Knockastanna Wind Farm Extension of Operational Life

Chapter 10: Cultural Heritage

SSE Renewables Generation Ireland Limited

Galetech Energy Services
Clondargan, Stradone, Co. Cavan,
H12 NV06, Ireland
Telephone +353 49 555 5050
www.galetechenergy.com

SLR Consulting
7 Dundrum Business Park, Windy Arbour,
Dublin, D14 N2Y7, Ireland
Telephone +353 1 296 4667
www.slrconsulting.com

Contents

10.1 Introduction

This archaeological and cultural heritage chapter was prepared by SLR Consulting Ltd. It presents the results of an archaeological and cultural heritage impact assessment, undertaken as part of the Environmental Impact Assessment (EIA) for the proposed continued operation of the Knockastanna Wind Farm, Co. Limerick **(hereafter referred to as 'the** proposed development'**).**

The purpose of this chapter is to assess the effects of the proposed development on the surrounding archaeological and cultural heritage landscape. The assessment is based on a desktop review of the accessible archaeological and cultural heritage data and aims to identify areas of archaeological/cultural significance that are likely to be impacted by the proposed time extension. A description of likely significant effects is presented, and appropriate mitigation methods are recommended.

10.1.1 Summary of the Proposed Development

The Knockastanna Wind Farm is located in County Limerick, within an upland area characterised by commercial forestry plantations. In summary, the proposed development comprises the continued operations of the existing wind farm for a further period of 15-years. The existing development, including secondary ancillary developments, consists of the following main components: -

- 4 no. wind turbines;
- Associated turbine foundations and crane hardstandings;
- 1 no. electrical control building with a total footprint of 66 square metres (m^2), including welfare facilities and associated electrical equipment enclosure;
- Underground electrical cabling between each of the existing wind turbines and the electrical control building;
- 1 no. site entrance and 2km of site access tracks; and
- Site drainage infrastructure.

A full description of the proposed development is presented in **Chapter 3**.

10.1.2 Statement of Authority

This chapter of the EIAR has been prepared by Beth Gray of SLR Consulting.

Beth Gray is a Senior Archaeologist with SLR, based in the Edinburgh Office, with over six years of experience in the sector. She has been responsible for delivering cultural heritage environmental impact assessment reports and planning statements for wind farms with previous projects including Cairn Duhie (2021), Euchanhead (2020), Ben Sca (2020), and Clashindarroch II (2020). Beth has been responsible for the delivery of cultural heritage chapters, and advice, through the assessment of direct, indirect, and cumulative impacts (both direct and indirect). Furthermore, Beth is an Associate of the Chartered Institute for Archaeologists (ACIfA).

10.1.3 Legislative Context

10.1.3.1 Current Legislation

Within Ireland, archaeological monuments and cultural heritage resources are protected through national and international policy, which are undertaken in agreement with the requirements of the European Convention on the Protection of the Archaeological Heritage (Valetta Convention). This was ratified by Ireland in 1997. The following legislation is of relevance to the proposed development:-

- National Monuments Acts of 1930 to 2004 (Including the National Monuments (Amendment) Act 1994);
- National Cultural Institutions Act 1997; and
- Heritage Act 1995.

Additionally, the Revised General Scheme of Monuments and Archaeological Heritage Bill 2021 was consulted.

10.1.3.2 Granada Convention

Article 2 of the 1985 Convention for the Protection of the Architectural Heritage of Europe (Granada Convention) emphasises the importance of maintaining inventories of archaeological and cultural heritage assets and for documentation to be prepared at the earliest opportunity in the event of a threat to these assets. The National Inventory of Architectural Heritage (NIAH) was established to fulfil the obligations of the Granada Convention and aims to be a central record of all architectural heritage in Ireland. Article 1 of the Granada Convention defines architectural heritage as:-

- Monument: all buildings and structures of conspicuous historical, archaeological, artistic, scientific, social or technical interest, including their fixings and fittings;
- Group of Buildings: homogenous groups of urban or rural buildings conspicuous for their historical, archaeological, artistic, scientific, social or technical interest which are sufficiently coherent to form topographically definable units; and
- Sites: the combined works of man and nature, being areas which are partially built upon and sufficiently distinctive and homogenous to be topographically definable and are of conspicuous historical, archaeological, artistic, scientific, social or technical interest.

10.1.4 Best Practice Guidance

Relevant guidance documents have been published by the Department of Arts, Heritage, Gaeltacht and the Islands, the Environmental Protection Agency (EPA), and the professional archaeological body the Chartered Institute for Archaeologists. These publications include:-

- *Framework and Principles for the Protection of the Archaeological Heritage* (1999);
- *Architectural Heritage Protection: Guidelines for Planning Authorities* (2011);
- *Chartered Institute for Archaeologists Standard and Guidance for Historic Environment Desk Based Assessment* (2014);
- *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, May 2022); and
- *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, August 2017).

10.1.5 Statutory Consultations

Consultation (see **Chapter 1**) with the Heritage Council; the Department of Housing, Local Government & Heritage; and the Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media was carried out on 14 June 2021. No responses regarding cultural heritage were received.

10.2 Methodology

The proposed methodology for the Cultural heritage provides for the assessment of direct effects and indirect effects of the proposed development.

Direct impacts/effects are assessed in the worst-case scenario that the proposed decommissioning of the wind farm may cause additional ground disturbance to that already incurred during the construction phase. Direct impacts/effects on potential buried remains were assessed in 2001 via the parent Environmental Impact Statement.

In deciding to grant planning permission for the existing development, An Bord Pleanála attached a condition of consent requiring details to be agreed regarding the appropriate monitoring and management of the construction phase. Correspondence issued to the Planning Authority dated 20th September 2007 provides notification of the appointment of a suitably qualified archaeologist to monitor all site investigations and excavation works under licence. According to the Developer no finds were identified or recorded during the construction phase.

Indirect cultural impacts/effects are also assessed with respect to the proposed continued presence of the extant infrastructure within the landscape and the effect of their presence on heritage assets. It is noted that the 2003 assessment did not assess the likelihood of a significant effect on heritage assets through changes to their setting as it was not required by the relevant guidance at the time of completion.

The following methodology has been adapted from *'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'*, published by the Environmental Protection Agency (EPA) in 2022.

In accordance with the EPA (2022) the assessment identifies effects as either direct or indirect, adverse, or beneficial, and short-term, long-term, or permanent. Direct effects are those which change the heritage significance of an asset through physical alteration; for this assessment, indirect impacts are those which affect the heritage significance of an asset by causing change within its setting.

Direct effects on the heritage significance of an asset have been assessed on the basis of a combination of the heritage significance of the affected asset (where known), the probability of further assets being located within the affected areas and their likely significance, and the magnitude of impact on those assets to be caused by the implementation of the proposed development.

Indirect effects on the significance of heritage assets have been identified and assessed with reference to the EPA Guidelines (2022). The assessment has been carried out in the following stages:-

- initial assessment of intervisibility and other factors leading to the identification of potentially affected assets;
- assessment of the heritage significance of potentially affected assets;
- assessment of the contribution of the setting to the heritage significance of those assets;
- assessment of the magnitude of the impact of the proposed development site on the contribution of settings to the significance of assets (by causing change within those settings); and
- prediction of the significance of the effect.

10.2.1 Assessment of Heritage Significance

10.2.1.1 Significance

To allow for a detailed, justifiable, and intelligible determination of impact; it is necessary to establish a consistent terminology for discussing the importance of heritage assets. This is referred to variously across the heritage statute, policy, and guidance documentation, including ***'importance'***, ***'interest'***, ***'significance'***, ***'special interest'*** and ***'character'*** amongst others. For the purposes of this assessment, the term **'significance' has been used consistently hereafter.**

The *Framework and Principles for the Protection of the Archaeological Heritage*[1], which relates specifically to archaeology, provides the following:-

> *"Any material remains which can contribute to understanding past societies **may be considered to have an element of archaeological significance**... Archaeological significance or interest may also be seen in terms of the potential for sites, monuments or artefacts to enable people to experience directly the evidence for past societies and through this allow them to better understand and appreciate their own past."*

A more detailed approach is provided within *Architectural heritage protection: guidelines for planning authorities*[2], which conceives of heritage significance as **deriving from the following categories of 'special interest':-**

- Architectural;
- Historical;
- Archaeological;
- Artistic;
- Cultural;
- Scientific;
- Technical; and
- Social

This guidance, which derives principally from the terms of the Granada Convention, makes the further point that these categories are not mutually exclusive, such that an asset might derive its significance from one, multiple or all these interests.

In accordance with this guidance, the significance of the heritage assets described within this assessment is discussed in terms of these contributing interests, enabling consistent, detailed, justifiable, and intelligible determinations of heritage significance to be made.

Table 10.1 shows the potential levels of the heritage significance of an asset related to designation, status and grading, and where non-designated, to a scale of Highest to Negligible importance. This table acts as an aid to consistency in the exercise of professional judgement and provides a degree of transparency for others in evaluating the conclusions reached by this assessment.

[1] Department of Arts, Heritage, Gaeltacht and the Islands. 1999.

[2] Department of Arts, Heritage, Gaeltacht and the Islands, 2011.

Heritage Significance	Explanation
Highest	Sites of international importance, including:- • World Heritage Sites;
High	Site of National importance, including:- • National Monuments, including those recorded on the Sites and Monuments Record (SMR) • Nationally Important assets recorded in the National Inventory of Architectural Heritage (NIAH)
Medium	Sites of Regional importance, including:- • Sites on the Record of Monuments and Places, found within the relevant County Development Plan • Regionally Important assets recorded in the National Inventory of Architectural Heritage (NIAH)
Low	Sites of minor importance or with little of the asset remaining to justify higher importance. Locally Important assets recorded in the National Inventory of Architectural Heritage (NIAH)
Negligible	Negligible or no heritage significance
Unknown	Further information is required to assess the significance of these assets.

Table 10.1: Heritage Significance

10.2.2 Magnitude of Impact

Determining the magnitude of any likely impacts requires consideration of the nature of activities proposed during the period of continued operation of the wind farm.

The changes could include direct change (e.g., ground disturbance), and indirect change (e.g., visible change, noise, vibration, traffic movements affecting the setting of the asset). Impacts may be beneficial or adverse and may be short term, long term or permanent. The magnitude of impact has been assessed with reference to the criteria set out in **Table 10.2**. The magnitude of both beneficial and adverse impact is assessed according to the scale of impact, from high to neutral/none.

Magnitude of Impact	Explanatory criteria
High Beneficial	The proposed development would considerably enhance the heritage significance of the affected asset, or the ability to understand, appreciate and experience it.
Medium Beneficial	The proposed development would enhance to a clearly discernible extent the heritage significance of the affected asset, or the ability to understand, appreciate and experience it.
Low Beneficial	The proposed development would enhance to a minor extent the heritage significance of the affected asset, or the ability understand, appreciate, and experience it.

Magnitude of Impact	Explanatory criteria
Very Low Beneficial	The proposed development would enhance to a very minor extent the heritage significance of the affected asset, or the ability understand, appreciate, and experience it.
Neutral/None	The proposed development would not affect or would have harmful and enhancing effects of equal magnitude on the heritage significance of the affected asset, or the ability to understand, appreciate, and experience it.
Very Low Adverse	The proposed development would erode to a very minor extent the heritage significance of the affected asset, or the ability understand, appreciate, and experience it.
Low Adverse	The proposed development would erode to a minor extent the heritage significance of the affected asset, or the ability to understand, appreciate, and experience it.
Medium Adverse	The proposed development would erode to a clearly discernible extent the heritage significance of the affected asset, or the ability to understand, appreciate, and experience it.
High Adverse	The proposed development would considerably erode the heritage significance of the affected asset, or the ability to understand, appreciate and experience it.

Table 10.2: Magnitude of Impact

10.2.3 Significance of Impact

The significance criteria are presented in **Table 10.3**. **Table 10.4** provides a matrix that relates the heritage significance of the asset to the magnitude of impact on its significance (incorporating contribution from setting where relevant), to establish the likely overall significance of effect. This assessment is undertaken separately for direct effects and indirect effects, the latter being principally concerned with effects through development within the setting of heritage assets. Those assets which the matrix scores as Profound would be considered as receiving a significant effect.

Significance	Description
Profound	The development would destroy all characteristics which are intrinsic to the asset.
Very Significant	An effect which, by its character, magnitude, duration, or intensity significantly alters most of a sensitive aspect of the environment.
Significant	The development would create an effect on a designated asset which, by its character, magnitude, duration, or intensity alters a sensitive aspect of the environment
Moderate	An effect which alters the character of the environment in a manner that is consistent with existing or emerging trends

Significance	Description
Slight	The development would not have an effect that causes noticeable changes in the character of the environment but without affecting its sensitivities
Not Significant/ Imperceptible	The development would have no effect which causes noticeable changes in the character of the environment but without significant consequences

Table 10.3: Significance Criteria

Magnitude of Impact	Heritage Significance (excluding negligible and unknown)			
	Highest	High	Medium	Low
High beneficial	Profound	Profound	Very Significant	Significant
Medium beneficial	Profound	Very Significant	Significant	Moderate
Low beneficial	Very Significant	Significant	Moderate	Moderate
Very low beneficial	Significant	Moderate	Slight	Slight
Neutral/None	Not Significant/ Imperceptible	Not Significant/ Imperceptible	Not Significant/ Imperceptible	Not Significant/ Imperceptible
Very low adverse	Significant	Moderate	Slight	Slight
Low adverse	Very Significant	Significant	Moderate	Moderate
Medium adverse	Profound	Very Significant	Significant	Moderate
High adverse	Profound	Profound	Very Significant	Significant

Table 10.4: Significance of Effect

10.2.4 Zone of Theoretical Visibility (ZTV) Analysis

The assessment of visual impact has been assisted by a ZTV calculation, prepared principally for landscape and visual impact assessment, and presented in **Annex 9.1**. The ZTV maps predict the degree of visibility of the proposed development from points within a study area around the site, as would be seen from an observer's eye. The ZTV model has been used to inform the likely effects on the setting of cultural heritage assets within the study area. The study area is defined as 5km from the proposed development site boundary, due to the average line of sight and relationship between the assets and surrounding landscape; while a 1km buffer zone has been imposed to assess for direct effects.

The ZTV is theoretical because it is based on landform only and does not take into account the screening or filtering effects of vegetation, buildings or other surface features, and in that respect is likely to provide an overestimate of the actual visibility.

Assets that fall outside the ZTV are excluded from further assessment, except where a view is identified which includes the heritage asset and the wind turbines, and that **view may enable appreciation of the assets' heritage significance.**

10.2.5 Cumulative Effects

A cumulative assessment is presented at **Section 10.4.5**. The assessment has considered all developments identified at **Chapter 1**; however, it is assessed as per EPA 2017 and 2022, that the most likely source of cumulative effects arise from other wind energy developments within 10km of the affected heritage asset, depending on the heritage significance of the asset, that have been given planning consent, have an active planning application or are undergoing a planning appeal. Operational wind farms are considered as part of the baseline assessment (**Table 10.5**).

10.2.6 Mitigation

If required, a statement of any proposed mitigation of the identified impacts will follow the assessment.

10.2.7 Residual Effects

A statement of the residual effects has been given following consideration of any further site-specific mitigation measures, where these have been identified.

10.2.8 Limitations to the Assessment

The baseline has been gathered from the sources outlined in **Section 10.2.9** and, therefore, shares the same range of limitations in terms of comprehensiveness and completeness of those sources.

In respect to assessing the impacts on the setting of assets, stated in **Section 10.2.4**, the ZTV is theoretical and is based solely on the landform. As such, the results of the ZTV are likely an overestimate of the actual visibility as they do not take into account vegetation, buildings, or other surface features.

No site visit was undertaken by SLR as part of this Cultural Heritage Assessment. However, a site visit was undertaken by the appointed archaeologist as part of the preparation of parent Environmental Impact Statement which was reviewed in advance of the preparing this assessment.

10.2.9 Sources Consulted

The following sources were consulted:-

- The Historic Environment Viewer (Online);
- The Record of Monuments and Places (RMP);
- The Record of Protected Structures (RPS) from the following:
  - *North Tipperary County Development Plan 2010-2016*;
  - *South Tipperary County Development Plan 2009-2015*;
  - *Draft Tipperary County Development Plan 2022-2028*;
  - *Limerick County Development Plan 2010-2016*; and
  - *Draft Limerick Development Plan 2022-2028*;
- The Sites and Monuments Record (SMR); and
- The National Inventory of Architectural Heritage (NIAH).

The following Ordnance Survey Maps were consulted using the online National Townland and Historical Map Viewer:-

- Historic 6 inch First Edition Colour;
- Historic 6 inch First Edition Black and White – Published 1843 – 1844;
- Historic 25 Inch – Published 1904; and
- Historic 6 Inch Last Edition Black and White – Published 1905.

The following sources were consulted to provide additional supporting information:-

- Kilcommon Pilgrim Loop. Available at: https://www.discoverireland.ie/tipperary/kilcommon-pilgrim-loop;
- Knockastanna Wind Farm EIS, 2001
- Caple, C. and Dungworth, D., 1998. Waterlogged anoxic archaeological burial environments;
- Plunkett, G. and Foley, C. (2006) *Peatland Archaeology in Northern Ireland: an evaluation*;
- Schulting, R.J., Murphy, E., Jones, C. and Warren, G. (2012) *New dates from the north and a proposed chronology for Irish court tombs*; and
- Smith, G.F. and Crowley, W. (2020) *The Habitats of Cutover Raised Bog*. National Parks and Wildlife Service.

10.3 Description of Existing Environment

The current landscape of the proposed development site and its immediate vicinity consists of several archaeological and cultural heritage assets. Whilst there are no assets of international importance (e.g., UNESCO World Heritage Sites), there are 57 no. sites of national importance found on the Sites and Monuments Record (SMR) within the 5km study area of the proposed development site. These sites are mainly prehistoric and include multiple barrows, ringforts and, standing stones. Additionally, there is 1 no. site of national importance (Reg No. 21900803) and 6 no. sites of regional importance within the study area that can be found on the National Inventory of Architectural Heritage (NIAH). Within the site itself, there are no recorded heritage assets (see **Annex 10.1**).

10.3.1 Proposed Development Site

The type and density of recorded archaeological remains can be used to inform a predictive model of what further, as of yet undefined, buried remains may exist within the proposed development site. To inform this predictive model, a buffer zone of 1km around the proposed development site was used to assess for direct effects. It is worth noting that a field survey was undertaken within the proposed development site during 2001 as part of the parent planning application, during which no features of an archaeological nature were identified. The location of the heritage assets within 1km of the proposed development site can be found in **Annex 10.1** and are listed within the gazetteer provided at **Annex 10.1**.

Although the archaeological site walkover carried out in 2001 as part of the parent Environmental Impact Statement (EIS) did not identify any archaeological features within the proposed development site, it did note that there was the possibility for unrecorded heritage assets within the surrounding peat bog.

The presence of blanket peat within the survey area presents the possibility for highly preserved archaeology. A blanket bog is an area of peatland that has developed within an area of high rainfall and low evapotranspiration, allowing for the

development of peat throughout the undulating ground (Smith and Crowley, 2020). The anaerobic environment and acidity within a peat bog mean that it is extremely good at preserving archaeological material (Caple and Dungworth, 1998). Approximately 1600 recorded archaeological finds have been recovered from Irish peat bogs, including stone tools, weaponry, coin hoards and human remains (Plunkett and Foley, 2006).

10.3.1.1 Prehistoric

There are no known prehistoric heritage assets within the proposed development site. There are 2 no. known prehistoric sites within the 1km of the site boundary. A prehistoric barrow (SLR05) is located c. 0.57km north of the proposed development site. According to the Sites and Monuments Record (SMR), the barrow was first noted in 1924 and visited in 1999 where it was described as overgrown and inaccessible. A further site visit in 2020 described it as an enclosed circular-shaped mound. The remains of a megalithic wedge tomb (SLR09) are located c. 0.7km southeast of the proposed development site. A 1910 description of the wedge tomb described it as having only 4 no. **stones remaining, with the 1982 '***Survey of the Megalithic Tombs of Ireland***' stating that** the original structure would have had a gallery of c. 2m in length, covered by a single roof stone. The wedge tomb was added to the SMR in 2011.

10.3.1.2 Early-Medieval and Medieval

There are no known early-medieval or medieval heritage assets within the proposed development site or the 1km buffer zone.

10.3.1.3 Post-Medieval

There are no post-medieval heritage assets within the proposed development site. There are 4 no. post-medieval heritage assets within the 1km buffer zone around the proposed development site.

Approximately 0.62km northeast of the proposed development site is Gowlagh Bridge (SLR01), a road bridge that spans a tributary of the River Bilboa, built c.1800. It is made of rubble and limestone, with a cast-iron patris plate on the northern elevation indicating some restoration work. Approximately 0.5km southeast of SLR01 is the Commaun Bridge (SLR03), an additional bridge over a tributary of the River Bilboa, also built c. 1800 and constructed with both rubble and limestone. Both bridges are recorded as being notable reminders of nineteenth-century engineering. Approximately 0.75km southwest of the proposed development, is a detached single-storey house (SLR02), built c.1830. The house is deemed to be a notable example of a small Irish farm complex and retains its original form. All 3 no. structures were recorded by the National Monuments Service in 2007 and are deemed to be of regional importance on the National Inventory of Architectural Heritage (NIAH).

A children's burial ground (cillín) (SLR08) sits c. 0.9km to the northwest of the proposed development site. The site is situated on the edge of a ridge and consists of low slabs **of stone that are believed to be grave markers. A children's burial ground was used** for unbaptised and stillborn infants, who were not allowed to be buried within consecrated ground. Whilst the burial ground does not have a definitive date associated with it, the earliest known reference of a cillín is 1619 and as such SLR08 can be considered to be most likely post-medieval in date. The heritage asset was added to the SMR in 2008.

10.3.1.4 Undated

There are no known undated heritage assets within the proposed development site. There are 3 no. undated heritage assets within the 1km buffer zone. A holy well named Tobernagommaun (SLR04) sits c. 0.7km southwest of the proposed development site. It can be seen on the 1844 6 Inch Ordnance Survey map and was recorded on the SMR in 2019. Whilst no tradition survives for the well, it is known that they are strongly linked to Christianity and have been used in Ireland since the introduction of Christianity in c. 400 AD.

Two enclosures sit to the east of the proposed development site. SLR06 sits c. 0.2km to the east and consists of a circular-shaped banked enclosure with a possible curvilinear bank located 25m southeast. SLR06 was first identified on the 1844 6 Inch OS map and was recorded on the SMR in 2020. Approximately 0.3km northwest of SLR06 is another enclosure (SLR07). SLR07 sits c. 0.2km east of the proposed development site and consists of a circular-shaped enclosure c. 25m in diameter. SLR06 was added to the NMR in 2020.

10.3.1.5 Historic Mapping

A review of historical Ordnance Survey maps was undertaken using those available on the Ordnance Survey Ireland (OSI) National Townland and Historical Map Viewer. The following maps were consulted:-

- Historic 6 inch First Edition Colour;
- Historic 6 inch First Edition Black and White – Published 1843 – 1844;
- Historic 25 Inch – Published 1904; and
- Historic 6 Inch Last Edition Black and White – Published 1905.

No further potential or likely heritage assets were identified within the boundary of the proposed development site, or its environs, through this process.

10.3.1.6 Heritage Assets within the Proposed Development Site

No heritage assets are recorded within the boundary of the proposed development site and the absence of above-ground remains was verified by the archaeological site walkover in 2001.

However, the possibility of below-ground remains cannot be ruled out. In terms of potential, the surrounding 1km buffer zone does contain 9 no. known heritage assets; these include 2 no. prehistoric sites, 3 no. post-medieval sites, and 4 no. undated sites. The prehistoric sites (SLR05, SLR09) are thought to be related to funerary practices. This indicates that the area surrounding the proposed development site may have formed part of a funerary landscape during the prehistoric period. However, both prehistoric sites are in poor condition and have no recorded associated human remains.

The possibility of unknown prehistoric sites in the proposed development site is low based on the absence of earthworks which would otherwise highlight the presence of a megalithic tomb or barrow. These are often significant in size, and it would be anticipated that above-ground indicators would be present and would have been noted during the 2001 walkover. If prehistoric archaeological remains are identified, then they are likely to be extremely poorly preserved, as indicated by the condition of SLR05 and SLR09.

The potential for early medieval and medieval heritage assets is very low, as no sites of this type have been found within 1km.

The potential for unknown post-medieval remains is very low as most of those found within 1km of the site are well preserved and documented architectural assets. These findings are in accordance with the findings of the parent planning application which stated that there were no known potential assets within the proposed development site. However, it was concluded that for the possibility of unknown remains within the peat could not be ruled out. This assessment concurs with that conclusion.

10.3.2 5km Study Area

10.3.2.1 Introduction

As stated in **Section 10.3,** there are 57 no. sites of national importance found on the Sites and Monuments Record (SMR) within 5km of the proposed development site. These sites are mainly prehistoric and include multiple barrows, ringforts and, standing stones. Additionally, there is 1 no. site of national importance (Reg No. 21900803) and 6 no. sites of regional importance within a 5km radius that can be found on the National Inventory of Architectural Heritage (NIAH).

Assets that fall within the ZTV (**Annex 9.1**) have been chosen for inclusion within this description of the existing environment, as they are most likely to have effects upon their setting as a result of the proposed development. Assets have been scoped out of the assessment, where appropriate, due to their location outside the ZTV; their positioning offering no view of the proposed development site; or the asset no longer being visible above ground. The location of the assessed heritage assets can be seen in **Annex 10.1**.

10.3.2.2 The Church of the Visitation (22403801)

The Church of the Visitation is a Catholic Church, located c. 3.5km northwest of the proposed development site in the village of Rear Cross, County Tipperary. The church was originally constructed in c. 1860 for the Methodist community in Wales, before being moved and re-erected for the Catholic community in Rear Cross in 1887. The church is a freestanding gable-fronted cruciform-plan church, constructed principally from corrugated iron. The church is noted as a picturesque focus for the village of Rear Cross and is of national importance as it is the largest and most complex corrugated iron ecclesiastical building in Ireland.

The Historic 6 Inch First Edition Ordnance Survey (OS) map, published in 1843, does not show a village. Instead, the location consisted of a small number of structures, most likely domestic in nature, within arable land. The Historic 25 Inch First Edition Ordnance Survey (OS), surveyed in 1902, shows that the village of Rear Cross was more developed; with more domestic structures, a school, a post office, a creamery, two smithies, and the church itself. Thus, it is reasonable to say that at the time of the construction of the church, the village of Rear Cross was still developing.

The current setting for the church is within the village of Rear Cross, along the R503. The village contains a mixture of domestic and commercial properties, including The Rising Sun pub and an Amber Service Station. The entrance to the church looks south over the R503, woodland, and an area of blanket peat bog. Electricity cables follow the path of the R503, with one passing over the roof of the church towards the school at the north. Immediately east and north of the church is the Rearcross National School.

10.3.2.3 Commaun Bridge (21900803)

The Commaun Bridge is a bridge over a tributary of the River Bilboa, built c. 1800 and constructed with both rubble and limestone. It is located c. 0.9km west of the Site. The bridge is of regional importance as it is noted as a good reminder of nineteenth-century engineering.

The First Edition 6 Inch OS Map, surveyed in 1839, shows that the bridge was originally constructed to transport goods and people over the tributary of the River Bilboa. The bridge was connected to a track that circumnavigates Knockastanna hill.

The current setting and purpose of the bridge are similar to the original purpose when the bridge was constructed, to enable the transportation of people or goods over the tributary and onto the road around the hill of Knockastanna. The road is a single-track road and creates a path through the surrounding woodland and moorland. The proposed development is situated c. 1km west of the bridge, and the pre-existing turbines can be viewed through gaps in the surrounding vegetation.

10.2.3.4 Farmhouse (21900802)

21900802 is a detached single-storey farmhouse, built c.1830, c. 1km northeast of the proposed development site. It is noted as a good example of a small Irish farm complex and retains original features including the sash windows and rendered quoins.

The First Edition OS map, surveyed in 1839, shows the farmhouse situated on the north side of the road that surrounds Knockastanna hill and west of Gowlagh Bridge. The farmhouse was bordered by arable fields to the north and scrubland to the south. In addition to the recorded farmhouse, three roofed structures are seen within the complex as well as a small, wooded, area.

Currently, the farmhouse is situated on a north-facing slope of Knockastanna Hill, in a dip to the north of the main surrounding road. A review of aerial photographs available on the National Townland and Historical Map Viewer shows that the farmhouse is surrounded by other agricultural buildings, including those more modern in date than the original structures. It appears that the three roofed structures depicted on the 1844 OS map have since been demolished and a more modern structure has taken their place. There is significant forestry to the south of the farmhouse and the proposed development site is situated c. 0.9km to the southwest of the farmhouse.

10.3.2.5 Megalithic Wedge Tombs (TS039-020 and TS039-021)

TS039-020 is a megalithic wedge tomb located on a west-facing slope overlooking the Aughvaria river valley, c. 2km northeast of the proposed development site. The well-preserved gallery of the tomb consists of two side stones and several outer-wall stones. The wedge tomb is aligned east to west, but the east end of the gallery is missing. The gallery is covered by two roof stones and contains a portico and a septal stone. Whilst wedge tombs were initially communal interment sites for human remains, no recorded human remains have been recovered from TS039-020.

TS039-021 is a megalithic wedge tomb on a west-facing slope overlooking the Aughvaria river valley, c. 2km northeast of the proposed development site. It is c. 0.1km southwest of a nearby wedge tomb (TS039-020). Two side stones make up a well-preserved gallery, with evidence of further outer wall stones. The tomb opens to

the west and is aligned along the east-west axis. The gallery is covered by two roof stones. At the west end of the gallery is a septal stone that divides the chamber from the portico. A field boundary intersects the tomb and there is evidence of a possible earthen mound on the top of the roof stones. No recorded human remains have been recovered from TS039-021.

The proximity of TS039-020 and TS039-021 suggests that the immediate landscape that the assets are situated within was funerary and suggests a possible connection between the two assets. The orientation of the wedge-tombs, with an opening at the west, has been suggested to have been aligned with the direction of the setting sun. The tombs themselves are not particularly prominent in the surrounding landscape and this would suggest that they were not intended to be viewed from a distance.

The current setting of the wedge-tombs is agricultural and pastoral land, with field boundaries of thick vegetation and trees. A single-laned track lies to the west of the heritage assets, providing access to the domestic and agricultural buildings along it. Telephone poles and wires run perpendicular to the single-track road. The location provides panoramic views of the surrounding hills and mountains, with Knockastanna hill, the existing wind farm, and third-party wind turbines visible to the west.

10.3.2.6 Holy Well (LI008-006)

A holy well named Tobernagommaun (LI008-006) sits c. 0.7km southwest of the proposed development site. The immediate setting of the holy well is described as being a spring within a valley, next to a hawthorn bush. Whilst no tradition survives for the well, it is known that they are strongly linked to Christianity and have been used in Ireland since the introduction of Christianity in c. 400 AD. Holy wells were used for prayer, with offerings often tied to nearby trees, including hawthorns. The sites of holy wells were often chosen for their privacy or secluded nature.

As the date of the initial use of the spring for religious purposes is unknown, the original setting of the asset cannot be ascertained. The well can be seen on the First Edition 6 Inch OS map, published in 1844, and thus it can be said to predate this period. In 1844, the holy well was situated within scrubland and rough grassland, with a small, roofed structure located to the southwest. This structure does not appear on later maps. The holy well is located to the east of the Commaun Bridge and the associated road used to circumnavigate Knockastanna hill. Knockastanna hill is located immediately to the east of the well, and there is no indication of forestry upon the hill at this time.

The current setting of the holy well is within pastoral fields and scrubland. Analysis of aerial photographs and maps available on the National Townland and Historical Map Viewer shows a woodland to the north and the east of the location of the holy well. To the northeast of the well, the closest existing turbine is located c. 0.8m to the east. A single-track road lies 0.25km to the west.

10.3.2.7 Barrow (LI008-007)

LI008-007 is a potential prehistoric barrow located c. 0.57km north of the proposed development site. The asset is described as a circular-shaped mound. During a site visit in 1999, it was described as overgrown and inaccessible.

The potential barrow is located on the floodplain of the Aughvaria River, which lies to the immediate north of the asset, in poorly drained pasture. The 1999 entry within the SMR notes that the asset has moderate views to the south, the direction of the proposed development.

Due to repeated flooding from the nearby Aughvaria River, and the growth of vegetation within the field, the asset is 90% destroyed and no longer visible above ground. Thus, the asset has been excluded from further assessment.

10.3.2.8 Enclosures (LI008-008 and LI008-009)

LI008-008 and LI008-009 are two enclosures, situated to the east of the proposed development. LI008-008 sits c. 0.2km to the east of the proposed development and is recorded as having been a circular-shaped banked enclosure. There are no visible remains left, however, a potential curvilinear bank is noted c. 16m southeast of the original location. LI008-009 is located c. 0.2km east of the proposed development and consists of a circular-shaped enclosure, c. 26m in diameter, that is visible on aerial photographs.

As the assets are undated, their original setting cannot be fully determined. However, they are positioned on a north-facing slope of Knockastanna hill. The north view overlooks the River Bilboa and the surrounding mountains within the Slieve Felim mountain range. The assets sit within the blanket peat bog that encompasses most of the summit of Knockastanna hill. Whilst the function of these enclosures is unknown, their positioning on the north-facing slope may have been chosen due to the strategic positioning and good views.

Although undated, it is anticipated that since the construction of the enclosures, the surrounding landscape is likely to have changed significantly. The current setting of the enclosures is scrubland, with a large area of forestry to the east and the proposed development to the west. Due to the positioning of the assets on a north-facing slope, there are extensive views towards the north.

10.3.2.9 Upright stones (LI016-002001), circular earthworks (LI016-002002), and collapsed standing stone (LI016-002003).

LI016-002001 is a row of three upright stones, boulderlike in shape and containing milky quartz inclusions. The row of stones is known locally as 'The Three Stones' and is thought to point towards the northeast in the direction of Mauherslieve (Mother Mountain). LI016-002003 sits 10m south of LI016-002001 and is thought to be a collapsed standing stone; it is not within the same alignment as the row of stones. A roughly circular earthwork (LI016-002002), believed to be a barrow, is located 25m to the southeast. The proximity of these heritage assets suggests a connection, but due to their poor preservation and lack of further investigation, their connection is unclear.

As these assets are undated, their original setting cannot be determined. The current setting of the heritage assets is pastoral land on a north-facing slope. To the north, down the slope, are several modern farm buildings and a small amount of woodland. From the surrounding topography, it is most likely that these heritage assets command a wide view of the surrounding landscape, from the east to the west. This view would include the proposed development site, located c. 3.7km to the northeast.

10.3.2.10 Boulder Burials (TN038-004)

TN038-004 is the site of 4 no. boulder burials situated atop high ground on Barnarhu Hill. The four boulder burials are situated in a 10m long row, aligned east to west. Each boulder sits atop smaller support stones, with the third boulder from the east having a small chamber beneath it. The SMR notes the proximity of the boulder burials to the site of a now-destroyed stone circle (TN038-005). Whilst some boulder burials are

associated with the recovery of human remains, no recorded human remains are associated with TN038-004.

The east-west orientation of the boulder burials suggests that the key views from the monument were to the east and west, perhaps to note the locations of the rising and setting sun. The boulders are prominent within the landscape due to the height from the supporting stones and their positioning on the high ground of Barnarhu Hill.

The current setting of the boulder burials is scrubland, c. 0.6km north of the village of Rear Cross. A single lane access track branched off from the R503, and modern farm buildings are located c. 0.2km to the southeast. The prominent positioning of the boulder burials atop the high ground means that they have panoramic views of the surrounding landscape. The proposed development site and associated turbines are located c. 3.75km southeast of the monument and, due to their positioning in the landscape, are most likely visible.

10.3.2.11 Orthostat (TN038-008)

TN038-008 is a 2.6m tall orthostat, known locally as Cloghfadda, orientated on a west-northwest-east-southeast axis. The entry within the SMR places the stone within a field, to the north of the road known as Reardnogy More. However, the stone is located directly on the south side of the road, next to a gated field entrance. Telephone poles and wires run parallel to the road. The surrounding landscape is relatively flat scrubland and pastoral fields, with small areas of trees and hedgerows lining the road. To the west, along the road, is a set of domestic buildings which are directly visible from the stone. There are moderate views of the surrounding hills, including the proposed development site to the south. The Baurnadomeeny Wedge Tomb (TN038-009) is directly visible to the south. The proximity of the standing stone to the Baurnadomeeny Wedge Tomb suggests a possible connection, potentially acting as a marker within the landscape.

There will have been a change to the landscape since the original erection of the standing stone, with the modern additions of the domestic buildings, road, telephone poles, and the existing turbines at the proposed development site forming part of the modern setting. The view towards the Baurnadomeeny Wedge Tomb is not interrupted by the existence of these modern additions.

10.3.2.12 Baurnadomeeny Wedge Tomb (TN038-009)

TN038-009 is the site of a well-preserved wedge-tomb, which was excavated in 1959. The tomb consists of a double kerbed cairn c. 16m in diameter, in the middle of which is a gallery c. 7m in length that is orientated on an east-west alignment. The gallery is divided into two sections by a septal stone, forming a portico and the main chamber. There are incised lines, possibly man-made, on the eastern orthostat. 21 cremated burials were found in association with the tomb, including 5 in the portico and 1 in the main chamber. Artefacts recovered from the tomb include worked flint, worked chert, and some pottery sherds.

The current setting of the Baurnadomeeny wedge tomb is that of pastoral fields with a small copse to the south/south-east. The heritage asset is on a gentle south-facing slope of part of the south-western spur of Mauherslieve. Due to the gentle nature of the slope, the wedge tomb is not prominent within the landscape.

From analysis of the topography, the proposed development site would most likely be visible from the surrounding area but the immediate view from the wedge tomb is

blocked due to the nearby trees to the south. The east-west orientation of the wedge tomb is most likely aligned with the location of the rising and setting sun, with some accounts stating that the gallery directly lines up with the path of the summer solstice sun.

10.3.2.13 Shanballyedmond Court Tomb (TN038-013)

TN038-013 is a megalithic court tomb, that was excavated and partially restored in 1958 by Professor Michael J. O'Kelly. The tomb is on an east-facing slope at the foot of Cullaun Mountain. The tomb is within the outline of a u-shaped kerbed cairn, c. 12.5 by 9.5m in area. The court is at the northeast and opens into a two-chambered gallery. Excavation uncovered 34 postholes outside of the kerb and 6 no. separate sets of human remains. One set of human remains, from a pit in the inner chamber, was found undisturbed. Further finds included, stone tools, flint arrowheads, and pottery; all of which were Neolithic in date.

A report published in 2012 (Schulting et al., 2012) gives 2 no. radiocarbon dates attributed to the use of the court tomb. Charcoal taken from a post-hole was given a calibrated date of 3938 BC, placing this deposit in the Neolithic period. Charcoal taken from the base of the cairn spread was given a calibrated date of 1893 BC, placing the deposit in the Bronze Age. The presence of solely Neolithic artefacts within the court tomb means that it was most likely used for the longest duration during this period, before being used briefly during the Bronze Age.

The current setting of the Shanballyedmond Court Tomb is within a fenced field to the west of an unnamed minor road leading south from the village of Rear Cross. To the east of the site, adjacent to the road is a small walled car park for visitors to the heritage asset. The road is lined with trees, which obscure the view to the east. The wider landscape is farmland and pastoral fields, with a collection of farm buildings c. 02km to the northeast. Using Google street-view, the court tomb is not visible from the road when approaching from either the northeast or the southwest, due to the fencing and vegetation surrounding the site. The presence of the car park adjacent to the site of the tomb infers that the asset is well visited.

10.3.2.14 Ringfort (TN038-014)

TN038-014 is described as a ringfort, consisting of a circular area (c. 23m in diameter) that is enclosed by wall footings. There is a visible orthostat at the northeast end and a possible entrance gap at the southwest. The ringfort is situated upon a south-eastern facing slope, and this location would have been chosen due to views over the valley of the River Bilboa below. This would allow the occupants of the ringfort a defensive position and a command over the landscape. The positioning of the ringfort on the south-eastern slope provides potential intervisibility with TN038-023, another ringfort.

The current setting of the ringfort is upon a southeast-facing slope, within pastoral fields. The asset can be seen on aerial photographs, available on the National Townland and Historical Maps Viewer, as a circular area of different vegetation to the surrounding arable field.

Immediately to the southeast of the ringfort, there is a line of coniferous trees, which obscure the location of the hillfort from the surrounding landscape. A set of domestic and agricultural buildings are located c. 0.2km to the southeast of the asset, along the road named as Shanbally. A set of telephone poles and wires run perpendicular to this road. The south-east facing slope that the ringfort is situated upon overlooks the

Bilboa River Valley to the southeast, which is bordered by the hills and mountains of the Slieve Felim mountain range, including Knockastanna hill. The proposed development site is situated c. 1.9km to the southeast of the ringfort and is visible from the Shanbally road. Rearcross Quarries Ltd. is located c. 0.6km to the southwest, however, this is most likely obscured from the view of the heritage asset due to substantial forestry covering the western side of the slope.

The main focus of the ringfort would have been the valley to the southeast. The setting of the ringfort has changed since its initial construction, with modern additions such as the domestic and agricultural buildings, the road, and the telephone poles interrupting the view into the valley.

10.3.2.15 Children's Burial Ground (TN038-15)

TN038-15 is a children's burial ground (cillín) that is located c. 0.9km to the northwest of the proposed development site. The site is situated on the edge of a ridge and consists of low slabs of stone that are believed to be grave markers. A children's burial ground was used for unbaptized and stillborn infants, who were not allowed to be buried within consecrated ground. Whilst the burial ground does not have a definitive date associated with it, the earliest known reference of a cillín is 1619 and as such TN038-015 is most likely post-medieval. The burial ground is located 2km south of the village of Rear Cross and is within proximity to many smaller domestic dwellings and farmsteads. There are no clear links to the surrounding landscape that denote the reasoning for the placement of the heritage asset in its current positioning.

The current setting of the children's burial ground is within agricultural land, mainly fields with tree-lined field boundaries. Due to its location on the edge of a ridge, the location of the children's burial ground most likely offers views of the proposed development site to the southeast. As there are no clear links between the heritage asset and the surrounding landscape, the proposed development will not produce any distraction to the understanding or appreciation of this heritage asset.

10.3.2.16 Ringfort (TN038-023)

TN038-023 is described as a ringfort, consisting of a circular-shaped earthwork, c. 28m in interior diameter and c. 45m in exterior diameter, that is defined by a scarp and an external fosse. The asset is bisected by a modern access lane from east to west. The positioning of the ringfort on a south-southwest facing slope indicates that the positioning was intended to command views over the surrounding landscape, mainly the Bilboa River Valley to the southwest. This would have provided a defensive position and command over the valley. The ringfort may have had intervisibility with TN038-014, a ringfort.

The current setting of the ringfort is upon a south-southwest facing slope, within an area of reclaimed grassland. The ringfort is located c. 0.2km north-west of a set of agricultural buildings, which lie along a single-track road that runs to the R503 c. 0.5km to the south. The placement of the asset on the south/south-west facing slope offers a view over the Bilboa River valley and the proposed development site.

The setting of the ringfort has changed since its original construction. Whilst the ringfort still has the same views over the valley, the valley itself has undergone modernisation and is now populated with post-medieval and modern structures.

10.3.2.17 Kilcommon Pilgrim Loop

The presence of the Kilcommon Pilgrim Loop is noted c. 5.5km to the northeast of the proposed development. The trail is 7km long, starting in the village of Kilcommon, and would have originally been a mass path to connect those in more isolated locations to the local church. The path is now a sign posted Pilgrim Path and is popular with both casual walkers and those seeking a more religious experience. The path passes over the south/southwestern slopes of Mauherslieve, which offers views towards the proposed development site. The original purpose of the path was to provide an easy path for worshippers through the landscape and this indicates that the setting of the path is the immediate landscape surrounding it.

10.4 Description of Likely Effects

10.4.1 Construction Phase

As stated in **Chapter 3** of this EIAR, no additional construction is proposed as part of the life extension of the proposed development site. The only work to be undertaken at the site would be routine maintenance and the reinstallation of Turbine 05. The routine maintenance is expected to be non-invasive, such that no heritage assets would be directly impacted by the proposed development. No construction phase effects are therefore predicted.

10.4.2 Operational Phase

The parent planning application EIS did not assess operational impacts on heritage assets.

Assets that fall within the ZTV (**Annex 9.1**) have been assessed for operational impacts upon their setting. Indirect impacts are assessed as potentially occurring during the proposed additional period of operations and are characterised as an alteration of any aspect of the setting of a heritage asset that contributes to its significance. Assets have been scoped out of the assessment, where appropriate, due to their location outside the ZTV, their positioning offering no view of the proposed development site, or the asset no longer being visible above ground. The location of the assessed heritage assets can be seen in **Annex 10.1**.

10.4.2.1 The Church of the Visitation (22403801)

As determined in **Section 10.3.2.2**, the setting of the Church of the Visitation has changed over time due to the development of the village. However, the church is still seen as a focal point for the area. The main view of the front of the church looks towards the north, and as such the wind farm is not visible. When exiting the church, the view is towards the south in the direction of the proposed development site. Whilst, theoretically, the ZTV indicates that the proposed development site would be visible from the church, the presence of the plantation to the immediate south of the asset means that the turbines do not detract from an appreciation of the church. As such, the proposed development will not impact the appreciation and understanding of the heritage asset.

The Church of the Visitation in Rear Cross is of high heritage significance due to its National Importance rating on the NIAH. The church is also included on the Record of Protected Structures (RPS), record number S799 as part of the *North Tipperary County Development Plan 2010-2016* and record number TRPS799 within the *Draft Tipperary County Development Plan 2022-2028*. The magnitude of impact upon the asset

through the continued presence of the wind turbines is neutral; there would be no change affecting the understanding of cultural significance, and thus the significance of effect is imperceptible.

10.4.2.2 Commaun Bridge (21900803)

As determined in **Section 10.3.2.3**, the original immediate setting of the bridge is that of the tributary of the River Bilboa. As such, the wind farm is peripheral to the bridge and would not have an impact on the appreciation or understanding of the heritage asset.

The Commaun Bridge is of medium heritage significance due to its designation as a Regionally Important asset. The Commaun Bridge is also noted in the Record of Protected Structures, Reg No. 309, as part of the *Limerick County Development Plan 2010-2016* and the *Draft Limerick City & County Development Plan 2022-2028*. Given that the existing wind farm is peripheral to the setting of the bridge, the magnitude of impact upon its setting is neutral and as such the significance of effects is imperceptible.

10.4.2.3 Farmhouse (21900802)

As detailed in **Section 10.3.2.4**, the setting of the farmhouse (21900802) has undergone significant change since its initial construction, with the addition of modern buildings and the development of the surrounding land. Furthermore, the location of the farmhouse within a local depression and the presence of dense forestry between the asset and the wind farm means that the existing turbines are unlikely to be visible. As such, the proposed development will not have any impact upon the appreciation and understanding of the heritage asset.

The heritage asset (21900802) is of medium heritage significance due to its designation as a Regionally Important asset. The magnitude of impact upon its setting is neutral and as such the significance of effects is imperceptible.

10.4.2.4 Megalithic Wedge Tombs (TS039-020 and TS039-021)

The presence of the existing wind farm (Knockastanna) does not cause any intervisibility issues between the TS039-020 and TS039-021 and other surrounding tombs of a similar nature. However, their presence is noted in the view of the setting sun, to the west of the assets, which may have contributed to a change in setting at the time of construction. Albeit other modern additions, such as telephone poles and agricultural buildings, are present in this view also. As the wind farm is part of the current setting of the heritage assets, a life extension would not cause any further change to the setting and as such would not impact upon the ability to understand or appreciate the heritage assets.

TS039-020 and TS039-021 are protected under the National Monuments Acts and are therefore of high significance. As there is no perceived change in setting, the magnitude of impact is anticipated to be neutral. This would result in an imperceptible significance of effect.

10.4.2.5 Holy Well (LI008-006)

As shown in **Section 10.3.2.6**, LI008-006 is located c. 0.7km southwest of the proposed development site. Given the proximity to the holy well to the proposed development site, there is a possibility that noise from the closest turbine (T03) may interfere with the peaceful nature of the site. However, the woodland to the north and east of the holy

well provides a barrier between the heritage asset and obscures the turbine locations from view as well as providing sound mitigation to the sound of the operation of the turbines. This mitigates any noise and, as such, it is assessed that the wind farm provides only a minor distraction from the understanding and appreciation of the site.

LI008-006 is protected under the National Monuments Acts and is therefore of national importance and high significance. As there would be no perceived change in setting, the magnitude of impact is neutral and as such the significance of the effects is imperceptible.

10.4.2.6 Enclosures (LI008-008 and LI008-009)

As stated in Section **10.3.2.8**, LI008-008 and LI008-009 are positioned on a north-facing slope with extensive views towards the north. Due to topography, the view of the turbines is restricted due to intervening forestry.

As the slope upon which the assets are located is north facing, it can be said that this is the primary view taken advantage of by the assets. This view is not obscured by the existing turbines. Whilst the proximity to the turbines to the west may partially affect views in this direction, there is no evidence to indicate that these views were, or are, important. As such, the continued operation of the wind turbines e is unlikely to affect the understanding and appreciation of LI008-008 and LI008-009.

LI008-008 and LI008-009 are protected under the National Monuments Acts and are therefore of national importance and high significance. The magnitude of impact upon their setting is predicted to be neutral and as such the significance of effects is imperceptible.

10.4.2.7 Upright stones (LI016-002001), circular earthworks (LI016-002002), and collapsed standing stone (LI016-002003).

As stated in **Section 10.3.2.9**, the existing turbines obscure the view of Mauherslieve from the upright stones and the associated heritage assets. Therefore, it is likely that the initial construction of the wind farm had an effect on the understanding and appreciation of the purpose of these monuments. However, the existing wind farm (Knockastanna) now forms part of the current setting of the heritage assets, and as such a life extension would not alter this or increase the effect on their setting.

LI016-002001, LI016-002002, and LI012-002003 are protected under the National Monuments Acts and are therefore of national importance and high significance. Whilst the original construction of the wind farm may have caused a change to the setting of the heritage asset, a life extension would not cause any further change and as such, the magnitude of is anticipated to be neutral. This would result in an imperceptible significance of effect.

10.4.2.8 Boulder Burials (TN038-004)

As stated in **Section 10.3.2.10**, The east-west orientation of the boulder burials suggests that the key views from the monument were to the east and west, perhaps to note the locations of the rising and setting sun. The proposed development is located c. 3.75km south-east of the boulder burials and as such, is most likely within the periphery of the views from the monument, but not within the main views. As such, the proposed development would not have an impact on the appreciation or understanding of this heritage asset.

TN038-004 is protected under the National Monuments Acts and is therefore of national importance and high significance. As no change to its setting has been assessed as likely, the magnitude of impact upon its setting is neutral and as such the significance of the effects is imperceptible.

10.4.2.9 Orthostat (TN038-008)

As described in **Section 10.3.2.11**, the view towards the Baurnadomeeny Wedge Tomb (TN038-009) from the Orthostat (TN038-008) is not interrupted by the existence of the modern additions to the setting. Thus, the proposed development will not cause any impact on the understanding and appreciation of the standing stone.

TN038-008 is protected under the National Monuments Acts and is therefore of national importance and high significance. As no change to its setting has been identified, the magnitude of impact upon its setting is neutral and as such the significance of the effects is imperceptible.

10.4.2.10 Baurnadomeeny Wedge Tomb (TN038-009)

As stated in **Section 10.3.2.12**, the Baurnadomeeny Wedge Tomb (TN038-009) is most likely orientated to align with the path of the rising and setting sun. The location of the existing wind farm does not interrupt this path, and as such there is no perceived impact upon the setting of the heritage asset.

TN038-009 is protected under the National Monuments Acts and is therefore of national importance and high significance. The magnitude of impact upon its setting is neutral and as such the significance of the effects is imperceptible.

10.4.2.11 Shanballyedmond Court Tomb (TN038-013)

As stated in Section **10.3.2.13**, Shanballyedmond Court Tomb is enclosed within a fenced off area. The presence of the fences surrounding the asset means that the proposed development site, located c. 2.5km to the southeast, is partially obscured from view. This ensures that the wedge tomb is the focus when visiting the site, with any possible visible wind turbines being a minor distraction. As such, the setting of the court tomb would not be impacted by the continued operation of the turbines at the proposed development site.

TN038-013 is protected under the National Monuments Acts and is therefore of national importance and high significance. The magnitude of impact upon its setting is neutral and as such the significance of the effects is imperceptible.

10.4.2.12 Ringfort (TN038-014)

As described in **Section 10.3.2.14**, the setting of TN038-014 has changed significantly since its original construction, with the surrounding environment undergoing significant modernisation. As such, the presence of the development on the far side of the valley is a minor distraction within the landscape and does not present further interruption to the view over the Bilboa River Valley. Thus, an extension of life for the existing turbines within the proposed development site would not cause any impact on the appreciation or understanding of the ringfort. Furthermore, the positioning of the proposed development site does not provide any disruption to possible intervisibility between TN038-014 and TN038-023.

TN038-014 is protected under the National Monuments Acts and is therefore of national importance and high significance. The magnitude of impact upon its setting is neutral and as such the significance of the effects is imperceptible.

10.4.2.13 Children's burial ground (TN038-015)

As noted in **Section 10.3.2.15**, there are no clear links between the **Children's Burial** Ground and the surrounding landscape. As such, the proposed development will not produce any distraction to the understanding or appreciation of this heritage asset.

TN038-015 is protected under the National Monuments Acts and is therefore of national importance and high significance. The magnitude of impact upon its setting is neutral and as such the significance of the effects is imperceptible.

10.4.2.14 Ringfort (TN038-023)

As described in **Section 10.3.2.16**, the positioning of the proposed development site, in the background of the view over the Bilboa River Valley does not provide an interruption to this key view. Furthermore, the positioning of the proposed development site does not provide any disruption to possible intervisibility between TN038-023 and TN038-014.

TN038-023 is protected under the National Monuments Acts and is therefore of national importance and high significance. As there is no identified change to the setting, the magnitude of impact upon its setting is neutral and as such the significance of the effects is imperceptible.

10.4.2.15 Summary of Operational Effects

The existing Knockastanna Wind Farm forms part of the baseline environment and the wider setting of the heritage assets and, given that it is not proposed to alter the infrastructure present at the proposed development site, it is assessed that no likely significant effects will arise.

10.4.3 Decommissioning Phase

The decommissioning process includes the removal of wind turbines, the grubbing of foundations up to 1m, the removal of hardstands, the removal of the electrical switchroom, the recycling of copper cabling, and the covering of access tracks with topsoil (where selected to do so).

Given the absence of heritage assets within the proposed development site, the decommissioning process will not result in any direct effects. Furthermore, there will be no negative indirect effects on any of the aforementioned known heritage assets as the removal of the infrastructure will return the landscape to its original setting prior to the construction of the existing wind farm.

10.4.4 Cumulative Effects

At the time of the original EIS, cumulative assessments were not carried out on the site and its surrounding assets. Since then, legislation, guidance and policy have been updated. The parameters for a cumulative assessment were identified using guidance provided by the EPA (2022) and NatureScot in Version 5 of the Environmental Impact

Assessment Handbook (2018)[3]. Since the initial construction of the wind farm, subsequent developments have been constructed and developed in the surrounding area, shown in **Table 10.5.** These developments have been added to the baseline of the identified heritage assets within the 5km study area.

Development	Planning Register Reference	Integrated Pollution Control (IPC) or Industrial Emissions Directive (IED) License	Development Description	Status
Rearcross Quarries, Co. Tipperary	03/510121 and 11/510323	-	Quarry and all associated ancillary infrastructure	Operational
Lackamore Quarry, Co. Limerick	00/975 and 07/752	-	Quarry and all associated ancillary infrastructure	Operational
Garracummer Wind Farm, Co. Tipperary	04/1034, 04/1259, 04/1178, 08/1236, 09/154, 09/213, 10/79, 10/183, 11/26, 11/70 and 12/77	-	17 no. wind turbines and associated ancillary infrastructure	Operational
Mienvee Wind Turbine, Co. Tipperary	00/649, 00/700, 03/1478 and 05/1493	-	1 no. wind turbine and associated ancillary infrastructure	Operational
Hollyford Wind Farm, Co. Tipperary	05/287 & 12/400	-	3 no. wind turbines and associated ancillary infrastructure	Operational
Glenough Wind Farm, Co. Tipperary	04/1195, 08/136, 08/701, 10/5 and 10/595,	-	14 no. wind turbines and associated ancillary infrastructure	Operational
Glencarbry Wind Farm, Co. Tipperary	07/255, 11/80, 13/24, 13/135, 13/205, 14/33, 15/955 and 16/796	-	12 no. wind turbines and associated ancillary infrastructure	Operational
Cappawhite A Wind Farm,	07/364, 11/6, and 13/210	-	17 no. wind turbines and associated	Operational

[3] Appendix 1: Cultural Heritage Impact Assessment, Scoping Report; Paragraph 28 as well as Box Ap1.Info2

Co. Tipperary			ancillary infrastructure	
Cappawhite B Wind Farm, Co. Tipperary	12/510385, 13/510414, 14/10, 15/600566, 16/600701 and 18/601014	-	4 no. wind turbines and associated ancillary infrastructure	Operational
Castlewaller Wind Farm, Co. Tipperary	11/510251 and 16/600472	-	16 no. wind turbines and associated ancillary infrastructure	Permitted
Upperchurch Wind Farm, Co. Tipperary	13/510003, 18/600913, 20/1048 and ABP-306204-19	-	22 no. wind turbines and associated ancillary infrastructure	Permitted
Turraheen Upper Wind Turbine	14/600062 and 15/600867	-	1 no. wind turbine and associated ancillary infrastructure	Operational
Agricultural Developments	Various	-	Various	Various
Residential Dwellings	Various	-	Various	Various

Table 10.5: Developments addressed in cultural heritage cumulative impact assessment

As per the aforementioned guidance (EPA 2017, EPA 2022, and SNH 2018), cumulative assessment should only take place where direct or indirect adverse effects arise on assets. As such, cumulative impacts would only be assessed when a heritage asset was predicted to receive an adverse effect from the proposed development.

As no adverse effects have been found, it is assessed that a cumulative assessment is not warranted in this instance.

10.4.5 'Do-Nothing' Effects

In a 'Do-Nothing' scenario, the wind farm will continue to operate until its required decommissioning date. Subsequently, all infrastructure will be removed from site and any visual effects on heritage assets will be entirely reversed.

10.5 Mitigation and Monitoring

As the proposed development does not comprise the construction of additional infrastructure, and no previously undisturbed ground will be affected by the continued operation of the wind farm, no archaeological mitigation works, or monitoring is required or proposed.

10.6 Summary

This assessment has considered data from a wide range of sources to determine the extent to which known and unknown heritage assets within both the proposed development site and a 5km study area are likely to be affected by the continued

operation of the existing Knockastanna Wind Farm. The assessment considered likely direct and indirect effects on the identified heritage assets, the need for any mitigation methods and any residual effects.

No heritage assets were identified within the proposed development site and no likely direct impacts on known or hitherto unknown heritage assets of an archaeological nature were assessed as likely.

The assessment considered the likelihood of indirect (visual) effects on heritage assets within the 5km study area. The proposed development has been assessed as having a neutral significance of effect on all identified heritage assets, due to the absence of any increased effect on the setting of the heritage assets.

The decommissioning of the development is assessed to have no direct impact on any known heritage assets within the proposed development site. Furthermore, at the decommissioning stage, the landscape would be returned to its pre-wind farm state and, as such, all effects will be fully reversed and there will be no permanent effect to the assets.

No archaeological mitigation measures are assessed as being required.

References

Legislation

- Convention for the Protection of the Archaeological Heritage of Europe (Granada, 1985);
- Convention for the Protection of the Archaeological Heritage of Europe (revised) (Valetta, 1992);
- Cultural Institutions Act 1997;
- Heritage Act 1995; and
- National Monuments Acts 1930, 1954, 1987, 1994, 2004

Guidance

Chartered Institute for Archaeologists (2014) *Standard and Guidance for Historic Environment Desk Based Assessment*. Accessed at: https://www.archaeologists.net/codes/cifa

Department of Arts, Heritage, Gaeltacht and the Islands (1999) *Framework and Principles for the Protection of the Archaeological Heritage*. Accessed at: https://www.archaeology.ie/sites/default/files/media/publications/framework-and-principles-for-protection-of-archaeological-heritage.pdf

Department of Arts, Heritage, Gaeltacht and the Islands (2011) Architectural Heritage Protection: Guidelines for Planning Authorities. Accessed at: https://www.buildingsofireland.ie/app/uploads/2019/10/Architectural-Heritage-Protection-Guidelines-for-Planning-Authorities-2011.pdf

Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

Environmental Protection Agency (2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Draft).

Cartographic Sources

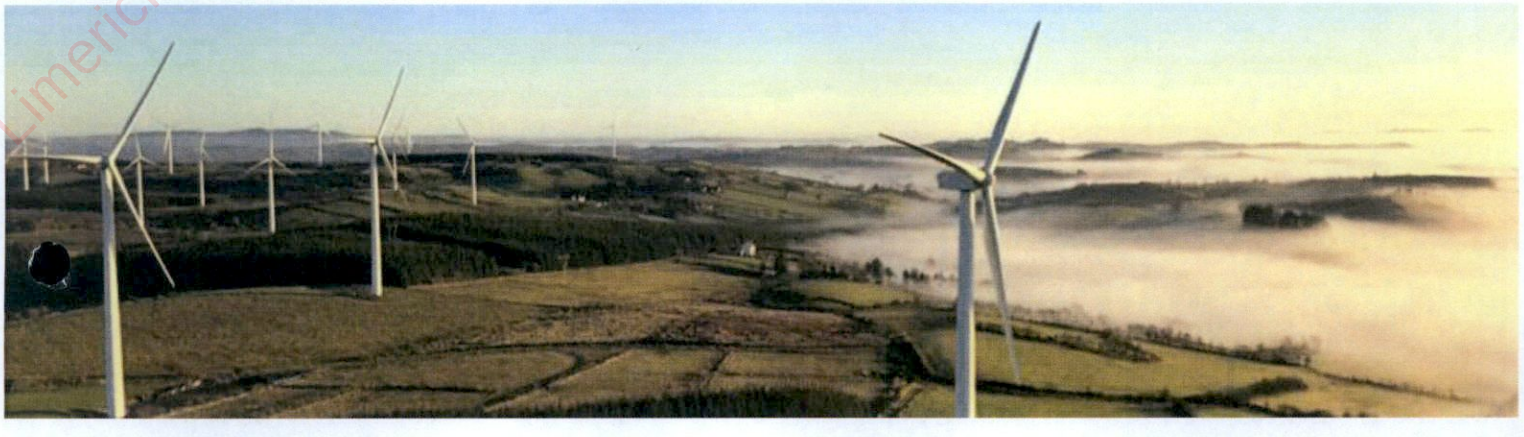
- Ordnance Survey Historic 6 inch First Edition Colour;
- Ordnance Survey Historic 6 inch First Edition Black and White – Published 1843 – 1844;
- Ordnance Survey Historic 25 Inch – Published 1904; and
- Ordnance Survey Historic 6 Inch Last Edition Black and White – Published 1905.

Sources

Caple, C. and Dungworth, D., 1998. *Waterlogged anoxic archaeological burial environments*. English Heritage.

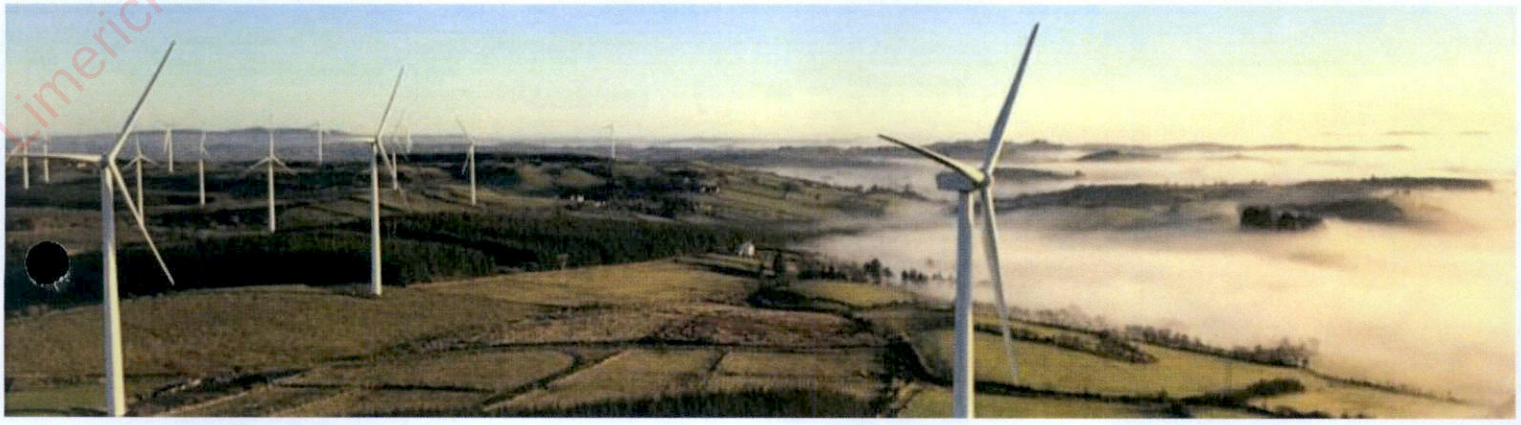
Discover Ireland (2021) *Kilcommon Pilgrim Loop*. Available at: https://www.discoverireland.ie/tipperary/kilcommon-pilgrim-loop

Plunkett, G. and Foley, C. (2006) 'Peatland archaeology in Northern Ireland: an evaluation', *Journal of Wetland Archaeology*, 6(1), pp.83-97.



Schulting, R.J., Murphy, E., Jones, C. and Warren, G. (2012) 'New dates from the north and a proposed chronology for Irish court tombs', *Proceedings of the Royal Irish Academy: Archaeology, Celtic Studies, History, Linguistic, Literature*, vol. 112C, pp.1-60.

Smith, G.F. and Crowley, W. (2020) *The Habitats of Cutover Raised Bog*. National Parks and Wildlife Service.



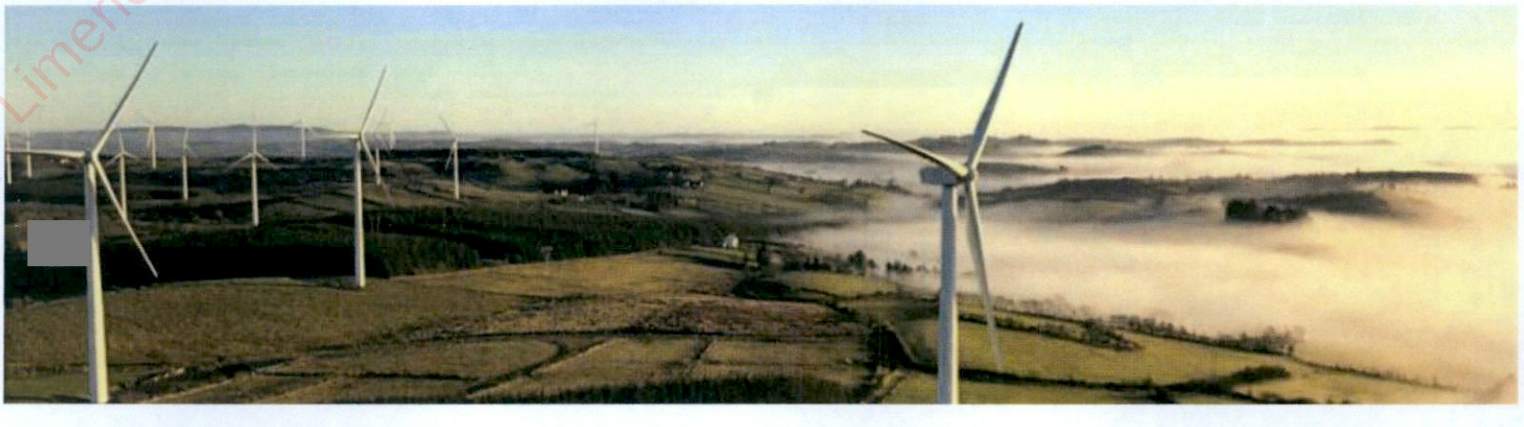
Knockastanna Wind Farm Extension of Operational Life

Chapter 11: Noise and Vibration

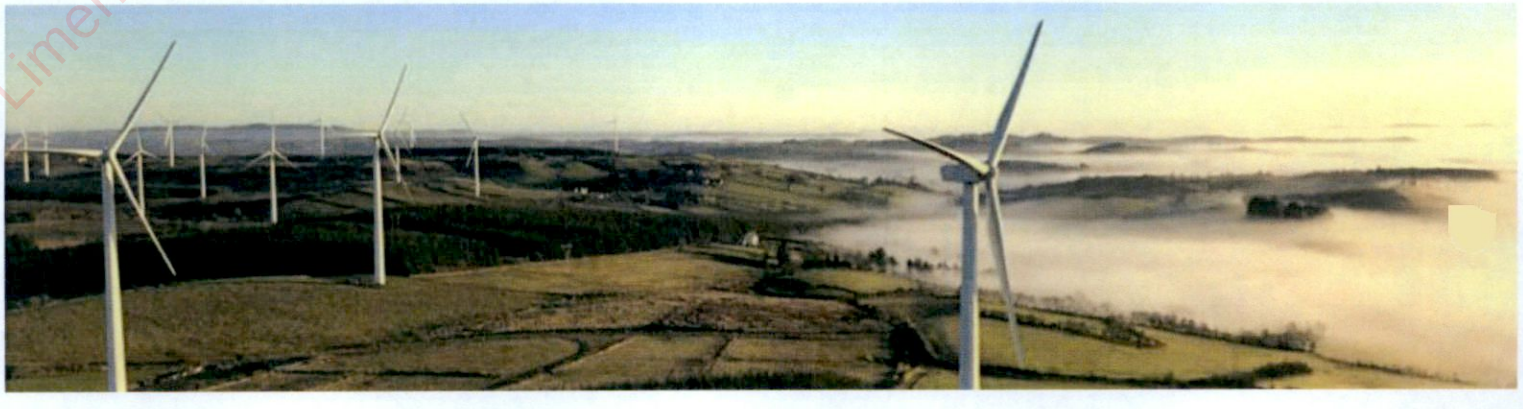
SSE Renewables Generation Ireland Limited

Galetech Energy Services
Clondargan, Stradone, Co. Cavan,
H12 NV06, Ireland
Telephone +353 49 555 5050
www.galetechenergy.com

SLR Consulting
7 Dundrum Business Park, Windy Arbour,
Dublin, D14 N2Y7, Ireland
Telephone +353 1 296 4667
www.slrconsulting.com



Contents



11.1 Introduction

11.1.1 Background and Objectives

This chapter describes the assessment undertaken of the likely noise and vibration effects arising from the proposed continued operation of the Knockastanna Wind Farm.

This chapter draws on a previous noise monitoring campaign undertaken following the commissioning of the existing development and discusses the likely and significant effects of the continued operation, and decommissioning, of the development. Where required, appropriate mitigation measures to limit any significant identified effects on the noise environment are presented. The residual effects and cumulative effects of the proposed development post-mitigation are also assessed.

11.1.2 Description of the Proposed Development

In summary, the proposed development comprises the continued operations of the existing wind farm for a further period of 15-years. The existing development, including secondary ancillary developments, consists of the following main components:-

- 4 no. wind turbines;
- Associated turbine foundations and crane hardstandings;
- 1 no. electrical control building with a total footprint of 66 square metres (m^2), including welfare facilities and associated electrical equipment enclosure;
- Underground electrical cabling between each of the existing wind turbines and the electrical control building;
- 1 no. site entrance and 2km of site access tracks; and
- Site drainage infrastructure.

A full description of the proposed development is presented in **Chapter 3**.

11.1.3 Statement of Authority

This EIAR chapter has been prepared by various members of the Galetech Energy Services (GES) Environment & Planning Team including Cormac McPhillips, Technical Services Manager at Galetech Energy Services. Cormac has extensive acoustic assessment experience including the preparation and review of post-construction noise monitoring programmes in accordance with relevant standards and best practice methods. GES has substantial acoustic impact assessment experience having prepared Noise & Vibration chapters for multiple existing, permitted and proposed wind energy developments which have been subject to EIA.

11.2 Methodology

11.2.1 Proposed Approach

The following methodology has been adopted for this assessment:-

- Review the noise limits applied to the existing development through the relevant condition of consent;
- Review previously completed noise monitoring surveys undertaken following the commissioning of the existing development;
- Comment on noise levels recorded during post-construction monitoring against the appropriate operational phase noise limits imposed in the relevant condition of consent; and
- Assess the effects arising from general maintenance works to be undertaken during the proposed period of operations and during decommissioning.

11.2.2 EPA Description of Effects

The significance of effects of the proposed development shall be described in accordance with the EPA guidance document *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (May 2022). Details of the methodology for describing the significance of the effects are provided in **Chapter 1**. The effects associated with the proposed development are described with respect to the EPA guidance in the relevant sections of this chapter.

11.2.3 Fundamentals of Acoustics

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

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

The frequency of sound, which is the rate at which a sound wave oscillates, is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250 Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. **The 'A-weighting' system is** defined in the international standard BS EN 61672-1:2013 *Electroacoustics Sound Level Meters Specifications*. BS ISO 226:2003 *Acoustics - Normal Equal-loudness Level Contours* has been found to provide the best correlations with human response to perceived loudness. **SPLs measured using 'A-weighting' are expressed in terms of** dB(A).

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

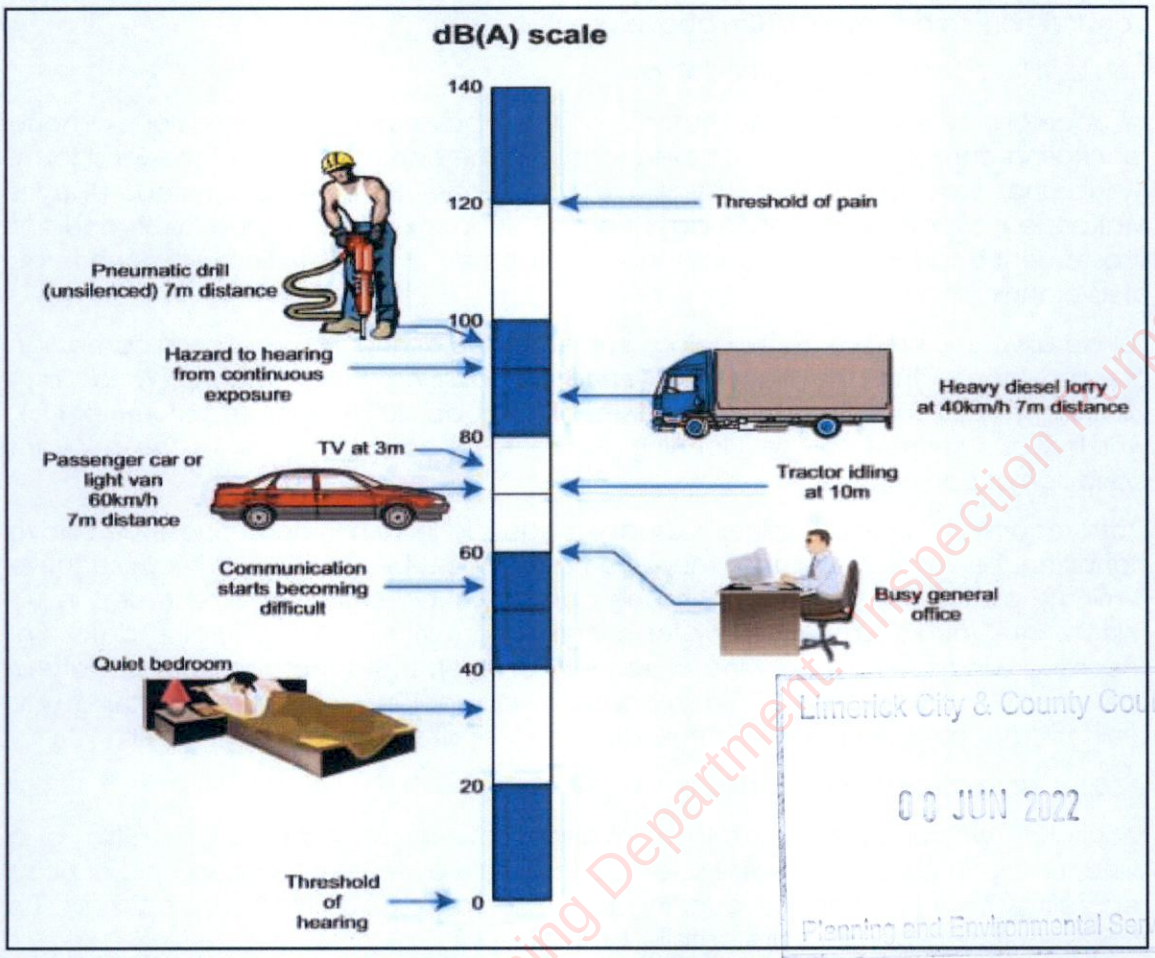


Figure 11.1: The level of typical common sounds on the dB(A) scale (NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004)

11.3 Assessment Criteria

11.3.1 Operational Phase Noise Limits

The appropriate noise limits for the existing wind farm are provided at Condition No. 9 of An Bord Pleanála Reference PL13.130932 which states:-

> *"At the critical wind speed (that is, the speed at which the noise of wind turbines and blades is most in excess of ambient noise levels), the noise from the proposed development shall not, when measured externally at the nearest occupied house, exceed 40 dB(A)Leq when measured over any five minute period. Within six months of commissioning the turbines the developer shall undertake the measurement of noise levels in order to determine the extent and characteristics of noise levels arising from the wind farm in the vicinity of the nearest two occupied residential properties. The results of such noise measurements shall be forwarded to the planning authority. In the event of a failure to meet the above limit, the wind farm operation shall be stopped until written agreement is reached with the planning authority on design or* ***operational alterations intended to reduce the noise accordingly.*** [emphasis added]

The critical wind speed of the site was determined, during baseline noise monitoring undertaken in January and February 2006 prior to the commencement of

construction, to be 7m/s at 10m above ground.

11.3.2 Noise Monitoring Methodology

In accordance with the requirements of the above planning condition, a noise monitoring campaign was completed following the commissioning of the wind farm. Monitoring was undertaken by Hayes McKenzie Partnership Limited **('Hayes McKenzie')** over a period of 55-days from 11 June 2009 to 5 August 2009; and the subsequent analysis confirmed that the development was operating within the terms of its planning permission.

Full details of the precise methodology implemented during the monitoring campaign are provided within the Hayes McKenzie report titled *Knockastanna Wind Farm Planning Conditions Compliance Assessment* (October 2009), enclosed at **Annex 11.1**, which was furnished to the Planning Authority in accordance with the relevant condition of consent[1].

Data recorded for wind turbines is usually measured in 10-minute periods. The above condition, however, states that measurements should be carried out in consecutive 5-minute periods. During the monitoring campaign, noise data was recorded in 10-minute intervals in order to allow for a correlation with the wind turbine data e.g. recorded wind speeds and wind direction. However, this approach does not affect the overall conclusions of the monitoring campaign which were required to demonstrate compliance with the 40 dB LAeq limit at the critical wind speed.

11.3.2.1 Noise Monitoring Locations

Monitoring was undertaken at 4 no. inhabited dwellings located within 1.3km of a wind turbine. The locations were selected to obtain a representative sample of noise recordings from locations surrounding the wind farm. Coordinates for each of the noise monitoring locations are detailed in **Table 11.1**.

Location	Coordinates (ITM)		Nearest Turbine	Distance to Nearest Turbine (m)
	Easting	Northing		
House B	184878	155679	T03	1266
House E	186725	155437	T05	833
House H	186471	157217	T02	949
House J	185120	156710	T02	659

Table 11.1: Measurement Location Coordinates

[1] A copy of the noise monitoring report is stamped as having been received by the Planning Authority on 6 August 2010.

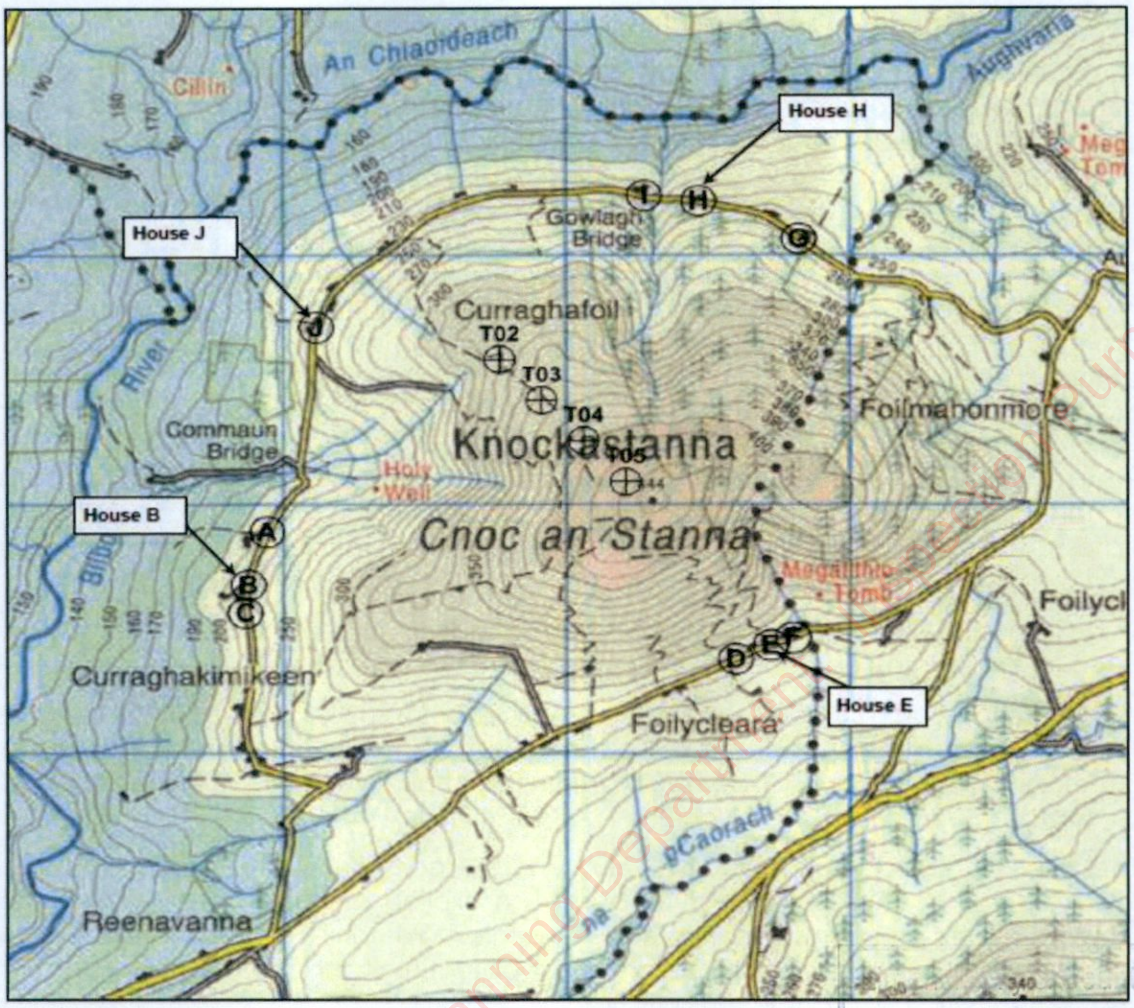


Figure 11.2: Noise Survey Locations

11.3.2.2 Noise Monitoring Equipment

Noise levels were recorded using Larson Davis model LD-820 Precision Integrating **Sound Level Meters fitted with ½" microphones** in accordance with the type 1 standard in IEC 651-1:1979. The microphones were fitted with double-skin windshields, based on the Gracey & Associates model 8310 design, and mounted on tripods at a height of 1.2 metres.

The meters were programmed to measure a number of noise parameters; including LA_{eq}[2], LA_{max}[3] (maximum), LA_{min}[4] (minimum) and LA_{90}[5] over consecutive 10-minute periods.

All equipment was calibrated prior to monitoring, during an interim site visit, and on completion of the monitoring campaign with an appropriate acoustic calibrator. All equipment was found to be within 0.4dB of the start calibration, which is within

[2] The equivalent continuous sound level and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

[3] The maximum sound level is the highest time-weighted sound level measured during a period.

[4] The minimum sound level is the highest time-weighted sound level measured during a period.

[5] The sound level which is exceeded for 90% of the measurement period.

allowable tolerances. All equipment was within its appropriate calibration period.

A rain gauge was installed at House H and set up to measure rainfall in 10-minute periods. This allowed for the identification of periods of rainfall to allow for the removal of affected sample periods from the noise monitoring data sets.

11.3.2.3 Wind Data

Wind speeds were recorded by the nacelle anemometer installed on each individual turbine and, separately, was derived from the rotational speed or power output of the nearest turbine to the residential property. Wind direction was recorded based on data recorded from each individual turbine and correlated with the wind speed data at the time.

11.3.3 Site Maintenance & Decommissioning Activities - Noise

While the proposed development does not specifically comprise any dedicated construction activities, the ongoing maintenance of the wind farm (e.g. access tracks, hardstands, etc.) and decommissioning works will involve construction-like activities and the use of plant and machinery which will result in noise emissions.

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during construction or construction-like activities.

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

The approach adopted in *BS* 5228-1:2009+A1:2014 calls for the designation of a NSL into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded (construction-like noise only), indicates a potential significant noise impact is associated with the construction activities.

Table 11.2 sets out the values which, when exceeded, potentially signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1. These levels relate to construction noise only.

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

Table 11.2: Example Threshold of Potential Significant Effect at Dwellings

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

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

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

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

The following assessment method is only valid for residential properties.

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

If the specific construction/construction-like noise level, including traffic, exceeds the appropriate category value (e.g. 65 dB $L_{Aeq,T}$ during daytime periods) then a significant effect is deemed likely to have occurred.

11.3.4 Site Maintenance & Decommissioning Activities - Vibration

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

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

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

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

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

Transport Infrastructure Ireland (TII) (formerly National Roads Authority (NRA)) document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (NRA, 2004) also contains information on the permissible construction vibration levels during the construction phase as shown in **Table 11.3**.

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

Table 11.3: Allowable Transient Vibration at Properties

11.4 Description of the Existing Environment

The existing development is located in a rural upland area, within County Limerick, adjacent to the administrative boundary with County Tipperary. Land-use in the environs of the proposed development site is largely confined to marginal pastoral agriculture with vast tracks of commercial forestry plantations on higher ground. The relative remoteness of the proposed development site and its environs is evidenced

by the fact that the area is relatively sparsely populated with no residential dwellings located within 500m of an existing wind turbine, 9 no. dwellings within 1km of a wind turbine, and 53 no. dwellings located within 2km of a wind turbine. The location of all residential dwellings within 2km of an existing wind turbine are illustrated at **Annex 11.2**[6].

A comparative assessment has been completed of the current existing environment and that of July-August 2009 during the completion of the post-commissioning noise monitoring campaign. This assessment confirms that no dwellings have been constructed, or permitted by either Limerick County Council or Tipperary County Council, within 500m of an existing wind turbine since the completion of post-commissioning noise monitoring. Therefore, it is concluded that there have been no substantive alterations to the existing environment since the completion of the post-commissioning noise monitoring campaign.

11.5 Description of Likely Effects

11.5.1 'Do-Nothing' Scenario

If the proposed development is not progressed, the existing wind turbines will be dismantled at the end of their permitted operational period and the associated noise generated will be removed from the soundscape.

11.5.2 Construction Phase

All construction activities associated with the wind farm have been completed and no additional infrastructure is proposed to be constructed. Any works to be undertaken, including the reinstatement of turbine T05 (as described at **Chapter 3**), will comprise routine maintenance works undertaken in the normal management of an operational wind farm. Therefore, no construction phase noise or vibration effects will arise.

11.5.3 Operational Phase

11.5.3.1 Wind Turbine Noise

Noise Monitoring Results

As described above, a comprehensive operational phase noise monitoring was completed between June 2009 and August 2009 following the commissioning of the existing wind farm. This monitoring was undertaken in accordance with the methodology described above, and at **Annex 11.1**. The results of the monitoring campaign are provided, in full, at **Annex 11.1**, and summarised below.

Noise levels were recorded using the LA_{90} descriptor due to the interference which can be caused from non-wind turbine noise sources on the LA_{eq} measurement parameter. Best practice guidance contained within the Institute of Acoustics (IOA) document *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (2013) (IOA GPG) states that ***"L_{A90} levels should be determined from calculated L_{Aeq} levels by subtraction of 2 dB"***. Therefore, in accordance with best practice guidance, a 2dB reduction was applied to the noise limit prescribed in the condition of consent therefore resulting in a noise limit of 38dB(A)LA_{90}.

[6] There are 53 no. residential dwellings located within 2km of an existing wind turbine; however, it is also noted that the curtilage of 5 no. additional dwellings are located within the 2km area.

Following the completion of the noise monitoring campaign, in order to assess the **'worst-case' noise effects of the operational wind farm, the recorded noise data was** filtered to solely include data from the downwind wind direction for each of the recorded monitoring locations. This approach removes data points from other wind directions, and at lower wind speeds, which may inadvertently affect the overall results and reduce the noise level experienced at each location. Thus, the assessment undertaken was extremely conservative and precautionary.

Furthermore, it should also be noted that the recorded noise levels included anthropogenic noise sources, other than wind turbine noise. Consequently, to provide an assessment of wind turbine noise only, day-time recordings were screened from the noise samples to eliminate vehicular noise, bird song and other anthropogenic sources. Therefore, only recordings taken between 23:00 and 07:00 were utilised in the noise assessment; i.e. when background noise levels were likely to be at their lowest; which, again, results in the assessment being extremely conservative.

Table 11.4 below details the average noise levels recorded at each of the monitoring locations for the above time period at the critical wind speed.

Monitoring Location	Time Period	Noise Limit (dB(A) LA_{90})	Recorded Noise Level (dB(A) LA_{90})	Compliance with Prescribed Noise Limit
1 (House B)	Night Hours (23:00 – 07:00)	38	34.0	Yes
2 (House E)	Night Hours (23:00 – 07:00)	38	31.6	Yes
3 (House H)	Night Hours (23:00 – 07:00)	38	36.0	Yes
4 (House J)	Night Hours (23:00 – 07:00)	38	37.8	Yes

Table 11.4: Recorded Noise Levels

The results of the noise monitoring campaign clearly demonstrate that noise levels, recorded at the critical wind speed of 7m/s, as established during baseline noise monitoring (see **Section 11.2.4**), are below the limit value of 38dB(A)LA_{90} (and 40dB(A)L_{eq}) at all monitoring locations; and confirms that the wind farm is operating within the terms of its planning permission. It should be noted that the recorded noise levels detailed at **Table 11.4** comprise both ambient noise and noise arising from the wind turbines; and, therefore, given that overall noise levels remain below the prescribed limits, it can be definitively stated that noise arising from the wind turbines is below the appropriate limit.

Predicted Noise Levels during Future Operations

In the first instance, it is noted that the *Wind Energy Development Guidelines for Planning Authorities 2006* state that *"In general, noise is unlikely to be a significant problem where the distance from the nearest turbine to any noise sensitive property is more than 500 metres."* As stated above, there are no dwellings located within 500m of an existing wind turbine. Consequently, it is assessed that the likelihood of significant effects arising during the proposed 15-year additional operational period is low.

Moreover, it is noted that there has been no notable alteration to the existing environment since the completion of the post-commissioning noise monitoring campaign. In particular, no residential dwellings have been constructed, or permitted, within 500m of a wind turbine. Therefore, it is assessed that the results of the 2009 noise monitoring campaign remain relevant to all dwellings proximate to the development.

Secondly, the existing wind turbines have been the subject of a comprehensive maintenance programme since commissioning to ensure their efficient and effective operation. During the proposed extended period of operations (15-years), the maintenance programme will be continued to ensure the efficient operation of the wind farm and any necessary remedial actions will be immediately undertaken to avoid the undue generation of noise.

Therefore, it is assessed that the effects of the continued operation of the existing wind farm will be negative, long-term, and of a slight magnitude.

11.5.3.2 Wind Farm Maintenance

During the proposed 15-year period of additional wind farm operations, regular maintenance works will be undertaken to ensure the safe and efficient operation of the project.

While the wind farm is presently, and will continue to be, operated and monitored remotely, a regular on-site presence will be maintained. On average, the wind farm will be visit on 1-2 no. occasions per week by a light commercial vehicle for general maintenance purposes (e.g. visual inspection of wind turbines and electrical equipment). Any noise generated by such activities will be low-level, with no particular or notable emissions being generated, and is unlikely to be audible beyond the site itself.

On occasion, it may be necessary to undertake more substantial maintenance works **including, for example, maintenance of access tracks or the wind farm's drainage** infrastructure or the reinstatement of T05. Such works may require the use of tracked excavators, HGVs, and other plant and machinery as outlined at **Table 11.5**.

In this instance, dwellings surround the proposed development site at varying distances. The closest dwelling is H4[7] as identified at **Annex 11.2** (**Volume II**) with site access tracks being located c. 165m from the dwelling. Taking this as a worst-case example, the range of plant and machinery outlined at **Table 11.5** have been assessed for their likely noise effects at this dwelling. The assessment is representative **of a 'worst-case'** scenario, with noise levels being lower at properties located further than 165m from the works, or where the works are undertaken at a greater distance from a dwelling, due to the attenuation of noise over distance.

Item (BS5228 ref)	Activity	Plant Noise Level at 10m Distance (dB $L_{Aeq,T}$)	Plant Noise Level at 165m Distance (dB $L_{Aeq,T}$)
HGV Movement (C.2.30)	Removing spoil and transporting fill and other materials	79	54

[7] It should be noted that H4 is currently derelict and unoccupied.

Item (BS5228 ref)	Activity	Plant Noise Level at 10m Distance (dB $L_{Aeq,T}$)	Plant Noise Level at 165m Distance (dB $L_{Aeq,T}$)
Tracked Excavator (C.4.64)	Excavations and reinstatement	77	52
General Construction (Various)	All general activities plus deliveries of materials and plant	84	59
Concrete Mixer Truck and Concrete Pump (C.4.27)	Pouring foundation for T05	75	50
Dumper Truck (C.4.39)	Moving excavated material	76	51
Mobile Telescopic Crane (C.4.39)	Turbine Reinstatement	77	52
Dewatering Pumps (D.7.70)	If required	80	55
JCB (D.8.13)	For services, drainage and landscaping	82	57
Vibrating Rollers (D.8.29)	Access track surfacing	77	52

Table 11.5: Typical Plant & Machinery Noise Emission Levels

In all instances, the assessment finds that there are no items of plant or machinery that are expected to give rise to noise levels that would be considered 'out of the ordinary' or in exceedance of acceptable levels. The noise levels at H4 are predicted to be below the appropriate Category A value (i.e. 65dB $L_{Aeq,T}$) and therefore a significant effect is not assessed as likely in relation to construction-like activities during wind farm maintenance works. As all other dwellings will be located at an increased distance from such activities, no significant effects are predicted as likely to arise.

It should be further noted that the use of such plant & machinery would take place over a short-term duration and the noise generated would be common-place, and not be of an usual type, in this rural agricultural landscape. Similarly, additional traffic movements associated with such works are not assessed as likely to generate significant adverse noise effects.

During the completion of maintenance works, particularly the use of vibrating rollers during access track maintenance, low levels of localised vibration may be generated through the use of plant & machinery. However, due to the extremely limited use of vibration-generating equipment, the characteristics of the works where their use would be required, and the separation distance to the nearest dwelling(s); it is

assessed that levels of vibration will not exceed the limits detailed at **Table 11.3** such that human discomfort or cosmetic or structural effects to buildings would occur. Due to the ground-attenuation factor, it is assessed as highly unlikely that any vibration will be experienced beyond the proposed development site itself.

Overall, therefore, it is concluded that the undertaking of standard maintenance works, including the reinstatement of turbine T05, will not give rise to any likely significant noise or vibration effects. While noise and vibration may be generated by such activities, they will be of a temporary duration and other than vehicular movements of public roads, are likely to be largely unnoticed beyond the proposed development site.

11.5.4 Decommissioning Phase

During the decommissioning phase, the magnitude of works and the plant & machinery to be utilised will be largely similar to that used using maintenance works and as detailed at **Table 11.5** above. Therefore, it is assessed that the noise generated by the plant & machinery will be of a similar magnitude to that described at **Table 11.5** and will not, therefore, result in an exceedance of the appropriate limit (**see Table 11.2**) or a significant effect at any dwelling. Furthermore, the decommissioning phase will be of a temporary duration following which all noise generating plant & machinery will be removed from site.

Similarly; given the characteristics of the works to be completed, the separation distance to the nearest dwelling, and the absence of a requirement for vibrating rollers to be used; it is assessed that there is no likelihood of the allowable limits at **Table 11.3** being exceeded such that a significant effect would occur.

11.5.5 Cumulative Effects

Other developments in the vicinity of the development generally comprise residential dwellings and agricultural buildings. These developments are not assessed as likely to generate significant volumes of noise or vibration such that significant in-combination effects could occur. The felling of existing forestry plantations is likely to be undertaken during the proposed operational period; however, due to the temporary nature of such activities and their characteristics, significant cumulative effects are not assessed as likely.

While there are a number of other wind energy developments located within the wider landscape (see **Chapter 1**) and including their associated grid connection infrastructure; the nearest of which is the Garracummer Wind Farm located in excess of 2km to the southeast; due to the intervening separation distance, it is assessed that significant cumulative effects will not occur. Section 5.6 of the Wind Energy Development Guidelines states that *"In general, noise is unlikely to be a significant problem where the distance from the nearest turbine to any noise sensitive property is more than 500m."* Therefore, given that there are no dwellings located within 500m of both the Knockastanna Wind Farm and the Garracummer Wind Farm, it is concluded that significant cumulative effects will not arise.

11.6 Mitigation and Monitoring Measures

11.6.1 Construction Phase

As there are no construction works to be undertaken, no mitigation are required or proposed.

11.6.2 Operational Phase

11.6.2.1 Wind Farm Maintenance

Notwithstanding that significant noise and vibration effects are not assessed as likely, all maintenance activities will be completed in accordance with the provisions, where relevant, of *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise* which offers detailed guidance on the control of noise & vibration. The relevant practices to be adopted during maintenance works shall include:-

- Limiting the hours during which site activities likely to create noticeable levels of noise or vibration are permitted;
- Establishing channels of communication between the Applicant or contractor, Local Authorities and residents;
- Selection of plant with low inherent potential for generation of noise and/or vibration;
- No plant or machinery will be permitted to cause a public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of works;
- Compressors will be noise-suppression models, fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use; and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use; and
- The hours of maintenance works (and associated traffic movements) will, insofar as possible, be limited to avoid unsociable hours. Activities shall generally be restricted to between 07:00hrs and 19:00hrs Monday to Friday and between 07:00hrs and 13:00hrs on Saturdays, with no activities on Sundays or public holidays unless in the event of an emergency.

11.6.2.2 Wind Turbine Noise

The findings of the post-commissioning noise monitoring campaign confirm that operational phase noise levels are below the limits set out in the planning consent for the existing development. Other than the continuation of a rigorous turbine **maintenance programme in accordance with the manufacturer's specifications, no** specific noise mitigation measures are required or proposed.

11.6.2.3 Vibration

In accordance with relevant standards for allowable vibration effects, it has been assessed that proposed development will not result in significant vibration effects such that human discomfort or cosmetic or structural damage to buildings could occur. Consequently, no specific mitigation measures are proposed or required.

11.6.3 Decommissioning Phase

No specific mitigation measures are proposed for the decommissioning phase. Those measures listed at **Section 11.5.2.1**, as they relate to the use of plant and machinery, will be implemented as relevant during the decommissioning phase.

11.6.4 Monitoring

11.6.4.1 Construction Phase

As there are no construction works to be undertaken, no noise or vibration monitoring is required or proposed.

11.6.4.2 Operational Phase

Post-commissioning operational noise monitoring has demonstrated that the development is operating within the terms of its planning permission. Therefore, it is concluded that there is no requirement for any further noise, or vibration, monitoring to be completed.

11.6.4.3 Decommissioning Phase

No monitoring of noise or vibration levels during the decommissioning phase is proposed.

11.7 Residual Effects

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

11.7.1 'Do-Nothing' Scenario

If the proposed development were not to proceed, the existing wind farm will be dismantled and the related wind turbine noise will be removed from the soundscape.

11.7.2 Construction Phase

All construction activities associated with the wind farm have been completed and no additional infrastructure is proposed to be constructed. Therefore, no construction phase noise or vibration effects will arise.

11.7.3 Operational Phase

The continued operation of the development will not give rise to any additional noise levels in the environment. The current operational noise levels, as recorded by Hayes McKenzie and found to be within acceptable limits, will be maintained for a further period of 15-years. As mitigation measures specific to the reduction of noise levels are not required or proposed, the residual effects remain per the pre-mitigation effects and equate to a negative, long-term effect of slight magnitude.

11.7.4 Decommissioning Phase

The residual effects of the decommissioning phase are assessed to be negative, temporary duration and of a negligible magnitude.

11.8 Summary

The noise environment at a set of representative noise-sensitive locations in the vicinity of the existing wind farm has been quantified by an appropriate survey of operational phase noise levels. Using the recorded results, it has been confirmed that recorded noise levels are below the criteria set out by An Bord Pleanála.

Due to the implementation of a comprehensive maintenance regime since the commissioning of the wind farm, it is assessed that there is no likelihood of increased noise emissions arising from the development. This assessment concludes, therefore, that there is no likelihood of significant adverse noise effects arising from the continued operation of the Knockastanna Wind Farm for a further period of 15-years.