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Appendix 3.1

Construction and Environmental Management Plan

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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BALLINAGREE WIND FARM

CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN

Prepared for: Ballinagree Wind DAC

Ballinagree Wind farm

Date: January 2022

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1. INTRODUCTION

1.1 General Introduction and Purpose

This document is the Construction and Environmental Management Plan (CEMP) for the proposed Ballinagree Wind Farm and has been prepared by Fehily Timoney and Company (FT) on behalf of Ballinagree Wind DAC.

The CEMP will be updated prior to construction to take account of any relevant conditions attached to the planning permission and will be implemented for the duration of the construction phase of the project. The CEMP will be a live document and will be subject to ongoing review through regular environmental auditing and site inspections and updated as required. For the avoidance of doubt, all measures stipulated in this CEMP will be implemented in full.

The CEMP sets out the key construction and environmental management issues associated with the proposed project and will be developed further at the post-planning and construction stages by the client and on the appointment of the main contractor to the project.

The CEMP should be read in conjunction with the EIAR. In the case of any ambiguity or contradiction between this CEMP and the EIAR, the EIAR shall take precedence.

This CEMP sets out the key environmental management issues associated with the construction, operation and decommissioning of the proposed project, to ensure that during these phases of the development, the environment is protected and impacts on the environment are minimised.

The document is divided into six sections:

Section 1: *Introduction* provides an overview of the existing site and the proposed project

Section 2: *Existing Site Environmental Conditions* provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions are to be considered by the contractor in the construction, operation and decommissioning of this proposed project.

Section 3: *Overview of Construction Works*, this section provides an overview of the construction works proposed, including drainage and sediment controls to be installed.

Section 4: *Environmental Management Plan (EMP)*, this section outlines the main requirements of the EMP and outlines operational controls for the protection of the environment including soil management, habitat and species, site drainage control, archaeology, construction traffic, site reinstatement and decommissioning, waste management.

Section 5: *Safety & Health Management Plan,* this section defines the work practices, procedures and management responsibilities relating to the management of safety and health during the design, construction and operation of the Ballinagree Wind Farm.

Section 6: *Emergency Response Plan* contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of Ballinagree Wind Farm.

1.2 The Applicant

The applicant for the proposed project is Ballinagree Wind DAC.

1.3 The Project

The proposed project is comprised of the following key elements:

- The wind farm site (also referred to in this CEMP as 'the Site');
- The grid connection;
- The turbine delivery route (also referred to in this CEMP as 'the TDR');
- Biodiversity enhancement and management plan lands (also referred to in this CEMP as 'the BEMP lands').

A detailed description of the proposed project is contained in Chapter 3 of the EIAR. A detailed description of the proposed construction works is outlined in Section 3.

An overview of the proposed project is shown in Figure 1-1.

The wind farm site includes the wind turbines, internal access tracks, hard standings, meteorological masts, recreational amenity infrastructure and associated signage, onsite substation, internal electrical and communications cabling, temporary construction compound, drainage infrastructure, borrow pits and all associated works related to the construction of the wind farm. Refer to Figure 1-2 for the general arrangement of the Site.

The grid connection which comprises a 110 kV underground cable and is shown in Figure 1-4. The Construction Methodology report provides a detailed description of the proposed grid connection infrastructure and construction methodologies associated with same. It is located in Appendix 3.3 of the EIAR.

The Turbine Delivery Route is described in Section 2.1.2 and shown in Figure 1-3.

A Biodiversity Enhancement and Management Plan is located Appendix 3.4 of the EIAR. The BEMP lands are identified in Figure 1-5.

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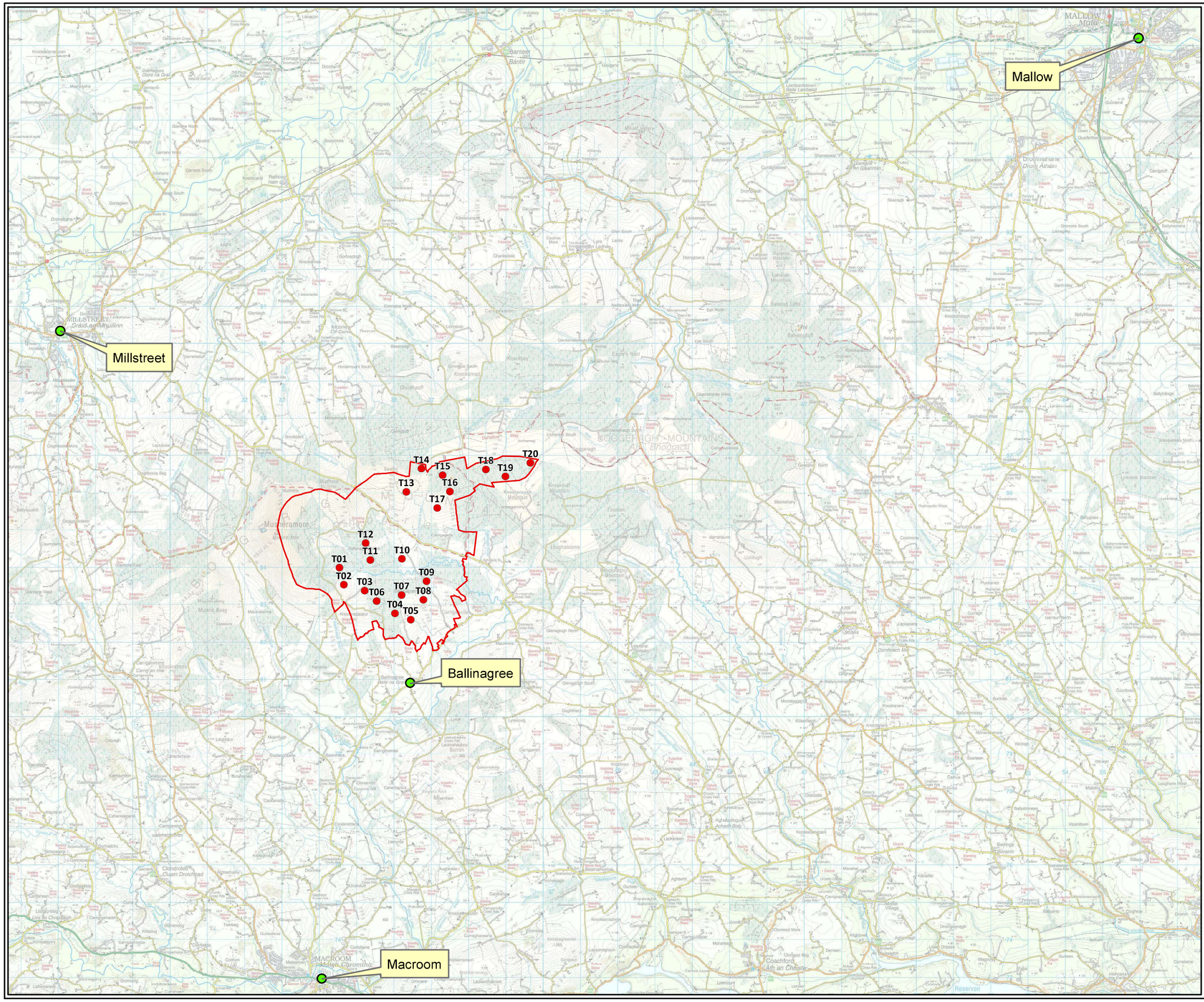

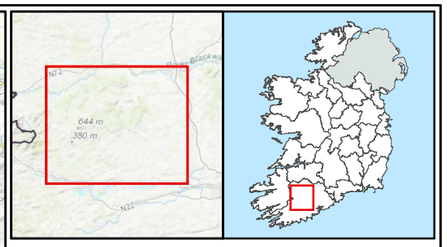

Legend

- Wind Farm Site
- Proposed Turbine Layout

N W E S

0 2.5 5 10 Kilometers

TITLE: Site Location and Project Overview			
PROJECT: Ballinagree Wind Farm			
FIGURE NO:	1.1		
CLIENT:	Coillte and Ørsted		
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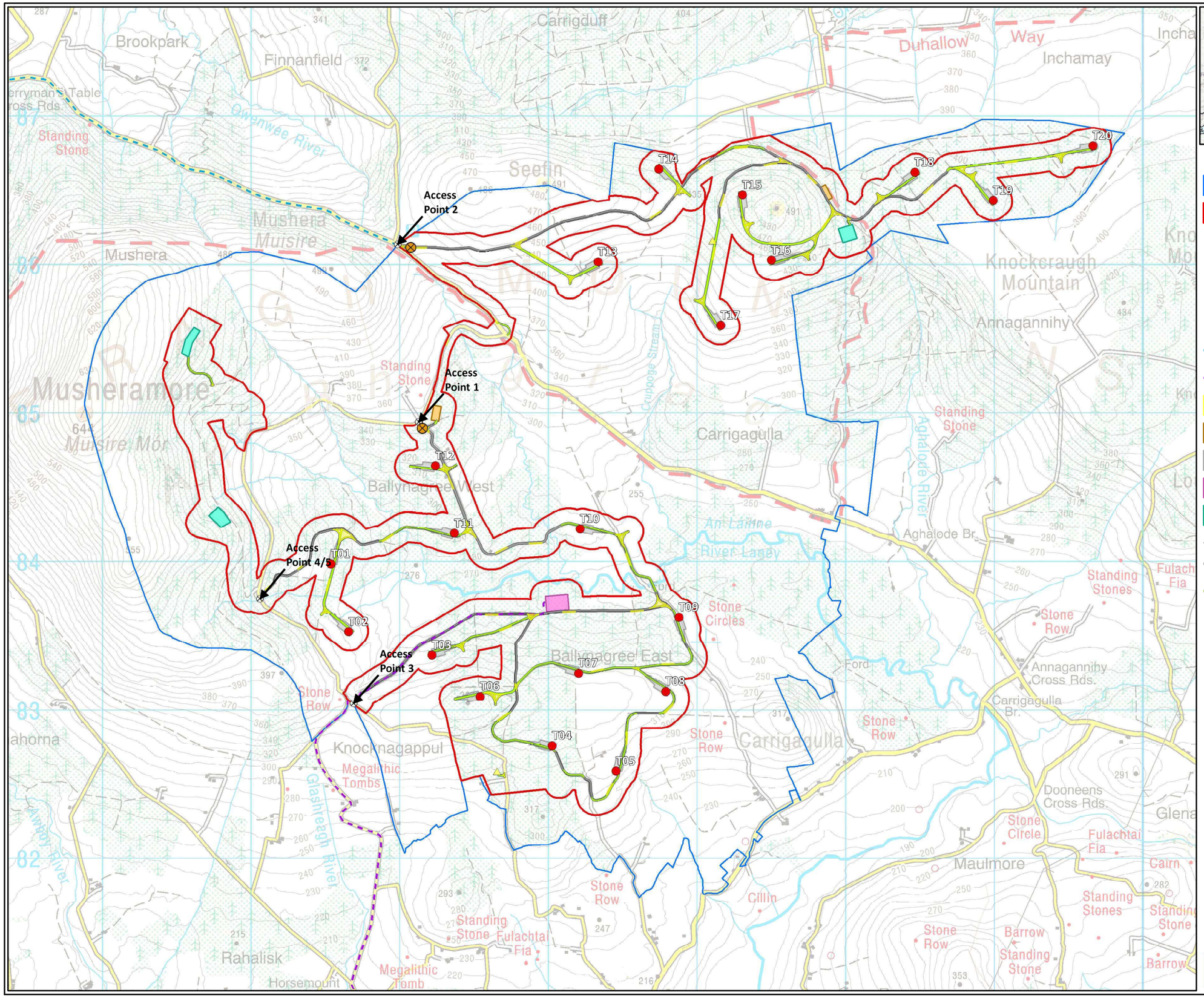

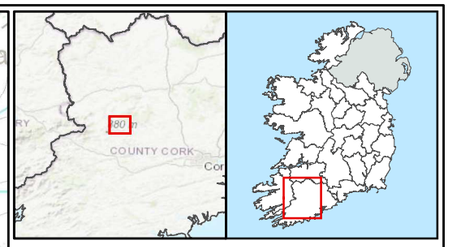

Legend

- Wind Farm Site
- Development Boundary
- Proposed Turbine Layout
- Met Mast
- Access Points
- Wheel Wash
- Turbine Delivery Route
- Grid Connection
- Turning Heads and Passing Bays
- Construction Compound
- Turbine Hardstanding Area
- Substation Compound
- Proposed Borrow Pits

Access Tracks:

- Existing Track Upgrade
- New Access Track

TITLE:	Wind Farm Site		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	1.2		
CLIENT:	Coillte and Ørsted		
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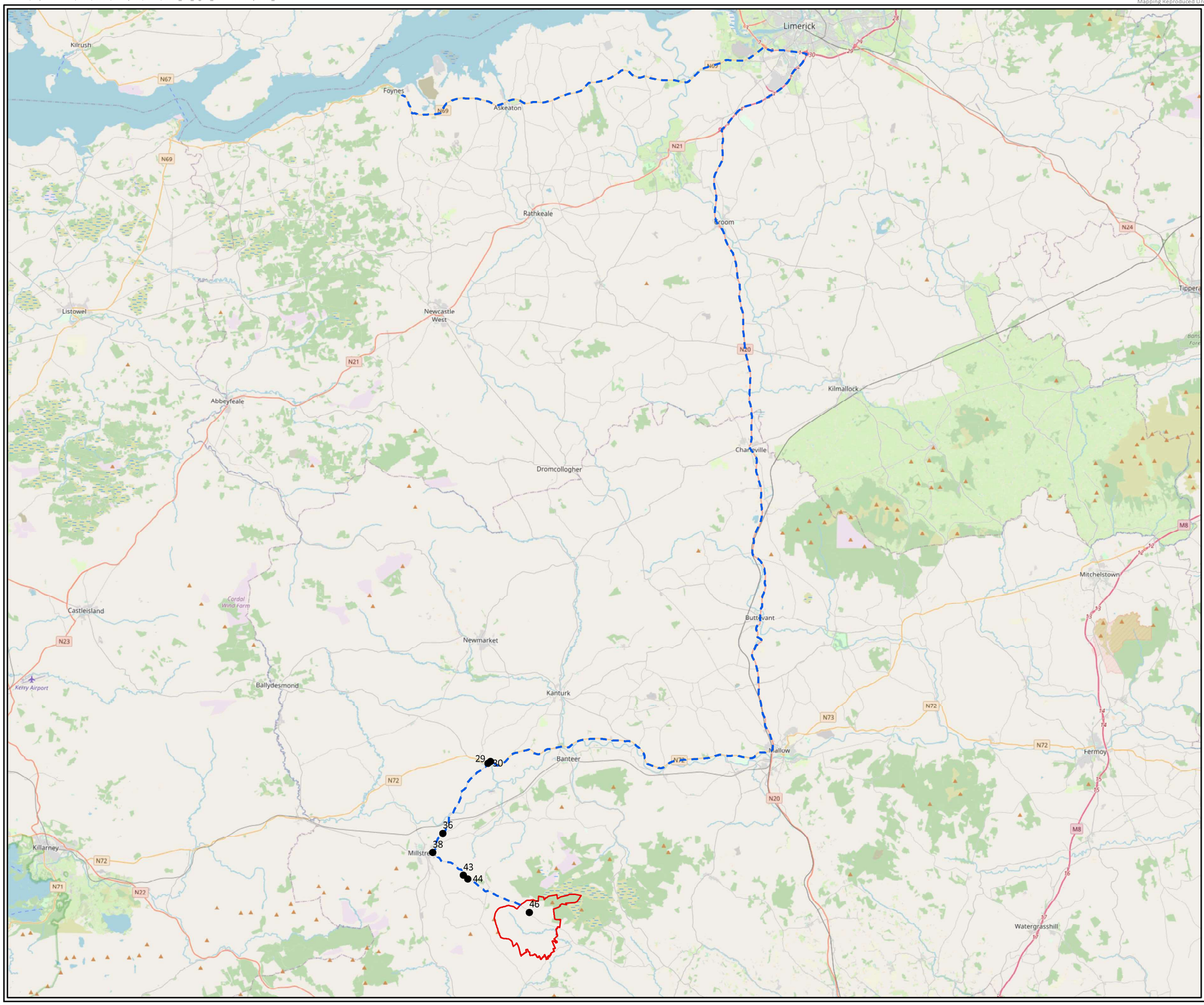

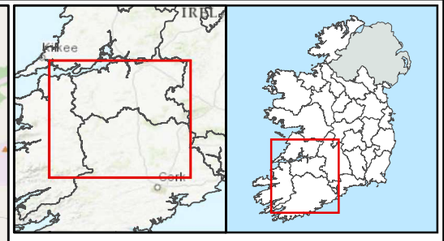

Legend

- Wind Farm Site
- Turbine Delivery Route
- TDR Nodes

TITLE:	Turbine Delivery Route		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	1.3		
CLIENT:	Coillte and Ørsted		
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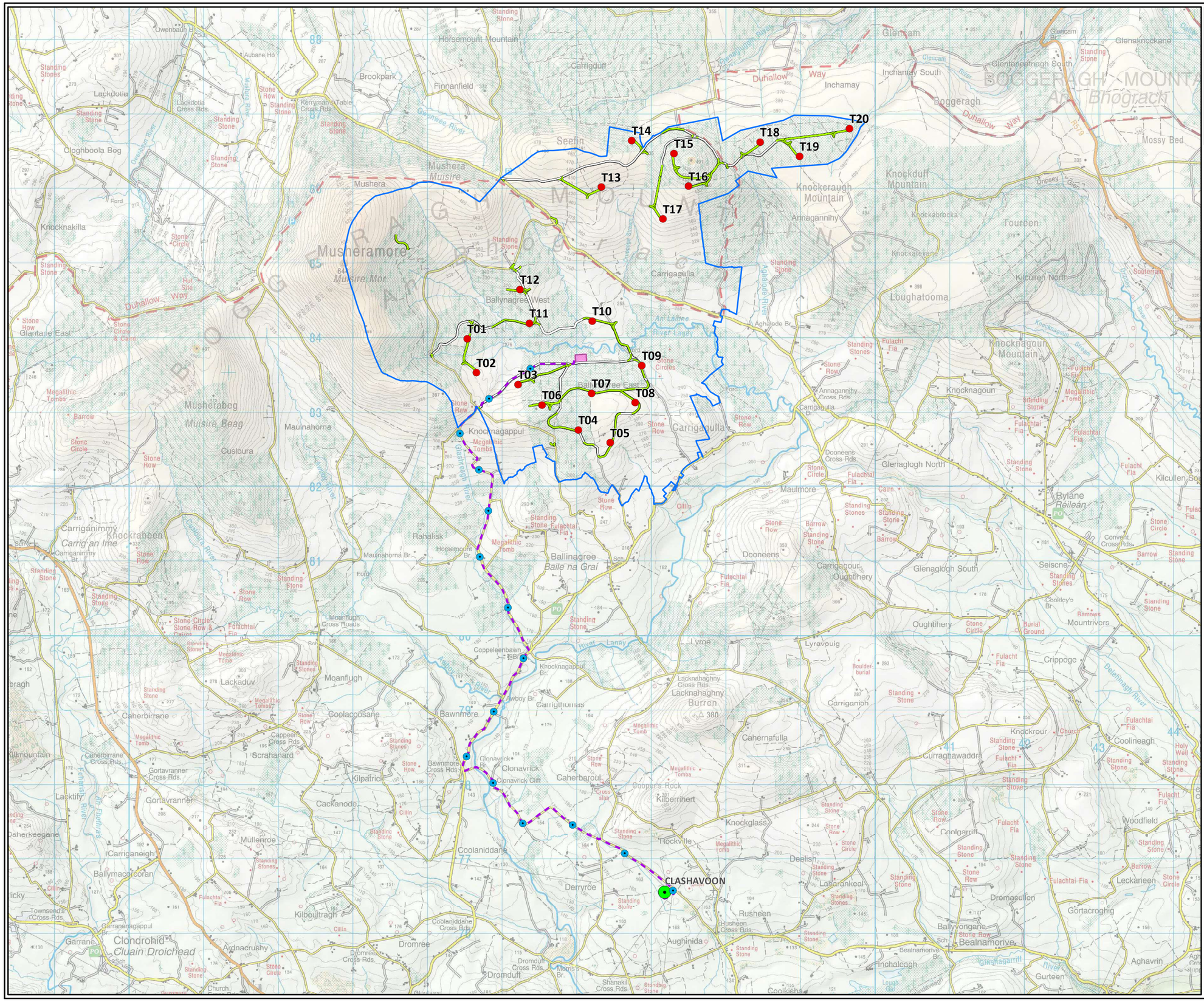

Legend

- Wind Farm Site
- Proposed Turbine Layout
- Joint Bays
- 220kV Substation
- Grid Connection
- Substation Compound

Access Tracks:

- Existing Track Upgrade
- New Access Track

TITLE:	Grid Connection		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	1.4		
CLIENT:	Coillte and Ørsted		
SCALE:	1:50000	**REVISION:**	0
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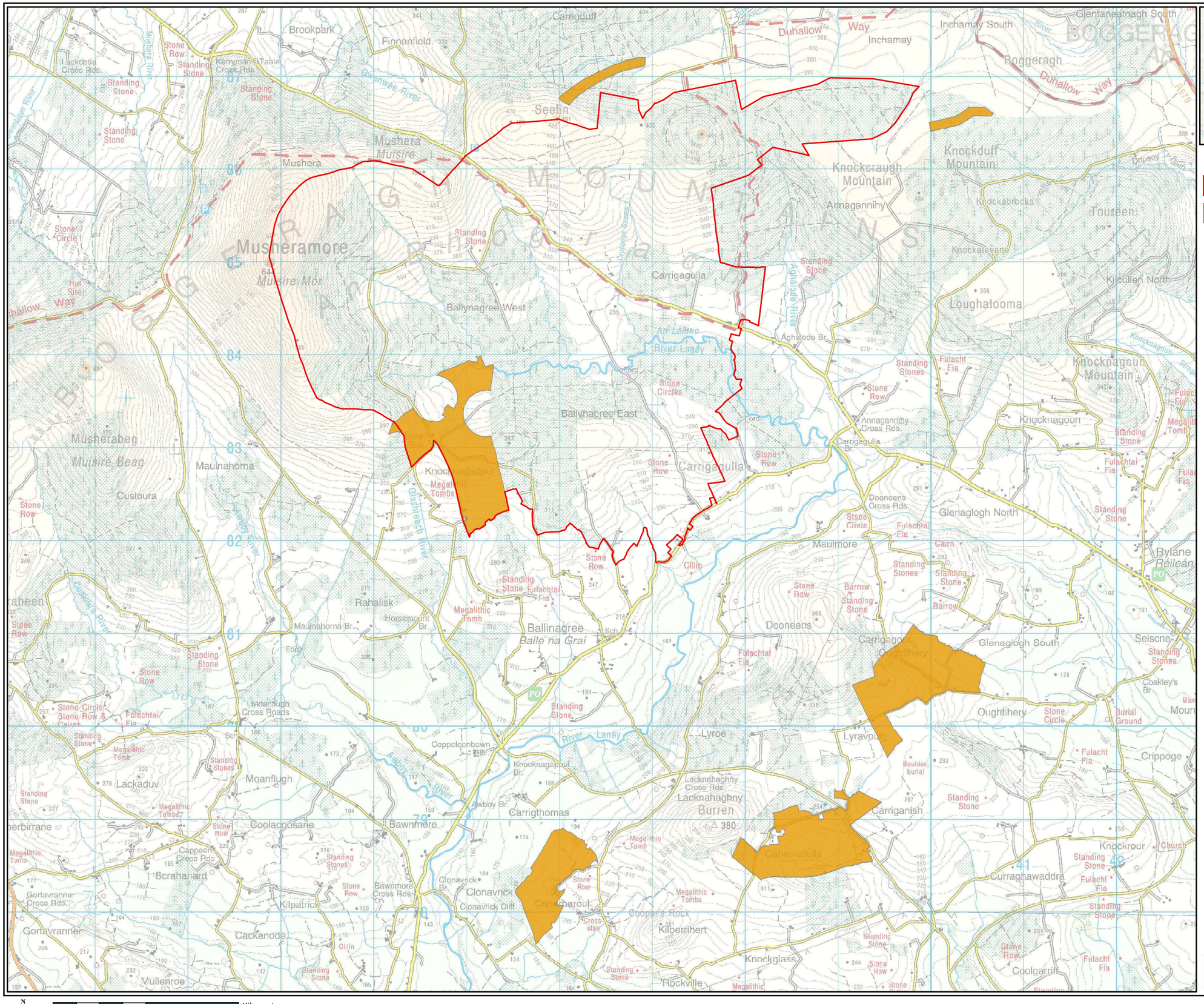

Legend

- Wind Farm Site
- BEMP Lands

TITLE:	BEMP Lands
PROJECT:	Ballinagree Wind Farm
FIGURE NO:	1.5
CLIENT:	Coillte and Ørsted
SCALE: 1:40000	**REVISION:** 0
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2. EXISTING SITE ENVIRONMENT

2.1 Existing Environment Description

2.1.1 Wind Farm Site

The proposed wind farm site is located within the jurisdiction of Cork County Council, approximately 35 km north west of Cork City. The project is located approximately 8km south east of Millstreet and approximately 10 km north of Macroom.

The Wind Farm Site is located in a rural area approximately 8km southeast of Millstreet. Settlement in the area is made up of one-off rural housing and farmyards generally located along the road network of the area (Linear settlement pattern). The nearest settlement is the village of Ballinagree which is located approximately 1.5km to the south of the wind farm site.

The wind farm site encompasses a mixture of habitat types, with conifer plantation and pastures the main types of land cover present. Pockets of recently felled conifer woodland, heath, scrub and improved agricultural grassland are also present across the site. Pockets of upland peat bog is present in the northern part of the site.

Elevations within the wind farm site range from 200m to 490m approximately above ordinance datum. Slopes within the site range from 0% to approximately 20% grade.

Access to the site is primarily via the existing local road L2578 'Butter Road' from the direction of Millstreet to the North West. HGVs shall approach the site via this road.

Ballinagree Wind Farm shall involve the use of 5 no. existing forestry and agricultural entrances as access points with the public road. The locations of these access points are shown on Figure 1-2.

The access points which have been selected with consideration for safety of public road users and construction staff and to ensure they can be constructed to comply with the design requirements of Cork County Council and TII.

A detailed description of the existing site environment can be found in Chapter 3 of the EIAR.

The layout of the proposed wind farm site is shown on Figure 1-2.

2.1.2 Turbine Delivery Route

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR).

The TDR and location of temporary accommodation works are shown in Figure 1-3.

In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. All accommodation works will be carried out in advance of the turbine deliveries in agreement with the landowner and local authority and subject to a road opening license as required.

Further information on the proposed turbine delivery route and transport routes to the wind farm site can be found in Chapter 13 of the EIAR.

2.1.3 Grid Connection

The grid connection route (GCR) will consist entirely of underground 110kV cable and will connect the on-site substation to the existing 110/220kV substation at Clashavoon. The GCR will be ca. 11.37 km in length, with 9.35 km to be constructed primarily within the existing road corridor. The proposed GCR arrangement is illustrated in Figure 1-4. The 110kV grid connection cable will follow public roads and shall feature horizontal directional drilling (HDD) at 4 no. locations to cross existing watercourses.

Further details of the proposed grid connection can be found in Section 3.1.4.

2.1.4 Biodiversity Enhancement and Management Plan Lands

A Biodiversity Enhancement and Management Plan is located Appendix 3.4 of the EIAR and comprises agricultural and forestry lands. The BEMP lands are identified in Figure 1-5.

2.2 Biodiversity

The dominant habitats present within the proposed wind farm site are largely modified habitats including mature, semi-mature and young 1st and 2nd rotation commercial conifer plantation WD4, improved agricultural grassland GA1, semi-natural to semi-improved wet grassland GS4 and buildings and artificial surfaces BL3 (forestry tracks, local roads).

For the vast majority of the route the grid cable will be buried beneath the road surface and as such the dominant habitat along the proposed grid connection route is buildings and artificial surfaces BL3. Travelling southerly the adjacent road verge are generally comprised of narrow grassy verge (wet grassland GS4, dry-humid acid grassland GS3 and/or occasional dry grassy verge GS2) with bramble and Willow scrub WS1, hedgerow WL1 or occasional treeline WL2. The dominant adjacent land-use is improved agricultural grassland GA1 or occasionally conifer plantation WD4.

2.2.1 Sites of International and National Importance

There are no European sites geographically overlapping with the Site, grid connection and BEMP. The Turbine Delivery Route will be along existing roads which run close to the following European sites:

- Lower River Shannon SAC (002165)
- Barrigone SAC (000432)
- Curraghchase Woods SAC (000174)
- Askeaton Fen Complex SAC (002279)
- River Shannon and River Fergus Estuaries SPA (004077)

However, there are no works proposed at these locations for the purpose of turbine delivery and as such the movement of delivery vehicles along the road will have no effects on the European sites.

Only two Natura 2000 sites are located within 5km of the study area and GCR. These are Mullaghanish to Musheramore Mts. SPA (004612) and Blackwater River SAC (002170).

The Boggeragh Mountains NHA (002447) overlaps the northern part of the wind farm study area.

2.2.2 Invasive Species

High impact invasive plant species, Japanese Knotweed *Fallopia japonica* was recorded within a farmland holding towards the centre/east of the study area and just off-site to the south of the study area. The Knotweed stands were not in the construction footprint of the windfarm, along the GCR or at POIs requiring work along the TDR. No Third Schedule Invasive Species were recorded within the proposed BEMP lands.

Japanese Knotweed is also present in the wider environment and is present along roadsides in the wider area. Rhododendron *Rhododendron ponticum* is also occasionally present within conifer plantation WD4 towards the centre of the study area and to the south.

2.3 Land, Soils and Geology

The land use across the site is predominantly made up of agricultural lands and mature forest.

The subsoils across the site comprise glacial till derived from Devonian sandstones, bedrock outcrop or sub-crop, blanket peat and alluvium.

The southern portion of the proposed development site is characterised by elevated lands with typical elevations of between 323m to 430m AOD with steep to moderate slopes to the west of the site boundary. Slopes within the proposed development and at proposed infrastructure locations generally range from 2 to 16 degrees.

The northern portion of the proposed development includes turbine locations T13 to T20. It comprises of elevated lands sloping relatively steeply to the south (ranging from 2 to 16 degrees).

Slopes at proposed turbine locations in this portion of the development range from gentle (2 degrees) to moderate. There is a maximum slope angle of 16 degrees at turbine T16. Slopes at the proposed borrow pits BP01 and BP02 (western area of the site) are considered moderate to steep with slopes of 14 and 16 degrees, respectively.

Based on the GSI aquifer vulnerability mapping, overburden deposits are generally between 3 and 10m deep in the central portion of the site; generally, 3 to 5m deep in the north and east of the site; and <3m deep in the west south and a portion of the north of the site.

From a review of the GSI Landslide Susceptibility database, the proposed development and proposed infrastructure locations are generally located within areas of 'Low' to 'Moderately High' susceptibility. The mid-section and north-eastern most area of the site is classed as 'Low' with a strip of the southern-most area and the northern area class as 'Moderately High'. The western-most part of the site where the borrow-pits are located is classed as 'Moderately High'.

There was no evidence of active or historical slope instability observed across the site during the site walkover. There are no historical records of landslide activity within or close to the site, according to the GSI database. The GSI information is based on a national dataset and has been superseded following a more recent walkover and study of the area. The site walkover and ground investigations including trial pits and boreholes, peat probing and shear vane testing were all carried out across the site along with a detailed slope stability assessment that resulted in the Factor of Safety across the site to be above the minimum recommended 1.3 limit, indicating a low risk of slope instability.
Detailed information on land, soils and geology is provided in Chapter 9 of EIAR.

2.4 Hydrology & Water Quality

The wind farm site is located within two hydrometric areas (catchment) of the Irish River Network System. These are Lee, Cork Harbour and Youghal Bay (ID 19) and Blackwater (Munster) (ID 18) catchments. The average annual rainfall for the period 1981-2010 in the area of the wind farm site is 1,720 mm.

The wind farm site is situated within three sub-catchments as defined by the WFD.

These waterbodies are known as:

- Sullane_SC_020 (19_7)
- Blackwater (Munster)_SC_050 (18_4)
- Blackwater (Munster)_SC_070 (18_7).

Turbines T1, T2, T3, T6, T7, T8, T9, T10, T11, T12, T13, T16 and T17 are within Laney_010 sub-basin. Turbines T4 and T5 are within Laney_020. Turbines T14, T15 and T18 are within Nad_010 and turbines T19 and T20 are within Glen (Banteer)_010 sub-basin.

The cable route between the proposed on-site 110 kV substation at Knockacullata and proposed on-site 110 kV substation at Lackendarragh North is within four waterbodies (river sub-basins) catchments as defined by the WFD. These are:

- Bride (Blackwater)_010 - IE_SW_18B050050,
- Ross (Killavullen)_010 – IE_SW_18R020500,
- Bride (Blackwater)_020 – IE_SW_18B050320,
- Blackwater (Munster)_180 – IE_SW_18B022100 sub-basin.

The national flood hazard mapping (www.floodmaps.ie), does not indicate any record of historical flooding within the wind farm site boundary. There is a recurring flood incident recorded under the name “Annagannihy North to Musheera Co. Cork Recurring” located at the unnamed stream approximately 650m northeast of turbine T10.

OPW flood data and existing hydrological features recorded within the site area shown on Figure 2-1 and Figure 2-2.

WFD water quality status and river waterbody risk within the study area is provided in Table 2-1:

Table 2-1: WFD River Status and River Waterbody Risk

Waterbody	Waterbody	River Status	Waterbody Risk
Wind Farm			
Laney River	IE_SW_19L010100	High	Not at Risk
West Ballynagree	IE_SW_19L010100	High	Not at Risk
Knocknagappul 19	IE_SW_19L010100	High	Not at Risk
Carrigagulla	IE_SW_19L010100	High	Not at Risk
Nadanuller Beg	IE_SW_18N010400	High	Not at Risk
Glen (Banteer)	IE_SW_18G040600	High	Not at Risk
Unnamed tributaries of Laney River	IE_SW_19L010100	High	Not at Risk
Unnamed tributaries of Nadanuller Beg	IE_SW_19L010100	High	Not at Risk
Grid Connection			
Bealick	IE_SW_119L010500	Good	At Risk
Kilberrihert 19	IE_SW_119L010400	High	Not at Risk
Coolaniddane	IE_SW_119L010400	High	Not at Risk
Caherbaroul	IE_SW_119L010400	High	Not at Risk
Clonavrick	IE_SW_119L010400	High	Not at Risk
Laney	IE_SW_119L010400	High	Not at Risk
Awboy	IE_SW_19A030200	Good	At Risk
Carrigthomas	IE_SW_19L010400	High	Not at Risk

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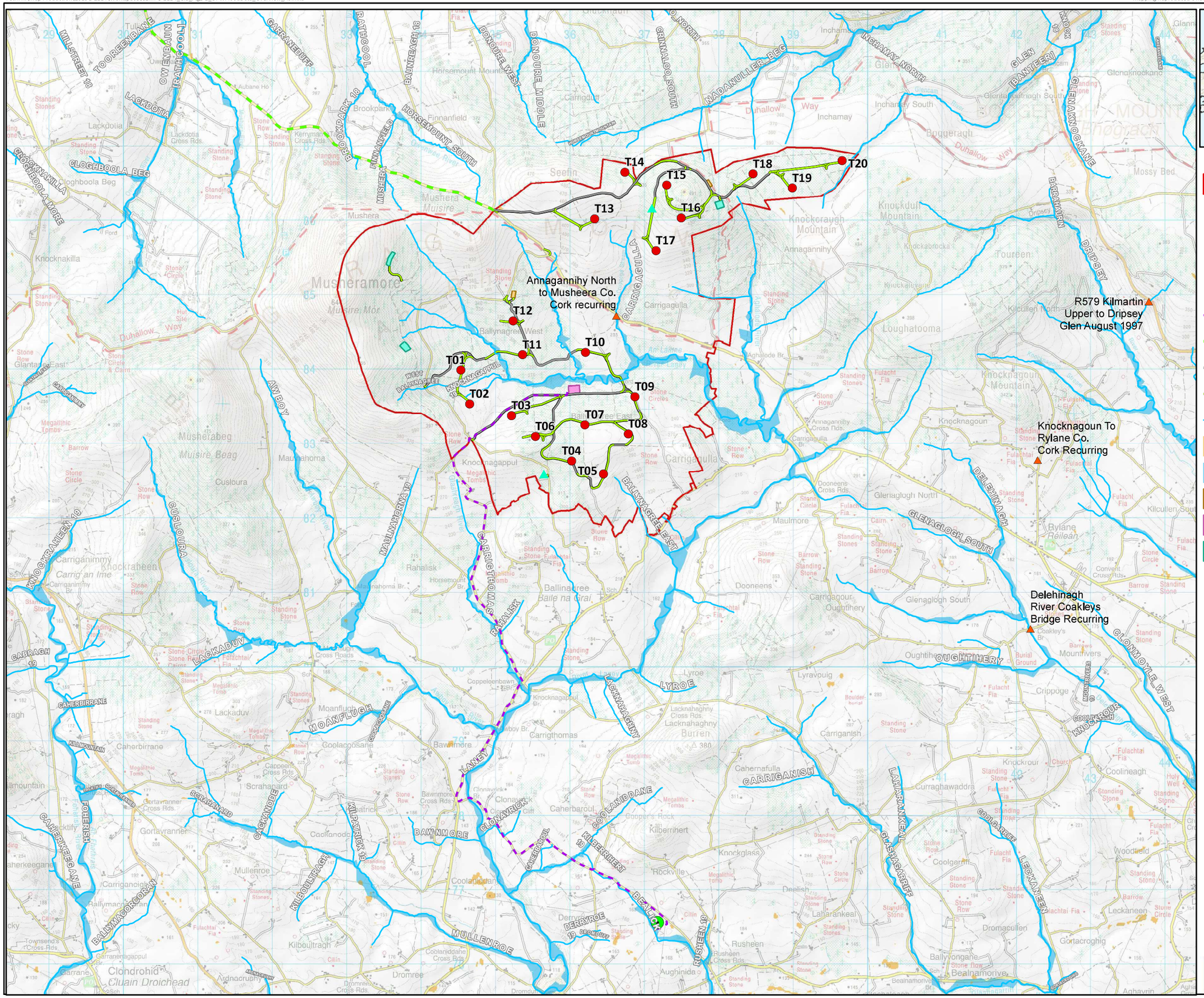

Legend

- Proposed Wind Farm Site
- Proposed Turbine Layout
- OPW Historic Flood Points
- Substations (110-220kV)
- Met Mast
- Grid Connection
- Turbine Delivery Route
- Existing Track Upgrade
- New Access Track
- Rivers
- PFRA 1% AEP Pluvial Flood Extent
- PFRA 1% AEP Fluvial Flood Extent
- Temporary Construction Compound
- Substation Compound
- Proposed Borrow Pits

TITLE:	OPW Flood Data		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	2.1		
CLIENT:	Coillte and Ørsted		
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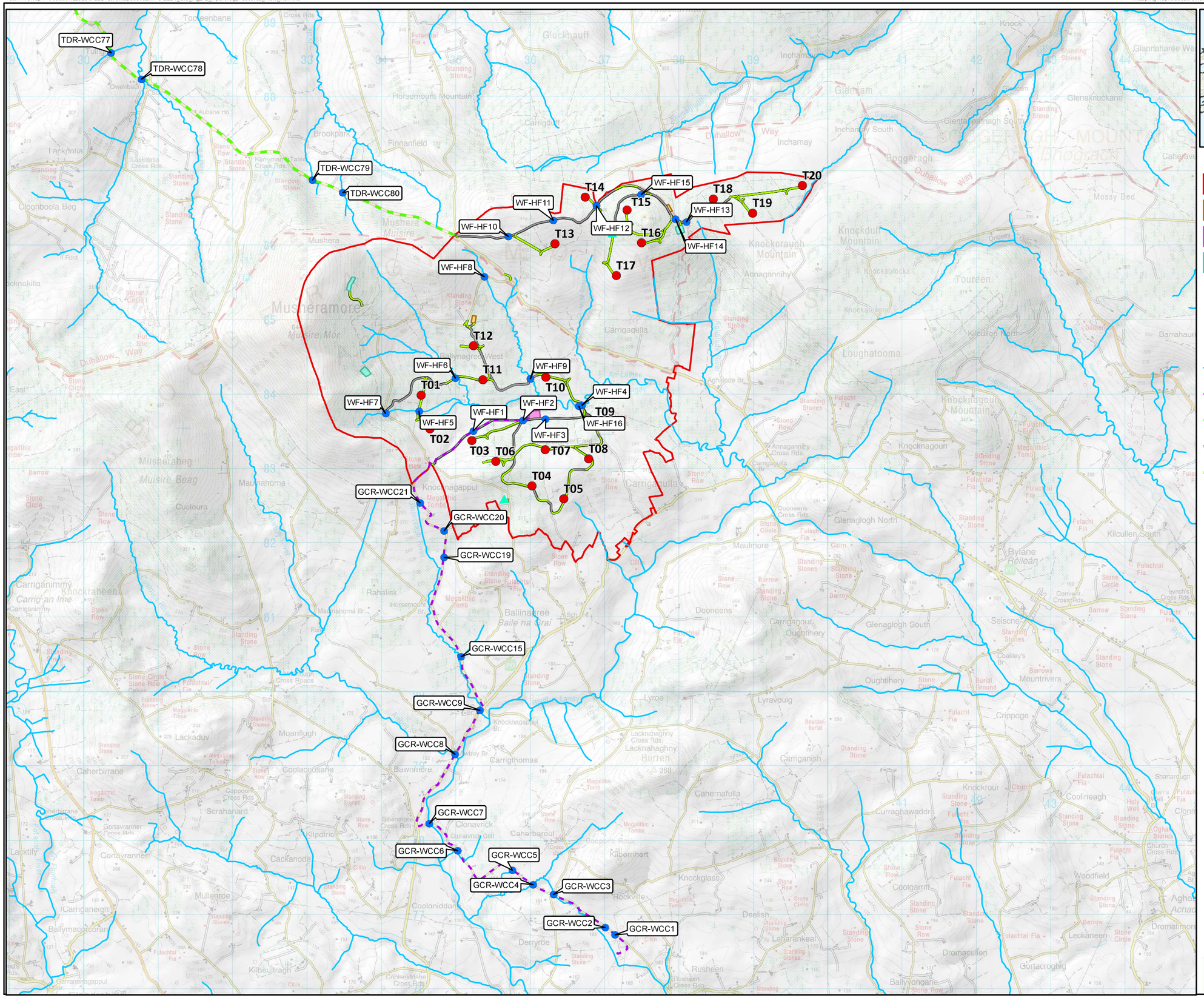

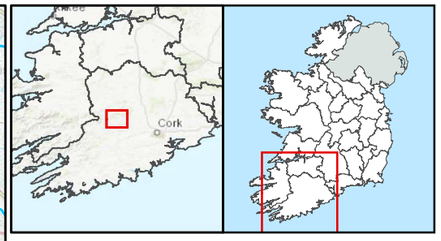

Legend

- Proposed Wind Farm Site
- Temporary Construction Compound
- Substation Compound
- Proposed Borrow Pits
- Proposed Turbine Layout
- Met Mast
- Hydrological Features New
- Rivers
- Grid Connection
- Turbine Delivery Route
- Existing Track Upgrade
- New Access Track

TITLE:	Hydrology Features		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	2.2		
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2.5 Archaeological, Architectural and Cultural Heritage

There are 14 known archaeological sites located within the wind farm site boundary of the wind farm site.

The locations of the extant archaeological monuments within private lands adjacent to the grid connection route were inspected from the roadsides. There is a stone row (CO049-019----) located within the section of the main wind farm in Knockagappul. It is located c. 50m from the roadside and no potential unrecorded archaeological features were noted within the margins of the road. A wedge tomb further to the south (CO049-067----) is located within a garden of a private house. It is not visible from the roadside to the east but its recorded position is not close to the road margin.

The turbine delivery route will use the existing road network between Foynes and the wind farm site. An inspection was undertaken of the hardstand area within a pasture field in the Drishane Castle demesne, which will accommodate a staging area for the transfer of turbine blades. The staging area comprises a large, level, grass field which was in use as sheep grazing land at the time of survey. It is bounded at south by a section of the random rubble estate wall which borders the public road. The southeast exit from the staging area will be via an existing cul-de-sac road that extends to Drishane cemetery to the north. This burial ground includes a modern southern extension to the earlier graveyard which is recorded archaeological site (RMP CO039-077002-). The partially levelled remains of a ruinous church are on the north side of the graveyard (RMP CO039-077002-).

For further information on archaeology, architectural and cultural heritage of the project, refer to Chapter 14 of the EIAR.

3. OVERVIEW OF CONSTRUCTION WORKS

3.1 Description of the Proposed Project

3.1.1 Wind Farm Site

The Wind Farm Site layout is shown in Figure 1-2.

The proposed wind farm will consist of 20 no. wind turbines , 2no. meteorological masts, and 1 no. substation compound along with ancillary civil and electrical infrastructure. Walking trails will be provided for community use.

Further details can be found in Chapter 3 of the EIAR.

3.1.2 Grid Connection

3.1.2.1 Grid Connection Cable Route

The grid connection route (GCR) will consist entirely of underground 110 kV cable and will connect the on-site substation to the existing 110/220 kV substation at Clashavoon. The GCR will be approximately 11 km in length, with approximately 9 km to be constructed primarily within the existing road corridor. The proposed Grid Connection Route arrangement is illustrated in Figure 1-4. The 110 kV grid connection cable will follow public roads and shall feature horizontal directional drilling (HDD) at 4 no. locations to cross existing watercourses.

Connection works to Clashavoon substation will involve the installation of ducting, joint bays, drainage and ancillary infrastructure and the subsequent running of cables along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches.

It is expected that full road closures will be put in place to facilitate cabling works in combination with lane closures, partial road closures and stop/go systems. This will enable the works to be completed as quickly and as safely as possible, with minimal disruption time for residents of the area. These works shall be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section.

The grid connection is located within the Sullane_SC_020 sub-catchment in its entirety.

The majority of the proposed grid connection route is underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop and alluvium indicated along the proposed route.

3.1.3 Turbine Delivery Route

The proposed turbine delivery route is presented in Figure 1-3.

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR). The proposed access route to site is as follows:

- Loads will depart the Port of Foynes and turn left onto the N69 towards Limerick;
- Loads will travel onto the M7 and turn onto the N21;
- Loads will turn onto the N20 and travel south through the towns of Charleville and Buttevant;
- Loads will turn right onto the N72 at Mallow and travel west;
- Loads will turn onto the R583 towards Millstreet;
- Loads will turn left onto the L2758 before entering Millstreet;
- Loads will travel South-East along the L2758 to the proposed wind farm site.

Key elements of the temporary accommodation works for the delivery of turbines are summarised in Table 3-1below. The general location of accommodation works are shown in Figure 1-3 and identified as 'Points of Interest (POIs)'. The location and nature of proposed temporary accommodation works are described in further detail in Table 3.1.

Table 3-1: TDR Temporary Accommodation Works

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works
2	Foynes Port Access Road/N69	Temporary removal of street furniture. Overrun of splitter island. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Tree and vegetation trimming.
6	N69 West of Toreen	Trimming of tree canopy
7	N69 Toreen	Trimming of tree canopy
9	N69 Clarina Roundabout	Temporary removal of street furniture. Overrun and oversail of northern edge of roundabout island. Placement of temporary load bearing surface. Removal of trees and vegetation.
10	N69/N18 Dock Road West Roundabout	Temporary removal of street furniture. Overrun and oversail of northern edge of roundabout island. Placement of temporary load bearing surface. Removal of trees and vegetation.
11	N69/N18 Dock Road East Roundabout	Temporary removal of street furniture. Overrun and oversail of public road verge. Placement of temporary load bearing surface.
19	N20 Ballybeg bends	Public road verge oversail. Temporary removal of street furniture. Removal of trees and vegetation.
20	N20 Kilcloosha bends	Public road verge oversail. Removal of vegetation.
23	N20/R883 Roundabout, Mallow	Overrun and oversail through roundabout island. Ground reprofiling and placement of temporary load bearing surface. Removal of trees and vegetation.
24	N20/N72 Roundabout Mallow	Overrun and oversail through roundabout and footpaths. Placement of temporary load bearing surface. Temporary removal of street furniture. Removal of tree.
26	N72 Dromcummer Beg	Vegetation trimming. Temporary removal of street furniture.
27	N72 Coolclough Bends	Temporary removal of street furniture. Relocation of telegraph pole. Removal of vegetation.
28	N72 Dromagh	Trimming of trees and vegetation.
29	N72 Dromtarriff Bends	Trimming of trees and vegetation. Removal of hedgerow. Temporary removal of street furniture. Oversail into third party lands. Placement of temporary load bearing surface.

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works
30	N72/R583 Junction	Removal of trees and vegetation. Temporary removal of street furniture and wall.
31	R583 Killetragh	Trimming of trees and vegetation.
32	R583 Minehill	Overrun and oversail of public road verge. Placement of temporary load bearing surface. Trimming and removal of trees and vegetation.
36	R583 Drishane Castle	Construction of a temporary staging area comprising aggregate hard standing and associated access track to and from the public road R583 in the grounds of Drishane Castle. Removal of masonry wall to facilitate temporary access from public road R583. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Relocation of telegraph pole. Trimming of trees and vegetation.
37	R583 Right Bend Entering Millstreet	Relocation of utility poles and overhead lines.
38	R583/L1123 Junction	Relocation of utility poles and overhead lines. Removal of walls. Temporary removal of street furniture. Placement of load bearing surface on third party land. Overrun and oversail of public road footpaths. Suspension of parking.
40	L1123 Left bend south of Millstreet	Relocation of utility poles and overhead lines. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Suspension of parking.
41	Tulig road right bend	Relocation of utility poles and overhead lines. Trimming of vegetation.
42	Tulig Road left/ right bend	Trimming of trees and vegetation. Relocation of utility poles and overhead lines.
43	River Owenbawn Left Bend	Removal of trees and vegetation. Relocation of utility poles and overhead lines. Removal of wall.
44	Auhane West of Tullig	Ground reprofiling and placement of load bearing surface on third party land. Relocation of utility poles and overhead lines. Temporary removal of street furniture. Removal of hedge.
46	Temporary widening of existing junction between Butter Road (L1123/L2758) and unnamed local road on approach to main site entrance.	Ground reprofiling and placement of load bearing surface on third party land. Removal of hedge.
47	Local Road on approach to main site entrance	Placement of temporary load bearing surface to roadside verges.

A detailed route selection report has been completed by Pell Frischmann Consulting Engineers. It describes the accommodation works in greater detail. It is included in the EIAR as Appendix 13.2

POIs which require significant works are shown in detail in the 0400 series planning drawings.

The main street of Millstreet will not be used as part of the TDR with the exception of the delivery of wind turbine tower sections to the wind farm site, which will need to approach the junction between the R583 and L1123 from the west to avoid impacting third party property.

This is due to the turning radius of the vehicles used to transport the tower sections which is greater than that of the lifting trailers used to transport the wind turbine blades. For this reason, a left-hand turn at the junction between the R583 and L1123 Butter Road on the main TDR route is not possible for the tower loads, and it is necessary to approach this junction from the west. After the loads have passed through Millstreet, the tower sections shall be decoupled from their clamp trailers at Claratlea and laid on the public road, while keeping a lane open for through traffic. The decoupled clamp trailers shall continue west and carry out a 180 degree turn at an existing Coillte forestry access at Rathduane which has sufficient space to facilitate the manoeuvre before returning to pick up the tower sections at Claratlea. The loaded vehicles shall then return through Millstreet and turn right onto the L1123 Butter Road, rejoining the main TDR route to the wind farm site. A detailed description of the proposed manoeuvre can be found in Appendix 13.3 of the EIAR in the form of a Method Statement for Turning Tower Sections which has been prepared by Pell Frischmann Consulting Engineers and includes swept path drawings. An overview of the turning manoeuvre is shown in Figure 3.1 below.

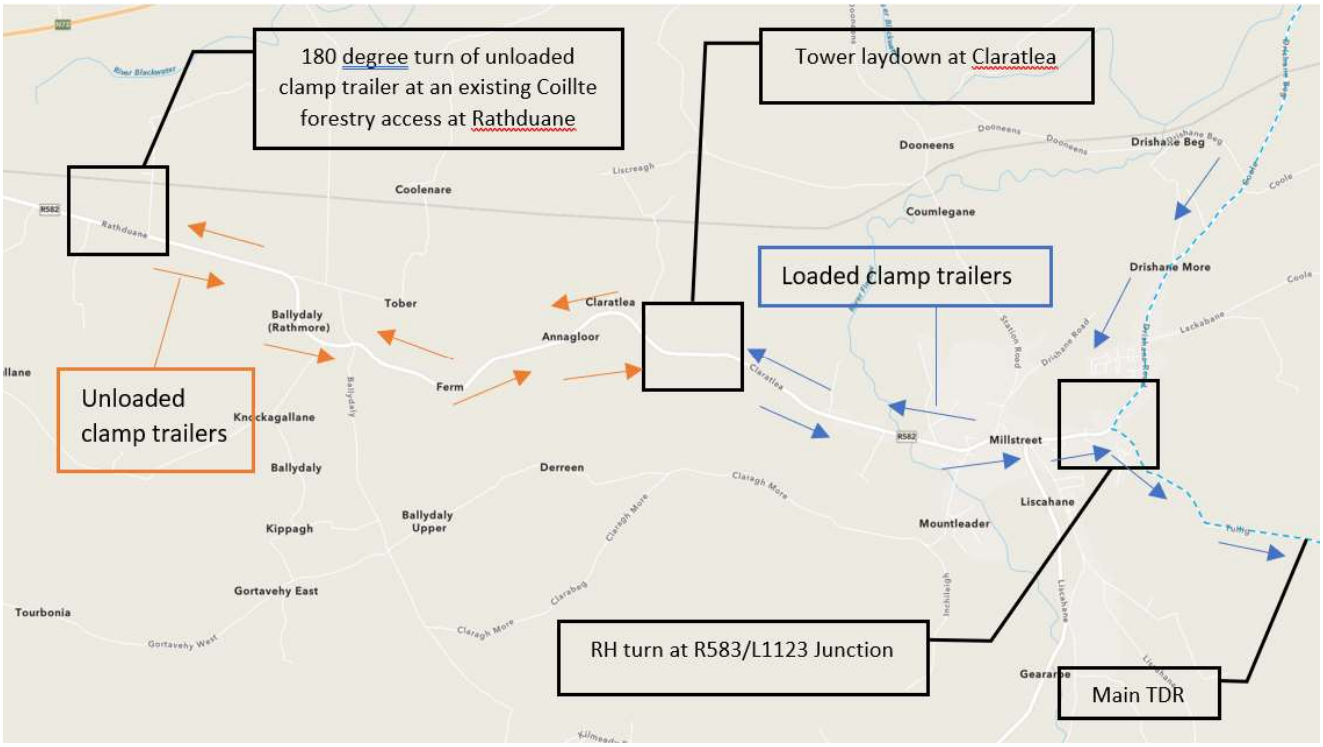


Figure 3-1: Turbine Tower Turning Summary

3.2 Construction Period

It is expected that the construction phase, including civil, electrical and grid works, and turbine assembly will take between approximately 18 - 24 months.

The proposed construction programme upon which assessments in the EIAR have been based is presented in Figure 3-2 below.

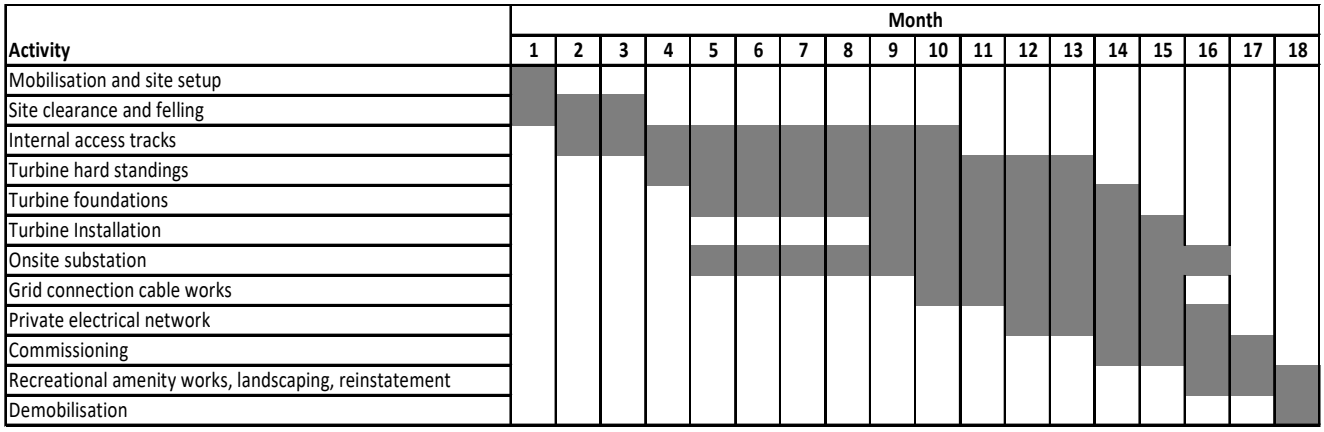


Figure 3-2: Proposed Construction Programme

3.3 Overview of the Construction Sequence

The construction of a wind farm project is a major infrastructural project. The construction of this project will involve many inter-related, inter-dependent and overlapping elements of a complex nature.

The following section outlines the construction methodology for the proposed project. Upon mobilisation for the construction of the development, peat excavation (where required), upgrading of existing site tracks, felling and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction. This will be followed by the construction of the turbine foundations and the provision of the hardstanding areas. In parallel with these works the on-site electrical works; sub-station and internal cable network are constructed. The proposed grid connection cable route works will commence following the completion of the proposed on-site wind farm works.

3.3.1 Overview of the Construction Methodology

Method statements are presented below for the key elements of the construction process. The contractor for the main construction works will, following appointment, take ownership, expand upon and generally develop these method statements appropriately for the construction stage.

The proposed construction methodology is summarised under the following headings:

- Site Entrances
- Temporary Site Compounds
- Felling
- Concrete Washout and Wheel Washing
- New Site Access Tracks
- Upgrade of Existing Internal Access Tracks
- Drainage and Watercourse Crossings
- Internal Wind Farm Cable Works
- Borrow Pit Construction
- Crane Hardstands

- Turbine Foundations
- Substation Compound
- Electrical Works
- Turbine Erection
- Grid Connection Cabling Works
- TDR Temporary Accommodation Works

3.3.1.1 Site Entrances

Ballinagree Wind Farm will use five existing forestry and agricultural entrances. The locations of these access points are shown on Figure 1-2.

The access points have been selected with consideration for safety of public road users and construction staff and to ensure they can be constructed to comply with the requirements of both Cork County Council and TII design requirements for direct accesses. Each of the access points are described in detail in Chapter 3 and Chapter 13 of the EIAR.

Site entrance designs and minimum visibility splays to be provided for the construction and operation of the proposed wind farm are shown in 0101-Series planning application drawings.

Site entrances will be constructed using the same methodology as the construction of the wind farm tracks as described in section 3.3.1.5.

The proposed trail head car park is shown on planning drawing P2114-0300-0017

Access Point 1: This is the main site entrance for the southern part of the site and shall also act as the main site entrance for the overall wind farm. An existing Coillte forestry access shall be upgraded to facilitate the delivery of turbine components. All turbine components accessing the southern part of the site shall use this entrance for the installation of turbines T1 to T13. This access point shall also be used for all construction and operation vehicles and shall be used by both HGV's and LGV's. This access point shall also act as the main entrance to the recreational amenity trail head at the location of the southern temporary compound during the operational phase of the project. This access is already regularly used by HGV's associated with agricultural and forestry activities and will continue to be used during the construction and operation phases of the project.

Figure 3-3: Access Point 1

Access Point 2: This is the main site entrance for the northern part of the site. An existing agricultural and forestry access shall be upgraded to facilitate the delivery of turbine components. All turbine components accessing the northern part of the site shall use this entrance for the installation of turbines T14 to T20. This access point shall be used for construction and operation by both HGV's and LGV's. This access is already regularly used by HGV's associated with agricultural and forestry activities and will continue to be used for these activities during the construction and operation phases of the proposed project. This access has also been used in the past to facilitate the construction of the existing Boggeragh Wind Farm.

Figure 3-4: Access Point 2

Access Point 3: This is an existing agricultural and forestry access which provides access to the southern part of the site. This access point will be used for operational access by LGV's only. The proposed grid connection export cable shall exit this site through this access point. This access is already regularly used by HGV's associated with agricultural activities.

Figure 3-5: Access Point 3

Access Point 4: This is an existing Coillte forestry access which will be used during the construction phase by LGV's and HGV's. This access point will form part of a public road crossing point with Access Point 5 for construction traffic travelling to and from the proposed borrow pits in the west of the site only. This access is already regularly used by HGV's associated with agricultural and forestry activities.

Figure 3-6: Access Point 4

Access Point 5: This is an existing Coillte forestry access which will be used during the construction phase by both LGV's and HGV's. This access point will form part of a public road crossing point with Access Point 4 for construction traffic travelling to and from the proposed borrow pits in the west of the site only. This access is already regularly used by HGV's associated with agricultural and forestry activities.

Figure 3-7: Access Point 5

3.3.1.2 Temporary Site Compounds

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. The location of the temporary site compounds are shown on Figure 1-2.

Ballinagree will have 2no. temporary compounds; one located near the main entrance to the southern part of the site which will include welfare facilities and offices and will act as the primary construction site compound, and a second, smaller compound in the northern part of the site as shown in Figure 1-2.

Temporary compounds shall be aggregate hard standings surrounded by security fencing, located as shown on the accompanying drawings. On completion of the construction phase, the temporary compounds will be dismantled, the hardstanding will be left in situ and covered over with soil which will be allowed to revegetate naturally. Part of the southern compound will be kept as a carpark for the recreation trail.

Facilities to be provided in the temporary site compounds will include the following:

- site offices, of Portacabin type construction
- portaloos
- bottled water for potable supply
- a water tanker to supply water used for other purposes
- canteen facilities
- storage areas
- employee parking
- bunded fuel storage
- contractor lock-up facility
- diesel generator
- waste management areas

The temporary compound for the northern cluster is shown on planning drawing P2114-0300-0015. The temporary compound for the southern cluster is shown on planning drawing P2114-0300-0016.

3.3.1.3 Felling

Much of the proposed wind farm site comprises commercial coniferous forestry. 10 no. turbines are located within forestry and consequently tree felling will be required as part of the project. Permanent felling of approximately 70 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation. The felling area proposed is the minimum necessary to construct the proposed project and also to comply with any environmental mitigation (bats in particular). In addition to the wind farm infrastructure felling described above, 18 ha of coniferous forestry is being felled as part of the proposed BEMP measures. The total amount of felling proposed for the project therefore is 88 hectares. In advance of other construction works, clearance felling will commence on site and is expected to take up to 3 months.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

In this regard, before any felling works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The felling plan, surface water management, construction management, emergency plans and any contingency plans;
- Environmental issues relating to the site;
- The outer perimeter of all buffer and exclusion zones;
- All health & safety issues relating to the site.

The proposed tree felling around proposed 'infrastructure' will be limited to:

- 20m wide corridors for new and upgraded access tracks;
- Outer footprint of turbine hardstandings including an additional 10m offset from same;
- Outer footprint of temporary compounds;
- Outer footprint of onsite substation compound;
- 6m corridor for buried cables in private lands;
- 101.3m radius around each turbine tower located in forestry for bat impact mitigation;
- 25m radius around the footprint of on-site meteorological masts.

3.3.1.4 Concrete Washout Area and Wheel Washing

All concrete will be delivered to site via ready-mix trucks from a local supplier.

Concrete washout will be carried out in a dedicated area of the temporary compound or at a designated washout pit on site. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement pond provided to receive all run-off. Wheel wash details are shown on planning drawing P2114-0300-0024. Settlement pond details are shown on planning drawings P2114-0501-0006 and P2114-0501-0007.

The concrete wash-out area will be constructed as follows:

- The topsoil and subsoil, if necessary, will be stripped out and placed adjacent to the temporary compound area.
- An impermeable membrane will be installed directly onto the subsoil, and/or subsoil, to form the impermeable concrete wash-out settlement lagoon.
- A designated truck wash-down concrete apron shall be constructed next to this settlement lagoon.
- Impermeable lined drains will direct the wash-out flow to the wash-out settlement lagoon.
- The residual liquids and solids will be disposed of off-site at an appropriate licenced waste facility.

Upon completion of the project the concrete wash-out areas and settlement lagoons will be decommissioned by removing the impermeable membrane and backfilling the area with the material arising during excavation. The removed material will be recovered or disposed of off-site at an appropriate facility.

Wheel wash facilities will be located near site entrances 1 and 2 as shown on Figure 1-2to reduce construction traffic fouling public roads. Each wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Silt will be removed from each unit and from site by a licensed contractor.

3.3.1.5 New Site Access Tracks

All site tracks will be designed taking account of the loadings required by the turbine manufacturer and will consist of a compacted stone structure. Suitable granular fill material for the sub-base of the track will be sourced from the borrow pits within the site. Suitable class 6 structural fill will be imported from a licensed quarry as required to meet the requirements of the detailed design. Class 6F2 and clause 804 granular material for track base course and running surface will be imported from a licensed quarry.

The majority of access tracks on the site will be constructed using traditional founded track construction and best practice construction methods from suitable load bearing strata. This system will consist of either one or two layers of stone depending on the load bearing capacity of the base layer. Where the underlying layer is mineral subsoil, two layers of stone are used; a stone capping layer and running layer.

In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface. Drainage runs and associated settlement ponds will be installed.

Track construction details are as follows:

- Establish alignment of the new site tracks from the construction drawings and mark out the centrelines with ranging rods or timber posts.
- The access tracks will be of single-track design with an overall width of 5m. There will be some local widening on the bends, junctions and around Turbine Foundations for the safe passage of large vehicles. All bends have been designed to suit the requirements of the delivery vehicles.
- All machinery shall work within designated construction areas indicated on the contract drawings.
- All access for construction vehicles within the site shall follow the proposed internal access tracks as shown in Figure 1-2.

- Topsoil/subsoil will be stripped back to required levels. Excavated material will be placed along the side of sections of the tracks and dressed to blend in with surrounding landscaping and partially obscure sight of the track.
- The soil will be excavated down to a suitable formation layer of either firm subsoil or rock.
- The formation will be prepared to receive the geotextile membrane.
- Well-graded granular fill will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Site Manager based on the characteristics of the material and the compaction plant to be used.
- Batters will have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

2.75 km of floating road construction will be adopted in the northern part of the site where peat depths are greatest. In this instance, geogrid will be placed directly on the existing ground surface and aggregate will be placed and compacted in lifts on top with additional layers of geogrid placed at specified depths where necessary. A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface.

3.3.1.6 Upgrade of Existing Internal Access Tracks

Figure 1-2 illustrates the internal access tracks within the Wind Farm Site.

An extensive network of agricultural and forestry access tracks exists within the site. 11.8km of these existing access tracks will be upgraded for the proposed project.

All access tracks will be widened to 5 m wide along straight sections and wider at bends as required. The tracks will be finished with a well graded aggregate. The drainage system will be installed adjacent to the internal access tracks. Existing drainage infrastructure will be maintained and upgraded where necessary.

Access track formation will consist of a minimum 500mm hardcore on geo-textile membrane.

Existing track upgrades shall follow the same outline methodology as for new access tracks.

Refer to 300 series planning drawings for typical track dimensions.

3.3.1.7 Temporary Tracks

Temporary aluminium access trackway will be used to provide short term access to areas of the site not served by the proposed aggregate tracks during the construction and commissioning phase. This solution is commonly used to provide temporary road access to outdoor events and is designed to be installed quickly in modular sections with minimal impact to existing ground. It is primarily used for ground protection and to prevent the creation of excess mud from site vehicles.

A Temporary Aluminium Access Trackway is shown below in Figure 3-8.

Figure 3-8: Temporary Aluminium Access Trackway

3.3.1.8 Internal Wind Farm Cabling Works

The specification for cable trenches will vary slightly depending on cable voltage, location and existing land use. Typical cable trench construction details are presented in 0300-Series planning application drawings.

All electrical and fibre-optic cabling on site between the wind turbines and the substation building will be buried in trenches approximately 0.6m wide by 1m deep located within or directly adjacent to the internal tracks.

The following describes the construction methodology for cable installation works inside the wind farm site. Some cables will be buried directly and some will be ducted. Direct buried cables will be used in non-load bearing areas and ducts will be used in load bearing areas.

For direct buried cables, the following outline methodology shall apply:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with environmental management plan outlined in Section 4 of this CEMP.
- The line of the cable trench will run beside the site access tracks until it exits to the public road.
- The ground will be excavated using a mechanical digger. The top layer of soil will be removed and placed to one side. It will be used for landscaping the top of the backfilled cable trench following the laying of the cables. The remaining subsoil, excavated to the required depth, will be placed separately and used as backfill for the trench.
- Safe ladder access/egress to trenches will be provided into the trench.
- The cables will be laid directly onto a bed of suitable material, free from sharp stones and debris*.
- A suitable material will be placed over the top of the cables to protect them during backfilling*.
- Warning tape and plates will be installed by hand in accordance with the trench design and ESBN specifications and the engineer's design.
- On completion, the ground will be reinstated, and marker posts will be positioned at agreed centres to the side of the trench highlighting the presence of cables below.
- Trenches will vary in width depending on the number of cables in the circuit. Where there is more than one set of cables they will be separated as per cable manufacturers and ESB/ EirGrid requirements.

Where ducting is required within the wind farm site (i.e. for areas where cables will be laid under access tracks or other loaded surfaces), suitable ducting will be required to protect the cables. In this scenario, tasks marked by an asterisk (*) in the above methodology will be replaced by the following steps:

- Ducts will be placed into the trench manually, having been delivered to road side embankment/verge by tractor and pipe trailer and then offloaded by hand.
- Approved bedding material will be used to surround the ducts. It will be delivered straight from a concrete truck or by skid steer along the route.
- Approved fill material will be compacted above and below the power cable ducting as per the engineer's design.
- Exposed duct ends will be capped.
- A 12mm Draw rope will be blown through the ducting at later date.
- Small jointing pits will be located along the route of the trench which will be left open until jointing takes place. A protective handrail/ barrier will be placed around each pit for health and safety reasons.
- Once the cables are joined and sealed the jointing container will be removed and the cables at the joint-bay locations will be back-filled in the same manner as the rest of the cable trench.
- The cables will connect the turbines to the substation. Ducts will be cast into each turbine foundation to provide access for the cables Likewise, at the substation, ducts will be cast through the building foundation to provide access for the cables.
- There are no existing buried services expected within the site however the appointed contractor will be responsible for carrying out pre-construction surveys ahead of construction.
- Prior to commencement of the works, records of services such as watermains, sewers, gas mains and other power cables will be obtained from the relevant service providers. Cable detection tools, ground penetrating radar and slit trenches will be used, as appropriate, to find the exact locations of existing services. The final locations of the cable trenches will be selected to minimise conflicts with other services.
- Trenches where ducts are laid will be back filled every evening. During excavation works signage will be erected at each location warning of the dangers.

3.3.1.9 Drainage and Watercourse Crossings

A surface water management plan has been prepared. It can be found in Appendix 10.2 of the EIAR. it contains methodology for drainage, water quality management and silt control. The measures contained within the plan will be applied when constructing the watercourse crossings.

Drainage design and details can be found on the 0501 series planning drawings.

Watercourse crossings details can be found on the 0300 series planning drawings.

Watercourse crossings can generally be classified as follows:

- Existing structures (bridges or culverts) that need to be crossed by infrastructure (access tracks or cables) associated with the proposed project, without a need to modify the existing structure;
- Installation of new structures to facilitate the crossing of existing watercourses by infrastructure associated with the proposed project;

- Existing structures that need to be either replaced or upgraded to facilitate the crossing of existing watercourses by infrastructure associated with the proposed project;
- Crossing of existing open streams or drains by cable ducts.

The methodology/sequence of works associated with the proposed watercourse crossing methods are described below.

Construction Methodology for Instream Works and Temporary Stream Diversions

The following methodology shall be applied at all locations where instream works are required.

- Instream works shall only take place during the period July to September (as required by IFI for instream works). However, as stated above, all instream works shall take place in written agreement with the IFI;
- Operation of machinery in-stream should be kept to an absolute minimum. All construction machinery operating in-stream should be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery should be checked prior to commencement of in-stream works.
- Before contact with water is made, any equipment or machinery that will be used in the water, including Personal Protective Equipment (e.g. footwear, gloves), will be sprayed and cleaned with a 1% solution of Virkon® Aquatic (or other proprietary disinfectant);
- Upon completion of the work or moving the equipment or machinery from the water, these will be visually inspected for any possible sources of contamination and any attached plant or animal material or debris will be removed. The equipment and machinery will be further sprayed and cleaned with a 1% solution of Virkon® Aquatic (or other proprietary disinfectant);
- If temporary diversion channels are necessary as part of the instream works, they should provide for fish passage, be non-eroding, and be of similar width to the natural stream channel. The channel diversion should be compliant with the following measures:
    - Diversion of water to and from temporary channels should only take place during the period July to September (as required by IFI for instream works) and in accordance with the IFI;
    - Consultation with the NPWS should also be carried out as species protected under the Wildlife Act, EU Habitats Directive and the EU Freshwater Fish Directive occur within the river water bodies affected by the instream works;
    - The works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;
    - A minimum 10 meter vegetative buffer zone will be maintained between disturbed areas and the water body. There will be no storage of material/equipment, excavated material or overnight parking of machinery inside the 10m buffer zone;
    - Double silt fencing will be placed upslope of the buffer zone on each side of the water body. The silt fencing will have removable "gates" as required to allow access of excavator while maintaining ease of replacement overnight or during periods of heavy rainfall. The silt fencing will be extended at least 10m upstream and downstream of the crossing location;
    - Bog mats will be used underneath the excavator inside the 10 meter vegetative buffer zone to prevent soil erosion and potential water quality impacts from localised surface water runoff;
    - Temporary storage of excavated overburden from the diversion channel will be undertaken outside of the 10m buffer on flat ground or within a local hollow. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the water body;

- The water body dam (in the stream to be diverted) will be made of sand (clean) bags, cobbles or clean well-graded coarse gravel fill. Poorly sorted material will not be used as it would be a potential source of fine sediment (the dam will be installed once the diversion channel is in place);
- The banks and bottom of the diversion channel will be lined with impermeable geotextile to prevent erosion and surface water quality impacts. A layer of clean course gravel will be placed over the geotextile on the bed of the channel to keep it in place;
- An energy dissipater (such as clean rock fill or splash plates) will be placed on the water body bed and opposing bank of the receiving water body downstream of the diversion channel. This will prevent scouring and erosion of the water body bed and bank at the outfall during diversion;
- Water body bed trench excavation works will commence once stream flow is fully diverted from the crossing excavation area;
- Temporary storage of excavated material from the crossing trench will be undertaken separately to the material from the diversion channel. All storage areas will be outside the 10m buffer zone. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the water body;
- Sediment laden water from trench dewatering will be discharged onto a well vegetated, dry, flat area at least 50m from a water body via a straw bale dewatering structure or geotextile filter bag. The outfall will also be surrounding by silt fencing;
- In addition, the suitability of the discharge area shall be confirmed by the site geotechnical engineer so as not to pose an increased risk to slope stability with consideration for ongoing activities both upslope and downslope of the proposed location and shall be sited to avoid areas of deep peat;
- If there is no suitable area for discharge onto ground, settlement ponds will be used where necessary and will be put in place prior to commencement of preparation works;
- Any water from trench dewatering will not be discharged directly to a water body;
- Clay bunds will be placed within the trench backfill on either side of the water body to prevent the trench acting as a drain towards the stream, thus preventing potential water quality impacts;
- Upon completion of the in-stream works, the stream crossing will be restored to its original configuration and stabilised to prevent bank erosion by means of timber stakes, timber planks and geotextiles as required (Project Design Measure);
- The diversion channel will be backfilled and reinstated to its original level and rock armour will be placed at the stream banks where the inflow and outflow of the diversion channel previously existed;
- The ground surface along the reinstated diversion channel will be re-seeded at the soonest opportunity to prevent soil erosion;
- The silt fencing on either side of the stream buffer will be left in place and maintained until the disturbed ground has re-vegetated;
- Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance;
- Disturbance of bankside soils and stream sediments will be restricted to the minimum required for the cable laying process to avoid unnecessary impact on the stream morphology;
- There will be no batching or storage of cement allowed at the stream crossing;

- There will be no refuelling allowed within 100m of the stream crossing;
- All plant will be checked for purpose of use prior to mobilisation at the stream crossing;
- Works will not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted; and
- Once construction of the crossing is completed, reconnection to the existing water body can be made and this should only occur within the approved operational window for in-stream works.

Construction Methodology for Watercourse Crossings in the Wind Farm Site

Minor Watercourses and Drain Crossings (Access Tracks)

It is expected that all minor watercourse and drain crossings within the site will be crossed using piped culverts. Piped culverts will only be used over very short stretches i.e. at track crossings. Pipe culverts will be sized to take the 1 in 100-year flood flow with a 20% allowance for Climate Change. Concrete or HDPE pipes may be used depending on the size of the watercourse to be crossed.

The Wind Farm Site layout does not cross any significant stream within the site boundary. Minor drains such as manmade agricultural and forest drains will be crossed using 450mm diameter pipes.

Where cross drains are to be provided to convey the drainage across the track at regular intervals, the sizes of these cross drains are 300 mm diameter pipes.

Silt Protection Controls (SPCs) are proposed at the location of the drain crossings. SPCs will consist of a minimum of silt traps containing filter stone and filter material staked across the width of the swales and upstream of the outfall to any watercourse.

Pipe culverts will be installed in accordance with the design shown in Figure 3-9 below.

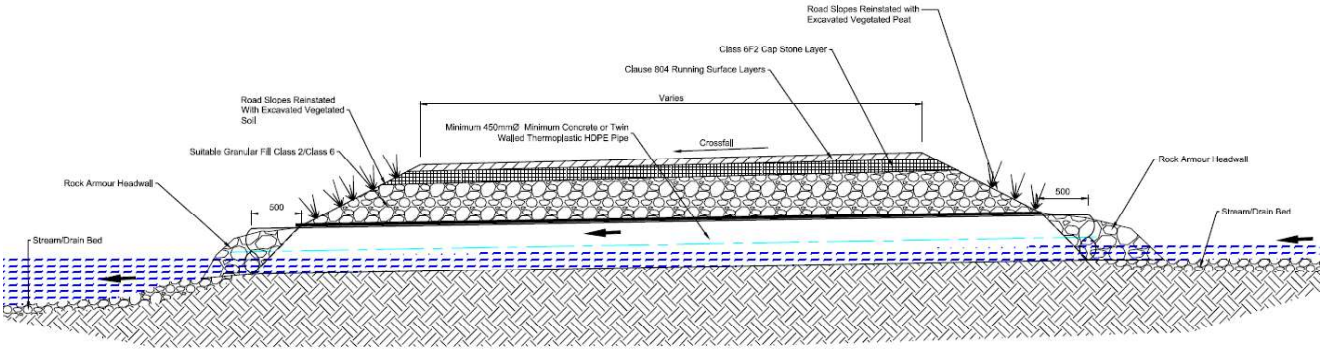


Figure 3-9: Piped Culvert Crossing Long Section

For a minor watercourse/drain crossing using a piped culvert, the following methodology will be used.

- The access track construction will finish at least 2.5m from the nearside bank of the minor watercourse/drain.
- Use of weather forecasts will be made, and works will be planned when a dry spell of weather is forecasted;
- Work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;

- Where there is a requirement to disturb either the bed or bank as a result of the construction/replacement works, the watercourse will be dammed upstream and diverted prior to work commencing;
- A temporary berm (i.e. sandbags and/or rectangular straw bales) will placed along the edge of the track/road to prevent loose material being dislodged or washed into the water body;
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4. Instream works and temporary diversions where required shall be carried out in accordance with the measures outlined in Section 3.3.9.1.
- The bed of the channel in which the culvert will be laid will be prepared using a mechanical digger and hand tools to the required levels in accordance with the design.
- A bedding layer will be laid in the base of the minor watercourse/drain using Class 6 aggregate material and blinding to the desired levels in accordance with the design.
- The pipe is laid in one lift or in sections using an excavator in accordance with an approved lift plan.
- Bedding material is placed and compacted around the pipe to the desired levels in accordance with the design.
- Suitable bedding material in the form of clean round gravel between 10-100mm diameter, shall be laid in the base of the pipe in accordance with the recommendations set out in *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses from* Inland Fisheries Ireland.
- The pipe is covered using compacted Class 6N fill material in accordance with the design up to the levels required by the access track sub formation.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.
- For small drain crossings, pipes of suitable diameter will be laid directly into the bed of the drain.

In some cases, where existing internal forest tracks need to be widened, it will be necessary to widen, replace or extend existing pipe drains. In such cases, the above measures shall also be employed.

Minor Watercourses and Drain Crossings (Cable Trenching)

For a minor watercourse/drain crossing, the following methodology will be used.

- The cable trench construction will finish at least 2.5m from the nearside bank of the minor watercourse/drain.
- Use of weather forecasts will be made, and works will be planned when a dry spell of weather is forecasted;
- Work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;
- Where there is a requirement to disturb either the bed or bank as a result of the construction/replacement works, the watercourse will be dammed upstream and diverted prior to work commencing;
- A temporary berm (i.e. sandbags and/or rectangular straw bales) will placed along the edge of the track/road to prevent loose material being dislodged or washed into the water body;

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4. Instream works and temporary diversions where required shall be carried out in accordance with the measures outlined in Section 3.3.9.1.
- The bed of the watercourse will be prepared using a mechanical digger and hand tools to the required levels in accordance with the design along the alignment of the cable route.
- Once the trench has been excavated, a bedding layer of sand will be installed and compacted.
- PVC ducts will be installed on top of the compacted base layer material in the trench.
- Once the ducts have been installed, couplers will be fitted and capped to prevent any dirt etc. entering the unjointed open end of the duct. In poor ground conditions, the open end of the duct will be shimmed up off the bed of the trench to prevent any possible ingress of water and dirt into the duct. The shims will be removed once the next length of duct has been joined to the duct system.
- The as-built location of the installed ducts will be surveyed and recorded using a total station/GPS before the trench is backfilled to ensure recording of exact location of the ducts, and hence the operational electricity cable. These co-ordinates will be plotted on as-built record drawings for the operational phase.
- When ducts have been installed in the correct position on the trench base layer, sand will be carefully installed in the trench around the ducts so as not to displace the duct and compacted.
- A red cable protection strip will be installed above duct surround layer of material.
- A layer of excavated material will be installed on top of the duct surround material to the correct level.
- Yellow marker warning tape will be installed for the full width of the trench.
- The bed of the watercourse, stream banks and agricultural land will be reinstated as per their original condition.

Box Culvert Construction Methodology

Box culverts have been used at stream crossings where pipes would not be sufficient.

Culverts will be sized to take the 1 in 100 year flood flow with a 20% allowance for Climate Change.

The construction methodology for the box culvert will be the same as a piped culvert with the only difference being a box being used instead of a pipe.

Clear Span Bridge Construction Methodology

Clear Span bridge construction will be required as part of the wind farm internal access track construction (WF-HF4) as shown on drawing P2114-0300-0018. Sufficient free-board will be allowed for in the proposed bridge design to allow for 1 in 100-year fluvial flood conditions with a 20% allowance for Climate Change.

In order that flood flows will not be obstructed, the stream crossings will be sized to convey a 1 in 100-year flood flow with a 20% allowance for Climate Change.

The construction methodology is detailed as follows:

- Excavation near river banks is required to install and secure pre-cast concrete abutments.
- Abutments will be set back 2.5m from 1% AEP flood height (100-year event).
- Dry working conditions at these sites will be maintained by retaining the existing bank and using a short section of sand bags in a cofferdam style formation on the stream side of the working area. The sandbag screen will prevent any soil from excavations from falling into stream.
- On alternate sides of the stream, within the sequenced sandbag screen set-ups, the abutment base will be excavated to rock or competent stratum with a mechanical excavator.
- The foundations and abutments will be pre-cast concrete sections. They will be lifted into place on the base. The area around the abutments up to access road level will be infilled with a structural fill.
- Once each abutment is in place and secured with structural fill, the pre-cast concrete deck will be laid down on the abutments, anchored and a thin screed of concrete will be poured on top.
- When the concrete deck is connected to the abutments, the filling and compaction of the road will be completed.
- Ducts for the later pulling of power and communication cables for the wind farm will be pre-cast into the bridge deck sections.
- Construction of the water crossing will be scheduled to align with fisheries seasonal restrictions.
- The access road on the approach to the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures, including check-dams and /or silt traps, along the proposed road will be installed in advance of the works along with the first layer of road construction.
- All earthworks adjacent to the crossing locations will be carried out so as to prevent soil entering the watercourse.
- Safe access over the stream for this installation will be via a steel walkway & handrail which will span the stream.

Construction methodology for Watercourse crossings along the Grid Connection

The grid connection cable route contains 3 No. bridge watercourse crossings and one large culvert crossing which will be completed using horizontal directional drilling (HDD).

A number of other minor watercourses crossing locations have been noted along the cable route, i.e. culverts, pipe drains and minor field drains. Crossing of these existing culverts will be as per undercrossing or overcrossing methods, depending on the depth of the culvert or using open trenching.

Standard Trench Crossings of Existing Culverts or Services

For the crossing of buried pipe drains, culverts or services, if encountered, the following options for construction may be used:

- Piped Culvert Crossings – Where sufficient cover is available, the cable ducts will be laid above the culvert with a minimum separation distance, 300mm to be agreed with the local authority and Eirgrid within the parameters assessed in the EIAR.
- Piped Culvert Crossings - Where sufficient cover is not available, the cable ducts will be laid under the culvert with a minimum separation distance, 300mm to be agreed with the local authority and Eirgrid within the parameters assessed in the EIAR.

When crossing existing culverts or buried services, the following methodology will be employed:

- The general method of trench construction will follow the procedure outlined above for Installation of cable ducting.
- The service infrastructure shall be located and marked by an engineer in accordance with the Code of Practice for Avoiding Danger from Underground Services, Health and Safety Authority 2005.
- All services will be safeguarded and protected in accordance with the asset owner's specifications.
- Within 500 mm of the existing service, hand digging will be employed to expose it.
- Cable ducts shall pass over or under the existing service, depending on the depth of the service and other constraints. Figure 3-12 shows design details for ducts passing in flatbed formation above existing culverts and buried services.
- A minimum separation distance of 300mm shall be maintained between the cable ducts and the existing service.
- Existing services within the trench shall be left in the same condition as they were found. Any issues shall be reported to the asset owner immediately.

Piped Culvert Crossings – Ducting Under Culvert

Where the culvert consists of a socketed concrete or sealed plastic pipe with insufficient cover over the culvert to accommodate the cable trench, a trench will then be excavated beneath the culvert and cable ducts will be installed in a trefoil arrangement under the sealed pipe.

This method of crossing is illustrated in Figure 3-10below. If these duct installation methods cannot be achieved or utilized, the ducts will be installed by alternative means as set out in the following sections.

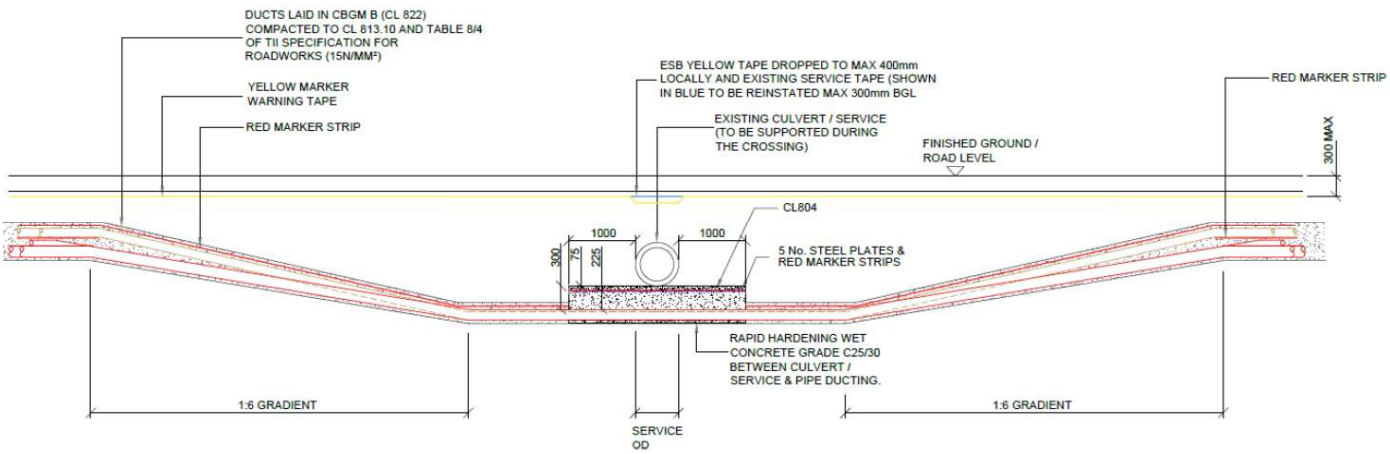


Figure 3-10: 110kV Cable Duct Undercrossing Method

Piped Culvert Crossing – Ducting Over Culvert

Where sufficient cover exists above the culvert, the trench will be excavated above the culvert and the ducts will be installed in the trefoil arrangement passing over the sealed pipe where no contact will be made with the watercourses. This method of duct installation is further detailed in Figure 3-11.

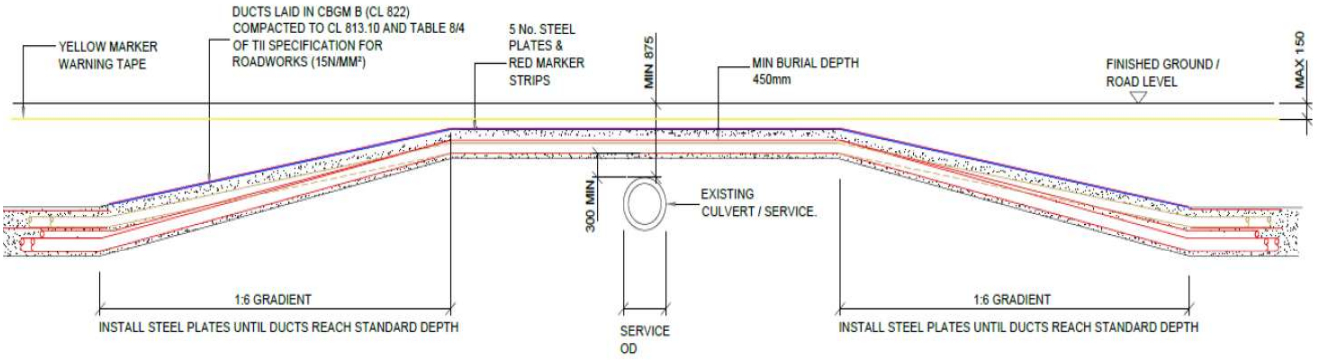


Figure 3-11: 110kV Cable Duct Overcrossing Method

Where cable ducts are to be installed over an existing culvert with insufficient cover, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert. The ducts will be laid in a flatbed formation over the existing service. They will be encased in a reinforced concrete surround in accordance with Eirgrid's specifications.

After the crossing over the culvert has been achieved, the ducts will be laid in a trefoil arrangement again within a standard trench. This will be done gradually to comply with minimum duct and cable design bend requirements. In transition sections between trefoil and flat formation, the base of the trench shall be graded to eliminate stepping and minimum bedding and surround material will be maintained throughout.

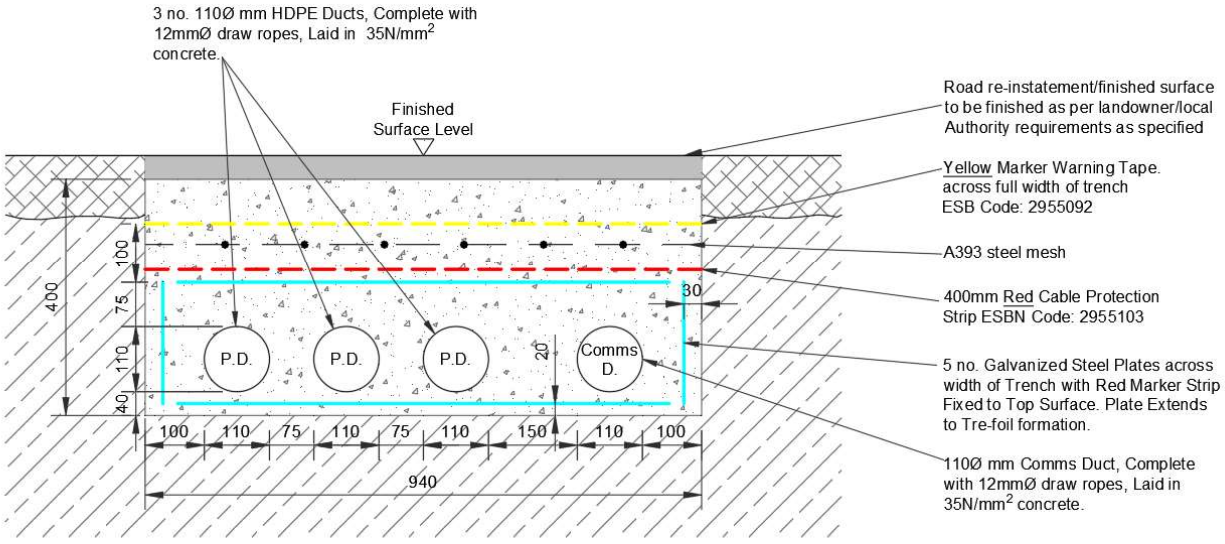


Figure 3-12: Flatbed Formation Detail

For further information refer to 110kV Underground Cable Construction Methodology report in Appendix 3.3 of the EIAR.

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites", and these guidelines will be adhered to during the construction of the development.

For further details please refer to the Construction Methodology for the Ballinagree Windfarm 110kV Underground Cable Report in Appendix 3.3 of the EIAR.

Sections of trenching and ducting will involve instream works at numerous culvert crossing locations in order to install cabling. To facilitate the works, these watercourses will be dammed and the water diverted over or around the works using either a flume pipe or a diversion channel. Following the completion of works at the watercourse, the dam will be removed and the watercourse reinstated.

The following methodology describes instream works using a standard Dam and Flume diversion method:

- Where temporary fluming or flow diversion are in situ, in a watercourse frequented by salmon or trout, (at least medium sensitivity) all fish within the designated area will be subject to fish rescue and translocation downstream by a fisheries biologist.
- The flume pipe(s) will be set out on the bed of the existing stream.
- A dam will be constructed using sand bags and suitable clay material around the flume pipe(s) and across the stream so that all the flows are diverted through the pipe(s).
- Silt traps, such as geotextile membrane, straw bales etc. will be placed downstream of the in-stream trenching location prior to construction, to minimise silt loss.
- The ducting installation works will be carried out in the dry stream bed and under/around the flume pipe(s). If required, a temporary sump will be established and used to collect any additional water. This water will be removed by pumping to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the de-watering.
- Refer to Section 3.3.1.9.1 for further details with respect to the suitable siting of discharge areas.
- Following the completion of works, the stream bed will be reinstated with original or similar material and the spawning gravels replaced under the supervision of an aquatic ecologist.
- Once the stream bed is appropriately re-instated the dam and the flume pipe(s) will be removed thus restoring the stream to its original condition.

Section 3.3.1.9.1 contains the methodology to be adopted to carry out instream works using a standard Dam and Divert diversion method:

Replacement of Existing Culverts

The grid connection route extends approximately 11.37 km mainly along local roads (9.35km) and an unpaved forestry access road. There are nineteen known culverts along the route. Of these culverts, most appear to be either concrete pipe, HDPE twinwall pipe or stone construction, seventeen of which are on the public road. Where there is insufficient cover over the culvert, it will be necessary to trench under the culvert. It should be again noted that the EirGrid preferred method of crossing third party services/culverts is undercrossing. For stone culverts there is a high probability that the culvert would collapse sending stream water into the trench.

To avoid this occurring, stone culverts with insufficient cover will be identified and replaced prior to trenching works. The following approach will be taken:

- Works will be supervised by the Ecological Clerk of Works and / or the project aquatic ecologist who will liaise with IFI and National Parks and Wildlife Service (NPWS) prior to works commencing. The ECoW will also monitor surface water quality downstream of the works in accordance with the surface water monitoring programme and will have the authority to cease any works should the monitoring identify unacceptable water quality conditions.
- Any works within watercourses that provide fish habitat (indicated in the EIAR at least of "Medium" sensitivity), will be avoided between Oct 1st and April 30th as per IFI guidelines.
- All plant and equipment will be serviced and cleaned before entry to site to limit risk of oil spillage and for biosecurity.
- Works will be carried out in dry weather with low flows in the streams with forecast for dry weather for the duration of the works – approximately 2 days.
- Machinery used will stay on the public road; machinery will not be permitted to enter the stream channel.
- The road edge adjacent to the watercourse will be lined with sandbags and silt fences (multiple fences recommended) as appropriate to prevent runoff from the trenching works reaching the stream. The design of these multiple features shall also allow for the safe removal of accumulated silt away from the channel, particularly through staged removal of the most contaminated upper fence before the lower ones, and the removal of the final fence only when it is clear of any silt
- Clean sandbags will be used to dam flows on the upstream side of the culvert. Sandbags will be placed by hand at a suitable location to take advantage of any natural pool but set back from the works to permit unhindered excavation of the existing culvert.
- A second sandbag dam will be placed on the downstream side of the culvert to prevent backflow into the works and contain any groundwater seepage that is likely to be turbid.
- Sandbagging requires careful attention to detail if it is to be effective. All bags must be laid neck uppermost and seams aligned. Bags must not be overfilled or they will not tamp together or will burst with ease. Additional bags will be filled ready to raise the freeboard of dams.
- Flume placement for temporary flow diversion or permanent replacement of culverts will follow guidelines issued by IFI and CIRIA to ensure that fish passage is not impeded.
- If topography permits, the water will be piped over the road by gravity flow, otherwise, it will be pumped. Discharge will be via break tank or similar approved storage onto a splash-plate or rip-rap (gabion basket) to dissipate energy and avoid scour or erosion of the stream bend or banks. The pump will be fitted with a screen, so fish are not drawn into the pump intake.
- The use of pump sumps will be considered within the dammed area. These will be lined to prevent scouring. The intention is to intercept clean groundwater ingress and pump it out rather than allowing it to get silted in the works area by segregating off areas.
- Any spoil generated will be removed to a designated safe area clear of the flood plain. Some of this spoil will be saturated and will require bunding and sheeting over.
- If bank material needs to be removed it will be stored separately and reinstated accordingly.

- The ducting will be advanced past the culvert. The existing culvert will be excavated 'in the dry'. A new culvert, sized for a 100-year rainstorm event, will be installed with appropriate gradient, headworks and outfall. A precast concrete culvert, concrete pipe or HPDE pipe will be used. Culverts will be embedded to at least 300mm below the existing stream bed to ensure backwatering. Culverts will avoid a significant change in gradient (i.e. >3%). After embedding, replacement culverts will be filled with clean washed gravels and cobbles to replace lost habitat and facilitate fish movement.
- Dry stone headworks will be placed at the culvert intake and discharge. The stream bed adjacent to the works will be reinstated at the direction of the project aquatic ecologist.
- The ECoW will determine the quality of any water trapped between the two dams – visual inspection and turbidity meter. If this water is clean it will be left in situ. If it is not clean, it will be removed from the works area prior to removal of the dams. If required, dewatering of the works area prior to dam removal will be undertaken by pumping from the stream bed to a suitable percolation area as described in Section 3.3.1.9.1.
- The upstream dam will then be removed to permit flow though the new culvert. This will be done in phases, so a large volume of water isn't released at once. The downstream dam will be removed in a similar manner.

Horizontal Directional Drilling

Horizontal Directional Drilling (HDD) will be employed at 4 no. locations along the proposed grid connection route as shown on the site layout plans.

The depth of the bore shall be at least 3m below the level of the public road and stream bed. A survey of buried services within the public road will be carried out by the contractor prior to commencement to confirm the conditions predicted in the EIAR. The council will be made aware in advance of the operation and invited to oversee the activity.

The locations of the launch and reception pits are positioned to ensure the bore is at such depth as not to conflict with the drainage or surface of the road or associated infrastructure.

The operation shall take place from one side of the watercourse. It will be carried out by an experienced HDD specialist. Each crossing is expected to take place in a single day under one mobilisation.

In the case of HDD operations within the public road corridor, the works shall be carried out under a road closure and road opening license in accordance with measures described in the Traffic Management Plan.

A pilot hole for the HDD will be bored as per the agreed alignment. It shall be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation is lubricated using Clear Bore™ or similar. When the pilot hole has been drilled to the correct profile, its diameter is increased if necessary, to match the external diameter of the cable duct. The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for cable installation.

HDD will be carried out using Vermeer D36 x 50 Directional Drill, or similar plant. The launch and reception pits will be approximately 0.55 m wide, 2.5 m long and 1.5 m deep. The pits will be excavated with a suitably sized excavator and shall employ the same mitigation measures outlined herein for trenching and joint bay excavations.

The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle. This will enable the excavation to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3.0 m long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ (environmentally friendly product (not toxic to aquatic organisms)) and water is pumped through the centre of the drill rods to the reamer head. This mixture is forced into the void and enables the annulus which has been created to support the surrounding sub soil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers.

The use of a natural, inert and biodegradable drilling fluid such as Clear Bore™ is intended to avoid any adverse effects arising from the use of other, traditional polymer-based drilling fluids. It will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to an approved disposal site. Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches and joint bays.

Minimum environmental protection measures to be implemented on site shall include the following:

- A site-specific drilling design, risk assessment and method statement shall be prepared by the contractor prior to the works.
- CLEARBORE shall be used rather than Bentonite as a drilling fluid as it is biodegradable.
- HDD operations to be limited to daylight hours and conditions when low levels of rainfall are forecast.
- The depth of the bore shall be at least 3m below the bed of the watercourse.
- Visual inspection to take place at all times along the bore path of the alignment.
- A field response plan to minimize loss of returns of drilling fluid and actions to restore returns shall be provided.
- No refuelling will take place within 50m of the watercourse or any sensitive habitats.
- Pre-construction verification surveys shall take place at drilling sites to confirm the presence of any sensitive species.
- A qualified environmental monitor or ecological clerk of works (ECoW) will be onsite for the duration of the drilling operation.

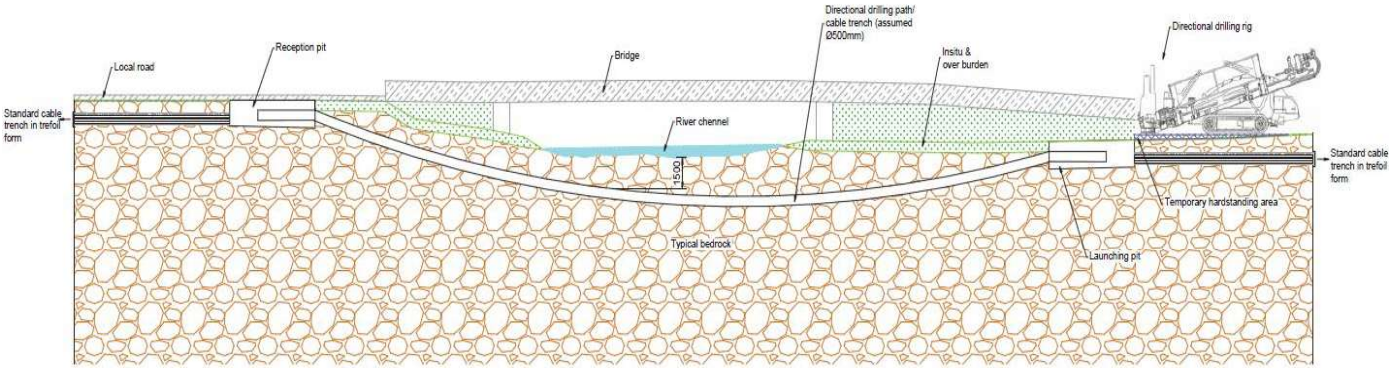


Figure 3-13: HDD Activity Profile

For further information on HDD works refer to 110kV Underground Cable Construction Methodology report in Appendix 3.3 of the EIAR. Further detail on HDD crossing design can be found in accompanying planning application drawings.

Construction Methodology for Watercourse Crossings along the Turbine Delivery Route

On the turbine delivery route, one watercourse crossing is to be modified. This is an existing bridge (WF-HF8 as shown in Figure 3-14 and Figure 2-2). This will be replaced by a new clear span bridge.

Figure 3-14: Existing Stone Bridge Crossing (WF-HF8)

Sufficient free-board will be allowed for in the proposed bridge design to allow for 1 in 100-year fluvial flood conditions plus 20% for Climate Change.

The works will include the removal of an existing stone bridge and associated abutments, construction of concrete bridge supports which will be built from the public road and lifting of the assembled bridge structure into place. The bridge components will be delivered to site on standard HGVs. Disturbance of the stream bed shall be avoided where possible.

The construction methodology is as follows:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4.
- A temporary road closure will be put in place for the duration of the works (refer to Section 4.3.8 for TMP measures).
- Use of weather forecasts will be made, and works will be planned when a dry spell of weather is forecasted;
- Work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;

All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4. Instream works shall be carried out in accordance with the measures outlined in Section 3.3.9.1.

- Bank protection will be installed as necessary to ensure that disturbance to the existing stream banks are minimised during construction.
- Following excavation of the existing road surface, the existing stone bridge will be removed by a mechanical digger and taken from the works area by dumper truck. The excavated material shall be taken for disposal to a licensed waste facility in accordance with the waste management plan.
- Excavation near river banks is required to install and secure pre-cast concrete abutments meaning that dry instream working conditions will need to be established.
- The extent of the excavation for bridge supports will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter.
- The excavated material will be stored within the site at designated locations per the Soil Management Plan.
- Abutments will be set back 2.5m from 1% AEP flood height (100-year event). Dry working conditions at these sites will be maintained by retaining the existing bank and using a short section of sand bag cofferdam. Only part of the stream will be isolated at any one time. This will isolate flow either side of the channel in sequence, to allow dry working conditions while each abutment is installed. The required working area is relatively small for each abutment and the cofferdam set-up allows continuous flow during the short construction period.
- Strong polyethylene bags filled with clean sand will be used and will be wrapped between geotextile to create watertight conditions.
- Once complete, water retained by the cofferdam will be discharged onto a well vegetated, dry, flat area at least 50m from a water body via a straw bale dewatering structure or geotextile filter bag. The outfall will also be surrounding by silt fencing; If there is no suitable area for discharge onto ground, settlement ponds will be used where necessary and will be put in place prior to commencement of preparation works;
- On alternate sides of the stream, within the sequenced cofferdam set-ups, the base for the abutments will be excavated to rock or competent stratum with a mechanical excavator.
- The foundations and abutments will be constructed using a single pre-cast concrete section and will be lifted into place on the base. The area around the abutments up to road level will be infilled with a suitable structural fill.
- Once each abutment is in place and secured with structural fill, the pre-cast concrete deck will be laid down on the abutments, anchored and a thin screed of concrete will be poured on top. Ducts for the later pulling of power and communication cables for the wind farm will be pre-cast into the bridge deck sections.
- When the concrete deck is connected to the abutments, the filling and compaction of the road will be completed.
- The road leading to and from the crossing will be profiled using suitable imported roadbase material in accordance with TII standards.
- The road surface will be reinstated to its previous condition.
- Cables will be pulled through the bridge deck following completion of the bridge structure.

3.3.1.10 Borrow Pit Construction

3 no. onsite borrow pits will be used to source suitable fill material for the construction of the various tracks, turbine bases and hardstanding areas. The location of the proposed borrow pits is shown on Figure 1-2.

The borrow pits will be developed as follows:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4 of this CEMP.
- The access tracks will be prepared to the borrow pit locations in line with the methodology described in Section 3.3.1.4.
- The extent of the works areas shall be accurately delineated using stakes and rope to prevent works being carried out outside the agreed areas.
- Stock proof fencing shall be installed around the borrow pit in advance of any works taking place.
- A bespoke method statement shall be drawn up by the contractor for the main construction works shortly before the works take place.
- After drainage and temporary dewatering infrastructure has been put in place, the main excavation works will commence by stripping the topsoil material.
- Topsoil will be stockpiled to be used for reinstatement of the borrow pit and used for local landscaping of the wind farm site.
- Excavation works will be carried out by the following means at the borrow pit:
    - Conventional excavators (using buckets) to excavate and load dumper trucks
    - Rippers mounted on conventional excavators to 'rip' the rock where appropriate
    - Rock breakers (where required)
- Excavated material will be processed by mechanical crusher and screened as necessary.
- Excavated rock will be loaded onto dumper trucks and transported to the required area for tipping and placement e.g. when building the access tracks.
- When the borrow pits have been exploited, they shall be closed and reinstated using surplus mineral soil or rock excavated from elsewhere on the site as described in accordance with an approved project reinstatement plan.
- The borrow pit, once reinstated, shall be covered with topsoil and allowed to re-vegetate naturally. However, appropriate measures will be taken if it is found that natural re-vegetation is too slow or if the area is being taken over by inappropriate species.
- Noise, dust and site drainage mitigation measures shall be implemented as described in the environmental management plan in Section 4 of this CEMP.

To monitor groundwater during the construction phase groundwater monitoring wells will be installed between areas of deeper excavations and sensitive groundwater receptors. The wells will be used to monitoring groundwater levels and quality to assess any potential impacts during the construction works.

The borrow pits are shown on planning drawings P2114-0300-0006, P2114-0300-0007 and P2114-0300-0008.

3.3.1.11 Turbine Hardstands

All crane pads and associated splays will be designed taking account of the loadings provided by the turbine manufacturer. They will consist of a compacted stone structure in accordance with the detailed engineering designs and employer's requirements.

All crane pads will be formed from a suitably stiff layer of subsoil or rock. The finished crane pad surface will provide a minimum bearing capacity of 260kN/m^2.

Crane pad and associated splay formation will consist of either 1 or 2 layers of suitable fill material depending on the properties of the underlying load bearing layer. Where the underlying layer is soft soil, 2 layers of suitable fill formation are used and the stone capping layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface. It is not likely this will be the case at this site. The crane pads are approximately 40m x 75m and have a maximum cross and longitudinal fall tolerance of 2%.

The crane hardstands will be constructed using a typical excavation method.

The excavation method can be summarised as follows:

Excavation Method:

All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in the environmental management plan in Section 4 of this CEMP.

- Establish alignment of the hardstands from the construction drawings and mark out the corners with ranging rods or timber posts.
- Drainage runs and associated settlement ponds will be installed.
- The excavated material will be stored close to the hardstand or taken back to the borrow pit. Topsoil and subsoil stockpiles will be formed, and the side compacted to prevent silt run off during heavy rain or airborne dust during dry periods.
- Batters to have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species.

3.3.1.12 Turbine Foundations

The wind turbine foundations will be constructed using standard reinforced concrete construction techniques and will be designed as either:

- Submerged foundation design.
- Non-Submerged Foundation design.

Turbine foundations will be designed to Eurocode Standards. Foundation loads will be provided by the wind turbine supplier, and factors of safety will be applied to these in accordance with European design regulations. The turbine will be anchored to the foundation as per the turbine manufacturer's guidelines which will be incorporated in the civil foundation design. The shape and size of the foundation can vary in size and shape to approximately 25m in diameter.

The turbine foundations will be constructed as follows:

Standard Excavated Reinforced Concrete Base:

a) The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter.

b) The excavated material will be stored at agreed locations close to the base. Topsoil and subsoil stockpiles will be formed, and the side compacted to prevent silt run off during heavy rain or air bourn dust during dry periods. The subsoil material will be used as backfill and the topsoil will be used for landscaping around the finished turbine post construction.

c) No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.

d) Around the perimeter of the foundation formation a shallow drain will be formed to catch ground water entering the excavation. The drain will direct the water to a sump if required where it will be pumped out to a settlement pond away from the excavation.

e) A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. If required, geogrid and soil replacement will be laid according to the foundation design, followed by placement of the concrete blinding layer.

f) If soil replacement is required, the aggregate used must be tested and approved by the project geotechnical engineer.

g) High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools.

h) Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required.

i) The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base.

j) Concrete will be placed using a concrete pump and compacted using vibrating pokers to the levels and profile indicated on the construction drawings.

k) Upon completion of the concreting works the foundation base will be covered from the elements that could cause hydration cracking and/or delay setting in any way.

l) Steel shutters will be used to pour the upper plinth section.

m) The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the top-soil set-aside during the excavation. The suitability of backfill material is to be approved by the project geotechnical engineer.

n) A gravel footpath will be formed from the access track to the turbine door and around the turbine for maintenance.

3.3.1.13 Substation Compound

The compound surrounding the substation will measure approximately 150 m x 105 m as shown in 0300-Series planning application drawings. The compound will include a substation control building and electrical components necessary to import the electricity generated from the wind farm to the existing Clashavoon substation.

The building's main function is to provide housing for switchgear, control equipment and monitoring equipment necessary for the proper functioning of the substation and wind farm. The building will be constructed by the following methodology:

- The area of the control buildings and compound will be marked out using ranging rods or wooden posts and the vegetable soil stripped and removed to the nearby storage area for later use in landscaping. No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.
- Drainage runs and associated settlement ponds will be installed
- The dimensions of the Building and Compound area will be set to meet the requirements of EirGrid and the necessary equipment to safely and efficiently operate the wind farm.
- The foundations will be excavated down to the level indicated by the designer and concreted.
- The blockwork walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors.
- The blockwork will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation.
- The concrete roof slabs will be lifted into position using an adequately sized mobile crane.
- The wooden roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.

The remainder of the substation compound will be brought up to the agreed formation and approved stone imported and graded to the correct level as per the detail design.

Equipment plinths will be marked out, excavated and constructed using in-situ reinforced concrete or pre-cast concrete. Provision will be made in each plinth for earth connection.

Following the construction of the equipment plinths an earth mat will be installed throughout the compound. This will be connected to each plinth and the buildings as per the electrical earth protection design.

3.3.1.14 Electrical Works

Substation Fit Out and Switchgear Installation

The substations will have a domestic electrical system including lights, sockets, fire alarm and intruder alarm. The high voltage switchgear for the wind farm is installed through the following method.

- The switchboard units are delivered to site on a truck and unloaded using a forklift, front end loader or HIAB crane.
- Suitable task specific RAMS and lifting plans will be in place prior to the commencement of all works.
- The switchgear will be unloaded on to a concrete plinth directly outside the substation building.
- The units will be moved inside the substation building using a hand driven forklift and positioned over the internal trench supports, prepared previously.

- The switchgear is then secured as per manufacturer's instructions, typically by bolting directly to steel support bars over the trench.
- The building is fitted out with small light and power and ancillary wind farm control equipment such as SCADA computer, remote telemetry units, metering etc.
- All equipment and fittings are then connected, wired tested and commissioned in accordance with the Electrical Contractor's commissioning plan.

Transformers

- The turbine transformers will be placed directly onto the turbine foundation upon delivery to site, prior to the installation of the turbine towers.
- The transformers will be of the sealed type and will be inspected for any damage prior to offloading. It is likely that the units will be installed using a small mobile all-terrain crane and will be tested, commissioned and energised by suitably trained and authorised persons.
- The accessible sections of the transformer will be protected within an enclosure which shall be locked at all times and displaying appropriate warning signs.
- Transformers and ancillary plinth-mounted equipment required in the substation compound will be delivered to site and unloaded directly in place by HIAB crane or similar.
- Suitable task specific RAMS and lifting plans will be in place prior to the commencement of all works

3.3.1.15 Turbine Erection

Once the turbine components arrive on site they will be placed on the hardstand and lay down areas prior to assembly. The towers will be delivered in sections and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

It is anticipated that each turbine will take approximately 3 to 4 days to erect (depending on the weather), requiring two cranes. Finally, the turbines will be commissioned and tested.

Turbine installation works will be carried out in accordance to a site specific lift plan.

3.3.1.16 Grid Connection Cabling Works

The following describes the outline construction methodology for cable installation works along the grid connection route between the wind farm onsite substation and the Clashavoon substation.

The proposed grid connection route is shown on Figure 1-4 and described in Section 2.1.3.

- Agreement will be sought from local authorities with respect to the location of trenches on roads to ensure no damage is caused to storm-water drains, water-mains or other services. All drain and culverts affected by the works are to be re-instated to the satisfaction of the Local Authorities. Particular care will be taken in order to minimise disruption to local residents and public road users.
- The location of the cable route will be set out by GPS (RTK enabled) equipment in accordance with the design drawings prepared for the site.

- Prior to any construction works commencing, a pre-commencement road survey will be carried out on the public roads in the vicinity of the works. The area where excavations are planned will be surveyed with a cable-avoiding scanning tool, by a person trained in Location of Underground Services. Location equipment to be calibrated within the previous 12 months.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- Traffic management measures will be implemented prior to works commencing accordance with the construction stage TMP and measures outlined in Section 4 of this CEMP.
- Overhead lines will be identified and overhead clearance limiting measures will be put in place at the start of each day. Machinery will also include automatic limiters to safeguard against interaction with overhead lines.
- Underground services may be encountered during the trenching works the locations and depth of these underground services the locating of these services will include the reviewing of service drawings, investigations along the trenching route, and consultation with the various service providers.
- All environmental buffer zones shall be identified and set out prior to construction works advancing. Where necessary a stock proof timber post and wire fence shall be erected to establish these areas and thus prevent the entry of contractor's plant within these buffers during construction works. It is noted that given the presence of large sections of the cable route on public roads, extensive adherence to buffer zones is unlikely.
- The cable infrastructure will follow the existing road infrastructure where possible as shown on accompanying planning application drawings and Figure 1.4. Cables will be laid underground using standard trenches, with pre-excavation drainage works in place prior to trench excavation.
- In areas where the cable trench route runs within a public road carriageway, temporary reinstatement of the road surface will be carried out at the end of the working day to allow safe re-opening of the road for public traffic. See below for sequence of works for temporary road reinstatement.
- A 360-degree excavator will first remove the top layer from the route along the roadside. It will be loaded onto a haulage truck. The material will be recycled. The excavation of trench will commence. A trained spotter will be used to assist machine operators while reversing or when their visibility becomes restricted.
- Trench to be dug to agreed drawing specifications. All plant and stored material will be kept a safe distance back from the trench edges.
- No open trench will be left unattended. Pedestrian barriers will be erected to prevent unintentional entry occurring by the open trench. Cones and/or barriers will be used on rural roads to maintain a safety zone in proximity to the trench.
- Safe ladder access/egress to trenches will be provided into the trench.
- Ducts will be placed into trench manually, having been delivered to the roadside embankment/verge areas by tractor and pipe trailer and then offloaded by hand.
- Approved bedding material will be used to surround the ducts and delivered straight from a concrete truck.
- Approved fill material will be compacted at the base, again above the power cable ducting as per the engineer's design.
- Warning tape and plates will be installed by hand in accordance with the trench design and Eirgrid specifications.

- Backfill materials will be delivered to the site in tipper trucks and offloaded at agreed designated set down areas where it will be either loaded into site dumpers or a stoning cart then brought to the trench area that requires being backfilled. Main material deliveries such as ducting and pre-cast joint bay sections will be to the temporary site compound and moved to the work area as required.
- Backfill materials will be compacted using suitable compaction equipment to prevent future settlement as per NRA Specification for Roadworks Series 600 – Earthworks, 2013.
- Hand digging will be used when within 500mm of any known existing services.
- Trenches where ducts are laid will be back filled every evening. During excavation works signage will be erected local to the works warning of the dangers. Traffic safety barriers will also be erected along the works area.
- Exposed duct ends will be capped.
- Spoil will be disposed of at a licenced facility
- Unauthorised access will be monitored and prevented.
- A 12mm draw rope will be blown through the ducting at a later date.
- The trench and the working strip will be reinstated to the satisfaction of the local authority and TII standards for public roads.
- Where the trench strip passes through agricultural land, the surface will be reinstated to the area's pre-existing condition.

Typical trench details for the grid connection cable are shown on planning drawing P2114-0300-0014.

Installation of Joint Bays and Link Box Chambers

- Setting out and location of services will be carried out in the same manner as for trench excavations.
- Traffic management to be set up as per the construction stage traffic management plan.
- A tracked excavator will be used for the excavation of the joint bay pits in accordance with detailed design drawings.
- A Tractor/dump trailer and/or tipper truck shall be used to remove excavated spoil from the work area. Spoil shall be removed to a licensed waste facility.
- A watchman will be used to assist machine operators while reversing or when their visibility is restricted.
- Where joint bays are located, the excavation shall be adequately protected with fencing with signage erected, warning of deep excavation.
- Safe ladder access/egress to excavation shall be in place. The ladder will be footed at the base and tied at the top.
- Base materials will be placed by the excavator from a truck and placed in the base of the excavation.
- Precast chamber sections will arrive on site via articulated lorries accompanied by a crane truck. The crane truck will load each unit separately from the articulated truck.
- The precast units will be transported to site and a flatbed trailer and a truck mounted crane will lift the section into position.
- A lift plan /DJSP will be required for all Joint Bay installations.
- When the joint bays are in place, the sections will be back filled using approved fill material. The road surface will be reinstated using cold tar/surface dressing.
- Unauthorised access will be monitored and prevented.

Typical details for Joint Bays and Link Box Chambers are shown on planning drawings P2114-0300-0011, P2114-0300-0012 and P2114-0300-0013.

Figure 3-15: Typical Installation and Temporary Reinstatement of Joint Bay

Watercourse Crossings

Methodologies associated with watercourse crossings along the proposed grid connection route are detailed in Section 3.3.1.9.

Temporary Reinstatement of Excavations

- Hot works permit to be issued for the area of works for the area to be reinstated.
- A grader (if required), Roller and mini-patch planer will be delivered to site by low-loader. A 2 - in - 1 Tar - and Chipper or patch sprayer will be driven to site.
- A mini patch planer will be attached to a skid steer and will plane a fresh cut line along the verge of the trench.
- The trench fill material will be graded to shape the trench to match the existing camber of the carriageway and compacted using a drum roller.
- The Tar - and - Chipper will make first pass, of one metre wide.
- Once the bitumen emulsion and chips have been dispensed from the 2- in 1 Tar and chipper and the drivers cab is clear of the area, the roller will follow and compact the chips into the emulsion.

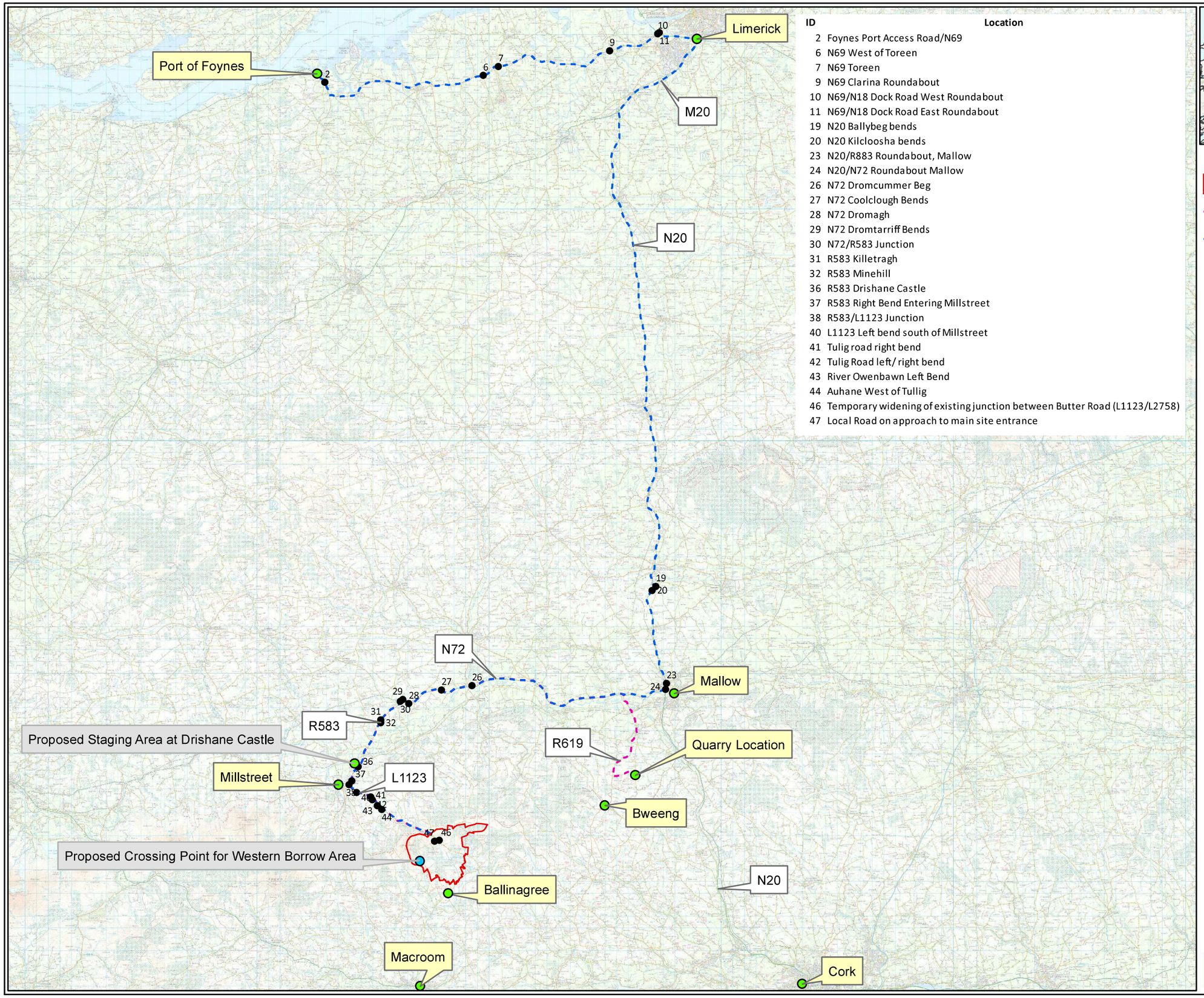
- If the 2 - in - 1 - Tar - and - Chipper is not being used, a towable emulsion sprayer will be used. This involves the towable sprayer being towed by a pickup truck, and an operative spraying the trench area by means of a lance from the unit.
- The emulsion is heated up to 70°C.The operator will wear protective overalls, heat resistant gloves and eye protection.
- The emulsion is sprayed out to cover the existing trench fill where a follow up crew will spread surface dressing chips over the sprayed area at a safe distance of 5m from the lance.
- Compaction will then take place by a drum roller.
- Both the 2 - in - 1 - Tar - and - Chipper and towable sprayer will have internal diesel burners, with no exposed naked flame.
- Delay set macadam may also be required on busier roads, 75mm of delay set macadam shall be placed within the trench at the end of each working day, by means of skid steer and trench reinstatement bucket and compacted.

Figure 3-16: Towable Sprayer for Temporary Reinstatement

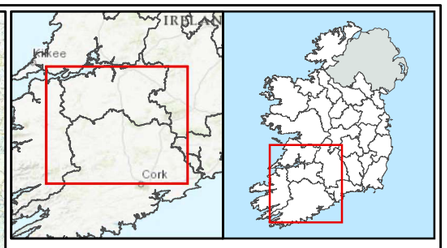
3.4 Construction Working Hours

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 hours on Saturdays.

It should be noted that it will be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Foundation pours will likely extend beyond normal working hours also. Turbine component deliveries will be caried out at night. Consultation will be carried out with the local community in advance of out of hours working. Additional emergency works may also be required outside of normal working hours as quoted above which will be notified to the planning authority. Work on Sundays or public holidays will only be conducted in exceptional circumstances and subject to prior consultation and notification insofar as possible with the local community.



ID	Location
2	Foynes Port Access Road/N69
6	N69 West of Toreen
7	N69 Toreen
9	N69 Clarina Roundabout
10	N69/N18 Dock Road West Roundabout
11	N69/N18 Dock Road East Roundabout
19	N20 Ballybeg bends
20	N20 Kilcloosha bends
23	N20/R883 Roundabout, Mallow
24	N20/N72 Roundabout Mallow
26	N72 Dromcummer Beg
27	N72 Coolclough Bends
28	N72 Dromagh
29	N72 Dromtarriff Bends
30	N72/R583 Junction
31	R583 Killetragh
32	R583 Minehill
36	R583 Drishane Castle
37	R583 Right Bend Entering Millstreet
38	R583/L1123 Junction
40	L1123 Left bend south of Millstreet
41	Tulig road right bend
42	Tulig Road left/ right bend
43	River Owenbawn Left Bend
44	Auhane West of Tullig
46	Temporary widening of existing junction between Butter Road (L1123/L2758)
47	Local Road on approach to main site entrance



Legend

- Proposed Wind Farm Site
- Proposed Haul Route
- Proposed Turbine Delivery Route (TDR)
- TDR Nodes

N
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0 5 10 20 Kilometers

TITLE:	Transport Routes		
PROJECT:	Ballinagree Wind Farm		
FIGURE NO:	3.17		
CLIENT:	Coillte and Ørsted		
SCALE:	1:320000	**REVISION:**	0
DATE:	05/01/2022	**PAGE SIZE:**	A3

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4. ENVIRONMENTAL MANAGEMENT PLAN

4.1 Introduction

This plan should be read in conjunction with the EIAR.

This Environmental Management Plan (EMP) defines the work practices, environmental management procedures and management responsibilities relating to the construction of the proposed Ballinagree Wind Farm.

This EMP describes how the Contractor for the main construction works will implement a site Environmental Management System (EMS) on this project to meet the specified contractual, regulatory and statutory requirements and identified mitigation measures. This plan will be further developed and expanded following the grant of planning permission and appointment of the Contractor for the main construction works. Please note that some items in this plan can only be finalised with appropriate input from the Contractor who will carry out the main construction works and once the planning conditions are known. It is the Contractor's responsibility to implement an effective environmental management system to ensure that environmental requirements for the construction of this project are met.

All site personnel will be required to be familiar with the environmental management plan's requirements as related to their role on site. The plan describes the project organisation, sets out the environmental procedures that will be adopted on site and outlines the key performance indicators for the site.

- The EMP is a controlled document and will be reviewed and revised as necessary.
- A copy of the EMP will be located on the site H&S notice board.
- All employees, suppliers and contractors whose work activities cause/could cause impacts on the environment will be made aware of the EMP and its contents.

This section includes the mitigation measures to be employed by the contractor and client during the construction, operation and decommissioning of the proposed project as per the EIAR and NIS.

4.2 Project Obligations

In the construction of the proposed Ballinagree Wind Farm there are a number of environmental management obligations on the developer and the contractor. As well as statutory obligations, there are several specific obligations set out in the EIAR and NIS. The final CEMP which will be produced by the main contractor following appointment will incorporate these obligations. The contractor and all of its sub-contractors will be fully aware of and in compliance with these environmental obligations.

4.2.1 EIA/NIS Obligations

The EIAR and NIS identified mitigation measures that will be put in place to mitigate the potential environmental impacts arising from construction of the project. Measures identified in the EIAR and NIS are detailed in this CEMP and listed in the Schedule of Mitigation Measures in Appendix 3.2 of the EIAR. The CEMP should be read in conjunction with the EIAR and NIS. In the case of any ambiguity or contradiction between this CEMP and the EIAR and NIS, the EIAR and NIS shall take precedence.

4.2.2 Planning Permission Obligations

All planning conditions associated with the project's planning permission shall be adhered to. All pre-commencement planning conditions shall be discharged fully by the project owner prior to site start.

4.2.3 Felling Licence

Felling of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbine foundations, hard stands, crane pads, access tracks and substation. 10 no. turbines are located within forestry and consequently tree felling will be required as part of the project.

The estimated maximum area of coniferous tree felling required is ca. 88ha, which will be subject to license approval from the Forest Service prior to construction.

Tree felling will be the subject of a Felling Licence from the Forest Service and will be in accordance with the conditions of such a licence. A Felling Licence will be in place prior to any felling works commencing on site. To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

Before any harvesting works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The felling plan, surface water management, construction management, emergency plans and any contingency plans;
- Environmental issues relating to the site;
- The outer perimeter of all buffer and exclusion zones;
- All health & safety issues relating to the site.

4.2.4 Other Obligations

The developer and/or contractor for the main construction works will liaise directly with the County Council and An Garda Síochána in relation to securing any necessary permits to allow the works to take place including for example (non-exhaustive list):

1. Commencement notice
2. Special Permits in relation to oversized vehicles on public roads
3. Temporary Road Closures (if required)
4. Road Opening Licence.

The developer will also liaise closely with the local residents, especially homeowners and landowners along the local access routes in relation to works and all reasonable steps will be taken to minimise the impact of the development on such persons. A traffic management plan is included in section 4.3.8.

4.3 Environmental Management Programme

4.3.1 Air Quality

Construction stage mitigation measures to minimise dust and emissions are as follows:

- Construction vehicles and machinery will be serviced and in good working order;
- Receptors which receive dusting and soiling on the haul routes, entering the site; and dwellings directly adjacent to the grid connection route that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling have taken place;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be minimised through regular servicing of machinery.

4.3.1.1 Dust Management Plan

Introduction

This Dust Management Plan (DMP) outlines the sources of dust during the works, identifies measures to minimise dust during the works and the complaints procedure for dust.

4.3.1.1.1 Dust generation and control

4.3.1.1.1.1 Dust generation

The proposed works associated with the proposed project that have the potential to cause dust include:

- Site clearance activities including felling of forestry
- Soil excavations
- Movement of dump trucks containing soils/subsoils within the site
- Stockpiling of soils.

4.3.1.1.1.2 Dust control

The following dust control measures will be put in place during construction and decommissioning works:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with high quality graded aggregate;
- A water bowser will be available to spray work areas and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits, which shall be reduced in periods of dry, windy weather;
- Wheel washing facilities will be provided at the two main entrance/exit points of the proposed project site.

Complaints Procedure

At the main site entrance, the contact details for the site will be available so that local residents are encouraged to contact the site in the event of an off-site dust impact.

The contractor on site will need to be immediately informed of the incident so that fugitive dust complaints can be substantiated.

In all instances, a complaint will be logged by the environmental manager and each complaint will be assigned a discrete complaint number in the Environmental Log.

The environmental manager will maintain the complaints register and any complaints received will be investigated and the dust suppression methods employed will be reviewed. Suitable remedial action will be undertaken as necessary.

4.3.2 Noise and Vibration

The predicted noise levels from on-site activity from the proposed project is below the noise limits in BS 5228-1:2009+A1:2014. Nonetheless, several mitigation measures will be employed to minimise any potential impacts from the proposed project.

The noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays and public holidays, unless specifically agreed otherwise. For example, during turbine erection, an extension to the working day may be required but this would be necessary only on a relatively small number of occasions. It will be ensured that vehicles on local roads do not wait outside residential properties with their engines idling during turbine deliveries. Local residents and the local authority will be consulted in advance of any activities likely to occur outside of normal working hours.

Consultation with the local community is important in minimising the impacts and therefore construction will be undertaken in consultation with the local authority as well as the residents being informed of construction activities through the Community Liaison Officer.

The construction works on site will be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014. Proper maintenance of plant will be employed to minimise the noise produced by any site operations.

All vehicles and mechanical plant will be fitted with effective exhaust silencers. Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.

The hours of construction activity will be as described in section 3.4.

The on-site construction noise levels will be below the relevant noise limit of 65 dB $L_{Aeq,1hr}$ for operations exceeding one month, and therefore construction noise impacts are not considered to be significant. However, there is potential for temporary elevated noise levels due to the grid connection works. However, the impact of these works at any particular receptor will be for a short duration (i.e. typically less than 3 days). Where the works at elevated noise levels are required over an extended period at a given location, a temporary barrier or screen will be used to reduce noise levels below the noise limit where required. The noise impact will also be minimised by limiting the number of plant items operating simultaneously where reasonably practicable.

4.3.3 Biodiversity / Flora and Fauna Management

Objectives

The primary objectives of biodiversity / flora and fauna management over the construction, operation and decommissioning phases of the project are as follows:

- Promote the conservation of habitats on site through the establishment of management and/or mitigation;
- Provide management and mitigation for aquatic habitats and water quality;
- Provide management and mitigation for avifauna;
- Provide management and mitigation for bats and terrestrial mammals;
- Monitor the usage of the wind farm site by birds post construction;
- Monitor for any collision by birds at the wind farm site post construction;
- Monitor for any collision by bats at the wind farm site post construction.

For mitigation measures associated with the protection of terrestrial ecology please refer to Appendix 3.2 of the EIAR – Schedule of Mitigation Measures.

For mitigation measures associated with the protection of aquatic ecology please refer to Appendix 3.2 of the EIAR – Schedule of Mitigation Measures.

In addition to the above mitigation measures from the EIAR, the mitigation measures from the Natura Impact Statement (NIS) carried out for the project shall also be adopted. For mitigation measures associated with the NIS please refer to Appendix 3.2 of the EIAR – Schedule of Mitigation Measures.

4.3.4 Soil Management Plan

All excavated material will be re-used within the site where possible, minimising the need for removal of any materials for off-site disposal. This will minimise the amount of construction traffic on local roads. This will in turn lead to the reduction of noise and dust associated with construction traffic.

There are 3 no. proposed borrow pits within the site that will provide general fill for construction. Where aggregate (structural fill) of a suitable quality required for construction cannot be sourced from the onsite borrow pits it shall be imported from a licensed quarry.

Daily Preparation during the Implementation of the Soil Management Plan

The Geotechnical Engineer appointed by the contractor should conduct regular meetings with the Construction Management Team to discuss the phasing of soil management as the work progresses.

Particular regard will be taken of daily weather conditions and long-range forecasts. The Geotechnical Engineer should have the authority to suspend the works if weather conditions are deemed too extreme for the effective protection of earthworks, excavations and slope stability.

Construction Stage Mitigation Measures

Earthworks

The project will be constructed in a phased manner within a 18-24 month period, as described in Chapter 3, to reduce the potential impacts of the project on the Land, Soils and Geology. Phased construction reduces the amount of open, exposed excavations at any one time. Given that the works comprises a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.

One of the primary mitigation measures employed at the preliminary design stage was the avoidance of volumes of excavated overburden deposits to be exported off site. All excavated overburden will be retained on-site.

This will include:

- Use of suitable site won material (bedrock) as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations.
- Overburden will be re-used on site in the form of landscaping and for reinstatement purposes at the proposed borrow pit.

Overburden deposits excavated during the course of the works will be temporarily stored in a level area adjacent to the construction phase excavations prior to reuse.

Some temporary stockpiles (not exceeding 2m in height) of material will be necessary adjacent to the excavation areas prior to reinstatement. No long-term stockpiles of material will remain after construction. No surplus/waste soil or rock will be removed from the proposed project site. Temporary stockpiles should be shaped and sealed to prevent the ingress of water from rainfall.

To mitigate against the compaction of soil at the site, prior to the commencement of any earthworks, the work corridor will be pegged, and machinery will stay within this corridor so that peatland/soils outside the work area are not damaged. Excavations will then be carried out from access tracks as they are constructed in order to reduce the compaction of soft ground.

To mitigate against erosion of the exposed soil or rock, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events (>10mm/hour). To mitigate against possible contamination of the exposed soils and bedrock, refuelling of machinery and plant will only occur at designated refuelling areas.

Soil excavated from trenches along the proposed grid connection route will be taken to a licenced facility for disposal or recycling where required. If feasible, the upper layers of tarmac and asphalt will be excavated separately to the lower engineered fill layers. The tarmac/asphalt layers will be taken to a licenced facility for disposal or recycling.

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel fill will be used to provide additional support to temporary cuts/excavations where appropriate. Unstable temporary cuts/excavations will not be left unsupported. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion.

Excavations in Peat for Turbine Bases, Hardstandings and Infrastructure Foundations

The works require that turbine bases are to be founded on competent founding strata which will require excavation through peat and mineral soil.

Similarly, crane hardstandings, construction compounds, substation platforms and met mast foundations are to be founded on competent mineral soil and/or rock which will also require excavation through peat and mineral soil. Excavations for the borrow pits will also require the removal of peat and non-peat mineral soil overlying the rock.

The following measures shall be implemented to minimise any adverse impact on peat stability.

- All excavations within peat are to be adequately supported or peat slopes are to be battered to a safe slope inclination typically of 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required.
- Excavations shall be kept reasonably free from water at all times. Water should be prevented from being impounded within excavations by either using drainage channels cut into the excavation face or by pumping.
- Where water is channelled or pumped from an excavation then this water is to be fed into an established watercourse or drainage ditch following suitable treatment.

Measures for spills

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of;
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area and in each item of plant to deal with any accidental spillage.

A Surface Water Management Plan (SWMP) can be found in Appendix 10.2 of the EIAR which contains further details on requirements for spill management.

Slope Stability

With regard to slope stability issues, detailed design and construction phase best practice will be implemented as follows:

- The works will be supervised by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer.
- Drainage infrastructure will be put in place in advance of excavations. Drains will divert surface water and groundwater away from excavations into the existing and proposed surface drainage network. Uncontrolled, direct and concentrated discharges of water onto the ground surface will not occur .
- Loading or stockpiling of materials on the surface of soft ground will not occur . Loading or stockpiling on other deposits will not be undertaken without first establishing the adequacy of the ground to support loads by an appropriately qualified geotechnical engineer experienced in construction within upland conditions. No stockpiling of material shall take place on steep slopes.
- Turbines located in areas adjacent to peat deposits will incorporate drainage measures such that surface water will be drained away from the peat and will not be allowed to collect adjacent to the peat mass.
- Excavation will be carried out from access roads or hardstanding areas to avoid tracking of construction plant across areas of soft ground/peat. Temporary access tracks as described in section 3.3.1.7 will be used where this is not possible.
- An assessment of the stability at proposed infrastructure locations has been carried out as part of the EIAR based on worst case conditions. A further assessment will be undertaken at detailed design stage by a suitably qualified and experienced geotechnical engineer prior to the commencement of all excavations to confirm the findings of this assessment.
- Blasting of rock will not be permitted.
- Excavations which could have the potential to undermine the up-slope component of an existing slope will be sufficiently supported to resist lateral slippage. Careful attention will be given to the existing drainage.
- Earthworks will not be commenced when heavy or sustained rainfall is forecast. A rainfall gauge will be installed on site to provide a record of rainfall intensity. An inspection of site stability, excavations and drainage by the Geotechnical Engineer will be carried out on site regularly.
- An emergency plan is included Section 6 outlining the action plan which would be implemented in the unlikely event of a landslide/slope failure. Should a landslide/slope failure occur or if signs of instability/ground movement are observed, work will cease immediately.

Borrow Pits

Three number locations have been identified as potential borrow pits. The peat depth within the development footprint of the borrow pits is less than 0.5m.

Upon removal of the rock and gravel from the borrow pits, it is proposed to reinstate the borrow pits using excavated peat and spoil. The excavated rock and gravel from the borrow pits will be used in the construction of the infrastructure elements (turbine bases, roads, etc.) at the wind farm. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be placed safely. It is proposed to construct cells within the borrow pits for the placement of the excavated peat and spoil.

This is to allow for the safe placement and grading of the peat and spoil using dumper trucks and excavators. The text below provides design and construction guidelines for the borrow pits.

The borrow pits shall be constructed as follows:

(1) The rock within the proposed borrow pit footprints will be removed by breaking based on ground investigation carried out at the proposed borrow pits.

(2) It is proposed to construct the borrow pits so that the base of the borrow pits are below the level of the adjacent section of access road. As excavation progresses into the back edge of the borrow pits, the base of the borrow pits may be raised to suit local conditions. Localised deepening of the borrow pit floors may be required depending on extraction operations.

(3) Depending on the depth and type of rock present in the borrow pits it may be possible to excavate the rock from the borrow pits whilst leaving in place upstands/segments of intact rock which will help to retain the placed peat and spoil. The upstands/segments of intact rock will essentially act as engineered rock buttresses within the borrow pits.

(4) Slopes within the excavated rock formed around the perimeter of the borrow pits will be formed at stable inclinations to suit local in-situ rock conditions. Exposed sections of the rock slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance.

(5) The stability of the rock faces within the borrow pits will be inspected by an experienced geotechnical engineer upon excavation to ensure stability during construction works and in the long term. This inspection will allow unfavourable rock conditions to be identified and suitable mitigation measures to be applied such as removal of loose rock.

(6) Where it is not possible to leave upstands/segments of intact rock in place it may be necessary to construct rock buttresses founded on in-situ rock within the borrow pits. The rock buttresses should be constructed of rock fill from the borrow pit excavation. The founding stratum for each rock buttress should be inspected and approved by a competent person.

(7) It may be necessary to construct the rock buttresses within the borrow pits in stages as infilling of peat and spoil behind the buttresses progress. The buttress should be constructed of selected rock fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed peat and spoil, as necessary.

(8) Infilling of the peat and spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be reinstated safely.

(9) A number of rock buttresses to form cells with the borrow pits may be required to ensure access for trucks and excavators can be achieved.

(10) The rock buttresses should be wide enough to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The side slopes of the rock buttress should be constructed between 45 to 60 degrees.

(11) The height of the rock buttresses constructed should be greater than the height of the reinstated peat and spoil to prevent any surface peat and spoil run-off. Buttresses up to 5m in height are likely to be required.

(12) The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil is likely to be required.

(13) The surface of the placed peat and spoil will be shaped to allow efficient run-off of surface water from the placed arisings.

(14) A layer of geogrid to strengthen the surface of the placed peat and spoil within the borrow pits may be required.

(15) An interceptor drain will also be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and also when reinstated.

(16) Control of groundwater within the borrow pits will be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall locations will to be required during construction.

(17) A settlement pond will be required at the lower side/outfall location of the borrow pits.

(18) Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil within the borrow pits.

(19) Supervision by a geotechnical engineer or appropriately competent person is recommended for the works.

(20) All the above mentioned general guidelines and requirements will be confirmed by the designer prior to construction. A detailed construction methodology for the borrow pits should be compiled prior to construction.

General Recommendations for Good Construction Practice

To minimise the risk of construction activity causing potential peat instability it is recommended that the Construction Method Statements (CMS) for the project will also take into account, but not be limited, to the general recommendations below, together with the specific recommendations above.

(1) Avoidance of uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge. All water discharged from excavations during work shall be piped over areas specifically assessed as being unsuitable and hence directly into suitable drainage lines.

(2) Avoidance of unstable excavations. All excavations shall be suitably supported to prevent collapse and development of tension cracks.

(3) Avoidance of placing fill and excavations in the vicinity of steeper peat slopes, that is at the crest or toe of the slope.

(4) Installation and regular monitoring of geotechnical instrumentation, as appropriate, during construction in areas of possible poor ground, such as deeper peat deposits.

(5) Site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions to be regularly assessed by suitably experienced geotechnical engineer.

(6) Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions.

(7) Routine inspection of wind farm site by Contractor to include an assessment of ground stability conditions (e.g. cracking, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).

4.3.5 Surface Water Management Plan

A Surface Water Management Plan (SWMP) can be found in Appendix 10.2 of the EIAR. The Surface Water Management Plan (SWMP) should be read in conjunction with the EIAR and shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works. It contains methodology for drainage, water quality management and silt control. The measures contained within the plan will be applied when working near water.

4.3.6 Archaeological Management Plan

Wind Farm Site
The extensive forestry plantations, including tree stumps and root systems within recently felled areas, within planted sections of the wind farm site will preclude advance archaeological site investigations such as geophysical survey and test trenching. A systematic advance programme of archaeological field-walking surveys will be undertaken within these areas following pre-construction tree felling to confirm that they do not contain any visible surface traces of potential unrecorded archaeological or architectural heritage sites. Archaeological monitoring of ground excavation works during the construction phase will then be carried out in these areas under license by the National Monument Service.

The turbines, hardstands and associated new access tracks located within improved green field areas will be subject to a pre-construction geophysical survey followed by targeted archaeological test trenching. This will include the investigation of a potential section of a relict field boundary noted in the interface between an area of marginal land and an improved section of pastureland located within the southern end of the T8 hardstand area. The programme of advance investigations will also include the completion of a boundary survey, to include a detailed photographic record, of the section of the drystone wall, which forms part of the Ballynagree East and Carrigagulla townland boundary, located within the northern end of the T5 hardstand.

The uneven and overgrown ground conditions within the upland open bog/heath areas in the northern end of the site are likely not suitable for pre-construction geophysical surveys. A pre-construction programme of linear archaeological test trenching will be carried out on the footprint of the three turbines (T13, 16 and 17) in these areas and along the routes of any associated new access tracks which will require ground excavation works during the construction phase.

A pre-construction archaeological wading and metal-detecting survey of proposed watercourse crossing points will be carried out under licence by the National Monuments Service.

Grid Connection
All ground works within undisturbed green field locations, including HDD areas, required as part of the grid connection will be subject to constant archaeological monitoring as will works within the environs of the Famine memorials at the crossroads in Killberrihert townland. An archaeological watching brief of other grid connection trench excavations within the public road will be carried out as part of the programme of licensed archaeological monitoring of the project and the extent of this supervision will be agreed in advance with the National Monuments Service as part of the license application process.

Turbine Delivery Route
The delivery of turbines to the wind farm site will require topsoil stripping within a green field area in the southern end of the Drishane Castle demesne lands in order to create a hardstand staging area. A pre-works geophysical survey followed by targeted archaeological test trenching will be carried out in advance of these ground works. Any ground works within other green field areas required to accommodate the turbine delivery route will be subject to archaeological monitoring.

Mitigation measure for Wind Farm Site, Grid Connection and Turbine Delivery Route
In the event that any sub-surface archaeological features are identified they will be recorded and cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation *in situ* (by avoidance) or preservation by record (archaeological excavation).

Monitoring of mitigation measures
There are a number of obligatory processes to be undertaken as part of archaeological license applications and these will allow for monitoring of the successful implementation of the archaeological mitigation measures. These include the submission of method statements detailing the proposed strategy for all site investigations will submitted for the approval of the National Monuments Service as part of the license application. These documents will clearly outline the proposed extent of works and outline the onsite and consultation processes to be enacted in the event that any unrecorded archaeological sites or features are identified. A report will be compiled on all site investigations to comply with the licensing process which will clearly present the results in written, drawn and photographic formats and copies will be submitted to Cork County Council, the National Monuments Service, the Planning Authority and the National Museum of Ireland.

4.3.7 Waste Management Plan

It will be the objective of the Developer in conjunction with appointed contractor to prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site. This is in line with the relevant National Waste Management Guidelines and the European Waste Management Hierarchy, as enshrined in the Waste Management Act 1996, as amended.

Any waste generated during the development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary compound during construction.

This Construction Waste Management Plan has been prepared for the proposed Ballinagree Wind Farm in line with the ”Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects” (2006) as published by the Department of the Environment, Community and Local Government and supported by the Eastern-Midlands Region Waste Management Plan 2015-2021.

The Waste Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works. This plan should be read in conjunction with the EIAR.

Assignment of Responsible Personnel

It will be the responsibility of the contractor for the main construction works (when appointed) to nominate a suitable site representative such as a Project Manager, Site Manager or Site Engineer as Waste Manager who will have overall responsibility for the management of waste. The waste manager will have overall responsibility to instruct all site personnel including sub-contractors to comply with on-site requirements. They will ensure that at an operational level that each crew foreman is assigned direct responsibility.

Waste Generated

It is envisaged that the following categories of waste will be generated during the construction of the project:

- municipal solid waste (MSW) from the office and canteen
- construction and demolition waste
- waste oil/hydrocarbons
- paper/cardboard
- timber
- steel.

A fully authorised waste management contractor will be appointed prior to construction works commencing. This contractor will provide appropriate receptacles for the collection of the various waste streams and will ensure the regular emptying/and or collection of these receptacles.

Waste Minimisation/Reduction

All efforts will be made by site management to minimise the creation of waste throughout the project.

This will be done by:

- material ordering will be optimised to ensure only the necessary quantities of materials are delivered to site
- material storage areas will be of a suitable design and construction to adequately protect all sorted materials to ensure no unnecessary spoilage of materials occurs which would generate additional waste
- all plant will be serviced before arriving on site. This will reduce the risk of breakdown and the possible generation of waste oil/hydrocarbons on site
- all operators will be instructed in measures to cut back on the amount of wastage for trimming of materials etc. for example cutting of plywood, built into the amount ordered
- educating foremen and others to cut/use materials such as ply wisely for shutters etc.
- prefabrication of design elements will be used where suitable to eliminate waste generation on site
- where materials such as concrete are being ordered, great care will be practiced in the calculation of quantities to reduce wastage.

Waste Reuse

When possible, materials shall be re used onsite for other suitable purposes e.g.

- re-use of shuttering etc. where it is safe to do so
- re-use of rebar cut-offs where suitable
- re-use of excavated soil for screening, berms etc.
- re-use of excavated rock or stone – where possible will be used as suitable fill elsewhere on site for the new site tracks, the hardstanding areas and embankments where possible.

Waste Recycling & Recovery

In accordance with national waste policy, source separation of recyclable material will take place. Receptacles will be clearly labelled, signposted and stored in dedicated areas in the construction compound.

The following sourced segregated materials container will be made available on site the construction compound:

- timber
- ferrous metals
- aluminium
- dry mixed recyclables
- packaging waste
- food waste.

The materials will be transported off-site by a licensed contractor to a proposed recovery centre and these materials will be processed through various recovery operations. A list of nearby licensed waste management facilities is shown in Table 4-1.

Table 4-1: Nearby Waste Management Facilities

Facility	Type of wasted accepted
Kanturk Civic Amenity Site	Plastic, metals, oil, paper, cardboard, glass, electrical goods
Mallow Civic Amenity Centre	Plastic, metals, oil, paper, cardboard, glass, electrical goods, timber, green waste
Munster waste management	Domestic, commercial, industrial, agricultural
Codrum Recycle Centre	Plastic, metal, oil, paper, cardboard, glass, Electrical good

Waste Disposal

Residual waste generated on-site will require disposal. This waste will be deposited in dedicated receptacles and collected by the licensed waste management contractor and transported to an appropriate facility. All waste movements will be recorded, which records will be held by the waste manager on-site.

Contaminated Material

Any contaminated soils will be handled, removed and disposed of in accordance with statutory requirements for the handling, transportation and disposal of waste. In particular, the following measures will be implemented:

- Contaminated material will be left in-situ and covered, where possible until such time as WAC (Waste Acceptance Criteria) testing is undertaken in accordance with recommended standards and in-line with the acceptance criteria at a suitably licenced landfill or treatment facility. This will determine firstly the nature of the contamination and secondly the materials classification i.e. inert, non-hazardous or hazardous,
- If the material is deemed to be contaminated, consultation will take place with the respective local authority and/or EPA on the most appropriate measures. Such materials will be excavated, transported by a contractor with a valid waste collection permit and recovered/disposed of at an appropriate facility.

Waste Management Training

Copies of the project waste management plan will be made available to all relevant personnel on site. All site personnel and sub-contractors will be instructed about the objectives of the Waste Management Plan and informed of the responsibilities that fall upon them as a consequence of its provisions.

It will be the responsibility of the contractors appointed (Waste Manager) to ensure that all personnel are made aware of their responsibilities under the plan via a toolbox talk or otherwise.

4.3.8 Traffic Management Plan

This document is the Construction Traffic Management Plan (TMP) for the proposed Ballinagree Wind Farm, Co. Cork. The Construction Traffic Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works and the turbine supply contract.

Some items in this plan can only be finalised with appropriate input from the contractor who will be appointed to carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan.

This plan should be read in conjunction with Chapter 13 of the EIAR.

The contractor is required to prepare the necessary Site-Specific Traffic Management Plans prior to the construction works commencing in accordance with Chapter 8 of the Traffic Signs Manual 2019 and subject to load permits.

The contractor will be responsible for the implementation of all agreements between the developer and the County Council and local residents with the objective that the transportation needs for the proposed project will have a minimal impact on the road network and local communities.

As with any construction development project, the transport of materials onto the site will give rise to increased traffic and associated impacts. However due to the very nature of construction these impacts will be temporary.

Construction traffic will require regular access to the site at varying times throughout the construction phase. The aim of this TMP is to put in place procedures to manage traffic effectively on site and in the immediate vicinity of the proposed project, to ensure the continued movement of traffic on the public roads and to minimise disturbance during transportation of materials particularly oversize loads. The correct implementation of this TMP will ensure that appropriate procedures are in place to minimise any effects on the safety and movement of the general public.

Prior to the commencement of construction, the TMP will be reviewed by the main contractor (and any sub-contractors) and will be updated as necessary.

General Traffic Management Measures

General measures that shall be addressed in the TMP shall include:

Traffic Management Co-Ordinator – A dedicated Traffic Management Coordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management on the project.

Roads and Routes: The final TMP will clearly identify roads that will be used to access the project site and roads that are not to be used. Turbine component and quarry material deliveries shall use the N72, R583 and L2750/L1123 Butter Road as the primary haul route..

One-way Systems: as some of the local roads are relatively narrow, the roads authority may want to introduce a system of one-way construction traffic movements during the construction of the development. Any such one-way systems will be identified in the construction stage TMP in agreement with the roads authority.

Road Condition Survey: a pre-condition survey will be carried out on all public roads that will be used in connection with the development to record the condition of the public roads in advance of construction commencing. A post-construction survey will also be carried out after the works are completed. The specification and timing of the surveys will be agreed with the roads authority. Joint surveys shall be completed if the roads authority requests. Local sections of the TDR will be upgraded prior to construction starting.

Road Reinstatement: All roads will be reinstated expeditiously on completion of the construction works. Roads will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

Site Inductions: All workers will receive a comprehensive site induction which will include a section on traffic management and clear guidance on the routes to be used/not used to access the site.

24-Hour Emergency Contact: a 24-hour emergency phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for grid connection) and the site entrance for the wind farm site.

Traffic Management Guidance: all necessary temporary traffic management will be planned and executed in accordance with best practice, including Chapter 8 of the Traffic Signs Manual published by the Department of Transport in 2019.

Community Liaison: A project website will be in place for the duration of the project's construction phase which will include regular project programme status updates, contact details, facilities for community feedback/observations as well as a complaints procedure. A community liaison will be appointed by the contractor in advance of the commencement of the construction phase who will have responsibility for consulting with members of the public and act as a first point of contact for the project management team. Letter drops will be carried out to notify members of the public living near the proposed site and cable route to advise them of any particular upcoming traffic related matters e.g. temporary lane/road closure or delivery of turbine components.

Signage: Clear signage relating to the development, both temporary and permanent, will be provided for accessing the site.

Road Sweeping: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. When, if necessary, a road sweeper will be used to maintain the public roads in a clean condition during the construction activities of the project.

Site Entrances: The entrances to the site will be secured when the site is not in use. When necessary, a flagman will be used to assist traffic movements at the site entrance or in other areas as required. For example, during turbine blade and tower deliveries.

Temporary Road Crossing Point: Site entrances from and to the wind farm and borrow pits will be secured and locked when not in use. Where required, the entrances will be controlled by flagmen to assist traffic movements. The proposed crossing point will be managed appropriately to allow the safe passage of construction vehicles in, out and across the public road Priority will be maintained for public traffic. A concrete apron will be provided on both sides of the crossing point during the construction phase, constructed 40mm below road level and overlaid with surface course material. This road is a very quiet public road with extremely low traffic volumes.

Abnormal Load Deliveries: Abnormal loads will require an abnormal load permit prior to delivery and will be delivered mostly at night time as agreed with local authority and An Garda Siochána.

Measures contained within the construction stage CEMP and TMP shall be discussed with Coillte forestry operators in advance of the works to ensure no conflicts occur with ongoing forestry activities.

Mitigation measures proposed for the grid connection works include:

Road Opening Licence: The road works associated with the grid connection cabling will be completed in line with the requirements of a road opening license as agreed with the local authority.

Route Proofing: In advance of the main grid connection works an assessment will be carried out to define the precise alignment of the cable route within the corridor which has been assessed.

This will include slit trenching with the aim of minimising the construction impacts and avoiding existing services in the road.

Maintaining Local Access: reasonable access to local houses, farms and businesses will be maintained at all times during any road closures associated with the grid connection works. The details of this will be agreed with the roads authority in advance of the grid connection works commencing.

Road Cleanliness: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. Road sweeping vehicles will be used when necessary, to ensure that the public road network remains clean.

Temporary Trench Reinstatement: Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority.

Surface Overlay after Trench Reinstatement: following temporary reinstatement of trenches on public roads, sections of the public roads will receive a full surface overlay. Details to be agreed with the roads authority At a minimum they will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

Construction Plant and Vehicles

The typical construction plant and vehicles used as part of the construction of a wind farm are as follows (non-exhaustive):

- Hydraulic Excavators
- Dump Trucks
- General construction delivery vehicles (e.g. steel reinforcement bar, electrical components etc.)
- Concrete trucks and pumps
- Cranes of various lifting capacities (up to 1000 tonnes)
- Oversized articulated delivery vehicles (for turbine component transport)
- Site Jeeps (off-road 4x4 all purpose vehicles)
- Private vehicles of those employed on site for the construction phase.

It should be noted however that final selection of construction plant and vehicles may vary depending on suitability, availability, contractor's choice, etc.

Plant operators will be responsible for the upkeep and maintenance of construction plant and vehicles, ensuring good working order prior to use. Should emergency maintenance need to be carried out on site, this will be carried out at a designated area away from sensitive receptors and will ensure that a spill kit is nearby.

Construction commencement dates are yet to be confirmed at this stage; these will be made known to the Planning Authority by way of formal Commencement Notice.

Construction Compound

The locations of the construction compounds are shown on the site layout, Figure 1-2.

Consultation and Notification

An Garda Síochána

The Transport Management Plan shall be finalised following the appointment of the contractor for the main construction works.

The contractor will liaise directly with An Garda Síochána in relation to the plan. Any concerns/requirements they have will be incorporated in to the plan. This may include details in relation to the escorting of oversized loads.

The necessary permits (including approved route permits) will be applied for and obtained from An Garda Síochána.

Cork County Council

The contractor will liaise directly with the County Council in relation to the plan. Any concerns/requirements they have will be incorporated into the plan. The contractor will also liaise with Limerick County Council , as necessary, along the final turbine delivery route.

The necessary permits (including standard permits) will be applied for and obtained from the relevant local authorities.

Local Residents

The following measures will be used to communicate the necessary information to the households along the local road to be used as a haul road:

- Information signs will be erected in advance of the construction/transportation works.
- A flyer drop will be carried out to advise households along the local road leading to the site in relation to the programme of construction works and especially in relation to oversized load movements.
- Residents will be consulted with regarding the development of plans for the project.
- Contact details for a Liaison Officer will be provided so that any concerns can raised, logged and be easily channelled to the Developer to be dealt with.
- A project website will be in place for the duration of the project's construction phase which will include regular project programme status updates, contact details, facilities for community feedback/observations as well as a complaints procedure.

Complaints will be entered into the site complaints log and the relevant site environmental officer will arrange to meet with those affected. The situation will be acted upon immediately and reviewed by the Project Manager.

Key Personnel and Responsibility

Once prepared and agreed with the local County Council and An Garda Síochána the contractor will implement the project specific Traffic Management Plan (TMP).

Please note that some items in this plan can only be finalised with appropriate input from the contractor who will carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan.

Typically, the following members of the contractors' staff will have responsibility for adherence to the TMP as follows:

Traffic Management Coordinator

The Traffic Management Coordinator will be responsible for maintaining regular contact with An Garda Síochána, The local County Council, the statutory bodies and the client concerning traffic control, interference with services and co-ordination of crossings at roads, rivers and railways.

The Transport Officer will contact the relevant bodies in relation to develop method statements prior to the work taking place. The Transport Officer will be responsible for instructing the Construction Manager, Foreman and all other personnel on the information in the agreed method statement prior to the work commencing and ensuring that the method statement is adhered to.

The Transport Officer will be responsible for ensuring that the Traffic Management Plan will be implemented in full.

Safety Officer

The Safety Officer will be responsible for implementing all safety requirements detailed in the Project Safety Plan. Ensure that all operatives receive site safety induction prior to commencing work on site. They will ensure that all plant, particularly lifting equipment, on site has the relevant certification and are checked regularly by a competent person. The Safety Officer will carry out safety audits and checks on a regular basis and amend procedures where necessary.

Construction Manager

The Construction Manager will be responsible for overall supervision of the operations to ensure they are constructed in a safe and efficient manner. He will ensure that sufficient resources are available to meet the programme and that the necessary information is provided to the appropriate staff.

Foreman

The Foreman is responsible for ensuring that the crew carry out the work in accordance with the method statement and contract specifications and drawings using good working practices in a safe manner. He will supervise construction personnel ensuring their competence. He will check all plant and equipment on a regular basis ensuring it is maintained and in good working order.

Wind Turbine Generator Deliveries

A detailed turbine delivery route assessment has been carried out for the project which can be found in Appendix 13.2 of the EIAR.

The components of 20 no. wind turbines will be transported by road to the Wind Farm Site for on-site assembly, using the access route outlined in the Turbine Delivery Route Assessment Report.

Wind turbine component deliveries, cranes and all large plant associated with turbine installations will use the turbine delivery route.

The impact of the deliveries on traffic is mitigated by delivering components during off-peak or night-time deliveries.

Mitigation measures proposed for the turbine delivery route also include:

Programme of Deliveries: a programme of deliveries will be submitted to the roads authority in advance of deliveries of turbine components to the site. The programme will include details of the dates and times of each component delivery along with the route to be taken.

Turbine component deliveries will be carried out during off-peak times and will be done using a convoy and a specialist heavy haulage company.

Garda Escort: Turbine deliveries will be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised.

Reinstatement: Any area affected by the works to facilitate turbine delivery will be fully reinstated to its original condition.

Consultation: Consultation with the local residents and Cork County Council will be carried out in advance to manage turbine component deliveries.

The location of temporary accommodation works associated with turbine deliveries are shown in Figure 1-3. Swept path analysis drawings showing turbine component manoeuvres can be found in the Route Survey Report for the Turbine Delivery Route carried out by Pell Frischmann, October 2020 in Appendix 13.2 of the EIAR.

All turbine blades will be carried on a highly manoeuvrable superwing carrier to reduce the need for mitigation in constrained sections of the route.

It is proposed that the blade will be transferred to a Goldhofer blade lifting trailer at the temporary staging area at Drishane Castle, near Millstreet to the proposed wind farm site. This trailer has the ability to lift blades up to a maximum angle of 60 degrees, lifting blades over potential constraints and shortening the vehicle length.

The staging area shall consist of a hard standing off the public road at which turbine blades shall be transferred from the superwing carriers to the blade lifting trailers. The location of the Drishane Castle staging area is shown on Figure 3-17. The general arrangement of the temporary staging area is shown on planning drawings.

Two temporary access points to the staging area will be created from the public road at existing road junctions. These shall be controlled entrances and only used by turbine delivery vehicles, cranes and support vehicles associated with the delivery of turbine components.

Vehicles shall enter the eastern end of the staging area at an access point located at the junction between the R583 and L1116 where a break in the existing wall and hedgerow will facilitate the proposed temporary access and exit from the western end of the hard standing, making use of an existing junction between the R583 and L95831-1. The staging area will be fenced off from the public and closed when not in use and shall only be used when required during the delivery of wind turbine components in accordance with timings identified in the construction stage traffic management plan (TMP).

All overhead utilities and obstructions shall be removed at any locations that the blades are raised on the blade lifting trailer. The removal of overhead utilities will be either temporary disconnections or permanent re-routing. Such works will be carried out by the utility providers in advance of turbine delivery to site.

Any trenching and road reinstatement works associated with utility diversions will be subject to a road opening license and can be carried out in such a way as to ensure one lane of traffic will be open at all times. Such works will be carried out over a number of days.

However, if the permanent re-routing of overhead utilities is not possible, temporary disconnections of overhead lines will be required on several occasions to facilitate the delivery of turbine blades and will be carried out during the delivery of the components. Advance disconnection works will be required before the first turbine deliveries.

The schedule of turbine component deliveries will be determined by the turbine supplier. Temporary disconnections will be carried out during off peak times to facilitate convoys, with a duration of several hours between disconnection and re-connection of services on each occasion.

Towers will be carried in a 4+7 clamp adaptor style trailer, whereas loads such as the hub, nacelle housing and drive train will be carried on a six-axle step frame trailer.

The main street of Millstreet will not be used as part of the TDR with the exception of the delivery of wind turbine tower base sections to the wind farm site, which will need to approach the junction between the R583 and L1123 from the west to avoid impacting third party property.

Tower sections shall be carried by clamp trailer to a designated transfer area at Claratlea, west of Millstreet as identified in Figure 4-1 below. The tower sections will be lowered to the ground resting on timber sleepers or bog mats and the clamp trailers uncoupled. All works shall take place within the public road carriageway. The unloaded vehicles shall then turn at an existing Coillte Forestry Access at Rathduane identified in the Figure 4-2 below and return to collect the tower sections at Claratlea. The loads shall then travel east along the R583 and turn right onto the L1123 towards the wind farm site.

The manoeuvre will take place at night and can be carried out for up to 3no. turbine base tower sections in convoy. It is expected that the manoeuvre can be carried out in approximately hour per convoy and will be required to take place on up to 7no. separate occasions over a period of several months with the possibility of reducing the number of occasions if several convoys are transported together. The manoeuvre shall be carried out in accordance with a traffic management plan and under Garda escort.

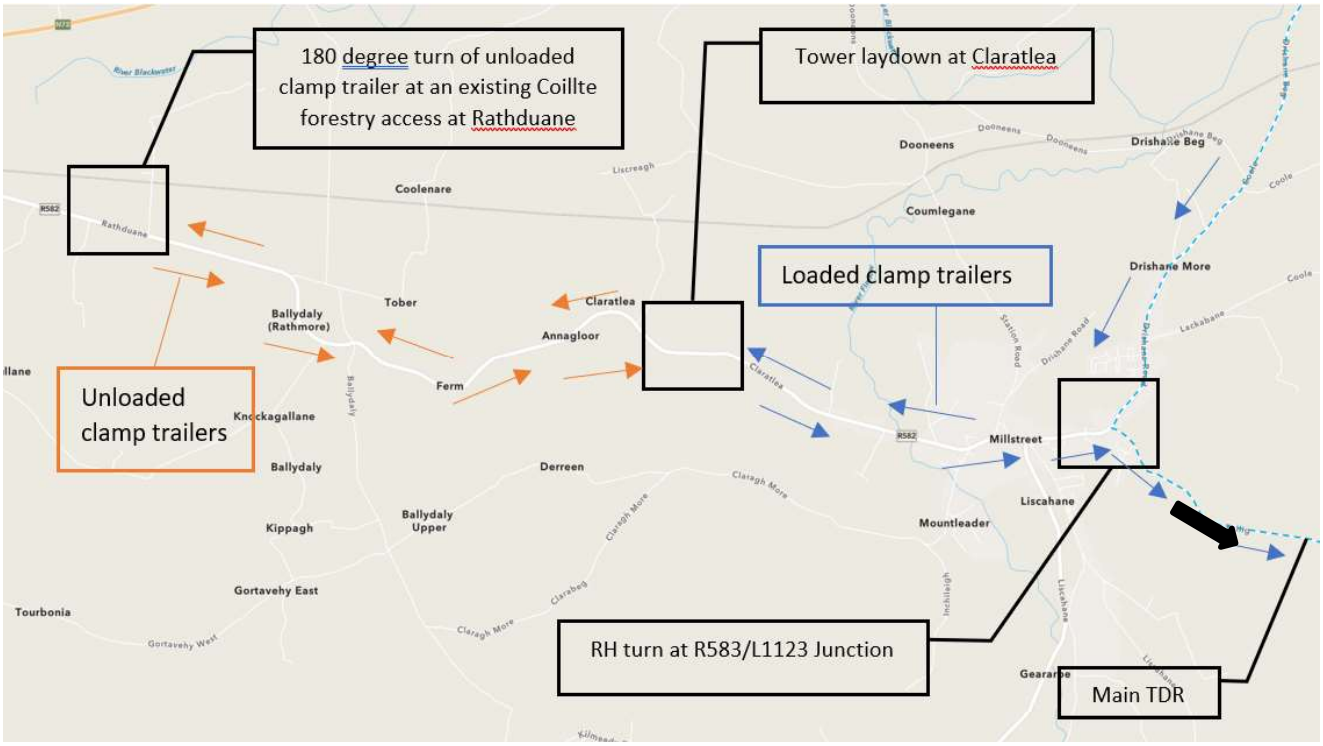

Figure 4-1: Tower Lay Down and Pick Up Locations

Restricted Public Road Use by Construction Traffic

The local authority may impose restrictions on the use of some local roads. These will be agreed in liaison with Cork County Council prior to construction, as well as specific signage requirements for construction works.

Some of the existing local roads are narrow, and to this effect, one-way delivery and access route systems may be employed to mitigate against unsuitable two-way construction traffic.

Using local roads is unavoidable, however, introducing a one-way system where necessary and restricting construction traffic access to a small number of roads will minimise disruption to the local community.

Materials will be delivered to site via the indicative haul routes shown in Figure 3-17.

Road Closures, Diversions and Safety Measures for Road Crossings

It is envisaged that road closures will be necessary for the carrying out portions of the cable trenching, with the majority of the proposed cable trenching taking place on existing local roads. The consent of Cork County Council will be required and the necessary road diversions together with the appropriate signage will be put in place. As there is a good network of local roads, it is anticipated that there are a number of options available for diverting traffic which will allow flexibility during this process of construction and maintain local access at all times during this element of the works.

It is proposed to maintain local access at all times during this element of the works. It is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions. Diversion signage will also be included.

Safety measures for road users adjacent to deep excavations, such as temporary concrete barriers will be detailed for Trenchless Road Crossings in advance of construction and agreed with Cork County Council.

Figure 4-2 details proposed road works locations and diversions associated with the grid connection works.

Temporary signage and traffic management for works in rural single carriageway roads in accordance with Chapter 8 of the Traffic Signs Manual is shown in Figure 4-3 and Figure 4-4..

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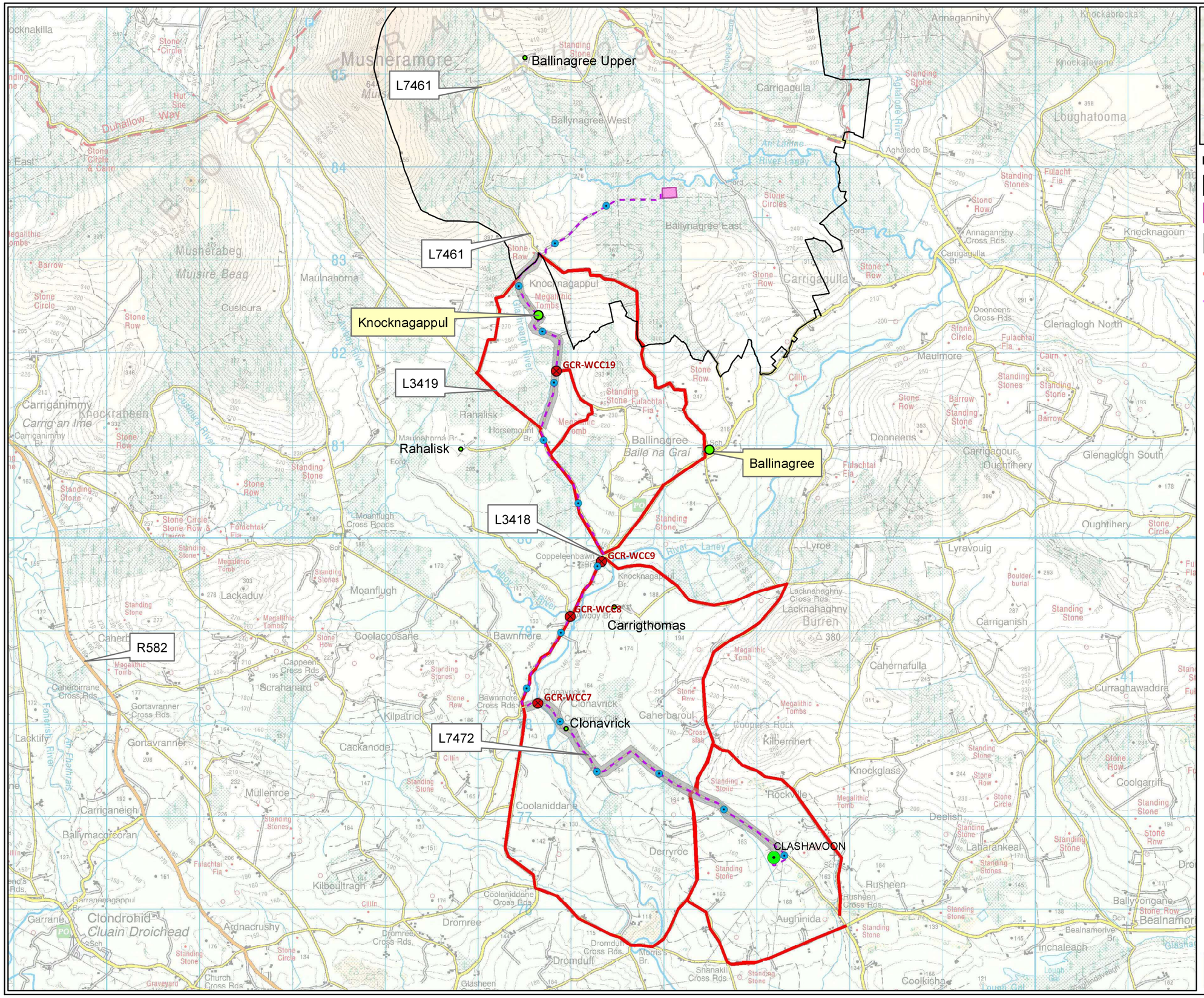

Legend

- Proposed Wind Farm Site
- Substation Compound
- Roads requiring temporary road closures during construction stage
- Diversion Route Option
- Proposed Grid Connection Route
- Clashavoon Substation (110-220kV)
- Joint Bay
- Location of horizontal directional drill

N W E S

0 0.5 1 2 Kilometers

TITLE: Temporary Road Closures and Diversion Routes			
PROJECT: Ballinagree Wind Farm			
FIGURE NO:	4.2		
CLIENT:	Coillte and Ørsted		
SCALE:	1:40000	**REVISION:**	0
DATE:	10/01/2022	**PAGE SIZE:**	A3

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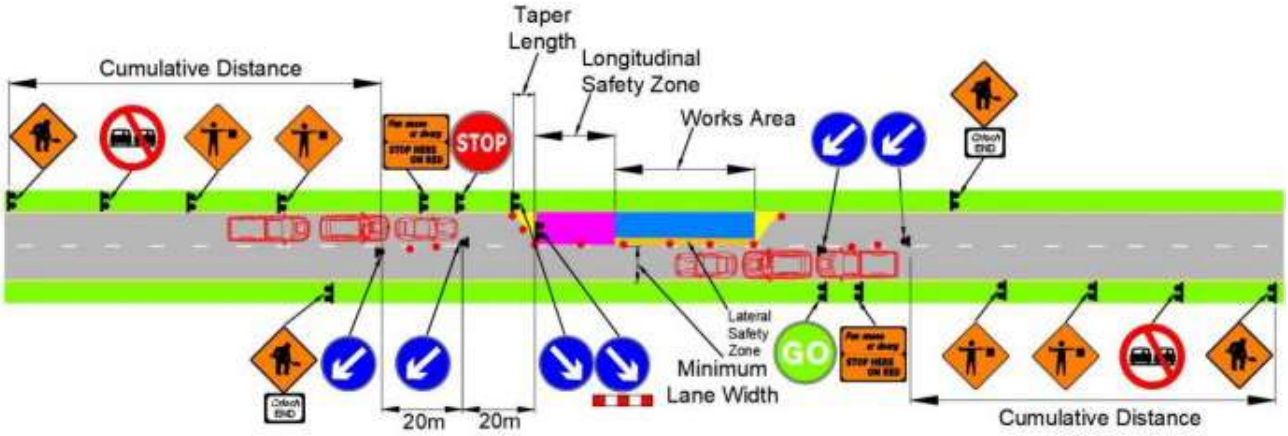

Figure 4-3: Stop and Go Traffic Control Signage for Single Carriageway Rural Road

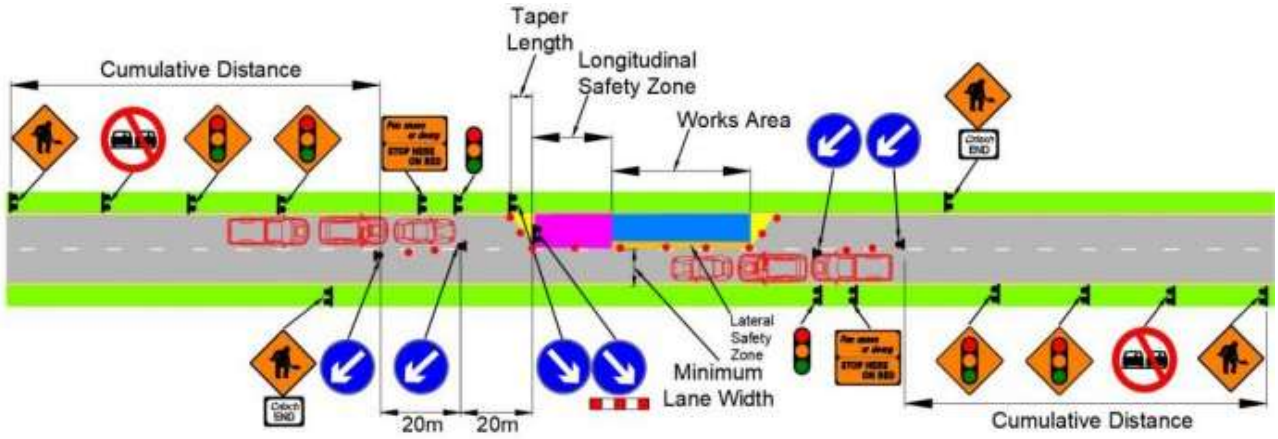

Figure 4-4: Temporary Traffic Signals Control for Works in Single Carriageway Rural Roads

3 no. borrow pits have been identified to provide site-won aggregate material for the construction of the wind farm roads and hard standings. The locations of the borrow pits are shown on Figure 1-2. As described in Chapter 13 of the EIAR, a public road crossing using existing Coillte forestry access points shall be used to facilitate the transport of aggregates from the two borrow pits located in the west of the site to the southern part of the wind farm site using Access Points 4 and 5.

A controlled crossing shall be implemented between Access Points 4 and 5 to facilitate the movement of HGVs across the public road to the wind farm site. The public road at this location experiences very low traffic volumes (AADT = 17 recorded in April 2021). It is also commonly used by walkers and cyclists due to its proximity to the Duhallow Way and would likely experience increased traffic during summer months from visitors to the area.

Access points will be secured and locked when not in use. The proposed crossing point will be managed appropriately to allow the safe passage of construction vehicles in, out and across the public road. Priority will be maintained for public traffic.

The crossing point/site access points should be highlighted to vulnerable road users. Exiting site traffic will be made aware of the possible presence of vulnerable road users.

Stop and Go discs will be used to control the crossing point See Figure 4-5for acceptable type in accordance with Chapter 8 of the Traffic Signs Manual. If it is required to stop both streams of traffic at the one time, then a disc displaying Stop on both sides shall be used.

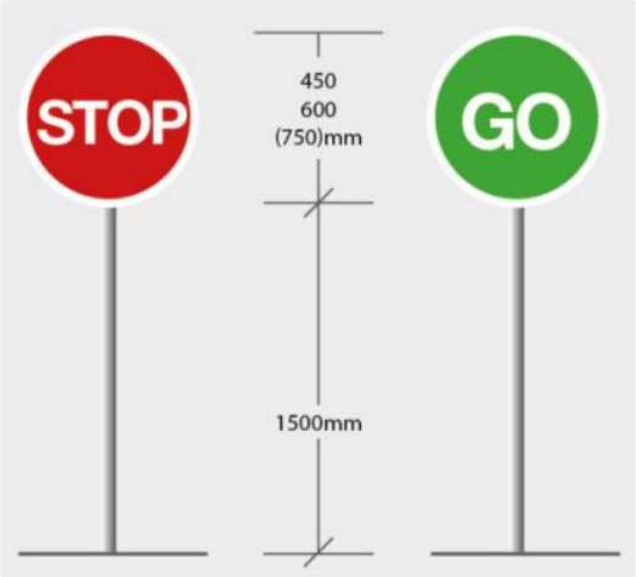

Figure 4-5: Acceptable Stop-Go Discs

At the site crossing point, a single operator may be used to control the traffic using a double-sided Stop disc. The operator, stops both flows of traffic to allow the construction vehicle to cross the public road and then leaves the carriageway and signals to the traffic to proceed.

A concrete apron will be provided on both sides of the crossing point during the construction phase, constructed 40mm below road level and overlaid with surface course material.

Road Cleaning

Public roads shall be kept free of mud, dust, spillages and debris from the construction site, construction plant or haulage vehicles. Any necessary measures shall be put in place at the site entry/exit points.

Carriageway/ Road Reinstatement

It is anticipated that the proposed haul routes will be capable of accommodating the construction traffic associated with the project. In the event that there are concerns around the structural capacity of a road on a proposed haul route, a structural survey shall be carried out to determine suitability of the existing roads to carry the loading. Where the structural survey indicates that a proposed haul route is not in a suitable condition, details of any upgrading works required shall be submitted to Cork County Council for approval. The developer shall upgrade the road or junction in advance of haulage operations.

A pre-condition survey of haul routes, consisting of a video survey and photographs shall be carried out and a copy submitted to Cork County Council.

Any damage caused to the road shall be repaired to its previous condition, to the satisfaction of Cork County Council. Any defects that appear during the haulage period shall be rectified by the project owner.

Traffic Management Measures for Potential Cumulative Impacts

The following existing and proposed developments have been identified as having the potential to create cumulative negative effects on the existing road network. Should activities associated with these developments coincide with the construction of Ballinagree Wind Farm, the Contractor should advise the local authority of these developments as part of the finalisation of the construction stage TMP so that they can be considered.

Table 4-2: Existing and Proposed Projects Assessed for Cumulative Impacts

Project	Existing/Permitted	Reason for Assessment
Existing forestry activities on the site and the surrounding forest blocks	Existing	Proximity to proposed wind farm site and sharing of haul routes.
Solar Farm at Carragraigue, Inchamay North and Crinnaloo South Co. Cork (Planning refs 165455, 186562)	Permitted	This type of development gives rise to construction traffic and its proximity to the proposed wind farm site and TDR has the potential for cumulative traffic and transport impacts. .
Extension to Substation to include Battery Storage at Bawnmore Wind Farm (Planning ref 185240)	Permitted	Type of development (which will give rise to construction traffic) Type of development and proximity to grid connection route.
Knockglass Solar Farm (Planning ref 155424)	Permitted	Type of development (which will give rise to construction traffic) and proximity to grid connection route.
Battery Storage Facility at Caherdowney, Millstreet, Co. Cork (Planning ref 185686)	Permitted	Type of development (which will give rise to construction traffic) and proximity to wind farm site and TDR.
Solar Farm at Cloghmacow, Crookstown, Co. Cork (Planning ref 196847)	Permitted	Type of development (which will give rise to construction traffic) and proximity to grid connection route.
Solar Farm at Berrings, Co. Cork (Planning ref 187280)	Permitted	Type of development (which will give rise to construction traffic) and proximity to grid connection route.
Solar Farm at Currabeha, Crookstown, Co. Cork (Planning ref 164783)	Permitted	Type of development (which will give rise to construction traffic) and proximity to grid connection route.

4.4 Environmental Management Team - Structure and Responsibility

A preliminary organisation chart is included in Figure 4-6. Revisions to the project organisation chart shall be controlled independently of this plan following the appointment of the Contractor for the main construction works.

The Contractor's Project Manager will be responsible for the delivery of all elements of the Environmental Management Plan.

The Contractor's Project Manager will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan throughout.

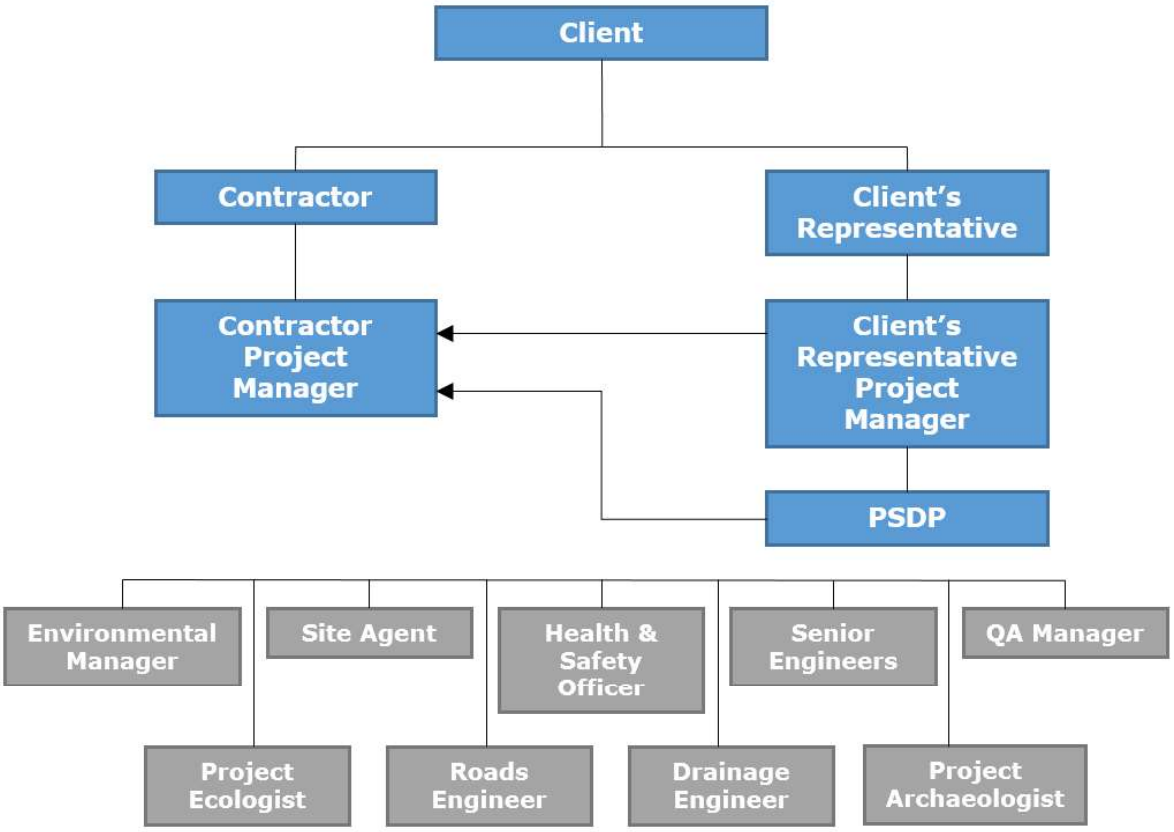

Figure 4-6: Project Management Team Organogram

4.5 Training, Awareness and Competence

All site personnel will receive environmental awareness information as part of their initial site briefing. The detail of the information should be tailored to the scope of their work on site.

The contractor for the main construction works may decide to conduct the environmental awareness training at the same time as Health and Safety Training (often referred to as Site Inductions).

This will ensure that personnel are familiar with the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

The CEMP will be available in the main site compound during the project. The environmental performance at the site is on the agenda of the monthly project management meetings for the project.

Elements of the CEMP will be discussed at these meetings including objectives and targets, the effectiveness of environmental procedures etc. Two-way communication will be encouraged by inviting all personnel to offer their comments on environmental performance at the site.

4.6 Environmental Policy

The contractor is responsible for preparing and maintaining an Environmental Policy for the site. The policy should be appropriate to the project, commit to continuous improvement and compliance with legal requirements and provide a framework for objectives and targets. This will be communicated to all site personnel and will be available on site notice boards.

4.7 Register of Environmental Aspects

The contractor is responsible for preparing and maintaining a *Register of Environmental Aspects* pertaining to the site. This register will identify the environmental aspects associated with activities onsite and determine which aspects have or can have a significant impact on the environment.

4.8 Register of Legislation

The contractor is responsible for preparing and maintaining a register of key environmental legislation pertaining to the site. This register will reference all current environmental legislation and will be inspected, reviewed and updated regularly to ensure compliance.

4.9 Objectives and Targets

Objectives and targets are required to be set to ensure that the project can be constructed and operated in full accordance with the EIAR, planning conditions and legislative requirements, with minimal impact on the environment.

Environmental objectives are the broad goals that the contractor must set in order to improve environmental performance. Environmental targets are set performance measurements (key performance indicators or KPI's) that must be met in order to realise a given objective.

4.10 Non-Conformance, Corrective and Preventative Action

Non-Conformance Notices will be issued where there is a situation where limits associated with activities on the project are exceeded, or there is an internal/external complaint associated with environmental performance.

Non-Conformance is the situation where essential components of the EMS are absent or dysfunctional, or where there is insufficient control of the activities and processes to the extent that the functionality of the EMS is compromised, in terms of the policy, objectives and management programmes. A Non-Conformance register should be controlled by the contractor.

The EMS and all its components must conform to the EMP. In the event of non-conformance with any of the above, the following must be undertaken:

- Assess cause of the non-compliance;
- Develop a plan for correction of the non-compliance;
- Determine preventive measures and ensure they are effective;
- Verify the effectiveness of the correction of the non-compliance;
- Ensure that any procedures affected by the corrective action taken are revised accordingly.

Responsibility must be designated for the investigation, correction, mitigation and prevention of non-conformance.

4.11 EMS Documentation

The Contractor is required to keep the following documentation in relation to the environmental management of the project (as a minimum):

- Construction Environmental Management Plan
- Register of Environmental Impacts
- Register of Planning Conditions
- Monitoring Records
- Minutes of Meetings
- Training Records
- Audit and Review Records.

All these documents and records are to be available for inspection in the site office. The documentation shall be to date and shall be reviewed on a regular basis with revisions controlled in accordance with the site quality plan.

4.12 Control of Documents

The Contractor will establish, implement and maintain a procedure to control CEMP documents and records so they are clearly identifiable, organised, current, easily located and revised when necessary.

5. SAFETY & HEALTH MANAGEMENT PLAN

5.1 Introduction

This Safety and Health Management Plan (SHMP) defines the work practices, procedures and management responsibilities relating to the management of health and safety during the design, construction and operation of the Ballinagree Wind Farm and shall be read in conjunction with the Preliminary Safety & Health Plan prepared for the project by the Project Supervisor for the Design Process. The Safety and Health Management Plan for the construction stage shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works.

This SHMP describes how the contractor for the main construction works will implement a site safety management system (SMS) on this project to meet the specified contractual, regulatory and statutory requirements, environmental impact statement and natura impact statement mitigation measures and planning conditions. It is the contractor's responsibility to implement an effective safety management system to ensure that the developer's safety requirements for the construction of this project are met.

All site personnel will be required to be familiar with the requirements of the safety management plan as related to their role on site. The plan describes the project organisation and sets out the health and safety procedures that will be adopted on site.

- The Safety and Health Plan is a controlled document and will be reviewed and revised as necessary.
- A copy of the Safety and Health Plan will be located on/near the site H&S notice board.
- All employees, suppliers and contractors whose work activities cause/could cause impacts on the environment will be made aware of the SHMP and its contents.

5.2 Project Obligations

The construction of Ballinagree Wind Farm the will impose numerous safety management obligations on the developer, designer and contractor. As well as statutory obligations, there are several specific obligations set out in the EIAR and in the planning conditions for the proposed wind farm. These obligations are set out below. The contractor for the main construction works and all its sub-contractors are to ensure that they are fully aware of and in compliance with these safety obligations.

5.2.1 EIA Obligations

EIAR obligations are described in Section 4.2.1.

5.2.2 Planning Permission Obligations

Planning permission obligations will be fully outlined in the Contractor's CEMP.

5.2.3 Statutory Obligations

The Safety, Health and Welfare at Work Act 2005 (as amended) and the Safety, Health and Welfare at Work (Construction) Regulations 2013 (as amended) place a responsibility on the Developer as the "Client", the Designer, the Project Supervisors and the Contractor.

The Client must:

- Appoint a competent and adequately resourced Project Supervisor for the Design Phase (PSDP)
- Appoint a competent and adequately resourced Supervisor for the Construction Stage (PSCS)
- Be satisfied that each designer and contractor appointed has adequate training, knowledge, experience and resources for the work to be performed
- Co-operate with the project supervisor and supply necessary information
- Keep and make available the safety file for the completed structure
- Provide a copy of the safety and health plan prepared by the PSDP to every person tendering for the project
- Notify the Authority of the appointment of the PSDP.

Designers must:

- Identify any hazards that their design may present during construction and subsequent maintenance
- Eliminate the hazards or reduce the risk
- Communicate necessary control measures, design assumptions or remaining risks to the PSDP so they can be dealt with in the safety and health plan
- Co-operate with other designers and the PSDP or PSCP
- Take account of any existing safety and health plan or safety file
- Comply with directions issued by the PSDP or PSCS.

The PSDP must:

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project
- Where possible, eliminate the hazards or reduce the risks
- Communicate necessary control measure, design assumptions or remaining risks to the PSCS so they can be dealt with in the safety and health plan
- Ensure that the work of designers is coordinated to ensure safety
- Organise co-operation between designers
- Prepare a written safety and health plan for any project and deliver it to the client prior to tender
- Prepare a safety file for the completed structure and give it to the client.

The PSCS must:

- Co-ordinate the identification of hazards, the elimination of the hazards or the reduction of risks during construction
- Develop the Safety and Health Plan initially prepared by the PSDP before construction commences
- Co-ordinate the implementation of the construction regulations by contractors
- Organise cooperation between contractors and the provision of information
- Co-ordinate the reporting of accidents to the Authority
- Notify the Authority before construction commences
- Provide information to the site safety representative
- Co-ordinate the checking of safe working procedures
- Co-ordinate measures to restrict entry on to the site
- Co-ordinate the provision and maintenance of welfare facilities
- Co-ordinate arrangements to ensure that craft, general construction workers and security workers have a Safety Awareness card, e.g. Safe Pass and a Construction Skills card where required
- Co-ordinate the appointment of a site safety representative where there are more than 20 persons on site
- Appoint a safety adviser where there are more than 100 on site
- Provide all necessary safety file information to the PSDP
- Monitor the compliance of contractors and others and take corrective action where necessary;
- Notify the Authority and the client of non-compliance with any written directions issued.

The Contractor must:

- Co-operate with the PSCS
- Promptly provide the PSCS with information required for the safety file
- Comply with directions of the project supervisors
- Report accidents to the Authority and to the PSCS where an employee cannot perform their normal work for more than 3 days
- Comply with site rules and the safety and health plan and ensure that your employees comply
- Identify hazards, eliminate the hazards or reduce risks during construction
- Facilitate the site safety representative
- Ensure that relevant workers have a safety awareness card and a construction skills card where required
- Provide workers with site specific induction
- Appoint a safety officer where there are more than 20 on site or 30 employed
- Consult workers with site specific induction
- Monitor compliance and take corrective action.

Consequently, at all stages of the project there are statutory requirements for the management of safety, health and welfare of all involved in or affected by the development. This CEMP and specifically the Safety and Health Management Plan address key construction management issues associated with the proposed wind farm. This plan will be developed further at the construction stage, on the appointment of the Contractor for the main construction works.

5.2.4 The Management of Health and Safety during the Design Process

Fehily Timoney & Company (FT) has been appointed Project Supervisor for the Design Process (to prepare the Environmental Impact Assessment Report and planning application for the proposed Ballinagree Wind Farm development). FT is competent to fulfil this role in accordance with the Safety, Health and Welfare at Work (Construction) Regulations, 2013. Health and safety are a major priority for FT and FT adopts health and safety practices that are an inherent part of a safe and sustainable business. FT's objective is to provide a safe and healthy work environment for all and to meet our duties to clients, contractors and members of the public.

It is FT's policy to comply fully with all health and safety legislation, in particular the Safety, Health and Welfare at Work Act, 2005, Safety, Health and Welfare at Work (General Application) Regulations 2007, and the Safety, Health and Welfare at Work (Construction) Regulations 2013.

FT has developed in-house procedures to ensure, so far as is reasonably practicable, that all projects:

- are designed to be capable of being constructed to be safe/ without risk to health;
- can be operated and maintained safely and without risk to health during use; and
- comply in all respects, as appropriate, with the relevant statutory enactments and instruments.

These procedures include effective risk management procedures involving the identification and evaluation of risks and the development of mitigation measures to eliminate (where possible) or reduce those risks during the life-cycle of the project. The FT team is committed to health and safety and shares responsibility for managing risk at all stages of a project.

All work by FT is undertaken in a competent and efficient manner taking account of the general principles of prevention to safeguard the safety, health and welfare of construction & maintenance workers and other third parties.

The FT procedures for the management of safety during the design process are outlined in the in-house procedure PP09 "Health and Safety Requirements in Design Projects" and is adhered to on all design projects.

The purpose of this procedure is to define the requirements for the management of health & safety during design projects, to ensure compliance with The Safety, Health and Welfare at Work (Construction) Regulations 2013 (as amended).

The procedure includes standard forms which are used to communicate health and safety considerations within the design team and also guidelines which develop the company's health and safety procedure and outline the company's responsibilities for health and safety during the design process.

The procedure addresses health and safety issues at all stages of a project, from the preliminary design through to commissioning and operation. By establishing a chain of responsibility each party is clear on their role and obligations from a health and safety perspective.

Risk assessments are carried out, at preliminary and detailed design stages by every discipline involved in the design. Each risk assessment is prepared by the designers and reviewed by the Health and Safety Facilitator for the project.

Risk assessments are used to identify hazards and assess risk at all stages during the life of the project including the construction & maintenance stages.

A Health and Safety Facilitator for the Design Process (HSF) is appointed on all projects where FT are the Project Supervisor for the Design Process (PSDP).

Health & Safety Facilitators are selected from the senior ranks of FT design staff to ensure they have the required knowledge, experience and training to carry out the role.

Meetings will be held between the HSF and relevant design personnel to collate all the risk assessments and other pertinent information and to discuss any issues relating to health and safety and ensure the constructability of the designs. The minutes of these meetings are circulated to the entire design team complete with actions allocated to the designers as appropriate. At such a meeting a "Construction Risk Analysis" form is completed which forms the basis for the Preliminary Safety & Health Plan. This document outlines the particular, significant and residual risks and in addition specific construction methods or sequences assumed during the design. Special requirements for maintenance envisaged at design stage are also included.

A Designers Safety File shall be kept and maintained during the design. All design criteria adopted, and safety & health information required for the Safety File shall be kept in this file which is maintained by the HSF and is the pre-cursor to the Safety File. The information required from the Contractor/ PSCS for inclusion in the Safety File is specified at tender stage in the Preliminary Safety and Health Plan.

This information from the PSCS & Contractor(s) and the Designers Safety File is used to compile the Safety File in the latter stages of a contract and formally issued to the Client on completion of the contract.

FT promotes a collaborative approach to health and safety on site where the Client, PSDP, Designers, Contractors and PSCS co-operate with each other and share information. Joint site safety audits and/or walk-downs are carried out as part of this collaboration and safety is monitored and addressed on site on an ongoing basis. The regular safety meetings are held to document this ongoing co-operation, get an over-view of works currently in hand onsite and about to commence and share information.

5.2.5 The Preliminary Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 (as amended) a Preliminary Safety & Health Plan will be required as part of the design process. This plan will be further developed by the PSCS on appointment and maintained as a live document during construction and commissioning of the development.

The safety and health plan is required to include the following information:

- a general description of the project;
- details of other work activities taking place on site;
- works involving particular risks;
- the timescale for the project and the basis on which the time frame was established;

- conclusions drawn by designers and the PSDP having taken into account the General Principles of Prevention and any relevant Safety and Health Plan or Safety File;
- the location of electricity water and sewage connections so as to facilitate early establishment of welfare facilities.

In accordance with the PSDP's procedures the Preliminary Safety & Health Plan for the proposed Ballinagree Wind Farm development should include the following sections and subsections to ensure the PSCS is aware of the health and safety issues at tender stage and enable them to price accordingly:

Preamble:

1 General Project Information:
- 1.1 Title
- 1.2 Description of Project
- 1.3 Employer
- 1.4 Designers / Other Consultants
- 1.5 Project Supervisor Design Process
- 1.6 Drawings, Specifications and Other Documents
- 1.7 Intended Contract Commencement Date
- 1.8 Intended Contract Completion Date
- 1.9 Basis for Contract Duration
- 1.10 Restrictions on Working Hours
- 1.11 Notification of Project
- 1.12 Termination of the PSCS Appointment

2 The Existing Environment:
- 2.1 Site Location
- 2.2 Relevant Adjoining Land Uses
- 2.3 Site Restrictions
- 2.4 Restrictions on Access
- 2.5 Hazardous Area Classification
- 2.6 Existing Services
- 2.7 Ground Conditions
- 2.8 Existing Hazards
- 2.9 Liaison with Statutory Bodies

3 Other Work Activities:
- 3.1 Other Contracts Which May Affect Work
- 3.2 Occupation of Site
- 3.3 Building Activities
- 3.4 Other Work Activities
- 3.5 Emergency Procedures in Place on Site

4 Particular and Residual Risks:
- 4.1 Works Which Puts Persons at Work at risk
- 4.2 Work Which Puts Persons at Risk from Chemical or Biological Substances
- 4.3 Work with Ionising Radiation
- 4.4 Work near High Voltage Power Lines
- 4.5 Work Exposing Persons at Work to the Risk of Drowning
- 4.6 Work on Wells, Underground Earthworks and Tunnels
- 4.7 Work Carried Out by Divers at Work Having a System of Air Supply
- 4.8 Work Carried Out in a Caisson with a Compressed Air Atmosphere
- 4.9 Work Involving the Use of Explosives
- 4.10 Work Involving the Assembly or Dismantling of Heavy Prefabricated Components
- 4.11 Work Involving Hazardous Material
- 4.12 Residual Risks

5 Additional Information:
- 5.1 Existing Documents
- 5.2 Site Possession
- 5.3 Site Rules
- 5.4 Site Specific Safety Objectives
- 5.5 Phasing of Works
- 5.6 Permits / Authorisation Required
- 5.7 Maintenance
- 5.8 Continuing Liaison
- 5.9 Specific Recommendations

6 Information Required for Safety File:
- 6.1 Information Required for Safety File from PSCS

5.2.6 The Management of Health and Safety during the Construction Phase

The selection criteria for the Contractor for the works will be based on the ability to construct the works in a manner that will not endanger the safety, health and welfare of any parties and competence to fulfil the role of PSCS.

The contract will be awarded on the basis of assessment of the candidates against relevant health and safety criteria including experience of similar projects, knowledge of the construction processes involved and training of their management and staff who will be involved in carrying out the works.

5.2.7 The Construction Stage Safety and Health Plan

In accordance with the requirements of the Safety, Health & Welfare at Work (Construction) Regulations 2013 (as amended) the preliminary Safety & Health Plan prepared by the PSDP will be further developed by the PSCS before the commencement of the construction work and updated on a regular basis during the construction phase of the project.

The document will include the following sections and subsections to ensure the management of health and safety during the construction phase of the project:

1. Description of Project:
    - project description and programme details
    - details of client, PSDP and PSCS, designers
    - main contractor and other consultants
    - extent and location of existing records and plans
    - arrangements for communicating with Contractors, PSDP and others as appropriate

2. Communication and Management of the Work:
    - management structure and responsibilities
    - safety and health goals for the project and arrangements for monitoring and review of safety and health performance
    - arrangements for:
        - regular liaison between parties on site
        - consultation with the workforce
        - the exchange of design information between the Client, Designers, Project Supervisor for the Design Process, Project Supervisor Construction Stage and Contractors on site
        - handling design changes during the project
        - the selection and control of contractors
        - the exchange of safety and health information between contractors
        - security, site induction, and on-site training
        - welfare facilities and first aid
        - the production and approval of risk assessments and method statements
        - the reporting and investigation of accidents and other incidents (including near misses)
    - site rules
    - fire and emergency procedures

3. Arrangements for Controlling Significant Site Risks:
    - safety risks
        - services, including temporary electrical installations
        - preventing falls
        - work with or near fragile materials
        - control of lifting operations
        - dealing with services (water, electricity and gas)
        - the maintenance of plant and equipment
        - poor ground conditions
        - traffic routes and segregation of vehicles and pedestrians
        - storage of hazardous materials
        - dealing with existing unstable structures
        - accommodating adjacent land use
        - other significant safety risks

- Health risks:
    - removal of asbestos
    - dealing with contaminated land
    - manual handling
    - use of hazardous substances
    - reducing noise and vibration
    - other significant health risks

The construction stage safety and health plan will be maintained on site by the PSCS and will be communicated to all relevant parties on an ongoing basis through inductions, site safety meetings and tool box talks etc. as required.

6. EMERGENCY RESPONSE PLAN

6.1 Introduction

This chapter of the CEMP presents an Emergency Response Plan for the proposed project. The Emergency Response Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works and following detailed design development.

This Emergency Response Plan contains predetermined guidelines and procedures to ensure the safety, health and welfare of everybody involved in the project and to protect the environment during the construction phase of Ballinagree Wind Farm. This outlines the immediate response to an emergency situation and will be developed by the main construction works contractor and PSCS as part of their construction stage Safety and Health Plan.

An emergency is any disruptive or harmful event that endangers people, environment, property or assets. Emergencies can be small, as in a fire contained by employees using firefighting equipment or large, as in damage resulting from a storm.

In the context of the Ballinagree Wind Farm, examples of Emergency Response Plan emergency events are:

- medical emergency
- explosion
- overheated equipment
- chemical and fuel spill
- fire
- loss of power
- vehicle incidents
- land slippage

Example sources of emergency or disaster events are:

- unstable/inappropriate stockpiles on site
- faulty or incorrect use of equipment
- falls from height
- storm/adverse weather
- power failure
- fuel spill
- road failure
- serious vehicle collisions or overturning

6.2 Emergency Response Plan

An emergency response plan deals with the immediate physical effects of a disaster and outlines the initial response.

6.2.1 Emergency Response Liaison

The contractor/PSCS will designate an individual to serve as the Emergency Response Liaison for this project. The emergency response liaison will coordinate the emergency response for the duration of any emergency at or nearby the project site.

The local County Council, An Garda Síochána and the HSE Ambulance Co-ordinator will be provided with the construction programme and the onsite contact information from the Emergency Response Liaison prior to construction.

The Emergency Response Liaison will be immediately reachable at all times during project construction. The Liaison will coordinate with the above agencies to establish emergency procedures for access to and within the site in the event of an emergency.

6.2.2 Reporting Emergencies

In the event of fire, storm, flood, serious injury or other emergency, contact:

ALL ON SITE EMERGENCIES DIAL 999

6.2.3 Designated Responder

A map depicting turbine tower locations with the emergency meeting point will be furnished to the local County Council Fire Department and HSE ambulance co-ordinators.

Upon arrival on the scene, the senior EMS Officer will set up the incident command structure. The Emergency Response Liaison and all contractor's personnel will cooperate with directions of the incident commander and assist as directed.

The nearest emergency services, ambulance and Accident & Emergency (A&E) facilities are:

Service:	Contact Details:	
Accident & Emergency (A&E)	Cork University Hospital	(021) 4922000
Ambulance Service	Dial 112 or 999	
Fire Services	Dial 112 or 999	

Service:	Contact Details:	
Garda Station	Millstreet Garda Station	029 70002
District HQ:	Macroom Garda Station	026 20597
Divisional HQ:	Anglesea Street Garda Station	021 4522000

Each member of the contractor's site team who are First-Aid and Cardiopulmonary Resuscitation (CPR) trained personnel will be identifiable with a hard hat sticker indicating their training.

6.2.4 Emergency Alarm

The emergency alarm will be raised on site as soon as an emergency situation is detected, the alarm will be identified (contractor to check those that apply):

	Air Horn		Radio		Voice		Hand Signals		Siren

6.2.5 Emergency Reporting

In the event of an emergency the nearest supervisor with radio equipment/mobile phone will be notified. The degree of emergency will be reported to the Emergency Response Liaison who will contact the Emergency Services and request the appropriate emergency service.

6.2.6 Medical Protocol

In the event of a major medical emergency, the emergency centre (999) will be notified and an ambulance and emergency medical team will respond to the scene. All major medical cases require professional (ambulance) transportation. In the event of a minor medical case, the affected employee can be transported via company vehicle in the escort of a foreman or site engineer (with first aid training).

6.2.7 Emergency Response

Upon notification, the Emergency Response Liaison will respond to the emergency scene and manage emergency operations:

1. Assess hazards and make the area safe – If you cannot enter the area without risking your safety, don't do it, call the Emergency Services immediately and wait for them. If you think you can safely enter the area, look around the emergency scene for anything that can be dangerous or hazardous to you, the casualty, or anyone else at the scene. Bystanders can help with making the area safe. First aid kits will be available on site. Operators that have been first aid/CPR/AED trained will be listed on site and easily identifiable by a hard hat sticker.

2. Take charge of the situation – if you are the first-aid provider on the scene act fast. If someone is already in charge, briefly introduce yourself and see if that person needs any help. If there is any chance the casualty could have a head or spinal injury, tell them not to move.

3. Get Consent – always identify yourself as a first-aid provider and offer to help. Always ask for consent before touching a conscious adult casualty. Remember to protect yourself first by wearing gloves and eye protection.

4. Assess Responsiveness – is the casualty conscious or unconscious? Note their response while you are asking them for their consent. If they respond, continue with the primary survey, and if they don't respond, be aware that an unconscious casualty is or has the potential of being a breathing emergency.

5. Call out for help – this will attract bystanders. Help is always useful in an emergency situation. Someone can be called over to phone for medical help. Others can bring blankets if needed, get water, etc. a bystander can help with any of the following:

- Make the area safe.
- Find all the casualties.
- Find the first aid kit, or any useful medical supplies.
- Control the crowd.
- Call for medical help.
- Help give first aid, under your direction.
- Gather and protect the casualty's belongings.
- Take notes, gather information, be a witness.
- Reassure the casualty's relatives.
- Lead the ambulance attendants to the scene of the emergency.
- Notify Emergency Services as soon as you can. Either send a bystander or call yourself.

In the event of a major medical emergency the Emergency Response Liaison, as the person-in-charge of the emergency scene, will dispatch someone to the site access point nearest the emergency scene to direct and lead arriving outside responders to the emergency scene. The designated meeting point will be agreed prior to the commencement of construction. Emergency personnel will be met at this meeting point communicated by management during the 999 call. The emergency personnel escort will use the hazard lights on their vehicle, so they are easily identified.

6.2.8 Escape and Evacuation Procedure

Dependent upon the degree of the emergency and if safe to do so, employees will evacuate to the designated assembly area where the designated wardens shall account for all employees and determine if anyone still remains within the emergency scene.

Should a wild land fire or peat slippage occur, and the designated assembly area is compromised other locations will be designated as secondary assembly areas.

Wind turbines shall be fitted with fire suppression systems and will have emergency escape procedures in place for operational staff in the event of fire in a wind turbine.

6.2.9 Turbine Tower Rescue Procedure

In the event personnel are trapped or injured in an elevated turbine tower position the following protocol will be initiated:

1. The Emergency protocol will be initiated
2. Emergency Response Liaison will be notified
3. Tower Rescue Team will be activated and respond to the scene
4. Outside medical and Rescue Teams will be notified and respond to the scene.

Tower Rescue Procedure:

1. Upon learning of an emergency, the on-scene foreman shall assess the emergency and ascertain its degree, location and the extent of any injuries.
2. Upon confirming that an emergency exists the on-scene foreman notifies the Emergency Response Liaison and the project Office.
3. Upon notification of the emergency the Emergency Response Liaison shall notify senior project supervision and the local emergency centre (999) of the emergency.
4. The Emergency Response Liaison shall inform the dispatcher of the location, tower number, the degree of the emergency and the extent of injuries.

6.2.10 Prevention of Illness/Injury Due to Weather/Elements

1. All employees will have access to shelter and heat in the event of inclement weather.
2. Employees will have access to at least a litre of water at all times.
3. High wind warnings and weather forecast will be discussed every morning with the crews. Weather conditions and forecast will be monitored regularly by management.
4. No Employee will work alone. A buddy system will be used so employees can contact a supervisor in case of an emergency.

6.2.11 Environmental Emergency Procedure

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Emergency Silt Control and Spillage Response Procedures are included in Section 4.3.3 to 4.3.5 of this CEMP.

Suitable spill kits and absorbent material for dealing with oil spills will be maintained on site. In the event of pollution or potential risk of pollution the Local Authority should be informed immediately.

In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland should also be informed immediately.

6.2.12 Emergency Response Plan – Haul Routes

Emergency Response Procedure relating to transportation of plant, equipment and materials to site to be developed by the main contractor during the construction phase of the wind farm.

6.2.13 Emergency Events – Wind Turbines

Each wind turbine, incorporating the tower, blades, gearbox and ancillary equipment in the tower and nacelle is a machine under the European Machinery Directive [2006/42/EC]. The duties of designers and manufacturers of machinery are set out in the Machinery Directive, which has been transposed into national law by the 2008 European Communities (Machinery) Regulations [S.I.No.407/2008] (as amended). All wind turbines should be CE marked, which is in effect, a mark of assurance that the wind turbine complies with the essential health and safety requirements (EHSRs) of EU supply law. In all cases, the manufacturer or the manufacturer's authorised representative must compile information in a technical file confirming how the machine complies with these requirements. The commissioning of turbines and ancillaries must only be carried out by competent, trained and qualified personnel. The system of work for commissioning must be planned, organised, maintained and revised to ensure safety of personnel.

Potential emergency events associated with wind turbines include:

- Blade loss
- Fire
- Wind turbine toppling (due to foundation or tower failure);
- Wind turbine rotational failure in extreme wind conditions (due to control system or rotor break failure);

The primary mitigation against an emergency catastrophic event that may endanger the health and safety of the public is implemented at design stage through adequate siting of wind turbines which provide sufficient set back distances from occupied buildings and other infrastructure to avoid the risk of impact in the event of wind turbine collapse.

Peat slippage contingency measures have been included in Section 6.2.14 below in the unlikely event of landslide scenario.

6.2.14 Peat Slippage Contingency Measures

6.2.14.1 Excessive Movement

Where there is excessive movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

(1) All activities (if any) shall cease within the affected area.

(2) Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.

(3) Re-commencement of activities shall only start following a cessation of movement and a review by an experienced geotechnical engineer.

6.2.14.2 Onset of Peat Slide

In the unlikely event where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out.

(1) On alert of a peat slide incident, all activities (if any) in the area will cease and all available resources will be diverted to assist in the required mitigation procedures.

(2) Action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.

(3) All relevant authorities should be notified if a peat slide event occurs on site.

(4) For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by an experienced geotechnical engineer and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

6.2.14.3 Check Barrages

Whilst it is not anticipated from the analysis undertaken that a peat slide will occur on site, as a contingency a check barrage procedure is included below.

The check barrage procedure deals with preventing a peat slide from moving downstream within a watercourse.

As detailed above, it is preferable to first prevent a peat slide from reaching a watercourse by constructing check barrages on land. Failing this, the most effective method of preventing excessive peat slide debris from travelling downstream in a watercourse is the use of a check barrage. A check barrage comprises the placement of rock fill across a watercourse. The check barrage is a highly permeable construction that will allow the passage of water but will prevent peat debris from passing through. Rock fill should comprise well-graded coarse rock pieces from about 300mm up to typically 1000mm.

The size of the barrage will vary depending on the scale of the peat debris to be contained and the geometry of the watercourse at the barrage location. In general, due to the low speed of a peat slide there is generally little impact force and most of the lateral load is due to fluid pressure on the upslope face of the barrage.

Typically, the check barrage should fill the entire channel width of the watercourse up to a height of 3 to 4m with a crest width of typically 2m and side slopes of about 45 degrees depending on the geometry of the barrage location.

The check barrage procedure is as follows:

(1) Access to the check barrage location shall be along the existing access roads on the wind farm site and/or along public roads, where possible. When it is necessary to form the barrage then rock fill will be placed across the watercourse to effectively block the passage of peat debris.

(2) Operatives employed to carry out the construction of the check barrage would need to be inducted by means of a briefing by on-site supervisors as to the proposed location of the check barrage.

(3) The check barrage provides containment for peat debris in the highly unlikely event of a major peat slide. Further remedial measures, should they be required, will be assessed by the Contractor and the Project Geotechnical Engineer and carried out as soon as physically possible when the location and extent of the failure is established.

(4) Where a barrage was constructed as a precaution and no peat debris reached the watercourse then the barrage should be removed as soon as any measures to prevent further peat sliding is agreed with all parties.

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Appendix 3.2

Schedule of Environmental Commitments and Mitigation Measures

Appendix 3.2 Schedule of Mitigation Measures

This document sets out all mitigation measures as detailed in the Environmental Impact Assessment Report (EIAR) for the proposed Ballinagree Wind Farm

1 AIR AND CLIMATE

1.1 Air Quality

Construction Phase

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate which compacts, preventing dust
- A water bowser will be available to spray work areas (wind turbine area and grid connection route) and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable.
- The access and egress of construction vehicles will be controlled and directed to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;
- Wheel washing facilities will be provided at the two main entrance/exit points of the proposed wind farm site.
- The developer in association with the contractor will be required to implement the dust control plan as part of the CEMP. In the event the Planning Authority decides to grant permission for the proposed wind farm, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority.
- Receptors which have the potential to receive dusting and soiling from local routes entering the site; and dwellings directly adjacent to the grid connection route construction that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling occur;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.

Operational Phase

As the operation of the proposed wind farm will have positive impacts on air quality, mitigation measures are considered unnecessary.

Decommissioning Phase

Mitigation measures for the removal of wind turbines and all other site works from the proposed development site will be the same as the construction phase with respect to dust control and minimisation. The proposed access tracks across the proposed wind farm site will be left in situ and utilised as forest roads following decommissioning and no mitigation measures are proposed. In terms of the underground grid cable, this will be left in situ and so no mitigation measures are proposed.

1.2 Climate

It is considered that the proposed wind farm project will have an overall positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting the new binding renewable energy target for the EU of 32% by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2021. In terms of renewable energy, an increase in electricity generated from renewable sources is to increase to up to 80% by 2030, with up to 8GW of increased onshore wind capacity. This will be achieved by:

- Phasing out fossil fuels
- Harnessing renewable energy
- Micro-generation; and
- Other measures.

As no significant impacts on climate are predicted during construction, operation and decommissioning no mitigation measures are necessary or proposed. In terms of the operational phase, the operation of the proposed wind farm project will have a positive effect on climate due to the displacement of fossil fuels.

2 NOISE AND VIBRATION

Construction

The predicted noise levels from on-site activity from the proposed project is below the noise limits in BS 5228-1:2009+A1:2014. Nonetheless, several mitigation measures will be employed to minimise any potential impacts from the proposed project.

The noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise. For example, during turbine foundation concrete pours and turbine erection, an extension to the working day may be required, i.e., 05:00 to 21:00, but this would be necessary only on a relatively small number of occasions. For the proposed night time turbine deliveries, it will be ensured that vehicles on local roads do not wait outside residential properties with their engines idling, and that the local residents will be informed of any activities likely to occur outside of normal working hours.
Consultation with the local community is important in minimising the impacts and therefore construction will be undertaken in consultation with the local authority as well as the residents being informed of construction activities through the Community Liaison Officer.

The construction works on site will be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014. Proper maintenance of plant will be employed to minimise the noise produced by any site operations.

All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the project. Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 hours on Saturdays. However, to ensure that optimal use is made of fair-weather windows, or at critical periods within the programme, it could occasionally be necessary to work outside these hours. Any such out of hours working would be agreed in advance with the local planning authority.

The on-site construction and decommissioning noise levels will be below the relevant noise limit of 65 dB $L_{Aeq,1hr}$ for operations exceeding one month, and therefore construction noise impacts are not considered to be significant. There is potential for temporary elevated noise levels due to the grid connection works. However, the impact of these works at any particular receptor will be for a short duration (i.e. less than 3 days at worst case). Works will be limited to daytime hours and there will be consultation with the relevant home owners well in advance of commencement of construction in the relevant area. Where the works at elevated noise levels are required for longer than 3 days at a given location, a temporary barrier or screen will be used to reduce noise levels below the noise limit where required. The noise impact will also be minimised by limiting the number of plant items operating simultaneously where reasonably practicable. During the proposed night time deliveries, there will be a brief significant effect while the convoy is passing the properties.

Operation

The predicted noise from the proposed project range of turbines is below the daytime and night-time noise limits. However, there are some exceedances when the predicted cumulative noise from the proposed project and adjacent wind farms are assessed. Exceedances are observed at receptor R777 during daytime periods at standardised 10m height wind speeds of 7 and 8 m/s. The predicted noise exceeds the criteria marginally by 0.9dB which is considered slight and can be mitigated against through modes of turbine operation as described below. The noise modelling assumed that this receptor is downwind of all wind turbines. In practice, this will not be physically possible and the actual noise level at the receptor will be lower. Nonetheless, mitigation measures are outlined.

The noise modelling undertaken assesses a worst-case scenario with all noise sensitive locations downwind of all wind turbines. In practice, it is expected that the actual noise levels from the proposed project will be less than those predicted and hence, the extent of the mitigation will also be reduced. Ultimately, the derived noise limits will guide the turbine selection and operation, and noise limits will be complied with.

Should the project be granted permission, an operational noise survey will be undertaken to ensure the project complies with the noise limits. If an exceedance in the noise limit occurs, mitigation measures will be refined to ensure compliance with the noise limits is achieved at all noise sensitive locations. The requirements of the operational noise survey will be in accordance with any relevant planning conditions but will as a minimum involve noise monitoring at a number of representative noise sensitive locations over a period after the windfarm becomes operational.

Mitigation Measures during Decommissioning

The noise impact for construction works traffic will be mitigated by generally restricting movements along access routes to the standard working hours and exclude working on Sundays, unless specifically agreed otherwise with the local authority.

The decommissioning works, which will be of a lower impact than construction works, will be carried out in accordance with the policies and guidance required at the time of the works, and restricted to normal working hours, typically 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 on Saturdays.

3 BIODIVERSITY

3.1 Part A: Terrestrial Biodiversity

From the outset an iterative process of constraints led design was employed for the proposed windfarm whereby independent ecological expertise was utilised at an early design stage in identifying the constraints and designing the site layout to take account of these constraints. The siting of the turbines and associated infrastructure was informed by the environmental constraints.

Construction Phase Mitigation Measures – Habitats and Botanical Species

All turbines were sited based on avoidance of high sensitivity habitats. A minimum 75m buffer was applied from natural waterbodies (except at stream crossing points). While the TDR does traverse the River Blackwater SAC, instream works are not required. Any potential impacts will be minimised by implementing the following mitigation measures, such that residual construction related effects will be negligible in magnitude overall for the proposed windfarm development.

The below best practice and mitigation measures will be undertaken during the project construction phase:

- No removal/clearance of habitats or movement of construction machinery will occur outside of the development works area/footprint during the construction phase, where the works area/footprint will be clearly marked for associated site staff.
- In the absence of any mitigation to protect existing trees during the construction phase, there is potential for retained scattered trees and treelines in the lands to be damaged by construction activity. This would arise from damage to roots of trees if they remain unprotected and are within the proposed construction corridors. Additionally, there is potential for machinery strike to damage tree limbs.

  In a worst-case scenario, the damage inflicted on the scattered trees and treeline habitats would result in their degradation and removal from the lands. Measures to protect trees include the installation of tree protection barriers around the root protection zones of retained trees in the development site.
- Where essential works are required within the root protection zones, ground protection (such as a cellweb membrane) will be installed following consultation with a qualified and experience arborist and/or engineer, to minimise risks of damage to roots.
- Existing hedgerows and trees being retained at/near the site will be protected and retained in line with current guidelines and the advice of a suitably qualified arborist (e.g., NRA 2006)
- The construction of the proposed development will be implemented in accordance with the planning phase Construction Environmental Management Plan (CEMP) for the proposed development to ensure environmental protection of the site in accordance with best practice controls (e.g., CIRIA 2015 & 2001). This will be effective in addressing potential indirect impacts on habitats and species such as those associated with dust emissions.

Invasive Plant Species

Prior to the development works and landscaping/reinstatement activity begins, a survey by an appropriately experienced ecologist will be carried out to confirm the full extents of the invasive plant species within the proposed development site boundary. The Contractor's will implement an Invasive Species Management Plan (ISMP) for the works.

The Plan will be clearly communicated to all site staff and will be adhered to. Any further invasive species identified during the preconstruction survey will also be managed in accordance with best practice. The control of some species may require the use of herbicides, which can pose a risk to human health, to non-target plants or to wildlife. In order to ensure the safety of herbicide applicators and of other public users of the site, a qualified and experienced Contractor will be employed to carry out all work. The contractor will refer to and implement the following, which provides detailed recommendations for the control of invasive species and noxious weeds: Chapter 7 and Appendix 3 of the TII Publication The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2008).

Maintaining site hygiene at all times in an area where invasive non-native species are present is essential to prevent further spread. The following site hygiene measures will be implemented onsite during the construction and/or for maintenance works during the operational stage where applicable:

- Fence off the infested areas prior to and during construction works where possible in order to avoid spreading seeds or plant fragments around or off the construction site.
- Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk.
- Avoid if possible using machinery with tracks in infested areas.
- Clearly identify and mark out areas where contaminated soil is to be stockpiled on site and cannot be within 75m of any watercourse or within a flood zone.
- If soil is imported to the site for landscaping, infilling or embankments, the contractor will gain documentation from suppliers stating that it is free from invasive species.
- Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan.
- Erection of adequate site hygiene signage in relation to the management of non-native invasive material as appropriate.

Construction Phase Mitigation Measures – Avifauna

- Construction operations will largely take place during the hours of daylight to minimise disturbances to roosting birds or any active crepuscular/nocturnal bird species.
- A Toolbox Talk will be prepared and incorporated as part of the construction phase site induction. A wildlife register will be maintained by the environmental site staff during the construction phase. Site staff will be encouraged to report any bird sightings of note made during the construction phase and this information will be logged by the environmental site staff. The site manager will continue to maintain a wildlife register throughout the operational phase.
- The construction compound, substation and wind farm will not be lit at night (with the exception of aviation warning lights and low-level switchable safety lighting). All lighting systems will be designed to minimise nuisance through light spillage.

Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.

- All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled at prescribed locations and all waste materials will be disposed of to licensed facilities.
- Tree felling will be undertaken in accordance with the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000), to ensure a tree clearance method that reduces the potential for sediment and nutrient runoff.
- Tree-felling and removal of mature vegetation will be undertaken outside of the bird breeding season (March 1st – August 31st). Hedgerows and mature trees will be retained insofar as possible along the TDR and grid access route. To avoid impacts on nesting birds and potentially small mammals the vegetation and ditch/wall removal on the TDR will be undertaken outside of bird nesting season (March 1st to August 31st) the works are being first checked by a suitably qualified ecologist to ensure that no protected species are present.
- An appropriately qualified and experienced Ecological/Environmental Clerk of Works (ECoW) will be appointed to monitor the day-to-day construction activity and implementation of the environmental and ecological mitigation measures.
- Standard Vantage Point Monitoring in accordance with the Survey Methods for Use in Assessing the Impacts of Onshore Wind farms on Bird Communities (Scottish Natural Heritage. 2014) will be carried out during the construction year by a competent experienced ornithologist. A VP survey will be carried out between mid-March and mid-August. If construction activity extends into the winter period (October-March) a winter VP survey will be carried out to monitor the occurrence of waders, wildfowl and raptors in the vicinity of the Land Boundary Site. The survey shall cover the development footprint and all areas within 500m of the works.
- A total of 30 bird nest boxes (woodcrete and/or recycled plastic) will be erected within the application site during the year of construction with the selection of boxes and suitable deployment locations decided by a suitably qualified ecologist.

Construction Phase Mitigation Measures – Mammals

A buffer area around turbines located in commercial forestry has been applied as recommended where trees will be felled to reduce the likelihood that bats will be present in the immediate vicinity of the operational turbines. Given the extent of vegetation clearance and construction work involved there is likely to be some slight and localised residual disturbance of mammals during the construction phase. Any such impacts are likely to be limited in scale, temporally and spatially.

- A pre-construction mammal survey will be carried out immediately before the commencement of vegetation clearance. This will include an active and passive bat survey. Where any existing stone walls or structures are scheduled for removal (on-site, along the GCR or TDR) these will be first checked for evidence of the presence of roosting bats. There are no known mammal resting/roosting or breeding sites which will be directly impacted by the proposed development.
- An ecologist will supervise/check areas where tree-felling and vegetation removal will occur prior to and during construction. This will ensure that any site-specific issues in relation to wildlife will be highlighted and appropriate mitigation measures (e.g., NRA guidelines) are applied.

- Construction operations will largely take place during the hours of daylight to minimise disturbances to nocturnal mammal species. Mitigation measures outlined in Chapter 8B Aquatic Ecology, Chapter 9 (Soil, Geology and Hydrogeology) and Chapter 10 (Hydrology and Water Quality) of this EIAR will be implemented to minimise and prevent the potential indirect impacts described in this Chapter on aquatic and Annex I habitats and associated bird species at the site and in the surrounding area.
- All lighting systems will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.
- All edible and putrescible wastes will be stored and disposed of in an appropriate manner.
- Any sightings of mammals on-site will be logged on the wildlife register. This includes any fatalities recorded during construction phase.
- Bat activity will be monitored at the site in the year(s) of construction with two active detector night-time surveys between May and October. A passive detector will be deployed at several locations close to the construction footprint for the duration of the construction period to monitor the pattern of bat activity in the area throughout the tree felling and construction period. The locations chosen for the deployment of the passive detector(s) will include a number of locations at or adjacent to turbine locations and a number of other locations remote from turbines. These locations will be used for pre-, during- and post-construction bat activity monitoring.
- A total of 30 bat boxes (woodcrete and/or recycled plastic) will be erected at suitable locations in the area, with the type of boxes and the deployment locations selected by a suitably qualifed ecologist.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species, and be advised of appropriate behaviour around such habitats and species.

Construction Phase Mitigation Measures - Other Protected Taxa

- Areas where peat is to be stored temporarily, or permanently, will be checked in advance for the presence of Frogs (and spawn). If protected species are present, the environmental staff will translocate these, if possible (under licence if applicable). The same measure will be applied for any drains or areas of standing water forded by construction machinery. These areas will be checked on an ongoing basis by the ECoW and any areas with breeding frogs, spawn or tadpoles will be mapped and if possible fenced off temporarily to allow Frogs to metamorphose. If such areas cannot be avoided by site traffic the environmental staff will translocate the frogs (adults/young) under licence if applicable.
- An updated survey for adult Marsh Fritillary, *Euphydras aurinia*, will be carried out in the year of construction (May/June) ideally before construction commences. Locations with Devils Bit Scabious within the site and along the turbine delivery and grid access route will be checked in September/October for the presence of larval webs. Marsh Fritillary butterfly is the only Irish insect listed under Annex II of the EU Habitats Directive. In the event that larval webs are recorded within the proposed works area, mitigation measures will follow best practice guidelines as outlined in the '*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*' (NRA, 2008).

- If other taxa such as other species of Lepidoptera, Common Viviparous Lizard etc. are recorded within or adjacent to the site, or the turbine delivery and grid access routes, these sightings will be logged on the wildlife register.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species, and be advised of appropriate behaviour around such habitats and species.

Operational Phase Mitigation Measures – Designated Sites

There will be no particular risks to the Boggeragh Mountains NHA related to the operational phase and no dedicated operational phase mitigation is required in relation to this or any other nationally designated site in the wider hinterland.

Operational Phase Mitigation Measures – Habitats and Botanical Species

There will be no additional removal of habitat during the operational phase of the proposed development. As a result, there is no potential for direct negative impacts on habitat and flora arising from the operational phase of the development.

All operational-phase monitoring and mitigation commitments provided herein and elsewhere in the EIAR and NIS in relation to the proposed wind farm development will be fully implemented to ensure environmental protection of the site and receiving environment throughout the operation phase and onto decommissioning and reinstatement.

Where maintenance of site infrastructure or the existing drainage network (e.g. drain clearance)over the operational lifetime is required, measures will be implemented to prevent pollution (e.g. fuels, turbine fluids, and silty water) through the appropriate and temporary use of silt fences, cut-off drains, silt traps, check dams and drainage to vegetated areas where appropriate; any indication of failing water treatment measures entering any water-feature at/near site will be reported immediately to the Operational Site Manager and other external agencies as necessary in the event of a pollution incident e.g. Inland Fisheries Ireland. Any environmental incidents which result in pollution of the local water courses will be followed up with appropriate remedial measures in consultation with Inland Fisheries Ireland and other relevant agencies where needed e.g., NPWS, the local authorities.

Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

Operational Phase Mitigation Measures – Avifauna

- Bird activity will be monitored in the year(s) of construction and for three years post construction by a suitably qualified ecologist. Upland breeding bird surveys will be carried out and winter VP surveys will be undertaken with reference to standard methodology (e.g., SNH, 2017, Gilbert *et al*. 2011). Annual reports will be prepared and submitted for the attention of NPWS and the planning authority.

- The installation of warning lights on turbines can help to increase their visibility, and thereby reduce the risk of bird collision. A number of the turbines will be fitted with aviation warning lights in accordance with the requirements of the Irish Aviation Authority in advance of project construction.
- A fatality monitoring programme will be instigated for the first three years of operation of the wind farm. At least a portion of the fatality searches will be carried out using specially trained cadaver dogs and their handlers. This will involve monthly searches around each turbine base during the winter period (October-March) and three further breeding season (April-August) carcass searches. All feather spots and bird (and bat) carcasses will be photographed and logged and an annual fatality search report will be prepared and submitted for the attention of NPWS and the planning authority. Any fatalities noted by site staff or maintenance crews will be logged on the wildlife register and this register will be made available to the ecologist carrying out the monitoring program.
- Bird boxes will be checked and maintained annually for the first three years of operation, and every other year for the lifetime of the wind farm and by a suitably qualified ecologist.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

Operational Phase Mitigation Measures – Mammals

- All lighting systems at the site, including at the entrance and around the substation will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness.
- All edible and putrescible wastes will be stored and disposed of in an appropriate manner.
- Any sightings of mammals on-site will be logged on the wildlife register – these logs will be maintained and available for inspection at the site office/substation. Any records of mammal fatalities within the wind farm site will be logged and photographed.
- As a precautionary mitigation measure, in addition to the creation of buffers between the proposed turbines and surrounding vegetation (discussed above) reduced rotation speed will be implemented when turbines are idling. Automatic 'feathering' of idling blades will be implemented (through SCADA) to reduce rotation speed of blades to below 2 RPM while idling. Feathering blades has been shown to be effective in reducing fatality rates of bats by up to 50% and does not result in a significant loss of energy output (SNH, 2019). No additional control measures to avoid/reduce collision related bat fatalities are considered warranted in this instance.
- Bat boxes will be inspected by a suitably qualified ecologist for the first three years of operations of the wind farm and inspected every other year for the lifetime of the windfarm. Any boxes requiring maintenance or replacement will be identified and removed/replaced under the supervision of an ecologist.
- Monitoring of the site is recommended based on the proposed Bat Conservation Ireland Wind Farm Guidelines (November 2012), as several bat species were recorded within and adjacent the proposed development site.

Under these Guidelines and EUROBATS (Rodrigues *et al*., 2008) guidelines, it is recommended that monitoring of bats be implemented for at least 3 years once the wind farm is operational. Surveys will be conducted from March/April to October/November inclusive, during temperate weather conditions (i.e., air temperatures not lower than 10°C, calm, dry and overcast conditions). This monitoring will include detector surveys of bat activity near all turbines and the continuing status of any nearby potential roosts. Passive detector(s) will be deployed at several locations, a number of these close to turbines and others remote from turbine locations, within the wind farm site and BEMP lands during the summer/autumn months. These deployment locations will be the same used in the pre- and during-construction bat monitoring. An annual report of operational phase bat activity will be prepared and submitted for the attention of NPWS and the Planning Authority.

- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

Operational Phase Mitigation Measures - Other Protected Taxa

- Any sightings of rare or protected invertebrates, amphibians etc. made in the course of operational phase monitoring will be recorded and if appropriate this information will be submitted to the National Biodiversity Data Centre.
- Sightings of other taxa recorded within or adjacent to the site during the operational phase will be logged on the wildlife register.
- Visitor information signage will be erected near the amenity car park describing the diversity of species and habitats in this area. Visitors will be made aware of the sensitivity of the habitats and species and be advised of appropriate behaviour around such habitats and species.

Mitigation Measures during Decommissioning

The potential for impacts during decommissioning are similar in nature, if not in scope, to those assessed for the Construction Phase. All decommissioning works will be governed by the same requirements to control run-off or potential pollution to watercourses as have been implemented during the construction phase. The site compound will need to conform to the construction phase mitigation measures including those related to lighting design and proper treatment of edible and putrescible wastes. All plant removed during decommissioning of the site will be re-used at other wind farm sites whenever possible. All remaining materials which cannot be re-used will be recycled. This is likely to include scrap metal, plastic and other waste materials. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor in the most environmentally appropriate manner available at the time of the decommissioning by an appropriately licenced contractor.

Following reinstatement, the site will be monitored on a regular basis to determine the progress of revegetation and if necessary to look at introducing supplementary planting with native species. A reassessment of the site will be carried out at the end of year 1 to assess the sites progression over the previous year and to take photographic evidence of the site vegetation status, drainage management and general site appearance at the end of year 1.

3.2 Part B: - Aquatic Ecology

Construction Phase

Construction phase mitigation measures for aquatic ecology predominantly involve the preservation of water quality.

Mitigation measures for tree felling

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zone (DAFM, 2015). In light of the site topography (gradient) and vicinity of proposed felling areas, this would be particularly important adjacent to the Glen River (felling area for turbine T20 approx. 30m west from watercourse), as well as adjacent to the River Laney and Nadanuller Beg Stream. Given the close proximity of felling areas to receiving watercourses and potential source-receptor pathways (i.e., drainage channels), a machinery exclusion zone of 10m will apply. Check dams/silt fences will be required within the on-site drainage channels which provide potential surface water pathways to receiving watercourses. Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall.

To ensure tree clearance methodology that reduces the potential for sediment and nutrient run-off, the construction methodology will follow the specifications set out in the following guidance documents:

- DAFM (2019). Standards for Felling and Reforestation;
- DAFM (2015). Forestry Standards manual

Given the sensitivity of aquatic ecological receptors in the River Laney, Nadanuller Beg Stream and Glen River and downstream-connecting Blackwater River SAC (002170) (e.g., salmonids, otter, freshwater pearl mussel, Annex I floating river vegetation), machine operations must not take place in the 48hour period before predicated heavy rainfall, during heavy rainfall or in the 48hour period following heavy rainfall (DAFM, 2018). Removal of branch lop-and-top and other debris (brash) from felling areas within 20m of drainage channels will reduce nutrient seepage immediately post-felling and in the proceeding years after felling has occurred (DAFM, 2019).

Additional mitigation is proposed for felling within BEMP lands. This includes the following;

1. Fell and extract existing conifer crop with tracked machinery in Year 1.
2. Mulch any remaining brash using a low ground-pressure excavator in Year 1.
3. Block furrow drains in Year 1, inserting peat dams at intervals of 10 metres. Dams may be spaced further apart in flatter areas.
4. During year 3 check to see if any natural regeneration of conifers is occurring in the area and manually clear any regeneration of exotics if present.
5. During Year 6 check to see if any natural regeneration of conifers is occurring in the area and manually clear any regeneration of exotics if present.

Mitigation measures for on-site excavations

Whilst smaller-scale temporary dewatering may occur at some excavations (i.e. turbine bases, borrow pits) the risk of sediment escapement to surface waters (e.g. Glen River, Nadanuller Beg Stream, River Laney and associated tributaries) is reduced given the small-scale and localised nature of these dewatering events, in addition to considerable geographic separation (≥50m) and limited potential surface water pathways on site. Excavated spoil will be used to reinstate borrow pits and no stockpiling areas are required on site. Topsoil will be stored local to excavations and used for reinstatement and landscaping.

Mitigation measures for access track construction

It is proposed to construct approximately 13.7 km of completely new access track to facilitate site access and construction activities and to widen approximately 11.8 km of existing tracks by approximately 1m, with some additional widening at bends. All track widening will be undertaken using clean uncrushable stone with a minimum of fines, to reduce the risk of suspended solid releases to receiving watercourses.

The proposed new crossing over the River Laney (WF-HF4) to facilitate access track construction will be via a single span bridge. The single span bridge and 2.5m set back from the banks will avoid the requirement for instream works.

The 9 no. surface water drains within the site boundary to be crossed during the construction phase will be via precast box culverts. Forestry drains will be crossed using 450mm diameter pipes. Where cross drains are to be provided to convey the drainage across the track, the minimum sizes of these cross drains are 300mm diameter pipes. Silt Protection Controls (SPCs) are proposed at the location of the drain crossings. It is recommended that the SPCs will consist of a minimum of silt traps containing filter stone and filter material staked across the width of the swales and upstream of the outfall to any watercourse.

Mitigation measures during turbine and met mast construction

Whilst all 20 no. turbines are located up-gradient of receiving watercourses, the greatest threat to aquatic ecology from turbine base (hard stand) construction (based on site topography and the layout of surface water features) was identified at those turbines in closer proximity to watercourses, i.e., T1, T2, T5, T9, T11 & T20). The risk was particularly high at the turbine T20 hard stand area which is located in a coniferous plantation c.110m from the headwaters of the Glen River, a watercourse that supports salmonids, European eel, Annex I 'floating river vegetation' and shares downstream connectivity with the Blackwater River SAC (002170).

Give that the proposed met mast PMM1 and PPM2 is located >900m from the Ballynagree East Stream and >300m from an unnamed tributary of the Carrigagulla Stream, respectively, no impacts to aquatic ecology are anticipated, in the presence of mitigation.

Mitigation measures for site drainage

It is noted that there is typically poor hydrological connectivity and considerable geographic separation between the proposed construction areas and the riverine watercourses draining the site (e.g., frequent coniferous plantation buffers present etc.), so the risk of silt-laden surface water run-off to receiving watercourses is much reduced, even in the absence of mitigation.

Mitigation measures for grid connection installation (trenching and HDD)

The Rahalisk Stream (GCR-WCC15), Clonavrick Stream (GCR-WCC6), Caherbaroul Stream (GCR-WCC5), Coolaniddane River (GCR-WCC4) and Kilberrihert Stream (GCR-WCC3) will be crossed via trenching (5 no. locations). A further 5 no. grid connection crossings are over on-site drainage channels. The cable ducts will be placed in the verge or carriageway of the public road network, whilst along internal site tracks, the cable ducts will be installed above proposed pre-cast concrete box culverts. Excavation of the grid route trench will require excavation of soils/subsoils which has the potential to impact the water quality and aquatic habitat of receiving watercourses. Excavated spoil emanating from the cut trenches, where appropriate (i.e., when trenching within private tracks or the public road verge) will be used to back-fill the trenches. Any excess will be disposed of off-site, at an appropriate licenced facility. All excavated material emanating from trenches within the public road network will be disposed at an appropriate licenced facility.

The River Laney (GCR-WCC7), Awboy River (GCR-WCC8), Carrigthomas Stream (GCR-WCC9) and an unnamed Carrigthomas Stream tributary (GCR-WCCC19) will be crossed via horizontal directional drilling (HDD). These watercourses do not share hydrological connectivity with a European site. A pre-construction otter survey should be undertaken in the vicinity of the 4 no. drilling locations to ensure than no breeding or resting areas are located within 150m of the drilling locations. Should an otter breeding (holt) or resting area (couch) be detected, a derogation licence will be obtained from the NPWS to facilitate drilling works. At GCR-WCC7, GCR-WCC8, GCR-WCC9 and GCR-WCCC19, silt curtains and floating booms will also be used where deemed to be appropriate, in consultation with IFI.

An Ecological Clerk of Works (ECoW) will monitor both turbidity and observe the riverbed during the drilling process to detect any leakage (frac-out) of drilling fluid. Should this leakage be observed, works will cease immediately.

Given the absence of crossings over watercourses with downstream hydrological connectivity to the Blackwater River SAC (002170), there are no predicted potential impacts (significant or otherwise) to the site's aquatic qualifying interests.

Mitigation measures for turbine delivery route

With regards the TDR, works with potential to cause significant impacts to watercourse crossings are only proposed at a single location, namely crossing WF-HF8 located on an unnamed River Laney tributary in the northern portion of the wind farm site (aquatic survey site N3). To reduce the requirement for instream works, the existing bridge will be replaced with a 6m-single span bridge. Cable ducts associated with the wind farm internal collector circuit will be built into the bridge deck, which will be pre-fabricated off site. The installation of a new single span bridge will incorporate a fish-passable culvert, which will greatly improve fish passage opportunities on the watercourse.

Mitigation measures for BEMP

The mitigation applied to the BEMP lands will be specific to felling during provision of the wildlife corridors.

Operational Phase

Mitigation Measures within the Site

The overall estimated increase in the peak run-off the due to construction of all new hardstanding areas, on-site substation, new roads and the widening of the existing tracks is 0.483m^3/s (or 0.16%) for a 1-in-100 years storm event. In light of this slight increase, potential impacts to receiving watercourses are considered unlikely, even pre-mitigation. Nonetheless, mitigation measures (including interceptor drains and check dams installed with the swales) will be implemented to reduce this risk even further.

Due to the natural 'grassing-over' the drainage swales and revegetation of other exposed surfaces, and the non-intrusive nature of site operations, there will be a further reduction in the risk of sediment release to the watercourses during the operational stage.

Mitigation Measures for BEMP

During the operational phase of the BEMP lands, no specific mitigation will be required. The proposed measures will be in alignment with the existing land use practices, .e. grazing regimes, livestock fencing maintenance etc. However, the intensity and nature of the land management will be improved to benefit biodiversity. The measures will also include areas dedicated solely to biodiversity, such as the creation of wildlife corridors and the planting of broadleaf woodland. Specifically, the reduction in areas of coniferous afforestation, the fencing of watercourses (from livestock) and the improvement of herbicide and nutrient application regimes will further benefit water quality of adjoining watercourses.

Decommissioning Phase

In relation to aquatic ecology, similar mitigation measures will apply for the decommissioning phase as for the construction phase. In the event of decommissioning of the Ballinagree wind farm, the access tracks will be used in the decommissioning process. Mitigation measures applied during decommissioning activities will be similar to those applied during construction but will be of reduced magnitude.

It is proposed that turbine foundations and hardstand areas should be left in place and covered with local soil/topsoil to revegetate at the decommissioning stage. It is considered that leaving the turbine foundations, access tracks and hardstand areas in-situ will cause less environmental damage than removing them. The grid connection ducting and substation will be left in situ as part of the national grid, therefore no potential impacts during decommissioning stage are likely to occur. Hence no mitigation measures are required.

The temporary accommodation works along the TDR will not be required for the decommissioning phase as turbine components can be dismantled on site and removed using standard HGVs.
No decommissioning activities are envisaged for the Biodiversity Enhancement and Management Plan lands .

4 LAND, SOILS AND GEOLOGY

The following section outlines appropriate mitigation measures by design and best practice to avoid or reduce the potential impact of the proposed development.

Mitigation by Design and Best Practice

With regard to the proposed development, detailed design and best practice will be implemented. As part of the preliminary design, the following was carried out:

- **Extensive peat probing to identify areas of peat deposits across the site:**
  Peat probes were taken across the site area and it was established that peat is predominantly concentrated to the northern and north-eastern areas of the site. There are areas of peaty topsoil located in the southern part of the site however the maximum depth of this peaty topsoil is 0.3m. The peat probes carried out identified areas of deeper peat (2 to 3m) and areas of steeper slopes (16 to 18 degrees) so all infrastructure locations have been selected taking these factors into account.
- **Excavation of trial pits and advancement of boreholes to establish overburden and bedrock characteristics**:

  Trial pits were carried out at each infrastructure location across the site. The reason for the trial pits was to confirm the base of the peat depth already provided by the peat probing (predominantly in the north and north-eastern areas of the site), to identify the material underlying the peat or topsoil and to inform understanding of the depth of rock. Boreholes were carried out at all proposed borrow pit locations to establish depth to bedrock and bedrock properties. The results of this ground investigation determined the finalised three borrow pit locations.
- **Shear vane testing to establish characteristic peat strengths where peat deposits were identified:**

  Shear vane tests were carried out with the peat probes taken across the site. Shear vanes were taken at every infrastructure location and at intervals along the proposed access tracks. The shear strengths were assessed and indicate that the average peat strength at all infrastructure locations was 41kPa. Peat strength at sites of known peat failures (assuming undrained loading failure) are generally very low, for example the undrained shear strength at the Derrybrien failure (AGEC, 2004) as derived from back-analysis, was estimated at 2.5kPa. The recorded undrained strength at the proposed development site is significantly greater than the lower bound values for Derrybrien indicating that there is no close correlation to the peat conditions at the Derrybrien site and that there is significantly less likelihood of failure on the Ballinagree Wind Farm site.
- **Peat stability assessment and investigation of peat depths and strengths across the site:**

  A peat stability risk assessment was carried out for the main infrastructure elements at the wind farm. This approach takes into account guidelines for geotechnical/peat stability risk assessments as given in PLHRA (2017) and MacCulloch (2005). The risk assessment uses the results of the stability analysis (deterministic approach) in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability, to assess the risk for each infrastructure element. The findings of the peat stability assessment displayed that the proposed development site has an acceptable margin of safety at all proposed infrastructure locations and access tracks.

Each method listed above identified key constraints across the site such as peat depths, steep slopes, areas of weak peat and locations of deeper bedrock/ unsuitable borrow pit material. Infrastructure locations were amended based on all of these factors and all of the infrastructure for the site was located to minimise slope stability risk.

Construction Phase

The following sections outline appropriate mitigation measures to avoid or reduce the potential impact of the proposed development.

The primary mitigation measure employed has been the design of the wind farm in terms of locating the turbines, access roads, borrow pits, material storage areas and other site infrastructure within an area of commercial forestry where the soils are extensively worked and drained. In other sites, there have been issues with instability in peat areas adjacent to forestry. However, these areas have also had areas of steep slopes in the peat covered locations. Where the peat is located in forested areas within the Ballinagree site, the topography is relatively flat.

In order to reduce the impacts on geology, hydrogeology and slope stability, infrastructure has been primarily located within areas of thinner peat/soft ground. Extensive work has already been undertaken at the preliminary design stage to apply risk avoidance by design which included:

- The layout of the proposed infrastructure is based on an assessment of the existing conditions which included site investigations, peat probing, shear vane testing and layout reviews and the preliminary design has sought to minimise negative effects by avoidance.
- The excavation and construction related works will be subject to further design risk assessment at detailed design stage to confirm risk levels for the construction, operation and maintenance of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection.
- A detailed method statement for each element of the works will be prepared by the Contractor prior to any element of the work being carried out.
- Given that the works comprise a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.
- The Contract will require programming of the works such that earthworks are not scheduled during severe weather conditions such as red weather warnings or periods of heavy rainfall and wind.

Construction Environmental Management Plan

The CEMP describes how the contractor for the main construction works will implement a site Environmental Management System (EMS) to meet the specified contractual, regulatory and statutory requirements including the requirements identified as part of the environmental impact assessment process.

The CEMP will be updated prior to construction to take account of any amendments arising during the consenting process and relevant conditions attached to the planning permission and will be implemented for the duration of the construction phase of the project. The CEMP will be a live document and will be reviewed and updated as required.

Tree Felling

The felling works will lead to the exposure of underlying soils to surface water runoff, which could result in soil erosion. This also could lead to an increase in sediment and nutrient concentrations in the surface water run-off which may in turn impact groundwater in the Locally Important Aquifer beneath the proposed development site.

One of the primary mitigation measures to be employed at the construction phase of the development is the management of silt laden runoff. The potential impact from silt laden surface water runoff from increased erosion of exposed overburden deposits will be assessed at site-specific locations particularly at drainage locations watercourses and where tree felling works are proposed.

To minimise the impact to surface water quality, existing forestry drainage will be maintained outside the immediate site area, and where appropriate additional site drainage and settlement ponds will be installed as required prior to construction activities. Silt fencing will be installed in all drainage and monitoring of water quality undertaken during the tree felling works.
The use of plant and machinery during tree felling works will require the storage and use of fuels and oils.

Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of felling plant and equipment will be carried out from these tanks or from delivery vehicles at designated refuelling areas.

Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area in the immediate vicinity of operating machinery and in each item of plant to deal with any accidental spillage.

Earthworks

The development will be constructed in a phased manner to reduce the potential impacts of the development on the Land, Soils and Geology at the site. Phased construction reduces the amount of open, exposed excavations at any one time. Given that the works comprises a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.

One of the primary mitigation measures employed at the preliminary design stage is the minimisation of volumes of excavated overburden deposits to be exported off site. Reduction in off-site disposal reduces impact on local landfills, reduces emissions and impacts on the local area in terms of transportation.

Excavated overburden will be retained on-site and reused as far as possible.

This will include:

- Use of suitable site won material (Siltstone and Sandstone bedrock) as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations.
- Surplus overburden will be re-used on site in the form of landscaping and for reinstatement purposes at the proposed borrow pits.

Some temporary stockpiles (not exceeding 2m in height) of material will be necessary adjacent to the excavation areas prior to reinstatement, however no long-term stockpiles of material will remain after construction and no surplus/waste soil or rock will be removed from the proposed development site. Stockpiles will be covered over during extreme rainfall to prevent any surface water contamination and should be left in place for no longer than a week at a time.

To mitigate against the compaction of soil at the site, prior to the commencement of any earthworks, the work corridor will be pegged, and machinery will stay within this corridor so that peatland / soils outside the work area are not damaged. Excavations will then be carried out from access tracks, as they are constructed in order to reduce the compaction of soft ground.

To mitigate against erosion of the exposed soil or rock, all excavations will be constructed and backfilled as quickly as possible. However, timelines for this will depend on the level of excavation required and type of materials present at each location. Excavations will stop during or prior to heavy rainfall events.

Soil excavated from trenches along the proposed grid connection route will be reused where possible or will be taken to a licenced facility for disposal or recycling where required. If necessary, the upper layers of tarmac and asphalt will be excavated separately to the lower engineered fill layers. The lower engineered fill layers will be reused. The tarmac / asphalt layers will be taken to a licenced facility such as Ashgrove Recycling and Waste Management, Co. Cork for disposal or recycling.

Interceptor drains will be installed prior to any construction works commencing. These will be dug from the roads as the roads progress. Temporary settlement ponds and silt management measures will be installed to mitigate against sediment run-off as required.

Control of Sediment Laden Runoff

The potential impact from silt laden surface water runoff from increased erosion of exposed overburden deposits will be assessed particularly at drainage locations and where earthworks and tree felling are proposed.

Best practices will be employed in the prevention of silt laden run-off from entering watercourses as discussed below.

To minimise the impact to surface water quality, existing forestry drainage will be maintained outside the immediate site area, and where appropriate additional site drainage and settlement ponds will be installed as required prior to construction activities. Silt fencing will be installed in new and existing drainage and monitoring of water quality undertaken during the construction phase.

Final drainage will be constructed following the completion of these activities with silt fencing maintained until such time as a vegetation cover has become established.

Measures for Spills

Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of construction vehicles will be carried out from these tanks or from delivery vehicles at designated refuelling areas.

Specific mitigation measures relating to the management of hydrocarbons are as follows:

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area and in each item of plant to deal with any accidental spillage.

Slope Stability

With regard to slope stability issues, detailed design and construction phase best practice will be implemented as follows:

- The works will be designed and supervised by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer.
- Drainage infrastructure will be put in place in advance of turbine excavations. Drains will divert surface water and groundwater away from excavations into the proposed surface drainage network. Uncontrolled, direct and concentrated discharges of water onto the ground surface will be avoided.
- Loading or stockpiling on the surface of soft ground will not take place.
- Turbines located in areas adjacent to peat deposits will incorporate drainage measures such that surface water will be drained away from the peat and will not be allowed to collect adjacent to the peat mass.
- Excavation will be carried out from access roads or hardstanding areas to preclude tracking of construction plant across areas of soft ground/peat.
- A detailed reassessment of the stability of conditions at proposed infrastructure locations will be undertaken by a suitably qualified and experienced geotechnical engineer prior to the commencement of all excavations to ensure these activities do not result in or contribute to slope failure.
- Earthworks will not be commenced when heavy or sustained rainfall (orange or red weather warnings) is forecast. A series of rainfall gauges will be installed across the site to provide a record of rainfall intensity.

An inspection of site stability and drainage by the Geotechnical Engineer will be carried out on site when a daily rainfall of over 10mm/hr or 25mm/day is recorded on site, works will only recommence after heavy rain with the prior approval of the Geotechnical Engineer following their inspection.

- An emergency plan will be updated at pre-construction stage detailing the action plan which would be implemented in the unlikely event of a landslide/slope failure. Should a landslide/slope failure occur or if signs of instability/ground movement are observed, work will cease immediately.

Prior to the progression of the project to detailed design and to inform the detailed design of the proposed development, the developer will also ensure that:

- Additional and more extensive ground investigation works are undertaken, and these will be tailored to the engineering requirements of the project.
- The scheme will be developed to full detailed design prior to construction to minimise the risk of ground instability.
- Adequate time will be afforded to any designers or contractors involved in the execution of the additional ground investigation works; detailed design and construction works.

Groundwater

To mitigate against the increased vulnerability of the underlying aquifer to groundwater pollution, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events. To mitigate against possible contamination of the underlying groundwater, refuelling of machinery and plant will only occur at designated refuelling areas. Details of mitigation measures related to spills and fuel storage are outlined above.

The dewatering of the foundation excavations is not expected to cause interference with domestic wells in the area, due to large offset distances to known and presumed wells, relatively shallow depths of excavation and temporary short-term nature of dewatering, if required. To monitor groundwater during the construction phase groundwater monitoring wells will be installed between areas of deeper excavations and sensitive groundwater receptors. The wells will be used to monitoring groundwater levels and quality to assess any potential impacts during the construction works.

The GSI database is however not complete; it is probable that there are other wells in addition to those in the GSI databases, but are generally associated with houses, the offset to which from the turbines is a minimum of 750m. It is assumed in this assessment that there is a well present in every household within 1km of the site boundary. Given the limited depth of the excavations during the construction phase and the distance to sensitive groundwater receptors the potential risk posed to groundwater supply wells is considered to be Imperceptible following the implementation of mitigation measures discussed above.

If, however, in the exceedingly unlikely event of a previously unknown domestic well being impacted by the proposed development, an alternative supply will be provided – either a connection to mains water or a replacement well will be drilled.

The GSI holds records of groundwater wells in the vicinity of the proposed grid connection route. However, trenches are shallow (1.2m deep) and will only be open for a couple of days at most.

Depending on the ground conditions, presence of services, traffic management required, weather conditions, etc., the rate of installation of cable ducting would vary between 50m and 100m per day. Dewatering is therefore unlikely to be required and no impacts on wells is envisaged.

Grid connection and internal cable trenches could provide preferential pathways for groundwater and contaminant movement. Trenches will be excavated during dry periods in short sections (of approximately 50m – 100m) and left open for minimal periods, to avoid acting as a conduit for surface water flows. No excavations will be carried out in heavy rainfall. To further mitigate the risk of cable trenches becoming preferential pathways, clay plugs (or other low permeability material) will be installed at regular intervals along the trench to stop / inhibit water movement.

Mitigation Measures during Operation

It is not envisaged that the operation of the proposed development will result in significant impacts on the geological and hydrogeological regimes within the study area, as there will be no further disturbance of overburden post-construction.
The main potential residual impact during the operation phase would be the risk to groundwater from contamination from spills.

Mitigation Measures during Decommissioning

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.

The Irish Wind Energy Association (IWEA) (11) states that when decommissioning a wind farm "*the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbanc*e". It is proposed to leave the access tracks in-situ at the decommissioning stage. IWEA also state that "*it may be best*" to leave site tracks in-situ depending on the size and geography of the development.

It is considered that leaving the turbine foundations, access tracks and hardstanding areas in-situ will cause less environmental damage than removing and recycling them. It is proposed to retain the foundations and hardstanding areas of the construction and cover with overburden material from local sources or site won material, to allow for re-vegetation of the development site.

Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures outlined above.

5 HYDROLOGY AND WATER QUALITY

Mitigation Measures during Construction

Increase in Surface Runoff

Permanent roadside drainage will be installed as part of the construction stage. This will include the use of interceptor drains, swales, check dams and settlement ponds. These measures will buffer site runoff during periods of high rainfall by retaining the water until the hyetograph has receded. A hyetograph is a graphical representation of the distribution of rainfall intensity over time.

Suspended Solids

The key mitigation measure during the construction phase is locating the proposed turbines 75m from the watercourse. No construction activities or drainage will be within 50m of the watercourses, with an exception for watercourse crossings. The proposed buffer zones will:

- Avoid physical damage to watercourses, and associated release of sediment.
- Avoid excavations within close proximity to surface water courses.
- Minimise the potential for the entry of suspended sediment from earthworks into watercourses.
- Minimise the potential for the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

The following measures shall be implemented during the construction phase:

- Settlement ponds with a diffuse outflow detail will be put in place as construction progresses across the site. Erosion control and retention facilities, including settlement ponds will be regularly maintained during the construction phase by Environmental Clerk Of Works (ECOW). The three-stage treatment train (swale – settlement pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will reduce any risk of flooding downstream.
- The developer will ensure that erosion control, namely silt-traps, silt fencing, swales are visually checked on a weekly basis and following a heavy rainfall event during the construction phase. Heavy rainfall event is defined as:
    - >10 mm/hr (high intensity local rainfall events).
    - >25 mm in a 24 hour period (heavy frontal rainfall lasting most of the day).
    - >half monthly average rainfall in any 7 days.
- Settlement pond will be daily visually checked by ECOW.
- A water quality monitoring programme will be established to ensure that water quality is maintained throughout the construction phase. The details of this programme are outlined below. This programme will ensure that designed measures including settlement ponds are working, and existing water quality is maintained.
- Where haul roads pass close to watercourses, silt fencing will be used to protect the streams.

- Silt traps will also be provided at outfalls from roadside swales to settlement ponds.
- Interceptor cut-off drains will be provided on the upslope side of the access roads to prevent the mixing of overland flows with the drainage for the proposed development. These interceptor drains will cross access roads via cross drains and discharge diffusely over land to avoid concentration of runoff. The roadside drains will therefore only carry the site access road runoff and so avoid carrying large volumes of water and concentrating flows.
- Interceptor cut-off drains will be provided around borrow pits to divert overland flow to the nearest watercourse and prevent it from entering the borrow pits.
- Where new cross-drains are proposed on this site to convey surface water from roadside swales to settlement ponds, these will be sized at a minimum of 300 mm diameter to avoid blockages.
- Cross drains of 450 mm will be provided to prevent a risk of clogging for drainage crossings and conveying flow from agricultural drains and forestry drains under access track roads due to the potentially bigger debris potentially being drained from agricultural and forestry area.
- Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. The excavations for turbines will be pumped into the site drainage system (including settlement ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases.
- All open water bodies adjacent to proposed construction areas will be protected by fencing including the proposed settlement ponds.
- Excavated subsoil material not required for in-site reinstatement will be removed to the designated material storage areas at the borrow pit location.
- Silt fencing will be erected at the locations of the drain crossings for the duration of the construction period.
- Site access tracks have been laid out to reduce longitudinal slope of roadside drains where possible. Where roadside drains are laid at slopes greater than 2%, check damns will be provided. This will reduce effective slope and runoff velocities and any consequent potential for erosion.
- Silt fencing will be erected at the location of stream crossings along the grid connection.
- The temporary storage of excavated material on site will be put at least 50 m from watercourses and therefore outside the 50m buffer zone. Silt fencing will be erected at the locations of the piles for the duration of the construction period. This is to prevent the runoff flushing sediments into a watercourse.
- An ECOW will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the Site will include daily monitoring operation of settlement ponds, and of the drainage system and maintenance as required.
- Additional protection will be provided in the form of silt fencing downslope during construction of new watercourse crossings, to further ensure that there is no impact from the development to streams and rivers downslope of the site. All open water bodies adjacent to proposed construction areas will be protected by silt fencing.
- Daily visual inspections of drains and streams will be performed during the construction period of the new crossing structures to ensure suspended solids are not entering the streams and rivers alongside the work area, to identify any obstructions to channels, and to allow for appropriate maintenance of the existing roadside drainage regime.

- Weather warnings will be monitored, and no construction will take place during extreme events. Large excavations and movements of subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast. Works will be suspended if forecasting suggests either of the following is likely to occur:
    - >10 mm/hr (high intensity local rainfall events).
    - >25 mm in a 24 hour period (heavy frontal rainfall lasting most of the day).
    - >half monthly average rainfall in any 7 days.

Water Quality Monitoring Programme

A monitoring programme will be established to ensure that water quality is maintained. This programme will ensure that designed measures are working, and water quality is not affected.

An ECOW will be on-site during construction to monitor water quality. Turbidity meters will be installed prior to construction upstream and downstream of the site. Levels of turbidity will be monitored prior to construction to determine pre-construction levels in the waterbodies. A visual check of turbidity of watercourses will be carried out daily during construction. Should the turbidity levels measured during construction be higher than the existing levels or daily visual inspection show high level of turbidity, construction will be stopped, and remediation measures will be put in place immediately.

Regardless of their current quality, surface waters will be treated the same in terms of the level of protection and mitigation measures employed (there will be no negative change in status).

Strict mitigation measures in relation to maintaining a high quality of surface water runoff from the development will ensure that the water quality status of surface waterbodies in the vicinity of the site will be maintained regardless of their existing status. The proposed mitigation measures will ensure the water quality status is not deteriorated.

Release of Hydrocarbons

- Refueling of mobile plant during construction will only be carried out at designated refueling station locations on site. However, where mobile fuel bowsers are used the following measures will be taken:
    - Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use;
    - The pump or valve will be fitted with a lock and will be secured when not in use;
    - All bowsers will carry a spill kit and operatives must have spill response training; and
    - Portable generators or similar fuel containing equipment will be placed on suitable drip trays.
- Storage of fuels, lubricants and hydraulic fluids will occur at the contractor's compound, which will be fenced and have a lockable gate, thereby ensuring that the area in which fuels, lubricants and hydraulic fluids are stored will be properly secured against unauthorized access or vandalism.
- Any diesel, fuel or hydraulic oils stored on site will be stored in bunded storage tanks – the bund area will have a volume of at least 110 % of the volume of such materials stored.

- Emergency drip trays and spill kits will be kept available on site vehicles, to ensure that any spills from vehicles are contained and removed off site.
- Contractors' personnel will be trained in oil spill control and clean up procedures, and in the proper and safe disposal of any waste generated through such an event.
- Designated contractors' personnel will be certified in oil spill control and clean up procedures, and in the proper and safe disposal of any waste generated through such an event.

Contamination from Wastewater Disposal

- During the construction phase, portaloos and/or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licenced waste disposal contractor.

Release of Cement-Based Products

- Prior to leaving the site, every truck delivering concrete to the site wash the chute only to a lined pit provided at each turbine location and substation compound.
- There will be no on-site batching of concrete on the site and no storage of cement will be permitted within 50 m of the crossing construction areas.
- Where possible, pre-cast elements will be used to minimise the need for wet concrete works within the site. Wet concrete will be used for turbine foundations construction, construction of substation compound, supports for the proposed bridge crossing HF-WF4. Box culverts will be pre-cast.
- Weather forecasting will be used to plan dry days for pouring concrete. Met Éireann describes days with rainfall less than 1.0mm as 'Dry Days', and days with 1.0mm of rainfall or more as 'Wet Days'.
- It will be ensured that the concrete pour site is free of standing water prior to concreting and plastic covers will be available in case of a sudden rainfall event.

Proposed Mitigation Measures for Tree Felling

Tree felling will be permitted under limited felling license(s) from the Forest Service and will be subject to the conditions of such a license. A Limited Felling License will be in place prior to works commencing on site. To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in:

- Felling and Reforestation Policy, Forest Service, Department of Agriculture, Food and the Marine, Dublin. May 2017
- Standards for Felling and Reforestation, Forest Service, Department of Agriculture, Food and the Marine, Dublin. October 2019
- Forestry Standards Manual (Agricultural, Food and the Marine, 2015)
- Forestry Act 2014 and the Forestry Regulations 2017 (SI No 191 of 2017) and SI 31 of 2020 - Forestry (Amdmt) Regs 2020 re reg 19AA procedures (pdf 99Kb)

- Forest Service. 2000a. Forestry and Water Quality Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin.
- Forest Service. 2000b. Code of Best Forest Practice – Ireland. Irish National Forest Standard. Forest Service, Department of the Marine and Natural Resources, Dublin.
- Forest Service. 2000c. Forest Harvesting and the Environment Guidelines. Forest Service, Department of the Marine and Natural Resources, Dublin.

In particular the following mitigation measures are proposed:

- Before operations commence, identify a 10m wide exclusion zone along the edge of all aquatic zones. Please note this exclusion zone has nothing to do with a 50m buffer zone defined for the construction of the wind farm. Exclusion zone refers to machinery associated with tree felling. No machinery is allowed to enter this area. However, they can fell in the exclusion zone if a tree felling machinery has a long arm. Trees that can't be reached will be felled with a chainsaw.
- Ensure all operators are aware of exclusion zone.
- Machine traffic and timber stacking are not permitted within these zones
- Machine traffic and timber stacking are not permitted within these zones.
- Trees within the reach of the harvester arm will be felled by harvester, and shredded and bunched outside the exclusion zone.
- Trees outside machine reach will be felled manually by chainsaw operators. Felled trees to be winched out of the exclusion zone where appropriate and safe to do so, or removed by extended harvester arm, for subsequent snedding and processing outside the exclusion zone.
- In all cases, fell trees away from the water feature.
- Regarding aquatic zones, ensure banks remain undisturbed. No branches or debris are to enter the aquatic zone during operations. Immediately and with care, remove any branches that do fall in.
- Minimise the crossing of drains during felling and extraction, and restrict machine activity to brashed extraction racks and haulage routes.
- Where necessary, deploy a heavy-duty plastic culvert lengthways into the channel and cover with brash material. The culvert must be of a diameter approximating the depth of the drain, to avoid any unnecessary undulation along the extraction route.
- Where required, a solution for smaller drains is to temporarily lay log sections lengthways into the channel and overlay with brash. Again, select logs that approximate the depth of the channel to be crossed.
- When installing and removing the temporary crossing, ensure that no work is carried out within the aquatic zone, and that the stream bed and bankside remain undisturbed.
- Carefully remove temporary crossings as they become no longer needed. Any brash padding used must be peeled back carefully away from the water feature, to avoid dislodging collected sediment.
- Direct crossing over the stream bed is not permitted.
- Ensure the feature is crossed at a right angle to the flow of water.

- Where needed, any necessary crossing shall be via an appropriate structure that spans proud of the flow of water and prevents the breakdown and erosion of the banks.
- Typical solutions include the laying down of a bridge comprising logs overlaid with geotextile and brash to intercept soil falling off wheels.
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed.
- Timber will be stacked in dry areas, and outside a local 50m watercourse buffer. Straw bales and check dams to be emplaced on the down gradient side of timber storage sites.
- Brash mats will be used to support vehicles on soft ground (e.g., during trenching and drainage construction), reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place before they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall.
- Prior to the commencement of operations, install silt traps within existing forest drains that connect with aquatic zones, either directly or indirect through other relevant watercourses.
- Silt traps will be staggered along the length of the drain, and not only at the lower reaches towards its outflow.
- Silt trap design can vary, from depressions added to the drain bed, to log sections laid lengthways into the drain, to the use of geotextile barriers
- Apply silt fences where necessary, to block pathway for silt in areas where overland flow is possible.
- Once silt traps and silt fences become functional, check regularly and maintain as necessary, in order to ensure continued effectiveness throughout operations.
- Cease all felling and extraction and other machine operations onsite (or redirect to more stable areas of the site) during and after periods of rainfall which result in the possibility of the surface mobilisation of silt.
- At least weekly check silt traps and silt fences, and maintain as required, to ensure their continued effectiveness throughout works. All excess silts to be removed and disposed of appropriately.
- Undertake daily visual checks of relevant watercourses (primarily at their outflow from the site) and adjoining aquatic zones, to confirm (or otherwise) that no sediment or silt discharge is arising from site works.
- Keep a record of the above monitoring and retain for possible inspection.

Proposed Mitigation Measures During Grid Connection or HDD

The following mitigation measures are proposed:

Suspended Solids

- Grid connection cables will be installed in trenches within or adjacent to the wind farm access roads when leaving the on-site substation and laid within the public road carriageway corridor for the remainder of the route with the exception of where the cable terminates at Clashavoon substation where a short section of the route will be located within private lands owned by the network operator. Trenches will be excavated during dry days in short sections and left open during dry days, to avoid acting as a conduit for surface water flows.
- The temporary storage of excavated material on site will be put at least 50 m from watercourses.
- Weather warnings will be monitored, and no construction will take place during extreme events to mitigate against potential flooding.
- Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows.
- For sections of the gird connection route within the wind farm site the excavated material can be used for reinstatement of the cable trenches. However, for sections within road carriageway all backfilled material will be imported from a licenced quarry and all excavated material will be removed to the licensed waste facility. There will be no permanent stockpiling of excavated material. For trenching within the domain of public roads, approved fill material will be imported as required to avoid stockpiling.
- All excavated soil material will be managed on site.
- Silt fencing will be provided around any exposed areas to prevent the ingress of suspended solids into adjacent watercourses. These mitigation measures will prevent surface water contamination and will prevent subsequent flows of contaminated water into watercourses.

Hydrocarbons

Proposed Mitigation Measures For Turbine Delivery

Modifications along the TDR involves the temporary removal of street furniture, trimming and removal of vegetation and the temporary local widening of public roads and junctions which will involve the stripping of topsoil and laying and compacting of graded aggregates. These works are confined to relatively small, localised areas and it is not anticipated that this will have any significant hydrological impact.

The proposed mitigation measures to control the surface runoff from the construction area are set out below.

The following measures are proposed:

- The earthwork activities will be completed in dry conditions only.
- Exposed slopes formed by the earthworks will be covered with a biodegradable erosion control blanket immediately following excavation. This will provide cover for bare soil and support for vegetation.
- The hard standing providing load bearing surface for the delivery vehicles shall be covered with compacted aggregate immediately following formation.

- Following formation of the hard standing, the road shall be swept clear of soils which may have been dragged across the carriageway during the formation of the hardstanding.
- The hardstanding area will be fenced off when not in use for turbine component deliveries.
- Excavated soil will be removed immediately to a licensed waste facility or to a suitable material storage area within the wind farm site in accordance with the soil management plan for the project.

Proposed Mitigation Measures during Operation and Maintenance

The main hydrological impact of the project is an increase in runoff. This is mitigated by the drainage system installed during construction which will remain in place, besides the settlement ponds which will be removed after the construction stage. It is anticipated that the drainage system will provide an increased time of concentration and consequently the peak runoff will be decreased. The drainage system will be left in-situ during operational stage.

When operational, the project will have a negligible effect on surface water quality as there will be no further disturbance of soils post-construction.

The following mitigation measures are proposed for replacing or removal of the wind turbine blades:

- Emergency drip trays and spill kits will be available on main wind farm site, to ensure that any spills from vehicles are contained and removed off site.
- Refuelling or maintenance of machinery will not occur within 50mof a watercourse. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required.

During the operation stage, small quantities of oil will be used in cooling the transformers associated with the facility. There is therefore a potential for small oil spills. Risks of potential oil leakage and pollutions draining to the watercourse from the installed transformer is mitigated with transformer interceptor bund wall.

It is not envisaged that the maintenance period will involve any significant impacts on the hydrological regime of the area. The maintenance will incorporate effective maintenance of the drainage system. The maintenance regime will include inspecting the following post extreme storm event:

- Drains, cross-drains and culverts for any blockages
- Outfalls to existing field drains and watercourses
- Existing roadside swales for any obstructions
- Swales
- Progress of the re-establishment of vegetation.

The maintenance regime will also include implementing appropriate remedial measures as required after the above inspections and testing the water quality at the outfalls at appropriate intervals. Visual inspections will be undertaken during the maintenance period in accordance with maintenance schedule in CIRIA C753.

Proposed Mitigation Measures during Decommissioning

In the event of decommissioning of the wind farm site, the access tracks will be used in the decommissioning process. Mitigation measures applied during decommissioning activities will be similar to those applied during construction.

6 TRAFFIC AND TRANSPORTATION

Construction

Main Wind Farm Site

This section outlines the mitigation measures that will reduce, minimise or eliminate the potential impacts created by the project and outlined above.

The following mitigation measures are proposed to reduce the impact of the construction activity in relation to the construction phase of the project:

Traffic Management Plan

The following traffic management measures shall be implemented:

Traffic Management Co-Ordinator – A dedicated Traffic Management Coordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management on the project.

Roads and Routes: The final TMP will clearly identify roads that will be used to access the project site and roads that are not to be used. Turbine component and quarry material deliveries shall use the N72, R583 and L2750/L1123 Butter Road as the primary haul route.

One-way Systems: as some of the local roads are relatively narrow, the roads authority may want to introduce a system of one-way construction traffic movements during the construction of the development. Any such one-way systems will be identified in the construction stage TMP in agreement with the roads authority.

Road Condition Survey: a pre-condition survey will be carried out on all public roads that will be used in connection with the development to record the condition of the public roads in advance of construction commencing. A post-construction survey will also be carried out after the works are completed. The specification and timing of the surveys will be agreed with the roads authority. Joint surveys shall be completed if the roads authority requests.

Road Reinstatement: All roads will be reinstated expeditiously on completion of the construction works. Roads will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

Site Inductions: All workers will receive a comprehensive site induction which will include a section on traffic management and clear guidance on the routes to be used/not used to access the site.

24-Hour Emergency Contact: a 24-hour emergency phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for grid connection) and the site entrance for the wind farm site.

Traffic Management Guidance: all necessary temporary traffic management will be planned and executed in accordance with best practice, including Chapter 8 of the Traffic Signs Manual published by the Department of Transport.

Letter Drops: a letter drop will be carried out to notify members of the public living near the proposed site and cable route to advise them of any particular upcoming traffic related matters e.g. temporary lane/road closure or delivery of turbine components.

Signage: Clear signage relating to the development, both temporary and permanent, will be provided for accessing the site.

Road Sweeping: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. When, if necessary, a road sweeper will be used to maintain the public roads in a clean condition during the construction activities of the project.

Temporary Road Crossing Point: Site entrances from and to the wind farm and borrow pit will be secured and locked when not in use. Where required, the entrances will be controlled by flagmen to assist traffic movements. The proposed crossing point will be managed appropriately to allow the safe passage of construction vehicles in, out and across the public road. Priority will be maintained for public traffic. A concrete apron will be provided on both sides of the crossing point during the construction phase, constructed 40mm below road level and overlaid with surface course material.

Site Entrances: The entrances to the site will be secured when the site is not in use. When necessary, a flagman will be used to assist traffic movements at the site entrance or in other areas as required.

Abnormal Load Deliveries: Abnormal loads will require an abnormal load permit prior to delivery and will be delivered at times and frequencies directed by An Garda Siochána.

Grid Connection Works

Mitigation measures proposed for the grid connection works include:

Road Opening Licence: The road works associated with the grid connection cabling will be completed in line with the requirements of a road opening license as agreed with the local authority.

Route Proofing: In advance of the main grid connection works an assessment will be carried out to define the precise alignment of the cable route within the corridor which has been assessed. This will include slit trenching with the aim of minimising the construction impacts and avoiding existing services in the road.

Maintaining Local Access: reasonable access to local houses, farms and businesses will be maintained at all times during any road closures associated with the grid connection works. The details of this will be agreed with the roads authority in advance of the grid connection works commencing.

Road Cleanliness: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. Road sweeping vehicles will be used when necessary, to ensure that the public road network remains clean.

Temporary Trench Reinstatement: Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority.

Surface Overlay after Trench Reinstatement: following temporary reinstatement of trenches on public roads, sections of the public roads will receive a full surface overlay. Details to be agreed with the roads authority. At a minimum they will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

Turbine Component Delivery

The turbine delivery route has been assessed using a detailed appraisal of potential routes and the identification of the most appropriate route including the required accommodation requirements along the route to mitigate the impact of the turbine delivery. The impact of the deliveries on traffic is mitigated by delivering components during off-peak or night-time deliveries.

Mitigation measures proposed for the turbine delivery route also include:

Programme of Deliveries: a programme of deliveries will be submitted to the roads authority in advance of deliveries of turbine components to the site. The programme will include details of the dates and times of each component delivery along with the route to be taken.

Turbine component deliveries will be carried out during off-peak times and will be done using a convoy and a specialist heavy haulage company.

Garda Escort: Turbine deliveries will be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised.

Reinstatement: Any area affected by the works to facilitate turbine delivery will be fully reinstated to its original condition after the construction phase.

Consultation: Consultation with the local residents and Cork County Council will be carried out in advance to manage turbine component deliveries.

Biodiversity Enhancement and Management Plan Lands

No additional mitigation measures are required for implementation of the BEMP.

Operation

It is considered that no further mitigation measures are necessary for the operational stage of the project.

Decommissioning

The traffic impact associated with the decommissioning phase will be significantly less than the construction phase.

Traffic and transportation impact mitigation for decommissioning of the project will be the same as those for construction stage works and will be tailored to suit the existing environment conditions of the day and technology available.

Infrastructure associated with the grid connection will form part of the national transmission network and will be left in-situ. Therefore, no impacts are envisaged upon decommissioning of the grid infrastructure and no mitigation is required.

Mitigation measures adopted for project decommissioning shall be in line with those identified for the construction phase of the project.

All decommissioning works are to be carried out in accordance with a decommissioning plan to be agreed with the planning authority in advance of the decommissioning works.

7 ARCHAEOLOGY, ARCHITECHTURAL AND CULTURAL HERITAGE

Wind Farm Site

The extensive forestry plantations, including tree stumps and root systems within recently felled areas, within planted sections of the wind farm site will preclude advanced archaeological site investigations such as geophysical survey and test trenching and these areas have a less likely archaeological potential as a result of planting activity.

A systematic advance programme of archaeological field-walking surveys will be undertaken within these areas following pre-construction tree felling to confirm that they do not contain any visible surface traces of potential unrecorded archaeological or architectural heritage sites. Archaeological monitoring of ground excavation works during the construction phase will then be carried out in these areas under license by the National Monument Service.

The turbines, hardstands and associated new access tracks located within improved green field areas will be subject to a pre-construction geophysical survey followed by targeted archaeological test trenching. This will include the investigation of a potential section of a relict field boundary noted in the interface between an area of marginal land and an improved section of pastureland located within the southern end of the T8 hardstand area. The programme of advance investigations will also include the completion of a boundary survey, to include a detailed photographic record, of the section of the drystone wall, which forms part of the Ballynagree East and Carrigagulla townland boundary, located within the northern end of the T5 hardstand.

The uneven and overgrown ground conditions within the upland open bog/heath areas in the northern end of the site are likely not suitable for pre-construction geophysical surveys. A pre-construction programme of linear archaeological test trenching will be carried out on the footprint of the three turbines (T13, 16 and 17) in these areas and along the routes of any associated new access tracks which will require ground excavation works during the construction phase.

In the event that any sub-surface archaeological features are identified during these site investigations they will be recorded and then securely cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation in situ (by avoidance) or preservation by record (archaeological excavation).

Grid Connection

All ground works within undisturbed green field locations, including HDD areas, required as part of the grid connection will be subject to constant archaeological monitoring as will works within the environs of the Famine memorials at the crossroads in Killberrihert townland.

An archaeological watching brief of other grid connection trench excavations within the public road will be carried out as part of the programme of licensed archaeological monitoring of the project. In the event that any sub-surface archaeological features are identified they will be recorded and cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation *in situ* (by avoidance) or preservation by record (archaeological excavation).

Turbine Delivery Route

The delivery of turbines to the wind farm site will require topsoil stripping within a green field area in the southern end of the Drishane Castle demesne lands in order to create a hardstand staging area. A pre-works geophysical survey followed by targeted archaeological test trenching will be carried out in advance of these ground works.

Prior to the removal of the road bridge (WF-HF8) in Ballynagree East townland to facilitate the TDR, the vegetation overgrowth will be removed and an archaeological record of the structure, in written, drawn and photographic formats, will be carried out. All ground works at this location will then be subject to archaeological monitoring.

All ground works within other green field areas required to accommodate the turbine delivery route will be subject to archaeological monitoring.

In the event that any sub-surface archaeological features are identified during these site investigations they will be recorded and cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation *in situ* (by avoidance) or preservation by record (archaeological excavation).

BEMP Lands

The proposals for biodiversity enhancement measures will not result in any predicted impacts on the cultural heritage resource and, therefore, no mitigation measures are required.

Monitoring of mitigation measures

There are a number of obligatory processes to be undertaken as part of archaeological licence applications which will allow for monitoring of the successful implementation of the archaeological mitigation measures. These include the submission of method statements detailing the proposed strategy for all site investigations for the approval of the National Monuments Service as part of the licence application. These documents will clearly outline the proposed extent of works and outline the onsite and consultation processes to be enacted in the event that any unrecorded archaeological sites or features are identified. A report will be compiled on all site investigations to comply with the licensing process which will clearly present the results in written, drawn and photographic formats and copies will be submitted to the National Monuments Service, the Planning Authority and the National Museum of Ireland.

8 LANDSCAPE AND VISUAL IMPACT

Given the highly visible nature of commercial wind energy developments it is not generally feasible to screen them from view using on-site measures as would be the primary form of mitigation for many other types of development. Instead, landscape and visual mitigation for wind farms must be incorporated into the early stage site selection and design phases.

In this instance, the two main forms of landscape and visual mitigation employed were:

- Mitigation by avoidance and design – reverse ZTV analysis
- Buffering of Residential Receptors

Mitigation by Avoidance and Design

Macro Works have been involved in the proposed project since 2017 when early-stage feasibility studies took place. One of the main mitigation measures brought forward from these early-stage feasibility studies was to locate the southwestern cluster of the proposed development within the forested basin landform to the northwest of the village of Ballinagree, to reduce the visual exposure of the proposed project to receptors in the surrounding landscape. Whilst the design evolved to include an array of turbines along Seefin ridge to the north of the basin, it was still considered important to utilise the Musheramore ridge to screen the proposed development for visual receptors such as the scenic routes to the east of the site and from the settlement of Millstreet northwest of the site.

During early-stage assessments, a preliminary set of visuals was captured which included two key viewpoints to the west and northwest of the site, one (VP3) to represent the settlement of Millstreet and another (VP6) to represent a section of the S20 scenic route and Blackwater Way (Duhallow). Reverse ZTV maps were prepared from each of these representative views as the preliminary set of visuals identified that turbine T1 presented in isolation along Musheramore ridge from both viewpoints as illustrated in Figure 15.17 and Figure 15.18 below. Unlike standard ZTV maps, reverse ZTV maps can identify areas within the site in which turbines can be placed so as not to be visible from a particular location, or visible to a particular degree (i.e., hub height and above). As a result of this analysis, turbine T1 was removed from the turbine array which entirely eliminates visibility of the proposed project from VP6 and notably reduced the visual exposure of the proposed project from VP3. Subsequently, turbine T2 was also removed from the cluster as it lay in a prominent / outlier position and was the only turbine located above the local road that traverses the upper slopes of Musheramore within the basin.

Even though the emerging layout now included an elevated array of turbines located across the nearby Seefin ridge the same principle of siting all of the turbines in the southwestern cluster within the landscape basin insofar as possible was still relevant. This is on the basis that the two turbine clusters have a contextual separation that belies their relative close proximity to each other (1.5km between nearest turbines). The Seefin turbines are a linear ridgetop array that serves as a perceptual extension to the existing Boggeragh Wind Farms, whereas the Ballinagree basin turbines are nestled into a lower section of landscape within predominant southerly viewshed. Maintaining this perceptual separation between the clusters was promoted during the design refinement process to avoid the sense of a development that sprawled across different landscape contexts.

A series of design refinements saw the project range from 19 to 24 turbines at various tip heights and rotor diameters.

Preliminary sets of visuals were produced comprising of wireframe montages representing a variety of receptors, viewing distances and viewing angles, which were compared on the basis of; the visual presence of the proposed turbines, the aesthetics of the proposed project, and the visual relationship of the proposed wind farm with the surrounding existing wind energy developments. A final layout comprising 20 turbines at a max tip height of 185m was then generated from this iterative design process.

Buffering of Residential Receptors

For the proposed Ballinagree Wind Farm, the minimum distance of any turbine from the nearest residential receptor is 809m, which is in excess of the draft Wind Energy Development Guidelines (2019) minimum set back of 500m and the setback distance of 4 times the tip height of the proposed turbines. In this instance the setback for visual amenity purposes would be 740m from residential receptors on the basis of the 185m high turbines.

Variation in residential buffer distances within the nearest kilometre has a much more noticeable effect on perceived turbine scale than when it occurs in the context of more distant views. This is due to the law of perspective – that doubling the distance to an object halves its perceived height. The reduction factor is even more pronounced when considered in the context of the 'swept area' of turbine blades and not just their tip height.

9 HUMAN BEINGS, POPUALTION AND HUMAN HEALTH & MATERIAL ASSETS

Population

As there are no significant impacts predicted on population trends and population density, no mitigation measures are required.

Socio-economics, Employment and Economic Activity

Given that potential impacts of the proposed development at construction, operation and decommissioning phases are predominantly positive in respect of socio-economics, employment and economic activity, no mitigation measures are considered necessary.

Land Use

Mitigation measures for land use are primarily related to preliminary design stage, which has allowed for the prevention of unnecessary or inappropriate ground works or land use alterations to occur. The construction and operational footprint of the proposed development has been kept to the minimum necessary to avoid impact on existing land uses as so far as possible.

Existing forestry tracks have been incorporated into the design in order to minimise the construction of new tracks and roads and minimise the removal of forested areas. Where new access tacks are required, these have been sensitively designed in order to minimise impact on forestry. Electricity cables will be installed underground in or alongside access tracks to avoid impact on forestry practices. The construction and decommissioning works will be planned and controlled by a Construction and Environmental Management Plan (CEMP). This provides details on day to day works and methodologies. As part of these works, the public and other stakeholders will be provided with updates on construction activities which will affect access to lands. This will be communicated to members of the public through a community liaison officer employed for the duration of the construction period.

Prior to the grid connection installation works within public roads, it is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions, in order to maintain local access as much as possible and avoid impacts on various land uses. All proposed works and deliveries along the TDR route will also be controlled by a Construction and Environmental Management Plan to avoid undue impact to adjacent land uses.

Recreation, Amenity and Tourism

Mitigation measures for recreation, amenity and tourism are primarily related to the preliminary design stage of the Ballinagree Wind Farm, which has allowed for the prevention of unnecessary or inappropriate development to occur that would significantly affect any recreational or tourist amenity. In designing the Ballinagree Wind Farm, careful consideration was given to the potential impact on landscape amenity.

The most significant potential for tourism and recreation activity at the wind farm site and surrounding area was identified as trail walking and hiking.

The development of the proposed Ballinagree Wind Farm has the potential to increase the amenity value of the area by improving recreation facilities, providing both new and improved trails in and around the site which can be used for walking and hiking. This provision is in keeping with the character of recreational activities popular in the area.

In providing for public safety, appropriate signage and safety measures will be put in place where forestry tracks will be closed to the public due to construction and decommissioning activities.

During the construction and decommissioning phases, a diversion will be put in place for the section of the Duhallow Way which passes through the wind farm site. This will direct walkers to an alternative route adjacent existing access tracks in order for walkers to bypass the construction activity. Appropriate signage will be put in place to direct walkers. Notification of this diversion will be provided to Sport Ireland, Failte Ireland and Cork County Council in order to provide online information for walkers and hikers in advance of their recreation activity.

Human Health and Safety

Construction and Decommissioning

To maintain safety and avoid health impacts on construction workers and the general public, best practice site safety and environmental management will be maintained. The proposed development will be designed, constructed, operated and decommissioned in accordance with the following:

- Safety, Health & Welfare at Work (Construction) Regulations 2013
- Safety, Health & Welfare at Work Act 2005
- Safety, Health & Welfare at Work (General Applications) Regulations 2007

All construction staff will be adequately trained in health and safety and will be informed and aware of potential hazards.

All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project.

FÁS Safe Pass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required. The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety & Health Management Plan.

In relation to COVID-19, up to date HSE guidance will be consulted regularly in line with HSA recommendations and all reasonable on-site precautions will be taken to reduce the spread of COVID-19 on construction sites, should the virus be prevalent at the time of construction.

Once mitigation measures and health and safety measures are followed, the potential for impact on human health on the construction site during construction and decommissioning is expected to be not significant and temporary to short-term.

Public safety will be addressed by restricting access to the public in the vicinity of the site works during the construction and decommissioning stage. The construction site and associated recreation trails will be closed to the public for the 18-24 month construction period as well as the decommissioning period. This measure aims to avoid potential injury to members of the public as a result of construction activities.

Where recreational trails are closed to the public during construction and decommissioning, signage will be provided indicating alternative routes for walkers which avoid the construction site. This aims to avoid potential confusion and disorientation to recreation users as well as maintaining public safety in proximity to the construction site.

Appropriate warning signage will be posted at the construction site entrance, directing all visitors to the site manager. Appropriate signage will be provided on public roads approaching site entrances and along haul routes.

In relation to the TDR, extra safety measures will be employed when large loads are being transported, for instance, Garda escort will be requested for turbine delivery and a comprehensive turbine delivery plan will be utilised to avoid potential impact to human safety for road users and pedestrians.

For the installation of the grid connection cable in the public road, a detailed traffic management plan will be developed in discussion with locals who will be directly impacted by the works, and in agreement with the Local Authority. Public consultation will be conducted along the grid cable route to inform local residents ahead of construction and decommissioning works.

Once mitigation measures and health and safety measures are implemented and followed, the potential for impact on human health for members of the public during construction and decommissioning of the proposed project is expected to be not significant and temporary to short-term.

Operational

For operation and maintenance staff working at the proposed wind farm, appropriate site safety measures will be utilised during the operational phase by all permitted employees. All personnel undertaking works in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury.

Equipment within high voltage substations presents a potential hazard to health and safety. The proposed substation will be enclosed by palisade fencing and equipped with intruder and fire alarms in line with ESB and EirGrid standards.

All electrical elements of the proposed development are designed to ensure compliance with EMF standards for human safety.

All on-site electrical connections are carried by underground cable and will be marked out above ground where they extend beyond the track or hardstanding surface. Details of cables installed in the public road will be available from ESBN.

Lightning conductors will be installed on each turbine as all structures standing tall in the sky require this protection. Turbines specifically require this to prevent power surges to electrical components. Turbines will be fitted with ice detection systems which will stop the turbine from rotating if ice is forming on a turbine blade. This aims to prevent ice throw which can cause injury.

Rigorous statutory and engineering safety checks imposed on the turbines during design, construction, commissioning and operation will ensure the risk posed to humans is negligible. 24-hour remote monitoring and fault notifications are included as standard in the Turbine Operations and Maintenance Contracts.

In addition to scheduled maintenance, the maintenance contracts will allow for call out of local engineers to resolve any issues as soon as they are picked up on the remote monitoring system.

Access to the turbines inner structure will be locked at all times and only accessed by licenced employees for maintenance.

In line with the Health Service Executive's Emergency Planning recommendations, any incident which may occur at the site which requires emergency services, incident information will be provided in the 'ETHANE' format.

- Exact location
- Type of incident
- Hazards
- Access and egress
- Number of casualties (if any) and condition
- Emergency services present and required.

The design of the proposed wind farm has considered the susceptibility to natural disasters. The proposed site drainage will mitigate against any potential flooding risk with the use of swales.

Coillte fire plans are reviewed and updated on a regular basis. A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of fire-fighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.

Shadow flicker detection systems will be installed on all turbines in order to reduce potential occurrence of shadow flicker on nearby receptors.

In order to ensure the proposed wind farm is compliant with the noise limits, some of the turbines may need to be operated in noise reduced modes of operation in order to protect residential amenity. The wind farm system shall include a kill switch that can be operated at any time with an overriding manual shutdown system in case of an emergency.

Renewable, Non-Renewable Resources and Utility Infrastructure

Existing services along the proposed grid connection cable route have been predicted through a desktop study and will be confirmed in the pre-construction surveys prior to construction. This will minimise the impact in terms of disruption or damage to existing utilities. It is not intended to divert existing services but instead, where possible, the cable will be laid above or below existing services. Communication with service providers will be maintained for the duration of the construction works where required.

Non-renewable resources of stone and fill will be sourced locally and will be excavated from on-site borrow pits insofar as possible to minimise transportation distances, reducing CO2 emissions.

The 88 hectares of commercial forestry which will be felled at the proposed Ballinagree Wind Farm site will be replanted at alternative lands under a felling licence.

Where services and street furniture are required to be removed temporarily to accommodate turbine delivery, residents and business in proximity to the works will be informed in advance.

A comprehensive turbine delivery procedure will be implemented between Foynes Port and the wind farm site which will include safety procedures and Garda escort. The procedure will avoid impact on the roads involved with the TDR including the N69, M7, M20, N20, N72, R583 and L2758 leading to the site. It is likely that turbine delivery will take place outside of regular travelling/commuting hours in order to avoid potential traffic impacts on major routes.

A Construction Waste Management Plan has been prepared for the proposed Ballinagree Wind Farm in line with the ”Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects” (2006) as published by the Department of the Environment, Community and Local Government and supported by the Southern Region Waste Management Plan 2015-2021.

The Waste Management Plan will be finalised in accordance with the CEMP following the appointment of the contractor for the main construction works and will take cognisance of any newly published waste management policy.

10 SHADOW FLICKER

Shadow flicker control modules, consisting of light sensors and specialised software, will be installed on the turbines as part of a system to prevent operation during periods when shadow flicker may occur. The calculated potential shadow flicker periods will be input into the turbine control software and when the correct conditions are met e.g., the light intensity is sufficient, turbine orientation is correct etc. during these periods, individual turbines will cease operation until the conditions for shadow flicker are no longer present. These are standard, widely accepted control modules that are installed in most wind turbines.

When the conditions for shut down are met the turbines will gradually come to a stop, however, it should be recognized there will be a short period of time before complete shutdown occurs. This will depend on the reaction time of the shadow flicker control modules and the particular turbine type, as well as a gradual reduction in rpm i.e., the blades will not come to a sudden stop.

11 TELECOMMUNICATIONS AND AVIATION

Telecommunications and Broadcasting

Mitigation measures consisted of mitigation by design to avoid impacts on telecommunication links. As there is no potential for electromagnetic interference from the proposed project on telecommunications, there are no mitigation measures proposed for the construction, operation, or decommissioning phase of the proposed project.

There is potential for broadcasting to be affected at receivers close to the wind farm site during the operational phase, i.e., nearby dwellings. Mitigation by design has achieved a setback of over 800m between the proposed turbines and the nearest dwelling which will reduce potential effects on receivers. A protocol will be signed with 2RN which will ensure remedial measures will be implemented should they be required as a result of potential negative effects on 2RN's network. Mitigation includes supplying dwellings with optimised roof-top antennas or satellite reception if required.

The proposed grid connection will be left in situ underground within the public roadway. In advance of the main grid connection works an assessment will be carried out to confirm the precise alignment of the cable route within the corridor which has been assessed. This will include slit trenching to ensure avoidance of existing services in the road.

Overhead telecommunication lines along the TDR will be placed underground prior to turbine delivery or briefly disconnected during turbine delivery during the construction phase. Any interference to service will be brief (lasting less than 1 day) and potential effects to service will be communicated in advance to those affected. Notice will be provided to all stakeholders affect prior to works commencing.

Aviation

In line with standard practice for wind farm developments, the coordinates and elevations for turbines will be supplied to the IAA at the end of the construction phase. An aeronautical obstacle lighting scheme will be agreed with IAA in line with IAA's consultation response and applied to the proposed turbines.

12 NIS MITIGATION MEASURES

1.1.1 Mitigation by Avoidance and Design

The following measures are incorporated into the proposed wind farm design to reduce impacts on designated sites, flora and fauna through avoidance and design:

- The hard-standing area of the wind farm has been kept to the minimum necessary for the maximum turbine envelope proposed, including all site clearance works to minimise land take of habitats and flora.
- Site design and layout deliberately avoided direct impacts on designated sites as recommended by statutory bodies as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).
- All cabling for the project will be placed underground; this significantly reduces collision risk to birds over the lifetime of the wind farm and is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).
- The grid connection routes have been selected to minimise land take of potentially sensitive habitats by following the site access tracks and public roads as much as possible.
- Care has been taken to ensure that sufficient buffers are in place between wind farm infrastructure (75m for turbines and 50m for everything else) and hydrological features such as rivers and streams with the exception of crossings, works associated with the improvement to the access track and works associated with the undergrounding of the cable route.
- The design was also carried out with cognisance to ecological features. Cables are to be placed underneath public roads where possible to avoid impact to roadside vegetation.

Further mitigation measures prescribed to avoid or reduce potential for the proposed project to have an adverse effect on the integrity / conservation objectives of the Blackwater River (Cork/Waterford) SAC (002170) are prescribed hereunder.

1.1.2 Mitigation Measures

Table 4-1: Details of Mitigation Measures to be Implemented for Proposed Project

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		Mitigation Measures to be Implemented Prior to Construction		
1	The Construction and Environment Management Plan (CEMP)	The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the proposed wind farm, to ensure that during these phases of the development, the environment is protected, and any potential impacts are minimised. The contractor is not permitted to omit or alter mitigation measures set out in the CEMP.	Mitigation measures will be implemented in full by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures outlined below and in the CEMP will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works. High probability of success.	The Project Manager, Environmental Manager and Qualified Ecologist will monitor the implementation of the mitigation measures outlined in the CEMP. Further mitigation measures (not already detailed below) pertaining to the proposed project are outlined in the CEMP in Appendix 4 including detailed management plans that form part of the whole document.
2	A Project Ecologist/Ecological Clerk of Works (ECoW) The Project Ecologist/ECoW will ensure successful implementation of all mitigation measures for biodiversity management.	A Project Ecologist/Ecological Clerk of Works (ECoW) with appropriate experience and expertise (in implementing ecological mitigation measures for wind farm developments) will be employed for the duration of the construction and decommissioning phases to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/ECoW will be awarded the authority to stop construction activity if there is potential for adverse ecological effects to occur.	A Project Ecologist/Ecological Clerk of Works (ECoW) will be employed by the Developer through the Contractor awarded the contract to construct the wind farm. All mitigation will be implemented in full. High probability of success.	The Project Ecologist/ECoW will monitor the implementation of the mitigation measures detailed below and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor as per each management plan.
3	Communication with IFI	A line of communication with IFI will be established by the ECoW and fisheries officers will be invited to inspect mitigation measures at the site. This will ensure transparency, encourage proactive culture around implementation of measures and facilitate input from key stakeholders if required.	ECoW will open a line of communication upon appointment. Mitigation measure will be implemented in full. High probability of success.	ECoW to provide reports of communication and/or site visit findings to update the developer and contractor of input from key stakeholders.
4	Water baseline and monitoring Establish baseline biological water quality in order to detect change throughout the lifetime of the proposed project.	Biological sampling (SSRS or Q sampling as applicable)and physico-chemical sampling will be carried out at the established baseline sampling points as determined within the aquatic ecology report. Commencement will occur prior to construction to provide an updated baseline and will continue for the duration of the construction and operational phases of the project. Establish baseline biological water quality so regular monitoring can detect any long-term changes in water and aquatic habitat quality which could be missed by grab sampling for physico-chemical parameters only.	Mitigation measure will be implemented in full by the Developer. High probability of success.	Monitoring program will be bi-weekly for the duration of construction and decommissioning and will be yearly for the duration of the operation of the proposed project. Regular reporting to developer, contractor and consenting authority.
5	Invasive Species Eradication of invasive species will be completed prior to construction. Measures shall be in accordance with the invasive species management plan (ISMP) (Appendix 5) and Regulation 49 of the EC (Birds & Natural Habitats) Regulations (2011).	Prior to works commencing an invasive species survey will be undertaken in the previously identified locations within the study area of the project to reconfirm the extend of the non-native invasive species (Japanese knotweed and Rhododendron) and to ensure they have not spread to any new areas within the footprint of the proposed project. This will also ensure no new species have migrated to areas within the footprint of the proposed project. The invasive species management plan in Appendix 5 will be adhered to for all works in areas confirmed as containing non-native invasive species. The plan is intended to be a working document and will be updated during the construction, operational and decommissioning phases. The main objective of the invasive species management strategy are containment, treatment and eradication.	Mitigation measure will be implemented in full by the Developer. High probability of success.	The plan will be updated and implemented prior to construction and then updated through all stages of the project lifecycle. Following construction, the plan will be updated for the operational phase, taking into account the results of the detailed construction invasive species management plan and operational maintenance requirements. During decommissioning it will be updated if new areas are identified to have been within the footprint of the works.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		Maintaining site hygiene at all times in an area where invasive non-native species are present is essential to prevent further spread. The following site hygiene measures will be implemented onsite during the construction and/or for maintenance works during the operational stage where applicable: • Fence off the infested areas prior to and during construction works where possible in order to avoid spreading seeds or plant fragments around or off the construction site. • Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk. • Avoid if possible using machinery with tracks in infested areas. • Clearly identify and mark out areas where contaminated soil is to be stockpiled on site and cannot be within buffers of any watercourse or within a flood zone. • If soil is imported to the site for landscaping, infilling or embankments, the contractor will gain documentation from suppliers stating that it is free from invasive species. • Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan. • Erection of adequate site hygiene signage in relation to the management of non-native invasive material as appropriate.		
6	Environmental Manager The Environmental Manager will ensure successful implementation of all mitigation measures for water control and management.	A suitably qualified Environmental Manager (competent in the implementation and management of environmental mitigation measures for wind farms) will be appointed to ensure the effective operation and maintenance of drainage and other mitigation measures associated with water control and management during the construction process. The operations management of the proposed project will include regular monitoring of the drainage system and maintenance in line with all management plans within the CEMP. The Environmental Manager will be awarded the authority to stop construction activity if there is potential for adverse effects to water control and/or management.	An environmental manager will be employed by the Developer through the Contractor awarded the contract to construct the wind farm and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed below and in accordance with the relevant management plans within the CEMP ensuring successful implementation. Regular reporting to developer and contractor as per each management plan.
7	Silt traps and silt fencing The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner.	Silt traps and silt fencing measures for the proposed wind farm site are provided at outfalls from roadside swales to silting ponds, at the end of the drainage channels, at the outside of the tree felling buffer zone and strategically placed down-gradient within forestry drains near streams. The traps and fences will be maintained regularly ensuring that they are clear of sediment build-up and are not severely eroded. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off. This measure will reduce the risk of sediment runoff reaching waterways within the catchment of the main wind farm site. This in turn will avoid adverse effects on the surrounding water courses and aforementioned SAC.	Mitigation measures will be implemented in full by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures as detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor as per each management plan.
8	Settlement ponds The main purpose of the settlement ponds is to increase residence time and prevent sediment reaching the watercourses.	Settlement ponds as detailed in the surface water management plan within the CEMP, will be put in place in advance of works as construction progresses across the site. The settlement ponds have a diffuse outflow and will mitigate any increase in surface water run-off and treat suspended solids in the surface water runoff. This will prevent sediment reaching the waterways within the catchment of the main wind farm site This in turn will avoid adverse effects on the watercourse network.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor. High probability of success	The Environmental Manager will monitor the implementation of the mitigation measures as detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor as per each management plan. Settlement ponds are to be cleared of deposits regularly and when requested by the ECoW and/or the Environmental Manager to ensure their ongoing functioning and maintenance of excess capacity.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		Construction Phase Mitigation Measures		
9	Habitats or flora	The area of the proposed works will be kept to the minimum necessary, including all site clearance works, to minimise disturbance to habitats and flora. In this case, the footprint of the proposed development has been kept to the minimum necessary, including the use of layout design methods (e.g., existing roads and stream crossings to minimise excavation works). No disturbance to habitats or flora outside the proposed project area will occur. All works will be restricted to the immediate footprint of the development, which will be wholly within the development site boundary and kept separate from any key areas for biodiversity. Machinery, and equipment will be stored within the site compound. Designated access points will be established within the site and all construction traffic will be restricted to these locations. Exclusion zones will be demarcated and no site traffic will enter the area.	A Project Ecologist/Ecological Clerk of Works (ECoW) will be employed by the Developer through the Contractor awarded the contract to construct the wind farm. All mitigation will be implemented in full. High probability of success.	The Project Ecologist/ECoW will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor as per each management plan.
10	Avifauna	• Construction operations will take place during the hours of daylight for the most part to minimise disturbances to roosting birds or any active crepuscular/nocturnal bird species. • A Toolbox Talk will be prepared and incorporated as part of the construction phase site induction. A wildlife register will be maintained by the environmental site staff during the construction phase. Site staff will be encouraged to report any bird sightings of note made during the construction phase and this information will be logged by the environmental site staff. The site manager will continue to maintain a wildlife register throughout the operational phase. • The construction compound, substation and wind farm will not be lit at night (with the exception of aviation warning lights and low-level switchable safety lighting). All lighting systems will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible and all non-essential lighting will be switched off during the hours of darkness. • All edible and putrescible wastes will be stored and disposed of in an appropriate manner. Similarly, all construction materials will be stored and stockpiled at prescribed locations and all waste materials will be disposed of at licensed facilities. • Tree-felling and removal of mature vegetation will be carried out outside of the bird breeding season (March 1st – August 31st). Where this is not possible due to construction program constraints the appointed ECoW will inspect the area to be felled no more that 48hrs in advance of the felling / clearance works and advise if bird species are present and if so, on a suitable exclusion buffer needed until the species has fledged. Hedgerows and mature trees will be retained insofar as possible along the TDR and grid access route. Standard Vantage Point Monitoring in accordance with the Survey Methods for Use in Assessing the Impacts of Onshore Wind farms on Bird Communities (Scottish Natural Heritage. 2017) will be carried out during the construction period by a competent experienced ornithologist. A VP survey will be carried out between mid-March and mid-August (6 visits during breeding season) and October to March (6 visits during winter season to monitor the occurrence of waders, wildfowl and raptors. The survey shall cover the development footprint and all areas within 500m of the works. In the unlikely event that a nest is discovered a species specific buffer (exclusion zone for all works) will be put in place until the birds have fledged. This will be in line with the latest guidance for example Willams et al., 2013 and Pearce-Higgins *et al.,* 2009.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Project Ecologist/ECoW will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
11	Lighting	Construction operations will take place during the hours of daylight to minimise disturbances to active nocturnal species. This is in line with best practice recommendations for mitigation measures in regard to nocturnal species (birds, bats, otters) and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006). Limited operations such as concrete pours, turbine erection and installation of the grid connection require night-time operating hours; full consideration of BCT guidance note 08/18 will be implemented when determining appropriate lighting for works to take place during night-time hours. Works will be supervised by the project ecologist/ECoW.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Project Ecologist/ECoW will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP. Regular reporting to developer and contractor.
12	Toolbox talk Will ensure all personnel present receive the relevant information for the areas they are working on each given day.	Toolbox talks will be undertaken with construction staff on disturbance to key species during construction. This will help minimise disturbance.	Toolbox talks will be provided to all staff by the ECoW daily before the start of any works.	The ECoW will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
13	Plant and vehicles Will prevent contamination within the site.	All site plant will be inspected at the beginning of each day prior to use. Defective plant shall not be used until the defect is satisfactorily fixed. All major repair and maintenance operations will take place off site. Vehicles entering the site will be in good working order, free from leakage of fuel or hydraulic fluid.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	Inspection of plant on site will be maintained throughout the lifetime of the project.
14	Pollution incident control response Will ensure appropriate training to all personnel and knowledge of emergency response plans	All personnel working on site will be trained in pollution incident control response. An emergency response plan will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. A regular review of weather forecasts of heavy rainfall (>10mm/hour) is required. A record will be kept of daily visual inspections of drains, silt ponds, etc on site and weekly inspections of streams which receive flows from the main wind farm site, during the construction phase.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor as per each management plan.
15	Surface water	A self-imposed buffer zone of 50m will be maintained for all watercourses with the exception of existing road upgrades and stream crossings. Felling buffer zone will involve a 10m exclusion zone along the edge of all aquatic zones. Please note this exclusion zone has nothing to do with a 50m buffer zone defined for the construction of the wind farm. The exclusion zone refers to machinery associated with tree felling. No machinery is allowed to enter this area. However, they can fell in the exclusion zone if a tree felling machinery has a long arm. Trees that can't be reached will be felled with a chainsaw. The site drainage has been designed to complement existing overland flow and existing onsite drainage. A three-stage treatment train (swale – settlement pond – diffuse outflow) is required to retain and treat the discharges from all hard surface areas. Settlement ponds are required to be cleared of deposits generated by aggregate used for access tracks or other sediment regularly. Cleared material shall be interred securely to prevent ingress into the drainage network.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP. Daily visual inspections of drains, silt ponds, etc on site and weekly inspections of streams will be performed during the construction period. This will ensure suspended solids are not entering the streams and rivers alongside the work area. These inspections will identify any obstructions to channels and allow for appropriate maintenance of the existing roadside drainage regime. If suspended solids in water courses exceed the baseline levels construction work will be stopped, and remediation measures will be put in place immediately.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		This measure will reduce the risk of sediment runoff or pollutants reaching waterways within the catchment of the proposed project. This in turn will avoid adverse effects on the surrounding water courses and the aforementioned SAC.		
16	Felling schedule (License)	Tree felling will be the subject of a felling license from the Forest Service and to the conditions of such a license. A Felling License will be in place prior to works commencing on site. To ensure a tree clearance method that reduces the potential for sediment and nutrient run-off, the construction methodology will follow the specifications set out in the following guidance documents: • DAFM (2019). Standards for Felling and Reforestation; • Forestry Service (2000a). Forest Service Forestry and Water Quality Guidelines; • Forestry Service (2000b). Forest Harvesting and Environmental Guidelines; • DAFM (2018). Draft Plan for Forestry and Freshwater Pearl Mussel in Ireland	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license. Regular reporting to developer and contractor and in line with any license requirement.
17	Felling schedule (aquatic zone of main wind farm site)	In accordance with the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zone (Forestry Service, 2000a, 2000b). Given the close proximity of felling areas to receiving watercourses and potential source-receptor pathways (i.e., drainage channels), a minimum buffer zone for felling areas of 15-20m will be applied. Silt fences will be required within the drainage channels. These will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.
18	Felling schedule (timber extraction rack)	Where damage or serious rutting has started to occur, timber extraction will be suspended immediately. Relocation of the extraction rack will be used to remedy the situation. This will avoid timber extraction routes acting as conduits for surface water flows. This in turn will avoid adverse effects on the surrounding water courses via emissions to water.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.
19	Felling schedule (felling)	Felling will be undertaken in the spring to facilitate the sowing of grass seeds post-harvest to aid sediment filtration and nutrient absorption, using native grass species e.g., *Holcus lanatus and Agrostris capilaris* (DAFM, 2018).	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.
20	Felling schedule (machine operations)	Machine operations will not take place in the 48 hour period before predicated heavy rainfall (>10mm/hour), during heavy rainfall or in the 48 hour period following heavy rainfall (DAFM, 2018). Weather forecasts will be checked at least 24 hours in advance of works.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
21	Felling schedule (removal of debris)	Removal of branch lop-and-top and other debris (brash) from felling areas within 20m of forestry drains (i.e., up-slope of active pathways to larger downstream watercourses) will be carried out to reduce nutrient seepage immediately post-felling and in the proceeding years after felling has occurred (DAFM, 2019). Brash mats will be used to support vehicles on soft ground and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place before they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall. Brash mats must not be left within 20m of a watercourse.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with permitted license and in accordance with the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with any license requirement.
22	Road / access track construction	It is proposed to construct approximately 14.4km of new internal access tracks and carry out upgrades to 11.1km of existing tracks (including bend widening) to facilitate site access and construction activities. All track widening will be undertaken using clean uncrushable stone with a minimum of fines to reduce the risk of suspended solid releases to receiving watercourses. Still traps will be placed in the new roadside swales. Proposed new tracks will be drained as via roadside swales with stilling ponds at the end of the swale. These grassed swales will serve to detain flow and reduce the velocities of surface water flows. The swales will be 0.3 m deep with a bottom width of 0.5 m and side slope of 1 in 3. The swales will be constructed in accordance with CIRIA C698 Site Handbook for the Construction of SuDS which can be used in conjunction with CIRIA C753 The SuDS Manual. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. Site drainage, including silt traps and settlement ponds, will be put in place in parallel with or ahead of construction, such that excavation for new infrastructure will have functional drainage system in place. The settlement ponds will remain in place during construction phase. The settlement ponds will drain diffusely overland, over existing vegetated areas, within the site boundary. Tracks will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids in the run-off.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
23	Main wind farm drainage	Of the 13no. water crossings within the site boundary to be crossed during the construction phase three 10 are existing structures that will be crossed either above or below the existing pipe drains. One crossing will involve the upgrading of the existing bridge. Three proposed new crossings will be via precast box culverts and one will involve the construction of a new bridge. Silt Protection Controls (SPCs) are proposed at the location of the drain crossings. The SPCs will consist of a minimum of silt traps containing filter stone and filter material staked across the width of the swales and upstream of the outfall to any watercourse. Drains around hard-standing areas will be shallow to minimise the disturbance to sub-soils. Permanent roadside drainage will be installed as part of the construction stage. This will include the use of interceptor drains, swales, check dams and stilling ponds. These measures will buffer site run-off during periods of high rainfall by retaining the water until the storm hydrograph has receded. Site drainage, including silt traps and stilling ponds, will be put in place in parallel with or ahead of construction, such that excavation for new infrastructure will have functional drainage system in place. The stilling ponds will remain in place during construction phase. The stilling ponds will drain diffusely overland, over existing vegetated areas, within the site boundary. The stilling ponds will be back-filled and the swales that were connected to them will be re-connected to the outfall once construction is completed.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		The routes for the proposed access tracks are laid out to follow existing tracks. Site access roads have been laid out to reduce the longitudinal slope of roadside drains and to follow natural flow paths. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. Where existing tracks will be used to access the site, roadside drains alongside these tracks will be cleared of obstructions only where strictly necessary (i.e., if flooding occurs). Vegetation and other obstructions provide sediment arrest and flow attenuation functions and as such will not be interfered with unless absolutely necessary.		
24	Wheel wash facilities	Wheel wash facilities will be located at site entrances 1 and 2 to reduce construction traffic fouling public roads. The wheel wash will come with an additional water tank which will be filled regularly. These units will be self-contained and will filter the waste for ease of disposal. Waste will be removed from each unit and from site by a permitted contractor to a licensed facility. Measures will be in accordance with the invasive species management plan (ISMP) (Appendix 5) and Regulation 49 of the EC (Birds & Natural Habitats) Regulations (2011).	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
25	Concrete	Major construction works including concrete pours onsite will be timed to occur outside periods where heavy rainfall (>10mm/hour) would be expected. A regular review of weather forecasts (weather forecasts will be checked at least 24 hours in advance of works.) of heavy rainfall is required, and the site contingency plan will be updated in accordingly before and after such events. Concrete washout will be carried out in a dedicated area of the temporary compound. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement lagoon provided to receive all run-off. During construction concrete will be kept out of all watercourses and drains.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
26	Management of hydrocarbons	Any diesel, fuel or hydraulic oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Fuels, lubricants and hydraulic fluids for equipment used on the site will be carefully handled to avoid spillage. Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of; Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and Appropriate spill control equipment, such as oil soakage pads, will be kept within the refuelling areas and in each item of plant to deal with any accidental spillage.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
27	Refuelling	Refuelling of plant and fuel bowsers during construction will be carried out at the primary refuelling station which will be located at the main temporary site compound. The station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.

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		In addition to the above, onsite refuelling of machinery will be carried out 100m from watercourses using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site or at the primary refuelling station at the main site compound and will be towed by a 4x4 jeep to designated refuelling areas near to where machinery is located but at distances of greater than 100m from watercourses. Drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site.		
28	Spill control	Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area and in each item of plant to deal with any accidental spillage. All staff will be trained in appropriate spill control measures. See Emergency spill plan within the CEMP.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
29	Welfare utilities	Portaloos and / or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licensed waste disposal contractor.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
30	Minor water course crossing – dry conditions	Duct installation will only take place during dry periods to ensure no in-stream works and an environmental manager shall supervise the works.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
31	Standing water	Standing water, which could arise during excavations, has the potential to contain a high concentration of suspended solids as a result of the disturbance to soils. This water will be pumped into the site drainage system which will be constructed at site clearance stage, in advance of excavations for the turbine bases. In situations where space for drainage infrastructure or suitable treatment measures are not available (e.g., during grid cable installation) excess water from excavations will be required to be removed by tanker for disposal at licensed facility).	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
32	Cross-drains	Suitably sized cross-drains will be provided for drainage crossings to convey flows from agricultural drains and forestry drains across the access tracks, to prevent a risk of clogging.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
33	Flooding	Settlement ponds are to be provided as part of the drainage system for the development. The settlement ponds, together with the swales, will serve to reduce velocities in the surface water runoff draining from the access tracks and hardstanding areas and will provide retention of the flows. These have been designed for both pre and post-construction scenarios for 1 in 100 year storm events with a 20% allowance for Climate Change and will mitigate any increase in the risk of flooding. No construction personnel, operation or maintenance personnel will be permitted on site during extreme flood events.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
34	Excavated material	Excavated material will be re-used on-site where possible for berms etc. Surplus material will be removed from the site to an appropriately licensed or permitted facility. Surplus soil, peat or rock excavated during the course of the works will be used on site in the form of landscaping including low berms, where appropriate. Borrow pits will be reinstated using excavated peat and spoil.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		A setback distance of at least 100m from watercourses will be adhered to when storing temporary spoil. Temporary spoil heaps will be compacted and covered to minimise sediment-laden runoff. No spoil stockpiles will be left on site after construction. Temporary stockpiles of sand/stone and other materials will be covered with sheeting when not in use to prevent washout of fines during rainfall. All stockpile material will be bunded adequately and protected from heavy rainfall to reduce silt runoff, where necessary. Adequate security will be provided to prevent spillage as a result of vandalism.		
35	Contaminated material	Contaminated soils will be handled, removed and disposed of in accordance with statutory requirements for the handling, transportation and disposal of waste. In particular, the following measure will be implemented: Contaminated material will be left in-situ and covered, where possible until such time as WAC (Waste Acceptance Criteria) testing is undertaken in accordance with recommended standards and in-line with the acceptance criteria to a suitably licenced landfill or treatment facility as detailed in the waste treatment management plan within the CEMP. This will determine firstly the nature of the contamination and secondly the materials classification i.e., inert, non-hazardous or hazardous.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the relevant management plans within the CEMP.
36	Traffic management	All traffic will adhere to the traffic management plan within the CEMP.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	Monitoring will be in accordance with the traffic management plan within the CEMP.
Operational Phase Mitigation Measures				
37	Inspections	Quarterly inspections of the erosion and sediment control measures on site (i.e., drains, swales, outfalls to field drains) will be undertaken for the first year following construction and annually thereafter to ensure operational efficiency.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the license and relevant management plans within the CEMP.
38	Management of hydrocarbons	Oil used in transformers (at the substation and within each turbine) and storage of oils in tanks at the substation could leak during the operational phase and impact on groundwater quality. The substation transformer and oil storage tanks will be in a concrete bund capable of holding 110% of the oil in the transformer and storage tanks. Turbine transformers are located within the turbines, so any leaks will be contained. Further management of hydrocarbons will be as detailed in the item 26 above.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the license and relevant management plans within the CEMP.
39	Invasive Species Management Plan (Appendix 5)	Invasive species will continue to be treated within the project area according to the invasive species management plan for as long as they persist within the site.	Mitigation measure will be implemented in full by the Developer. High probability of success.	The plan will be updated and implemented prior to construction and then updated through all stages of the project lifecycle. During construction, it will be updated by the contractor to form the detailed invasive species management plan which will form part of the detailed CEMP. Following construction, the plan will be updated for the operational phase, taking into account the results of the detailed construction invasive species management plan and operational maintenance requirements.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
				During decommissioning it will be updated if new areas are identified to have been within the footprint of the works.
40	Lighting on turbines	Turbines identified during the design process will be illuminated with medium intensity fixed red obstacle lights of 2000 candelas as determined by the IAA. Lighting will be fitted with baffles to ensure that the light is directed skywards and will not be discernible from the ground.	Mitigation measures will be implemented by the Developer through the Contractor awarded the contract to construct the wind farm. All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	Monitoring will be in line with Fatality monitoring program.
41	Vegetation-free buffer zones	The vegetation-free buffer zones around all turbines will be managed and maintained during the operational life of the development. These will be kept clear by mechanical means only; no chemical methods will be used.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the license and relevant management plans within the CEMP.
Decommissioning Phase Mitigation Measures				
All prior to and construction phase mitigation will be implemented during the decommissioning phase.				

1.1.2.1 Water Quality Monitoring Plan

A monitoring programme will be established to ensure that the water quality is maintained. This programme will ensure that designed measures are working to ensure water quality is not affected. The details of this programme are outlined below.

Daily visual inspections of drains and outfalls will be performed during the construction period to ensure suspended solids are not entering the streams and rivers of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If excessive suspended solids are noted, construction work will be stopped, and remediation measures will be put in place immediately.

Visual inspections will be continued during the operational period until vegetation is established on site.

A detailed water quality monitoring programme will be undertaken during the construction phase of the proposed development, in addition to the visual inspections outlined above, so as to ensure the effective implementation of the proposed mitigation measures. Field measurements and grab samples will be undertaken at the established baseline sampling points as determined within the aquatic ecology report. Commencement will occur prior to construction to provide an updated baseline and will continue for the duration of the construction and operational phases of the project. The field measurements will be recorded at the site and will include measurement undertaken as part of the initial physiochemical water quality testing. The field measurements will be taken on a weekly basis during the site clearance and earthworks stage of the construction period.

An ECOW will continuously compare the results with the pre work levels and ensure that designed mitigation measures are working.

1.1.2.2 Avifauna Monitoring program

A post-construction monitoring programme is to be implemented at the subject site in order to confirm the efficacy of the mitigation measures above; the results of this will be submitted annually to the competent authority and NPWS. As stated through the assessment the main species requiring monitoring are hen harrier and mallard. Published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure (Drewitt and Langston, 2006).

In addition, published recommendations on swans and wind farms (Rees, 2012) suggests that systematic post construction monitoring; adapted to quantify collision, barrier and displacement, be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components are proposed for this project.

1) Fatality Monitoring (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction)- A comprehensive fatality monitoring programme is to be undertaken following published best practices as stated below; the primary components are as follows:

    a. Initial carcass removal trials to establish levels of predator removal of possible fatalities. This is to be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results (Shawn *et al*., 2010). No turbines which are used for carcass removal trials are to be used for subsequent fatality monitoring. Carcass removal trials shall be continued for the duration of fatality searches.

    b. Turbine searches for fatalities are to be undertaken following best practice (Fijn *et al*., 2012 and Grunkorn, 2011) in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates based on carcass removal rates (e.g., 1 per month). To be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS.

    c. A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).

    d. Recorded fatalities to be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Reports will be submitted to the competent authority and NPWS following each round of surveys.

2) Flight Activity Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction) - A flight activity survey is to be undertaken during the summer and winter months to include both Vantage Point and hinterland surveys as Per SNH (2017) guidance:

    a. Record any barrier effect i.e., the degree of avoidance exhibited by species approaching or within the wind farm (Drewitt and Langston, 2006). Target species to be all raptors and owls, all wild goose and duck species, all swan species and all wader species.

    b. Record changes in flight heights of key receptors post construction.

Reports will be submitted to the competent authority and NPWS following each round of surveys. This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.

3) Monthly Wildfowl survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A monthly wildfowl census, following the methods utilised for the baseline survey, is to be repeated on a monthly basis during the winter period.

This aims to:

a. Assess displacement levels (if any) of wildfowl such as swans post construction
b. Assess overall habitat usage changes within the vicinity of the Ballinagree Wind Farm Development post construction.

This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS. Reports will be submitted to the competent authority and NPWS following each round of surveys.

4) Breeding Bird Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey (moorland breeding bird and Common Bird Census), following methods used in the baseline survey to be repeated yearly between early April to early July.

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

Appendix 3.3

Grid Connection Constructability Report

CONSTRUCTION METHODOLOGY

Ballinagree Windfarm - 110kV Underground Cable

Document No: 05843-R01-01

Revision:	Author:	Checked:	Date:	Notes:
00	NOC	DB	10.11.21	*Issued for Information*
01	NOC	GH	11.01.22	*Issued for Information*

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1.0 Introduction

The purpose of this document is to outline and explain the construction techniques and methodologies which will be implemented during construction of the Ballinagree Wind Farm 110kV underground cable grid connection to the existing EirGrid Clashavoon 220kV Substation in Co. Cork. The grid connection will consist entirely of underground cabling (UGC) with the majority of the UGC to be installed within the public road network.

The UGC works will consist of the installation of 5 No. ducts in an excavated trench to accommodate 3 No. power cables, and 1 No. fibre communications cable to allow communications between the Ballinagree Wind Farm Substation and Clashavoon 220kV substation.

This document is intended to be used as an aid to understand the methodologies to be employed during construction and should be read in conjunction with all other specialist reports which accompany the Planning Application. In addition, this document is in outline form only and will be revised and updated prior to the commencement of any construction activities, detailed Method Statements will be prepared in respect of each aspect of the development.

2.0 110kV Underground Cable Route

The UGC route is approximately 11.307km in length and runs in a northerly direction from the existing Clashavoon 220kV Substation to Ballinagree Wind Farm substation location utilising an existing access track adjacent to Clashavoon 220kV Substation on the periphery of EirGrid property, the public road network, forestry access tracks and minimal sections of private land.

The exact location of the UGC within the site boundary is subject to minor modification following a further detailed assessment to be undertaken prior to construction and following consultation with EirGrid, Cork County Council and all other relevant stakeholders, having regard to all environmental protection measures outlined in the planning application and accompanying technical reports.

Below **(Figure 1)** which outlines the UGC route, with each section of the route being formulated in detail within Table 1.

This grid connection route is shown as an Overall Site Layout Plan in Drawing No. 05843-DR-001.

Figure 1 – Grid Connection Route Location (See Drawings 05843-DR-001/008)

Table 1 of this report summaries the route location features of the underground cable connection and route.

Table 1 – Approximate Route Location of Preliminary Design:			
Substation/Access Roads	**Public Roads**	**Private Land**	**Forestry Access Roads/WF**
244m	9,463m	120m	1,600m

Table 1: Clashavoon 220kV Substation to WF Substation – UGC Route Location Summary

Table 2 below separates the UGC route into a number of sections and describes the specific construction requirements of each individual section. All plant and equipment employed on the works will be subject to good site organisation and hygiene, particularly during construction activities.

Table 2 - Summary of 110kV Underground Cable Route	
Section	**Description**
Section 1 244m approx.	**UGC Route from EirGrid's Clashavoon 220kV Substation (110kV side) to Local Public Road** **(For reference see drawings 05843-DR-001 & 05843-DR-002)** The underground cable route exits Clashavoon 220kV Substation from the southeast side (110kV side) and heads in an easterly direction. The route runs parallel to the substation fence until it reaches the southeast corner of the substation. At this point the route turns in a northerly direction toward the junction of the substation entry road and the local public road. This section of the route is totally within EirGrid owned land until it meets the local public road. <u>Section 1 Features:</u> ▪ *1 No. Joint Bays and associated chambers* The joint bay will be located below ground and finished/reinstated to the required EirGrid specification. The joint bay will have an associated communication chamber and link box which will have a surface access hatch matching existing ground levels. Due to the high number of existing UGC circuits in the assessed location of joint bay 1 the final location can only be determined once consultation with EirGrid and detailed site investigation works have been carried out. The final position of the joint bay, link box and communication chamber will need to be agreed with EirGrid as part of the design approval process. ▪ *Multiple UGC Crossings* Third-party records show that the Ballinagree UGC Wind Farm route runs in Parallel or crosses with several existing HV UGC routes within Section 1. The exact location, depth and arrangement of the existing HV UGC and joint bays and associated chambers will need to be confirmed by detailed survey and site investigation works. It should be noted that there is the possibility that the proximity of the existing HV UGC route may have a mutual de-rating effect on both UGC circuits. The de-rating effect will be minimised by setting and maintaining a minimum separation distance between the cables. Additionally, it should be further noted that along the length of section 1 it will be necessary to cross the existing HV UGC route several times. Any crossing points will need to be identified by detailed survey and site investigation works. The scale of the de-rating effect will need to be considered by detailed design calculation and system modelling. The EirGrid preferred undercrossing method will be used where possible. Where undercrossing of the existing UGC routes is not possible an overcrossing method will be used. All UGC crossings will need to be agreed with EirGrid as part of the design approval process. The UGC crossings have been designed in-line with the EirGrid specifications. ▪ *Culvert Crossings* The UGC route will cross existing culverts using an undercrossing or overcrossing method which will be selected based on the cover available above the culvert. Where it is not possible to cross

Table 2 - Summary of 110kV Underground Cable Route	
Section	**Description**
	under an existing culvert while maintaining the culvert in place, the culvert may be replaced. Culvert crossings have been designed in-line with the EirGrid specifications.
Section 2 1,200m approx.	**UGC within the Local Public Road Network towards the Windfarm Substation** From section 1 the UGC route merges onto the local road which it follows in a north-westerly direction. The proposed Ballinagree UGC route will run in Parallel with another HV UGC route for the full length of section 2. **(For reference see drawings 05843-DR-001 & 05843-DR-002)** Section 2 Features: ▪ *1 No. Joint Bay and associated chambers* The joint bay will be located below ground and finished/reinstated to the required Cork County Council specification. All reinstatement works will be carried out in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. All Joint Bay infrastructure are to be installed within the corridor of the existing carriageway. The link boxes and communication chambers will also be installed in the road carriageways or verges were available. Road widening works may be required to facilitate this joint bay. The final position of the joint bay, link box and communication chamber will need to be agreed with EirGrid as part of the design approval process. ▪ *Culvert Crossings* The UGC will cross multiple existing culverts within section 2 using an undercrossing or overcrossing method which will be selected based on the cover available above the culvert. Culvert crossings have been designed in-line with the EirGrid specifications. Where it is not possible to cross under an existing culvert while maintaining the culvert in place, the culvert may be replaced. All reinstatement works will be carried to the required Cork County Council specification and in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. ▪ *Existing UGC Route Plus Associated Joint Bays and Chambers* Third-party records show that the proposed Ballinagree UGC Wind Farm route runs in parallel with an existing HV UGC route for approximately 1,200 meters. These records indicate that the existing HV UGC route has two joint bays and associated chambers within section 2. The exact location, depth and arrangement of the existing HV UGC and joint bays and associated chambers will need to be confirmed by detailed survey and site investigation works. It should be noted that there is the possibility that the proximity of the existing HV UGC route may have a mutual de-rating effect on both UGC circuits. The de-rating effect will be minimised by setting and maintaining a minimum separation distance between the cables. Additionally, it should be further noted that along the length of section 2 (1,200m parallel section) it may be necessary to cross the existing HV UGC route several times. Any crossing points will need to be identified by detailed survey and site investigation works. The scale of the

Table 2 - Summary of 110kV Underground Cable Route	
Section	**Description**
	de-rating effect will need to be considered by detailed design calculation and system modelling. The EirGrid preferred undercrossing method will be used where possible. Where undercrossing of the existing UGC routes is not possible an overcrossing method will be used. All UGC crossings will need to be agreed with EirGrid as part of the design approval process. The proposed UGC crossings have been designed in-line with the EirGrid specifications.
Section 3 4,344m approx.	**UGC Route within the Local Public Road Network Including Three Bridge Crossings** **(For reference see drawings 05843-DR-001, 002, 003, 004 & 005)** Section 3 starts at the road junction where the existing HV UGC turns right to follows the road north. The Ballinagree UGC route continues in the local road network in a north-westerly/northerly direction making several left and right hand turns to follow the public road network through. The route crosses three, three arch bridge crossing within section 3. <u>Section 3 Features:</u> ▪ *6 No. Joint Bays and associated chambers* These joint bays will be located below ground and finished/reinstated to the required Cork County Council specification. All reinstatement works will be carried out in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. The joint bays will have associated communication chambers and link boxes which will have a surface access hatch matching existing ground levels. All Joint Bay infrastructure are to be installed within the corridor of the existing carriageway. The link boxes and communication chambers will also be installed in the road carriageways or verges were available. Road widening works may be required to facilitate these joint bays, link boxes and communication chambers. The final positions of these joint bays, link boxes and communication chamber can only be decided once detailed site investigation works have been carried out. The final position of the joint bays, link boxes and communication chambers will need to be agreed with EirGrid as part of the design approval process. ▪ *Culvert Crossings* The UGC will cross existing culverts using an undercrossing or overcrossing method which will be selected based on the cover available above the culvert. Culvert crossings have been designed in-line with the EirGrid specifications. Where it is not possible to cross under an existing culvert while maintaining the culvert in place, the culvert may be replaced. ▪ *3 Bridges Crossings* There are three (3), three arch bridge crossing within section 3. 1. Clonaverick Bridge - Laney River – HDD 1 2. Awboy Bridge - Awboy River – HDD 2 3. Coppeleenbawn Bridge - Glashreagh River – HDD 3

Table 2 - Summary of 110kV Underground Cable Route	
Section	**Description**
	All three bridges are in the public road and has insufficient room to install the cable within the bridge deck to EirGrid specification (450mm cover to top of ducts). The design of these bridge is therefore inadequate to accommodate the works using a standard trench design. It is therefore proposed to horizontal directional drill (HDD) under each bridge (See Section 9). Initiating a drill from the launch site within private land on the northwest side of the Laney River (subject to landowner agreement) and reception within the local road network on the southern side of the watercourse. Two further HDD shots will be executed within the existing road corridor. Road widening works may be required to facilitate each individual HDD launch and reception site. The design and final location of the HDD launch/reception areas will need to be confirmed by a specialist drilling contractor following detailed site investigation works including bore holes. The total length of the proposed HDD will be approx. 40m – 100m. The HDD launch/reception pits will be reinstated with a transition coupler or transition chamber. All reinstatement works will be finished/reinstated to the required Cork County Council or landowners' specifications. All reinstatement works will in the public road will be carried out in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. The final position of each individual HDD and possible transition chambers will need to prior agreement with EirGrid as part of the design approval process.
Section 4 1,573m approx.	**UGC Route within the Local Public Road Network towards the Windfarm Substation** **(For reference see drawings 05843-DR-005 & 006)** From Section 3 the UGC route makes a left turn heading again in a north-westerly direct before turning right and remains within the local road network which it follows in a northerly direction. The Ballinagree UGC route will again run in Parallel with another HV UGC route for the full length of section 4. <u>Section 4 Features:</u> ▪ *2 No. Joint Bays and associated chambers* The Joint bays will be located below ground and finished/reinstated to the required Cork County Council specification. All reinstatement works will be carried out in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. Each joint bay will have an associated communication chamber and link box which will have a surface access hatch matching road/ground levels. All Joint Bay infrastructure are to be installed within the corridor of the existing carriageway. The link boxes and communication chambers will also be installed in the road carriageways or verges were available. Road widening works may be required to facilitate these joint bays. The final position of the joint bays, link boxes and communication chambers will need to be agreed with EirGrid as part of the design approval process.

Table 2 - Summary of 110kV Underground Cable Route	
Section	**Description**
	▪ *Culvert Crossings* In section 4 the UGC route will cross several existing culverts using an undercrossing or overcrossing method which will be selected based on the cover available above the culvert. Culvert crossings have been designed in-line with the EirGrid specifications. Where it is not possible to cross under an existing culvert while maintaining the culvert in place, the culvert may be replaced. All reinstatement works will be carried out to the required Cork County Council specification and in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. *1 Existing UGC Route* Third-party records indicate that the Ballinagree UGC Wind Farm route runs in parallel with an existing HV UGC route for the approximately 1,580 meters (the entire length of section 4). These records indicate that the existing HV UGC route does not include any joint bays or associated chambers within section 4. The records available indicate that the Parallel UGC route runs along the western side of the road and mainly in the verge. Again, the exact location, depth and arrangement of the existing HV UGC route will need to be confirmed by detailed survey and site investigation works. It should again be noted that there is the possibility that the proximity of the existing HV UGC route may have a mutual de-rating effect on both UGC's. The de-rating effect will be minimised by setting and maintaining a minimum separation distance between the cables. Again, it should be noted that along the length of section 4 (parallel section) it may be necessary to cross the existing UGC route at least once. The scale of the de-rating effect will need to be considered by detailed design calculation and system modelling. The EirGrid preferred undercrossing method will be used where possible. Where undercrossing of the existing UGC routes is not possible an overcrossing method will be used. All UGC crossing will need to be agreed with EirGrid as part of the design approval process. The UGC crossings have been designed in-line with the EirGrid specifications.
Section 5 2345m approx.	**The UGC Route Continues within the Local Public Road Network towards the Windfarm Substation** **(For reference see drawings 05843-DR-006 & 007)** From section 4 the UGC route makes a right turn and heads in a northerly direct before making a following a series of sharp left and righthand bend before arriving at the entry track to Ballinagree Wind Farm. The UGC route remains within the local road network for the whole of section 5. <u>Section 5 Features:</u> ▪ *3 Joint Bays and associated chambers*

Table 2 - Summary of 110kV Underground Cable Route	
Section	**Description**
	The Joint bays will be located below ground and finished/reinstated to the required Cork County Council specification. All reinstatement works will be carried out in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. Each joint bay will have an associated communication chamber and link box which will have a surface access hatch matching road/ground levels. All Joint Bay infrastructure are to be installed within the corridor of the existing carriageway. The link boxes and communication chambers will also be installed in the road carriageways or verges were available. It is proposed to install all joint bays within the corridor of the existing carriageway. The link boxes and communication chambers may be installed in the road verge. Road widening works may be required to facilitate these joint bays. The final position of the joint bays, link boxes and communication chambers will need to be agreed with EirGrid as part of the design approval process. ▪ *Culvert Crossings* Within section 5 the UGC route will again cross several existing culverts using an undercrossing or overcrossing method which will be selected based on the cover available above the culvert. One of the culverts (Culvert 16 – See 05843-DR-006) along this section the route will cross a large box culvert constructed of concrete and stone with a flat slab concrete roof. There is insufficient cover available in the road above the culvert to cross with a standard trench design. It is therefore a requirement to horizontal directional drill (HDD - 4) under this culvert. This can be executed by aligning the HDD within the existing road corridor to cross beneath the obstacle in the least intrusive manner. Some road widening works may be required to facilitate the HDD launch and reception site, this may include additional temporary works area within the adjacent private lands. The design and final location of the HDD launch/reception areas will need to be confirmed by a specialist drilling contractor following detailed site investigation works including bore holes. The total length of the HDD will be approx. 40m. The HDD launch/reception pits will be reinstated with a transition coupler or transition chamber. All reinstatement works will be finished/reinstated to the required Cork County Council or landowners' specifications. All reinstatement works will in the public road will be carried out in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. The final position of each individual HDD and possible transition chambers will need to prior agreement with EirGrid as part of the design approval process. The remaining culvert crossings have been designed in-line with the EirGrid specifications. Where it is not possible to cross under an existing culvert while maintaining the culvert in place, the culvert may be replaced. All reinstatement works will be carried out to the required Cork County Council specification and in-line with the 'Guidelines for Managing Openings in Public Roads – 2017'. EirGrid's preferred undercrossing method will be used where possible. Where undercrossing of the existing UGC routes is not possible an overcrossing method will be used. All UGC crossing will need to be agreed with EirGrid as part of the design approval process. The UGC crossings have been designed in-line with the EirGrid specifications.

Table 2 - Summary of 110kV Underground Cable Route	
Section	**Description**
Section 6 1600m approx.	**The Final section of the UGC Route turns off The Local Public Road Network and enters the forester access road until reaching the new Ballinagree Windfarm Substation** **(For reference see drawings 05843-DR-007 & 008)** <u>Section 6 Features:</u> ▪ *2 No. Joint Bays and associated chambers* The Joint bays will be located below ground and finished/reinstated to the required landowner specification. Each joint bay will have an associated communication chamber and link box which will have a surface access hatch matching road/ground levels. All Joint Bay infrastructure are to be installed within the corridor of the existing carriageway. The link boxes and communication chambers will also be installed in the access track. Track widening works may be required to facilitate these joint bays. The final position of the joint bays, link boxes and communication chambers will need to be agreed with EirGrid as part of the design approval process. ▪ *Culvert Crossings* In section 6 the UGC route will again cross several existing culverts using an undercrossing or overcrossing method which will be selected based on the cover available above the culvert. Culvert crossings have been designed in-line with the EirGrid specifications. Where it is not possible to cross under an existing culvert while maintaining the culvert in place, the culvert may be replaced. All reinstatement works will be carried out to the required landowner specification. ▪ *UGC Entry Point to Ballinagree Wind Farm Substation* The final entry point and position of the UGC route will be within the new Ballinagree Substation where the cable will transition from the ducted UGC route through a sand pit before rising vertically up to the cable sealing ends. The final location of the route will to be determined by the client in consultation and agreement with EirGrid as part of the design approval process.
Note: The precise location of the cable route may be subject to change as result of existing services/utility locations, ground conditions and any environmental constraints.	

3.0 Preliminary Site Investigations

It will be required to carry out Preliminary site investigations along the cable route prior to construction to confirm design assumptions.

The following items may be carried out for the grid connection cable route:

- Slit trenches at locations of service crossings (Full road/track width).

- Trial holes along the route to ascertain ground conditions and thermal resistivity of the soil.
- Trial holes at all joint bay positions to ascertain ground conditions and thermal resistivity of the soil.
- Boreholes at HDD locations to ascertain ground conditions.

Traffic Management – Single lane Closure with Stop/Go system in place as required.

Equipment:

- 4x4 vehicle
- Concrete vibrator
- Wheeled dumper
- Soil compactor
- 360° tracked excavator (only rubber tracked machines will be allowed on public roads)

4.0 Access Routes to Work Area

The majority of the underground cable will be installed within the public road network and existing access tracks and will therefore be accessed via the existing road network and access points. Where the cable route is located on private lands, contractor(s) will be required to utilise the local public road network in the vicinity of the work area and from there utilise existing access points, where appropriate.

A detailed Traffic Management Plan will need to be prepared, and agreed with Cork County Council, prior to the commencement of construction. Some work areas will require a road closure where it is not possible to safely implement a Stop/Go system. Where road closures are necessary, a suitable diversion will be implemented using appropriate signage, following consultation with Cork County Council.

Careful and considered local consultation will be carried out, to minimise the amount of disturbance caused during works. Prior to the commencement of construction, the contractor will assess all access routes and determine any additional access requirements which will be incorporated as part of the method statement. All plant and equipment employed during the works (e.g. diggers, tracked machines, footwear etc.) will be inspected prior to arrival on site and on leaving site and cleaned where necessary to prevent the spread of invasive aquatic / riparian species.

5.0 Traffic Management

Traffic management and road signage will be in accordance with the Department of Transport: Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works and in agreement with Cork County Council. All work on public roads will be subject to the approval of a road opening license application. The contractor will prepare detailed traffic management plans for inclusion as part of the road opening applications. Where road widths allow, the UGC installation works will allow for one side of the road to be open to traffic at all times by means of a 'Stop/Go' type traffic management system, where a minimum 2.5m roadway will be maintained at all times. Where it is not possible to implement a 'Stop/Go' system a full road closure will be required. Temporary traffic signals will be implemented to allow road users safely pass through the works area

by channelling them onto the open side of the road. The UGC will be usually installed in 100m sections, and no more than 100m will be excavated without the majority of the previous section being reinstated.

All construction vehicles will be parked within the works area so as not to cause additional obstruction or inconvenience to road users or residents. The traffic signals will be in place prior to the works commencing and will remain in place until after the works are completed. The public road will be checked regularly and maintained free of mud and debris. Road sweeping will be carried out as appropriate to ensure construction traffic does not adversely affect the local road condition.

In the event of emergency; steel plates, which will be available on site, can be put in place across the excavation to allow traffic to flow on both sides of the road.

All traffic management measures will comply with those outlined in the accompanying Traffic Management Report and will be incorporated into a detailed Traffic Management Plan to be prepared, in consultation with Cork County Council, prior to the commencement of UGC construction.

6.0 Road Opening Licence

The grid connection works will require a road opening licence under Section 254 of the Planning and Development Act 2000-2015 from Cork County Council. A Traffic Management Plan (TMP) will be agreed with Cork County Council prior to the commencement of the development. The TMP will outline the location of traffic management signage, together with the location of any necessary road closures and the routing of appropriate diversions. Where diversions are required, these will be agreed with Cork County Council in advance of the preparation of the TMP.

7.0 Construction Hours

Standard working hours for construction will be 8.00am to 8.00pm Monday to Friday and 8.00am to 6.00pm on Saturday (if required), with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency. All site personnel will be required to wear project notification labelling on high visibility vests and head protection so that they can be easily identified by all workers on-site.

8.0 UGC Construction Methodology

The UGC will consist of 3 No. 160mm diameter HDPE power cable ducts and 2 No. 125mm diameter HDPE communications duct (plus a 63mm Earth Continuity Conductor Duct between Clashavoon 220kV Substation and Joint Bay 1) to be installed in an excavated trench, The standard trench is 600mm wide by 1,250mm deep, with variations on this design to adapt to bridge crossings, culvert crossings, service crossings and watercourse crossings, etc. The power cable ducts will accommodate 1 No. power cables per duct. The communications duct will accommodate a fibre cable to allow communications between the Ballinagree Wind Farm substation and Clashavoon 220kV substation. The ducts will be installed, and the trench reinstated in accordance with the landowner or Cork County Council specifications, the electrical cabling/fibre cable is then pulled through the installed ducts in sections between joint bays. Construction methodologies implemented and materials used will ensure that the UGC is installed in accordance with the requirements and specifications of EirGrid.

8.1 Trenching Methodology

The following section outlines the methodology to be followed during trenching works:-

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all mitigation and control measures included within the EIAR and as required by planning conditions where relevant;
- All existing underground services along the UGC route shall be confirmed prior to the commencement of construction works;
- At watercourse crossings, the contractor will be required to adhere to the environmental control measures outlined within the EIAR, the detailed Construction Environmental Management Plan (CEMP) and best practice construction methodologies;
- Where the cable route intersects with culverts, the culvert will remain in place (where possible) and the ducting will be installed either above or below the culvert to provide minimum separation distances in accordance with EirGrid and Irish Water specifications;
- In the event that culverts require removal for ducting installation, a suitable method of damming the water source and pumping the water around the work area would be set out in a method statement and agreed with the relevant stakeholders. Once the ducts are installed the culvert will be reinstated to match existing levels and dimensions. If works of this nature are required, the contractor will liaise with Inland Fisheries Ireland in advance of works;
- Traffic management measures will be implemented in accordance with those included in the EIAR, and a detailed Traffic Management Plan will be prepared and agreed with Cork County Council;
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features and all stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW);
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported off site and disposed of at a fully authorised soil recovery site;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 100m section of trench will be opened at any one time. The second 100m will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 1 week per joint bay location.

Figure 2 – Example of 110kV Underground Duct Installation

8.2 Ducting Installation Methodology

For the trenching and ducting works the following step by step methodology will apply for the standard trefoil trench design:

1. Grade, smooth and trim trench floor when the required 1,250mm depth and 600mm width have been obtained.
2. Place bedding layer of Cement Bound Granular Mixture B (CBGM B) material in accordance with the specification and compact it so that the compacted thickness is as per the drawings.
3. Lay the bottom row of ducts in trefoil formation as detailed on the design drawings. Use spacers as appropriate to establish horizontal duct spacing. Fit a secure cap / bung to the end of each duct run to prevent the ingress of dirt or water.
4. Carefully surround and cover ducts with CBGM B in accordance with the design drawings and specifications and thoroughly compact without damaging ducts.
5. Place cable protection strips on compacted CBGM B directly over the ducts.
6. Lay the top row of ducts onto the freshly compacted CBGM B including the cable protection strips above the bottom row of ducts. Place a secure cap at the end of each duct to prevent the ingress of dirt or water.
7. Carefully surround and cover ducts with CBGM B material in accordance with the drawings and thoroughly compact without damaging ducts.
8. Place red cable protection strip on top of compacted CBGM B over each set of ducts as shown on the drawings.
9. Place and thoroughly compact CBGM B material or Clause 804 backfill or soil backfill as specified and place warning tape at the depth shown on the drawings.

10. For concrete and asphalt/bitmac road sections, carry out immediate temporary/permanent reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with local authorities *(Figure 3).*

11. For unsurfaced/grass sections, backfill with suitable excavated material to ground level leaving at least 100mm topsoil or match existing level at the top to allow for seeding or replace turves as per the specification of the local authority or landowner *(Figure 4).*

12. Clean and test the ducts in accordance with the specification by pulling through a brush and mandrel. Install 12mm polypropylene draw rope in each duct and seal all ducts using robust duct end seals fitted with rope attachment eyes in preparation for cable installation at a later date. All the works should be witnessed by EirGrid Clerk of Works (CoW) as required.

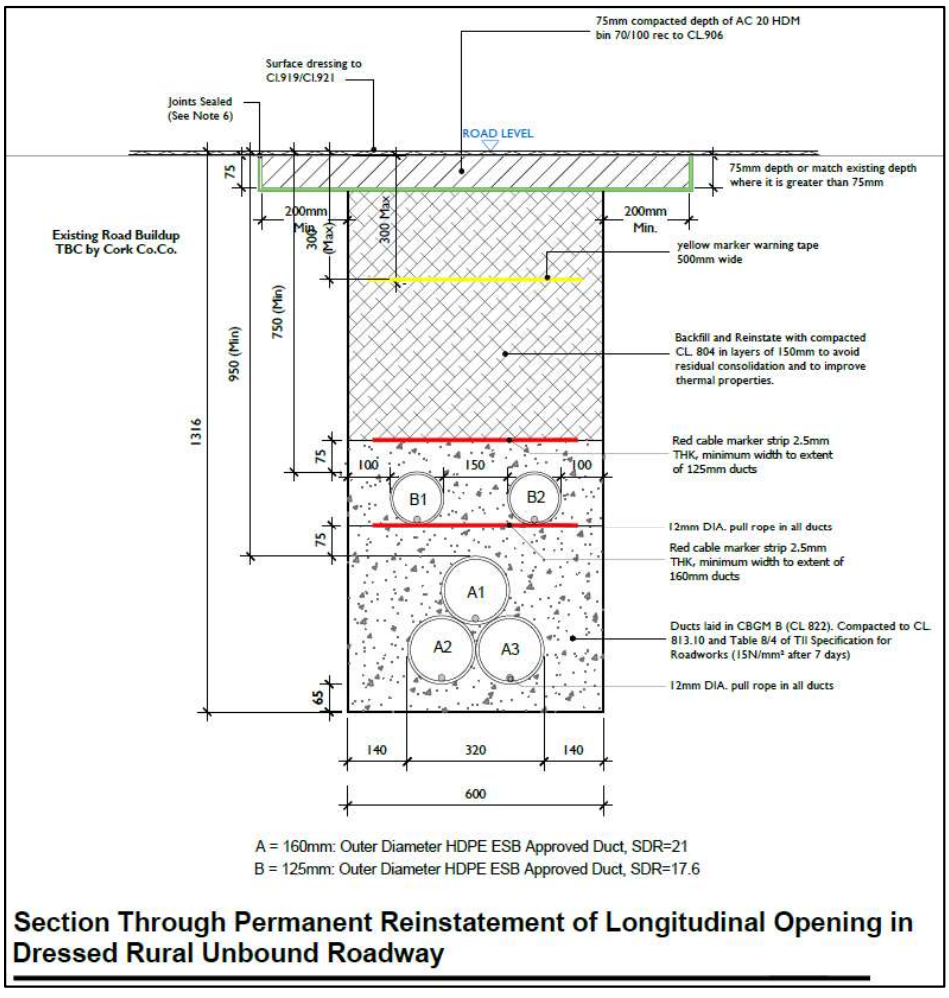

Figure 3 – 110kV Trefoil Trench in Rural Roadway

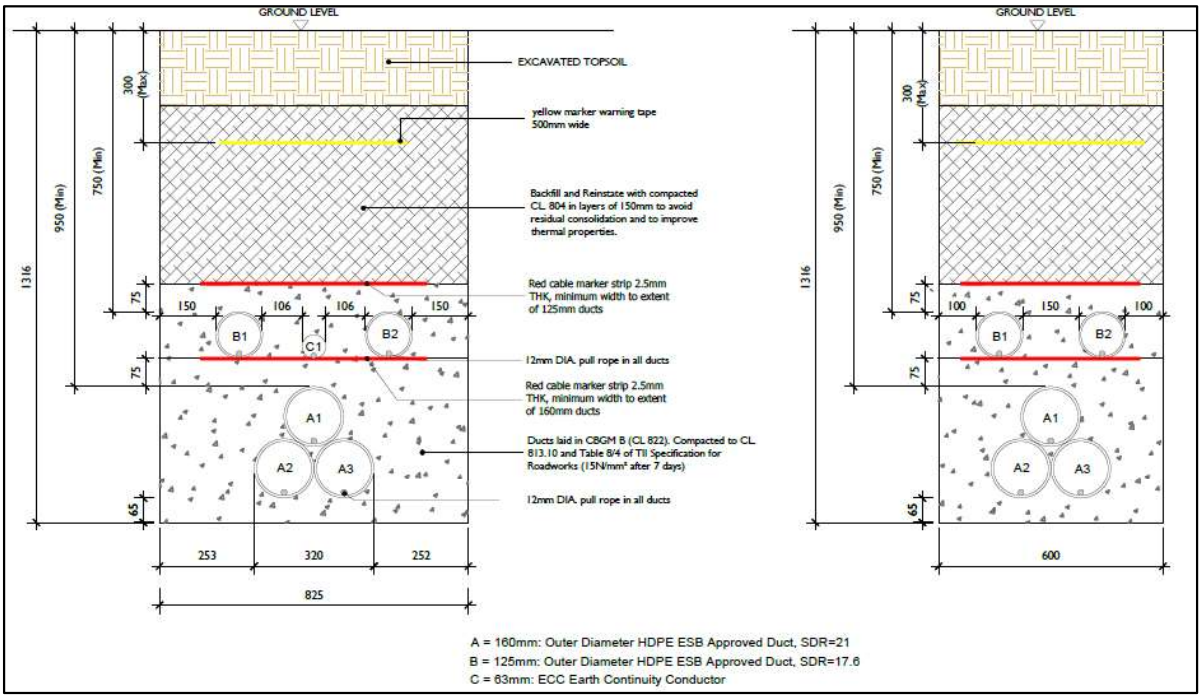

Figure 4 - Trench in Off Road Section

Equipment:

- 2-3 General Operatives;
- 1 Excavator Operator;
- 1 no. tracked excavator (only rubber tracked machines will be allowed on public roads);
- 1 no. dumper or tractor and trailer.

Materials:

- Sand for pipe bedding;
- Ready-mix Concrete where necessary (delivered to site);
- Trench backfilling material (excavated material and aggregates) to relevant specifications;
- 160mm & 125mm diameter HDPE ducting;
- Temporary Surface Reinstatement Materials;

8.2.1 UGC Installation on Public Road

The majority of the 110kV route is located within public road carriages and where applicable the trench will be installed in the non-trafficked strip between the wheel marks on the road. The cable will be micro-sited based on the presence of exiting utilities and the nature of the road and the adjoining terrain. It is preferable to excavate a trench within the middle of the lane, or the middle of the roadway to reduce load on the cable.

8.2.2 UGC Installation on Forestry Tracks

Where the cable is installed in forestry tracks the location where the cable is laid will depend on several factors such as; width of track, bends along the track and crossings. Where the track needs to be widened, stone will be brought in to build up the area to the same level of the track. The excess material from the track will be used elsewhere on reinstatement works.

8.3 Surface Cable Markers & Marker Posts

Surface cable markers will be placed along the route where cable depth is unavoidably shallow, due to constraints such as existing services, to indicate the precise location of the UGC. These markers will be metallic plates in accordance with EirGrid standards.

Marker posts will be used on non-roadway routes to delineate the cable route and joint bay positions. Corrosion proof aluminium triangular danger sign, with 700mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker post shall also be placed in the event that burial depth is not standard. Siting of marker posts to be agreed with EirGrid as part of the detailed design process *(Figure 5)*.

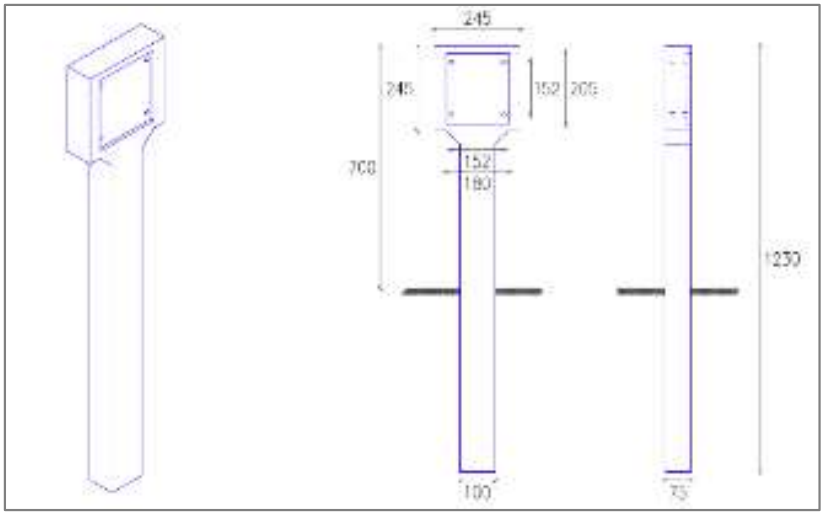

Figure 5 - EirGrid Marker Posts Example

8.4 Managing Excess Material from Trench

All excavated material will be temporarily stored adjacent to the trench prior to re-use in the trench reinstatement (where applicable). Stockpiles will be restricted to less than 2m in height. Excess material and excavated tar, etc. will be transported off site by an appropriately authorised waste collector and disposed of at an appropriately licenced waste facility.

8.5 Storage of Plant and Machinery

All plant, machinery and equipment will be stored on site within the UGC works area or within the temporary construction compounds to be located within the Ballinagree Windfarm. Oils and fuels will be stored in an appropriately bunded area within the temporary construction compounds.

8.6 Joint Bays and Associated Chambers

Joints Bays are to be installed along the UGC route to facilitate the jointing of 3 No. lengths of UGC (see Appendix A, Route Summary for distances between each joint bay). Joint bays are approximately 2.5m x 6m x 1.75m pre-

cast concrete structures installed below finished ground level. Joint bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible.

In association with Joint bays, Communication Chambers are required at every joint bay location to facilitate communication links between the Ballinagree Wind Farm substation and the existing 110kV substation at Clashavoon. Earth Sheath Link Chambers are also required at every joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located in close proximity to Joint bays. Earth Sheath Link Chambers and Communication Chambers will be pre-cast concrete structures with an access cover at finished surface level.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to approval by EirGrid. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.

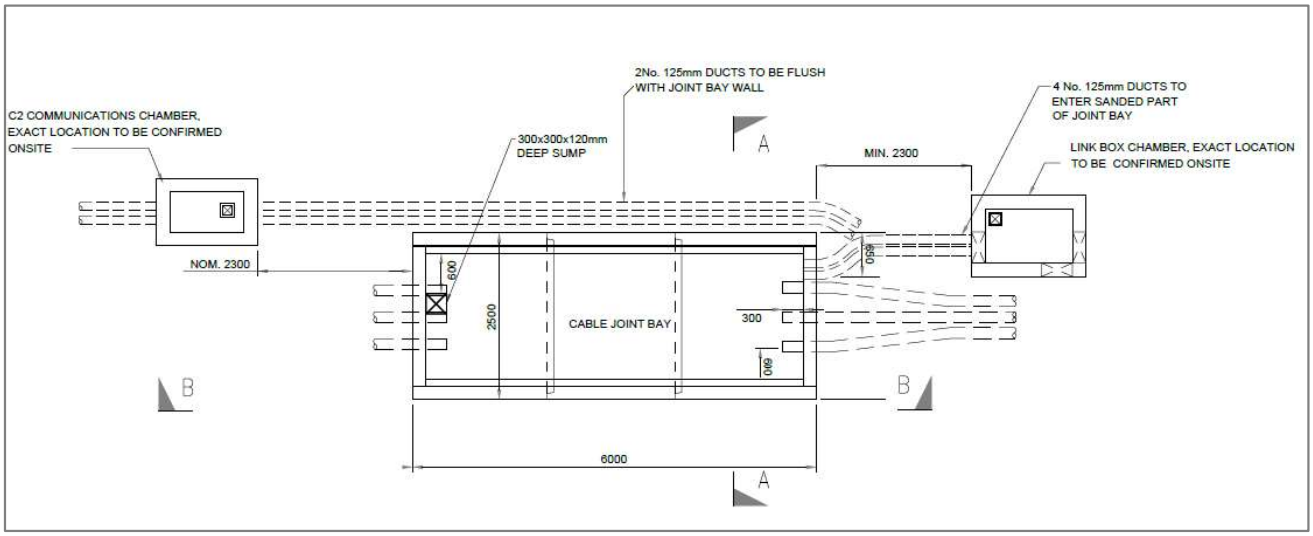

Figure 6 –110kV Joint Bay Plan Layout

8.7 Joint Bay Construction and Cable Installation

Before starting construction, the area around the edge of the joint bay which will be used by heavy vehicles will be surfaced with a terram cover (if required) and stone aggregate to minimise ground damage. Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated during the insertion or which wash out during the works. If the ground slopes from the working area toward a watercourse or if there is evidence of solids washing off the works area toward nearby watercourses or drains, a silt fence with straw bales, will be interposed between the works area and the watercourse.

All excavated material will be stored near the excavations and reused for reinstatement works. Any soil required for reinstatement that will be temporarily stockpiled on site will be placed at least 15m back from the nearest watercourse on level ground and will be ringed at the base by silt fencing and be regularly monitored by a designated competent person for signs of solids escape. In which case an additional line of silt fencing with straw bales will be added in line with the relevant environmental control measures.

If the joint bay needs to be dewatered, this will be pumped to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the dewatering process to comply with the environmental control measures.

The following steps outline the methodology for joint bay construction and reinstatement:

1. The contractor will excavate a pit for joint bay construction, including for a sump in one corner.

2. Grade and smooth floor; then lay a 50mm depth of thick sand for pre-cast concrete construction on 200mm thick Clause 804 granular material.

3. Place pre-cast concrete sections on sand bedding. *(Figure 7)*

Figure 7 – Example of Joint bay under construction (pre-cast)

4. Where joint bays are located under the road surface the joint bay will be backfilled with compacted layers of Clause 804 and the road surface temporarily reinstated as specified by the local authority.

5. Precast concrete covers may be used as temporary reinstatement of joint bays at off road locations. These covers are placed over the constructed joint bay and are then removed at the cable installation stage of the project.

6. At a later date to facilitate cable installation and jointing, reinstate traffic management signage, secure individual sites, re-excavate three consecutive joint bays and store excavated material for reuse.

7. The cable is supplied in pre-ordered lengths on large cable drums *(Figure 8).* Installing "one section" of cable normally involves pulling three individual conductors into three separate ducts. The cable pulling winch must be set at a predetermined cut off pulling tension as specified by the designer. The cable will be connected to the winch rope using approved suitably sized and rated cable pulling stocking and swivel or the pulling head fitted by the cable manufacturer**.** A sponge may also be secured to the winch rope to disperse lubricant through the duct. Lubrication is also applied to the cable in the joint bay before it enters the duct.

Figure 8 - HV cable pulling procedure (Drum set-up example)

8. Once the "two sections" of cable (total of 6 conductors) are pulled into the joint bay, a jointing container is positioned over the joint bay and the cable jointing procedure is carried out in this controlled environment. *(Figure 9)*

Figure 9 - HV cable jointing container

9. Please note that where the cable is to be installed in steep sections of the route the cable may have to be clamped/cleated within the joint bay's either side of the steep section to avoid and future damage caused by the UGC creeping downhill.

10. Following the completion of jointing and duct sealing works in the joint bay, place, and thoroughly compact cement-bound sand in approximately 200mm layers to the level of the cable joint base to provide vertical support. Install additional layers of cement-bound sand and compact each layer until the cement-bound sand is level with the top of the joint. Install an additional 100mm cement-bound sand layer. Install cable protection strip. Backfill with cement-bound sand to a depth of 250mm below surface and carry out permanent reinstatement including placement of warning tape at 400mm depth below finished surface.

Equipment:

- 2-3 General Operatives
- 1 Excavator Operator
- 360˚ tracked excavator (13 ton normally, 22 ton for rock breaker)
- 1 no. tracked dumper or tractor and trailer

Materials:

- Sand for pipe bedding
- Clause 804 Material
- 160mm diameter HDPE ducting;
- 125mm diameter HDPE ducting;
- 63mm ECC Duct – (Clashavoon 220 Substation to Joint Bay 1)
- Precast Joint Bay Chamber Units
- Link Boxes & C2 Communication Chambers (precast)

9.0 Horizontal Direction Drilling (HDD)

Horizontal Direction Drilling (HDD) is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. There are thee bridges and one culvert on this UGC route which will require HDD due to there being insufficient cover and depth in the bridge to cross within the bridge deck.

Detailed site investigation works will be completed at each of the HDD locations to confirm ground conditions. This information will be obtained by completing boreholes at each location, the results from the borehole data will be used to design the HDD and crossing depths. A bespoke design will be prepared for each HDD crossing by a specialist drilling contractor. Each individual HDD design will be subject to prior EirGrid review and approval. As part of each HDD design an Outline Frac-Out Mitigation Plan will be prepared by the contractor which will detail the measures which will be implemented to prevent, contain, control and stop any frac-out. A sample 'HDD outline Frac-Out Mitigation Plan' is shown in Appendix B of this report.

The drilling methodology is as follows:

1. A works area of circa. 40m^2 will be fenced on both sides of the river crossing,
2. The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
3. Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
4. A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
5. The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
6. A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
7. The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
8. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
9. Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.

10. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
11. The ducts will be cleaned and proven and their installed location surveyed.
12. The entry and exit pits will be reinstated to the specification of ESB Networks, EirGrid and Cork County Council.
13. A transition coupler or transition chamber will be installed at either side of the obstacles following the horizontal directional drilling as per EirGrid requirements, this will join the HDD ducts to the standard ducts.

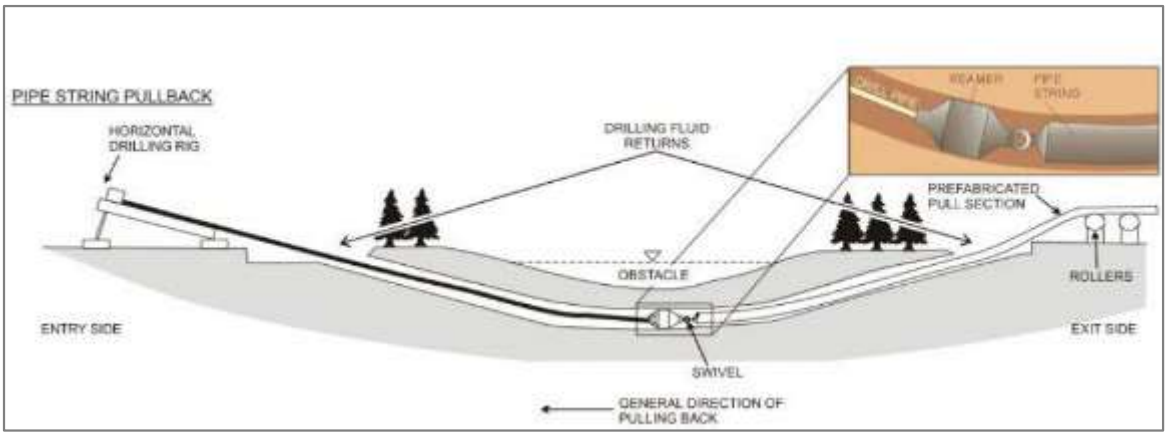

Figure 10 - Example of HDD Installation

10.0 Watercourse Damming and Reinstatement Methodology

Sections of trenching and ducting will involve instream works at numerous culvert crossing locations in order to install cabling. To facilitate the works, these watercourses will be dammed and the water diverted over or around the works using either a flume pipe or a diversion channel. Following the completion of works at the watercourse, the dam will be removed and the watercourse reinstated.

Duration: 1-2 Days per location

Personnel, Machinery & Equipment:

- 2-3 operatives
- Wheeled dumper or track dumper (6 to 8 tons)
- 360˚ tracked excavator

Materials:

- Pipe culvert
- Box culvert
- Cable ducting and trenching backfill
- Sand bags
- Water pump
- Geotextile membrane
- Straw bales

Standard Methods - Dam & Flume Work:

1. The flume pipe(s) will be set out on the bed of the existing stream.

2. A dam will be constructed using sand bags and suitable clay material around the flume pipe(s) and across the stream so that all the flows are diverted through the pipe(s).

3. Silt traps, such as geotextile membrane, straw bales etc. will be placed downstream of the in-stream trenching location prior to construction, to minimise silt loss.

4. The ducting installation works will be carried out in the dry stream bed and under/around the flume pipe(s). If required, a temporary sump will be established and used to collect any additional water. This water will be removed by pumping to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the de-watering.

Standard Methods - Dam & Divert Work:

1. A suitable channel for the stream will be excavated adjacent to the original channel.
   Bedding stone will be placed on the bed of the new channel.

2. A dam will be constructed using sandbags and suitable clay material across the stream so that the flow is diverted down the new channel.

3. Silt traps, such as geotextile membrane, straw bales etc. will be placed downstream of the in-river trenching location prior to construction, to minimise silt loss.

4. The trench will be excavated in the dry stream bed. If required, a temporary sump will be established and used to collect any additional water. This water will be removed by pumping to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the de-watering.

Standard Methods - Reinstatement of the Watercourse at Dam and Flume Locations:

1. Following the completion of works, the stream bed will be reinstated with original or similar material and the spawning gravels replaced under the supervision of an aquatic ecologist.

2. Once the stream bed is appropriately re-instated the dam and the flume pipe(s) will be removed thus restoring the stream to its original condition.

Standard Methods - Reinstatement of the Watercourse at Dam and Divert Locations:

1. Following the installation of the cable ducts, the stream bed will be reinstated with original or similar material and the spawning gravels replaced under the supervision of an aquatic ecologist.

2. Once the stream bed is appropriately reinstated, the dam will be removed thus restoring the stream to its original alignment.

3. The temporary channel will then be reinstated with the previously excavated material.

11.0 Replacement of Existing Culverts

The grid connection route extends approximately 11.307km mainly along local roads and an unpaved forestry access road. There are currently nineteen known culverts along the route. Of these culverts, most appear to be

either concrete pipe, HDPE twinwall pipe or stone construction, most of which are on the public road. Where there is insufficient cover over the culvert, it will be necessary to trench under the culvert. It should be again noted that the EirGrid preferred method of crossing third party services/culverts is undercrossing. For stone culverts there is a high probability that the culvert would collapse sending stream water into the trench. To avoid this occurring, stone culverts with insufficient cover will be identified and replaced prior to trenching works. The following approach will be taken:

1. Works will be supervised by the ECoW and / or the project aquatic ecologist who will liaise with IFI and National Parks and Wildlife Service (NPWS) prior to works commencing. The ECoW will also monitor surface water quality downstream of the works in accordance with the surface water monitoring programme and will have the authority to cease any works should the monitoring identify unacceptable water quality conditions.

2. Any works within watercourses that are subject to fish habitat (indicated in the EIAR at least of "Medium" sensitivity), will be avoided between Oct 1st and April 30th as per IFI and Loughs Agency guidelines.

3. All plant and equipment will be serviced and cleaned before entry to site to limit risk of oil spillage and for biosecurity.

4. Where temporary fluming or flow diversion are in situ, in a watercourse frequented by salmon or trout, (at least medium sensitivity) all fish within the designated area will be subject to fish rescue and translocation downstream by a fisheries biologist. Fish rescue will be conducted under Section 14 authorisation (DCCAE/ IFI) or Section 69 authorisation (Loughs Agency) where appropriate.

5. Works will be carried out in dry weather with low flows in the streams with forecast for dry weather for the duration of the works – approximately 2 days.

6. Machinery used will stay on the public road; machinery will not be permitted to enter the stream channel.

7. The road edge adjacent to the watercourse will be lined with sandbags and silt fences (multiple fences recommended) as appropriate to prevent runoff from the trenching works reaching the stream. The design of these multiple features shall also allow for the safe removal of accumulated silt away from the channel, particularly through staged removal of the most contaminated upper fence before the lower ones, and the removal of the final fence only when it is clear of any silt

8. Clean sandbags will be used to dam flows on the upstream side of the culvert. Sandbags will be placed by hand at a suitable location to take advantage of any natural pool but set back from the works to permit unhindered excavation of the existing culvert.

9. A second sandbag dam will be placed on the downstream side of the culvert to prevent backflow into the works and contain any groundwater seepage that is likely to be turbid.

10. Sandbagging requires careful attention to detail if it is to be effective. All bags must be laid neck uppermost and seams aligned. Bags must not be overfilled or they will not tamp together or will burst with ease. Additional bags will be filled ready to raise freeboard of dams.

11. Flume placement for temporary flow diversion or permanent replacement of culverts will follow guidelines issued by IFI and CIRIA to ensure that fish passage is not impeded.

12. If topography permits, the water will be piped over the road by gravity flow, otherwise, it will be pumped. Discharge will be via break tank or similar approved storage onto a splash-plate or rip-rap (gabion basket) to dissipate energy and avoid scour or erosion of the stream bend or banks. The pump will be filled with a screen, so fish aren't drawn into the pump intake.

13. The use of pump sumps will be considered within the dammed area. These will be lined to prevent scouring. The intention is to intercept clean groundwater ingress and pump it out rather than allowing it to get silted in the works area by segregating off areas.

14. Any spoil generated will be removed to designated safe area clear of the flood plain. Some of this spoil will be saturated and will require bunding and sheeting over.

15. If bank material needs to be removed it will be stored separately and reinstated according.

16. The ducting will be advanced passed the culvert and the existing culvert will be excavated 'in the dry' and a new culvert, sized for a 100-year rainstorm event, will be installed with appropriate gradient, headworks and outfall. A precast concrete culvert, concrete pipe or HPDE pipe will be used. Culverts will be embedded to at least 300mm below the existing stream bed to ensure backwatering. Culverts will avoid a significant change in gradient (i.e. >3%). After embedding, replacement culverts will be filled with clean washed gravels and cobbles to replace lost habitat and facilitate fish movement.

17. Dry stone headworks will be placed at the culvert intake and discharge and the stream bed adjacent to the works will be reinstated at the direction of the project aquatic ecologist.

18. The ECoW will determine the quality of any water trapped between the two dams – visual inspection and turbidity meter. If this water is clean it will be left in situ. If it is not clean, it will be removed from the works area prior to removal of the dams. If required, dewatering of the works area prior to dam removal will be undertaken by pumping from the stream bed to either a) the cable trench for percolation or b) taken back to the wind farm site for treatment at an existing settlement pond or c) treatment using a Siltbuster. The most efficient method will depend on the volume of water present and the available percolation.

19. The upstream dam will then be removed to permit flow though the new culvert. This will be done in phases, so a large volume of water isn't released at once. The downstream dam will be removed in a similar manner.

12.0 Relocation of Existing Services

In order to facilitate the installation of the underground cable, it may be necessary to relocate existing underground services such as water mains or existing cables. In advance of any construction activity, the contractor will undertake detailed surveys and scans of the route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

13.0 Watercourse Crossings

The grid connection cable route contains 3 No. bridge watercourse crossings and one large culvert crossing which will be completed using horizontal directional drilling (HDD) (refer to Section 9 above for further details). Where the cable route intersects with existing watercourses, a detailed construction method statement will

need to be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies.

A number of other minor watercourses crossing locations have been noted along the cable route, i.e. culverts, pipe drains and minor field drains. Crossing of these existing culverts will be as per undercrossing or an overcrossing methods, depending on the depth of the culvert or using open trenching. A detailed site survey of all culverts will need to be completed as part of the next phase of the project prior to construction. The culvert crossing methods are detailed in *Figures 11* and *12*.

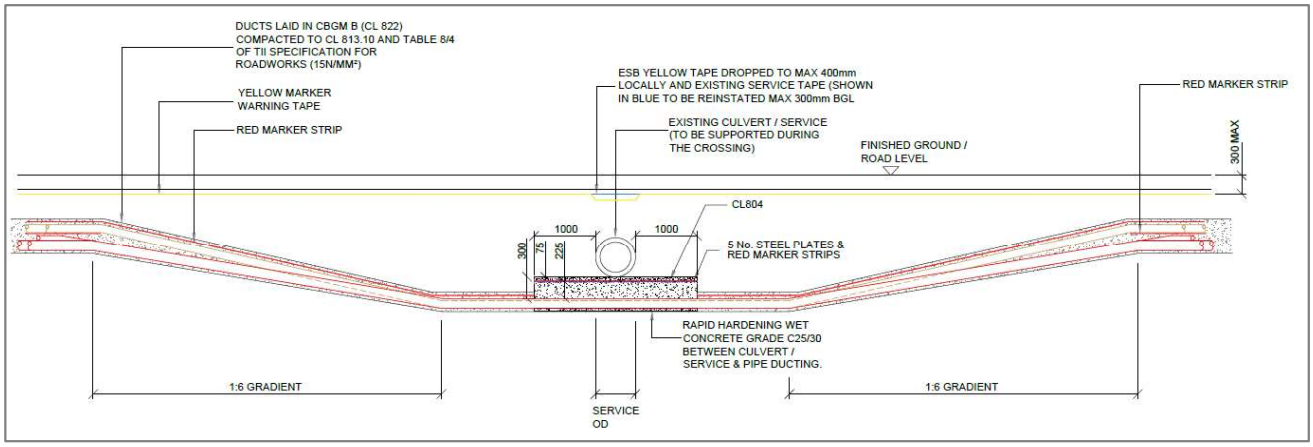

Figure 11 – 110kV UGC Culvert Undercrossing

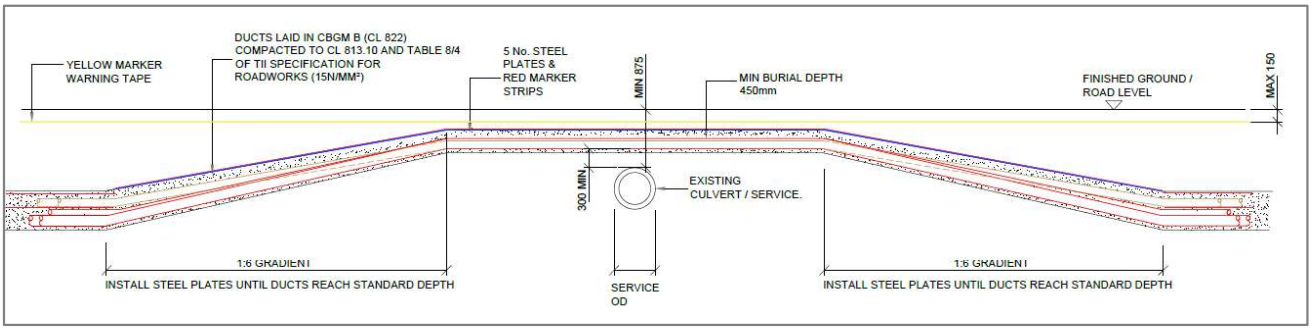

Figure 12 – 110kV UGC Culvert Overcrossing

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites", and these guidelines will be adhered to during the construction of the development.

14.0 HV Underground Cable (UGC) Crossings & Parallel Runs

As mentioned in **Table 2** above there are several locations where the Ballinagree UGC route will have to cross other existing HV UGC route. These crossing and parallel runs occur in **Sections 1**, **2**, and **4** (see Table 2 for details)**.** Each individual crossing and parallel run will need to be individually access on a case-by-case basis. Site investigation works along with detailed surveying techniques and consultation with EirGrid will be required to determine the locations depths and configurations and ratings of the existing

UGC routes. Once these details are determined then cable rating studies and system modelling can be carried out to determine how best to proceed with the UGC route design in these areas.

It bears repeating that there is the high probability that the proximity (both in parallel and in crossing) of the existing HV UGC routes may well have a mutual de-rating effect on both UGC circuits. The de-rating effect will be minimised by setting and maintaining a minimum separation distance between the cables. The scale of the de-rating effect will need to be considered by detailed design calculation and system modelling. The EirGrid preferred undercrossing method will be used where possible. A crossing method can be seen in *Figure 13* below. Where undercrossing of the existing UGC routes is not possible an overcrossing method will be used. All UGC crossings will need to be agreed with EirGrid as part of the design approval process. The UGC crossings have been designed in-line with the EirGrid specifications.

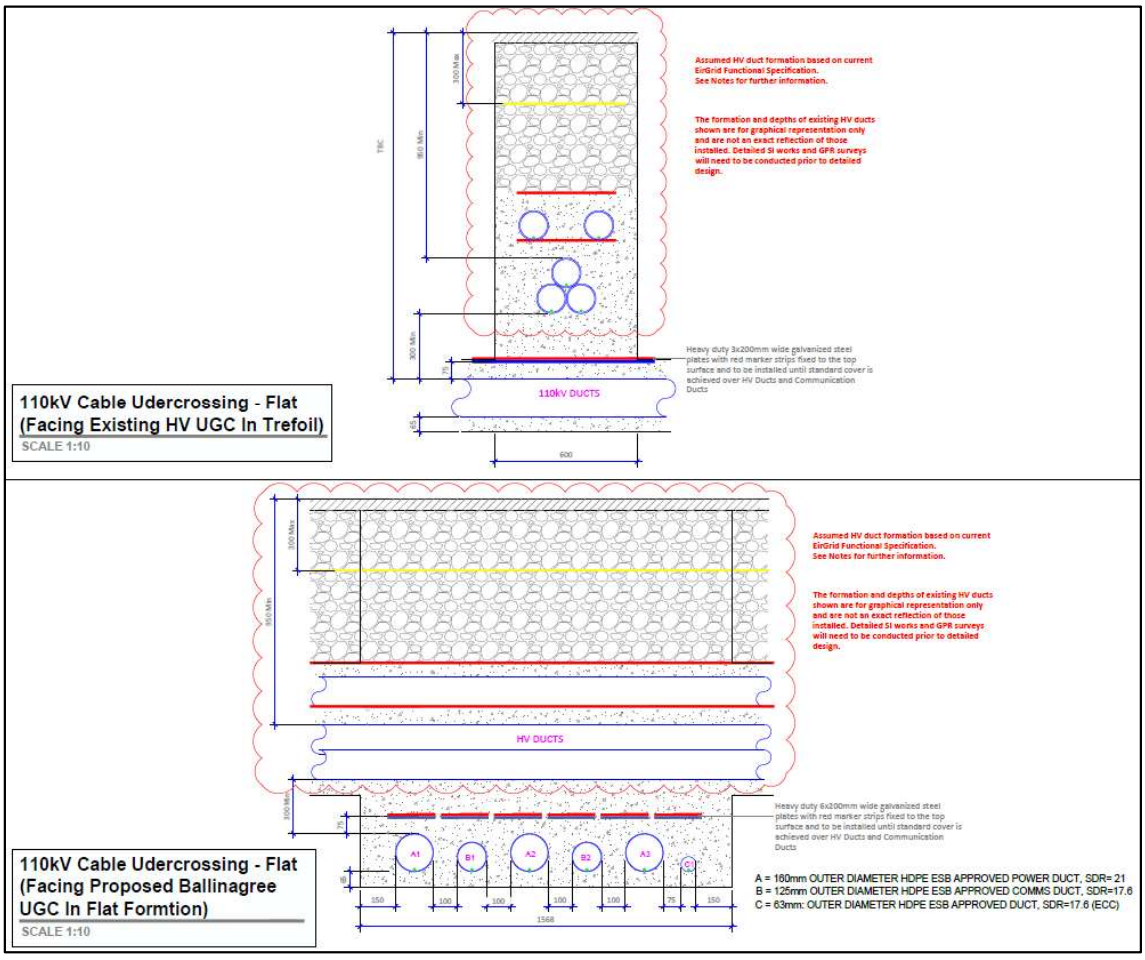

Figure 13 – Example of 110kV UGC Cable Undercrossing in Access Track

15.0 Reinstatement of Private Land

Once all construction works are complete, the work areas will be reinstated with excavated soil and either seeded out with native species, allowed to vegetate naturally or reinstated with excavated grass turves and will be restored to their original condition. This work will be carried out in in consultation with the landowner and in line with any relevant measures outlined in the planning application, CEMP and planning conditions.

16.0 Best Practice Design and Construction & Environmental Management Methodology

Prior to commencement of construction works the contractor will draw up detailed Method Statements which will be informed by this Outline Construction Methodology, environmental protection measures included within the planning application, measures within the CEMP, and the guidance documents and best practice measures listed below. This method statement will be adhered to by the contractors and will be overseen by the Project Manager, Environmental Manager and ECoW where relevant.

The following documents will contribute to the preparation of the method statements in addition to those measures below: -

- Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland*, Dublin,*
- *National Roads Authority (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin;
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects.* Technical guidance (C648). CIRIA;
- E. Murnane et al., (2006) *Control of water pollution from linear construction projects*. Site guide (C649). CIRIA.
- Murphy, D. (2004) Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board, Dublin;
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532);
- Enterprise Ireland (unknown). *Best Practice Guide (BPGCS005) Oil storage guidelines;*
- Law, C. and D'Aleo, S. (2016) *Environmental good practice on site pocket book*. (C762) 4th edition. CIRIA;
- CIRIA *Environmental Good Practice on Site (fourth edition) (C741) 2015*.

The works will be carried out by employing accepted good work practices during construction, and environmental management measures such as those discussed below. Please note that the following measures will be supplemented by further specific environmental protection measures that will be included in method statements prepared for specific tasks during the works and will form part of the detailed CEMP.

- All materials shall be stored at the temporary compound within the Ballinagree Wind Farm site and transported to the works zone immediately prior to construction;
- Where drains and watercourses are crossed with underground cables, the release of sediment will be prevented through the implementation of best practice construction methodologies.
- Weather conditions will be considered when planning construction activities to minimise risk of run off from site;
- Provision of 50m exclusion zones and barriers (silt fences) between any excavated material and any surface water features to prevent sediment washing into the receiving water environment;
- If dewatering is required as part of the works e.g. in trenches for underground cabling or in wet areas, water must be treated prior to discharge;
- The contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase;

- If very wet ground must be accessed during the construction process bog mats/aluminium panel tracks will be used to enable access to these areas by machinery. However, works will be scheduled to minimise access requirements during winter months;
- The contractor shall ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, with the Contractor required to prepare a contingency plan for before and after such events;
- The contractor will carry out visual examinations of local watercourses from the works during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted;
- Excavations will be left open for minimal periods to avoid acting as a conduit for surface water flows.
- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures.
- Appropriate containment facilities will be provided to ensure that any spills from vehicles are contained and removed off site. Adequate stocks of absorbent materials, such as sand or commercially available spill kits shall be available;
- Concrete or concrete contaminated water run-off will not be allowed to enter any watercourses. Any pouring of concrete (delivered to site ready mixed) will only be carried out in dry weather. Washout of concrete trucks shall be strictly confined to a designated and controlled wash-out area within the Wind Farm site; remote from watercourses, drainage channels and other surface water features;
- A designated trained operator experienced in working with concrete will be employed during the concrete pouring phase;
- Concrete waste water can be pumped into a skip to settle out; settled solids will need to be appropriately disposed of off-site;
- Wash-down water from exposed concrete surfaces, will be trapped to allow sediment to settle out and reach neutral pH before clarified water is released to the drain system or allowed to percolate into the ground;
- Where dust suppression is considered to be required by the Contractor, such requirements and methodology shall be subject to the agreement with the Ecological Clerk of Works;
- Entry by plant equipment, machinery, vehicles and construction personnel into watercourses or wet drainage ditches shall not be permitted. All routes used for construction traffic shall be protected against migration of soil or waste water into watercourses;
- Cabins, containers, workshops, plant, materials storage and storage tanks shall not be located near any surface water channels and will be located beyond the 50m hydrological buffer at all times.

17.0 Invasive Species Best Practice Measures

Invasive species can be introduced into a location by contaminated plant, machinery and equipment which were previously used in locations that contained invasive species. Good site organisation and hygiene management shall be maintained always on site, and best practice measures will be implemented, as follows:

- The contractor will prepare an Invasive Species Action Plan to be implemented during construction, and all personnel will be made aware of the requirements contained within;
- Plant and machinery will be inspected upon arrival and departure from site and cleaned/washed as necessary to prevent the spread of invasive aquatic / riparian species such as Japanese knotweed

Fallopia japonica and Himalayan Balsam *Impatiens glandulifera*. A sign off sheet will be maintained by the contractor to confirm the implementation of measures;

- Site hygiene signage will be erected in relation to the management of non-native invasive material.

18.0 Waste Management

All waste arising during the construction phase will be managed and disposed of in a way that ensures the provisions of the Waste Management Act 1996 and associated amendments and regulations and the Waste Management Plan. Soil will be reinstated into trenches where possible. In the event, there is excess material with no defined purpose, it will be transported to an authorised soil recovery site.

Appendix A – Route Summary

Section From	*Section To*	*Section Length (m)*	*Bonding Arrangement*	*No. of Watercourses*	*Watercourses*	*No. of Bridges*	*Bridges*	*Location Drawing Ref.*
Clashavoon SS	JB-01	230	Single point Bonded	2	C1, C2 Existing Surface Water (EXS) Substation infrastructure	-	-	05843-DR-002
JB-01	JB-02	830	Cross-bonded	5	C3, C4, C5, C6, C7	-	-	05843-DR-002/003
JB-02	JB-03	809	Cross-bonded	3	C8, C9, C10	-	-	
JB-03	JB-04	837	Cross-bonded	1	C11	-	-	
JB-04	JB-05	692	Cross-bonded	1	C12	-	-	05843-DR-003/004
JB-05	JB-06	720	Cross-bonded	1	B1 - Clonavrick Bridge, Laney River HDD	1	B1	
JB-06	JB-07	727	Cross-bonded	0		-	-	
JB-07	JB-08	822	Cross-bonded	1	B2 - Awboy Bridge over River Awboy - HDD	1	B2	05843-DR-004/005/006
JB-08	JB-09	794	Cross-bonded	2	B3 - Coppeleenbawn Bridge - River Glashreagh - HDD, C13	1	B3	
JB-09	JB-10	795	Cross-bonded	2	C14, C15	-	-	
JB-10	JB-11	648	Cross-bonded	0		-	-	05843-DR-006/007
JB-11	JB-12	675	Cross-bonded	1	C16 - Concrete culvert 1300mm D x 1900mm W 200mm slab, 450mm cover	-	-	
JB-12	JB-13	653	Cross-bonded	1	C18	-	-	
JB-13	JB-14	683	Cross-bonded	0		-	-	05843-DR-007/008
JB-14	JB-15	692	Cross-bonded	1	C19	-	-	
JB-15	Ballinagree SS	700	Cross-bonded	1	C20	-	-	
	Total:	**11,307**		**22**		**3**		

Appendix B – Sample HDD Outline Frac-Out Mitigation Plan

HDD Outline Frac-Out Mitigation Plan

All HDD personnel to be briefed and fully conversant with this **Frac-Out Mitigation Plan** prior to works commencing. There are four stages to the management of a frac-out which will be implemented as follows: -

1) Prevention **2) Containment** **3) Control** **4) Stop**

Methods for Mitigating Hydro-Fracture

1 Prevention

A hydrofracture or 'frac-out' is the unintentional return of drilling fluids to the surface during HDD. A frac-out occurs when the down hole mud pressure exceeds the overburden pressure (i.e. shallow or loose sections of the bore), or the fluid finds a preferential seepage pathway (such as fault lines and fractures, infrastructure or loose material). These fractures can be natural or induced by over-pressurising the formation. Most frac-outs are usually minor, within works easements and close to the bore entry or exit.

Drilling fluid is comprised primarily of water and approximately 1 to 3% bentonite, a naturally occurring clay mineral, so it is, in most circumstances, a non-toxic, benign fluid, except when suspended within a water body where it can harm ecology. The risk of inadvertent fluid returns should be reduced through competent design and good practices.

Annular fluid pressures are minimised by constant monitoring of the drilling fluid parameters.

- The Fluids Technician will monitor drill fluid density, viscosity and solids content on a regular basis, **(half-hourly)**, to ensure that the fluid does not increase in viscosity, requiring additional pressure to maintain mobility.
- The Driller will monitor the drill fluid pressures, volumes, viscosities and densities of mud being pumped through the bore. Any increases in pump pressure will be investigated immediately to prevent the risk of pressure build up within the annulus.
- The Fluids Technician will monitor active fluid tank volumes and account for any unexpected changes (The drill fluid is designed to allow water loss in porous formations in order to build filter cake).
- The bore hole will be reamed on a regular basis to keep the annulus clear. Rates of Penetration and circulated cuttings volumes will be monitored to ensure that drilled cuttings are being flushed from the bore and are not building up creating pressure restrictions.
- Annular fluid velocity will be kept below critical velocity to prevent eddying and subsequent erosion caused by turbulent flow. When drilling clay based formations (which may be present), inhibitors may be used to prevent the absorption of water and subsequent swelling of the formations.
- A **Frac-Watch** programme will be operated at all times whilst circulating, particularly when drilling past potential pathways
- The **Frac-Watch** programme will ensure that the ground surface above the drilling path will be inspected throughout the HDD process. Spotters will be responsible for the monitoring (numbers dependant on drill length and location topography etc.)

HDD drilling fluid returns to be monitored. Risk of hydro-fracture to be mitigated through monitoring and HDD fluid selection. Methods of monitoring include: -

Operational (This will be undertaken throughout HDD process)

- *Full briefing of personnel prior to HDD operation (Mitigation Plan)*
- *Personnel will be assigned to specific tasks and be fully conversant with procedures in Mitigation Plan*
- *Follow best drilling practices (HDD Design)*
- *Monitor & control mud weights*

- *Maintain effective fluid properties*
- *Monitor pressures on HDD rig*
- **Frac-Watch** - *Visual monitoring of returns at both launch and reception pits*
- **Frac-Watch** - *Spotters to be deployed*
- **Frac-Watch** - *Spotters to have two-way radios, along with launch and reception teams (close monitoring and direct communication ensures swift reaction)*
- **Frac-Watch** – Driller to inform spotters of progress of drill so that they know location of drill head/reamer (i.e. Joint 1, 2, 3.etc.)

2 Containment

Contingencies are in place to deal with potential frac-outs when drilling operations commence. If a frac-out occurs, drilling operation to be suspended temporarily and assessment of location and severity to be carried out.

a. The rig and pumps will immediately be shut off

b. The drilling assembly will be pulled off bottom to reduce annular pressures

c. Once shut down procedure is complete, the frac-out will be contained by all site personnel as-quickly-as possible by any one of the measures listed below where applicable.

Physical (This will be undertaken if a frac-out occurs)

The following is to be stored at the **Entry Site** and **Exit Site**.

- Sandbags – use to contain sediment, deploy at source. Frac-out may occur some distance from the bore path. Sand Bags will be available to control drill fluid at surface
- 1 x roll of Polyethylene
- Tractor & bowser
- Pumps

d. Client Site Manager to be notified as-soon-as possible.

3 Control

The freshwater based, bentonite suspension, drill fluid systems utilised are, essentially, low viscosity grouts. In most cases, the fracture pathways will quickly seal up. Frac-out is likely to indicate that the bore hole requires reaming to reduce the pressure required to return drill fluid to surface.

Once the frac-out has been contained a swab-trip may be sufficient to prevent further frac-out and re-establishment of fluid returns. Lost Circulation Material (LCM) drill fluid additives will be available to seal fractures in the formation.

After an assessment has been conducted following a frac-out the following control measures should be implemented as follows: -

a) Re-Circulation Attempt (This will be undertaken if a frac-out occurs)

- The pilot bore or reaming operation will be retracted away from the frac-out to try and re-establish fluid returns. This may require the complete extraction of the drill string and a re-drill if necessary.

b) Mechanical (This will be undertaken if a frac-out occurs)

This will be carried out via fluid mixing system and pumped down drill string to frac-out.

- Physical plugging by Loss of Circulation Material (LCM), Enviro Formfill to be utilised as-soon-as possible to manufacturer's specification.

4 Stop Procedure (If sections 1, 2, & 3 are unsuccessful)

If any of the measures outlined in sections 1, 2, & 3 are unsuccessful then drilling operation will be suspended.

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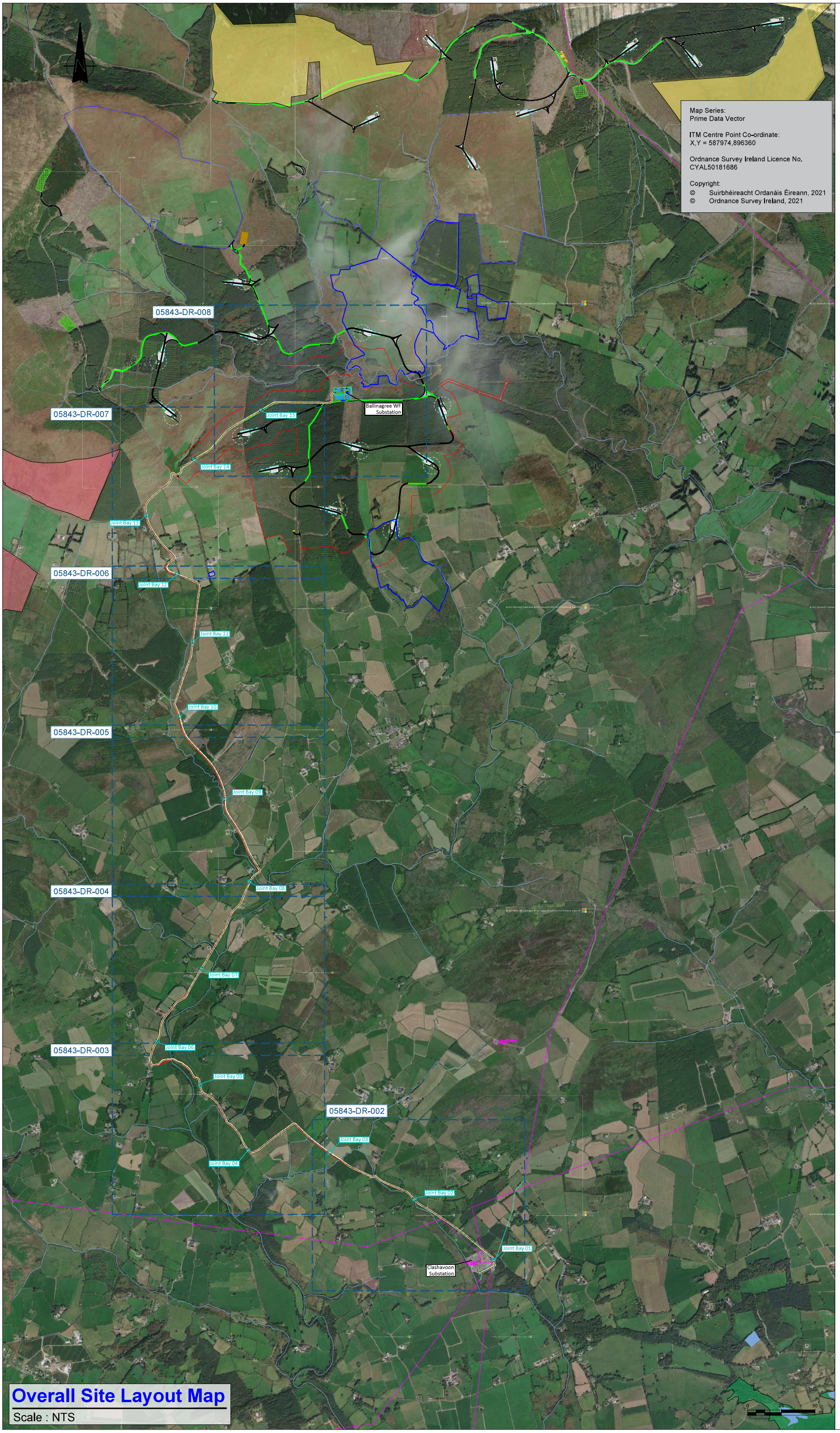

LEGEND: -

- Proposed 110kV UGC Route (11.307km)
- Existing Rivers & Streams
- Existing ESB OHL & UGC HV Network
- Special area of Conservation
- Natural Heritage Areas
- Proposed Natural Heritage Areas
- Proposed Red Line Boundary

NOTES: -

- This drawing is to be used only for the purpose of the planning application and is subject to detailed design.
- Position of underground cable and location of joint bays, links boxes and comms chambers may vary depending on site conditions.
- Position of link boxes and comms chambers is to be agreed onsite with EirGrid/ESB.
- Other services may be encountered on the route.

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PROJECT

Ballinagree Windfarm
110kV Grid Connection

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05-843

SHEET TITLE

Overall Site Layout Map

SHEET NUMBER

05843-DR-001

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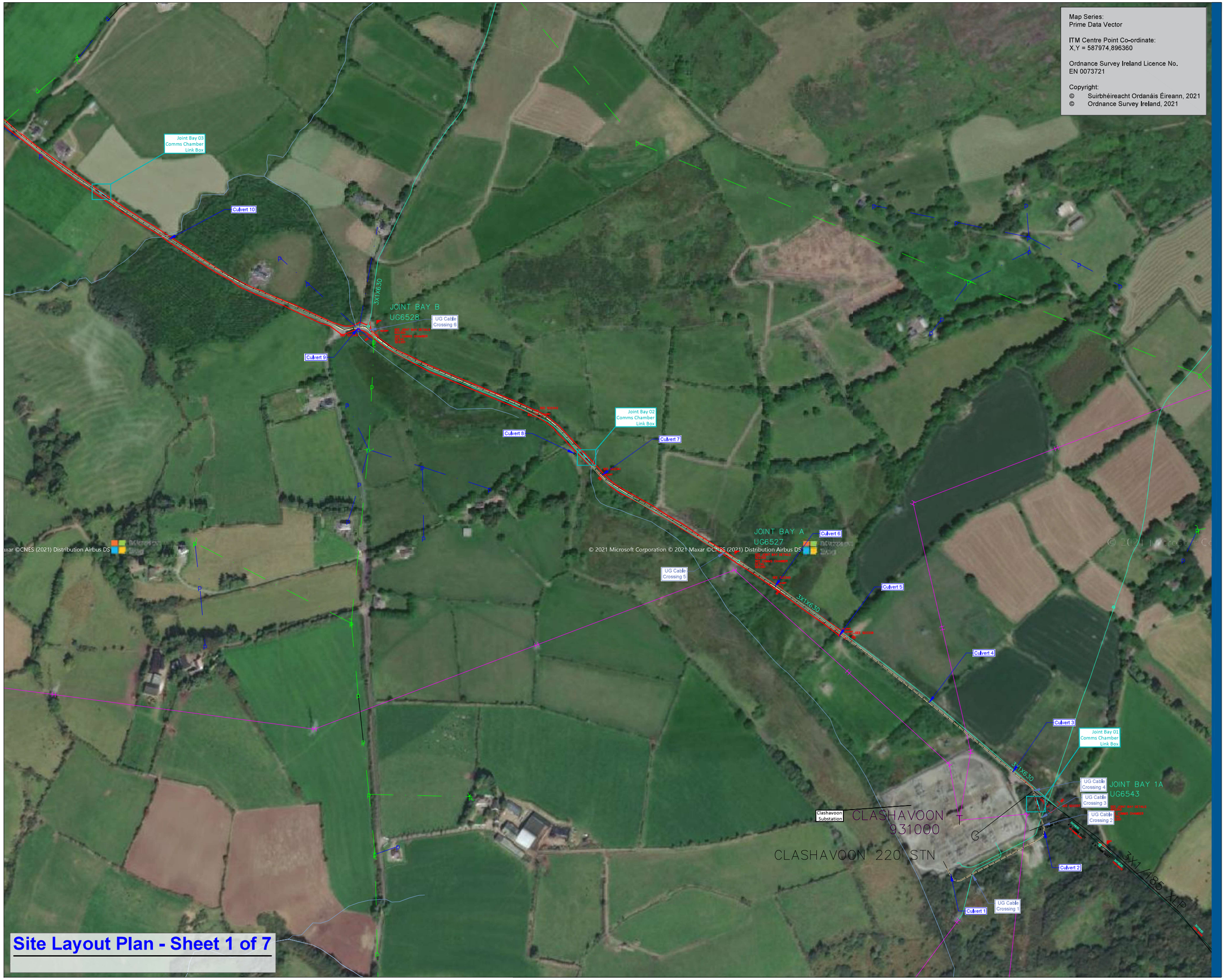

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- Other services may be encountered on the route.

LEGEND: -

- Proposed 110kV UGC Route (11.307km)
- Existing Rivers & Streams
- Existing ESB OHL & UGC HV Network
- Existing ESB OHL MV & LV Network
- Existing Surface Water
- Proposed Red Line Boundary

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I/R	DATE	DESCRIPTION
F01	07.01.22	Issued for Information
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Site Layout Plan -
Sheet 1 of 7

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- Other services may be encountered on the route.
- Position of HDD launch/reception shown points are indicative only and will be subject to site investigation works and detailed design.

LEGEND: -

Proposed 110kV UGC Route (11.307km)
Existing Rivers & Streams
Existing ESB OHL MV & LV Network
Proposed Red Line Boundary

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F01	07.01.22	Issued for Information
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05-843

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LEGEND: -

- Proposed 110kV UGC Route (11.307km)
- Existing Rivers & Streams
- Existing ESB OHL MV & LV Network
- Proposed Red Line Boundary

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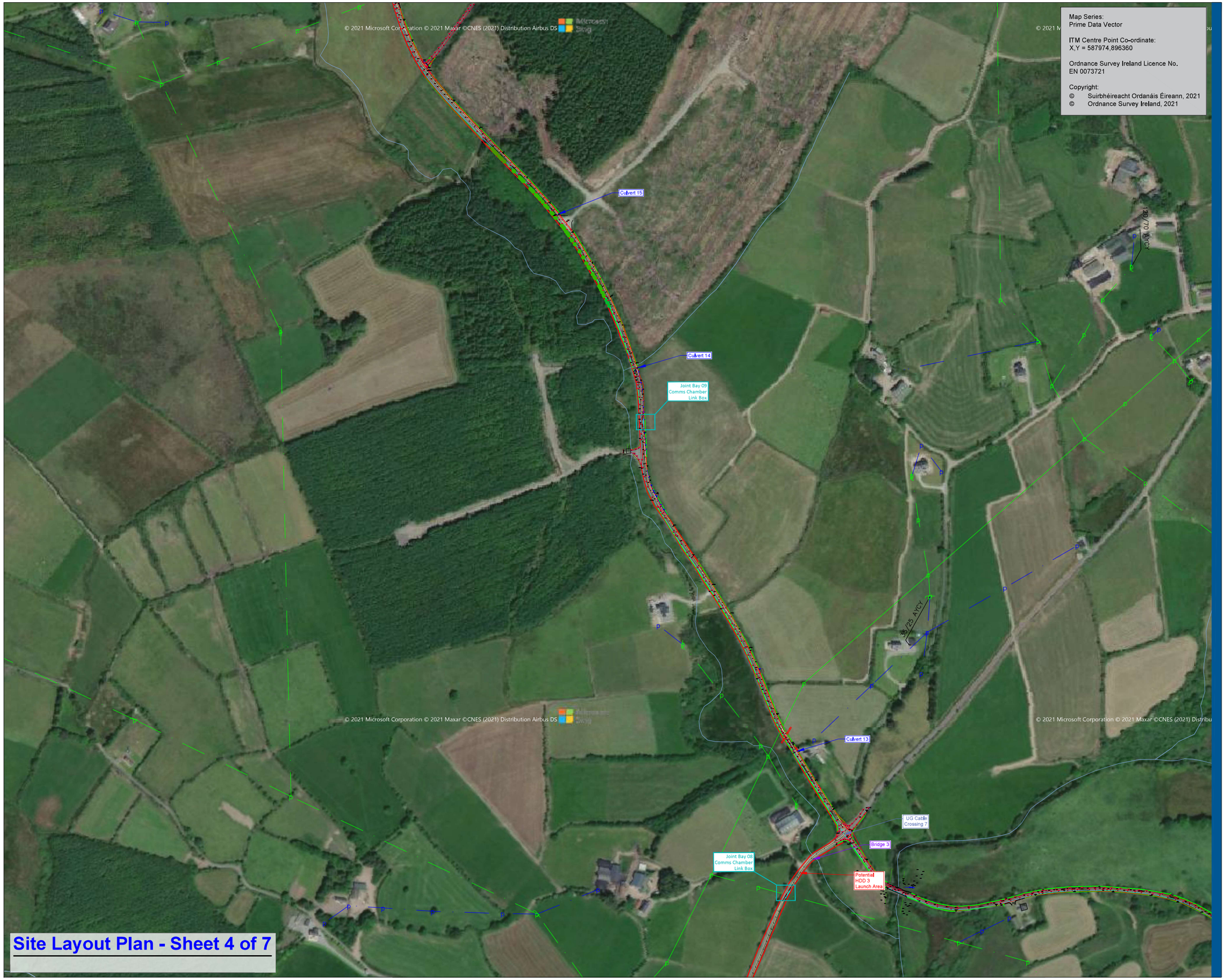

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- Other services may be encountered on the route.
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LEGEND: -

Proposed 110kV UGC Route (11.307km)
Existing Rivers & Streams
Existing ESB OHL MV & LV Network
Proposed Red Line Boundary

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- Other services may be encountered on the route.

LEGEND: -

- Proposed 110kV UGC Route (11.307km)
- Existing Rivers & Streams
- Existing ESB OHL MV & LV Network
- Landowner Folio Boundary
- Proposed Red Line Boundary

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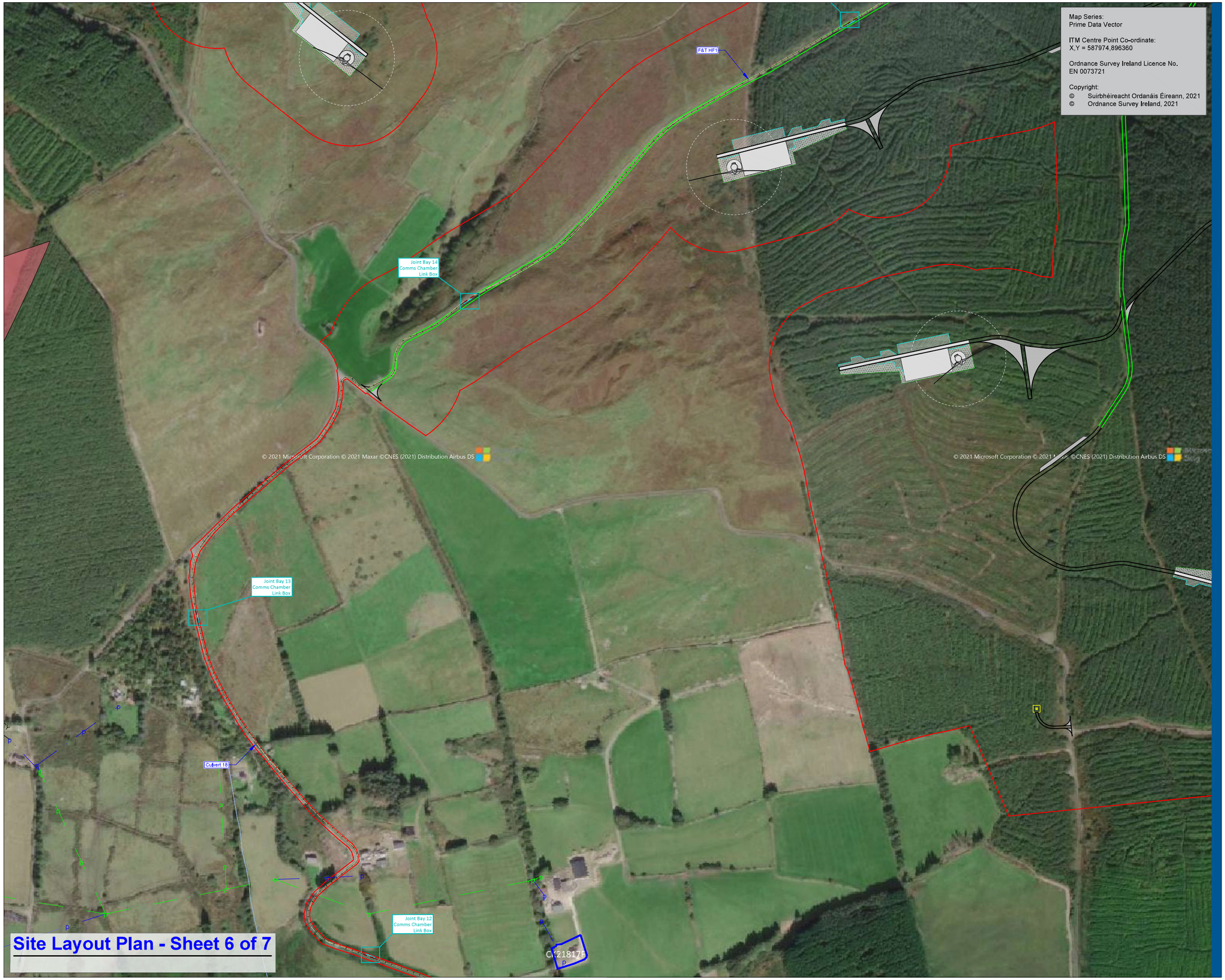

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PROJECT

Ballinagree Windfarm

110kV Grid Conection

CLIENT

COILLTE
GROW·TRANSFORM·SUSTAIN

CONSULTANTS

NOTES: -

- This drawing is to be used only for the purpose of the planning application and is subject to detailed design.
- Position of underground cable and location of joint bays, links boxes and comms chambers may vary depending on site conditions.
- Position of link boxes and comms chambers is to be agreed onsite with EirGrid/ESB.
- Other services may be encountered on the route.

LEGEND: -

- Proposed 110kV UGC Route (11.307km)
- Existing Rivers & Streams
- Existing ESB OHL & UGC HV Network
- Existing ESB OHL MV & LV Network
- Landowner Folio Boundary
- Special area of Conservation
- Proposed Red Line Boundary

PROGRESS PRINT

ISSUE/REVISION

I/R	DATE	DESCRIPTION
F01	07.01.22	Issued for Information
F00	10.12.21	Issued for Information

PROJECT NUMBER

05-843

SHEET TITLE

Site Layout Plan -
Sheet 6 of 7

SHEET NUMBER

05843-DR-007

ISO A1 594mm x 841mm

Map Series:
Prime Data Vector

ITM Centre Point Co-ordinate:
X,Y = 587974,896360

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CK24464

Joint Bay 15
Comms Chamber
Link Box

F&T HF1

F&T HF2

Ballinagree WF
Substation

Site Layout Plan - Sheet 7 of 7

Project Management Initials:
Designer: JC
Checked: NOC
Approved: RG

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- Existing ESB OHL MV & LV Network
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Sheet 7 of 7

SHEET NUMBER

05843-DR-008

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

Appendix 3.4

Biodiversity Enhancement and Management Plan

Biodiversity Enhancement & Management Plan

Land Management & Monitoring Prescriptions

Ballinagree Wind Farm

Prepared for:

Ballinagree Wind farm

Prepared by:

Ecology Ireland Ltd.

ecologyireland

December 2021

Contents

Executive Summary

This Biodiversity and Environmental Management Plan has been prepared to outline a set of land management prescriptions (commitments and monitoring) as part of proposed Ballinagree Wind Farm Development. Four private landowners with a combined total of c. 304 ha of lands in the vicinity of the wind farm, but beyond 250m of any proposed turbine, have agreed to a long-term commitment to detailed land management measures designed to maintain and enhance local biodiversity. In addition, Coillte has undertaken to create wildlife corridors through strategic tree-felling between areas of upland habitat in the vicinity of the proposed wind farm area.

The measures include those designed to protect watercourses, prevent overgrazing and to clear invasive and site inappropriate plants. Higher value habitats will be actively managed to maintain and improve their value and lower value habitats will see specific interventions designed to improve their attractiveness for a wide range of species. Inputs (e.g. fertiliser, herbicide) will be controlled and appropriate planting will increase the available feeding, roosting and nesting cover for wildlife. Certain measures (e.g. control of stocking density) will be universal across the management lands. Other measures (e.g. planting of wildbird cover and native deciduous woodland) will be entirely site specific. The measures proposed for each land parcel take into account the habitats present and their current condition and importance in the local landscape.

The BEMP programme represents a significant commitment to enhance the biodiversity value and ecological connectivity across a large land bank. The programme will run for the lifetime of the windfarm and many of the proposed features (e.g. tree and hedgerow planting) will have a longer-lasting biodiversity benefit to the lands included in this plan and the wider locality. The BEMP is not designed to mitigate or address particular potential impacts associated with the construction, operation or decommissioning of the proposed wind farm. It is instead a commitment provided to yield a lasting biodiversity benefit to the area around Ballinagree.

1 Introduction

Ecology Ireland Wildlife Consultants Ltd. has prepared this Biodiversity Enhancement and Management Plan (BMP) for lands in the vicinity of the proposed Ballinagree Wind Farm. These lands include areas under the ownership of Coillte and also a number of private landholdings.

*Biodiversity is the **shortened form of two words "biological" and "diversity"**. It refers to all the variety of life that can be found on Earth (plants, animals, fungi and micro-organisms) as well as to the communities that they form and the habitats in which they live.*

The overall objectives of this plan are manifold but may be summarised as follows:

- To improve the ecological connectivity between patches of attractive habitat in the wider area
- To significantly increase the amount and quality of hedgerow across a number of landholdings
- To establish a number of high resource value habitats including hedgerows, small areas of native woodland and wildbird cover across the BEMP lands.
- To commit to biodiversity friendly farming practices through control of stocking densities, minimising the use of herbicides and pesticides and to protect watercourses from livestock.
- To erect and maintain bird and bat boxes and night roosts for Lesser Horseshoe Bats.
- Monitoring of local biodiversity and the implementation of the biodiversity prescriptions through the lifetime of the wind farm.

The BEMP is not designed to mitigate or address particular potential impacts associated with the construction, operation or decommissioning of the proposed wind farm. It is instead a commitment provided to yield a lasting biodiversity benefit to the area around Ballinagree. The measures will benefit a range of habitats and species through prescriptions that have been developed with the agreement and input of all participants in the BEMP. The commitments herein are wide-ranging but built upon established land management measures that have been developed as part of agri-environmental and biodiversity management schemes.

Coillte lands

Coillte has extensive lands under their ownership in and adjacent to the proposed wind farm area. Conifer plantation is a dominant local habitat and at an early stage in the development of the BEMP an opportunity to improve connectivity between open areas of heath/bog upland was identified. This will be achieved by felling corridors (wildlife corridors) through large blocks of existing mature conifer plantation. These corridors once cleared will be maintained to improve the connectivity between patches of upland peatland habitat.

An **ecological corridor** is a clearly defined geographical space that is governed and managed over the long-term to maintain or restore effective ecological connectivity.

Private Lands

A number of local landowners have also been instrumental to the development of the BEMP for private farmland. They have discussed and agreed to adopt a series of land management prescriptions on their own landholdings in the vicinity of the proposed wind farm development. Farm specific plans have been prepared with the input of the landowners to maximise the potential biodiversity gain at each site, dependent on the habitats present and their condition (see Sections 3-6 of this report). Each of the private land holdings has a significant amount of grassland, including improved agricultural grassland (GA1). Several have more upland habitats, including some areas of Annex 1 habitat (e.g. Wet Heath).

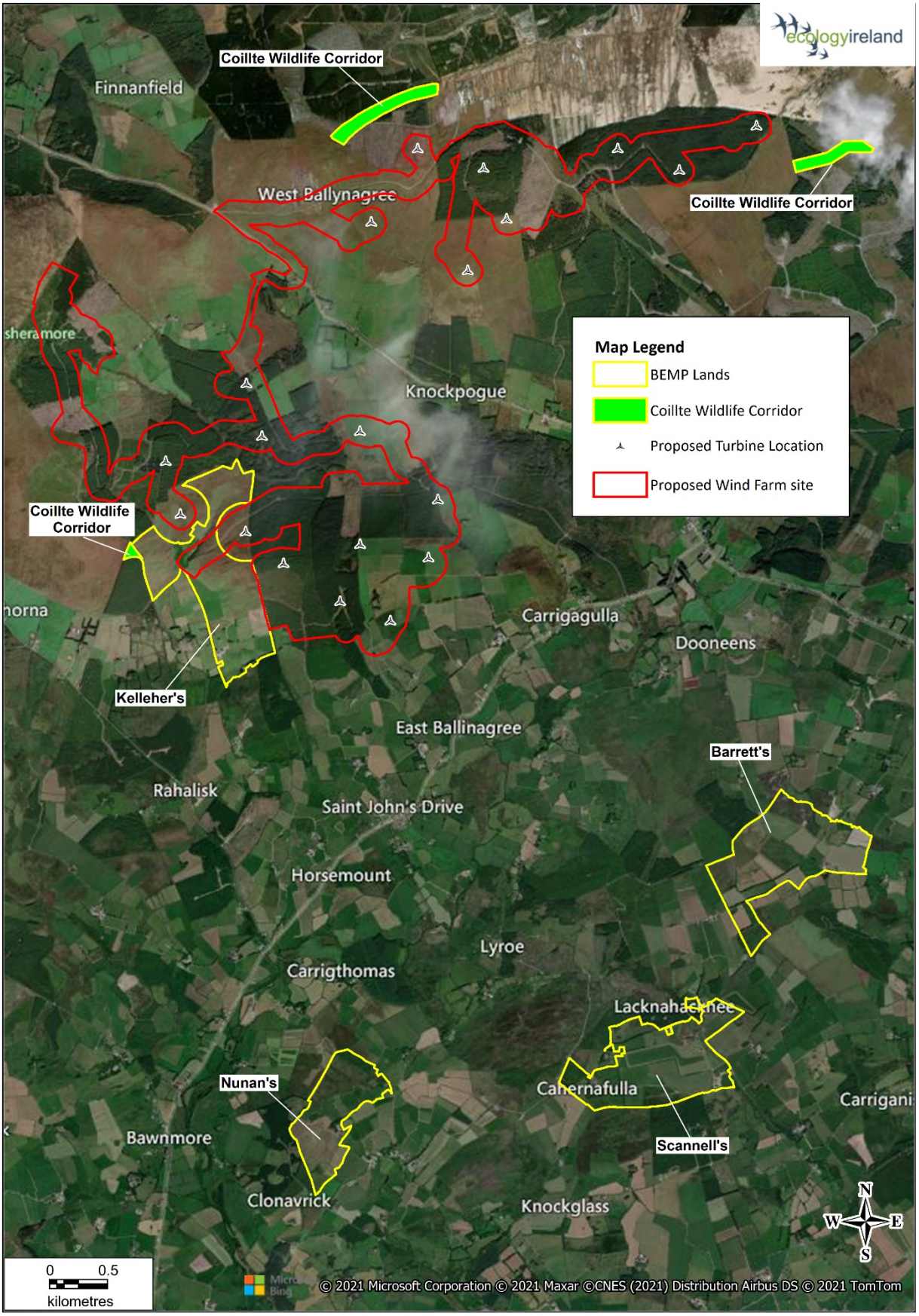
All lands, both private and public, that are included in the BEMP are over 250m from the proposed turbine locations. It was decided not to include lands closer to active turbines on a precautionary basis. If these lands (close to turbines) were actively managed to become more attractive for birds and bats (for instance) there could be a perceived marginal increase in collision risk for such individuals.

The location of the lands included in this BEMP are shown in Figure 1. This includes three wildlife corridors that will be created and maintained on Coillte lands and also four individual land holdings. Table 1 summarises the area of each of the land parcels in this BEMP. The overall area of lands which are included in this plan totals over 322 hectares.

Table 1. Areas of each land parcel included in the BEMP

Land Parcel	Area (ha)
Coillte wildlife corridor (northwest)	10.38
Coillte wildlife corridor (northeast)	6.63
Coillte wildlife corridor (west)	0.99
Kelleher's lands	92.14
Nunan's lands	47.32
Scannell's lands	81.82
Barrett's lands	82.98
Total Area	**322.26**

Figure 1. Land areas included in the BEMP.



2 Background to Biodiversity Management Strategy

This section presents information on the overall habitat makeup of the lands under consideration and explains what measures are appropriate for the habitats present across the land holdings. As illustrated in Figure 1, the three Coillte Wildlife Corridors are located in the vicinity of the proposed wind farm site and these corridors are designed to improve ecological connectivity between areas of upland heath/bog. The north-western of the three corridors is approximately 10.4 hectares in area, the north-eastern corridor is somewhat smaller at 6.6ha and the third corridor will be created by clearance of 0.99 ha of plantation forestry to the west of the proposed wind farm development. Lands permanently felled for this purpose will be replanted elsewhere as described in Chapter 3 of the EIAR.

There are four private landholdings included in the BEMP lands. The largest of these is Anthony Kelleher's (92 ha) and this is located closest to the proposed wind farm site. Three landholdings south of the proposed wind farm are also included. None of the landholdings are located within or adjacent to any designated conservation site. The dominant habitat across these land holdings is Improved Agricultural Grassland (GA1).

Improved Agricultural Grassland (GA1) is a habitat with generally low ecological value and as such it especially suitable for basic land management prescriptions (e.g. control of stocking, planting of hedges etc.). Provision of wildbird cover (sacrificial crop) and prescriptions in line with the All-Ireland Pollinator Plan are also typically appropriate for GA1 lands. There are also significant areas of Wet Grassland (GS4) and related habitats in these land parcels and these present an opportunity to control the extent of soft rush growth and implement other biodiversity positive features. Measures associated with rush control are included in the plans for the private lands included in the BEMP (see Sections 3-6).

Areas of degraded Wet Heath (HH3) and Cutover Bog (PB4) where present (on Kelleher's lands) are suitable for land management as these are habitats that can be greatly improved with appropriate management. Lands running by watercourses are already (at least in part) managed to control livestock access. This will be formalised in some instances with fencing and livestock exclusion.
All private land holdings were walked and the proposed land management prescriptions discussed with the individual landowners. Each landowner has given formal consent to the developer to participate in the BEMP and to implement a range of management measures as discussed in this report. This represents a considerable commitment across the lifetime of the wind farm. Other proposed prescriptions discussed and agreed with each of the landowners include commitments to provide nesting/roosting opportunities for Barn Owl and bats at appropriate locations.

2.1 Biodiversity Best Practice

There are several advice and best practice documents and online resources that have been used in the preparation of this document. These include:

- European Commission (2008). Management of Natura 2000 habitats Northern Atlantic wet heaths with *Erica tetralix* 4010. Technical Report 08/24.

- National Red Grouse Steering Committee (2013). Red Grouse Species Action Plan. Available on www.npws.ie
- Hen Harrier Project (2020). Hen Harrier Programme Supporting Actions. 2nd Edition, 2020.
- Sears/Natural Scotland (2008). Bracken Control: Guide to Best Practice.
- Freshwater Habitats Trust (UK) – Pond Creation Toolkit https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/#Core%20factsheets
- The All-Ireland Pollinator Plan. https://pollinators.ie/
- Hickey, S., Sheehan, D. & Nagle, T. (2020). Bride Project EIP: Farm Management Guidelines. Guide to Farming with Nature. Available https://www.thebrideproject.ie/wp-content/uploads/2020/04/BRIDE-Project-Farm-Habitat-Management-Guidlines.pdf

2.2 BEMP Management

A BEMP liaison officer will be nominated by the developer to act as a point of contact and manager for the implementation of the scheme. They will ensure that the commitments provided herein are monitored and implemented and that all participants (private landowners, Coillte) are kept updated on the progress of the BEMP. The liaison officer will act as an intermediary between the developer's ecologist and the individual landowners. Regular project review meetings will be held, particularly in the early establishment years of the scheme and advice and support will be provided as appropriate to the participants in the BEMP.

Further detail relating to the commitments provided in this BEMP and the timeline for the delivery of individual prescriptions will be discussed and agreed within 6 months of the grant of planning permission. The bulk of the interventions (planting, fencing etc.) will be achieved in the first three years from the grant of planning. The individual farm-level agreements will cover an initial 5-year period and will set measurable targets for each land holding which will be monitored and reported upon during this early establishment phase. This 5-year Action Plan will be published on a dedicated website that will be established and maintained for the duration of the project. Annual reports will be prepared and measure the progress towards targets (e.g. planting of new hedgerow) and provide an update on ecological monitoring carried out in the area during this initial 5-year establishment phase. At the end of the first 5-year plan an updated Action Plan will be prepared and agreed with the participating landowners. This will see the continuation of land management and maintenance of the various biodiversity prescriptions already in place for the remainder of the wind farm permission period. The lands will be subject to annual ecological surveys (audit of BEMP measures) throughout the lifetime of the windfarm. Key results and updates will be published on the BEMP website.

The following sections summarise the biodiversity enhancement measures that will be implemented by each of the landowners.

2.3 Overall BEMP commitments for lifetime of windfarm

A critical part of a Biodiversity Enhancement and Management strategy is to commit to strategies to manage the land that will promote the maintenance of the high value features and improve the overall biodiversity through active management and monitoring of the lands.

To achieve this there are lots of possible management actions that can be considered. Some are focussed on a particular species (e.g. erection a nest box) or habitat (e.g. preventing livestock entering watercourses) and other measures have a more general focus e.g. limiting stocking density.

There shall be none of the following allowed on the lands included in the BEMP:

- Burning areas of vegetation.
- Removal of hedgerows.
- Planting of Conifers.
- New land drainage.
- Organising, allowing or engaging in recreational activities involving off-road or racing vehicles.
- Turf-cutting.
- Unapproved use of Herbicides.
- Unapproved of pesticides/rodenticides.

Common Management Measures:

For all of the BEMP areas, the following measures are to be applied:

- Removal of all self-sown conifer saplings
- Removal of all invasive non-native species, notably *Rhododendron*
- Control of Bracken (according to Sears/Natural Scotland (2008). Bracken Control: Guide to Best Practice).

3 Anthony Kelleher's lands

Anthony Kelleher's farm is shown in Figure 3.1. Note lands within 250m of any proposed turbine are not included as these are not to be included in the proposed Biodiversity Land Areas. The land has a good range in elevation from about 240mOD in the south to over 390mOD at the high point of the west of the farm.

The Knocknagappul Stream runs through the northern section of the land holding. The West Ballinagree Stream joins the Knocknagappul and in turn enters the River Laney within the northeast corner of the farm. The farm contains extensive areas of Annex I habitat, predominantly Wet Heath (HH3), particularly in the north (see Figure 3.2). There is also a good amount of degraded Wet Heath and areas of dry-humid Acid Grassland (GS3). The northern part of the land holding has a range of habitats including an area of Semi-Natural Woodland/Poor Fen & Flush (WN/PF2). The southern part of the farm is dominated by Improved Agricultural Grassland (GA1).

The BEMP measures include core commitments for grassland management, particularly for the Improved Agricultural Grassland (GA1) but also some additional options to provide greater benefits for local wildlife (e.g. provision of Wild Bird Cover crop and planting of native tree species). These are all described in Section 3.1-3.5 below

The total area of the Kelleher lands included in the BEMP amounts to 92.14 ha.

Figure 3.1 Kelleher's lands

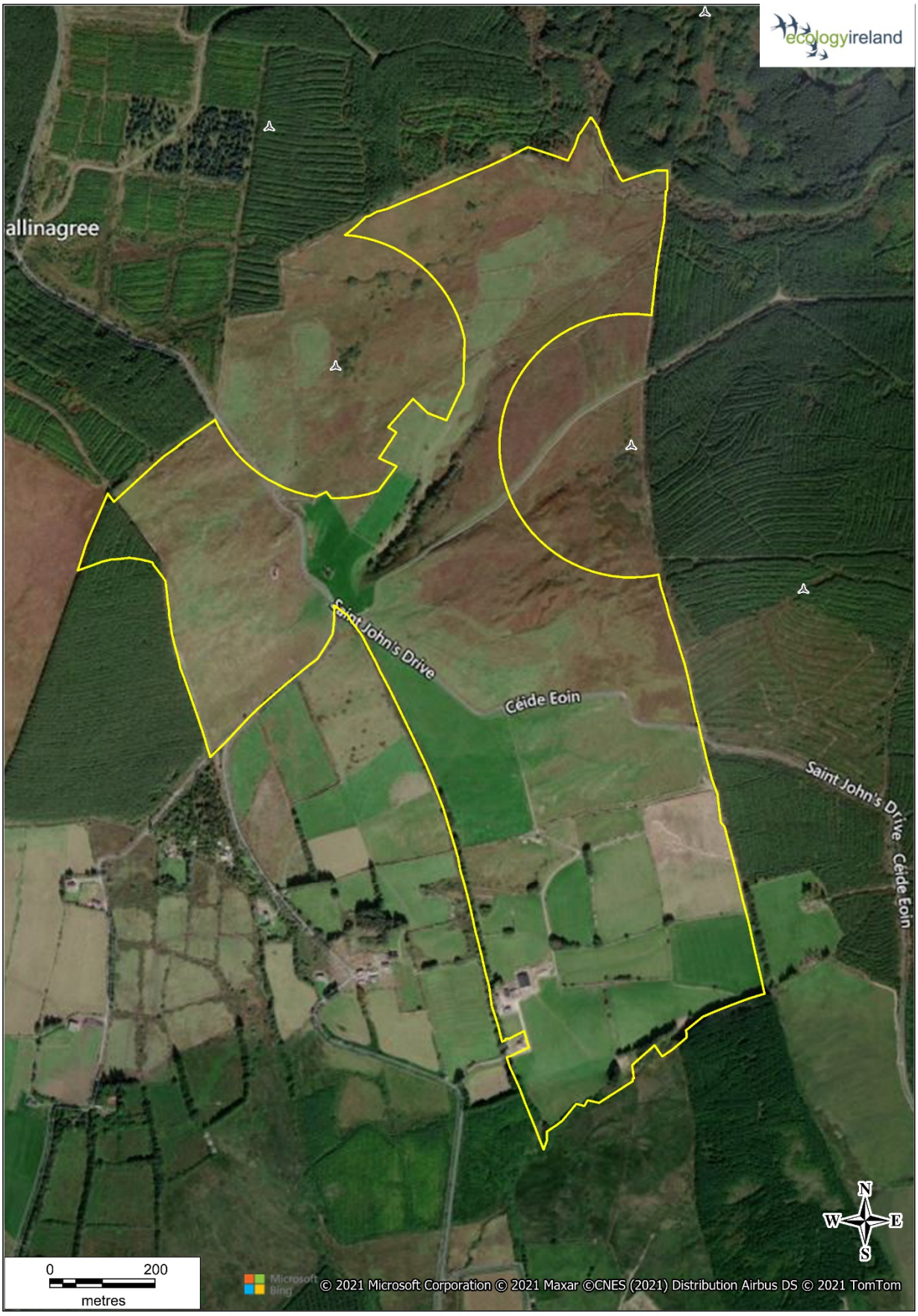
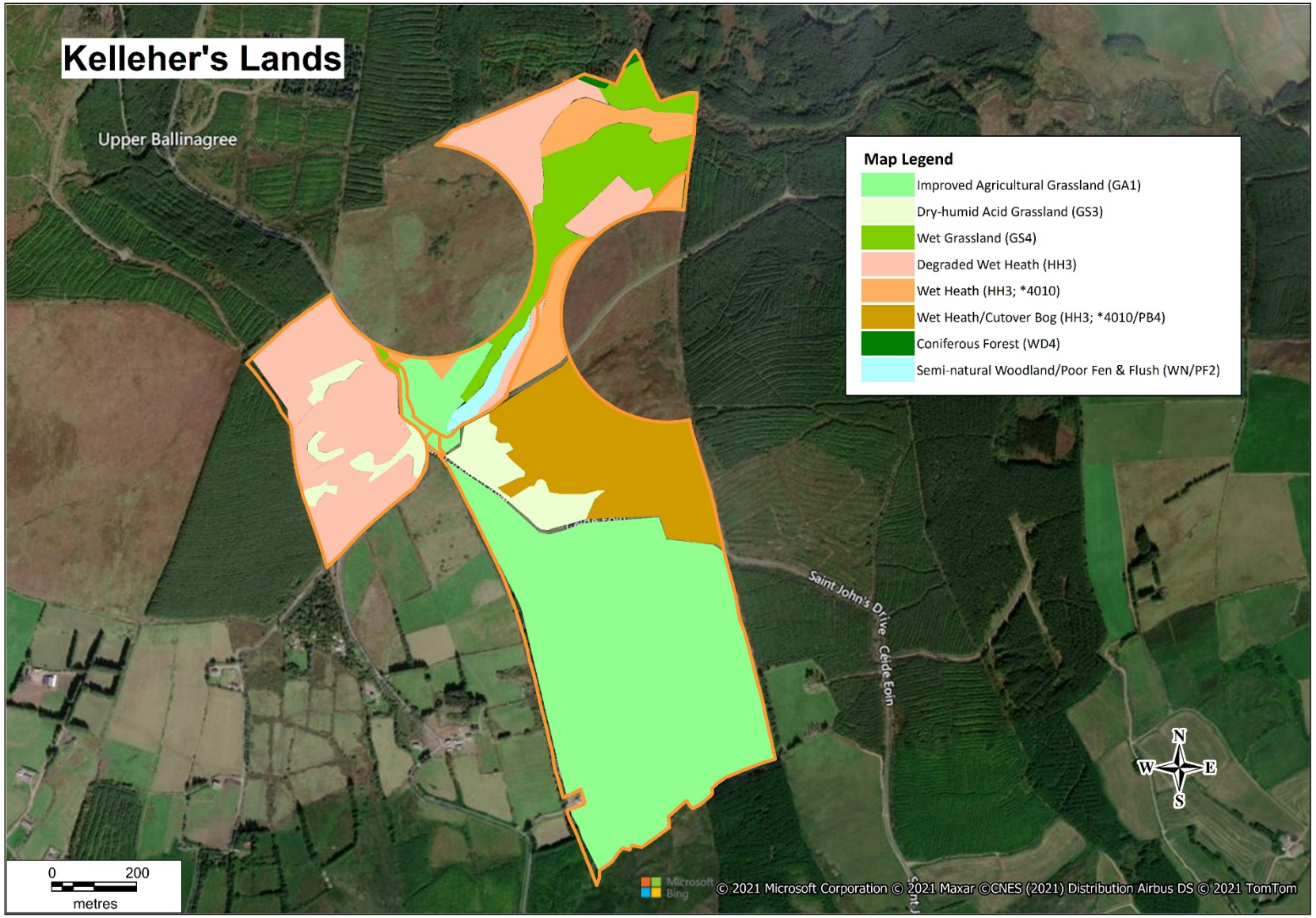


Figure 3.2 Habitat Map – Kelleher's Lands



3.1 Management of Grassland Habitats (GA1/GS4/GS3)

These measures will apply to areas of agricultural grassland as per Figure 3.2 above (GA1/GS3 and GS4). Stocking measures apply to all of the grassland areas, as does rush management and hedgerow management. Figure 3.3 shows the indicative extent of each of the following land management prescriptions that have been agreed in principle with Mr. Anthony Kelleher.

Stocking & Grassland Management

Grazing of the agricultural fields included in this BEMP option will be by cattle/sheep with a target low stocking density of 0.5 LU/Ha (this stocking density will not exceed 0.7 LU/Ha without agreement). The aim is to maintain a tussocky sward. This will help create conditions for ground nesting birds such as Meadow Pipit and Skylark. Supplementary feeding of stock with hay in the winter can take place, but feeding areas (e.g. ring feeders) will be moved around the fields regularly to prevent poaching of the ground. Supplementary feed can provide seeds and feeding opportunities for wintering passerines.

i. Rush management. Rushes within the agricultural fields will not be allowed to grow to the extent that they rush tussocks collapse and form mats that can smother the ground vegetation. Rotational cutting, i.e. cutting every other year should be sufficient to maintain these levels. Rush cutting in the fields and rough grassland areas should aim to maintain rush levels at 30-70% cover. Approved herbicide application (direct application – licking) will be permitted to combat persistent high levels of rush cover.
    a) All rush cuttings will be removed from the treated fields. Topping will be delayed until after mid-July to minimise the risk to ground-nesting birds. In fields with a heavy soft-rush infestation (>60% cover) a second cut, four to eight weeks after the initial topping, will help to reduce rush cover in the following year. Reducing and maintaining rush cover at below 50% cover in areas initially with 60% and more cover will be a target.
    b) It may be impractical to cut rushes in the wetter or rockier fields, so these may be left if they form a small proportion of the field area, or they can be controlled by cattle trampling during aftermath grazing.

Hedgerow Planting/Hedgerow management/Fencing

Hedgerows will be planted according to the advice in Appendix A of this report and as indicatively illustrated in Figure 3.3. The extent of new hedgerow establishment shown would be c. 5km. In addition, existing hedgerows will be protected by stock-proof fencing and bolstered where appropriate by supplemental planting. Stock-proof fencing/electric fencing will be erected a minimum of 3m from the base of the established hedgerows.

Existing hedgerows are to be managed to provide hedges with thick (minimum 2m wide) bases. Hedges will be cut to provide an A-shape, wider at the base with the aim to create hedges that are a minimum of 2m wide at the base and 2.5m high. All hedgerow cutting is to take place in the period 1st September to 28th February, i.e. outside the bird breeding season. Any existing areas of scrub found within the grassland fields are to be retained. Trimming of the scrub can be undertaken to prevent encroachment into the surrounding areas. Hedgerow management advice from the All-Ireland Pollinator Plan will be followed (see Appendix A).

Livestock will be prevented from accessing natural watercourses by stock-proof fencing. As per the Bride Project "*In times past, before the advent of piped water, cattle and other livestock, used ponds, rivers and other water sources for drinking. Nowadays, increased and more concentrated numbers of livestock can cause siltation, bank erosion and water pollution at watercourse drinking points. If possible, water should be piped to troughs, located away from the river, to prevent these problems. Alternatively, the use of nose pumps or pasture pumps can be an effective alternative to river access, especially for smaller numbers of animals*." An indicative map showing the principal watercourses where they intersect the BEMP lands is shown in Figure 3.3 below. All fencing will be renewed and maintained as required during the lifetime of the wind farm.

3.2 Wild Bird Cover

Under this option a larger area of a field (or entire fields) of Improved Agricultural Grassland will be planted and maintained to provide wild bird cover. This will be sown with an appropriate seed mix (to be approved by the project ecologist). The indicative mapping shows an area of 3.1ha under wild bird cover.

Oat & Linseed mixes can be sown each year and grow well in all soil types, but the seed mix chosen will be discussed and agreed with the project ecologist. Areas of wild bird cover will be fenced to prevent access by livestock. The areas need to be sown before the 31st May except in exceptionally wet years. The crop is left in situ through the winter period at least until mid-March. An outline document on the wild bird cover management is provided in Appendix B.

The location of the area sown can be rotated from year to year but the amount of wild bird cover will be maintained at a minimum of 3ha during the project. Management options and sowing density will be discussed and agreed with the project ecologist.

3.3 Management of Upland Heath/Bog Habitats

Areas of peatland which will be managed to have a low stocking density are shown in Figure 3.3.

The management of grazing pressure is critical to the health and diversity of these upland habitats. To bring degraded wet heath and blanket bog into favourable condition (see EC 2008):

- a maximum year-round stocking rate of around 0.1 sheep/ha or 0.015 LUs/ha has been recommended for degraded Wet Heath/Cutover Bog, with winter levels lower still, or stock entirely removed from these areas from November-February;

Any extant land drains in this habitat will be blocked according to the advice of the project ecologist. This option also requires reliable stock fencing and control in areas where this management measure is to be applied. Annual monitoring of the heath/bog habitats included in the BEMP area will confirm the success of the management measures and make further recommendations as needed in relation to any interventions required.

To maintain intact wet heath (and blanket bog) in favourable condition undisturbed wet heaths and blanket bog requires little active management. However, it is necessary to control grazing pressure. Light or no grazing in the autumn or winter, with at most very light grazing in the summer is the ideal grazing regime (EC 2008).

- Year-round stocking rates should not exceed 0.25-0.5 ewes/ha or 0.037-0.075 LUs/ha;
- Winter stocking rates should be reduced by at least 25%, with all cattle and horses removed where there is a risk of poaching;
- Blanket bog or Wet Heath dominated by *Molinia* (Purple Moor Grass) will be better grazed with cattle or ponies in the spring and summer months, as this will reduce the dominance of this grass over time and aid restoration.

Particular attention to be given to the encroachment of scrub on higher value (Annex I) habitats. Scrub clearance (outside the bird nesting season) in the peatland habitats will be carried out manually if and when this is required – the use of plant will be avoided except for low ground pressure and light vehicles. Similarly, any encroaching self-seeded saplings and invasives will be prioritised for removal from Heath/Peatland habitats.

3.4 Erection of Bird and Bat Nest Boxes & Bat Roost

Under this option an external Barn Owl nest box will be erected at an agreed location either on a tree or on a pole specifically installed for this purpose. An additional Barn Owl box will be installed in an appropriate location within a farm building within the landholding area.

Barn Owl Box in situ (Credit Barn Owl Trust).

A minimum of 10 recycled plastic/woodcrete bird nest boxes will be erected at locations selected by the project ecologist. The type and specification of the boxes will be chosen to be appropriate to the habitats present. These boxes will be inspected and maintained regularly throughout the project.

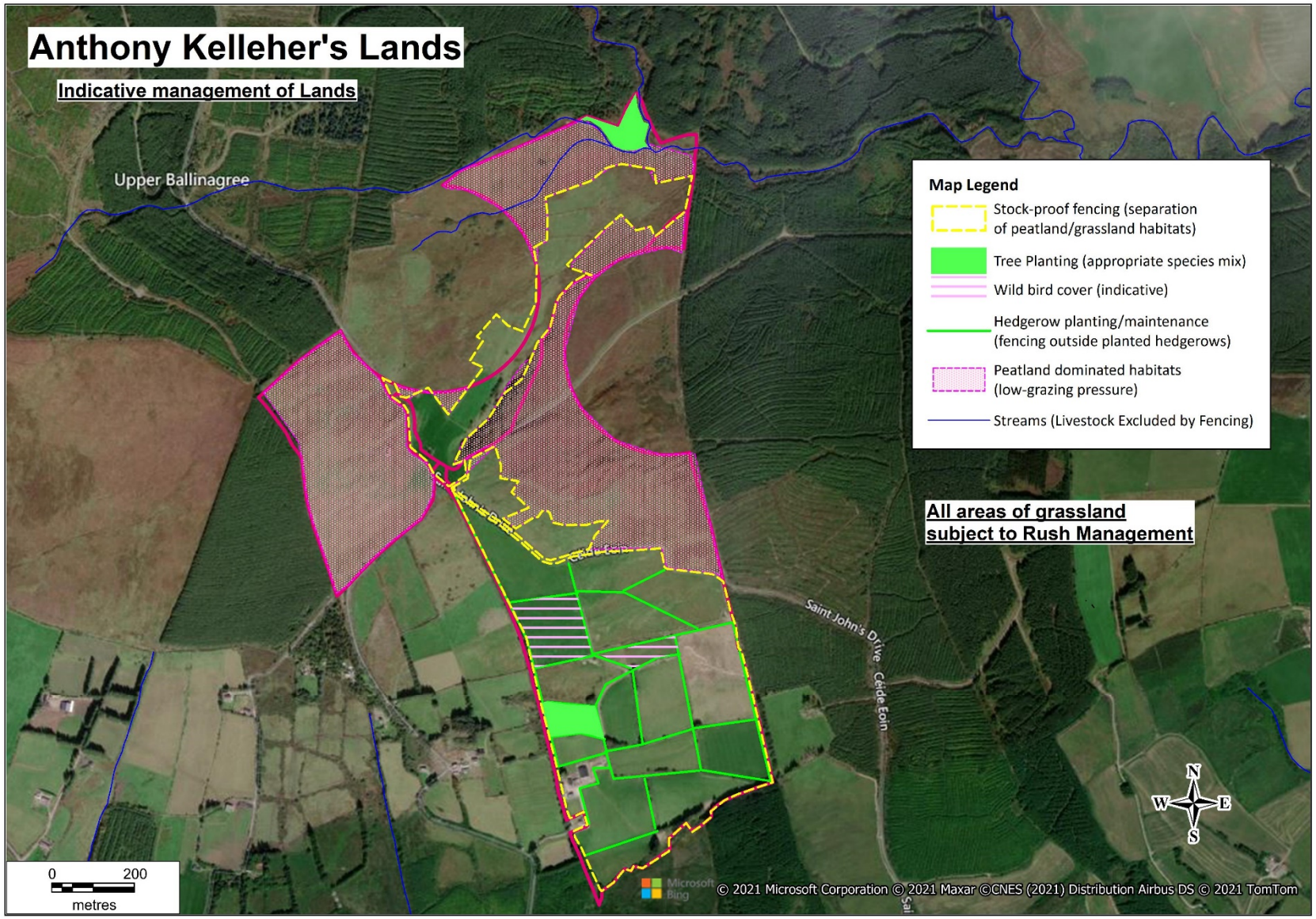
A minimum of five recycled plastic/woodcrete bat roost boxes will be erected and maintained at sites selected by the project ecologist. These will be inspected annually by a licensed bat specialist. In addition, two Lesser Horseshoe Bat Night Roost structures (see Appendix D) will be installed at selected and agreed locations within the landholding.

3.5 Establishing a Patch of Native Woodland

This option will involve the establishment of 2 copses of native woodland (see indicative mapping in Figure 3.3). As shown the total of indicative tree-planting is 1.8ha.

This will involve the planting two patches of woodland (using native species) to increase the local biodiversity. Native woodland patches provide food and cover for wildlife. Many biodiversity plans for farmland include provision for establishment of native woodland. For example, the Bride Valley Project Farm Management Guidelines are provided in Appendix D. The location and extent of planting, as well as the appropriate species mix will be agreed with the input of the Project Ecologist.

Figure 3.3 Summary of indicative BEMP commitments for Kelleher's lands.



4 Noel Nunan's lands

Noel Nunan's landholding of 47.3 ha is shown in Figure 4.1. It is dominated by improved and semi-improved grassland currently grazed by dry cattle stock. There is an area of forestry at the north of the land parcel. There is no significant watercourse within this land holding.

4.1 Management of Grassland Habitats

These measures will apply to areas of agricultural grassland. Stocking measures apply to all of the grassland areas, as does rush management and hedgerow management. Figure 4.2 shows the indicative extent of each of the following land management prescriptions that have been agreed in principle with Mr. Noel Nunan.

Stocking & Grassland Management

Grazing of the agricultural fields included in this BEMP option will be by cattle/sheep with a target low stocking density of 0.5 LU/Ha (this stocking density will not exceed 0.7 LU/Ha without agreement). The aim is to maintain a tussocky sward. This will help improve conditions for ground nesting birds such as Meadow Pipit and Skylark. Supplementary feeding of stock with hay in the winter can take place, but feeding areas (e.g. ring feeders) will be moved around the fields regularly to prevent poaching of the ground. Supplementary feed can provide seeds and feeding opportunities for wintering passerines.

ii. Rush management. Rushes within the agricultural fields will not be allowed to grow to the extent that they rush tussocks collapse and form mats that can smother the ground vegetation. Rotational cutting, i.e. cutting every other year should be sufficient to maintain these levels. Rush cutting in the fields and rough grassland areas should aim to maintain rush levels at 30-70% cover. Approved herbicide application (direct application – licking) will be permitted to combat persistent high levels of rush cover.

   a) All rush cuttings will be removed from the treated fields. Topping will be delayed until after mid-July to minimise the risk to ground-nesting birds. In fields with a heavy soft-rush infestation (>60% cover) a second cut, four to eight weeks after the initial topping, will help to reduce rush cover in the following year. Reducing and maintaining rush cover at below 50% cover in areas initially with 60% and more cover will be a target.
   b) It may be impractical to cut rushes in the wetter or rockier fields, so these may be left if they form a small proportion of the field area, or they can be controlled by cattle trampling during aftermath grazing.

Hedgerow Planting/Hedgerow management/Fencing

The existing hedgerow network within this land holding is relatively extensive. New hedgerows will be planted according to the advice in Appendix A of this report and as indicatively illustrated in Figure 4.2. The extent of new hedgerow establishment shown would be c. 1.9km.

In addition, existing hedgerows will be protected by stock-proof fencing and bolstered where appropriate by supplemental planting. Stock-proof fencing/electric fencing will be erected a minimum of 3m from the base of the established hedgerows. All fencing will be renewed and maintained as required during the lifetime of the wind farm.

Existing hedgerows are to be managed to provide hedges with thick (minimum 2m wide) bases. Hedges will be cut to provide an A-shape, wider at the base with the aim to create hedges that are a minimum of 2m wide at the base and 2.5m high. All hedgerow cutting is to take place in the period 1st September to 28th February, i.e. outside the bird breeding season. Any existing areas of scrub found within the grassland fields are to be retained. Trimming of the scrub can be undertaken to prevent encroachment into the surrounding areas. Hedgerow management advice from the All-Ireland Pollinator Plan to be followed (see Appendix A).

4.2 Wild Bird Cover

Under this option a larger area of a field (or entire fields) of Improved Agricultural Grassland will be planted and maintained to provide wild bird cover. This will be sown with an appropriate seed mix (to be approved by the project ecologist). The indicative mapping shows an area of 2.6ha under wild bird cover.

Oat & Linseed mixes can be sown each year and grow well in all soil types, but the seed mix chosen will be discussed and agreed with the project ecologist. Areas of wild bird cover will be fenced to prevent access by livestock. The areas need to be sown before the 31st May except in exceptionally wet years. The crop is left in situ through the winter period at least until mid-March. An outline document on the wild bird cover management is provided in Appendix B.

The location of the area sown can be rotated from year to year but the amount of wild bird cover will be maintained at a minimum of 2ha during the project. Management options and sowing density will be discussed and agreed with the project ecologist.

4.3 Erection of Bird and Bat Nest Boxes & Bat Roost

Under this option an external Barn Owl nest box will be erected at an agreed location either on a tree or on a pole specifically installed for this purpose.

A minimum of 10 recycled plastic/woodcrete bird nest boxes will be erected at locations selected by the project ecologist. The type and specification of the boxes will be chosen to be appropriate to the habitats present. These boxes will be inspected and maintained regularly throughout the project.

A minimum of five recycled plastic/woodcrete bat roost boxes will be erected and maintained at sites selected by the project ecologist. These will be inspected annually by a licensed bat specialist. In addition, one Lesser Horseshoe Bat Night Roost structures (see Appendix D) will be installed at an agreed location within the landholding.

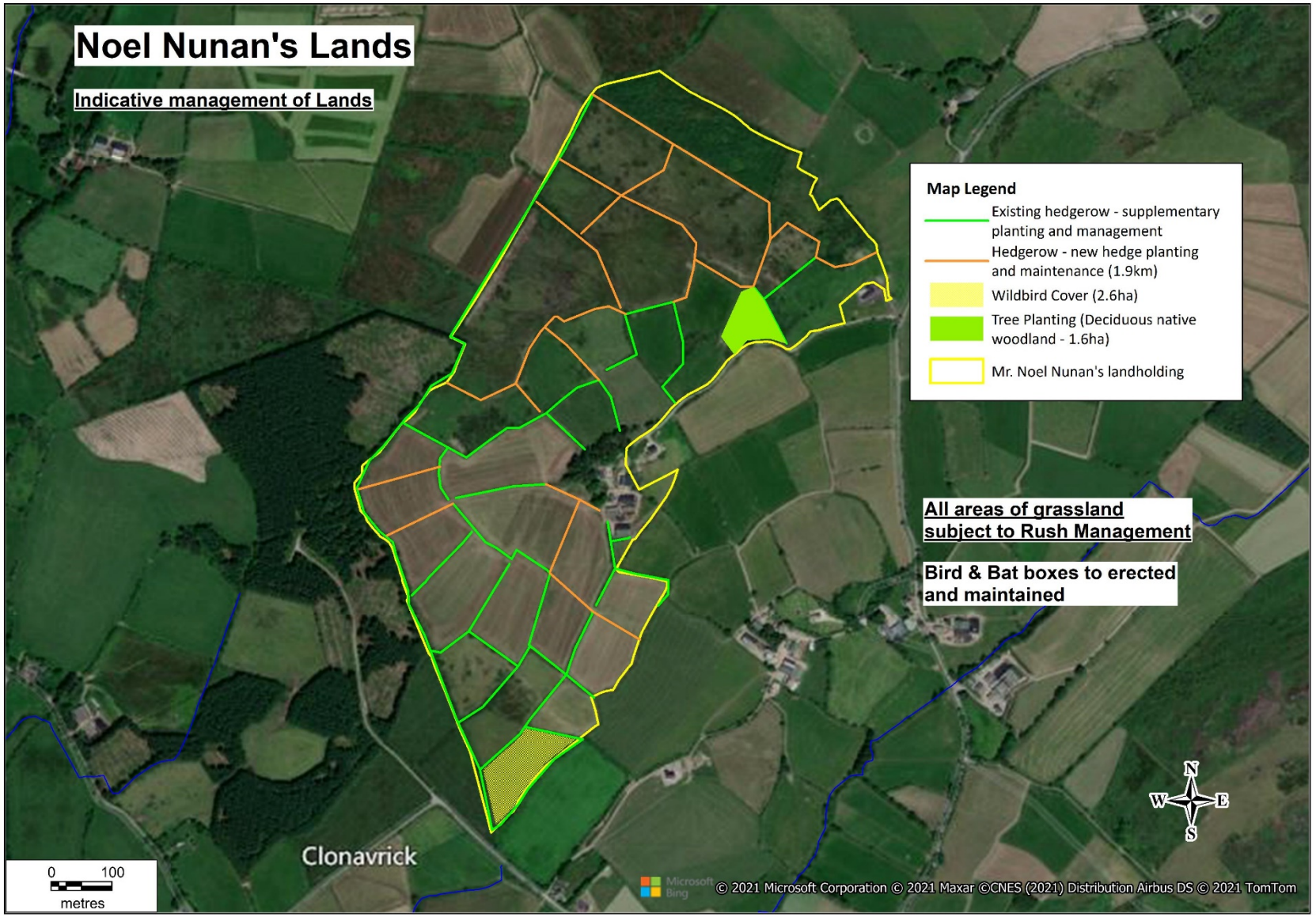
4.4 Establishing a Patch of Native Woodland

This option will involve the establishment of a copse (or copses) of native woodland (see indicative mapping in Figure 4.2). As shown the total of indicative tree-planting is 1.6 ha.

This option will involve the planting an area of woodland (using native species) to increase the local biodiversity. Native woodland patches provide food and cover for wildlife. Many biodiversity plans for farmland include provision for establishment of native woodland. For example, the Bride Valley Project Farm Management Guidelines are provided in Appendix D. The location and extent of planting, as well as the appropriate species mix will need to be agreed with the input of the Project Ecologist.

Figure 4.1 Nunan's lands included in the BEMP.

Figure 4.2 Summary of indicative BEMP commitments for Nunan's lands.



5 James Scannell's lands

James Scannell's land holding of 81.8 ha is shown in Figure 5.1. It is dominated by improved cattle-grazed agricultural grassland with relatively large fields and low-quality hedgerows. There is an area of forestry at the southwest of the land parcel. The land is fairly intensively managed at present and there are a series of internal farm tracks throughout the land holding. There are a number of watercourses within and directly adjacent to the land, including the Glashagarriff River and a number of minor tributaries.

5.1 Management of Grassland Habitats

These measures will apply to areas of agricultural grassland. Stocking measures apply to all of the grassland areas, as does rush management and hedgerow management. Figure 5.2 shows the indicative extent of each of the following land management prescriptions that have been agreed in principle with Mr. James Scannell.

<u>Stocking & Grassland Management</u>

Grazing of the agricultural fields included in this BEMP option will be by cattle/sheep with a target low stocking density of 0.5 LU/Ha (this stocking density will not exceed 0.7 LU/Ha without agreement). The aim is to maintain a tussocky sward. This will help improve conditions for ground nesting birds such as Meadow Pipit and Skylark. Supplementary feeding of stock with hay in the winter can take place, but feeding areas (e.g. ring feeders) will be moved around the fields regularly to prevent poaching of the ground. Supplementary feed can provide seeds and feeding opportunities for wintering passerines.

iii. Rush management. Rushes within the agricultural fields will not be allowed to grow to the extent that they rush tussocks collapse and form mats that can smother the ground vegetation. Rotational cutting, i.e. cutting every other year should be sufficient to maintain these levels. Rush cutting in the fields and rough grassland areas should aim to maintain rush levels at 30-70% cover. Approved herbicide application (direct application – licking) will be permitted to combat persistent high levels of rush cover.

   a) All rush cuttings will be removed from the treated fields. Topping will be delayed until after mid-July to minimise the risk to ground-nesting birds. In fields with a heavy soft-rush infestation (>60% cover) a second cut, four to eight weeks after the initial topping, will help to reduce rush cover in the following year. Reducing and maintaining rush cover at below 50% cover in areas initially with 60% and more cover will be a target.
   b) It may be impractical to cut rushes in the wetter or rockier fields, so these may be left if they form a small proportion of the field area, or they can be controlled by cattle trampling during aftermath grazing.

<u>Hedgerow Planting/Hedgerow management/Fencing</u>

The existing hedgerow network within this land holding is fairly extensive but of fairly low-quality. There is considerable opportunity for hedgerow planting and management on these lands.

New hedgerows will be planted according to the advice in Appendix A of this report and as indicatively illustrated in Figure 5.2. Up to 7km of new or mostly new hedgerow will be established as shown in Figure 5.2. In addition, existing hedgerows will be protected by stock-proof fencing and bolstered where appropriate by supplemental planting. Stock-proof fencing/electric fencing will be erected a minimum of 3m from the base of the established hedgerows. Stock-proof fencing will be erected to exclude livestock from accessing the watercourses that run through the land holding. All fencing will be renewed and maintained as required during the lifetime of the wind farm.

Existing hedgerows are to be managed to provide hedges with thick (minimum 2m wide) bases. Hedges will be cut to provide an A-shape, wider at the base with the aim to create hedges that are a minimum of 2m wide at the base and 2.5m high. All hedgerow cutting is to take place in the period 1st September to 28th February, i.e. outside the bird breeding season. Any existing areas of scrub found within the grassland fields are to be retained. Trimming of the scrub can be undertaken to prevent encroachment into the surrounding areas. Hedgerow management advice from the All-Ireland Pollinator Plan to be followed (see Appendix A).

Figure 5.2 also show an indicative tree-line field boundary that will be established to border an existing farm track. As shown, this will see the establishment of a native tree dominated tree-line of c. 1.7km in length.

5.2 Wild Bird Cover

Under this option a larger area of a field (or entire fields) of Improved Agricultural Grassland will be planted and maintained to provide wild bird cover. This will be sown with an appropriate seed mix (to be approved by the project ecologist). The indicative mapping shows an area of 4.6ha under wild bird cover.

Oat & Linseed mixes can be sown each year and grow well in all soil types, but the seed mix chosen will be discussed and agreed with the project ecologist. Areas of wild bird cover will be fenced to prevent access by livestock. The areas need to be sown before the 31st May except in exceptionally wet years. The crop is left in situ through the winter period at least until mid-March. An outline document on the wild bird cover management is provided in Appendix B.

The location of the area sown can be rotated from year to year but the amount of wild bird cover will be maintained at a minimum of 4ha during the project. Management options and sowing density will be discussed and agreed with the project ecologist.

5.3 Erection of Bird and Bat Nest Boxes & Bat Roost

Under this option an external Barn Owl nest box will be erected at an agreed location either on a tree or on a pole specifically installed for this purpose. If a suitable additional site is available on farm buildings a second Barn Owl box will be erected within the land holding.

A minimum of 10 recycled plastic/woodcrete bird nest boxes will be erected at locations selected by the project ecologist. The type and specification of the boxes will be chosen to be appropriate to the habitats present. These boxes will be inspected and maintained regularly throughout the project.

A minimum of five recycled plastic/woodcrete bat roost boxes will be erected and maintained at sites selected by the project ecologist. These will be inspected annually by a licensed bat specialist. In addition, two Lesser Horseshoe Bat Night Roost structures (see Appendix C) will be installed at selected agreed locations within the landholding.

Figure 5.1 Scannell's lands included in the BEMP.

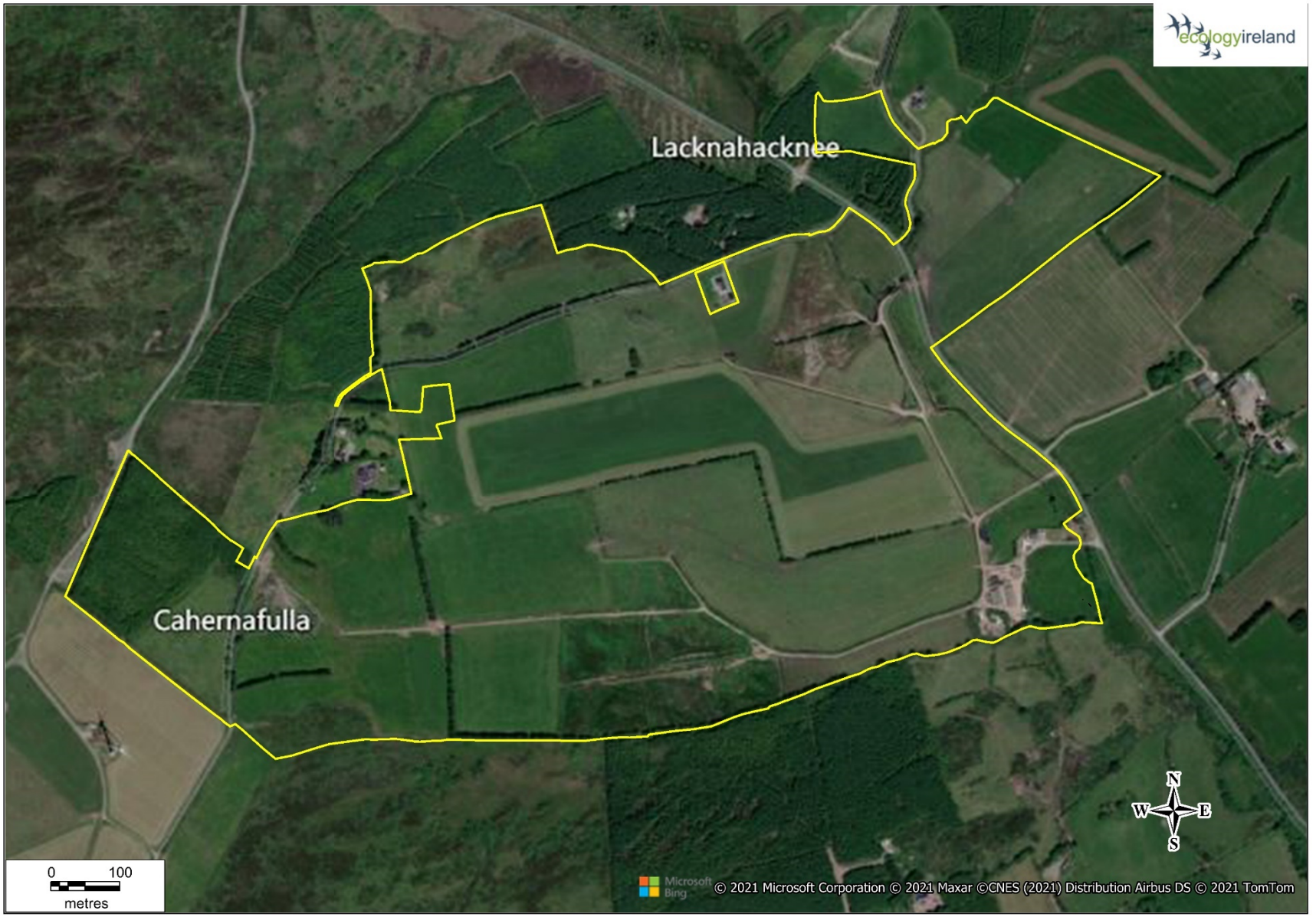
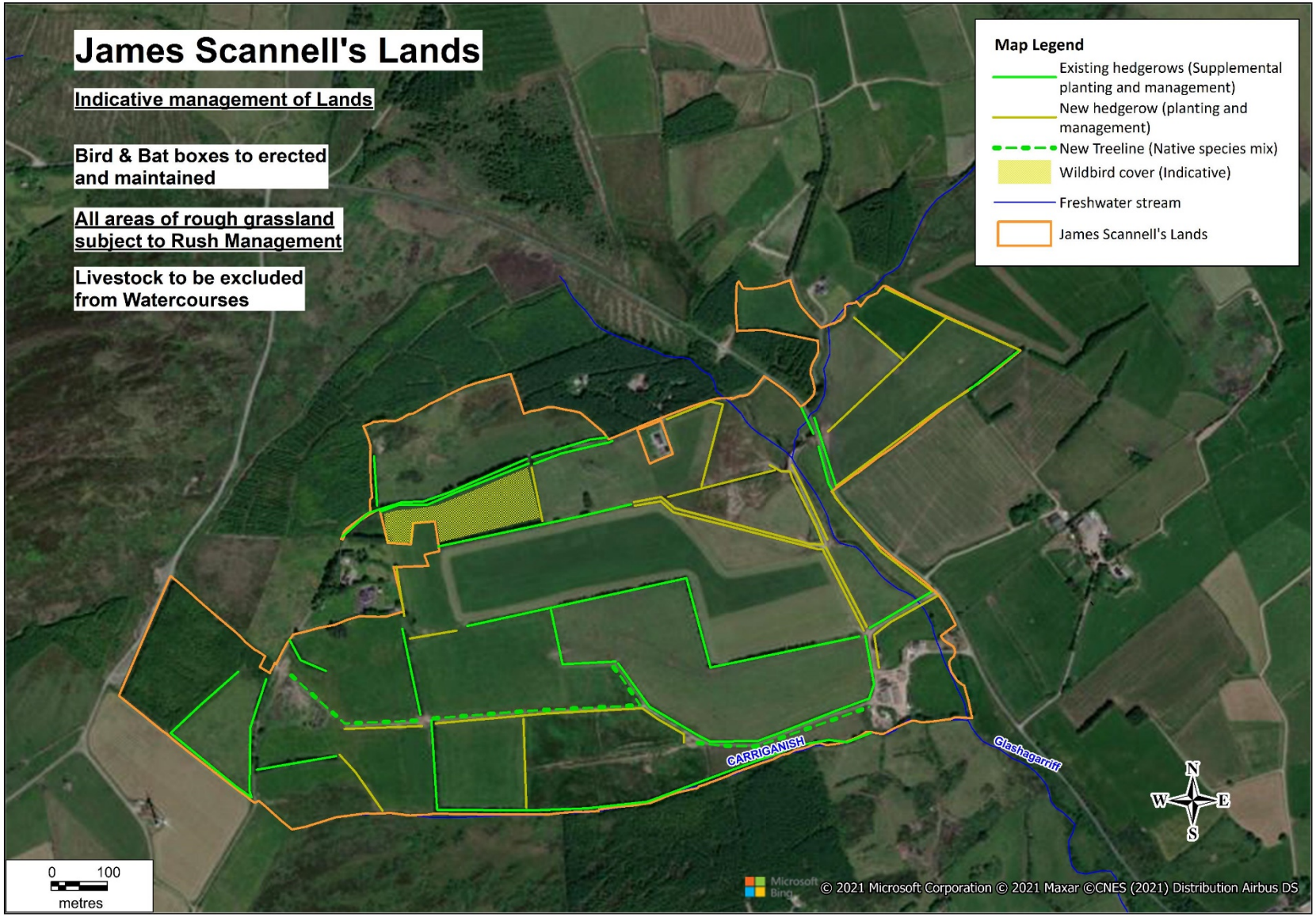


Figure 5.2 Summary of indicative BEMP commitments for Scannell's lands.



6 Joseph Barrett's lands

Joseph Barrett's land holding of c. 83 ha is shown in Figure 6.1. It is dominated by improved agricultural grassland with a fairly extensive existing hedgerow network of variable quality. The land is fairly intensively managed and the field size is relatively large. A small watercourse flows along the northern boundary of the land holding.

6.1 Management of Grassland Habitats

These measures will apply to areas of agricultural grassland. Stocking measures apply to all of the grassland areas, as does rush management and hedgerow management. Figure 6.2 shows the indicative extent of each of the following land management prescriptions that have been agreed in principle with Mr. Joseph Barrett.

Stocking & Grassland Management

Grazing of the agricultural fields included in this BEMP option will be by cattle/sheep with a target low stocking density of 0.5 LU/Ha (this stocking density will not exceed 0.7 LU/Ha without agreement). The aim is to maintain a tussocky sward. This will help improve conditions for ground nesting birds such as Meadow Pipit and Skylark. Supplementary feeding of stock with hay in the winter can take place, but feeding areas (e.g. ring feeders) will be moved around the fields regularly to prevent poaching of the ground. Supplementary feed can provide seeds and feeding opportunities for wintering passerines.

iv. Rush management. Rushes within the agricultural fields will not be allowed to grow to the extent that they rush tussocks collapse and form mats that can smother the ground vegetation. Rotational cutting, i.e. cutting every other year should be sufficient to maintain these levels. Rush cutting in the fields and rough grassland areas should aim to maintain rush levels at 30-70% cover. Approved herbicide application (direct application – licking) will be permitted to combat persistent high levels of rush cover.

   a) All rush cuttings will be removed from the treated fields. Topping will be delayed until after mid-July to minimise the risk to ground-nesting birds. In fields with a heavy soft-rush infestation (>60% cover) a second cut, four to eight weeks after the initial topping, will help to reduce rush cover in the following year. Reducing and maintaining rush cover at below 50% cover in areas initially with 60% and more cover will be a target.
   b) It may be impractical to cut rushes in the wetter or rockier fields, so these may be left if they form a small proportion of the field area, or they can be controlled by cattle trampling during aftermath grazing.

Hedgerow Planting/Hedgerow management/Fencing

The existing hedgerow network within this land holding is fairly extensive (>11km) but is of variable quality. There is also considerable opportunity for hedgerow planting and management on these lands. Existing hedgerows will be subject to supplementary (bolstering) planting to improve their structure and biodiversity value. New hedgerows will be planted according to the advice in Appendix

A of this report and as indicatively illustrated in Figure 6.2. Up to 4.8km of new hedgerow will be established as shown in Figure 6.2. In addition, existing hedgerows will be protected by stock-proof fencing. Stock-proof fencing/electric fencing will be erected a minimum of 3m from the base of the established hedgerows. Stock-proof fencing will also be erected to exclude livestock from accessing the watercourse that runs through the northern part of the land holding. All fencing will be renewed and maintained as required during the lifetime of the wind farm.

Existing hedgerows are to be managed to provide hedges with thick (minimum 2m wide) bases. Hedges will be cut to provide an A-shape, wider at the base with the aim to create hedges that are a minimum of 2m wide at the base and 2.5m high. All hedgerow cutting is to take place in the period 1st September to 28th February, i.e. outside the bird breeding season. Any existing areas of scrub found within the grassland fields are to be retained. Trimming of the scrub can be undertaken to prevent encroachment into the surrounding areas. Hedgerow management advice from the All-Ireland Pollinator Plan to be followed (see Appendix A).

6.2 Erection of Bird and Bat Nest Boxes & Bat Roost

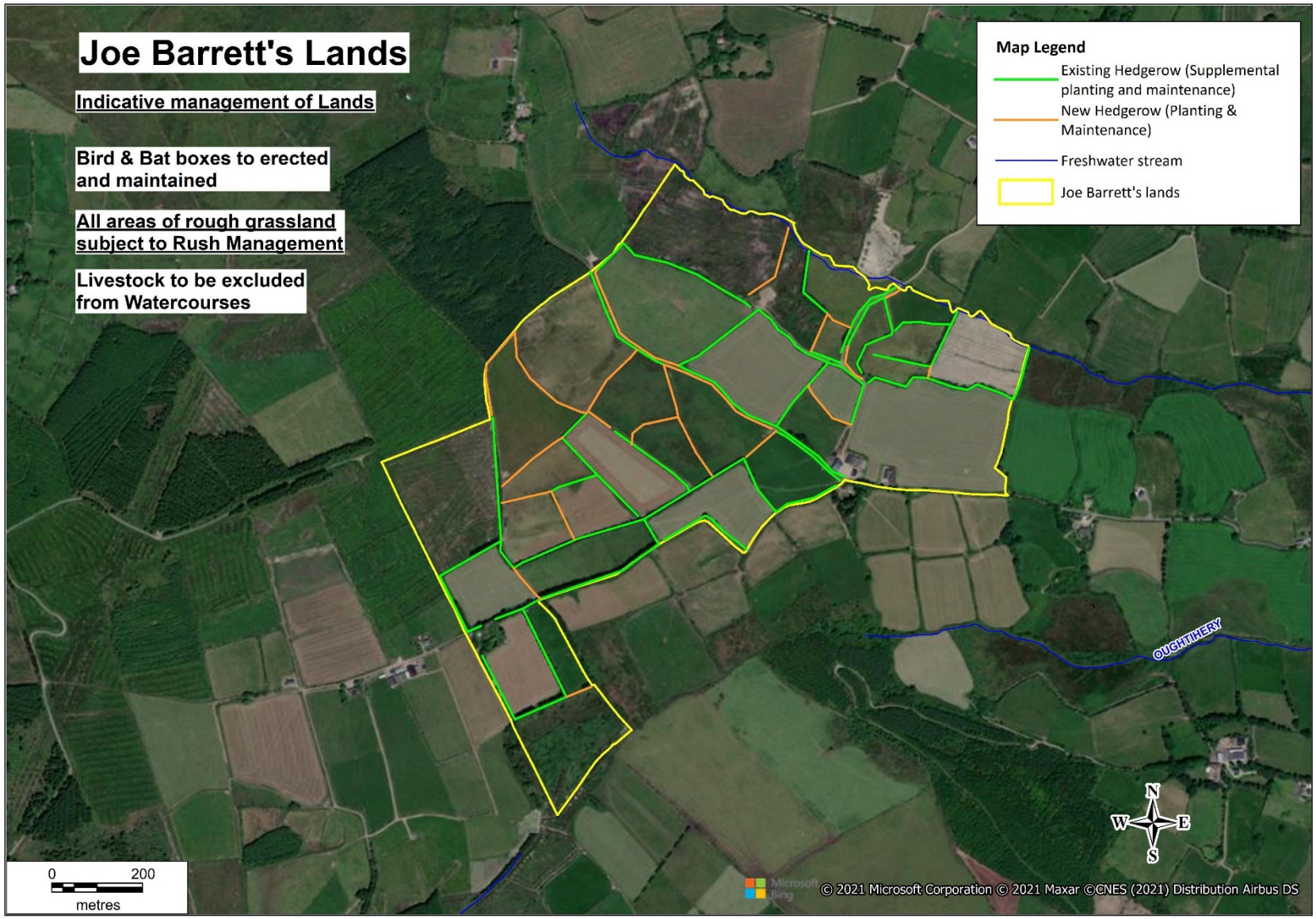
Under this option an external Barn Owl nest box will be erected at an agreed location either on a tree or on a pole specifically installed for this purpose. If a suitable additional site is available on farm buildings a second Barn Owl box will be erected within the land holding. A bat roost box will be installed within a suitable farm building within the landholding.

A minimum of 15 recycled plastic/woodcrete bird nest boxes will be erected at locations selected by the project ecologist. The type and specification of the boxes will be chosen to be appropriate to the habitats present. These boxes will be inspected and maintained regularly throughout the project.

A minimum of 8 recycled plastic/woodcrete bat roost boxes will be erected and maintained at sites selected by the project ecologist. These will be inspected annually by a licensed bat specialist. In addition, two Lesser Horseshoe Bat Night Roost structures (see Appendix C) will be installed at selected and agreed locations within the landholding.

Figure 6.1 Barrett's lands

Figure 6.2 Summary of indicative BEMP commitments for Barrett's lands.



7 Coillte Wildlife Corridors

It is proposed to strategically clear c. 18ha of Coillte lands to provide enhanced ecological connectivity between large areas of open upland habitats (see Figure 1). As is shown in Figures 7.1-7.3 below this will open corridors between areas of upland habitat.

Proposed Restoration/Management Actions

The following agreed actions will be subject to discussion and agreement with both BAU Estates Team and the Certification & Environment Team to actions and methodologies employed will reflect those employed by Coillte under forest certification guidelines. However, the proposed approach as part of the BEMP commitments is as follows:

1. Fell and extract existing conifer crop with tracked machinery in Year 1.
2. Mulch any remaining brash using a low ground-pressure excavator in Year 1.
3. Block furrow drains in Year 1, inserting peat dams at intervals of 10 metres. Dams may be spaced further apart in flatter areas.
4. During year 3 check to see if any natural regeneration of conifers is occurring in the area and manually clear any regeneration of exotics if present.

During Year 6 check to see if any natural regeneration of conifers is occurring in the area and manually clear any regeneration of exotics if present.

As part of the ongoing monitoring of the BEMP passive monitoring of the use by mammals and birds of these corridors will be monitored using long-term deployment of wildlife trail cameras over the course of the first 5-year action plan phase of the BEMP. In addition, the use of the corridors by commuting and foraging bats will be monitored using passive detectors during the first 5-year action plan. Key results will be posted on the BEMP website.

The current aerial mapping view of each of the corridors is shown in Figure 7.1-7.3 below.

Figure 7.1 Coillte wildlife corridor to west of the proposed wind farm site (0.99ha).

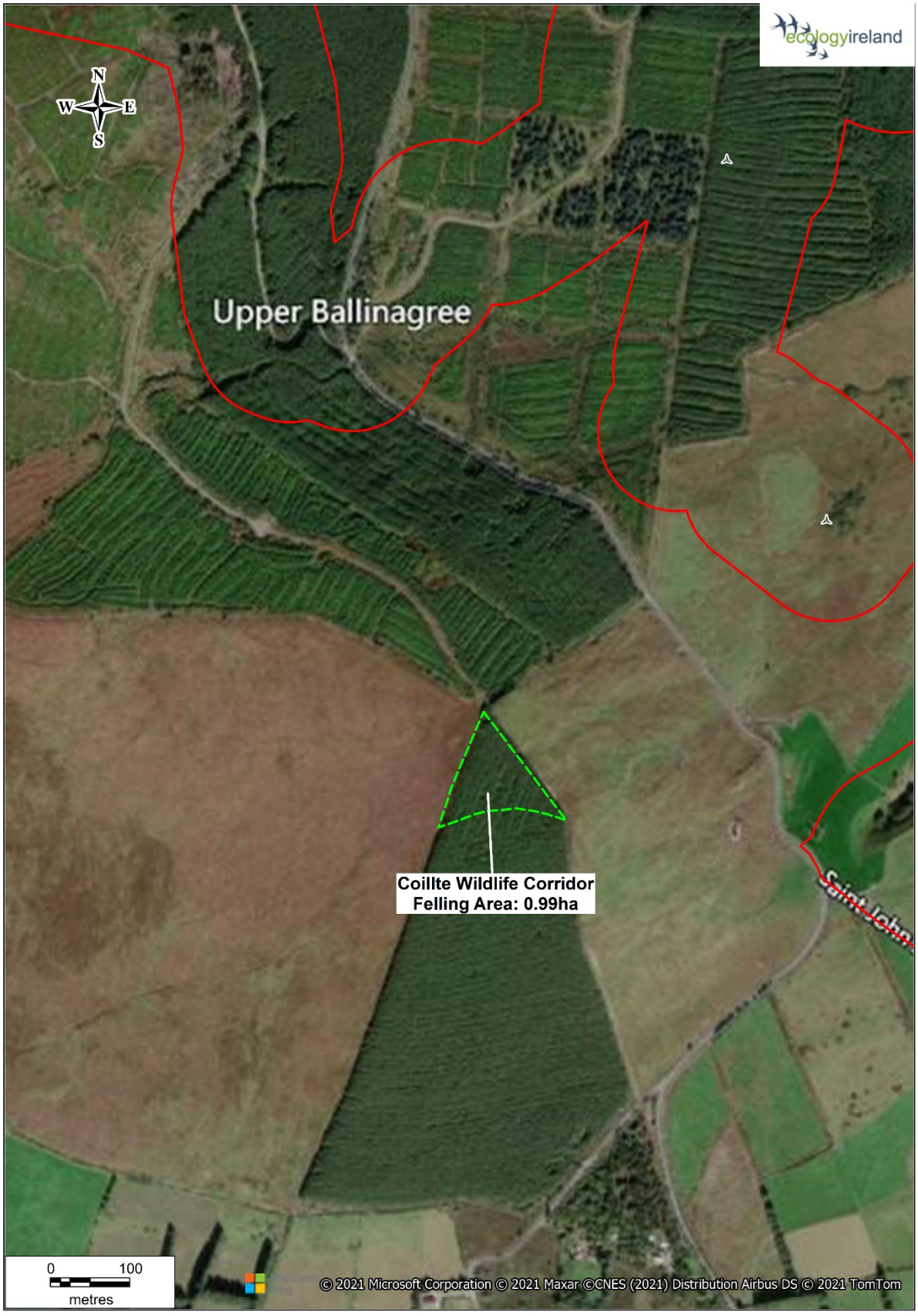


Figure 7.2 Coillte wildlife corridor to northwest of the proposed wind farm site (10.38ha).

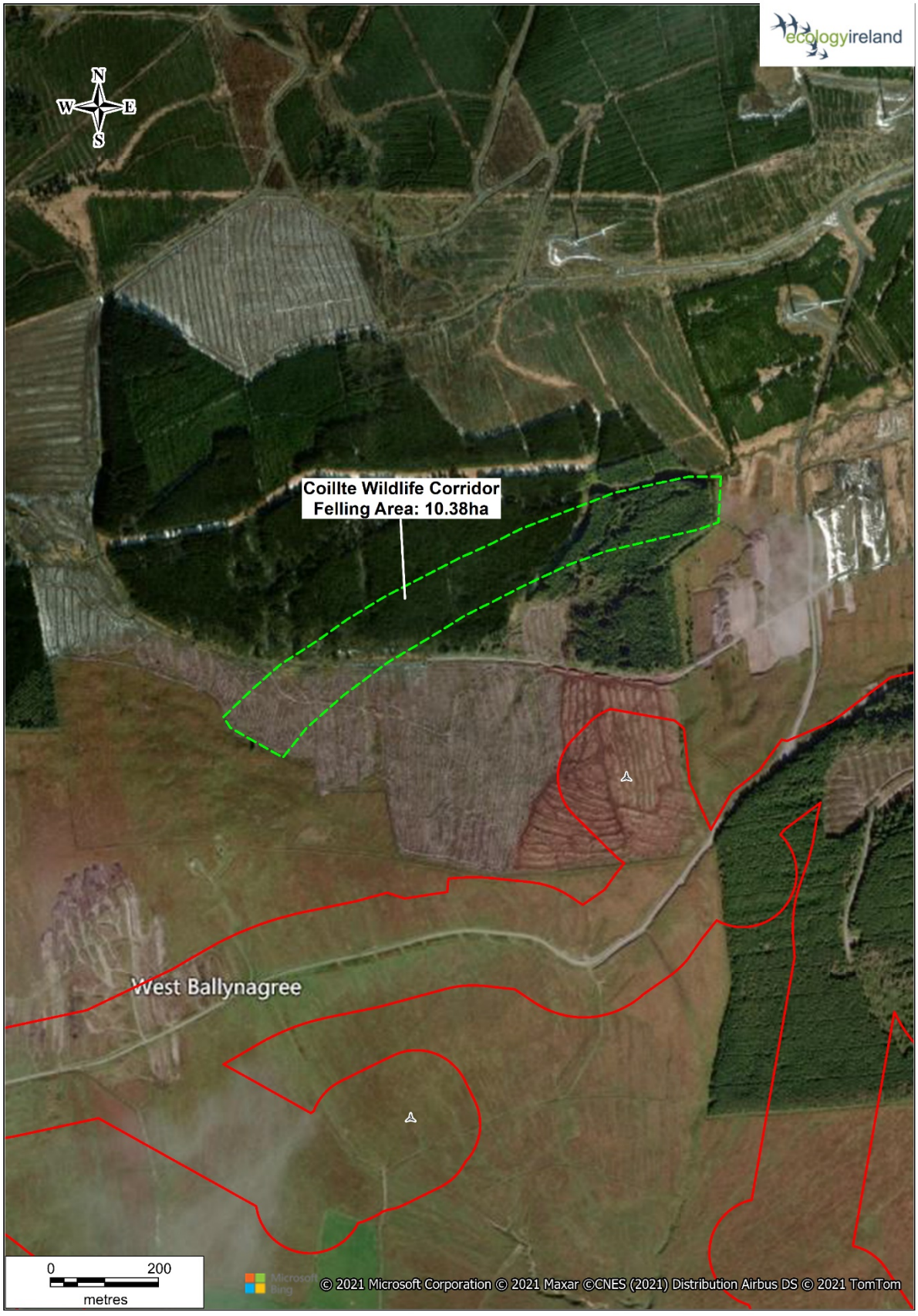
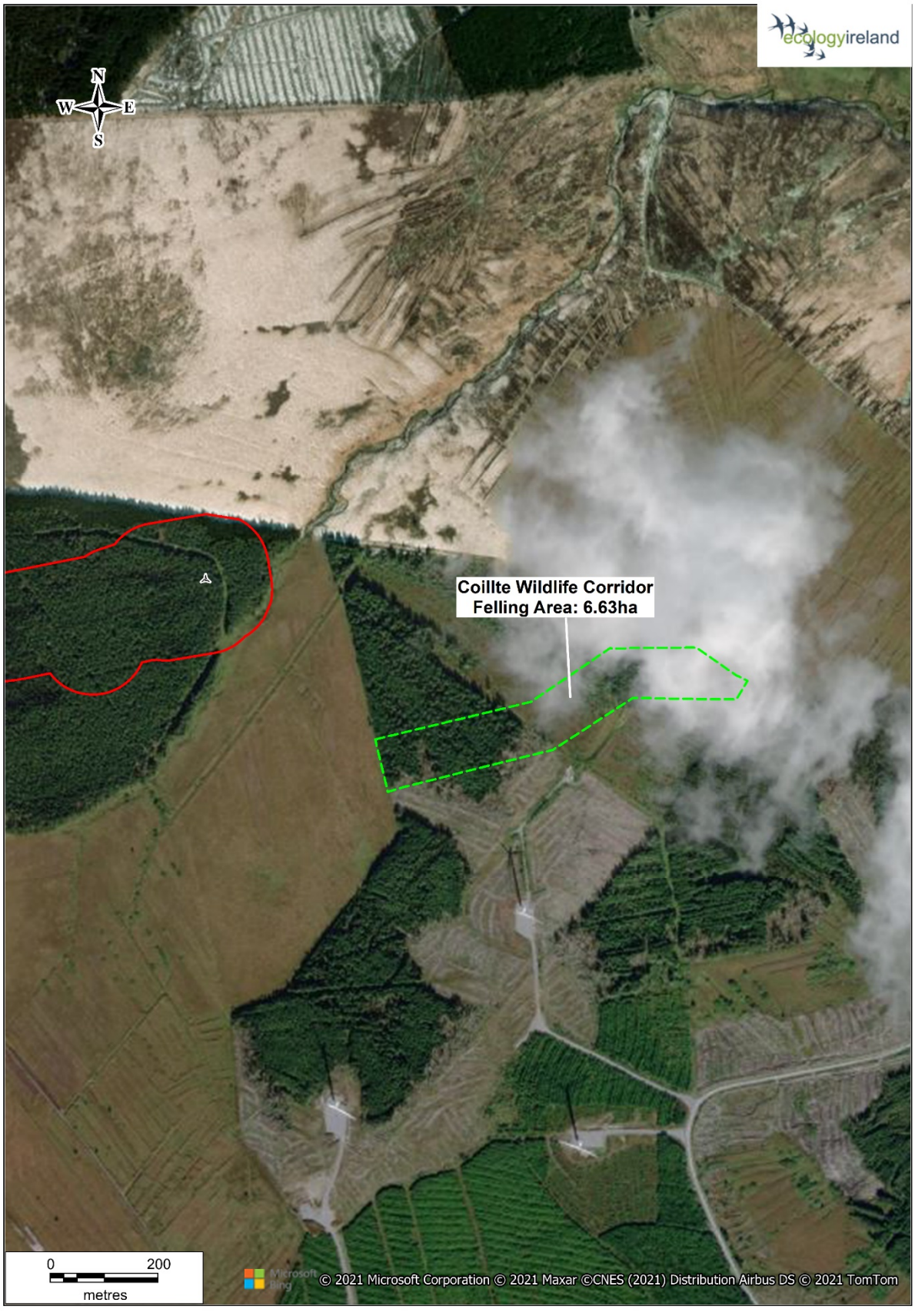


Figure 7.3 Coillte wildlife corridor to northeast of the proposed wind farm site (6.63ha).



Appendix A

Hedgerow Establishment & Management

(Credit: Bride Project; All-Ireland Pollinator Plan)

Bride Project website: https://www.thebrideproject.ie/ (accessed 22nd November 2021)
All-Ireland Pollinator Plan website: https://pollinators.ie/ (accessed 22nd November 2021.

8.

HEDGEROWS (B, C, WQ)

OVERVIEW

The majority of Ireland's hedgerows date from the eighteenth and nineteenth century, but some hedgerows have been dated to prehistoric times. Hedgerows have been used to define field, farm, parish and even county boundaries and they are a very ancient and important part of our heritage. They were also used as livestock enclosures and thus needed to be stockproof. This is why many of our hedgerows contain thorn species such as Hawthorn (Whitethorn), Blackthorn, Holly, Dog Rose, Bramble and Gorse (Furze). The electric fence has now replaced these and is being used to reinforce stockproof hedging on many farms. The BRIDE Project hedgerow mix introduces several other native and less widely used species such as Guelder Rose, Spindle, Hazel, Buckthorn, Alder Buckthorn and Bird Cherry to enhance the biodiversity value of this new approach to hedgerow creation. This measure is designed to reinstate some of our lost hedgerows along with creating a new habitat for insects, birds and bats. **Retain - not remove!**

Guelder Rose, one of the hedgerow species included in the BRIDE Hedgerow Mix

TIMEFRAME

Any time between October and March.

Location

Hedgerows can be planted in the centre of a large field or alongside a livestock or machinery passageway. The quality of existing hedgerows can be improved by filling gaps with some of the hedgerow species.

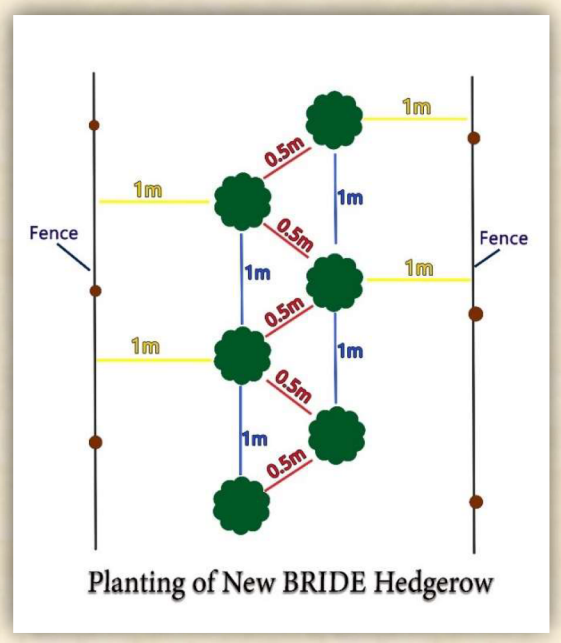
Benefits

Hedgerows create shelter from rain and sun for livestock as well as a very important habitat for a wide range of plant and animal species. Hedgerows provide corridors for wildlife that enable them to connect with other habitats. A mature hedgerow will visually enhance the farm you work on and also the countryside you live in. It can also prevent run-off from farmland thus preventing flooding, soil erosion and pollution. Hedgerows also significantly lower your carbon footprint.

Habitat Creation - Grassland Farmer

New hedgerows should ideally be located alongside a farm passageway or can be used to replace an existing wire fence boundary. If planting beside a farm passageway, ensure it is set back far enough from the passageway (2m) such that it does not interfere with livestock, electric fences or machinery. Plant on the northern side of an east-west running passageway to allow the sun dry out the passageway and thus help to prevent potholes. Plant on either side or both sides of a north-south running passageway.

Have the ground as bare as possible before planting a new hedgerow. The plants should be spaced at 3 per metre in a staggered line using the BRIDE Project hedgerow mix (up to 15 species – use at least 8 species). The mix contains many different species as the focus is on improving biodiversity rather than making the hedgerow stockproof. The traditional hedgerow contained mainly Whitethorn (Hawthorn) and Blackthorn but with the advent of electric fencing the need for thorn shrub species is no longer as important as it was in the past. Planting a native tree every 50m will add to the structure and biodiversity value of the hedgerow. Adding too many trees will cause shade as the trees mature in later years and possibly out compete the hedgerow species. When choosing plants, it is important to use plants with a good root structure that are tall and strong enough to require minimum maintenance. Small 'whips' will mean more work keeping the area free from competing grasses and bramble. Ensure the hedgerow is protected from livestock using an electric fence 1m out from the new hedgerow.



Planting of New BRIDE Hedgerow

This fence will need to be moved out further as the hedge grows and expands.

BRIDE Hedgerow Plant Mix	
Species	**Latin Name**
Crab Apple	*Malus sylvestris*
Blackthorn	*Prunus spinosa*
Alder Buckthorn	*Frangula alnus*
Purging Buckthorn	*Rhamnus catharticus*
Bird Cherry	*Prunus padus*
Wild Cherry	*Prunus avium*
Dogwood	*Cornus sanguinea*
Hawthorn	*Crataegus monogyna*
Hazel	*Corylus avellana*
Holly	*Ilex aquifolium*
Wild Privet	*Ligustrum vulgare*
Guelder Rose	*Viburnum opulus*
Spindle	*Euonymous europaeus*
Goat Willow	*Salix caprea*
Grey Willow	*Salix cinerea*

Habitat Creation - Tillage Farmer

This option may not suit tillage farmers as the requirement for larger fields and machinery was the reason many hedgerows were removed in recent decades. However, planting a new hedgerow in some of the bigger fields will greatly add to the biodiversity and carbon reduction of tillage farms as well as creating corridors of connectivity for wildlife. Large fields are prone to soil erosion, weather exposure and run-off. Creating new hedgerows will minimise soil erosion and siltation of streams and rivers and greatly enhance the landscape value of your farm. Livestock access will not be an issue for tillage farmers but avoiding spray drift and fertiliser onto the habitat is important.

Habitat Management – Existing Hedgerows

All BRIDE Project hedgerows should be allowed to grow and mature so that their full biodiversity and carbon sequestration value can be achieved. They should be side-trimmed only, to prevent encroachment and this will need to be carried out every year or at least every 2 years. The practice of "leaving a whitethorn here and there" defeats the purpose of the exercise and makes the job more difficult for the hedge cutting contractor. Do not use pesticide, fertiliser and slurry anywhere near the habitat.

Side Trimmed Hedgerow

Habitat Management – New Hedgerows

If rabbits or hares are a problem, guards will need to be used and will be an additional cost where this is an issue. Over the first and possibly second year, vegetation will need to be kept down to ensure the new plants are not out-competed. Trampling around the plants in the first year of establishment will prevent undergrowth build-up. The first year can also be problematic for the plant if drought conditions occur. The new hedgerow may need watering if this is the case. Wind rock can be an issue before the plant gets properly rooted so ensure the plant is upright and straight at all times. Pruning after planting is not required as the mix contains many plant species, several of which will not tolerate pruning.

Rabbit / Hare guards may be needed in certain areas

Habitat Management - Roadside Hedgerows

Roadside hedges can be maintained in a similar way to hedgerows in a field. However, in an area of poor visibility, the hedge will need to be flailed to a height where visibility of oncoming traffic or pedestrians is not compromised e.g. at a junction, bad bend, under power or telephone lines, at a field entrance, dwelling house or farm entrance - where good sightlines are important. Roadside hedgerows need to be side trimmed every year (this can take place throughout the year, in the interest of safety) to prevent encroachment onto the road, thereby reducing the risk of damage and injury to vehicles and road users respectively.

Poor quality hedgerow with low height structure, gaps and low density

Hedgerow Management advice:

Cutting to encourage flowering

- Leave at least one mature Whitethorn/ Blackthorn tree within each hedgerow.
- Where possible, cut hedgerows on a minimum 3-year cycle. Cutting annually stops the hedgerow flowering and fruiting.
- Where possible, cut in rotation rather than all at once as this will ensure some areas of hedgerow on your farm will always flower (Blackthorn is white in March. Whitethorn flowers at silage time in May).
- Hedges managed for pollinators should ideally be cut between Nov-Jan. If they must be cut outside this, cut in rotation, so some areas remain undisturbed.
- Let some Bramble and Ivy grow in hedgerows. They are key nectar and pollen sources in summer and autumn.
- Where hedgerows must be cut along the roadside for safety, allow the inside to flower.
- Aim for a hedgerow that is as high as possible, but at least 2.5m above ground level or above the bank.
- Let some of your hedgerows grow wild, side-trimming only.

Hedgerow base

- Avoid spraying the hedgerow base, use mechanical weed control and spot spray only in exceptional cases
- Leave an unfertilised buffer margin at the hedgerow base

A pollinator-friendly hedgerow should be flowering, at least 2.5m in height, and should be trimmed in an A-shape.

Willow is a very important food source in early spring when queens emerge from hibernation. Having Grey/Goat Willow, Whitethorn, Whitebeam, Crab apple or Wild Cherry as individual mature trees around the farm will provide important food for pollinators.

Autumn

Appendix B

Establishment and Management of Wild Bird Cover

(After joint presentation by Teagasc, BirdWatch Ireland and Bat Conservation Ireland)

(https://www.teagasc.ie/media/website/environment/biodiversity-countryside/Wild-Bird-Cover.pdf)

Supplementary advice on establishment of wildbird cover strips

(from Hen Harrier Project; http://www.henharrierproject.ie/HHPActions.pdf)

Wild Bird Cover 1

Why? This unharvested crop is a giant bird table for seed eating birds and tillage flora and fauna

Seed eating birds

- in decline due to :
  - Intensification
  - Specialisation
  - Loss of tillage in many counties

Seed eating birds

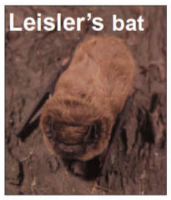
- need a variety of seeds:
  - Large cereal seeds - Yellowhammer
  - Small linseed or kale seeds - Linnet

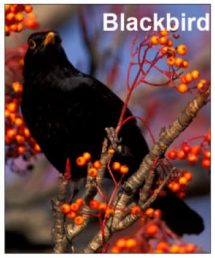
Flowers in Wild Bird Cover

- Attract pollinators and insects

Birds and Bats

- Feed on insects and worms





Wild Bird Cover crops

- provide cover for small mammals

Birds of prey

- feed on small mammals

BAT CONSERVATION IRELAND

BirdWatch Ireland

teagasc
AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

Wild Bird Cover 2

Oats & Linseed sown each year *Recommended*

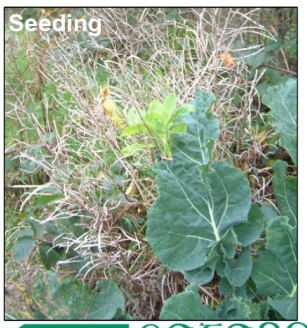
- Grow in all soil types (including heavy, acid)
- Tolerates a low pH

Oats and Linseed sown together

Kale

- Needs a high pH- lime important
- Fertiliser may be essential for establishment
- Club root risk (resistant varieties available)
- Biennial
  - Vegetative in year 1
  - Flowers and seeds in year 2
  - Remains in situ for 2 years
  - Sow every 2nd year
  - Establish half the plot in kale and other half cereal

Year	Half Plot	Half Plot
1	Kale Yr 1	Cereal
2	Kale Yr 2	Cereal
3	Cereal	Kale Yr 1
4	Cereal	Kale Yr 2
5	Kale Yr 1	Cereal



Bat Conservation Ireland

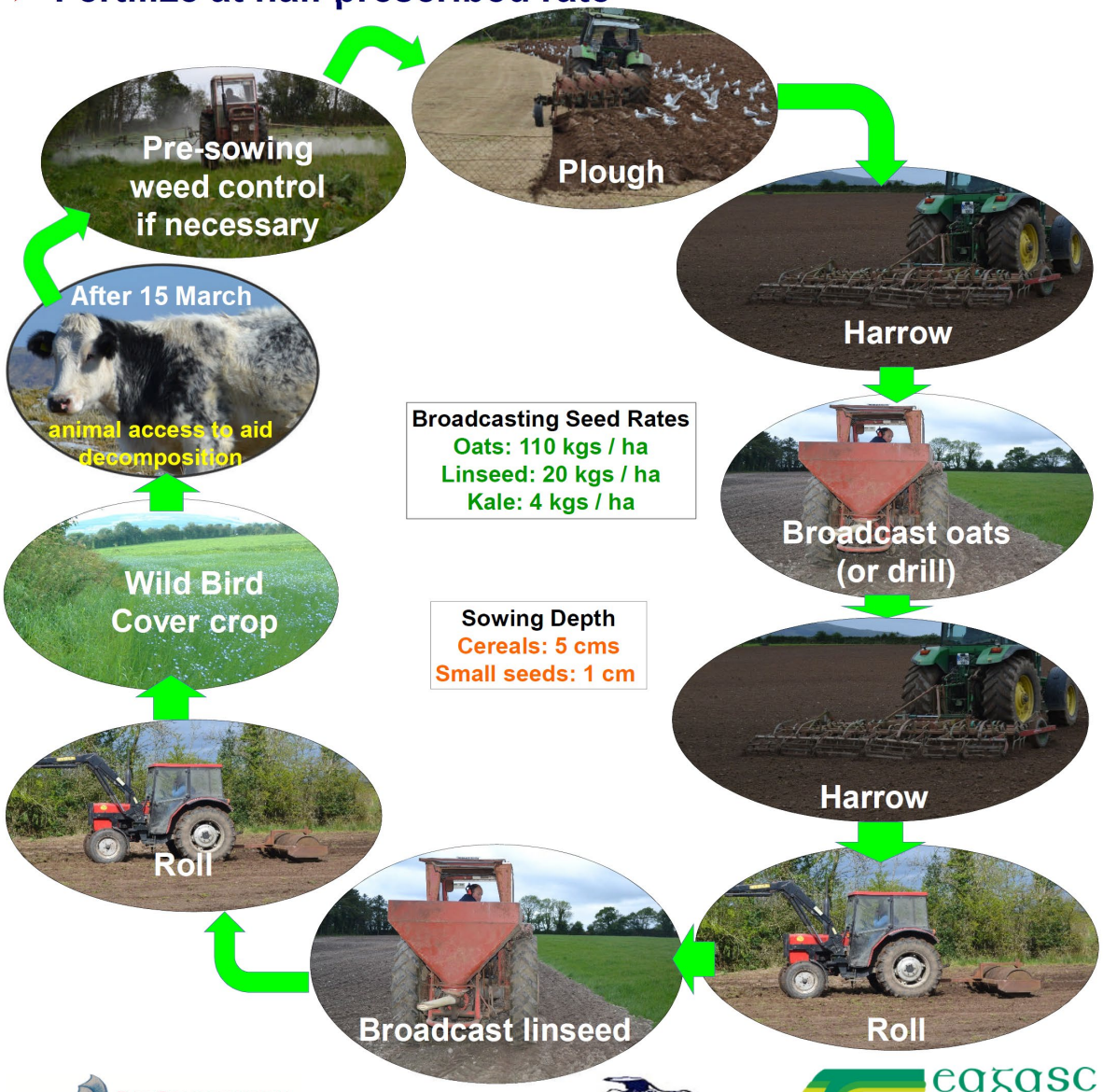
BirdWatch Ireland

teagasc
Agriculture and Food Development Authority

Wild Bird Cover 3

Sowing & Management

- Fine, firm seedbed essential
- Any cultivation method allowed provided successful crop establishment
- Pre-sowing weed control may be necessary
- Plough, harrow and roll as necessary
- Drill or broadcast - if drilling, reduce seed rate
- Fertilize at half prescribed rate



Bat Conservation Ireland

BirdWatch Ireland

teagasc
Agriculture and Food Development Authority

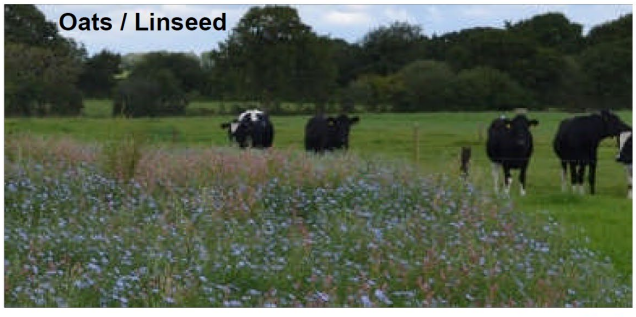
Wild Bird Cover 4

GLAS Requirements

- Sow by 31 May
  - each year for cereals,
  - every second year for kale
- Do not apply pesticides after sowing
- Spot treat noxious weeds and invasive species

- Fence
  - stock proof
  - fit for purpose

- Do not harvest
- Leave in situ until 15 March the following year (2 seasons for kale)
- Before replanting, livestock may enter from 15 March to aid decomposition of trash



Bat Conservation Ireland

BirdWatch Ireland

teagasc
Agriculture and Food Development Authority

The Hen Harrier Project has prepared a number of recommended actions for biodiversity on farmland. They recommend a wild bird seed cover strip alongside an existing hedge or treeline:

Wild Bird Cover

The crop is sown as a strip 9 m wide, running parallel to an existing hedge. The crop should be sown on the sheltered side of the hedge, ideally on the southern or eastern side. If livestock are present the crop must be protected by a stockproof fence. An uncultivated grass strip at least 1 m wide must be retained between the hedge and the seed crop. The crop must contain a cereal crop (preferably Triticale) and Linseed. Other seeds such as Buckwheat, Gold of Pleasure, Mustard, Fodder Radish, Forage/ Oil Seed Rape and Vetch may also be included in the seed mix. The sowing rate is 7.5 Kg of Triticale/ 100 m strip and 1.5 Kgs of Linseed. Other seeds should be in much smaller quantities. Triticale is the recommended cereal crop; it has considerable advantages over Oats as it is better suited to acidic soils and poor ground conditions. It also has stronger straw which will delay lodging. The chaff on the seed triticale makes it less attractive to birds and rodents ensuring that seed consumption is delayed until other food sources are depleted, this will ensure that a significant feed resource is retained into the mid-winter period.

- prepare the site as early as ground conditions permit. Burn

off the existing sward with a suitable herbicide to prevent competition with perennial grasses. it is important to avoid drift into the adjacent hedge or uncultivated grass strips.

- sites for wild bird cover should be power harrowed rather than ploughed. This reduces post cultivation soil carbon loss.
- the crop must be sown by May 31st each year, where a spring sown crop has failed it is permitted to establish an Autumn sown crop with suitable winter cereals 10 Kgs/ 100 m strip or 0.5 Kgs/ 100m of Forage Rape. Availing of this option wil prevent the use of the site for wild bird cover in the following year.
- the action must be delivered in an 11 m wide strip along a field boundary (9m crop with a 1 m grass strip between the crop and the hedge and a further 1 m grass strip between the crop and the fence). The minimum length of a strip is 80m. This action can be delivered at multiple locations on the farm.
- the wild bird cover does not have to remain in the same place for the duration of the project. It can be established in different locations each year.
- the crop must remain in situ until the March 15th the following year. Livestock may enter the parcel from March 15th to planting time, to aid in the decomposition of the trash.
- linseed/ cereal mix 1.5 kg Linseed for a 100m strip plus 7.5 kg of Triticale/ ha for 100 m
- pesticides cannot be applied post sowing.

- Annual weeds particularly weeds of cultivation are a positive feature of wild bird cover strips.
- one bag of granulated lime and 0.5 bags of 10:10:20 should be spread on each 100 m strip at the time of sowing
- all seeds can be scattered by hand, but it is important that they are rolled into the seed bed immediately after sowing.

When you have finished growing wild bird cover on a site, let grasses and herbs regenerate naturally from the seed bank in the soil.

Appendix C

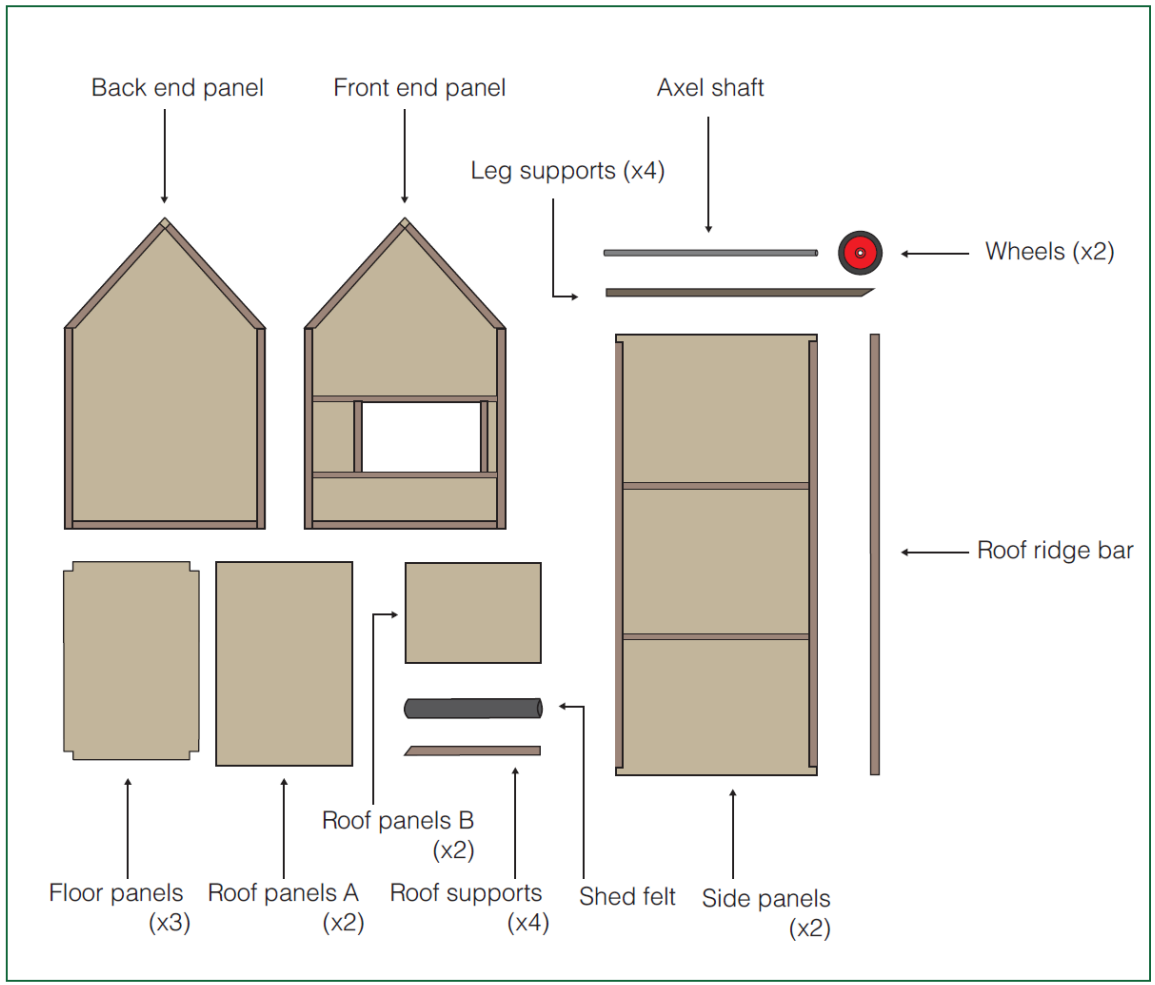
Design of Lesser Horseshoe Bat (Night Roost)

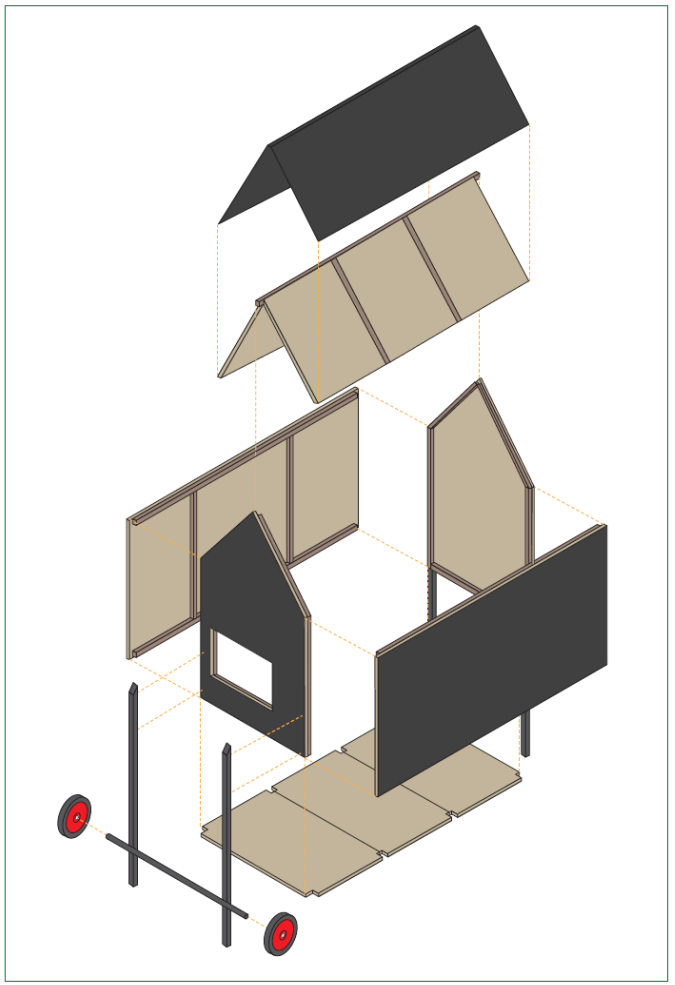
(Credit: Vincent Wildlife Trust)

Vincent Wildlife Trust website: https://www.vincentwildlife.ie/ (accessed November 22nd 2021).

Cathedine Night Roost Design

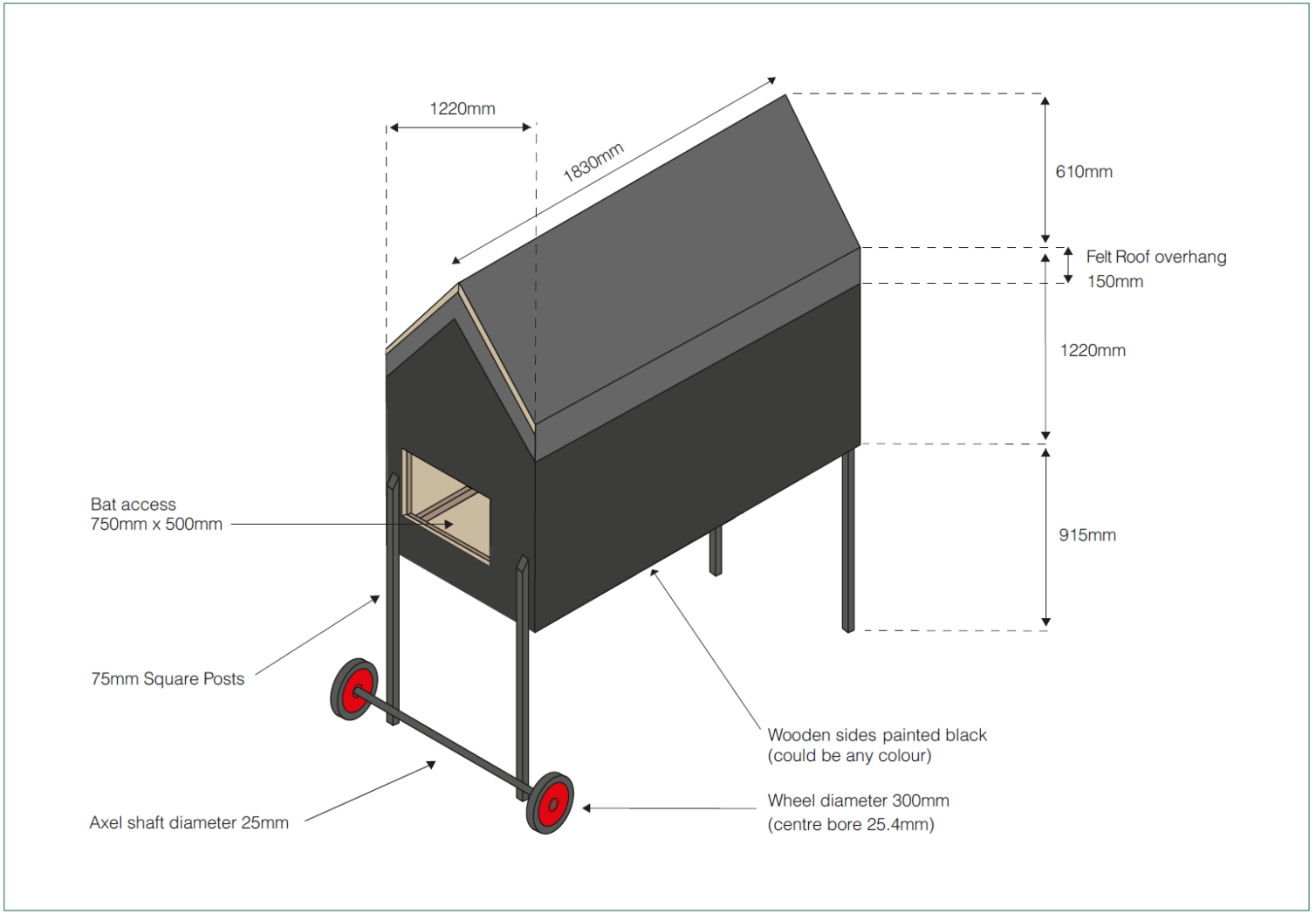
The Vincent Wildlife Trust





Cathedine Night Roost Design

The Vincent Wildlife Trust



Appendix D

Establishment & Management of Woodland patches (Credit: Bride Project)

Bride Project website: https://www.thebrideproject.ie/ (accessed 22nd November 2021)

23.

WOODLAND (B, C, WQ)

OVERVIEW:

Native woodland (woodland that is dominated by trees that are native to Ireland) once covered most of Ireland but once the first farmers came to inhabit the island over 5000 years ago, the countryside has slowly changed to a landscape dominated by agriculture. The gradual dominance of agriculture has left the island with a very low percentage of woodland cover (one of the lowest in the EU).

TIMEFRAME

Trees can be planted anytime from October through to March

LOCATION

Locating an area to plant woodland needs to be considered carefully as the wood will change dramatically as the trees begin to mature. Furthermore, woodland has traditionally been planted on the poorest land area of the farm and if this area is not suitable for grass or cereals it may not be suitable for trees. Keep in mind the long-term view of this undertaking and ensure that it will not interfere with any future building or other development plans. Most areas of the farm should be suitable for planting but consider the potential loss of a cherished view (in years to come). Know the soil type of your farm so that the most suitable species can be planted. Ensure no overhead powerlines are present. Existing farmland habitats should be avoided.

BENEFITS

Trees provide enormous environmental benefits such as food and shelter for a wide range of species. Trees are also vital for their role in carbon sequestration and their ability to soak up

water and hence reduce flood risk. Native trees in particular are very valuable for biodiversity as they can support a huge range of insects, fungi, mosses, lichens, plants, birds and mammals. Mature woodland, especially native woodland, is one of the most biodiversity-rich habitats and even small areas of woodland can significantly improve the biodiversity of intensively managed farmland. Planting woodland, hedgerows or tree-lines will positively alter the visual landscape of the countryside for years to come. Removing these habitats will do the opposite and create a featureless landscape.

Rare native oak woodland near Conna, in the Bride valley

Habitat Creation

A native woodland plot involves the planting of 160 native trees on 0.1ha (min.) of the farm. The Native Woodland Establishment Scheme is more suitable to planting larger areas (over 0.1ha). These sapling trees consisting of nine species (Pedunculate or Sessile Oak, Scots Pine, Downy Birch, Wild Cherry, Hawthorn, Hazel, Spindle, Crab Apple, Buckthorn or Alder Buckthorn) in a fenced plot to prevent livestock access. The larger (Oak and Scots Pine) and medium-sized species (Wild Cherry and Downy Birch) are planted in the central area of the plot while the smaller species are planted on the outer perimeter but some of the more shade tolerant species (Hawthorn, Spindle and Hazel) will be interspersed throughout the wood. Willows are extremely important for biodiversity as many insect species rely on them for pollen and as a food plant. They can easily be planted from cuttings and it is recommended that at least five be planted in each wood.

BRIDE Woodland Plant Mix	
Species	**Latin Name**
Alder	*Alnus glutinosa*
Downy Birch	*Betula pubescens*
Bird Cherry	*Prunus padus*
Wild Cherry	*Prunus avium*
Hazel	*Corylus avellana*
Holly	*Ilex aquifolium*
Pedunculate Oak	*Quercus robur*
Sessile Oak	*Quercus petraea*
Scots Pine	*Pinus sylvestris*
Rowan	*Sorbus aucuparia*
Goat Willow	*Salix caprea*
Grey Willow	*Salix cinerea*

New woodland is ideally suited to an awkward corner or an area away from the farmyard, but do not put it on an existing wildlife habitat. The new wood will not be thinned as it is designed purely for biodiversity enhancement and should be planted as a legacy with future generations in mind. It is said that "an oak tree grows for 300 years, rests for 300 years and declines gracefully for the next 300 years". Leave a winding path through larger woodland plots so that the farmer and future generations can appreciate the wood as it grows and matures. Open spaces within a wood provide important habitats for wildflowers and grasses and will help to increase the biodiversity value of the wood. Native tree species (see BRIDE Project tree mix) suited to the farm's specific soil type and aspect will be chosen by the ecologist in consultation with the project participant.

Habitat Management

New native woodland

It is important that newly planted trees are kept free from encroaching grass and bramble especially during the first three years after planting. It is also important to ensure that protective fencing is erected to prevent livestock access. Check for rabbit or hare damage and use guards if necessary. Pruning in the first 3-5 years, if needed, will prevent forking of the tree in future years. Water (especially in the first year) if necessary.

Pruning the tree in the first 3-5 years will prevent forking later. It is only a matter of time before this tree will split.

Established Deciduous Woodland

Existing woodland should be fenced to prevent livestock access. Deer can also damage woodland and fencing may be necessary if deer are preventing natural regeneration. Invasive species such as Cherry Laurel and Rhododendron should be eradicated. This process is best achieved by cutting and chemically treating the remnant stump - treatment may need to be continued for at least three years. Non-native trees such as Beech and Sycamore support far less biodiversity than native tree species such as Oak and these non-native species can dominate large sections of woodland if they remain unchecked. Gradual replacement of non-native tree species with native trees could be considered.

Deadwood, whether fallen or standing is a very important component of native woodland ecosystems. Dead or decaying trees provide a rich habitat for fungi and a wide range of invertebrates that recycle nutrients back into the soil during the decomposition process. No need for bug hotels in a properly functioning woodland!

Appendix E

Letters of Consent

Landowner: Andrew Scannell

Address: Kilberrihert, Coachford, County Cork

Folio Number(s): CK10316F, CK28978F and CK104443F

Date: 29/11/2021

To Whom it may concern,

I confirm that I am aware of and I hereby consent to the submission of a planning application for the Ballinagree Wind DAC project which includes the proposal for my lands to be included as part of the Biodiversity Enhancement Management Plan. The proposed works are described in the plans and reports submitted alongside the planning applications.

Regards,

Andy Scannell

Landowner: Anthony Kelleher

Address: Horsemount, Ballinagree, Macroom, Cork

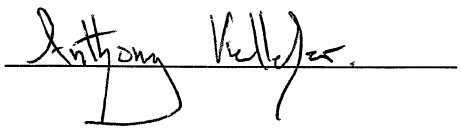
Folio Number(s): CK49759 and CK45440F

Date: 24/11/2021

To Whom it may concern,

I confirm that I am aware of and I hereby consent to the submission of a planning application for the Ballinagree Wind DAC project which includes the proposal for my lands to be included as part of the Biodiversity Enhancement Management Plan. The proposed works are described in the plans and reports submitted alongside the planning applications.

Regards,



Landowner: Joe Barrett

Address: Glounaglough, Rylane, County Cork

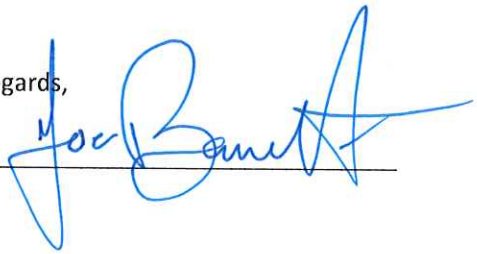
Folio Number(s): Part of Folios CK11021, CK11023 and CK3039

Date: 29/11/2021

To Whom it may concern,

I confirm that I am aware of and I hereby consent to the submission of a planning application for the Ballinagree Wind DAC project which includes the proposal for my lands to be included as part of the Biodiversity Enhancement Management Plan. The proposed works are described in the plans and reports submitted alongside the planning applications.

Regards,



Landowner: Noel Nunan

Address: Cahernaboul, Macroom, County Cork

Folio Number(s): CK7131

Date: 29/11/2021

To Whom it may concern,

I confirm that I am aware of and I hereby consent to the submission of a planning application for the Ballinagree Wind DAC project which includes the proposal for my lands to be included as part of the Biodiversity Enhancement Management Plan. The proposed works are described in the plans and reports submitted alongside the planning applications.

Regards,

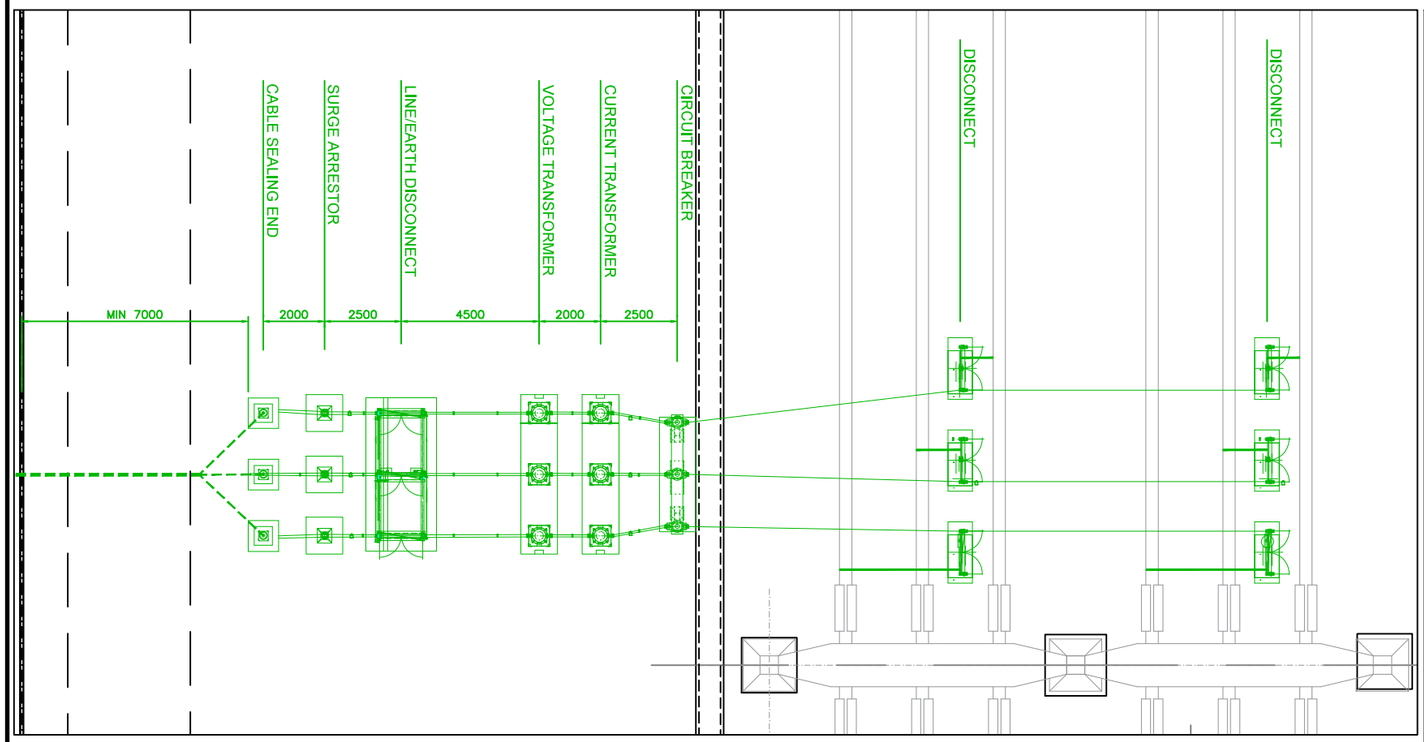
Noel Nunan

FEHILY TIMONEY

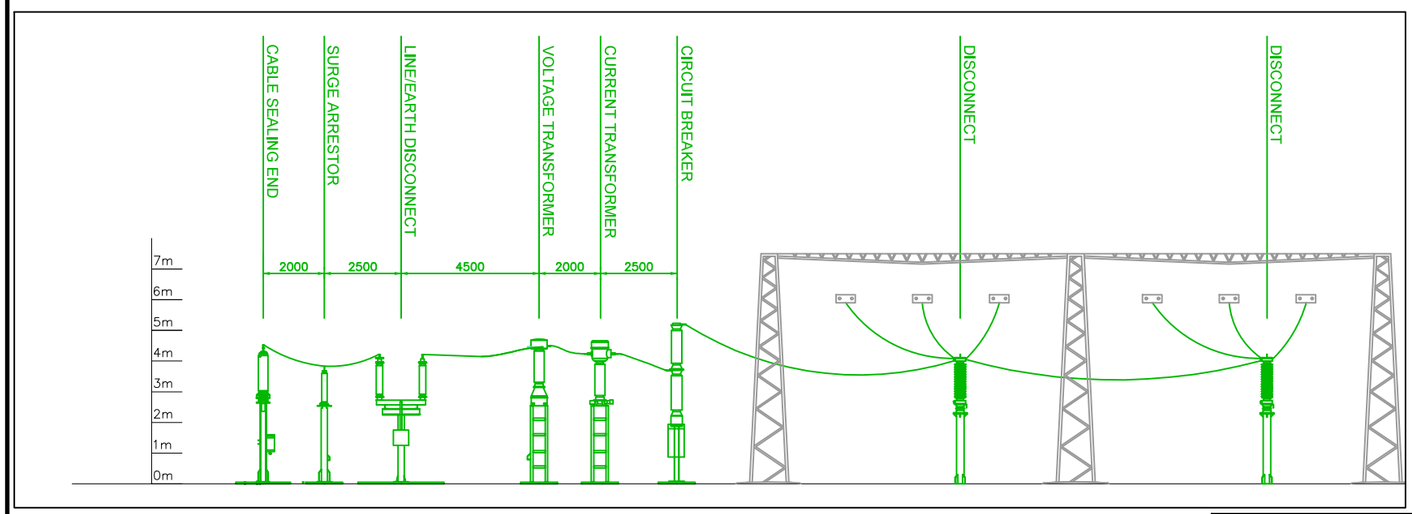
CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

Appendix 3.5

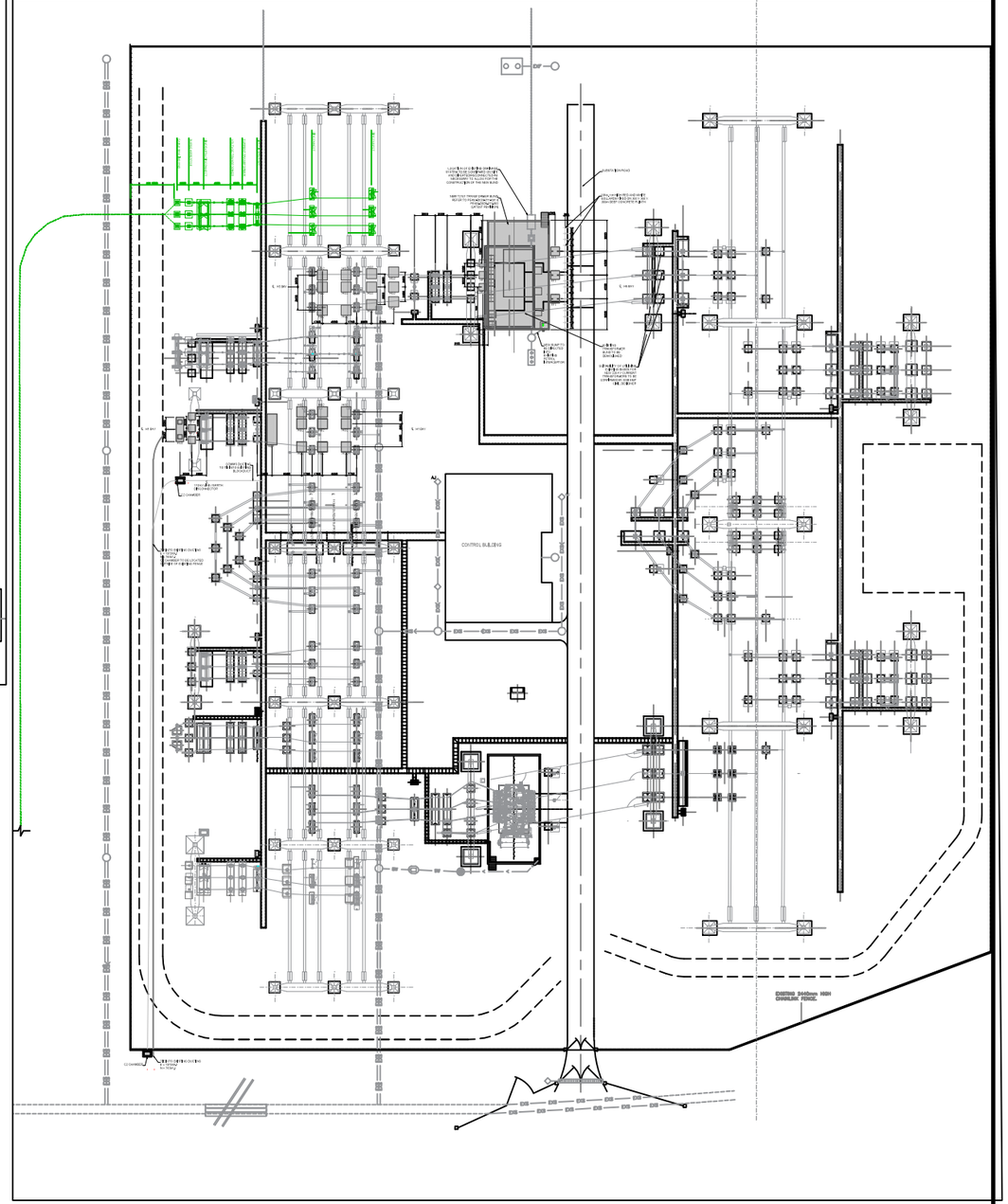
New 110kV Line Bay



Proposed New Line Bay - Plan
SCALE - 1:200



Proposed New Line Bay - Section
SCALE - 1:200



Key Plan
SCALE - 1:1000

NOTE: Proposed Line Bay layout for informaton only.
Final position to be agreed with Eirgrid

PROGRESS PRINT

Legend:
Proposed works shown in green

tli GROUP
Head Office
Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

CLIENT
COILLTE
GROW · TRANSFORM · SUSTAIN

PROJECT
Ballinagree Windfarm
110kV Grid Connection

PROJECT NUMBER
05-843

SHEET NUMBER
05843-DR-020

SHEET TITLE
Clashavoon 220kV Substation
Proposed New 110kV Line Bay

DRAWING STATUS
Issued for Information

ISSUE/REVISION

I/R	DATE	DESCRIPTION
F01	11.01.22	Issued for Information
F00	17.11.21	Issued for Information