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CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

APPENDIX 3

Description of Proposed Development

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APPENDIX 3.1

Construction and Environmental Management Plan (CEMP)

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& PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED FAHY BEG WIND FARM, CO. CLARE

CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN

Prepared for: RWE Renewables

RWE

Date: November 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 Fahy Beg Wind Farm and has been prepared by Fehily Timoney and Company (FT) on behalf of RWE.

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 will 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 Fahy Beg 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 Fahy Beg Wind Farm.

1.2 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.

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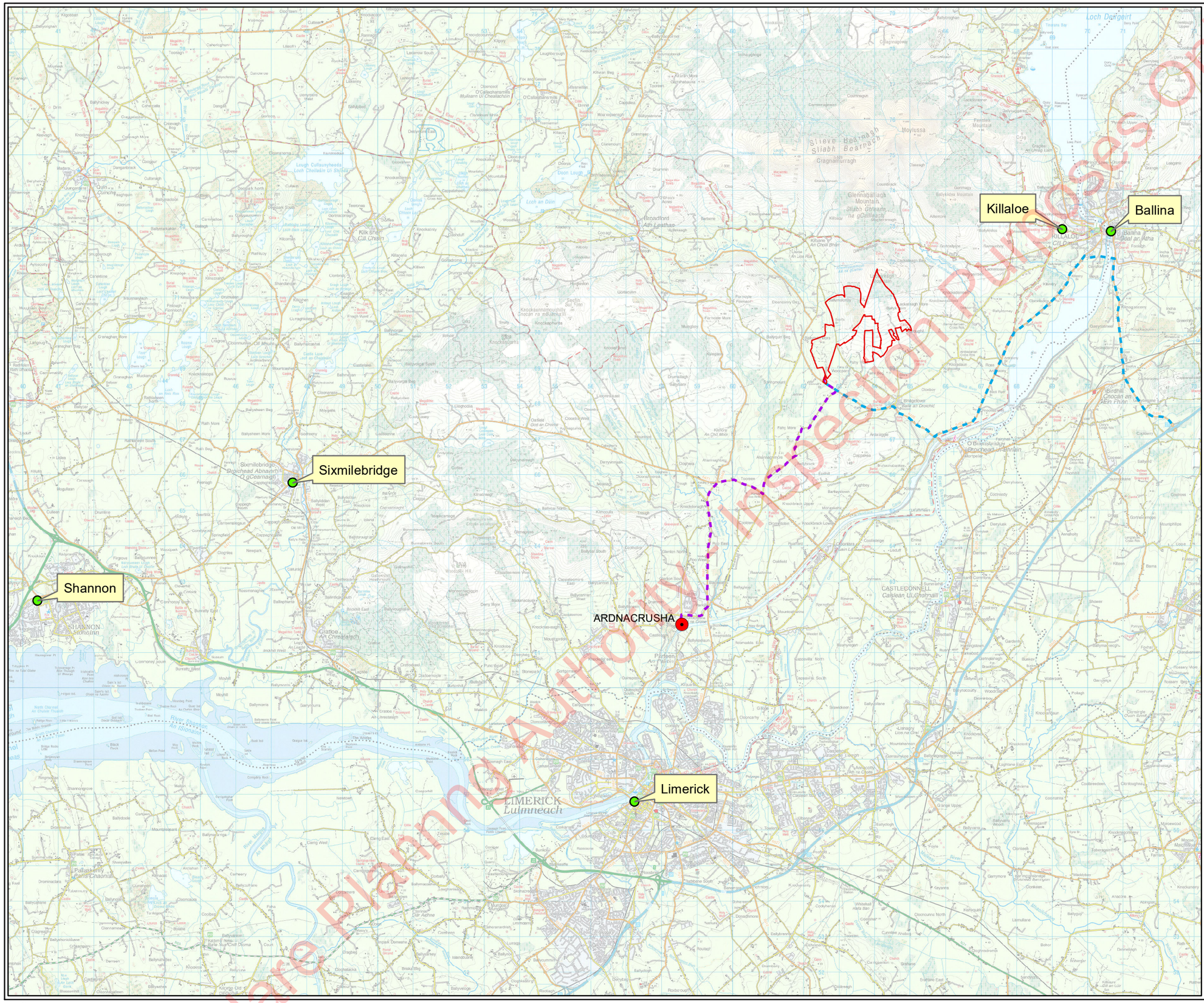

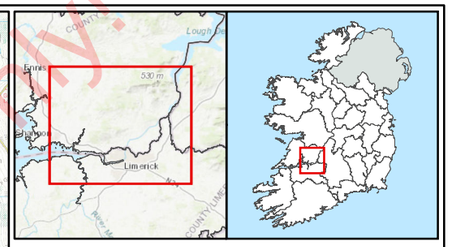

Legend

- Wind Farm Site
- Grid Connection Route
- Turbine Delivery Route
- Ardnacrusha Substation (110kV)

TITLE:	General Site Overview		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	1.1		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:105000	**REVISION:**	0
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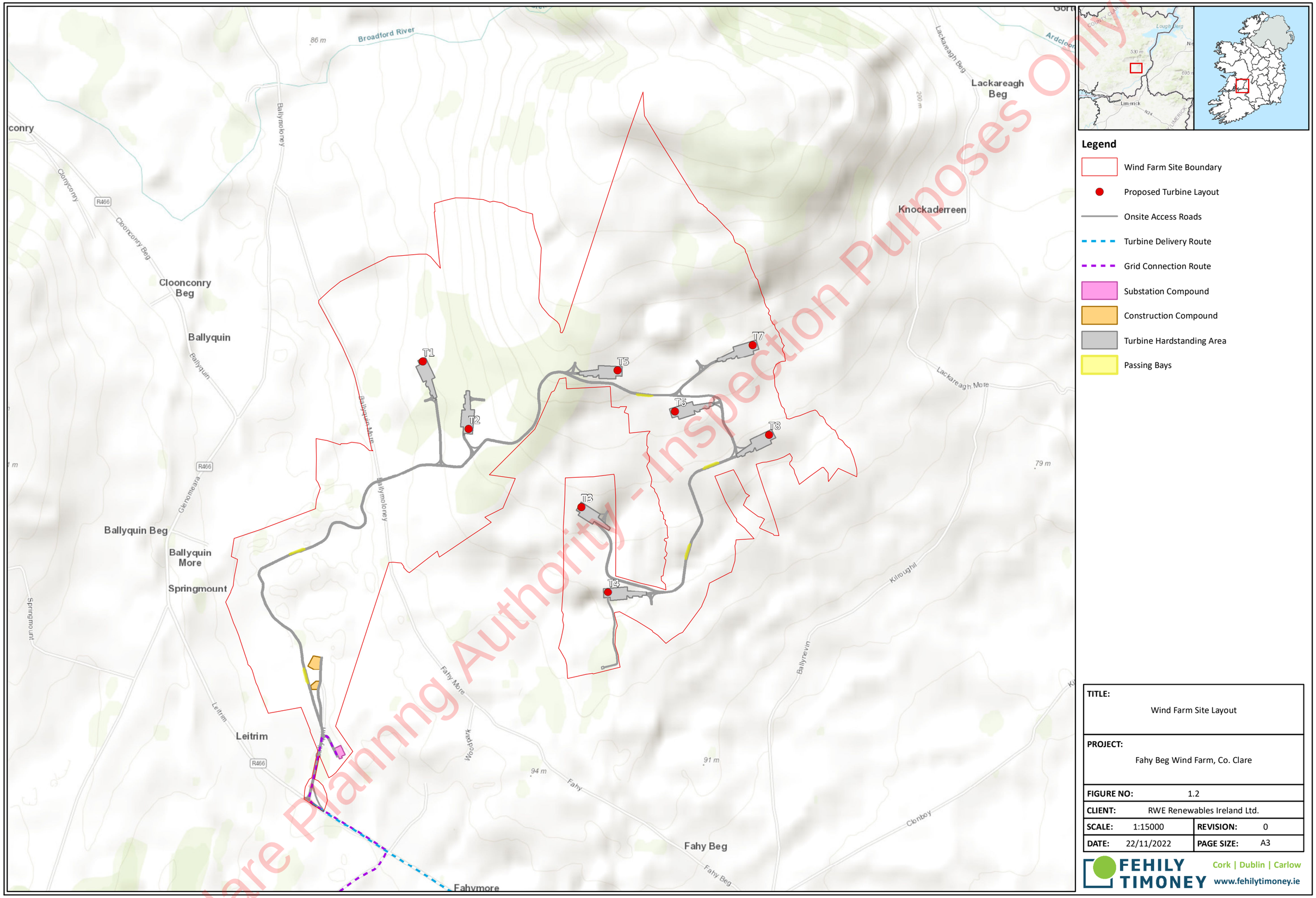

Legend

- Wind Farm Site Boundary
- Proposed Turbine Layout
- Onsite Access Roads
- Turbine Delivery Route
- Grid Connection Route
- Substation Compound
- Construction Compound
- Turbine Hardstanding Area
- Passing Bays

TITLE:	Wind Farm Site Layout		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	1.2		
CLIENT:	RWE Renewables Ireland Ltd.		
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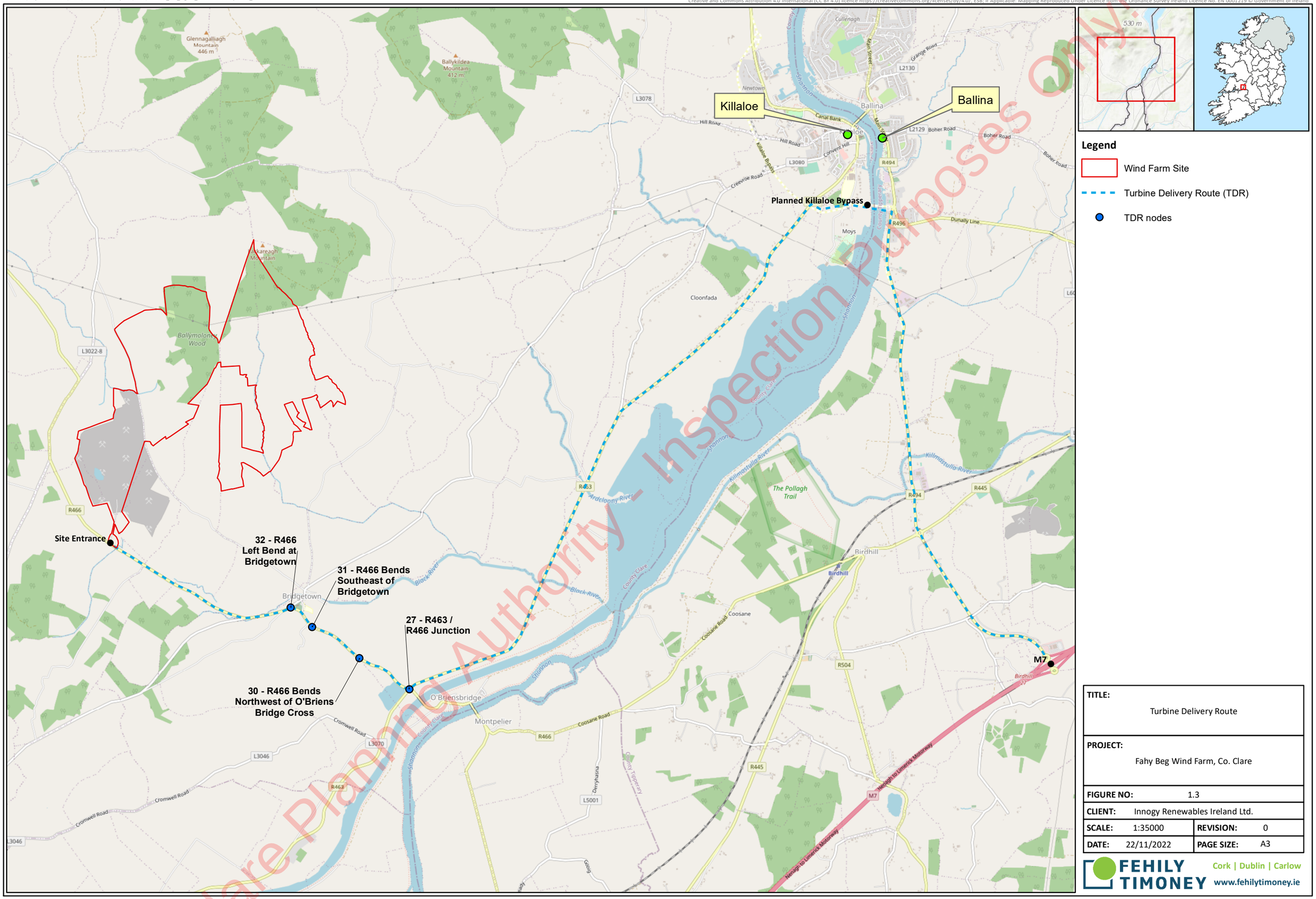

Legend

- Wind Farm Site
- Turbine Delivery Route (TDR)
- TDR nodes

TITLE:	Turbine Delivery Route		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	1.3		
CLIENT:	Innogy Renewables Ireland Ltd.		
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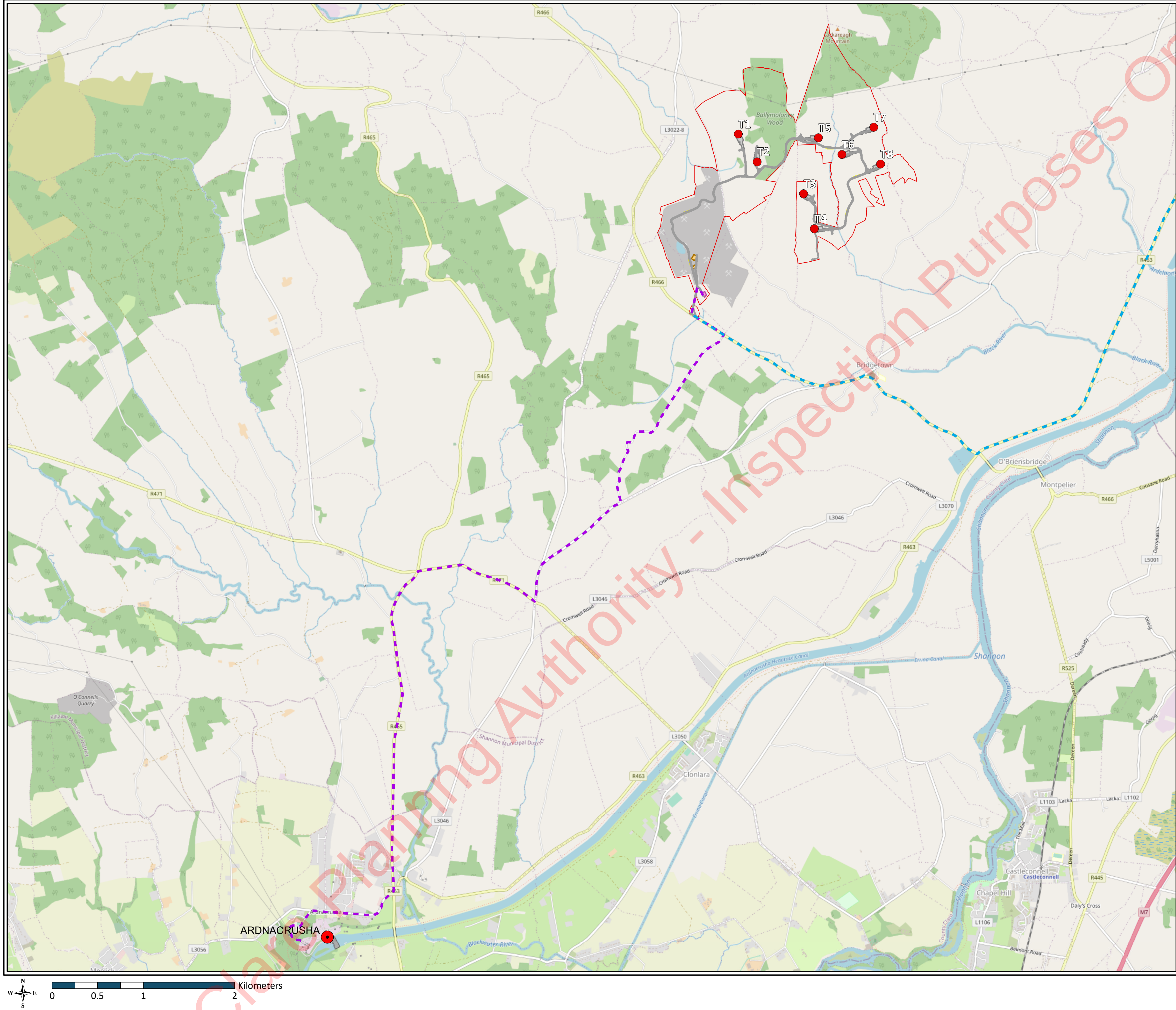

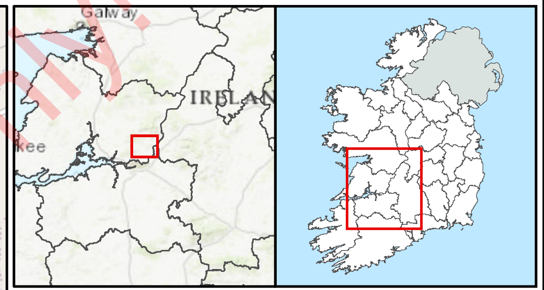

Legend

- Wind Farm Site Boundary
- Passing Bays
- Turbine Hardstanding Area
- Construction Compound
- Substation Compound
- Proposed Turbine Layout
- Ardnacrusha Substation (110kV)
- Met Mast Access Track
- Turbine Delivery Route
- Grid Connection Route
- Onsite Access Roads

TITLE: Grid Connection	
PROJECT: Fahy Beg Wind Farm, Co. Clare	
FIGURE NO: 1.4	
CLIENT: RWE Renewables Ireland Ltd.	
SCALE: 1:40000	**REVISION:** 0
DATE: 22/11/2022	**PAGE SIZE:** A3

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2. EXISTING ENVIRONMENT

2.1 Existing Environment Description

2.1.1 Wind Farm Site

The proposed wind farm site is located within the jurisdiction of Clare County Council, approximately 6km east of Broadford, 13km Northeast of Limerick City, and 6km west of Killaloe

The Wind Farm Site is located in a rural area approximately 6km east of Broadford. 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 Fahy Beg 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.

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 Regional road R466 from the direction of O'Briensbridge to the North West. HGVs shall approach the site via this road.

Fahy Beg Wind Farm shall involve the use of one existing quarry entrance, one existing agricultural entrance and one new entrance between the quarry site and the proposed main windfarm site for the purposes of the windfarm as access points from the public road.

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 and/or planning permission 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 38kV cable and will connect the on-site substation to the existing 110kV substation at Ardnacrusha. The GCR will be 10.6km, in length, with 10.3km to be constructed within the existing public road corridor. The proposed GCR arrangement is illustrated in Figure 1-4. The 38kV 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

Biodiversity enhancement measures have been incorporated into the proposed project design and will be located within the proposed wind farm site.

A Biodiversity Enhancement and Management Plan is located Appendix 3.4 of the EIAR. The BEMP lands are contained within wind farm site boundary.

3. OVERVIEW OF CONSTRUCTION WORKS

3.1 Description of the Proposed Project

3.1.1 Wind Farm Site

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

The proposed wind farm will consist of 8 no. wind turbines , 1 no. meteorological mast, and 1 no. substation compound along with ancillary civil and electrical infrastructure.

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

3.1.2 Grid Connection

The grid connection route (GCR) will consist entirely of underground 38 kV cable and will connect the on-site substation to the existing 110 kV substation at Ardnacrusha. The GCR will be approximately 10.612 km in length, with approximately 10.335 km to be constructed primarily within the existing road corridor. The proposed Grid Connection Route arrangement is illustrated in Figure 1-4. The grid connection cable will follow public roads and shall feature horizontal directional drilling (HDD) at 4 no. location to cross existing watercourses.

Connection works to Ardnacrusha 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.

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 Foynes Port and turn left onto the N69 travelling east;
- Join the eastbound N18 at Junction 2, Limerick and continue east onto the M7;
- Depart the M7 at Junction 27 and continue north on the R494 towards Killaloe;
- Turn left onto the proposed bypass and utilise the new Shannon River crossing before turning left onto the R463 travelling southbound;
- Continue south on the R463 before turning right onto the R466;
- Loads will continue north on the R466 to the proposed site entrance.

Key elements of the temporary accommodation works for the delivery of turbines are summarised in Table 3-1 below. The 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. All necessary temporary accommodation works are outlined in the TDR Survey Report in Appendix 13.1 of the EIAR.

Table 3-1: TDR Temporary Accommodation Works

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works
3	Foynes Port Access Road / N69	Remove Road Signs, Lamp posts. Clear Vegetation. Lay of load bearing surface.
6	N69 Tree Canopy	Trimming of tree canopy
8	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.
9	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.
10	N69/N18 Dock Road East Roundabout	Temporary removal of street furniture. Overrun and oversail of public road verge. Placement of temporary load bearing surface.
11	M7 Junction 27	Placement of temporary load bearing surface to roadside verges.
12	R494 Birdhill Roundabout	Street furniture removal and temporary load baring surface laid
18	R494 Roundabout at Templehollow	Street furniture removal and temporary load baring surface laid
19	R493 Roundabout Northeast of Cloverfield	Removal of street furniture. Load baring surface laid.
20	R436 Bends South of Cloverfield	Vegetation to be trimmed.
23	R463 Ardcloony Bridge at Garranroe	Vegetation to be trimmed. Temporary removal of utility pole. Temporary load bearing surface laid.
25	R463 Bends South of Knockadrohid	Trimming of vegetation. Temporary removal of utility pole.
26	R463 Bends South of Knockadrohid	Trimming of vegetation. Temporary removal of utility pole.
27	R463/R466 Junction	Load bearing surface to be laid. One junction box, utility marker post, road signs and tree stumps should be removed. Existing utilities to be protected.
28, 29, 30	R466 Bends Northwest of O'Briensbridge	Load bearing surface to be laid. Trees, vegetation and hedgerows to

TDR Node Reference Number (POI__)	Location	Summary Description of Proposed Temporary Accommodation Works
	Cross	be trimmed.
31	R466 Bends Southeast of Bridgetown	Load bearing surface to be laid. Road sign, trees, fence and vegetation to be removed. Vegetation, road sign and trees to be removed. Embankment to be reprofiled.
32	R466 Left Bend at Bridgetown	Load bearing surface to be laid. Road sign, trees, fence and vegetation to be removed.

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

3.2 Construction Period

It is expected that the construction phase, including civil, electrical and grid works, and turbine assembly will take between approximately 12 - 18 months.

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 during month 7 in parallel of the proposed on-site wind farm works.

The proposed construction programme is presented in Figure 3-1 below:

Activity	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Mobilisation and site setup												
Site clearance and felling												
Internal access tracks												
Turbine hard standings												
Turbine foundations												
Turbine Installation												
Onsite substation												
Grid connection cable works												
Private electrical network												
Landscaping, reinstatement, demobilisation												

Figure 3-1: Proposed Construction Programme

3.4 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;
- Crane Hardstands;
- Turbine Foundations;

- Substation Compound;
- Electrical Works;
- Internal Wind Farm Cable Works;
- Turbine Installation;
- Grid Connection Cabling Works;
- TDR Temporary Accommodation Works;

3.4.1 Site Entrances

Fahy Beg Wind Farm will use one existing quarry and one new quarry site entrance and one agricultural entrance.

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 Clare 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.

3.4.2 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.

Two temporary construction compounds shall be located near the main entrance to the site which will include welfare facilities and offices.

The proposed compounds are located on existing cleared areas which have been previously excavated as part of the historical quarry activities. These areas are served by pre-existing internal quarry access roads.

The temporary compounds shall be aggregate hard standings surrounded by security fencing. On completion of the construction phase, the temporary compound will be dismantled, the hardstanding will be left in situ and allowed to revegetate naturally.

Facilities to be provided in the temporary site compound 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.

3.4.3 Felling

Permanent felling of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads and access tracks. In advance of other construction works, clearance felling will commence on site and is expected to take up to 2 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;
    - Felling Corridors around higher value woodland has been reduced to 10 m to protect as much woodland as possible.
- Outer footprint of turbine hardstandings including an additional 10m offset from same;
- Outer footprint of temporary compound;
- Outer footprint of onsite substation compound including an additional 10m offset from same;
- 6m corridor for buried cables in private lands;
- 82.2 m radius around each turbine tower located in forestry for potential bat impact mitigation;
- 25m radius around the footprint of on-site meteorological mast

3.4.4 Concrete Washout Area and Wheel Washing

All concrete will be delivered to site via ready-mix trucks from a local supplier. Local suppliers are identified in section 13.4.2.4 of Chapter 13.

Concrete washout will be carried out in dedicated areas at the temporary construction compound and at the T2 turbine hard standing area.

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, the location of licensed waste facilities are identified in Table 4-1.

Wheel wash facilities will be located near the site entrance to 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.

3.4.5 New Site Access Tracks

All site tracks have been designed taking account of the loadings required and will consist of a compacted stone structure. Suitable granular fill material for the sub-base of the track will be sourced from turbine hardstanding excavation areas and imported from licensed quarries as required. Suitable Class 6 structural fill will be imported from a licensed quarry, which are identified in section 13.4.2.4 of Chapter 13 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 licensed quarries.

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. Construction details are outlined in 0300 series planning drawings.

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 as shown on the design drawings, 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 the consented areas as identified on planning and 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.

The requirement for floating road construction methods are not proposed for the project.

3.4.6 Upgrade of Existing Internal Access Tracks

Approximately 1.4km of existing tracks shall be upgraded. Access tracks will be widened to 5 m wide along straight sections and wider at bends as required as shown on design drawings. 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 track dimensions.

3.4.7 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 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 following sections outline construction methodologies to be used for the various watercourse crossing scenarios in the context of crossings associated with the proposed wind farm site and grid connection. No watercourse crossing works are required along the TDR. Where instream works are required, the methodology set out in Section 3.4.7.1 shall be employed.

3.4.7.1 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 will be kept to an absolute minimum. All construction machinery operating in-stream will be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery will 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 will provide for fish passage, be non-eroding, and be of similar width to the natural stream channel. The channel diversion will be compliant with the following measures:
    - Diversion of water to and from temporary channels will 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 will 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;
- 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 will be made and this will only occur within the approved operational window for in-stream works.

3.4.7.2 Construction Methodology for Watercourse Crossings in the Wind Farm Site

Minor Watercourses and Drain Crossings (Access Tracks)

It is proposed 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.

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 3-2 below.

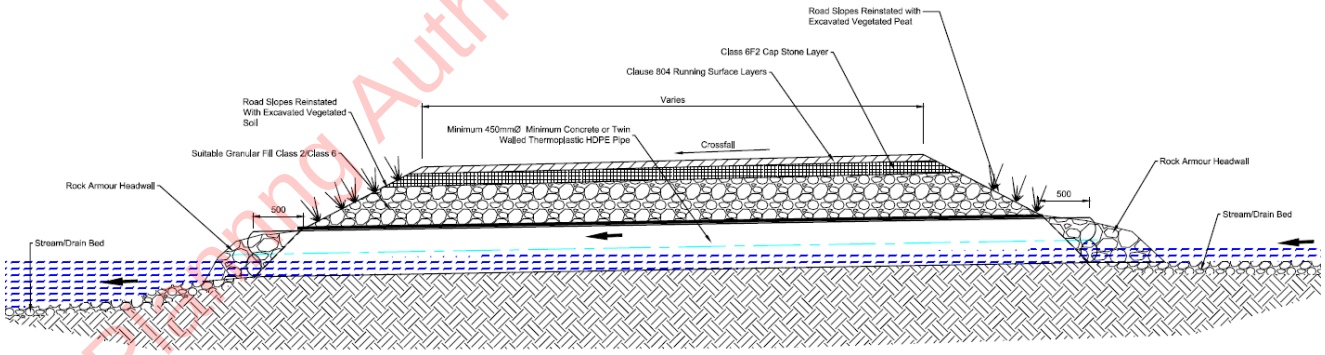


Figure 3-2: Piped Culvert Crossing Long Section

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, due to the nature of the crossing point (i.e. channel dimensions).

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 bridges are the preferred type of water crossing, with box culverts and piped culverts used where a bridge would not be feasible.

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.

3.4.7.3 Construction Methodology for Watercourse Crossings Along the Grid Connection Route

The grid connection cable route contains 4 no. watercourse crossings 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.

For further information refer to 38kV Grid Connection Construction Methodology report in Appendix 3.3 of the EIAR. Further detail on HDD crossing design can be found in accompanying planning application drawings.

Horizontal Directional Drilling

Horizontal Direction Drilling (HDD) is a method of drilling under obstacles such as bridges, watercourses, existing UG infrastructure etc. This method is employed where installing the ducts using standard installation methods is not possible and is implemented to install cable ducts under these obstacles. There will be a requirement to drill beneath obstacles in this underground grid connection route. These include 3 No. bridges due to lack of cover and insufficient room. (HDD 2 & 3 & 4).

The horizontal directional drilling will be implemented to bore a minimum 1.5m beneath the waterway and bridge foundations. The required depth may increase subject to geotechnical investigations on site of each bridge.

The proposed drilling methodology is as follows:

- A works area of circa 40m2 for the HDD entry side, and circa 40m2 on the HDD exit side, all within public road, will be required for the HDD equipment and vehicles. These areas will be fenced off during the HDD implementation.
- The drilling rig and fluid handling units will be located 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.
- Entry and exit pits (approximately 3.2m (w) x 6.m (L) x 1-2m deep) 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 outlined in section 13.4.2.5 of Chapter 13.
- The HDD pilot bore will be undertaken using a wireline guidance system. Assembly will be set up by the drilling team and steering engineer.
- The pilot bore will be drilled to the pre-determined profile and alignment under the watercourse crossings.
- The steering engineer and drill team will monitor the drilling works to ensure that modelled stresses and pressures are not exceeded.
- The drilled cuttings will be flushed back by drilling fluid to the entry and exist pits and recycled for reuse.
- Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit side which will then be pulled back to the entry side as part of the pre-reaming/hole opening process to enlarge the hole to the correct size.
- When the pre-reaming/hole opening/hole cleaning has been completed, a reamer of slightly smaller diameter than the final cut will be installed on the drill string to which the ducts will be attached for installation.
- The drilling fluid will be disposed of to a licensed facility.
- The ducts will be cleaned, proven and their installed location surveyed.
- The entry and exit pits will be reinstated to the specification of ESB Networks and any requirements of Clare County Council within the parameters assessed in the EIAR .
- A joint bay/transition chamber/transition coupler will be installed on either side of the road following the horizontal directional drilling as per ESB requirements.

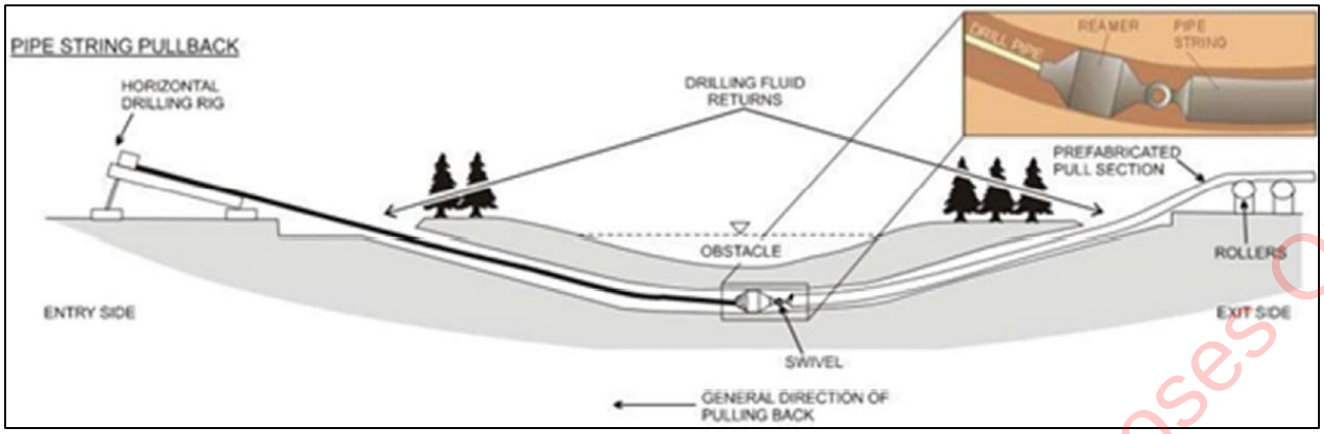


Figure 3-3: Typical HDD Installation (not to scale)

Standard Trench Crossings of Existing Culverts or Services

For the crossing of buried pipe drains, culverts or services, if encountered, one of following options for construction will 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 ESBN 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 ESBN 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 3-6 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 3-4 below. 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.

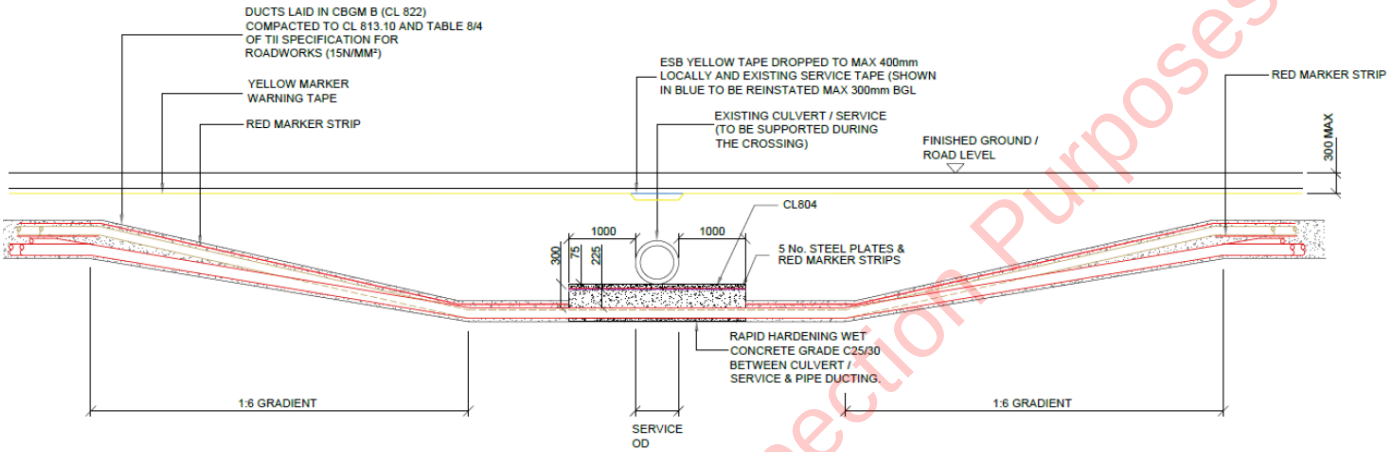


Figure 3-4: 38kV Cable Duct Undercrossing Method

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 3-5.

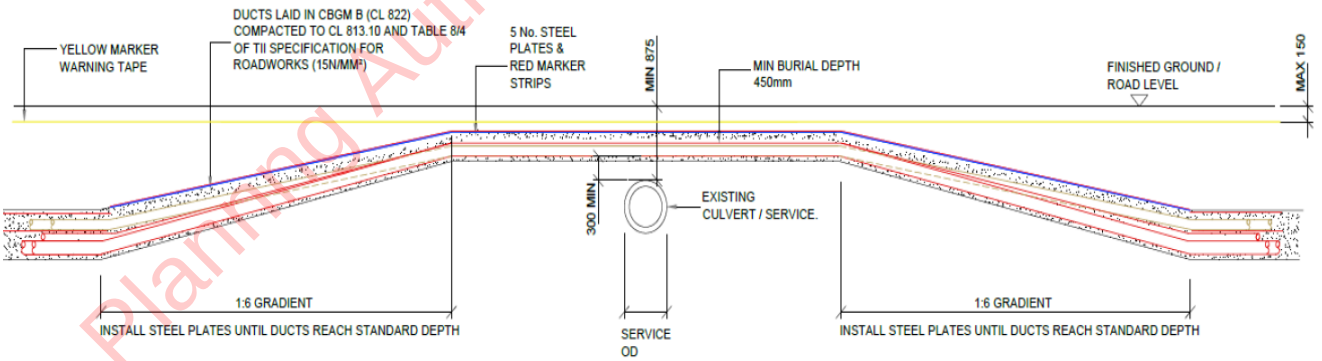


Figure 3-5: 38kV Cable Duct Overcrossing Method

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 ESBN specifications within the parameters assessed in the EIAR.

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.

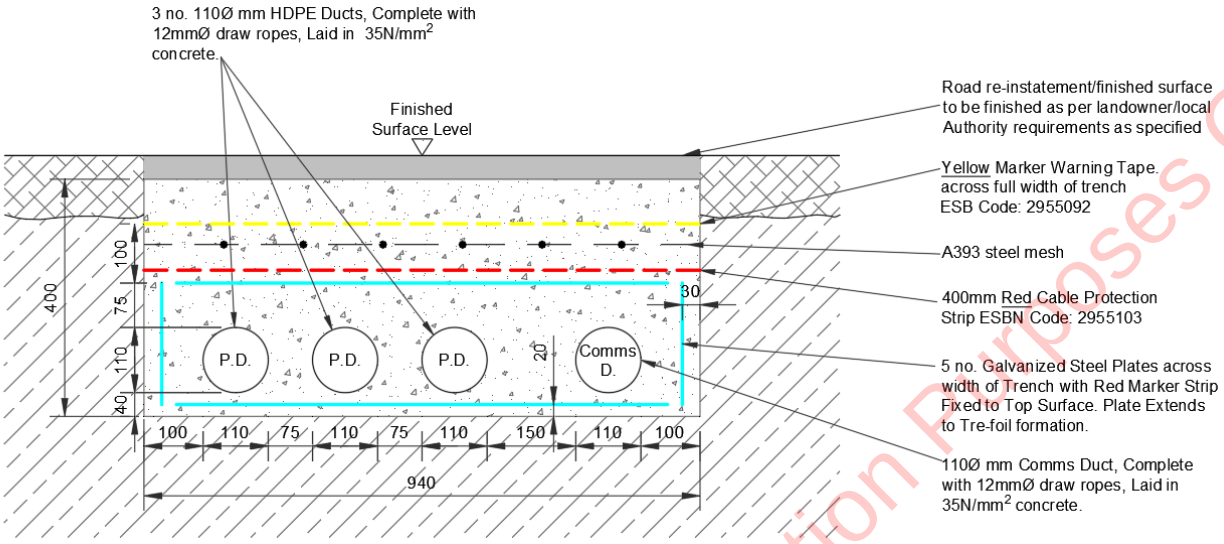


Figure 3-6: Flatbed Formation Detail

For further information on construction methodologies associated with the proposed grid connection please refer to 38kV Underground Cable Construction Methodology report in Appendix 3.3 of the EIAR.

3.4.8 Turbine Hardstands

All crane pads and associated splays have been 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 removed from site. 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.

3.4.9 Turbine Foundations

For this project the turbine foundations will be circular in shape and will be 25m in diameter and 3.5m in depth.

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 placement 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.

3.4.10 Substation Compound

The compound surrounding the substation will measure approximately 54 m x 33 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 Ardnacrusha 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.

3.4.11 Electrical Works

3.4.11.1 Substation Fit Out and Switchgear Installation

The substation 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.

3.4.11.2 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

3.4.12 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 confirmation surveys ahead of construction.
- Prior to commencement of the works, up to date 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.

3.4.13 Turbine Installation

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 with a site specific lift plan.

3.4.14 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 Ardnacrusha substation.

For further information on construction methodologies associated with the proposed grid connection please refer to 38kV Underground Cable Construction Methodology report in Appendix 3.3 of the EIAR.

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

- All existing underground services shall be confirmed on site prior to the commencement of construction works.
- Traffic management measures will be implemented in accordance with those included in the Traffic Management Plan which will be prepared and agreed with Clare County Council. A TMP is included in this CEMP, in section 4.
- The excavated trench will be approximately 600mm in width and approximately 1220mm deep both within the public road network and within private lands.
- The base of the excavated trench will be lined with sand bedding to be imported to site from a local licensed supplier. The 110mm diameter HDPE cable ducting will be placed into the prepared trench, inspected and backfilled.
- 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.
- No more than a 100m section of trench will be opened at any one time. The second 100 metres 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 required, grass will be reinstated by either seeding or by replacing with grass turves.
- 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. days.

Typical trench details for the grid connection cable are shown on 0300 Series planning application drawings.

Figure 3-7: Typical 38kV Underground Duct Installation

Installation of Joint Bays and Link Box Chambers

- Joints Bays are to be provided approximately every 800 meters along the UGC routes to facilitate the jointing of 15 no. lengths of UGC. 38kV Joint Bays are typically 1.6m x 4.5m x 1.275m pre-cast concrete structures installed below the finished ground level.
- 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 TMP is included in section 4 of this CEMP.
- 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 0300 Series planning application drawings.

Figure 3-8: Typical Installation and Temporary Reinstatement of Joint Bay

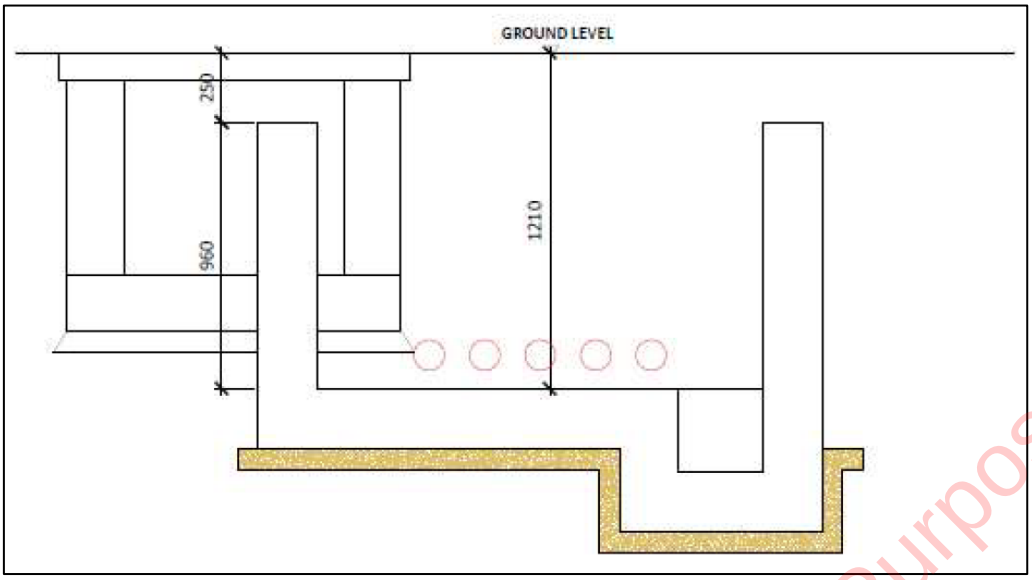


Figure 3-9: Typical Section through Joint Bay and Link Box

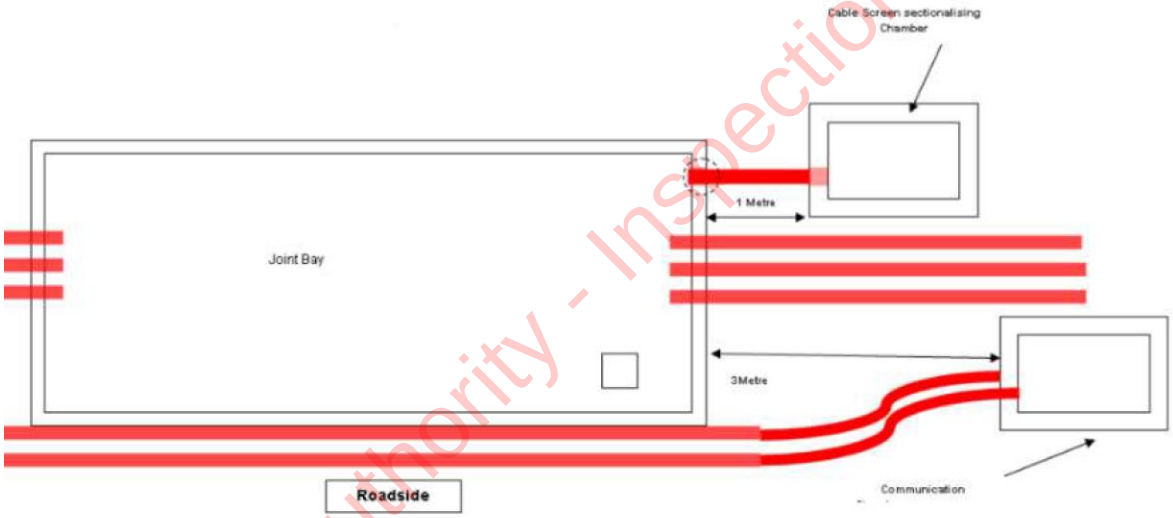


Figure 3-10: Typical Joint Bay and Link Box Plan Details

Watercourse Crossings

Methodologies associated with watercourse crossings along the proposed grid connection route are detailed in Section 3.4.7.

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.

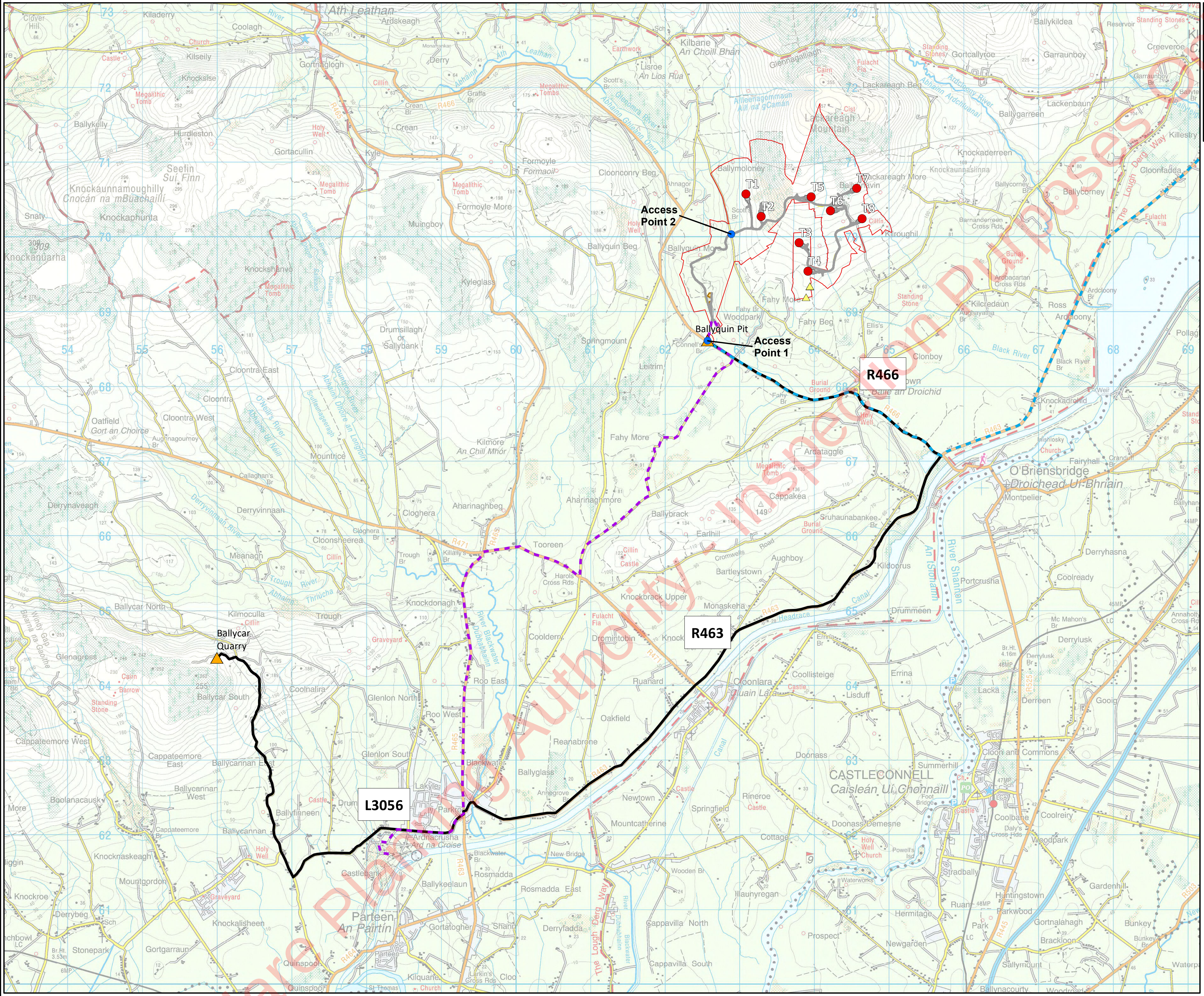
Figure 3-11: Towable Sprayer for Temporary Reinstatement

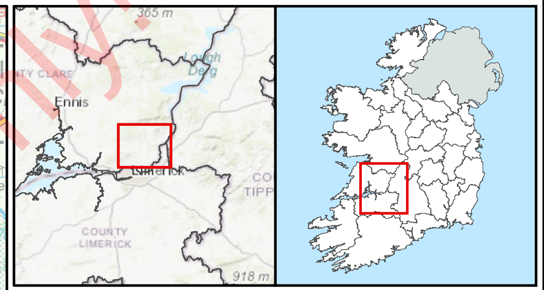
3.5 Construction Working Hours

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 - 1300 on Saturday.

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.

Path: R:\Map Production\2020\P20-003\Workspace\EIAR\P20-003_GIS_Fig13-12_HaulRoutes_A3.mxd





Legend

- Wind Farm Site Boundary
- Proposed Turbine Layout
- Permanent Met Mast
- Active Quarries
- Access Points
- Turbine Delivery Route
- Grid Connection Route
- Onsite Access Roads
- Proposed Haul Route
- Passing Bays
- Turbine Hardstanding Area
- Construction Compound
- Substation Compound

0 1 2 4 Kilometers

TITLE:	Haul Routes		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	3.12		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:50000	REVISION:	0
DATE:	22/11/2022	PAGE SIZE:	A3

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4. ENVIRONMENTAL MANAGEMENT PLAN

4.1 Introduction

This Environmental Management Plan (EMP) defines the work practices, environmental management procedures and management responsibilities relating to the construction of the proposed Fahy Beg Wind Farm. This plan should be read in conjunction with the EIAR.

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 which will be implemented 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 Fahy Beg 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 EIAR/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

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 Dust Management Plan

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.

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 generation and control

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.

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 Management

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 3.5.

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 prescribed in the Natura Impact Statement (NIS) carried out for the project will be implemented in full. 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.

Aggregate (structural fill) of a suitable quality required for construction shall be imported from licensed quarries.

Daily Preparation during the Implementation of the Soil Management Plan

The Geotechnical Engineer appointed by the contractor will 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 will 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 12 - 18 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.

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 will 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 outlined in section 13.4.2.5 of Chapter 13 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 outlined in section 13.4.2.5 of Chapter 13 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 for Foundations and Hardstandings

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.

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 will 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 will 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 slope stability at proposed infrastructure locations has been carried out as part of the EIAR which is outlined in section 9.3.7.2 of Chapter 9. This will be confirmed during a further assessment which 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. Appropriate support measures to be determined at detailed design stage as part of the temporary accommodation works. 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 will 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

There are no on-site borrow pits envisaged for this project. Surplus topsoil and spoil will be deposited in berms for reinstatement purposes around turbine bases hardstands and along access roads. Material placed alongside access roads will not exceed 1m in height and will be shaped and sealed to prevent the ingress of water. Additionally spoil shall be removed to a licensed waste facility.

Additional Recommendations

To minimise the risk of construction activity causing potential peat instability the following will be implemented:

(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, which 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. The plan 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

Mitigation Measures and Monitoring

A suitably qualified archaeologist will be employed to oversee the construction phase of the proposed project. A systematic advance programme of archaeological field-walking surveys will be undertaken within all construction areas located within forestry plantations following pre-construction tree felling to confirm whether there are any surface traces of any potential unrecorded archaeological or architectural heritage sites exist within areas inaccessible due to the presence of thick tree cover. Archaeological monitoring of ground excavation works during the construction phase will then be carried out within all green field and forested areas of the Site under licence by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage. In the event that any archaeological sites are identified during monitoring, ground works will halt at the location and the archaeological remains will be recorded and cordoned off. The NMS will then be consulted to determine further appropriate mitigation measures, which may include preservation *in situ* by avoidance or preservation by record through systematic archaeological excavations licensed by the NMS. A written and drawn record of the extant townland boundary between Ballyknavin and Fahy Beg which is on the route of an access road will be compiled by the appointed archaeologist during the monitoring of the construction phase and this record will be included in their report.

Archaeological monitoring of all cable trench excavations will be carried out within the section of the local road adjacent to Enclosure CL044- 075---- in Fahy More South and a watching brief will be maintained of other cable trenching works. All TDR ground works within the environs of Saint Thomas's Church in Bridgetown village will also be subject to constant archaeological monitoring.

The locations of all recorded archaeological sites within fields and forestry clearings within the Site will be cordoned off and the outer edges of their Zones of Notification will be clearly signed as 'No Entry: Archaeological Area' for the duration of the construction phase.

These sites comprise Enclosures CL044- 064----, CL044- 067---- and CL044- 077---- as well as the recorded location of a children's burial site and bullaun stone (CL045- 052001- and CL045- 052002-) in the area in the east end of the site. The location of the derelict farmyard within Ballyknavin townland will also be clearly signed as a 'No Entry: Historic Farmyard' during the construction phase. In addition, the site inductions for all construction staff will include information in relation to the locations and access constraints relating to these sites.

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 Fahy Beg 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.

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 in 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

Licensed Waste Facility Location	Type of Waste
Roadstone Ltd, Ballyquin More O'Brien's Bridge Co. Clare.	Soil and stones
Ballyquin Beg, Kilbane, Broadford Co Clare.	Mixture of concrete, bricks, tiles and ceramics. Soil and stones
O'Connell Quarries, Ballycar, Ardnacrusha, Co. Clare.	Concrete, mixture concrete, bricks, tiles, and ceramics, bituminous mixtures
Jim Bolton Sand and Gravel Ltd, Faheymore, O'Briens Bridge, Co. Clare.	Soil and stones
10B Knockbeg Point, Ballyhennessy, Shannon Co. Clare	Waste metal, cables, mixed metals

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 Fahy Beg Wind Farm, Co. Clare. 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 R494, R463 and R466 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 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 Síochána.

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. Roads shall 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 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 into 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.

Clare 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.

Construction commencement dates will be made known to the Planning Authority by way of formal Commencement Notice.

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

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

Mitigation measures proposed for the turbine delivery route 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 Síochána. 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 Clare County Council will be carried out in advance to manage turbine component deliveries.

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 Clare 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 3-12.

Road Closures, Diversions and Safety Measures for Road Crossings

It is envisaged that road closures will be necessary for carrying out portions of the cable trenching, with the majority of the proposed cable trenching taking place on existing local roads. The consent of Clare 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 Clare County Council.

Figure 4-1 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 4-2 and Figure 4-3.

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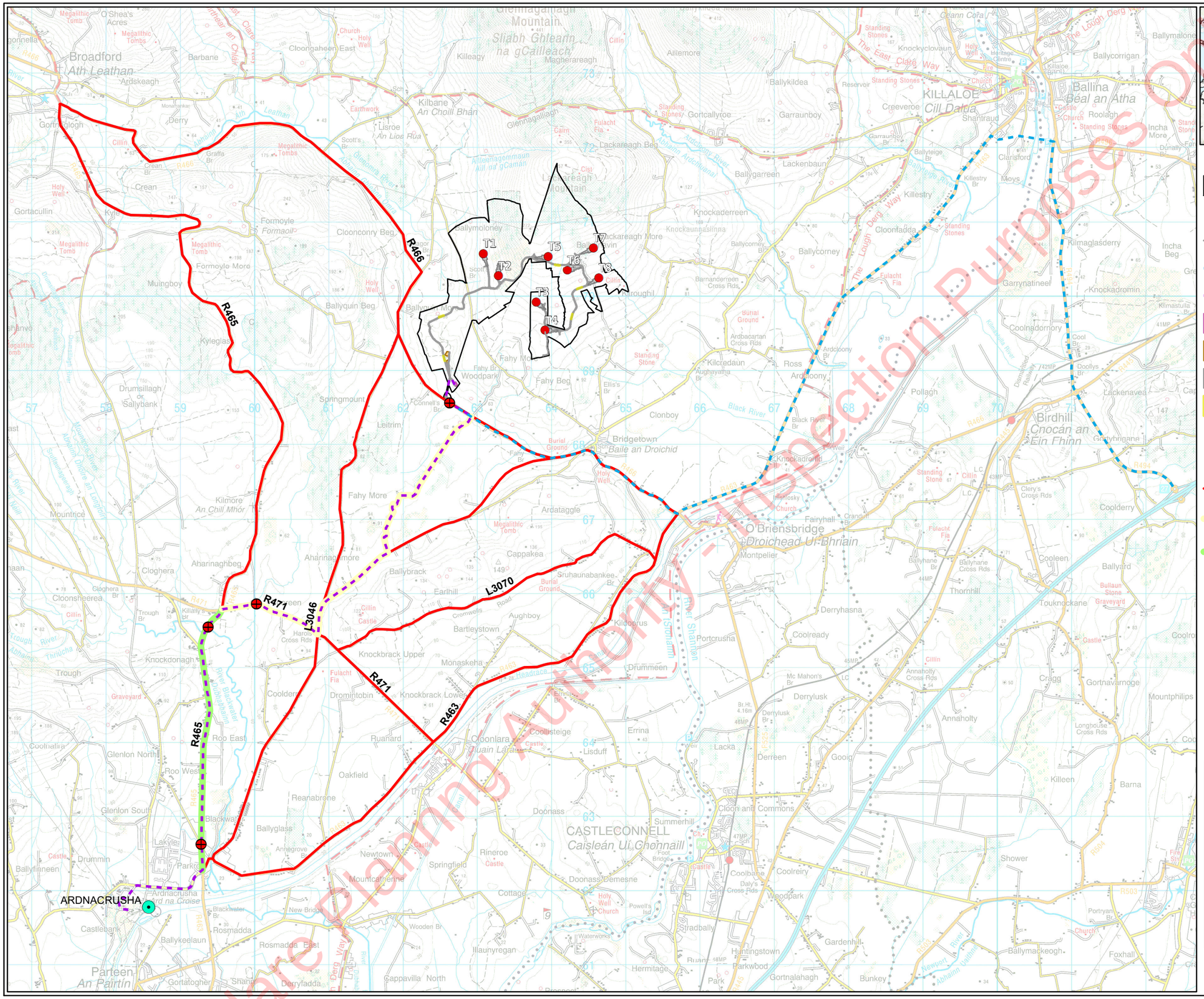

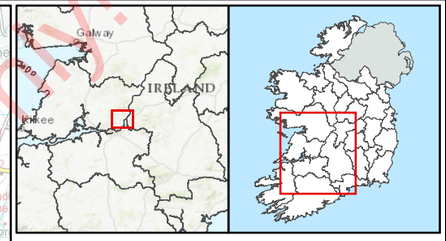

- Wind Farm Site Boundary
- Proposed Turbine Layout
- Onsite Access
- Turbine Delivery Route
- Grid Connection Route
- Substation Compound
- Construction Compound
- Turbine Hardstanding
- Passing Bays
- Ardnacrusha Substation (110kV)
- Location of Horizontal Directional Drill
- Diversion Route Options
- Roads requiring temporary road closures during construction stages
- Roads requiring temporary single lane road closures during construction stages

TITLE:	Temporary Road Closure and Route Diversion Locations		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	4.1		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/11/2022	**PAGE SIZE:**	A3

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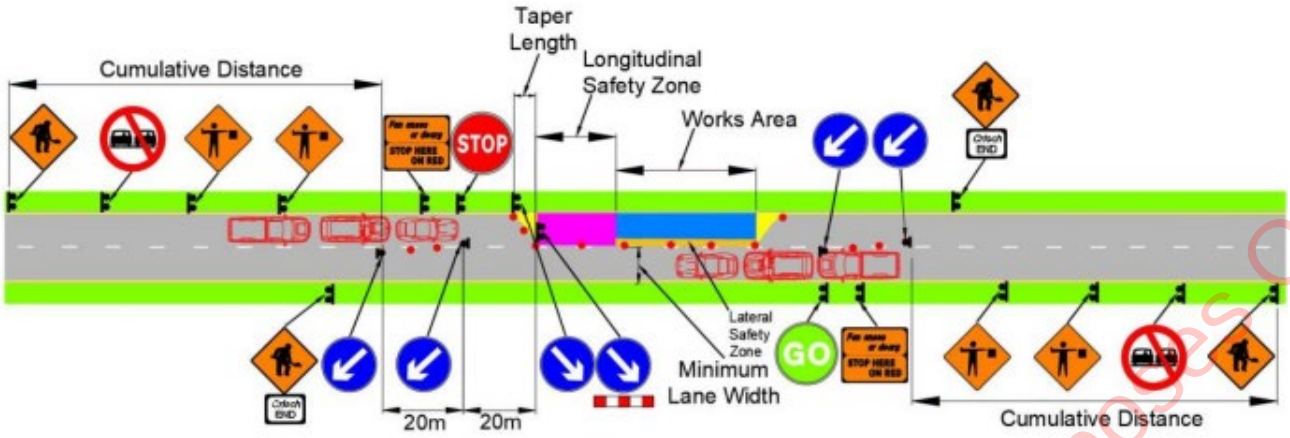

Figure 4-2: Stop and Go Traffic Control Signage for Single Carriageway Rural Road

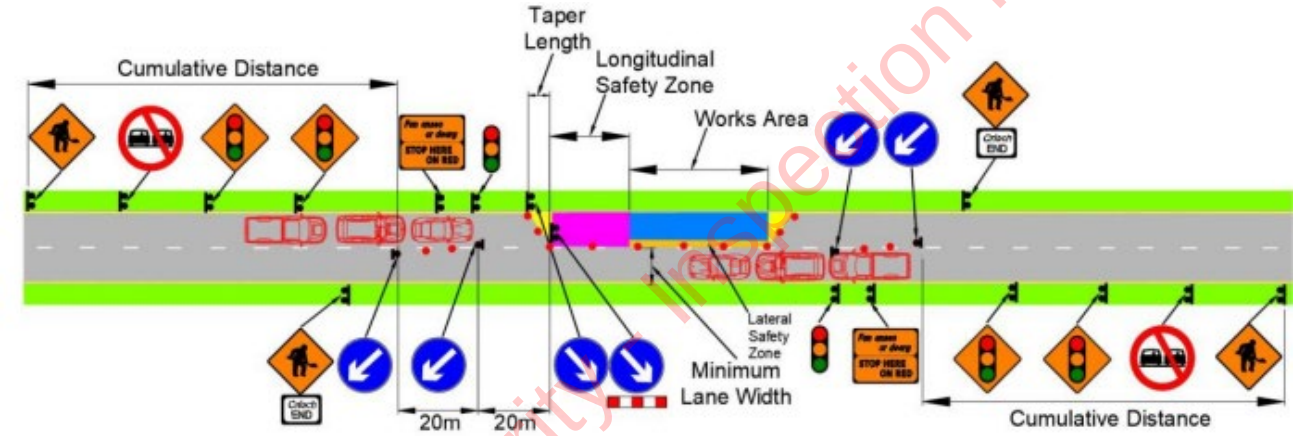

Figure 4-3: Temporary Traffic Signals Control for Works in Single Carriageway Rural Roads

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.

Stop and Go discs will be used to control the crossing point. See Figure 4-4 for 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.

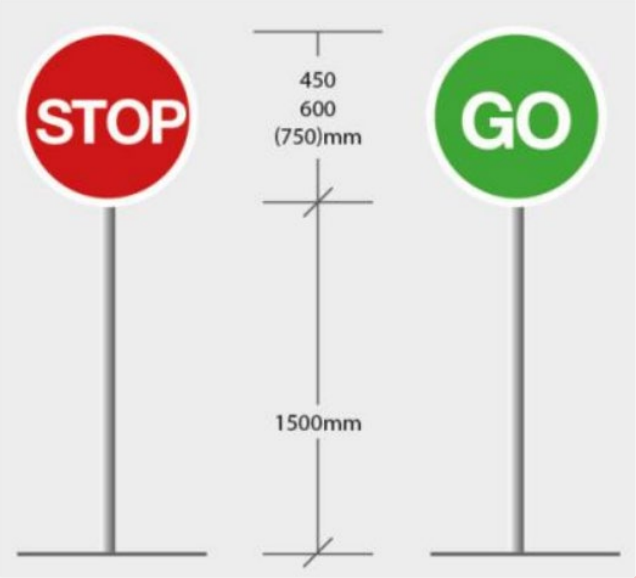

Figure 4-4: Acceptable Stop-Go Discs

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 Clare 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 Clare County Council.

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

4.4 Environmental Management Team - Structure and Responsibility

A preliminary organisation chart is included in Figure 4-5.

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.

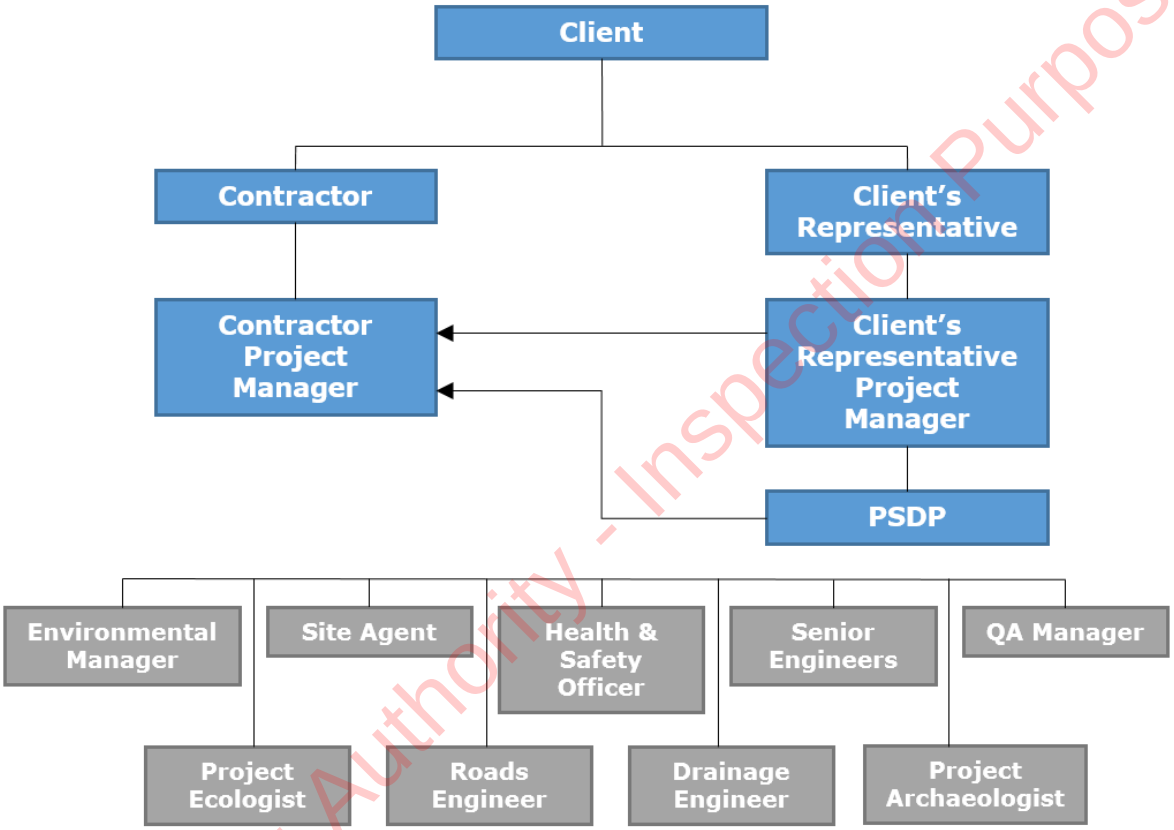

Figure 4-5: Project Management Team Organogram

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 will 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 will 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 will 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 Fahy Beg 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 assessment report 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 Fahy Beg 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 EIAR/NIS Obligations

EIAR/NIS 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 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 Fahy Beg Wind Farm development will 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.

5.2.5 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.

5.2.6 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 (EMP) 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 EMP 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 Fahy Beg 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 Fahy Beg 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.

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

6.2 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.

6.3 Reporting Emergencies

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

ALL ON SITE EMERGENCIES DIAL 999

6.4 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)	University Hospital Limerick	(061) 301 111
Ambulance Service	Dial 112 or 999	
Fire Services	Dial 112 or 999	
Garda Station	Killaloe Garda Station	061 620 540
District HQ:	Ennis Garda Station	065 6848116
Divisional HQ:	Ennis Garda Station	065 6848116

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.

6.5 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

6.6 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.

6.7 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).

6.8 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.

6.9 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.

6.10 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.

6.11 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.

6.12 Environmental Emergency Procedure – Pollution Control

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 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.

6.13 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.

6.14 Emergency Events – Wind Turbine Damage/Failure

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 will 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 6.15 below in the unlikely event of landslide scenario.

6.15 Land Slippage Contingency Measures

6.15.1 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.

6.15.2 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 will 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.

6.15.3 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.

The check barrage will 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 will 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 Mitigation Measures

SCHEDULE OF MITIGATION MEASURES

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

1 AIR AND CLIMATE

1.1 Air Quality

1.1.1 Construction Phase

A Construction Environmental Management Plan (CEMP) has been prepared and is included in Appendix 3.1 of Volume 3 of the EIAR. This includes for the following mitigation measures during the construction phase of the proposed wind farm relevant to air quality:

- 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 as described in Chapter 3;
- The developer in association with the contractor will be required to implement the dust control plan as part of the CEMP (a CEMP is contained in Volume 3, Appendix 3.1). 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.

1.1.2 Operational Phase

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

1.1.3 Decommissioning Phase

Mitigation measures for the removal of wind turbines from the proposed project site would be similar as per 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 agriculture and 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 80% by 2030, with up to 8.2GW of increased onshore wind capacity. This will be achieved by:

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

As set out in the Climate Action Plan 2021, in terms of harnessing renewable energy, the volumes and frequencies of RESS will increase, so that the 80% target is met. The measures required to achieve this include finalising the design and implementation of RESS 2 and RESS 3.

As no significant impacts on climate are predicted during construction, no mitigation measures are 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

2.1 Construction Phase

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 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. If turbine deliveries are required at night, 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, and the noise control measures set out Section 4.3.2 of the Construction Environmental Management Plan (CEMP) which is included in Appendix 3.1 of Volume 3 of the EIAR. 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. 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. 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.

2.2 Operational Phase

The predicted noise from the proposed wind farm meets the daytime and night-time noise limits at the closest locations to the proposed windfarm, and therefore no mitigation is required.

Based on the predicted noise levels, for some receptors sufficiently far from adjacent wind farms, a new source of noise will be introduced into the soundscape and it is expected that there will be a long-term slight to

moderate significance of impact for dwellings within the 35 dB LA90 study area with a moderate significance of impact on the closest dwellings to the proposed wind farm.

Should the project be granted permission, an operational noise survey will be undertaken to ensure the project complies with the noise limits once the windfarm is operational. 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. In the event of an exceedance noise mitigation could be provided by running the turbines in noise reduced modes of operation (NROs). The noise level can be lessened by reducing the rotational speed of the turbines, with a resultant loss of electrical energy production.

2.3 Decommissioning Phase

The noise impact for construction works traffic will be mitigated by 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, 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 on Saturdays in accordance with best practice.

3 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.

3.1 Mitigation by Design and Best Practice

With regard to the proposed project, design and best practice has been and will be implemented as follows:

The primary mitigation measure employed has been the design of the site in terms of locating the turbines, access roads, material storage areas and other site infrastructure within an area comprising existing quarry pits, agricultural pastoral land and commercial forestry where the soils are extensively worked and drained.

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

- Peat probing and site walkover surveys to identify geotechnical constraints (e.g. peat deposits and evidence of historic landslip) likely to adversely affect the design of the site.
- Excavation of trial pits to establish ground and groundwater conditions.
- Preparation of Slope Stability Assessments, included in the Geotechnical Assessment Report, Appendix 9.1 of this EIAR
- Relocation and micro-siting of turbines, hardstanding's and access roads based on the site assessments and geotechnical assessments in order to reduce ground risk associated with the proposed project.
- The works have been designed and checked by geotechnical and civil engineers, who are suitably qualified and experienced in excavation and earthworks design and construction methodologies. Details of experience and competence is included in Chapter 1.

The following will also be implemented:

- Any excavation and construction related works will be subject to a design risk assessment at detailed design stage to determine risk levels for the construction, operation and maintenance and decommissioning of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. Information on residual impacts will be recorded and relayed to appropriate parties
- 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.

3.2 Construction Phase

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

3.2.1 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) has been prepared for the proposed project and is included in Volume 3, Appendix 3.1. The CEMP defines the work practices, environmental management procedures and management responsibilities relating to the construction phase of the proposed project.

The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the site, to ensure that during these phases of the development, the environment is protected, and any potential impacts are minimised. The final CEMP will be developed further at the construction stage, on the appointment of the main contractor to the project to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned and shall be submitted to the planning authority.

Reference to relevant sections of the CEMP with respect to the mitigation of potential impacts to Land, Soils and Geology from the proposed project are outlined below.

3.2.2 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:

- 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.

- Refuelling of plant during construction will only be carried out at designated refuelling station locations on site.
- Emergency drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site. The emergency response procedure is provided in Section 1.8 of SWMP.

3.2.3 Earthworks

The project will be constructed in a phased manner 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 minimisation 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 (Gravel deposits) 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.

Surplus 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, however no long-term stockpiles of material will remain after construction and no surplus/waste soil or rock will be removed from the proposed project site. Temporary stockpiles will be shaped and sealed to prevent the ingress of water from rainfall and placed away from open excavations, sloping / soft ground as not to create an instability risk during temporary works.

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 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 GCR 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 lower engineered fill layers will be reused. 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.

3.2.4 Control of Sediment 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 new and existing drainage locations and where earthworks and tree felling are proposed.

Details of the proposed Surface Water Management System and mitigation measures is summarised below and are also outlined in Section 4.3.5 of the CEMP in Appendix 3.1 of Volume 3 of the EIAR.

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 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. Chapter 10 of the EIAR discusses surface water issues in more detail.

3.2.5 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.

3.2.6 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 of materials on the surface of soft ground will be avoided. 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.
- Excavation will be carried out from access roads or hardstanding areas to avoid tracking of construction plant across areas of soft ground.
- An assessment of the stability at proposed infrastructure locations has been carried out as part of this EIAR based on worst case conditions in accordance with the principals of Eurocode 7 (IS EN 1997-1) i.e. at turbine locations (T1 and T3), which displayed the steepest topography and require the deepest cut/fill operations. 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 and careful attention will be given to the existing drainage.
- 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.

3.2.7 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 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 monitor 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 690m at a financially involved landowner's dwelling. 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 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 (1.2 m deep) and will only be open for a short period.

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.

3.3 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. Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of maintenance 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 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.

3.4 Mitigation measures during Decommissioning

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

Some of the impacts associated with reinstatement of the site (excavation of turbine bases, access tracks etc.) will be avoided by leaving these in place where possible. 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 disturbance*". 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 these elements of the construction. Turbine bases will be covered with overburden material to allow for re-vegetation of the development site. It is proposed that the internal site access tracks and hard standings will be left in place and the land reinstated at these locations. The GCR infrastructure including substations and ancillary electrical equipment shall form part of the national grid and will be left in-situ.

Removal of this infrastructure would result in considerable disruption to the local environment in terms of increased sedimentation, erosion, dust, noise, traffic and an increased possibility of contamination of the local water table. However, if removal is deemed to be required by the respective local authority all infrastructure will be removed with mitigation measures similar to those during construction being employed.

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.

4 HYDROLOGY AND WATER QUALITY

4.1 Construction Stage

Best practice construction methods will be used during the construction stage to minimise impacts on water quality.

4.1.1 Instream Works

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

- Construction machinery operating in-stream should be mechanically sound to avoid leaks of oils, hydraulic fluid;
- All equipment or machinery to be used in the water will be sprayed and cleaned with disinfectant.

4.1.2 Temporary Stream Diversions

If temporary diversion channels are necessary, the channel should be non-eroding, of similar width to the natural channel. This will be designed in accordance with NRA guidelines and compliant with the following:

- 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;
- Bog mats will be used underneath excavators inside the 10 meter vegetative buffer zone to prevent soil erosion and potential water quality impacts from localised surface water runoff;
- There will be no batching of concrete within 100m of the watercourse;
- Once reinstated, the channel will be re-seeded as soon as possible and silt fencing will be left in place until the area has re-vegetated.

4.1.3 Watercourse Crossings

For minor watercourse and drain crossings within the site, the following methodology will be used:

- 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 the watercourse will be dammed upstream and diverted prior to work commencing;
- A temporary berm will be placed along the edge of the track/road to prevent loose material being dislodged or washed into the water body;

4.1.4 Clear Span Bridges

The construction methodology for clear span bridges is detailed as follows:

- Excavation near riverbanks is required to install and secure pre-cast concrete abutments;
- Abutments will be set back 2.5m from 1 in 100-year event;
- Dry working conditions at these sites will be maintained by retaining the existing bank and using a short section of sandbags 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.

4.1.5 Horizontal Directional Drilling

HDD will be employed at 4 no. locations along the GCR in accordance with the following methodology:

- The depth of the bore should be at least 3m below the level of the public road and stream bed so as not to conflict with the road drainage and watercourse;
- Inert, biodegradable drilling fluid will be used;
- There will be no refuelling within 50m of the watercourse.

4.1.6 Proposed Mitigation Measures GCR Cable Installation

Good industry practice such as pollution prevention measures detailed in Pollution Prevention Guidelines / Guidance for Pollution Prevention (PPG/GPP) PPG1, GPP21 and GPP22 will be implemented and will reduce the risk and the overall impact if a spill or leakage were to occur.

4.1.7 Proposed Mitigation Measures for Tree Felling

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;
    - Felling Corridors around higher value woodland has been reduced to 10 m to protect as much woodland as possible.
- Outer footprint of turbine hardstandings including an additional 10m offset from same;
- Outer footprint of temporary compound;
- Outer footprint of onsite substation compound including an additional 10m offset from same;
- 6m corridor for buried cables in private lands;
- 82.2 m radius around each turbine tower located in forestry for bat impact mitigation;
- 25m radius around the footprint of on-site meteorological mast

4.1.8 Proposed Mitigation Measures for Turbine Delivery

Good industry practice such as pollution prevention measures detailed in Pollution Prevention Guidelines / Guidance for Pollution Prevention PPG1, GPP21 and GPP22 will reduce the risk and the overall impact if a spill or leakage were to occur.

4.2 Proposed Mitigation Measures during Operation and Maintenance

The proposed surface water management plan (SWMP) will ensure that there is no impact on water quality as a result of the proposed development. The proposed drainage system will provide several stages of treatment to surface water runoff from constructed areas, which follows the concept of a multi-stage SuDS 'treatment train'.

Interceptor drains installed upslope of access tracks and areas of hardstanding will divert surface water runoff from undeveloped land around the constructed areas to disperse naturally within open ground without mixing with the construction drainage.

The proposed swales will intercept surface water runoff from access tracks and areas of hardstanding. The grass within the swales will provide some filtration to remove a portion of silt and suspended solids. Silt traps will be provided upstream of outfalls from roadside swales.

The settlement ponds will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of a very small particle size to fall out of suspension prior to discharge. Additional treatment will be provided upstream of the settlement pond with the use of drainage stone at the inlet to provide filtration. In an emergency, the outfall from a settlement pond will be blocked to provide a temporary holding area for accidental spillages on site.

As stated in the SWMP, to adhere to CIRIA C753, part of the maintenance routine that will mitigate issues relating to surface water is to inspect the following: drains, cross-drains and culverts for blockages; outfalls to existing field drains and watercourses, existing roadside swales for obstructions; progress of re-vegetation.

The water quality will also be tested at outfalls at appropriate intervals (to be defined when informed) for 12 months to comprise the baseline monitoring regime pre-construction.

4.3 Proposed Mitigation Measures during Operation and Maintenance

The access tracks will remain in situ for land management purposes, after the end of the operational period. Additionally, the turbine foundations and hardstanding will remain in situ and be covered over with soil from the site to re-vegetate naturally. This inherently mitigates disturbance through decommissioning process. Silt protection procedures, similar to during construction will be re-instated for decommissioning. If there is perceived to be risk of erosion during inspection of the revegetated hardstandings then erosion control measures will be taken

5 POPULATION, HUMAN HEALTH & MATERIAL ASSETS

5.1 Population

As there are no significant effects predicted on population trends and population density, no mitigation measures are required.

5.2 Socio-economics, Employment and Economic Activity

Given that potential effects 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.

5.3 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.

5.4 Recreation, Amenity and Tourism

Mitigation measures for recreation, amenity and tourism are primarily related to the preliminary design stage of the Fahy Beg 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 Fahy Beg Wind Farm, careful consideration was given to the potential impact on landscape amenity.

5.5 Human Health & Safety

5.5.1 Construction & 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.

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 will be closed to the public for the 12-18 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.

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. A traffic and transport assessment has been completed and is detailed in Chapter 13: Traffic and Transportation.

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.

5.5.2 Operational Phase

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 as described in Chapter 10 – Hydrology and Water Quality.

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. This is further detailed in Chapter 12 of the EIAR: Shadow Flicker.

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. Details of these mitigation measures are set out in Chapter 7 of the EIAR: Noise and Vibration.

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.

5.6 Material Assets (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.

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.

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.

The comprehensive turbine delivery procedure which will be implemented between Foynes Port and the wind farm site will include safety procedures and Garda escort in accordance with the Traffic Management Plan contained in Appendix 3.1.
The procedure will avoid impact on the roads involved with the TDR including the N69, M7, R466, R494, R463, and unidentified local roads 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 Fahy Beg 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.

6 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.

For all three scenarios a scheme of mitigation will be implemented into the turbine control software to cease turbine operation during periods of shadow flicker. The proposed method of mitigation will be used to mitigate all shadow flicker effects resulting in zero shadow flicker within the 10 rotor diameter study area, allowing for a short time for the rotor to come to a stop.

7 TRAFFIC AND TRANSPORTATION

7.1 Construction Phase

7.1.1 Main Wind Farm Site

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

A detailed traffic management plan (TMP) will be agreed with the road's authority and An Garda Síochána prior to commencing construction. The TMP is included in the CEMP contained in Appendix 3.1 of the EIAR. This includes the following:

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 R494, R463 and R466 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 Closures: with the use of the local roads network for the grid connection route, the narrow carriageway widths for some of the roads proposed may require full road closures. Any such road closures would be agreed with the roads authority in advance of construction and diversions would be incorporated into the traffic management plan.

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 Sweeper: 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.

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.

7.1.2 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.

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.

7.1.3 Turbine Component Delivery Mitigation

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

7.2 Operation

It is considered that no further mitigation measures are necessary for the operational stage of the project.

7.3 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.

8 ARCHAEOLOGY, ARCHITECTURAL AND CULTURAL HERITAGE

A suitably qualified archaeologist will be employed to oversee the construction phase of the proposed project. A systematic advance programme of archaeological field-walking surveys will be undertaken within all construction areas located within forestry plantations following pre-construction tree felling to confirm whether there are any surface traces of any potential unrecorded archaeological or architectural heritage sites exist within areas inaccessible due to the presence of thick tree cover. Archaeological monitoring of ground excavation works during the construction phase will then be carried out within all green field and forested areas of the Site under licence by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage. In the event that any archaeological sites are identified during monitoring, ground works will halt at the location and the archaeological remains will be recorded and cordoned off. The NMS will then be consulted to determine further appropriate mitigation measures, which may include preservation *in situ* by avoidance or preservation by record through systematic archaeological excavations licensed by the NMS. A written and drawn record of the extant townland boundary between Ballyknavin and Fahy Beg which is on the route of an access road will be compiled by the appointed archaeologist during the monitoring of the construction phase and this record will be included in their report.

Archaeological monitoring of all cable trench excavations will be carried out within the section of the local road adjacent to Enclosure CL044- 075---- in Fahy More South and a watching brief will be maintained of other cable trenching works. All TDR ground works within the environs of Saint Thomas's Church in Bridgetown village will also be subject to constant archaeological monitoring.

The locations of all recorded archaeological sites within fields and forestry clearings within the Site will be cordoned off and the outer edges of their Zones of Notification will be clearly signed as 'No Entry: Archaeological Area' for the duration of the construction phase. These sites comprise Enclosures CL044- 064----, CL044- 067---- and CL044- 077---- as well as the recorded location of a children's burial site and bullaun stone (CL045- 052001- and CL045- 052002-) in the area in the east end of the site. The location of the derelict farmyard within Ballyknavin townland will also be clearly signed as a 'No Entry: Historic Farmyard' during the construction phase. In addition, the site inductions for all construction staff will include information in relation to the locations and access constraints relating to these sites.

9 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 main form of landscape and visual mitigation employed is the buffering of residential receptors

Buffering of Residential Receptors

For the proposed Fahy Beg Wind Farm, a minimum setback distance of 706m is required. All of the buffer distances comply with the setback distance outlined in the current 2006 Guidelines and the Draft Revised Guidelines (2019). Complying with the setback limits is important because the perceived scale of turbines reduces exponentially with distance. 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 is, 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.

10 TELECOMMUNICATIONS AND AVIATION

10.1 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.

10.2 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.

11 BIODIVERSITY

Mitigation measures are described below which will avoid, reduce and where possible, offset likely significant impacts arising in relation to ecology from the construction, operation and decommissioning of the site. These mitigation measures shall be implemented in full.

11.1 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 effects on designated sites.
- All cabling for the project will be placed underground; this significantly reduces collision risk to birds over the lifetime of the wind farm (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, and using existing crossings.
- Further mitigation measures for hedgerows/treelines that will be affected by the grid connection route are discussed further in Section 8.6.2.3.
- Care has been taken to ensure that sufficient buffers are in place between wind farm infrastructure and hydrological features such as rivers and streams. Buffers of 50m from natural watercourses have been maintained, excepting where crossing points occur.
- Four new stream crossings shall be required within the wind farm site. A clear-span bridge design has been selected to avoid instream works and to minimise disturbance of banks and associated indirect effects such as siltation at the most sensitive location. Pre-cast concrete culverts will be installed at the remaining locations which are lower-value and do not support key ecological receptors; the use of precast structures will avoid the risk of concrete contamination.
- Directional drilling is the proposed installation method where the grid connection crosses EPA-mapped watercourses. As such, in-stream works will not be required and the potential for contaminant or pollutant input will be greatly reduced as a result.
- The design of the grid connection was also carried out with cognisance to ecological features. Cables are to be placed underneath public roads where possible to avoid impact to roadside hedgerows. Further mitigation measures for hedgerows/treelines that will be affected by the grid connection route are discussed further in Section 8.6.2.3.
- The design of TDR Node 9 was carried out with cognisance of the adjacent Inner Shannon Estuary – South Shore pNHA. The route identified is constrained to the existing public road network and does not overlap or abut any habitats, supporting habitats or features of interest for this site.

11.2 Mitigation Measures during Construction

Construction of this project is expected to cause temporary (disturbance) adverse effects on local ecological receptors. The mitigation measures described below will reduce these effects significantly. It is noted that all measures requested by IFI during consultation have been included.

11.2.1 Project Ecologist

A Project Ecologist/Ecological Clerk of Works (ECoW)) will be employed for the duration of the construction phase to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/ECoW will advise on environmental effects and communicate with the project owner and contractor to ensure the required actions to implement the mitigation prescribed in the EIAR are carried out.

11.2.2 Habitats and 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 including existing roads and stream crossings to minimise excavation works.

No disturbance to habitats or flora outside the proposed development area will occur. Works will be restricted to the immediate footprint of the development (see CEMP; Appendix 3.1). 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. Access to the site will be via the existing regional road R466.

Hedgerow and Treeline Reinstatement

Hedgerow and treeline planting will be carried out for the proposed wind farm and TDR Nodes. This will reinstate or replace linear habitat loss to ensure no net loss of these habitats occurs.

A total of 12 new hedgerows totalling c. 1.4 km in length will be planted at the proposed wind farm site to mitigate linear wooded habitat loss and enhance connectivity in the landscape. Details are included in the Biodiversity Enhancement & Management Plan (Appendix 3-4). The species proposed to be planted at these locations are detailed in Table 3-1.

Hedgerows removed or lowered by TDR Node works will be reinstated using the same native species present in original hedgerows. The exception to this is that Ash is not proposed to be used, due to it's vulnerability to ash dieback disease. Other large-growing native species such as Alder and Oak are proposed instead. Semi-mature specimens of native provenance will be included to accelerate rehabilitation of these areas. Native, semi-mature specimen trees will be planted where large trees are felled at TDR Nodes to offset the loss of existing trees. A proportion of smaller trees will also be planted with the semi-mature specimens.

The species proposed to be planted at these locations are detailed in Table 3-2:

Table 3-1: Hedgerow Planting at Wind Farm Site

Linear Feature	Plant
1	Oak, rowan, holly, birch, grey willow, alder
2	Oak, birch, grey willow, alder
3	Grey willow, hawthorn, elder
4	Grey willow, hawthorn, elder
5	Grey willow, hawthorn, blackthorn
6	Grey willow, hawthorn, blackthorn
7	Hawthorn, elder, birch, holly
8	Oak, rowan, holly, grey willow
9	Oak, hawthorn, blackthorn
10	Oak, rowan, birch, grey willow, blackthorn
11	Oak, rowan, birch, grey willow, blackthorn
12	Grey willow, hawthorn, alder, oak

Table 3-2: Hedgerow/Treeline Reinstatement at TDR Nodes

Node	Species
30	Hawthorn, Alder, Oak
31	Pedunculate oak, Alder, Hawthorn
32	Birch, Oak, Alder

11.2.3 Woodland Reinstatement

The oak-ash-hazel woodland (WN2) abutting the clear span bridge will be replanted following construction, to minimise habitat loss and repair connectivity for wildlife along the riparian corridor. An area of approximately 320m^2 across both sides of the bridge will be planted with the following mix: grey willow- 30%; hazel- 70%. Details are included in the Biodiversity Enhancement & management Plan (Appendix 3-4).

11.2.4 Management of the Spread of Non-native Invasive Species

Where invasive non-native species are present at TDR Nodes, measures will be implemented to ensure spread of these species is prevented and eradicated as described below and in the invasive species management plan (Appendix 8-8).

- Prior to works an invasive secies survey will be undertaken in the area to reconfirm the findings of the EIAR.
- The invasive species plan and management plan (Appendix 8-8) will be adhered to for works at TDR nodes

According to Invasive Species Ireland (ISI) invasive non-native species are the second greatest threat (after habitat destruction) to worldwide biodiversity. Invasive species negatively impact Ireland's native species; changing habitats and ultimately threatening ecosystems which impacts on biodiversity as well as economics as they are costly to eradicate.

Halting the spread of non-native invasive species can be achieved via prevention, containment, treatment and eradication.

Prevention

Wind Farm Site

No invasive species are present within the proposed wind farm footprint. As such, if baseline conditions remain unchanged, interaction with proposed works is avoidable for all invasive species recorded in the study area. Due to the possibility of spread of invasive species in the intervening period, a preconstruction invasive species survey is required as part of the invasive species management plan (ISMP) (Appendix 8-8). Containment and eradication measures are detailed in the ISMP which will be used as required in the event of changes to the invasive species baseline.

Grid Connection Route

Prior to trimming or vegetation removal along the grid connection an invasive species survey will be undertaken to reconfirm the findings of the EIAR. Containment and eradication measures are detailed in the ISMP which will be used as required where avoidance of invasive species is not possible.

Works along the Turbine Delivery Route

Prior to trimming or vegetation removal at turbine delivery work locations, an invasive species survey will be undertaken to reconfirm the findings of the EIAR. As interaction of proposed works with invasive species is likely based on surveys of the existing environment, containment measures are required in accordance with the invasive species management plan (ISMP) (Appendix 8-8). Options for eradication are also detailed.

Containment, Treatment, Eradication

- Cordoning off the area – this shall include a buffer of 5m surrounding the area of infestation to ensure that seeds are not transported to other sections of the site via vehicular traffic, equipment or PPE.
- No machinery or personnel shall be allowed within this restricted area. Similarly, there shall be no storage of materials within or adjacent to this restricted area.
- There shall be no vegetation clearance or trimming within the cordoned area (except where undertaken in accordance with the invasive species management plan) as this can lead to the species recolonising

other areas via the wind, water if displaced into drains, or soil and vegetation attached to machinery, vehicles or personnel.

- If schedule III species are present, no soil or vegetation shall be removed from this area unless it is securely contained and is transported under licence to a suitably licenced facility for treatment.
- For non-schedule III species, no soil or vegetation shall be removed from this area unless it is securely contained and is to be disposed of appropriately onsite or transported to a suitably licenced facility for treatment.
- Informing all site staff through toolbox talk as part of site inductions.
- Any new sightings of the species shall by relayed to construction staff and the developer via the project ecologist/ECoW. These areas shall follow the same protocol as described above.
- Reporting sighting(s) to the NPWS and NBDC and liaising with the NPWS.

11.2.5 Mammals

A preconstruction mammal survey will be undertaken to reconfirm the findings of the EIAR.

An ecologist will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate (e.g., an ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any site-specific issues in relation to wildlife not currently present (e.g. badger setts, red squirrel dreys) on site will be reconfirmed prior to commencement of works so as to allow appropriate mitigation measures to be put in place.

In the event that an issue arises, the NPWS will be updated, consulted with, relevant guidelines shall be followed and any licences/amendments to licences will be sought from NPWS.

Construction operations will take place predominantly during the hours of daylight to minimise disturbances to faunal species at night. Some works along the grid connection route and wind farm site may occur at night but the project ecologist/ECoW shall limit night-time works to sections of the route / site which avoid sensitive features (e.g. mature treelines).

Badgers

A pre-construction mammal survey including a badger survey will be undertaken within the mammal survey study area to reconfirm the existing environment as described in the EIAR and, in the event that a badger sett should be encountered at any point, then NPWS will be informed and NRA *Guidelines for the Treatment of Badgers Prior To the Construction of National Road Schemes* will be followed.

A number of badger setts including active setts were present within the site boundary area during surveys, and there are records of badger in the local area. Badgers can move between setts regularly and may also excavate new setts within their territory. As such there is potential for the layout and status of the badger setts onsite to change in the intervening period between planning and construction stages.

A badger mitigation plan to ensure construction does not contravene the Wildlife Act will be required if planning is granted, and as such a confidential badger mitigation report has been prepared and submitted with this application. The plan will be updated as required prior to construction, and the NPWS scientific unit and local conservation ranger will be consulted prior to implementing the plan.

Setts in close proximity to the development will require temporary hard-blocking and exclusion for the duration of construction works to ensure that badgers potentially occupying these setts during construction works are not injured. Setts affected by proposed felling only will be hard blocked for the duration of felling operations, but will be unblocked after felling is completed, provided adequate buffers between construction areas and setts exist.

No hard-blocking or sett exclusions will be undertaken during the badger breeding season (December-June inclusive).

A report detailing evacuation procedures, sett excavation and destruction, and any other relevant issues will be submitted to the NPWS, as a formal record of compliance with the Wildlife Act.

Details on the location of setts and proposed mitigation are included in the confidential Appendix: ***Badger Mitigation Plan.***

Vegetation clearance

There is the potential for setts to be discovered during vegetation clearance works. Care will need to be taken during this early stage of the development and a competent ecologist will be required on-site for these works. If setts are discovered all works within 30m of the sett (50m during breeding season) shall cease including vegetation clearance. NPWS shall be contacted and the mitigation plan shall be amended as required. An activity survey shall be carried out to assess the potential for the sett to be used by Badgers.

Measures to prevent the injury of Badgers during proposed mitigation measures

In the event that a badger is found injured during the proposed mitigation measures, it is important to realise that injured badgers will be frightened and can be very dangerous. They are strong animals and are not used to being handled, so no attempt will be made to touch an injured badger, as this could result in workers being bitten. NPWS shall be contacted along with ISPCA and potentially a vet specified by NPWS capable of treating the species.

Otter

No evidence of otter holts was observed within the study area, and no otter signs were recorded at the proposed wind farm site. The GCR otter survey recorded otter activity along the Blackwater (Clare) and Glenomra wood stream watercourses at or near GCR crossing points but no holts are present within 150m of GCR crossings.
A pre-construction mammal survey will be undertaken (no later than 12 months prior to construction) within the mammal survey study area to reconfirm the existing environment as described in the EIAR and, if an Otter holt should be encountered at any point, then NPWS will be informed and NRA *Guidelines for the Treatment of Otters Prior To the Construction of National Road Schemes* will be followed.

Red Squirrel

Where possible, any required felling of trees in forestry areas will be limited to time periods outside which Red Squirrel may have young in dreys (peak period January to March).

If this is unavoidable, then areas to be clear felled will be surveyed in advance by a suitably qualified ecologist to determine whether any occupied dreys are present. Suitable mitigation measures will be implemented and a derogation/disturbance licence will be sought if dreys are found within the felling footprint or adjacent areas.

Pine Marten

Where possible, felling of trees in forestry areas will be limited to time periods outside which pine martens may have young in dens (March and April). If this is unavoidable, then areas to be clear felled will be surveyed in advance by a suitably qualified ecologist to determine whether any occupied pine marten dens are present. A license under the Wildlife act will be applied for should any sites have to be disturbed.

Irish Stoat

Since stoat dens are difficult to detect, mitigation measures should focus on avoiding impacts during the breeding season. Since stoats are born in April, and reach adult size by September, the implementation of mitigation measures for breeding birds (no vegetation removal between March-August inclusive) will avoid disturbance to stoat during the majority of their breeding season.

If vegetation clearance is unavoidable during this period, then areas to be clear felled will be surveyed in advance by a suitable qualified ecologist to determine whether any stoat are present. A licence under the Wildlife Act will be sought as necessary.

Irish Hare, Pygmy Shrew and Hedgehog

These species are mobile and will disperse, however, hibernating Hedgehogs and the young of Irish Hare, Pygmy Shrew or Hedgehog are vulnerable during clearance of vegetation. An ecologist will check for the presence of hibernating hedgehog and or young mammals as appropriate, prior to vegetation clearance works prior to or during construction (as necessary).

Where habitat is too dense the ecologist will supervise vegetation removal and grassland trimming / maintenance during clearance works as appropriate.:

- Outside of the bird breeding season (March 1st to August 31st inclusive) attention will be paid to the removal of vegetation, scrub and hedgerow with regards to leverets, October to March for hibernating Hedgehog and September to October for breeding Pygmy Shrew as is appropriate.
- Within the breeding bird season and outside of it, attention will be paid to the removal and/or maintenance of dense grassland for breeding hare (all year), pygmy shrew (April to October) and Hedgehog (April to July).

11.2.6 Bats

Buffer Zone

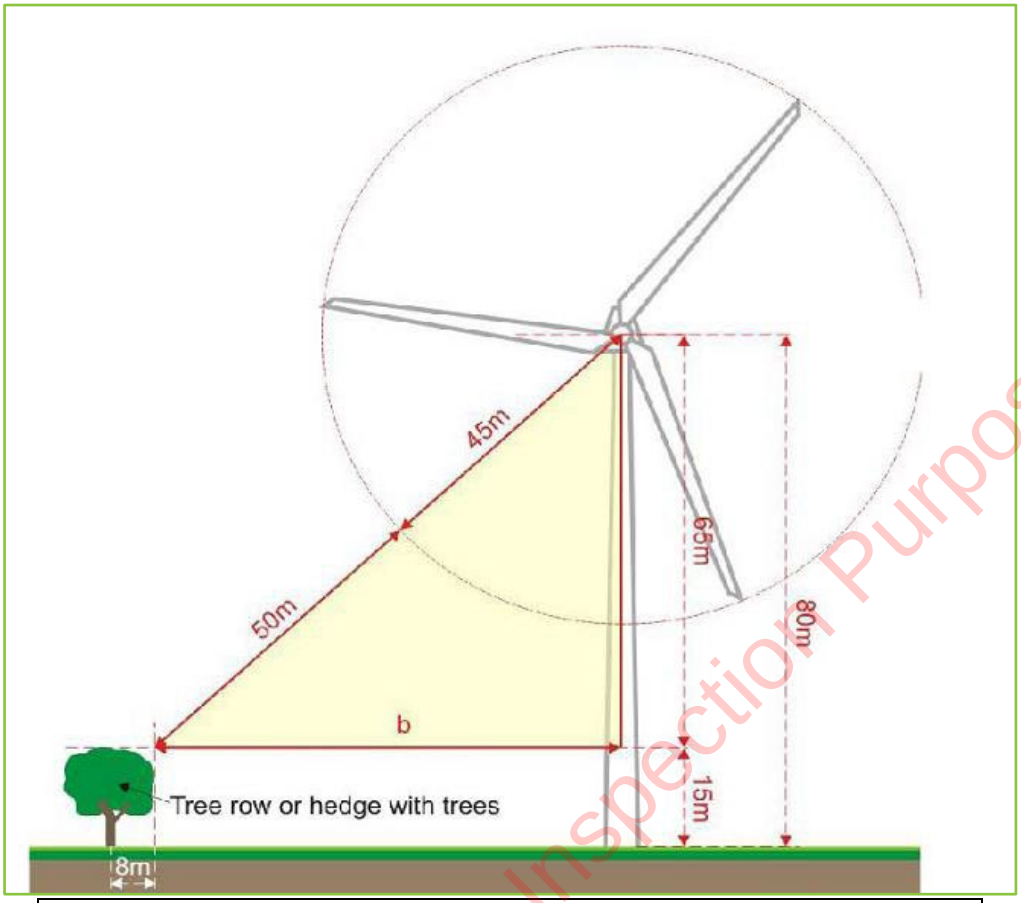
To minimize risk to bat populations, a buffer zone is required around any treeline, hedgerow, woodland feature, into which no part of the turbine should intrude.

According to SNH (2021) guidance:

> *"The Eurobats guidance recommends a 200m buffer around woodland areas. There is, however, currently no scientific evidence to support this distance in the UK and it is recommended that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features such as wetlands etc.) is adequate mitigation in most, lower risk situations. Exceptionally, larger buffers may be appropriate, e.g. near major swarming and hibernation sites. The longevity of wind farms should also be taken into account and the maximum growth, or management, of woodland and other relevant habitat features considered in their planning.*

These distances were taken into account during the design phase of the proposed Fahybeg Wind Farm Development.

The following formula was used to calculate the required felling buffer for each turbine (taking into account the height of surrounding woodland/plantations at each turbine location). Calculations were run for each set of proposed optional turbine dimensions.



$b = \sqrt{\{(50 + bl)^2 - (hh - fh)^2\}}$ where: b = the distance on the ground between the edge of the canopy and the turbine (m) bl = blade length (m) hh = hub height (m) fh = feature height (m)
$b = \sqrt{\{(50 + 75)^2 - (100 - fh)^2\}}$

Note: fh for each turbine location is given in column 3 of Table 3-3:

Surrounding habitats, height of surrounding trees and felling buffer calculated using the above equation are included below. Note that the tree heights have been increased to allow for growth prior to felling, thereby expanding the buffers.

To minimise risk to bat populations, a buffer zone is required around any treeline, hedgerow, woodland feature, into which no part of the turbine will intrude. The buffers for each turbine location based on the five optional sets of turbine dimensions (see Section 3.3.2 in Chapter 3 Description of Proposed Development) are presented below.

Table 3-3: Assessment of potential turbine/bat conflict zones (based on proposed turbine dimension options 1-5)

Turbine number	Habitats Requiring Felling	Tree Height allowing for growth (m)	Felling Buffer Radius (m)				
			Option 1	Option 2	Option 3	Option 4	Option 5
1	Hedgerows; Scrub	10	64	71	60	70	68
2	None	0	N/A	N/A	N/A	N/A	N/A
3	Hedgerows	5	56	64	50	63	60
4	Hedgerows	10	64	71	60	70	68
5	Conifer Plantation	25	82	87	80	87	86
6	Conifer Plantation; Scrub; Mixed broadleaved woodland (immature ash plantation)	25	82	87	80	87	86
7	Conifer Plantation; Scrub	25	82	87	80	87	86
8	Hedgerows; Treelines	5	56	64	50	63	60

Existing trees will be cleared around all six turbines to provide a vegetation-free buffer zone around each turbine. All buffers will be maintained throughout the lifetime of the wind farm. This will be achieved through mechanical means only; the use of chemical substances is prohibited.

The following mitigation measures for bats are proposed:

Supervision of vegetation clearance

An ecologist/ECoW will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate (e.g., ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any site-specific issues in relation to wildlife not currently present (e.g., bat roost locations) on site will be discovered prior to commencement of works to allow appropriate mitigation measures to be put in place. In the event that an issue arises, the NPWS will be informed and the relevant guidelines will be implemented as appropriate (e.g. NRA guidelines).

Retention of trees

Several species of bats roost in trees. Treelines and mature trees within the wind farm site will be avoided and retained intact. Overall impacts on these areas will be minimised through modified design and sensitivity during construction. Any trees and treelines along approach roads and planned site access tracks will be retained unless felling is unavoidable.

Retained trees should be protected from root damage by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing.

Pre-construction Surveys

Pre-felling roost surveys are required for Ballymoloney Woods and the mature ash tree within the T5 felling buffer to reconfirm the finding of the EIAR. Emergence/re-entry surveys may also be required, pending results of PRF surveys. If required, derogation licences shall be sought from NPWS.

If three years lapse from between planning-stage surveys in 2020 and installation of the wind turbines, it will be necessary to repeat one season of static detector surveys during the activity period (EUROBATS, 2014). Future survey work will be completed according to best practice guidelines available (Hundt, 2012; Collins, 2016; SNH, 2019; 2021) and includes static detector, activity and roost inspection surveys.

Retention of tree PRFs

Potential roosting features occurring in mature trees proposed to be felled will be retained and strapped to suitable adjacent trees using durable fastening solutions to provide ensure they remain available to bats and that no net loss of PRFs occurs.

Tree Felling Measures (TDR)

Where mature trees with low bat roosting potential are proposed to be felled, these trees will be left in situ for 24 hours prior to disposal. This will allow any bats present to escape.

It is noted that only low potential trees were identified within the footprint of TDR Nodes; two ash trees with heavy Ivy growth (TDR Node 31). These trees may have potential for individual/small numbers of bats to roost opportunistically and are classified as having low suitability for roosting bats.

Compensation for loss of commuting routes/Diversion from felling buffers

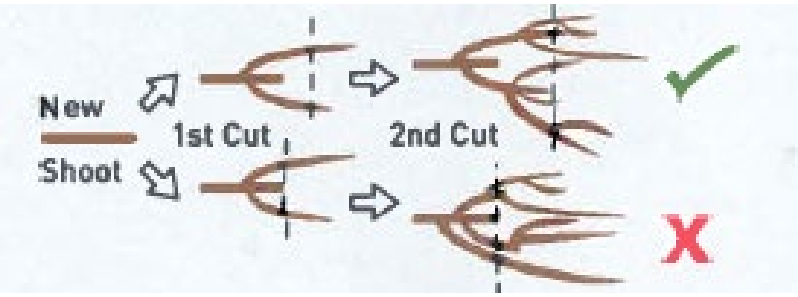
Linear features such as hedgerows and treelines serve as commuting corridors for bats (and other wildlife). The magnitude of habitat loss is Imperceptible. Between 920m and 1,098m (10-12 %) of Hedgerows will be lost within the development footprint. Between 190m and 206m (4-5 %) of Treelines will be lost within the development footprint. Felling around turbines will alter commuting and foraging routes associated with existing hedgerows and woodland edges.

Where hedgerows and treelines are affected by turbine felling buffers, bats will be directed away from tree-free buffers along an alternative commuting route. This will be achieved by planting new pollinator-friendly hedgerows along Lines 2, 3, 4, 7, 10 & 11 (see Figure 8-19). Willow and Alder will also be included in these hedgerows due to their rapid growth. It is proposed to create double lines of hedgerow, with Willow on one side, and pollinator-friendly hedgerow species listed below on the other. Planting of these species will be staggered to prevent excessive shading and aid establishment of the hedgerows.

All hedgerow planting is required to use plants of native provenance. The landscaping contractor is required to be informed well in advance to allow the acquisition of suitable native stock. 2–3-year-old alder and willow trees are required for hedgerows 2, 3, 4, 7, 10 & 11, to help accelerate establishment. These will be supplemented with planting of whips.

The following fast-growing damp tolerant species will be planted along the inner edges of these hedgerows: grey willow *Salix cinerea* and alder *Alnus glutinosa.* The following native fruiting hedgerow species will be planted along the outer edges of these hedgerows: whitethorn *Crataegus monogyna*, blackthorn *Prunus spinosa,* elder *Sambucus nigra,* Holly *Ilex aquifolium* and rowan *Sorbus aucuparia.*

Tightly cut hedgerows with flat tops provide little benefit to wildlife, taller and bulky hedgerows are required as this provides more shelter for wildlife. When the hedgerows are maintained, stems will be cut a little above the last cut (see Plate 3-1) as cutting back to the exact same point depletes the energy of the hedgerow, forms a build-up of scar tissue which discourages new growth.



Source:Teagasc

Plate 3-1: Hedgerow Level of Cut

Light annual cutting of hedgerows is not good for wildlife as it limits the production of flowers and fruit. The sites hedgerows will be cut every three to four years in rotation if cutting is required, as this will leave areas of undisturbed hedgerows. Cutting equipment used will be sharp so as not to shatter or fray the hedge. Shattering and fraying allows for disease to enter plants and can lead to decay and weaken the vigour of the hedgerow. A finger-bar cutter is recommended as the most appropriate tool to minimise fraying and smashing of branches (Heritage Council, 2017). A flail-type hedge cutter is unsuitable for hedge trimming in situations where hedgerow health is a priority.

Hedgerow maintenance will not be carried out between the 1st of March and 31st of August as this is the nesting period for birds and any maintenance at this time will disturb breeding; this is in keeping with the Wildlife Act 1976 (as amended).

Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Construction operations within the wind farm site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. Some works along the cable route and wind farm site may occur at night but the project ecologist/ECoW shall limit night-time works to sections of the route / site which avoid sensitive features (e.g. mature treelines). Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) will be used to prevent overspill.

This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

11.2.7 Avifauna

Subject to other environmental concerns (e.g., run-off), the removal of vegetation and scrub as well as trimming of trees along the GCR and TDR will be undertaken outside of the bird breeding season (March 1st to August 31st inclusive). This will help protect nesting birds.

This in line with best practice recommendations for mitigation measures in regard to birds and wind farms (Drewitt, A. L. and Langston, R. H., 2006)

The clearance of vegetation at the Site, GCR and TDR nodes, including forestry plantation, should only be carried out in the period September to February inclusive, i.e. outside the main bird nesting season. Where vegetation removal is required outside this period, vegetation will be inspected for nesting birds by a suitably qualified Ecologist. In the event of birds nesting within areas required to be felled suitable mitigation (implementation of buffer zones and/or seasonal constraints; nest monitoring) will be put in place and felling will only proceed upon agreement with NPWS and receipt of a wildlife licence.

Planting new pollinator-friendly hedgerows along Lines 1-12 (see EIAR Figure 8-19, Table 8-75). Willow will be included in these hedgerows due to it's rapid growth rate which will accelerate establishment. This planting will ensure no net loss of linear wooded habitats used by barn owl and kestrel for hunting. Wildflower strips will be planted to provide habitat analogous to rough grassland for hunting barn owl and kestrel. These strips will be located along access tracks away from proposed turbine locations (see EIAR Figure 8-19).

Construction operations will take place during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms (Drewitt and Langston, 2006). Limited operations such as concrete pours, turbine erection and installation of the grid connection may require night-time operating hours; these works will be supervised by the project ecologist/ECoW.

Toolbox talks will be undertaken with construction staff on disturbance to key species during construction. This will help minimise disturbance. This is in line with best practice recommendations for mitigation measures with regard to birds and wind farms (Drewitt and Langston, 2006).

Re-instated hedgerows will be planted with locally sourced native species. This will result in habitat enhancement for local species of conservation importance such as Greenfinch. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms (Drewitt and Langston, 2006).

Kingfisher; Grey Wagtail; Dipper: Implement mitigation measures outlined in Chapter 10 - Hydrology and Water Quality of this EIAR, the CEMP and Aquatic Ecology Mitigation below, to minimise and prevent the identified indirect impacts to water quality.

Re-confirmatory surveys (March/April) of the proposed turbine locations, Roads and hard standings will be conducted to assess any evidence of Barn owl, Buzzard, Kestrel, Sparrowhawk, Snipe and Woodcock activity or taking up of new territories. Should any new nests be recorded, works at these locations will be restricted to outside the breeding season (April-July) or until chicks are deemed to have fledged (following monitoring).

If construction commences during meadow pipit breeding season, a survey to locate breeding territories and nests will be completed to reconfirm the findings of the EIAR, and any nest locations in the potential ZoI will be cordoned off until breeding activity is finished.

11.2.8 Aquatic Ecology - Water Quality Measures during the Construction Phase

Proposed Mitigation Measures for the Construction Stage of the project

Construction phase mitigation for hydrology will follow that outlined in section 10.7 of Chapter 10, and the mitigation measures outlined will be adhered to in conjunction with those outlined in this section. Construction phase mitigation measures for aquatic ecology predominantly involve the preservation of water quality.

All measures for the protection of water quality within the proposed development site, as detailed in the CEMP, will also protect the aquatic ecology and fisheries value of downstream watercourses.

The measures adopted within the CEMP will ensure effective protection of aquatic ecological interests downstream of the proposed development, particularly the habitats supporting sensitive aquatic species and with connectivity to the Lower River Shannon SAC (002165).

Proposed Mitigation Measures for Tree Felling

Localised tree felling will be required in the vicinity of turbine T1, T3, T4. T5, T6, T7 and T8 hardstand areas, and along the access tracks running through wooded habitats. It is estimated that 11.1 Ha of existing wooded habitats will be felled to facilitate development of the proposed wind farm infrastructure (e.g., turbine hardstands, and associated access tracks), in addition to a further 3.1 Ha of conifer plantation to facilitate establishment of a new oak woodland (giving an overall felling areas o 14.2 Ha). There are potential source-receptor pathways from felling areas to the streams draining the proposed site.

Check dams/silt fences will be installed within any drainage channels within turbine felling buffers prior to commencement of felling. In addition, silt fencing will be installed along the western perimeter of the T6 buffer which abuts the riparian corridor of the River Black. Silt fencing will be installed along both sides of the un-named stream at T7. 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 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.

Where felling within the riparian corridor is required, this will be carried out by hand only to prevent disturbance of steep-sided stream valleys. The use of machinery to collect felled trees is permissible where grab arms may reach into these areas, but no tracked machinery is permitted to enter stream valleys.

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 best practice 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;

Additional mitigation measures for the protection of aquatic ecology and receptors during felling activities will follow those outlined in section 10.7 of Chapter 10 (e.g. minimum buffer zone widths along watercourses).

Given the sensitivity of aquatic ecological receptors in the downstream receiving environment (e.g. salmonids, lamprey species, kingfisher, otter), it is proposed to undertake felling in the spring period to facilitate the sowing of grass seeds post-harvest to aid sediment filtration and nutrient absorption, using native grass species *Holcus lanatus* and *Agrostris capilaris* (DAFM, 2018). Machine operations will not take place in the 48-hour period before predicated heavy rainfall, during heavy rainfall or in the 48-hour 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).

Wind Farm Construction

A Surface Water Management Plan is included in the CEMP. This has regard to guidelines included in '*Guidelines for the crossing of watercourses during the construction of national road schemes*' (NRA, 2008b) and '*Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*' (IFI, 2016). This is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters. The Surface Water Management Plan sets out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase. It also includes preparatory works on the site, including installation of silt fences and bunds.

All access tracks will be designed to minimise excavation on the site and reduce the risk of sediment runoff. A sealed silt fence will be placed at both sides of points where rivers or streams are crossed and to a minimum of 10m upstream and downstream of each crossing at both sides of the road. Swales for turbine bases and hard standings will be constructed.

All infrastructure will have a setback distance of 50 m away from all streams within the site except for the watercourse crossings. Where site tracks are existing rather than a new site track, this buffer will not apply. There are also four stream crossings proposed within the wind farm site. Where access tracks pass close to watercourses, silt fencing will be used to protect the streams. The maintenance and monitoring of such silt fences will be subject to an on-site quality management system which is set out in the CEMP. Stream crossings will be constructed during low flow conditions and within a 5-day weather window.
The internal access track crossings will be via a single span, pre-cast concrete bridge, and precast box culverts. Installation will only be completed during a dry period between July and September (as required by Inland Fisheries Ireland for in-stream works) to avoid the salmonid spawning season and sensitive life stage period. Potential releases of sediment-laden surface run-off as a result of bank clearance works to facilitate bridge installation/access will be mitigated against through the water quality mitigation measures applicable throughout the site (see section 10.7 of chapter 10 and the CEMP).

Silt fences will be placed downstream of all works and regularly maintained. Materials used to install culverts and stream crossings will be ore-cast.

Spoil heaps from the excavations for the turbine bases and trenches (where cables are to be buried) will be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. Any berms will be covered with a geo-textile matting to avoid sediment runoff; berms will be surrounded by silt fencing until vegetation has been established in the following growing season. Underground cables will be located underneath and directly adjacent to access tracks as far as possible. Trench excavations will not be carried out during heavy rainfall (over 4mm per hour), or during 24-hour periods before heavy rainfall. Regular checks of weather forecasts will be carried out and construction schedules will be adjusted to avoid heavy rainfall. Trenches will be excavated in short sections and left open for minimal periods to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within any cable trenches at intervals.

An Emergency Erosion and Silt Control Response Plan is included as a contingency in the CEMP, which details the required measures for the Contractor to implement in the event of a 'worst case' scenario on the site, such as a breakout of sediment-laden water from a silt pond. Timing of the proposed instream works will also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream environment during the salmonid close season (October–March annually), which also avoids the lamprey spawning season.

Secure concrete washout areas are designated on site and detailed in the CEMP. These are located > 50m from the nearest watercourse. Washout of chutes only is permitted in these areas.

Standing water in the excavations at the turbine bases will contain an increased concentration of suspended solids. The excavations will be pumped into temporary settlement basins as necessary which will be lined and which will drain into existing or proposed drainage channels on site. The settlement basins will be constructed in advance of any excavations for the turbine bases.

Wheel washing facilities will be provided at the site entrance draining to silt traps. Additional silt fencing will be kept on site for the ongoing maintenance of the structures provided. Portaloos will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licensed waste disposal contractor and will not be discharged on site.

Any diesel or fuel oils stored on site will be bunded to 110 % of the capacity of the storage tank. Such facilities will not be located near any drain or watercourse. Design and installation of fuel tanks will be in accordance with best practice guidelines. Refuelling of plant during construction will be carried out in an appropriately designed designated area, no refuelling will be permitted within 50m of watercourses. Drip trays and spill kits will be kept available on site. Appropriate containment facilities will be provided to ensure that any spills from the vehicle are contained and removed off site.

Appropriate preventative measures are detailed in the ISMP to ensure that non-native aquatic/riparian species are not introduced into the site. These measures follow the manual '*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*' by NRA (2010).

Strict biosecurity measures will be implemented if plant and machinery working in areas with invasive species along the grid route is used at the wind farm site. All machinery shall be disinfected and visually inspected before leaving works areas where invasive species are present.

Crayfish plague is known from the Lower River Shannon 25C and Shannon Estuary South Catchments to the north and south but has not been detected to date in the Lower River Shannon 25D and Shannon Estuary North Catchments where the proposed wind farm and grid connection are located. The potential introduction of Crayfish plague is of particular concern at watercourse crossings given the potential for White-clawed Crayfish populations downstream.

To reduce the risk of invasive species and pathogen introduction (e.g. Crayfish plague), all equipment will be thoroughly checked, cleaned and dried in accordance with best practice as specified in the CIRIA C532, C648 and C741 guidelines below. Furthermore, plant machinery which has worked within riparian corridors or come in to contact with water will be steam-cleaned and dried in advance of works commencement in the Blackwater catchment.

Any operatives entering watercourses will be required to disinfect clothing and equipment coming in contact with water prior to and after entering the watercourse. The same disinfection measures shall apply (disinfection and wash down before and after works) to any machinery working in or near watercourses. For the purposes of this measure, watercourses include both include both drainage ditches and rivers.

An invasive species management plan which details management measures for each invasive plant species is included in Appendix 8-8.

Grid Connection

The Surface Water Management Plan sets out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase. This includes areas of the grid connection route near waterways and at crossing points. Works on riverbanks can potentially lead to destabilisation, erosion and increased siltation downstream. The four river crossings will be carried out using horizontal directional drilling.

A sealed silt fence will be placed at both sides of points where rivers or streams are crossed and to a minimum of 10m upstream and downstream of each crossing at both sides of the road. The maintenance and monitoring of such silt fences will be subject to an on-site quality management system which are set out in the CEMP.

Spoil heaps from any excavations will be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. Spoil heaps will not be stored within the Lower River Shannon SAC and will be placed at least 10m from the river. Any berms will be covered with a geo-textile matting to avoid sediment runoff; berms will be surrounded by silt fencing until vegetation has been established in the following growing season. If cables will be installed in trenches, they will be located underneath and directly adjacent to access tracks as far as possible. Trench excavations will not be carried out during heavy rainfall (over 4mm per hour), or during 24-hour periods before heavy rainfall. Regular checks of weather forecasts will be carried out and construction schedules will be adjusted to avoid heavy rainfall. Trenches will be excavated in short sections and left open for minimal periods to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within any cable trenches at intervals.

An Emergency Erosion and Silt Control Response Plan have been included as a contingency in the CEMP, which details the required measures for the Contractor to implement in the event of a 'worst case' scenario on the site.
Timing of the proposed works will also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream environment during the salmonid close season (October–March annually), which also avoids the lamprey spawning season.

An Ecological Clerk of Works (ECoW) will monitor both turbidity and observe the riverbed during the horizontal directional drilling process to detect any leakage (frac-out) of drilling fluid. Should this leakage be observed, works will cease immediately. If drilling fluids are required, a biodegradable fluid such as CLEARBORE shall be used rather than Bentonite. HDD methodology is detailed in the CEMP (Section 3.4.7.3).

These works as a precautionary measure will be undertaken within the salmonid open season for instream works (June 1st -September 30th). In addition, a silt fence will be placed downstream and regularly maintained.

Machinery will be stored in the site compound. Wheel washing facilities will be provided at the site entrance draining to silt traps. Portaloos will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licensed waste disposal contractor and will not be discharged on site.

Any diesel or fuel oils stored on site will be bunded to 110 % of the capacity of the storage tank. Fuels and oils will be stored at the temporary construction compound, which is located c.320m from the nearest watercourse. Design and installation of fuel tanks will be in accordance with best practice guidelines (BPGCS005, detailed below). Refuelling of plant during construction will be carried out on a designated and appropriately managed area, at minimum 50m away from watercourses. Drip trays and spill kits will be kept available on site. Appropriate containment facilities will be provided to ensure that any spills from the vehicle are contained and removed off site.

Appropriate preventative measures are detailed in the ISMP to ensure that non-native aquatic/riparian species are not introduced into the site. These measures should follow as relevant the manual *'The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*' by NRA (2010).

Strict biosecurity measures will be implemented if plant and machinery working in areas with invasive species along the grid route is used at the wind farm site. All machinery shall be disinfected and visually inspected before leaving works areas where invasive species are present.

Crayfish plague is known from the Lower River Shannon 25C and Shannon Estuary South Catchments to the north and south but has not been detected to date in the Lower River Shannon 25D and Shannon Estuary North Catchments where the proposed wind farm and grid connection are located. The potential introduction of Crayfish plague is of particular concern at watercourse crossings given the potential for White-clawed Crayfish populations downstream.

To reduce the risk of invasive species and pathogen introduction (e.g. Crayfish plague), all equipment will be thoroughly checked, cleaned and dried in accordance with best practice as specified in the CIRIA C532, C648 and C741 guidelines below. Furthermore, plant machinery which has worked within riparian corridors or come in to contact with water will be steam-cleaned and dried in advance of works commencement in the Blackwater catchment.

Any operatives entering watercourses will be required to disinfect clothing and equipment coming in contact with water prior to and after entering the watercourse. The same disinfection measures shall apply (disinfection and wash down before and after works) to any machinery working in or near watercourses. For the purposes of this measure, watercourses include both include both drainage ditches and rivers.

An invasive species management plan which details management measures for each invasive plant species is included in Appendix 8-8.
Works within and adjacent to watercourses, as part of HDD and new excess track crossing construction, will adhere to the guidelines set out in the best practice documents as listed below:

- CIRIA (2001). Control of water pollution from construction sites - Guidance for consultants and contractors (C532). Construction Industry Research and Information Association, London.
- CIRIA (2006). Control of Pollution from Linear Construction Project; Technical Guidance (C648). Construction Industry Research and Information Association, London.
- CIRIA (2015a). Manual on scour at bridges and other hydraulic structures, second edition (C742). Construction Industry Research and Information Association, London.
- CIRIA (2015b). Environmental Good Practice on Site (4th edition) (C741). Construction Industry Research and Information Association, London.
- CIRIA (2019). Culvert, screen and outfall manual (C786). Construction Industry Research and Information Association, London.
- DHPLG (2019). Draft Revised Wind Energy Development Guidelines. Department of Housing, Planning and Local Government. December 2019
- Enterprise Ireland (unknown). Best Practice Guide (BPGCS005) Oil storage guidelines.
- IFI (2016). Guidelines on Protection of Fisheries during Construction Works in and adjacent to waters. Inland Fisheries Ireland, Dublin.
- IFI (2019) Windfarm scoping document (draft). Inland Fisheries Ireland, Dublin.
- IWEA (2012). Best Practice Guidelines for the Irish Wind Energy Industry. Guidance prepared by Fehily Timoney and Company for the Irish Wind Energy Association.

- Kilfeather, P.K. (2007). Maintenance and protection of the Inland Fisheries resource during road construction and improvement works. Requirements of the Southern Regional Fisheries Board. Southern Regional Fisheries Board, Clonmel, Co. Tipperary
- Murphy, D.F. (2004). Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites. Eastern Regional Fisheries Board, Dublin.
- NRA (2008). Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes. National Roads Authority.
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- SNH (2012). Assessing the cumulative impact of onshore wind energy developments. Scottish Natural Heritage, March 2012.
- SNH (2019b). Good Practice during Wind Farm Construction (4th edition). Scottish Natural Heritage.

Turbine Delivery

The Surface Water Management Plan sets out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase.

Where excavation is required a sealed silt fence will be placed at both sides of points where rivers or streams are crossed and to a minimum of 10m upstream and downstream of each crossing at both sides of the road. The maintenance and monitoring of such silt fences will be subject to an on-site quality management system which will be set out in the CEMP.

The load bearing surface installed at Node 23 adjacent the Ardclooney River will use clean aggregate made of hard rock which contains no fine material to prevent sediment washout. Any disturbed ground will be reseeded with native grass species *Holcus lanatus* and *Agrostris capilaris* following removal of the temporary load bearing surface after use.

An Emergency Erosion and Silt Control Response Plan is included in the CEMP, which details the required measures for the Contractor to implement in the event of a 'worst case' scenario on the site. Timing of the proposed works will also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream environment during the salmonid close season (October–March annually), which also avoids the lamprey spawning season.

Machinery will be stored in the site compound. Wheel washing facilities will be provided at the site entrance draining to silt traps. Portaloos will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a licensed waste disposal contractor and will not be discharged on site.

Any diesel or fuel oils stored on site will be bunded to 110 % of the capacity of the storage tank. Such facilities will not be located near any drain or watercourse (fuels and oils will be stored at the temporary construction compound, located c. 320m from the nearest watercourse). The design and installation of fuel tanks will be in accordance with best practice guidelines. Refuelling of plant during construction will be carried out in a designated and appropriately managed area away from watercourses. Drip trays and spill kits will be kept available on site. Appropriate containment facilities will be provided to ensure that any spills from the vehicle are contained and removed off site.

Appropriate preventative measures will be detailed in the ISMP to ensure that non-native aquatic/riparian species are not introduced into the site. These measures should follow as relevant the manual *'The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*' by NRA (2010).

An invasive species management plan which details management measures for each invasive plant species is included in Appendix 8-8.

11.2.9 March Fritillary

A preconstruction survey of the proposed footprint and adjacent areas will be completed during August/September prior to construction to reconfirm the finding of the EIAR. If marsh fritillary larvae are present in the proposed footprint or zone of influence, translocation to suitable habitat outside the infrastructure footprint will be carried out. This will be achieved by marking the location of pupae/larvae, and carefully excavating the surrounding sod under ecological supervision. Translocated sods will be placed in receptor sites which have been excavated to receive the sods. Receptor sites will be located nearby in similar habitat with abundant *S. pratensis*.

If required, translocation will be carried out immediately following the survey during September to ensure pupae/larvae can be relocated.

11.3 Mitigation Measures during the Operation of the project

11.3.1 Designated Nature conservation sites

Mitigation measures outlined in section 8.6.3.6 of Chapter 8 and in Chapter 10 - Hydrology and Water Quality of this EIAR, will be implemented, in addition to those described in the NIS to minimise and prevent the identified indirect effects on water quality as outlined previously.

Measures to protect bats detailed in section 8.6.3.4 will mitigate potential effects to foraging Leisler's bat which could potentially be associated with Cloonlara House pNHA, or lesser horseshoe bats potentially associated with Dane's Hole, Poulanlecka pNHA.

11.3.2 Habitats and Flora

Implement mitigation measures outlined in section 8.6.3.6 of Chapter 8 and in Chapter 10 - Hydrology and Water Quality of the EIAR, in addition to the NIS, to ensure that there will be no contamination of water bodies due to siltation or contaminated run-off during the operational phase.

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.

11.3.3 Mammals

Maintenance of woodland fencing will use manual means only within 30m of badger setts during non-breeding (July-November inclusive) and 50m during breeding season (December – June inclusive). No fence posts will be driven into the ground within 30m of a sett (alternative means such as self-supporting fencing will be used).

Provision for the passage of small and medium-sized mammals shall be made in deer fencing around woodland enhancement areas, with Gaps measuring 300mm x 300mm inserted at the bottom of the fence at 50m intervals. The gaps should be formed in a way which does not compromise the integrity of the wire mesh. Alternatively, 300mm diameter pipes may be dug into the ground at 50m intervals to provide passage under the fence.

Information on sett locations and implementation of buffer zones is contained in the confidential Appendix: Badger Report.

11.3.4 Bats

Feathering of Blades

Turbines will operate in a manner which restricts the rotation of the blades as far as is practicably possible below the manufacturer's specified cut-in speed (SNH 2021). This is achieved by feathering the blades during low wind speeds; the angle of the blades is rotated to present the slimmest profile possible towards the wind, ensuring they do not rotate or 'idle' when not generating power.

Turbine blades spinning in low wind can kill bats, however bats cannot be killed by feathered blades which are not spinning (Horn *et al*., 2008). The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50% (SNH 2021).

As such, the feathering of blades to prevent 'idling' during low wind speeds is proposed for all turbines.

Cut-in Speeds/Curtailment

Increasing the cut-in speed above that set by the manufacturer can reduce the potential for bat/turbine collisions. A study by Arnett et al., (2011) showed a 50% decrease in bat fatality can be achieved by increasing the cut-in speed by 1.5 m/s.

Species with elevated risk of collision (Leisler's bat, soprano and common pipistrelle) in particular would benefit from increasing the cut-in speed of turbines, as dictated on a case-by case basis depending on the activity levels recorded at each turbine.

While bat activity varied considerably by species, all locations had moderate-high or high activity for common pipistrelle at some point during the activity season (with higher activity focused on summer and autumn), while the majority of locations had activity levels for soprano pipistrelle and Leisler's bat ranging from moderate to high (again with higher activity focused on summer and autumn). Therefore, increased cut-in speeds will be implemented for all turbines from commencement of operation. Cut-in speeds will be increased during the bat activity season (April-October) and/or where weather conditions are optimal for bat activity (see below) from 30 minutes prior to sunset and to 30 minutes after sunrise at all turbines.

Cut-in speeds restrictions will be operated according to specific weather conditions:

1. When the air temperature is above approximately 10 to 11°C at nacelle height.
2. Generally, bat activity peaks at a wind speed range of 5.0 to 6.5m/s (at nacelle height).

Due to the considerable unnecessary down time resulting from the proposed "blanket curtailment" (above) and the advances in smart curtailment, a focused curtailment regime is proposed as described below from year four of operation. This will focus on times and dates, corresponding with periods when the highest level of bat activity occur within the Site. This includes the use of the SCADA (Supervisory Control and Data Acquisitions) operating system (or equivalent) to only pause/feather the blades below a specified wind speed and above a specified temperature within specified time periods.

Post-construction surveys will be undertaken for the first three years of operation to confirm if blanket curtailment restrictions can be amended in line with post-construction activity levels.

The post construction surveys will be used to update the current curtailment regime (blanket curtailment) designed around the values for the key weather parameters and other factors that are known to influence collision risk. This will include all of the following:

- Wind speed in m/s (measured at nacelle height)
- Time after sunset
- Month of the year
- Temperature (ºC)
- Precipitation (mm/hr)

Post Construction surveys

Monitoring will take place for at least 3 years after construction, providing sufficient data to detect any significant change in bat activity relative to pre-construction levels. It will assess changes in bat activity patterns and the efficacy of mitigation to inform any changes to curtailment.

During years one to three of operation (under blanket curtailment restrictions) bat activity will be measured continuously between April and mid-October at each turbine location, in combination with carcass surveys. In addition, wind speed and temperature data will be continuously recorded at the nacelle height of each turbine.

Modern remotely operated wind turbines as proposed here allow cut-in speeds to be controlled centrally/automatically, facilitating an operation regime designed to minimise harmful impacts to bats.

The feathering of turbine blades combined with increased cut-in speeds have been shown to reduce bat fatalities from 30% to 90% (Adams et al., 2021, Arnett et al., 2008, 2011, 2013; Baerwald et al., 2009). The most recent of studies showed a 63% decrease in fatalities (Adams et al., 2021).

Monitoring Curtailment

If, following the initial 3 years of post-construction surveys, bat activity increases above the baseline and/or remains consistently high and carcass searches indicate fatalities are occurring (refer below), increased cut-in speeds will continue. This will subsequently be monitored in years 5, 7, 10, 15, 20, 25 and 30 with further review after each monitoring period.

Alternatively, if it is found that the results of bat activity surveys and fatality searches confirm that the level of bat activity at turbine locations is reduced (to low) then consent will be sought from Clare County Council (in

consultation with NPWS) for the cessation in the requirement for these cut-in speeds / curtailment measures, or a reduction on the timing restrictions for these measures.

Where post construction acoustic surveys are undertaken, they will utilise full spectrum automatic detectors deployed, as a minimum, for one complete bat activity season.

Acoustic monitoring will be supplemented with thermal imaging cameras etc. to provide more detailed information on bat activity in the vicinity of turbines. Due to the level of Leisler's activity within the study area, nacelle-level surveys[1] are also proposed for the post construction surveys. These will be used to identify the level of Leisler's bat activity above the tree canopy and within the height of the rotor-swept area. This mitigation measure is compatible with all of the proposed turbine dimension options.

An assessment of static data gathered during operational surveillance will be completed using the online analysis tool Ecobat as recommended by SNH (2021) as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.

Lighting

It appears that the lighting on top of wind turbines may affect the likelihood of bats colliding with turbines. Research on this topic, which is reviewed in Powelsland (2009), indicates that intermittent lighting is less likely to cause species to collide with turbines.

As such, flashing red aviation obstruction lights will be provided on perimeter turbines, subject to approval by the IAA. These will not negatively impact bats (Bennett and Hale 2014).

Buffer zones

The vegetation-free buffer zones around the identified turbines will be managed and maintained during the operational life of the development. These will be kept clear by mechanical means only and maintained on an annual basis in the same condition as during first clearance.

Due to mitigation by design, turbines are proposed to be sited at a suitable separation distance from trees and trees or vegetation are to be removed to ensure a woodland-free buffer zone.

The immediate surroundings of individual turbines will be managed and maintained so that they do not attract insects (i.e. the concentration of insects in the wind turbine vicinity should be reduced as much as possible, but not such that insect abundancies affected elsewhere on the site). This will be achieved through physical management of habitats without the use of toxic substances.

The radii (determined by five optional sets of turbine dimensions) of each buffer zone as determined by the height of surrounding vegetation is listed below in Table 3-4 below. It is noted that no trees are present around T2 and as such felling is not required at that location. However, precautionary buffer options for vegetation management have been applied. These will apply in the case that regular grazing of this area ceases, and targeted intervention is required to keep vegetation short. Similarly for T3, 4 and 8 which are located in agricultural land, management in of surrounding grassland within buffers (in addition to felling for hedgerows) will be required in the event of cessation of grazing.

[1] Used to supplement ground-based equipment designed to replicate the survey effort undertaken at the pre-application stage (see Roemer et al., 2017). They are particularly useful at woodland key-holed sites.

Hedgerow planting to maintain connectivity and divert bats around felling buffers

Where hedgerows or treelines are affected by turbine felling buffers, bats will be directed away from tree-free buffers along an alternative commuting route. This will be achieved by planting new pollinator-friendly hedgerows along Lines 2, 3, 4, 7, 10 & 11 (see Figure 3-1, Table 3-1). Willow will be included in these hedgerows due to it's rapid growth rate which will accelerate establishment.

Table 3-4: Vegetation Management Buffer Zones for Bats (based on proposed turbine dimension Options 1-5)

Turbine number	Vegetation Management Buffer Radius (m)				
	Option 1	Option 2	Option 3	Option 4	Option 5
1	64	71	60	70	68
2	46	55	38	54	51
3	56	64	50	63	60
4	64	71	60	70	68
5	82	87	80	87	86
6	82	87	80	87	86
7	82	87	80	87	86
8	56	64	50	63	60

Monitoring of mitigation measures

The success of the implemented mitigation measures for bats on the project shall be monitored for a period of no less than three years post construction and appropriate measures taken to enhance these if and where required.

Bat fatality monitoring

Whilst no significant residual impacts on bats are predicted, the proposed development could provide an opportunity to gain baseline data on bat/turbine interaction and it is recommended that the scheme be monitored for bat fatalities for the first three years of operation (post construction surveys) and subsequently in years 5, 7, 10, 15, 20, 25 and 30 as part of the additional curtailment monitoring schedule. A comprehensive onsite avian fatality monitoring programme is to be undertaken following published best practice. This fatality monitoring programme will be extended and duplicated for bat fauna.

The primary components of the bird mortality monitoring programme are outlined below, and an assessment of bat mortality will essentially follow the same methodology:

a) Carcass removal trials to establish levels of predator removal of possible fatalities. This will be done following best recommended practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. No turbines which are used for carcass removal trials will be used for subsequent fatality monitoring.

b) Turbine searches for fatalities will be undertaken following best practice in terms of search area (focusing on the hard standing) (SNH, 2019; 2021) while also encompassing the wider search radius defined by bird fatality monitoring requirements, and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above.

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 will be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Table 3-5: Monitoring schedule proposed for bat mitigation measures

Mitigation measure	Monitoring required	Description	Duration
Newly planted hedgerows	Ensure viable growth of planting	Planted material shall be checked periodically over the growing season to remove dead material. Any dead material shall be replaced within the same season with viable stock according to age/height specifications already specified in mitigation.	Years 1, 2, 3, 5, 10, 15, 20, 30, 34From time of planting to 1 year post construction
Mortality study	Fatality monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation conducted during years 1, 2, 3, 5, 7, 10, 15, 20, 25 and 30 post construction.

Table 3-6: Summary of Operational-phase Mitigation Measures for Bats

Moderate-High Level Bat Mitigation Applies to all turbines	**Category**
A buffer zone free of woodland/trees within 50m of turbine blade tips will be created.	Habitat alteration
Operate the wind turbines in a manner that reduces the movement of the blades below the cut-in speed (e.g. by feathering the blades).	Feathering
Implement blanket curtailment during year 1-3 while post construction surveys are undertaken. The curtailment will involve operating the selected wind turbine from 30 minutes prior sunset to 30 minutes after sunrise at a cut-in speed of 5.5 m/s during specified weather conditions and during the active bat season (April to October).	Blanket curtailment
Implement a monitoring programme during years 1 – 3 post construction to detect any large-scale changes in bat activity including carcass surveys. Bat activity will be measured continuously between April and mid-October at each turbine location. In addition, wind speed and temperature data will be continuously recorded at the nacelle height of each turbine.	Post construction monitoring
If, following the initial 3 years of post-construction surveys, bat activity increases above the baseline and/or remains consistently high and carcass searches indicate fatalities are occurring, increased cut-in speeds will continue. This will subsequently be monitored in years 5, 7, 10, 15, 20, 25 and 30 with further review after each monitoring period. Alternatively, if it is found that the results of bat activity surveys and fatality searches confirm that the level of bat activity at turbine locations is reduced (to low) then a derogation will be sought from Cork County Council (in consultation with NPWS) for the cessation in the requirement for these cut-in speeds / curtailment measures, or a reduction on the timing restrictions for these measures through SCADA (or equivalent) operating systems.	Smart curtailment

Moderate-High Level Bat Mitigation Applies to all turbines	**Category**
Undertake a carcass search during years 1-3, and subsequently in years 5, 7, 10, 15, 20, 25 and 30 as part of the additional curtailment monitoring schedule.	Carcass monitoring
Maintain immediate area around the wind turbines in a manner that does not attract insects.	Maintain vegetation free buffer

11.3.5 Avifauna

A post-construction monitoring programme is to be implemented at the subject site in order to confirm the efficacy of the mitigation measures; the results of this will be submitted annually to the competent authority and NPWS. 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.

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 practice; the primary components are as follows:

    a. Initial carcass removal trials to establish levels of predator removal of possible fatalities. This will 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 = 150m around turbine bases) 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 local 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 local authority and NPWS following each round of surveys. This survey will 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 Census (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 Fahy Beg 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 local 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. This aims to:

   a. Assess any displacement effects such as those recorded on breeding birds. Overall density of breeding birds to be annually recorded.

5) Breeding Wader Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey, following methods used in the baseline survey to be repeated yearly April-May-June.

Both of the above surveys are 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.

Lighting

Flashing lights are believed to be less attractive to birds than steady lights (NatureScot, 2020). Therefore, the use of flashing red lights will reduce the likelihood of birds being attracted to turbine locations.

It is noted that red light is believed to be more attractive to birds than white light (NatureScot, 2020), however red light is known not to increase the attractiveness of turbine locations for bats (Bennett and Hale, 2014) and due to the level of bat activity onsite this ecological receptor takes precedence and red flashing lights will be used.

Lighting will be fitted with baffles to ensure that the light is directed skywards and will not be discernible from the ground.

11.3.6 Aquatic Ecology

The operational wind farm will have a negligible effect on aquatic ecological interests and fisheries, as there are no further potential impacts on surface water run-off or watercourses within the site. During the operation phase, oils will be required for cooling the transformers giving rise to the potential for oil spills within the site. However, this will not be associated with the TDR and any potential TDR works during the operational phase will be limited to temporary accommodation works in the event that turbine replacement is required.

It is not envisaged that maintenance will involve any significant impacts on the hydrological regime of the area. Weekly inspections of the erosion and sediment control measures on site will be required during the construction period, followed by fortnightly inspections until the risk of erosion or siltation has declined following the successful establishment of vegetation during the operational phase.

Sediment control measures for turbine felling buffers shall be maintained and replaced as required throughout the lifespan of the wind farm.

11.4 Mitigation Measures during the Decommissioning of the project

11.4.1 Wind Farm and Grid Connection

The same mitigation measures for the wind farm and GCR will apply for the decommissioning phase as for the construction phase. This will include a mammal survey to check if any setts or holts have become established during operation, in addition to breeding or resting places of any other protected mammals.

In relation to aquatic ecology, the same mitigation measures will apply for the decommissioning phase as for the construction phase. This will include general mammal, badger and otter surveys to check whether any mammal breeding/resting places have become established during operation. In the event of decommissioning of the Fahybeg 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 potential impacts 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 cable, 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 for these elements.

11.5 Enhancement Measures

A series of enhancement measures are proposed to increase the biodiversity value of the proposed site. These are detailed in the Biodiversity Enhancement & Management Plan (see Appendix 3-4). A summary is provided below.

11.5.1 Quarry Biodiversity Area

An area of c. 4.6 Ha of mixed broadleaved woodland will be retained within the quarry. The woodland will be allowed to mature naturally. The area will be demarcated and signage will be erected to prevent interference with the area but the area will remain accessible to animals using the woodland.

11.5.2 Nest Boxes

One barn owl nest box and one kestrel nest box will be installed on suitable trees in the quarry biodiversity area under ecological supervision. These can be installed on poles if suitable trees are not available

11.5.3 New Oak Woodland Establishment

An area of c. 3.1 Ha of immature conifer plantation north of T5 will be felled in order to establish an area of new oak woodland abutting the long-established Ballymoloney Woodland. The woodland will be established through a mix of planting and natural recolonisation. Acorns from the adjacent Ballymoloney Wood will be collected during mast years, grown on in a nursery and planted as saplings, in addition to birch of local provenance which will act as a nursery tree, and holly of local provenance. Unplanted areas will be allowed to recolonise naturally. Periodic grazing under strict supervision may be used for brief periods to control brambles and other dense scrubby vegetation, and pigs may be used to disturb ground and disperse seeds, also under strict supervision for brief periods.

The woodland will be fenced off to prevent deer and other large herbivores entering, but fencing will include gaps at the bottom to allow other mammals to continue traversing the area. Gaps measuring 300mm x 300mm will be placed at the bottom of the fence at 50m intervals to allow continued access for mammals. See Figure 8-19 for the location of this measure.

11.5.4 Protection of Ballymoloney Wood

An area of c. 3.8 Ha of Ballymoloney Woods will be fenced off to prevent deer and other large herbivores entering. This will give this area of the woodland a chance to regenerate naturally. The woodland is currently open and is accessed by fallow deer and cattle. The absence of natural regeneration is notable, and is considered to be attributable in large part to overgrazing by large herbivores.

The woodland will be fenced off to prevent large herbivores entering, but fencing will include gaps at the bottom to allow other mammals to continue traversing the area. Gaps measuring 300mm x 300mm will be placed at the bottom of the fence at 50m intervals. See Figure 3-1 for the location of this measure.

11.5.5 Bee Banks

Banks made up of well-drained soil will be created along access tracks in the vicinity of T6 and T8, located near the wildflower strips (Figure 3-1). There will be 3 banks. c. 20m length each. These can be created by scraping vegetation away from an existing bank if available, or by constructing a bank from excess spoil generated onsite.

It is important to avoid heavily compacting it with machinery. The road-facing sections of banks will be required to be kept clear of vegetation using mechanical means only. This can be carried out in winter as required (frequency depends on rate of re-vegetation) by scraping away vegetation.

11.5.6 Log Piles

A proportion of the timber being removed (substantial pieces of timber-tree trunk/branches) will be salvaged by cutting into logs to create log stacks/piles in the areas specified in Figure 3-1. These piles will be used by insects as the timber decays. Logs of different sizes can be stacked on top of each-other or positioned vertically in a pile. It is important to ensure that the logs remain damp and do not dry out by part-burying (some) logs and placing in a partly shaded location within the site.

11.5.7 Refugia/Hibernacula

Refugia piles and hibernacula will be created. These provide sheltering locations for a wide range of wildlife, including reptiles, amphibians, small mammals and invertebrates. Refugia piles are produced by piling natural materials such as logs, sticks and leaves; that can be supported by additional materials such as rubble and bricks to form a structure with many cracks and crevices for sheltering. Hibernacula are produced in a similar way, but often require setting into the ground in a shallow pit and topping with soil to enclose the structure and creating a more stable microclimate suitable for hibernating species. These structures will be installed near hedgerows and in areas of woodland within the site, where they are less likely to be disturbed. Locations are specified in Figure 3-1.

11.5.8 Wildflower Strips

Planting will consist of seeding the reinstated site compound area after construction has finished with a native wildflower meadow seed mixture. There will be 2m width wildflower strips planted adjacent to access tracks, totalling c. 1750 m^2 in area. Fencing is required for strips bounding agricultural land. See Figure 3-1 for the location of this measure.

Wildflower seed mixes are required to be of native provenance; mainstream commercially available mixes are not acceptable. Ecoseeds https://www.ecoseeds.co.uk/ (Northern Ireland) or another reputable and experienced supplier capable of supplying seed mixes that meet the required criteria shall be used.

A typical wildflower meadow plant assemblage includes the following species: Birdsfoot Trefoil, Black Medick, Cowslip, Devil's Bit Scabious, Meadow Buttercup, Field Scabious, Hemp Agrimony, Kidney Vetch, Lady's Bedstraw, Lesser Knapweed, Meadowsweet, Mullein, Ox-eye Daisy, Purple Loosestrife, Ragged Robin, Red Campion, Red Clover, Ribwort Plantain, Rough Hawksbit, Sorrel, St Johnswort, Wild Angelica, Wild Carrot, Yarrow, Yellow Agrimony, Yellow Rattle, Teasel, Corn Marigold, Corn Poppy, Cornflower and Scented Mayweed. In particular, the clover species will provide habitat for Large Red Tailed Bumble Bee (Carvell et al., 2011). It is also recommended to include fine leaved grasses such as Red Fescue, Smooth Meadow-Grass and Crested Dog's Tail for conservation of this bee, which was noted in the desk study.

Flowering species recorded within the wet grassland habitats onsite will also be incorporated into the planting mix.

11.6 Vulnerability to Major Accidents or Disasters

Should a major accident or natural disaster occur, the potential sources of pollution onsite during the construction and operational phases of the Fahy Beg Wind Farm are limited. The primary sources with the potential to cause significant environmental pollution and associated negative impacts on human health and the environment include the bulk storage of hydrocarbons, chemicals and wastes. In the case of the proposed Fahy Beg Wind Farm development site, the storage of chemicals of this kind are strictly limited. For biodiversity, the main possible impacts are considered to be the release of sediment and pollutants into watercourses, which could negatively impact upon aquatic habitats and species.

Potential vulnerabilities relevant to the proposed project are limited to:

- Flooding
- Fire
- Major incidents involving dangerous substances;
- Catastrophic events
- Landslides.

The risk of flooding is addressed in Chapter 10: Hydrology and Water Quality, which concludes that the wind farm site will have a negligible impact on flood risk in the surrounding area, as a result of the proposed development. Furthermore, there is no expected increase to flood risk along the grid route or TDR.

In the event of extreme weather conditions, the proposed surface water drainage will manage storm water avoiding significant negative impact on the project's infrastructure. Therefore, it is unlikely that the proposed development will result in increased flood risk, and it is unlikely that flood risk would result in effects on human safety (including traffic), water quality, biodiversity, soil stability, material assets and archaeological or architectural heritage, as the increased flood risk is considered negligible.

Mitigation measures are set out in Chapter 10: Hydrology and Water Quality to avoid potential negative impacts during the construction stage with respect to flood risk.

The potential for fire at the proposed Fahy Beg Wind Farm is mitigated against by design. Furthermore, the wind farm will be remotely monitored, and potential accidents will be quickly identified and reported.

In line with IWEA Health and Safety Guidelines for the Onshore Wind Industry (2011), Emergency Response Plans will include emergency response procedures for initial actions in the event of a fire. Records will be kept for testing of fire alarms and drills and maintenance/inspection of fixed and portable firefighting equipment. Information will be provided to employees on fire safety and fire prevention, including risks of and control measures to prevent fire outbreak, evacuation procedures and those responsible for their implementation, and the use of firefighting equipment, in line with HSA guidance.

During the construction phase of the proposed development, an emergency response plan will be in place as set out in Section 6 of the CEMP, included in Appendix 3.1 of Volume 3 of this EIAR.

Given the nature of the proposed development, coupled with the lack of proximity to established Seveso sites, there is a negligible potential risk of negative impact to the proposed development and its receiving environment, as set out throughout this EIAR, arising from the occurrence of major incidents involving dangerous substances.

Potential catastrophic events associated with operational wind turbines include:

- 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)
- Fire.

The primary mitigation against a catastrophic event that may endanger biodiversity has been 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 negative impact in the event of wind turbine collapse.

The proposed tip height for wind turbines at the Fahy Beg Wind Farm is between 169 – 176.5m. No wind turbine is located within 500m of a residential dwelling. No turbines have been located within 1.5 x tip height of the proposed on-site substation.

Turbines have been sited with consideration for existing ground conditions to minimise the risk of turbine foundation failure, toppling and landslide. Intrusive site investigations have been carried out to confirm ground conditions at turbine locations as well as slope stability analysis throughout the wind farm site. Other design mitigation measures employed for the siting of wind turbines include the following:

- Areas mapped by GSI as having a high susceptibility to landslides have been avoided
- Turbine locations have been assessed by site investigation and visually by geotechnical engineers prior to confirmation of final siting
- Care has been taken in design of road and hard standing alignments, cutting and filling and drainage;
- Peat probing has been carried out at turbine locations. No peat was identified within the wind farm site.

See Chapter 9: Land, Soil and Geology for more information on ground conditions.

As detailed in Chapter 9: Land, Soils and Geology, a slope stability assessment was carried out at the Fahybeg Wind Farm site to investigate the lands for potential slope failure. No evidence of slope instability was observed at the site and there are no historical records of landslide activity within 1km of the site on the GSI database. Site investigation was conducted which revealed no peat on the site. As such, potential peat stability issues were ruled out at the proposed infrastructure locations.

Mitigation by design has been incorporated into the project to avoid potential effects from landslides. Mitigation for potential landslide/slope failure is set out in Chapter 9: Land, Soils and Geology. Mitigation measures relating to flood risk which could have a bearing on potential landslides are detailed in Chapter 10: Hydrology and Water Quality.

Wind turbines are fitted with sophisticated remote monitoring and control systems to manage rotational speed. Turbines also have the capability to shut down in storm conditions through adjustment of blade pitch. Turbines are also fitted with emergency power supply (EPS) units to provide backup power in the event of a loss of mains power supply that could impact the control system.

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. An emergency response plan is contained in the CEMP included in Appendix 3.1 of Volume 3 of this EIAR.

During the construction phase of the proposed development, an emergency response plan will be in place as set out in Section 6 of the CEMP in the unlikely event of a landslide/slope failure.

In relation to potential vulnerability of the project to major accidents and natural disasters it is concluded that the potential susceptibility to natural disaster of the proposed Fahy Beg Wind Farm is negligible. Therefore the potential for any related effects on biodiversity and the environment arising from fire or pollution are also negligible.

12 NIS MITIGATION MEASURES

12.1 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.
- The proposed access track through long-established woodland was positioned to minimise tree felling, by using an existing track and traversing areas with the lowest density of trees. In addition it's location at the eastern edge of the woodland minimises habitat fragmentation.
- Site design and layout deliberately avoided direct effects on designated sites.
- The grid connection route has been selected to minimise land take of potentially sensitive habitats by following the site access tracks and public roads and using existing crossings.
- Care has been taken to ensure that sufficient buffers are in place between wind farm infrastructure and hydrological features such as rivers and streams. Buffers of 50m from natural watercourses have been maintained, excepting where crossing points occur.

  Four new stream crossings shall be required within the wind farm site. A clear-span bridge design has been selected to avoid instream works and to minimise disturbance of banks and associated indirect effects such as siltation at the most sensitive location. Pre-cast concrete culverts will be installed at the remaining locations which are lower-value and do not support key ecological receptors; the use of precast structures will avoid the risk of concrete contamination. Box culverts will be installed a minimum of 500mm into the stream bed in accordance with the NRA guidelines.
- The design of the wind farm will include SuDS. As such the existing hydrology of the site will not be altered. Due to the grassing over of the drainage swales and revegetation of other exposed surfaces, and the non-intrusive nature of operations, there is a negligible risk of sediment release to the watercourses during the operational stage.

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 Lower River Shannon SAC (002165) and Dane's Hole, Poulnalecka SAC (000030) are prescribed hereunder.

12.2 Mitigation Measures

Table 12-1: 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) (located in Appendix 3)	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. The CEMP and all management plans within, will reduce the risk of impacts from the proposed project including the potential impacts to the conservation objectives outlined in Table 4-19 to Table 4-22.	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 a 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 2 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. 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 changes 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 (Appendix 7). 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 and/or containment of invasive species as required will be completed prior to construction. Measures shall be in accordance with the invasive species management plan (ISMP) (Appendix 2) and Regulation 49 of	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 extent of the non-native invasive species 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 spread to areas within the footprint of the proposed project. The invasive species management plan in Appendix 2 will be adhered to for all works in areas confirmed as containing non-native invasive species.	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

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 EC (Birds & Natural Habitats) Regulations (2011).	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. 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 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 which will not be within buffers (refer to section 4.6.1) 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.		requirements. During decommissioning it will be updated if new areas are identified to have been within the footprint of the works.
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 (Appendix 3). 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. Silt fencing will be installed along the western perimeter of the T6 buffer which abuts the riparian corridor of the River Black. Silt fencing will be installed along both sides of the un-named stream at T7. 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.	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.

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 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.		
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.
		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. Access to the site will be via the three access points stated in Section 2.2.1.6. 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.
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 and turbine erection require night-time/pre-dawn 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.	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.

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 will help minimise disturbance.		
13	Maintenance of plant and vehicles Will prevent contamination within the site.	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 (refer to the CEMP) 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 15m 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 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. 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. A sealed silt fence will be placed at both sides of points along the GCR where rivers or streams are crossed and to a minimum of 10m upstream and downstream of each crossing at both sides of the road. An Emergency Erosion and Silt Control Response Plan is included as a contingency in the surface water management plan (see Appendix 9). For piped drain crossings, 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	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
		recommendations set out in Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses from Inland Fisheries Ireland.		
16	Tree felling (License)	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 the CEMP. Regular reporting to developer and contractor and in line with the CEMP.
17	Tree felling (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 the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with the CEMP..
18	Tree felling (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 the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with the CEMP.
19	Tree felling (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 the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with the CEMP.
20	Tree felling (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.	The Environmental Manager and/or ECoW will monitor the implementation of the mitigation measures in accordance with the relevant management plans detailed in 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
			All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full. High probability of success.	Regular reporting to developer and contractor and in line with the CEMP.
21	Tree felling (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 the relevant management plans detailed in the CEMP. Regular reporting to developer and contractor and in line with the CEMP.
22	Road / access track/ temporary load bearing surface construction	Approximately 1.4 km of internal access tracks will upgraded and 7.2 km of new internal access tracks will be constructed to facilitate site access and construction activities. All track construction/upgrading and temporary load bearing surfaces at TDR Nodes 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 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 systems in place. The settlement ponds will remain in place during the 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	Wind farm site drainage	Of the 10 no. new water crossings within the wind farm site boundary required during the construction phase, four cross natural watercourses. One of these four crossings will be a clear span bridge, while the remainder will be box culverts. The remainder of crossings are over forestry or agricultural drains.	All required mitigation measures will be included as a contractual obligation on the contractor and will be implemented in full.	The Environmental Manager will monitor the implementation of the mitigation measures

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
		Detailed methodologies for instream works (required for box culvert installation) are included in Section 3.4.7.1 of the CEMP. Instream works shall only take place during the period July to September (as required by IFI for instream works). Any instream works shall only take place in accordance with written agreement from IFI. Sediment controls and water diversion will be implemented as required, and the channel shall be restored to it's original configuration following works. Seasonal restrictions and silt control measures will also be implemented for the clear span bridge construction, and the main components of the bridge will be precast concrete. Comprehensive construction methodology is detailed Section 3.4.7.1 of the CEMP. 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. Stream crossings will be constructed during low flow conditions and within a 5-day weather window. 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. 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.	High probability of success.	detailed and in accordance with the relevant management plans within the CEMP.
24	Wheel wash facilities	Wheel wash facilities will be located at site access points 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.	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
		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 2) and Regulation 49 of the EC (Birds & Natural Habitats) Regulations (2011).		
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 accordingly before and after such events. Concrete washout will be carried out in two dedicated areas (located at T2 hard standing and 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 will be 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. 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 wheeled vehicle 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.	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.
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.

No.	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Level of Success	Monitoring scheme to prevent mitigation failure
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 crossings – dry conditions	Duct installation in drains 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 will 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 for landscaping, and will be used to cover the turbine hardstandings and foundations following decommissioning. 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. 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. Spoil heaps from any excavations will be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. All stockpiled 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.	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
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, 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.
37	HDD control measures	The drilling rig and fluid handling units will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off. The steering engineer and drill team will monitor the drilling works to ensure that modelled stresses and pressures are not exceeded. The drilled cuttings flushed back by drilling fluid to the entry and exit pits will be recycled for reuse. The drilling fluid will be disposed of to a licensed facility. Any waste generated during duct cleaning will be disposed of to a 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 ECoW will monitor the implementation of the mitigation measure in accordance with the CEMP. Regular reporting to developer and contractor and in line with the CEMP.
		Operational Phase Mitigation Measures		
38	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.	Mitigation measures will be implemented by the Developer/Operator of the wind farm. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with relevant management plans within the CEMP.
39	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.	Mitigation measures will be implemented by the Developer/Operator of the wind farm. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with 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
		Further management of hydrocarbons will be as detailed in the item 26 above.		
40	Invasive Species Management Plan (Appendix 2)	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. During decommissioning it will be updated if new areas are identified to have been within the footprint of the works.
41	Lighting on turbines	Turbines identified during the design process will be illuminated with medium intensity flashing red obstacle lights of 2000 candelas, subject to approval 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/Operator of 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. See section 4.6.2.2 below.
42	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.	Mitigation measures will be implemented by the Developer/Operator of the wind farm. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with relevant management plans within the CEMP. Monitoring will be in line with the BEMP (see Appendix 1).
43	Wastewater management	The wastewater holding tank will be a sealed storage tank with all wastewater tankered off site as required by an authorised waste collector to a wastewater treatment plant. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007, will be employed to transport wastewater away from the site. The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying.	Mitigation measures will be implemented by the Developer/Operator of the wind farm. High probability of success.	The Environmental Manager will monitor the implementation of the mitigation measures detailed and in accordance with the CEMP.
Decommissioning Phase Mitigation Measures				
All prior to and construction phase mitigation will be implemented during the decommissioning phase.				

12.2.1 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, 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 physicochemical 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.

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

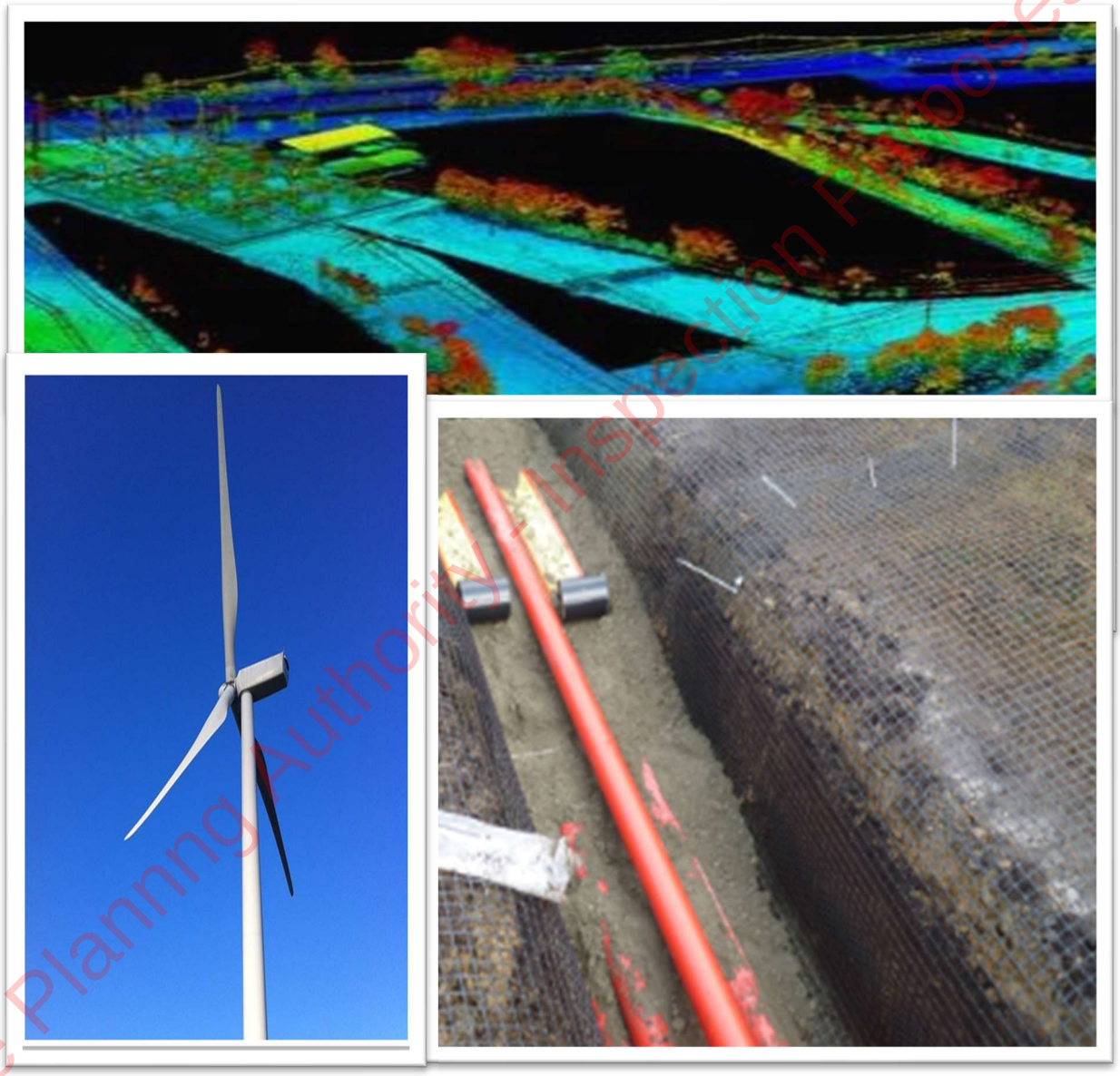
APPENDIX 3.3

38kV Grid Connection Outline Construction Methodology

Outline Construction Methodology

05-815 Fahybeg Wind Farm

38kV Grid Connection



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00	SW	EH	25.08.22	Draft for comment

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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 the construction of the proposed Fahybeg Wind Farm 38kV grid connection to the Ardnacrusha 110kV Substation. The 38kV grid connection route will consist entirely of underground cables (UGC) which will be installed in wind farm lands, the public road network along with ESB owned land. The UGC works will consist of the installation of 4 no. duct in an excavated trench to accommodate 3 no of power cables and 1 no. fibre communications cable.

This document is intended to be used as an aid to understand the methodologies to be employed during construction. 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 proposed development.

2.0 Proposed Grid Connection Route

The exact location of the UGC will be determined following a further detailed assessment to be undertaken prior to construction and following consultation with Clare County Council and all other relevant stakeholders, having regard for all environmental protection measures required.

Table 1 of this report summaries the route location, features of the underground cable connection and proposed route.

Table 1 – UGC Route Location Summary			
Site	**Private Land**	**Public Road**	**Total**
Ardnacrusha sub to Fahybeg	277m	10,335m	10,612m

Table 1: Ardnacrusha Substation to Fahybeg– UGC Route Location Summary

Figure 1 outlines the proposed grid connection routes, with each section of the route being discussed in detail in Table 2.

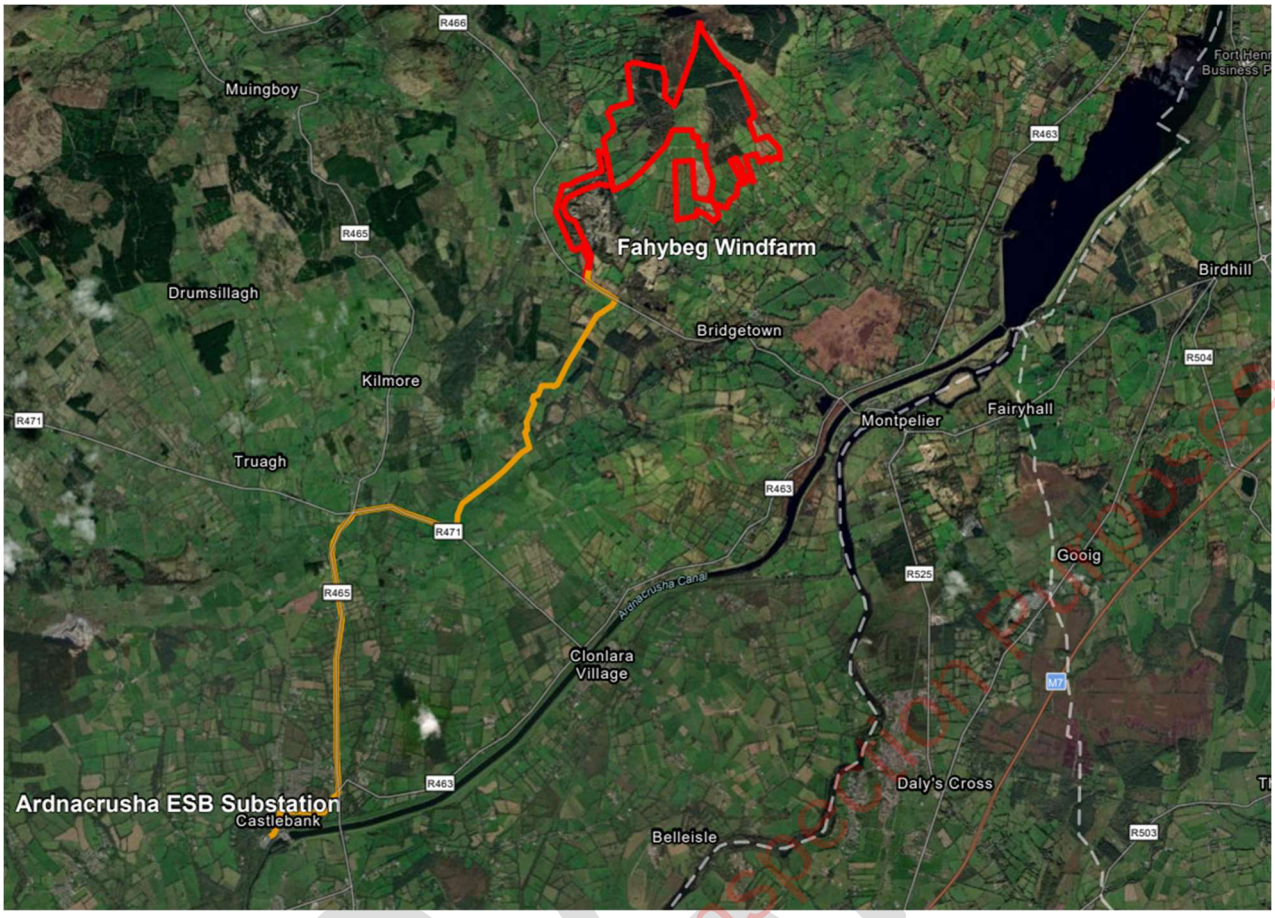

Figure 1 - Proposed Grid Connection Route

Table 2 below describes the specific construction features along the routes described above and identifies access routes to the work areas. All plant and equipment employed on the proposed works will be subject to good site organisation and hygiene, particularly during construction activities.

Table 2 - Summary of Features along Grid Connection Design Route	
Section	**Description**
38kV UGC Route **Section 1** **Ardnacrusha Substation to Carmody Cross**	**Description of Section** This route is entirely made up of UGC, it crosses multiple services such as Gas, storm, water and ESB UGC and OHL and Eir. The cable will be pulled inn 10 different sections. The first section of this route runs from the ESB owned Ardnacrusha substation along ESB own land before turning right onto L3056 for approx. 872m .it then turns left on to R465 and runs for approx. 3.63km where it ends at Carmody Cross. **Features** On this section of route there are a 6 no. of joint bays all on the public road network. The Joint Bays will be located below ground and finished/reinstated to the required roads specification which will match existing ground levels. There are 2 water crossings were 1 will require a HDD crossing with transition pits, crossing the river in the existing road corridor. The other crossing will be either HDD or crossing in flat formation, depending on GPR survey results of the bridge at full design stage.
38KV UGC **Section 2** **Carmody Cross to Fahybeg Substation**	**Description of Section** This section of route begins at Carmody Cross where the UGC turns from R465 onto the R471 road. It runs for a length of approx. 1.38km where it then turns left onto L3046 for a length of approx. 440m. it then runs across 2 unnamed roads, the first for a distance of approximately 1.07km and the second for a length of 2.4km. it then turns right onto R466 for the last run of cable which is a length of 1.33km. **Features** On this section of route there are 8 no. of joint bays all on the public road network. The Joint Bays will be located below ground and finished/reinstated to the required roads specification which will match existing ground levels. There are 2 bridge crossings which require HDD crossings. They are located on the R471 and R466 roads. There are 4 culvert crossings, these crossings will be over or under crossings in flat formation.

Table 2: Summary of Features along Grid Connection Design Routes

3.0 Preliminary Site Investigations

It may be proposed to carry out Preliminary site investigations along the cable route prior to construction to confirm design assumptions.

The following items may be carried out:

Slit trenches at locations of major service crossings (half road width).

A number of trial holes will be dug along the route to ascertain ground conditions and thermal resistivity of the soil, in particular at joint bay locations.

Equipment:

- 4x4 vehicle
- Concrete vibrator
- Wheeled dumper
- Soil compactor
- 360° tracked excavator (only rubber tracked machines will be allowed on public roads)

4.0 UGC Construction Methodology

The proposed UGC trench will consist of 3 no. 110mm diameter HDPE power cable ducts and 1 no. 110mm diameter HDPE communications duct to be installed in an excavated trench, typically 600mm wide by 1220mm deep, with variations on this design to adapt to service crossings and watercourse crossings. The power cable ducts will accommodate 3 no. power cables. The communications duct will accommodate a fibre cable to allow communications between the Fahybeg Substation and the Ardnacrusha 110KV Substation.

Where the cable is installed in private lands the location where the cable is laid will depend on multiple factors such as ground conditions and access.

The ducts will be installed, and the trench reinstated in accordance with the local road's authority within Clare County Council, when installed in public roads. The installation of the electrical cabling/fibre cable will be pulled through in 15 separate sections. Construction methodologies to be implemented and materials to be used will ensure that the UGC is installed in accordance with the requirements of the County Council.

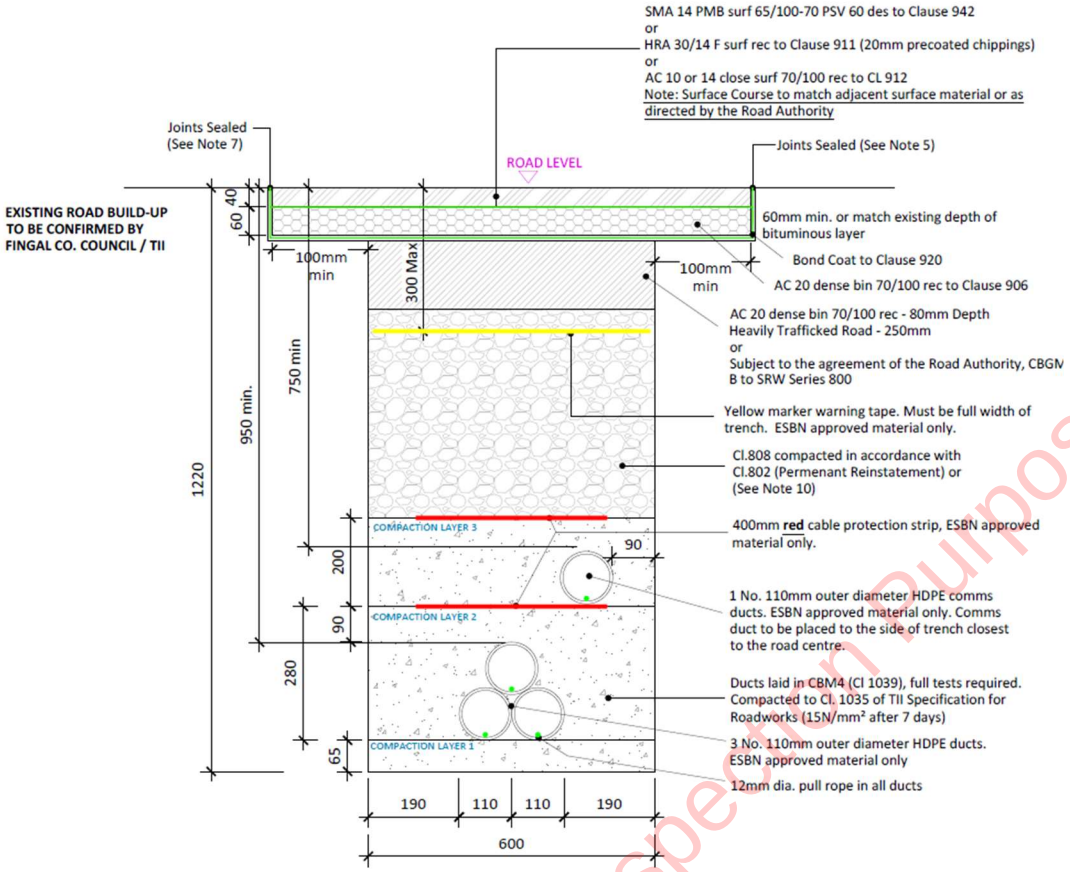

Figure 2 - Typical Trench in Road Section

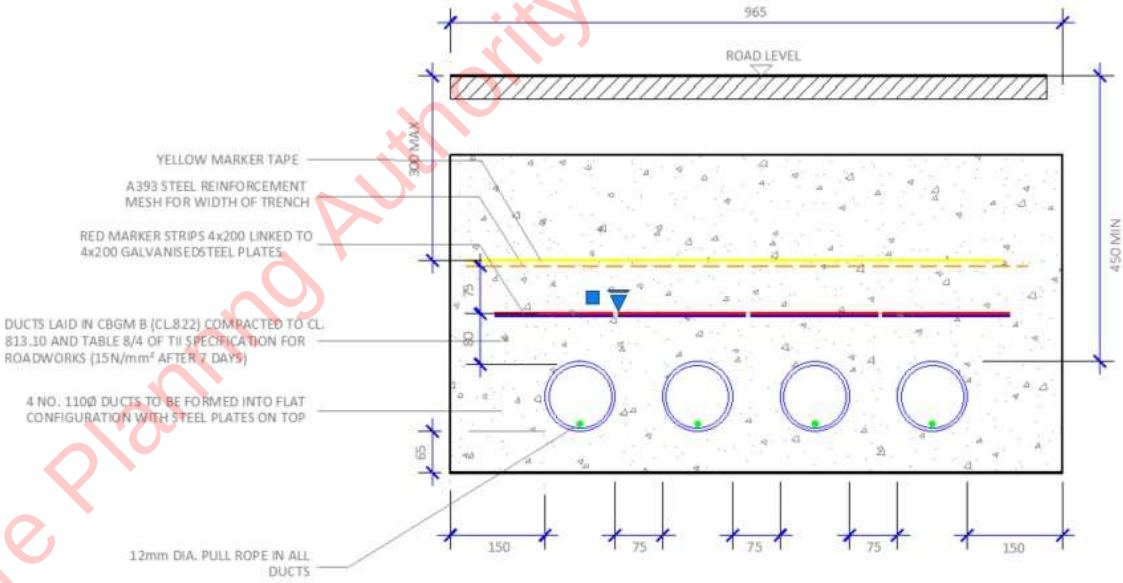

Figure 3 - Typical ducting in flat formation

4.1 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 ESB standards.

Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions. Corrosion proof aluminium triangular danger signs, with a 700mm base, and with centred lightning symbol, on fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker posts shall also be placed in the event that burial depth is not to standard. The precise siting of marker posts will be dictated by ESBN as part of the detailed design process.

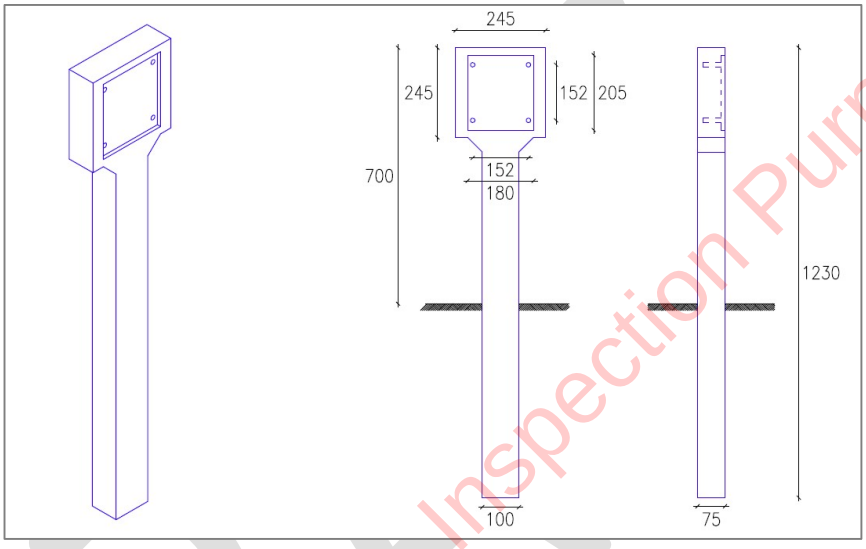

Figure 4 - ESB Marker Posts

4.2 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 as required by conditions where relevant.
- All existing underground services shall be identified on site prior to the commencement of construction works.
- Traffic management measures will be implemented in accordance with those included in the Traffic Management Report, and a detailed Traffic Management Plan will be prepared and agreed with Clare County Council.
- The excavated trench will be approximately 600mm in width and approximately 1220mm deep both within the public road network and within private lands.
- The base of the excavated trench will be lined with sand bedding to be imported to site from a local licensed supplier. The 110mm diameter HDPE cable ducting will be placed into the prepared trench, inspected and backfilled as per Figures 2 & 3.
- 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.
- No more than a 100m section of trench will be opened at any one time. The second 100 metres 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 required, grass will be reinstated by either seeding or by replacing with grass turves.
- 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.
- Works will only be conducted in normal working hours of Monday to Friday 08:00 to 20:00 and Saturday 08:00 to 18:00, with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency.
- Following the installation of ducting, pulling the cable will take approximately 1 no. days.

Equipment:

- 1 Excavator Operator.
- 2-3 General Operatives.
- 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.
- 110mm diameter HDPE ducting.
- Temporary Surface Reinstatement Materials.

Figure 5 - Typical 38kV Underground Duct Installation

4.3 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. Where excess material exists, it may be used in the reinstatement of the wind farm sites or disposed of to a licensed facility.

4.4 Storage of Plant and Machinery

All plant, machinery and equipment will be stored on site within the works area or within the temporary construction compound to be located within the permitted wind farm sites. Oils and fuels will not be stored on site and will be stored in an appropriately bunded area within the temporary storage compound.

4.5 Joint Bays and Associated Chambers

Joints Bays are to be provided approximately every 800 meters along the UGC routes to facilitate the jointing of 15 no. lengths of UGC. 38kV Joint Bays are typically 1.6m x 4.5m x 1.275m pre-cast concrete structures installed below the finished ground level.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between Fahybeg Wind Farm and the existing 110kV substation at Ardnacrusha. Earth Sheath Link Chambers are also required approximately every second joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, installed in a flat formation so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located close to Joint Bays. Earth Sheath Link Chambers

and Communication Chambers will typically be pre-cast concrete structures with an access cover at the finished surface level.

The precise siting of all Joint Bays, Earth Sheath Link Chambers, and Communication Chambers is subject to approval by ESBN. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions. The marker posts will consist of a corrosion-proof aluminium triangular danger sign, with a 750mm base, with a cantered lightning symbol, on engineering grade fluorescent yellow background. They will be installed inadequately sized concrete foundations and will also be placed where the cable has not been buried to the standard depth, due to existing road conditions. Drawings of the joint bays and communication chambers are included within this planning package.

Equipment:

- 360° tracked excavator (wheeled excavator where required)
- 1 no. tracked 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;
- Precast Chamber Units / Construction materials for chambers
- Cable ducting

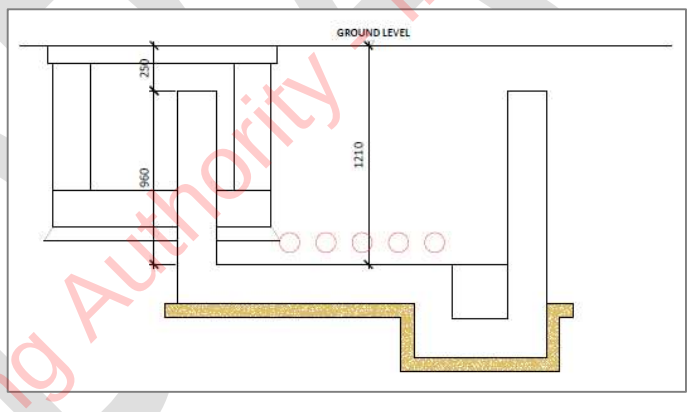

Figure 6 - Typical Section through Joint Bay and Link Box

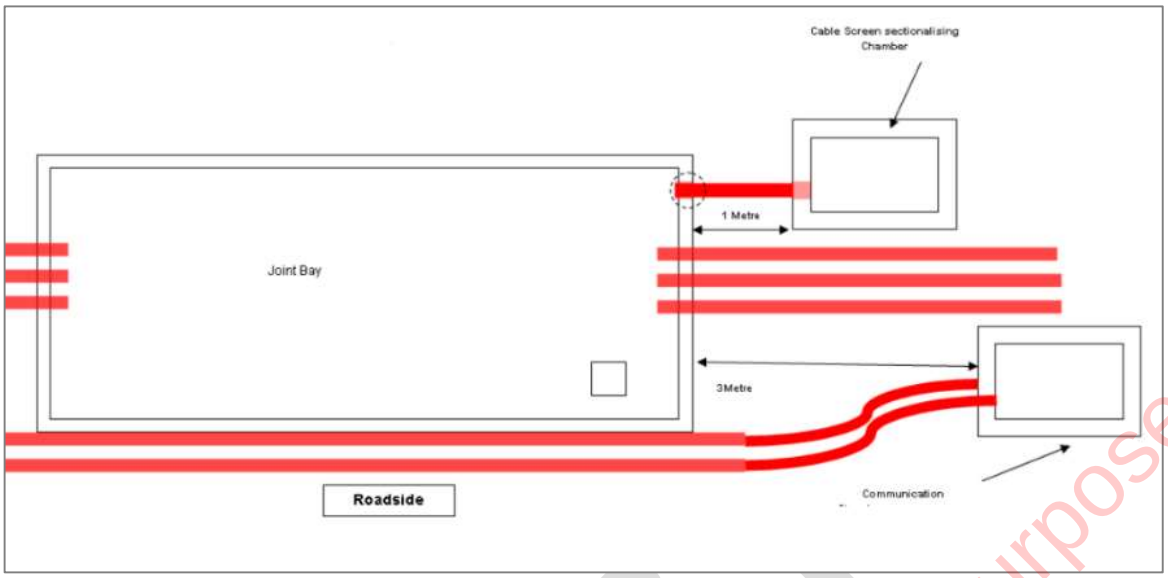

Figure 7 -Typical Joint Bay and Link Box Plan Details

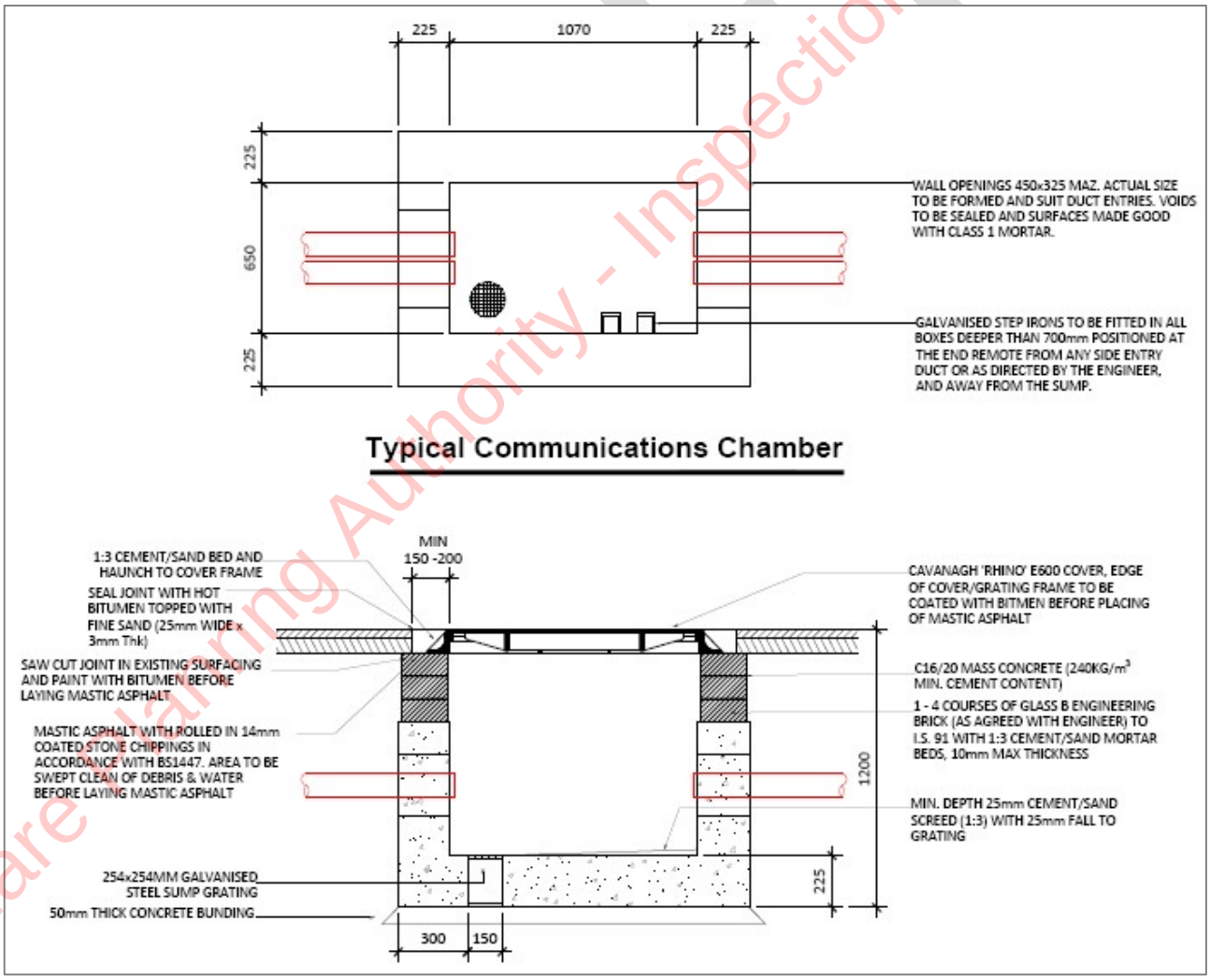

Figure 8 - Typical Communications Chamber

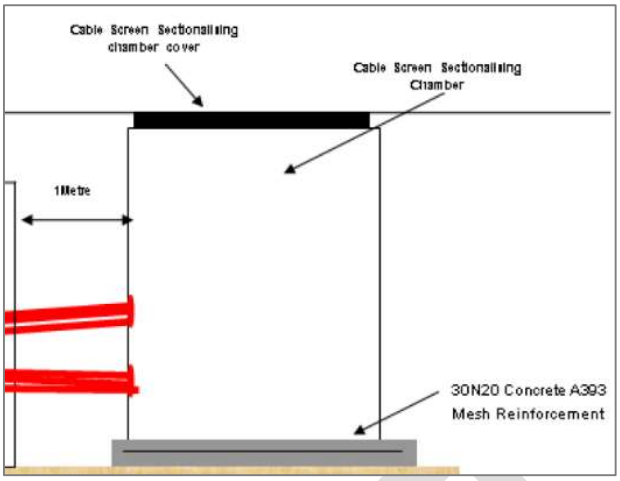

Figure 9 - Typical Sheath Link Chamber

4.6 Horizontal Direction Drilling (HDD)

Horizontal Direction Drilling (HDD) is a method of drilling under obstacles such as bridges, watercourses, existing UG infrastructure etc. This method is employed where installing the ducts using standard installation methods is not possible and is implemented to install cable ducts under these obstacles. There will be a requirement to drill beneath obstacles in this underground grid connection route. These include 3 No. bridges due to lack of cover and insufficient room. (HDD 2 & 3 & 4).

The horizontal directional drilling will be implemented to bore a minimum 1.5m beneath the waterway and bridge foundations. The required depth may increase subject to geotechnical investigations on site of each bridge.

The proposed drilling methodology is as follows:

- A works area of circa 40m^2 for the HDD entry side, and circa 40m^2 on the HDD exit side, all within public road, will be required for the HDD equipment and vehicles. These areas will be fenced off during the HDD implementation.
- The drilling rig and fluid handling units will be located 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.
- Entry and exit pits (approximately 3.2m (w) x 6.m (L) x 1-2m deep) 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.
- The HDD pilot bore will be undertaken using a wireline guidance system. Assembly will be set up by the drilling team and steering engineer.
- The pilot bore will be drilled to the pre-determined profile and alignment under the watercourse crossings.
- The steering engineer and drill team will monitor the drilling works to ensure that modelled stresses and pressures are not exceeded.

- The drilled cuttings will be flushed back by drilling fluid to the entry and exist pits and recycled for re-use.
- Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit side which will then be pulled back to the entry side as part of the pre-reaming/hole opening process to enlarge the hole to the correct size.
- When the pre-reaming/hole opening/hole cleaning has been completed, a reamer of slightly smaller diameter than the final cut will be installed on the drill string to which the ducts will be attached for installation.
- The drilling fluid will be disposed of to a licensed facility.
- The ducts will be cleaned, proven and their installed location surveyed.
- The entry and exit pits will be reinstated to the specification of ESB Networks and any requirements of Clare County Council.
- A joint bay/transition chamber/transition coupler will be installed on either side of the road following the horizontal directional drilling as per ESB requirements.

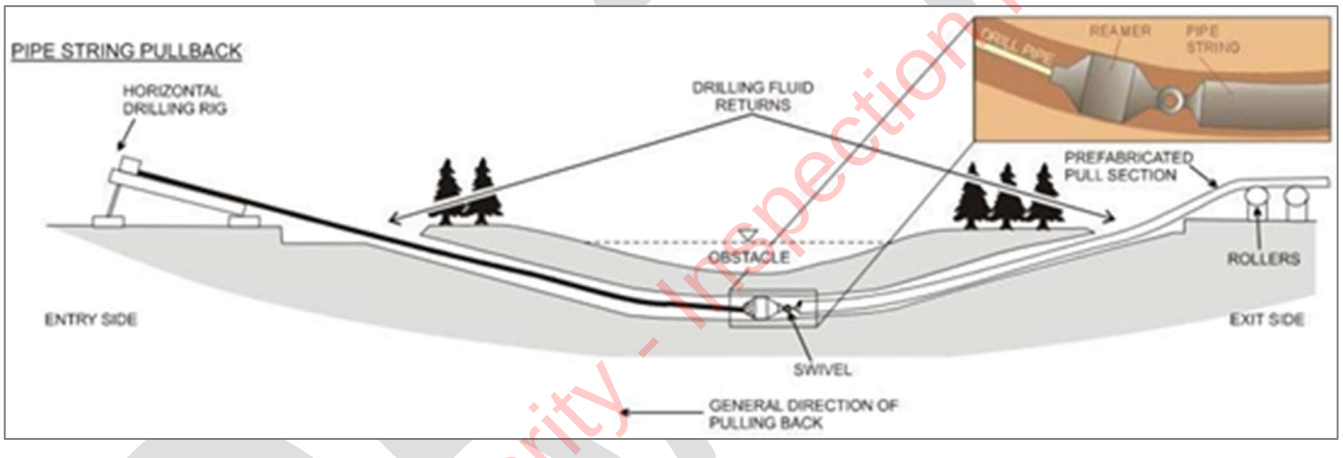

Figure 10 - Typical HDD Installation (not to scale)

5.0 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, measures proposed within the CEMP, and the guidance documents and measures listed below. These 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 proposed 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 proposed 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 wind farm sites 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 taken into account 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 proposed 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.

- 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, and the Contractor is required to prepare a contingency plan for before and after such events.
- The contractor will carry out visual examinations of local watercourses from the proposed 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 potential 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 solar park sites; remote from watercourses, drainage channels and other surface water features.
- 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 wastewater 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.

6.0 Major Watercourse Crossings

There are 4 major water crossings encountered on the proposed grid connection route. The first and second water crossing, are located on R465 in the form of 2 bridge crossing. The first crossing may not require an HDD and will be passed in the form of ducting in a flat formation across the bridge, further survey is required for full route design to establish extent of existing services in the road and junctions either side of the bridge. The solution may be to cross via HDD to avoid any service crossing conflicts. The second crossing is over the river Blackwater and will require a HDD due to lack of cover in the bridge. Both bridge crossings will remain in the road corridor.

The third crossing is located on R471 over the Glenomra wood stream and will require a HDD crossing. The fourth and final major water crossing is located on the R466 road approximately 100m before the entrance to the windfarm and is located on a tributary of the Bridgetown river.

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 proposed development.

7.0 Drainage Management Plan

The measure described in this section will be adopted during construction phase in order to manage on-site drainage in accordance with current best practise and legislation.

The Site Manager shall contact:

- The Client.
- Environmental Protection Agency ("EPA") 24-hour emergency incident line 1890 33 55 99:
- Inland Fisheries 24-hour pollution line 1890 34 74 24. The pollution hotline number shall be referenced in the construction site rules and displayed in the Site Office, within the previously consented Fahybeg facility, and in the Emergency preparedness & response plan.

Each Contractor working with controlled substances shall supply appropriate spill kits which shall be kept on site. The spill kits shall be made accessible at all times to all site personal.

8.0 Road Opening Licence

The proposed UGC works will require a road opening licence under Section 254 of the Planning and Development Act 2000-2015 from Clare County Council. A Traffic Management Plan (TMP) will be agreed with Clare County Council prior to the commencement of the development. This 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 Clare County Council in advance of the preparation of the TMP.

9.0 Relocation of Existing Services

In order to facilitate the installation of the proposed UGC, it may be necessary to relocate existing underground services such as water mains, telecoms or existing cables. In advance of any construction activity, the contractor will undertake additional surveys of the proposed 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.

10.0 Cable Pulling

Once the ducting is installed the electrical cables (situated on a drum) are pulled through the ducting by a specialised mechanical winch. The winch will also monitor the tension on the cables being pulled so as not to damage the cables. A guide rope is installed with the ducting to assist in the cable pulling process. The guide rope also is used for proving the ducts by attaching a mandrel, a sponge or brush, for cleaning the duct installed. Cable lubricant is applied to the outside of the cables being pulled through the duct. The lubricant assists in the pulling process by removing friction between the cable and the rollers. This not only speeds up the process but also prevents snagging and therefore damage to the cable.

11.0 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 CEMP and associated conditions.

12.0 Emergency Response Plan

All site personnel will be inducted in the provisions of the Emergency Response Plan. The following outlines some of the information, on the types of emergencies, which must be communicated to site staff (list not exhaustive).

- Release of hazardous substance - Fuel or oil spill
- Concrete spill or release of concrete
- Flood event – extreme rainfall event
- Environmental buffers and exclusion zones breach
- Housekeeping of materials and waste storage areas breach
- Stop Works order due to environmental issue or concern

The Emergency Response Plan must be completed by the appointed Contractor before the project begins.

13.0 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.

14.0 Waste Management

All waste products (general waste, plastic, timber, etc.) arising during the construction phase will be managed and disposed of in accordance with the provisions of the Waste Management Act 1996 and associated amendments and regulations, and a Waste Management Plan will be prepared by the contractor prior to the commencement of construction. All waste material will be disposed of at a fully licensed facility.

15.0 Archaeology

The following are the mitigation measures which will be carried out during construction where required.

- If required a project archaeologist will be appointed to oversee the project.
- Demarcation of protective buffer zones around cultural heritage sites where there is a potential for disturbance during the construction phase and inclusion of the same in site induction.

16.0 Programme

Estimates for the duration of the construction works are included in the table below. Please note that some of the elements are likely to happen concurrently, therefore the overall start-to-finish duration is estimated to be 4 months.

Table 3: Estimated Construction Duration	
Development Element	**Estimated Construction Duration**
Cable route (not including HDD)	12 Weeks
HDD	4 Weeks
Cable Pulling and Jointing	4 Weeks

Table 3 - Estimated Construction Duration

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 3.4

Biodiversity Enhancement and Management Plan (BEMP)

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

FAHY BEG WIND FARM

Biodiversity Enhancement & Management Plan

Prepared for:

RWE Renewables Ireland Ltd.

RWE

Date: **January 2023**

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1. INTRODUCTION

This Biodiversity Enhancement & Management Plan (BEMP) sets out the implementation of biodiversity enhancement features at the proposed wind farm site. The plan includes both mitigation and enhancement measures, which are clearly differentiated. Additionally, maintenance measures are detailed. All mitigation, enhancement and maintenance measures included in this BEMP will be implemented in full.

The measures contained in this BEMP include those designed to protect and enhance existing habitats. 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 range of species. Appropriate planting will increase the available feeding, roosting and nesting cover for wildlife.

The BEMP includes the following:

- Details of all measures to be taken to protect and enhance habitats of local biodiversity value occurring at the site and the species which utilise the same within the vicinity;
- A description of target habitats and range of species appropriate to the site;
- Appropriate strategies for maintaining existing and targeted habitats and species;
- Timelines for new planting and habitat creation;
- Details of ecological oversight and monitoring;
- A map identifying the areas to be managed.

1.1 Study Area

The proposed wind farm is located in the townlands of of Fahy Beg, Ballymoloney, Ballyknavin, Ballyquin More, Woodpark and Leitrim. The proposed grid connection utilises the R466 regional road for approximately 0.4km before turning right onto the Fahymore local road and continues right onto the R471 for approximately 1.4km. The GCR will turn left onto the R465 for approximately 3.6km before using the local road network to access the Ardnacrusha 110kv Substation within the townlands of Ballykeelaun and Castlebank. The main site entrance is an existing entrance to the Roadstone Ballyquin quarry located on the R466 regional road.

The geographic scope of the BEMP is confined to the Land ownership boundary (optioned lands) for the proposed wind farm, and TDR Nodes. It is noted that mitigation measures are restricted to within the wind farm site planning boundary and TDR Node locations and agreements are in place with all landowners to ensure the measures will be implemented.

1.2 Designated Nature Conservation Sites

European (Natura 2000) sites within the potential zone of influence (ZoI) of this project, such as candidate Special Areas of Conservation (cSACs)[1] and Special Protection Areas for birds (SPAs) were also identified as part of the ecological appraisal. A separate report for Appropriate Assessment (AA) screening and Natura Impact Statement were prepared to appraise the potential impact on European sites and, in respect of the NIS only, specify mitigation measures to avoid any adverse effect on the integrity of such European sites.

There was one Annex 1 habitat identified at the proposed site: *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]. This is located outside the proposed footprint and associated zone of influence.

The following European Sites are within the potential ZoI of the proposed development:

- Lower River Shannon SAC
- Lough Derg (Shannon) SPA
- Danes Hole, Poulnalecka SAC
- Slievefelim to Slivermines Mountains SPA
- River Shannon and River Fergus Estuaries SPA.
- Slieve Aughty Mountains SPA

1.3 Habitats

The following habitats (Figure 1) are located within the study area, as classified by Fossitt (2000):

Improved Agricultural Grassland (GA1)
Dry Meadows and Grassy Verges (GS2)
Dry Humid Acid Grassland (GS3)
Wet Grassland (GS4)
Dense Bracken (HD1)
Scrub (WS1)
Mixed Broadleaved Woodland (WD1)
Conifer Woodland (WD4)
Oak-Birch-Holly Woodland (WN1)
Oak-Ash-Hazel Woodland (WN2)
Wet Willow-Alder-Ash Woodland (WN6)
Spoil and Bare Ground (ED2)
Recolonising Bare Ground (ED3)
Other Artificial Lakes and Ponds (FL8)
Reed and Large Sedge Swamp (FS1)
Drainage Channels (FW4)
Eroding Upland River (FW1)
Hedgerows (WL1)
Treelines (WL2)
Buildings and Artificial Surfaces (BL3)

[1] Note: At present many SACs in Ireland are currently 'candidate' SACs and referred to as cSACs. The relevant Statutory Instruments for the SACs in Ireland have not yet been made, however, these "candidate" sites must still be afforded the same level of protection as if they were SACs in accordance with the Habitats Directive.

1.3.1 Target Habitats

Within the habitats listed above, a number are targeted by the measures proposed in this management plan. These habitats and the applicable measures are summarised in Table 1-1, and described in detail below:

Table 1-1: Target Habitats

Habitat	Proposed Measures
Oak-Ash-Hazel Woodland (WN2)	Replanting either side of clear span bridge
Hedgerows (WL1) Treelines (WL2)	New planting (to prevent net loss of hedgerow, provide alterative bat foraging/commuting routes, provide alternative hunting areas for kestrel/barn owl).
Mixed Broadleaved Woodland (WD1)	Retain woodland in quarry Protect area of Ballymoloney Woods to facilitate natural regeneration

1.4 Target Species and Groups

Following extensive desk studies and field studies a range of key ecological receptors were identified at the site. These are detailed within EIAR Chapter 8: Biodiversity. The enhancement and mitigation measures detailed here will protect these species, in addition to improving the biodiversity value of the site generally.

1.4.1 Bats

A total of six bat species, in addition to genus -level records of Myotis Spp. have been recorded as present within the study area during the 2020/2021 bat surveys. The measures that will be implemented to protect bats are:

Bat Buffer Maintenance, Alternative Bat Commuting Routes, New Hedgerow/Treeline Planting, Woodland Retention and the Woodland Planting.

1.4.2 Bees

Bees will benefit from the wildflower strips and hedgerow planting.

Earth banks will be created to provide nesting habitat for mining bees, which in Ireland are represented by the genera *Andrena* and *Nomada.* Mining bees, and pollinators in general, will also benefit from the wildflower strips and hedgerow planting.

1.4.3 Insects (general)

A range of insect species will benefit from measures which create and enhance semi-natural habitats at the site. These include the creation of pollinator -friendly habitats described above, in addition to the creation of log piles which will provide insect habitats.

1.4.4 Badger

A range of measures including sett exclusion (if required), seasonal restrictions, buffer zones, restrictions on machinery use and vegetation clearance, temporary hard blocking and monitoring are proposed to ensure badgers are not negatively impacted by the proposed development. No hard-blocking or exclusion will be undertaken at active badger setts during the breeding season (December – June inclusive).

1.4.5 Small Mammals

Small mammals such as wood mouse and pygmy shrew will benefit from wildflower and new hedgerow planting. These features will provide increased cover and food for these animals.

The abovementioned species, in addition to other small mammals such as hedgehog, will also benefit from the installation of Hibernacula which will provide shelter.

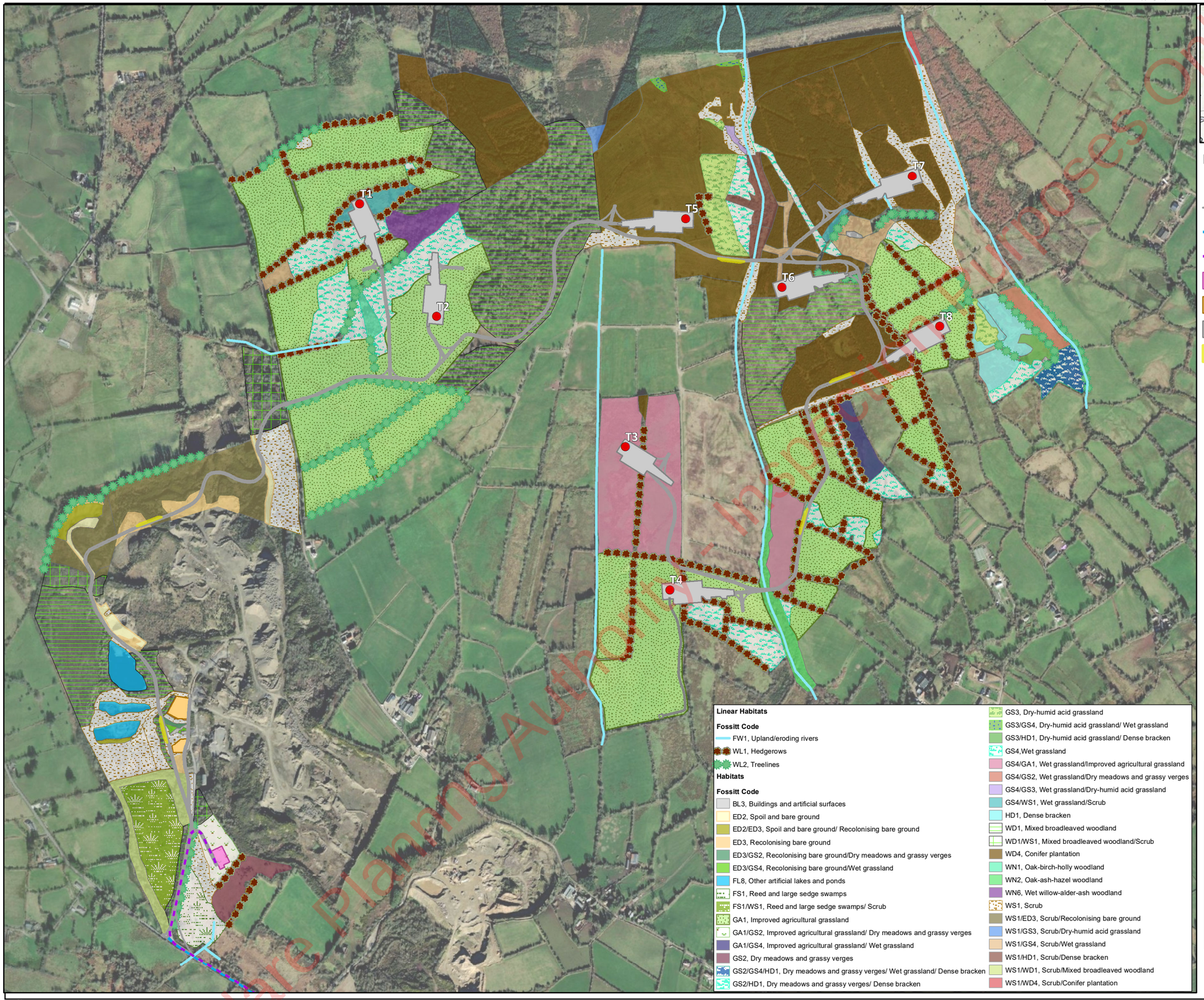
1.4.6 Raptors

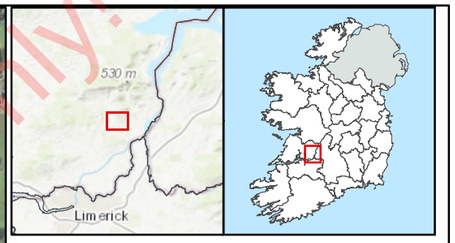
Birds such as barn owl and kestrel will benefit from new hedgerow planting and provision of wildflower strips through increased abundance of small mammal prey. These features are located away from proposed turbine locations.

1.4.7 Small Passerines

Small passerines as a general grouping will benefit from nature friendly management of the site including hedgerow planting.

Path: R:\Map Production\2020\P20-003\Workspace\EIAR\Ecology\Biodiversity Enhancement Plan\P20-003_GIS_Fig1_Habitat_Map_A3.mxd





Legend

- Proposed Turbine Layout
- Onsite Access Roads
- Turbine Delivery Route
- Grid Connection Route
- Substation Compound
- Construction Compound
- Turbine Hardstanding Area
- Passing Bays

Linear Habitats

Fossitt Code

- FW1, Upland/eroding rivers
- WL1, Hedgerows
- WL2, Treelines

Habitats

Fossitt Code

- BL3, Buildings and artificial surfaces
- ED2, Spoil and bare ground
- ED2/ED3, Spoil and bare ground/ Recolonising bare ground
- ED3, Recolonising bare ground
- ED3/GS2, Recolonising bare ground/Dry meadows and grassy verges
- ED3/GS4, Recolonising bare ground/Wet grassland
- FL8, Other artificial lakes and ponds
- FS1, Reed and large sedge swamps
- FS1/WS1, Reed and large sedge swamps/ Scrub
- GA1, Improved agricultural grassland
- GA1/GS2, Improved agricultural grassland/ Dry meadows and grassy verges
- GA1/GS4, Improved agricultural grassland/ Wet grassland
- GS2, Dry meadows and grassy verges
- GS2/GS4/HD1, Dry meadows and grassy verges/ Wet grassland/ Dense bracken
- GS2/HD1, Dry meadows and grassy verges/ Dense bracken
- GS3, Dry-humid acid grassland
- GS3/GS4, Dry-humid acid grassland/ Wet grassland
- GS3/HD1, Dry-humid acid grassland/ Dense bracken
- GS4,Wet grassland
- GS4/GA1, Wet grassland/Improved agricultural grassland
- GS4/GS2, Wet grassland/Dry meadows and grassy verges
- GS4/GS3, Wet grassland/Dry-humid acid grassland
- GS4/WS1, Wet grassland/Scrub
- HD1, Dense bracken
- WD1, Mixed broadleaved woodland
- WD1/WS1, Mixed broadleaved woodland/Scrub
- WD4, Conifer plantation
- WN1, Oak-birch-holly woodland
- WN2, Oak-ash-hazel woodland
- WN6, Wet willow-alder-ash woodland
- WS1, Scrub
- WS1/ED3, Scrub/Recolonising bare ground
- WS1/GS3, Scrub/Dry-humid acid grassland
- WS1/GS4, Scrub/Wet grassland
- WS1/HD1, Scrub/Dense bracken
- WS1/WD1, Scrub/Mixed broadleaved woodland
- WS1/WD4, Scrub/Conifer plantation

N W E S

0 200 400 800 Meters

TITLE:	Habitats		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	1		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:10000	**REVISION:**	0
DATE:	30/11/2022	**PAGE SIZE:**	A3

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2. MITIGATION MEASURES

2.1 Re-establish woodland abutting clearspan bridge to repair connectivity

The Oak-Ash-Hazel Woodland (WN2) abutting the clear span bridge will be replanted following construction, to minimise habitat loss and repair connectivity for wildlife along the riparian corridor. An area of approximately 320m^2 across both sides of the bridge will be planted with the following mix: grey willow- 30%; hazel- 70%.

2.2 Retention of potential bat roost features from felled trees – Ballymoloney woods

Potential roosting features occurring in mature trees proposed to be felled will be retained and strapped to suitable adjacent trees using durable fastening solutions to provide ensure they remain available to bats and that no net loss of PRFs occurs.

Ecological supervision is required to identify PRFs for translocation, and to ensure attachment to receptor trees is completed correctly and does not interfere with existing PRFs in receptor trees.

If tree sections with PRFs deteriorate naturally to an uninhabitable state, bat boxes will be installed as replacements.

2.3 Maintenance of Bat Buffers

The areas surrounding turbines will be actively managed to discourage foraging by bats. The buffer extent around each turbine has been calculated based on proposed turbine dimension options and the height of surrounding trees (see EIAR Chapter 8: Biodiversity). Where buffers overlap both woodland and open habitats, the full circular buffer will be applied to both the wooded area and adjacent open habitat as the area to be managed to discourage bat foraging. Buffer sizes for turbines in wooded areas range from 86-92m from the turbine base. Where no woodland is present, conservative buffers matching those for adjacent wooded areas has been applied within which grassland will be managed as required to discourage foraging bats.

Tree-free buffers will be maintained around all turbines to reduce risks to bats. These bat felling buffers will be maintained by keeping vegetation short, which will minimise insect abundance. This will be achieved by mechanical means only, and pesticides and toxic substances shall not be utilised. The buffers shall be cut twice per year, in spring and summer as required. This is applicable primarily to areas where trees will be removed, but mowing will be implemented in existing grassland within buffers as required if regular grazing is not occurring.

2.4 Hedgerow Planting at Wind Farm Site

This measure provides mitigation in four specific areas:

- Prevents net loss of linear wooded habitats
- Directs bats away from tree-free buffers along alternative commuting routes
- Prevents net loss of linear bat foraging and commuting features
- Prevents net loss of kestrel and barn owl hunting habitat

Where hedgerows or treelines are affected by turbine felling buffers, bats will be directed away from tree-free buffers along an alternative commuting route. This will be achieved by planting new pollinator-friendly hedgerows along Lines 2, 3, 4, 7, 10 & 11 (see Figure 2, Table 2-1). Willow will be included in these hedgerows due to it's rapid growth rate which will accelerate establishment.

The remaining lines (1, 5, 6, 8, 9 & 12) will ensure no net loss of linear wooded habitats, barn owl, kestrel hunting habitat and bat foraging /commuting features. The combined length of Lines 1-12 is c. 1400m, which represents a net gain in the length of linear wooded habitat at the site. In addition to the mitigating functions detailed above, the proposed hedgerow planting will also enhance connectivity in the landscape for wildlife, which has been impacted in some areas by intensive agricultural management.

It is proposed to create closely-spaced double lines of hedgerow, with willow on one side, and pollinator-friendly hedgerow species listed in Table 2-1 on the other. Planting of these species will be staggered to prevent excessive shading and aid establishment of the hedgerows. Young trees will require protection until established.

All hedgerow planting is required to use plants of native provenance (local if possible). The landscaping contractor is required to be informed well in advance to allow the acquisition of suitable native stock. 2–3-year-willow trees are required for hedgerows 2, 3, 4, 7, 10 & 11, to help accelerate establishment. These will be supplemented with planting of whips.

Table 2-1 Species to be planted in new hedgerows

Linear Feature	Plant
1	Oak, rowan, holly, birch, grey willow, alder
2	Oak, birch, grey willow, alder
3	Grey willow, hawthorn, elder
4	Grey willow, hawthorn, elder
5	Grey willow, hawthorn, blackthorn
6	Grey willow, hawthorn, blackthorn
7	Hawthorn, elder, birch, holly
8	Oak, rowan, holly, grey willow
9	Oak, hawthorn, blackthorn
10	Oak, rowan, birch, grey willow, blackthorn
11	Oak, rowan, birch, grey willow, blackthorn
12	Grey willow, hawthorn, alder, oak

2.5 Hedgerow and Treeline Reinstatement at TDR Nodes

Where tree felling is required, *Long-term Moderate Reversible* impacts to treelines and hedgerows may occur. This is primarily due to the presence of sections of mature hedgerow or treelines which may be removed or damaged as a result of TDR Node works. Therefore, as a mitigating action, hedgerows removed or lowered by TDR Node works will be reinstated immediately following the delivery of turbine components using the same native species present in original hedgerows. The exception to this is that ash *Fraxinus excelsior* is not proposed to be used, due to it's vulnerability to ash dieback disease. Other large-growing native species such as alder and oak are proposed instead. Reinstatement of hedgerows will occur using the methods described in Section 2.4. Semi-mature specimens of native provenance will be included to accelerate rehabilitation of these areas. Native, semi-mature specimen trees will be planted where large trees are felled at TDR Nodes to mitigate the loss of existing trees. A proportion of smaller trees will also be planted with the semi-mature specimens. The species proposed to be planted at these locations are detailed in Table 2-2.

Table 2-2: Species to be replanted at TDR Nodes

Node	Species
30	Hawthorn, Alder, Oak
31	Pedunculate oak, Alder, Hawthorn
32	Birch, Oak, Alder
33	Grey Willow, Oak, Alder

2.6 Wildflower Strips

Wildflower strips will be planted to provide habitat analogous to rough grassland for hunting barn owl and kestrel. These strips will be located away from proposed turbine locations. The wildflower strips will also benefit other fauna through the provision of food (seeds, pollen, nectar, invertebrate prey) and shelter.

Planting will consist of seeding areas adjacent to access tracks in the vicinity of T6 and T8 with a native wildflower meadow seed mixture. There will be 2m width wildflower strips planted adjacent to access tracks, totalling c. 1750 m2 in area. Fencing is required for strips bounding agricultural land. See Figure 2 for the location of wildflower strips.

Wildflower seed mixes are required to be of native provenance; mainstream commercially available mixes are not acceptable. Ecoseeds https://www.ecoseeds.co.uk/ (Northern Ireland) or another reputable and experienced supplier capable of supplying seed mixes that meet the required criteria shall be used.

A typical wildflower meadow plant assemblage includes the following species: Birdsfoot Trefoil, Black Medick, Cowslip, Devil's Bit Scabious, Meadow Buttercup, Field Scabious, Hemp Agrimony, Kidney Vetch, Lady's Bedstraw, Lesser Knapweed, Meadowsweet, Mullein, Ox-eye Daisy, Purple Loosestrife, Ragged Robin, Red Campion, Red Clover, Ribwort Plantain, Rough Hawksbit, Sorrel, St Johnswort, Wild Angelica, Wild Carrot, Yarrow, Yellow Agrimony, Yellow Rattle, Teasel, Corn Marigold, Corn Poppy, Cornflower and Scented Mayweed. In particular, the clover species will provide habitat for Large Red Tailed Bumble Bee (Carvell et al., 2011). It is also recommended to include fine leaved grasses such as Red Fescue, Smooth Meadow-Grass and Crested Dog's Tail for conservation of this bee, which was noted in the desk study.

Flowering species recorded within the wet grassland habitats onsite will also be incorporated into the planting mix.

2.7 Badger Mitigation

A suite of measures is detailed in the confidential badger report to ensure disturbance of badgers does not occur. No works (hard-blocking, sett destruction, vegetation clearance, exclusions) with potential to affect any occupied setts will be undertaken during the breeding season (December- June inclusive).

See Confidential Appendix: Badger Mitigation for details of comprehensive mitigation for badgers.

Further Consultation with NPWS

NPWS will be contacted immediately should any of the following events occur:

- A new sett is recorded within the study area during works;
- There is evidence of badger persecution during surveys; and
- Hard-blocked and/or destructed setts are re-occupied by badger during construction.

3. ECOLOGICAL ENHANCEMENT

3.1 Quarry Biodiversity Area

3.1.1 Retention of Woodland

An area of c. 4.6 Ha of mixed broadleaved woodland will be retained within the quarry. The woodland will be allowed to mature naturally. The area will be demarcated and signage will be erected to prevent interference with the area but the area will remain accessible to animals using the woodland.

3.1.2 Nest Boxes

One barn owl nest box and one kestrel nest box will be installed on suitable trees in the quarry biodiversity area under ecological supervision. These can be installed on poles if suitable trees are not available.

These nest boxes will be maintained and replaced as required during the lifespan of the wind farm. Any maintenance work may only be carried out from October to February inclusive under the supervision of a qualified ecologist to ensure nesting season is avoided.

Nest boxes for these species are commercially available or can alternatively be constructed onsite. Plans for barn owl and kestrel boxes are included in Appendix 1.

3.2 Woodland Extension

An area of c. 3.1 Ha of immature conifer plantation north of T5 will be felled in order to establish an area of new oak woodland abutting the long-established Ballymoloney Woodland. The woodland will be established through a mix of planting and natural recolonisation (70 – 30% respectively, distributed evenly). Acorns from the adjacent Ballymoloney Wood will be collected during mast years, grown on in a nursery and planted as saplings, in addition to birch of local provenance which will act as a nursery tree, and holly of local provenance. Unplanted areas will be allowed to recolonise naturally. Periodic grazing under strict supervision may be used for brief periods to control brambles and other dense scrubby vegetation, and pigs may be used to disturb ground and disperse seeds, also under strict supervision for brief periods.

Vegetation control will be required until young trees are established. This will be achieved using mechanical means only; no herbicides will be used. Tree protectors will be used as required.

The woodland will be fenced off to prevent deer and other large herbivores entering, but fencing will include gaps at the bottom to allow other mammals to continue traversing the area. Gaps measuring 300mm x 300mm will be placed at the bottom of the fence at 50m intervals. See Figure 8 19 for the location of this measure.

3.3 Fencing of Ballymoloney Woodland

An area of c. 3.8 Ha of Ballymoloney Woods will be fenced off to prevent deer and other large herbivores entering. This will give this area of the woodland a chance to regenerate naturally. The woodland is currently open and is accessed by fallow deer and cattle. The absence of natural regeneration is considered to be attributable in large part to overgrazing by large herbivores.

The woodland will be fenced off to prevent large herbivores entering, but fencing will include gaps at the bottom to allow other mammals to continue traversing the area. Gaps measuring 300mm x 300mm will be placed at the bottom of the fence at 50m intervals. See Figure 8 19 for the location of this measure.

Strictly supervised grazing or disturbance by pigs may be implemented pending ecological advice, however it is recommended that such measures if used are not carried out for a minimum of 10 years after fencing to ensure natural regeneration has commenced and younger trees are resilient. It is noted that any such intervention should be intermittent, (i.e. every few years) to ensure natural regeneration is not interrupted.

3.4 Deer Fencing for Woodlands

The fencing for both woodlands detailed above will be a single fence running around the perimeter of both areas. The fence alignment is indicative and will run around existing trees where required.

Fencing will be rectangular wire mesh, 1.9m high or two lengths of sheep wire (one above the other), with no barbed wire along the top as per standard deer fencing for forestry. Provision for the passage of small and medium-sized mammals shall be made, with Gaps measuring 300mm x 300mm inserted at the bottom of the fence at 50m intervals. The gaps should be formed in a way which does not compromise the integrity of the wire mesh. Alternatively, 300mm diameter pipes may be dug into the ground at 50m intervals to provide passage under the fence.

3.5 Shelter Habitats

3.5.1 Bee Banks

Banks made up of well-drained soil will be created along access tracks in the vicinity of T66 and T8, located near the wildflower strips (Figure 2). There will be 3 banks. c. 20m length each. These can be created by scraping vegetation away from an existing bank if available, or by constructing a bank from excess spoil generated onsite.

It is important to avoid heavily compacting it with machinery. The road-facing sections of banks will be required to be kept clear of vegetation using mechanical means only. This can be carried out in winter as required (frequency depends on rate of re-vegetation) by scraping away vegetation.

3.5.2 Log Piles

A proportion of the timber being removed (substantial pieces of timber-tree trunk/branches) will be salvaged by cutting into logs to create log stacks/piles in the areas specified in Figure 2. These piles will be used by insects as the timber decays. Logs of different sizes can be stacked on top of each-other or positioned vertically in a pile. It is important to ensure that the logs remain damp and do not dry out by part-burying (some) logs and placing in a partly shaded location within the site.

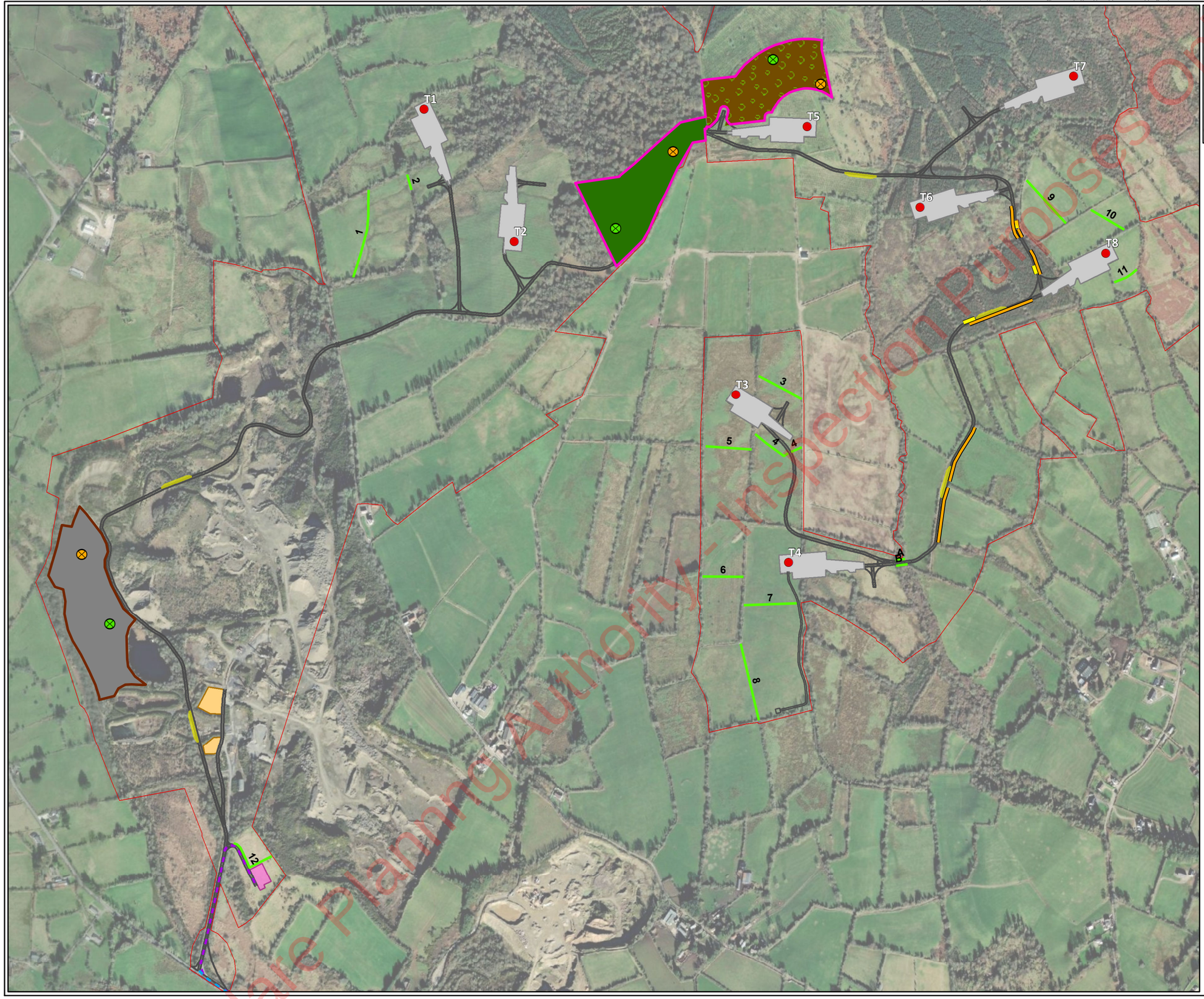
3.5.3 Refugia/Hibernacula

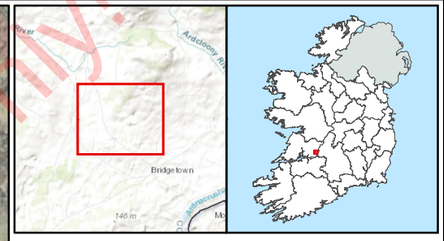
Refugia piles and hibernacula will be created. These provide sheltering locations for a wide range of wildlife, including reptiles, amphibians, small mammals and invertebrates. Refugia piles are produced by piling natural materials such as logs, sticks and leaves; that can be supported by additional materials such as rubble and bricks to form a structure with many cracks and crevices for sheltering. Hibernacula are produced in a similar way, but often require setting into the ground in a shallow pit and topping with soil to enclose the structure and creating a more stable microclimate suitable for hibernating species. These structures will be installed near hedgerows and in areas of woodland within the site, where they are less likely to be disturbed. Locations are specified in Figure 2.

(Source: Green Mumbles accessed Oct 2022)

Plate 1: Example of a Hibernacula

Path: R:\Map Production\2020\P20-003\Workspace\EIAR\Ecology\P20-003_GIS_Fig8-19_Habitat_Management_Measures_A3.mxd





Legend

- Wind Farm Site Boundary
- Proposed Turbine Layout
- Onsite Access Roads
- Turbine Delivery Route
- Grid Connection Route
- Substation Compound
- Construction Compound
- Turbine Hardstanding Area
- Passing Bays
- Quarry Biodiversity Area
- Woodland Fencing
- Ballymoloney Woods Enhancement Area
- Oak woodland planting area

Habitat Management Points

- Log Pile
- Refugia Pile

Habitat Management Lines

- Habitat Management Lines
- Bee bank
- Wildflower strip

TITLE:	Habitat Management Measures		
PROJECT:	Fahy Beg Wind Farm, Co. Clare		
FIGURE NO:	2		
CLIENT:	RWE Renewables Ireland Ltd.		
SCALE:	1:8500	**REVISION:**	0
DATE:	30/11/2022	**PAGE SIZE:**	A3

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4. MAINTENANCE

4.1 Woodland Fencing

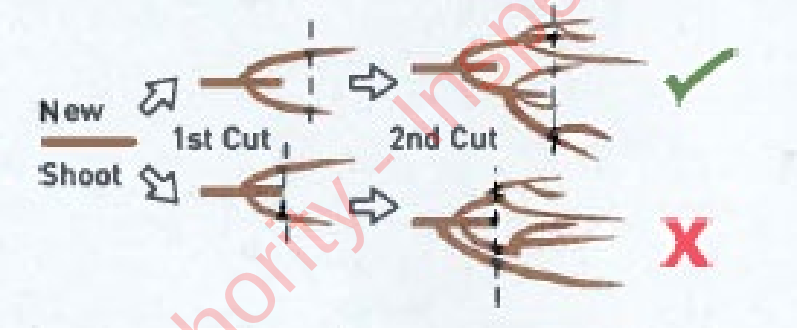
Proactive maintenance of the fencing will be required to ensure it's continued effectiveness. Regular inspections along the entire length will be required, at minimum monthly. Inspections following storm events are also required, as this is the most likely time for fencing to be damaged (falling trees or limbs can open up gaps in the fencing).

Repairs will be carried out immediately where required, and a stock of fencing materials will be kept on hand.

Fencing gaps for mammals will be checked twice per year, and where required maintained to ensure their continued function.

4.2 Hedgerow Maintenance

Tightly cut hedgerows with flat tops provide little benefit to wildlife, taller and bulky hedgerows are recommended as this provides more shelter for wildlife. When the hedgerows are maintained, stems will be cut a little above the last cut (see Plate 3-4) as cutting back to the exact same point depletes the energy of the hedgerow, forms a build-up of scar tissue which discourages new growth.



Source:Teagasc

Plate 2: Hedgerow Level of Cut

Light annual cutting of hedgerows is not good for wildlife as it limits the production of flowers and fruit. The sites hedgerows will be cut every three to four years in rotation as this will leave areas of undisturbed hedgerows. Cutting equipment used will be sharp so as not to shatter or fray the hedge. Shattering and fraying allows for disease to enter plants and can lead to decay and weaken the vigour of the hedgerow. A finger-bar cutter is recommended as the most appropriate tool to minimise fraying and smashing of branches (Heritage Council, 2017). A flail-type hedge cutter is unsuitable for hedge trimming in situations where hedgerow health is a priority.

Hedgerow maintenance will not be carried out between the 1st of March and 31st of August as this is the nesting period for birds and any maintenance at this time may disturb breeding; this is in keeping with the Wildlife Act 1976 (as amended).

4.2.1 Semi-mature Trees

Larger trees can be slower to establish following transplantation and need help until established. These trees may require watering and provisions should be made for this. While establishing, the trees will not require pruning, except where dead branches form or branches are damaged by winds. These branches should be carefully removed to prevent the introduction of disease.

4.3 Wildflower Strip Maintenance

Light annual grazing using sheep or cattle may be used to maintain the planted wildflower strips. In spring or summer grazing of the site will be avoided to favour early or late flowering species respectively and allow the development of nectar and seeds for ground nesting birds and mammals.

Due to the limited size of the wildflower strips, if grazing animals are used, active management of a small number of grazers for short periods will be required to avoid damage to these areas.

Mechanical mowing can also be used, either in combination with grazing, or alone. If mowing only is used, one cut and lift per year between October – February is required. This can be split into rotational mowing where half is cut late in the year and half is cut early the following year, however all areas will only be cut once per year.

5. MONITORING

5.1 General Monitoring of Management Measures

Commencing in year 1 of operation the status of the habitats created, enhanced hedgerows and the species enhancement measures will be checked as per Table 3-4 below. Monitoring will be undertaken by a qualified ecologist appointed by the developer/operator of the wind farm. The timing of monitoring is provided in Table 3-4 below. This will follow implementation of the plan to confirm whether habitats have successfully established and to identify any issues that need to be addressed. Following these monitoring visits, a short status report will be prepared. This will identify any necessary actions to ensure the success of the BEMP, which will be implemented on foot of the report findings.

A final assessment of the condition and success of the various biodiversity management and enhancement prescriptions will also be undertaken in Year 34 (i.e., in the year before the final year of operation).

Table 3-1: Summary of Biodiversity Enhancement & Management Measures

Measure	Target Species/Habitat	Implementation Timeline	Monitoring	Ongoing management
Mitigation				
Re-establish woodland abutting clearspan bridge to repair connectivity	Oak-Ash-Hazel Woodland (WN2)	To be planted following construction of clear span bridge	Years 1, 2, 3, 5, 10, 15, 34	Ensure hazel trees establish. Cut back willow as required to aid hazel establishment
Retention of potential bat roost features from felled trees – Ballymoloney woods	Bats	To be carried out in parallel with felling – tree sections with PRFs to be attached to suitable receptor trees after felling.	Years 1, 2, 3, 10, 15, 34	Ensure fastenings remain effective and are replaced as necessary. If tree sections with PRFs deteriorate naturally to an uninhabitable state, bat boxes will be installed as replacements
Bat Buffer Maintenance	All bat species occurring onsite	Buffers to be cleared prior to turbine installation. Clearance will take place outside the bird breeding season (March-August inclusive)	Annual monitoring throughout lifespan of wind farm (mid- late summer)	Ensure vegetation is kept low
New Hedgerows	All bat species occurring onsite pollinators	From project initiation	Years 1, 2, 3, 5, 10, 15, 20, 30, 34	Ensure establishment; ensure hedgerows are not cut back excessively and are maintained as a viable corridor.
Hedgerow/Treeline Reinstatement at TDR Nodes	Hedgerows/Treelines Associated bird & insect species	To be planted immediately following delivery of turbine components	Years 1, 2, 3, 5, 15	Ensure establishment
Badger Mitigation	Badger	Prior to and during construction	Prior to and during construction	Ensure continued function of mitigation measures
Enhancement				
Quarry biodiversity area- retention of woodland	Mixed broadleaved woodland (WD1)	From project initiation	Years 1, 2, 3, 5, 10, 15, 20, 30, 34	

Measure	Target Species/Habitat	Implementation Timeline	Monitoring	Ongoing management
Barn Owl nest Box	Barn Owl	Following wind farm completion	Years 1, 2, 3, 5, 10, 15, 20, 30, 34	Ensure boxes are well maintained and/or replaced as required
Kestrel nest box	Kestrel	Following wind farm completion	Years 1, 2, 3, 5, 10, 15, 20, 30, 34	Ensure boxes are well maintained and/or replaced as required
Oak Woodland Establishment	Oak-birch-holly woodland (WN1)	From project initiation; ongoing management through establishment phase	Woodland management: Years 1, 2, 3, 5, 10, 15, 20, 30, 34 Fencing maintenance: monthly inspections & inspections after storm events	Ensure establishment of planted trees; ensure continued functioning of fencing; targeted interventions to promote habitat heterogeneity
Fencing of Ballymoloney Woods	Mixed broadleaved woodland (WD1)	From project initiation; ongoing management through establishment phase	Woodland management: Years 1, 2, 3, 5, 10, 15, 20, 30, 34 Fencing maintenance: monthly inspections & inspections after storm events	Ensure continued functioning of fencing; targeted interventions to promote habitat heterogeneity
Wildflower Strips	Small mammals Insects Birds	Following access track construction	Years 1, 2, 3, 5, 10, 15, 20, 30, 34	Ensure continuation of appropriate grazing/mowing regime
Mining Bee Banks	Mining bees	Following access track construction	Years 1, 2, 3, 5, 10, 15, 20, 30, 34	Ensure continued presence; vegetation to be scraped off annually
Log Piles	Small mammals Insects	Following access track construction	Years 1, 3, 5, 10, 20, 30, 34	Ensure continued presence; add material as required
Refugia/Hibernacula	Small mammals Insects	Following access track construction	Years 1, 3, 5, 10, 20, 30, 34	Ensure continued presence; add material as required

6. REFERENCES & BIBLIOGRAPHY

AIPP (2021) *Pollinator-friendly management of Wind Farms*. All-Ireland Pollinator Plan, Guidelines 12. National Biodiversity Data Centre. Series No. 26, Waterford.

Fossitt, J., (2000). *A Guide to Habitats in Ireland*. The Heritage Council, Kilkenny. Heritage Council, 2017

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APPENDIX 1

Nest Box Plans

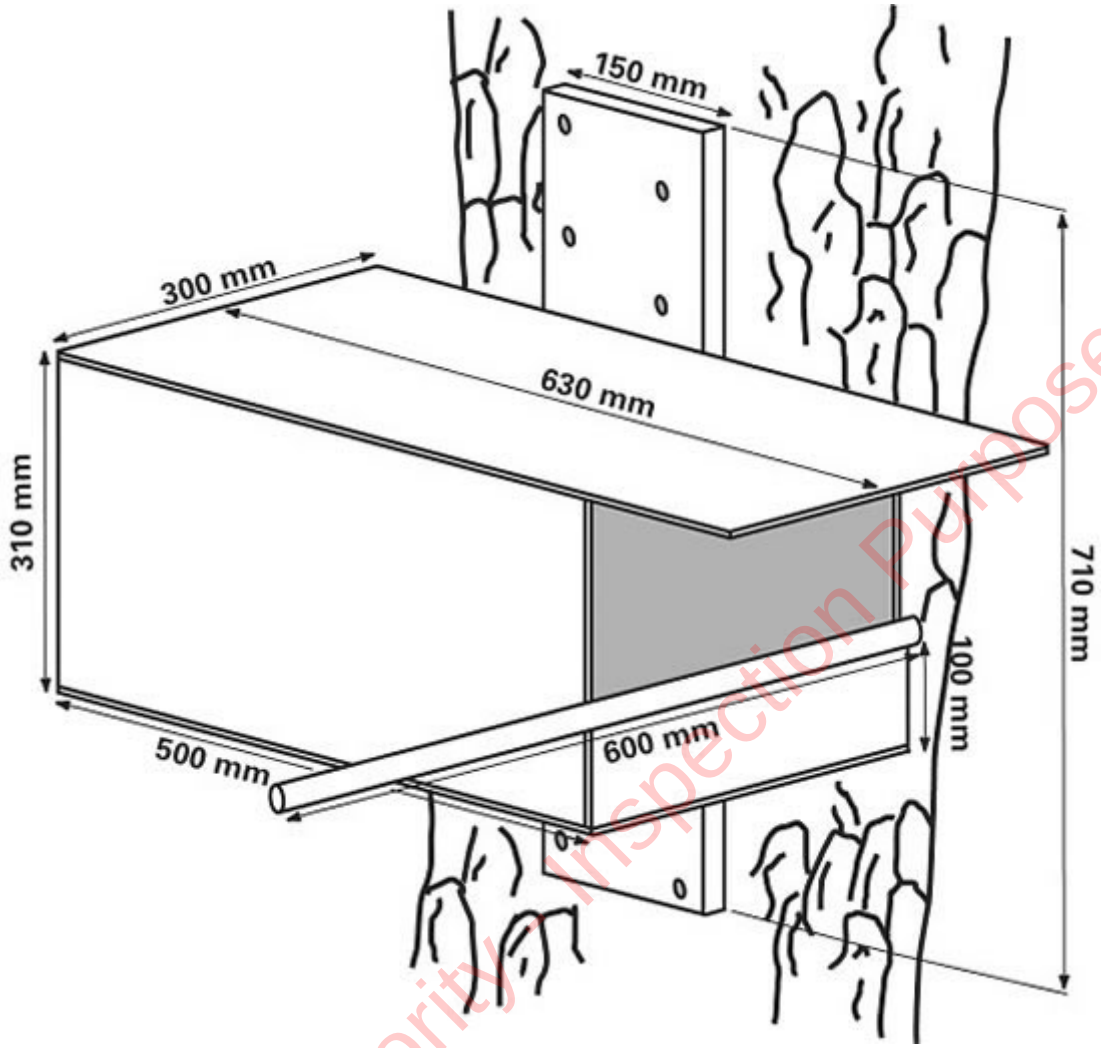
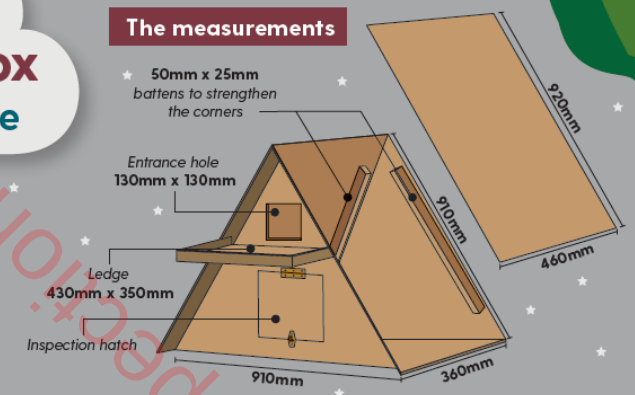


Plate 3: **Kestrel Nest Box Dimensions**

BirdWatchIreland

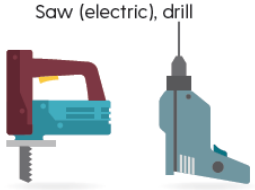
Making a Barn Owl box
A how-to guide

The measurements



The tools

Saw (electric), drill



tape measure and pencil

The materials

- Exterior grade (11mm) marine plywood x 1 sheet
- Batten timber (50mm x 25mm)
- Silicone sealant
- Roofing felt
- Stainless steel screws
- Small butt hinge x 1
- Small door latch lock x 1

Step 1 Using the diagram, measure and mark out the plywood. Labelling the sections can come in handy later.

Step 2 Cut all panels, entrance hole and inspection hatch (retaining cut out) .

Step 3 Assemble the box by screwing all but final sloped panel together. Use battens as illustrated to strengthen internally.

Step 4 Use batten timber to put a rim around the external ledge and secure to box using more batten material. Use hinge and latch to fit inspection hatch door.

Step 5 Use the silicone sealant to fill in any small gaps in the joints to weather-proof the box.

Step 6 Fit final sloped panel and finish with roof felt.

The installation

Pick a suitable location in a mature isolated tree or in a large tree on the edge of a wood or in a hedgerow.

Position the box 3 metres or higher in the tree, making sure it faces away from prevailing wind and out over suitable foraging habitats.

Do not hide the box in tree foliage. Make sure an owl can see the nest box from a distance and has a clear flight path to the box. Bear this in mind if installing the box during the winter months.

The design illustrated is for outdoor use, alternative designs are used for indoor situations such as in barns.

3m above ground or higher

IMPORTANT: Do not install Barn Owl boxes near busy roads, as the owls are vulnerable to being hit by cars. Choose sites at least 200m away from large busy roads.

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Plate 4: Barn Owl Nest Box Plans

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