8. LAND, SOILS AND GEOLOGY

8.1 Introduction

8.1.1 Background and Objectives

McCarthy Keville O'Sullivan (MKO), on behalf of Brickmount Ltd., has carried out an assessment of the proposed extension of duration of the existing SSE Dunneill Wind Farm, at Dromore West, Co. Sligo (the Proposed Development), on the land, soils and geology of the receiving environment.

This Environmental Impact Assessment Report (EIAR) chapter provides a baseline assessment of the environmental setting of the Proposed Development in terms of land, soils, and geology, and discusses the potential likely significant effects of extending the wind farm's operational life. This chapter also discusses any mitigation measures required to be put in place to limit any identified potentially significant impacts to soils and geology and provides an assessment of residual impacts and significance of effects. Hydrogeology and groundwater are not discussed in this chapter as they are discussed in detail in Chapter 9: Water of this EIAR.

8.1.2 Statement of Authority

This section of the EIAR has been prepared by Niamh McHugh and David Naughton and reviewed by Thomas Blackwell, of MKO. Niamh is an Environmental Scientist and holds a BSc (Hons) in Environmental Science and has been involved in the production of a number of EIARs for large-scale developments. Since joining MKO Niamh has been involved in a range of projects, working as part of a large multi-disciplinary team to produce EIA Reports. David is an Environmental Scientist with over five years of consultancy experience with MKO and has been involved in a number of EIAR applications, predominantly in renewable energy, namely onshore wind. David has worked as project manager for a number of EIAR applications, providing a pivotal link liaising between the applicant and the EIAR project team to ensure all work is carried out to a high standard. David holds a BSc (Hons) in Environmental Science.

Thomas Blackwell is a Senior Environmentalist with MKO with over 15 years of progressive experience in environmental consulting. Thomas holds a BA (Hons) in Geography from Trinity College Dublin and a M.Sc. in Environmental Resource Management from University College Dublin. Prior to taking up his position with MKO in August 2019, Thomas worked as a Senior Environmental Scientist with HDR, Inc. in the United States and held previous posts with private consulting firms in both the USA and Ireland.

8.1.3 Relevant Legislation

The EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. The requirements of the following legislation are complied with:

- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2001 – 2018;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) regulations and subsequent amendments (S.I. No. 84 of 1995, S.I. No. 352 of 1998,

S.I. No. 93 of 1999; S.I. No. 450 of 2000; S.I No. 538 of 2001); S.I. No. 30 of 2000 the Planning and Development Act, 2000; and S.I 600 of 2001 Planning and Development Regulations and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Planning and Development Act, 2000, as amended;
- S.I. No 296 of 2018: S.I. No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law; and,
- The Heritage Act 1995, as amended.

8.1.4 Relevant Guidance

The land, soils and geology chapter of this EIAR was prepared having regard, where relevant, to guidance contained in the following documents:

- Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency (2015): Draft – Revised Guidelines on the Information to be contained in Environmental Impact Statements;
- Environmental Protection Agency (2003): Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements);
- Environmental Protection Agency (2002): Guidelines on the information to be contained in Environmental Impact Statements);
- European Commission (2017) Guidance on Screening;
- European Commission (2017) Guidance on Scoping;
- European Commission (2017) Guidance on the preparation of the Environmental Impact Assessment Report;
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements; and,
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

8.2 Methodology

8.2.1 Desk Study

A desk study of the Proposed Development site and the surrounding study area (i.e., lands within the immediate vicinity of the wind farm) was completed in August 2021. The desk study involved collecting all the relevant geological data for the wind farm site and study area. This included consultation with the following:

- Environmental Protection Agency (EPA) database (www.epa.ie);
- Geological Survey of Ireland (GSI) - National Draft Bedrock Aquifer map;
- GSI - Groundwater Database (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 19 (Geology of Carlow-Wexford). (GSI, 1994);
- GSI – 1:25,000 Field Mapping Sheets; and,
- General Soil Map of Ireland 2nd edition (www.epa.ie).

8.2.2 Walkover Survey

A visual inspection of the existing Dunneill Wind Farm and surrounding area was undertaken by MKO on 12th October 2021. The purpose of the site inspection was to investigate the site for any surface indications of residual impacts to land, soils, and geology resulting from the historic construction and operation of the wind farm. Particular attention was paid to identifying any potential areas of soil erosion that might be the result of incorrect backfilling of excavations, or that may have arisen from operation of machinery and vehicles on the site. No evidence of any residual impacts to land, soils, and geology was observed.

8.2.3 Scoping and Consultation

The scope for this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process is outlined in Section 2.6 of this EIAR.

With respect to land, soils and geology relevance, there was a response from the Geological Survey Ireland (GSI) who requested MKO utilise their publicly available datasets in the course of the compilation of this chapter, which has been undertaken, as set out in Section 8.2.1 above.

8.2.4 Impact Assessment Methodology

Using information from the desk study and site walkover visual assessment, an estimation of the importance of the soil and geological environment within the study area is assessed using the criteria set out in Table 8-1 (NRA, 2008).

Table 8-1 Estimation of Importance of Soil and Geology Criteria (NRA, 2008).

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA). Large existing quarry or pit. Proven economically extractable mineral resource.
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying site is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage. Large recent landfill site for mixed wastes. Geological feature of high value on a local scale (County Geological Site). Well drained and/or high fertility soils. Moderately sized existing quarry or pit. Marginally economic extractable mineral resource.
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	Contaminated soil on site with previous light industrial usage. Small recent landfill site for mixed wastes. Moderately drained and/or moderate fertility soils. Small existing quarry or pit. Sub-economic extractable mineral resource.

Importance	Criteria	Typical Example
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying site is small on a local scale.	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral resource.

The criteria (EPA 2022) for the assessment of impacts require that likely impacts are described with respect to their extent, magnitude, type (*i.e.,* negative, positive, or neutral) probability, duration, frequency, reversibility, and trans frontier nature (if applicable). The descriptors used in this environmental impact assessment are those set out in EPA (2022) Glossary of Impacts as outlined in Chapter 1 of this EIAR. In addition, the two impact characteristics, proximity and probability, are described for each impact and these are defined in Table 8-2.

Table 8-2 Additional Impact Characteristics.

Impact Characteristic	Degree/ Nature	Description
Proximity	Direct	An impact which occurs within the area of the proposed project, as a direct result of the proposed project.
	Indirect	An impact which is caused by the interaction of effects, or by off-site developments.
Probability	Low	A low likelihood of occurrence of the impact.
	Medium	A medium likelihood of occurrence of the impact.
	High	A high likelihood of occurrence of the impact.

In order to provide an understanding of this descriptive system in terms of the geological/hydrological environment, elements of this system of description of impacts are related to examples of potential impacts on the geology and morphology of the existing environment, as listed in Table 8-3.

Table 8-3 Impact descriptors related to the receiving environment.

Impact Characteristics		Potential Geological/Hydrological Impacts
Quality	Significance	
Negative only	Profound	Widespread permanent impact on: › The extent or morphology of a designated site › Regionally important aquifers. › Extents of floodplains.

Impact Characteristics		Potential Geological/Hydrological Impacts
Quality	Significance	
		› Loss of a geologically sensitive site. › Mitigation measures are unlikely to remove such impacts.
Positive or Negative	Very Significant/ Significant	Local or widespread time dependent impacts on: › The extent or morphology of a cSAC / ecologically important area. › A regionally important geological feature (or widespread effects to minor geological features). › Extent of floodplains. › Widespread permanent impacts on the extent or morphology of a NHA/ecologically important area, › Mitigation measures (to design) will reduce but not completely remove the impact – residual impacts will occur.
Positive or Negative	Moderate	Local time dependent impacts on: › The extent or morphology of a cSAC / NHA / ecologically important area. › A minor geological feature. › Extent of floodplains. › Mitigation measures can mitigate the impact OR residual impacts occur, but these are consistent with existing or emerging trends
Positive, Negative or Neutral	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Positive, Negative or Neutral	Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Neutral	Imperceptible	No impacts, or impacts which are beneath levels of perception, within normal bounds of variation, or within the bounds of measurement or forecasting error.

8.2.5 Limitations/Difficulties Encountered

This EIAR has been prepared based on available desktop information and the site visit undertaken in October 2021. As the site is an existing operational wind farm with extensive buried utilities in place, no intrusive ground investigations were required to be carried out.

No specific limitations or difficulties were encountered in the preparation of this EIAR.

8.3 Receiving Environment

8.3.1 Site Description and Topography

The Proposed Development is situated on the slopes of the Ox Mountains, located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in Co. Sligo. the wind farm is located within 3 townlands in Co. Sligo, namely Crowagh (or Dunneill Mountain), Tawnadremira, and Ballyglass.

The Proposed Development consists of a proposed extension to the operational period of the existing Dunneill Wind Farm for an additional 15 years. Dunneill Wind Farm consists of 13 no. turbines located in two distinct cluster either side of an existing Local Access public road, with eight turbines to the north of the road and five turbines to the south of the road. As previously mentioned, the wind farm is located on the north-western slopes of the Ox Mountains and is bounded by the Dunneill River to the west of the wind farm, which forms natural boundaries along the southern and western sides of the wind farm site respectively.

The Environmental Impact Assessment Report (EIAR) Study Area for the Proposed Development is approximately 66 hectares (ha) while the total development footprint of the Proposed Development (i.e., the existing Dunneill Wind Farm) is approximately 2.8ha. The vast majority of the EIAR study area is under agricultural use for grazing and rough pasture in the north of the site, while the southern half of the site is predominantly commercial forestry.

The topography across the site slopes downwards in a northerly direction towards the coastline with a maximum elevation of approximately 190 metres Ordnance Datum (m OD) in the south of the site, between turbine T12 and T13, and a minimum elevation of approximately 110 metres Ordnance Datum (m OD) in the south of the site at T2. The predominant land use in the areas surrounding Dunneill Wind Farm is agricultural land to the north and peatland and commercial forestry to the south, with scattered one-off housing and small developments.

The Proposed Development contains approximately 3.3 km of site roads, constructed of consolidated gravel with a running width of 5m. Access to the site for general traffic such as maintenance vehicles is via the current existing entrances to the northern and southern halves of the wind farm site from a third-class/local road that bisects the site. The site comprises two distinct areas, north and south of the unnamed third-class road. This unnamed third-class road can be accessed from the L2702 Local Access Road to the west which runs in a north-south direction between Dunneill and the N59 National Road to the north. The location of the Proposed Development and site topography is shown on Figure 8-1.

8.3.2 Soils and Subsoils

According to GSI Mapping (www.gsi.ie) the Proposed Development is dominated by two soil types: blanket peats (BktPt) and poorly drained mineral soils (mainly acidic in nature [AminPD]). There is also a small band of alluvially derived mineral sediment (AlluvMIN) along the Dunneill River. Blanket peat soils dominate the site, with the poorly drained mineral soils being more prevalent in the northern portion of the site. The band of alluvially derived mineral sediment associated with the Dunneill River runs in a south-north direction to the west of the wind farm.

GSI mapping for the site indicates that the majority of the site is underlain by schist and pebble beds (UMme). The southwest boundary of the site is formed naturally by the Ox Mountains, which are underlain by schists and granites, with occasional rocky outcrops.

The Teagasc soils map (www.gis.teagasc.ie/soils/map) identifies the soil associations within the wider region of the site as a mix between peaty soils and fine loamy soils over shale and slate bedrock. These soils are generally not very well drained and not well suited to intensive agricultural practices. Previous

investigation of the site reported that soil depths were measured at any depth from 0.2 m to more than 1.5 m. The local subsoils map is shown on Figure 8-2.

It was noted during the site walkover that most of the northern part of the site is under agricultural use for pasture and rough grazing, while the southern part of the site is used for commercial forestry. Low levels of soil erosion are likely due to farm and forestry machinery action.

8.3.2.1 Bedrock Geology

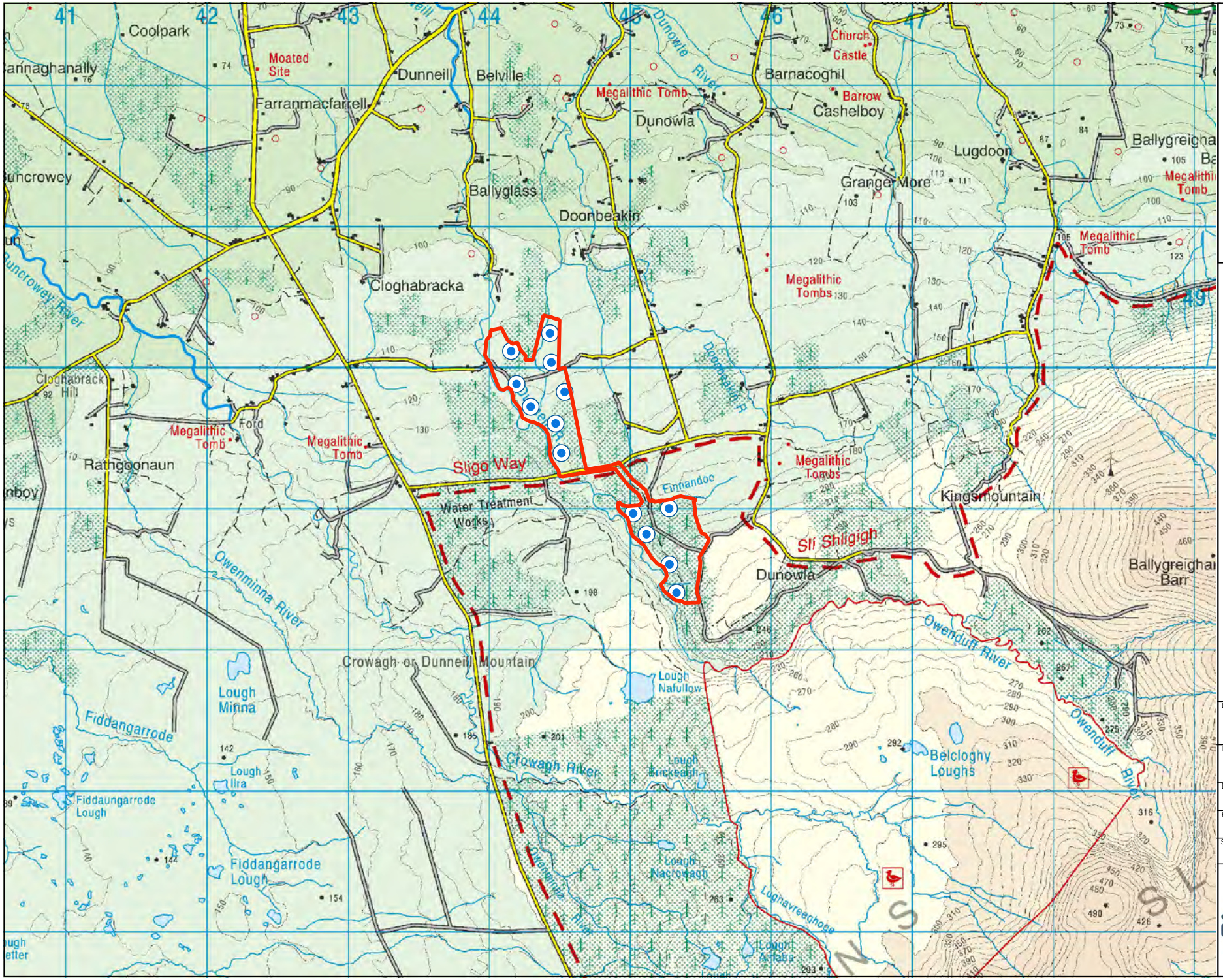
Based on the GSI bedrock map of the region, the site of the Proposed Development is underlain by Glencar Limestone Formation (CDGCAR) which consists of fine limestones and calcareous shale. The Glencar Formation is classified by the GSI as being a locally important aquifer which is generally moderately productive.

A bedrock geology map of the area is included as Figure 8-3. The bedrock and aquifer receptors at and adjacent the subject development is considered of Moderate value.

8.3.2.2 Geological Heritage and Designated Sites

There is one recorded Geological Heritage site within the wider area surrounding Dunneill Wind Farm. The Easky River solifluction lobe (SO005) is located approximately 7km southwest of the EIAR Study Area. The site consists of a lobed surface deposit of unconsolidated material at the foot of a hillslope. This is a nationally important natural geological structure due to its unique formation.

The location of this geological heritage site in relation to the Proposed Development is provided on Figure 8-4. There are a number of designated sites (both national and EU Natura 2000 sites) located within proximity of Dunneill. A small portion of the Ox Mountains Bogs Special Area of Conservation (SAC) overlaps with the Dunneill Wind Farm site boundary, while the majority of the SAC is located directly south of the site, as shown in Figure 8-4 below. Further assessment of potential impacts to designated sites are included in Chapter 6: Biodiversity and Chapter 7: Ornithology of this EIAR.



Map Legend

- EIAR Site Boundary
- Permitted Turbines

N

Drawing Title

Site Topography

Project Title	SSE Dunniell Wind Farm, Co. Sligo
Drawn By: NMCH	Checked By: LM
Project No.: 210207	Drawing No.: 8-1
Scale: 1:35,000	Date: 2022-08-02

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Map Legend

- EIAR Site Boundary
- Dunneil Wind Farm Footprint
- Existing Dunneil Turbines
- Existing Turbine Hardstands

Local Subsoils

- A - Alluviuam Undiferentiated
- BktPt - Blanket Peat
- TMp - Metamorphic Till

N

Drawing Title

Local Subsoils

Project Title

Dunneill Wind Farm

Drawn By	Checked By
DN	MW
Project No.	Drawing No.
210207	Figure 8-2
Scale	Date
1:15000	10.05.22

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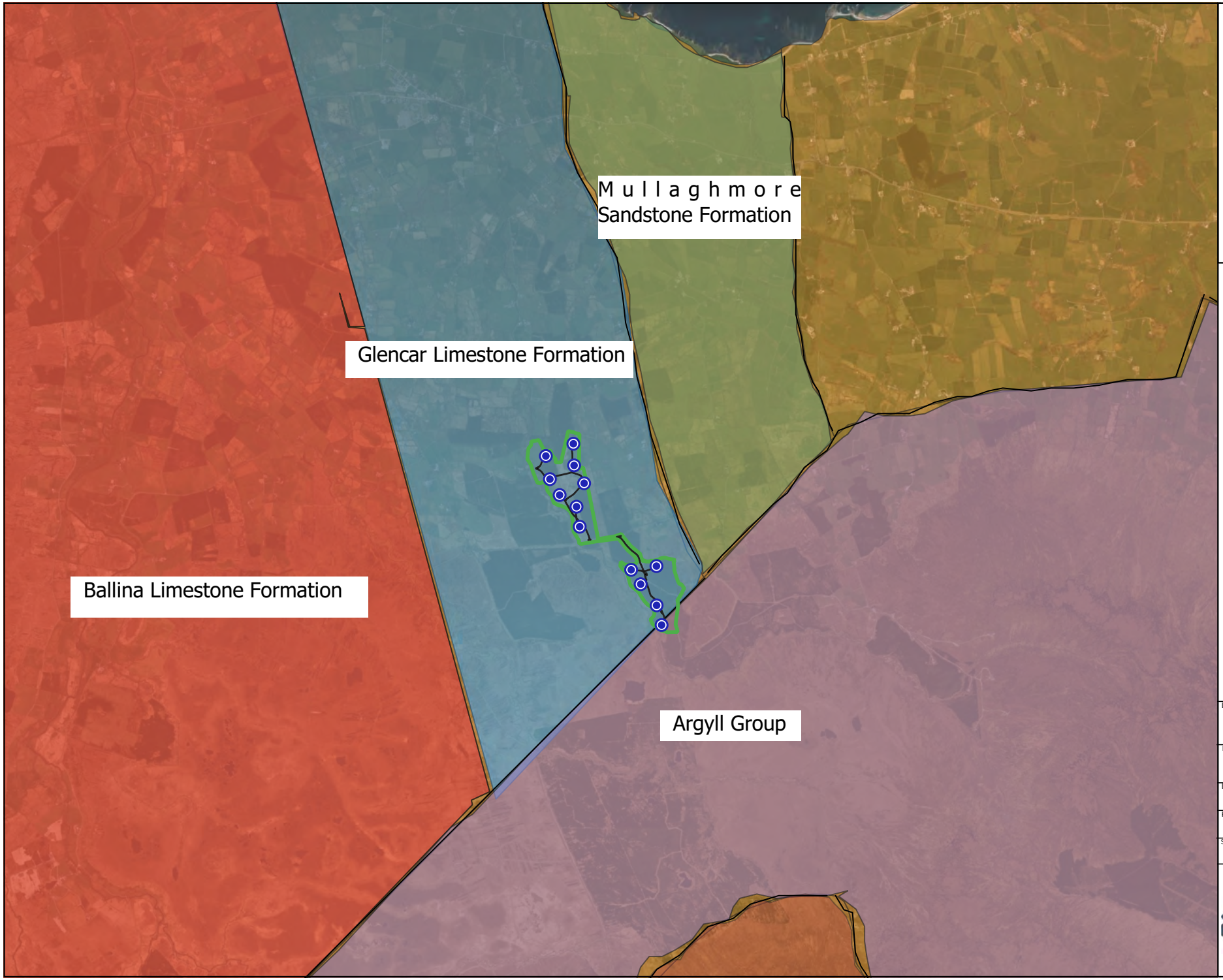

Map Legend

EIAR Site Boundary

Bedrock Geology

- Glencar Limestone Formation
- Argyll Group
- Ballina Limestone Formation
- Mullaghmore Sandstone Formation

N

Drawing Title

Bedrock Geology

Project Title

Dunniell Wind Farm, Co. Sligo

Drawn By	Checked By
NMCH	DN
Project No.	Drawing No.
210207	Figure 8-3
Scale	Date
1:50000	2022-05-10

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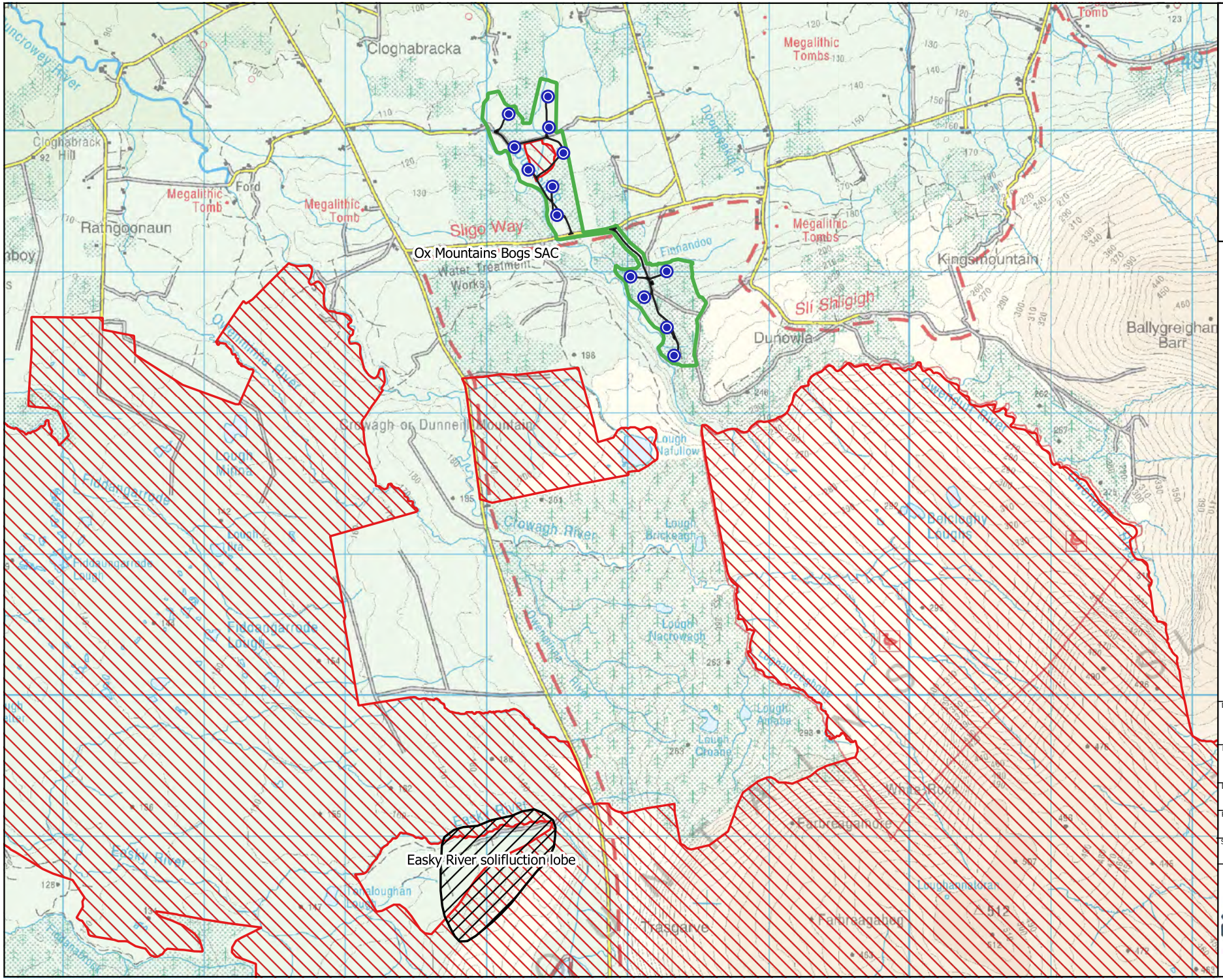

Map Legend

- EIAR Study Area
- Existing Dunneill Turbines
- Existing Dunneill Footprint
- Ox Mounatins Bog SAC - Special Area of Conservation
- Geological Heritage Site - Easky River Solifluction Lobe (SO005)

N

Drawing Title
Geological Heritage and Designated Sites

Project Title
Dunniell Wind Farm, Co. Sligo

Drawn By	Checked By
NMCH	DN
Project No.	Drawing No.
210207	Figure 8-4
Scale	Date
1:35000	2022-05-10

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8.3.2.3 Soil Contamination

According to the EPA online mapping (https://gis.epa.ie/EPAMaps), there are no licenced waste facilities on or within the immediate environs of the Proposed Development.

There are no historic mines at or in the immediate vicinity of the site that could potentially have contaminated tailings. The site walkover survey did not identify any evidence of potential soil contamination at or adjacent the Proposed Development and there is no record from the existing wind farm's operational phase of any environmental incidents with the potential to cause soil contamination.

8.3.2.4 Economic Geology

The GSI Online Minerals Database accessed via the Public Data Viewer shows no commercial pits or quarries within the vicinity of the Proposed Development.

The GSI online Aggregate Potential Mapping Database shows that the Proposed Development is not located within an area mapped as being of 'Very High' or 'High' granular aggregate potential (i.e., potential for gravel reserves considered Low).

8.4 Characteristics of the Development

The Proposed Development consists of a 13 no. turbine wind energy development, constructed in 2010. The 13 no. turbines are all Vestas V52 model with a combined maximum total capacity of 11 megawatts (MW). The turbines have a hub height of 49m a rotor diameter of 52m and a tip height of 75m. The existing operational wind farm includes a control building, site roads, a met mast and associated underground internal cabling. The Proposed Development is connected to the National Grid via an onsite 20kV substation and 20kV underground cable to the Cunghill 110kV Substation (approximately 20km southeast of the Proposed Development). However, it should be noted that as the grid connection does not form part of the Proposed Development, as defined in Chapter 4 of this EIAR, and does not form part of the accompanying planning application. The grid connection is assessed as a cumulative project only within this EIAR.

The original construction of the wind farm in 2010 required the excavation of soil and subsoil to facilitate turbine foundation construction and trenching from the cable ducts. Significant excavations were not required, and as confirmed during the site walkover in October 2021, all disturbed areas appear to have been returned to their pre-construction grades.

8.5 Likely, Significant Impacts and Mitigation Measures Implemented

8.5.1 Do-Nothing Scenario

The 'Do-Nothing' scenario entails the decommissioning of the existing wind farm once the current planning permission expires (2024) and restoration of the site to its original use as agricultural lands for pasture and crops.

Condition 10 of the original Planning Application to Sligo County Council (Ref: PL 03619) states the following in relation to the decommissioning of the wind farm:

> *'Upon termination of the use of the wind farm, the mast and turbines shall be dismantled and removed from the site and the site shall be restored to its existing condition in consultation with the planning authority. Prior to the commencement of development, the developer shall lodge with the planning authority, a cash deposit, a bond of an insurance company, or other*

security to secure the satisfactory reinstatement of the site on the cessation of the project. The amount of the security shall be 100,000 euro'.

Should the Decommissioning Plan as set out in the Planning Conditions for Dunneill Wind Farm be implemented it may lead to environmental effects on geology and soils due to the potentially extensive ground works required to remove existing access tracks and the turbine foundations. Local subsoils are not expected to be significantly affected during these potential decommissioning works, however a more environmentally sensitive approach is outlined for the end of the proposed extended operational period (i.e., in 15 years), as set out below. The effect of decommissioning is considered to have a long-term, slight negative impact in the context of this EIAR.

8.5.2 Construction Phase Impacts

As the Proposed Development consists of an extension to the operational period of an existing wind farm, no construction related excavations, groundworks or other intrusive works are planned. Therefore, **no impacts or significant effects** to the subsurface environment (soils or geology) will occur.

8.5.3 Operational Phase Impacts

No impacts on soils and geology have occurred, or are anticipated, during the operational phase. The operational phase of the development will not involve any disturbance to the topsoil, subsoils or geology of the area. Routine operational and maintenance works are anticipated to be required throughout the lifespan of the Proposed Development. These works are likely to include minor upgrades or replacements of turbine components, and mechanical/electrical components related to the control building. There is potential for limited use of plant and machinery as part of this maintenance work. There would be **no significant impacts** on soils and geology associated with any future maintenance works.

8.5.3.1 Contamination of Soil by Leakages and Spillages

During routine maintenance works plant and machinery may require refueling on-site and so hydrocarbons may be present. Managed incorrectly, there is the risk of spills and leaks associated with these operations impacting on land and soils.

Pathway: Topsoil, subsoil and bedrock pore space.

Receptor: Topsoil, subsoil and bedrock.

Potential Impact: Negative, direct, slight, short term, medium probability impact on topsoil, subsoils and bedrock.

Mitigation Measures

- All plant and machinery to be serviced before being mobilised to site;
- No plant maintenance completed on-site, any broken-down plant removed from site to be fixed;
- Refuelling completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas away from open water;
- Only designated trained operators authorised to refuel plant on-site;
- Procedures and contingency plans set up to deal with emergency accidents or spills; and,

- Highest standards of site management maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during works.

Residual Impact

The implementation of the above mitigation measures will result in a residual **Imperceptible, Negative direct, short term, unlikely impact** to land, topsoil, subsoils or bedrock. There was no recorded or observed evidence of storage of significant quantities of hydrocarbons or other chemicals, nor any leakages or spillages of hydrocarbons during the site walkover.

Significance of Effects

Based on the assessment above **No Significant Effects** on land, topsoil, subsoils or bedrock as a result of leakages or spillages due to future maintenance works are expected.

Significance of Effects

No Significant Effects on land, soils and geology environment are envisaged during the operational stage of the Proposed Development.

8.5.4 Decommissioning Phase

The potential impacts associated with future decommissioning of the Proposed Development in circa 15 years will be similar to those associated with a typical wind farm construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.8 of this report.

During decommissioning, it may be possible to reverse or at least reduce some of the potential impacts caused during the initial construction of the wind farm by rehabilitating construction areas such as turbine bases and hard standing areas. This will be done by covering with local topsoil and reseeding with a local native mix to encourage vegetation growth and reduce run-off and sedimentation.

Condition 10 of the original Planning Application (Ref: PL 03619) is set out in Section 8.5.1 above.

It is considered that this Condition is not appropriate, from an environmental perspective, for the Proposed Development. Upon decommissioning of the Proposed Development, the wind turbines will be disassembled in reverse order to how they were erected. All above-ground turbine components will be separated and removed off-site for reuse or recycling. The disassembly and removal of the turbines will not have an impact on the subsurface environment (soils and geology) at the site.

It is proposed to leave turbine foundations in place underground and to cover with earth and reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environmental nuisances such as noise, vibration and dust.

It is proposed to leave underground cables in place where they are unlikely to be impacted by typical agricultural and forestry works. It is proposed that site roadways will be left in situ, as appropriate, to facilitate access for agricultural and commercial forestry lands. A decommissioning plan will be agreed with the local authority at least three months prior to decommissioning of the Proposed Development.

Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude. Mitigation measures, as outlined in Section 8.5.3.1, will be implemented during the future decommissioning phase to avoid any potential impacts.

However, as noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made far in advance, so within the extended 15-year lifespan of the Proposed Development, technological advances and preferred approaches for reinstatement may change. According to the SNH guidance, it is, therefore:

> *'Best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm'.*

No significant effects on the subsurface soils and geology are envisaged during the decommissioning stage of the Proposed Development.

8.5.5 Potential Cumulative Impacts

Potential cumulative effects on geology and soils between the Proposed Development and other developments in the vicinity, including those listed in Section 2.7.2 of this EIAR, were also considered as part of this assessment. The nearest wind energy development to Dunneill is the existing Kingsmountain Wind Farm, located approximately 2km east-southeast of the Proposed Development. The Kingsmountain development was also subject to an EIA that identified mitigation measures to ensure that no significant impact to land, soils or geology would occur.

Beyond cumulative wind farm assessment in the study area, the existing 20kV underground grid connection cable was also assessed for potential effects upon soils and geology. The grid connection is composed of approximately 21km of buried 20kV transmission line from the onsite 20kV substation at Dunneill wind farm to the existing Cunghill 110kV substation, to the southeast of Dunneill. The grid connection is an existing linear infrastructure and there are no associated potential impact pathways which could lead to significant effects in combination with the Proposed Development.

Due to the limited scale of other developments in the vicinity, there is little potential for significant impacts to land, soil, and geology resulting from those developments. The Proposed Development does not involve any construction or excavation works, and there is no potential for significant impacts to land, soil, and geology. Therefore, **no significant cumulative impacts** on land, soils and geology environment are anticipated during the continued operational and decommissioning phases of the Proposed Development.

8.5.6 Summary

The Proposed Development (extension of operation for Dunneill Wind Farm) does not involve any construction works, including excavations or otherwise, that may have the potential to impact local soils or underlying geology. Historically, groundworks including excavations for turbine foundations, and trenching for laying of cables, formed part of the construction of the wind farm in 2010.

During the site walkover a portion of the northern part of Dunneill was observed to be in use for agriculture (pasture and rough grazing) with some limited soil erosion evident along tracks and margins due to farming activity.

Storage and handling of small quantities of hydrocarbons/chemicals may be required during the operational and decommissioning phases however **No Significant Effects** are likely.

No Significant Impacts to the land, soil and geology at the site have occurred, or are anticipated, as a result of the proposed extension of the wind farm's operational phase.

9. WATER

9.1 Introduction

9.1.1 Background and Objectives

McCarthy Keville O'Sullivan (MKO), on behalf of Brickmount Ltd., has carried out an assessment of the proposed extension of duration of the existing Dunneill Wind Farm, at Dromore West, Co. Sligo (the Proposed Development), on water (hydrology and hydrogeology).

The Applicant plans to continue to utilise the existing site as an operational 13 No. turbine wind farm to generate renewable energy for export to the National Grid, for a period of a further 15 years. No new construction or significant project alterations are proposed beyond routine operation and maintenance activities.

This Environmental Impact Assessment Report (EIAR) chapter provides a baseline assessment of the environmental setting of the Proposed Development in terms of hydrology and hydrogeology and discusses the potential likely significant effects of extending the wind farm's operational life. The objectives of this assessment area to:

- Produce a baseline study of the existing water environment (surface and groundwater) in the area of the Proposed Development;
- Identify likely positive and negative impacts of the development on surface and groundwater during construction and operational phases of the development;
- Identify mitigation measures implemented to avoid, reduce, or offset significant negative impacts;
- Assess significant residual impacts and effects;
- Assess cumulative impacts of the Proposed Development along with other local infrastructure developments.

9.1.2 Statement of Authority

This section of the EIAR has been prepared by Niamh McHugh and David Naughton and reviewed by Thomas Blackwell, of MKO. Niamh is an Environmental Scientist and holds a BSc (Hons) in Environmental Science and has been involved in the production of a number of EIARs for large-scale developments. Since joining MKO Niamh has been involved in a range of projects, working as part of a large multi-disciplinary team to produce EIA Reports. David is an Environmental Scientist with over five years of consultancy experience with MKO and has been involved in a number of EIAR applications, predominantly in renewable energy, namely onshore wind. David has worked as project manager for a number of EIAR applications, providing a pivotal link liaising between the applicant and the EIAR project team to ensure all work is carried out to a high standard. David holds a BSc (Hons) in Environmental Science.

Thomas Blackwell is a Senior Environmentalist with MKO with over 15 years of progressive experience in environmental consulting. Thomas holds a BA (Hons) in Geography from Trinity College Dublin and a M.Sc. in Environmental Resource Management from University College Dublin. Prior to taking up his position with MKO in August 2019, Thomas worked as a Senior Environmental Scientist with HDR, Inc. in the United States and held previous posts with private consulting firms in both the USA and Ireland.

9.1.3 Scoping and Consultation

The scope for this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process is outlined in Section 2.6 of this EIAR. Issues and concerns highlighted with respect to local water sources are summarised in Table 9-1 below.

Table 9-1 Summary of Water Environment related Scoping Responses

Consultee	Description	Addressed in Section
Geological Survey of Ireland (GSI)	Recommended the use of their Groundwater Data Viewer in the compilation of the EIAR Chapter	9.3.4
Health Service Executive (HSE)	The EIAR should note any changes which have occurred in the receiving environment since the construction of the wind farm, including the addition of any new housing developments or the addition of additional sensitive receptors into the locality.	n/a
Inland Fisheries Ireland (IFI)	Particular attention should be given to potential impacts the wind farm extension of duration would have on the aquatic and riparian systems associated with the Dunneill River and Fiddandoo River The assessment should pay particular attention to assessing the existing drainage network and associated infrastructure. All waterbodies which are receiving drainage from the site should be assessed in terms of biodiversity	6.7, 9.3.3
Irish Water (IW)	No response received at the time of report issue.	n/a
Sligo County Council, Water Services	No response received at the time of report issue.	n/a

9.1.4 Relevant Legislation

This EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

Regard has also been taken of the requirements of the following legislation (where relevant) as it pertains to the water environment:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1994, S.I. No. 101 of 1996, S.I. No. 351 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001, S.I. 134 of 2013 and the Minerals Development Act 2017), the Planning and

Development Act 2000 (as amended), and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/337/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;

- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Act, 2000, as amended;
- S.I. No 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law;
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy) and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) establishing a framework for the Community action in the field of water policy and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. Since 2000 water management in the EU has been directed by the Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU ("WFD"). The WFD was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003
- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations 2017, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);S.I. No. 106 of 2007: European Communities (Drinking Water) Regulations 2007and S.I. No. 122 of 2014: European Communities (Drinking Water) Regulations 2014, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the "Drinking Water Directive") and EU Directive 2000/60/EC;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended by S.I. No. 389/2011; S.I. No. 149/2012; S.I. No. 366/2016; the Radiological Protection (Miscellaneous Provisions) Act 2014; and S.I. No. 366/2016); and,

9.1.5 Relevant Guidance

The water section of the EIAR is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) where relevant;
- Environmental Protection Agency (September 2015): Draft – Revised Guidelines on the Information to be Contained in Environmental Impact Statements where relevant;
- European Commission (2017) Guidance on Screening;
- European Commission (2017) Guidance on Scoping;

- European Commission (2017) Guidance on the preparation of the Environmental Impact Assessment Report;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016);
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006); and,
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

9.2 Methodology

9.2.1 Desk Study & Preliminary Hydrological Assessment

A desk study and preliminary hydrological assessment of the site of the Proposed Development and the surrounding study area (i.e., lands within the immediate vicinity of the wind farm) was completed in advance of the site walkover. This involved collection of all relevant geological, hydrological, hydrogeological and meteorological data for the area. This included review of the following sources:

- Environmental Protection Agency (EPA) Maps application (https://gis.epa.ie/EPAMaps/);
- Geological Survey of Ireland (GSI) - Groundwater Database (www.gsi.ie);
- GSI – Groundwater Wells and Springs database (https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx#Wells)
- GSI – 1:500,000 scale bedrock geology map of Ireland (https://www.gsi.ie/en-ie/data-and-maps/Pages/Bedrock.aspx)
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- EPA/Water Framework Directive Map Viewer (www.catchments.ie);
- OPW Flood Hazard Mapping (www.floodinfo.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

9.2.2 Site Investigations

A visual inspection of the existing Dunneill Wind Farm and surrounding area, including drainage mapping, was undertaken by MKO on the 12th of October 2021. The purpose of the site inspection was to investigate the site for any indications of residual impacts to the water environment resulting from the historic construction and operation of the wind farm.

Particular attention was paid to identifying existing site drainage, drainage patterns, watercourses, water flow directions and any other notable hydrological features.

Limited relevant historic site data was also available from the Environmental Impact Statement (EIS) for Dunneill Wind Farm (Airtricity Developments (Ireland) Ltd, 2003).

9.2.3 Impact Assessment Methodology

Please refer to Chapter 1 of the EIAR for details on the impact assessment methodology (EPA, 2002, 2003, 2015, 2017 and 2022). In addition to the above methodology, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of sensitivity which are defined in Table 9-2 are then used to assess the potential effect that the Proposed Development may have on them.

Table 9-2: Receptor Sensitivity Criteria (Adapted from www.sepa.org.uk)

Sensitivity of Receptor	
Not sensitive	Receptor is of low environmental importance (e.g. surface water quality classified by EPA as A3 waters or seriously polluted), fish sporadically present or restricted. Heavily engineered or artificially modified and may dry up during summer months. Environmental equilibrium is stable and is resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. GSI groundwater vulnerability "Low" – "Medium" classification and "Poor" aquifer importance.
Sensitive	Receptor is of medium environmental importance or of regional value. Surface water quality classified by EPA as A2. Salmonid species may be present and may be locally important for fisheries. Abstractions for private water supplies. Environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. GSI groundwater vulnerability "High" classification and "Locally" important aquifer.
Very sensitive	Receptor is of high environmental importance or of national or international value i.e. NHA or SAC. Surface water quality classified by EPA as A1 and salmonid spawning grounds present. Abstractions for public drinking water supply. GSI groundwater vulnerability "Extreme" classification and "Regionally" important aquifer

9.3 Receiving Environment

9.3.1 Site Description, Land and Topography

The Proposed Development is situated on the slopes of the Ox Mountains, located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in Co. Sligo. The wind farm is located within 3 townlands in Co. Sligo, namely Crowagh (or Dunneill Mountain), Tawnadremira, and Ballyglass.

The Proposed Development consists of a proposed extension to the operational period of the existing Dunneill Wind Farm for an additional 15 years. Dunneill Wind Farm consists of 13 no. turbines located in two distinct cluster either side of an existing Local Access public road, with eight turbines to the north of the road and five turbines to the south of the road. As previously mentioned, the wind farm is located on the north-western slopes of the Ox Mountains and is bounded by the Dunneill River to the west of the wind farm. A tributary of the Dunneill River, the Finandoo stream, bisects the development in an east-west direction.

The Environmental Impact Assessment Report (EIAR) Study Area for the Proposed Development is approximately 66 hectares (ha) while the total development footprint of the Proposed Development (i.e., the existing Dunneill Wind Farm) is approximately 2.8ha. The vast majority of the EIAR study

area is under agricultural use for grazing and rough pasture in the north of the site, while the southern half of the site is predominantly commercial forestry.

The topography across the site slopes downwards in a northerly direction towards the coastline with a maximum elevation of approximately 190 metres Ordnance Datum (m OD) in the south of the site, between turbine T12 and T13, and a minimum elevation of approximately 110 metres Ordnance Datum (m OD) in the south of the site at T2. The predominant land use in the areas surrounding Dunneill Wind Farm is agricultural land to the north and peatland and commercial forestry to the south, with scattered one-off housing and small developments.

The Proposed Development contains approximately 3.3 km of site roads, constructed of consolidated gravel with a running width of 5m. Access to the site for general traffic such as maintenance vehicles is via the current existing entrances to the northern and southern halves of the wind farm site from a third-class/local road that bisects the site. The site comprises two distinct areas, north and south of the unnamed third-class road. This unnamed third-class road can be accessed from the L2702 Local Access Road to the west which runs in a north-south direction between Dunneill and the N59 National Road to the north.

Due to the specific nature of the Proposed Development there is a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the Proposed Development does not necessitate a potable source. In place for a potable source, the staff facilities of the Proposed Development are serviced by the harvesting of rainwater from the roof of the buildings, and when necessary, bottled water is supplied for drinking.

Wastewater management from the staff welfare facilities in the control buildings are managed by means of a sealed foul waste holding tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. Wastewater is not treated on-site, and therefore the EPA's 2009 '*Code of Practice: Wastewater Treatment and Disposal Systems Servicing Single Houses (p.e. 10)*' does not apply. Similarly, the EPA's 1999 manual on *'Treatment Systems for Small Communities, Business, Leisure Centres and Hotels'* also does not apply, as it too deals with scenarios where it is proposed to treat wastewater on-site.

This method of treating wastewater arising on-site is deemed best practice on wind farm sites, which have often been located in areas where finding the necessary percolation requirements for on-site treatment would be challenging and has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal.

9.3.2 Water Balance

Long term rainfall and evaporation data was sourced from Met Éireann. The 30-year annual average rainfall (AAR) (1981 – 2010) data from the Met Eireann weather station at Belmullet, Co. Mayo are presented in table 9-3. The Belmullet weather station is located approximately 92 km west of the Proposed Development and is the closest weather station for which long-term averages are available.

The closest synoptic station where the average potential evapotranspiration (PE) is recorded is at Belmullet, Co. Mayo also. The long-term average PE for this station is 508.9 millimeters per year (mm/yr). this value is used as a best estimate of the site PE. Actual Evaporation (AE) at the site is estimated as 483.5mm/yr (which is 0.95 x PE).

Table 9-3: Local Average long-term Rainfall Data (mm)

Station		Easting (IG)		Northing (IG)		Ht (mOD)		Opened		Closed		
Belmullet		68615		313459		67		1956		N/A		
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	**Mean AAR (mm)**
134	97	99	72	70	72	79	102	102	146	134	137	**104**

The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the site is calculated as follows:

Effective rainfall (ER) = AAR – AE = 1,248mm/yr – 483.5mm/yr = 764.5mm/yr

Based on recharge coefficient estimates from the GSI (www.gsi.ie), 22.5% recharge is reported for the majority of the Proposed Development site (Dunneill Wind Farm) while the northern section of the site which houses turbines no 1 – no. 6 has a recharge coefficient of 10%. This means that 22.5% or 10% of the effective rainfall in each respective area infiltrates into the ground and becomes groundwater, the remaining 77.5% or 90% of the effective rainfall will runoff as surface water into rivers, lakes and streams.

Based on the recharge coefficient, the annual recharge and runoff rates for the Proposed Development (i.e., Existing Dunneill Wind Farm) are estimated to be 172mm/yr or 76.5mm/yr; and 592.5mm/yr or 688mm/yr respectively.

9.3.3 Surface Water

9.3.3.1 Regional and Local Hydrology

The entire site of the Proposed Development lies within the Western River Basin District (RBD). With respect to regional hydrology, under the Water Framework Directive (WFD) the proposed Development is located entirely within the Sligo Bay (35) surface water catchment. The Proposed Development site is located within 1 no. regional surface water sub-catchment, the Dunmoran_SC_010 sub-catchment. Bordering sub-catchments include Easky_SC_010 and Owenmore (Sligo)_SC_040 beyond the west and south respectively. A regional hydrology map is shown as Figure 9-1

9.3.3.2 Local and Site Drainage

The nearest named watercourse to the Proposed Development is the Dunneill River System, a river which has its origins in the Ox Mountains and flows northwards into Sligo Bay 13.5 km north of Templeboy village. The Dunneill River is located approximately 74 meters from the nearest turbine (T13) at its closest point. A tributary of the Dunneill River, the Finandoo stream, bisects the development in an east-west direction, with the access road to the southern section of Dunneill Wind Farm crossing this stream.

Three existing shallow surface streams and drainage crossings were also recorded within the wind farm site. One stream is located in the north of the wind farm, along the access road between turbine T3 and T4 (ITM E544370 N829954) and runs in a south-north direction towards Doonbeakin river to the north of the wind farm which ultimately drains into Sligo Bay. The other two watercourse crossing are located in the south of the site, both of which run in an east-west direction, draining into Dunneill River. The grid coordinates for these locations are ITM E545075 N829051 along the main access road towards the

southern section of the wind farm and ITM E545324 N828482 along the access track between Turbine T12 and T13.

Surface water runoff on the Proposed Development site typically drains in a west-northwest direction towards the Dunneill River. There are a number of manmade drainage channels (farmland) and smaller unnamed streams which originate from local springs in the northern section of the site, with fewer streams in the southern half due to topography and use of the site for commercial forestry. There are 6 no. springs in total although one of these is outside the EIAR Study Area (see Figure 9-2), to the north, while the others are located within the aquatic areas (wetland habitat), away from existing wind farm infrastructure. A local hydrology map is presented as Figure 9-2, while the EIAR Study Area is defined in Chapter 1 of this EIAR.

Due to the nature of the Proposed Development, there is a very small water requirement, primarily for staff facilities. In place for a potable source, the staff facilities of the Proposed Development are serviced by the harvesting of rainwater from the roof of the buildings, and when necessary, bottled water is supplied for drinking. Irish water lists no existing water connection to the Proposed Development.

Wastewater management from the staff welfare facilities in the control buildings are managed by means of a sealed foul waste holding tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. Wastewater is not treated on-site, and therefore the EPA's 2009 '*Code of Practice: Wastewater Treatment and Disposal Systems Servicing Single Houses (p.e. 10)*' does not apply. Similarly, the EPA's 1999 manual on *'Treatment Systems for Small Communities, Business, Leisure Centres and Hotels'* also does not apply, as it too deals with scenarios where it is proposed to treat wastewater on-site.

9.3.3.3 Flood Risk Identification

OPW's indicative river and coastal flood map (www.floodinfo.ie), CFRAM Preliminary Flood Risk Assessment (PFRA) maps which can be accessed at the Department of Environment, Community and Local Government on-line planning mapping (www.myplan.ie), and historical mapping (i.e. 6" & 25" base maps) were consulted to identify those areas as being at risk of flooding.

There are no flood incidents recorded within the vicinity of the Proposed Development on the OPW's indicative river and coastal flood map. Please note that not all local flooding issues are recorded on the OPW database.

The Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie) has areas along the coastline (adjacent to the east and south/southwest of the site) indicated as within the "coastal flood hazard" scenario. This mapping shows the extent of the indicative 100-year coastal flood zone. The identified areas are confined to the coastline and do not extend into the site boundary. There are no fluvial or pluvial flood zones identified on the PFRA mapping within the vicinity of the site.

Historical 6" and 25" maps for the proposed route were consulted to identify areas that are "prone to flooding". There are no areas within the vicinity of the Proposed Development identified as prone to flooding shown in the historical mapping. Based on the above information there is low potential risk of flooding at the development site.

Map Legend

- EIAR Site Boundary
- WFD_Subcatchments

N

Drawing Title: Regional Hydrology

Project Title: SSE Dunniell Wind Farm, Co. Sligo

Drawn By	Checked By
NMCH	LM
Project No.	**Drawing No.**
210207	9-1
Scale	**Date**
1:55,000	2022-08-02

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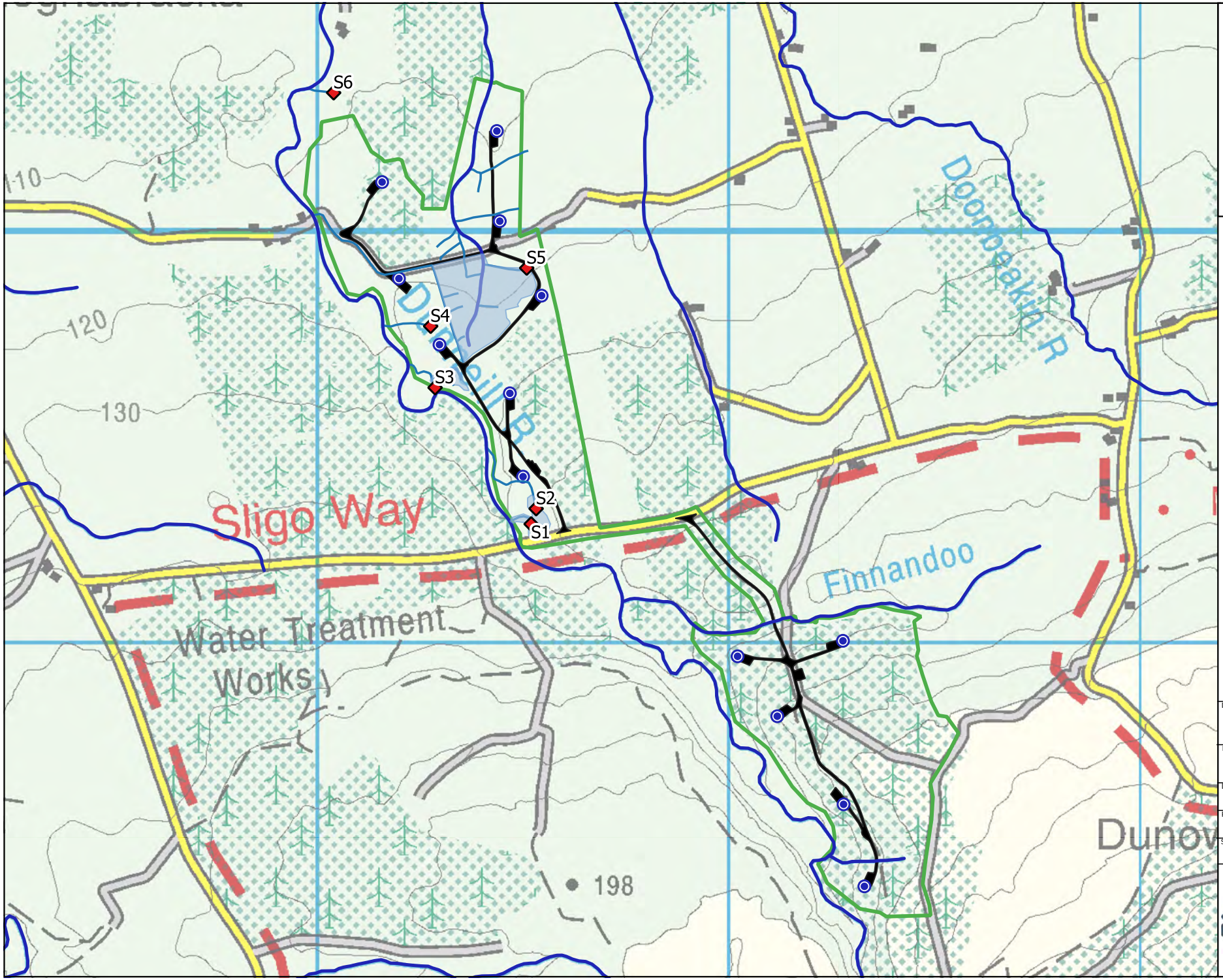

Map Legend

- EIAR Study Area
- Existing Dunneill Turbines
- Existing Dunneill Footprint
- Aquatic Zones - Wetland
- Local Springs

N

Drawing Title: Local Drainage and Hydrology

Project Title: Dunniell Wind Farm, Co. Sligo

Drawn By	Checked By
NMCH	DN
Project No.	Drawing No.
210207	Figure 9-2
Scale	Date
1:12000	2022-05-11

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9.3.3.4 Surface Water Hydrochemistry

The Environmental Protection Agency's (EPA) Quality Rating System (Q-Rating) is a biotic index used to rate the ecological quality of streams and rivers. The rating system assigns streams a Q-Value of between 1 and 5, with 1 indicating bad ecological quality and 5 indicating the highest ecological quality. The nearest EPA monitoring points to the Proposed Development are located on the Dunneill River and the Doonbeakin stream. The Dunneill River Station is located on the local road bridge over the Dunneill River, immediately adjacent to and west of the wind farm site. The latest Q-Value from 2021 shows a score of 4-5 (High Water Quality) for Dunneill River. The Doonbeakin stream station is located approximately 850m northeast of the nearest turbine (T2). The latest Q-Value from 2006 shows a score of 4 (Good Water Quality) for the Doonbeakin stream. These watercourses are not expected to be affected by the continued operation of the existing Dunneill Wind Farm due to the fact that the wind farm has been in operation since 2010 and there are no additional groundworks proposed. No surface water sampling was performed on the site of the Proposed Development as it was not deemed to be a requirement due to the absence of any construction works or activities associated with the Proposed Development which could impact upon water quality.

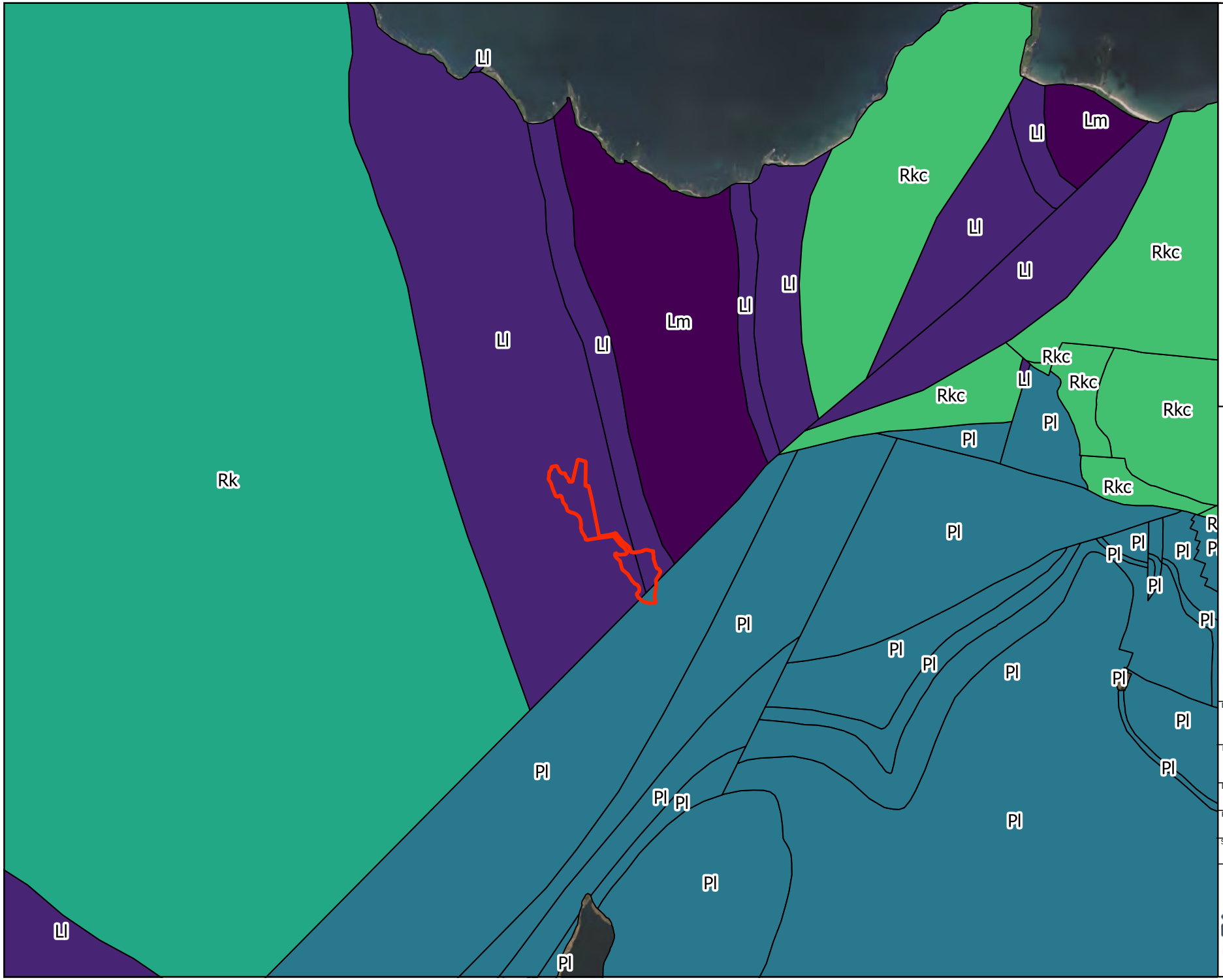
9.3.4 Groundwater

9.3.4.1 Hydrogeology

Based on the GSI bedrock map of the region, the Proposed Development is underlain by the Glencar Limestone Formation (CDGCAR), which consists of calcareous shales and limestones, and the Benbulben Shale Formation (CDBENS), which consists of calcareous shales. These two bedrock formations are classified as often difficult to differentiate between and appearing to interfinger together. These rock formations are classified by the GSI as 'Locally important aquifers – bedrock which is moderately productive only in local zones.' This aquifer classification extends northwards from the site towards Dromore West and Templeboy village as far as the coastline. A bedrock aquifer map is shown as Figure 9-3.

The Proposed Development is underlain by the generally poorly productive Collooney Water Body (GWB) as delineated by the EPA/GSI. The Collooney GWB is characterised by the mountainous terrain of the Ox Mountains range, which runs along the spine of the GWB. While there is no data specific to the bedrock of Collooney GWB, data in the neighbouring Foxford GWB indicate low transmissivities, in the range of 0.1-10 m^2/d. effectives thickness of the GWB is estimated to range between 0-7 meters. The depth to which groundwater varies in the Proposed Development was not noted as part of the original EIS prepared for the Dunneill Wind Farm below ground level (bgl). The groundwater flow, however, is known to generally flow to the north.

A regional groundwater body map is provided as Figure 9-4.


Map Legend
EIAR Site Boundary
Bedrock Aquifers
(LM) Locally Important Aquifer - Bedrock which is Generally Moderately Productive
(LI) Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
(PI) Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
(Rkc) Regionally Important Aquifer - Karstified (conduit)
(Rk) Regionally Important Aquifer - Karstified
LI
Lm
Rkc
Rk
Pl
N
O
Ordnance Survey Ireland Licence No. AR 0021821
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Drawing Title
Bedrock Aquifer Map
Project Title
Dunniell Wind Farm, Co. Sligo
Drawn By
NMCH
Checked By
LM
Project No.
210207
Drawing No.
9-3
Scale
1:70000
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Map Legend

- EIAR Site Boundary

WFD Groundwater Bodies

- Groundwater Body - Collooney
- Groundwater Body - Ballygawley
- Groundwater Body - Beltra-Sligo
- Groundwater Body - Easkey
- Groundwater Body - Foxford
- Groundwater Body - Lavagh-Ballintougher
- Groundwater Body - Swinford

N

Drawing Title

Groundwater Bodies

Project Title

Dunniell Wind Farm, Co. Sligo

Drawn By	Checked By
NMCH	LM
Project No.	Drawing No.
210207	9-4
Scale	Date
1:100000	2022-08-12

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9.3.4.2 Groundwater Vulnerability

Groundwater vulnerability is generally mapped as varying between High (H) and Extreme (E) across the area of the Proposed Development. Most of the site for the Proposed Development falls under the category of High (H).

9.3.4.3 Groundwater Hydrochemistry

There is no groundwater hydrochemistry data available related to the site of the Proposed Development. As this is an existing development and no groundworks are proposed, groundwater sampling has not been undertaken. As there is no excavation or construction activity associated with the Proposed Development groundwater quality impacts, or discharges to groundwater are not anticipated.

The Initial Characterisation Report on the Collooney GWB does not contain hydrochemical data or other groundwater quality data.

9.3.5 Water Framework Directive Water Body Status & Objectives

The Water Framework Directive (WFD) establishes a framework for the protection of ground and surface waters and their dependent habitats and wildlife. Under the directive the EPA is working to classify all waterbodies in the State and to assign a risk status to each of them. The overall objective of the WFD is for all waterbodies to achieve a minimum of 'Good' water quality status.

Local Groundwater Body and Surface Water Body status and risk result are available from (www.catchments.ie).

9.3.5.1 Groundwater Body Status

Groundwater Body (GWB) status information is available (www.catchments.ie). Please refer to Figure 9-4 for the location and extent of associated groundwater bodies.

In terms of WFD status the Collooney GWB (IE_WE_G_0048) which underlies the Proposed Development site has an undefined status. It is not a 'high status objective' and is assigned 'not a risk' status. There is no monitoring data available at present for this GWB.

9.3.5.2 Surface Water Body Status

Local surface water body status and risk result are available from (www.catchments.ie). There are two surface water bodies identified within the site of the Proposed Development or in the immediate vicinity, namely the Dunneill River (Dunneill _010) and the Doonbeakin Stream (Doonbeakin_010). Both of these watercourses have an 'Good' status indicating good water quality in the area.

The WFD sub-catchment assessment report for the Dunmoran_SC_010 (EPA, 2019) identifies the Dunneill River as not facing any particular environmental pressures from agriculture or domestic wastewater (septic tanks). The operation of the wind farm to date has not had any long-term impact on the water quality of these streams. As the Proposed Development does not involve any excavation or construction activity no impact is anticipated for surface waterbodies in the area.

9.3.6 Designated Sites & Habitats

Designated sites include National Heritage Areas (NHAs), Proposed National Heritage Areas (pNHAs) Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special

Protection Areas (SPAs). There are 17 designated sites within 15km of the Proposed Development, which are:

- Ox Mountains Bogs SAC
- Knockalongy and Knockachree SAC
- Lough Hoe Bog SAC
- Lough Nabrickkeagh Bog SAC
- River Moy SAC
- Unshin River SAC
- Ballysadare Bay SAC
- Ballysadare Bay SPA
- Aughris Head SPA
- Ox Mountains Bogs pNHA
- Knockalongy and Knockachree Cliffs pNHA
- Lough Hoe Bog pNHA
- Lough Nabrickkeagh Bog pNHA
- Easky River pNHA
- Dunneill River pNHA
- Aughris Head pNHA
- Ballysadare Bay pNHA

The existing wind farm infrastructure is partly located within the Ox Mountains SAC. However, as there are no groundworks or construction works proposed as part of the Proposed Development, it is not expected that there will be any negative effects associated with the proximity to the Ox Mountains SAC. The Proposed Development has been operational as a Wind Farm since 2010, and no negative effects have been observed in relation to the Ox Mountains SAC.

Natural Heritage Areas (NHAs) are sites of national importance for nature conservation designated under the Wildlife (Amendment) Act 2000 and their management and protection is provided for by this legislation and planning policy. Proposed Natural Heritage Areas (pNHAs) were designated on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. A review of the National Parks and Wildlife Service (NPWS) website indicates that there are 8 pNHAs located within 15km of the site.

Designated sites within proximity to the Proposed Development are detailed further in Chapter 6: Biodiversity of this EIAR, and in the accompanying Appropriate Assessment Screening Report (AASR) and Natura Impact Statement (NIS).

9.3.7 Water Resources

A search of the Geological Survey of Ireland (GSI) well database (www.gsi.ie) indicates that there are two wells mapped in the vicinity of the Proposed Development. Both of these mapped wells are boreholes that were drilled for agricultural and domestic purposes. They are located approximately 4.5km northwest and 5km north respectively from the site entrance.

The GSI Database is not exhaustive, and it is most likely that other private wells exist within the vicinity. Due to the local aquifer characteristics and topography, it is not likely that groundwater flow towards these wells occurs. Based on the absence of construction activity and limited maintenance work proposed during the operational phase of the extension of life of the wind farm, no impacts to groundwater quality, quantity or flow are likely.

9.3.8 Receptor Sensitivity

Due to the existing nature of the Proposed Development (extension of operation for the existing Dunneill Wind Farm) potential for impacts to surface water and groundwater are not likely. No new

construction works, excavations, groundworks or significant alterations to the existing wind farm are proposed. The primary risk to groundwater at the site would be from cementitious materials, hydrocarbon spillage and leakages. There is limited potential for these risks to occur during the operational phase of a wind farm as significant quantities of potentially hazardous materials are not stored on-site. All potential contamination sources will be carefully managed at the site during the operational phase of the Proposed Development and mitigation measures will be put in place to deal with these potential minor impacts.

Groundwater within the vicinity of the Proposed Development is not identified as sensitive to pollution, although the groundwater vulnerability is classed as high (H), the aquifer is productive to locally productive, with no private-use wells present on the site. No significant interactions with the hydrogeological regime are expected to occur during the operational phase of the wind farm.

There are three surface water features which were identified as occurring on or adjacent to the site of the Proposed Development, namely the Dunneill River Network, the Belville River Network and the Doonbeakin River Network. These surface waters are known to face other environmental pressures from areas such as agriculture and domestic wastewater discharges from septic tanks. These surface waters also form part of designated sites and are important natural habitats, as outlined in Chapter 6: Biodiversity. As such, these surface waters are considered to be very sensitive to potential contamination.

Mitigation measures currently in place at the operational wind farm to ensure the protection of all downstream receiving waters will be continued should the application for extension of the operational period be granted.

Implementation of these mitigation measures will ensure that surface runoff is of a high quality and will not impact on the quality of downstream surface water bodies. No additional drainage works are proposed at the site, thereby avoiding changes to flow volumes leaving the site.

9.4 Likely, Significant Impacts and Mitigation Measures Implemented

9.4.1 Overview of Impact Assessment Process

The conventional source-pathway-target model (see below, top) was applied to assess potential impacts on downstream environmental receptors (see below, bottom as an example) as a result of the Proposed Development.

Where potential impacts are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022); and,

- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003).

The description process clearly and consistently identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

In order to provide an understanding of the stepwise impact assessment process applied below, we have firstly presented a summary guide that defines the steps (1 to 7) taken in each element of the impact assessment process (refer to

Table 9-4). The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to all operation activities which have the potential to generate a source of significant adverse impact on the geological and hydrological/ hydrogeological (including water quality) environments.

Table 9-4: Impact Assessment Steps

Step 1	Identification and Description of Potential Impact Source: This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.	
Step 2	Pathway / Mechanism:	The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
Step 3	Receptor:	A receptor is a part of the natural environment which could potentially be impacted upon, e.g. human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
Step 4	Pre-mitigation Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.
Step 5	Proposed Mitigation Measures:	Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to this type of development, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by engineering design.
Step 6	Post Mitigation Residual Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
Step 7	Significance of Effects:	Describes the likely significant post mitigation effects of the identified potential impact source on the receiving environment.

9.4.2 Do-Nothing Scenario

The 'Do-Nothing' scenario entails the decommissioning of the existing wind farm once the current planning permission expires (2024) and restoration of the site to its original use as agricultural lands for pasture and rough grazing and commercial forestry in the south.

Condition 10 of the original Planning Permission from Sligo County Council (Ref: 03619) states the following in relation to the decommissioning of the wind farm:

> *'Upon termination of the use of the wind farm, the mast and turbines shall be dismantled and removed from the site and the site shall be restored to its existing condition in consultation with the planning authority. Prior to the commencement of development, the developer shall lodge with the planning authority, a cash deposit, a bond of an insurance company, or other security to secure the satisfactory reinstatement of the site on the cessation of the project. The amount of the security shall be 100,000 euro'.*

Should the Decommissioning Plan as set out in the Condition be implemented it may lead to environmental effects on hydrology due to the potentially extensive ground works required to remove existing access tracks and the turbine foundations. Surface water drainage and groundwater flow patterns are not expected to be significantly affected during these potential decommissioning works however a more environmentally sensitive approach is outlined for the end of the proposed extended operational period as set out below. The effect of decommissioning is considered **neutral** in the context of the EIAR.

9.4.3 Construction Phase

No construction activities or significant alterations to the existing wind farm are proposed as part of this application therefore **no impacts or significant effects** to the water environment will occur.

9.4.4 Operational Phase

There will be no soil disturbance or use of machinery during the operation phase. Furthermore, since there was no deep excavation associated with the project there is no potential for impacts on groundwater flow during the operation phase. Therefore, **no impacts** are envisaged during the operational phase.

The operational wind farm does not require on-site storage of significant quantities of materials or liquids likely to cause a pollution incident, however small quantities of hydrocarbons may be required from time to time in order to operate/maintain machinery. Chapter 4: Description of the EIAR states that there will be no ground disturbing works associated with the operational phase, no natural drainage features will be altered and there will be no direct or indirect discharges to natural watercourses during the continued operation of the wind farm.

While pollution incidents could arise from staff welfare facilities, this is considered unlikely as wastewater from the staff welfare facilities in the control building are managed by means of an existing sealed foul waste holding tank with no untreated foul water discharged into adjacent surface or coastal waters. The existing holding tank will continue to be maintained according to current best practice guidance and is inspected and maintained at regular intervals. Only waste management companies holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended), are employed to collect and transport wastewater away from the site to a licensed facility. Spillages could arise from maintenance vehicles visiting the site; however, this is also considered unlikely as all such vehicles are regularly maintained in good working condition and park on areas of hard standing away from surface water features. In addition, each vehicle carries a spill kit.

The Ox Mountains Bog SAC is of international value for nature conservation and would have a high sensitivity to changes in water quality. However, given the measures in place to protect water quality detailed above, in the unlikely event that a pollution event did occur, it would be localised, small-scale, short-term, with a negligible magnitude of change. This potential impact has therefore been assessed as not significant.

The habitat Key Ecological Receptors (KERs) were assessed as being of local (higher) value and would have a high sensitivity to changes in water quality. However, given the measures in place to protect water quality detailed above, in the unlikely event that a pollution incident occurred, it would be localised, small-scale, short-term, with a negligible magnitude of change. This potential impact has therefore been assessed as not significant.

A Natura Impact Statement (NIS) has been carried out for the Proposed Development. The NIS concludes that '*the Proposed Development will not have an adverse impact on any European Sites, either alone or in combination with other plans or projects*'.

9.4.4.1 Potential Release of Hydrocarbons During Operation and Storage

During routine maintenance works plant and machinery may require refueling on-site and so hydrocarbons may be present. Also, the transformer in the substation and transformers in each turbine are a mix of oil cooled and dry type cast resin transformer. Managed incorrectly, there is the potential for spills / leaks of oils from this equipment resulting in contamination of surface and groundwater.

Pathway: Surface water, soil/bedrock pore water and groundwater.

Receptor: Surface water, groundwater, sea.

Potential Impact: Negative, direct, slight, short term, medium probability impact on surface waters and groundwater.

Mitigation Measures

Oil used in transformers (at the substation and at each turbine) and any storage of oils or hydrocarbons within the control building compound could potentially leak during the operational phase and impact on groundwater or surface water quality. The substation transformer is in a concrete bund capable of holding 110% of the stored oil volume, and all oil on site is stored in suitable bunds capable of holding 110% of the stored oil volume. Turbine transformers are located within the turbine hardstands, with dedicated concrete foundations, so any leaks would be contained within the turbine transformer units and hydrocarbons would not be able to permeate to ground. In addition:

- All plant and machinery to be serviced before being mobilised to site;
- No plant maintenance completed on-site, any broken-down plant removed from site to be fixed;
- Refuelling completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas away from open water;
- Only designated trained operators authorised to refuel plant on-site;
- Procedures and contingency plans set up to deal with emergency accidents or spills; and,
- Highest standards of site management maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during works.

These mitigation measures are considered sufficient to reduce risk to ground/peat/soils and subsoils, and to groundwater and surface water quality.

Residual Impacts

The implementation of the above mitigation measures will result in a residual **neutral, imperceptible, direct, short term, unlikely impact** to surface water and groundwater. There was no recorded or

observed evidence of storage of significant quantities of hydrocarbons or other chemicals, nor any leakages or spillages of hydrocarbons during the site walkover.

Significance of Effects

No significant effects on the water environment are envisaged during the operational stage of the Proposed Development.

9.4.5 Decommissioning Phase - Likely Significant Effects and Mitigation Measures

The potential impacts associated with decommissioning of the Proposed Development in circa 15 years will be similar to those associated with a typical wind farm construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.8 of this report.

During decommissioning, it may be possible to reverse or at least reduce some of the potential impacts caused during the initial construction of the wind farm by rehabilitating construction areas such as turbine bases and hard standing areas. This will be done by covering with local topsoil and reseeding with a local native mix to encourage vegetation growth and reduce run-off and sedimentation.

In relation to decommissioning, Condition 10 of the original Planning Application (Ref: PL 03619) states the following:

> *'Upon termination of the use of the wind farm, the mast and turbines shall be dismantled and removed from the site and the site shall be restored to its existing condition in consultation with the planning authority. Prior to the commencement of development, the developer shall lodge with the planning authority, a cash deposit, a bond of an insurance company, or other security to secure the satisfactory reinstatement of the site on the cessation of the project. The amount of the security shall be 100,000 euro'.*

It is considered that this Condition is not appropriate, from an environmental perspective, for the Proposed Development. Upon decommissioning of the Proposed Development, the wind turbines will be disassembled in reverse order to how they were erected. All above- ground turbine components will be separated and removed off-site for reuse or recycling. The disassembly and removal of the turbines will not have an impact on the hydrological environment at the site.

It is proposed to leave turbine foundations in place underground and to covered with earth and reseeded as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environmental nuisances such as noise, vibration and dust.

It is proposed to leave underground cables in place where they are unlikely to be impacted by typical agricultural works. It is proposed that site roadways will be left in situ, as appropriate, to facilitate agricultural and amenity uses by the local community. A decommissioning plan will be agreed with the local authority at least three months prior to decommissioning of the Proposed Development.

Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude. Mitigation measures to avoid these potential impacts will be implemented.

However, as noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made far in advance, so within the 15-year lifespan of the Proposed Development, technological advances and preferred approaches to reinstatement may change. According to the SNH guidance, it is, therefore:

'Best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm'.

No significant effects on the hydrological and hydrogeological environment are envisaged during the decommissioning stage of the Proposed Development.

9.4.5.1 Earthworks Resulting in Suspended Solids Entrainment in Surface Waters

Decommissioning phase activities that require earthworks resulting in removal of vegetation cover/ road pavement material and excavation of mineral subsoil (where present) are detailed in Chapter 4: Description. Potential sources of sediment laden water include stockpiled excavated material providing a point source of exposed sediment.

This activity has the potential to result in the release of suspended solids to surface watercourses and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies. However, given the relatively small, localised scale of the works, the volume of runoff from decommissioning works is expected to be minimal in relation to the overall runoff to local waterbodies.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient watercourses and dependant ecosystems.

Pre-Mitigation Potential Impact: Indirect, negative, significant, temporary, likely impact.

Implemented Mitigation Measures:

The key mitigation measure during the decommissioning phase is the avoidance of sensitive aquatic areas. The Dunneill River runs within close proximity of the western border of the site of the Proposed Development. A tributary of the Dunneill River, the Finandoo, bisects the development in an east-west direction. Because of this proximity to surface waters, mitigation measures were put in place in the original construction phase. No in-stream works would be required during the decommissioning phase of the existing wind farm. Best construction practices will be adhered to throughout the decommissioning phase of the development.

Residual Impact

The implementation of the mitigation measures discussed above will prevent the release of any significant quantity of suspended solids to surface watercourses. Therefore, there is likely to be **no residual impact** on downstream waters, from earthworks during the decommissioning phase.

Significance of Effects:

Based on the analysis above there would be **no significant effects** on surface water quality resulting from earthworks during the decommissioning phase of the project.

9.4.5.2 Potential Impacts on Groundwater Levels and Local Well Supplies During Excavations

Dewatering of deep excavations have the potential to impact on local groundwater levels. No significant dewatering works are likely and therefore, no groundwater level impacts are likely to occur from the decommissioning of the wind farm infrastructure.

Pathway: Groundwater flowpaths.

Receptor: Groundwater levels.

Pre-mitigation Potential Impact: None.

Implemented Mitigation Measures

No impact on groundwater is anticipated, therefore no further mitigation measures are proposed.

Residual Impact

No impacts on groundwater levels or local well supplies are likely to occur during the decommissioning phase of the project.

Significance of Effects

Decommissioning of the project will have **no significant effects** on groundwater.

9.4.5.3 Potential Release of Hydrocarbons during Construction and Storage

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

Pathway: Groundwater flowpaths and grid route/road drainage network.

Receptor: Groundwater and surface water.

Pre-Mitigation Potential Impact:

Indirect, negative, slight, short term, likely impact to local groundwater quality.

Mitigation Measures

Oil used in transformers (at the substation and within each turbine transformer) and any storage of oils or hydrocarbons within the control building compound could potentially leak during the decommissioning phase and impact on groundwater or surface water quality. The substation transformer is in a concrete bund capable of holding 110% of the stored oil volume, and all oil on site is stored in suitable bunds capable of holding 110% of the stored oil volume. Turbine transformers are located within the turbine hardstands, with dedicated concrete foundations, so any leaks would be contained within the turbine transformer units and hydrocarbons would not be able to permeate to ground. In addition:

- All plant and machinery to be serviced before being mobilised to site;
- No plant maintenance completed on-site, any broken-down plant removed from site to be fixed;
- Refuelling completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas away from open water;

- Only designated trained operators authorised to refuel plant on-site;
- Procedures and contingency plans set up to deal with emergency accidents or spills; and,
- Highest standards of site management maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during works.

These mitigation measures are considered sufficient to reduce risk to ground/peat/soils and subsoils, and to groundwater and surface water quality.

Residual Impacts

The implementation of the above mitigation measures will result in a residual **neutral, imperceptible, direct, short term, unlikely impact** to surface water and groundwater. There was no recorded or observed evidence of storage of significant quantities of hydrocarbons or other chemicals, nor any leakages or spillages of hydrocarbons during the site walkover.

Significance of Effects

No significant effects on the water environment are envisaged during the decommissioning stage of the Proposed Development.

9.4.5.4 Potential Hydrological Impacts on Designated Sites

The existing wind farm is located partially within the Ox Mountains Bog SAC and Ox Mountains Bog pNHA, an area which is comprised of large swathes of blanket bog with a number of qualifying interests. The site of the Proposed Development also lies approximately 5.5 km west of the Knockalongy and Knockachree Cliffs SAC and Knockalongy and Knockachree Cliffs pNHA. These designated sites are in particular proximity to the site but there are a number of others within 15km of the Proposed Development, as mentioned in Section 9.3.6.

The Dunneill River pNHA is located approximately 3.3 km north of the Proposed Development. The Easkey River pNHA is also located nearby the Proposed Development at 5.8 km northwest. The Aughris Head pNHA is located approximately 6.4 km northeast of the Proposed Development, with the Aughris Head SPA being located approximately 7.8 km northeast of the Proposed Development. Lough Hoe Bog SAC and pNHA are located approximately 13.2 km southwest of the Proposed Development. The Unshin River SAC is located approximately 7.9 km east of the site of the Proposed Development, with the nearby River Moy SAC being located approximately 10.2 km southeast of the site. The Lough Nabrickeagh Bog SAC and pNHA are also located approximately 11.4 km southwest of the site of the Proposed Development. Ballysadare Bay SAC, SPA and pNHA are located approximately 13.1 km northeast of the Proposed Development.

Potential for impacts to these designated sites will be prevented by adhering to the mitigation detailed for the protection of the SACs, SPAs, and pNHAs. Potential for impacts in the form of surface water deterioration will be prevented by adhering to the mitigation described below:

Pathway: Surface and groundwater flowpaths.

Receptor: Down-gradient water quality and designated sites.

Pre-Mitigation Potential Impact: Indirect, negative, slight, short term, likely impact.

Impact Assessment and Implemented Mitigation Measures:

Mitigation measures which are already operational on the wind farm, will be maintained. Further mitigation measures may need to be put in place during the decommissioning phase, as surface waters from sections of the wind farm site will potentially drain to these areas.

Mitigation measures as outlined in Section 9.4.5.1 to Section 9.4.5.3 above will be implemented to provide the necessary protection to these hydrologically sensitive areas.

These mitigation measures, which include drainage control measures, sediment control measures, and mitigation measures related to spills/chemical releases will ensure that the quality of runoff from the site during decommissioning remains good. Therefore, there is no potential for significant direct or indirect impacts on designated sites.

The hydrological regime locally will not be affected by the decommissioning works and so the regime of the designated sites will not be affected.

Residual Impact

The implementation of the mitigation measures discussed above will block the pathways for impacts to downstream designated sites. Observations during the site walkover revealed no evidence of any impacts to surface waters or designated sites. It is likely there will be **no residual impacts** on designated sites.

Significance of Effects

Based on the analysis above there are **no significant effects** on designated sites likely as a result of the decommissioning phase works.

9.4.6 Cumulative Impacts

The hydrological impact assessment undertaken in this chapter finds that significant effects are unlikely due to the limited nature of the works associated with the extension of operation of the wind farm. Potential cumulative effects on local hydrology or hydrogeology between the Proposed Development and other developments in the vicinity, including those listed in Section 2.7.2 of this EIAR, were also considered as part of this assessment. The nearest wind energy development to Dunneill is the existing Kingsmountain Wind Farm, located approximately 2km east-southeast of the Proposed Development. The Kingsmountain development was also subject to an EIA that identified mitigation measures to ensure that no significant impact to surface waters, groundwaters or coastal waters would occur.

Beyond cumulative wind farm assessment in the study area, the existing 20kV underground grid connection cable was also assessed for potential effects upon soils and geology. The grid connection is composed of approximately 21km of buried 20kV transmission line from the onsite 20kV substation at Dunneill wind farm to the existing Cunghill 110kV substation, to the southeast of Dunneill. The grid connection is an existing linear infrastructure and there are no associated potential impact pathways which could lead to significant effects in combination with the Proposed Development.

Due to the limited scale of other developments in the vicinity, there is little potential for significant impacts to surface waters, groundwaters or coastal waters resulting from those developments. Therefore, **no significant cumulative impacts** on local hydrology or hydrogeology are anticipated during the continued operation of the Proposed Development.

10. AIR AND CLIMATE

10.1 Introduction

This chapter identifies, describes and assesses the potential significant direct and indirect effects on air quality and climate arising from the continued operation and decommissioning of the Proposed Development. The full site description is detailed in Chapter 4.

Dunneill Wind Farm is located on the northwest slopes of the Ox Mountains, located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in Co. Sligo. The wind farm site (EIAR site boundary) covers approximately 66 hectares (ha) with a development footprint of circa. 2.8ha. The existing Dunneill Wind Farm site is located within 3 townlands in County Sligo, namely Crowagh (or Dunneill Mountain), Tawnadremira, and Ballyglass. The existing wind farm consists of 13 No. turbines with a total rated capacity of c.11 Megawatts (MW), which became operational in 2010.

The southern portion of the site is located within conifer plantation, while the northern part of the site is predominantly agricultural grasslands with some small pockets of commercial forestry. No additional changes to the current land-uses of commercial forestry and agriculture are proposed for the site.

Due to the non-industrial nature of the wind farm and the fact that it is already operational and does not require a construction phase, and the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this EIAR. It is expected that air quality in the existing environment is good, since there are no major sources of air pollution (e.g., heavy industry) in close proximity to the site.

The production of energy from wind turbines has no direct emissions as is expected from fossil fuel-based power stations. Harnessing more energy by means of wind farms will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment. Some minor short term or temporary indirect emissions associated with the construction of the Proposed Development include vehicular and dust emissions. Emissions from the construction, operation and decommissioning phases of the project are addressed in Section 10.1.5.

10.1.1.1 Relevant Guidance

The air quality and climate section of this EIAR is carried out in accordance with the 'EIA Directive' as amended by Directive 2014/52/EU and having regard, where relevant, to guidance listed in Section 1.7.2 of Chapter 1: Introduction.

10.1.1.2 Statement of Authority

This chapter of the EIAR was completed by Niamh McHugh and reviewed by David Naughton, of MKO. Niamh is a Graduate Environmental Scientist, having joined the company in 2021. Niamh holds a B.Sc in Environmental Science from the National University of Ireland, Galway. Since joining the company, Niamh has been involved in the production of several EIAR chapters, mainly for large-scale onshore wind energy developments. David is a Project Environmental Scientist with over five years of consultancy experience with MKO and has acted as project manager on a number of renewable energy developments during that time. David has overseen and prepared numerous EIARs for wind energy developments during his time at MKO. David holds a BSc (Hons) in Environmental Science.

10.2 Air Quality

10.2.1 Air Quality Standards

In 1996, the Air Quality Framework Directive (96/62/EC) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999. The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- The third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air and was transposed into Irish law by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. No. 58 of 2009).

The Air Quality Framework Directive and the first three Daughter Directives have been replaced by the Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality) (as amended by Directive EU 2015/1480), which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for $PM_{2.5}$ (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM_{10}) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 10-1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre ($\mu g/m^3$) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016). These Regulations supersede the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999).

Table 10-1 Limit values of Directive 2008/50/EC, 1999/30/EC and 2000/69/EC (Source: https://www.epa.ie/air/quality/standards/)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of Human Health	24 hours	75	28	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Lower assessment threshold for the protection of human health	24 hours	50	19	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Nitrogen dioxide (NO_2)	Upper assessment threshold for the protection of human health	1 hour	140	73	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection of human health	1 hour	100	52	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 10 (PM_{10})	Upper assessment threshold for the protection of human health	24 hours	35	-	Not to be exceeded more than 35 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 10 (PM_{10})	Lower assessment threshold for the protection of human health	24 hours	25	-	Not to be exceeded more than 35 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 2.5 ($PM_{2.5}$)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	-	1st Jan 2005
Benzene (C_6H_6)	Protection of human health	Calendar Year	5	1.5	-	1st Jan 2010

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 10-2 presents the limit and target values for ozone.

Table 10-2 Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Target Value for 2020
Protection of human health	Maximum daily 8-hour mean	120 mg/m^3 not to be exceeded more than 25 days per calendar year averaged over 3 years	120 mg/m^3
Protection of vegetation	AOT40* calculated from 1-hour values from May to July	18,000 $mg/m^3.h$ averaged over 5 years	6,000 $mg/m^3.h$
Information Threshold	1-hour average	180 mg/m^3	-
Alert Threshold	1-hour average	240 mg/m^3	-

* AOT40 is a measure of the overall exposure of plants to ozone. It is the sum of the differences between hourly ozone concentration and 40 ppb for each hour when the concentration exceeds 40 ppb during a relevant growing season, e.g., for forest and crops.

10.2.1.1 Air Quality and Health

The Environmental Protection Agency (EPA) report '*Air Quality in Ireland 2020'* noted that in Ireland, the premature deaths attributable to poor air quality are estimated at 1,300 people per annum. A more recent European Environmental Agency (EEA) Report, '*Air Quality in Europe – 2020 Report'* highlights the negative effects of air pollution on human health. The report assessed that poor air quality accounted for premature deaths of approximately 417,000 people in Europe in 2018, with regards to deaths relating to $PM_{2.5}$. The estimated impacts on the population in Europe of exposure to NO_2 and O_3 concentrations in 2018 were around 55,000 and 20,600 premature deaths per year, respectively. From this, 1,300 Irish deaths were attributable to fine particulate matter ($PM_{2.5}$), 50 Irish deaths were attributable to nitrogen oxides (NO_2) and 60 Irish deaths were attributable to Ozone (O_3) (Source: *Air Quality in Europe – 2020 Report',* EEA, 2020).

Whilst there is the potential of such emissions and also dust emissions to be generated from the site operations, a number of mitigation measures will be implemented at this site to reduce the impact from dust and vehicle emissions, which are discussed in Section 10.3.4 below.

10.2.2 Air Quality Zones

The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The Proposed Development site lies within Zone D, which represents rural areas located away from large population centres.

10.2.3 Existing Air Quality

The air quality in the vicinity of the Proposed Development site is typical of that of rural areas in the West of Ireland, i.e., Zone D. Prevailing south-westerly winds carry clean, unpolluted air from the Atlantic Ocean onto the Irish mainland. The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, 'Air Quality in Ireland 2020'[1] was published by the EPA in 2021. The EPA reports provide SO_2, PM_{10}, NO_2 and O_3 concentrations for areas in Zone D.

10.2.3.1 Sulphur Dioxide (SO_2)

The EPA Air Quality in Ireland 2020 summary tables provide statistics for hourly sulphur dioxide concentrations for four Zone D monitoring stations under Table A5 of the EPA report, namely, Cork Harbour, Kilkitt, Askeaton and Letterkenny. The average sulphur dioxide statistics across each of the four monitoring stations listed in Zone D from the 2020 summary tables is presented in Table 10-3 below[2].

[1] *EPA (2021). Air Quality in Ireland 2020 – Summary Data Tables https://www.epa.ie/publications/monitoring–assessment/air/Summary-Data-Tables–2020.pdf*

[2] *Letterkenny had the highest levels of Sulphur Dioxide emissions (Annual Mean, Median, Hourly Max and Daily Max) of any of the monitoring stations listed within the country for Table A5 of the 'Air Quality in Ireland 2020 – Summary Data Tables'. Lower values would be expected for the Proposed Development as it is located within a much more rural location.*

Table 10-3 Average Sulphur Dioxide Data for Zone D Sites in 2020

Parameter	Measurement (ug/m^3)
Annual Mean	4.15
Hourly values > 350	0.5
Hourly max	135.18
Daily values > 125	0
Daily max	25.55

During the monitoring period there were no exceedances of the daily limit values for the protection of human health. As can observed from Table 10-3 the average maximum hourly value recorded during the assessment period was 135.18 µg/m^3. In addition, there were no exceedances of the annual mean limit for the protection of ecosystems. It would be expected that SO_2 values at the Proposed Development site would be lower than those recorded for the Zone D sites above due to a more rural location than the Zone D monitoring stations listed (i.e., Letterkenny and Cork Harbour).

10.2.3.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, soil and road surfaces, construction works and industrial emissions. The EPA Air Quality in Ireland 2020 summary tables provide annual mean PM_{10} concentration for twelve Zone D monitoring stations under Table A11 of the EPA report, namely, Tipperary Town, Carrick-on-Shannon, Enniscorthy, Birr, Askeaton, Macroom, Castlebar, Cobh, Claremorris, Kilkitt, Cavan and Roscommon Town. The average Particulate matter (PM_{10}) statistics across each of the twelve monitoring stations listed in Zone D from the 2020 summary tables is presented in Table 10-4 below.

Table 10-4 Average Particulate Matter (PM_{10}) Data for Zone D Sites in 2020

Parameter	Measurement (ug/m^3)
Annual Mean	11.17
% Data Capture	75
Values > 50 ug/m^3	Maximum Value of 5 exceedances at Macroom
Daily Max	46.5

Notes: [1-] PM_{10} daily limit for the protection of human health: No more than 35 days >50 µg/m^3

The daily limit of 50 µg/m^3 for the protection of human health was not exceeded more than 35 times during the monitoring period. It would be expected that PM_{10} values at the Proposed Development site would be lower than those recorded for the Zone D sites above due to a more rural location.

10.2.3.3 Nitrogen Dioxide (NO_2)

The EPA Air Quality in Ireland 2020 summary tables provide statistics for hourly nitrogen dioxide concentrations for five Zone D monitoring stations under Table A2 of the EPA report, namely, Emo Court, Birr, Castlebar, Carrick-on-Shannon and Kilkitt. The average Nitrogen Dioxide (NO_2) statistics across each of the twelve monitoring stations listed in Zone D from the 2020 summary tables is presented in in 2020 is presented in

Table 10-5 below.

Table 10-5 Average Nitrogen Dioxide Data for Zone D Sites in 2020

Parameter	Measurement (µg/m^3)
Annual Mean	7.6
NO_2 Values >200	0
Values > 140 (UAT)	0
Values >100 (LAT)	0
Hourly Max.	54

The annual NO_2 value was below the annual mean limit value for the protection of human health of 40 µg/m^3. Furthermore, the lower and upper assessment thresholds of 100 and 140 µg/m^3 was not exceeded during the monitoring period. The average hourly max. NO_2 value of 54 µg/m^3 measured during the monitoring period was below the hourly max threshold of 200 µg/m^3. It would be expected that NO_2 values at the Proposed Development site would be lower than those recorded for the Zone D sites above due to a more rural location.

10.2.3.4 Carbon Monoxide (CO)

The EPA Air Quality in Ireland 2020 summary tables provide statistics for rolling 8-hour carbon monoxide concentrations for only one Zone D site, namely Birr air monitoring station, under Table A6 of the EPA report. Carbon Monoxide data from Birr Monitoring Station (Zone D) in 2020 is presented in Table 10-6 below.

Table 10-6 Carbon Monoxide Data for Birr - Zone D Site in 2020

Parameter	Measurement
Annual Mean	0.4 mg/m^3
Median	0.4 mg/m^3
% Data Capture	4.2%
Values > 10	0
Max	1.2 mg/m^3

The average concentration of carbon monoxide was 0.4 mg/m^3. The carbon monoxide limit value for the protection of human health is 10,000 µg/m^3 (or 10mg/m^3). On no occasions were values in excess of the 10 mg limit value set out in Directives 2000/69/EC or 2008/69/EC. It would be expected that Carbon Monoxide values at the Proposed Development site would be similar or lower than those at Birr due to a more rural location.

10.2.3.5 Ozone (O_3)

The EPA Air Quality in Ireland 2020 summary tables provide statistics for rolling 8-hour ozone concentrations for seven Zone D monitoring stations under Table A7 of the EPA report, namely, Emo Court, Kilkitt, Carnsore Point, Mace Head, Castlebar, Valentia and Malin Head. The average Ozone (O_3) statistics across each of the seven monitoring stations listed in Zone D from the 2020 summary tables is presented in Table 10-7 below.

Table 10-7 Average Ozone Data for Zone D Sites in 2019

Parameter	Measurement
Annual Mean	62 µg/m^3
Median	63 µg/m^3
% Data Capture	98%
No. of days > 1800	0 days

There were no exceedances of the maximum daily eight-hour mean limit of 120 µg/m^3. The legislation stipulates that this limit should not be exceeded on more than 25 days. It would be expected that Carbon Monoxide values at the Proposed Development site would be similar or lower than those recorded for the Zone D sites above due to a more rural location.

10.2.3.6 Dust

There are no statutory limits for dust deposition in Ireland. However, EPA guidance suggests that a deposition of 10 mg/m^2/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m^2/day. The EPA recommends a maximum daily deposition level of 350 mg/m^2/day when measured according to the TA Luft Standard 2002.

The extent of dust generation at any site depends on the type of activity undertaken, the location, the nature of the dust, i.e., soil, sand, peat, etc., and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather.

The Dunneill Wind Farm is currently operational and there are no construction activities or works envisaged which would produce perceptible levels of dust during the continued operation of the Proposed Development.

10.2.4 Likely, Significant Impacts on Air Quality and Associated \mitigation Measures

10.2.4.1 'Do-Nothing' Scenario

If the Planning Permission for the extension of the operational period of this wind farm were not to proceed, the wind farm as it exists currently would be decommissioned. In doing so, the environmental effects in terms of emissions are likely to be neutral. However, the opportunity to reduce emissions of carbon dioxide, oxides of nitrogen (NOx), and sulphur dioxide (SO_2) to the atmosphere by would be lost due to the continued dependence on electricity derived from coal, oil and gas-fired power stations, rather than the renewable energy sources such as the extension of duration for this wind farm. This will result in an indirect negative impact on air quality nationally, regionally and locally.

Under the Do-Nothing scenario, the existing wind farm would be decommissioned in accordance with the conditions of the current planning permission (ABP Pl. Ref. 21.204790), once this permission expires in 2024. Should the Decommissioning Plan as set out in the current conditions be implemented it may lead to environmental effects on air quality due to the potential increase in emissions from construction plant and vehicles required to remove the existing turbines and other infrastructure.

There would be exhaust emissions from construction plant and vehicles, and potential dust emissions due to the movement of the same associated with the decommissioning of the wind farm. A Decommissioning Plan will be agreed with the local authority at least 3 months prior to the start of

decommissioning works which would include mitigation measures to reduce any potential negative impacts on the environment. However, a preliminary decommissioning plan has been prepared and is included in Appendix 4-3 of this EIAR.

The effect of decommissioning is considered **neutral** in the context of the EIAR.

10.2.4.2 Construction Phase

The Dunneill Wind Farm is currently operational, and it is proposed to extend the duration of operation of the wind farm by 15 years. No construction activities will occur as part of the extension of operational life, therefore there **are no construction phase impacts** on air quality.

10.2.4.3 Operational Phase

10.2.4.3.1 *Exhaust Emissions*

Exhaust emissions associated with the operational phase of the Development will arise from machinery and Light Goods Vehicles (LGV) that are intermittently required onsite for maintenance. This will give rise to a **long-term imperceptible negative impact**.

Mitigation Measures

Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.

Residual Impact

The implementation of the above mitigation measures will result in a residual **long-term, imperceptible, negative impact** upon air quality.

Significance of Effects

Based on the assessment above there will be **no significant direct or indirect effects**.

10.2.4.3.2 *Air Quality*

By providing an alternative to electricity derived from coal, oil or gas-fired power stations, the Proposed Development has resulted, and will continue to result in emission savings of carbon dioxide (CO_2), oxides of nitrogen (NO_2), and sulphur dioxide (SO_2) during its operational phase. The production of renewable energy from the Development will have a **long-term significant positive impact** on air quality. Further details on the carbon dioxide savings associated with the Development are presented in Section 10.3.3 below.

Residual Impact

Production of renewable energy at the Proposed Development will result in a residual **Long-term, significant, positive impact** on air quality.

Significance of Effects

Based on the assessment above there will be a **significant positive direct and indirect effect** on-air quality due to the continued operation of the Proposed Development.

10.2.4.3.3 Human Health

Long-term exposure to chemicals such as SO_2 and NOx are harmful to human health. The production of clean, renewable energy from the Development has, and will continue to offset the emission of these harmful chemicals by fossil fuel powered sources of electricity and, therefore, will have a **long-term slight positive impact** on human health. Further information on the impact of the Development on Human Health is contained in Chapter 5: Population and Human Health.

Residual Impact

Long-term Slight Positive Impact

Significance of Effects

Based on the assessment above there will be a **slight positive effect** on human health due to the operation of the Proposed Development.

10.2.4.4 Decommissioning Phase

The potential impacts associated with decommissioning of the Proposed Development (2039 should planning permission be granted for the Proposed Development) will be similar to those associated with a typical wind farm construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.8 of this EIAR.

A preliminary Decommissioning Plan for the Proposed Development, see Appendix 4-3, contains details which will be agreed with the local authority prior to any decommissioning. The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the EIAR.

Any potential air quality impacts and consequential effects likely to occur during the decommissioning phase are similar to those which would occur under the Do-Nothing alternative (2024 Decommissioning Date). There would be exhaust emissions from construction plant and vehicles, and potential dust emissions due to the movement of the same associated with the decommissioning of the wind farm. Should mitigation measures be implemented as outlined within the Decommissioning Plan (see Appendix 4-3) be implemented, then **no significant effects** upon air quality are envisaged during the decommissioning stage of the Proposed Development.

10.3 Climate

All relevant legislation and policy in relation to climate is outlined in detail in Chapter 2 of this EIAR. A summary of the same is provided in the following sections.

10.3.1 Climate Change and Greenhouse Gases

Although variation in climate is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing us today and is primarily the result of increased levels of greenhouse gases in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels in energy use. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

10.3.1.1 Greenhouse Gas Emission Targets

Ireland is a Party to the Kyoto Protocol, which is an international agreement that sets limitations and reduction targets for greenhouse gases for developed countries. It is a protocol to the United Nations Framework for the Convention on Climate Change. The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, are now binding.

Under the Kyoto Protocol, the EU agreed to achieve a significant reduction in total greenhouse gas emissions in the period 2008 to 2012. Ireland's contribution to the EU commitment for the period 2008 – 2012 was to limit its greenhouse gas emissions to no more than 13% above 1990 levels.

10.3.1.1.1 *Doha Amendment to the Kyoto Protocol*

In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialised countries and the European Community committed to reduce GHG emissions to an average of 5% below1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18% below 1990 levels in the eight-year period from 2013 to 2020. The composition of Parties in the second commitment period is different from the first; however, Ireland and the EU signed up to both the first and second commitment periods.

Under the protocol, countries must meet their targets primarily through national measures, although market-based mechanisms (such as international emissions trading) can also be utilised.

10.3.1.1.2 *COP21 Paris Agreement*

COP21 was the 21st session of the Conference of the Parties (COP) to the United Nations Convention. Every year since 1995, the COP has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments. COP21 was organised by the United Nations in Paris and held from 30th November to 12th December 2015.

COP21 closed on 12th December 2015 with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C. It is flexible and takes into account the needs and capacities of each country. It is balanced as regards adaptation and mitigation, and durable, with a periodical ratcheting-up of ambitions.

10.3.1.1.3 *COP25 Climate Change Conference*

The 25th United Nations Climate Change conference COP25 was held in Madrid and ran from December 2nd to December 13th, 2019. While largely regarded as an unsuccessful conference, the

European Union launched its most ambitious plan, 'The European Green New Deal' which aims to lower CO2 emissions to zero by 2050. The deal includes proposals to reduce emissions from the transport, agriculture and energy sectors and will affect the technology chemicals, textiles, cement and steel industries. Measures such as fines and pay-outs by member states who rely on coal power will be in place to encourage the switch to renewable clean energies such as wind. On the 4th of March 2020, the European Commission put forward the proposal for a European climate law. This aims to establish the framework for achieving EU climate neutrality. It aims to provide a direction by setting a pathway to climate neutrality and to this end, aims to set in legislation the EU's 2050 climate-neutrality objective. If accepted, this climate law will likely be implemented in 2021. Decisions regarding the global carbon market were postponed until the next Climate Conference (COP26) which will be held in Glasgow in November 2021.

10.3.1.1.4 COP26 Climate Change Conference

The UN Climate Change Conference of the Parties (COP26) was held in Glasgow from the 31st of October to the 12th of November 2021. There were four key objectives that had been identified for COP 26 which included:

- Secure global net zero by 2050 and keep 1.5 degrees within reach
- Adapt to protect communities and natural habitats to the already changing climate
- Mobilise climate finance whereby developed countries must deliver on raising $100bn in climate finance per year
- Finalise the Paris Rulebook (rules needed to implement the Paris Agreement) and turn ambitions into action

Although COP26 was considered unsatisfactory in delivering the action and commitments needed to reach the Paris Agreement targets, it did raise the global ambition on climate action. Whilst COP26 failed to meet the 1.5 degree target and did not manage to secure the $100bn in climate finance there were a number key successes which included the following:

- Green finance for the net zero economy – establishment of the Glasgow Financial Alliance for Net Zero of $130 trillion of private capital to accelerate the transition to a net-zero economy.
- Disclosure and transparency for the private sector.
- Increasing the pace of implementing the Paris Agreement.

10.3.1.1.5 United Nations Sustainable Development Summit 2015

Transforming our World: the 2030 Agenda for Sustainable Development which includes 17 Sustainable Development Goals (SDGs), and 169 targets was adopted by all UN Member States at a UN summit held in New York in 2015. The Agenda is universally applicable with all countries having a shared responsibility to achieve the goals and targets which came into effect on January 1st, 2016. The goals and targets are to be actions over the 15-year period, are integrated and indivisible i.e., all must be implemented together by each Member State.

The Sustainable Development Goals National Implementation Plan 2018-2020 was published by the Department of Communications, Climate Action & Environment in partnerships with OSI, ESRI Ireland and the Central Statistics Office in 2018. The Plan sets out how Ireland will work to achieve the goals and targets of the Agenda for Sustainable Development both domestically and internationally. Relevant SDGs and how they are implemented into Irish National plans and policies can be found in Table 10-8.

Table 10-8 United Nations Sustainable Development Goals adopted in 2015. https://sustainabledevelopment.un.org/sdgs

SDG	Targets	International Progress to Date (2019)	National Relevant Policy
SDG 7 Affordable and Clean Energy: *Ensure access to affordable, reliable, sustainable and modern energy for all*	› By 2030, ensure universal access to affordable, reliable and modern energy services › By 2030, increase substantially the share of renewable energy in the global energy mix › By 2030, double the global rate of improvement in energy efficiency › By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology › By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	The renewable energy share of total final energy consumption gradually increased from 16.6 per cent in 2010 to 17.5 per cent in 2016, though much faster change is required to meet climate goals. Global primary energy intensity (ratio of energy used per unit of GDP) improved from 5.9 in 2010 to 5.1 in 2016, a rate of improvement of 2.3 per cent, which is still short of the 2.7 per cent annual rate needed to reach target 3 of Sustainable Development Goal 7.	*Ireland's Transition to a Low Carbon Energy Future 2015-2030* *Strategy to Combat Energy Poverty in Ireland* *Ireland's Transition to a Low Carbon Energy Future 2015-2030* *National Mitigation Plan* *National Energy Efficiency Action Plan for Ireland # 4 2017-2020* *Better Energy Programme* *One World, One Future* *The Global Island*
SDG 13 Climate Action: *Take urgent action to combat climate change and its impacts**	Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries Integrate climate change measures into national policies, strategies and planning Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of	In 2017, greenhouse gas concentrations reached new highs, with globally averaged mole fractions of CO2 at 405.5 parts per million (ppm), up from 400.1 ppm in 2015, and at 146 per cent of pre-industrial levels. Moving towards 2030 emission objectives compatible with the 2°C and 1.5°C pathways requires a peak to be achieved as soon as	*National Adaptation Framework* *Building on Recovery: Infrastructure and*

SDG	Targets	International Progress to Date (2019)	National Relevant Policy
**Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.*	mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	possible, followed by rapid reductions. During the period 1998–2017, direct economic losses from disasters were estimated at almost $3 trillion. Climate-related and geophysical disasters claimed an estimated 1.3 million lives. As of April 2019, 185 parties had ratified the Paris Agreement. Parties to the Paris Agreement are expected to prepare, communicate and maintain successive nationally determined contributions, and 183 parties had communicated their first nationally determined contributions to the secretariat of the United Nations Framework Convention on Climate Change, while 1 party had communicated its second. Under the Agreement, all parties are required to submit new nationally determined contributions, containing revised and much more ambitious targets, by 2020. Global climate finance flows increased by 17 per cent in the period 2015–2016 compared with the period 2013–2014. As at 20 May 2019, 75 countries are seeking support from the Green Climate Fund for national adaptation plans and other adaptation planning processes, with a combined value of $191 million.	*Capital Investment 2016-2021* *National Mitigation Plan* *National Biodiversity Action Plan 2017-2021* *National Policy Position on Climate Action and Low Carbon Development*

10.3.1.1.6 *Climate Action Network Europe, Off Target Report 2018*

The June 2018 '*Off Target Report'* published by the Climate Action Network (CAN) Europe, which ranks EU countries ambition and progress in fighting climate change, listed Ireland as the second worst performing EU member state in tackling climate change. It also projected that Ireland would miss its 2020 climate (20% reduction in greenhouse gases) and renewable (40% increase in overall energy from renewable electricity sources) energy targets. Additionally, it was noted that Ireland is also off course for its 2030 emissions target.

In March 2019, the Minister for Communications, Climate Action, and the Environment, Richard Bruton, announced a renewable electricity target of 70% by 2030 for Ireland. Furthermore, the release of the Climate Action Plan in June 2019 has noted a 30% reduction in greenhouse gases by 2030. Considering only renewable energy from electricity as part of this plan and to meet the required level of emissions reduction by 2030, Ireland will:

Reduce CO_2 eq. emissions from the sector by 50–55% relative to 2030 NDP projections.
Deliver an early and complete phase-out of coal- and peat-fired electricity generation.
Increase electricity generated from renewable sources to 70%, indicatively comprised of:
- at least 3.5 GW of offshore renewable energy;
- up to 1.5 GW of grid-scale solar energy; and
- up to 8.2 GW total of increased onshore wind capacity.

Meet 15% of electricity demand by renewable sources contracted under Corporate PPAs.

Achieving 70% renewable electricity by 2030 will involve phasing out coal and peat-fired electricity generation plants, increasing our renewable electricity, reinforcing our grid (including greater interconnection to allow electricity to flow between Ireland and other countries), and putting systems in place to manage intermittent sources of power, especially from wind.

As detailed in Section 1.5.5 in Chapter 1 of this EIAR, the SEAI monthly electricity generation figures for December 2020 indicate that Ireland hit it's 40% renewable energy target for 2020 with a share of renewable electricity recorded at 40.2%. Reporting on Ireland's target status for 2020 has not yet been published and is due for publication in the coming months. With a renewable share of electricity generation at 70% in mind, it is now more critical than ever that we continue to progress renewable energy development in Ireland so as we are successful in meeting our 2030 target.

The Climate Action Plan noted specific sectors which are required to step-up in order to help Ireland achieve its EU targets. The renewable energy sector was cited alongside the country's commitment to increase onshore wind capacity by up to 8.2 GW. The Proposed Development will help contribute towards this target.

The proposed wind farm development is compatible with the relevant provisions as set out in the Climate Action Plan 2019, relating to the harnessing of renewable energy. In summary, the Proposed Development will contribute the following:

- Continued annual average energy production of 26,365 MWh/yr of electricity which would be sufficient to supply 6,277 Irish households with electricity per year. This calculation is presented in Chapter 4 of this EIAR.
- Helping to meet the target that 70% of our electricity needs will come from renewable sources by 2030.
- Helping to reduce carbon emissions and improving Ireland's security of energy supply.

Further detail on the EU 2030 targets are noted in Chapter 2, Section 2.3 of this EIAR.

10.3.1.1.7 *Climate Action Plan 2019*

The *Climate Action Plan* (DCCAE, 2019) which features 183 action plans sets out how Ireland will meet its EU targets to reduce its carbon emissions by 30% between 2021 and 2030 and lay the

foundations for achieving net zero carbon emissions by 2050. The CAP sets out an ambitious course of action over the coming years to address the impacts which climate may have on Irelands environment, society, economic and natural resources. This Plan clearly recognises that Ireland must significantly step up its commitments to tackle climate disruption.

Chapter 1 of the CAP sets out the nature of the challenge which Ireland faces over the coming years. The CAP notes that the evidence for warming of our climate system is beyond dispute with observations showing that global average temperatures have increased by more than 1°C since pre-industrial times. These changes will cause extensive direct and indirect harm to Ireland and its people, as well as to other countries more exposed and less able than we are to withstand the associated impacts, which are predicted to include:

- Rising sea-levels threatening habitable land and particularly coastal infrastructure,
- Extreme weather, including more intense storms and rainfall affecting our land, coastline and seas;
- Further pressure on our water resources and food production systems with associated impacts on fluvial and coastal ecosystems;
- Increased chance and scale of river and coastal flooding;
- Greater political and security instability;
- Displacement of population and climate refugees;
- Heightened risk of the arrival of new pests and diseases;
- Poorer water quality; and
- Changes in the distribution and time of lifecycle events of plant and animal species on land and in the oceans.

It is also recognised within the Plan that in addition to the above many of the pollutants associated with climate change are also damaging to human health.

It is the ambition of the CAP to deliver a step-change in our emissions performance over the coming decade, so that we will not only meet our EU targets for 2030 but will also be well placed to meet our mid-century decarbonisation objectives.

Chapter 7 of the CAP details the plans surrounding electricity. Within Ireland electricity accounting for 19.3% of Irelands greenhouse gases in 2017, the following is noted:

> *"It is important that we decarbonise the electricity that we consume by harnessing our significant renewable energy resources by doing this we will also become less dependent on imported fossil fuels."*

In 2017 within Ireland a total of 30.1% of electricity produced came from renewable sources, the target to be achieved by 2020 is set at 40%. The CAP goes on to note that 'given our 40% target is based on a percentage of total energy demand, this rising demand makes meeting our 2020 target even more challenging and latest forecasts indicate we may miss this target by 3 to 4 percentage points'. Further to this, while decarbonising electricity is a key aspect of the strategy it is noted that this is against the background of rapid projected growth in electricity demand. It is expected that demand for electricity is forecast to increase by 50% above existing capacity in the next decade. Generation electricity builds of a renewable nature rather than fossil fuels has been marked as essential.

The CAP goes on to note that with regards to policy measures to date that they will not achieve the level of decarbonisation required in the electricity sector to meet the 2030 emissions reduction targets, as such it is listed that 'we must 'reduce our electricity sector emissions to 4-5 Mt in 2030'. In relation to emissions the following is noted:

> *"In 2017, emissions from electricity were 12 Mt and in 2030, despite implementation of Project Ireland 2040 measures, emissions are projected to be 8 Mt. This clearly demonstrates the need for a significant step-up in ambition over existing policy, not only to meet our 2030 targets, but*

to set us on course to deliver substantive decarbonisation of our economy and society by 2050."

In the electricity sector, reaching a 70% share of renewable electricity would require 50-55% emissions reduction by 2030.

Under section 7.2 the following targets have been set out to meet the required level of emissions by 2030:

- *"Reduce CO_2 eq. emissions from the sector by 50–55% relative to 2030 Pre-NDP projections*
- *Deliver an early and complete phase-out of coal- and peat-fired electricity generation*
- *Increase electricity generated from renewable sources to 70%, indicatively comprised of:*
  - *at least 3.5 GW of offshore renewable energy*
  - *up to 1.5 GW of grid-scale solar energy*
  - *up to 8.2 GW total of increased onshore wind capacity*
- *Meet 15% of electricity demand by renewable sources contracted under Corporate PPAs"*

Achieving 70% renewable electricity by 2030 will involve phasing out coal- and peat-fired electricity generation plants, increasing our renewable electricity, reinforcing our grid (including greater interconnection to allow electricity to flow between Ireland and other countries), and putting systems in place to manage intermittent sources of power, especially from wind.

Section 7.2 of the CAP notes the 'Measures to deliver targets' in which efforts to meet the 2030 ambitions which includes increased harnessing of renewable energy. CAP identifies a need for 8.2GW of onshore wind generation and states that in 2017 there was 3.3GW in place, therefore Ireland needs to more than double its installed capacity of wind generation. Accordingly, the CAP presents clear and unequivocal support for the provision of additional renewable energy generation and presents yet further policy support for increased wind energy.

The Proposed Development can assist in reaching this target as the continued operation of the existing Dunneill Wind Farm has the capacity to offset an additional 163,905 tonnes of CO_2 thereby reducing the Greenhouse Gas effect and improving air quality as we continue to transition to cleaner energy industries. Please see Section 10.3.3 for details on Carbon offset calculations.

10.3.1.1.8 Climate Action Plan 2021

The Climate Action Plan 2021 (CAP 2021) was launched in November 2021. CAP 2021 follows the Climate Act 2021, which commits Ireland to a *legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030*. The most critical measure in CAP 2021 is to increase the proportion of renewable electricity to up to 80% by 2030 which also includes an increased target of up to 5 Gigawatts of offshore wind. Other key actions of CAP 2021 by 2030 include the following:

"The government will also introduce a small-scale generation scheme for farmers, businesses and communities to generate their own electricity and feed this back into the grid.

The plan calls for a significant reduction in transport emissions by 2030. Measures will include enabling 500,000 extra walking, cycling and public transport journeys per day by 2030. We will accelerate the pace of EV (Electric Vehicle) take-up, to reach almost 1 million EVs in the private transport fleet by 2030. We will also increase public transport and rail and bus electrification, including 1,500 electric buses and better rural links. We will increase the biofuels mix to reduce emissions from the existing fleet.

A new National Retrofit Plan will drive demand, make retrofitting more affordable, and expand the capacity of the industry, including the training of more skilled workers. Other measures include increased targets for district heating and the public sector, and strengthening building standards for all buildings.

This plan will give Irish agriculture a viable future, producing world class food with a lower carbon footprint, thanks to a science-based approach that also improves biodiversity and protects nature.

Climate Action Plan 2021 places farmers at the very centre. The targets for agriculture will help make Irish farms more carbon efficient and build a more resilient agri-food sector. Farmers know the land better than anyone and are best placed to meet out climate ambitions. They will be backed by an even greater emphasis on science and robust research. There will be a reduction in chemical nitrogen and more targeted use of fertiliser, while maintaining our position as global leader in grass growth through multi-species swards. Other measures include improving the genetics of our herds to reduce emissions and improve productivity. These changes are good for the environment but importantly make sense economically.

Farmers will be incentivised to make these changes and there will be new income streams in areas, such as the generation of renewable energy.

Reducing emissions from land use, and a move to being an overall store of carbon, will involve further bog rehabilitation, increased afforestation, and the rewetting of peat organic soils. A new forestry programme will be prepared for launch in 2023".

CAP 2021 assumes full implementation of the 2019 plan.

10.3.1.1.9 Climate Change Performance Index

Established in 2005, the Climate Change Performance Index (CCPI) is an independent monitoring tool which tracks countries climate protection performance. It assesses individual countries based on climate policies, energy usage per capita, renewable energy implementation and Greenhouse Gas Emissions (GHG) and ranks their performance in each category and overall. The 2021 CCPI was published in December 2020. While the CCPI 2021 indicated signs of potential reductions in global emissions, no country achieved its Paris Climate targets and therefore the first three places of the ranking system remain unoccupied.

Ireland, ranked 41st in 2019, has climbed 2 places to 39th for 2020, and remains as a "low" performer in international performance. However, it remains at "very low" at a national performance level. The CCPI report states that while some improvements have been made, GHG per capita emissions are at a high level and "significant challenges lie ahead in closing Ireland's emission gap, meeting the current (2030) target and aligning Ireland's emission trajectory with a net zero goal for 2050. Ireland is one of the worst performing countries in the GHG Emissions category. Recognising Ireland's Climate Action Plan (2019), the CCPI states:

"*the government must go much further in implementing policies across all sectors that drive sustained emissions reductions over the next decade. Near-term ambition needs to be ratcheted up quickly by specifying deep cuts in fossil fuel and reactive nitrogen usage to put Ireland on a net zero emissions pathway aligned with the Paris temperature goals".*

10.3.1.1.10 Programme for Government

The Programme for Government was published in October 2020 and last updated April 2021. In relation to climate change the programme recognises that the next ten years are a critical period in addressing the climate crisis. It is an ambition of the programme to more than halve carbon emissions over the course of the decade (2020-2030). The programme notes that the government are committed to

reducing greenhouse gas emissions by an average 7% per annum over the next decade in a push to achieve a net zero emissions by the year 2050. The programme also recognises the severity of the climate challenge as it clarifies that:

"Climate change is the single greatest threat facing humanity"

With regards to energy the programme notes that the government will implement a new National Energy Efficiency Action Plan to reduce energy use, including behavioural and awareness aspects of energy efficiency such as building and data management. Further, the government are also committed to the rapid decarbonisation of the energy sector, along with this it is noted that the necessary steps will be taken to deliver at least 70% of renewable electricity by the year 2030. Some of the measures to achieve this will include the following:

- Hold the first Renewable Electricity Support Scheme (RESS) auction by the end of 2020, with auctions held each year thereafter, including the first RESS auction for offshore wind in 2021.
- Produce a whole-of-government plan setting out how at least 70% renewable electricity generation by 2030 will be delivered and how the necessary skills base, supply chains, legislation, and infrastructure to enable it will be delivered. This new plan will make recommendations for how the deployment of renewable electricity can be sped.
- Finalise and publish the Wind Energy Guidelines, having regard to the public consultation that has taken place.
- Continue Eirgrid's programme 'Delivering a Secure, Sustainable Electricity System' (DS3).
- Strengthen the policy framework to incentivise electricity storage and interconnection.
- Support the clustering of regional and sectoral centres of excellence in the development of low-carbon technologies.

10.3.1.1.11 *Climate Action and Low Carbon Development (Amendment) Act 2021*

The Climate Action and Low Carbon Amendment Bill 2021, entitled an Act, is a piece of legislation which commits the country to move to a climate resilient and climate neutral economy by 2050. This Bill was passed into law in July 2021.

The Programme for Government has committed to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieving net zero emissions by 2050. This Bill will manage the implementation of a suite of policies to assist in achieving this target.

The Bill includes the following key elements, among others:

- Places on a statutory basis a 'national climate objective', which commits to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally -sustainable and climate-neutral economy.
- Embeds the process of carbon budgeting into law, Government are required to adopt a series of economy-wide five-year carbon budgets, including sectoral targets for each relevant sector, on a rolling 15-year basis, starting in 2021.
- Actions for each sector will be detailed in the Climate Action Plan, updated annually.
- A National Long Term Climate Action Strategy will be prepared every five years.
- Government Ministers will be responsible for achieving the legally-binding targets for their own sectoral area with each Minister accounting for their performance towards sectoral targets and actions before an Oireachtas Committee each year.
- Strengthens the role of the Climate Change Advisory Council, tasking it with proposing carbon budgets to the Minister.

- Provides that the first two five-year carbon budgets proposed by the Climate Change Advisory Council should equate to a total reduction of 51% emissions over the period to 2030, in line with the Programme for Government commitment.

10.3.1.1.12 Emissions Projections

Ireland's 2020 target under the EU Effort Sharing Decision (ESD[3]) is to achieve a 20% reduction on 2005 levels of non-Emissions Trading Scheme (non-ETS) sector emissions (agriculture, transport, residential, commercial, non-energy intensive industry, and waste). Ireland is set to miss its target for compliance with the ESD as our non-ETS emissions are projected to be 7% below 2005 levels in 2020 under both projected scenarios compared to the target of 20% below 2005 levels by 2020. This projection includes the impact of COVID on the 2020 emissions which due to national lockdowns saw Transport emissions decline but Agriculture emissions largely unaffected. Ireland is projected to exceed the 2020 ESD targets despite the impact of the pandemic.

The Environmental Protection Agency (EPA) publish Ireland's Greenhouse Gas Emission Projections and at the time of writing, the most recent report, *'Ireland's Greenhouse Gas Emissions Projections 2020–2040'* was published in June 2021. The report includes an assessment of Ireland's progress towards achieving its emission reduction targets out to 2020, 2030 and 2040 set under the EU ESD and Effort Sharing Regulation (ESR[4]).

The EPA has produced two scenarios in preparing these greenhouse gas emissions projections: a "With Existing Measures" (WEM) scenario and a "With Additional Measures" (WAM) scenario. These scenarios forecast Irelands greenhouse gas emissions in different ways. The WEM scenario assumes that no additional policies and measures, beyond those already in place by the end of 2019 (latest national greenhouse gas emission inventory), are implemented. The WAM scenario assumes that in addition to the existing measures, there is also full implementation of planned government policies and measures to reduce emissions such as those in the 2019 Climate Action Plan.

The EPA Emission Projections Update notes the following key trends:

- Total greenhouse gas emissions are projected to decrease from the latest 2019 levels by 3% by 2030 under the "With Existing Measures" scenario.
- Under the "With Additional Measures" scenario, emissions are estimated to decrease by 20% by 2030.
- Ireland's Non ETS emissions are projected to be 7% below 2005 levels in 2020 under both the 'With Existing Measures' and 'With Additional Measures' scenarios. The target for Ireland is a 20% reduction.
- Ireland exceeded its annual binding limits in 2016, 2017, 2018 and 2019.
- Over the period 2013 – 2020, Ireland is projected to cumulatively exceed its compliance obligations by 12.2 Mt CO_2 (metric tonnes of Carbon Dioxide) equivalent under the 'With Existing Measures' scenario and the 'With Additional Measures' scenario.

The report concludes:

- "Projections indicate that Ireland will exceed the carbon budget over the period 2021-2030 by 51.3 Mt CO_2 equivalent assuming LULUCF flexibilities described in the Regulation are fully utilised."
- "To determine compliance under the Effort Sharing Decision, any overachievement of the binding emission limit in a particular year (between 2013 and 2020) can be banked and used towards compliance in a future year. However, even using this mechanism Ireland will still be in non-compliance according to the latest projections."

[3] *DECISION No 406/2009/EC of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020*
[4] *REGULATION (EU) 2018/1999 on the Governance of the Energy Union and Climate Action*

- "A significant reduction in emissions over the longer term is projected as a result of the expansion of renewables (e.g., wind), assumed to reach 55% by 2030 under the 'With Existing Measures' scenario and 70% by 2030 under the 'With Additional Measures' scenario"
- "The projects reflect plans to bring Ireland onto a lower carbon trajectory in the longer term. However, Ireland still faces significant challenges in meeting EU 2030 targets in the non-ETS sector and national 2050 reduction targets in the electricity generation, built environment and transport sectors. Progress in achieving targets is dependent on the level of implementation of current and future plans."

In November 2020 the EPA also published '*Ireland's Provisional Greenhouse Gas Emissions 1990-2019*'. The provisional estimates of Ireland's greenhouse gas figures for the years 1990-2019 are based on the SEAI's final energy balances released in November 2020. The key findings from the report are as follows:

- "In 2019, Ireland's total national greenhouse gas emissions are estimated to have declined by 4.5% on 2018 levels to 59.9 Mt CO2 equivalent"
- The Provisional estimates of greenhouse gas emissions for the period 1990- 2019 indicate that Ireland will exceed its 2019 annual limit set under the EU's Effort Sharing Decision (ESD) by 6.98 Mt CO2eq.
- Emissions in the Energy Industries sector show a decrease of 11.2% or 1.19 Mt CO2eq in 2019, which is attributable to a 69% decrease in coal and an 8% decrease in peat used in electricity generation. Electricity generated from wind increased by 16.0% in 2019.

10.3.2 Climate and Weather in the Existing Environment

Ireland has a temperate, oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather station at Claremorris, Co. Mayo is the nearest weather and climate monitoring station to the Proposed Development site that has meteorological data recorded for the 30-year period from 1971 – 2000 (see Table 9-1 below). The monitoring station is located approximately 60 kilometres (km) south of the Proposed Development site. The wettest months are September and December, and April is usually the driest. July is usually the warmest month with an average temperature of 15° Celsius. The mean annual temperature recorded at Claremorris was 9.3° Celsius.

Table 10-9 Data from Met Éireann Weather Station at Claremorris, 1971 - 2000: Monthly and Annual Mean and Extreme Values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
mean daily max	7.5	8.1	9.8	12.1	14.9	17.0	18.9	18.7	16.4	13.1	9.9	8.1	12.9
mean daily min	1.7	1.8	2.9	3.9	6.1	8.8	11.0	10.6	8.6	6.4	3.5	2.5	5.7
mean temperature	4.6	4.9	6.3	8.0	10.5	12.9	15.0	14.7	12.5	9.8	6.7	5.3	9.3
absolute max.	13.3	13.6	16.2	22.3	25.4	29.8	30.5	28.0	25.1	19.9	15.9	14.3	30.5
min. maximum	-2.9	0.1	0.0	5.0	6.1	11.2	11.7	12.2	10.5	6.8	1.3	-1.5	-2.9
max. minimum	11.3	10.9	10.4	11.3	14.2	15.3	17.0	16.7	16.7	15.6	12.5	12.1	17.0
absolute min.	-11.7	-9.1	-8.0	-5.5	-3.1	0.7	0.6	2.6	-1.2	-4.3	-5.3	-12.9	-12.9
mean num. of days with air frost	8.7	7.3	5.2	3.3	0.8	0.0	0.0	0.0	0.1	1.2	5.3	7.6	39.5
mean num. of days with ground frost	15	14	12	10	5	0	0	0	2	5	12	14	89
mean 5cm soil	3.2	3.1	4.5	7.3	10.9	14.1	15.5	14.6	12.0	8.9	5.3	4.2	8.6
mean 10cm soil	3.2	3.1	4.5	7.3	10.9	14.1	15.5	14.6	12.0	8.9	5.3	4.2	8.6
mean 20cm soil	4.2	4.2	5.5	7.7	10.7	13.8	15.3	15.0	13.0	10.3	6.9	5.3	9.3
RELATIVE HUMIDITY (%)													
mean at 0900UTC	90.7	90.3	88.7	82.5	79.3	80.4	83.6	86.2	88.1	91.6	91.2	91.0	87.0
mean at 1500UTC	85.6	79.8	75.7	67.9	68.0	71.1	73.2	73.4	74.7	80.2	84.4	88.1	76.8
SUNSHINE (hours)													
mean daily duration	1.3	1.9	2.6	4.3	5.0	4.4	3.7	3.8	3.2	2.4	1.7	0.9	2.9
greatest daily duration	7.9	9.3	10.8	13.4	15.1	15.8	14.8	13.7	11.4	9.3	8.6	6.7	15.8
mean num. of days with no sun	9.5	7.3	5.7	2.8	2.0	2.2	2.2	2.1	3.4	5.0	8.1	10.8	61.1
RAINFALL (mm)													
mean monthly total	127.9	102.1	101.6	63.7	68.1	64.5	70.1	95.7	94.3	128.2	127.7	129.6	1173.6
greatest daily total	31.5	107.0	26.8	34.0	51.3	38.0	42.2	49.7	41.0	46.7	54.9	41.2	107.0
mean num. of days with >= 0.2mm	21	18	21	16	16	15	17	18	18	21	21	22	224
mean num. of days with >= 1.0mm	18	15	17	12	12	11	12	13	14	17	18	17	176
mean num. of days with >= 5.0mm	9	7	7	4	4	4	4	6	5	8	8	9	75

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
WIND (knots)													
mean monthly speed	10.2	10.3	10.2	8.7	8.1	7.7	7.2	6.8	7.7	8.7	8.9	9.7	8.7
max. gust	96	85	74	74	62	51	66	78	58	70	67	81	96
max. mean 10-minute speed	59	48	45	41	41	34	39	32	37	46	40	52	59
mean num. of days with gales	1.4	0.9	0.7	0.1	0.1	0.0	0.0	0.0	0.1	0.3	0.4	0.8	4.8
WEATHER (mean no. of days with)													
snow or sleet	5.7	4.4	3.8	1.6	0.2	0.0	0.0	0.0	0.0	0.1	1.2	3.1	20.0
snow lying at 0900UTC	2.3	0.7	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	4.6
Hail	4.4	3.2	5.4	3.2	1.6	0.4	0.1	0.0	0.7	0.8	2.6	2.7	25.2
Thunder	0.3	0.1	0.2	0.2	0.4	0.7	0.7	0.2	0.2	0.2	0.3	0.5	4.0
Fog	3.4	2.3	1.6	1.8	1.2	1.4	2.0	3.2	3.3	3.2	2.6	3.4	29.5

10.3.3 Calculating Savings from the Proposed Development

A simple formula can be used to calculate carbon dioxide emissions reductions (in tonnes CO_2) resulting from the generation of electricity from wind power rather than from carbon-based fuels such as peat, coal, gas and oil. The formula is:

$$t\ CO2 = \frac{A * B * C * D}{1000}$$

where: A = The rated capacity of the wind energy development in MW

B = The capacity or load factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc.

C = The number of hours in a year

D = Carbon load in grams per kWh (kilowatt hour) of electricity generated and distributed via the national grid.

The Proposed Development will have a maximum export capacity of c. 11MW.

A load factor of 0.35 (or 35%) has been used for the Proposed Development.

The number of hours in a year is 8,760.

The most recent data for the carbon load of electricity generated in Ireland is for 2019 and was published in Sustainable Energy Authority Ireland's (SEAI) December 2018 report, '*Energy in Ireland, 2020 Report.'* The emission factor for electricity in Ireland in 2020 was 324 g CO_2/kWh.

The calculation for carbon savings associated with the proposed development is therefore as follows:

$$CO2 \text{ (in tonnes)} = \frac{(11 \text{ x } 0.35 \text{ x } 8{,}760 \text{ x } 324)}{1000}$$

$$= 10{,}927 \text{ tonnes per annum}$$

Based on this calculation, approximately 10,927 tonnes of carbon dioxide will be displaced per annum from the largely carbon-based traditional energy mix by the proposed continued operation of Dunneill Wind Farm. Over the proposed 15-year lifetime extension of the wind farm, therefore, **163,905 tonnes of carbon dioxide will be displaced** from traditional carbon-based electricity generation.

10.3.4 Likely Significant Effects and Associated Mitigation Measures

10.3.4.1 'Do-Nothing' Effect

Under the Do-Nothing scenario, the existing wind farm would be decommissioned in accordance with the conditions of the current planning permission (ABP Pl. Ref. 21.204790).

If the Proposed Development were not to proceed, the opportunity to further significantly reduce emissions of greenhouse gas emissions, including CO_2, NO_x and SO_2 to the atmosphere would be lost. The opportunity to contribute to Ireland's commitments under the Kyoto Protocol and EU law would also be lost. This would be a **long-term, indirect, slight negative** impact.

The use of machinery during the decommissioning of the existing wind farm would result in the emission of greenhouse gases. Operations such as the transport of equipment and materials as well as construction personnel are typical examples of machinery use. This impact is considered to be imperceptible, given the insignificant quantity of greenhouse gases that would be emitted. This would likely result in a **short-term, imperceptible, negative** impact.

10.3.4.2 Construction Phase

The Dunneill Wind Farm is currently operational, and it is proposed to extend the operational phase of the wind farm by a further 15 years. No construction activities will occur as part of the proposed extension of duration of operational life of the wind farm, therefore there are **no construction phase impacts** on climate.

10.3.4.3 Operational Phase

10.3.4.3.1 *Greenhouse Gas Emissions*

The Proposed Development will generate energy from a renewable source. This energy generated will offset energy and the associated emission of greenhouse gases from electricity-generating stations dependent on fossil fuels, thereby having a net positive effect on climate. As detailed in Section 10.3.3 above, the Proposed Development will continue to displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 15 -year lifespan extension of the wind farm. The Proposed Development will assist in reducing carbon dioxide (CO_2) emissions that would otherwise arise if the same energy that the proposed wind farm will generate were otherwise to be generated by conventional fossil fuel plants. This is a long-term significant positive effect.

Residual Impact

Long-term, Moderate, Positive Impact on Climate as a result of reduced greenhouse gas emissions.

Significance of Effects

Based on the assessment above there will be a **moderate positive effect on Climate**.

10.3.4.4 Decommissioning Phase

The potential impacts associated with decommissioning of the Proposed Development (2039 should planning permission be granted for the Proposed Development) will be similar to those associated with a typical wind farm construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.8 of this EIAR.

A preliminary Decommissioning Plan for the Proposed Development, see Appendix 4-3, contains details which will be agreed with the local authority prior to any decommissioning. The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the EIAR.

Any potential air quality impacts and consequential effects likely to occur during the future decommissioning phase (i.e., 2039) are similar to those which would occur under the Do-Nothing alternative (2024 decommissioning date). The use of machinery during the decommissioning of the wind farm would result in the emission of greenhouse gases. Operations such as the transport of equipment and materials as well as construction personnel are typical examples of machinery use. The impact of this is considered imperceptible, given the insignificant quantity of greenhouse gases which would be emitted. Should mitigation measures be implemented as outlined within the

Decommissioning Plan (see Appendix 4-3) be implemented, then **no significant effects** related to climate are envisaged during the decommissioning stage of the Proposed Development.

10.4 Cumulative Assessment

Potential cumulative effects on air quality and climate between the proposed development and other projects in the vicinity were also considered as part of this assessment. The projects considered as part of the cumulative effect assessment are described in Section 2.7 of this EIAR.

The nature of the Proposed Development is such that it will have a **long-term, slight, positive impact** on the air quality and climate.

The Dunneill Wind Farm is currently operational, and it is proposed to extend the operational life of the wind farm by 15 years. No construction activities will occur as part of the proposed extension of operational life, therefore there are no construction phase cumulative negative effects on air and climate.

There will be no net CO_2 emissions from operation of the Proposed Development. Emissions of CO_2, NOx, SO_2 and dust during the operational phase of the Proposed Development will be minimal, relating to the use of operation and maintenance vehicles on-site, and therefore there will be **no measurable negative cumulative effect** with other projects on air quality and climate.

11. NOISE

11.1 Introduction

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

This chapter draws on previous noise monitoring campaigns undertaken at the Proposed Development and specifically the most recent campaign undertaken during October and November 2021 and discusses the likely and significant effects of the continued operation, and decommissioning, of the development. The methodology for this noise monitoring campaign was agreed in advance with Sligo County Council (SCC) and was undertaken in order to comply with Condition 12(c) of Planning Permission PL 03/619.

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.

The most recent noise monitoring and analysis, undertaken in October and November 2021 to discharge the planning condition relating to operational noise, was undertaken in accordance with relevant guidance relating to the measurement of turbine noise i.e. A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IOA, 2013) (GPG), including its Supplementary Guidance Notes.

Hayes McKenzie Partnership Limited (HMPL) carried out similar noise monitoring campaign at the same locations between November 2011 and March 2012. The results of this campaign were similar to the 2021 campaign i.e., compliant with planning permission.

11.1.1 Description of the Proposed Development

Chapter 4 of this EIAR provides a full 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 application seeks a fifteen (15) year planning permission for continuation of the operational life of the existing wind farm (SCC Reg. Ref. 03/619 & ABP Pl. Ref. 21.204790, as amended by SCC Reg. Ref 10/371 and 10/388) from the date of expiration (March 2024) of the current permissions. No modifications are proposed to the existing windfarm which comprises the following elements:

a) *13 no. existing Vestas V52 850 kilowatt (kW) wind turbines with a maximum overall blade tip height of 75 metres (m).*
b) *Existing 1 no. onsite 20 kilovolt (kV) electrical substation compound which includes a control building, welfare facilities, associated electrical plant and equipment, security fencing, associated underground cabling and a foul waste holding tank.*
c) *Existing 1 no. permanent meteorological mast with a height of 50m and an associated concrete platform/base;*
d) *All associated existing underground electrical and communications cabling connecting the turbines to the on-site substation;*
e) *Existing site access tracks of circa 3.3 kilometres (km) total length, 3 no. car parking spaces and 13 no. turbine hardstands;*
f) *2 No. existing gated site entrances from an unnamed third-class public road which dissects the windfarm site into north and south;*
g) *Existing Site drainage; and,*
h) *All existing ancillary infrastructure, associated site fencing and signage.*

11.1.2 Statement of Authority

This EIAR chapter has been prepared by Matthew Cassidy of SSE Renewables, with input from Robin Woodward (HMPL) and Mike Craven (HMPL), regarding operational noise assessments. Matthew has more than sixteen years of acoustic experience, including the preparation and management of wind farm noise assessments for EIA purposes throughout the UK and Ireland. Matthew has a PhD in acoustics and noise control, and is a member and chartered engineer with the Institute of Acoustics. Both Robin and Mike have extensive acoustic assessment experience including the preparation and review of post-construction noise monitoring programmes in accordance with relevant standards and best practice methods. HMPL has substantial acoustic impact assessment experience having prepared Noise chapters and reports for hundreds of existing, permitted and proposed wind energy developments across the UK and Ireland 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 at the existing development;
- Comment on noise levels recorded during the most recent monitoring survey 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: Introduction of this EIAR. 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

11.2.4 Fundamental 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).

11.3 Assessment Criteria

11.3.1 Operational Phase Noise Limits

11.3.1.1 Planning Conditions

Condition 12 of the existing planning permission (Ref PL 03/619) for the site states the following:

> *a) Noise levels emanating from the proposed development following commissioning, when measured externally at a noise sensitive location, shall not exceed 40dBL_{Aeq} for a hub height wind speed of 5m/s or 45dBL_{Aeq} for a hub height wind speed of 8m/s.*
>
> *(b) There shall be no discrete tones or impulses from the proposed development, both during the construction phase and following commissioning. If the noise contains a discrete, continuous note (whine, hiss, screech, hum, etc.) or if there are distinct impulses in the noise, a penalty of +5dB(A) shall be applied to the measured noise level. This increased noise level shall than be used in assessing compliance with the level specified above.*
>
> *(c) A noise monitoring survey shall be carried out every 5 years over the life of the wind farm, or when otherwise directed by the Planning Authority. The first survey shall be carried out within one year of commissioning of the proposed development. Noise levels during the operation of the windfarm shall be monitored over a range of wind and weather conditions to profile the actual noise detectable at dwellings within 500m of the proposed turbines. The extent and timing of each survey, and monitoring sites used shall be agreed with the Planning Authority in advance. The results of each survey shall be submitted to the Planning Authority within one month of completion of the survey.*
>
> *(d) An intensive baseline survey shall be carried out at all dwellings located within 500m of the windfarm prior to its construction. The details of this survey shall be agreed in advance with the Planning Authority.*
>
> *(e) Where it is suspected that the proposed development is the source of excessive noise at a noise sensitive location, or where circumstances have altered, the developer shall undertake a noise monitoring survey if so directed by the Planning Authority. The survey and monitoring sites used shall be agreed with the Planning Authority in advance. The results of the survey shall be submitted to the Planning Authority within one month of completion of the survey. If monitoring shows that the permitted sound level has been exceeded, the offending turbine shall be decommissioned immediately and measures to restore permitted levels shall be taken.*
>
> *(f) During the construction phase noise levels shall not exceed the background noise level by more than 6dB (A) at any time when measured at any external position at an occupied dwelling. The background levels shall be measured in the absence of any noise from the site on days and at times when construction operations would normally be carried out on the site.*

Reason: In order to prevent noise pollution.

The noise compliance assessment methodology, submitted to and agreed with Sligo County Council (SCC), includes the details regarding the conversion of the stated noise limits, expressed in dB L_{Aeq} to the equivalent and corresponding L_{A90} by subtracting 2 dB. This conversion is indicated as appropriate within relevant guidance such as ETSU-R-97 and the GPG. Wind farm operational noise measurements are generally assessed using the L_{A90} index to minimise the influence of transient, non-wind farm related sounds. The corresponding noise limits are therefore 38 dB L_{A90} for a hub height wind speed of 5 m/s and 43 dB L_{A90} for a hub height wind speed of 8m/s.

There is no indication that noise associated with the operation of the turbines has any specific tonal or impulsive content that would require a penalty as under the requirements of part (b) of the condition. As a result, the aspect has not been considered further as part of the full compliance monitoring report attached as Appendix 11-1 of this EIAR.

11.3.2 2021 Noise Survey

Noise measurement equipment was installed at two residential dwellings which were located closest to the Proposed Development. Noise monitoring data was gathered during the period from 6th October to 4th November 2021 (please refer to Figure 11-1 for Noise Monitoring locations).

The noise measurements were made with RION model NL-52 Sound Level Meters, fitted with 1/2" microphones, which comply with the Class 1 standard in IEC 61672-1:2002. The microphones were fitted with a 45 mm radius foam ball windshield surrounded by a 125 mm radius secondary windshield of 40 mm thickness (based on recommended design specifications within ETSU W/13/00386/REP) and mounted on a tripod at a height of approximately 1.2 - 1.5 metres above ground level.

Rain gauges were also installed at the measurement locations such that any data that may be affected by the presence of rainfall could be removed from the analysis.

Turbine information was supplied by the wind farm operator, as taken from the turbine SCADA (Supervisory Control and Data Acquisition) systems, in 10-minute intervals, which included hub-height wind speed, nacelle position (degrees), and active power output (kW) from each of the installed wind turbines.

The noise, rain and wind (SCADA) data was collected / provided in time synchronised ten-minute intervals throughout the survey period. This allows the data sets to be correlated and for the noise levels (including other noise sources not associated with the operation of the turbines), at the wind speeds that the planning condition specifies, to be determined.

Full details of the measurement locations and the results can be found within Appendix 11-1.

11.3.2.1 2021 Noise Survey Results

The measured ten-minute L_{A90} and L_{Aeq} noise levels have been plotted against hub height wind speeds, as sourced from the SCADA systems data provided by SSE. The SCADA data was also used to filter out any periods where the turbines were non-operational or were not operating within expected parameters. The wind direction information provided as part of the SCADA data was also used to remove any periods where the properties were not considered to be downwind of the turbines.

A line of best fit, as defined within the compliance report, was plotted through the collected noise and wind data, to determine the noise levels at the wind speeds defined as part of the existing planning condition relating to operational noise from the site.

The derived prevailing operational noise levels include all sources of noise in the area and not just that associated with the Dunneill wind turbines themselves. In order to minimise corruption from other sources such as residential activities, birdsong and occasional traffic movements, only measurement data obtained during the night was used to inform the analysis.

The results indicate that the site is operating in compliance with its associated condition requirements in terms of operational noise. Furthermore, as the measurements were undertaken at the two properties located closest to the wind farm site it is considered that compliance can also be inferred at dwellings located further away from the development.

Full details of the measurements and the results can be found within Appendix 11-1.

11.3.3 Site Maintenance and Decommissioning Activities - Noise

While the Proposed Development does not specifically comprise any dedicated construction activities, the ongoing maintenance of the wind farm (e.g., turbines, electrical control building, 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 11-1 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.

Table 11-1 Example Threshold of Potential Significant Effect at Dwellings

Assessment category and threshold value period (T)	Threshold values, LAeq,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**

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 and 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 11-2 below.

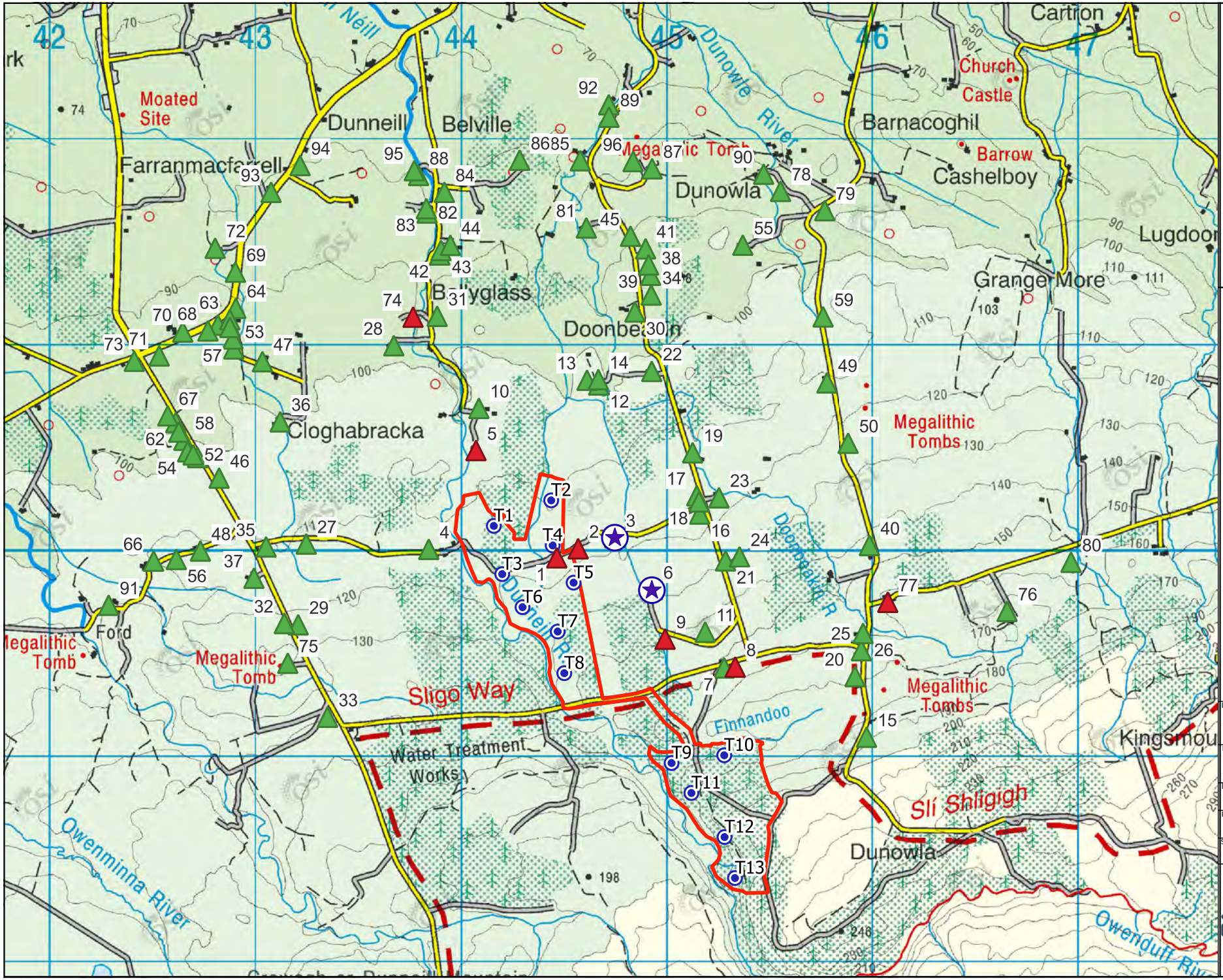
Table 11-2 Allowable Transient Vibration at Properties

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

11.4 Description of the Existing Development

Dunneill Wind Farm is located in a rural area on the northwest slopes of the Ox Mountains, located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in Co. Sligo. The predominant surrounding land use within the

Proposed Development is agricultural, with a predominant use for pasture. The relative remoteness of the Proposed Development site and its environs is evidenced by the fact that the area is relatively sparsely populated with 4 no. residential dwellings located within 500m of an existing wind turbine, of which one is an involved landowner and three are third party properties. The location of all residential dwellings within 2km of existing wind turbines are illustrated in Figure 11-1 below.


Map Legend
EIAR Site Boundary
Dwellings within 2km of Turbines
Derelict
Dwelling
Noise Monitoring Locations
Moated Site
Dunneill
Belville
Farranmacfarrell
Dunowla
Barnacoghil
Castle
Church
Barrow
Cashelboy
Granger More
Lugdoon
Doonbeg
Cloghabracka
Megalithic Tombs
Megalithic Tomb
Ford
Sligo Way
Water Treatment Works
Finnandoo
Sli Shligigh
Owenminna River
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Ordnance Survey Ireland Licence No. AR 0021821© Ordnance Survey Ireland/Government of Ireland
Drawing Title
Noise Monitoring Locations and Residential Receptors
Project Title
Dunneill Wind Farm
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Project No.
210207
Drawing No.
Figure 11-1
Scale
1:24,000
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11.5 Likely, Significant Impacts and Mitigation Measures Implemented

11.5.1 'Do-Nothing Scenario'

The 'Do-Nothing' scenario entails the decommissioning of the existing wind farm once the current planning permission expires (2024) and restoration of the site to its original use as agricultural lands for pasture and crops.

Condition 10 of the original Planning Application to Sligo County Council (Ref: PL 03619) states the following in relation to the decommissioning of the wind farm:

> *"Upon termination of the use of the wind farm, the mast and turbines shall be dismantled and removed from the site and the site shall be restored to its existing condition in consultation with the planning authority. Prior to the commencement of development, the developer shall lodge with the planning authority, a cash deposit, a bond of an insurance company, or other security to secure the satisfactory reinstatement of the site on the cessation of the project. The amount of the security shall be 100,000 euro."*

Should the Decommissioning Plan as set out in the Planning Conditions for Dunneill Wind Farm be implemented it may lead to additional noise and vibration impacts due to the potentially extensive ground works required to remove existing access tracks and the turbine foundations. A more environmentally sensitive approach is outlined for the end of the proposed extended operational period (i.e., 2039), as set out below.

If the Proposed Development is not progressed, the existing wind turbines will be dismantled at the end of their permitted operational period (i.e., 2024) and the associated noise generated during their operation will be removed from the soundscape.

11.5.2 Construction Phase Impacts

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.

11.5.3 Operational Phase Impacts

11.5.3.1 Wind Turbine Noise & Vibration

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 4 no. residential dwellings located within 500m of an existing wind turbine. Noise monitoring undertaken in 2021 at the two closest dwellings indicate compliance with planning permission noise conditions. Consequently, it is assessed that the likelihood of significant effects arising during the proposed 15-year additional operational period is low.

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.

As described above, a comprehensive operational phase noise monitoring was completed between October and November 2021. This monitoring was undertaken in accordance with the methodology described above, and within Appendix 11-1. The results of the monitoring campaign are provided, in full, within Appendix 11-1 of this EIAR.

The results indicate that the site is operating in compliance with its associated condition requirements in terms of operational noise. Furthermore, as the measurements were undertaken at the two residential properties located closest to the wind farm site it is considered that compliance can also be inferred at residential dwellings located further away from the development.

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**.

Mitigation Measures

The findings of the post-commissioning noise monitoring campaigns 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.

In accordance with relevant standards for allowable vibration effects, it has been assessed that the 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.

Residual Impact

The implementation of the above mitigation measures will result in a residual **Imperceptible, Negative, Direct, long-term, impact** with regard to noise and vibration impacts for sensitive receptors within proximity of the Proposed Development.

Significance of Effects

No Significant Effects on noise and vibration associated with the continued operation of the existing Dunneill wind turbines are envisaged during the operational stage of the Proposed Development.

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 visited 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 works including, for example, maintenance of access tracks or the wind farm's drainage infrastructure. Such works may require the use of tracked excavators, HGVs, and other plant and machinery as outlined at Table 11-3 below.

In this instance, dwellings surround the proposed development site at varying distances. The closest third-party inhabitable dwelling is H3 as identified in Chapter 5 and Figure 5-7 of this EIAR with the nearest Turbine (T5) being located c. 297m from the dwelling. Taking this as a worst-case example, the

range of plant and machinery outlined in Table 11-3 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 297m from the works, or where the works are undertaken at a greater distance from a dwelling, due to the attenuation of noise over distance.

Table 11-3 Typical Plant & Machinery Noise Emission Levels

Item (BS5228 ref)	Activity	Plant Noise Level at 10m Distance (dB $L_{Aeq,T}$)	Plant Noise Level at 297m Distance (dB $L_{Aeq,T}$)
HGV Movement (C.2.30)	Removing spoil and transporting fill and other materials	79	49
Tracked Excavator (C.4.64)	Excavations and reinstatement	77	47
General Construction (Various)	All general activities plus deliveries of materials and plant	84	54
Dumper Truck (C.4.39)	Moving excavated material	76	46
Mobile Telescopic Crane (C.4.39)	Turbine Reinstatement	77	47
Dewatering Pumps (D.7.70)	If required	80	50
JCB (D.8.13)	For services, drainage and landscaping	82	52

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 H3 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 unusual 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 in Table 11-3 above, 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. 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. Therefore, it is assessed that the noise and vibration effects of the continued routine maintenance works of the existing wind farm will be **negative, long-term, and of a slight magnitude**.

Mitigation Measures

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;
- Compressor 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.

Residual Impact

The implementation of the above mitigation measures will result in a residual **Imperceptible, Negative direct, short term, impact** with regard to noise and vibration impacts for sensitive receptors within proximity of the Proposed Development.

Significance of Effects

Based on the assessment above **No Significant Effects** on noise and vibration associated with the routine maintenance of the existing Dunneill Wind Farm are envisaged during the operational stage of the Proposed Development.

11.5.4 Decommissioning Phase Impacts

During the decommissioning phase, the magnitude of works and the plant & machinery to be utilised will be largely similar to that used during maintenance works and as detailed in Table 11-3 above. Therefore, it is assessed that the noise generated by the plant & machinery will be of a similar magnitude to that described in Table 11-3 above and will not, therefore, result in an exceedance of the appropriate limit (see Table 11-3 above) 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 carried out and the separation distance to the nearest dwelling; it is assessed that there is no likelihood of the allowable limits, listed in Table 11-3 above, being exceeded such that a significant effect would occur. Therefore, it is assessed that the noise and vibration effects of the future decommissioning works of the existing wind farm will be **negative, short-term, and of a slight magnitude**.

Mitigation Measures

No specific mitigation measures are proposed for the decommissioning phase. Those measures listed in Section 11.8.2.1 above, as they relate to the use of plant and machinery, will be implemented as relevant during the decommissioning phase.

Residual Impact

The implementation of the mitigation measures listed in Section 11.8.2.1 above, will result in a residual **Imperceptible, Negative direct, short term, impact** with regard to noise and vibration impacts for sensitive receptors within proximity of the Proposed Development.

Significance of Effects

Based on the assessment above **No Significant Effects** on noise and vibration associated with the future decommissioning of the Proposed Development are envisaged.

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 / harvesting of existing forestry plantations in the vicinity of the Proposed Development 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 anticipated.

While there are a number of other wind energy developments located within the wider landscape (see Chapter 2 of this EIAR), the nearest of which is the existing Kingsmountain Wind Farm which is located approximately 2km southeast of the Proposed Development. Due to this intervening separation distance between the Proposed Development and other wind farms, 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 the outcome of the noise survey noted above in Section 11.5.3.1 and within Appendix 11-1, it is concluded that significant cumulative effects will not arise.

11.5.6 Proposed Monitoring Measures

11.5.6.1 Construction Phase

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

11.5.6.2 Operational Phase

As outlined in Condition 12(a) of the existing planning permission for Dunneill Wind Farm, the following noise limits have been imposed by Sligo County Council (Pl. Ref. 03/619);

> *'Noise levels emanating from the proposed development following commissioning, when measured externally at a noise sensitive location, shall not exceed 40dBL_{Aeq} for a hub height wind speed of 5m/s or 45dBL_{Aeq} for a hub height wind speed of 8m/s;*

Post-commissioning operational noise monitoring has demonstrated that the development is operating within the terms of its planning permission.

However, as outlined in Condition 12(c) of the existing planning permission for Dunneill Wind Farm, the following noise limits have been imposed by Sligo County Council (Pl. Ref. 03/619);

> *'A noise monitoring survey shall be carried out every 5 years of the life of the wind farm, or when otherwise directed by the Planning Authority. The first survey shall be carried out within one year of commissioning of the proposed development. Noise levels during the operation of the windfarm shall be monitored over a range of wind and weather conditions to profile the actual noise detectable at dwellings within 500m of the proposed turbines. The extent and timing of each survey, and monitoring sites used shall be agreed with the Planning Authority in advance. The results of each survey shall be submitted to the Planning Authority within one month of completion of the survey.*

As outlined above, noise monitoring has been ongoing at Dunneill Wind Farm, and the results have demonstrated compliance with the current planning conditions (see Appendix 11-1 for further details). The most recent noise monitoring campaign as part of the current planning condition compliance, was carried out between October and November of 2021, with the report submitted to Sligo County Council in December of the same year.

As part of the Proposed Development to extend the operation of Dunneill Wind Farm, it is proposed that this noise monitoring would continue to be carried out on a 5-year basis (i.e., five noise monitoring campaigns proposed across the 15-year period including the survey years of 2024, 2029, 2034 & 2039).

Furthermore, should it be necessary to assess a complaint from a location which does not have an associated representative baseline curve, noise monitoring may be carried out and directional filtering applied to assess both wind farm noise and background.

11.5.6.3 Decommissioning Phase

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

11.6 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 within the current Planning Permission PL 03/619 as set out in Condition 12 by SCC.

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

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12. ARCHAEOLOGY AND CULTURAL HERITAGE

12.1 Introduction

This archaeological, architectural, and cultural heritage chapter was prepared by Tobar Archaeological Services. It presents the results of an archaeological, architectural and cultural heritage impact assessment for the Proposed Extension of Operation of the Existing Dunneill Wind Farm, Co. Sligo. The site comprises largely green field agricultural land and commercial forestry. This application seeks a fifteen (15) year planning permission for extension of the operational life of the existing wind farm from the date of expiration (March 2024) of the current planning permission (Pl. Ref. 03/619 and ABP Pl. Ref. 21.204790).

The purpose of this chapter is to assess the potential direct and indirect effects of the Proposed Development on the surrounding archaeological, architectural and cultural heritage landscape. The assessment is based on both a desktop review of the available cultural heritage and archaeological data and a comprehensive programme of field walking of the study area. The report amalgamates desk-based research and the results of field walking to identify areas of archaeological/architectural/ cultural significance or potential, likely to be impacted either directly or indirectly by the Proposed Development. An assessment of potential effects, including cumulative effects, is presented, and mitigation measures are recommended where appropriate. The visual effect of the Proposed Development on any newly discovered monuments/sites of significance as well as known recorded monuments is also assessed.

12.1.1 Proposed Development

Planning permission is being sought from Sligo County Council to enable the existing wind farm to continue operating in its current form for an additional 15 years. It is not proposed to alter the current 13 turbine layout or infrastructure and no ground works are required. The full scope of works is described in Chapter 4: Description of the Proposed Development.

The existing Dunneill Wind Farm was first granted planning permission by Sligo County Council in 2003 (Pl. Ref. 03/619). This permission was subsequently appealed to An Bord Pleanála (ABP Pl. Ref. 21.204790), which upheld the decision to grant and issued planning permission for the wind farm in March 2004. An Environmental Impact Statement (EIS) was prepared and submitted as part of the initial planning application. An extension to the duration of the planning permission (to March 2011) was granted by Sligo County Council in March 2009, to allow for building of the wind farm. The Dunneill Wind Farm was subsequently developed and became operational in 2010 with electricity being supplied to the grid.

The wind farm has therefore been operational for approximately 12 years to date, with the current planning permission set to expire in March 2024. Condition No. 8 of Pl. Ref. 03/619 states that the continued operation of Dunneill Wind Farm beyond the permission date should be subject to further planning permission being granted. By March 2024, the existing turbines will have been in operation for only 14 years, whereas the normal operational life of a turbine is 25 to 30 years. It is therefore intended to apply for a 15-year extension to the operation life of the Dunneill Wind Farm.

12.1.2 Statement of Authority

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared by Miriam Carroll and Annette Quinn of Tobar Archaeological Services. Miriam and Annette both graduated from University College Cork in 1998 with a Masters degree in Methods and Techniques in Irish

Archaeology. Both are licensed by the Department of Housing, Local Government and Heritage to carry out excavations and are members of the Institute of Archaeologists of Ireland. Annette Quinn and Miriam Carroll have been working in the field of archaeology since 1994 and have undertaken numerous projects for both the private and public sectors including excavations, site assessments (EIAR) and surveys. Miriam Carroll and Annette Quinn are directors of Tobar Archaeological Services which has been in operation for 18 years.

12.1.3 Legislation and Guidelines

The chapter has been prepared in compliance with all relevant Environmental Impact Assessment (EIA) legislation and guidance (see Chapter 1: Introduction for relevant guidance and legislation).

12.1.3.1 Current Legislation

Archaeological monuments are safeguarded through national and international policy, which is designed to secure the protection of the cultural heritage resource. This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention). This was ratified by Ireland in 1997.

Both the National Monuments Acts 1930 to 2004 and relevant provisions of the Cultural Institutions Act 1997 are the primary means of ensuring protection of archaeological monuments, the latter of which includes all man-made structures of whatever form or date. There are a number of provisions under the National Monuments Acts which ensure protection of the archaeological resource. These include the Register of Historic Monuments (1997 Act) which means that any interference to a monument is illegal under that Act. All registered monuments are included on the Record of Monuments and Places (RMP).

The RMP was established under Section 12 (1) of the National Monuments (Amendment) Act 1994 and consists of a list of known archaeological monuments and accompanying maps. The RMP affords some protection to the monuments entered therein. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage and Local Government) and shall not commence the work for a period of two months after having given the notice. All proposed works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2004).

The term 'national monument' as defined in Section 2 of the National Monuments Act 1930 means a monument *'the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto'*. National monuments in State care include those which are in the ownership or guardianship of the Minister for Arts, Heritage and the Gaeltacht. Section 5 of the National Monuments Act (1930) allows owners of other national monuments to appoint the Minister for the Arts, Heritage and the Gaeltacht or the relevant local authority as guardian of such monuments, subject to their consent. This means in effect that while the property of such a monument remains vested in the owner, its maintenance and upkeep are the responsibility of the State. Some monuments are also protected by Preservation Orders and are also regarded as National Monuments. National Monuments also includes (but not so as to limit, extend or otherwise influence the construction of the foregoing general definition) every monument in Saorstát Éireann to which the Ancient Monuments Protection Act, 1882, applied immediately before the passing of this Act, and the said expression shall be construed as including, in addition to the monument itself, the site of the monument and the means of access thereto and also such portion of land adjoining such site as may be required to fence, cover in, or otherwise preserve from injury the monument or to preserve the amenities thereof.

Under the Heritage Act (1995) architectural heritage is defined to include *'all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of*

historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents...'. A heritage building is also defined to include *'any building, or part thereof, which is of significance because of its intrinsic architectural or artistic quality or its setting or because of its association with the commercial, cultural, economic, industrial, military, political, social or religious history of the place where it is situated or of the country or generally'.*

12.1.3.1.1 Granada Convention

The Council of Europe, in Article 2 of the 1985 Convention for the Protection of the Architectural Heritage of Europe (Granada Convention), states that *'for the purpose of precise identification of the monuments, groups of structures and sites to be protected, each member State will undertake to maintain inventories of that architectural heritage'.* The Granada Convention emphasises the importance of inventories in underpinning conservation policies.

The National Inventory of Architectural Heritage (NIAH) was established in 1990 to fulfil Ireland's obligations under the Granada Convention, through the establishment and maintenance of a central record, documenting and evaluating the architectural heritage of Ireland. Article 1 of the Granada Convention establishes the parameters of this work by defining 'architectural heritage' under three broad categories of Monument, Groups of Buildings, and Sites:

- Monument: all buildings and structures of conspicuous historical, archaeological, artistic, scientific, social or technical interest, including their fixtures and fittings;
- Group of buildings: homogeneous 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;
- 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.

The Council of Europe's definition of architectural heritage allows for the inclusion of structures, groups of structures and sites which are considered to be of significance in their own right, or which are of significance in their local context and environment. The NIAH believes it is important to consider the architectural heritage as encompassing a wide variety of structures and sites as diverse as post boxes, grand country houses, mill complexes and vernacular farmhouses.

12.1.4 Sligo County Development Plan 2017-2023

The relevant policies and objectives of Sligo County Council regarding archaeology and built heritage were consulted. Those pertaining to archaeology and built, or architectural heritage include the following.

12.1.4.1 Archaeology

It is the policy of Sligo County Council to:

P-AH-1 Protect and enhance archaeological sites, monuments, their setting, appreciation and amenity within the Plan area, including those that are listed in the Record of Monuments and Places (RMP) or newly discovered archaeological sites and/or sub-surface archaeological remains.

P-AH-2 Require archaeological impact assessment, surveys, test excavation and/or monitoring for planning applications in areas of archaeological importance, if a development proposal is likely to impact upon in-situ archaeological monuments, their setting and archaeological deposits.

P-AH-3 Require the preservation of the context, amenity, visual integrity and connection of archaeological monuments to their setting. Views to and from archaeological monuments shall not be obscured by inappropriate development. Where appropriate, archaeological visual impact assessments will be required to demonstrate the continued preservation of an archaeological monument's siting and context.

P-AH-4 Secure the preservation in-situ or by record of:

- the archaeological monuments included in the Record of Monuments and Places as established under section 12 of the National Monuments (Amendment) Act, 1994;
- any sites and features of historical and archaeological interest;
- any subsurface archaeological features that may be discovered during the course of infrastructural/development works in the operational area of the Plan. Preservation relates to archaeological sites or objects and their settings. Preservation in-situ is most effectively achieved by the refurbishment of existing buildings, in situations where it is possible to retain the greater part of existing structures without the need for new foundations.

P-AH-5 Protect historic burial grounds that are recorded monuments and encourage their maintenance in accordance with best conservation principles. Development may be restricted or conditions requiring substantial excavation may be imposed in and adjacent to former burial grounds.

P-AH-6 Where possible, facilitate and enhance public access to and understanding of the archaeological heritage and disseminate archaeological information and advice to prospective developers and the general public.

P-AH-7 Require that all development proposals for industrial buildings and sites of industrial archaeological importance be accompanied by an industrial archaeology assessment of the surrounding environment. New development should be designed in sympathy with existing features and structures.

P-AH-8 Protect and preserve the archaeological value of underwater archaeological sites and associated features. In assessing proposals for development, the Council will take account of the potential underwater archaeology of rivers, lakes, intertidal and subtidal environments. Cuil Irra Peninsula – Carrowmore, Knocknarea and Carns Hill

P-AH-9 Refer to the National Monuments Section, DAHG all development proposals within the archaeological and historic landscape of the Cuil Irra Peninsula (which includes the core areas of Knocknarea, Carrowmore and Carns Hill) as identified in Fig. 7.A (see next page).

P-AH-10 Ensure that Archaeological Impact Assessments are requested at pre-planning and planning application stage for all development proposals within the archaeological and historic landscape of the Cuil Irra Peninsula (which includes the core areas of Knocknarea, Carrowmore and Carns Hill)

It is an objective of Sligo County Council to:

O-AH-1 Identify and protect internationally important archaeological landscapes such as the Carrowkeel, Inishmurray and the Cuil Irra Peninsula (which includes the core areas of Knocknarea, Carrowmore and Carns Hill), in co-operation with landowners and relevant stakeholders and statutory agencies.

O-AH-2 Identify appropriate archaeological sites in the Plan area to which public access could be provided and work to secure public access, where appropriate, in consultation with the land owners.

O-AH-3 Prepare and implement conservation plans in partnership with relevant stakeholders for key heritage sites in County Sligo, including, Drumcliffe and the Greenfort, Sligo.

12.1.4.2 Architectural heritage

It is the policy of Sligo County Council to:

P-ARH-1 Preserve, protect and enhance the architectural heritage of County Sligo for future generations. The area's architectural heritage is of national and regional importance and is central to Sligo's ability to promote itself as a centre for cultural tourism.

P-ARH-2 Ensure that any development, modifications, alterations, or extensions affecting a protected structure, an adjoining structure or a structure within an ACA is sited and designed appropriately and is not detrimental to the character of the structure, to its setting or the general character of the ACA.

P-ARH-3 Exempt a development proposal from the normal requirement for the payment of a development contribution if the proposal involves restoration/refurbishment of a protected structure to a high architectural standard.

P-ARH-4 Facilitate enabling development to be carried out in conjunction with works to protected structures where consistent with the parameters outlined in subsection 7.3.5 Enabling Development.

P-ARH-5 Protect important non-habitable structures such as historic bridges, harbours, railways or non-structural elements such as roadside features (e.g. historic milestones, cast-iron pumps and post-boxes), street furniture, historic gardens, stone walls, landscapes, demesnes and curtilage features, in cases where these are not already included in the Record of Protected Structures.

P-ARH-6 Promote the retention and re-use of the vernacular built heritage through increasing public awareness of its potential for re-use and its adaptability to change.

P-ARH-7 When considering proposals to adapt vernacular buildings to meet contemporary living standards and needs, require applicants to apply the conservation principles and guidelines set out in the ICOMOS Charter on the Built Vernacular Heritage (Mexico 1999) – refer to Appendix H of this Plan.

12.1.4.3 Statutory Consultations

As detailed in Section 2.6, Chapter 2 of this EIAR, a Scoping Request was issued to consultees on the 16th of June 2021. Included in the list of consultees was the Department of Housing, Local Government and Heritage, which includes the National Monuments Service. No correspondence or response was received from the Department of Housing, Local Government and Heritage or the National Monuments Service.

12.1.5 Location and Topography

The Proposed Development is located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in County Sligo. The approximate grid reference location for the centre of the site is ITM E544576 N829278. The Ox Mountains are located just to the southeast of the site. The wind farm development lands (within the EIAR Boundary) cover approximately 26,733m^2. The Proposed Development consists of 13 no. existing Vestas V52 850-kilowatt (kW) turbines with a total blade tip height of 75m (49m tower and 52m rotor diameter). The turbines are situated both on agricultural pastureland and commercial forestry. The site also incorporates a 20kV substation and control building, meteorological mast and internal access roads.

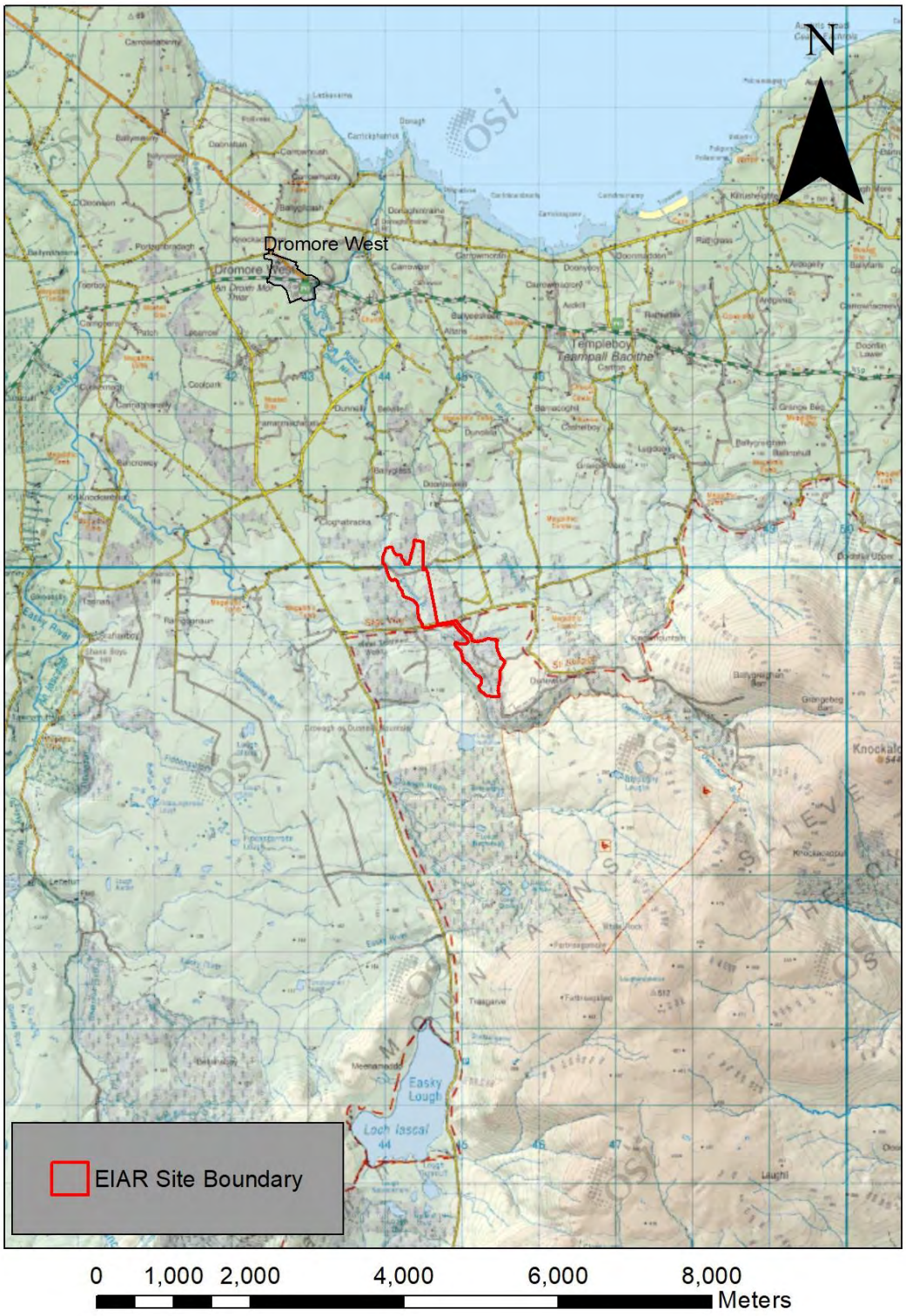


Figure 12-1: Site Location Map

12.2 Assessment Methodology

The assessment of the archaeology, architecture and cultural heritage of the Proposed Development area included GIS mapping and desk-based research followed by field inspection. A desk-based study of the Proposed Development site was initially undertaken in order to assess the archaeological, architectural and cultural heritage potential of the area and to identify constraints or features of archaeological/cultural heritage significance within or near to the Proposed Development site.

12.2.1 Geographical Information Systems

A Geographic Information System (GIS) is a computer database which captures, stores, analyses, manages and presents data that is linked to location. GIS includes mapping software and its application with remote sensing, land surveying, aerial photography, mathematics, photogrammetry, geography and tools that can be implemented with GIS software. An industry standard GIS system was used to manage the datasets relevant to the archaeological and architectural heritage assessment and for the creation of all the maps in this section of the report. This involved the overlaying of the relevant archaeological and architectural datasets on georeferenced aerial photographs and road maps (ESRI), where available. The integration of this spatial information allows for the accurate measurement of distances of a Proposed Development from archaeological and cultural heritage sites and the extraction of information on 'monument types' from the datasets. Areas of archaeological or architectural sensitivity may then be highlighted in order to mitigate the potential negative effects of a development on archaeological, architectural and cultural heritage.

12.2.2 Desktop Assessment

The following sources were consulted as part of the desktop assessment for the Proposed Development:

- The Record of Monuments and Places (RMP)
- The Sites and Monuments Record (SMR)
- National Monuments in State Care County Sligo
- The Topographical Files of the National Museum of Ireland
- First edition Ordnance Survey maps (OSI)
- Second edition Ordnance Survey maps (OSI)
- Third edition Ordnance Survey Map (Record of Monuments and Places)
- Down Survey maps (www.downsurvey.tcd.ie)
- Aerial photographs (copyright of Ordnance Survey Ireland (OSI)
- Excavations Database
- National Inventory of Architectural Heritage (NIAH)
- Record of Protected Structures (County Development Plan)
- Previous archaeological surveys and assessments carried out on or near to the Proposed Development site (various)
- Archaeological inventory of County Sligo

Each of these are discussed in the following sections.

12.2.2.1 Record of Monuments and Places, Sites and Monuments Record and National Monuments

A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Sligo. All known recorded archaeological monuments are indicated on 6-inch Ordnance Survey (OS) maps and are listed in these records. The SMR/RMP is not a complete record of all monuments as newly

discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments and SMRs which may be accessed at https://maps.archaeology.ie/historicenvironment/.

A review of all National Monuments in State Care and those subject to Preservation Orders was undertaken as part of the assessment in order to ascertain any potential impacts on their setting as a result of the Proposed Development.

12.2.2.2 Cartographic Sources and Aerial Photography

The 1st (1840s) and 2nd (1900s) edition OS maps for the area were consulted, where available, as was OSI aerial photography.

12.2.2.3 Topographical Files - National Museum of Ireland

Details relating to finds of archaeological material and monuments in numerous townlands in the country are contained in the topographical files held in the National Museum of Ireland. In order to establish if any new or previously unrecorded finds had been recovered from the study area these files were consulted for every townland within and adjacent to the same.

12.2.2.4 Archaeological Inventory Series

Further information on archaeological sites may be obtained in the published County Archaeological Inventory series prepared by the Department of Housing, Local Government and Heritage. The archaeological inventories present summarised information on sites listed in the SMR/RMP and include detail such as the size and location of particular monuments as well as any associated folklore or local information pertaining to each site. The inventories, however, do not account for all sites or items of cultural heritage interest which are undiscovered at the time of their publication. Many sites have been discovered since the publication of the Inventory Series which have now been added to the Sites and Monuments Record.

12.2.2.5 Record of Protected Structures

The Record of Protected Structures for County Sligo was consulted for the schedule of buildings and items of cultural, historical or archaeological interest which may be affected by the Proposed Development. The development plan also outlines policies and objectives relating to the protection of the archaeological, historical and architectural heritage landscape.

12.2.2.6 Excavations Database

The Excavations Database is an annual account of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2020. This database was consulted as part of the desktop research for this assessment to establish if any archaeological excavations had been carried out within, or near to, the Proposed Development area.

12.2.2.7 National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage (NIAH) lists some of the architecturally significant buildings and items of cultural heritage and is compiled on a county-by-county basis by the Department of Housing, Local Government and Heritage. The NIAH database was consulted for all townlands within and adjacent to the study area. The NIAH survey for Sligo has been published and was downloaded on to the base mapping for the Proposed Development (www.buildingsofireland.ie). The NIAH is a state initiative under the administration of the Department of Housing, Local Government

and Heritage and established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999.

The purpose of the NIAH is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Housing, Local Government and Heritage to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS). The published surveys are a source of information on the selected structures for relevant planning authorities. They are also a research and educational resource. It is hoped that the work of the NIAH will increase public awareness and appreciation of Ireland's architectural heritage.

12.2.3 Field Inspection

Although the wind farm site is existing and no new development is proposed, the site contains a number of recorded monuments and in this regard an assessment and inspection of same was undertaken to ensure that the sites were afforded adequate protection / buffer zones. The inspection was undertaken by Paul Fingleton of Tobar Archaeological Services on the 8th October 2021. A full photographic record of the site was made and is attached in Appendix 12-1.

12.2.3.1 Limitations Associated with Fieldwork

No limitations to fieldwork were encountered.

12.2.4 Assessment of Likely Significant Effects

The likely effects on the existing archaeological, architectural and cultural heritage environment are assessed using the criteria as set out in the draft *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017) and as outlined in Section 1.7.2 of Chapter 1: Introduction. The following terminology is used when describing the likely effects of the Proposed Development from a Cultural Heritage perspective.

12.2.4.1 Types of Impact

The following types of impact have been considered throughout this EIAR:

- Direct impacts arise where an archaeological heritage feature or site is physically located within the footprint of the development whereby the removal of part, or all of the feature or site is thus required.
- Indirect impacts may arise as a result of subsurface works undertaken outside the footprint of the development, secondary environmental change such as a reduction in water levels and visual impacts.
- Cumulative Impacts arise when the addition of many impacts create a larger, more significant impact.
- Residual Impacts are the degree of environmental changes that will occur after the proposed mitigation measures have been implemented.

12.2.4.1.1 *Magnitude of Effects (Significance)*

The impact assessment throughout the EIAR has been classified under the following magnitudes:

- Profound: Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where an archaeological site is completely and irreversibly destroyed.

- Very Significant: An effect which by its character, magnitude, duration or intensity significantly alters most of the sensitive aspect of the environment.
- Significant: An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. An effect like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity and data about an archaeological site.
- Moderate: A moderate effect arises where a change to an archaeological site is proposed which though noticeable, is not such that the integrity of the site is compromised, and which is reversible. This arises where an archaeological site can be incorporated into a modern-day development without damage and that all procedures used to facilitate this are reversible.
- Slight: An effect which causes changes in the character of the environment which are not high or very high and do not directly impact or affect an archaeological site.
- Not Significant: An effect which causes noticeable changes in the character of the environment but without significant consequences.
- Imperceptible: An effect on an archaeological site capable of measurement but without noticeable consequences.

12.2.5 Methodology for the assessment of impacts on visual setting (indirect effects)

A standardised approach was utilised for the assessment of impacts of visual setting (indirect effects) according to types of monuments and cultural heritage assets which may have varying degrees of sensitivity. This assessment does not include visits to each and every site as this is considered to be beyond the scope of the EIAR as they are mainly located on private lands. Because the wind farm is existing and nothing additional is being proposed at the operational phase then potential effects as a result of the continued operation of the baseline environment will not occur.

Table 12-1: Cultural Heritage Assets considered according to sensitivity in the baseline environment

Cultural Heritage Asset	Distance Considered
National Monuments (State Ownership and Preservation Order Sites)	10km
Recorded Monuments, RPS	2km
NIAH structures	2km
Undesignated sites, if relevant	500m from Proposed Development

12.3 Existing Environment

12.3.1 Description of the Proposed Development Area

Plate 12-1: General view of turbine 8 (foreground), T7 to right of photo, T6 and T3 with T1 in background behind forestry plantation looking north.

Plate 12-2: Existing Road looking at same turbine as previous picture looking north.

Plate 12-3: Turbine 4 looking north with preserved cultural heritage building in foreground (probable 19th century).

Plate 12-4: T6 to T8 looking southeast.

Plate 12-5: Substation site in lower ground set back from road looking north.

12.3.2 Archaeological Heritage

Archaeological Heritage includes World Heritage Sites, National Monuments, sites which are subject to a preservation order, sites listed in the RMP/SMR and newly discovered archaeological sites. Each of these are addressed in the following sections.

12.3.2.1 National Monuments (State Care and those with Preservation Orders)

National Monuments are those recorded monuments which are in the ownership / guardianship of the Minister for Housing, Local Government and Heritage. They are frequently referred to as being in 'State Care'. Those with preservation orders (also National Monuments) are also included. An assessment of all National Monuments within 10km of the turbines was undertaken to ascertain any potential impacts on their visual setting (See Section 12.2.5 for methodology of assessment).

No National Monuments are located within the Proposed Development site and none are located within close proximity to same. No National Monuments in State Care or those with Preservation Orders are located within 10km of any of the existing turbines.

12.3.2.1.1 *Knocknarea (Maeve's Cairn) National Monument No/ 153*

Although Knocknarea (Maeve's Cairn) is located well outside the 10km study zone within which National Monuments in State Care are visually assessed, this monument is of International Significance and the monument was therefore visited on the day of survey. There is visibility of the existing turbines from the cairn although barely discernible at this distance (Plate 12-7). The cairn is located 18.1km to the nearest turbine (T9) therefore the turbines are not located within or immediately adjacent to the protected landscape for the Cuil Irra Peninsula as detailed in the County Development Plan (Figure 7a). As the wind turbines are already existing and there will be no changes to the existing Dunneill Wind Farm as part of the Proposed Development, there will be no impact or alteration on the current/existing setting at Knocnarea or other archaeological features, due to the Proposed Development.

Plate 12-6: Cairn looking West.

Plate 12-7: Views recorded looking towards Dunneill turbines (although visible they are barely discernible)

The cairn is described as follows:

This massive circular, limestone cairn (diam. c. 60m; H c. 10m), named 'Miosgan Meva' (Maeve's Cairn) on the OS 6-inch maps, crowns the summit of Knocknarae Mountain. Its flat-topped silhouette is a miniature version of the squat bulk of the mountain itself, which rises abruptly from the fertile coastal grasslands of the Cúil Irra peninsula, flanked by Ballysadare Bay to S and Sligo Bay to N. It is one of the most iconic archaeological monuments and landmarks in NW Ireland, its importance, past and

present, manifest in the enduring folk tradition which identifies it as the burial site of the legendary Queen Maeve of Connacht.

The pale-grey cairn, rising above the dark heather-covered plateau and light-reflecting limestone escarpments of the mountain, is visible and instantly recognisable from many widespread points in the surrounding landscape. The location of the cairn itself affords panoramic views, encompassing extensive areas of county Sligo, and stretching far into counties Mayo and Donegal. Important distant landmarks which tie the cairn into an ancient network of routeways and a wider ritual and mythological landscape, include Benbulben, the cairn-topped peaks of the Ballygawley Mountains (SL020-128—; SL020-129—; SL021-007—) and the Ox Mountains (SL019-174001; SL019-174002-; SL019-177—), Cairns Hill (SL014-231001-; SL014-232—), Carrowkeel Megalithic cemetery (MA040-086— to MA040-105—) and Kesh Corann (SL040-008—).

In its more immediate vicinity, the cairn is the dominant visual focus of a remarkably dense concentration of prehistoric ritual and settlement monuments. It is flanked on the summit by a roughly N-S linear cluster of smaller satellite tombs, cairns and mounds (SL014-076001- to SL014-076009-; SL014-076019-); the descending terraces of the mountain host huts sites (SL014-076047- to SL014-076050-), and field walls (SL014-076011-), and two caves (SL014-288—; SL014-290—) on the W flank of the mountain have produced evidence of Neolithic burials. At the foot of the mountain, the numerous passage tombs of Carrowmore megalithic cemetery (SL014-209001- , etc.), and associated monuments, spread eastwards across the undulating lowlands of Cúil Irra.

Flat-topped, with broadly sloping sides, the cairn presents a deceptively simple outline. Closer examination reveals more complexity (Berg 1995, 238-239). Although the body of the cairn is primarily limestone, a number of large gneiss boulders protrude from the perimeter at N–NE, and may be part of a kerb. Five small, low subcircular or D-shaped cairn-like concentrations of stone (diam. 8-11m; H 0.5-1m) abut the base of the cairn at E, S and W. Two large stones, a prostrate limestone slab 2m to N of the cairn, and a gneiss erratic 5.5m to S of the cairn, appear to represent deliberately placed markers on a N–S alignment. A low, inconspicuous earthen bank (Wth c. 3m; H 0.3m) encircles the cairn at a distance of 1-6m; it respects the five small cairns and the marker stones, kinking outwards to include them within its circuit (Berg 1995, 238-239).

The cairn is intact; it escaped the depredations of 18th- and 19th-century treasure hunters, and it has not been excavated. Its internal structures, therefore, remain a mystery. It is likely to be about 5000 year old, the same age as its eastern counterparts, the excavated Neolithic passage tombs at Newgrange (ME019-045—) and Knowth (ME019-030001-).

Maeve's Cairn is a National Monument (No. 153) in state ownership.

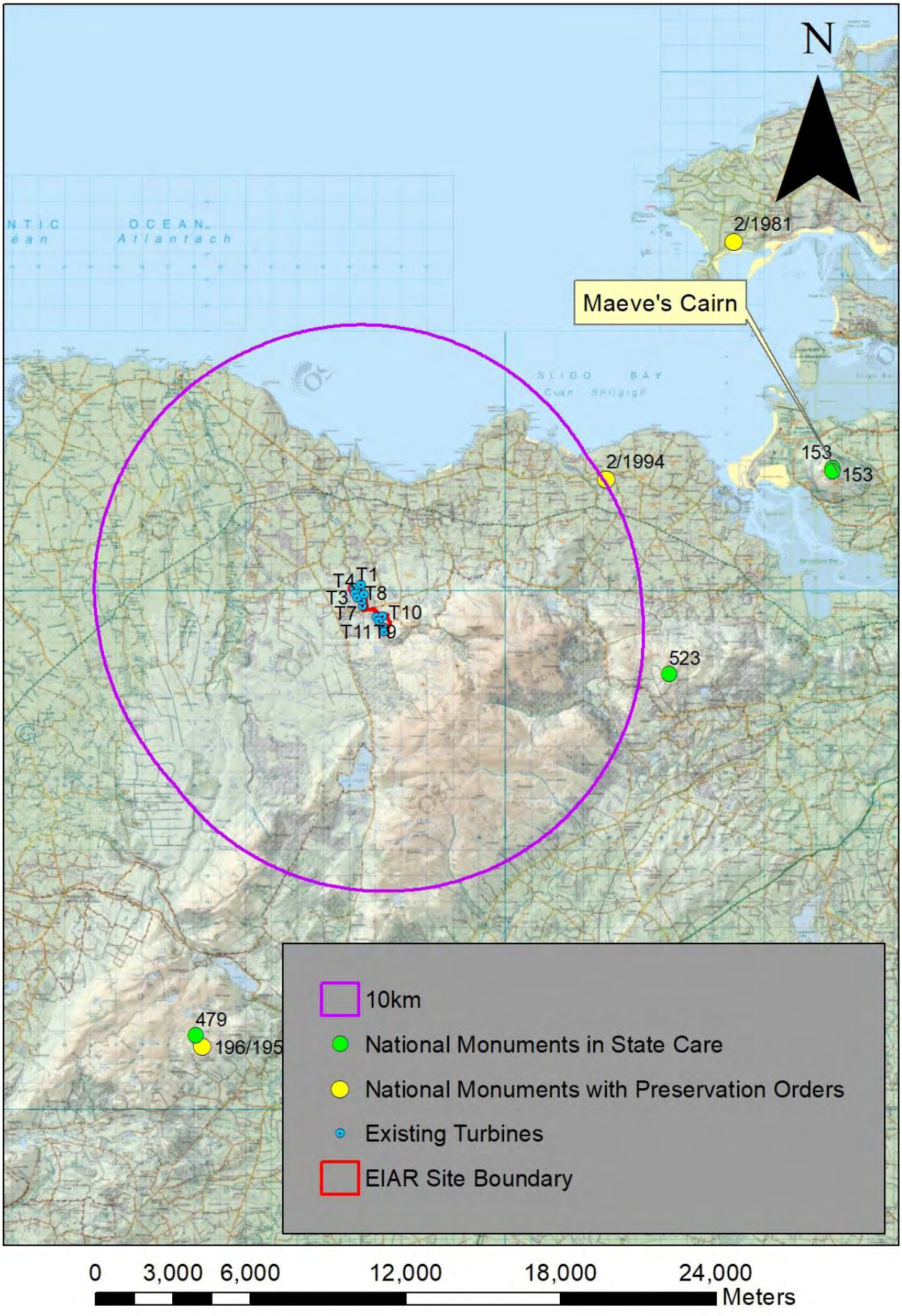


Figure 12-2: Note, No National Monuments within 10km of the nearest existing turbine

12.3.2.2 Recorded Monuments within the EIAR site boundary

No monuments listed in the Sites and Monuments Record (SMR) are located within the EIAR site boundary.

12.3.2.3 Recorded Monuments within 2km of Turbines

In terms of the general context within which the existing and Proposed Development is located, thirty-seven monuments are located within 2km of the nearest turbines (tabulated below) outside the EIAR site boundary. The majority of monument types are ringforts and enclosures (12) and one souterrain. Two burnt mounds and three fulachta fia are located within 2km as well as seven Megalithic tombs, one stone circle and one stone row. Other monuments include huts sites (2) a Holy well and a number of redundant records (2). A crannog is located in western half of Lough Nafullow, located on a bog-covered upland plateau. Tracts of forestry border the southern shores of the lake. Listed in the RMP (1995) as 'crannog -possible' on the basis of an oval-shaped island (c. 25m E-W; c. 15m N-S) shown on the 1837 edition of the 6-inch map in the centre of the W half of the lake, with the townland boundary extends through the W edge of the island. The island is not shown on later editions of the map. It is possible that a rise in lake levels since 1837 has caused the submergence of the island.

Table 12-2: RMPs within 5km of the nearest proposed turbines

Map ID	SMR NO.	ITM E	ITM N	DESCRIPTION	Townland	WTG ID	DISTANCE (M)
1	SL018-056	543840	830823	Ringfort - rath	Belville	T1	753
2	SL018-078	544978	827720	Crannog	Crowagh Or Dunneill Mountain, Tawnadremira	T13	760
3	SL018-054	543472	830608	Megalithic tomb - court tomb	Belville	T1	810
4	SL018-094	543472	830609	Redundant record	Belville	T1	810
5	SL018-080	546015	829345	Megalithic tomb - wedge tomb	Dunowla	T10	843
6	SL018-088	545419	830104	Burnt mound	Dunowla	T5	945
7	SL018-087	545377	830252	Fulacht fia	Dunowla	T5	957
8	SL018-079	546103	829465	Megalithic tomb - unclassified	Dunowla	T10	975
9	SL018-076	543086	829440	Megalithic tomb - court tomb	Crowagh Or Dunneill Mountain	T3	1166
10	SL018-055	543769	831282	Enclosure	Belville	T1	1210

Map ID	SMR NO.	ITM E	ITM N	DESCRIPTION	Townland	WTG ID	DISTANCE (M)
11	SL018-095	544420	831481	Souterrain	Doonbeakin	T2	1233
12	SL018-095001-	544444	831499	Enclosure	Doonbeakin	T2	1251
13	SL018-097	543049	829297	Burnt mound	Crowagh Or Dunneill Mountain	T3	1261
14	SL018-077002-	543275	828635	Hut site	Crowagh Or Dunneill Mountain	T8	1418
15	SL018-061	545940	830326	Redundant record	Dunowla	T10	1491
16	SL018-010	543802	831618	Enclosure	Belville	T2	1495
17	SL018-060	545976	830528	Enclosure	Barnacoghil	T2	1600
18	SL018-014	544219	831845	Ringfort - rath	Doonbeakin	T2	1607
19	SL018-058001	545937	830720	Megalithic tomb - court tomb	Barnacoghil	T2	1607
20	SL018-057	545936	830820	Megalithic tomb - unclassified	Barnacoghil	T2	1639
21	SL018-058002	545976	830704	Enclosure	Barnacoghil	T2	1640
22	SL018-016	544513	831921	Ringfort - rath	Doonbeakin	T2	1676
23	SL018-059002	546044	830685	Stone row	Barnacoghil	T2	1701
24	SL018-092	542723	828970	Ritual site - holy well	Crowagh Or Dunneill Mountain	T3	1708
25	SL018-059001	546060	830698	Stone circle	Barnacoghil	T2	1720
26	SL018-086	546062	830715	Fulacht fia	Barnacoghil	T2	1726
27	SL018-024	545618	831509	Cliff-edge fort	Dunowla	T2	1753

Map ID	SMR NO.	ITM E	ITM N	DESCRIPTION	Townland	WTG ID	DISTANCE (M)
28	SL018-015	544449	832054	Ringfort - rath	Doonbeakin	T2	1806
29	SL018-017	544829	832022	Megalithic tomb - court tomb	Doonbeakin	T2	1825
30	SL018-009002	543481	831840	Enclosure	Dunneill	T1	1831
31	SL018-053	542301	830374	Enclosure	Farranmacfarrell	T1	1837
32	SL018-085	546216	830621	Fulacht fia	Barnacoghil	T2	1854
33	SL018-093	542715	828698	Hut site	Crowagh Or Dunneill Mountain	T6	1858
34	SL018-009001	543446	831864	Enclosure	Dunneill	T1	1866
35	SL018-008	542771	831423	Designed landscape - tree-ring	Farranmacfarrell	T1	1873
36	SL018-096	542768	831477	House - 17th century	Farranmacfarrell	T1	1913
37	SL018-007	542700	831514	Designed landscape - tree-ring	Farranmacfarrell	T1	1988

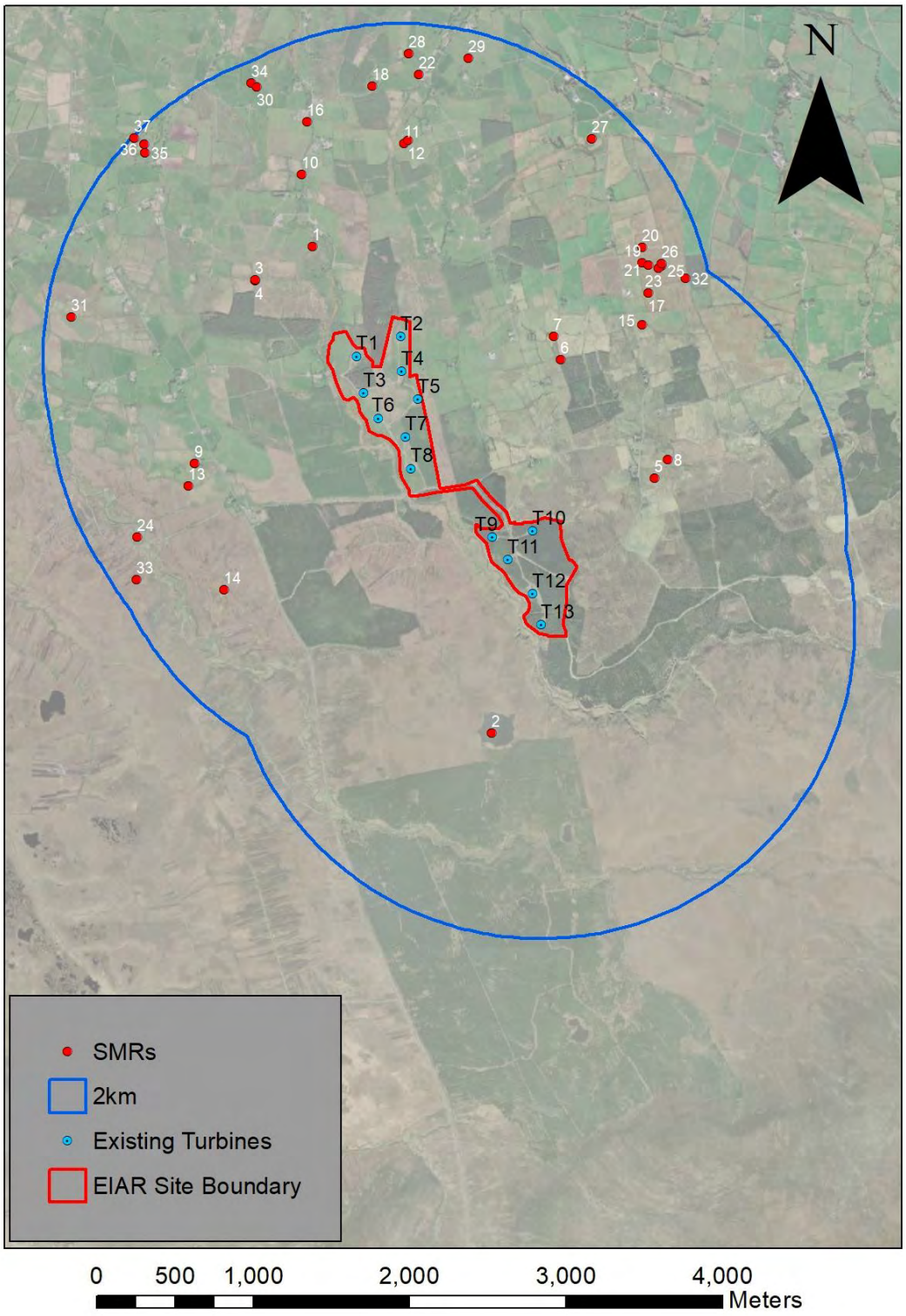


Figure 12-3: RMPs within 2km of the nearest turbine.

12.3.2.3.1 The Prehistoric Period

The prehistoric period is represented by burnt mounds / fulachta fia, Megalithic Tombs, a stone circle and a stone row as well as two hut sites which may have their origin in the prehistoric period.

Seven megalithic tombs are located within 2km of the turbines, as listed in Table 12-2 above. Further detail on these monuments is provided below.

One example (SL018-054) at Belville is described in the Megalithic Survey of Ireland as follows:

> *Court-tomb*
> This monument was first shown on the 1837 edition of the OS 6-inch map. It is situated on flat bogland almost 3km to the S of Dromore West. The Ox Mountains form the skyline to the S while Knocknarea and the mountains of N Sligo are visible to the NE.
> The monument consists of the ruins of a gallery, 7·50m long, preceded at the SSE by the scant remains of what appears to be an asymmetric court. Two sets of jambs at the front of the gallery indicate an ante-chamber about 1·50m in length. All the orthostats of the E side are missing and and while there is only one long orthostat visible at the opposite side it is possible that one or more could be concealed in the fence running along that side of the monument. Beyond the fence is a line of stones, two of which are upright, but it would appear that the stones here have no structural significance. A displaced split-boulder roofstone, 2·40m by 2·30m by 1·10m rests on the one surviving sidestone. Another, 2·30m by 2·40m by 1m thick, rests on a collapsed entrance jamb and on an adjoining courtstone. A mound, rising to a height of 1m, extends from the fence around the E side of the structure and runs towards a stony area, possibly a collapsed wall, to the SE of the court.
> The collapsed jamb at the front of the gallery measures 60cm by 65cm by 1·30m. The courtstone next to this is 85cm by 40cm by 70cm high and the courtstone beyond, 70cm by 50cm by 70cm high. The entrance jamb at the W measures 1m by 60cm by 90cm and the courtstone next to it 1·30m by 70cm by 40cm high. The entrance jambs, which also form part of the court perimeter, would seem to have stood about 60cm apart. Behind these and filling the ante-chamber is a displaced stone measuring 1·70m by 1·10m by 50cm thick.
> The jambs dividing the portico from the main part of the gallery are set 50cm apart. That to the E measures 70cm by 40cm by 40cm high and its fellow 70cm by 40cm by 80cm high. The sidestone here is 2·90m by 40cm by 60cm high. Its top edge slopes downwards from the S to N. Adjoining the last is a stone 50cm long and 45cm high which could be another sidestone. A trench, 50cm deep, occupies the N end of the gallery extending up to the backstone. This is a flat-topped stone measuring 1·40m by 60cm by 30cm high.

The Dunowla example (SL018-080) to the east of the Dunneill Wind Farm is described in the same survey as follows:

> *Wedge-tomb (?)*
> This monument is situated on a knoll, at the edge of the bog, overlooking the last monument (Sl. 67), 150m to the NE.
> The monument is very ruined and difficult to interpret. At the N is a line of six stones which may represent either a gallery side or the outer-wall of a wedge tomb. These are 40cm to 75cm long, 20cm to 35cm thick and 20cm to 35cm high. To the W of these is a rather larger stone which measures 90cm by 40cm by 50cm high. This could be a gallery sidestone. Set at right angles to it is an orthostat, 1m by 50cm by 60cm high, which may have formed part of a facade. At the E end of the structure is another stone which may have served as a gallery sidestone. This measures 90cm by 30cm by 20cm high. Between it and the end of the line of six stones described earlier is a stone 65cm by 10cm by 15cm. Its function is not clear. Three displaced slabs lie at this end of the monument. These are up to 1·40m in maximum dimension and 20cm to 25cm thick. Beside the largest is an orthostat, 60cm by 30cm by 30cm high, which could be another gallery sidestone. About 4·50m to the SW of these, at the edge of the mound incorporating the structure, are three orthostats, perhaps outer-wall stones. These are up to 80cm in maximum dimension and are 30cm to 55cm high. The mound, up to 1m in height, measures 11·50m E-W by 8·85m N-S.

The second Dunowla tomb (SL018-079) is unclassified and is described as follows:

Unclassified

This monument was first shown on the 1913 edition of the OS 6-inch map. It and the next monument (Sl. 68), which lies 150m to the SSW, are situated about 6km to the SE of Dromore West at the foot of the Ox Mountains. Both look N across the coastal lowlands to Sligo Bay and beyond. The example dealt with here stands 10m to the N of a little stream.

The tomb is deeply buried in bog and all that can be seen is the back of a gallery aligned E-W. The gable-topped backstone, at the E, measures 1·50m by 50cm by 90cm. The sidestone adjoining this at the N is partly concealed. It is at least 1·90m by 50cm by 90cm. Its flat top is about level with the backstone. The opposite sidestone also has a flat top. It measures 1·80m by 50cm by 1·10m high. To the E of this is another sidestone which runs into the bog. It is at least 90cm by 30cm by 40cm high. It too seems to have a flat top. The gallery represented by these stones is at least 3·50m long and is 1·30m wide at the back.

SL018-076 to the west of Dunneill is described in the survey as follows:

Court-tomb

This monument was not shown on any edition of the OS 6-inch map. It lies about 4km to the S of Dromore West and is situated immediately behind a cottage on the W side of the road leading S to Easky Lough. The site is 500m E of the Crowagh River and is at the edge of an extensive tract of bogland which extends S to the Ox Mountains. The land in the vicinity of the monument provides level, marshy pasture. A small stream, 120m from the site, flows NW to join the Crowagh River.

The monument consists of a gallery some 10m in length preceded at the N by the remains of a court. The gallery is divided by jambs into three chambers. The first two chambers contain a considerable amount of fill and the side-walls are largely concealed. A number of corbel or corbel-like stones along the sidewalls of the gallery are shown stippled on the plan. The structure is incorporated in a long cairn whose outline is obscured by a field bank which runs along its W side and curves around its S end and by a narrow drain along its E side.

The cairn, which is largely covered by grass-grown turf, survives to a height of at least 1m. Stones protrude from it in places and many more lie loose on the surface. Precise definition of its outline is hindered by the field bank and drain, already mentioned, and by the uneven and boggy nature of the ground in the area of the court. However, it would seem to have been at least 25m in length and 10m or more in width at the court end. The juxtaposition of field bank and drain suggest that it may have been trapezodial in shape with its narrower end to the S. A line of seven stones, 10cm to 50cm in height and extending for 4m , is exposed in the W face of the drain at the SE. The status of these is uncertain. Between this line and the back of the gallery is an arc of six stones (hatched on plan). These are up to 40cm in height and form a clear revetment within the cairn. Just inside the field bank, to the W and S, there is a rise of about 20cm in ground level but the significance of this is not clear. It may form the edge of a pathway. A pit, 3m across and 1m deep, has been dug to the N of the middle chamber of the gallery and there is another shallower pit to the SE of the back of the gallery. A mature tree stands at the SW corner of the cairn.

Three courtstones flank the entrance to the gallery at the S and there is one at the N. The latter measures 1m by 50cm by 50cm high. Beside this is a heap of stones with a curved line of stones, up to 60cm high, extending N from it. None of these are *in situ.* The backs of the courtstones at the opposite side are concealed. The innermost is 1·30m long and 50cm high and the stone next to it is 1·20m long and 35cm high. The third stone is 90cm by 1m by 35cm high. A stone, 70cm long and 30cm high, 90cm to the N of the last could be another courtstone but is not certainly *in situ.* Some 3m further N is a spread of large boulders covering an area measuring 8m by 4·50m.

The jambs at the entrance to the gallery also form part of the perimeter of the court. These are set transversely to the long axis of the court and stand 90cm apart. That at the W measures 1·60m by 80cm by 80cm high and its fellow 1·50m by 1·20m by 80cm high. A lintel, 1·90m by 1·20m by 50cm thick, lies above these. Its E end rests on a small slab, 35cm thick, which itself rests on two thin padstones (not on plan). There are two more padstones between the opposite end of the lintel and the jamb there.

The front chamber is about 3m long. The E side is represented by one partly concealed orthostat 1·60m by 50cm by 40cm in exposed height. There are no orthostats visible at the opposite side but the line of the side-wall may be indicated by two corbel-like stones partly embedded in cairn material. That next to the entrance measures 1·15m by at least 50cm by 20cm thick and the other 1·20m by at least 60cm by 30cm thick.

The jambs separating the first and second chambers stand 70cm apart. That at the W measures 1·50m by 70cm by 40cm in exposed height and its fellow 1·30m by 1·10m by 50cm high. Immediately N of these and resting on the fill in the front chamber is a stone which appears to be a displaced lintel. It measures 1·75m by 1m by 80cm thick. The second chamber is about 2m in length. The E side seems to be represented by two low and largely concealed stones one of which supports the jamb between the first and second chamber. The opposite side of this chamber is concealed but there is a corbel-like stone here measuring 80cm by 70cm by 25cm thick.

The third chamber is separated from the rest of the gallery by two transverse jambs standing 90cm apart. The W jamb is 1·25m by 50cm by 90cm high. It rests on a flat sill-stone measuring 1·45m by 50cm by 25cm high. At the E end of this are two small packing stones (not on plan). The E jamb here also rests on the sill and on two low stones beside it. This jamb appears to have been twisted out of its original position. It measures 1·20m by 70cm by 1m high. Resting against it at the N is a slab, 1·50m by 60cm by 60cm thick, which may be a displaced lintel.

The third chamber is 2·40m long and 1·85m wide. The sides are each of three stones the backs of which remain concealed. The first stone at the W side is 50cm long and 30cm high, the second is 70cm long and 55cm high and the third 1·10m long and 55cm high. At the opposite side the first stone is 35cm long and 30cm high, the second is 60cm long and 40cm high and the third is 1·25m long and 80cm high. Outside the S end of the last a stone, 60cm by 25cm, is visible on the surface of the cairn. This seems to serve as a support to the sidestone. A line of three corbels lies above the W side of the chamber. That at the N rests above a padstone 10cm thick and measures 60cm by 50cm by 40cm thick. The second corbel is 1·20m by 90cm by 50cm thick and the third 1·10m by 80cm by 45cm thick. A single corbel at the opposite side rests against the displaced jamb. It is 1·20m by 45cm by 35cm thick. The flat-topped stone closing the back of the gallery measures 1·70m by 70cm by 95cm high.

The tomb at Barnacoghil (SL018-058001) townland to the northeast is described in the survey as follows:

Court-tomb

This monument, 100m to the S of the last (Sl. 60), is situated at the edge of a tract of boggy ground which falls away immediately to the N of the site. The Ox Mountains form the skyline to the S and there is an extensive outlook to the N and NE across the coastal lowlands. There are rock outcrops 150m to the NE.

The monument is very ruined. It consists of a gallery 7·80m in overall length and up to 1·90m in width. The entrance, at the E, is marked by two tall jambs and to the N of this is a single inclined courtstone measuring 1·60m by 70cm by 70cm high. No traces of cairn are evident.

The entrance jambs stand 80cm apart. That to the N measures 1·20m by 1m by 1·50m high and its fellow 1m by 80cm by 1·40m high. Between these is a partly concealed stone which could be a sill. This is 80cm long and 40cm high. Three orthostats survive on the S side of the gallery. That adjoining the entrance measures 1·50m by 70cm by 1m high and the stone next to it 1·20m by 50cm by 50cm high. Between these is a small stone 15cm high, perhaps not *in situ*. The third stone is 1·60m by 70cm by 75cm high. The four orthostats on the opposite side are 70cm to 1·50m long, 40cm to 60cm thick and 40cm to 65cm high. The gallery narrows to 1·35m wide at the S and it may well be that it terminated at the surviving stones there.

A second unclassified tomb at Barnacoghil (SL018-057) is as follows:

Unclassified

This tomb and the nearby court-tomb (Sl. 61) were first shown on the 1913 edition of the OS 6-inch map. The tombs are situated some 4km to the SE of Dromore West. The monument dealt with here is 100m N of the second tomb and is on damp, gently sloping pasture crossed by old cultivation ridges. There are rock outcrops 100m to the E.

The meagre remains of the tomb are difficult to interpret. At the E is an erect stone and two leaning orthostats which could represent one side of the outer-wall of a wedge-tomb. At the S end of this line is a small erect stone which could be the last remains of a facade. A line of three orthostats, 1·20m to 1·40m to the W of the supposed outer-wall, could represent the side of a gallery aligned NE-SW. Three displaced stones lie at the N end of the monument.

The small erect stone at the S end of the structure measures 70cm by 20cm by 30cm high. The leaning stone adjoining this is 1·20m by 40cm by 70cm high and the second leaning stone here is 1m by 30cm by 60cm high. The erect stone 2·50m to the N of the last measures 80cm by 50cm by 45cm high. The supposed sidestone to the W of this is 70cm by 30cm by 40cm high. The second supposed sidestone here leans to the W. It measures 80cm by 40cm by 60cm high and the stone next to it 50cm by 40cm by 30cm high. The three displaced stones are up to 1·65m in maximum dimension and 30cm to 45cm thick.

The interpretation given above is tentative but the possibility that the structure is the remains of a long, narrow court-tomb gallery cannot be ruled out. The monument is best left unclassified.

The last tomb (SL018-017) is located at Doonbeakin and is described in the megalithic survey of Ireland as follows:

Court-tomb

This monument was first shown on the 1913 edition of the OS 6-inch map. It lies little more than 2km to the SE of Dromore West, on flat pasture land, some 200m E of the Doonbeakin River.

The monument consists of a gallery, 7·50m long, divided by jambs into two chambers and preceded, at the NW, by a shallow crescentic court. The structure is incorporated in a low mound measuring 19m long by 12m in greatest width at the court end. A line of four stones, 10cm to 40cm high, standing inside the perimeter at the E may represent a kerb. Five stones at the NE corner of the mound do not seem to be *in situ*.

The original extent of the court is unknown. Three orthostats flank the entrance jambs of the gallery at either side. Those at the E are 80cm to 1·20m long and 45cm to 70cm thick. Their heights from the entrance outwards are 1m, 40cm and 35cm. At the opposite side the courtstones are 80cm to 1·20 long and 45cm to 90cm thick. That next the entrance is 80cm high and the others 40cm and 60cm. The entrance jambs also serve as courtstones. These are set 70cm apart. The N jamb measures 1·10m by 70cm by 1·20m high and the other 1·10m by 70cm by 90cm high.

The front chamber is 2·80m long and is up to 2·20m wide. The single sidestone at the W measures 2·30m by 60cm and 60cm high. Its flat top slopes downwards from the court. The flat top of the larger sidestone at the E slopes in the opposite direction. This measures 1·75m by 65cm by 1·20m high and the stone next to it 90cm by 45cm by 90cm high. The jambs dividing this chamber from the next are set 65cm apart. That to the W measures 1·05m by 60cm by 50cm high and its fellow 1·05m by 50cm by 80cm high .

The second chamber is 4·10m long and narrows from 2·25m wide near the front to 1·65m towards the rear. The W side is represented by two orthostats. That next to the jamb measures 1·45m by 60cm by 60cm high and the other 1·35m by 55cm by 30cm high. The smallest of the three stones opposite is partly concealed. It is at least 55cm long by 25cm wide and 20cm high. The stone adjoining this measures 90cm by 70cm by 35cm high and the third stone 95cm by 45cm by 35cm high. The backstone is 1·65m by 55cm by 50cm high. Its flat top surface slopes downwards to the S.

Fulachta fia and burnt mounds consist of a horseshoe-shaped or kidney-shaped mound consisting of fire-cracked stone and charcoal-enriched soil built up around a sunken trough located near or adjacent to a water supply, such as a stream or spring, or in wet marshy areas. The first recorded use of the Irish

term 'fulacht fiadh/fia' (cooking pit of the deer or of the wild) as relating to ancient cooking sites was in the 17th century. These are generally interpreted to have been associated with cooking and date primarily to the Bronze Age (c. 2400-500 BC). There are a number of examples located in the study area in the townlands of Dunowla, Crowagh Or Dunneill Mountain and Barnacoghil as outlined in Table 12-2 above.

The stone row SL018-059002 is situated in rough, boggy terrain. Not marked on the 1837 or the 1913 OS 6-inch maps. An intermittent row of low stones extends, on a NE–SW axis, between the SE side of an enclosure (SL018-058002-) and the SW side of a possible stone circle (SL018-059001-), a distance of c. 35m. The line of stones appears to continue for c. 5m to NE of the stone circle. The stones appear to be set on edge but are very low, and are concealed by, or barely protruding above, the bog vegetation. At the SW end of their extent, close to the enclosure (SL018-058002-), the stones are 1-2m apart but the spacing increases to c. 10m as they approach the stone circle (SL018-059001-). To the NE of the stone circle the stones are again more closely spaced.

The stone circle (SL018-059001) is situated on a low rise in an area of rough, boggy pasture. Not marked on the 1837 edition of the OS 6-inch map; indicated as 'Stone Circle' on the 1913 edition. Circular area (diam. 10.5m) defined by a series of small, low closely-set stones (H 0.2-0.3m). The stones are almost entirely obscured by vegetation. A possible stone row (SL018-059002-), in the form of an intermittent line of low stones, extends for c. 35m to SW to an enclosure (SL018-058002-), within which there is a court tomb (SL018-058001-). A fulacht fiadh (SL018-086—) lies 7m N of the stone circle.

12.3.2.3.2 The Early Medieval Period

The majority of monuments consist of those which may be definitively attributed to the Early Medieval period and ringforts and enclosures dominate the archaeological landscape within the 2km area outside the EIAR boundary. Ringforts comprise earthen monuments while cashels take a similar form to the latter but are constructed using stone. Enclosures may represent the remains of ringforts or cashels but may not retain enough features to classify them as such or fall outside the acceptable size range for these monuments. Ringforts consist of a circular or roughly circular area enclosed by an earthen bank formed by material thrown up from the digging of a concentric ditch on its outside. Ringforts are usually enclosed by a single bank (univallate) while bivallate or trivallate ringforts i.e. those enclosed by double or triple rings of banks are less common. The number of banks and ditches enclosing these monuments are considered to reflect the status of the site, rather than the strengthening of its defences. Archaeological excavation has shown that the majority of ringforts functioned as enclosed farmsteads, built during the Early Christian period (5th – 9th century A.D.). Excavation within the interior of the monuments has traced the remains of circular and rectangular dwelling houses as well as smaller huts probably used to stall animals. The enclosing earthworks would also have protected domestic livestock from natural predators such as wolves and foxes. Souterrains are frequently associated with ringforts, cashels and enclosures. Souterrains derive their name from the French sous terrain meaning ‘underground’ and comprise an underground structure consisting of one or more chambers connected by narrow passages or creepways, usually constructed of drystone-walling with a lintelled roof over the passages and a corbelled roof over the chambers. Most souterrains appear to have been built in the early medieval period by ringfort inhabitants (c. 500 - 1000 AD) as a defensive feature and/or for storage.

Such monuments are located across numerous townlands including Belville, Doonbeakin, Barnacoghil, Dunneill and Farranmacfarrell as outlined in Table 12-2 above.

A crannog (SL018-078) is located in W half of Lough Nafullow, located on a bog-covered upland plateau. Tracts of forestry border the S of the lake. Listed in the RMP (1995) as 'crannog -possible' on the basis of an oval-shaped island (c. 25m E-W; c. 15m N-S) shown on the 1837 edition of the 6-inch map in the centre of the W half of the lake, with the townland boundary extends through the W edge of the island. The island is not shown on later editions of the map. It is possible that a rise in lake levels since 1837 has caused the submergence of the island.

12.3.2.3.3 *Sites with religious or ritual association*

A Holy Well SL018-092 is located at the base of the Crowagh River valley, on a broad U-shaped area of level, grassy ground defined by a meander in the river. Immediately to W of the river, the valley slope rises steeply to a plateau of blanket bog which stretching to the W. The well consists of a rectangular, vertical-sided pit (2.4m NE–SW; 1.1m NW–SE; D 0.5m) with a narrow outflow channel extending from the N corner for 4m to the river bank at NNW. Several large stones form a rough surround or paving at the S–SW end of the well. According to local information, the well is known as 'The Blessed Well' but it is not associated with a saint, and there is no tradition of a pattern or a 'cure'. The well was used by turf harvesters as a source of fresh water.

12.3.2.4 Archaeological Investigations undertaken within the Proposed Development site and adjacent to same

The site is located within a number of townlands namely: Crowagh or Dunneill Mountain, Ballyglass and Tawnadremira. The database of excavations contains details regarding licensed excavations undertaken both within and adjacent to the Proposed Development. The following were noted within the database.

A positive result was obtained for the windfarm site itself where a fulacht fia was uncovered during testing of the turbine bases. It was uncovered and subsequently archaeologically excavated. The results are summarised below:

2008:1052 - Ballyglass/Dunneill/Dunowla/ Tawnadremira or Crowagh, Sligo

County: Sligo Site name: Ballyglass/Dunneill/Dunowla/ Tawnadremira or Crowagh

Sites and Monuments Record No.: N/A Licence number: 08E0809

Author: Dominic Delany, Dominic Delany & Associates, Unit 3, Howley Court, Oranmore, Co. Galway.

Site type: Testing

ITM: E 544450m, N 829245m

Test excavations took place on the site of a proposed wind farm at Dunneill, in the foothills of Slieve Gamph, south of Dromore West, Co. Sligo. Phase 1 of testing occurred in the north of the site on 2 and 3 October 2008. Nine trenches were opened across the footprint of the scheme, each centred on the site of a proposed wind turbine generator. The trenches were excavated using a wide grading bucket and were all 10m long (the length and width of the turbine). Trenches were excavated to the top of archaeology or natural subsoils. There was no evidence of archaeological material at the proposed locations of turbines 1 or 3–8. Evidence of a fulacht fiadh was, however, found on the proposed location of turbine 2. Consultation between DDA, Airtricity and DoEHLG resulted in a decision to proceed with full excavation under the existing licence. A second phase of testing took place on 8 January 2009 which involved testing the proposed location of turbines 9–11. Nothing of archaeological significance was found.

2009:719 - Crowagh or Dunneill Mountain, Ballyglass and Tawnadremira (Dunneill Wind Farm), Sligo

County: Sligo Site name: CROWAGH OR DUNNEILL MOUNTAIN, BALLYGLASS AND TAWNADREMIRA (DUNNEILL WIND FARM)

Sites and Monuments Record No.: N/A Licence number: 08E0809

Author: Dominic Delany, Dominic Delany & Associates, Unit 3, Howley Court, Oranmore, Co. Galway.

Site type: No archaeological significance

ITM: E 568993m, N 836528m

Second-phase test excavations were carried out on the site of a proposed wind farm at Tawnadremira townland, Co. Sligo, in January 2009. The first phase of testing took place in October 2008 and resulted in the discovery of a burnt mound which was subsequently excavated in December 2008 (Excavations 2008, No. 1052). This second phase was concerned with the southern part of the wind farm, which is the location of Turbines 9 to 13. One turbine site had been topsoil-stripped and was inspected. Four test-trenches were opened across the footprint of the scheme, each centred on the site of a proposed wind turbine generator. The trenches were 10m long and were excavated using a 5ft-wide grading bucket. The stratigraphy found consisted of peat over orange sandy boulder clay with occasional gravel deposits. The stratigraphy was disturbed by forestry in some of the trenches. The results of testing indicated that nothing of archaeological significance was likely to be found within the footprint of the scheme.

Monitoring of works including topsoil removal also took place at the site in December 2008 and January 2009. Some of this work involved the preservation of sites previously identified at the EIS stage and this was achieved in consultation with the contractors. Monitoring of topsoil and peat removal in the area of Turbine 1 resulted in the discovery of a pre-bog clearance cairn. The feature was recorded and reinstated in consultation with the DoEHLG.

Monitoring of other works including topsoil removal in advance of turbine and road construction did not yield any features or finds of archaeological significance.

12.3.2.5 Topographical Museum Files

Some of the locational information for stray finds can be gleaned from Heritage Maps (heritage maps.ie) where the National Museum have provided such data.
No finds are registered within the site or within close proximity to same.

12.3.2.6 Cartographic Evidence

12.3.2.6.1 *1st and 2nd Edition OS maps*

The Ordnance Survey came to Ireland in 1824 in order to carry-out a precise admeasurement of the country's 60,000 or so townlands as a preliminary to the larger task of reforming Ireland's local taxation system. The townland boundaries were demarcated by a Boundary Commission, and the Ordnance Survey had the task of measuring them. In addition to boundaries the maps are truly topographical in content. Drawn at the large scale of six inches-to-one-mile (1:10,560) it was important to mark all buildings, roads, streams, placenames, etc, that were required for valuation purposes. Ultimately the maps were used as a basis for the rateable valuation of land and buildings in what became known as Griffith's Valuation. Working from north to south, the survey began in Antrim and Derry in 1829 and was completed in Kerry in 1842. It was published as thirty-two county maps between 1832 and 1846, the number of sheets per county varied from 153 for County Cork to 28 for Dublin, each of the 1,994 sheets in the series depicting an area 21,000 by 32,000 feet on the ground. Each county was projected on a different central meridian and so the maps of adjacent counties do not fit neatly together at the edges. Map content stops at the county lines.

The First Edition (6 inch Historic OS)

The early Ordnance Survey maps are an unrivalled source for the period immediately before the Great Irish Famine (1847-50) when the population was at the highest level ever recorded. The maps depict an open landscape in the area of the proposed turbines and infrastructure. No features of note are depicted. The existing windfarm and proposed development is largely depicted as open mountainous land with some small buildings shown along the central Dunneill River. The southern portion of the site is particularly devoid of any features.

The Second Edition (25 inch Historic OS)

The 25 inch OS map shows more enclosed field with the northern portion of the site being more 'developed'. A limekiln is shown just to the southwest of Turbine 4. This structure was referenced in the original EIS and was fenced off as part of the mitigation measures. This limekiln is still extant and was noted as part of the current phase of field work.

Plate 12-8: Limekiln shown just to north of access road between T4 and T3 to the west. Photo taken looking south. Limekiln indicated by arrow.

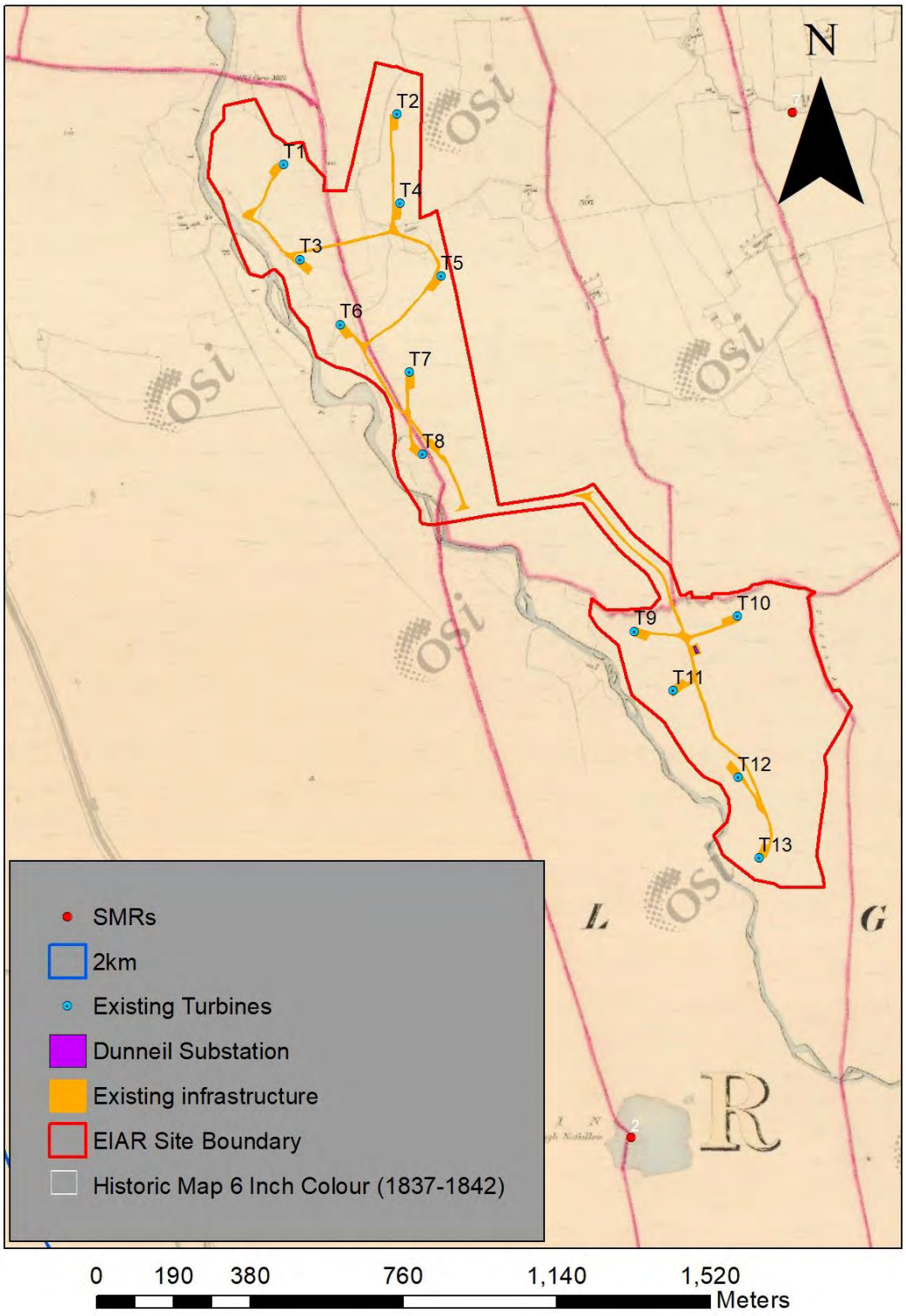


Figure 12-4: Existing turbines and roads overlaid on 1st edition OS background.

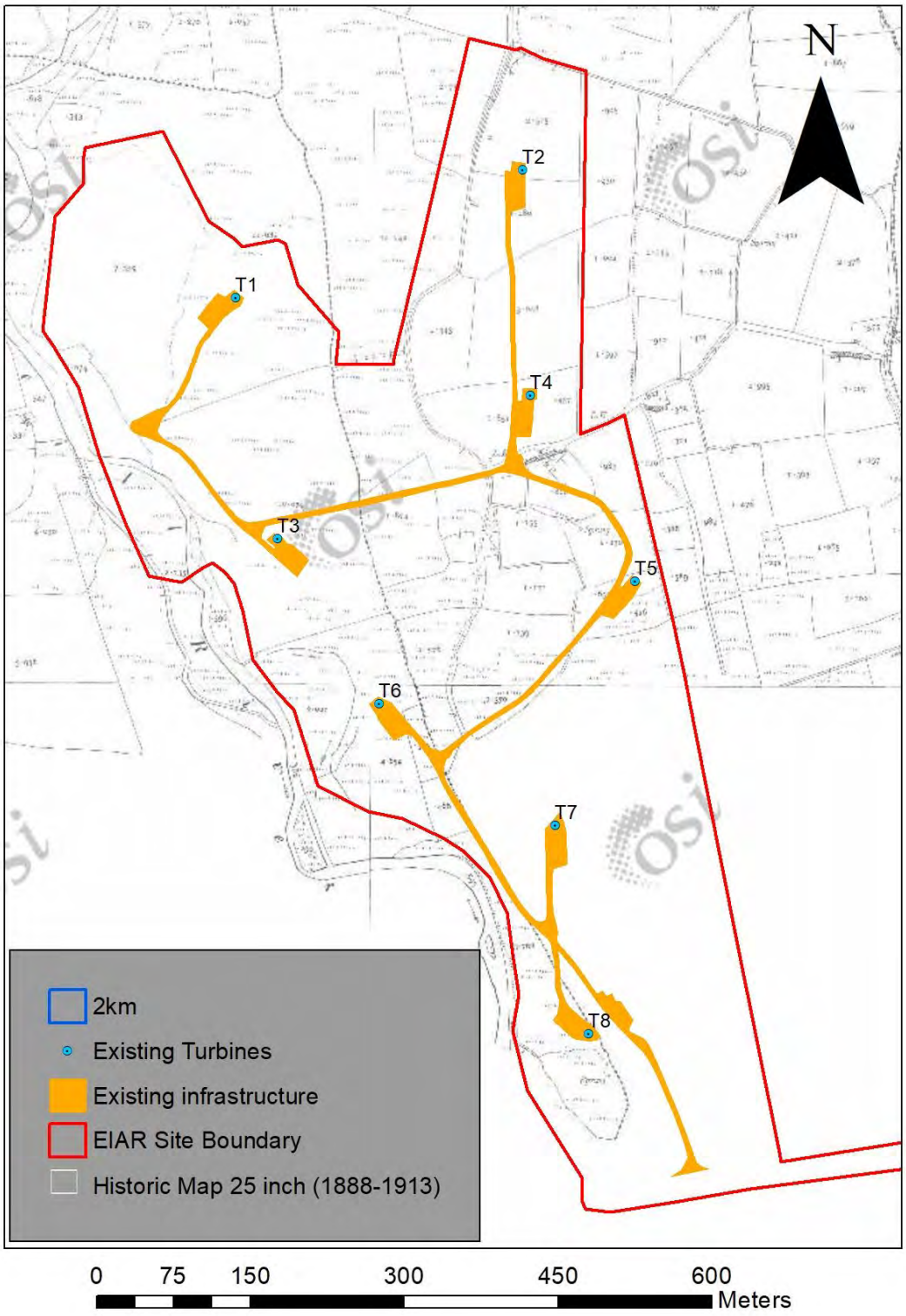


Figure 12-5: Northern portion of site shown on 1st edition OS map (southern section only available in 6 inch scale).

12.3.3 Architectural and Cultural Heritage

12.3.3.1 Protected Structures and NIAH within the Proposed Development site boundary

No built heritage structures which are subject to statutory protection (RPS) or otherwise (NIAH) are located within the Proposed Development boundary.

12.3.3.2 Protected Structures and NIAH within 2km of the nearest turbines

The RPS for County Sligo is detailed in the 2017 – 2023 County Development plan as a PDF. Whilst townland information is provided with each structure no further locational information is provided such as grid references (ITM or otherwise). No digital dataset is available therefore this chapter relies on the NIAH records since the majority of RPS structures also have NIAH references. No RPS information is provided on the Sligo County Council Planning website mapping or on MyPlan.ie.

No NIAH structures are located within 2km of the nearest turbine.

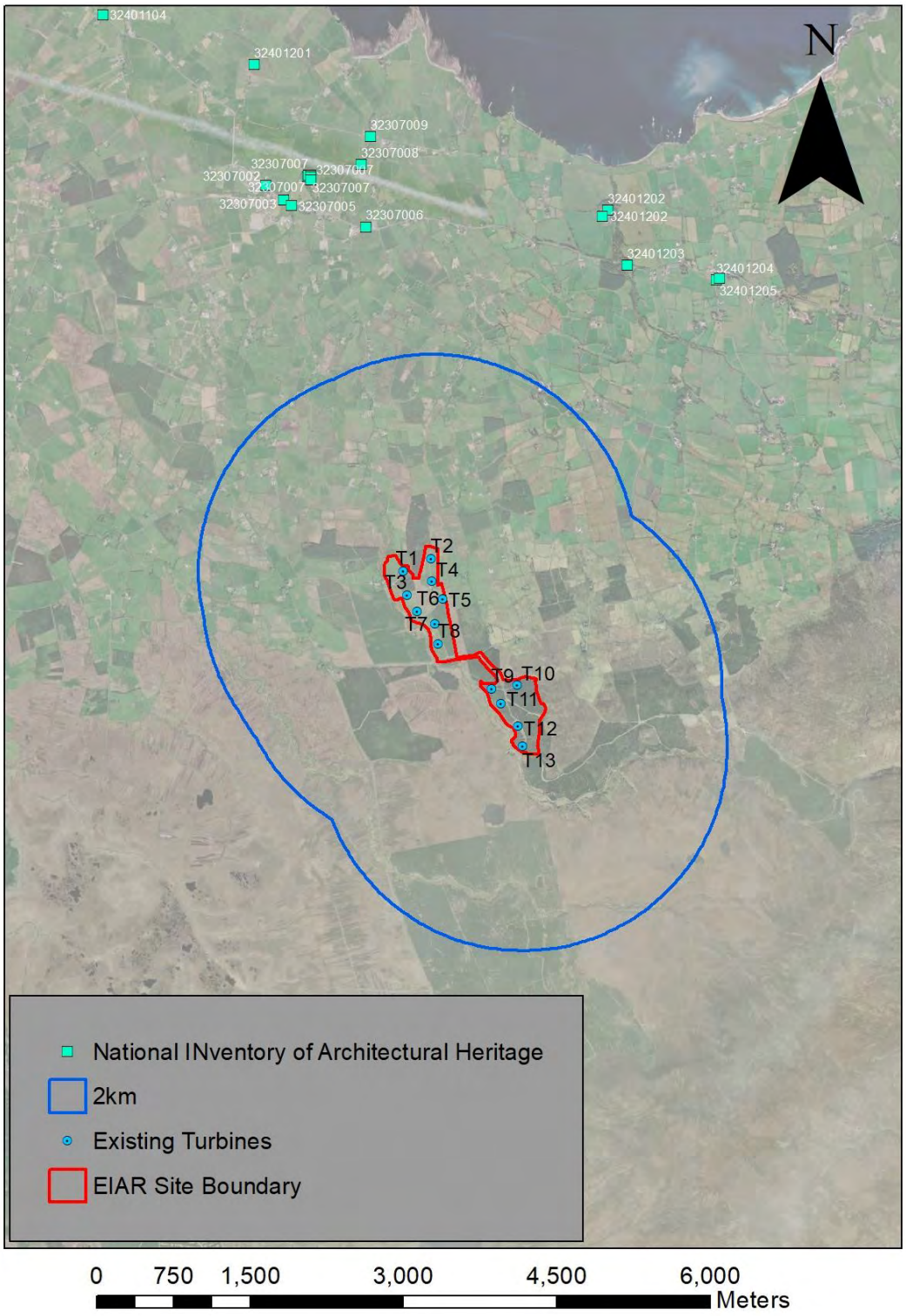


Figure 12-6: Note no NIAH within 2km of the nearest turbine.

12.3.3.3 Cultural Heritage

No new sites of cultural heritage features either of local or regional importance were recorded during the walkover survey. A number of features which had already been highlighted in the previous EIS were noted and are still extant, in particular a Limekiln to the south west of Turbine 4 and a number of 19th century stone buildings and outhouses. The overall local cultural heritage landscape has remained well preserved despite the introduction of new roads, turbine bases and hardstands.

12.4 Likely Significant Effects and Associated Mitigation Measures

12.4.1 Do Nothing Scenario

The 'Do-Nothing' scenario in the context of this EIAR consists of the decommissioning of the existing wind farm once the current planning permission expires (2024) and restoration of the site to its original use as agricultural lands for pasture and crops.

Condition 10 of the original Planning Application to Sligo County Council (Ref: PL 03619) states the following in relation to the decommissioning of the wind farm:

> *'Upon termination of the use of the wind farm, the mast and turbines shall be dismantled and removed from the site and the site shall be restored to its existing condition in consultation with the planning authority. .....*

Should the Decommissioning Plan as set out in the Planning Conditions for Dunneill Wind Farm be implemented it would require groundworks associated with the removal of existing access tracks, hardstands and the turbine foundations. Any potential sub-surface archaeology which may have been present, however, has already been dealt with through the mitigation measures in the original EIS and the associated planning conditions. All sub-surface archaeology was addressed through archaeological testing, monitoring and excavation. Decommissioning would not result in any direct effects to archaeology if the groundworks associated with the decommissioning are confined to areas already developed.

12.4.2 Construction Phase Potential Impacts – Indirect

Indirect effects, in terms of archaeology, architectural and cultural heritage are considered to be those effects which happen away from 'the site'. This includes impacts on visual setting of any cultural heritage asset in the wider landscape. Since these effects are only possible during construction activities, they are considered operational effects and are therefore discussed in Section 12.4.4 below. No indirect effects were identified which could occur at the 'construction stage' as no construction activities are proposed (see below).

12.4.3 Construction Phase Potential Impacts (Direct)

No construction activities, groundworks or alterations to the existing wind farm are proposed beyond routine maintenance during the operational phase of the Proposed Development. Direct impact refers to a 'physical impact' on a monument or site. The construction phase was completed during the initial wind farm construction during which time archaeological testing, monitoring and resolution of a fulacht fiadh was undertaken in compliance with the planning conditions and mitigation measures in the EIS. Since there are no proposals to alter the footprint of the hardstands or turbines or any groundworks, no impacts on the archaeological or architectural heritage resource will take place.

12.4.4 Operational Phase Potential Impacts (Direct)

In terms of directs effects on archaeology, architecture and cultural heritage, since groundworks are already completed as part of the original wind farm, it is considered that no direct effects would occur at the operational stage.

12.4.5 Operational Phase Potential Impacts (Indirect)

The baseline environment consists of the existing windfarm (including turbines, existing roads, a met mast and an electrical control building) and one archaeological monument within the EIAR site boundary.

The Proposed Development is expected to have a lifespan of 15 years. Planning permission is being sought for a 15-year operational period commencing from the date of expiration of the existing wind farm planning permission (ABP Pl. Ref. 21.204790) in March 2004. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

No significant operational phase activities are proposed which would require further assessment. The continuation of the operational phase of the windfarm will not arise in any further effects on setting. Cumulative effects on setting are addressed below.

12.5 Cumulative Impacts

Cumulative impact is defined as 'The addition of many small impacts to create one larger, more significant, impact' (EPA 2022). Cumulative impacts encompass the combined effects of multiple developments or activities on a range of receptors. In this case, the receptors are the archaeological monuments and architectural/cultural heritage sites in the immediate vicinity of the Proposed Development. Cumulative Impacts at the Construction and Operational Stages are considered Cumulative effect takes into account other projects such as the existing Kingsmountain Wind Farm located to the southeast.

12.5.1 Cumulative Impacts (Direct Impacts – Construction stage)

The Proposed Development consists of the extension of operation of the existing windfarm. All construction works were carried out previously and none are being proposed as part of this development. No direct impacts were identified during this assessment and therefore if no direct effects were identified, no direct cumulative effects will occur within the EIAR boundary. All potential direct effects were addressed during the construction stage of the existing windfarm. An archaeologist was appointed to carry out archaeological testing, excavation and monitoring of all groundworks which sought to identify and protect all existing monuments and potential sub-surface archaeological features within the windfarm site.

The potential **direct** effects arising from other projects including the Kingsmountain Wind Farm, Black Lough Wind Farm, Cloonkeelaun Wind Farm, Cloonkeelaun Single Turbine, Clonkeelaun Double Turbine, Lackan Wind Farm, Carrowleagh Wind Farm, Bunnyconnellan Wind Farm as well as the grid connection route would have been dealt with in the same way either through mitigation measures or planning conditions associated with archaeology. In this regard when the projects are considered together there is no increase in direct cumulative effects.

12.5.2 Cumulative Impacts (Indirect)

The operational stage will continue in the way that it currently operates (from the baseline environment). Should the application receive a favourable response from the planning authority, then the turbines will continue to operate automatically by means of anemometry equipment and control systems to changes in wind speed and direction. Indirect impacts on setting occur at the operational stage of the development. Nothing additional is being proposed as part of the operational stage however. There are a number of other wind farm developments located within a 20-kilometre radius of the proposed development site. The other wind farm developments have been listed and included under Section 2.5.2 of the EIAR. The other wind farm developments have been considered under the overall cumulative assessment of the proposed development.

A viewshed analysis was undertaken from the summit of Knocknarea (Maeve's Cairn) over a 20km radius from the cairn. The viewshed shows theoretical visibility of the northern section of the Dunneill turbines with limited visibility of the southern turbines. As the wind turbines are already existing and there will be no changes to the existing Dunneill Wind Farm as part of the Proposed Development, there will be no impact or alteration on the current/existing setting at Knocnarea or other archaeological features, due to the Proposed Development. Furthermore, none of the additional existing windfarms (listed below) fall within the visible areas from Maeve's Cairn. Cumulative effects when considering all projects together from the summit of Maeve's Cairn will not occur.

- Kingsmountain Wind Farm
- Black Lough Wind Farm
- Cloonkeelaun Wind Farm
- Cloonkeelaun Single Turbine
- Clonkeelaun Double Turbine
- Lackan Wind Farm
- Carrowleagh Wind Farm
- Bunnyconnellan Wind Farm

The grid connection is in situ below ground and will not result in any indirect effects on setting or any cumulative effects.

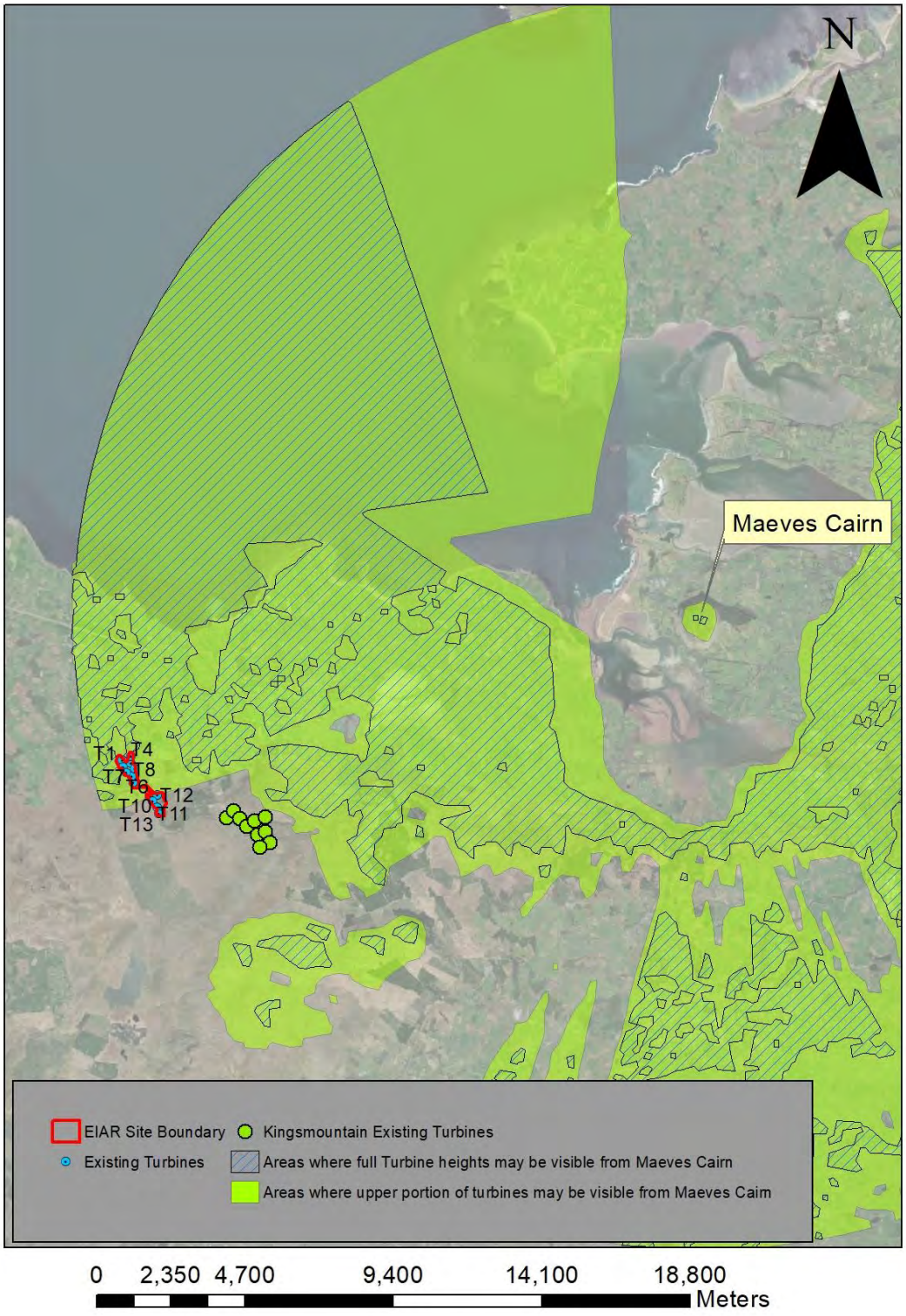


Figure 12-7: Visible areas from Maeve's Cairn summit over 20km radius.

12.6 Decommissioning Phase

Given the presence of one archaeological monument (Limekiln, as shown on Plate 12-8 and described above) within the EIAR site boundary as well as a number of cultural heritage (non-statutory) features, the decommissioning phase could potentially have a number of direct negative impacts on the known cultural heritage. A suite of mitigation measures would be required to include full time presence of an archaeologist during decommissioning works to ensure that no significant or adverse impacts take place to the monuments and cultural heritage features located therein.

Furthermore, buffer / exclusion zones and fencing may be required to ensure that large turbine / crane components do not encroach on the monuments' extent.

12.7 Conclusion

This archaeological, architectural, and cultural heritage chapter was prepared by Tobar Archaeological Services. It presents the results of an archaeological, architectural and cultural heritage impact assessment for the extension of operation of an existing wind farm at Dunneill Windfarm, County Sligo. The site comprises largely green field agricultural land and commercial forestry. This application seeks a fifteen (15) year planning permission for extension of the operational life of the existing wind farm from the date of expiration (March 2024) of the current planning permission (Pl. Ref. 03/619 and ABP Pl. Ref. 21.204790).

The purpose of this chapter is to assess the potential direct and indirect effects of the Proposed Development on the surrounding archaeological, architectural and cultural heritage landscape. The assessment is based on both a desktop review of the available cultural heritage and archaeological data and a comprehensive programme of field walking of the study area. It is not proposed to alter the current 13 turbine layout or infrastructure and no ground works are required. The full scope of works is described in Chapter 4: Description of the Proposed Development.

An assessment of all National Monuments (State Care and Preservation Orders) within 10km of the turbines was undertaken to ascertain any potential impacts on their visual setting (See Section 12.2.5 for methodology of assessment). No National Monuments are located within the Proposed Development site and none are located within close proximity to same. Although Knocknarea (Maeve's Cairn) is located well outside the 10km study zone within which National Monuments in State Care are visually assessed the monument is of International Significance and was visited on the day of survey.There is visibility of the existing turbines from the cairn although barely discernible at this distance (Plate 12-7). . The cairn is located 18.1km to the nearest turbine (T9) therefore the turbines are not located within or immediately adjacent to the protected landscape for the Cuil Irra Peninsula as detailed in the County Development Plan (Figure 7a). A viewshed analysis was undertaken from the summit of Knocknarea (Maeve's Cairn) over a 20km radius from the cairn. The viewshed shows theoretical visibility of the northern section of the Dunneill turbines with limited visibility of the southern turbines. As the wind turbines are already existing and there will be no changes to the existing Dunneill Wind Farm as part of the Proposed Development, there will be no impact or alteration on the current/existing setting at Knocnarea or other archaeological features, due to the Proposed Development.

No monuments listed in the Sites and Monuments Record (SMR) are located within the EIAR site boundary.

In terms of the general context within which the existing and Proposed Development is located, thirty-seven monuments are located within 2km of the nearest turbines (tabulated below) outside the EIAR site boundary. The majority of monument types are ringforts and enclosures (12) and one souterrain. Two burnt mounds and three fulachta fia are located within 2km as well as seven megalithic tombs, one stone circle and one stone row. Other monuments include huts sites (2) a holy well, a crannog (1) and a number of redundant records (2). None will be impacted either directly or indirectly since nothing additional to the existing baseline environment is being proposed.

The RPS for County Sligo is detailed in the 2017 – 2023 County Development plan as a PDF. Whilst townland information is provided with each structure no further locational information is provided such as grid references (ITM or otherwise). No digital dataset is available therefore this chapter relies on the NIAH records since the majority of RPS structures also have NIAH references. No RPS information is provided on the Sligo County Council Planning website mapping or on MyPlan.ie. No NIAH structures are located within 2km of the nearest turbine. None will be impacted either directly or indirectly since nothing additional to the existing baseline environment is being proposed.

Cumulative Effects

This cumulative effect takes into account other projects including the grid connection and other windfarm projects within 20km of the Proposed Development. The Proposed Development consists of the extension of operation of the existing windfarm. All construction works were carried out previously and none are being proposed as part of the Proposed Development. No direct impacts were identified during this assessment and therefore no cumulative direct effects will occur.

The operational stage will continue in the way that it currently operates (from the baseline environment). Should the application receive a favourable response from the planning authority, then the turbines will continue to operate automatically by means of anemometry equipment and control systems to changes in wind speed and direction Indirect impacts on setting occur at the operational stage of the development. Nothing additional is being proposed as part of the operational stage and therefore cumulative indirect effects will not occur. Furthermore, a viewshed analysis was undertaken over an area measuring 20km from the summit of Maeves Cairn (Knocknarea National Monument) and whilst the northern Dunneill turbines may be visible at a distance from the cairn, the southern turbines show no theoretical visibility. The 18km intervening distance from the Proposed Development is such that effects on setting will be minimised. Furthermore, as the wind turbines at Dunneill are already existing and no changes are proposed as part of the Proposed Development, there will be no alterations to the existing setting at Knocnarea or other archaeological features from the current baseline.

None of the additional existing windfarms (listed above) fall within the visible areas from Maeve's Cairn. Cumulative effects when considering all projects together from the summit of Maeve's Cairn will not occur.

12.8 References

Architectural Heritage Guidelines for Planning Authorities (2011)

Bennett, I. (ed.) Excavations.ie, database of Irish excavation reports. Available at http://www.excavations.ie.

Department of Arts, Heritage, Gaeltacht and the Islands, 1999, Framework and Principles for the Protection of the Archaeological Heritage, 1999.

Guidelines on the information to be contained in Environmental Impact Statements, EPA 2017.

Sligo County Development Plan 2017-2023

Guidance on Setting and the Historic Environment, Historic Environment Division, February 2018

Other Sources

Record of Monuments and Places (RMP) for County Sligo

1st Edition 6 inch OS maps (1835)

2nd Edition 25 inch OS maps (1903)

Historic Environment Viewer (archaeology.ie)

www.excavations.ie

www.buildingsofireland.ie

www.logainm.ie

13. LANDSCAPE AND VISUAL

13.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) addresses the potential landscape and visual impacts of the continued operation of the existing Dunneill Wind Farm. It covers the assessment methodology, a description of the Dunneill Wind Farm and the existing landscape based on relevant guidance. It includes a description of the landscape policy of Counties Sligo and Mayo with specific reference to wind energy and the study area (as defined in Section 13.2.1 below) in which the Dunneill Wind Farm is located.

It is important to re-iterate that the Dunneill Wind Farm is an existing facility and has been operational for approximately 12 years to date, with the current planning permission set to expire in March 2024. This EIAR is being prepared in support of a planning application to extend the operational lifespan of the facility beyond 2024, by a further 15 years.

The Proposed Development (all elements pre-existing) comprises:

a. *13 no. existing Vestas V52 850 kilowatt (kW) wind turbines with a maximum overall blade tip height of 75 metres (m).*
b. *Existing 1 no. onsite 20 kilovolt (kV) electrical substation compound which includes a control building, welfare facilities, associated electrical plant and equipment, security fencing, associated underground cabling and a foul waste holding tank.*
c. *Existing 1 no. permanent meteorological mast with a height of 50m and an associated concrete platform/base;*
d. *All associated existing underground electrical and communications cabling connecting the turbines to the on-site substation;*
e. *Existing site access tracks of circa 3.3 kilometres (km) total length, 3 no. car parking spaces and 13 no. turbine hardstands;*
f. *2 No. existing gated site entrances from an unnamed third-class public road which dissects the windfarm site into north and south;*
g. *Existing Site drainage; and,*
h. *All existing ancillary infrastructure, associated site fencing and signage.*

The Proposed Development is located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in County Sligo. The approximate grid reference location for the centre of the site is ITM E544576 N829278.

The existing wind farm consists of 13 Vestas V52 850-kilowatt (kW) No. turbines with a blade tip height of 75m (49m tower, 52m rotor diameter) located in two distinct clusters either side of an existing local public road, with eight turbines to the north of the road and five turbines to the south of the road. The existing wind farm became operational in 2010 and is connected to the National Grid by a medium voltage 20 kilovolt (kV) underground cable between the existing 20kV substation at Dunneill Wind Farm and the existing Cunghill 110 kV Substation, located approximately 20km southeast of the Proposed Development.

The landscape of the area is described in terms of its existing character, which includes a description of landscape values and the landscape's sensitivity to change. The landscape and visual impact assessment of the wind farm uses visibility mapping, representative viewpoints and visits to the site and surrounds to inform the assessment. The potential impacts in both landscape and visual terms are then assessed, including cumulative impacts.

The key component of the Dunneill Wind Farm with the potential for landscape and visual effects are the 13 no. wind turbines which are in place. This means that the assessment is much less theoretical than usual for a project such as this and much more informed by the reality on the ground at and in the vicinity of the site. This assessment uses all of the traditional tools to compile a Landscape and Visual Impact Assessment (LVIA) as these still have relevance to the assessment process by providing context and illustrating the points that are being explained by text.

Although the turbines are in place, the Zone of Theoretical Visibility (ZTV) mapping (which will be explained in the chapter) at a minimum lets the reader know where the turbines will never be visible from. This allows interested parties to focus on the areas and visit the areas where potential visibility may theoretically exist. The ZTV also informs the locations used to present photo locations. This again allows interested parties to visit locations where there is known visibility of the project but does not preclude anyone (including the MKO team) from visiting many more areas in order to better understand the actual landscape and visual effects.

The viewpoints themselves act to inform the reader of potential effects at specific locations. In the case of this project, anyone visiting the site and the surrounding area has the ability to see the turbines, if visible, from all locations around the site. In this case, the assessment is not reliant on the viewpoints to the extent that it may be for traditional projects where turbines are only proposed.

A full description of the Dunneill Wind Farm is provided in Chapter 4 of this EIAR.

13.1.1 Statement of Authority

This EIAR chapter was written by Audrey Williams, a Landscape Architect with McCarthy Keville O'Sullivan Ltd. (MKO). Audrey has over three years of landscape design and project management experience from Ireland, Sweden and Canada, with a focus on residential and park planning design and renewable energy projects. Audrey specialises in preparing LVIA reports for large-scale renewable energy projects including wind farms, solar farms, quarry extraction and strategic housing schemes, as well as preparing landscape masterplans for residential and commercial spaces. Audrey has extensive project management experience in landscape design and master planning and preparing landscape feasibility reports for large wind farm developments.

This landscape and visual impact assessment was reviewed and finalised by Jack Smith and Jack Workman.

Jack Smith M.L., MSc., is a Landscape and Visual Impact Professional. He is an Environmental Scientist and Landscape and Visual Impact Assessment (LVIA) specialist with MKO. Jack is an Affiliate member of the British Landscape Institute and holds membership with the Landscape Research Group. Jack's primary role at MKO is producing the LVIA chapter of EIA reports.

Jack Workman MSc., is a Landscape and Visual Impact Assessment Specialist and the Landscape Team manager at MKO. Since joining MKO in February 2020, Jack Workman has conducted and project managed all aspects of LVIA for a broad range of commercial infrastructure developments including wind and solar energy projects, grid infrastructure, extraction industry and Strategic Housing Developments. He holds a BSc. in Psychology, and an MSc. in Coastal and Marine Environments (Physical Processes, Policy & Practice). Jack is an Affiliate member with the British Landscape Institute and is currently completing their pilot chartership program for the new Landscape Technician Membership grade. Jack holds a membership with the Chartered Institute of Water and Environmental Management and is also a member of the Landscape Research Group.

13.1.2 Dunneill Wind Farm Development Description

The Dunneill Wind Farm site is located approximately 3.5 kilometres (km) south of the village of Dromore West and approximately 3.7 km southwest of the village of Templeboy in County Sligo. The

site of the Dunneill Wind Farm site covers approximately 66 hectares (ha) of upland landscape where 13 no. wind turbines have been installed. The development footprint (existing infrastructure) of the windfarm comprises a much smaller area within the site, consisting of 2.8ha. The various infrastructure elements that were required for the construction and operational phase of the Dunneill Wind Farm are detailed in Chapter 4 of this EIAR.

13.1.3 Mitigation by Good Design

The as-built layout of the Dunneill Wind Farm that is the subject of this LVIA, already incorporates the following landscape and visual design considerations for good wind farm design:

- The turbines are sited strategically within an area surrounded by substantial topographical features which both eliminate visibility of the turbines from a large portion of the LVIA Study Area and serve to effectively absorb the turbines within views of the Wind Farm, providing a sense of scale that causes the turbines to appear congruous and appropriately scaled.
- The landscape features, such as vegetation and built infrastructure, that are present in the intervening space between the Dunneill Wind Farm and the locations where open views are available provide substantial screening of the turbines, particularly from sensitive locations in close proximity to the development.
- The connection to the national electricity grid is underground thereby eliminating potential landscape and visual effects during the operational phase.

Site visits and viewpoint assessment show that the actual visibility of the as-built turbines is far less than the theoretical visibility shown by other assessment tools such as ZTV mapping. Where visibility does occur, the design is in accordance with best practice guidance and the wind farm is seen as a coherent project.

13.1.4 Assessments of Turbine Design

Typically, various types and sizes of turbines are considered in the LVIA chapter of the EIAR to assess whether different turbine designs may give rise to landscape and visual effects. As the turbines are pre-existing and the turbine type and size is known, the various assessments throughout this chapter have been completed using the Vestas V52/850; which has a hub height of 49m, a rotor diameter of 52m and a ground to blade tip-height of 75m.

13.1.5 Scoping Replies

A scoping and consultation exercise has been carried out by MKO, as detailed in Chapter 2 of this EIAR. There were no concerns raised during the scoping process regarding landscape and visual impacts. Please see Chapter 2 for full details of the scoping process.

13.2 Brief Methodology and Assessment Criteria

This section broadly outlines the methodology and the guidance used to undertake the landscape and visual impact assessment of the Dunneill Wind Farm; a more detailed description of the methodology is outlined in Appendix 13-1. There are five main sections to this assessment:

- Visibility of the Dunneill Wind Farm
- Landscape Baseline
- Cumulative Baseline
- Representative Viewpoints and Viewpoint Locations
- Likely and Significant Effects – outlining the assessment of landscape, visual and cumulative effects

13.2.1 Scope and Definition of Landscape and Visual Impact Assessment (LVIA) Study Area

For the purposes of this chapter, where the 'Dunneill Wind Farm site', the 'Proposed Development site', or 'the site' is referred to, this relates to the primary study area and immediate environment in which the Dunneill Wind Farm is located. The Proposed Development site is discussed in some detail in terms of its landscape character in Section 13.4.

The landscape baseline mapping, visual receptor mapping and viewpoint selection are based on wider study areas. The geographical extent of this study area for this LVIA was determined by desktop study, survey work undertaken, the professional judgement of the assessment team, experience from other relevant projects and policy guidance or standards (Appendix 3, *DoEHLG Wind Energy Development Guidelines*' 2006 and GLVIA 2013). The LVIA Study Area was chosen as 20 kilometres for visual and landscape effects and 15 kilometres from the Dunneill Wind Farm for effects on landscape character. These are the study areas for which the baseline maps and viewpoint locations are produced and are referred to as the 'study area' or 'LVIA Study Area'. Furthermore, the following topic areas have been scoped out of the assessment:

- Effects on landscape and visual receptors that have minimal or no theoretical visibility (as predicted by the ZTV) and/or very distant visibility, and are therefore unlikely to be subject to significant effects;
- Effects on designated landscapes beyond a 20 km radius from the Dunneill Wind Farm, from where it is judged that potential significant effects on key characteristics and/or special qualities, or views are judged unlikely to occur;
- Effects on landscape character beyond a 15 km radius from the Dunneill Wind Farm, where it is judged that potential significant effects on landscape character are unlikely to occur;
- Effects on visual receptors beyond a 20 km radius from the Dunneill Wind Farm, where it is judged that potential significant effects are unlikely to occur;
- Cumulative effects in relation to single turbines (except where otherwise stated);
- Cumulative landscape effects beyond a 15 km radius and cumulative visual effects beyond a 20km radius from the Dunneill Wind Farm, where it is judged that potential significant effects on landscape character are unlikely to occur;
- Effects on visual or landscape receptors in County Mayo, given the limited theoretical visibility of the Dunneill wind Farm in this County (see Figure 13-1 below).

Ancillary project elements are included in the assessment of landscape and visual effects in the penultimate section of this chapter (Section 13.8.3.3.5), however, this LVIA is primarily focused on assessing the impact of the turbines of the Dunneill Wind Farm.

13.2.2 Guidelines

The legislation and general guidance on Environmental Impact Assessment is set out in Chapter 1 of this EIAR. The LVIA Reported in this chapter was guided and informed by guidance documentation specifically pertaining to the Landscape and Visual Impact Assessment. Details of the guidance used to conduct this LVIA are outlined in the Methodology Appendix – *Appendix 13-1*.

13.2.3 Baseline Landscape and Visual Information

In order to carry out this assessment, an initial desk study was undertaken which identified:

Landscape

- Sensitive Landscape Receptors in the LVIA Study Area

- Policies and objectives contained in the relevant county development plans pertaining to landscape and wind energy
- Landscape designations in the LVIA Study Area (including but not limited to: Amenity Areas; Views and Prospects; Landscape Character Areas)
- Landscape character of the LVIA Study Area
- Landscape character of the Dunneill Wind Farm site based on:
    - Site Surveys undertaken in 2021
    - Landscape Character Types identified in 'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities' (Department of the Environment and Local Government, 2006) and 'Draft Revised Wind Energy Guidelines' (Department of Housing Planning and Local Government, 2019).

Visual

- Zone of Theoretical Visibility (ZTV) mapping
- Identification of Visual Receptors in the LVIA Study Area

13.2.4 Assessment of Potential Impacts

The landscape and visual assessment methodology used in this chapter (outlined in Appendix 13-1) includes clearly documented methods based on the GLVIA guidelines (LI & IEMA, 2013). This includes consideration of landscape and visual sensitivity balanced with the magnitude of the effect to determine the significance of effects. Mitigating factors are then taken into consideration to arrive at residual landscape and visual effects. Residual landscape and visual effects are graded upon an 'impact assessment classification of significance' scale, as defined by the Environmental Protection Agency of Ireland (EPA, 2022).

Viewpoints are used to assess potential impacts, whereby the potential effects arising as a result of the Proposed Development are assessed from viewpoint locations representative of prominent landscape and visual receptors located within the LVIA Study Area. Throughout this chapter 'theoretical visibility', is referred to, this is based on Zone of Theoretical Visibility (ZTV) mapping which is addressed in the following section of this chapter. Further details of the methods used to produce ZTVs and Viewpoints, as well as the landscape and visual impact assessment process are presented in the methodology appendix - Appendix 13-1.

13.3 ZTV Mapping: Theoretical Visibility of the Dunneill Wind Farm

The ZTV mapping methodology outlined in Section 1.3 of Appendix 13-1 was used to examine the theoretical visibility of the 13 No. turbines built at the Dunneill Wind Farm from all landscape and visual receptors within the LVIA Study Area, using the half blade height of the wind turbines as points of reference. As noted in Appendix 13-1, actual visibility on the ground is significantly less than predicted by the ZTV mapping due to intervening factors such as: on site screening from natural and man-made features, atmospheric weather and/or localised topography. The half blade ZTV map of the Dunneill Wind Farm and LVIA Study Area is shown below in Figure 13-1.

Generation of the ZTV utilises large scale topographical data (interpolation across 10 m OSi contour data) and does not account for topographical variation of smaller scale (e.g. < 10 metre). Therefore, in reality, small, localised undulations in topography are likely to further inhibit visibility of the Proposed Development that may not be represented in the ZTV map. Other features of the landscape such as vegetation and man-made elements are also likely to obscure the proposed turbines from view from many areas where the ZTV indicates there is full visibility. In this regard, the ZTV is a useful tool to indicate where there is definitely no visibility of the Dunneill Wind Farm, therefore receptors located in these areas can be screened out from further assessment.

Separate colour bands are used on the ZTV map to indicate the number of turbines of which the half blade will potentially be visible. The legend on Figure 13-1 shows the number of visible turbines for each corresponding colour, which are as follows:

- Teal: 1-4 turbines visible
- Yellow: 5-9 turbines visible
- Navy: 10-13 turbines visible

As shown on Figure 13-1 below, large areas of the LVIA Study Area have no theoretical visibility of the Dunneill Wind Farm. As indicated by the ZTV, no theoretical visibility of the Dunneill Wind Farm occurs to the south, south-east and east due to the screening provided by the elevated landform of the Ox Mountains relative to the site. There are some extremely small areas of theoretical visibility indicated to the south-south-west.

Overall, concentrated areas of full theoretical visibility are limited to areas in close proximity to the Dunneill Wind Farm, as well as pockets of theoretical visibility to the northwest and southwest of the wider LVIA Study Area. Within 5km of the site there is mainly full theoretical visibility to the north, west, and north-east, with a larger area of partial theoretical visibility indicated to the south-west, as well as some large swathes of no theoretical visibility immediately south-east of the site, resulting from the topography surrounding the site.

Between 5 and 10 km theoretical visibility is mainly full to the south-west, west and north-west, with a large strip of no theoretical visibility to the west between 8 and 10km from the site. In addition to these areas, there is a relatively large area of full theoretical visibility to the north-east between 5 and 10 km, mostly located around the coast.

Beyond 10km from the site theoretical visibility is mainly limited to a large area of land adjacent to the coast to the north-west of the site, and a small stretch of coastline to the north-east. Beyond 15km from the site the only theoretical visibility is located on stretches of the Sligo coastline located across the sea from the site, where the open water permits long-ranging views. This area of full theoretical visibility includes the town of Strandhill.

A narrow strip of a both full and partial theoretical visibility extends away from the Dunneill Wind Farm to the south-west along a corridor of relatively flat boglands along the Mayo-Sligo border. In the

case of theoretical visibility in County Mayo, there is patchy theoretical visibility between 10 and 20 km in the LVIA Study Area, which is predominantly concentrated on areas of cutover bogland. In addition, to this there is a small area of partial theoretical visibility between 15 to 20 km to the southwest of the Dunneill Wind Farm. Given the distances involved and the relatively low amount of theoretical visibility of the Dunneill Wind Farm from locations in County Mayo, it is considered highly unlikely that significant landscape and visual effects will arise in this County and therefore, landscape and visual effects within County Mayo are scoped out from further discussion in the remainder of this report.

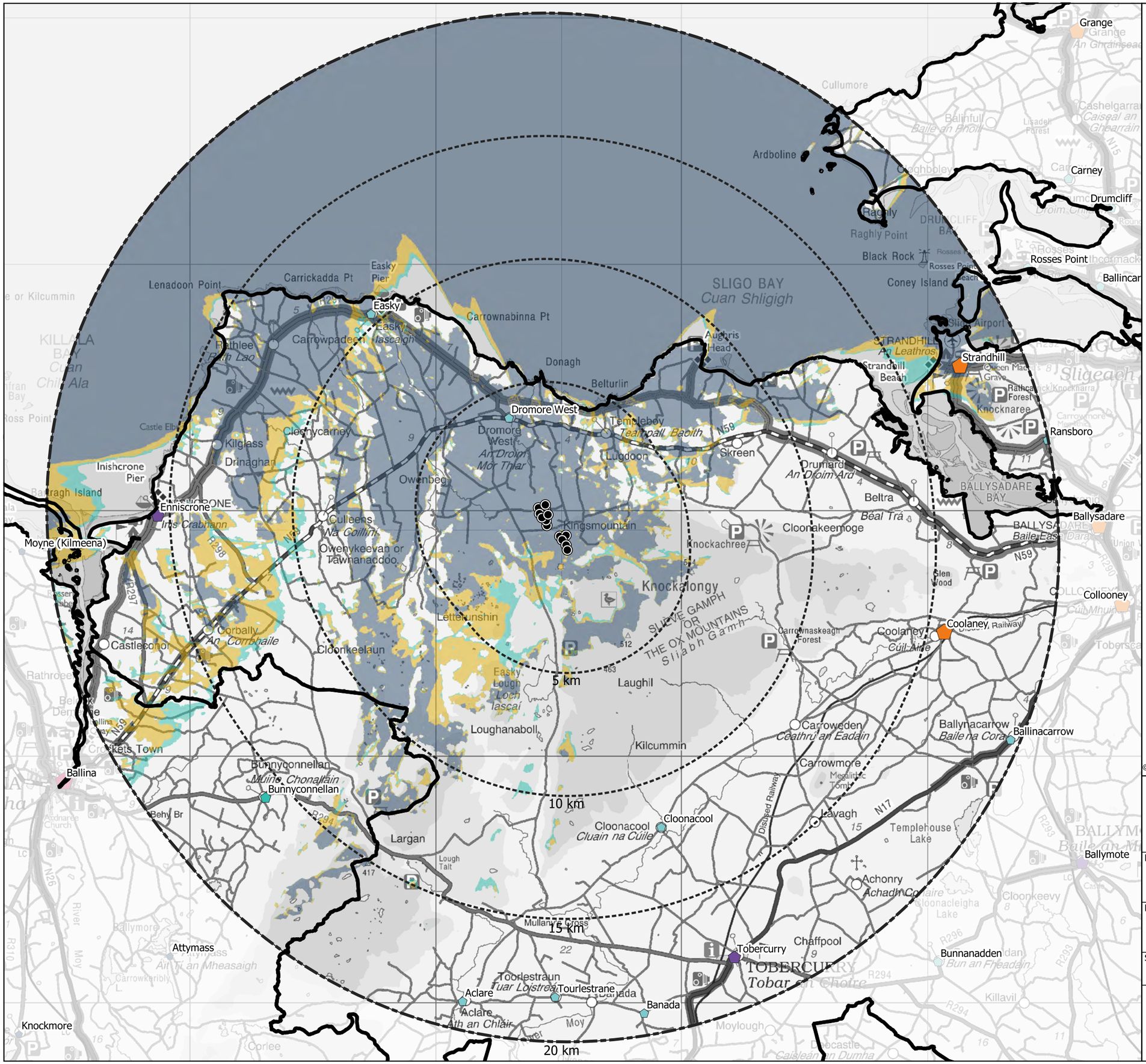
The heightened elevated lands of the Ox Mountains that surround the site to the south and east allow for localised views towards the site. The topography of the site and the surroundings is a key feature in this landscape and substantially limits theoretical visibility from a large portion of the LVIA Study Area. As shown in Figure 13-2 below, the topography surrounding the site is steeply elevated, with elevations ranging from 50m to 544m AOD to the south, south-east and east.

Where the ZTV does show visibility to the north and west, there are very few visual receptors. There are several towns and settlements to the north and west including Dromore West, Easky and Enniscrone are identified as 'Villages Sustaining Rural Communities' and represent the lowest tier in the Co. Sligo Settlement Hierarchy. Easky and Enniscrone are outlined as having 'specific tourism function' in the settlement hierarchy, however, the ZTV suggests that there will be no visibility from Enniscrone and Easky and at a substantial distance of approximately 10.5 km from the nearest turbine, visual effects are likely to be limited.

Further Use of the ZTV

Although the Dunneill turbines are in place and will be visible in the landscape, the ZTV mapping is a useful tool to determine where the turbines will never be visible from, enabling further focussed investigation in areas where they are much more likely to be visible. In this regard, the ZTV mapping guided an on-site visibility appraisal conducted in 2021 (see Section 13.1) which informed the selection of viewpoints conduct a further assessment of landscape and visual effects.

Additional ZTV mapping exercises were conducted to assess the theoretical visibility of the Dunneill Wind Farm cumulatively with all other existing, permitted and proposed wind farm developments located within the 20 km LVIA Study Area. These ZTV maps are presented and discussed in Section 13.1 of this Chapter, *Cumulative Baseline.*



Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines

Settlement Hierarchy SCDP 2017-23

- Gateway Satellite
- Key Support Town
- Villages

Settlement Hierarchy Mayo CDP 2014-20

- Linked Hub
- Key Towns
- Other Towns and Villages
- Rural Village

Half Blade ZTV (62m)

- 1-4 turbines theoretically visible
- 5-9 turbines theoretically visible
- 10-13 turbines theoretically visible

Drawing No.

Figure 13-1

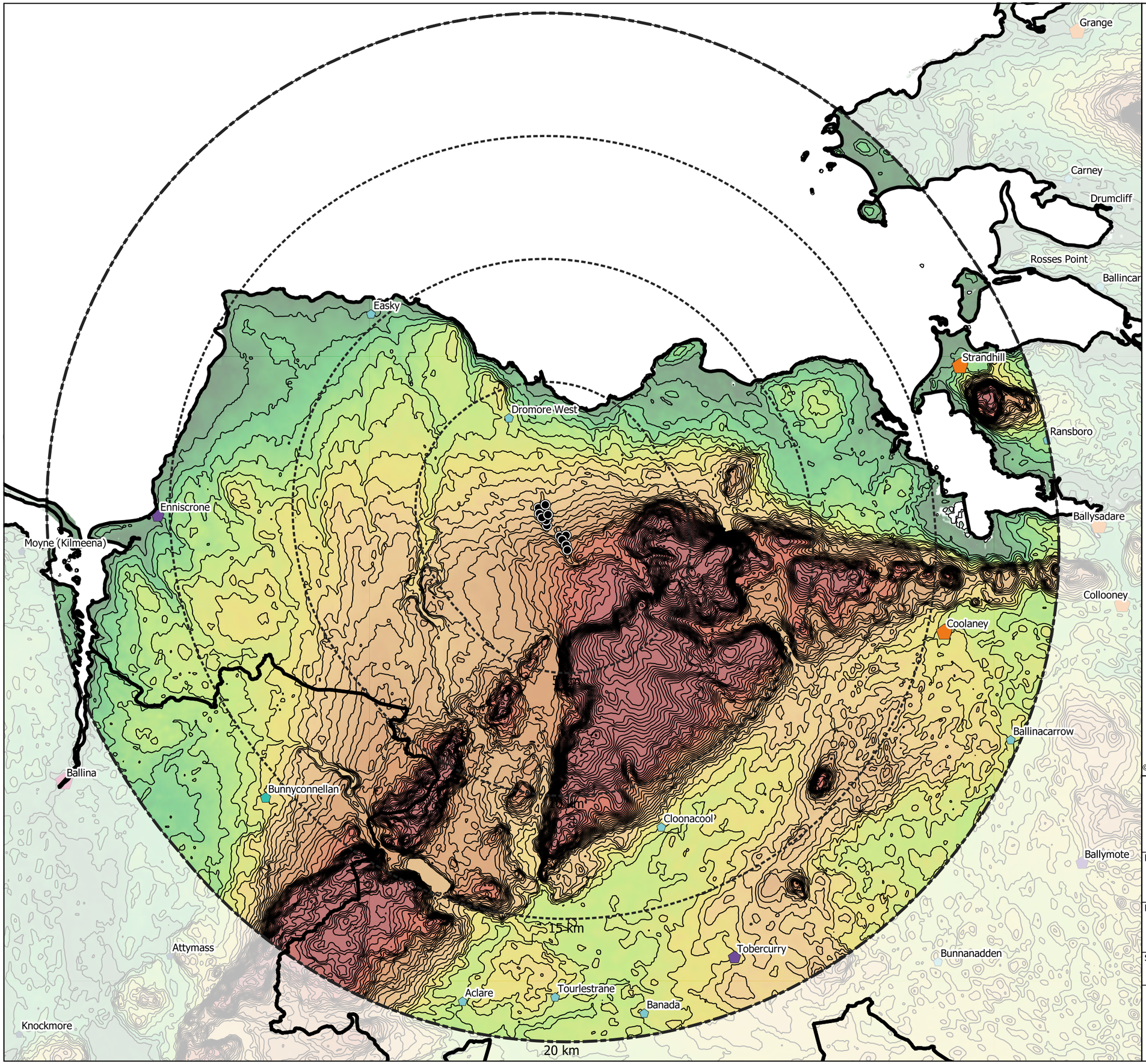
Drawing Title

Half Blade ZTV

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW



Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines

Settlement Hierarchy SCDP 2017-23

- Gateway Satellite
- Key Support Town
- Villages

Settlement Hierarchy Mayo CDP 2014-20

- Linked Hub
- Key Towns
- Other Towns and Villages
- Rural Village
- 10m Contours

Elevation (Above Ordnance Datum)

300m

0m

Drawing No.

Figure 13-2

Drawing Title

Topography

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW

13.4 Landscape Baseline

This sub-section reviews the policies and objectives of various planning policy documents relating to landscape, planning and the locational siting of wind farms, as they relate to the site of the Dunneill Wind Farm. The LVIA Study Area is situated in areas of Counties Sligo and Mayo, however, as stated previously, on the basis of the ZTV shown in Figure 13-1 above, the parts of the LVIA Study Area within County Mayo have been scoped out from further assessment. Therefore, landscape policy determined Sligo County Council was used as the main source of reference in this section.

The Landscape Baseline states baseline information about the receiving landscape of the Dunneill Wind Farm site and its wider setting. This is broken down into the following sections:

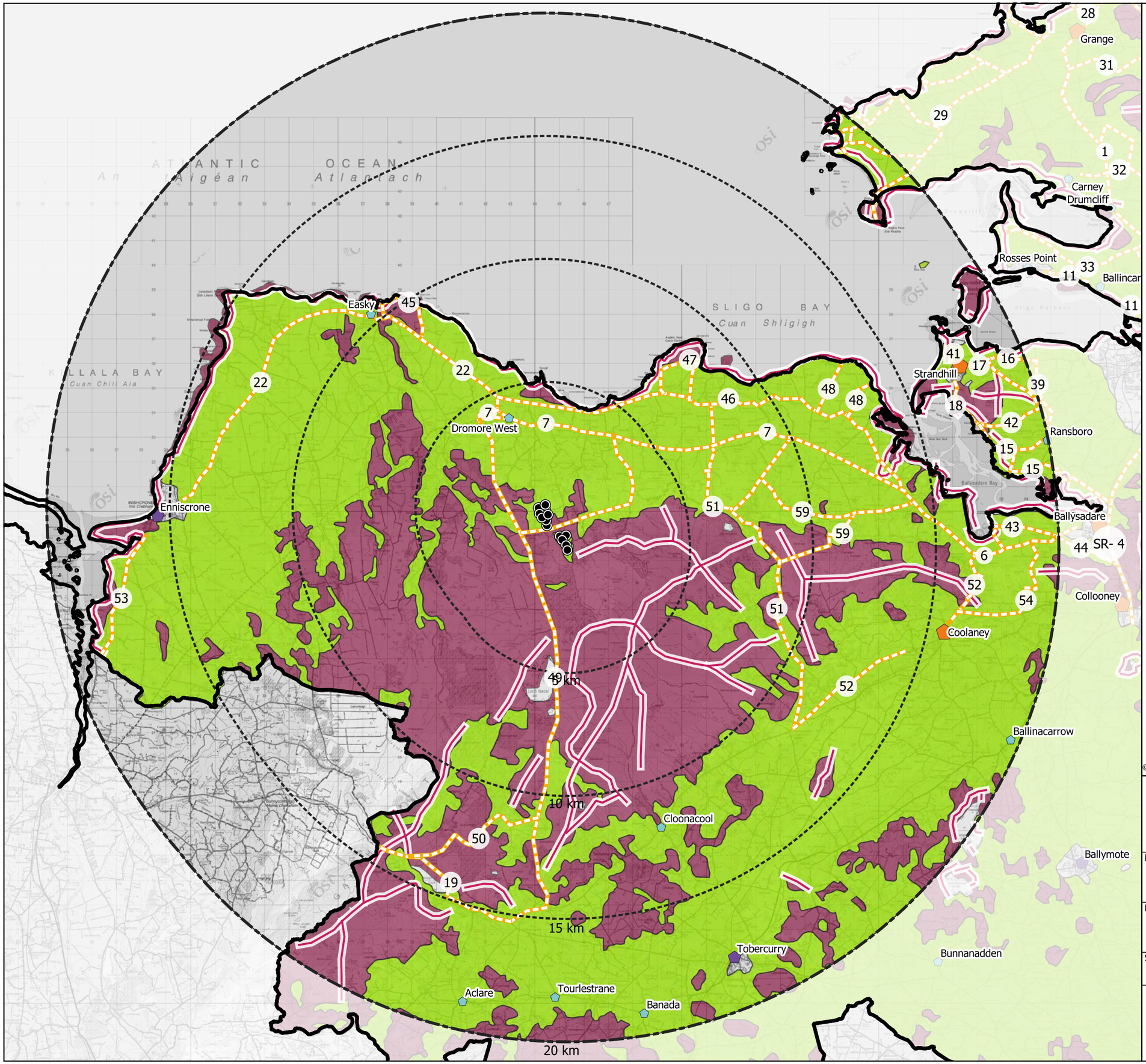
- **Landscape Designations and Policy Context** - Policy setting pertaining to the location and nature of the site from a landscape perspective based on:
  - Sligo County Development Plan 2017-2023
- **Landscape Character of the Dunneill Wind Farm Site** - A description of the physical landscape and characteristics of the site and its immediate landscape setting, this includes the following considerations:
  - Landscape characteristics based upon findings from a site visit conducted in 2021.
  - A review of the Wind Energy Development Guidelines (DoEHLG, 2006; DoHPLG, 2019) and siting guidance relating to the landscape characteristics of the site.
- **Landscape Character of the wider LVIA Study Area** - A description of landscape in a wider setting including the identification of designated Landscape Character Areas (LCAs), as well as Historic Landscape Characterisation located within 15 km of the Dunneill based upon:
  - Landscape Character Assessment, Sligo County Council (2017-2023).

13.4.1 Landscape Designations and Policy Context

The County Development Plan of Sligo (Sligo County Development Plan 2017-2023) was consulted to identify landscape designations and relevant policy objectives relating to such designations.

13.4.1.1 County Sligo Development Plan 2017-2023

The Sligo County Development Plan 2017 – 2023, hereafter referred to as the SCDP, is the principal instrument that is used to manage change in land use in the County. The SCDP was adopted on 31st July 2017 and came into operation on 28th August 2017. The Plan sets out the Council's intentions for future development, including measures for the improvement of the natural and physical environment and the provision of infrastructure. As the blueprint for development in County Sligo, the SCDP is the principal strategic framework document for sustainable development in spatial, economic, social and environmental terms.



Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines

Settlement Hierarchy SCDP 2017-23

- Gateway Satellite
- Key Support Town
- Villages
- Visually Vulnerable Areas SCDP 2017-23
- Scenic Routes SCDP 2017-23
- Normal Rural Landscapes SCDP 2017-23
- Sensitive Rural Landscapes SCDP 2017-23

Drawing No.

Figure 13-3

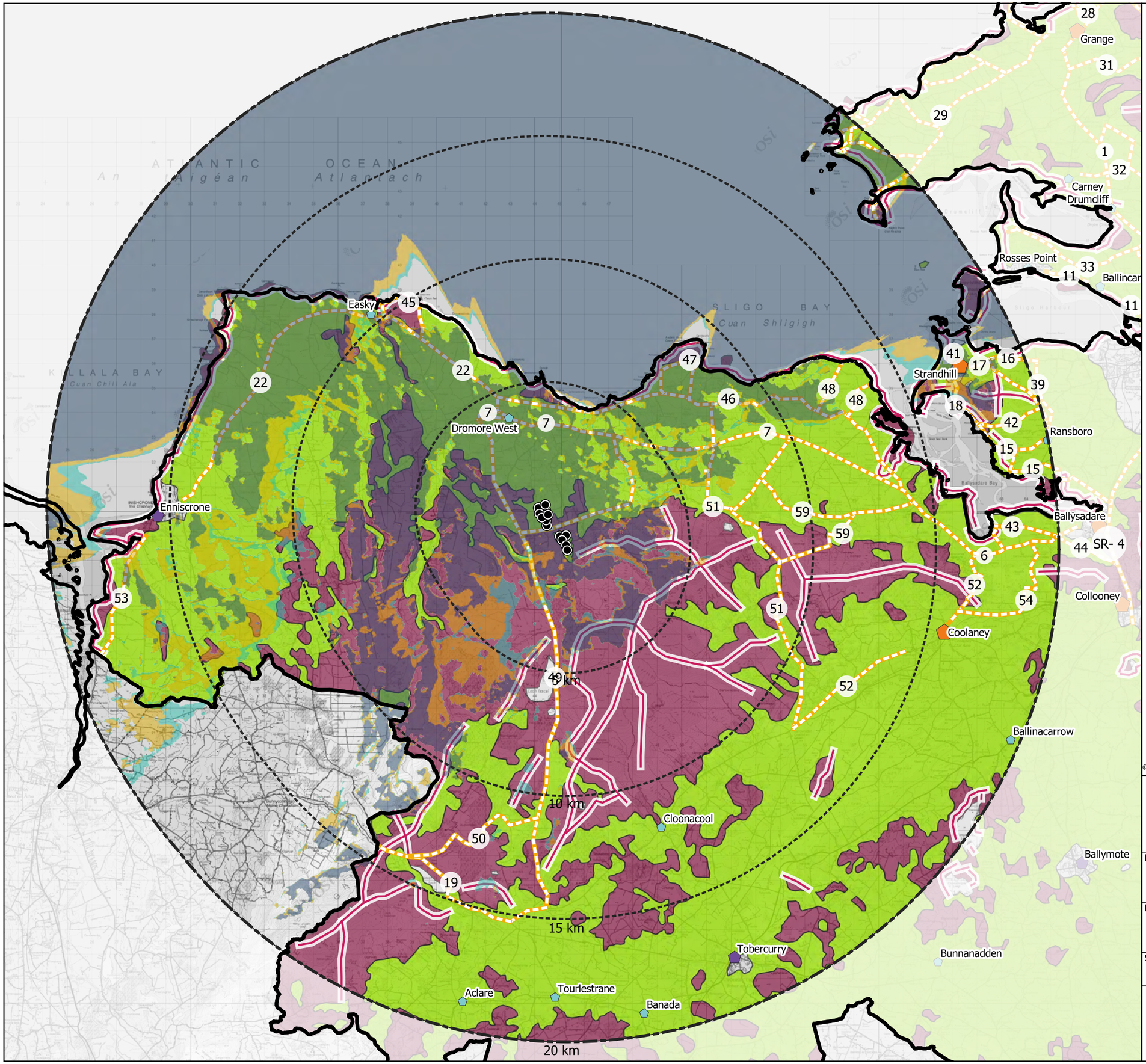
Drawing Title

Landscape Baseline

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW



Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines

Settlement Hierarchy SCDP 2017-23

- Gateway Satellite
- Key Support Town
- Villages
- Visually Vulnerable Areas SCDP 2017-23
- Scenic Routes SCDP 2017-23
- Normal Rural Landscapes SCDP 2017-23
- Sensitive Rural Landscapes SCDP 2017-23

Half Blade ZTV

- 1-4 turbines theoretically visible
- 5-9 turbines theoretically visible
- 10-13 turbines theoretically visible

Drawing No.

Figure 13-4

Drawing Title

Landscape Baseline with Half Blade ZTV

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW

13.4.1.2 Co. Sligo Landscape Policy

The SCDP acknowledges that the county's landscapes offer a significant economic asset and sets out a broad aim to *'promote the understanding of Sligo's landscape in terms of its unique character and recognise what elements should be preserved, conserved or enhanced'.*

Sligo County Council goes on to list policies relating to landscape, which include:

> ***"P-LCAP-1:*** *Protect the physical landscape, visual and scenic character of County Sligo and seek to preserve the County's landscape character;*
>
> ***P-LCAP-2:*** *Discourage any developments that would be detrimental to the unique visual character of designated Visually Vulnerable Areas;*
>
> ***P-LCAP-3:*** *Preserve the scenic views listed in Appendix F and the distinctive visual character of designated Scenic Routes by controlling development along such Routes and other roads, while facilitating developments that may be tied to a specific location or to the demonstrated needs of applicants to reside in a particular area. In all cases, strict location, siting and design criteria shall apply, as set out in Section 13.4 Residential development in rural areas (development management standards).*
>
> ***P-LCAP-4:*** *Strictly control new development in designated Sensitive Rural Landscapes, while considering exceptions that can demonstrate a clear need to locate in the area concerned. Ensure that any new development in designated Sensitive Rural Landscapes:*
>
> - *does not impinge in any significant way on the character, integrity and distinctiveness of the area;*
> - *does not detract from the scenic value of the area;*
> - *meets high standards of siting and design;*
> - *satisfies all other criteria with regard to, inter alia, servicing, public safety and prevention of pollution*
>
> ***P-LCAP-5:*** *Protect the historic and archaeological landscapes of the County"*

These policies are addressed comprehensively in the following sections.

13.4.1.3 Landscape Character Assessment

Sligo County Council does not currently have a Landscape Character Assessment that forms part of its county development plan. As part of the SCDP, Sligo County Council states *'the DAHG's National Landscape Strategy for Ireland 2015–2025 indicates the Department's intention to develop a National Landscape Character Assessment by 2020. The existing LCA for County Sligo may need to be reviewed to ensure consistency with the national assessment and any new departmental guidance.'*

Section 7.4.3 of the SCDP clarifies the above quote, explaining that a landscape characterisation and appraisal study was completed in 1996 which resulted in the classification of different landscape areas of differing sensitivity to development. This is not a full landscape character assessment and is detailed more fully below in Section 0.

Landscape Character Areas (provisionally prepared by MKO)

In the absence of a landscape character assessment for County Sligo and for the sake of thoroughness and completeness in the assessment of landscape effects on landscape character in the study area, provisional landscape character areas were identified by a qualified landscape architect in MKO. The

provisional landscape character assessment for Co. Sligo includes the following landscape character areas (LCAs):

- **Easky Kingsmountain LCA:** The landscape is mainly shaped by mountainous topography, low lying vegetation and coniferous forestry plantation, which provides for low quality pasture land uses. Several visual characteristics, including scenic routes, visually vulnerable areas and sensitive rural landscapes are common in this area. Ox Mountains are the largest topographical feature in this area and occupies much of the landscape. Wind farms are located in the northern vista.
- **Eastern Lowlands LCA:** Characterised by extensive farmland, the pattern of the landscape is shaped by the tree lines and hedgerows which form field boundaries. There is also some commercial forestry plantation present. This area is a gently undulating drumlin landscape with many watercourses running through it including the Unshin, Douglas and Owenmore Rivers.
- **Northern Lowlands LCA:** The landscape is relatively flat, gently undulating and forming the foothills of the Ox Mountains. Land cover comprises of a mixture of bogland and poor pastureland divided by well-maintained hedgerows. Large areas of Sensitive Rural Landscape are located within this LCA.
- **Inland Bog Basin LCA:** Characterised by its rugged hills and exposed plain mainly occupied with settled agriculture and peat bog production. The landscape is relatively flat, becoming more undulating to the south towards the Ox Mountains. Land cover comprises of a mixture of bogland and low quality pastureland uses outlined by mature tree lines. Large areas of Normal Rural Landscape are located within this LCA.
- **North Coastal Plain LCA:** This area occupies the northern coastal plain of Sligo. This is a thin strip of gently undulating terrain and coastal cliffs. The landscape in this area is predominantly occupied by settled agriculture outlined by tree lines and hedgerows. Several scenic routes and visually vulnerable areas are located within this LCA.

A map outlining the provisional LCAs that were prepared by MKO are shown in greater detail in Figure 13-5 below, as well as in Figure 13-11 further below.

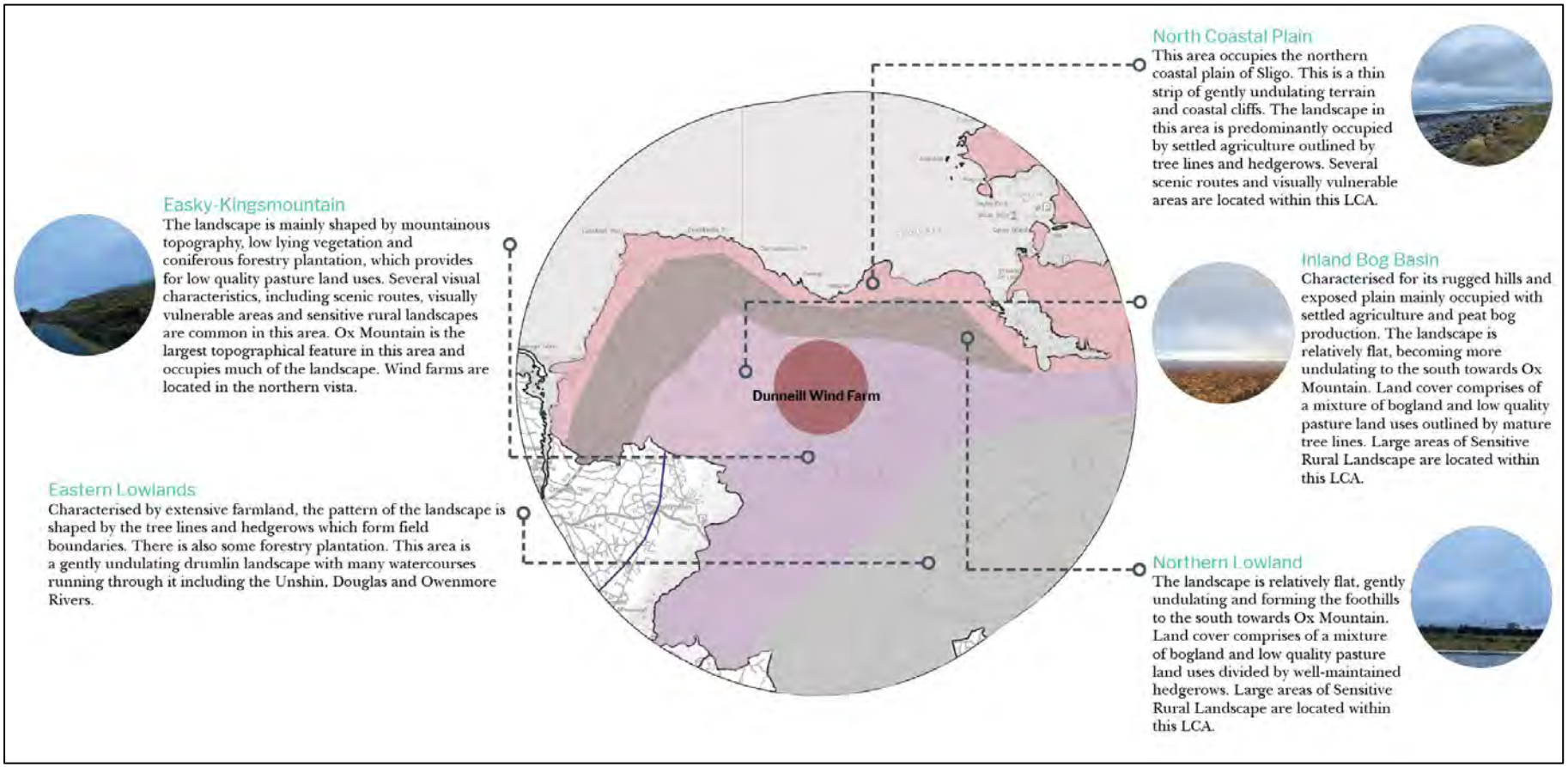


Figure 13-5: Landscape Character Areas of Co. Sligo (provisionally prepared by MKO)

13.4.2 Landscapes Characterisation

As noted above, the landscape characterisation and appraisal study were commissioned by Sligo County Council in 1996. Much of the landscape policy of the Sligo CDP (2017-2023) is broadly based on the Landscape Characterisation Map (LC Map) (shown on Figure 13-6 below and recreated on Figure 13-3), based on a study commissioned by Sligo County Council. The LC Map classifies the county according to its visual sensitivity and capacity to absorb new development without compromising the scenic character of certain areas. It designates the following:

> *"**Normal Rural Landscapes:** areas with natural features (e.g. topography, vegetation) which generally have the capacity to absorb a wide range of new development forms – these are largely farming areas and cover most of the County.*
>
> ***Sensitive Rural Landscapes:** areas that tend to be open in character, highly visible, with intrinsic scenic qualities and a low capacity to absorb new development – e.g. Knocknarea, the Dartry Mountains, the Ox Mountains, Aughris Head, Mullaghmore Head etc.*
>
> ***Visually Vulnerable Areas:** distinctive and conspicuous natural features of significant beauty or interest, which have extremely low capacity to absorb new development – examples are the Ben Bulben plateau, mountain and hill ridges, the areas adjoining Sligo's coastline, most lakeshores etc.*
>
> ***Scenic Routes:** public roads passing through or close to Sensitive Rural Landscapes, or in the vicinity of Visually Vulnerable Areas, and affording unique scenic views of distinctive natural features or vast open landscapes. In addition to remote views, scenic routes have often a distinctive visual character conferred by old road boundaries, such as stone walls, established hedgerows, lines of mature trees, adjoining cottages or farmyards together with their traditional, planted enclosures etc., all of which warrant protection."*

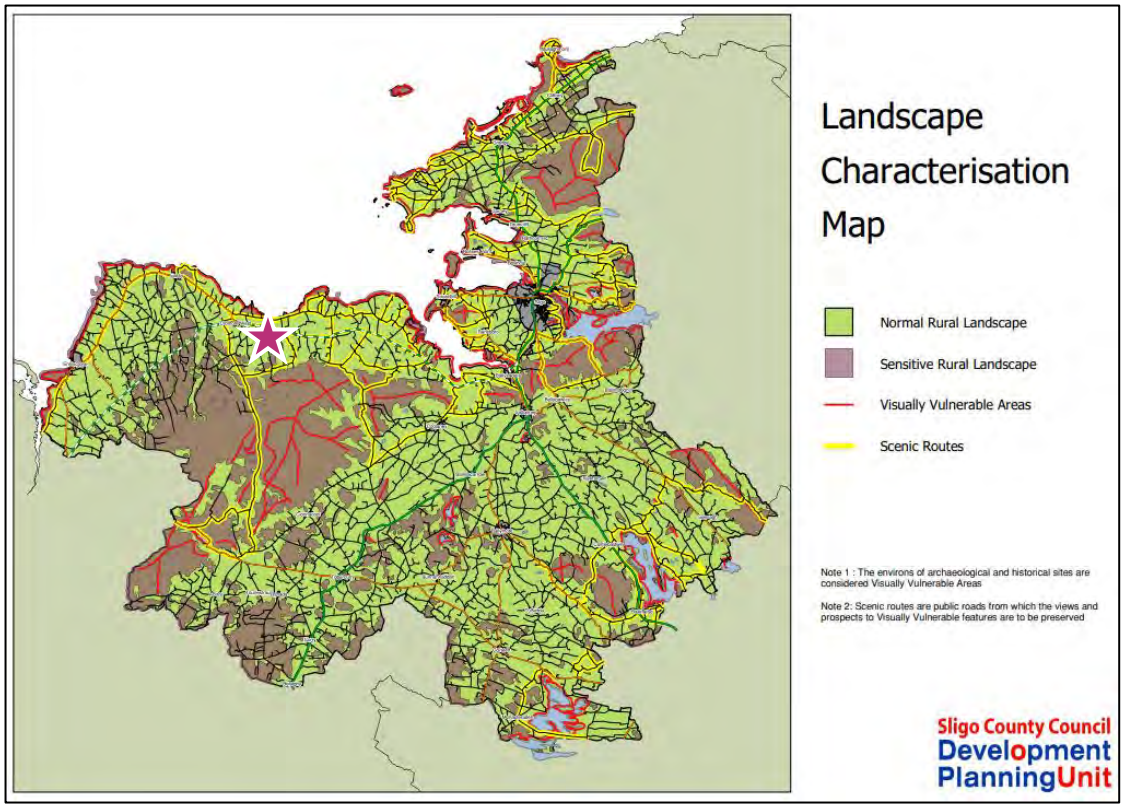


Figure 13-6: Landscape Characterisation Map extracted from the SCDP (2017-2023), where the Dunneill WF is indicated as a Red Star.

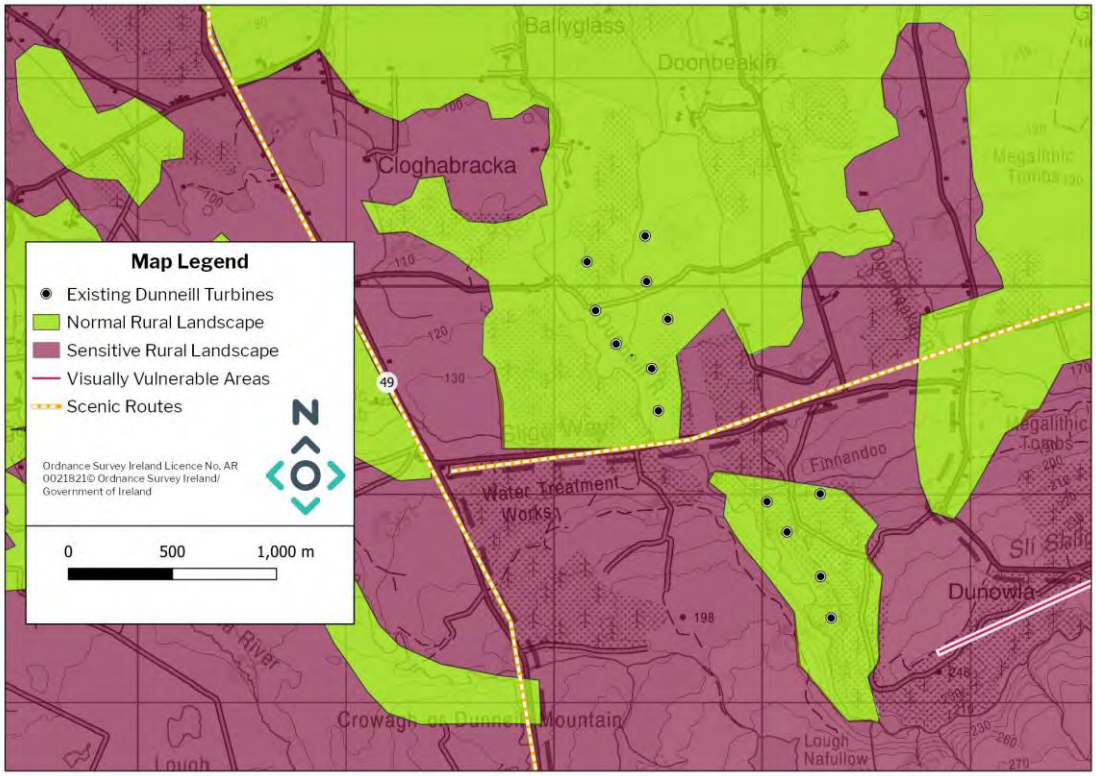


Figure 13-7 Landscape Characterisation proximate to the Dunneill Wind Farm

As seen in Figure 13-7 above, all 13 of the turbines are located within an area designated as a 'Normal Rural Landscape', with nearby areas designated as a 'Sensitive Rural Landscape'.

13.4.2.1 Heritage Landscape

The SCDP designates areas in the county as Heritage Landscapes, which is described as *"areas which are of exceptional value and of international importance, such as the Cuil Irra Peninsula, Carrowkeel and Inishmurray, are highly sensitive to development and thus must be afforded particular protection".* None of these landscapes are located within 15km of the Dunneill Wind Farm, and so likely significant landscape effects are not anticipated.

13.4.2.2 Scenic Routes and Visually Vulnerable Areas

The designation of Scenic Routes provides a basis for protecting views and prospects of certain visually vulnerable features. *Appendix E* of the SCDP outlines a list of roads designated as Scenic Routes and details of the scenic views to be preserved. *Appendix E* sets out the counties approach to scenic routes and lists the scenic routes in hierarchical order of national primary roads, national secondary roads, regional roads and local roads and their intended focus of view. The policies pertaining to Scenic Routes and Visually Vulnerable Areas set out in the SCDP including P-LCAP2, P-LCAP3 and P-LCAP4 which are quoted above. The Scenic Routes and Visually Vulnerable Areas located within the 20km study boundary are shown in Figure 13-8 below. The SCDP suggests that any development located within areas along Scenic Routes or within Visually Vulnerable Areas would have an extremely low capacity to absorb new development, particularly P-LCAP2 which states the Council will refuse developments that *"show detrimental effects to the unique visual character of Visually Vulnerable Areas".*

The description for Scenic Routes in the Sligo CDP states that *"it is not necessary for a particular feature to be visible for the full length of a route, as the designation is based on the overall quality and uniqueness of the views available. Due to the strong inter-visibility between landscape elements in County Sligo, most Scenic Routes enjoy scenic views of more than one Visually Vulnerable feature".*

It should be noted, however, that the majority of the Scenic Routes within the study area as outlined in the SCDP, have a focus of view towards the Ox Mountains, located to the southeast of the Dunneill Wind Farm. As seen in Figure 13-7 above, a designated Scenic Route runs adjacent to the Dunneill Wind Farm site as well between the northern and southern cluster. In addition to this, the network of designated Visually Vulnerable Features which generally coincide with the ridgelines of the Ox Mountains begin to the southeast of the Dunneill Wind Farm (see Figure 13-7 above and Figure 13-8 below). The network of scenic routes located north of the Dunneill Wind Farm (within the main area of theoretical visibility, see Figure 13-9 below) has heavily influenced the selection of viewpoints present later in this report.

13.4.2.3 Walking Routes and Cycleways

The Western Way walking trail runs throughout the majority of the study area from the southwest to the northeast. There is mainly full to partial theoretical visibility of the Western Way in close proximity to the site and where it passes between the northern and southern cluster. However, the ZTV shown in Figure 13-9 illustrates that for the majority of the Western Way the Dunneill Wind Farm will not be visible throughout the majority of the study area, with theoretical visibility on this route limited to within 5km of the site.

The Western Way is located within an area of full theoretical visibility (at least partially) within the LVIA study boundary, at a distance close enough to present potential significant effect, and is therefore assessed in more detail below. Considering the scale of the Dunneill Wind Farm and the distances involved, it is deemed at this stage that other walking routes within the LVIA Study Area are highly unlikely to experience significant effects as a result of the proposed extension of duration of the Dunneill Wind Farm. Figure 13-8 Figure 13-9 below outline walking trails within the study area and whether any theoretical visibility is anticipated.

13.4.2.4 Settlements

Section 3.2 of the SCDP outlines the Settlement Hierarchy for the county, which is also outlined in Figure 13-8 and Figure 13-9 of this report. The following four classes below are outlined as the respective settlement hierarchy for Sligo County:

- Gateway City
- Gateway Satellite
- Key Support Town
- Villages

As shown on Figure 13-8 below, there are several villages located within the study area which have full or partial theoretical visibility of the Dunneill turbines, including Easky, Strandhill and Dromore West. Dromore West is the only village within 5km of the Dunneill Wind Farm. Appendix 13-3 - *Viewpoints Assessment* further outlines the visual impact of the Dunneill Wind Farm from Dromore West.

13.4.2.5 Wind Energy Policy

The 2017-2023 Sligo County Development Plan does not currently have a renewable energy strategy in place but does recognise the ability and available potential for wind energy as set out in *Section 11.1.2* of the SCDP. The current wind energy policies for assessing wind energy developments in County Sligo refers to the DoEHLG's Wind Energy Development Guidelines (2006) with the exception of careful siting and design. The SCDP also recognises *"the mountainous landscapes and exposed location on the western seaboard create suitable conditions for wind energy developments. Pressure for future wind farm development is likely to be concentrated in upland and coastal areas, particularly where energy providers can access the national electricity grid".*

Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines

Settlement Hierarchy SCDP 2017-23

- Gateway Satellite
- Key Support Town
- Villages

- Scenic Routes SCDP 2017-23
- Waymarked Walking Trails

Drawing No.

Figure 13-8

Drawing Title

Visual Baseline

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW

Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines

Settlement Hierarchy SCDP 2017-23

- Gateway Satellite
- Key Support Town
- Villages
- Scenic Routes SCDP 2017-23
- Waymarked Walking Trails

Half Blade ZTV

- 1-4 turbines theoretically visible
- 5-9 turbines theoretically visible
- 10-13 turbines theoretically visible

Drawing No.

Figure 13-9

Drawing Title

Visual Baseline with Half Blade ZTV

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW

13.4.3 Landscape Character of the Dunneill Wind Farm

Landscape character refers to the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement, and creates the particular sense of place found in different areas.

13.4.3.1 Site Visit Findings

The Dunneill Wind Farm site was visited on 14th September 2021 where a preliminary assessment of topography, drainage, landcover and land use was conducted in conjunction with other LVIA surveys. Information gathered during these visits has informed the following site descriptions.

13.4.3.1.1 *Physical Landscape Unit*

The topography, vegetation and anthropological features on the land surface in an area combine to set limits on the amount of the landscape that can be seen at any one time. These physical restrictions form individual areas or units, known as physical units, whose character can be defined by aspect, slope, scale and size. A physical unit is generally delineated by topographical boundaries and is defined by landform and land cover.

The topography of this physical landscape unit and that of the wider setting is a mix between upland mountain moorland and lowland farmland. The Dunneill Wind Farm is located on the northern foothills of the Ox Mountains, which continue to slope down towards the northern Sligo coast.

There are no large settlements located within the physical landscape unit. Strandhill and Coolaney are identified as 'Gateway Satellites' in the settlement hierarchy for Co. Sligo and are the largest settlements within the LVIA Study Area. Both of these settlements are located beyond 15km from the Dunneill Wind Farm site and Coolaney is located in an area with no theoretical visibility. Visibility from Strandhill is likely greatly constrained by intervening screening elements such as built infrastructure within the settlement, vegetation present in the landscape and local variations in the topography. Villages generally take the form of small, scattered villages, linked by the local road network which includes the settlements of Dromore West, Easky and Cloonacool and several other small villages in the study area. The land-use within the physical unit is generally that of a settled working landscape.

Topography

The topography of the Dunneill Wind Farm and its surroundings is a key feature in this landscape. The local topography across the site slopes generally in a north-westerly direction, down away from the foothills of the Ox Mountains, as shown in Figure 13-10 below. The elevation of the site itself ranges from approximately 110 m to 190 m Above Ordnance Datum (AOD), although it can be seen from Figure 13-10 that there is substantially higher ground located proximate to the site to the southeast, with the turbines of the Dunneill site located at the northern edge of a steep rise in elevation. Plate 13-1 below illustrates the steepness of the landform of the Dunneill site.

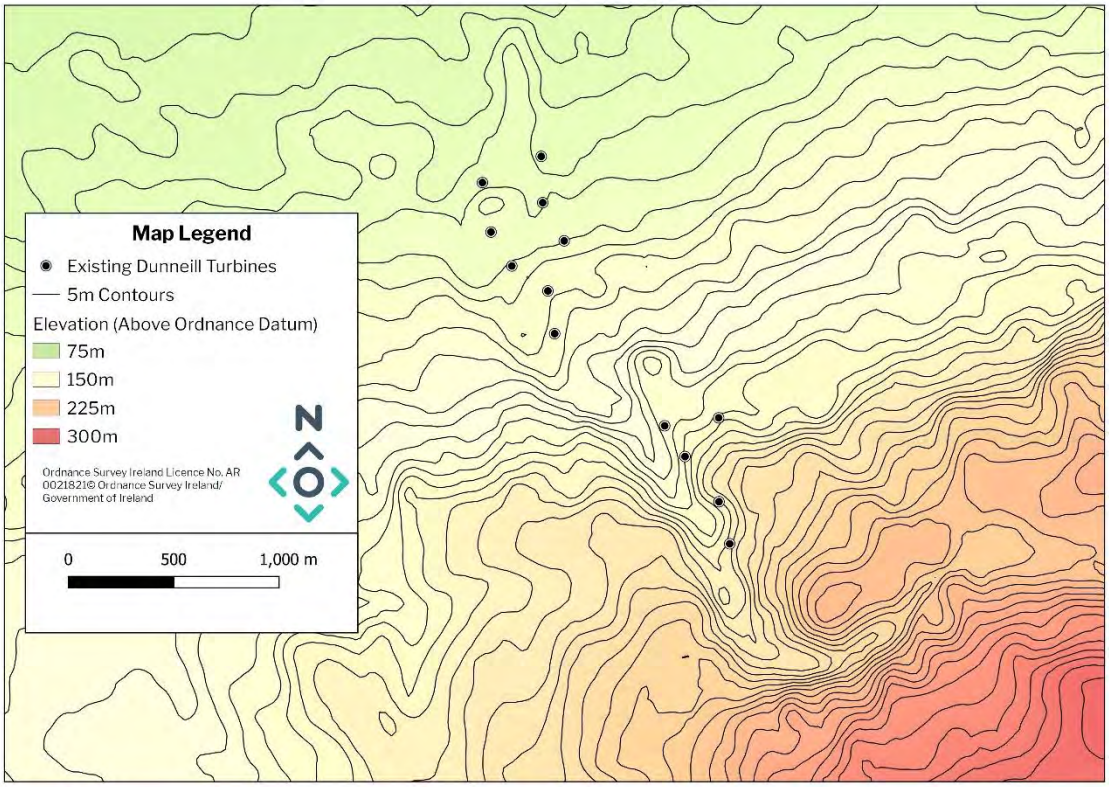


Figure 13-10 Topography of the Dunneill Wind Farm Site

Plate 13-1: View showing the existing topography from the southern boundary of the Dunneill Wind Farm site.

Drainage

The Dunneill River runs directly adjacent to and west of the existing wind farm, in a south-north direction towards Sligo Bay. Dunneill River is located approximately 15m west of the nearest wind farm infrastructure, running parallel to the access track between Turbine No. 7 and Turbine No. 6. Three existing shallow surface streams and drainage crossings were also recorded within the wind farm site. One stream is located in the north of the wind farm, along the access road between turbine T3 and T4 (ITM E544370 N829954) and runs in a south-north direction towards Doonbeakin river to the north of the wind farm which ultimately drains into Sligo Bay. The other two watercourse crossing are located in the south of the site, both of which run in an east-west direction, draining into Dunneill River. The grid coordinates for these locations are ITM E545075 N829051 along the main access road towards the southern section of the wind farm and ITM E545324 N828482 along the access track between Turbine T12 and T13.

As previously mentioned, the wind farm is located on the north-western slopes of the Ox Mountains and is bounded by the Dunneill River, located to the west of the wind farm, which forms natural boundaries along the southern and western sides of the wind farm site respectively.

Plate 13-2: View of the Dunneill River which transverses the northern site boundary.

Land cover

Landcover is the term used to describe the combinations of vegetation and land-use that cover the land surface. It comprises the more detailed constituent parts of the landscape and encompasses both natural and man-made features.

The Dunneill Wind Farm site is part of a remote landscape. Current landcover within the site is mainly coniferous forestry plantation and agricultural grass fields. The turbines of the northern cluster are sited primarily in agricultural fields located amongst tracts of coniferous forestry. The land is generally quite wet, with landcover comprising of wetland grasses and heath, by virtue of their location close to the

Dunneill River. However, the landcover of the fields where the northernmost turbines are located consists of semi-improved grassland.

The five turbines of the southern cluster are located within a large tract of coniferous plantation forestry, with landcover comprising of coniferous monoculture trees, and a gravel road network bounded by grassy banks, as seen below in Plate 13-3.

Plate 13-3: View showing the existing landcover from the southern boundary of the Dunneill Wind Farm site.

Land Use

Current land-use on the site comprises of agricultural use for grazing and rough pasture in relation to the northern cluster of turbines, while the southern cluster of turbines are located on land used for commercial forestry. As the Dunneill Wind Farm is an existing site, renewable energy production is also a primary feature of the land use of the site at present. These land uses are clearly demonstrated by the images shown previously.

Visual Landscape Unit

A visual landscape unit is defined by spatial enclosure and pattern, i.e. by landform and land-cover. The limits of the views that are available from a particular area are therefore determined by the physical landscape, such as topographical features and vegetation boundaries. At the site of the Dunneill Wind Farm, topography and vegetation are the key limiting factors in defining the size of the visual landscape unit. Due to the enclosed, mountainous nature of the site and the scale of the existing turbines, views towards the site are limited and localised. As demonstrated in Appendix 13-3 – *Assessment of Viewpoints*, all photo locations were taken within 10km of the site, and primarily within 5km of the site, with most Viewpoint locations situated to the north of the site. This is due to the large topographical features and ridgelines located to the southeast of the site which completely screen the site from view from multiple locations, which is well demonstrated on the ZTV map (Figure 13-1). As a result of the screening provided by topography, visibility of the site within the 20km LVIA Study Area

is primarily limited to within 10km of the site, with Viewpoint locations therefore concentrated within this part of the LVIA Study Area.

13.4.3.2 Landscape Characterisation in the Wind Energy Development Guidelines (DoEHLG, 2006; DoHPLG, 2019)

The following section considers both the Wind Energy Development Guidelines (DoEHLG, 2006) and the Draft Revised Wind Energy Development Guidelines (DoHPLG, 2019). These guidelines offer guidance for the siting and design of wind energy developments in various landscape contexts by defining six landscape character types that represent most situations where wind turbines may be proposed. The guidance is intended to be indicative and general and notes that it represents the 'best fit' solutions to likely situations.

The six landscape character types include 'Mountain Moorland', 'Hilly and Flat Farmland', 'Flat Peatland', Transitional Marginal Land', 'Urban/industrial' and 'Coastal' landscape character types. The guidelines note that where a wind energy development is located in one landscape character type but is visible from another, it will be necessary to decide which might more strongly influence the approach adopted for the assessment.

Landscape character types of Flat Peatland, Urban/Industrial and Coastal could be ruled out from the beginning, leaving Hilly and Flat Farmland, Mountain Moorland and Transitional Marginal Land. Hilly and Flat Farmland was not applicable to the site as Dunneill does not have "a patchwork of fields delineated by hedgerows varying in size". Although the Dunneill site has similar characteristics to that of Transitional Marginal Landscapes, the key characteristics and siting and design of Mountain Moorland is most prevalent for the Dunneill site. Further details of this landscape character type are provided below.

The key characteristics of the 'Mountain Moorland' landscape type include:

- Peaked, ridged or rolling mountains and upland with steep slopes or gently formed valleys;
- Generally unenclosed;
- Landcover comprising of blanket bog, a mottling of heather, wild grases and some rush in wet flushes;
- A landscape type of relative remoteness and often comprising pristine, unspoilt and remote landscapes.

"Given exposure and smoothness of terrain, these landscapes are often sought for wind energy development. The exposure of mountains and the preference for wind energy developments to be located at high elevations result in high visibility.

Mountain moorland may be inappropriate for wind energy development for reasons of natural heritage and the fact that some of these landscapes are of rare scenic quality and/or support some of the last wilderness areas of relatively pristine, unspoilt and remote landscapes.

However, many examples of these landscapes should be open for consideration subject to appropriate design and landscape siting to minimise adverse impact and optimise aesthetic effect."

The best practice siting and design guidance given for 'Mountain Moorland' in the Wind Energy Development Guidelines (DoEHLG, 2006) and the Draft Revised Wind Energy Development Guidelines (DoHPLG, 2019) is set out below:

Location

"It may be acceptable to locate wind energy developments on ridges and peaks. They may

also be appropriate, in certain instances, in a saddle between two peaks where they will be partially contained or "framed". A third acceptable location is lower down on sweeping mountainsides."

Spatial Extent

"Given the typical extensive areas of continuous unenclosed ground, larger wind energy developments can generally be accommodated because they correspond in terms of scale. However, the spatial extent of a wind energy development would need to be reduced where a suggestion of smaller scale is provided by nearby landscape features."

Spacing

"All spacing options are usually acceptable. Where a wind energy development is clearly visible on a crest or ridge there is considerable scope to vary the rhythm, though on simple ridges, regular spacing may be more appropriate. On sweeping and continuously even areas of mountain moorland or upland plateaux regular spacing may be most desirable."

Layout

"All layout options are usually acceptable. However, the best solutions would either be a random layout, and clustered where located on hills and ridges, or a grid layout on sweeping and continuously even areas of moorland or plateaux. Where a wind energy development is close to a linear element, such as a river, road or long escarpment, a corresponding linear layout or staggered line might be most desirable."

Height

"There would generally be no height restrictions on mountain moorlands as the scale of landscape is so great. However, shorter turbines may be more appropriate where they are located on small peaks and outcrops in order to maintain an appropriate scale. Profile, whether even or uneven, is dependent on topography: the more rugged and undulating (e.g., knolls and crags) the more uneven it will be. The profile of the wind energy development should not necessarily run in parallel to that of the topography."

Cumulative Effect

"The open expanse of such landscapes can absorb a number of wind energy developments, depending on their proximity. The cumulative impact will also depend on the actual visual complexity of landform, whether steeply rolling, undulating or gently sweeping. The more varied and undulating an area is topographically, the greater its ability to absorb and screen wind energy developments. The aesthetic effect of wind energy developments in these landscapes is acceptable where each one is discrete, standing in relative isolation."

13.4.4 Landscape Character of the LVIA Study Area

Landscape character refers to the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement, and creates the particular sense of place found in different areas.

The Dunneill Wind Farm site is located on the northern slopes of the Ox Mountain Range in a rural, remote mountainous landscape setting. Beyond the Dunneill site to the north and west the landform tapers downwards towards the coast and transitions to a rural agricultural landscape dominated by the field structures as defined by mature hedgerows, with small rural settlements and one-off houses scattered throughout the landscape.

To the north-west of Dunneill Wind Farm, within approximately 7km of the site, large tracts of coniferous plantation forestry are interspersed throughout the landscape, generally located on or approximate to large areas of cutover bogland, which makes up a large stretch of land to the west of the site between 5 and 10km away.

To the south of the Dunneill Wind Farm lies the Ox Mountain range, which is comprised of open moorland and some large tracts of coniferous plantation forestry, as well as Easky Lough located approximately 5km to the southwest. Further southeast and east the landscape transitions again to a rural agricultural character, with farmstead, agricultural fields, and one-off houses dominating the landcover. There are also a number of larger settlements such as Coolaney and Tobercurry located in this area, although the ZTV demonstrates that there is no visibility of the Dunneill Wind Farm as a result of the topography of the Ox Mountains.

To the north-east of the site lies Ballysadare Bay and Strandhill, a larger coastal settlement located approximately 17km from the Dunneill site. The character of this area, much like the coastal areas to the north and west of the site, is a rural coastal landscape, excepting the localised urban influence of Strandhill itself. It is also noted that a large section of the LVIA Study Area (and the ZTV) to the north and west lies on Sligo Bay and the Atlantic Ocean, with limited number of visual receptors located in this area.

Other landscape features of note in the LVIA Study Area include the River Moy and its estuary, approximately 19km west of the site, as well as the coastline of Sligo to the north, which provides scenic amenity to much of the area, although visibility of the Dunneill wind farm is restricted from locations along the coast.

13.4.4.1 Landscape Character Areas

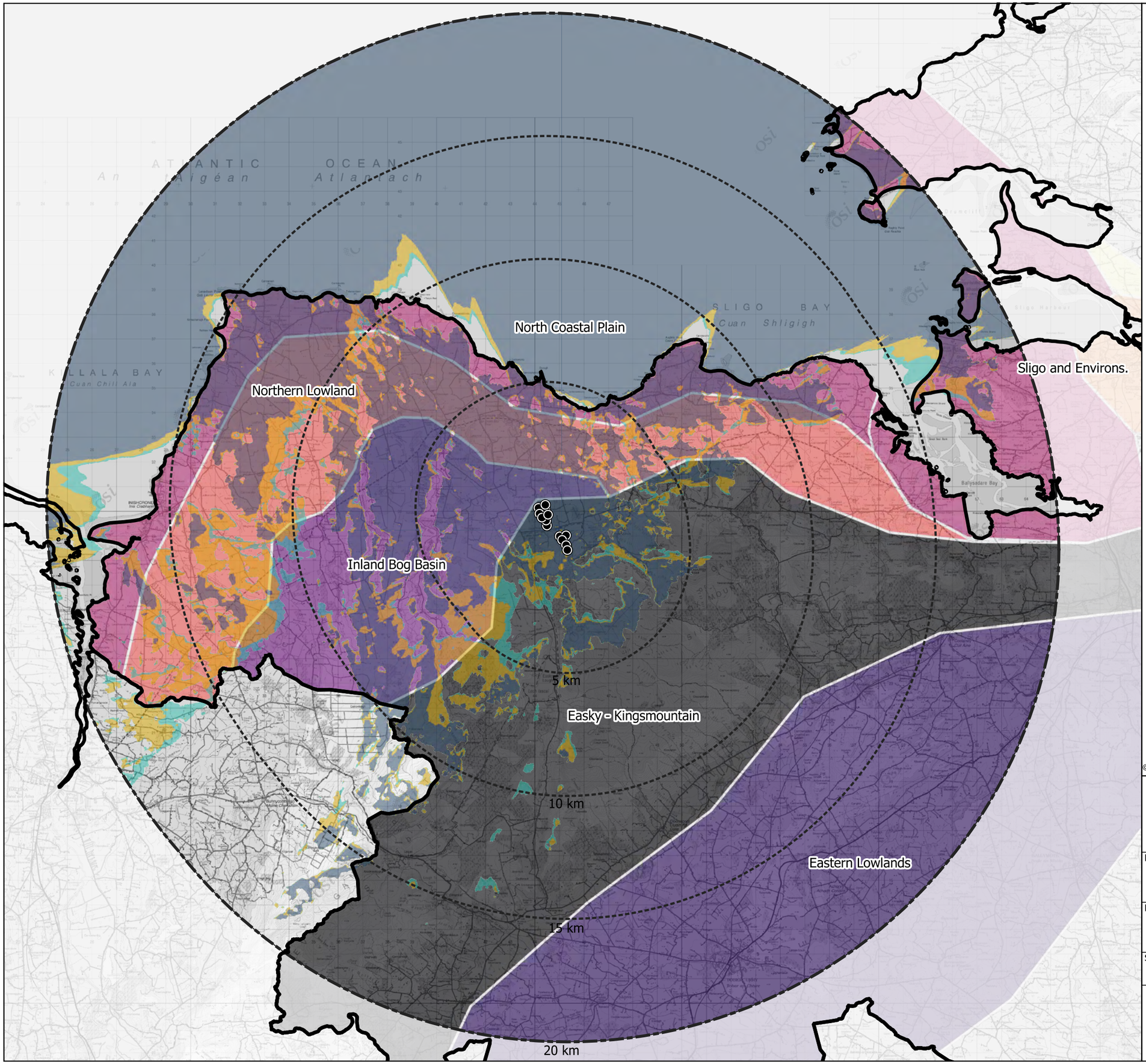
As noted in Section 13.4.1.3 above, Sligo County Council does not currently have a Landscape Character Assessment that forms part of its county development plan, and for the sake of thoroughness and completeness in the assessment of landscape effects on landscape character in the study area, provisional landscape character areas were identified by a qualified landscape architect in MKO.

The LVIA Study Area for assessment of landscape character extends to 15km from the Dunneill Wind Farm, as noted previously in this report and in Appendix 13-1 – *Methodology*. Five of the provisional landscape character areas prepared by MKO fall within the 15km LVIA Study Area. These LCUs are described above in Section 13.4.1.3 and shown on Figure 13-11 below. The following LCAs were identified as having full or partial theoretical visibility of the Dunneill Wind Farm:

- Easky – Kingsmountain LCA
- Inland Bog Basin LCA
- Northern Lowland LCA

- North Coastal Plain LCA

A detailed description and comprehensive assessment of each LCA listed above is outlined in Appendix 13-2.



Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines

Provisional Sligo Landscape Character Areas

- Easky - Kingsmountain
- Eastern Lowlands
- Inland Bog Basin
- North Coastal Plain
- Northern Lowland
- Sligo and Environs.

Half Blade ZTV

- 1-4 turbines theoretically visible
- 5-9 turbines theoretically visible
- 10-13 turbines theoretically visible

Drawing No.

Figure 13-11

Drawing Title

Landscape Character Areas with Half Blade ZTV

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW

13.5 Visibility Appraisal

13.5.1 Landscape and Site Context

This section of the LVIA chapter describes the views of the surrounding landscape that are available from the Dunneill Wind Farm. It also describes the existing views towards the site from the surrounding area, with particular reference to the views from roads, houses, and areas of amenity value.

13.5.1.1 Views from the Dunneill Wind Farm

The landscape of the Dunneill Wind Farm comprises a mix of coniferous forestry plantation (southern boundary) and agricultural field patterns (northern boundary). The landscape surrounding the Dunneill Wind Farm comprises mainly of agricultural pasture fields and one-off residential dwellings. Plate 13-4 below shows a view of the turbines within the Dunneill Wind Farm, looking north. Agricultural fields surrounded by coniferous forestry are seen within this view.

Plate 13-4: View of the Dunneill Wind Farm, from the Western Way Walking Trail.

13.5.1.2 Views towards the Dunneill Wind Farm

There is no visibility of the Dunneill Wind Farm from roads south and east of the turbines due to the topographical screening of Easky Mountain, as shown below in Plate 13-5. Views towards the site from the northwest and north are generally more open, unrestricted views. This is evident in Figures 13-1 (Showing the ZTV) and Figure 13-2 (showing the topography of the LVIA Study Area) which demonstrate that the topography of the elevated lands to the south and east restrict visibility of the Dunneill turbines within much of the study area.

Plate 13-5: View towards the Dunneill Wind Farm from the L-2702 south of the site.

It is further noted that even in close proximity to the Dunneill wind farm site, visibility is restricted due to the mature coniferous forestry lining local roads. Plate 13-6 below was taken from the local road between the two Dunneill turbine clusters (north and south). It can be seen that even in close proximity to the site (within 1km) the turbines are often entirely screened by vegetation (coniferous forestry) and therefore are not visible.

Plate 13-6: View towards the Dunneill Wind Farm from the local road which transverses through the northern and southern turbine clusters. The Dunneill turbines are not visible from this location.

Views towards Dunneill Wind Farm are available from the surrounding local roads to the north and west, some of which are recreational routes and scenic routes. During the site visit, the N59 was driven, where it was determined that visibility of the Dunneill turbines along much of this road is restricted due to local changes in topography and roadside vegetation screening, as shown in Plate 13-7 below, where mature deciduous trees are seen running adjacent to the roadway. There are a number of local roads in the vicinity which have visibility of the site, and these are represented in the Viewpoint Booklet accompanying this report.

Plate 13-7: View towards the Dunneill Wind Farm from the N59 road.

Beyond 5km of the Dunneill turbines, visibility is greatly limited with distance across the flat landscape in all directions. The combination of the height and scale of the Dunneill wind turbines and roadside vegetation screening from roads within the study area allows the turbines to be effectively visually absorbed into the landscape at these distances.

Plate 13-8 below was taken from the R297 in Dromore West, the only settlement within the settlement hierarchy for County Sligo (detailed below in Section 13.4) that is within 5km of the Dunneill turbines. This view is representative of road users along the R297 and Scenic Route 46 as well as residents in Dromore West. From this viewpoint location the Dunneill turbines are seen to be well framed by Easky Mountain without increasing the vertical extent of the skyline and they do not interfere with views of the Visually Vulnerable ridgeline.

Plate 13-8: View towards the Dunneill Wind Farm from the R297 in Dromore West.

Further descriptions regarding views towards the site are presented in the viewpoint descriptions in Appendix 13-3.

13.6 Cumulative Baseline

In terms of cumulative landscape and visual effects, only other wind energy projects have been considered, as only these would be described as very tall vertical elements in the landscape with the potential to give rise to significant cumulative effects. Other wind energy developments, within 20 km of the Dunneill Wind Farm, were identified by searching past planning applications lodged through the various planning authorities (Sligo County Council and An Bord Pleanála) online planning portals. The information identified in the initial planning search was then used to verify, by means of a desk-based study and ground-truthing, whether the permitted wind energy developments had been constructed.

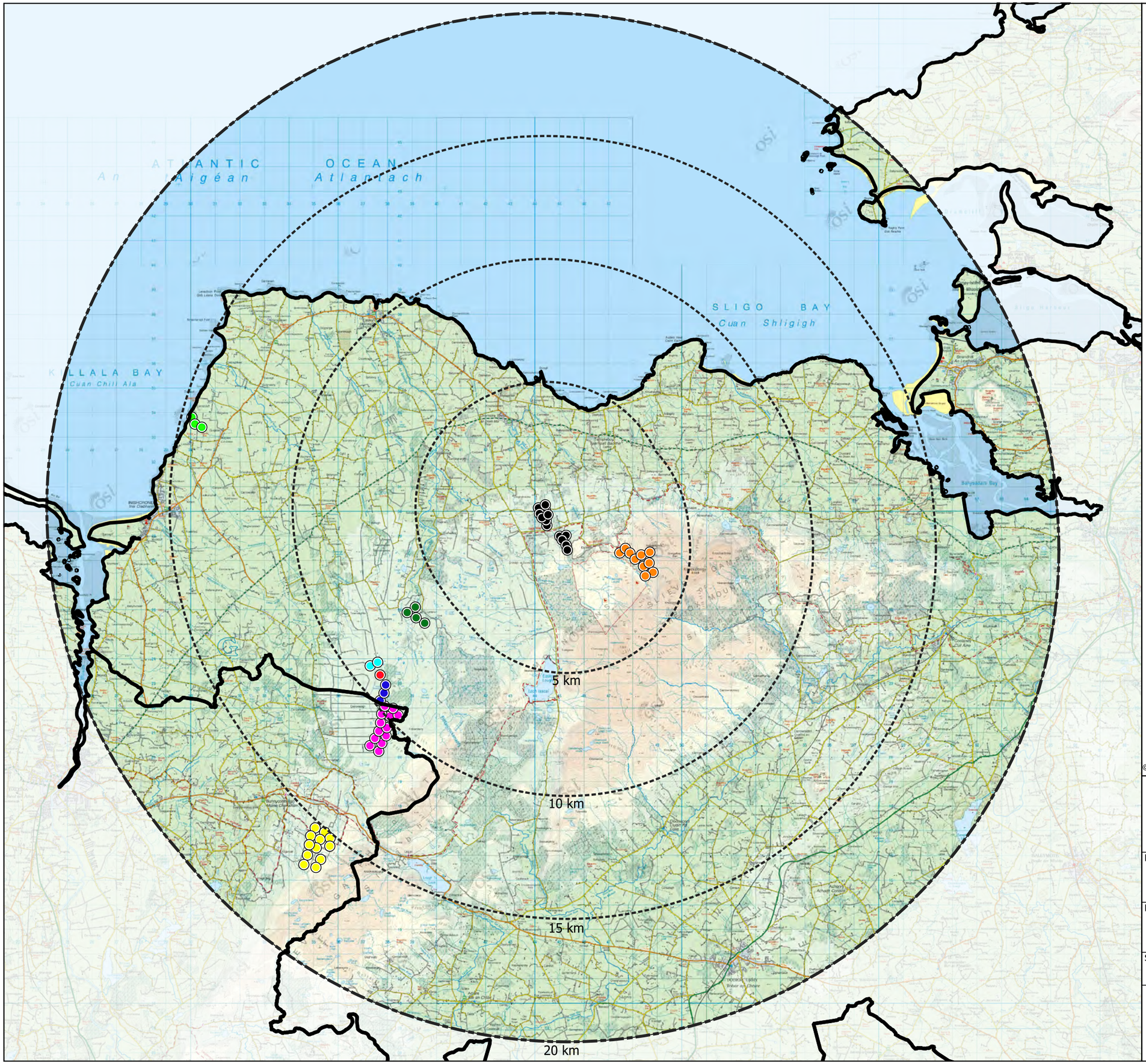
The list of existing, permitted and proposed wind turbines present within the a search area to 20km area are listed in Table 13-1 below:

Table 13-1 Cumulative Baseline: other wind farms within 20km of the Dunneill Wind Farm

Wind Farm	Status	No. of Turbines	Hub and Blade Dimensions
Up to 5km			
Kingsmountain	Existing	10	Tip Height 100m; Rotor Diameter 80m
5 to 10 km			
Black Lough	Existing	4	Rotor Diameter 124m; Tip Height 92m

Wind Farm	Status	No. of Turbines	Hub and Blade Dimensions
Up to 5km			
Cloonkeelaun	Existing	3	Tip Height 99.5m; Rotor Diameter 71m
Cloonkeelaun II	Existing	1	Rotor Diameter 99.5m; Tip Height 71m
Cloonkeelaun III	Existing	2	Rotor Diameter 99.5m; Tip Height 71m
Carrowleagh	Existing	13	Rotor Diameter 99.5m; Tip Height 71m
10 to 15 km			
Lackan	Existing	3	Tip Height 100m; Rotor Diameter 80m
15 to 20 km			
Bunnyconnellan	Existing	12	Tip Height 99.5m; Rotor Diameter 71m

There are 8 No. existing wind farms within the 20 km boundary, as shown in Table 13-1 above. The locations of the eight wind farms can be identified on the Cumulative Baseline map shown below (Figure 13-12).



Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines
- Existing Black Lough Turbines
- Existing Bunnyconnellan
- Existing Carrowleagh Turbines
- Existing Cloonkeelaun Turbines
- Existing Cloonkeelaun II Turbines
- Existing Cloonkeelaun III Turbines
- Existing Lackan Turbines
- Existing Kingsmountain Turbines

Drawing No.

Figure 13-12

Drawing Title

Cumulative Baseline

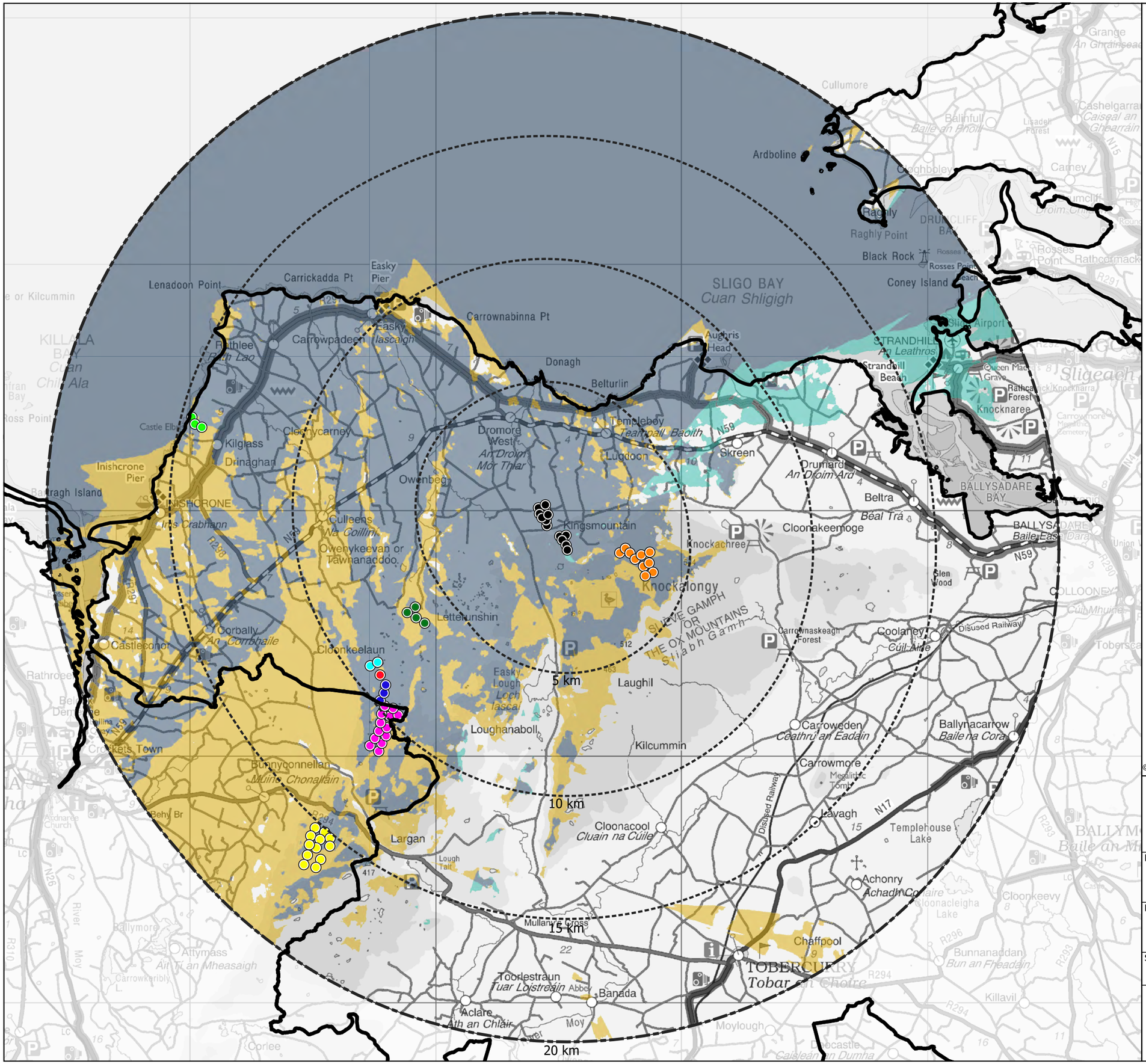
Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW

13.6.1 Comparative Cumulative Visibility to Half-Blade

Figure 13-13 below compares the cumulative theoretical visibility of all existing wind farms (represented in navy) with any additional theoretical visibility of turbines as a result of the continued operation of the existing Dunneill Wind Farm (represented in blue). As seen on this map below, the only substantial area where the Dunneill turbines cause additional theoretical visibility of wind turbines within the LVIA Study Area is located to the northeast of the site. This area of additional theoretical visibility begins approximately 4km from the Dunneill site, continuing in a patchy coverage over parts of Ballysadare Bay to Strandhill. Overall, in terms of the additional cumulative impact caused by the Dunneill Wind Farm, the additional theoretical visibility of turbines within the LVIA Study Area is relatively small, and located in remote areas with limited numbers of visual receptors and primarily at a substantial distance (>5km) from the site, where the turbines will appear smaller in potential views, likely benefitting from increased screening opportunities provided by elements within the landscape (i.e. vegetation, built form, and local variations in topography).



Map Legend

- LVIA Study Area Boundary
- County Border
- Existing Dunneill Turbines
- Existing Black Lough Turbines
- Existing Bunnyconnellan
- Existing Carrowleagh Turbines
- Existing Cloonkeelaun Turbines
- Existing Cloonkeelaun II Turbines
- Existing Cloonkeelaun III Turbines
- Existing Lackan Turbines
- Existing Kingsmountain Turbines

Cumulative Comparative ZTV

- Visibilty of Cumulative Turbines Only
- Visbility of Dunneill Turbines Only
- Visibility of both Dunneill and Cumulative Turbines

Drawing No.

Figure 13-13

Drawing Title

Cumulative Comparative ZTV

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:150,000	210207	25.05.2022	JS	JW

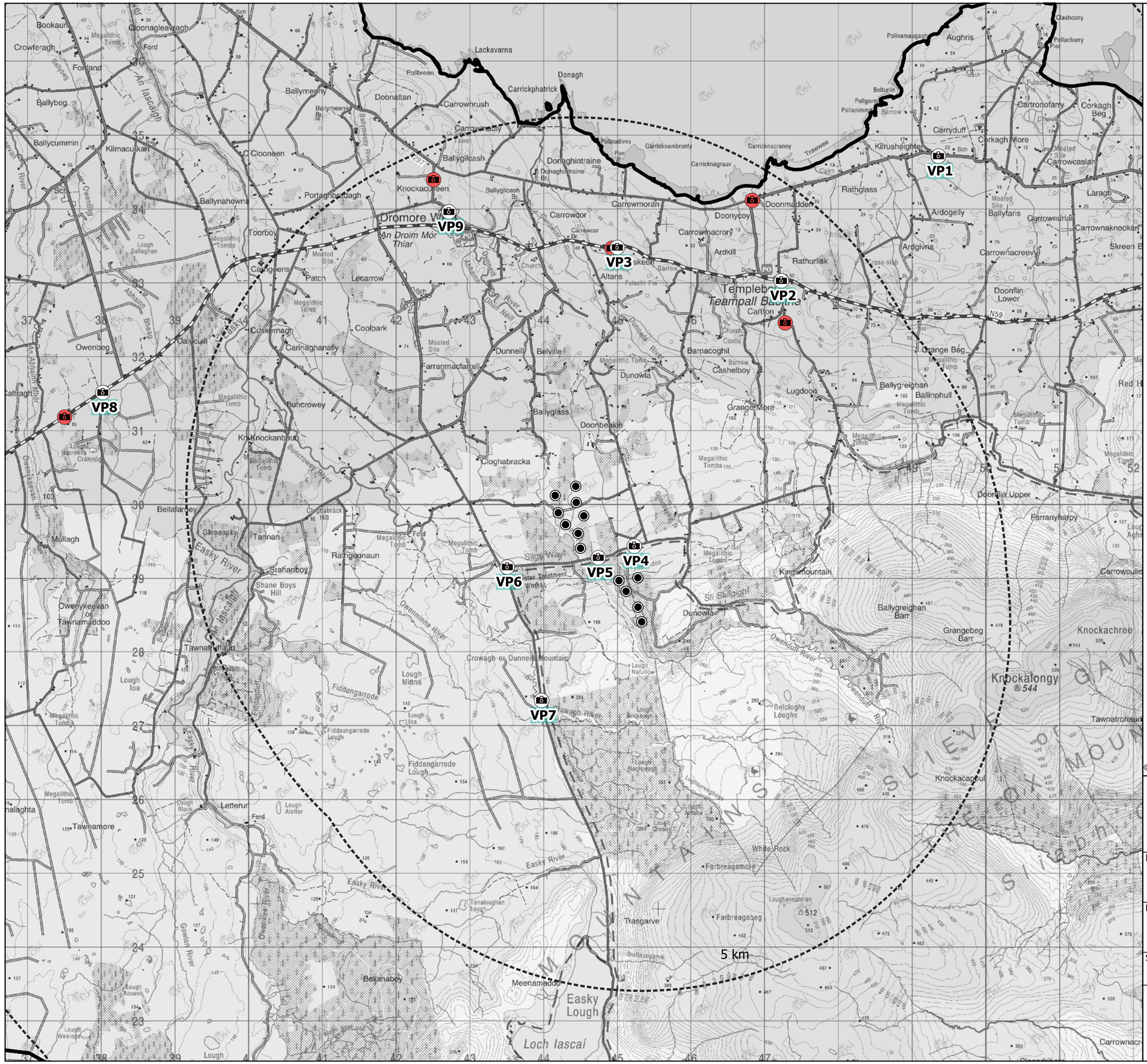
13.7 Representative Viewpoint Locations

The LVIA conducted in this chapter is part of an EIAR and the turbines of the Dunneill Wind Farm are already built and operational. The process of selecting viewpoint locations, taking representative photos and generating wide perspective viewpoints follows the regular methodology prescribed by best practice guidance for photomontage production, a tool usually used in LVIA. As the turbines are already constructed, there is no requirement to super-impose the Dunneill Wind Farm turbines within the viewpoints as would be normal procedure, as the turbines are already existent within the landscape and images. Assessment of likely significant effects is based on the actual visibility of the project as determined by site visits and aided by the viewpoints assessments.

Locations within the LVIA Study Area were chosen to serve as representative viewpoints of the Dunneill Wind Farm from landscape and visual receptors screened in for further assessment after multiple site visits and a desktop mapping assessment. The viewpoint locations are representative, and, in some instances, photos were not taken directly next to a visual receptor but in another location in close proximity where there may be superior line of sight towards the Dunneill Wind Farm (e.g., higher elevation or less screening). A detailed description of the viewpoint selection process and viewpoint assessment methodology is provided in Appendix 13-1. However, it is noted that several factors governed the choice of viewpoint locations, including:

- The methodology outlined in Appendix 13-1 based on best practice guidance for viewpoint selection and viewpoint assessment.
- Landscape and Visual receptors screened in through ZTV mapping exercises and site visits, including views from local settlements, populated areas, local and regional roads and scenic routes and views.
- Viewpoint locations were chosen that incorporate the cumulative landscape effects of other wind farm developments within the LVIA Study Area.

9 No. viewpoint locations were selected for the preparation of viewpoints in this LVIA, the locations of these viewpoints are shown on Figure 13-14 and described in Table 1-1 of Appendix 13-3. The viewpoints are presented in the Viewpoint Booklet accompanying this EIAR. Assessment of likely or significant visual effects of the Dunneill Wind Farm are demonstrated in the Viewpoints Assessment tables in Appendix 13-3, viewpoint assessment results are summarised in the following Section. It is noted that additional viewpoints were visited and assessed in the conduct of this LVIA, although these viewpoints are not included in the detailed assessment of viewpoints contained in Appendix 13-3, due to low levels of visibility of the Dunneill Wind Farm. These locations are indicated on Figure 13-14 by red camera icons. It is considered that no Significant visual effects will arise at these locations denoted by red camera icons as a result of the Dunneill Wind Farm.



Map Legend

- County Border
- Existing Dunneill Turbines

Viewpoints

- Viewpoint Location
- Viewpoints not included for full assessment

Drawing No.

Figure 13-14

Drawing Title

Viewpoint Locations

Project Title

Dunneill Renewable Energy Development

Scale	Project No.	Date	Drawn By	Checked By
1:50,000	210207	25.05.2022	JS	JW

13.8 Likely or Significant Landscape and Visual Effects

13.8.1 'Do-Nothing' Scenario

The 'Do-Nothing' scenario entails the decommissioning of the existing wind farm once the current planning permission expires (2024) and restoration of the site to its original use as agricultural lands for pasture and rough grazing and commercial forestry in the south. Should this occur, the impact would be neutral in the context of this EIAR.

13.8.2 Construction Phase Effects

No construction activities or alterations to the existing wind farm are proposed beyond routine maintenance during the operational phase of the Proposed Development.

13.8.3 Operational Phase Effects

The Proposed Development is expected to have a lifespan of approximately 15 years. Planning permission is being sought for a 15-year operational period commencing from the date of expiration (March 2024) of the existing wind farm planning permission (ABP Pl. Ref. 21.204790). During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

13.8.3.1 Landscape Effects

No direct landscape effects will occur at the Dunneill Wind Farm site as a result of the proposed continuation of operations. The lands within the site will continue to be used for renewable energy generation, commercial forestry and small scall agriculture.

13.8.3.1.1 *Landscape Character Areas*

A landscape character assessment was provisionally prepared by MKO in the absence of a landscape character assessment by Sligo County Council. An assessment of the effects on landscape character was undertaken for four LCAs within the LVIA Study Area that were identified as having significant theoretical visibility in the Landscape Receptor Preliminary Assessment. The individual assessments for each LCA are detailed in Appendix 13-2 and are summarised in Table 13-2 below.

Table 13-2 Summary of Landscape Effects of Landscape Character Areas.

Landscape Character Areas (MKO)	LCA Sensitivity to Wind Farm Development	Magnitude of Change	Significance of Landscape Character Effect
Easky-Kingsmountain	Medium	Slight	Slight
Northern Lowlands	Low	Slight	Not Significant
Inland Bog Basin	Low	Slight	Not Significant
North Coastal Plain	Medium	Negligible	Not Significant

The Dunneill Wind Farm is located in the Easky Kingsmountain LCA, and within the 15km LVIA Study Area for effects on landscape character there are three other LCAs, provisionally prepared by MKO. As demonstrated by Table 13-2, no significant landscape effects are likely to occur on the landscape character in the LVIA Study Area. The Dunneill Wind Farm is located within the Easky Kingsmountain LCA, in which a Slight negative effect on landscape character will occur as a result of the extension of duration of the Dunneill Wind Farm. It is noted that this effect on landscape character is localised within the relatively small area of this LCA where the Dunneill turbines are visible, with the majority of this LCA located outside of the ZTV. In addition, it is noted that the scale of the turbines of the existing Dunneill wind farm is such that they are effectively absorbed within the larger topographical features that define this LCA. All other effects on landscape character within the 15km LVIA Study Area are deemed to be Not Significant.

13.8.3.2 Cumulative Landscape Effects

After identifying the cumulative baseline and cumulative status for each LCA it was assessed to what extent the addition of the Dunneill Wind Farm changes the status of the individual LCAs. There was no LCA where the cumulative landscape status would change as a result of the decommissioning of the Dunneill wind turbines, and inversely the extension of duration of the turbines would not cause any change in the cumulative landscape status. Within the Easky Kingsmountain LCA the presence of the nearby existing Kingsmountain wind farm means that the cumulative status of this LCA will not change if the Dunneill turbines are decommissioned. In relation to the other LCAs assessed in Appendix 13-2, the presence of other wind farms, within and visible from these LCAs, means that the decommissioning and removal of the Dunneill wind turbines would also not change the cumulative landscape status. Therefore, cumulative landscape effects as a result of the proposed extension of duration of the Dunneill turbines are considered Slight.

13.8.3.3 Visual Effects

13.8.3.3.1 *Summary of Viewpoint Assessment*

An assessment of the visual effects of the Proposed Development was undertaken from the 10 viewpoint locations identified in Section 13.7 above using the assessment methodology described in Appendix 13-1. The locations of these viewpoints are shown in Figure 13-14 above. The individual assessments from the 11 viewpoints are presented in Appendix 13-3 and summarised in Table 13-3 below. Appendix 13-3 and the assessment of visual effects below should be read in conjunction with the Viewpoints Booklet forming Volume 2 of the EIAR.

The visual effects caused by the proposed wind turbines was assessed from each viewpoint in terms of the sensitivity of the visual receptors, along with the magnitude of change, as recommended in the GLVIA (2013) guidelines. This, in conjunction with a detailed review of the viewpoints themselves and the ZTV maps, informed the visual effects assessment.

Visualisations such as viewpoints are tools that can represent the likely effect of a development and are used to inform the reader's prediction of how that development will appear in the landscape. The viewpoints themselves act to inform the reader of potential effects at specific locations. In the case of this project, anyone visiting the site and the areas around the site has the ability to see the turbines, if visible, from all locations around the site. In this case, the assessment is not reliant on the viewpoints to the extent that it may be for traditional projects where photomontages are required.

In terms of the visual quality of the as-built Dunneill Wind Farm however, i.e. whether a visual effect is deemed to be positive, negative or neutral, this involves a degree of subjectivity. What appears to be a positive effect to one viewer could be deemed to be a negative effect by another viewer. All visual effects of the viewpoints below are Long Term and Direct effects.

Key reasons enabling the Dunneill Wind Farm to be effectively absorbed by the landscape of the site and surrounding area are outlined below and are evident in the viewpoint assessments:

- **Strategic Siting – of the Dunneill Wind Farm within surrounding topographical features**
  The mountainous topography of the Dunneill site and the surrounding landscape of the Ox Mountains contributes to the landscape's capacity to accommodate a wind farm.
  The heightened elevated lands of the Ox Mountains that surround the site to the south and east screen the Dunneill Wind Farm from a large part of the LVIA Study Area. The 2019 (DoEHLG), suggests the suitable location for wind farm development in Mountain Moorland would be acceptable on ridges and peaks or lower down on sweeping mountainsides, as is the case with the Dunneill site. Furthermore, the ZTV suggests that there is limited theoretical visibility of the Dunneill turbines to the south and east within the study area. Due to the mountainous topography to the south and east, and the flatter plain to the north, all 9 viewpoints were taken from within 7km of the Dunneill development, as it is deemed visibility beyond 7km will be very limited.

- **Screening from surrounding landscape elements - commercial forestry**
  Stands of coniferous plantation forestry are a prominent landscape feature of the Dunneill site and the surrounding landscape. Located between visual receptors and the turbines, these and other vegetational elements of the landscape provide screening, obscuring views towards the turbines or making those views intermittent in nature. In close proximity to the site, mature coniferous forestry reduces the potential for clear and open views of the turbines and this vegetation will help to screen the majority of the turbines from view, especially for those travelling along designated scenic routes in close proximity to the site. In areas where theoretical visibility is indicated on the ZTV map, actual visibility on the ground is diminished by screening factors such as this commercial forestry, as was evident in the viewpoints presented below.

- **The Dunneill Development does not obstruct landscape views of the Sligo coastline and does not materially impact scenic amenity attributed to the coast.**
  Many valuable scenic views and scenic routes located in the LVIA Study Area, and within the ZTV, are predominantly attributed to the coastal sector of the region, providing significant amenity for recreation and tourism. Valuable views are principally focussed in an offshore direction towards the coastline and the ocean, not inland towards the Dunneill Wind Farm. In addition, the siting of the turbines within a location framed by the surrounding ridgelines results in turbines located in the background of any inland views, particularly views from the coastal section of the LVIA Study Area to the north and west of the site. The Dunneill turbines will not materially impact any sensitive scenic amenities attributed to the coast.

Table 13-3 Viewpoint Assessment Summary

VP No	Description	Grid Ref.	Approx. distance & direction to nearest turbine	Visual Sensitivity of Receptor(s) (at viewpoint)	Magnitude of Change	Residual Significance of Visual Effect
1	View from the L-2204 local road in the townland of Corkagh More. This viewpoint is also located along Scenic Route 46.	E 549318 N 834733	7 km NE	**High**	**Slight**	**Sight**
2	View from the N59 in the townland of Lugdoon. This viewpoint is also located along Scenic Route 7.	E 547188 N 833043	4 km NE	**High**	**Slight**	**Sight**
3	View from the N59 in the townland of Ballyeeskeen. This viewpoint is also located along Scenic Route 7.	E 544963 N 833495	3.2 km NE	**High**	**Slight**	**Sight**
4	View from a local road in the townland of Doonbeakin. This viewpoint is also located along Scenic Route 49 and the Sligo Way and is located within a Sensitive Rural Landscape Area.	E 545193 N 829447	440 meters N	**High**	**Moderate**	**Moderate**
5	View from a local road in the townland of Ballyglass. This viewpoint is also located along Scenic Route 49 and the Sligo Way and is located within a Sensitive Rural Landscape Area.	E 544705 N 829290	250 meters E	**High**	**Moderate**	**Moderate**
6	View from the L-2702 local road in the townland of Crowagh. This viewpoint is also located along Scenic Route 49 and the Sligo Way and is located within a Sensitive Rural Landscape Area.	E 543471 N 829163	1 km W	**High**	**Slight**	**Sight**
7	View from the L-2702 local road in the townland of Crowagh. This viewpoint is also located along Scenic Route 49 and the Sligo Way and is located within a Sensitive Rural Landscape Area.	E 543936 N 827355	1.7 km SW	**High**	**Negligible**	**Not Significant**
8	View from the N59 in the townland of Owenbeg. This viewpoint is also located within a Sensitive Rural Landscape Area	E 537986 N 831528	6.2 km NW	**Medium**	**Slight**	**Slight**

VP No	Description	Grid Ref.	Approx. distance & direction to nearest turbine	Visual Sensitivity of Receptor(s) (at viewpoint)	Magnitude of Change	Residual Significance of Visual Effect
9	View from the R297 in the townland of Knockacullen. This view is located within the Village of Dromore West.	E 542679 N 833978	4.2 km NW	**Medium**	**Slight**	**Sight**

The assessment of visual effects determined the residual significance of the visual effects to range from 'Not Significant' to 'Moderate', with the number of findings at each level of significance listed in Table 13-4 below.

Table 13-4 Summary of Viewpoint Impact Assessment Results

Significance of Residual Visual Effect	Description	No. of Viewpoints
Profound	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment	0
Very significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment	0
Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment	0
Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends	2
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities	6
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.	1
Imperceptible	An effect capable of measurement but without significant consequences	0

The significance of the residual visual effect was not considered to be 'Profound' 'Very Significant' or 'Significant' at any of the nine viewpoint locations. A residual effect of 'Moderate' was deemed to arise at 2 of the viewpoint locations due to the intervening distance of <500m from the site. A residual visual effect of 'Slight' was deemed to arise at six of the 11 viewpoint locations. All other viewpoints were assessed as resulting in Not Significant (1) residual visual effects.

The viewpoint assessment results will be summarised and discussed in more detail in the following sections.

13.8.3.3.2 Visual Effects in the Overall LVIA Study Area

Generally, overall visual effects are strongly guided by ZTV mapping (based purely on topography, in this case 10-meter contour data) as an indication of areas that will have no visibility of proposed turbines and areas that will have theoretical visibility. The level of certainty for areas where no visibility is indicated by ZTV is very high. On the contrary, in areas where the ZTV mapping shows theoretical visibility this will not have taken account of local variations in ground levels not represented by the 10 metre contour data and more importantly vertical objects such as vegetation, buildings and other structures that will block views of the proposed turbines.

A combination of ZTV mapping, viewpoint assessment and on-site visual assessments has determined that visibility of the site and likely visual effects are primarily constrained to the flat coastal plain surrounding the proposed site from the north, west and north-west (at a distance of approximately 7km). The scale of the turbines and the topography of the landscape of the 20km LVIA Study Area where there is theoretical visibility substantially mitigates likely visual effects occurring in the majority of the landscape to the north, west, northwest, and northeast, within the LVIA Study Area but beyond 7km from the site. The areas beyond 7km in these directions are generally flat, with a gentle decline in elevation towards the coast. The general flatness of the areas beyond 7km results in a disproportionate screening effect resulting from screening elements common throughout the rural agricultural landscape (mature hedgerows, built infrastructure, commercial forestry, and other mature treelines). In essence, the highly vegetated landscape in this part of the study area significantly reduces visibility of the turbines with distance, therefore resulting in limited visibility of the turbines beyond 7km. While some visual impacts might arise in locations where there is very little screening, the wind turbines are located in a small, isolated area and are generally only visible locally. They will not obscure views or vistas of the coast or sea as the turbines are located inland, in the opposite direction to the coast, from areas with theoretical visibility.

The turbines comprise two clusters and this is apparent from locations in close proximity to the Dunneill Wind Farm. However, from locations within the 20km LVIA Study Area beyond 5km of the turbines, the scale of the turbines means that the separation distances between the clusters is much less noticeable (see VPs 1 and 8), and the turbines appear to have even spacing and read coherently in the landscape setting. In addition, from locations beyond 5km, the scale of the turbines in relation to the topography of the Ox Mountains that backcloth the turbines from the locations with theoretical visibility means that the Dunneill turbines do not increase the vertical extent of the skyline and are effectively absorbed within the scale of the landscape within which they are viewed, appearing as small, congruous background elements within such views.

There are a number of sensitive visual designations located to the north and north-east of the Dunneill Wind Farm, including within 5km of the site, with this area therefore being considered the most sensitive location in terms of visual effects within the overall 20km LVIA Study Area. This is represented by the eight viewpoints assessed in this part of the LVIA Study Area (VPs 1, 2, 3, 4, 5, 6, 7, and 9), and these are discussed in further detail below. Within the parts of the wider LVIA Study Area that have theoretical visibility of the turbines, there are limited numbers of sensitive visual receptors. There is one designated scenic route (No. 22 in the SCDP) that runs along the Sligo coastline, although the majority of the scenic amenity attributable to this scenic route is directed towards the coast itself and away from the Dunneill Wind Farm. In addition, the factors discussed previously related to screening within the highly vegetated rural agricultural landscape as well as the increased distance and scale of the turbines means that Significant visual effects are deemed not to arise. The Dunneill wind farm is not giving rise to Significant visual effects in this part of the LVIA Study Area at present and this will not change in the case of an extension in its operational lifespan. Viewpoints 1 and 8 demonstrate some of the 'worst-case' visual effects arising beyond 5km from the Dunneill Wind Farm and residual visual effects of Slight were deemed to arise at these locations.

13.8.3.3.3 *Visual effects within three to five kilometres of the Dunneill Wind Farm*

Viewpoints 2, 3, and 9 are located between three and five kilometres from the Dunneill Wind Farm. All three of these viewpoints demonstrate that at these distances the Dunneill Wind Farm is does not give rise to Significant visual effects. As Viewpoint 2 and 3, which are located along a designated scenic route, the Dunneill turbines are substantially screened by intervening vegetation present within this rural agricultural landscape area (mature hedgerows and treelines) that is located in the intervening space between the viewpoint locations and the site. In addition, the turbines are of a scale that they do not occupy a large vertical extent within views from these locations. A residual visual effect of Slight was deemed to arise at both of these locations.

Viewpoint 9 represents the greatest visual effects from the closest relatively large settlement to the Dunneill Wind Farm, Dromore West. From the majority of this village views towards the Dunneill

Wind Farm are heavily screened by the built infrastructure of the village itself, as well as vegetation located throughout the village. Views from this local high point, shown in Viewpoint 9, are open and expansive in the direction of the Dunneill Wind Farm and the Ox Mountains. The scale of the turbines from this location are such that they are readily absorbed into the view. The turbines do not increase the vertical extent of the skyline of the view, they do not rise above the level of the ridgelines of the Ox Mountains, and they appear appropriately sited in relation to the mountain moorland landscape character type within which they are viewed. A residual visual effect of Slight was deemed to arise at this location.

The Dunneill wind farm is not giving rise to Significant visual effects in this part of the LVIA Study Area (between 3 and 5km) at present and this will not change in the case of an extension in its operational lifespan.

13.8.3.3.4 *Visual effects within three kilometres of the Dunneill Wind Farm*

Viewpoints 4, 5, 6, and 7 are located within 3km of the Dunneill Wind Farm and, given their proximity to the site, are where the greatest visual effects are likely to arise. All these viewpoints are located along designated Scenic Route 49 that runs along the local road that dissects the two clusters of turbines of the Dunneill Wind Farm. Viewpoint 4 and Viewpoint 5 are located within 500m of the nearest turbine and consequently the greatest visual effects arise at these locations. It is noted that in the case of both of these viewpoints (VPs 4 and 5) there are limited views of a scenic quality from locations along the road, despite its designation as a scenic route. Views from these locations generally comprise views of commercial plantation monoculture forestry and agricultural land, with limited scenic amenity attributable to both of these locations.

From **Viewpoint 4** there are views of turbines from the Dunneill Wind Farm in multiple directions (northwest and southwest), although these are generally well screened by the intervening coniferous plantation forestry. Given the scale of the Dunneill turbines, and the intervening screening elements, the turbines do not occupy a substantial vertical extent within views from this location despite its proximity to the wind farm. A residual visual effect of Moderate was deemed to arise at this location. This is mostly on account of its high sensitivity as a designated scenic route in the SCDP, although as noted there is little scenic value to the views from this location.

From **Viewpoint 5** there are views of turbines only in one direction (north), despite this viewpoint being located just 420m away from the southern cluster of turbines which are entirely screened from view. Views from this location in general are restricted to short-to-medium range views as a result of the heavy presence of coniferous plantation forestry. Given the scale of the Dunneill turbines, and the intervening screening elements, the turbines do not occupy a substantial vertical extent from this location despite its proximity to the wind farm. A residual visual effect of Moderate was deemed to arise at this location. This is mostly on account of its high sensitivity as a designated scenic route in the SCDP, although as noted there is little scenic value to the views from this location, which is similarly the case with Viewpoint 4.

From **Viewpoint 6** there some longer-ranging views available with increased distance from the tracts of forestry seen in Viewpoints 4, and 5. However, these long-range views are not in the direction of the Dunneill Wind Farm, save for a glimpse of a ridgeline available along the local road, and through the tracts of forestry. There is still heavy screening of the turbines by the forestry from this location, and this coupled with the separation distance from this viewpoint further mitigates the visual effects arising as a result of the Wind Farm. A residual visual effect of Slight was deemed to arise at this location, on account of the screening of turbines that occurs, as well as the overall aesthetic quality of views in the direction of the wind farm.

From **Viewpoint 7** a Not Significant effect was deemed to arise. The turbines are heavily screened by intervening topography from this location and given that blade tips are the only components that will be visible, the presence of the turbines is barely distinguishable from a do-nothing scenario.

Overall, the greatest visual effects arise at locations in very close proximity to the turbines, although there are limited views of a scenic quality from these locations and the turbines do not occupy a substantial vertical extent on account of the scale of the turbines and the presence of large tracts of coniferous plantation forestry. The Dunneill wind farm is not giving rise to Significant visual effects in this part of the LVIA Study Area (within 3km) at present and this will not change in the case of an extension in its operational lifespan.

13.8.3.3.5 Ancillary Project Elements

For the purposes of this LVIA, a number of individual elements of the Dunneill Wind Farm, ancillary to the wind turbines, have been grouped together for the assessment of effects, given the similar nature of the construction work that was completed. These operational project elements include the roads and turbine hardstand areas and grid connection components that give rise to similar landscape and visual effects.

Due to the topography and screening elements present near the Dunneill Wind Farm site and surrounding areas, the lower ancillary project elements are only visible in their immediate surroundings, hence, any visual effects will be localised and predominantly confined to within the Dunneill Wind Farm site.

Visual effects arising from the ancillary project elements are slight, localised and long-term where seen, but remain largely unseen from within and outside the site.

13.8.3.3.6 Cumulative Visual Effects

Cumulative visual effects arise at Viewpoints 3, 7, 8, and 9. From **Viewpoint 7** there are combined views of turbines in succession (where there observer has to turn their head to see the separate development) with the existing Black Lough turbines visible in the opposite direction to the Dunneill Wind Farm. Given the extremely limited visibility of the Dunneill turbines from this location, and the distance between this viewpoint and the existing Black Lough wind farm (approximately 5km), Significant cumulative visual effects are not considered to arise.

From Viewpoints 3, 8, and 9 the Dunneill Wind Farm is viewed in combination with the existing Kingsmountain Wind Farm. There are varying degrees of separation between the two wind farms from these viewpoints, but in all cases the Dunneill Wind Farm increases the horizontal extent of turbines visible within views of the Ox Mountains. However, it is noted that the scale of both of these wind farms is similar, and both are easily absorbed within these views given the scale of the surrounding topography, which dwarfs both wind farms. It is further noted that all these viewpoints with combined views of the Dunneill Wind Farm and the Kingsmountain Wind Farm are located beyond 3 km from the Dunneill turbines, which substantially reduces the scale of the turbines within views from these locations. In conclusion, Significant cumulative visual effects are not deemed to arise as a result of the Dunneill Wind Farm at present and such Significant effects will not occur as a result of the continued operation of the Wind Farm.

13.8.4 Decommissioning Phase

The wind farm operator has determined that the existing wind turbines at the Dunneill Wind Farm have a remaining lifespan of at least 15 years beyond the expiration of the current planning permission (Pl. Ref. 03/619 and ABP Pl. Ref. 21.204790) in 2024. SSE have provided details of technical feasibility assessments undertaken concerning the lifetime extension of the Dunneill Wind Farm turbines, included as Appendix 3-1 to Chapter 3 of this EIAR.

It should be noted that decommissioning is required under the parent planning permission and the Proposed Development is postponing those activities for a further 15-years. Condition 10 of the original

Planning Application granted by Sligo County Council (Pl. Ref. 03/619) states the following in relation to decommissioning of the wind farm:

> *'Upon termination of the use of the wind farm, the mast and turbines shall be dismantled and removed from the site and the site shall be restored to its existing condition in consultation with the planning authority. Prior to the commencement of development, the developer shall lodge with the planning authority, a cash deposit, a bond of an insurance company, or other security to secure the satisfactory reinstatement of the site on the cessation of the project. The amount of the security shall be 100,000 euro.'*

It is considered that this Condition is not appropriate, as returning the site to its original condition would involve removal of site roads and turbine foundations, which would require significant excavation and ground works. A more environmentally sensitive decommissioning plan is presented in Appendix 4-3 of this EIAR and described below.

Upon decommissioning of the Proposed Development, the wind turbines will be disassembled in reverse order to how they were erected. All above-ground turbine components will be separated and removed off-site for reuse or recycling. It is proposed to leave turbine foundations in place underground and to cover them with earth and reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration.

It is proposed that site roadways will be left in situ, as appropriate, to facilitate on-going agricultural and commercial forestry uses. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed where required, however, this is not envisaged at this time. It is proposed to leave underground cables in place where they are below a level likely to be impacted by typical agricultural works.

During decommissioning, it may be possible to reverse or at least reduce some of the potential impacts caused during the initial construction of the wind farm by rehabilitating construction areas such as turbine bases and hard standing areas. This will be done by covering with local topsoil and reseeding with a local native mix to encourage vegetation growth and reduce run-off and sedimentation. A decommissioning plan will be agreed with the local authorities at least three months prior to decommissioning of the Proposed Development.

As noted in the Scottish Natural Heritage (SNH) report *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013) reinstatement proposals for a wind farm are typically made far in advance, so within the proposed 15-year extension of operation of the Proposed Development, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

> *'best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm'.*

Therefore, the decommissioning activities envisaged in the Decommissioning Plan have evolved since the original planning application was submitted and this EIAR, and the NIS, therefore, assesses the revised methodologies to be implemented.

13.9 Conclusion

It is important to re-iterate that the Dunneill Wind Farm is an existing facility and this EIAR is being prepared in support of a planning application to extend the operational lifespan of the wind farm beyond 2024, by a further 15 years.

The Dunneill Wind Farm and associated infrastructure was well designed and fits coherently within its landscape setting in terms of its layout, spatial extent and scale.

The majority of landscape and visual receptors located the wider LVIA Study Area are not adversely affected by the Dunneill Wind Farm. The majority of the landscape in the LVIA Study Area is located outside of the zone of theoretical visibility of the Dunneill Wind Farm as a result of the surrounding topography of the Ox Mountains. Additionally, any actual views towards the site within the LVIA Study Area are localised, and it is considered that beyond 7km there will be generally very limited visibility of the turbines in any case.

Landscape features of higher sensitivity with visibility of the Dunneill Wind Farm were assessed based on site visits and using the viewpoint assessment methodology that follows best practice guidance for LVIA. No significant landscape effects were recorded for any of the sensitive landscape features identified as a result of the Dunneill Wind Farm. In terms of landscape character, only the Easky Kingsmountain LCA (provisionally prepared by MKO), in which the Dunneill Wind Farm turbines are located, experience direct effects on landscape character as a result of the Dunneill Wind Farm. Any other effects on other LCAs are indirect, as visibility of the Dunneill Wind Farm is limited due to the scale and siting of the turbines. A residual landscape effect of Slight were deemed to arise in relation landscape effects on the Easky Kingsmountain LCA, and residual landscape effects of Not Significant were deemed to arise at in the other LCAs included in the assessment of effects on landscape character.

In terms of cumulative landscape effects, there was no LCA where the cumulative landscape status would change as a result of the decommissioning of the Dunneill wind turbines, and inversely the extension of duration of the turbines would not cause any change in the cumulative landscape status. In relation to the other LCAs assessed in Appendix 13-2, the presence of other wind farms, within and visible from these LCAs, means that the decommissioning and removal of the Dunneill wind turbines would also not change the cumulative landscape status. Therefore, it is considered that there will be no Significant cumulative landscape effects as a result of the proposed extension of duration of the Dunneill turbines.

The landscape area within which the Dunneill Wind Farm is located is remote, with limited numbers of residential receptors and settlements. As a result, most locations, where there are both sensitive receptors and open visibility of the majority of the turbines in the Dunneill Wind Farm tend not to be located in close proximity, reducing the spatial extent and size of the turbines from sensitive locations where they are likely to be viewed from.

The assessment of visual effects concluded that residual visual effects of ‘Moderate’ were deemed to arise at two of the 9 viewpoint locations. All other viewpoints assessed resulted in ‘Slight’ (6) and ‘Not Significant’ (1) residual visual effects.

Furthermore, it was shown that visibility is greatly restricted by the surrounding topography and actual visibility is further restricted by the effects of localised screening elements common throughout the landscape area where there is theoretical visibility of the Dunneill Wind Farm. Therefore, the turbine locations and heights are considered appropriate for the Dunneill Wind Farm. In conclusion, Significant landscape and visual effects are not deemed to arise as a result of the Dunneill Wind Farm at present and such Significant effects will not occur as a result of the continued operation of the Wind Farm.

14. MATERIAL ASSETS

14.1 Introduction

Material Assets are defined in the *Advice Notes for Preparing Environmental Impact Statements* (EPA, Draft 2015) as *"resources that are valued and that are intrinsic to specific places"* and in the *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (EPA, 2022) as "*built services and infrastructure. Traffic is included because in effect traffic consumes roads infrastructure*." They may be either of human or natural origin. The cultural assets of Archaeology and Cultural Heritage are addressed in Chapter 12 of this Environmental Impact Assessment Report (EIAR). Economic assets of natural heritage include non-renewable resources such as minerals or soils, and renewable resources such as wind and water. These assets are addressed in Chapter 8: Land, Soils and Geology, Chapter 9: Water, and Chapter 10: Air and Climate. Tourism and amenity resources, which are also considered material assets, are addressed in Chapter 5: Population and Human Health.

This chapter of the EIAR addresses the likely significant effects of the Proposed Development on transportation infrastructure (Section 14.2) and on telecommunications and aviation (Section 14.3), which are economic assets of human origin. This chapter of the EIAR has been prepared in accordance with the requirements of the EIA legislation and guidance outlined in Chapter 1: Introduction.

14.1.1 Statement of Authority

This section of the EIAR has been prepared by Niamh McHugh and David Naughton and reviewed by Thomas Blackwell, of MKO. Niamh is a Graduate Environmental Scientist who has recently taken up a position with MKO and has been involved in wind energy EIAR applications. Niamh holds a B.Sc (Hons) in Environmental Science. David is an Environmental Scientist with over five years of consultancy experience with MKO and has acted as project manager for numerous wind energy EIAR applications. David holds a BSc (Hons) in Environmental Science.

Thomas Blackwell is a Senior Environmentalist with MKO with over 15 years of progressive experience in environmental consulting. Thomas holds a BA (Hons) in Geography from Trinity College Dublin and a M.Sc. in Environmental Resource Management from University College Dublin. Prior to taking up his position with MKO in August 2019, Thomas worked as a Senior Environmental Scientist with HDR, Inc. in the United States and held previous posts with private consulting firms in both the USA and Ireland.

14.1.2 Guidance and Legislation

This section of the EIAR has been completed in accordance with the guidance set out in Chapter 1: Introduction. The assessment uses standard terminology to describe the likely significant effects associated with the Proposed Development. Further information on the classification of effects used in this assessment is presented in Section 1.7.2.

14.1.3 Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Section 2.6.2 of Chapter 2 of the EIAR. The relevant consultee responses are detailed below:

Broadcasting Authority of Ireland

The Broadcasting Authority of Ireland (BAI) responded to Scoping on the 16th of June 2021 stating that they are not aware of any issues from existing wind farms to existing FM (Frequency Modulation) networks. Also, the Proposed Development at Dunneill is not located close to any existing or planned FM transmission sites.

Transport Infrastructure Ireland

Transport Infrastructure Ireland (TII) responded to Scoping on the 24th June 2021. Their response provided a list of recommendations to be followed when preparing the EIAR. All relevant TII guidelines and policies, primarily in relation to the environment and planning, have been taken into account in the preparation of this assessment.

Department of Transport

The Department of Transport responded to Scoping on the 23rd June 2021 stating that they have no comment to make at this point in time with regard to the Proposed Development.

14.2 Traffic and Transport

The purpose of this section is to assess the effects, on roads and traffic, of the proposed extension of life of the existing Dunneill Wind Farm.

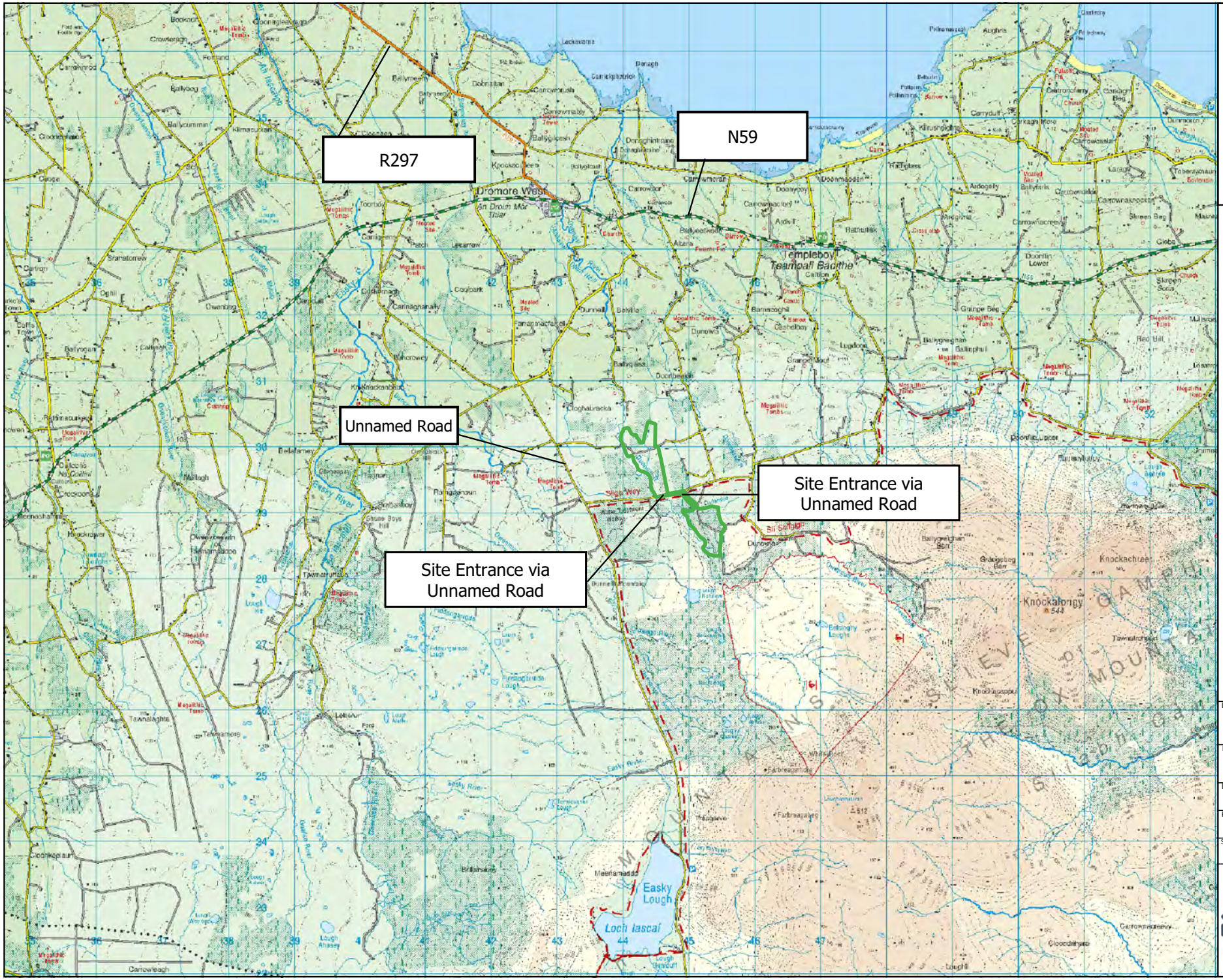
For the development of new wind farms, the construction phase is the critical period with respect to the traffic effects experienced on the surrounding road network in terms of both the additional traffic volumes that will be generated on the road network, and the geometric requirements of the abnormally large loads associated with the wind turbine plant. However, since the Proposed Development does not involve any construction work, any potential traffic and transport impacts are limited to the operational and decommissioning phases of the project.

14.2.1 Receiving Environment

14.2.1.1 Site Location

The location of the existing Dunneill Wind Farm, situated in the three townlands of Croagh (or Dunneill Mountain), Tawnadremira, and Ballyglass, Co. Sligo is shown in the context of the national and local road networks in Figure 14-1.

The closest settlement to the site is Dromore West, which is located approximately 3.5 km north of the Proposed Development, while Templeboy village is located approximately 3.7 km northeast of the Proposed Development.



Map Legend

EIAR Site Boundary

N

Drawing Title

Site Access

Project Title

Dunneill Wind Farm

Drawn By	Checked By
NMcH	DN
Project No.	Drawing No.
210207	14-1
Scale	Date
1:75000	09.08.2022

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14.2.1.2 Site Access

The existing wind farm is accessed via two existing entrances from the third-class/local road that bisects the site. One site entrance turns south towards the southern part of the wind farm (T9 – T13), and a second entrance turns north from the local road towards the northern area of the wind farm (T1 – T8). Both site entrances, either side of the local road are used for day-to-day maintenance and monitoring of the wind farm and substation.

Since the Dunneill Wind Farm is currently operational, and since no changes to the wind farm are proposed, there is no construction phase associated with the proposed extension of life of the wind farm. There will therefore be no new traffic generated by the Proposed Development.

During the operational phase, the wind farm will continue to be remotely monitored. Traffic associated with the operational phase of the wind farm will be from SSE personnel visiting the onsite substation and control building, and maintenance personnel who will visit individual turbines.

It is estimated that the traffic volumes that will be generated by the development during its continued operation will be minimal. The site will generate maintenance trips, with approximately two maintenance staff travelling to site at any one time. The impact on the network of these trips during the operational stage is discussed in Section 14.2.2 below.

14.2.2 Likely and Significant Effects and Associated Mitigation Measures

14.2.2.1 "Do-Nothing" Scenario

Under the Do-Nothing Scenario, the operational life of the Dunneill Wind Farm would not be extended, the wind farm would be decommissioned, and the site restored to its original use as commercial forestry and agricultural lands following the expiration of the current planning permission in March 2024. Should this occur, the impact on traffic and transport would be slight, temporary, and negative during the associated decommissioning works of the existing wind farm.

14.2.2.2 Construction Phase

As has been detailed in Chapter 1 and Chapter 4 of this EIAR, no new construction is likely to occur as part of this Proposed Development, as the proposal seeks to extend the operational life of the wind farm and associated on-site infrastructure. Therefore, there is no potential for construction phase related impacts on traffic or transport.

14.2.2.3 Operational Phase

During the operational phase the majority of maintenance works on the site will be completed by a two-person team travelling in a light goods vehicle. Maintenance crews will be required on-site to complete major component replacements (e.g., turbine component changes or onsite control building maintenance) on a sporadic basis. There have been no major component failures or exchanges at Dunneill Wind Farm to date, since construction in 2010. Typically, there are no more than two trips per day to the site made by car or light goods vehicle. The direct effect on the surrounding road network will be **imperceptible neutral, and long-term**, given the very low volume of daily trips to the site.

Mitigation Measures

Due to the very low volumes of traffic forecast to be generated during this stage no mitigation measures are required.

Residual Impacts

Long-term, imperceptible, neutral impacts on traffic and transportation during the operational phase of the Proposed Development.

Significance of the Effects

Based on the assessment above there will be **No Significant Effect** on traffic and transport as a result of the operational phase of the proposed development.

14.2.2.4 Decommissioning Phase

It is proposed to extend the life of the existing wind farm by 15 years. The potential impacts associated with future decommissioning of the Proposed Development in circa 15 years will be similar to those associated with a typical wind farm construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works, as outlined in Chapter 4, Section 4.8 of this report. If the site is decommissioned as proposed in 2039, cranes and heavy plant will be required on-site to disassemble each turbine tower and associated infrastructure.

Turbine infrastructure including turbine tower, nacelle, and rotor components will be separated and removed off-site for re-use, recycling and waste disposal.

Should the wind farm be decommissioned following an extension of operation, it is proposed that turbine foundations and hardstanding areas will be left in place and covered with soil/topsoil. It is proposed to leave the access roads in-situ. It is considered that leaving the turbine foundations, access tracks and hardstanding areas in-situ will cause less environmental damage than removing and recycling them. However, if removal is deemed to be required all infrastructure will be removed using appropriate construction and demolition best practice and methods. While the actual number of loads that will be required to be removed from the site in the event that the Proposed Development is decommissioned has not been determined at this stage, the impact in terms of traffic volumes will be significantly less than during the original construction stage.

Mitigation Measures

In the event that the Proposed Development is decommissioned after the 15 years extension of life, a Decommissioning Plan, including material recycling / disposal and a Traffic Management Plan, developed to minimise impacts to the local road network, will be prepared for agreement with the local authority. A preliminary Decommissioning Plan has been prepared and is included as Appendix 4-3 of this EIAR. A detailed Traffic Management Plan will be prepared in consultation with the local authority prior to any future decommissioning.

Residual Impact

As stated above, in the event that the wind farm is decommissioned, a Decommissioning Plan will be prepared and implemented in order to minimise the residual impacts. The decommissioning phase of the development will likely result in a residual impact to other road users that is a **slight, temporary, and negative** impact.

Significance of the Effects

Based on the assessment above there will be **No Significant Effect** on traffic and transport as a result of the decommissioning phase of the proposed development.

14.2.2.5 Cumulative In-Combination Effects

The potential cumulative impacts and associated effects between the Proposed Development and the projects described in Section 2.7 of this EIAR, hereafter referred to as the other projects, have been considered in terms of traffic and transport.

There are no construction phase impacts associated with the Proposed Development.

Operational phase impacts on traffic and transport are imperceptible and therefore there are **No Significant Cumulative Effects** in relation to traffic and transport associated with the extended operational phase of the wind farm in combination with other projects.

14.3 Telecommunications and Aviation

14.3.1 Introduction

This section of the EIAR assesses the likely significant effects of the proposed extension of life of the existing wind farm on telecommunications and aviation. Section 14.3.2 describes the way in which wind turbines can potentially interfere with telecommunications signals or aviation activities. Likely significant effects are assessed (and mitigation measures proposed) in Section 14.3.3.

14.3.2 Background

14.3.2.1 Broadcast Communications

Wind turbines, like all large structures, have the potential to interfere with broadcast signals, by acting as a physical barrier or causing a degree of scattering to microwave links. The most significant effect at a domestic level relates to a possible flicker effect caused by the moving rotor, affecting, for example, radio signals. The most significant potential effect occurs where the wind farm is directly in line with the transmitter radio path.

14.3.2.2 Domestic Receivers

Depending on local topography, a domestic receiver may receive broadcast signals from more than one location. The strength of the signals varies with distance from the transmitter, and the receiver's antenna is generally always directed towards the most local, and usually strongest, broadcasting station.

There are two types of potential electromagnetic interference to domestic receivers, depending on the location of the receiver in relation to a wind farm. 'Shadowed' houses are located directly behind a wind farm, relative to the location from where the signal is being received. In this case, the main signal passes through the wind farm and the rotating blades can create a degree of signal scattering. In the case of viewers located beside the wind farm (relative to the broadcast signal direction), the effects are likely to be due to periodic reflections from the blade, giving rise to a delayed signal.

In both cases, i.e., shadowed houses located behind the wind farm and those located to the side of it, the effects of electromagnetic interference may depend to some degree on the wind direction, since the plane of rotation of the rotor will affect both the line-of-sight blockage to viewers located behind the wind farm and the degree of reflection to receivers located to the side.

14.3.2.3 Other Signal Types

Wind turbines have the potential to affect other signal types used for communication and navigational systems, for example tower-to-tower microwave communication links, and airborne and ground radar systems. Interference with radar systems occurs when wind turbines are located close to an airport or directly in line with the instrument landing approach. These effects are generally easily dealt with by detailed micro-siting of turbines in order to avoid alignment with signal paths or by the use of repeater relay links out of line with the wind farm.

14.3.3 Likely Significant Effects and Associated Mitigation Measures

14.3.3.1 'Do-Nothing' Scenario

The Do-Nothing alternative to extending the life of the existing wind farm would be to decommission the wind farm once it's current planning permission expires in 2024. Should this occur, the impact would be **neutral** in the context of this EIAR.

14.3.3.2 Construction Phase

Since the Dunneill Wind Farm is currently operational, and since no changes to the wind farm are proposed, there is no construction phase associated with the proposed extension of life of the wind farm. There will therefore be no direct or indirect effects on telecommunications or aviation.

14.3.3.3 Operational Phase

14.3.3.3.1 *Telecommunications*

Pre-Mitigation Impact

The existing Dunneill Wind Farm has been operational for nearly 12 years. To date SSE are not aware of any complaints from telecommunications service providers regarding interference to service associated with the wind farm. In an email dated 16th May 2021 the Broadcasting Authority of Ireland (BAI) stated *"...we are not aware of any issues from existing wind farms into existing FM networks. Also, the existing wind farm is not located close to any existing or planned FM transmission sites"*.

Mitigation Measures

In the event of further scoping responses being received from the EIA consultees or from other telecommunication service providers, the comments of the consultees and any proposed mitigation measures will be considered in the continued operation of the wind farm, subject to a grant of planning permission.

Residual Impact

The continued operation of the Proposed Development will have no residual impact on the telecommunications signals of any other operator, as no changes to the existing wind farm are proposed.

Significance of Effects

There will be **no significant direct or indirect effect** on telecommunications from the proposed development.

14.3.3.3.2 *Aviation*

Pre-Mitigation Impact

To date no scoping response has been received from the Irish Aviation Authority (IAA). However, Dunneill Wind Farm has been operational for approximately 12 years and no aviation issues have arisen in that time. No changes to the existing wind farm infrastructure or turbine dimensions are proposed.

Mitigation Measures

The developer will coordinate with the IAA directly should a grant of planning permission be issued, to ensure that the development remains in compliance with all IAA requirements including lighting requirements. Any further details will be agreed with the Department of Defence, Air Corps and the IAA. The coordinates and elevations for the existing turbines has been supplied to the IAA, as is standard practice for wind farm developments.

Residual Impact

The Proposed Development will have no residual impact on aviation as all lighting and other requirements will continue to be met by the Applicant.

Significance of Effects

There will be **no significant direct or indirect effects** on aviation operations due to the proposed development.

14.3.3.4 Cumulative In-Combination Effects

The potential cumulative impacts and associated effects between the Proposed Development and the projects described in Section 2.7 of this EIAR, hereafter referred to as the other projects, have been considered in terms of aviation and telecommunications.

During the development of any large project that holds the potential to effect telecoms or aviation, the Developer is responsible for engaging with all relevant telecoms operators and aviation authorities to ensure that the proposals will not interfere with television or radio signals by acting as a physical barrier. In the event of any potential impact, the developer for each individual project is responsible for ensuring that the necessary mitigation measures are in place. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise.

The Dunneill Wind Farm has been operational for nearly 12 years and no changes to the existing wind farm are proposed. Therefore, no impacts on telecommunications and aviation are anticipated. There will be no significant cumulative effects in relation to telecommunications and aviation associated with the extended operational phase of the Dunneill Wind Farm in combination with other projects.

15. INTERACTION OF EFFECTS

15.1 Introduction

The preceding Chapters 5 to 14 of this Environmental Impact Assessment Report (EIAR) identify the potential significant environmental effects that may occur in terms of Population and Human Health, Biodiversity (Flora and Fauna) Ornithology (Birds), Land, Soils and Geology, Water (Hydrology and Hydrogeology), Air and Climate, Noise and Vibration, Cultural Heritage (Archaeological, Architectural and Cultural Heritage), Landscape and Visual, and Material Assets (Roads and Traffic, Telecommunications and Aviation) as a result of the Proposed Development as described in Chapter 4 of this EIAR. However, for any development with the potential for significant environmental effects there is also the potential for interaction between these potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or improve them, or have a neutral effect.

A matrix is presented in Table 15-1 below to identify potential interactions of impacts between the various aspects of the environment already assessed in this EIAR. The matrix highlights the potential for the occurrence of positive, neutral or negative effects during the operational phase (O) and the decommissioning phase (D). As the Proposed Development does not include any new construction works, related construction phase effects are not included. It is considered that the potential effects during the decommissioning phase will be similar to typical wind farm construction phase effects, but of a lesser magnitude, and these have been included in the interactions matrix below. The matrix is symmetric, with each environmental component addressed in the chapters of this EIAR being placed on both axes of a matrix, and therefore, each potential interaction is identified twice.

Table 15-1 Interaction Matrix: Potential for Interacting Impacts

EIAR Chapter Title	Phase	Population & Human Health	Biodiversity, Flora & Fauna	Ornithology, Birds	Land, Soils & Geology	Water	Air & Climate	Noise & Vibration	Landscape & Visual	Cultural Heritage	Material Assets
Population & Human Health	O										
	D										
Biodiversity, Flora & Fauna	O										
	D										
Ornithology, Birds	O										
	D										
Land, Soils & Geology	O										
	D										
Water	O										
	D										
Air & Climate	O										
	D										
Noise & Vibration	O										
	D										
Landscape & Visual	O										
	D										
Cultural Heritage	O										
	D										
Material Assets	O										
	D										

Notes: O = Operational Phase D = Decommissioning Phase
No Interacting Effect: Positive Effect:
Neutral Effect: Negative Effect:

The potential for interaction of impacts has been assessed, throughout this EIAR, as part of the Impact Assessment process. While the work on all parts of the EIAR was not carried out by MKO, the entire project and all the work of all sub-consultants was managed and coordinated by the company. This EIAR was edited and collated by MKO as an integrated report of findings from the impact assessment process, by all relevant experts, and impacts that potentially interact have been assessed in detail in the individual chapters of the EIAR above and summarised in Section 15.2 below.

Where any potential negative impacts have been identified during the assessment process, these impacts have been avoided or reduced by design and the proposed mitigation measures, as presented throughout the EIAR and highlighted in Section 15.2 below.

15.1.1 Statement of Authority

This section of the EIAR has been prepared by David Naughton and reviewed by Thomas Blackwell, both of MKO.

David is an Environmental Scientist with over five years of consultancy experience with MKO and has acted as project manager for numerous wind energy EIAR applications. David holds a BSc (Hons) in Environmental Science.

Thomas Blackwell is a Senior Environmentalist with MKO with over 15 years of progressive experience in environmental consulting. Thomas holds a BA (Hons) in Geography from Trinity College Dublin and a M.Sc. in Environmental Resource Management from University College Dublin. Prior to taking up his position with MKO in August 2019, Thomas worked as a Senior Environmental Scientist with HDR, Inc. in the United States and held previous posts with private consulting firms in both the USA and Ireland.

15.2 Impact Interactions

15.2.1 Population and Human Health

Population and Human Health, Land, Soils and Geology, and Air and Climate

The potential for excavation and movement of soils during the decommissioning phase of the Proposed Development may lead to generation of dust emissions which, consequently, have the potential to have a **temporary, imperceptible, negative impact** on local air quality and human health. Mitigation measures to reduce dust emissions generated during the decomissioning phase of the Proposed Development are presented in the Decomissioning Plan as outlined in Appendix 4-3 and Chapter 10: Air and Climate.

Population and Human Health, and Water

As described in Chapter 9: Water of this EIAR, the operational phase of the Proposed Development does not involve any alterations to the site drainage or otherwise and will not give rise to significant impacts to the water environment.

The future decommissioning phase of the Proposed Development, in 2039, has the potential to give rise to some limited water pollution as a result of likely on-site activities (earthworks, use of hydrocarbons for plant and machinery), and any water pollution could have a potential significant negative effect on the health of other users of that water within the same catchment. Mitigation measures are presented in Chapter 9 to minimise the potential of any such issues occurring.

Population and Human Health, Air and Climate, and Noise & Vibration

As identified in Chapter 5: Population and Human Health of this EIAR, the operational phase has the potential to create long-term, imperceptible residual impacts related to health and safety during the operational life of the Proposed Development. Mitigation measures to remove any potential health and safety impacts from the wind farm operation are provided in Chapter 5 of this report.

During the operational and decommissioning phases the Proposed Development has the potential to generate noise but as identified in Chapter 11: Noise, the potential effects on population and human health are not siginificant. Mitigation measures and best practices to be adopted concerning noise are presented in Chapter 11.

During the operational phase, the energy generated by the Proposed Development will offset energy and the associated emissions of greenhouse gases (GHGs) from electricity-generating stations dependent on fossil fuels, thereby having a positive effect on air quality and climate (i.e. slowing the rate of global warming). In doing so, the Proposed Development will have a **long-term slight positive impact** on human health by reducing the dependence on fossil fuels and harmful greenhouse gasses when compared to the 'do-nothing' scenario (i.e. decomissioning of wind farm in 2024).

Population and Human Health, and Landscape and Visual

The Proposed Development is an existing wind farm facility, first commissioned in 2010, and no significant changes to the wind turbines or other site infrastructure are proposed. The exisint Dunneill Wind Farm has been in operation for approximately 12 years and therefore forms part of the existing landscape setting. The Proposed Development will remain aligned with the future landscape and visual designations and policies guiding the development of Co. Sligo. The scale, siting and design of the turbines is considered appropriate, as the turbines do not detract from the scenic amenity views and are readily absorbed into the surrounding landscape. The landscape and visual impact assessment of the Proposed Development, included as Chapter 13 of this EIAR, concludes that, from 9 viewpoints assessed, the visual effect will be 'moderate' from two locations, and ranges from 'slight' to 'not significant' at the remaining locations. The operational phase will have a **long term, imperceptible, neutral** impact with regard to landscape. Therefore, it is considered that the overall visual impact of the Proposed Development will not be significant.

Population and Human Health, and Material Assets

Chapter 14: Material Assets of this EIAR discusses how the operational and decommissioning phases of the Proposed Development will impact traffic volumes. The operational phase will have **long term, imperceptible, neutral** impacts on traffic and transportation and will not give rise to any significant effects upon the local road network or road users. The decommissioning phase of the development will likely result in a residual impact to other road users that is **slight, temporary, and negative** in effect. Prior to any future decommissioning of the wind farm, a decommissioning plan, including material recycling / disposal and a traffic management plan will be prepared for agreement with the local authority.

15.2.2 Biodiversity

Biodiversity, and Land, Soils and Geology

No excavations, groundworks or other disturbance to land or soils is included as part of the operational phase of the Proposed Development. Therefore, no disturbance to flora or fauna related to land, soils or geology is likely during the wind farm's proposed continued operation.

The decommissioning phase of the Proposed Development may involve limited excavations and groundworks around the turbines, in order to return the site to beneficial use as agricultural lands. Reuse of local excavated soils and re-seeding with native plant species is proposed. Chapter 6: Biodiversity provides a full assessment of the likely effects and impacts upon habitats including designated sites, bats and other mammals and concludes that the Proposed Development is unlikely to give rise to significant effects on the Key Ecological Receptors (KERs).

Biodiversity and Water

Chapter 6 of this EIAR assessed the potential impacts of the operational phase upon aquatic ecology and concluded that the supporting habitat for Key Ecological Receptors (KERs) would have a high sensitivity to changes in water quality. Site activities during the operational phase of the Proposed Devleopment have a low potential to give rise to water pollution incidents, when the proposed measures to protect water quality are implimented, as outlined in Chapters 4, 6 and 9 of this EIAR. Potential impacts have therefore been assessed as not significant, and no consequential indirect effects, such as disturbance and deterioration of habitat quality on flora and fauna, that use that water within the same catchment are likely.

Biodiversity, and Air and Climate

During the operational phase, the Proposed Development will help offset carbon emissions from fossil fuel based electricity generation plants, which will help contribute to a slower increase in the rate of global warming and a reduction in air pollution. Consequently, this is likely, in combination with other renewable energy projects, to have a **long term, significant positive effect** on flora and fauna.

During the decommissioning phase of the Proposed Development, increased vehicular and dust emissions within and around the site have the potential to be a nuisance to flora and fauna, thereby having a **temporary, slight, negative effect**. The mitigation measures outlined in Chapter: 10 Air and Climate will ensure that the potential for negative effects is reduced or eliminated.

Biodiversity, and Noise and Vibration

No potential impacts upon biodiversity from noise and vibration arising during the operational phase of the Proposed Development were identified in Chapter 6 of the EIAR.

Site activity during the decommissioning phase could give rise to noise that could be a nuisance for fauna, thereby having a **temporary, slight, negative effect**. Best practice mitigation measures are included in Chapter 6 and Chapter 11 to minimise the potential negative effect of noise generated during the decommissioning phase on biodiversity.

Biodiversity, and Landscape & Visual

No significant impacts are likely upon vegetation within the development footprint and surrounding area during the operational phase of the existing wind farm. As the wind farm has been in operation since 2010 it is now considered to have become become part of the normal landscape of the wider area. No significant visual effects are likely during the operational phase.

The decommissioning phase proposes to replace hardstanding areas with soil and re-seed these locations resulting in a **long-term, localised and slight positive impact**.

15.2.3 Ornithology

Ornithology, and Water

The limited site maintenance activities that will take place during the operational phase, do not include any changes to the existing site drainage. With implementation of the mitigation measures outlined in Chapter 9 of this EIAR, no impacts to birds from the water environment are envisaged during the operational phase.

Site activities during the future decommissioning phase have the potential to give rise to some water pollution, and consequential indirect effects on birds and their prey species (such as disturbance and deterioration of habitat quality) that use waterbodies within the same catchment. Mitigation measures (as per Chapter 9) if implemented will ensure there are no significant effects on birds or their habitat. Further measures would also be included in a decommissioning plan to be agreed with the local authority in advance of works.

Ornithology, and Air and Climate

During the operational phase, the Proposed Development will help offset carbon emissions from fossil fuel based electricity generation plants, which will help contribute to a slower increase in the rate of global warming and, consequently, could in combination with other renewable energy projects, contribute to preventing the loss of bird species from Ireland as a result of climate change.

During the decommissioning phase of the Proposed Development, increased vehicular and dust emissions within and around the site have the potential to be a nuisance for birds, thereby having a **temporary, slight, negative effect**. The mitigation measures outlined in Chapter 10 of the EIAR will ensure that the potential for negative effects is reduced or eliminated.

Ornithology, and Noise and Vibration

Chapter 7: Ornithology concluded that as the operational parameters of the wind farm are not changing therefore the magnitude of change resulting from noise and visual disturbance causing displacement of birds by extending the operational phase is inexistent, and is therefore not significant.

Site activity during the future decommissioning of the Proposed Development could give rise to noise that could be a nuisance for birds that use the site, therefore, causing a **temporary, slight, negative effect**. Best practice mitigation measures are included in Chapter 7 and Chapter 11 to minimise the potential negative effect of noise generated during the decommissioning phase on ornithology.

15.2.4 Land, Soils and Geology

Land, Soils and Geology, and Water

The operational phase of the Proposed Development will not include any groundworks (e.g. excavations) or other activities likely to result in ground disturbance or pollution, which may give rise to impacts upon the water environment. Chapter 8 of the EIAR concluded that no significant effects to the subsurface environment will occur during the operational phase.

As identified in Chapter 8: Land Soils & Geology and Chapter 9: Water of this EIAR, groundworks including excavations and movement of spoil during the decommissioning phase has the potential to have a significant, negative effect on water quality through potentially silt-laden runoff from the proposed works areas. Mitigation measures to ensure there are no significant, negative effects on water quality are presented in Chapter 9.

Land, Soils and Geology, and Cultural Heritage

No disturbance to the subsurface (soils and geology) is proposed as part of the extended operational phase of the wind farm. Chapter 12: Cultural Heritage concluded that as no groundworks will take place during the operational phase, no direct effects on archaeology, architecture and cultural heritage will occur.

Potential groundworks including localised excavations and movement of spoil during the decommissioning phase of the Proposed Development has the potential to have a permanent, significant, negative effect on previously unrecorded sub-surface archaeological site and artefacts. The implementation of mitigation measures outlined in Chapter 12 will reduce the potential for negative effects on unrecorded sites and artefacts during excavations.

Land, Soils and Geology, and Landscape and Visual

There are no likely significant effects upon lands, soils and geology during the operational phase that could result in associated landscape and visual impacts.

Localised groundworks and excavations that may occur during the decommissioning phase are largely concerned with restoration of the site and therefore likely to have a positive impact on the local landscape. The visual effect of this change is expected to be **positive, long term, localised in nature and slight**.

15.2.5 Air and Climate

Air and Climate, and Material Assets

Chapter 14: Material Assets of the EIAR assesses the traffic effects of the Proposed Development during the operational phase and found that typically, no more than two trips per day to the site are made by car or light goods vehicle. As per Chapter 10: Air and Climate of the EIAR, there will be no significant direct or indirect effects to air quality associated with the continued operation of the wind farm.

During the decommissioning phase, the movement of construction vehicles (e.g. cranes and heavy plant) both within, and to and from the site, has the potential to give rise to dust and exhaust emissions. This is assessed further in Chapters 10 and 14 of this EIAR, and mitigation measures are presented to minimise any potential effects.

15.2.6 Landscape and Visual

Landscape and Visual, and Cultural Heritage

As described in Chapter 12: Cultural Heritage of this EIAR, the Proposed Development, as it is an extension of operation of an existing wind farm, will not change the landscape setting of recorded sites and monuments, either within the site bounds or in the wider area. It is considered that no direct effects would occur at the operational phase. It is concluded in Chapter 12 that no built heritage structures will be impacted either directly or indirectly by the Proposed Development, since nothing additional to the existing baseline environment is being proposed as part of the extended operation of the wind farm.

During the decommissioning phase a number of mitigation measures will likely be required such as buffer / exclusion zones and fencing, to ensure that large turbine / crane components do not encroach on existing historic sites present. A decommissioning plan will be agreed with the local authority at least three months prior to decommissioning of the Proposed Development. No significant landscape or visual effects are likely to occur should the wind turbines be removed.

15.3 Mitigation and Residual Impacts

Where any potential interactive negative impacts have been identified in the above, a full suite of appropriate mitigation measures has already been included in the relevant sections (Chapters 5-14) of the EIAR. The implementation of these mitigation measures will reduce or remove the potential for these effects. Information on potential residual impacts and the significance of effects, is also presented in each relevant chapter.

16. SCHEDULE OF MITIGATION

16.1 Introduction

All mitigation measures relating to the operational phase of the Proposed Development at Dunneill Wind Farm are set out in the relevant chapters of the EIAR (Environmental Impact Assessment Report) submitted as part of the planning permission application.

This section of the EIAR groups together all of the mitigation measures presented in the planning documentation. All mitigation measures which will be implemented during the operational and decommissioning phases of the project are outlined in Table 16-1. The mitigation measures can be grouped together according to their environmental field/topic under the following headings:

- Health and Safety
- Drainage and the Water Environment
- Subsoils and bedrock
- Biodiversity
- Residential Amenity (Including Shadow Flicker)
- Noise
- Air Quality/Dust
- Cultural Heritage

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation and provides a reporting template for site compliance audits.

16.2 EIAR Mitigation Measures

Table 16-1 Schedule of Mitigation, Dunneill Wind Farm

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Operational Phase		
MM1	EIAR Chapter 5	Regarding Health and Safety during the operational phase: o Mitigation measures that are currently in place will continue during the extended operation of the Proposed Development to ensure that the risks posed to staff, landowners and the general public remain negligible throughout the operational life of the wind farm. o An operational phase Health and Safety Plan is currently in place and will continue to fully address identified Health and Safety issues associated with the operation of the site. o During the operation of the wind farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the site's health and safety requirements. o During the operational phase there will be ongoing maintenance of the wind turbines and associated infrastructure. Access to the turbines is through a door at the base of the structure, which is locked at all times outside of maintenance visits.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
MM2	EIAR Chapter 5	Regarding Residential Amenity during the operational phase: o All mitigation as outlined under noise and vibration, dust, traffic, visual amenity and shadow flicker in the EIAR, will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Dunneill Wind Farm development. o In the event of shadow flicker exceeding guidance levels at a residential dwelling surrounding the wind farm mitigation options will be discussed with the affected homeowner, if required, including: - Installation of appropriate window blinds in the affected rooms of the residence; - Planting of screening vegetation; - Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation. These measures can include wind turbine control measures by way of SCADA control system to change a particular turbine's operating mode during certain conditions or times.		
MM3	EIAR Chapter 6	Regarding Bat Species Mitigation Measures during the operational phase: o As part of the continued operation of the wind farm an adaptive monitoring and potential mitigation strategy for years 1-3 of the extension duration will be incorporated. This is the most robust approach for the proposed development and is aligned with current best practice and legislation. The post consent monitoring would determine whether bat mortality beyond the NIEA significance threshold (more than 1 bat fatality		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		per turbine per year during carcass searches) is detected, thereby confirming a requirement for adaptive mitigation. o Best practice mitigation will include blade feathering as a standard across all turbines (i.e. 'feathering' of turbine blades when wind speeds are below the cut-in speed (4m/s). This measure has been shown to significantly reduce bat fatalities (by up to 50%) in some studies). o Post-consent monitoring would be undertaken in accordance with the minimum standards set out in Table 1 of the NIEA guidance and would include static detector surveys, walked survey transects and carcass searches. At the end of each year (i.e. years 1-3), the requirement for and efficacy of the any proposed adaptive mitigation programme (i.e. curtailment and/or buffering) will be reviewed, and any identified efficiencies incorporated into the mitigation programme. o Further details on mitigation and monitoring plan can be found in Section 6.2 of the Bat Report, which is listed as Appendix 6-1 of this EIAR.		
MM4	EIAR Chapter 5, 11	Regarding Noise Control during regular maintenance works during the operational phase: o Limiting the hours during which site activities likely to create noticeable levels of noise or vibration are permitted; o Establishing channels of communication between the Applicant or contractor, Local Authorities and residents; o Selection of plant with low inherent potential for generation of noise and/or vibration; o No plant or machinery will be permitted to cause a public nuisance due to noise; o The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		o All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of works; o Compressors 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; o Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use; and o 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. Regarding Noise Monitoring during the operational phase: o As part of the Proposed Development to extend the operation of Dunneill Wind Farm, it is proposed that the current noise monitoring, as part of the condition compliance (Pl. Ref. 03/619), would continue to be carried out on a 5-year basis (i.e., five noise monitoring campaigns proposed across the 15-year period including the survey years of 2024, 2029, 2034 & 2039). o Should it be necessary to assess a complaint from a location which does not have an associated representative baseline curve, noise monitoring may be carried out and directional filtering applied to assess both wind farm noise and background.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
MM5	EIAR Chapter 6, 8, 9	In order to limit impacts upon Soils and the Water Environment from potential leaks and spillages of hydrocarbons during routine maintenance works the following measures are proposed: o All plant and machinery to be serviced before being mobilised to site; o No plant maintenance completed on-site, any broken down plant removed from site to be fixed; o Refuelling completed in a controlled manner using drip trays at all times; o Mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas away from open water; o Only designated trained operators authorised to refuel plant on-site; o Procedures and contingency plans set up to deal with emergency accidents or spills; and, o Highest standards of site management maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during works.		
MM6	EIAR Chapter 10	Regarding Air Quality during the operational phase: o Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order, thereby minimising any emissions that arise.		
MM7	EIAR Chapter 2	In the event of further scoping responses being received from the EIA consultees, the comments of the consultees and any mitigation measures are considered		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		during operation of the Dunneill Wind Farm, subject to the outcome of the planning process.		
		Decommissioning Phase		
MX1	EIAR Chapter 4	In the event that the Proposed Development is decommissioned after the 15 years extension of life, a Decommissioning Plan will be prepared for agreement with the local authority. This will be a comprehensive plan updated in line with decommissioning methodologies that may exist at the time.		
MX2	EIAR Chapter 9	Regarding the Water Environment: o The key mitigation measure during the decommissioning phase is the avoidance of sensitive aquatic areas. The Dunneill River runs within close proximity of the western border of the site of the Proposed Development. A tributary of the Dunneill River, the Finandoo, bisects the development in an east-west direction. Because of this proximity to surface waters, mitigation measures were put in place in the original construction phase. No in-stream works will be required during the decommissioning phase of the existing wind farm. Best construction practices will be adhered to throughout the decommissioning phase of the development.		
MX3	EIAR Chapter 4, 8, 9, 10, 11	Regarding dust, noise and vibration during decommissioning of subsurface infrastructure: o It is proposed to leave turbine foundations in place underground and to cover them with earth and reseed as appropriate. On removal of turbines, the covering of the foundation will be completed using locally		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		sourced material (e.g. topsoil) where possible. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove large volumes of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. o Use of an appropriate native seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction is recommended.		
MX4	EIAR Chapter 6, 8, 9	In order to limit impacts upon Soils and the Water Environment from potential leaks and spillages of hydrocarbons during decommissioning works the following measures are proposed: o All plant and machinery to be serviced before being mobilised to site and regularly inspected for leaks and fitness of purpose during use. o No plant maintenance completed on-site, any broken down plant removed from site to be fixed. o Fuel volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately. o Refuelling completed in a controlled manner using drip trays at all times. o Mobile bowsers, tanks and drums stored in secure, impermeable bunded storage areas away from open water. o Only designated trained operators authorised to refuel plant on-site. o Procedures and contingency plans set up to deal with emergency accidents or spills. o Highest standards of site management maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during works.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		o An emergency plan for the decommissioning phase to deal with accidental spillages will be developed. Spill kits will be available to deal with and accidental spillage within and outside the refuelling area. o A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the decommissioning phase. o If earthworks are required during the decommissioning phase, silt fences will be placed downgradient of any such works. Fences will be embedded into the local soils to ensure all site water (should any arise) is captured and filtered.		
MX5	EIAR Section 10	Regarding Air Quality during the decommissioning phase: o Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order, thereby minimising any emissions that arise.		
MX6	EIAR Chapter 11	Regarding Noise and Vibration control during the decommissioning phase: Various mitigation strategies may be employed to reduce construction noise and vibration impacts, including the following: o Limiting the hours during which site activities likely to create noticeable levels of noise or vibration are permitted; o Establishing channels of communication between the Applicant or contractor, Local Authorities and residents;		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		o Selection of plant with low inherent potential for generation of noise and/or vibration; o No plant or machinery will be permitted to cause a public nuisance due to noise; o The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. o All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of works; o Compressors 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; o Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use; and o 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.		
MX7	EIAR Chapter 11	Regarding Site Traffic related impacts during the decommissioning phase: o A Traffic Management Plan will be developed to minimise impacts to the local road network and submitted as part of the Decommissioning Plan, for agreement with the local authority.		
MX8	EIAR Chapter 12	Regarding Cultural Heritage during the decommissioning phase:		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		o Given the presence of archaeological monuments within the EIAR site boundary, the decommissioning phase could potentially have a number of direct negative impacts on the known cultural heritage. A suite of mitigation measures would be required to include full time presence of an archaeologist during decommissioning works to ensure that no significant or adverse impacts take place to the monuments and cultural heritage features located therein. o Furthermore, buffer / exclusion zones and fencing may be required to ensure that large turbine / crane components do not encroach on the monuments' extent.		

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