Energy for generations

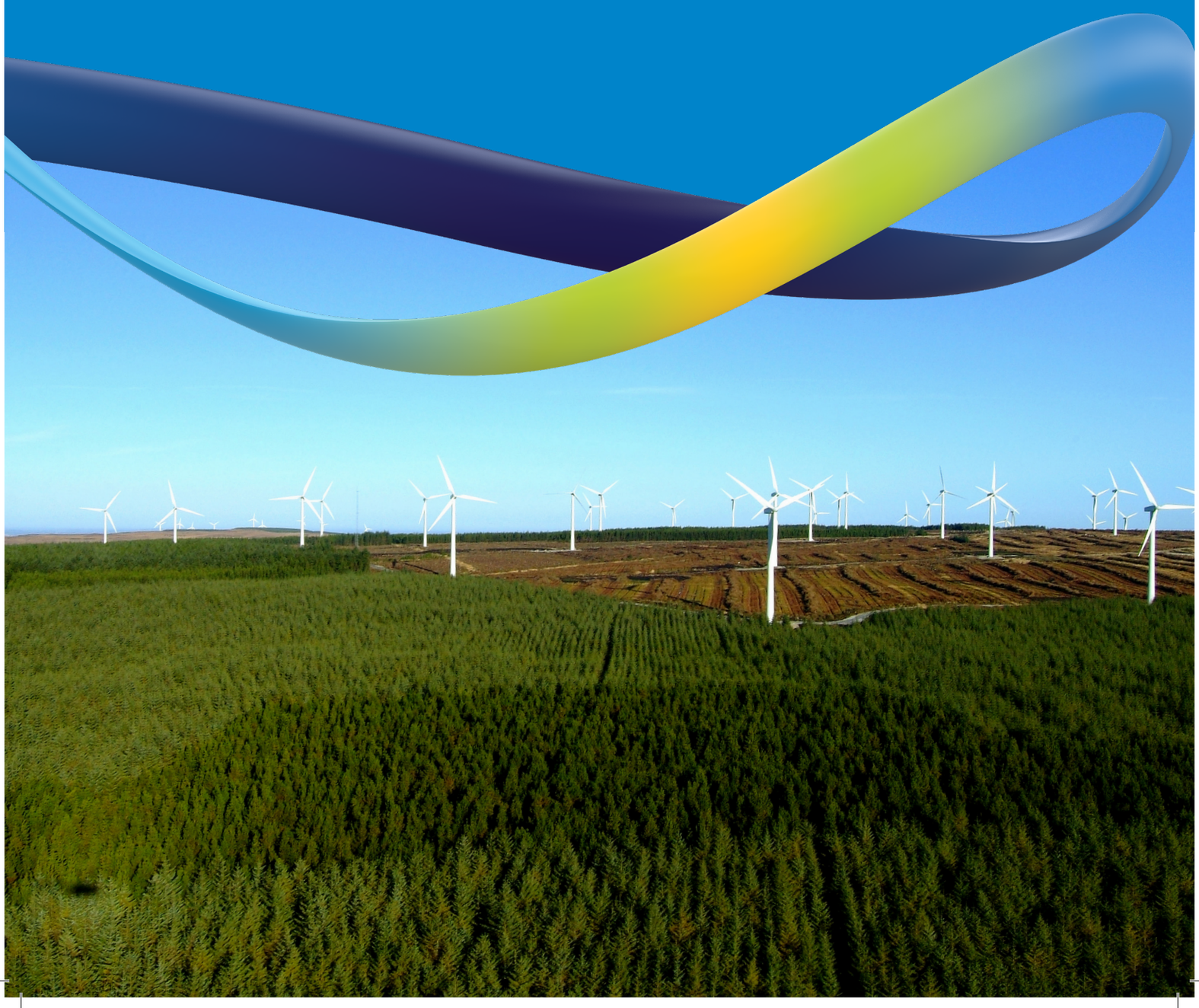
DERRYBRIEN WIND FARM PROJECT

Gort Windfarms Ltd.

Substitute Consent Application

Volume 2 Environmental Documents

Section 8 rEIAR Non Technical Summary



Energy for generations

Derrybrien Wind Farm Project

Gort Windfarms Ltd.

Remedial Environmental Impact Assessment Report
Non-Technical Summary (NTS)

Document No.: QS-000280-01-R460-001-000

Date: August 2020

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1 Introduction

1.1 General

This is a Non-Technical Summary (NTS) of the remedial Environmental Impact Assessment Report (rEIAR) on the entire Derrybrien Wind Farm Project located in County Galway.

It forms part of an application for Substitute Consent compiled for submission to An Bord Pleanála ('The Board', ABP).

1.2 The Development

The Derrybrien Wind Farm Project consists of an existing 70 No. turbine wind farm and associated on-site development including a substation ('Derrybrien Substation'); a grid connection consisting of a c.7.8km overhead electricity transmission line connecting to the national grid via a 110kV substation (herein referred to as 'Agannygal substation'); and all other development works associated with their construction including works carried out in response to a peat slide event that occurred during construction.

All of these elements are fully developed and operational.

1.3 The Site

The development site comprises a 514 Ha site in the townlands of Coppanagh, Slieveanore, Loughatorick North, Boleyneendorrish, Kilbeg, Toormacnevin, Funshadaun, Derrybrien North, Derrybrien South, Bohaboy, Derrybrien West, Derrybrien East, Derreennamucka, in County Galway.

It is located in the northern part of the Slieve Aughty Mountains approximately 11km due south of Loughrea, 13km northeast of Gort and 24km west of Portumna, see **Figure 1-1: Site Location of Derrybrien Wind Farm Project**.

The project site is located in a rural area, characterised by extensive commercial forestry and low densities of development. The nearest property to the wind farm site – a derelict house, is approximately 1.3km from the nearest wind turbine. The nearest cluster of houses to the site is in the vicinity of the village of Derrybrien approximately 2km to the south of the site. The Slieve Aughty Mountains have some of the largest concentrations of coniferous forest in the country having been planted, principally, in the 1960s and 1970s. The western part of the wind farm was mainly commercial forest plantation prior to development taking place. Traditional peat harvesting (turbary) is carried out in the eastern part of the wind farm site and in the wider area where turf cutting still takes place. Drained turbary lands occupy circa 67ha of land within the wind farm site. There are also circa 15ha of turbary lands immediately outside the site to the east.

Derrybrien Wind Farm is located within the designated Slieve Aughty Mountains Special Protection Area SPA (Site Code 004168) designated for the presence of the bird species Hen Harrier and Merlin.

1.4 The Application

The application for substitute consent for the development is being made by Gort Windfarms Limited which is a wholly owned subsidiary of the Electricity Supply Board (ESB).

Planning permission for the Project was originally granted to a third party between 1998 and 2003. In 2003 the project was acquired by Gort Windfarms Ltd. At this time construction had not begun.

Construction of the Project commenced in June 2003. A large peat slide occurred during construction in October 2003, originating on the southern section of the wind farm site. Construction works were halted immediately following this peat slide. Emergency works were carried out on the site, and in the local area to slow and stop the movement of peat, soil and debris and to minimise effects on watercourses, roads and lands. In the following period, works undertaken included the creation of 'peat repositories' for the storage of peat. Once engineering experts considered that it was appropriate to do so, construction work on the wind farm resumed and works were completed in 2006.

The wind farm has been in continuous operation since that time. It is expected it will operate until circa 2040, at which time it will be decommissioned.

In July 2008, the Court of Justice of the European Union (CJEU) delivered a judgment against the Irish State (Case C-215/06) finding fault in how the State had implemented the Environmental Impact Assessment (EIA) Directive – the means by which the environmental impacts of certain proposed projects are assessed. That judgement referred to Derrybrien Wind Farm. In November 2019, a further CJEU judgement found the State had not complied with the 2008 finding and required the State to take appropriate measures to ensure that projects undergo full environmental impact assessment.

Arising from these judgements, in June 2020 Gort Windfarms Limited – the developer, owner and operator of Derrybrien Wind Farm, was served a Notice by Galway County Council, under Section 177B of the Planning and Development Act ('The Act). The Notice directed it to apply under Section 177E of the Act, to An Bord Pleanála ('The Board', ABP) for Substitute Consent within a 12-week period. The Notice set out that the application should relate to Derrybrien Wind Farm and ancillary development including the development of a grid connection. The Notice stated that the application should be accompanied by an rEIAR and – if appropriate, a remedial Natura Impact Statement (rNIS).

The rEIAR - and all of the enclosed documents, have then been compiled to accompany an application for Substitute Consent.

The application for Substitute Consent seeks consent for all of the completed works and the continued operation of all elements to the end of the wind farm's operational life, around 2040.

1.5 The Assessment Process

1.5.1 Environmental Impact Assessment Legislation

To enable Environmental Impact Assessment (EIA) to be undertaken by the Competent Authority, an Environmental Impact Assessment Report (EIAR) has been prepared in accordance with the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018), which were signed by Minister Murphy on 26 July 2018. These Regulations transpose the requirements of Directive 2014/52/EU, amending previous Directive 2011/52/EU, on the assessment of the effects of certain public and private projects on the environment (the EIA Directive) into planning law.

Given the retrospective nature of this assessment – which relates to a completed development, this assessment is described as a 'remedial' assessment – and the accompanying EIAR and NIS as remedial EIAR and remedial NIS. As such the documents compare historical conditions of the site prior to site activity taking place with its post-activity and current condition. The Report documents any impacts the development may have had, or may have, on the surrounding environment during the construction, operational and decommissioning phases. Any mitigation measures that were put in place to ensure that the environment was protected are also discussed, and further mitigation measures are identified where required.

The rEIAR also assesses the cumulative effects associated with other developments and activities that have taken place in that period.

1.5.2 Appropriate Assessment

Under the EU Habitats Directive (Directive 92/43/EEC), the requirement for Appropriate Assessment (AA) has been considered. The assessment comprised both a Screening for AA which considered whether the Project, either alone, or in combination with other plans and projects, is likely to have significant effects on designated ecological sites – known as the European sites. This assessment identified the need for a remedial Natura Impact Statement (rNIS) which presents the information required by the competent authority to undertake an Appropriate Assessment. The purpose of the AA is to assess the implications of the Project, either alone or in-combination with other projects or plans, on the integrity of European sites in view of the site's conservation objectives.

The rNIS concludes that the Project with the implementation of the prescribed mitigation measures will not adversely affect the integrity of any European site.

1.5.3 Scope of the Assessments

The entirety of the Derrybrien Wind Farm Project and related works has been assessed in the rEIAR and the remedial Natura Impact Statement (rNIS), specifically:

1. Derrybrien Wind Farm and all associated works
2. Grid connection comprising Derrybrien-Agannygal 110kV Overhead line and Agannygal Substation connecting to the Ennis-Shannonbridge 110kV line and all associated works
3. Works undertaken in response to the peat slide which occurred during construction and all ancillary works.

The assessment covers all stages of the development – construction, operation and decommissioning. These elements are collectively referred to as 'the Project'.

The rEIAR meets the requirements of the EIA Directive. Because it is an assessment that compares the historical conditions of the site before planning permission was received and construction took place subsequently (c. 1998) with its current condition (2020) and expected final condition (post decommissioning in 2040) it does differ from a standard assessment. For example, the Report must identify significant environmental impacts which have already occurred together with ongoing (or continued) impacts as well as future likely impacts as would normally be required. The Report then must set out details of any appropriate mitigation in terms of remedial measures that have been carried out – or are proposed to be carried out, to address any significant adverse effects on the environment; and when those measures will be taken.

Information to support the assessment was collated from contemporaneous records dating from the various construction and operation stages. Where information was not available, or difficulties were encountered, these are recorded in the Report (as "Difficulties Encountered"). However, the information gaps identified in the rEIAR are not considered to be such as to affect the robust assessment of the environmental impacts of the Project.

1.5.4 Methodology for Environmental Assessment

The rEIAR has been prepared in-line with relevant guidance – namely:

- the Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, August 2017),
- the Draft Advice Notes for Preparing Environmental Impact Statements (EPA, September 2015), and
- the current Wind Energy Development Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government, 2006).

Where relevant, regard has been given to the Draft Revised Wind Energy Guidelines issued in December 2019. (Department of Housing, Planning and Local Government). The Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment (August 2018) published by the Department of Housing, Planning and Local Government were also considered.

The rEIAR project team comprises a multidisciplinary team of experts with extensive experience in the assessment of similar developments and in their relevant area of

expertise. Each chapter of this rEIAR has been prepared by a competent expert in the subject matter. The chapters of this rEIAR are as follows:

1. Introduction
2. Description of Development
3. Alternatives
4. Population and Human Health
5. Noise
6. Shadow Flicker
7. Biodiversity – Terrestrial Ecology
8. Aquatic Ecology and Water Quality
9. Landscape and Visual
10. Soils, Geology and Land
11. Hydrology and Hydrogeology
12. Air and Climate
13. Material Assets
14. Roads and Traffic
15. Cultural Heritage
16. Major Accidents and Disasters
17. Interaction of Impacts.
18. Remedial Measures

An rNIS has also been prepared in line with the requirements of the Habitats Directive.

Appropriate methodologies have been used to assess the effects relating to each of the environmental topics that have been investigated as part of the rEIAR. These methodologies are based on recognised good practice and guidelines specific to each subject area, details of which are provided within each individual technical section.

The impact of the development is considered against environmental conditions that existed before the development occurred – the ‘environmental baseline, 1998. This date was chosen because it is the date when the environmental impact assessment should originally have been carried out.

The Report sets out the significance of any identified impacts and effects. It also identifies any measures that have been taken – or are proposed, to avoid, reduce, remedy or offset the impacts of any significant adverse effects on the environment (these are called ‘mitigation measures’) and any measures that have been taken – or are proposed, to remedy any such effects (these are called ‘remedial measures’).

1.5.5 Consultation

Gort Wind Farms Limited has engaged with the general public in relation to the Derrybrien Wind Farm Project throughout the development and operation of the Project.

In preparing this application, the Applicant consulted with Galway County Council. Technical information was sourced from the Environmental Protection Agency (EPA), Inland Fisheries Ireland (IFI) (Shannon Region) and Coillte. Specific information was also provided by the National Parks and Wildlife Service (NPWS) relating to designated area.

In advance of the application being lodged, a 'plain English' information sheet was distributed in the local area (about 10km radius from the Wind Farm) advising people of the Substitute Consent process and providing contact details for an independent Community Liaison Officer and a dedicated project website (www.Derrybrienwindfarm.ie). Similar notices were issued to a range of consultees – ranging from State Agencies and Government Departments to the NGO Sector.

To ensure the public were aware of the application, newspaper notices were published in both a Regional and National newspaper and some 17 site notices were erected in the area. Notices clearly advised members of the public that the application documents could be viewed both in person at the offices of Galway County Council or An Bord Pleanála, and also online via the Department of Housing, Planning and Local Government EIA Portal and the dedicated project website.

N

Derrybrien Wind Farm Site

Derrybrien Substation

Derrybrien - Agannygal 110kV Overhead Line

Agannygal Substation

Inset Map

Galway

Derrybrien Wind Farm Site

Clarinbridge

Craughwell

Loughrea

Gort

Derrybrien

Galway

Portumna

Clare

Legend

- Derrybrien Substation
- Agannygal Substation
- Derrybrien Wind Farm Site
- Derrybrien - Agannygal 110kV Overhead Line
- County Boundaries

0 2.5 5 7.5 10 km

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ESB International is a trading name of ESBI Engineering & Facility Management Ltd.
Registered Office: as above
Registered in Ireland No. 155249

CLIENT: Gort Windfarms Ltd

PRODUCTION UNIT: Civil & Environmental Engineering

PROJECT: Derrybrien Wind Farm Project

DRAWING TITLE: Figure 1.1 - Site Location of Derrybrien Wind Farm Project

CONTRACT

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E.O'Shea	E.O'Shea	P.Kavanagh	J.McLoughlin	06/08/2020

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2 Description of the Project

There are three main elements to this Project as follows:

- Derrybrien Wind Farm,
- the grid connection,
- works undertaken in response to the peat slide which occurred during the construction of the Wind Farm.

The project elements are identified on **Figure 2-1: Project Location** and the project works and townland locations are shown on **Figure 2-2: Project Works and Townlands.**

2.1 Derrybrien Wind Farm

Derrybrien Wind Farm comprises 70 No. (Vestas V52-850kW) wind turbines. The postal address is Derrybrien North, Kylebrack, Loughrea, County Galway, Eircode H62 PE08.

The turbines are up to 75m tall with a hub height of up to 49m and a rotor diameter of 52m. The wind farm has a 'theoretical output' of 59.5MW – i.e. if optimal conditions always prevailed it could generate this amount of electricity. Typically, the site generates about 25% of that.

There are other features on the site typical of a wind farm, including:

- Crane hardstands – these are located adjacent to each wind turbine and provide a solid platform for cranes used during routine maintenance activities and - ultimately., decommissioning
- 2 No. Anemometer masts – 49m high lattice masts for the collection of wind speed data,
- Derrybrien Substation – a 20kv/110kV substation consisting of a fenced compound containing outdoor electrical equipment and a control building,
- Access roads into and around the site. Access into the wind farm is from a pre-existing Coillte road that links with the Black Road, which connects with the R353 Regional Road. Within the site there is a network of roads for routine operation and maintenance,
- Borrow pits / quarries –developed to provide material for the construction of access tracks and hard standing areas,
- Peat excavation and storage areas ('Peat repositories') – areas where peat removed to allow turbine construction was stored, many of which have naturally revegetated,
- On-site storage containers for the storage of spare parts
- Underground cables – which allow the electricity generated at each turbine to be fed back to electrical transformers at Derrybrien Station from where it is exported to the national grid;

- Works areas including the former construction compound
- Minor services such as drains, signs.

To enable the development some 220 hectares of commercial forestry was felled, with an additional 47 hectares felled during operations (2016-2018). Improvements to local roads were carried out to facilitate construction works and large loads.

The wind farm was constructed in the period mid-2003 to early-2006. It was commissioned and began commercial operations in March 2006. It is operated remotely, though it is attended on a regular basis by a very small operations and maintenance team. Typical routine inspection and maintenance works including repair works, cutting back of tree growth, repair of drains etc. are carried out as necessary.

The wind farm will operate until c. 2040. Then it will be decommissioned with the removal of the above ground elements of the wind farm, the substation and the substation foundation. It is anticipated that the site will then likely be allowed to naturally revegetate.

2.2 The Grid Connection

The grid connection allows the electricity generated on the wind farm to be exported to the national grid. It comprises an overhead line (OHL) between Derrybrien substation (located on the windfarm site) and Agannygal Substation – the Derrybrien–Agannygal OHL; and Agannygal Substation which is connected to the pre-existing Ennis-Agannygal-Shannonbridge 110kV Line.

The OHL route is c.7.8km long. It is located approximately 10km south of Loughrea and traverses the townlands of Loughatorick North, Derrybrien East, Derreennamucka and Derrybrien North. Agannygal Substation is located within the townland of Loughatorick North. It consists of an overhead conductor supported on double pole sets (wood) and mast structures (steel). Within Agannygal Substation the line is then connected into the Ennis-Shannonbridge Line by means of overhead conductor supported on two masts. Overall, the entire windfarm grid connection consists of 45 structures, comprising: 34 No. double wood pole sets; 4 No. end masts (1 located at Derrybrien Substation, 3 at Agannygal Substation), 6 No. angle masts and 1 intermediate mast.

Agannygal Substation comprises a fenced stoned compound (approximately 63m x 47.5m) containing outdoor electrical equipment and a Control Building.

To enable the construction of the grid connection, circa 34.7Ha of commercial forestry was felled. In addition, to provide adequate clearance between the pre-existing Moneypoint – Oldstreet 400kV OHL and the Derrybrien - Agannygal OHL works were required to lower the ground level (by c.3.5m).Access to construct the OHL was facilitated by existing forestry roads and some newly constructed accessways – both permanent and temporary.

2.3 Works undertaken in response to the peat slide

On the 16th October 2003, during the construction of the wind farm a peat slide occurred. The peat slide started within the wind farm site as excavation works were underway for the foundations for turbine T68.

This event involved the disturbance and movement of peat and forest debris. The site of the peat slide extended approximately 1.65km downslope from turbine T68 and displaced peat and forestry over an area of approximately 25ha (this is called 'the peat slide' or 'the peat slide area'). The majority of the peat slide area was in Coillte coniferous forests outside and to the south of the wind farm site.

From the peat slide area, material moved down a stream valley and into an area of open flatter ground where it slowed and was deposited upstream of the Black Road Bridge approximately 1.0 km downslope from the slide area. This is called the 'primary run-out zone for the slide'. Some peat was transported further down the Owendalulleegh River and deposited along the riverbanks. These areas are identified on **Figure 2-3: Location of and Approximate Extent of Peat Slide and Main Peat Slide Run Out Area.**

On the 30th October 2003, after heavy rainfall, the peat debris started to move again with its effect extending beyond the Flaggy Bridge.

It is estimated that there was about 450,000 cubic metres of peat in the peat slide area, and that 50 to 70% of the failed debris left the area with the balance remaining in situ. The peat slide occurred in the Owendalulleegh River Catchment in an upper tributary stream. As debris from the peat slide moved downslope it was deposited along existing banks and in areas mainly above Black Road Bridge. A significant amount of the debris remained within the source area (estimated at 200,000 cubic metres). Surveys indicated no debris was present on the riverbanks after about 3.1 km downstream of the confluence with the Owendalulleagh River. This peat debris would have degraded over time and the extent of the peat debris would not be readily discernible. Some debris material was carried down the Owendallulleegh to Lough Cutra settling out in the 4km^2 lake area of Lough Cutra. The finer buoyant material is likely to have over time been carried through Lough Cutra in the Beagh/Gort River and eventually discharged into Galway Bay at Kinvarra.

Investigations of the area downslope of Black Road Bridge in 2019, showed little or no visual evidence of any remaining peat debris deposited along the banks of the streams/rivers. Over time, any material deposited along the riverbanks has been eroded/degraded.

At the time of the peat slide, response works were carried out to minimise the impact of the event. To stop the movement of material, a total of eight barrages (dam like structures) were constructed along and downslope of the route of the slide between the wind farm and downstream of Flaggy Bridge. Three of these were temporary earthen barrages; one a temporary rockfill barrage and there were four boulder barrages). Of these, four barrages (nos. 1, 2, 3 and 4) remain today, of which two are proposed to be removed as part of this application.

Peat and soil from the peat slide which had accumulated on nearby lands, and material excavated for the construction of barrages and that had accumulated behind the barrages, was placed in three peat repository areas.

Short sections of road within the wind farm site were re-constructed at two locations.

There were significant investigations to identify the causes of the peat slide event. These findings were used to identify measures to reduce the likelihood of a reoccurrence when construction works resumed to complete the wind farm.

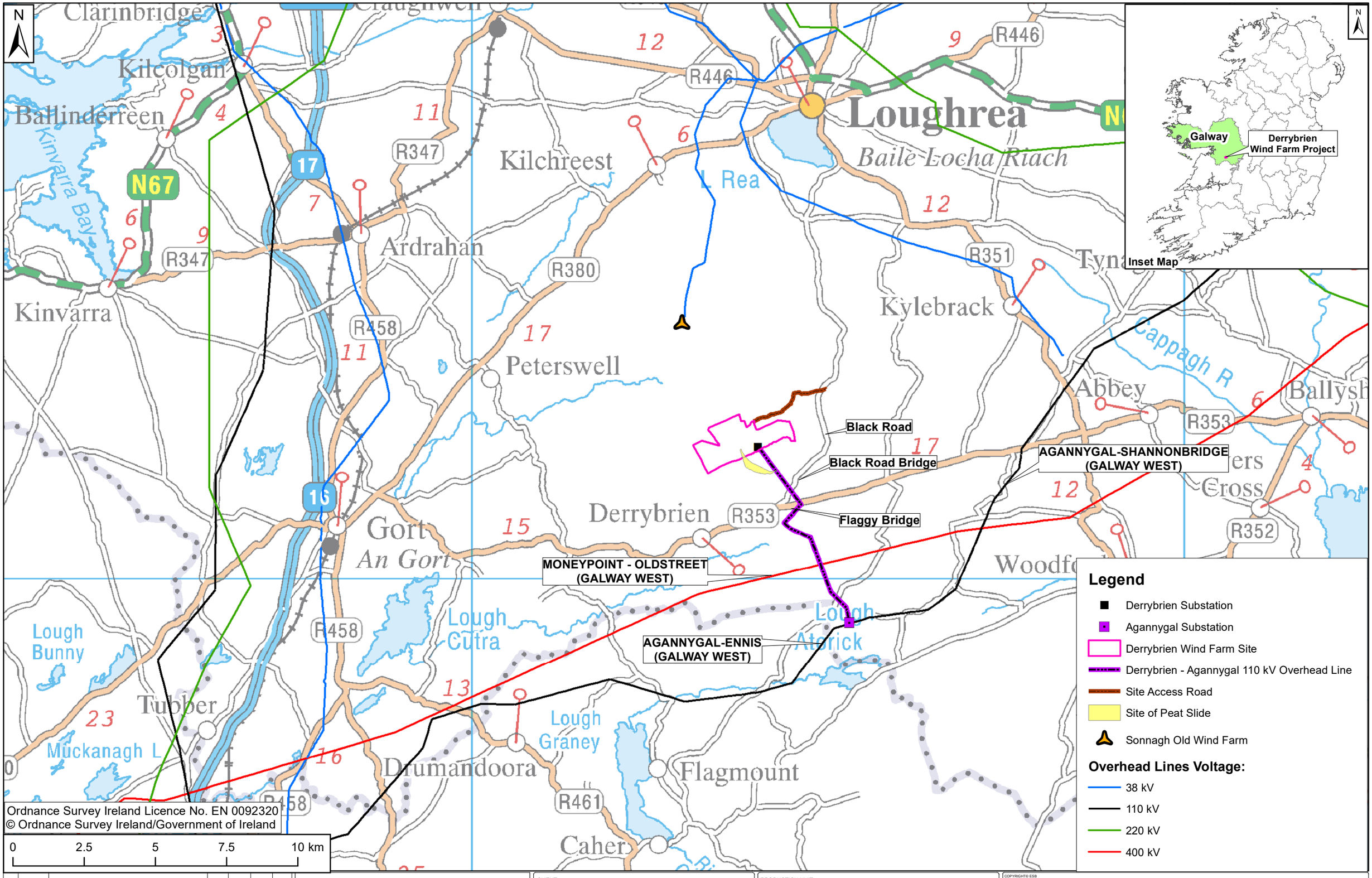
The features associated with the peat slide and the response works are mainly located within the townlands of Derrybrien North. Some minor works are located in the townland of Derrybrien East.

2.4 Related Projects and the Assessment of Cumulative Effects

There are a number of projects that are related to the wind farm development. These include tree felling by Coillte and associated replanting on lands in Counties Tipperary and Roscommon. The overall or combined effect of the Derrybrien Wind Farm Project together with these projects has been considered by way of 'cumulative impact assessment').

Similarly, a number of other existing and / or approved projects have been considered to ensure full impact assessment is undertaken. These include ongoing turbary peat harvesting within and adjacent to the wind farm site, peat extraction in the general area, other wind farm developments in the Slieve Aughty Mountains (Sonnagh Old wind farm and the uncompleted Keelderry wind farm), the Tynagh thermal electricity generating station, Forestry activities which are ongoing, major overhead line electrical infrastructure maintenance and upgrade activities, the Gort Regional water supply, flood relief schemes, the M18 Motorway project and a number of quarries in the general area.

The potential for impact with these related and cumulative projects has been assessed for each topic in their relevant chapters



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CLIENT: Gort Windfarms Ltd

PROJECT: Derrybrien Wind Farm Project

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N

FUNSHADAUN
COPPANAGH
DRUMMIN
BOLEYBEG
CULLENAGH
DRUMKEARY WEST
ALLYKEOLAUN
KNOCKAUNDARRAGH
KILBEG
TOORMACNEVIN
BOHABOY
REYNABRONE
DRUM
KYLENAGAPPA
BOLEYNEENDORRISH
KNOCKMOYLE WEST
KNOCKMOYLE EAST
DERRYBRIEN NORTH
KNOCKDRUMMORE
BALLYCORBAN
MARBLEHILL
GORTEENAYANKA
LOUGHPARK
GORTNAKILLA
ROSSEESHAL
SILVERSTREAM
KNOCKOURA
CLOGHVOLEY
CAPPAGHCON WEST
BALLINLOUGH
TULLA
KEELDERRY
ACRES
SLATEFIELD
DERRYBRIEN WEST
LAGGOO
Derrybrien
REYRAWER
MOYGLASS
BUNNAGLASS
DERREENNAMUCKA
DERRYBRIEN EAST
DERRYBRIEN SOUTH
DERRYWEE EAST
LOUGHATORICK NORTH
INCHAMORE
DERRYWEE WEST
TOORLEITRA
SCALP
LOUGHATORICK SOUTH
GORTAVEHA
SLIEVEANORE
LOUGHATORICK SOUTH
POLLAGOONA MOUNTAIN
R353

Inset Map
Galway
Derrybrien Wind Farm Project

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0 1 2 3 4 km

Legend

- Townland Boundaries
- Overhead lines

Location of Wind Farm and Ancillary Works

- Derrybrien Wind Farm Site
- Derrybrien Wind Farm Site Entrance
- Derrybrien Substation
- Access Road to Wind Farm Site
- Construction Compound (Hardstands)
- Upgrade works to section of Black Road
- Coillte track (turbaby road) upgraded
- Bridge upgrade

Location of Grid Connection and Ancillary Works

- Derrybrien - Agannygal 110kV Overhead Line
- Agannygal Substation
- Upgrade works to Access Road to Agannygal Substation
- Connection works to Ennis-Shannonbridge 110kV OHL span

Location of works associated with peat slide

- Site of Peat Slide
- Barrages
- Pre-existing Coillte Track
- New Access Track Constructed
- Borrow Pit / Quarry Adjacent to Barrage 1
- Bridge Repairs (Private)
- Bridge Repairs (Public)
- Stepping Stones
- Crooked Bridge

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Engineering and Major Projects is a division of ESB.

CLIENT: **Gort Windfarms Ltd**

PRODUCTION UNIT: **Civil & Environmental Engineering**

PROJECT: **Derrybrien Wind Farm Project**

DRAWING TITLE: **Figure 2.2 - Project Works and Townlands**

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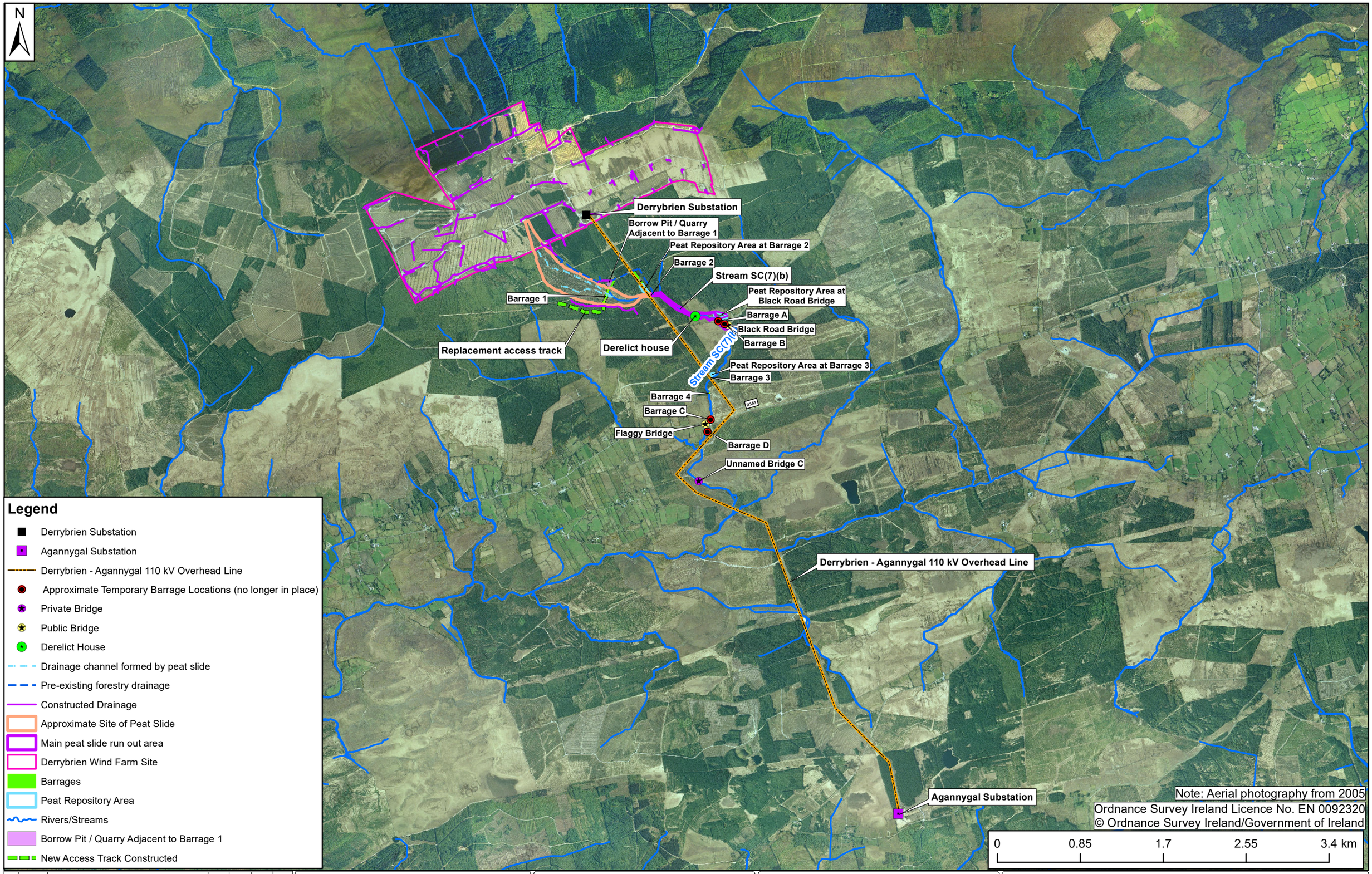

Legend

- Derrybrien Substation
- Agannygal Substation
- Derrybrien - Agannygal 110 kV Overhead Line
- Approximate Temporary Barrage Locations (no longer in place)
- Private Bridge
- Public Bridge
- Derelict House
- Drainage channel formed by peat slide
- Pre-existing forestry drainage
- Constructed Drainage
- Approximate Site of Peat Slide
- Main peat slide run out area
- Derrybrien Wind Farm Site
- Barrages
- Peat Repository Area
- Rivers/Streams
- Borrow Pit / Quarry Adjacent to Barrage 1
- New Access Track Constructed

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Energy for generations

CLIENT: Gort Windfarms Ltd

PROJECT: Derrybrien Wind Farm Project

CONTRACT

PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE:

Figure 2.3 - Location of and Approximate Extent of Peat Slide and Main Peat Slide Run Out Area

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E.O'Shea	E.O'Shea	P.Kavanagh	J.McLoughlin	05/08/2020

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3 Alternatives Considered

As part of the EIA process it was necessary to carry out a robust environmental assessment of all aspect of the Project including the consideration of alternatives.

Because the development is complete, this assessment focussed on the future potential options for the site. These were evaluated against the objectives of the project and how these could best be met considering the potential environmental impacts associated with each alternative. The project objectives are:

- **Objective 1:** To continue to operate the Derrybrien wind farm project to circa 2040 contributing to renewable electricity input to the national grid.
- **Objective 2:** To contribute to and continue to meet the EU and Ireland's stated policy and legally binding targets with respect to Renewable Energy Generation and displacement of fossil fuel energy production.
- **Objective 3:** To contribute to and continue to meet the renewable wind energy targets set in the County Galway Wind Energy Strategy (WES) which was originally developed in 2011 to meet a target of 500 MW to be installed in Co. Galway by 2017.

A range of alternatives to the proposed project were considered and include:

- 'do nothing' scenario – whereby Substitute Consent would be sought for all works completed to date followed by an immediate end to electricity generation and decommissioning of the entire development in 2020 / 2021;
- 'continued operation and later decommissioning' – whereby Substitute Consent would be sought to keep the development as it is and to operate it until the end of its operational life (c.2040) at which time it would be decommissioned;
- Alternative renewable energy projects – these being stand-alone projects such as a repowered wind farm (typically comprising a smaller number of taller turbines), a solar farm, or energy storage (battery or synchronous condenser technologies) which utilise some of the existing infrastructure – such as the grid connection, or co-location of a number of those technologies together – most likely being a re-powered wind farm with solar and or energy storage;
- An alternative land use – e.g. the re-establishment of commercial forestry; or
- Alternative decommissioning options – which mainly differ in terms of whether below ground structures are removed or left in situ after decommissioning.

The main alternatives are considered in detail. The assessment concludes that the 'Continued Operation and later decommissioning' option – the option being proposed at this time, is the most preferable alternative overall except in relation to shadow flicker, air and climate. In reality, the impact associated with shadow flicker is imperceptible for this option anyway, but it is being compared to alternatives where no shadow flicker would be possible. On air and climate, the assessment did not identify any significant negative impacts, but the option simply scores less than a larger renewable energy generator - namely repowering and co-location with repowering.

4 Assessment of Impacts

The following summaries the impacts of the development under each of the environmental headings. In all cases the assessment covers the baseline period prior to project construction (1998), the construction period (2003 to 2006) and the project operation through to decommissioning (likely 2040). It sets out impacts which have occurred (construction, peat slide and operation to date), which are occurring at the present time and the impacts which are likely to occur to the end of the project (circa 2040).

Each assessment includes a summary of 'cumulative impacts' – that is the overall impact of the Project together with other projects in the general area, which were either constructed or which were in operation at the same time.

4.1 Population and Human Health

This assessment uses information sourced from the Central Statistics Office (CSO), namely Census Data from 1996, 2002, 2011 and 2016, from CSO Labour Force Surveys, periodic CSO Quarterly National Surveys on health, Galway County Council Development Plans and the Department of Health "Health in Ireland Key Trends" Reports. CSO data related to industry and employment has also been sourced and provides statistics related to key sectors of economic activity such as agriculture, forestry, fishing mining and construction for example.

4.1.1 Population

4.1.1.1 The Baseline

The Project is mainly located within the Electoral Divisions (EDs) of Derrylaur Aille, Kilthomas and Marblehill/Loughatorick ED. The Electoral Divisions of Castleboy and Mountain are immediately beside the site. The nearest concentration of houses to the wind farm is in the vicinity of the village of Derrybrien just over 2km to the south of the wind farm, which is within Derrylaur ED.

In 1996 to 2016 the population of Galway County grew by 31.3%. This growth was concentrated in the areas closest to Galway City. In that period significant declines in population occurred in Derrylaur, Kilthomas and Loughatorick with a modest decline in the population of Marblehill. By contrast the populations in the Aille, Castleboy and Mountain areas showed significant increases. There has been an overall slight increase in population in these seven ED's since 1996. The population trends for this area are typical of other rural areas.

Prior to the construction period employment data for the local area indicated that employment was dominated by the agricultural, forestry and fisheries sectors followed by commerce, professional services, manufacturing, transport and construction similar to the county area. The area had an overall unemployment rate of 11.4% which was slightly better than the county area as a whole.

4.1.1.2 Impacts of the Development

No changes in population occurred as a result of the Derrybrien Project at any phase. During construction up to 160 people were employed at various stages of activity, with the majority travelling to the area to work. Construction lasted 34 months with an estimated value of €62 million with some 30% of this associated with the domestic supply market. Overall, there would have been significant socio-economic benefits nationally, in the local region and locally for the duration of construction. As a result of the peat slide, construction work was temporarily halted with the workforce re-tasked to responding to the peat slide. Some additional personnel were engaged as part of the remedial works. Some economic loss to road users and landowners occurred as a result of the slide through road diversions and loss of access to their farmland and associated farming activities. The impacts were temporary in nature.

During the operational period a small number of technicians (four to six) have been employed for operation and maintenance. Turf cutting and turbary activities have continued on the established turbary plots. This will likely continue during future operations to circa 2040.

At a national level the operation of Derrybrien Windfarm has had a positive economic impact as it contributes to a reduced reliance on fossil fuelled electricity generation and by contributing to avoiding the costs of imported fuels for such purposes. When operations commenced in 2006 Derrybrien would have contributed almost 10% of the National renewable electricity target for that time. The SEAI Energy in Ireland Report 2019 indicates that renewable electricity generation displaced circa €430 Million in fossil fuel imports. In 2017 Derrybrien wind farm contributed circa 3% of the renewable energy generation and therefore 3% of the savings from displaced fossil fuel. This positive effect will continue with the future operation of the wind farm to circa 2040.

Derrybrien Wind Farm generates annual Local Authority Rates for Galway County Council which provides indirect long-term benefit for the broader community, a positive and significant contribution. In 2020 this is expected to be €393,613. Since 2014, there has been a Wind Farm Community Benefit Fund in place to support projects that are aligned with local needs and opportunities such as the purchase of equipment, building or refurbishment work. The fund contributes €59,500 per annum, and a total community benefit fund of €297,500 has been made available to date and a wide range of projects have been supported. The effect of the Community Benefit Fund to date has been positive and locally significant. The positive impacts of the continued payment of rates and provision of Community Benefit Funds will continue with the operation of the wind farm to circa 2040.

Decommissioning is expected to last approximately 24 months with a short-term increase in employment levels. After decommissioning all employment at the wind farm will cease. The Project will no longer generate renewable electricity and there will be no contribution to displacement of imported fossil fuel costs. Rate payments to Galway County Council will cease and there will be no further contribution to the Community Benefit Fund – with a negative, locally significant and permanent impact.

No negative cumulative impact on the population in the general area has occurred. There has been a slight temporary positive impact on employment from coincidental construction. There has been - and will be, no significant negative cumulative impacts on the population arising from the presence of the Project. A significant cumulative positive effect has been the reduced need to import fossil fuels for electricity production from the operation of both Derrybrien and Sonnagh Old Wind farm.

4.1.1.3 Conclusion

The Project has given rise to positive social impacts resulting from employment, community benefit and rates provided to local authority. It also contributes significantly to the displacement of imported fossil fuel cost of economic benefit to the Irish economy and will continue to do so throughout the lifetime of the project.

In summary, the operation of the wind farm to date has not and future operation will not result in significant adverse impacts on population.

4.1.2 Human Health

The assessment of impacts has been undertaken based on the EPA Guidelines and avoids over-lap with other environmental topics such as air, water, soil etc. The assessment uses the 'Source, Pathway Receptor model' whereby - for an impact to occur all three elements must occur together. For example, during construction a dust (the source) could become airborne (the pathway) and if inhaled could impact on the lungs of a human being, (the receptor). In the absence of any of the three elements no plausible health impact can occur.

Population health data was obtained from Quarterly National Health Surveys published in 2001, 2007 and 2010, Central Statistics Office (CSO) data for 2007 to 2019 and more recent health surveys conducted by the Department of Health. Some specific CSO data relating to the relevant Electoral Divisions was also available.

4.1.2.1 The Baseline

The Quarterly National Household Survey Health issue (Third Quarter 2001) was used as there was no specific data available for 1998. Health data - nationally and for the West Region indicated that nearly 90% of surveyed adults reported their health as being "good to excellent", 10.3% stated it was "fair" and 2.4% that it was "bad". This reflected National trends.

Self-perceived health status throughout the operational period to 2020 continued to indicate high percentage levels of "very good to good" status nationally - above the European average, with only circa 2% stating their health was "bad" or "very bad".

The main causes of mortality nationally in the period 2005 and 2007 were circulatory system diseases, cancer, respiratory diseases, death from injury and poisoning and other causes. This remained consistent for 2014 to 2018.

Although, only limited health data at local (ED) level is available this indicates a similar picture to that nationally with respect to self-perceived health for the period available. In 2011 between 79.6% and 93.8% of the adult population within the EDs perceived their health to be "good" or "very good", "fair ranged" from 3.9% to 19.3%

and the percentage rating “bad” to “very bad” ranged from 0% to 2.6%. In 2016, between 83.9% and 90.9% of the adult population within the EDs perceived their health to be “good” or “very good” with the percentage recording “fair” health ranging from 5.8% to 15.5% and those indicating “bad” between 0% to 2.6%.

4.1.2.2 Impacts of the Development

Project construction activities can give rise to human health impacts through air borne dust and vehicle exhaust emissions, contamination of water supplies by sediment run off and spillages of fuels, construction noise, welfare facilities for the workforce and from traffic and transport associated with the project. All of these aspects were assessed in greater detail in the chapters addressing each topic.

Impacts on air quality which have the potential to effect human beings - particularly airborne dust containing fine particulate matter, were assessed as not significant because of the separation distances between the construction activities and the nearest occupied dwellings, see **Figure 4-1: Distance of Project components to nearest occupied dwelling**.

Similarly, for the grid connection there would have been negligible risk and no significant impact would have occurred – again due to the separation between the works sites and the nearest house.

Sediment and spill control measures put in place at the time of construction ensured that there was no significant impact on surface or groundwaters, which could lead to health impacts, through contamination of drinking water supply. Similarly, the provision of serviced sanitary facilities with a holding tank and the routine removal of foul waste from site - coupled with the use of portable toilet facilities, ensured no significant impact on human health occurred from this source.

Construction noise and vibration assessments indicates significant vibration impacts would not have been perceptible and noise from construction equipment would have been temporary in duration and slight in nature. This would not have given rise to significant impact on human health.

A number of contractor construction related incidents which resulted in minor injury to workers on site occurred, but none of these resulted in permanent health injuries to the work force or to members of the public. To mitigate against serious accident and health impact the site operated under Health & Safety Plans which were periodically revised and updated as different aspects of the construction were undertaken. Traffic and transport did not give rise to any impacts on human health.

No impacts to air quality or human health arose during the peat slide incident. An impact on the Lough Cutra water supply serving Gort did occur as a result of the peat slide, with increased water colour and suspended particles in the raw water recorded by Galway County Council. This necessitated increased cleaning of the sand bed filters and persisted for several weeks. This did not however interrupt the water supply. The drinking water impact was significant locally but of short duration. No impact was reported on the Group water supply scheme in Derrybrien. No impact from sediment or hydrocarbon spills on surface or groundwater - and hence on

human health occurred. Noise and vibration effects during the response works did not give rise to significant impact on human health.

In the aftermath of the peat slide there was significant anxiety in the population in Derrybrien regarding their health, wellbeing and safety related to the slide which had occurred and the potential for additional peat slides to occur. With the implementation of measures to reduce the impact of the peat slide and protect against potential additional slides, the risk of incidents decreased and impacts on Human Health were not significant. No health or safety incidents occurred during the peat slide itself and no impact on human health occurred.

The operation of the Project between the construction to mid-2020 did not give rise to any adverse health effects, from air quality, noise or shadow flicker or from electromagnetic Field Effects (EMF). Some positive effects from reduced climate changing greenhouse gas emissions and reduced emissions of pollutants, such as particulate matter from displacement of fossil fuel electricity generation has occurred.

The continued operation of the Project will also likely result in no significant adverse effects on human health with potential continued positive effects to circa 2040 with continued operation.

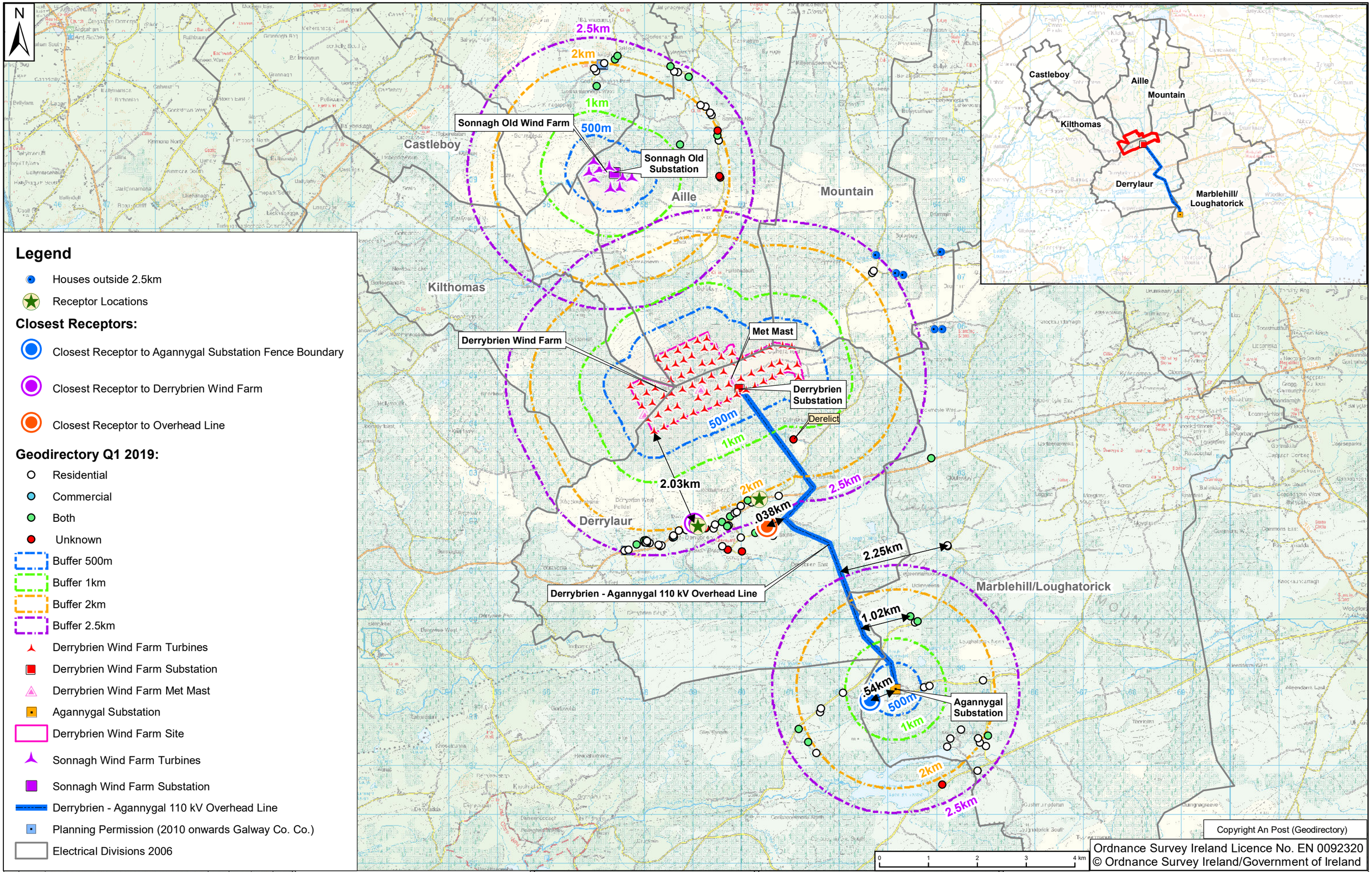
Decommissioning impacts on air quality will not give rise to human health effects given the large distances to the nearest occupied dwellings and the mitigation measures which will be put in place no significant impact on human health will occur.

Following the closure of the wind farm it will no longer generate renewable electricity and its positive impact on air quality and greenhouse gasses from displacement of fossil fuel electricity generation will no longer occur.

4.1.2.3 Conclusion

Potential negative impacts which could have or could occur were assessed for the construction and operational periods which have occurred. No significant negative impact on human health were identified with the exception of those which occurred during the peat slide incident. This mainly impacted the Gort Regional drinking water supply for a short period and also gave rise to increased anxiety in the local population around Derrybrien concerning potentially additional slide events. However, no significant human health impact occurred as a result of the slide.

The operational period of the wind farm has seen positive impacts on air quality and human health from displacement of fossil fuel electricity generation emissions as a result of renewable electricity output from the project. Greenhouse gas emissions and their effect on global warming and indirectly on human health have also been similarly displaced. These positive benefits are likely to continue to the project decommissioning phase, circa 2040, And will no longer occur thereafter..



Legend

- Houses outside 2.5km
- Receptor Locations

Closest Receptors:

- Closest Receptor to Agannygal Substation Fence Boundary
- Closest Receptor to Derrybrien Wind Farm
- Closest Receptor to Overhead Line

Geodirectory Q1 2019:

- Residential
- Commercial
- Both
- Unknown
- Buffer 500m
- Buffer 1km
- Buffer 2km
- Buffer 2.5km
- Derrybrien Wind Farm Turbines
- Derrybrien Wind Farm Substation
- Derrybrien Wind Farm Met Mast
- Agannygal Substation
- Derrybrien Wind Farm Site
- Sonnagh Wind Farm Turbines
- Sonnagh Wind Farm Substation
- Derrybrien - Agannygal 110 kV Overhead Line
- Planning Permission (2010 onwards Galway Co. Co.)
- Electrical Divisions 2006

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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☒ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

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CLIENT: **Gort Windfarms Ltd**

PROJECT: **Derrybrien Wind Farm Co. Galway**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 4.1- Distance of Project components to nearest occupied dwelling**

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4.2 Noise

An assessment of the previous, ongoing and potential environmental noise and vibration impacts of the Project was carried out.

4.2.1 The Baseline

The background noise environment - in the absence of existing operational wind farm developments, has been established through noise monitoring surveys undertaken at two noise sensitive locations (NSL's) in the vicinity of the Development. Typical background noise levels for day and night periods at various wind speeds have been measured in accordance with best practice guidance contained in the Institute of Acoustics document '*A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*' (IoA GPG). The results of the background noise survey have been used to derived appropriate noise criteria for the development in line with the guidance contained in *'Wind Energy Development Guidelines for Planning Authorities 2006.*

4.2.2 Impacts of the Development

When considering a development of this nature, the potential noise and vibration effects on the surroundings must be considered for two stages: the short-term construction phase and the long-term operational phase.

The assessment of construction noise and vibration and has been conducted in accordance with best practice guidance contained in *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise* and *BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration.* This assessment has concluded that, primary due to the distance between the main construction works and noise sensitive locations noise and vibration impacts associated with them would be expected to have been comfortably below identified criteria that would indicate significant impacts.

Based on detailed information on the site layout, the turbine noise emissions and turbine hub height for the development, a series of 'worst-case' turbine noise prediction models have been prepared for review. The predicted turbine noise levels have been calculated at all NSL's in accordance with the IOA GPG recommendations. The predicted turbine noise levels associated with the Development are predicted to be well within the best practice noise criteria curves recommended in Irish guidance document *'Wind Energy Development Guidelines for Planning Authorities 2006.* Therefore, it is not considered that a significant past or ongoing effect is associated with the Development.

Comment has also been presented in relation to the content of the *Draft Revised Wind Energy Development Guidelines (2019).* In the first instance it is noted that this document is in draft form and that significant concern has been expressed in relation to specific issues and the drafting of the document in terms of technical accuracy and practical implementation of the guidance. That comment aside, a review has

concluded that the intent of draft document is satisfied at all occupied Noise Sensitive Locations (NSL's) within the vicinity of the development.

No significant vibration effects are associated with the operation of the site.

In relation to site decommissioning, subject to good working practice as recommended in the rEIAR Chapter, it is not expected that there will be any significant noise and vibration impacts associated with this phase and the likely noise from decommissioning activities at the nearest NSL's is expected to be well below recommended threshold values. The associated construction noise and vibration impacts are not expected to cause any significant effects.

4.2.3 Conclusion

In summary, the noise and vibration impact of the proposed development is not significant considering national guidance for wind farm developments.

4.3 Shadow Flicker

An assessment of Shadow Flicker as it may have occurred in the past, current and future operations of Derrybrien Wind Farm has been carried out.

Shadow Flicker impact can occur when the blades of a wind turbine cast a shadow over a window in a nearby house or building (sensitive receptor) and the rotation of the blades causes the shadow to flick on and off. The flickering effect only lasts for a short period and happens only in specific combined circumstances, that is when the sun, the wind turbine and the window of a dwelling are directly aligned as detailed in Chapter 6 of this EIAR. The potential impact can only occur during the operational phase of the project.

The current Guidelines recommend that Shadow Flicker at sensitive receptors within 500m of a wind turbine should not exceed 30 hours per year or 30 minutes per day. Where shadow flicker occurrence could be a problem, developers are required to provide calculations to quantify the effect and where appropriate take measure to prevent or ameliorate the potential effect. It is noted that at distances greater than 10-rotor diameters from a turbine, the potential for shadow is very low. The rotor diameter of wind turbines used at Derrybrien is 52m.

4.3.1 The Baseline

The baseline for assessment is the absence of a development that could give rise to flicker at all sensitive receptors.

A detailed study was carried out to identify the location of all sensitive receptors within a 2km radius of Derrybrien Wind Farm from first operation through to any future proposals. The nearest potential sensitive receptor is an unoccupied structure (R01) at 1.3 km from the wind farm, and therefore well outside 10-rotor diameters from the nearest turbine. The nearest occupied dwelling is more than 2 km from the nearest turbine.

4.3.2 Impacts of the Development

Theoretical shadow flicker occurrence can be predicted at specific receptor locations utilising specialist computer software developed for the wind industry. EMD WindPro v3.3 was used to calculate the potential Shadow Flicker occurrence for all sensitive receptors within 2km of Derrybrien Wind Farm. The prediction used a conservative worst-case theoretical scenario whereby all limiting factors in the software module have been removed (e.g. 100% sunshine during daylight hours, wind turbines always rotating, no screening from trees / vegetation).

The worst-case theoretical scenario indicates that the unoccupied sensitive receptor (R01) has potential for theoretical Shadow Flicker occurrence, but the predictions do not exceed the guidelines of 30 minutes per day or 30 hours per year. The results are common for both the Operation Phase (2006-2020) and for the future operational phase of the project. There are no likely significant effects. Any effects would be momentary, and very unlikely to be noticeable due to the receptors distance from the nearest turbine (1.3km).

Any potential cumulative impacts of Shadow Flicker which have occurred during Operation Phase (2006-2020), and which are occurring during the ongoing operational phase have been considered. Sonnagh Old Wind Farm was considered as part of a wider Shadow Flicker analysis to assess potential cumulative impacts using industry best practice (IWEA, 2012). It was identified that there are no sensitive receptors within the overlapping cumulative impact area (2km buffer zone) between both wind farms. On that basis there is no potential cumulative impact for Shadow Flicker occurrence from Derrybrien Wind Farm.

4.3.3 Conclusion

Shadow Flicker occurrence is a temporary impact, which can only occur whilst turbines are in operation. The assessment demonstrates that there are no significant impacts from Shadow Flicker occurrence as a result of the operations of Derrybrien Wind Farm. In the unlikely event that momentary Shadow Flicker occurs appropriate mitigation described in Chapter 6 would be implemented and no residual impact will occur. There is no potential for Shadow Flicker occurrence after decommissioning.

4.4 Biodiversity Terrestrial

An assessment of the impacts on Biodiversity (terrestrial) arising from ‘the Project’ in order to determine the likely significant effects of the Project on key ecological features including habitats, birds, bats and other mammals has been completed. A remedial Natura Impact Statement (rNIS) has been produced which considers the potential impacts of the Project on European sites (sites designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)) (see Volume 2, Section 5).

As the Project is entirely within the Slieve Aughty Mountains SPA (code 004168), particular attention is given to the birds for which the site has been designated,

namely hen harrier and merlin, see **Figure 4-2: European Sites within 15km radius of the Project**.

4.4.1 The Baseline

The baseline environment of the Project area was determined following a desk study and extensive field surveys undertaken between 2003 and 2020. The approach to the work has taken account of industry standard guidance for the survey and assessment of impacts of wind farms. Habitat surveys have been on-going in the Project area since 2003. Surveys for hen harriers and other bird species have been carried out in the years 2004, 2006, 2007, 2009, 2011, 2015, 2018, 2019 and 2020 and comprised vantage point surveys within the wind farm and hinterland surveys (to circa 5 km of the wind farm site). Bat survey work was undertaken in 2011, 2016 and 2019. Survey has included the deployment of static detectors at turbine locations, driven bat transects, and (dog) searches for bat carcasses beneath turbines. Otter surveys have been undertaken within the wind farm site and along the watercourses draining the wind farm site - particularly the Owendalulleegh River which was impacted by the peat slide.

Terrestrial habitats occurring within the Project area are described and evaluated based on standard guidelines. The dominant habitats present include conifer plantation (representing different stages of forest cycle) and a variety of upland peatland habitats including remnant blanket bog and cutover bog. Terrestrial habitats range in importance from 'local importance, lower value' to 'local importance, higher value'. No rare or protected plant species were recorded from the habitats within the area.

Prior to construction of the wind farm, up to 12 hen harrier breeding territories had been recorded within a 5 km radius of the wind farm site in 2003. None of the territories in this period were within the area of the wind farm, with the nearest territories in 2003 being approximately 2 km away. Merlin had not been recorded at the wind farm site during pre-construction surveys.

At no time since monitoring commenced in 2004 have hen harriers been suspected of nesting within the wind farm site or within at least a 1 km radius of the wind farm. Hen harriers were, however, recorded foraging within the wind farm in each of the survey years.

The monitoring of hen harrier territories within the 5 km radius of the wind farm shows that the number of confirmed nesting attempts was fairly constant between 2004 and 2009 (9-14) but there then followed a decline to six in 2011 which continued more markedly into 2015 and 2018 (only 2 in each year). Between 2010 and 2018, the total number of pairs (confirmed and possible) dropped from 12 to 5.

The population decline noted since about 2011 within the 5 km radius of the wind farm is reflected in the Slieve Aughty Mountains SPA as a whole where a 48.1% population decline was recorded between 2005 and 2015. The cause(s) of the population decline and low productivity within the SPA remain largely unknown but are expected to be due to a number of reasons, perhaps acting in combination

including, habitat change (largely forest management affecting prey availability), predation, persecution, access and recreation (walking paths, cycling tracks etc), non-intensive grazing, wind energy & utility and service lines. The Derrybrien Wind Farm Project is not considered to have contributed to the decline. In fact, the areas of commercial forestry felled as part of the Project have developed to a mix of low scrub and re-vegetating bog species, which supports a range of potential prey items for hen harrier and merlin.

There were no sightings of merlin within the wind farm project area during the various breeding bird surveys. A range of bird species characteristic of bog, heath, scrub and forest habitats was recorded on site during the various monitoring surveys, including red grouse.

There were no sightings of hen harriers within or around the wind farm site during surveys in winters 2011/12 and 2019/20. Golden plover is an occasional winter visitor to the area.

Surveys have established that the bat community at the wind farm site includes a minimum of six species. The most commonly encountered are Leisler's bat, common pipistrelle and soprano pipistrelle. Other species that have been recorded are Nathusius' pipistrelle (confirmed records in autumn only), brown long-eared bat, and one or more Myotis bat species. Lesser horseshoe bat, for which the Lough Cutra Special Area of Conservation (approximately 10 km to the south-west) was designated, has not been recorded at the wind farm during surveys.

4.4.2 Impacts of the Development

Construction phase impacts included habitat loss in the footprint of the development, this is considered a minor negative impact that has had no significant effect. This conclusion takes account of the overall extent of habitat loss and the relatively low value of the affected habitats.

Potential indirect impacts associated with construction were considered to relate to the hydrological alteration of habitats. Those habitats of most sensitivity to hydrological change remained unaffected as they were avoided and sufficiently removed from site infrastructure. Localised drainage effects are considered to have had a minor long-term impact (no significant effect) on the cutover bog habitat.

Disturbance of low value habitat in the path of the peat slide area lead to a direct moderate negative impact ranging from short term to medium term duration.

Ongoing operational phase impacts are associated with maintaining site infrastructure and tree management in previously felled areas. Occasional cutting back of re-growth of trees within the felled forestry is deemed a minor positive impact of long-term duration as the resultant open habitat is of higher biodiversity value than a closed canopy conifer plantation that would otherwise have established in the area. This is considered a significant positive effect.

The effects on birds as a result of the project which could be of some significance are summarized as follows:

Potential disturbance to foraging hen harriers during construction works - rated as significant effect but of temporary duration.

Potential disturbance to hen harriers and other birds during future maintenance and decommissioning works rated as significant effect but of temporary duration.

Potential collision by hen harriers with the Derrybrien to Agannygal 110kV overhead line (in absence of bird flight diverters) - rated as a potential negative effect which could be of significance. For merlin, the risk of collision with power lines is low due to the flight height of the species which is invariably close to ground level.

Regeneration across the wind farm site and along the Derrybrien to Agannygal 110kV line corridor of a mix of bog and scrub vegetation where conifer plantation had been cleared to facilitate the project. This has provided approximately 255 ha of suitable foraging habitat for hen harriers as well as other important species such as Red Grouse and will be maintained for the lifetime of the project. Rated as a significant positive effect of long-term duration.

While there is no evidence to indicate that the Derrybrien - Agannygal 110kV overhead line has resulted in any collision casualties, it is acknowledged that such lines pose a risk of collision to large birds such as hen harriers and hence this is considered a potential negative impact which could be of significance.

Mitigation measures and monitoring requirements identified for birds are:

The placement of bird flight diverters along the 110kV overhead line in order to minimise the risk of collision.

Seasonal restrictions on routine maintenance works, other than those associated with individual turbine maintenance and works within the substations, so as to avoid disturbance to breeding birds.

Survey for territorial hen harriers within and around the wind farm project (to at least a 2 km radius from boundary) should major maintenance works be required to take place during the breeding season and also prior to decommissioning works.

The continuation of the monitoring programme for hen harriers at intervals for the remainder of the wind farm operation so as to maintain baseline population data on hen harriers and other birds associated with the wind farm project area.

The impact assessment for bats has concluded that:

- Habitats present on site prior to site clearance and construction are likely to have been of low inherent value to bats. Changes to local habitat composition will have resulted in minor and very localized effects on bats.
- Loss of roosting opportunities in bridges, and foraging opportunities along a minor watercourse and adjoining habitats affected by the peat slide, are likely to have had localized effects principally on common and soprano pipistrelles, brown long-eared and Myotis bat species.
- Wind farm operation to date and up to the point where the project is decommissioned is likely to have resulted in some bat fatality. Based on

empirical data and the detection of a soprano pipistrelle corpse at the wind farm during dog searches, the species likely to be principally affected are Leisler's bat and the three pipistrelle species. A precautionary assessment is that collision of Nathusius' pipistrelle is likely to be significant at the County level, with more localized impacts on the other species.

There is limited potential for cumulative impacts on bats to have occurred during construction of the wind farm or as a result of the peat slide. There is some potential for additional fatality from the operational (albeit far smaller) Sonnagh Old Wind Farm to impact local populations if bats range across both wind farm sites.

No impacts on bats of the decommissioning of the Project are predicted.

A curtailment (pause in operation) scheme with the following cut off parameters will be implemented at all turbines for the continued operation of the Project. The curtailment scheme will be in effect April to October (inclusive), it will stop the operation of turbines when temperatures are above 11 degrees Celsius and wind speed is below 5 m/s between dusk and dawn each night when bats are considered most vulnerable to collision. Monitoring of the scheme will be undertaken for three years.

The impact of the Project on large mammals has been assessed and no significant effects on local mammal populations were identified.

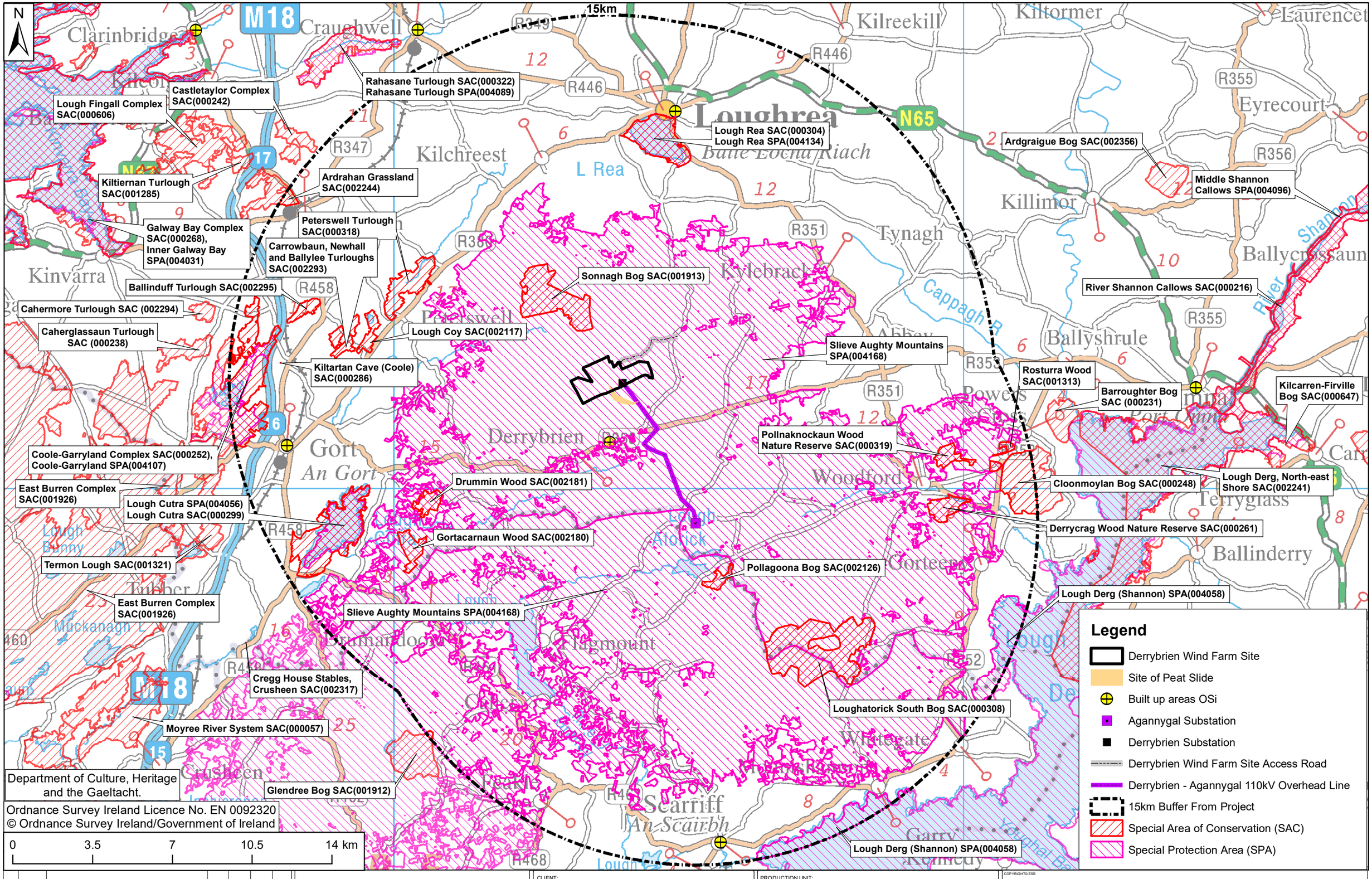
4.4.3 Conclusion

The assessment of residual effects has concluded that there are no residual negative significant effects on terrestrial habitats due to the construction, operation, and decommissioning of the wind farm project.

With mitigation in place, it is considered that the continuing operation of the Project and the decommissioning phase will not have a significant negative effect on hen harrier or merlin within the SPA or on the other breeding and wintering birds associated with the project area.

The potential to affect the (local) favourable conservation status of bats will be reduced with the implementation of mitigation measures. It is considered likely that with mitigation in place there will be no significant residual effects at the wind farm or in combination with other projects on local bat populations. This conclusion will be confirmed during the three years of monitoring post implementation.

There are no residual significant effects on mammals due to the construction, operation, and decommissioning of the Project.



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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☒ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

Energy for generations

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CLIENT: Gort Windfarms Ltd

PROJECT: Derrybrien Wind Farm Project

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PRODUCTION UNIT: Civil & Environmental Engineering

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Figure 4.2 - European Sites within 15km radius of Project

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4.5 Aquatic Ecology & Fisheries

An assessment of the impacts on aquatic ecology and fisheries arising from the Derrybrien Wind Farm Project has been carried out for all project phases to determine the likely significant effects of the Project.

4.5.1 The Baseline

The baseline environment of the study area was determined following a comprehensive desktop review (literature sources, technical reports, maps and various available datasets) supplemented by extensive field surveys undertaken between 2011 and 2020, which included electrofishing surveys, Q-value assessments (the Environmental Protection Agency's scheme of quality values. The higher the Q value the better the water quality, and water chemistry on all of the main channels and side streams draining the site. Aquatic habitats occurring within the wind farm study area are described and evaluated based on standard guidelines.

The windfarm is situated on a plateau in the Slieve Aughty Mountains, the eastern portion of which is used for turbary. It is drained by 9 sub-catchments the outlet streams from which flow mainly to 2 lager rivers, the Boleyneendorrish to the north and the Owendalulleegh to the south, the latter flowing into Lough Cutra and both water courses eventually reaching the sea at Kinvarra via an underground karst system. Less than 0.4% of site area drains to the east to the Duniry River catchment which eventually flows into Lough Derg in the Shannon catchment. The catchments of the OHL corridor and the Agannygal substation drain to the Owendalulleegh River, with the southern section reaching Lough Atorick in the Bleach River catchment, which eventually flows into Lower Lough Derg near Scarriff in Co Clare. The land use in the upper parts of the 9 subcatchments and along the OHL is dominated by coniferous plantation forestry

The desk study and field work revealed that the 2 main river channels have generally been of High Status in terms of their water quality, with Q-ratings of Q4-5 or Q5 from the late 1990's up until the present, with the only notable interruption following the 2003 peat slide. The smaller streams draining the windfarm have tended to have more variable water quality ranging from High (Q4-5) to Moderate Status (Q3-4) mainly. 6 fish species have been recorded within the watercourses within the study area which are numerically dominated by brown trout and stone loach. The rivers and monitoring locations assessed as part of the aquatic ecology are shown on **Figure 4-3: Rivers and Monitoring locations.**

4.5.2 Impacts of the Development

The construction phase of the project entailed clear-felling 222ha of coniferous forestry at various stages of development on the site and all of the construction activities would have given rise to increased nutrient and suspended solids run-off to water. The latter was mitigated using silt control measures and downstream impacts were largely or exclusively confined to the smaller streams draining the site, which would have resulted in minor to moderate adverse and temporary impacts in the

majority of these. This would have resulted in a drop in water quality from God or High to Moderate or Good (Q4 or Q4-5 to Q3-4 or Q4). The main channels of the Boleyneendorrish and Owendalulleegh would have remained largely unaffected by these works.

However, a major peat slide occurred the south-central part of the site in late October 2003. The peat travelled downstream to the main channel of the Owendalulleegh River along one of the subcatchment streams draining the windfarm causing severe riverine habitat damage in the stream and resulting in the deposition of large amounts of peat silt and woody debris along the main channel of the Owendalulleegh, with some finer material eventually reaching Lough Cutra and beyond. The peat slide caused a major fish kill in which it was estimated that thousands of fish were killed, likely dominated numerically by brown trout and stone loach but also including lamprey, eels and to a lesser extent perch and Gudgeon. There is no evidence that any fish were killed in Lough Cutra. The lake appears also to have acted as a sink for much of the finer peat material thereby preventing any significant impacts on water quality in the Beagh and Cannahowna Rivers downstream of the lake or on the water depended SAC's lower down in the catchment.

Water quality in the main channel of the Owendaluleegh was almost fully recovered to pre-peat slide levels when the river was next surveyed by the EPA in 2006, about 3.5 years after the peat slide event. Inland Fisheries Ireland fish surveys between 2009 and 2016, and more recent surveys for the current study in 2011, 2014 and 2019, have shown that the main channel of the Owendalulleegh currently holds a healthy stock of brown trout and stone loach and smaller numbers of eel and lamprey also. Based on these data and studies on the recovery of fish after major kills reported in the literature, fish populations are believed to have recovered in the affected channels within 6-7 years of the peat slide, with stone loach recovering within 2-3 years, trout within 3-5 years and lamprey within 6-7 years.

Fluctuations in water quality in recent years in some of the smaller tributaries draining the windfarm have been largely attributed to forestry management activities to a lesser extent to the effects of peat silt from turbary. The impacts have been slight to minor adverse and temporary in nature. Some localised impact from road repair and upgrading within the windfarm in 2014 are likely to have given rise to similar minor impacts also. Continued operation of the Derrybrien Project would likely see a similar level of minor impacts on the small streams draining the project sites but none on the main channels of the Boleyneendorrish, Owendalulleegh and Duniry Rivers.

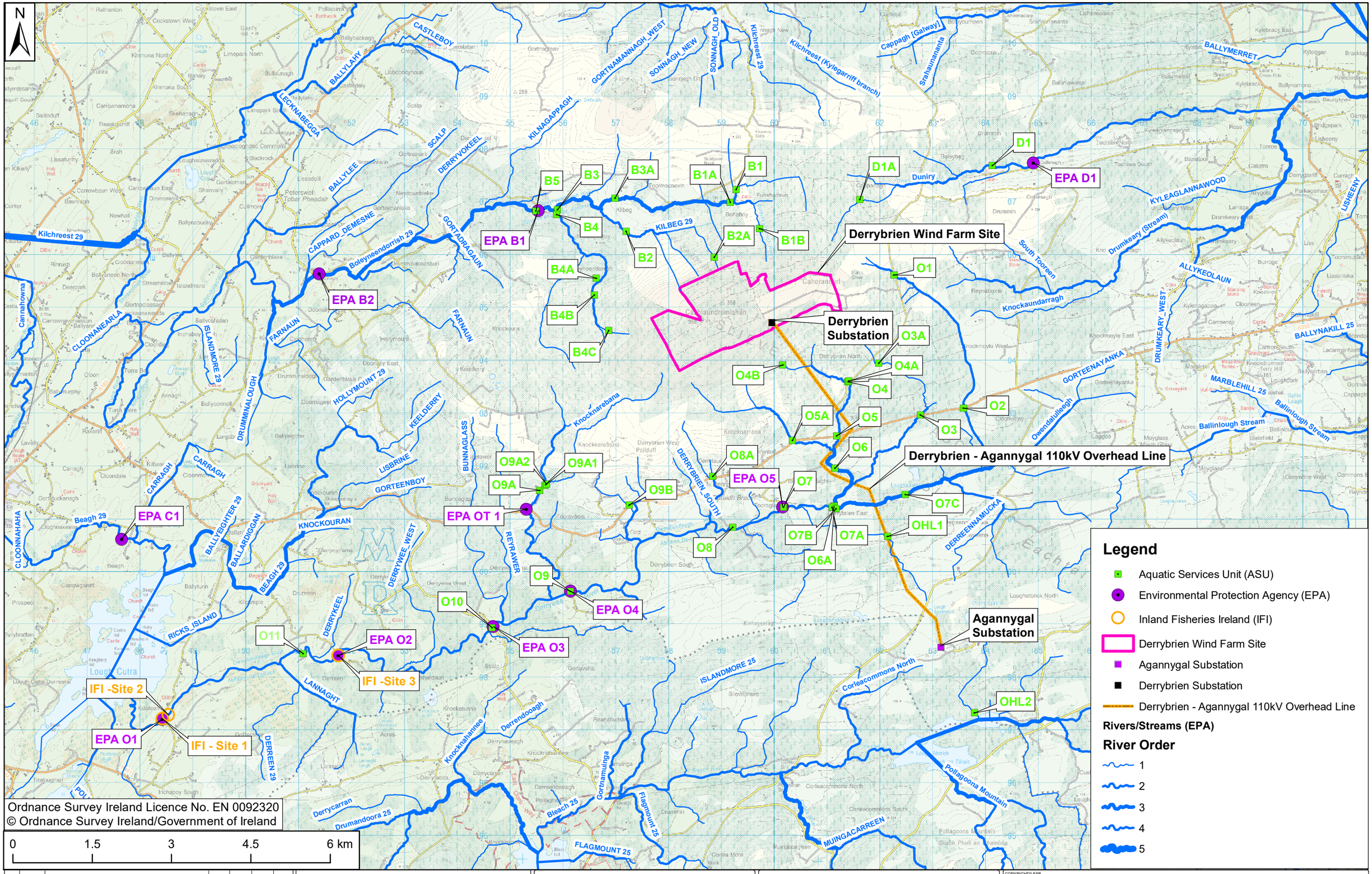
Decommissioning of site, OHL line and Agannygal substation has been designed to only remove above ground structures, thereby minimising ground disturbance which in turn is expected to result in at most slight to moderate adverse, temporary impacts on the small streams draining these sites but none on the main channels of the Boleyneendorrish, Owendalulleegh and Duniry Rivers. Removal of Barrages 3 and 4 could potentially result in a minor to significant, adverse impact of short-term duration in the affected tributary of the Owendalulleegh, a worst-case scenario would be a localised fish kill due to a sudden escape of accumulated soil behind the

barrages. All of the impacts mentioned above can be readily mitigated, reducing the impacts to slight to minor and temporary.

In terms of cumulative impacts which have occurred, and which will occur during the remaining life-time of the project, forestry activity in the catchments draining the windfarm, the OHL and Agannygal substation have been identified as the main one with potential for cumulative effects, with a smaller contribution from turbary. However, the contribution of the windfarm to the cumulative impacts of these activities is at most likely to very slight adverse but generally not distinguishable.

4.5.3 Conclusion

The ongoing operation of the wind farm and the OHL up to the end-of-life of the project will have no significant adverse impacts on the surface receiving waters, with any impacts occurring being slight and non-significant. This will also be true of the decommissioning stage provided all recommended or equivalent mitigation measures having the same effect are implemented.



Legend

- Aquatic Services Unit (ASU)
- Environmental Protection Agency (EPA)
- Inland Fisheries Ireland (IFI)
- Derrybrien Wind Farm Site
- Agannygal Substation
- Derrybrien Substation
- Derrybrien - Agannygal 110kV Overhead Line

Rivers/Streams (EPA)

River Order

- 1
- 2
- 3
- 4
- 5

0 1.5 3 4.5 6 km

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CLIENT: **Gort Windfarms Ltd**

PROJECT: **Derrybrien Wind Farm Project**

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PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 4.3 - Rivers and Monitoring Icoations**

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4.6 Landscape and Visual

The methodology for assessment of the landscape and visual effects of the Derrybrien wind farm has been informed by several key guidance documents. Because this is a remedial EIAR there are some changes to the usual assessment methods in relation to Landscape and Visual Impact Assessment.

4.6.1 The Baseline

Derrybrien Wind Farm is in the northern part of the Slieve Aughty range, east of the peak of Cushlaundrumlahan. The uplands are visible from a very wide area of the surrounding plains (where local variations in topography and vegetation do not block the view in places) but are unremarkable in form and scale. They generally feature as a broad, low, round-topped landform on the horizon, with limited visual presence.

The Agannygal substation lies less than 7 kilometres to the southeast and is located in a relatively remote area of coniferous forestry and bogland. An overhead line connects the Derrybrien wind farm with the substation at Agannygal.

Forest cover is one of the defining characteristics of the area and the Slieve Aughty Mountains generally. The plantations are interspersed with areas of peat bog. This was also the case before the Project was constructed, circa 1998, according to documents written around this time. In views towards the mountains the large, angular, dark coloured plantations are prominent, often blanketing the landscape and giving the horizon line a jagged profile. In views from within the uplands the plantations often block lateral views from the roads, generating a high degree of visual enclosure.

The settlement and transport patterns in the vicinity of the site are sparse. There are no occupied houses within 2km of the wind farm. The nearest village is Derrybrien, some 2km from the site, and the majority of the houses in and around the village have no view of the wind farm due to the local topography and vegetation cover. There are a small number of rural houses on the fringes or outside of Derrybrien (to the south), Ballynakill (to the east) and along the local road to the south of the site, which do have views of the wind farm. There are also views afforded from stretches of the Black Road that passes to the east of the site, where local topography and vegetation does not screen the view. There is a belt of unpopulated, forest-covered landscape several kilometres wide around the west, north and east of the site on the outer slopes of the mountains. This limits the number of visual receptors of the development.

4.6.2 Impacts of the Development

4.6.2.1 Landscape

The wind farm site is visible from a vast area of agricultural plains to the west, north and east of the Slieve Aughtys, where local topography and vegetation does not screen the view. There is a pattern of dispersed rural settlement along the network of local roads throughout this area. The area is also traversed by several regional and national roads carrying large volumes of traffic (including the M6, M18, N65 and

R380). Additionally, the uplands (and the wind farm) are visible from parts of Lough Derg (towards the eastern shore) some 20km to the east.

Sixteen photomontages were taken at viewpoints where the wind farm is visible. These include from the roads in the vicinity of the site, locations near settlements and dwellings as well as amenity areas and trails. It should be noted these are representative of the landscape as it is seen today and that there may be changes since the baseline date of c. c. 1998.

The landscape sensitivity is considered to be Low to Medium.

Overall the construction phase activities (and including the peat slide) would be most evident at the local scale, and would be considered a Moderate, adverse effect on the landscape, but one that is temporary in duration. The peat slide however would be considered as having been locally Significant from a landscape perspective in the short term. On a wider landscape scale, the landscape effects would be considered Not Significant. Over time, and at the present day, (approximately 16 years later), the areas affected by the works and the peat slide have largely re-vegetated and integrated into the landscape making them difficult to distinguish from the surrounding areas. The medium- and long-term landscape effects can be considered Not Significant to Slight.

During the operational period, the landscape effect of the turbines and associated elements, including the Agannygal substation and overhead line, would be considered to be Medium, and the magnitude of change considered High. The significance of the landscape effects of the wind farm can be classified as Moderate (level 4 out of a possible range of 1 Imperceptible, 2 Not Significant, 3 Slight, 4 Moderate, 5 Significant, 6 Very Significant, 7 Profound). The effects can be considered Neutral.

For the decommissioning stage, the landscape effects can be classified as Slight to Moderate. The removal of the wind farm from the landscape will result in a Slight to Moderate change to the character of the wider landscape also.

4.6.2.2 Visual

In terms of visual effect, the construction activities and the peat slide would have been Moderate, adverse visual effects but extremely localised and not visible from the viewpoints in the wider landscape. This would have been a temporary to short term visual effect on receptors in the vicinity of the site and in particular the Black Road area. However, in the medium to long term the visual effects would have lessened, and at present the areas visible from the Black Road and R353 have re-vegetated and assimilated with the surrounding landscape.

The visual effects arising from the development of the wind farm in the landscape range from Imperceptible to Moderate. The substation and other buildings on the wind farm site cannot be viewed from the public road, and therefore are considered to have an Imperceptible effect. The overhead line is quite prominent in the immediate vicinity of the site and in sections of the Black Road and the R353, but it

is not visible in the majority of the views described above. The Agannygal substation is visible over a very limited area.

During decommissioning visual effects will include temporary visual effects as a result of the operation of machinery to facilitate the removal of the wind farm elements. These are considered Moderate adverse effects and temporary in nature. Permanent visual effects resulting from the decommissioning of the project are considered to range from Imperceptible to Slight from the majority of the viewpoints.

The removal of turbines which have been in place for some time and which may be considered as a landmark in the area, may be considered to be an adverse effect by some viewers. However, in some cases where the removal of the turbines is considered to remove an element of visual clutter and result in a simpler composition of a view, this may be experienced as a beneficial or positive effect. The turbines are a relatively low height by today's standards which lessen the visual effects of their decommissioning.

4.6.3 Conclusion

The Derrybrien Project is now part of the working rural upland landscape.

Though located in the northern part of the Slieve Aughty Mountains and the uplands are visible from a very wide area of the surrounding plains, the uplands generally feature as a broad, low, round-topped landform on the horizon, with limited visual presence. The wind farm can also be seen over a wide area, however the relatively small scale and low height of the turbines and the nature of the landform result in this being perceived as an element in the landscape, along with the coniferous forestry, which is in no way dominant. The presence of a forest-covered landscape around the west, north and east of the site reduces visibility and visual receptors in close proximity to the turbines.

The landscape and visual effects for the construction of the Derrybrien wind farm project have been assessed as temporary effects.

The landscape and visual effects of the peat slide which occurred in 2003 are not now evident in the landscape or from the public roads. Vegetation has grown considerably over the intervening period.

The continuing operational phase, from mid-2020 to decommissioning, will involve very little change and any changes which occur are likely to be perceived or experienced only in very close proximity to the site and effects are not significant.

The decommissioning of the wind farm will result in some landscape and visual effects, though these are not considered to be significant. These changes will be most pronounced in close proximity to the site. The removal of turbines may be seen as part of the ongoing change in the working rural landscape which also reflects felling and replanting of coniferous forestry. The main changes will be the visual effects resulting from the turbine removal. Again, these will be more noticeable at the local scale, but there will also be some element of change to the wider landscape as a wind farm is removed from a landscape.

4.7 Soils, Geology and Land

An assessment on Soils, Geology and Land has been carried out in accordance with the 2017 EPA Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports with consideration of Peat Stability Risk Assessments (PSRA) undertaken for the Project site.

4.7.1 The Baseline

The available desktop information and the numerous geotechnical site investigations undertaken on the Project site have been used to inform the baseline Soils, Geology and Land conditions and to undertake the assessment of the impacts for the Project.

The majority of the Project site is characterised by a continuous cover of upland blanket bog. The wind farm site (365m AOD and 325m AOD) topography typically consists of flat or gently sloping ground with steeper slopes closer to the southern and northern boundaries of the site. From the wind farm site, the overhead line (OHL) is routed in a southernly direction where the topography is steep over the initial 1.5km and then crosses the more gently sloping terrain of the Owendalluleagh River valley to the Agannygal substation where the site has been cut and filled locally to provide a level platform at about 190m AOD.

The characteristics of the site activities and the impacts on the soils, geology and land are based on records from construction and from the operation and maintenance phase of the Project up to Q2 2020. It has been assumed that the characteristics of the activities that are likely to occur over the remaining life of the Project and during decommissioning will be similar. Both positive and negative stability impacts have been assessed. Activities associated with the grid connection and peat slide response works during the operation and maintenance phase of the project are considered relatively minor in the context of the wind farm site activities.

4.7.2 Impacts of the Development

The project has been assessed for the direct and site stability effects on Soils, Geology and Land for the various phase of the project i.e. construction, operation and maintenance and decommissioning. For this project, activities that have negative stability impacts on the receiving soils, geology and land typically involve temporary or permanent loading on the surface of the blanket bog that covers the site.

The activities that result in a direct negative effect on the receiving soils geology and land and typically involve the excavation, covering/sealing and drainage of the peat. As a particular case, the direct impact on soils, geology and land of the peat slide that occurred in 2003 is assessed.

The probability of a peat failure occurring is a function of the characteristics of the site as well as the stability impacts of the site activities on the peat. Therefore, a Peat Stability Risk Assessment (PSRA) has been carried out for the project in accordance with current best practice guidelines to interpret the risk of a peat slide across the site. This is based on factors that are relevant to peat stability such as topography, peat depth, peat strength, hydrology, and groundwater conditions. The probability of

a peat failure occurring for each site activity has then been assessed based on the results of the PSRA and on the characteristics of the stability impacts. For recurring activities, the probability of a peat slide has also been reassessed at key stages of the project to take account of improvements in site conditions that occur over time, such as the medium to long-term effects of the drainage improvements, which reduce the risk of a peat slide – a positive stability impact.

For this project, the possible extent of a peat slide as a consequence of stability impacts on the peat and the characteristics of the soils, geology and land potentially impacted by a slide have been calibrated by the very large peat slide that occurred on the site in October 2003, which has reasonably been considered the worst case scenario. Consideration has also been given to the smaller more localised peat failures that occurred in a few areas on site during construction, which had a significantly lower impact on the peat.

Prior to construction of the windfarm the bog within the footprint of the Project had been degraded by drainage, forestry plantations and peat harvesting. Therefore, the baseline sensitivity of the soils, geology and land that could be impacted by the Project has been assessed as MEDIUM based on a combination of the ecological value of the bog, the significance of carbon storage in the peat and the value of the land for forestry, agriculture and turbary rights. There are no recorded Geological Heritage Sites in the area.

In general, the stability impacts with the most significant effects, occurred during the construction stage of the Project when there would have been a higher level of activity on the site. On the wind farm site this would have been prior to the large peat slide that occurred at the site in October 2003. The impact of site activities reduces significantly over the project life cycle from the second phase of construction after the peat slide (2004-2005), through the operation and maintenance phases of the project (2005-2020 & 2020-c2040), to decommissioning in c. 2040. This is mainly because of the nature of the activities and improved site stability conditions as a consequence of drainage, which has been and will be maintained throughout the life of the project, and consolidation of the peat.

4.7.2.1 Construction Impacts prior to the peat slide

During the first phase of construction, prior to the peat slide on the 16th October 2003, the stability impacts with effects that were significant were related to the construction of the site access tracks as “floating roads” directly on the peat, the construction traffic loading on the floating roads, and the sidecasting of excavated materials on the intact peat slopes adjacent to the turbine foundation excavations.

In comparison, the stability impacts from other activities that were being carried out on the wind farm site at the time only had slightly significant effects on the stability of the peat. These included the live load surcharge from low ground bearing pressure construction and forestry equipment operating directly on the peat, the vibrations induced by rock blasting in the main borrow pit, and the local stability of temporary peat slopes around the perimeter of the turbine foundation excavations.

No peat failures occurred under the floating roads. However, at the excavations for the turbine foundations there was a local bearing failure in the peat under the sidecast materials at Turbines T23, T29 and T66 and a small-scale peat slide occurred at Turbine T17. At the time of the very large peat slide on the 16th October 2003 excavation was underway at Turbine T68 and the excavated materials were being sidecast on the slope downslope from the turbine, where the slide is thought to have initiated. The peat slide area and runout zone are shown on Figure 4-4 to Figure 4-6.

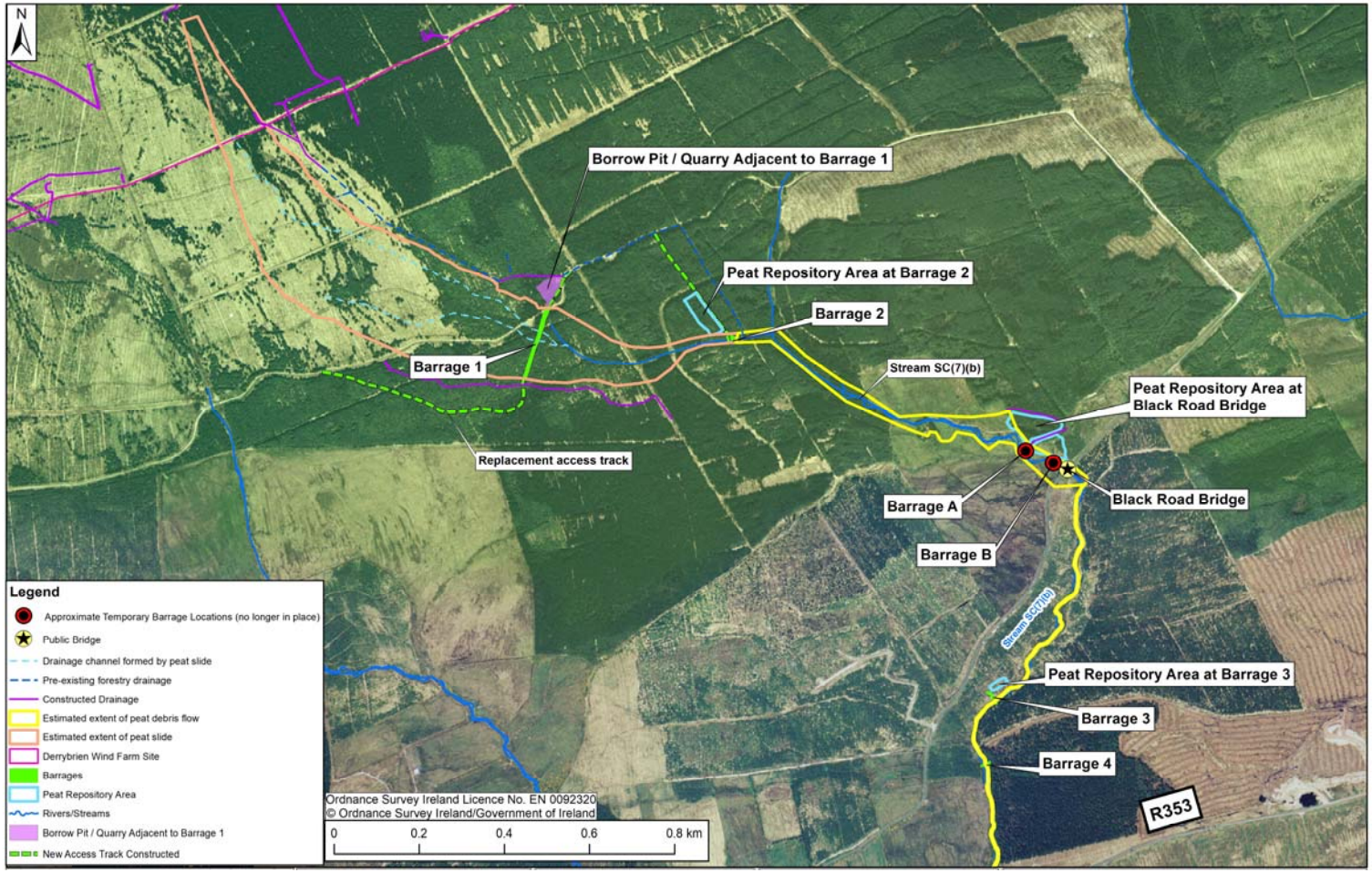


Figure 4-4:Peat Slide Area and Runout Zone (c. 2000).

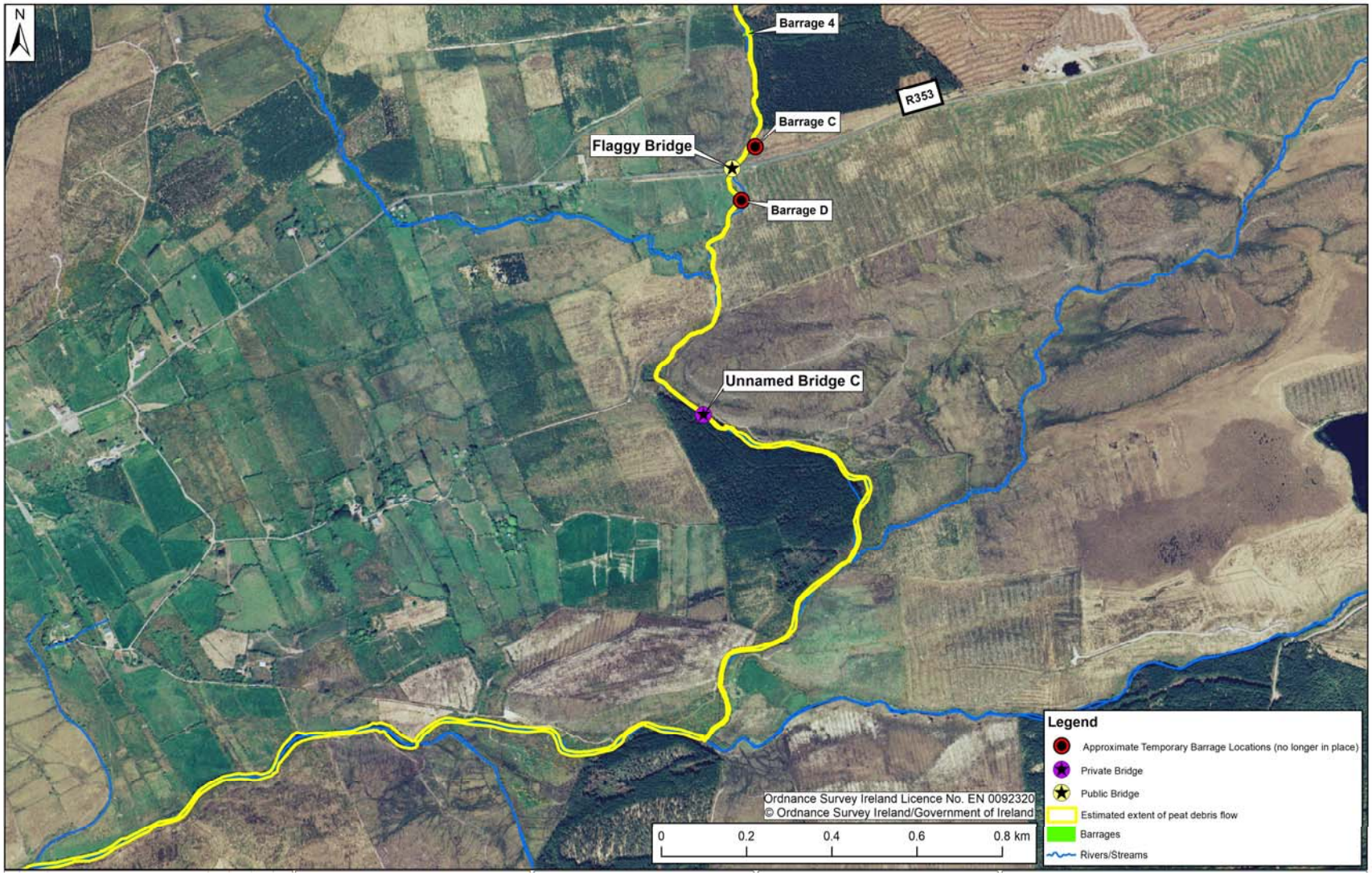


Figure 4-5: Peat Slide Area and Runout Zone continued (c. 2000).

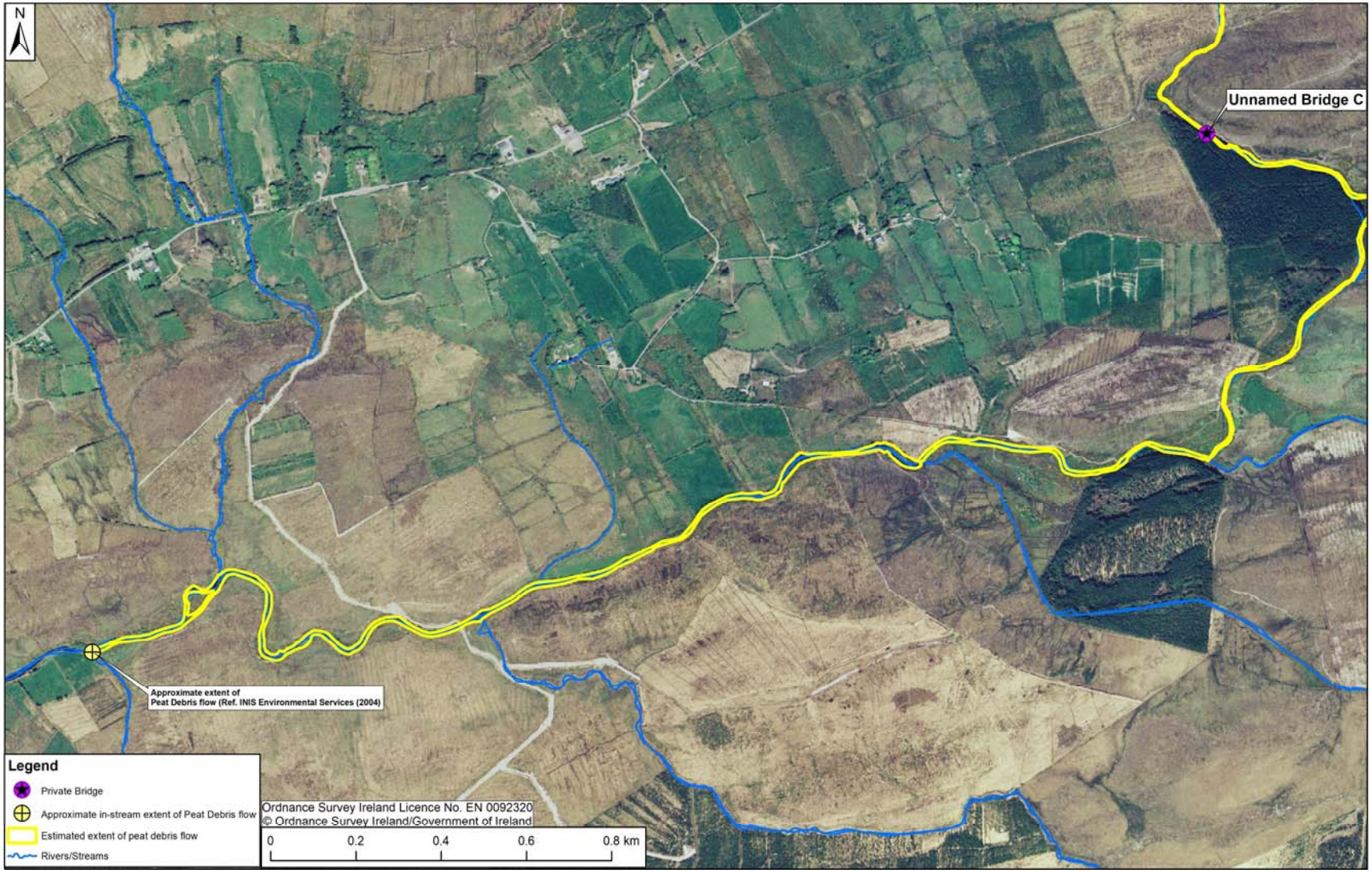


Figure 4-6: Peat Slide Area and Runout Zone continued (c. 2000).

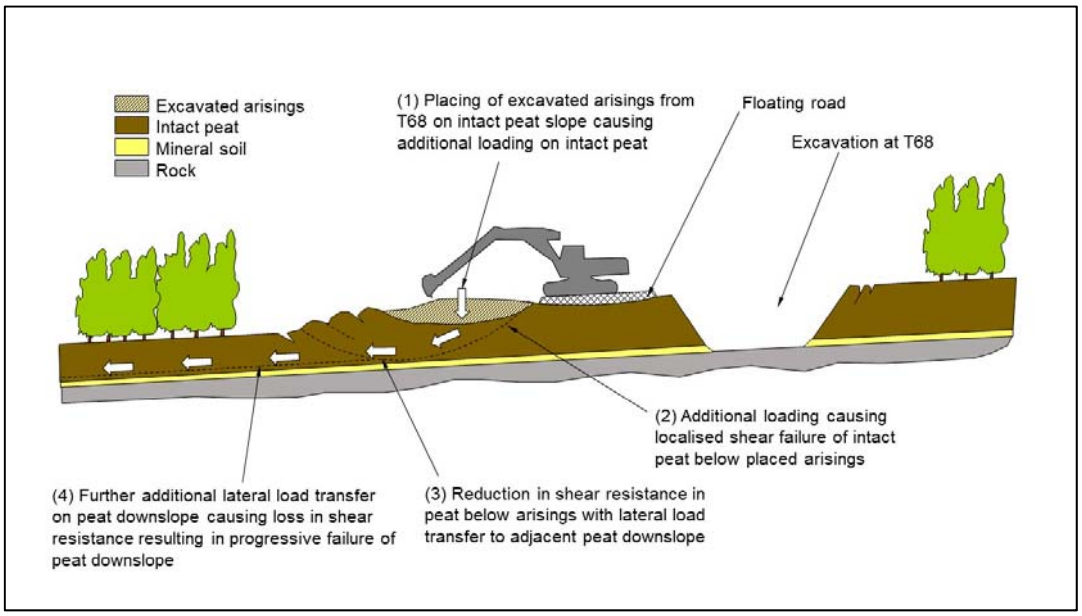
4.7.2.2 Overview of the peat slide, likely cause and possible failure mechanism

The peat slide source area contained approximately 450,000m^3 of peat at the time of the slide and it is estimated that approximately 250,000m^3 of this material flowed from the source area into the downslope stream where it was routed down the mountain slopes to an elevation of approximately 200 mAOD where it spread out on a relatively flat area of agricultural land and to approximately the Black Road Bridge. Following some heavy rainfall, the debris material was forced further downslope along the Owendalluleagh River channel before reaching a phase of dispersion in the river water approximately 6.9 km downstream of the source area.

At the time, the immediate slide source area and the debris extent significantly impacted the use of the lands and the integrity of the peat from the slide source area. This included the forestry lands, the agricultural lands and the river channel. A number of the wind farm and forestry access tracks were also removed as part of the event and had to be re-constructed. The material that remained within the failure scar on the upper slopes and wind farm site was typically comprised of detached rafts of intact peat, remoulded peat debris and a thin cover of intact basal peat over the underlying mineral soil and rock. Over time, surface runoff and groundwater has become concentrated along natural drainage channels within the slide area, increasing the level of drainage to the blanket bog on the surrounding slopes.

The peat slide was initially reported to have occurred immediately downslope of Turbine T68 on the southern slopes of the wind farm, and Consultants have identified this location as the likely initiation point for the slide. At the time of the failure, peat was being excavated from the site of the turbine and the arisings were being placed or “sidecast” onto the intact peat slopes on the downslope side of the turbine and floating road. Other drainage works were being carried out along the floating road within the slide area approximately 300 m downslope from T68.Consultants investigating the slide concluded that the construction activity, and particularly the placing of arisings onto the intact peat slopes, most likely triggered the slide. The failure mechanism proposed is shown schematically in **Figure 4-7**: **Schematic of likely failure mechanism of 16th October peat slide**. The additional surcharge load on the intact peat slopes could have initially caused a localised shear failure in the underlying intact peat, which would have reduced its shear resistance and resulted in a redistribution or transfer of lateral load to the adjacent peat downslope. Additional transfer of lateral loading as more material was placed on the slopes could have led to a progressive shear failure and reduction in shear resistance along the base of the peat further downslope. Ultimately, this could have led to the large planar or translational peat slide that occurred on the inclined slopes.

Figure 4-7: Schematic of likely failure mechanism of 16th October peat slide



The magnitude of the load on the intact peat slopes from the arisings was low relative to the scale of the peat slide. Furthermore, excavated arisings from the turbine foundations had already been sidecast on the intact peat slopes in a number of other locations on the site without causing a failure in the peat. Therefore, on its own it does not fully explain why the slide occurred at Turbine T68.

The loading from the sidecast materials has been attributed with triggering the slide, although there were a number of other contributory factors related to the topography, hydrology and peat strength in the area that made the location particularly susceptible to a peat failure. This resulted in a direct effect of significant significance on soils, geology, and land when the peat slide with a footprint of approximately 25ha occurred on the southern slopes of the wind farm site.

Overtime, the site stability impacts associated with the peat slide source area and peat slide debris are considered to have reduced significantly. For a short period of time after the slide in 2003 there was an elevated likelihood of remobilisation of the disturbed peat in the peat slide source area. In instances where this occurred material became retained behind the upslope barrages and removed. No material has been removed from behind barrages since 2007 and inspections have shown that there is no adverse accumulation of debris on upslope side of barrages. Furthermore, site walkovers, surveys and investigations since the peat slide have indicated that the peat within the peat slide source area has become increasingly stable over time, predominantly due to the ongoing drainage of the source area and resulting consolidation of the peat. Minimal peat debris along the debris run-out zone is now evident based on site walkovers downstream of the Black Road Bridge and revegetation of the peat slide source are is observed. The direct and stability impacts associated with the source area and debris run-out zone are therefore assessed as slight to not significant.

In response to the slide a number of temporary and permanent retention barrages were constructed along the slide route. These had a positive impact in terms of site stability by controlling further peat discharges from the source area and along the debris footprint as they retained some of the peat which had been mobilised and re-mobilised and provided stability support to the slide area and debris.

While there were negative site stability impacts associated with the construction of repositories to store the discharged peat, and various floating access tracks, these were considered to be of slight to moderate significance primarily based on their location, ground conditions, loadings and the extent of a potential slide event which could be caused. However, over time it is assessed that due to on-going consolidation of the peat beneath these works their stability has improved and the impact is assessed as slightly significant.

4.7.2.3 Construction Impacts (post peat slide)

For the second phase of construction, after the peat slide, there was a significant reduction in the effects of stability impacts due to some improvement in conditions on the site under sustained surcharge loads from the first phase of construction, and as a result of additional risk mitigation measures that were implemented on the site for the second phase of construction. In particular, this was due to additional extensive site investigation, the testing and analysis of the existing floating road, the storage of excavated materials in designated repositories and the removal of spoil from areas of elevated risk. However, the stability impact associated with the construction of the remaining minor lengths of floating roads was assessed as significant and the live loading on the roads moderate for the remainder of the construction phase.

The highest risk of peat instability was at the time that the materials were placed on the slopes. Over time the peat compressed and increased in strength under the weight of the material so that the effect of the sustained loads on the stability of the peat reduced to moderately significant for the second phase of construction.

The grid connections site stability impacts were assessed as considerably less than the wind farm site mainly due to the nature of the activities (discrete pole and angle mast construction, substation of relatively small footprint) and topography of the OHL route, the majority of which was at a lower elevation and typically on more gently sloping ground. Site stability impacts associated with the construction of the grid connection did not exceed slight significance.

4.7.2.4 Operational impacts

The site activities during the operation and maintenance phases of the wind farm between 2005 and the end of operation in c. 2040 have a much lower impact on the peat. There are no negative stability impacts that have significant or moderately significant effects on the stability of the peat. Operation and maintenance traffic loading on the floating roads is less frequent than during construction and the size of the mobile cranes that are used to service the turbines is kept to a minimum. Also, the performance and capacity of the road has continued to improve due to the

increase in the strength and stiffness of the underlying peat, which has compressed under the weight of the roads.

Upgrading works to c. 4.5km of access tracks were undertaken in 2014 however the thickness of the fill material was minimised to reduce the additional dead load on the roads, and all of the upgraded roads were proof tested to the design crane load on completion to verify their capacity and performance. Therefore, the effect of the additional dead load on the stability of the peat was slightly significant.

The stability impacts associated with the peat in the source area and peat debris are currently considered to be of slight significance. This is mainly due to the drainage and the revegetation of the source area and the degrading of the deposited peat debris.

Other routine operation and maintenance activities for the whole Project, such as tree regrowth topping (including that for the grid connection), drainage works etc. have a slightly significant effect on the stability of the peat.

4.7.2.5 Decommissioning Impacts

Decommissioning the Project in about 2040 will involve the dismantling and removal of all above ground structures on the wind farm site and the grid connection route, including the Agannygal substation, the underground cables on the wind farm site and Barrage 3 and Barrage 4. Therefore, the effect of the live load surcharge on the stability of the peat will be slightly significant.

The primary stability impact of this work will be the live load surcharges on the floating roads on the wind farm site from the construction vehicles, trucks, low-loader transporters and mobile cranes which will not exceed the design and proven capacity of the floating roads. Therefore, the effect of the live load surcharge on the stability of the peat will be slightly significant. There may be a requirement to widen the access track between T31 and T45, depending on the necessary crane requirements, this will only involve a small increase in load on the peat along the edge of the road, which will only have a slightly significant effect on peat stability.

For the grid connection the predominant stability impacts during decommissioning will be the live loadings on the peat due to removal of the OHL structures. Insofar as possible the construction stage access routes will be reused to access the structure locations, the effect of which is assessed as not significant except in a single location at AM38 which is assessed as slight due to deeper peat.

The removal of Barrages 3 and Barrages 4 will involve loading of very shallow peat in order to access and remove the barrage materials. The significance of this impact is considered slight. When the wind farm is decommissioned the site access tracks, turbine foundations, material deposition areas, and hardstanding areas at the turbines and substation will all be left in place on the site. The substation platform will remain in place and the remaining barrages, repositories and floating roads associated with the slide will also remain.

4.7.2.6 Residual Impacts

The residual stability impact of the sustained surcharge loads on the peat along the floating roads and in the material deposition areas will not have a significant effect on the stability of the peat. The turbine foundations and crane hardstandings, substation hardstand and barrages are constructed on the glacial till and rock below the peat so they will provide permanent support to the peat, which is a positive stability impact that is slightly significant.

The improved drainage network on the wind farm site will be maintained up to decommissioning so that it will continue to have a positive impact with a moderately significant effect on the stability of the peat relative to the baseline conditions prior to construction. However, over time the drains will become clogged with vegetation which will result in partial restoration of groundwater levels on the site. In the long-term this will reduce the effect on the stability of the peat to slightly significant.

Residual impacts with respect to the Grid Connection are not considered to be significant.

Residual impact associated with the peat slide source area and debris run-out are considered not to be significant based on the on-going evidence of improvement in direct and stability effects over time since the peat slide and anticipated on-going improvements. The combined effect of the stability impacts which have occurred or will occur in close proximity and the same time have been considered in this assessment.

4.7.2.7 Cumulative Impacts

No significant cumulative impacts have been identified with other projects activities with the exception of turbary turf cutting within and adjacent to the wind farm site. Traditionally carried out by hand, mechanical peat harvesting from turbary plots has become more popular. A peat stability risk assessment carried out for the project has shown that that there are significant areas of the turbary plots where the likelihood of a peat failure due to mechanical peat harvesting under uncontrolled conditions without appropriate mitigation measures rates as being very possible to likely to occur. When no mechanical peat harvesting is being carried out in a turbary plot then the likelihood of a peat failure reduces to a residual level of low. Mitigation measures have been identified to be implemented both by the wind farm itself and by turbary rights holders, which when implemented will reduce the likelihood of a peat slide to low.

4.7.3 Conclusion

The vast majority of direct impacts on Soil, Land and Geology occurred during the construction phase. These impacts include the excavation of peat and the covering/sealing of the land and the change in the water table levels within the peat. The direct effects are assessed based on a combined level of sensitivity of the peat.

The excavation and disposal of the peat for the Project had the most significant direct impact on soils geology and land. The majority of this excavated peat was on the wind farm site. The significance of the effect of excavation was assessed as of

significant significance. In particular, the oxidisation of carbon and land use due to of removal of peat on the peat slopes has led to this effect.

The peat slide which occurred immediately downslope of Turbine T68 on the southern slopes of the wind farm displaced some 450,000m^3 of peat of which an estimated 250,00m^3 moved downslope into the Owendallulleegh river catchment. Consultants have identified this location as the likely initiation point for the slide. At the time of the failure, peat was being excavated from the site of the turbine and the arisings were being placed or “sidecast” onto the intact peat slopes on the downslope side of the turbine and floating road. Consultants investigating the slide concluded that the construction activity, and particularly the placing of arisings onto the intact peat slopes in combination with other factors, most likely triggered the slide.

Other direct impacts have resulted in effects of lesser significance including the tracking of plant across the bog, the removal of forestry, drainage works, rock excavation and the sidecasting of peat on peat slopes across the project site. In addition, for the grid connection works the construction of Agannygal substation and the lowering of the ground below the 400 kV line are assessed as of slight significance. For the peat slide response works the impact of the construction of the barrages were considered of slight significance also.

Over the life time of the project the direct impact on land use has not and will not significantly vary from the construction phase however where the peat has been excavated or where disturbed peat has compressed or revegetated a new carbon flux regime will result and this will lead to a reduction in the rate of decomposition of the excavated peat. Ongoing maintenance activities such as drainage works, or tree regrowth topping will have an effect of slight significance. For the continued drainage of the wind farm site the effect, in particular, with respect to carbon flux is assessed as of slight significance.

The likelihood of cumulative site stability impacts arising from turbary activities using mechanical harvesting equipment will reduce to low likelihood of occurrence with the implementation of proposed mitigation by the wind farm and the turbary rights holders.

For the decommissioning phase of the project the direct impacts on soils land and geology of significance will be restricted to the tracking of plant across the deeper peat slopes for the OHL and barrage decommissioning works. These have been assessed as of slight significance.

The residual direct impact on soils, geology and land following decommissioning of the project that are of significance will be the ongoing release of stored carbon predominantly as a consequence of the excavated and/or deposited peat across the Project footprint and the peat slide event in 2003. On the wind farm site specifically, another residual impact is the ongoing drainage of the site however this is likely to be reduced overtime as the drainage channels become partially blocked over time.

Following the peat slide in October 2003 extensive mitigation measures were implemented for the remainder of the construction phase in order to reduce the likelihood of further peat instability. No further peat slides occurred during the works.

The likelihood of site instability as a consequence of the project activities would have been most elevated during the construction phase. Since then the on-going loading and drainage of the peat has resulted in a strength gain in the peat which has led to improved site stability conditions.

Standard operating procedures have been and will continue to be implemented for the operation phase of the project which take account of necessary controls identified during the design and construction phase to mitigation site instability impacts. For decommissioning activities these controls shall also be incorporated into the works methodology.

4.8 Hydrology and Hydrogeology

This assessment addresses the impacts on the hydrological and hydrogeological environment of the Wind Farm Project. The impacts may comprise the changes in volume and rate of surface water flow and direct or indirect impacts on the quality of surface waters and groundwater. All available records of construction activities and operational infrastructure were reviewed to identify how different activities were likely to impact upon identified water bodies including watercourses within and downstream of the Project areas.

4.8.1 The Baseline

Much of the information on the baseline (pre-construction) environment within the Project site was gathered through a desktop review of literature prepared from 1998 to 2003 from various sources and an analysis of aerial photography.

The wind farm site partially extends over the catchments of three rivers – Boleyneendorrish and Owendalulleegh in the Galway Bay South East EPA catchment and Duniry in the Lower Shannon EPA catchment. The Boleyneendorrish River drains approximately one-third (33%) of the wind farm site. The Owendalulleegh River System drains approximately two-thirds (66%) of the wind farm site through a number of small hill slope stream tributaries. The Duniry River drains a very small section of the site (<1%) to the northeast, see Figure 4-8: Catchments in relation to Derrybrien Wind Farm Project. Major drainage features tend to run east to west in the overhead line corridor, with minor tributary features aligned approximately north to south to tie into the major drainage features. The land on which Agannygal substation is located is elevated with respect to the surrounding areas to the north, west and south. There is no record of drainage on or in the vicinity of this site prior to construction.

Mudstones, siltstones and conglomerates underlie most of the wind farm site. This bedrock is a muddy impermeable bedrock that is not very conducive to transmitting and storing groundwater flow. Groundwater at the wind farm site can be classed as not sensitive to pollution, as the underlying bedrock is classified as a Poor Aquifer.

In addition, most of the site is covered in peat and poorly draining soils, which act as a protective cover to the underlying aquifer. Any contaminants that may be accidentally released on site are more likely to travel to nearby watercourses within surface runoff. The relatively low permeability of the bedrock means that contaminants in the overburden will not be very mobile and any contaminant that may reach the bedrock would not disperse and would remain localised to the source or would be diluted and removed as part of runoff during wet periods.

In Derrybrien village there is a group scheme serving 10 houses, while others have their own independent wells and some others – as well as the local church, harvest rainwater.

Before its development, the wind farm site had been extensively drained by a series of parallel open ditches developed to facilitate peat production, commercial forestry and turf cutting under turbary rights. Turf cutting has and continues to take place on the eastern part of the site.

The baseline hydrology of the site is characterised by high surface water runoff rates and a very flashy stream network.

4.8.2 Impacts of the Development

Construction activities would likely have resulted in the release of suspended solids to surface watercourses leading to an increase in the suspended sediment load, resulting in increased turbidity. This would likely have had water quality impacts in downstream waterbodies. Potential impacts would have been significant throughout the construction stage if not adequately mitigated against. However, a range of measures were put in place both prior to and following the October 2003 peat slide event to mitigate against the release of silty water into watercourses.

During the operational phase of the wind farm, the drainage network has experienced a variety of large storm events ranging from intense short-duration events to long-duration winter floods which saturated the wider area. The drainage network has - to date, demonstrated sufficient capacity to convey floodwaters without causing excessive flooding of access tracks and turbine bases and not requiring any significant drainage maintenance works. There is no engineered storage or attenuation of surface water runoff provided on site before discharging to receiving watercourses. Runoff water from the gravelled turbine bases and roads is discharged as over the edge drainage distributed over the entire site with limited concentration of wind farm site drainage to single point outfalls.

Regular maintenance has been carried out as necessary since commissioning with drainage inspections carried out monthly and following heavy rainfall or snow events. Maintenance issues included clearing out blocked drains at inlets or outlets, deepening or widening drains to increase capacity and flatten side slopes along access tracks at the main watercourse crossings, regrading drains that were shown to have insufficient fall and repair or replacement of collapsed culverts.

Specific works carried out in response to the peat slide included diversion of drains away from both sides of the slide area and upstream of it on the wind farm site. Drain diversions had a permanent but imperceptible downstream hydrological impact.

The containment barrages structures installed in response to the slide were designed to allow water to flow through while retaining sediments and other solids. In several cases drainage pipes enabled the flow of water through the structure. The barrages were constructed to prevent further movement of the mobilised peat and to prevent possible further release of debris into the watercourses. Silt, peat and other debris built up on the upstream side of a number of barrages, but this material was removed to maintain their functionality. However, as the barrages were properly maintained following their installation, they posed instead only a slight impact from a hydrological perspective during the construction phase. Since commissioning of the wind farm, Barrages 1 and 2 have only required a small amount of debris clearance most recently in 2009 while Barrages 3 and 4 have not required any clearing out of debris.

The physical nature of the river downstream of the slide area was altered following the slide. The most severe impacts were in the upper reaches of the river. The effects on the river hydromorphology are considered to have only been short-term as the environment was judged to have recovered back towards pre-slide conditions in the years following the slide.

The peat slide resulted in damage to several pre-existing in-stream structures downstream of the wind farm. Repairs were carried out to address structural stability and capacity concerns, thus returning them to their original respective flow capacities. In all cases the in-stream structures were returned close to their pre-existing state with no impact on the overall flow regime locally, upstream or downstream.

The continued effectiveness of the drainage network is dependent on the continuation of the current inspection and maintenance regime which will be maintained during the wind farm lifetime.

Water quality impacts potentially arising during the operational and decommissioning phases of the wind farm are likely to be limited to minor siltation or pollution incidents as a result of small-scale works. Such local incidents will not give rise to significant impacts on water quality in downstream receiving streams and rivers. Appropriate precautions have been and will be taken to ensure the protection of watercourses from silting during any maintenance activities.

The operation and future decommissioning of the Derrybrien Wind Farm Project will not give rise to any significant residual hydrogeological and hydrogeological impacts.

The cumulative assessment of impact considered a number of existing / approved projects and activities. Several flood relief measures and flood relief schemes have been put in place or are being planned in the Gort Lowlands area. While the effect of the wind farm drainage is to increase peak surface water flow rates in the vicinity of the wind farm, this effect diminishes rapidly downstream in the larger river catchments such that by the time flood flows reach Lough Cutra and the Ballylee

Thoor floodplain area, the increased runoff rate is not significant in respect to flooding and flood risk.

There are no significant cumulative impacts on hydrology and hydrogeology arising from the wind farm Project in combination with any other projects constructed since commissioning, under construction or in planning.

4.8.2.1 Flood risk assessment

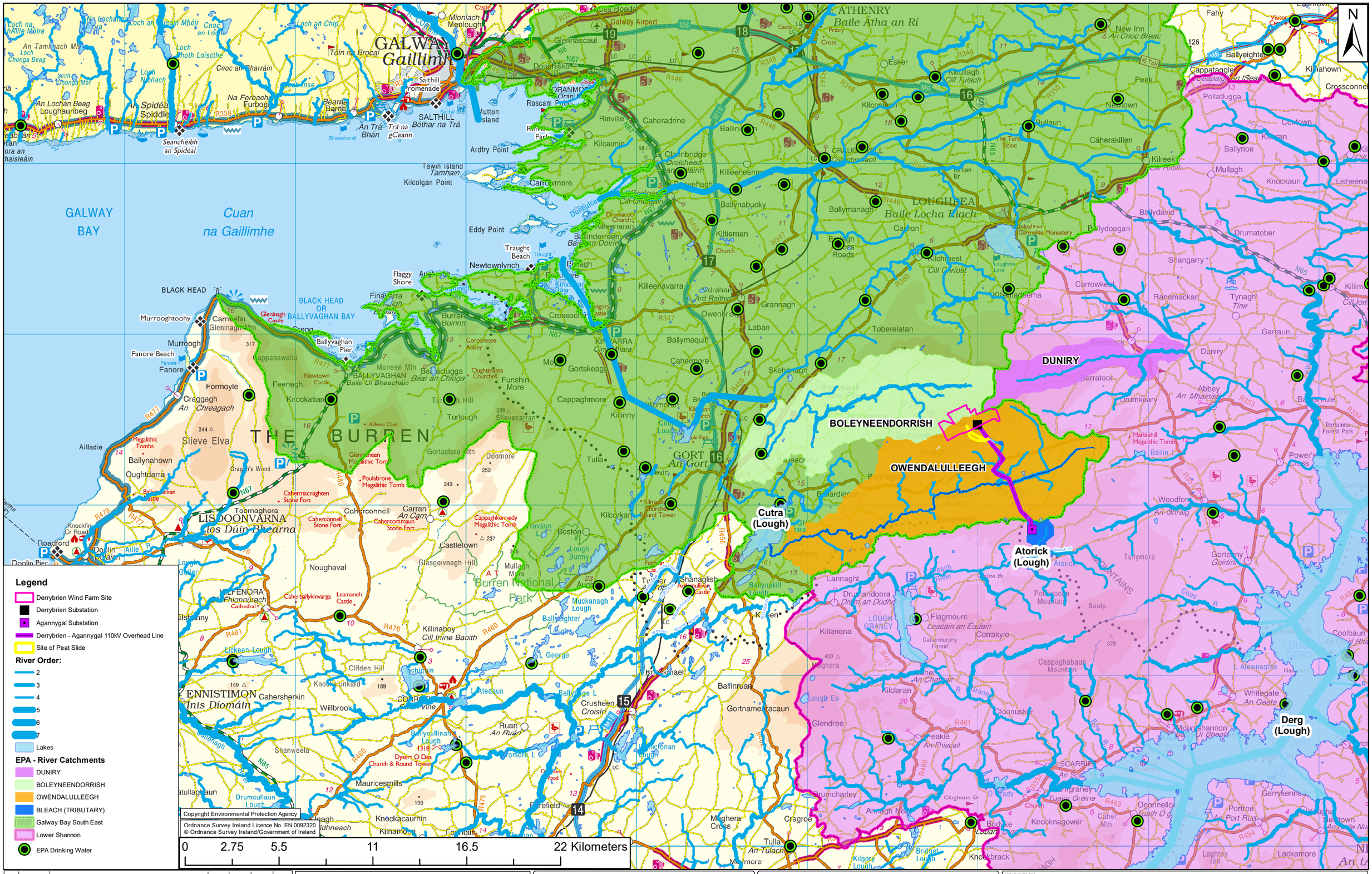
The change in land use in some areas from pre-construction “Greenfield” to gravel and concrete (with associated drainage efficiency) was, along with tree felling and improvements to the drainage network, responsible for any increase in downstream flood flows. Overall it is considered that the Project has increased the flood runoff rate over its former forestry and turbary uses from a high runoff category to a very high runoff category. The assessment of the effect of drainage associated with the wind farm showed a minor local increase in mean annual flood flows leaving the wind farm site. This flow increase is not significant in respect of the downstream receiving watercourses and as such did not result in any significant increase in flood risk or changes to river / stream channel morphology. Similarly, at a broader regional scale, where downstream floodplains to the west would be more sensitive to any increased flood risk, it was concluded that any increases in flood peaks and volumes would be imperceptible.

At Agannygal substation, the lack of flow attenuation features and the nature of drainage disposal offsite has had a slight negative impact as it does cause a noticeable change in the character of the environment but does not affect its sensitivity regarding flood risk.

The Project is therefore in overall compliance with the objectives of the Planning and Flood Risk Management Guidelines. The Derrybrien Wind Farm Project therefore has not and is not anticipated to give rise to any significant impacts related to flood risk locally or downstream of the site.

4.8.3 Conclusion

Based on the assessment of impacts on Hydrology and Hydrogeology, it was concluded that the Derrybrien Wind Farm Project has not and is not anticipated to give rise to any significant impacts related to the hydrological or hydrogeological regime or result in any unacceptable downstream hydrological impacts.



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4.9 Air and Climate

This assessment looks at the impact of the Project with respect to air quality and climate. The effects associated with the development are described with respect to the EPA Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR), Draft, August 2017.

4.9.1 The Baseline

Under the Clean Air for Europe Directive, EU member states must designate "Zones" for the purpose of managing air quality. For Ireland, four zones were defined in the Air Quality Standards Regulations (2011) and updated in 2013. The Derrybrien Wind Farm site and grid connection (110kV Overhead line and Agannygal substation) are located within the air quality management Zone D, which is a rural zone.

To assess the impact of the Project baseline air quality data for Zone D was obtained from the published EPA Air Quality in Ireland Reports dating from 1998, from the EPA network of air quality monitoring stations (historic and in current operation with data obtained from station reports and from the EPA SAFER database) and from current air quality data obtained from the EPA's Ambient Air Quality Monitoring sites and Air Quality Index for health mapping. Historic and current monitoring data for Zone D indicates that air quality was generally good in this zone and was compliant with the Irish Air Quality Standards, derived from the EU Directives on air quality, both at the time of construction and during its operational period to date.

Emerging trends regarding air quality in Ireland in general have been highlighted as an area of concern by the EPA in more recent reports when air quality data is compared to the stricter World Health Organisation Standards. Comparison with these WHO standards indicate emerging issues with fine dust particles (referred to as particulate matter of either ten micrometers (PM_{10}) or two point five micrometers ($PM_{2.5}$) in size), with oxides of nitrogen (NO_x) and with Ozone. For the rural Zone D fine dust particles coming from the combustion of fossil fuels are the main concern as these can enter the lungs and give rise to respiratory problems.

4.9.2 Impacts of the Development

4.9.2.1 Air Quality

During construction, air quality impacts would have arisen primarily from dust emissions from dust generating activities on the site and from construction equipment and delivery vehicles exhaust gas emissions. However, these impacts on air quality would have been very localised to the construction sites at the wind farm itself, at structure locations along the overhead line and at the Agannygal substation and would have been of a temporary nature. The nearest occupied dwelling to the wind farm itself is more than 2km distant, with the nearest construction location on the overhead line to a dwelling being 380m and the nearest dwelling to the substation site being 540m. Based on guidance provided by the Institute of Air Quality Management and given the distances of occupied dwellings to these construction sites there would be negligible risk and no significant air quality impact would have

occurred at any of these receptors. The impact from vehicle exhaust emissions on air quality would also have been negligible and not significant. Similarly, the peat slide incident that occurred necessitated some construction activities post the slide, but these did not give rise to significant air quality impacts

During the operational phase of the wind farm the project has not given rise to emissions to atmosphere and thus no adverse impact on general air quality has arisen. It has had a beneficial effect during this period in providing for energy without emissions of recognised environmental pollutants through displacement of fossil fuel energy production with clean renewable energy. This will continue throughout the operational period of the wind farm.

At the end of its life the Project will be decommissioned with minimal decommissioning works. As it is intended to remove only some structure foundations and to confine decommissioning to above ground structures the potential for generation of dust related emissions will be low and confined mainly to the demolition of the substation and control building at the wind farm site. The impact from dust arising from decommissioning of the line and substation will be of negligible risk and no significant impact will occur. To ensure that no impact will arise decommissioning mitigation measures such as road and stockpile dampening and minimising the area of exposed stockpiles of demolition materials together with a dust management plan will be implemented.

In summary the impacts on air quality arising from the construction, peat slide and subsequent operation of the wind farm have been negligible and insignificant in terms of negative impact with positive benefits on air quality in general identified as a result of its renewable electricity generation and the displacement of fossil fuel derived electricity which would have generated air borne pollutants from combustion of such fuels.

4.9.2.2 Transboundary Gas Emissions

Air pollution is a local, regional and global problem that results from anthropogenic activity. The impact of air pollutants is wide and varied, affecting both the environment and human health. The pollutants (SO2), (NOx), volatile organic compounds (VOC) and ammonia (NH3) are responsible for long-range transboundary air pollution such as acidification, eutrophication and ground-level ozone pollution. Fossil fuel thermal electricity generation plants release significant quantities of these gases into the atmosphere as do other sectoral activities. Electricity generation from renewable sources such as Derrybrien Wind Farm rather than fossil fuel sources reduces atmospheric pollutants.

The wind farm does not give rise to air emissions but each new megawatt (MW) of renewable electricity it generates potentially displaces sulphur dioxide ($SO_{2)}$, nitrogen oxides (NOx) , carbon monoxide, non-methane volatile organic carbons, and dust of 2.5 microns in size on an annual basis which will continue throughout its operational period. emissions compared to equivalent thermal generation plant. The wind farm

development has had a positive effect in the medium term on transboundary air quality.

4.9.2.3 Climate Change and Greenhouse Gas Emissions

The principal greenhouse gas associated with climate change is carbon dioxide. All organic material contains carbon which can be released when the material decays in a natural process or is released through fossil fuel combustion as part of a manufacturing or construction process. In the context of the Project, carbon can be lost through loss of sequestered carbon stored in peat, loss of sequestered carbon stored in forest plantations and loss of the future potential to store carbon in these carbon sinks which were removed as part of the project construction or as a result of the peat slide. Any such carbon losses need to be offset against carbon savings from production of renewable electricity to determine the effective displacement of fossil fuel generated electricity.

The construction of the wind farm and associated ancillary works (including substation and grid connection) required forest plantation clear-felling, drainage and excavation of peat. Carbon stored in peat has therefore been lost during construction both from the excavated peat and from its drainage. The carbon sequestration potential from actively growing peat has also been lost. The peat slide event which occurred during construction also displaced a large quantity of peat resulting in additional carbon losses. Carbon was also lost arising from the clear-felling of the commercial forest plantation, from forest plantation lost as a result of the peat slide and from potential loss of sequestration of carbon that would have occurred if the forest remained unfelled. During the operational period additional felling also took place.

In addition, carbon losses to the atmosphere from anthropogenic sources such as energy and fuel used for wind turbine manufacture and delivery, construction material production (fill, steel and concrete) and from construction and transportation activities (fuel use) to build the wind farm and its ancillary developments will also have occurred.

By contrast, operation of the wind farm, generating renewable electricity, has and will continue to displace emissions from fossil fuel-based electricity production in Ireland. These emissions include carbon dioxide, oxides of nitrogen and sulphur dioxide, the principle atmospheric gases emitted by thermal combustion electricity generating stations operating on coal, gas, peat or oil, which contribute not only to climate change but also transboundary air pollution.

It is important therefore that the balance of carbon costs from the construction of the wind farm and its ancillary infrastructure is assessed against the benefits of displacing fossil fuels arising from its operation to determine the significance of its contribution to greenhouse gases and climate change.

To assess the carbon losses the online carbon calculator tool developed by the Scottish Environmental Protection Agency (SEPA) specifically to assess, carbon

losses and savings from the construction and operation of wind farm developments on peat lands has been used.

The construction of the Project resulted in the permanent loss of circa 100,459 tCO_2eq from peat sources (including the peat slide). The clear-felling of forest plantation for the project development and subsequent operation resulted in an estimated loss of carbon of **73,392 tCO_2eq.** A small area of improved habitat estimated at 0.88ha occurred as a result of revegetation of the borrow pits. This is estimated to have reduced carbon losses by **122 tCO_2eq.** The total carbon cost of constructing the Derrybrien Project (wind turbine lifecycle, backup power, peat carbon including the peat slide and forest clear-felling) was therefore **227, 688** tCO2eq.

The wind farm generates electricity by harnessing the wind and supplies the power generated to the national Electricity Network. The wind farm was commissioned in 2006 and has to date (mid 2020) generated circa 1,897,000 MWh of clean renewable electricity. Based on experience to date, it is anticipated that the wind farm will continue to generate approximately 121,500 MWh of electricity annually, but this will be dependent on climatic factors. The payback period of the wind farm carbon budget has been estimated based on displacing a fossil fuel generator in Ireland. Variable renewable energy generators such as wind primarily displace electricity from the last fossil fuel plant dispatched to meet electricity demand, also known as the marginal generator. In Ireland these are mostly assumed to be gas generators (*Sustainable Energy Authority of Ireland, Renewable Energy Generation in Ireland 2019 Report*). Based on the displacement of gas generated electricity the carbon payback period for Derrybrien wind farm including the peat slide would be circa 4.7 years in a worst-case scenario.

The operational impact of the wind farm has therefore been a positive effect overall, of moderate significance and medium term in nature. The effect of the wind farm on climate change through reduction of greenhouse gases during its ongoing operation will continue to be positive in terms of effect on climate change, of moderate significance and medium in term. The continued production of renewable electricity will contribute to meeting Ireland's obligations under the Renewable Energy Directive, to decarbonising the Energy Sector and to achievement of the Government's ambitious targets set in the Government's Climate Action Plan.

When the wind farm finally ceases operation and is decommissioned it will no longer generate renewable electricity and its carbon displacement potential will be lost. The effect on reducing greenhouse gases linked to climate change from electricity generation will be negative, immediate and of medium term as it would be expected that alternative renewable generation would be developed to ensure the national greenhouse gas reduction targets are adhered to.

4.9.2.4 Cumulative impact assessment

Cumulative impacts with other projects in the general area have been assessed and no significant air quality effects were identified.

During its continued operational period ongoing positive cumulative impacts will occur with Sonnagh Old wind farm through continued displacement of fossil fuel generated electricity by renewable production from the two wind farms. This will have a continued positive effect on reducing greenhouse gas emissions in the medium term and positively effecting climate change.

4.9.3 Conclusion

During the construction phase of the Project, including the period when the peat slide event occurred, localised air quality impacts would likely have occurred from dust generation and from vehicle emission exhausts at the construction sites at the wind farm itself, along the overhead line route and at the Agannygal Substation site. However, these would have been of short duration and given the distances from construction activity locations to the nearest occupied dwellings no significant impacts are predicted to have occurred.

In terms of greenhouse gas emissions and climate change the carbon costs of constructing the wind farm have been estimated at **227,688** tons of CO_2 largely due to carbon losses from peat displaced or drainage requirement and forest felling required for construction. Based on the annual renewable electricity production of Derrybrien Wind Farm and the estimated annual carbon fossil fuel electricity generation displacement saving the carbon costs required circa 4.7 years of operation to offset. The Derrybrien wind farm has fully paid back the carbon cost of constructing the wind farm since circa mid- 2011. It annually produces circa 121,500 MWh of renewable electricity continuing to displace fossil fuel generators on the system reducing greenhouse gas and transboundary air pollutant emissions and avoiding the need to import fossil fuel and its associated costs. The overall impact can therefore be said to be positive, of moderate significance and medium term in duration.

4.10 Material Assets

As part of the overall assessment completed for Derrybrien Wind Farm (the Project) an assessment on material assets was undertaken – both of the environmental impacts to date, and potential impacts into the future.

4.10.1 The Baseline

The assessment initially considered the baseline condition / environment relating to material assets. That assessment excluded the following material assets as they were not considered likely to be significantly impacted by the Project:

- Airports and navigation
- Cities, towns, villages and settlements
- Agronomy
- Commercial and Industrial Development

Included in the assessment were water supply, sewerage schemes and wastewater infrastructure, energy infrastructure, telecommunications, tourism and recreational infrastructure and land use. The baseline described these 'assets' before the Project started (i.e. pre-construction). It should be noted that no notable alterations to either water supply, sewerage schemes and wastewater infrastructure, telecommunications and tourism and recreational infrastructure are made by the Project.

In considering the impacts of the Project which occurred during construction the assessment considered many aspects including the following:

- Water supply, sewerage management and telecommunications services on site.
- Energy infrastructure including electricity / power provisions during construction and construction works which impacted on energy infrastructure e.g. the existing Ennis-Shannonbridge overhead line (OHL).
- Surrounding tourism and recreational infrastructure.
- Land use within the Project site and changes which occurred during construction.

4.10.2 Impact of the Development

Findings of the assessment for the construction phase concluded that there was no impact on either a public sewer network or tourism and recreational infrastructure while impacts on telecommunications led to short-term, imperceptible, negative effects. Impacts on water supply, energy infrastructure and through the use of natural non-renewable fuel in diesel fuelled generators led to short-term, not significant, negative effects. While finally, the change in land use from commercial forest to a commercial wind farm, overhead line and grid connection is considered significant, neutral in nature as both are industrial land uses and of long-term in duration.

In considering the impacts which occurred during the response to the peat slide the assessment considered the following:

- Temporary closure of local and regional roads which could impact on tourists.
- Impacts on the Gort Water Supply scheme.
- Land use changes as a result of the peat slide.

Findings of the assessment for this phase concluded that temporary, negative, imperceptible effects were experienced by tourists in the area, significant, negative and temporary effects on the local community occurred in relation to water supply while long-term, moderate, negative effects occurred specifically in relation to land use.

In considering the impacts which occurred during the operation of the wind farm to date, the assessment considered aspects including the following:

- Water supply, sewerage management and telecommunications services for the Project.
- Energy infrastructure including electricity / power provisions.

- Television reception and signal interference.
- Surrounding tourism and recreational infrastructure.
- Land use and changes which occurred during operations of the wind farm.

Findings of the assessment for this phase concluded that effects in relation to material assets as a result of the Project were primarily long-term, imperceptible, negative impacts. However, in relation to energy supply long-term, significant, positive effects were experienced.

In considering the impacts which are likely to occur in the years ahead, both for ongoing operation and ultimate decommissioning, the assessment considered both the previously mentioned operational aspects and the following aspects associated with decommissioning:

- Water supply, sewerage management and telecommunications services.
- Energy infrastructure.
- Television reception and signal interference.
- Surrounding tourism and recreational infrastructure.
- Land use within the Project site and changes likely to occur during decommissioning.

Findings of the future operational assessment concurred with prior operational effects to date. Findings of ultimate decommissioning concluded that effects in relation to material assets as a result of the Project are expected to be primarily short-term, not significant, negative effects. However, in relation to energy supply long-term, significant, negative effects are anticipated.

No mitigation is proposed in relation to material assets.

4.10.2.1 Conclusion

In summary, during construction changes in land use were considered significant albeit neutral in effect; during the response to the peat slide significant, negative effects were experienced by the local community in relation to water supply however these effects were temporary and at no time was supply interrupted. Finally, in relation to energy supply long-term, significant, positive effects were experienced during operation of the wind farm while long-term, significant, negative effects are anticipated as a result of decommissioning of the wind farm.

4.11 Roads, Traffic and Transport

4.11.1 The Baseline

The assessment initially considered the condition of the receiving roads, transport and traffic environment before the Project started (i.e. pre-construction). In doing so it noted that there is little or no public transport in the vicinity of the Project and that aspect was not considered in great detail. In relation to existing roads and traffic conditions, the assessment described a variety of roads in the vicinity of the Project including minor tracks (either private or owned by Coillte) and local roads experiencing low traffic volumes, regional roads also experiencing typically low traffic

volumes and further afield national roads with significantly higher traffic volumes as would be expected. It should be noted that no notable alterations to the public network (e.g. road junction changes) are made by the Project.

In considering the impacts of the Project which occurred during construction the assessment considered many aspects including the following:

- The numbers of personnel, equipment and the volumes of materials which had to be brought to the site including wind turbines.
- The various works undertaken including tree felling and civil works (e.g. building access tracks / roads, turbine foundations and substation foundations).
- Upgrading of existing roads and bridges on the public network (e.g. Black Road).
- Construction of the electrical aspects of the Project including the substations, cabling and overhead power lines.

The general road network and access to the project site areas is shown on **Figure 4-9: Site Context.**

4.11.2 Impacts of the Development

Findings of the assessment for the construction phase concluded that significant negative effects, on roads, traffic and transport, were experienced during the peak construction phases when the most vehicles were using the local and regional road network around the Project. However, these effects were short-term in duration with imperceptible effects experienced further afield on the national road network.

In considering the impacts which occurred during the response to the peat slide the assessment considered aspects including the following:

- The numbers of personnel, equipment and material volumes which were used in the response.
- Temporary closures of local and regional roads surrounding the works.
- The various works undertaken including construction of access tracks, repairs to bridges.
- Tree felling required during the response.

Findings of the assessment for this phase concluded that significant negative effects, on roads, traffic and transport, were experienced by users of the local network. Again, these effects were temporary in duration with imperceptible effects experienced further afield.

In considering the impacts which occurred during the operation of the wind farm to date, the assessment considered aspects including the following:

- The numbers of personnel, equipment and material volumes used in operation and maintenance of both the wind farm and the associated overhead power lines and substation.
- The various works undertaken including repairs to roads both within the wind farm and on Black Road.

Findings of the assessment for this phase concluded that no significant effects were experienced although short-term, negative slight effects occurred on the surrounding network. The assessment notes that slight, long-term positive effects were experienced in relation to the improvement works undertaken at public roads and bridges.

In considering the impacts which are likely to occur in the years ahead, both for ongoing operation and ultimate decommissioning, the assessment considered both the previously mentioned operational aspects and the following aspects associated with decommissioning:

- The numbers of personnel, equipment and material volumes anticipated for decommissioning activities.
- The various works which will be undertaken including removal of some barrages, turbines, substations and overhead power lines.

It is anticipated that the effects of future operations will be consistent with those which have occurred during operation to date. During decommissioning there will be moderate, negative impacts likely during peak activity periods albeit temporary in duration with imperceptible effects beyond the local network. Again, the assessment notes that slight, long-term positive effects are likely to be experienced in relation to the improvement works undertaken at public roads and bridges.

4.11.3 Conclusion

In summary, during construction the impacts on the local network were significant, as is the norm with construction projects of the scale of this development. Similar impacts are expected during decommissioning. However, the only long-term impacts associated with the project are positive as a result of the upgrade of various roads and bridges in the vicinity of the Project.

Various mitigation measures are proposed for decommissioning of the Project in order to mitigate the effects identified herein.

N

Coillte Track:
Primary Wind Farm Access Road

Site Entrance

Derrybrien Wind Farm

Derrybrien
Substation

Site Access From Public
Road Network

Coillte & Private
Access Location

Coillte Track:
Turbary Access

Black Road

Derrybrien - Agannygal 110kV Overhead Line

Unnamed Local Road A

Site Access

Site Access
From Public
Road Network

Agannygal Substation

R380

R353

Inset Map

Galway

Derrybrien
Wind Farm Project

Legend

- Derrybrien Wind Farm
- Agannygal Substation
- Derrybrien Substation
- Derrybrien Wind Farm Site Entrance
- Derrybrien - Agannygal 110kV Overhead Line
- Derrybrien Wind Farm Site Access Road
- Derrybrien Wind Farm On site roads
- Site Access Road to Substation

0 1 2 3 4 km

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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☒ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

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PROJECT: Derrybrien Wind Farm Project

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4.12 Cultural Heritage

The term 'Cultural Heritage' as encompassing several aspects of tangible assets, including archaeological monuments, artefacts and architectural heritage structures, as well as intangible assets such as folklore, oral tradition and language.

4.12.1 The Baseline

The recorded and potential cultural heritage resource within a study area encompassing the wind farm site, including the peat slide and areas of remedial works, and the lands extending for 3km from its boundary, was reviewed in order to compile a comprehensive cultural heritage context for its location. A study area extending for 100m from either side of the Derrybrien-Agannygal 110kV Overhead line and Agannygal substation was also reviewed to determine if the construction of pole set, mast and substation structures had resulted in direct or indirect impacts on the locations and settings of any cultural heritage assets.

The assessment commenced with a desktop study that sought to identify all recorded archaeological, architectural and other cultural heritage sites within the study area and also endeavoured to identify any unrecorded features or areas of cultural heritage significance. The Sites and Monuments Record (SMR) and the Record of Monuments and Places (RMP) for County Galway, both published by the Archaeological Survey of Ireland (ASI), were the principal sources consulted for identifying known archaeological sites. The Record of Protected Structures (RPS) and the National Inventory of Architectural Heritage (NIAH) were consulted to assess the designated architectural heritage resource. The archaeological assessments compiled as part of the planning applications for the wind farm were also reviewed as were the results of subsequent phases of archaeological monitoring of the construction phases.

The wind farm and locations of associated off-site grid connection, peat slide and remedial works were inspected in August 2018 and October 2019. The environs of all internal elements of the wind farm development were inspected, i.e. turbines, road system, sub-station, masts and former borrow pits. A visual inspection of the overhead line and substation and location of the peat slide, both of which extend to the south of the wind farm, was also undertaken during the site inspections.

There are eleven recorded archaeological sites located within the 3km study area around the wind farm. There are no Preservation Orders on any of these sites and none have been designated as National Monuments. The nearest National Monument to the wind farm site is Isert Kelly Castle (Nat. Mon. ref. 272) which is located approximately 9.7km to the northwest. There are no recorded archaeological sites with visual alignment attributes, such as megalithic tombs and stone circles, located within the study area.

The recorded location of a cashel site (GA124-001----) is adjacent to an access road in the northwest quadrant of the wind farm. There are no surface remains of this site and the ASI records that it may have been destroyed by the forestry plantation which

occupied this area prior to the wind farm development. This site was not included in the RMP for Co. Galway published in 1997 and is not indicated as an archaeological site on the SMR map dated to the same year. The site is also not depicted on consulted historical maps and is not included in the archaeological assessment reports associated with the wind farm development in the late 1990s and the 2000s. The current online description of the site was uploaded to the National Monument Service's online Historic Environment Viewer in 2015 indicating that it was added to the SMR following construction of the wind farm. No traces of any archaeological features at its location, environs or within any other area of the wind farm were identified during archaeological monitoring of ground works during the construction phases. There are no other recorded archaeological sites located within 400m of the wind farm. It was verified on site that this feature exists as a level, soil-covered area flanked by an access track to the south and east which curves around its recorded location in the northwest corner of the wind farm. No traces of potential archaeological features were noted in this area during any of these site inspections. The consulted site drawings indicate the location of Borrow Pit 2 within the environs of this area which was subsequently infilled. There was no clear surface trace of this infilled pit noted during the site inspection and it is noted that nothing of archaeological significance was identified in this area during the monitoring of the wind farm construction.

There are no recorded archaeological sites within the environs of the peat slide, barrages and other remediation measures. The nearest example to this area is a burial ground (GA124-005----) which is located approx. 1.9km to the southwest of Barrage 4 and 2.1km south of the peat slide. A 2005 archaeological assessment of proposals for peat slide remedial works concluded that there were no unrecorded archaeological sites or other cultural heritage features located within the environs of the work locations. There are no recorded archaeological sites located within the study area extending for 100m from either side of the grid connection route and around Agannygal substation.

There are no Protected Structures or structures listed in the National Inventory of Architectural Heritage located within or in close proximity to the wind farm site or within the environs of the peat slide, remedial works, grid connection route and Agannygal substation.

4.12.2 Impact of Development

The footprint of the wind farm turbines, roads, substation, overhead grid connection and ancillary works remains confined within the area of their original construction and, other than the remedial peat slide works, no areas of additional ground works, which may have had the potential to impact on unrecorded, sub-surface archaeological features, were noted during the inspection of the wind farm.

Access to the wind farm site continues to be gained via the pre-existing forestry track extending from the Black Road to the east and the section of this public road to the east of the wind farm was upgraded during works. There are no recorded

archaeological sites or architectural heritage structures located along the Black Road margins and no unrecorded examples were noted during the site inspection of sections of this road that were upgraded as part of the development. The small bridges on this road are of modern concrete construction with sections of recently constructed rubble masonry walling attached to the concrete slab parapets. The south-facing hillslope on the footprint of the peat slide is now occupied by forestry regrowth and no traces of recent ground excavations works were noted in its vicinity The remedial work locations on the east and west sides of the road were inspected in advance of the works during the archaeological assessment prepared by the Moore Group and nothing of significance was identified. These locations and their environs were also inspected as part of the current assessment. The barrages comprise rock boulders set on existing ground and no potential unrecorded archaeological or architectural heritage features were noted at their locations or along their approaches from the road. There are no recorded archaeological sites or designated architectural heritage structures located within the sections of the Coillte landholding impacted by access, drainage and barrage works undertaken within the vicinity of the peat slide and. A two-arch masonry road bridge, known as the Flaggy Bridge, over a stream flowing under a section of the R353 road to the southeast of the wind farm and to the south of the peat slide remedial works was also inspected. This bridge is not listed in the RPS or NIAH but is of potential 18th/19th century date and is of local architectural heritage significance. It has round arches with tooled voussoirs, a central u-cutwater and low random rubble parapet walls. Repairs to the roadside parapet of this structure have not impacted on the underlying arches, which remain well-preserved, and have been undertaken with appropriate random rubble limestone material.

The locations of the overhead line and Agannygal substation were also visually appraised during the site inspections. Apart from the footprint of the overhead structures and regrading under the 400kV line for clearance purposes, the ground levels within the felled corridor appear to have otherwise remained undisturbed during the construction of the overhead line and periodic cutting of regrowth which has not entailed root extractions. The line extends over the Owendalulleegh River and no in-channel works were undertaken during its construction. The historic OS maps indicate that the section of the overhead line within lowlands to the south of Derrybrien were primarily composed of vacant bog land during the middle of the 19th century while small, dispersed field systems within reclaimed areas had begun to be developed by the end of that century and continued to expand into the 20th century until the area was extensively planted with the existing forestry. There are no farmyards or other built features shown on the footprint of the overhead line and substation on any of the historic OS maps and no unrecorded features were noted during the inspections.

Based on the results of the archaeological monitoring of ground works during construction combined with the current assessment, it is concluded that no negative effects occurred on the archaeological, architectural and cultural heritage resources during the construction phases of the wind farm.

It is concluded that no effects occurred on the archaeological, architectural heritage and cultural heritage resources during this peat slide and subsequent remedial measures which were subject to a pre-works archaeological assessment.

It is concluded that the operation of the wind farm between 2005-2020 has not resulted in any negative effects on the archaeological, architectural and cultural heritage resources.

It is also concluded that the future operation of the wind farm will result in no likely predicted negative effects on the archaeological, architectural and cultural heritage resources.

No likely negative impacts to the archaeological, architectural and cultural heritage resources are predicted to occur during the decommissioning of the wind farm.

It is concluded that no cumulative impacts on the archaeological, architectural and cultural heritage resource arose in combination with reviewed developments in the wider landscape during the construction phases, peat slide, remedial works, grid connection and Agannygal substation or during the operational phase between 2005-2020. It is also concluded that no cumulative impacts on these resources are currently occurring or are likely to occur.

No significant effects to the cultural heritage resource were identified during this assessment and no remedial measures and monitoring for any such effects are, therefore, required.

No mitigation measures to prevent, reduce or offset likely non-significant adverse cultural heritage effects are required for the continuing operational period of the wind farm. All detailed proposals for the decommissioning of the wind farm and overhead line will be subject to an archaeological assessment to determine if ground works will be required in undisturbed areas outside the footprint of the existing development that may have the potential to impact on any unrecorded, sub-surface archaeological features or artefacts that may exist within the subject areas. Any such works will be subject to archaeological monitoring carried out by a suitably qualified archaeologist operating under a licence issued by the National Monuments Service.

There a number of obligatory processes to be undertaken as part of archaeological licence applications and these will allow for monitoring of the successful implementation of any required archaeological mitigation measures.

4.12.3 Conclusion

The construction, operation and decommissioning of the wind farm, in conjunction with the peat slide and subsequent remedial works as well as the construction, operation and decommissioning of the overhead line and Agannygal substation are not predicted to result in any residual impacts on the cultural heritage resource.

4.13 Major Accidents and Disasters

The requirement to address major accidents and disasters stems from the European Parliament communication on the prevention of natural and man-made disasters with the main objective to safeguard human life, the safety and physical integrity of individuals, fundamental human rights, the environment, economic and social infrastructures, including basic utilities, housing, communications, transport and the cultural heritage. The 2012 communication recommended that issues relating to disaster prevention should be more fully included in the revision of the EIA Directive and is now been included in the EIA Directive that came into force on May 2017.

The requirement to address major accidents and disasters in Environmental Impact Assessment (EIA) was not in place at the time that the Derrybrien Project was granted planning permission and was introduced in the 2014 EIA Directive. However, the Major Accidents and Disasters Chapter of the rEIAR assesses all phases of the Derrybrien Project including construction, operation and decommissioning.

Although the terms “major accident” or “disaster” are not defined in the EIA Directives they are defined in UN, EU and National references. In the Irish national context, the Framework for Major Emergency Management defines a major emergency as follows:

> *“A Major Emergency is any event which, usually with little or no warning, causes or threatens death or injury, serious disruption of essential services or damage to property, the environment or infrastructure beyond the normal capabilities of the principal emergency services in the area in which the event occurs, and requires the activation of specific additional procedures and the mobilisation of additional resources to ensure an effective, co-ordinated response”.*

The approach to the assessment of Major Accidents and Disasters[1] advises that the extent to which the effects of major accidents and / or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk).

A risk-based approach has been used for the assessment following the EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports, which covers the identification, likelihood and consequence of major

[1] EPA, “*Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports”,* August 2017

accidents and/or natural disasters. The assessment utilises the risk classification set out in the 2010 guidance produced for Principal Response Agencies by the Department of Environment, Heritage and Local Government (DOEHLG) in relation to emergency management. The risk is a combination of the likelihood of an event, such as a peat slide, to occur and the level of impact that this would have on the receiving environment.

This is presented in the format of an “Emergency Risk Rating Matrix”. The risk matrix, shown in **Figure 4-10: Emergency Risk Rating Matrix** is colour coded to provide a broad indication of the critical nature of each risk:

- The red zone represents ‘high risk scenarios’;
- The amber zone represents ‘medium risk scenarios’; and
- The green zone represents ‘low risk scenarios

Figure 4-10: Emergency Risk Rating Matrix

Likelihood	Very Likely	5					
	Likely	4					
	Unlikely	3					
	Very unlikely	2					
	Extremely unlikely	1					
			Minor	Limited	Serious	Very serious	Catastrophic
			1	2	3	4	5
			Consequences				

For the construction phase, which included the peat slide event which occurred in 2003 a summary table of the risk categories identified for each aspect assessed is presented in

Table 4-1. The overall risk level is assigned the highest risk rating of all parameters assessed and related to the peat slide which occurred during construction which impacted significantly on the aquatic environment of the Owendallulleegh River.

Table 4-1 : Summary Construction Phase Risk Category Assessments

	Peat Slide Construction Phase 1	Peat Slide Construction Phase 2	Vehicle Accidents Construction Phase 1	Vehicle Accidents Construction Phase 2
Parameter	**A1**	**A2**	**B1**	**B2**
Life, Health and Welfare	Low	Low	Low	Low
Environment: Habitats	Medium	Medium	Low	Low
Environment: Water Quality and Fisheries	High	Medium	Low	Low
Infrastructure	Medium	Medium	Low	Low
Social	Medium	Low	Low	Low
Overall Risk level	High	Medium	Low	Low

A similar risk category assessment has been prepared for the Operational Phase of the Project and presented in Table 4-2**.** The overall risk level is assigned the highest risk rating of all parameters assessed.

Table 4-2: Summary Operational Phase Risk Category Assessments

Parameter	**Peat Slide**	**Vehicle Accidents**	**Small Aircraft hazard**	**Substation/Turbine Fire**	**Forest/Bog/Gorse Fire**
	A	**B**	**C**	**D**	**E**
Life, health and Welfare	Low	Low	Low	Low	Medium
Environment Habitats	Medium	Low	Low	Low	Medium
Environment Water Quality and Fisheries	Medium	Low	Low	Low	Medium
Infrastructure	Medium	Low	Low	Low	Medium
Social	Low	Low	Low	Low	Medium
Overall Risk level	**Medium**	**Low**	**Low**	**Low**	**Medium**

During the Operational phase the highest risk rating is ranked as Medium associated both with a potential peat slide or forest/bog/gorse fire. The risk rating for a potential peat slide has reduced due to the mitigation measures put in place to minimise the risk of such an occurrence.

The likelihood, impact level and risks associated with decommissioning were also assessed, see **Table 4-3**.

Table 4-3: Summary of Likelihood, Impact and Risk Decommissioning Phase

Parameter	Peat Slide (A)			Vehicular Accident (B)		
	Likelihood	Impact Scale	Risk Level	Likelihood	Impact Scale	Risk Level
Life, health and Welfare	Very unlikely	Minor	Low	Unlikely	Minor	Low
Environment Habitats	Very unlikely	Serious	Medium	Unlikely	Minor	Low
Environment Water Quality and Fisheries	Very unlikely	Very Serious	Medium	Unlikely	Minor	Low
Infrastructure	Very unlikely	Serious	Medium	Unlikely	Minor	Low
Social	Very unlikely	Limited	Low	Unlikely	Minor	Low

During the Decommissioning phase the highest risk rating is ranked as Medium associated with a potential peat slide.

Potential cumulative impacts with other projects are assed in the Chapter also but no significant cumulative risk was identified

Remedial measures to reduce the risk levels are described in the Chapter also.

Effective and proven risk mitigation measures are in place to reduce the likelihood of a peat slide to a low or negligible level. No residual impacts have arisen or are predicted with respect to major accidents and disasters during the project operational or decommissioning phases.

4.13.1 Conclusion

The residual risk or vulnerability of a major accident and/or disaster during the continued operation of the proposed development is considered ‘low’ with regards to the risk evaluation methodology.

4.14 Interactions of Impacts

The requirement to consider interaction of impacts is set out in Article 3.1 (e) of the European Directive of the parliament and the Counsel of 2014" amending the Environmental Impact Assessment Directive and has been in force since May 2017[2].

The likely significant effects of the proposed development on specific environmental topics together with the interaction of the impacts of different factors have been described in individual chapters by the specialist consultants, with coordination between Chapter authors. These interactions have been summarised in Chapter 17 where a matrix of the interactions of different factors has been prepared and a summary of the significant cross media interactions that were considered as part of the assessment is provided herein.

Separate summaries have been provided for interaction of impacts which have occurred or are occurring (construction, peat slide event and operational) and for interaction of impacts which are likely to occur (operation in the period mid-2020 to circa 2040 and decommissioning circa 2040 to 2042.

4.15 Remedial Measures

A summary of the remedial measures undertaken to date, for the construction and operational period to mid-2020, and those identified as being necessary for the continued operation and decommissioning of the project to avoid, prevent, reduce or, if possible, offset any significant adverse effects on the environment (i.e. mitigation measures) is provided in the rEIAR. This ensures that adequate information is set out to enable the Planning Authority carry out an assessment of the EIA, as required under the Planning Acts and Regulations.

[2] DIRECTIVE 2014/52/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

N

Derrybrien Wind Farm Site

Derrybrien Substation

Derrybrien - Agannygal 110kV Overhead Line

Agannygal Substation

Inset Map

Galway

Derrybrien Wind Farm Site

Clarinbridge

Craughwell

Loughrea

Gort

Derrybrien

Galway

Portumna

Clare

Legend

- Derrybrien Substation
- Agannygal Substation
- Derrybrien Wind Farm Site
- Derrybrien - Agannygal 110kV Overhead Line
- County Boundaries

0 2.5 5 7.5 10 km

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DRAWING TITLE: Figure 1.1 - Site Location of Derrybrien Wind Farm Project

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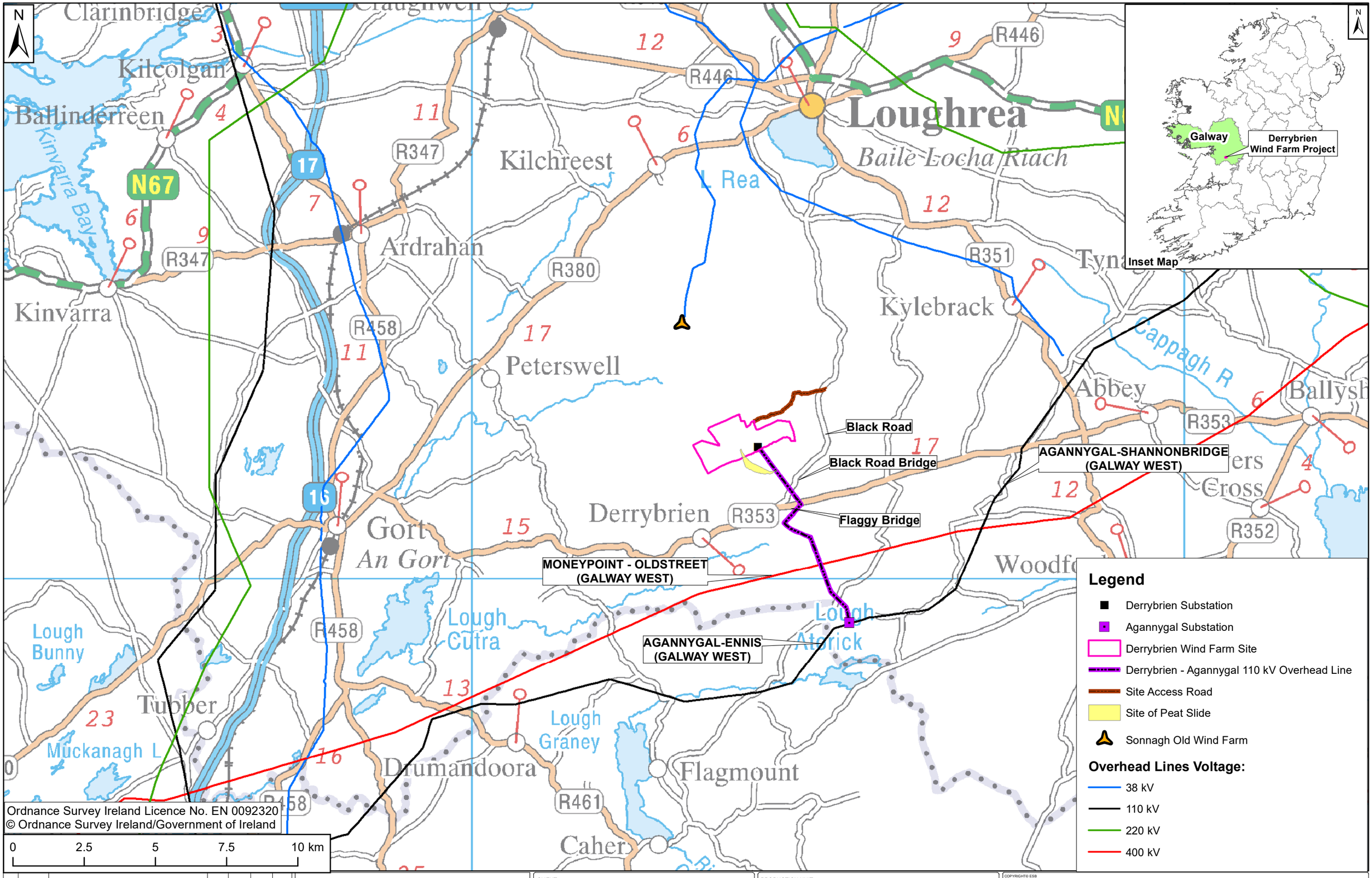

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DRAWING TITLE: **Figure 2.1 - Project Location**

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N

FUNSHADAUN
COPPANAGH
DRUMMIN
BOLEYBEG
CULLENAGH
DRUMKEARY WEST
ALLYKEOLAUN
KNOCKAUNDARRAGH
KILBEG
TOORMACNEVIN
BOHABOY
REYNABRONE
DRUM
KYLENAGAPPA
BOLEYNEENDORRISH
KNOCKMOYLE WEST
KNOCKMOYLE EAST
DERRYBRIEN NORTH
KNOCKDRUMMORE
BALLYCORBAN
MARBLEHILL
GORTEENAYANKA
LOUGHPARK
GORTNAKILLA
ROSSEESHAL
SILVERSTREAM
KNOCKOURA
CLOGHVOLEY
CAPPAGHCON WEST
BALLINLOUGH
TULLA
KEELDERRY
ACRES
SLATEFIELD
DERRYBRIEN WEST
LAGGOO
Derrybrien
REYRAWER
MOYGLASS
BUNNAGLASS
DERREENNAMUCKA
DERRYBRIEN EAST
DERRYBRIEN SOUTH
DERRYWEE EAST
LOUGHATORICK NORTH
INCHAMORE
DERRYWEE WEST
TOORLEITRA
SCALP
LOUGHATORICK SOUTH
GORTAVEHA
SLIEVEANORE
LOUGHATORICK SOUTH
POLLAGOONA MOUNTAIN
R353

Inset Map
Galway
Derrybrien Wind Farm Project

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0 1 2 3 4 km

Legend

- Townland Boundaries
- Overhead lines

Location of Wind Farm and Ancillary Works

- Derrybrien Wind Farm Site
- Derrybrien Wind Farm Site Entrance
- Derrybrien Substation
- Access Road to Wind Farm Site
- Construction Compound (Hardstands)
- Upgrade works to section of Black Road
- Coillte track (turbaby road) upgraded
- Bridge upgrade

Location of Grid Connection and Ancillary Works

- Derrybrien - Agannygal 110kV Overhead Line
- Agannygal Substation
- Upgrade works to Access Road to Agannygal Substation
- Connection works to Ennis-Shannonbridge 110kV OHL span

Location of works associated with peat slide

- Site of Peat Slide
- Barrages
- Pre-existing Coillte Track
- New Access Track Constructed
- Borrow Pit / Quarry Adjacent to Barrage 1
- Bridge Repairs (Private)
- Bridge Repairs (Public)
- Stepping Stones
- Crooked Bridge

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CLIENT: **Gort Windfarms Ltd**

PRODUCTION UNIT: **Civil & Environmental Engineering**

PROJECT: **Derrybrien Wind Farm Project**

DRAWING TITLE: **Figure 2.2 - Project Works and Townlands**

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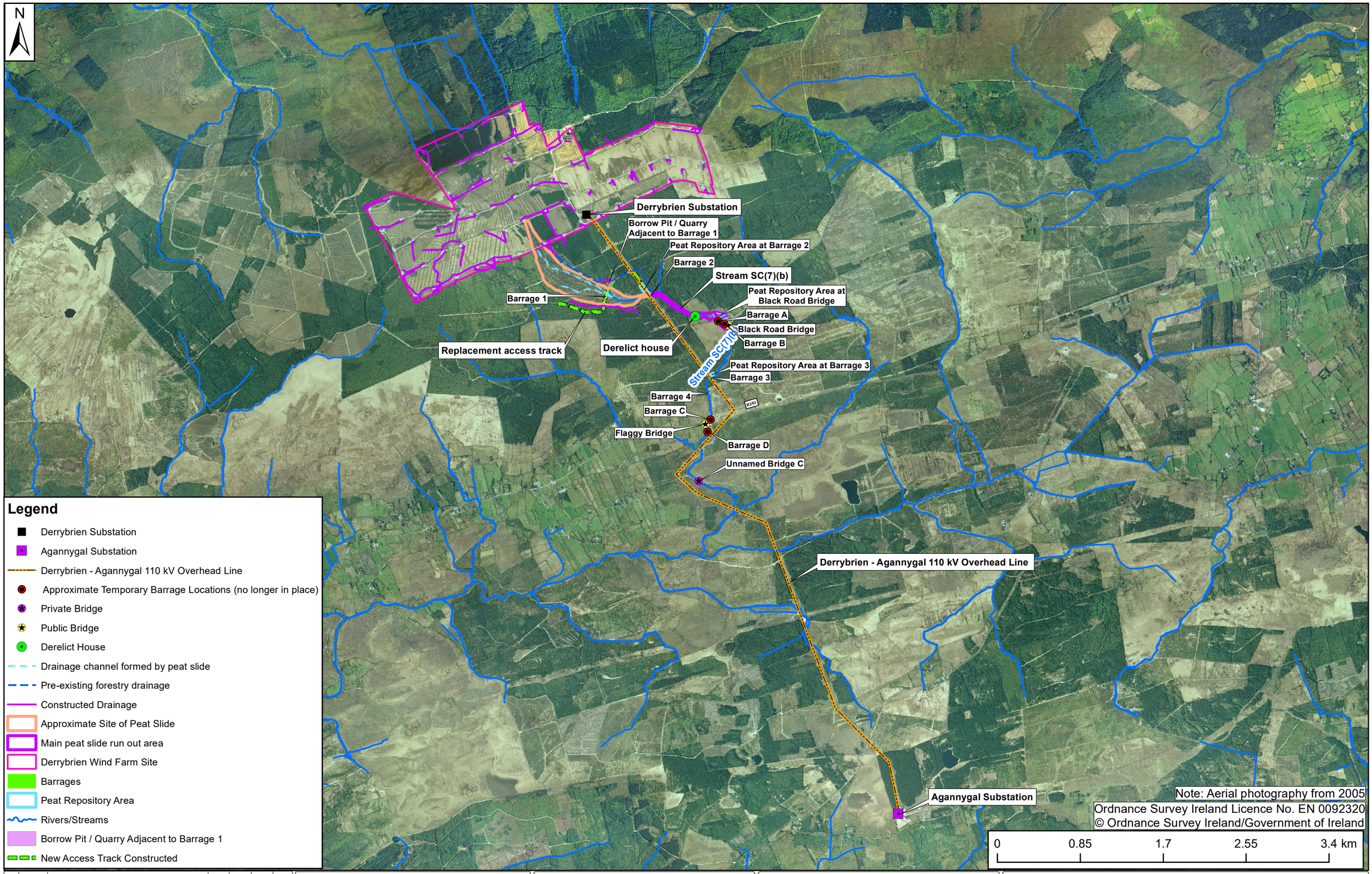

Legend

- Derrybrien Substation
- Agannygal Substation
- Derrybrien - Agannygal 110 kV Overhead Line
- Approximate Temporary Barrage Locations (no longer in place)
- Private Bridge
- Public Bridge
- Derelict House
- Drainage channel formed by peat slide
- Pre-existing forestry drainage
- Constructed Drainage
- Approximate Site of Peat Slide
- Main peat slide run out area
- Derrybrien Wind Farm Site
- Barrages
- Peat Repository Area
- Rivers/Streams
- Borrow Pit / Quarry Adjacent to Barrage 1
- New Access Track Constructed

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DRAWING TITLE:

Figure 2.3 - Location of and Approximate Extent of Peat Slide and Main Peat Slide Run Out Area

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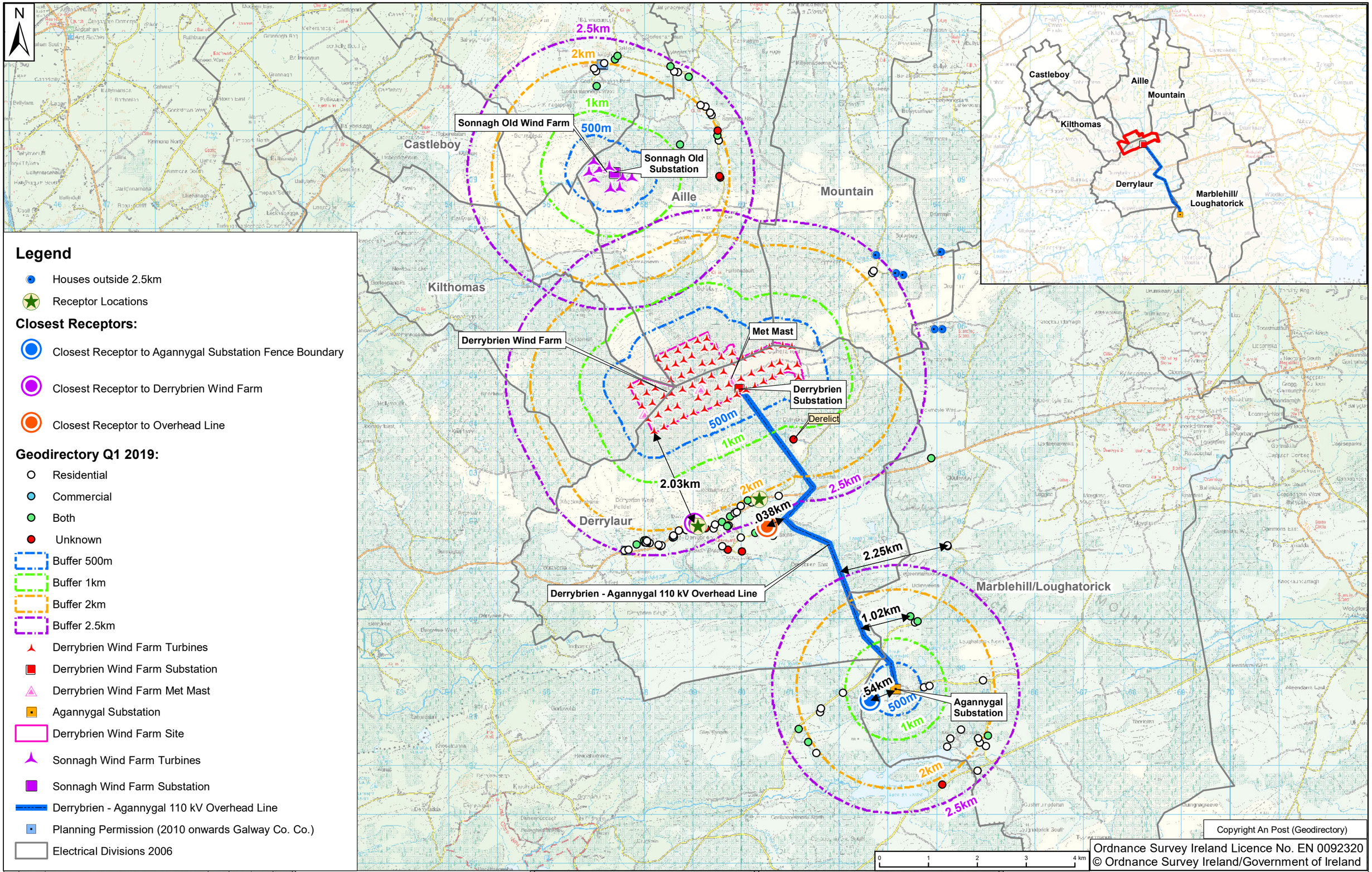
DRAWING NUMBER: QS-000280-01-D460-016-004-000



Legend

- Houses outside 2.5km
- Receptor Locations

Closest Receptors:

- Closest Receptor to Agannygal Substation Fence Boundary
- Closest Receptor to Derrybrien Wind Farm
- Closest Receptor to Overhead Line

Geodirectory Q1 2019:

- Residential
- Commercial
- Both
- Unknown
- Buffer 500m
- Buffer 1km
- Buffer 2km
- Buffer 2.5km
- Derrybrien Wind Farm Turbines
- Derrybrien Wind Farm Substation
- Derrybrien Wind Farm Met Mast
- Agannygal Substation
- Derrybrien Wind Farm Site
- Sonnagh Wind Farm Turbines
- Sonnagh Wind Farm Substation
- Derrybrien - Agannygal 110 kV Overhead Line
- Planning Permission (2010 onwards Galway Co. Co.)
- Electrical Divisions 2006

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PROJECT: **Derrybrien Wind Farm Co. Galway**

CONTRACT

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DRAWING TITLE: **Figure 4.1- Distance of Project components to nearest occupied dwelling**

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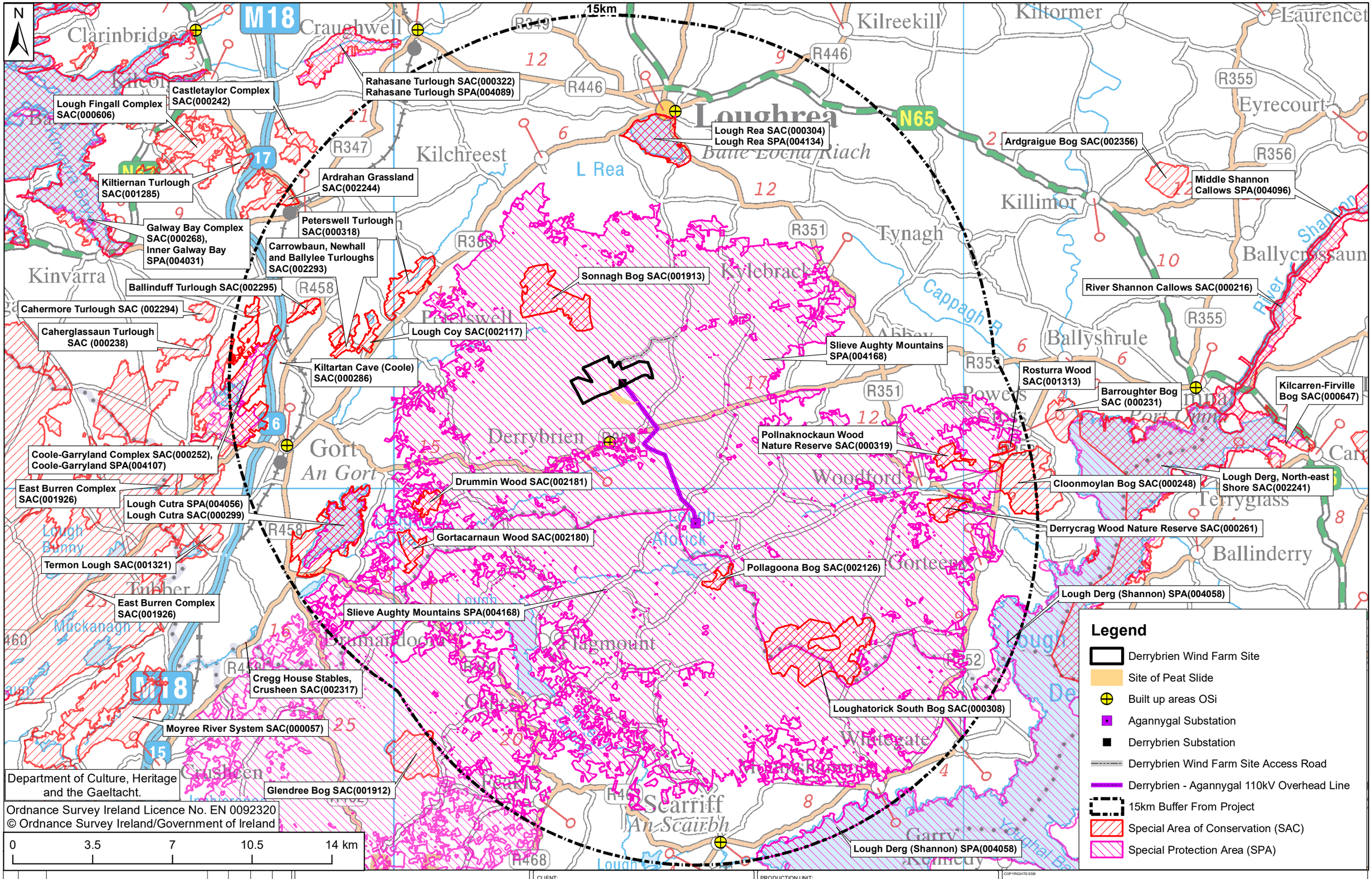
DRAWING NUMBER: **QS-000280-01-D460-016-005-000**



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
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PROJECT: Derrybrien Wind Farm Project

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DRAWING TITLE:

Figure 4.2 - European Sites within 15km radius of Project

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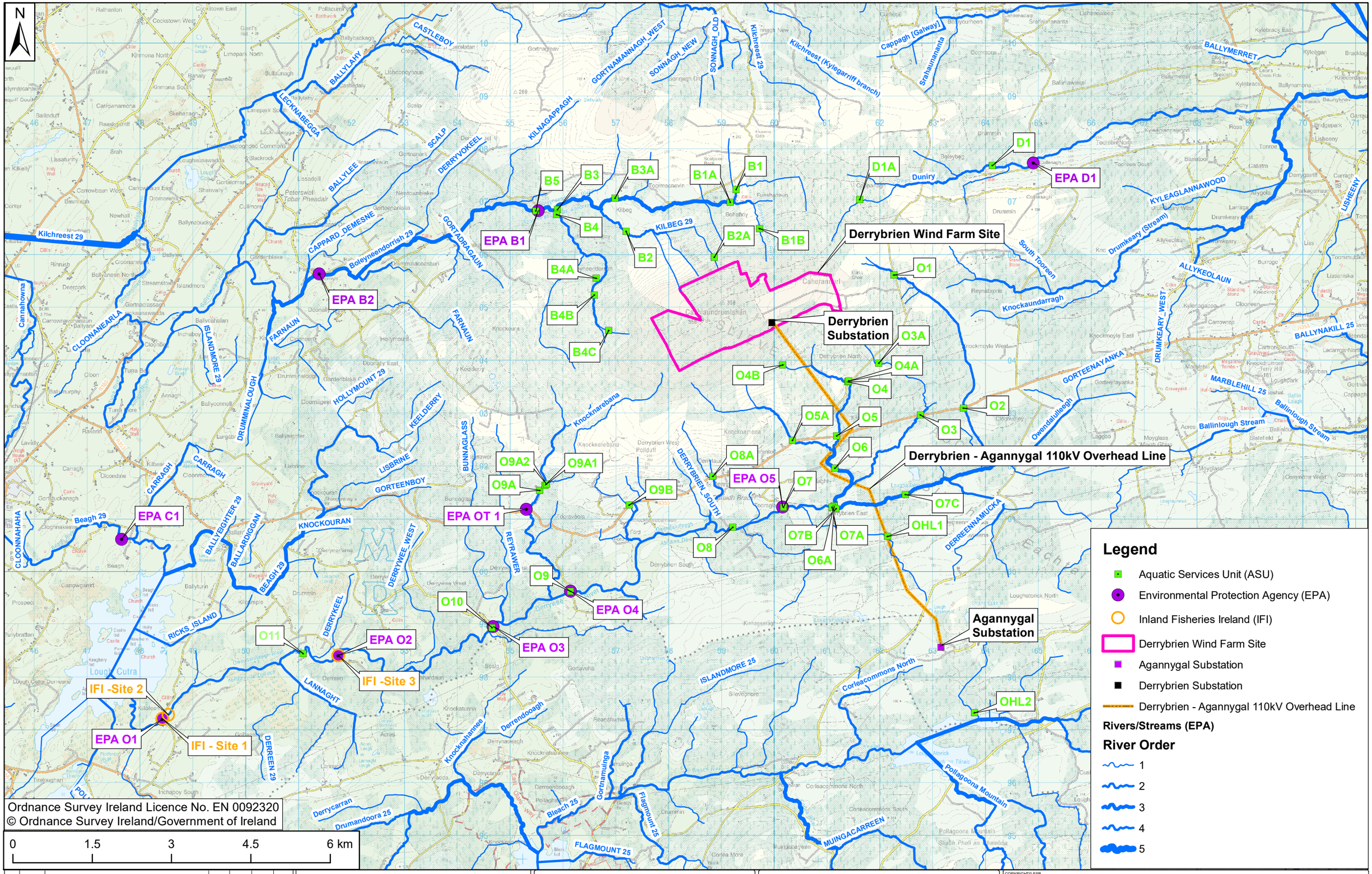

Legend

- Aquatic Services Unit (ASU)
- Environmental Protection Agency (EPA)
- Inland Fisheries Ireland (IFI)
- Derrybrien Wind Farm Site
- Agannygal Substation
- Derrybrien Substation
- Derrybrien - Agannygal 110kV Overhead Line

Rivers/Streams (EPA)

River Order

- 1
- 2
- 3
- 4
- 5

0 1.5 3 4.5 6 km

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DRAWING TITLE: **Figure 4.3 - Rivers and Monitoring Icoations**

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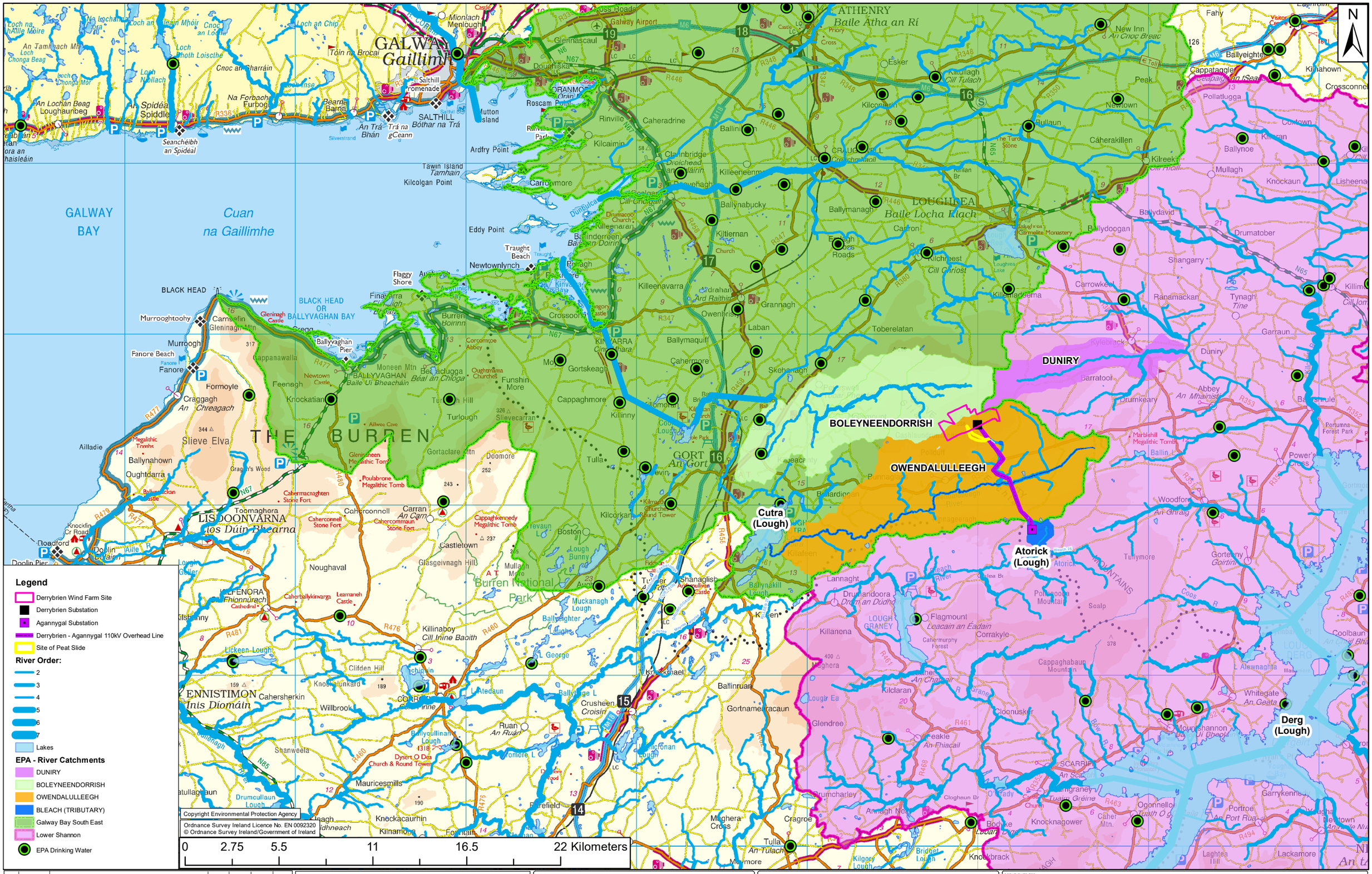

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PROJECT: Derrybrien Wind Farm Project

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DRAWING TITLE: **Figure 4.8 - Catchments in relation to Derrybrien Wind Farm Project**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
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DRAWING NUMBER: **QS-000280-01-D460-016-009-000**

N

Coillte Track:
Primary Wind Farm Access Road

Site Entrance

Derrybrien Wind Farm

Derrybrien
Substation

Site Access From Public
Road Network

Coillte & Private
Access Location

Coillte Track:
Turbary Access

Black Road

Derrybrien - Agannygal 110kV Overhead Line

Unnamed Local Road A

Site Access

Site Access
From Public
Road Network

Agannygal Substation

R380

R353

Inset Map

Galway

Derrybrien
Wind Farm Project

Legend

- Derrybrien Wind Farm
- Agannygal Substation
- Derrybrien Substation
- Derrybrien Wind Farm Site Entrance
- Derrybrien - Agannygal 110kV Overhead Line
- Derrybrien Wind Farm Site Access Road
- Derrybrien Wind Farm On site roads
- Site Access Road to Substation

0 1 2 3 4 km

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DRAWING TITLE: Figure 4.9 - Site Context

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
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