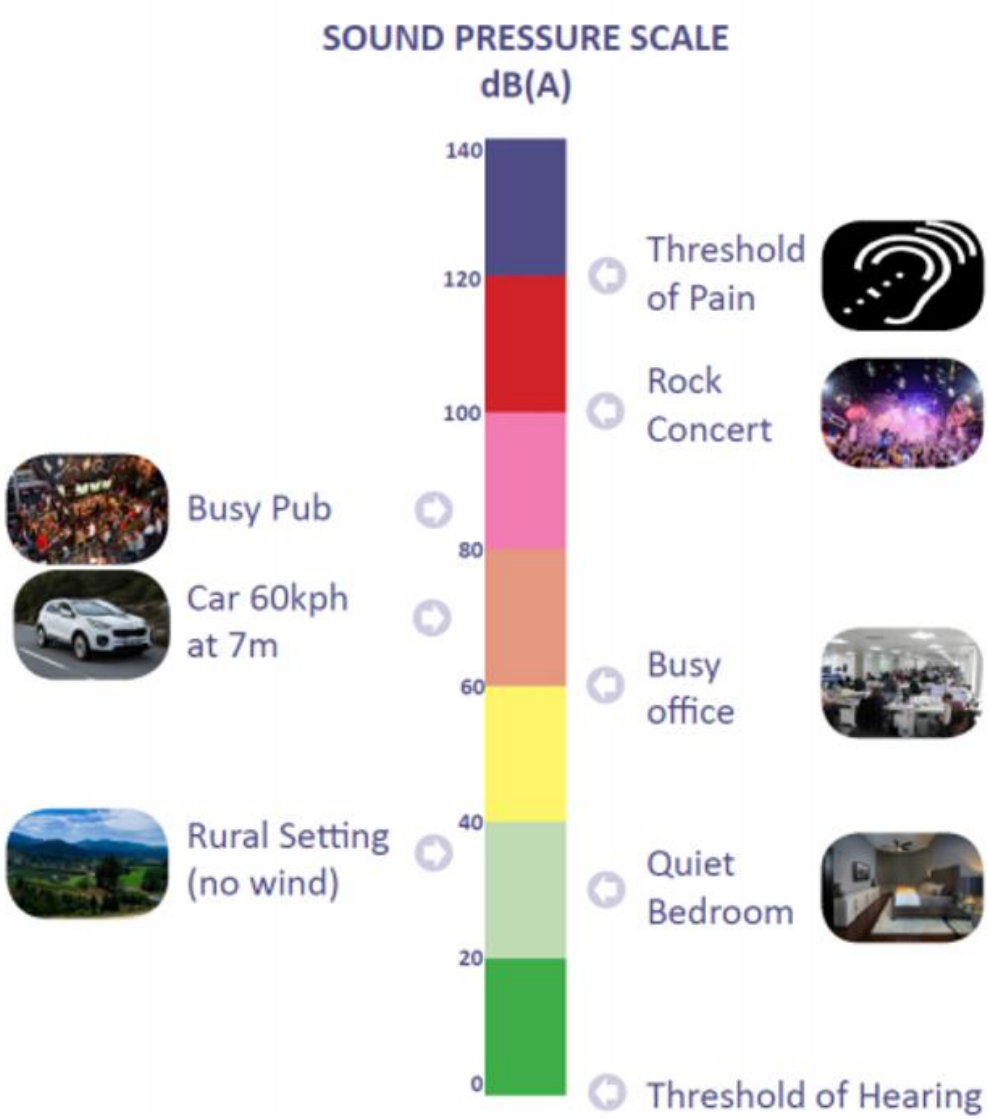



**Figure 9.1 The Level and Typical Common Sounds on the dB(A) Scale**

### 9.2.2 Desktop Study

The methodology used for this study included desktop research of published information, primarily a review of the consented Dernacart Wind Farm EIAR, in particular the Noise and Vibration Chapter.

The Proposed Development description in Chapter 2 was reviewed and the potential noise sensitive locations along same identified, refer to Figure 9.2. The existing baseline noise environment was characterised and the potential impact on the receiving environment assessed accordingly.

### 9.2.3 Baseline Noise Monitoring

Baseline noise data was collected on 22nd and 23rd February 2024, refer to **Section 9.3** for details.

### 9.2.4 Legislation

#### 9.2.4.1 Construction Phase

There are no mandatory noise limits for construction noise in Ireland. Best practice and guidance documents related to environmental noise assessment are referred to in Section 9.2.7.

#### 9.2.4.2 Operational Phase

There are no mandatory operational noise limits related to this type of development in Ireland. Best practice and guidance documents related to environmental noise assessment are referred to in Section 9.2.7.

### 9.2.5 Guidelines and Best Practice

#### 9.2.5.1 Construction Phase

*'British Standard 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites'* outlines noise thresholds for significant impacts.

*Transport Infrastructure Ireland's (TII) 'Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes' (2014)* was also consulted for noise and vibration related impact nuisance thresholds.

#### 9.2.5.2 Operational Phase

The following documents were consulted when assessing the operational noise and vibration impact from the proposed development on the receiving environment:

- *Environmental Protection Agency – Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), 2016.*
- *TII's 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (2004)*
- *Transport Infrastructure Ireland 'Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes' (2014)*
- *Institute of Environmental Management and Assessment (IEMA)'s 'Guidelines for Environmental Noise Impact Assessment' (2014).*

- *British Standard 5228 Parts 1 & 2, Code of Practice for Noise and Vibration Control on Construction and Open Sites + A1 2014.*
- *ISO 9613-2-1996- Acoustics – Attenuation of sound during propagation outdoors –Part 2: General method of calculation.*

### 9.2.6 Scope of Assessment

The scope of the assessment has been defined by industry standard best practice and guidance (Section 9.2.5) used in Ireland. In general, this includes:

- Establishing the existing or baseline noise conditions at representative noise sensitive receptors.
- Establishing noise limits based on the measured baseline noise levels in accordance with best practice and guidance.
- Using calculation, predict the noise emissions from the Proposed Development at the noise sensitive receptors for comparison against noise threshold criteria.

#### 9.2.6.1 Scoped out from Further Assessment

There will be no significant sources of vibration during either the construction or operational phases. Therefore, this aspect has been scoped out from further assessment.

#### 9.2.6.2 Significance of Effects

Determination of the significance of an effect will be made in accordance with the terminology outlined in the EPA's '*Guidelines on Information to be contained in Environmental Impact Assessment Reports'* (2022).

#### 9.2.6.3 Criteria for Evaluating Construction Noise Effects

There is no statutory guidance in Ireland relating to the maximum noise levels permitted during construction works, and in the absence of statutory guidance or other specific limits prescribed by local authorities, the thresholds outlined in the '*British Standard 5228-12009+A1:2009, Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise'* has been adopted in this assessment, as they are recognised by the expert community as the most appropriate in the assessment of construction noise. The noise levels, which are reproduced in Table 9.1, are typically deemed acceptable.

**Table 9.1 Criteria for Evaluating Construction Noise Effects**

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

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

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

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

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

The baseline noise monitoring data, refer to **Section 9.3**, determines that Category A applies for some noise sensitive locations (NSLs) while Category B was also applicable to NSLs which were monitored as part of baseline survey. Taking a conservative approach for this assessment, Category A will be used for the noise threshold limits. Therefore, if the predicted construction noise exceeds Category A threshold values then this is assessed as a significant effect.

However, it should be borne in mind, that the criteria above are presented as a guide and for information purposes as to what is generally acceptable for longer term exposure. They are also an average over a 10-hour working day. This allows for the criteria to be exceeded occasionally but for projects to remain compliant when averaged out over a full working day.

#### 9.2.6.4 Criteria for Evaluating Operational Noise Effects

In the absence of specific noise limits for this type of development, the most appropriate criteria are set out in The Environmental Protection Agency (EPA) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (Environmental Protection Agency, 2016).

The aforementioned guidelines requires that sites are screened to determine whether they are a 'quiet area' in accordance with the EPA publication Environmental Quality Objectives – Noise in Quiet Areas (2003). This screening is required to determine the most applicable noise limits for sites. The site does not meet the defined criteria of a 'Quiet Area'.

Next, NG4 requires the site to be screened to determine if the site is in an 'area of low background noise'. Background noise levels are examined to see if they satisfy the following criteria:

- Average Daytime Background Noise Level ≤40 dB LAF90, and
- Average Evening Background Noise Level ≤35 dB LAF90, and
- Average Night-time Background Noise Level ≤30 dB LAF90.

In order for a site to be considered an 'area of low background noise', all three criteria above must be satisfied. Baseline noise monitoring data was taken at noise monitoring locations (NMLs), representative of the closest NSLs to the substation. refer to **Section 9.3.5.** NML2 and NML3 are monitoring locations closest to operational section of proposed development, the 110kV substation.

NML3 satisfied criteria to be considered an area of low background noise however, survey results determined that the baseline data for the NML west of the substation, NML2, did not satisfy the above requirements for the baseline environment to be considered an area of low background noise, based on daytime $L_{AF90}$ values being ≤40 dB (42 dB). Therefore the soundscape at NML2 is considered to be in the 'All other Areas' category, as designated by NG4 guidelines. Given the proximity of NML2 NML3 and their similar soundscapes, based on professional judgement, the most appropriate category to assign both locations are the 'All other Areas' category

The most appropriate noise criteria for 'All other Areas' category, are set out in **Table 9.2**. Given that the proposed development substation will operate 24/7, an operational target of 45 dB LAeq, T will be used for assessment, so that the lower limits during night-time are addressed.

**Table 9.2 Limit Values for 'Areas of Low Background Noise' (Source: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG 4, January 2016)**

| Period | Limit Value dB Lar, T |
|---|---|
| Daytime (07:00 to 19:00 hrs) | 55 |
| Evening (19:00 to 2:00 hrs) | 50 |
| Night (23:00 to 07:00 hrs) | 45 |

#### 9.2.6.5 Noise Criteria for Permitted Development (Dernacart Wind Farm)

The Dernacart Wind Farm Development (Permitted Development) has operational noise limits imposed through the planning conditions (planning ref ABP-31032-21)). Operational noise limits are defined in Condition no. 9, and this is presented below.

*The operation of the proposed development, by itself or in combination with any other permitted wind energy development, shall not result in noise levels, when measured externally at nearby noise sensitive locations, which exceed:*

*(a) Between the hours of 7am and 11pm:*

*(i) the greater of 5 dB(A) $L_{90,10min}$ above background noise levels, or 43 dB(A) L90,10min, or 45 dB(A) $L_{90,10mi,}$ at standardised 10 metres height above ground level wind speeds of 7 metres per second or greater,*

*(ii) 40 dB(A) $L_{90,10min}$ at all other standardised 10 metres height above ground level wind speeds, and*

*(b) 43 dB(A) $L_{90,10min}$ at all other times.*

The lower operational noise limit is specified in terms of the LA90 parameter and is fixed at 43 dB LA90. It is generally accepted that for wind turbine noise the equivalent LAeq level can be determined by adding a 2 dB correction to the LA90 levels[1]. Therefore, a threshold of 45 dB LAeq, T will be used for the lower threshold level of the Permitted Development when considering the potential cumulative impacts with the Proposed Development.

### 9.2.7 Statement on Limitations and Difficulties Encountered

No difficulties or limitations were encountered when undertaking this assessment.

[1] The Institute of Acoustics, Good Practice Guide on Wind Turbine Noise (2013) provides a correction from an energy-based indicator for wind turbines of LAeq = LA90 + 2 dB.

## 9.3 Baseline Environment

This section describes the existing environment in terms of the noise monitoring locations, existing noise sources at these locations and the prevailing background noise levels.

A baseline environmental noise survey was undertaken in the vicinity of the proposed development to quantify the existing noise environment at the nearest noise-sensitive locations that may be affected by the proposed development. In this case, the nearest noise-sensitive locations are residential.

### 9.3.1 Noise Monitoring Locations (NMLs)

Figure 9.2 shows the NMLs which were chosen to characterise the existing noise baseline environment. and set appropriate noise criteria for construction and operational phases of the proposed development. NML1

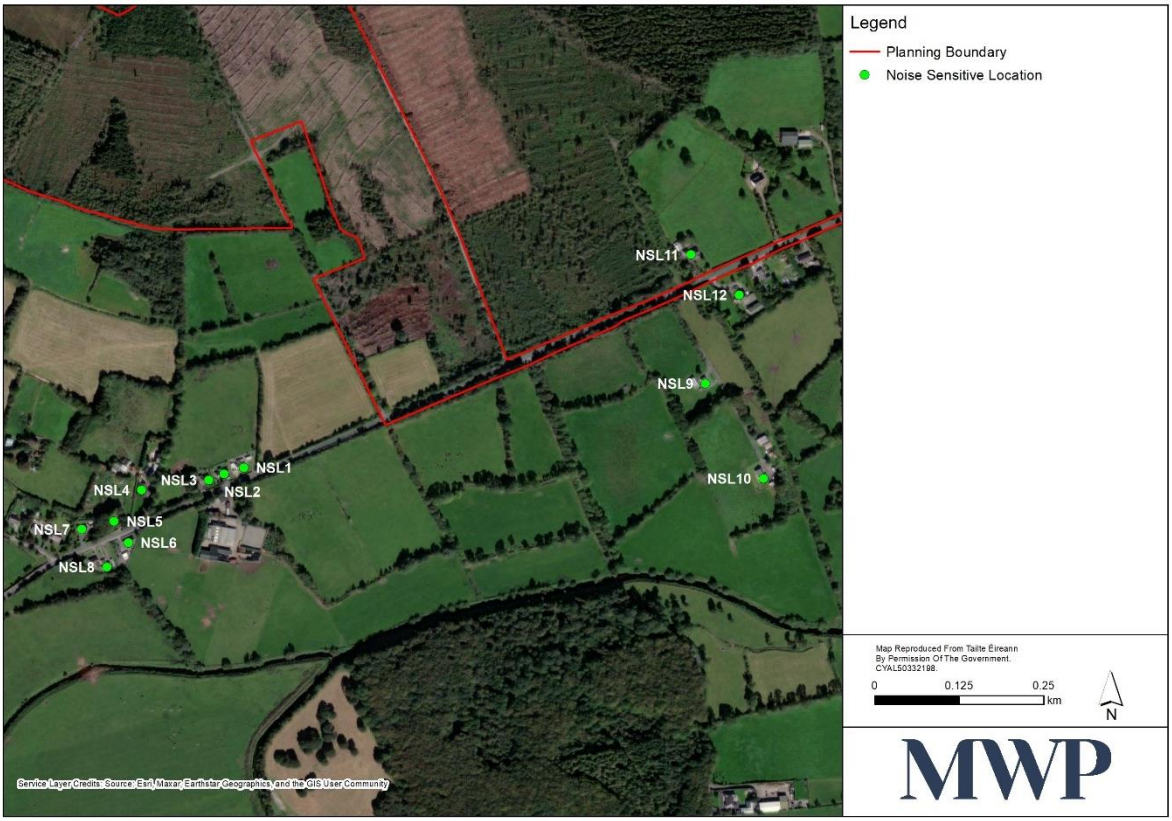
Figure 9.2 Noise Monitoring Locations


### 9.3.2 Noise Sensitive Locations (NSLs)

There are NSLs located in proximity to the substation, grid connection and access road areas. Grid connection works are mostly along road section of proposed development and will effect the NSLs for temporary periods.

The NSLs which will be effected for longer periods are NSLs in vicinity of substation works and substation operation. Figure 9.3 shows NSLs in close proximity to substation area.

Figure 9.3 NSL in proximity to the Substation




### 9.3.3 Survey Periods

MWP personnel (Kieran Barry) conducted the noise monitoring on 22nd and 23rd February 2024. Noise monitoring was carried during day, evening, and night-time periods. Noise measurements were conducted at the six locations identified. Measurements were conducted on a cyclical basis with sample periods of 15 minutes.

At NML2 and NML3, which are representative locations for receptors closest to the substation, measurements were taken during the daytime, evening and night-time periods as the substation will operation 24 hours.

Measurements at NML1, NML4, NML5 and NML6 were taken during daytime as construction of the grid and access track construction works will take place during daytime hours.

The survey results were noted onto a Survey Record Sheet immediately following each sample and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted the primary sources contributing to noise build-up during the survey.

Photos of NMLs are included in Volume 3 Appendix 6.

### 9.3.4 Instrumentation and Setup

The baseline noise survey was carried out in accordance with best practice and guidelines relevant to the measurement of environmental noise, in particular guidance set out in the Environmental Protection Agencies (EPA) Noise Guidance 4 document[2].

The sound level meter was located away from reflective surfaces, in open ground. The microphone was at a height of 1.5 m above the ground. The measurements were performed using the following equipment:

**Table 9.3 Noise Equipment Details**

| Manufacturer | Equipment Model | Serial Number | Microphone | Calibration Date |
|---|---|---|---|---|
| Larson Davis | 831 | 0003826 | PCB PCB377B02 | 10th May 2022 |

The microphone was protected using a proprietary Larson Davis windshield. Before and after the survey the measurement apparatus was check calibrated using a Larson Davis CAL200 Sound Level Calibrator Serial Number 11262 that produces a sound level of 93.96 dB re. 2 x $10^{-5}$ PA, at a frequency of 1k Hz.

The calibration certificates are attached as Appendix 6. Weather conditions were a mix of cloud and sunny spells, with light winds less than 5 meters per second, ideal for environmental noise monitoring.

### 9.3.5 Measurement Parameters

The noise survey results are presented in terms of the following parameters:

LAeq is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period. This parameter is representative of the specific noise from plant when plant is the dominant noise source, i.e. there is no extraneous noise from sources such as traffic.

LA90 is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

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

### 9.3.6 Survey Results

The results of the baseline surveys at NML1 to NML6 are summarised in Table 9.4 to Table 9.9:

[2] https://www.epa.ie/publications/monitoring--assessment/noise/NG4-Guidance-Note-(January-2016-Update).pdf

**Table 9.4 NML1 Baseline Noise Results**

| NML1 | Time and Date | $L_{Aeq}$ 15min dB | $L_{A90}$ 15min dB |
|---|---|---|---|
| Daytime | 22/02/24 13:47pm | 45 | 37 |
| | 22/02/24 15:47pm | 44 | 35 |
| | 22/02/24 17:52pm | 46 | 41 |
| **Average** | | **45** | **38** |

**Table 9.5 NML2 Baseline Noise Results**

| NML2 | Time and Date | $L_{Aeq}$ 15min dB | $L_{A90}$ 15min dB |
|---|---|---|---|
| Daytime | 22/02/24 14:11pm | 62 | 43 |
| | 22/02/24 16:13pm | 63 | 41 |
| | 22/02/24 18:17pm | 63 | 43 |
| **Average** | | **63** | **42** |
| Evening | 22/02/24 22.16pm | 58 | 29 |
| Night | 22/02/24 23:04pm | 57 | 30 |
| | 22/02/24 23:19pm | 51 | 30 |
| **Average** | | **54** | **30** |

**Table 9.6 NML3 Baseline Noise Results**

| NML3 | Time and Date | $L_{Aeq}$ 15min dB | $L_{A90}$ 15min dB |
|---|---|---|---|
| Daytime | 22/02/24 16:35am | 65 | 41 |
| | 22/02/24 16:50pm | 66 | 43 |
| | 22/02/24 18:35pm | 63 | 36 |
| **Average** | | **65** | **40** |
| Evening | 22/02/24 22.34pm | **58** | **31** |
| Night | 22/02/24 23:38pm | 49 | 29 |
| | 22/02/24 23:54pm | 55 | 31 |
| **Average** | | **52** | **30** |

**Table 9.7 NML4 Baseline Noise Results**

| NML4 | Time and Date | $L_{Aeq}$ 15min dB | $L_{A90}$ 15min dB |
|---|---|---|---|
| Daytime | 23/02/24 11:28am | 64 | 46 |
| | 23/02/24 12:35pm | 66 | 41 |
| | 23/02/24 13:44pm | 67 | 45 |
| **Average** | | **66** | **44** |

**Table 9.8 NML5 Baseline Noise Results**

| NML5 | Time and Date | $L_{Aeq}$ 15min dB | $L_{A90}$ 15min dB |
|---|---|---|---|
| Daytime | 23/02/24 11:50am | 61 | 36 |
| | 23/02/24 12:56pm | 61 | 34 |
| | 23/02/24 14:04pm | 60 | 36 |
| **Average** | | **61** | **35** |

**Table 9.9 NML6 Baseline Noise Results**

| NML6 | Time and Date | $L_{Aeq}$ 15min dB | $L_{A90}$ 15min dB |
|---|---|---|---|
| Daytime | 23/02/24 12:12pm | 67 | 38 |
| | 23/02/24 13:19pm | 68 | 35 |
| | 23/02/24 14:22pm | 65 | 36 |
| **Average** | | **67** | **36** |

## 9.4 Assessment of Impacts and Effects

### 9.4.1 Construction Phase

#### 9.4.1.1 Construction Phase Substation Noise

It is expected that the overall installation and construction phase for the proposed substation development will have a 16 month duration. Table 9.10 presents the predicted noise levels from a number of plant items required during the construction phase of the substation at the closest residential location i.e., the property approximately 220m west of the substation, NSL1.

The plant and machinery outlined in Table 9.10 are typical of plant commonly used in substation construction activities and can provide an accurate assessment of construction noise emissions.

The associated noise levels have been sourced from *BS 5228 Noise and Vibration from open and construction sites*, totalled, and extrapolated to the nearest noise sensitive receptor. The resultant noise level is then compared against the relevant noise threshold. The result is a theoretical worst case, as it assumes all machinery will be operating simultaneously which will not be the case and accounts for attenuation due to distance only. In reality there will be further noise attenuation due to atmospheric absorption, ground absorption, and landform screening. Therefore, the noise levels presented herein are an overestimate.

Using the following equation, noise emissions from the construction site are extrapolated to the nearest noise sensitive receptor.

$$SPL_2 = SPL_1 - 20\log(r2/r1)$$

Where:

- *Sound Pressure Level 1 (SPL1) = Known noise level at 10m from construction site*
- *Sound Pressure Level 2 (SPL2) = Unknown noise level at nearest receptor*
- *r2 = Distance between noise sensitive receptor and construction site*
- *r1 = 10 m*

The substation location, where the main construction works will occur is approximately 220m east from the nearest noise sensitive receptor, NSL1.

The resultant theoretical worst-case noise emission level at the nearest receptor, NSL1, is 59dB (A). This is below the construction noise thresholds of 65 dB (A) for daytime. Working hours at the site during the construction phase will be limited to 07:00 to 07:00 Monday to Friday and 07:00 to 01:00 Saturday, therefore no construction noise is anticipated for evening and night-time hours. There will be no intrusive works on Sundays.

**Table 9.10 Plant and Machinery and associated noise levels typically used in construction**

| Plant and Machinery | Sound Pressure Level @10m dB(A) | Predicted Sound Pressure Level @ 220 m Leq dB(A) |
|---|---|---|
| Telescopic Handler | 71 | 59 |
| Mobile Crane | 70 | |
| 30-50T Excavator | 79 | |
| 15-30T Excavator | 78 | |
| 12T Roller | 80 | |
| Dump truck | 78 | |
| Tractor & Trailer | 79 | |
| 15-20T Rubber Tired Excavator | 68 | |
| 3-10T mini digger | 69 | |
| Diesel Generator | 61 | |
| **Total** | **86** | |

The effects from substation construction noise are predicted to be **negative**, **not significant** and **temporary** at the nearest NSLs.

#### 9.4.1.2 Construction Phase 110kV underground Grid cable

The proposed underground 110kV grid connection cable will connect the proposed 110kV Dernacart Wind Farm substation at Barranaghs to the consented 110kV substation at Brackalone, Co. Laois. The grid connection cable is to be installed solely within the public road network, and will have a length of c. 10.85km that crosses over the administrative areas of Offaly County Council and Laois County Council passing through townlands of Barranaghs, Garryhinch, Annamore in County Offaly and Coolnavarnoga, Coolaghy, Kilbride, Ballymorris, Cooltederry and Bracklone Co. Laois. The physical environment along the majority of the route is characterised with sections of ribbon development and dispersed detached housing before entering the more urban and built up environment of Portarlington town. The landscape along the rural sections of the route primarily consists of patchwork farmland, with fields enclosed by hedgerows, along with boglands and conifer plantations.

The overall construction time frame for the UGC is approximately 30 weeks (6 months) to allow for installation of jointing bay, communication chambers, HDD and cable installation.

In general, the construction for the grid connection takes place in distinct stages including

1) the excavation of the trench using an excavator machine, typically a back hoe loader, tracked machine, or directional drilling machine for water crossings;

2) a dump truck to take away any spoil which is not used for back fill;

3) the trench surface receives a temporary surface dressing of either spray and chip or macadam; and

4) once the overall scheme is completed, the cable route and associated road areas on the local road will receive a finish as agreed with the respective local authorities.

All the machinery above will not be in operation simultaneously. The resurfacing works will take place some-time after the cabling works are completed. With an expected 75-100m of works to be completed each day the UGC works move along quickly, therefore the exposure of any noise sensitive receptor is typically not more than 1 to 2 days.

Dwellings along the route will experience elevated noise levels from the excavation and road re surfacing machinery during the period it takes to pass the receptor enroute to the constructed substation. Given the very short time frame, the temporary and minor nature of the works and machinery (back-hoe loader, dump truck and road re-surfacing plant) in combination with the low number of receptors impacted at any one time, the potential impact is not considered significant. Noise emissions are already elevated on the road due to passing traffic.

The main item of plant which will be used for the excavation of the trench will be a tracked or wheeled excavator. This is a piece of machinery with similar noise emissions to an agricultural tractor, which are commonplace in the area. Noise emissions for a 30 to 50 tonne tracked excavator is 79dB at 10m. This data is sourced from the British Standard 5228, Code of Practice for noise and vibration control on construction and open sites.

By their nature construction works are highly variable in the equipment used, the on time of each item of equipment, the mobility of the equipment and also in the proximity and exposure of each receptor, therefore it is not possible to predict accurately the potential noise emissions at potential receptors.

However, for receptors near works areas existing ambient noise levels are likely to be increased temporarily for the duration of the works. As the works are linear the noise levels will decrease quickly as the works proceed along the road.

Taking the above into account, it is predicted grid connection construction noise will cause a **negative**, **slight to moderate** and **temporary** effect at NSLs.

#### 9.4.1.3 Construction Phase Wind Farm Collector Cable and Access Track Noise

The proposed access track and underground electrical cabling from the Dernacart windfarm to the relocated substation is to be sited entirely within the townland of Barranaghs and traverses through commercial forestry plantation, scrub and peatland.

The access track and collector cable noise emissions will be of similar nature to the grid connection works however works do not pass in close proximity to NSLs. The closest NSL, NSL9, to the access track construction is approximately 270m away. The remainder of works along the collector cable/access are further away (>270m) from NSLs and therefore noise levels from construction will decrease further.

There is forestry felling required to accommodate the access track/collector cable section of works.

**Table 9.11** presents the predicted noise levels from felling at 10m as well as the nearest NSL to felling operations, NSL1, which is located approximately 350m away. The predicted noise pressure level at this distance is 49 dB LAeq, 1hr which is well below the construction noise threshold limit, 65 dB LAeq, 1hr.

**Table 9.11 Tree Felling -Likely Plant and Predicted Noise Levels**

| Plant and Machinery | BS 5228 Ref. | Activity | Sound Pressure Level @10m dB(A) | Predicted Sound Pressure Level @ 300 m Leq dB(A) |
|---|---|---|---|---|
| Harvester | C2.5 | Harvesting Trees | 76 | 49 |
| Forwarder | C4.53 | Moving Felled Trees | 77 | |
| | **Total** | | **80** | |

Taking the above into account, it is predicted wind farm cable and access track noise will cause a **negative**, **not significant** and **temporary** effect at NSLs.

#### 9.4.1.4 Construction Phase Traffic Noise

The proposed substation development can be accessed via the R423 road.

Construction traffic will include:

- HGVs importing construction materials including concrete and piping.
- HGVs delivering plant and fuel.
- Traffic associated with on-site construction personal.

The increase in AADT generated by construction vehicles is noted in **Chapter 12** of this **EIAR**, **Material Assets – Traffic and Transport**.

During the proposed 16 months construction duration, the proposed construction works would increase AADT volumes on the R423 by 63 vehicles, including 33 heavy vehicles, which equates to an AADT increase of 2.3%. The proposed grid construction works along public roads AADT volumes by 6.8% on the L50183, 3.63% on the L3153, 0.9% on the R419, up to 2.2% on the L3158, and 0.6% on the R420.

During the six weeks peak construction heavy vehicle traffic generation, the peak daily increase in daily traffic volumes on the R423 generated by peak construction would be up to 396 vehicles, including up to 366 heavy vehicles, which equates to an increase of 16.6%.

During the construction of the grid connection, there will be temporary isolated traffic management measures as the grid is being built. All construction vehicles will be parked appropriately within the designated works area so as not to cause additional obstruction/traffic build up or inconvenience to road users or local residents.

Considering that in order to increase traffic noise levels by 1 dB traffic volumes would need to increase by the order of 25%[3], it is considered that additional traffic introduced onto the local road network due to the construction phase associated with various phases of the development will not result in a significant noise impact.

It is predicted construction traffic noise will cause a **negative**, **not significant** and **temporary** effect at NSLs.

[3] Calculation of Road Traffic Noise (CRTN) issued by the Department of Transport in 1988

**Table 9.12 Summary of Construction Effects**

| Impact | Quality of Effect | Significance | Spatial Extent | Duration |
|---|---|---|---|---|
| Substation Construction Phase Noise | Negative | Not Significant | Local | Temporary |
| Grid Connection Construction Phase Noise | Negative | Slight to Moderate | Local | Temporary |
| Construction Phase Wind Farm Cable and Access Track Noise | Negative | Not Significant | Local | Temporary |
| Construction Phase Traffic Noise | Negative | Not Significant | Local | Temporary |

## 9.4.2 Operational Phase

### 9.4.2.1 Noise Associated with Substations

There are several ways in which noise can be generated from electricity infrastructure. Continuously radiated noise is the most noticeable to neighbours and this is associated primarily with transformers. This is acknowledged in the 2016 EirGrid research report (EirGrid Evidence Based Environmental Studies Study 8: Noise. Literature review and evidence based filed study on the noise effects of high voltage transmission development) on noise from electrical infrastructure which states:

***there is strong evidence that the only relevant noise sources are the power transformers and associated cooling systems.***

Transformers typically generate a low frequency humming noise, the extent of which depends on the transformer type and the level of noise attenuation at the substation. Generally, modern transformers are manufactured with a specified and guaranteed emission level. Improvements in the manufacture of transformers have reduced the associated level of noise emissions and hence modern transformers are typically quieter than equivalent capacity older transformers.

An Air Insulated Switchgear (AIS) substation, such as the one proposed, is where the electrical equipment infrastructure is primarily installed outdoors, with the use of natural air as an insultation between circuits.

The proposed development is a 110 kV Air Insulated Switchgear (AIS) substation. The components of which consist of a compound containing outdoor Air Insulated Switchgear (AIS) equipment comprising busbars, line bays, grid transformers and associated bays, house transformers and control building.

The sound power levels for a typical 110 kV substation is in the order of 93dB(A). For the purpose of this assessment, and to present a conservative assessment, 93dB(A) is used as the sound power level output for the 110 kV substation in the noise modelling scenarios, refer to **Figure 9.4.** The 110 kV substation noise emissions are likely to be less than the 110 kV.

#### 9.4.2.2 Operational Phase Noise Prediction Methodology

The noise predictions were undertaken using noise prediction software, specifically Bruel & Kjaer's software (iNoise 2024.1). The software calculations are based on ISO 9613, Attenuation of sound during propagation outdoors, Part 2, General Method of Calculation. The ISO 9613-2 model can take account of the following factors that influence sound propagation outdoors:

- Geometric divergence
- Air Absorption
- Reflecting obstacles
- Screening
- Vegetation
- Ground reflections

The following inputs were used to inform the noise prediction software.

**Table 9.13 Model Input Data**

| Item | Description |
|---|---|
| Noise Source Locations | Planning Drawings |
| House Locations | Aerial Imagery and Field Survey |
| Acoustic Emission | Estimate |
| Source Height | 2m |
| Landform | Generally flat (no landform barriers) |
| Ground Factor | 0.8 Note 1 |
| Receptor Height | 1.5m bungalows and 4m |
| Wind Direction | Downwind |
| Relative Humidity | 70% |
| Temperature | 10°C |

**Note 1:** Ground Factor is a value between 0 and 1, where 0 represents hard/ reflective surfaces and 1, represents soft absorbent surfaces.

#### 9.4.2.3 Operational Phase Substation Noise Results

The noise model, shown in **Figure 9.4**, shows the predicted noise levels from the proposed development in operation, at the noise sensitive locations (NSLs). **Table 9.14** shows the predicted noise levels at the NSLs from the proposed 110kV substation in relation to the operational noise targets.

**Table 9.14 Calculated Worst Case Noise Impact**

| NSL | Location | Predicted Noise Levels dB (A) Day/Evening/Night | Operational Noise Target, dB (A) |
|---|---|---|---|
| NSL1 | Refer Figure 9.2 | 35 | 45 |
| NSL2 | Refer Figure 9.2 | 35 | 45 |
| NSL3 | Refer Figure 9.2 | 34 | 45 |
| NSL4 | Refer Figure 9.2 | 32 | 45 |
| NSL 5 | Refer Figure 9.2 | 31 | 45 |
| NSL 6 | Refer Figure 9.2 | 31 | 45 |
| NSL 7 | Refer Figure 9.2 | 30 | 45 |
| NSL 8 | Refer Figure 9.2 | 30 | 45 |
| NSL 9 | Refer Figure 9.2 | 31 | 45 |
| NSL 10 | Refer Figure 9.2 | 29 | 45 |
| NSL11 | Refer Figure 9.2 | 32 | 45 |
| NSL12 | Refer Figure 9.2 | 31 | 45 |

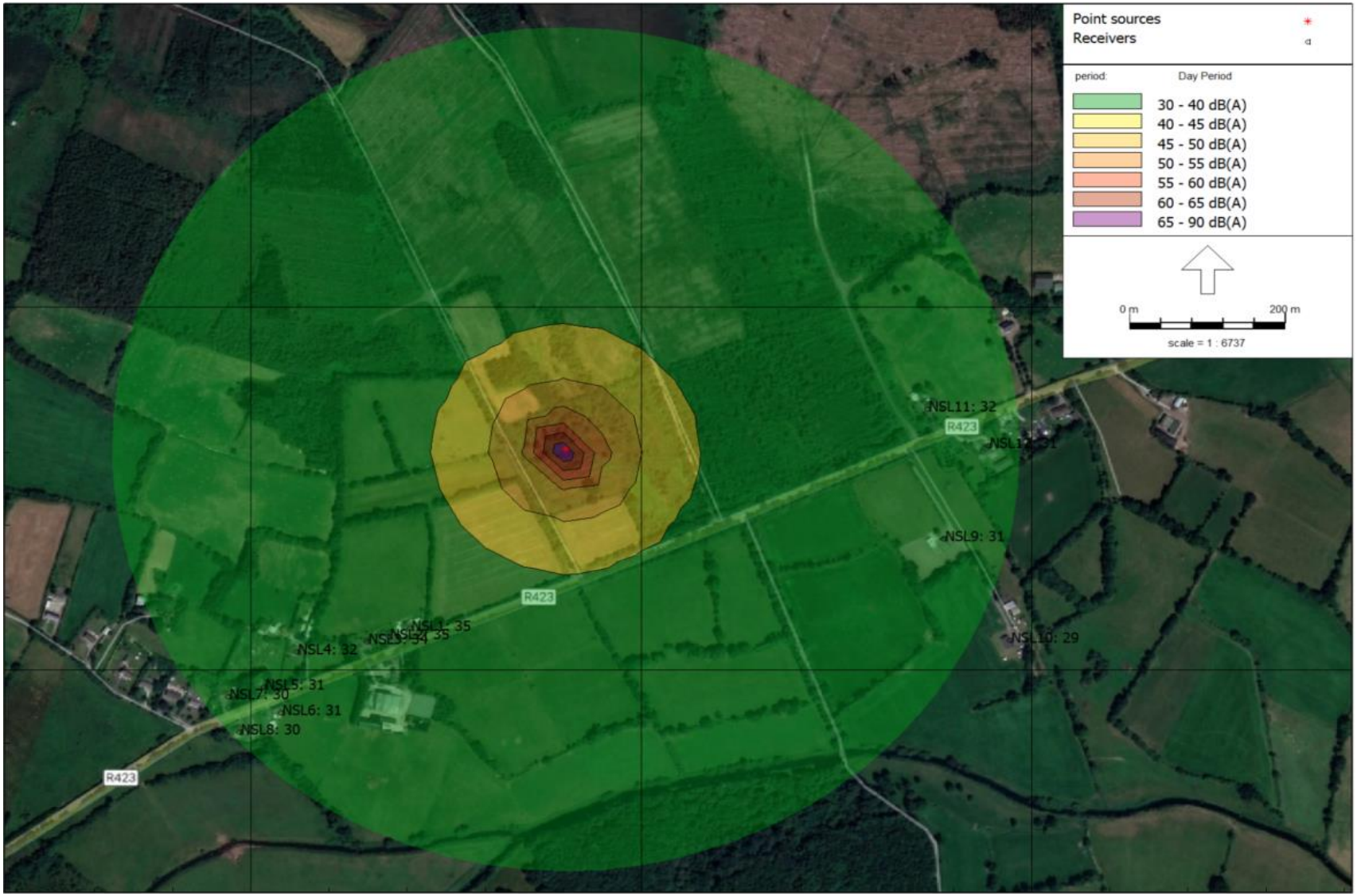



Figure 9.4 Noise Contour Propagation Map

Figure 9.4 shows that the predicted noise emissions at the nearest NSL, NSL1 is 36 dB (A), which is below the operational targets when the proposed development is operating.

Noise emissions at the other receptors further away from the proposed development, dissipate further due to distance and will therefore be less than the highest predicted noise level at NSL1, refer to Figure 9.4 and Table 9.14.

Overall, the noise model demonstrates that noise emissions from the proposed development are not predicted to exceed the noise limit targets set to prevent significant operation noise impacts at the nearest NSLs.

It is likely, that in reality, noise levels will be lower than predicted due to the conservative assumptions used in the prediction methodology.

It is predicted substation operational phase noise will cause a **neutral**, **imperceptible** and **long-term** effect at NSLs.

#### 9.4.2.4 Operational Phase Traffic Noise

There will be a low number of workers required during the operational phase. There will also be occasional traffic coming to site for maintenance and deliveries.

Additional traffic during the operational phase will not increase by the order of 25%, which is required for a 1dB increase. Significant noise impacts as a result of increased traffic during the operational phase are therefore not anticipated.

It is predicted operational phase traffic noise will cause a **neutral**, **imperceptible** and **long-term** effect at NSLs.

**Table 9.15 Summary of Operational Effects**

| Impact | Quality of Effect | Significance | Spatial Extent | Duration |
|---|---|---|---|---|
| Substation Operational Noise | Neutral | Imperceptible | Local | Long-Term |
| Operational Traffic Noise | Neutral | Imperceptible | Local | Long-Term |

### 9.4.3 Do-Nothing

Should the Proposed Development not proceed then the noise environment along the Proposed Development is unlikely to change significantly.

### 9.4.4 Cumulative Impacts and Effects

The proposed development will facilitate the export of electricity from the permitted Dernacart Wind Farm. The permitted Dernacart Wind Farm is located to the west of the proposed development substation and has not yet been constructed or is in operation.

The nearest NSL to the Dernacart Wind Farm is approximately 2.1km west of the proposed development substation.

As discussed in Section 9.2.7.4, there is a 45 LAeq,T threshold noise limit (derived from Planning Condition 10, planning ref ABP-31032-21) at noise sensitive receptors for the permitted development of Dernacart Wind Farm.

Wind turbine noise from the nearest NSL to the permitted development substation will dissipate significantly over a 2.1km distance and therefore no cumulative noise effects are predicted if the proposed development and wind farm are in operation together.

It is anticipated that proposed development construction works could be undertaken in tandem with the Dernacart wind farm construction works.

The Dernacart Wind Farm works are approximately 2.5km from the proposed development substation works and therefore no cumulative effects are predicted due to the intervening distances between both projects.

The construction of the proposed wind farm collector cable and access track may overlap with construction of the Dernacart Wind Farm as the location of the proposed works approaches Dernacart Wind Farm. Given the very short timeframe that these works will overlap with the Dernacart Wind Farm works, temporary/minor nature of works, significant cumulative noise impacts are not anticipated.

## 9.5 Mitigation Measures

### 9.5.1 Construction Phase

As there will be no significant effects there is no requirement for specific construction phase mitigation measures.

Best practice in the form of BS5228 –1&2:2009 + A1 2014, *Code of Practice for the Control of Noise and Vibration on Construction and Open Sites* will be adopted during the construction phase in order to minimise the noise generated by construction activities and nuisance to neighbours including the following:

- A pre-construction commitment to managing nuisance noise will be agreed through notification and consultation with affected parties, if deemed necessary.
- Working hours at the site during the construction phase will be limited to Standard working hours for construction will be 7.00am to 7.00pm Monday to Friday and 7.00am to 13.00pm on Saturday (if required) (subject to planning consent and local authority stipulated conditions) , with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency. Any deviations to these times will be agreed in advance with Laois County Council and Offaly County Council.
- Construction contractors will be required to comply with the requirements of the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988 as amended in 1990 and 1996 (S.I. No. 320 of 1988, S.I. No. 297 of 1990 and S.I. No. 359 of 1996), and the Safety, Health, and Welfare at Work (Control of Noise at Work) Regulations, 2006 (S.I. No. 371 of 2006).

The main control measures will be control of noise at source using the following methods in line with Clause 8 'Control of noise' of BS 5228-1:2009+A1:2014:

- Operators of all mobile equipment will be instructed to avoid unnecessary revving of machinery (Clause 8.2.1 General).
- Use of appropriate plant and equipment where possible with low noise level generation where possible (Clause 8.2.2 Specification and substitution).
- All construction plant to be used on site should have effective well-maintained silencers and mufflers (in the case of pneumatic drill) (Clause 8.2.3 Modification of existing plant and equipment).
- Noise generating equipment will be located as far as possible away from local noise sensitive areas identified (Clause 8.2.5 Use and siting of equipment); and
- Regular and effective maintenance of site machinery including a full maintenance schedule to ensure that all pieces of equipment are in good working order. With efficient use of well-maintained mobile equipment, considerably lower noise levels than those predicted can be attained (clause 8.2.6 Maintenance).

In addition, the following best practice measures are proposed:

- Training of site staff in the proper use and maintenance of tools and equipment;
- Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment;
- Machines that could be in intermittent use will be shut down between work periods or will be throttled down to a minimum;
- Plant start-up will be sequential rather than all together;
- Internal access tracks to be well maintained;
- Plant known to emit noise strongly in one direction will, when possible, be orientated so that the noise is directed away from noise-sensitive locations; and
- Drop heights for materials such as gravels will be minimised whenever practicable

### 9.5.2 Operational Phase

The results demonstrate that the proposed development 110 kV substation operation will not exceed the operation noise limit target at the nearest sensitive receptors. Therefore, no mitigation measures are required during the operational phase.

## 9.6 Residual Effects

Table 9.16 shows the proposed development Noise and Vibration residual effects after mitigation measures are applied. There will be no significant negative residual noise effects from the construction or operational phase of the proposed development.

**Table 9.16 Noise and Vibration Residual Effects Summary**

| PHASE | IMPACT | QUALITY OF EFFECT | SIGNIFICANCE | SPATIAL EXTENT | DURATION |
|---|---|---|---|---|---|
| CONSTRUCTION | Substation Construction Phase Noise | Negative | Imperceptible | Local | Temporary |
| | Grid Connection Construction Phase Noise | Negative | Not significant | Local | Temporary |
| | Wind Farm Cable and Access Track Noise | Negative | Imperceptible | Local | Temporary |
| | Construction Phase Traffic Noise | Negative | Imperceptible | Local | Temporary |
| OPERATIONAL | Substation Operational Phase | Neutral | Imperceptible | Local | Long term |
| | Operational Phase Traffic Noise | Neutral | Imperceptible | Local | Long Term |

## 9.7 Conclusion

There will be increased noise levels during the construction phase of the proposed development. During the construction phase noise levels are however expected to be within construction noise threshold limits adopted for assessment. Best practice will be applied through standard mitigation measures outlined within.

There will be no noise from the grid connection or access track and connector cable during the operational phase. The operational phase of the substation is not anticipated to generated significant noise or vibration and are predicted be within acceptable limits.

No significant vibration impacts are anticipated during either the construction or operational phase of development.

It has therefore been determined that there will be no significant noise or vibration impacts associated with the proposed Dernacart Wind Farm 110kv Substation and Grid Connection. The noise impact assessment has determined that due to the site location, the absence of any significant on-site noise generating activities and the distance to the nearest NSLs, the proposed development will not generate any significant noise levels at NSLs in the vicinity, during the operational or construction phases.

## References

*'British Standard 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites'* outlines noise thresholds for significant impacts.

*Transport Infrastructure Ireland's (TII) 'Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes' (2014)*

*Environmental Protection Agency – Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), 2016.*

*TII's 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (2004)*

*Transport Infrastructure Ireland 'Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes' (2014)*

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

*British Standard 5228 Parts 1 & 2, Code of Practice for Noise and Vibration Control on Construction and Open Sites + A1 2014.*

*ISO 9613-2-1996- Acoustics – Attenuation of sound during propagation outdoors –Part 2: General method of calculation.*