4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the development and its component parts which is the subject of a proposed application for planning permission to An Bord Pleanála ('the Proposed Development').

The Proposed Development will comprise the removal of 28 no. existing wind turbines, the construction of 11 No. wind turbines with a blade tip height of between 199.5m and 200 metres and all associated works. The Proposed Development will utilise the Existing Kilgarvan Wind Farm onsite 110kV Coomagearlahy electrical substation, along with the existing 110kV overhead line to Clonkeen 110kV Substation.

The Proposed Development comprises:

i. *Removal of 28 no. existing turbines and relevant ancillary infrastructure permitted under Kerry County Council and An Bord Pleanála Planning References; 02/124, 03/2176, 03/2306, 07/1605, 07/4364, Pl. 08.209629, 07/4515, 07/4701, Pl. 08.232259 and 05/1351;*
ii. *Erection of 11 no. wind turbines with a blade tip height range from 199.5m to 200m, a hub height range from 118m to 125m and a rotor diameter range from 149m to 163m, along with associated foundations and hard standing areas;*
iii. *A thirty-five year operational life from the date of full commissioning of the wind farm;*
iv. *Underground electrical 33kV and communication cabling connecting the proposed turbines and meteorological mast to the existing 110kV Coomagearlahy substation in the townland of Inchee;*
v. *Upgrade of and the continued use of the existing onsite Coomagearlahy 110kV substation in the townland of Inchee, permitted under Kerry County Council References 07/3648, 04/1648, 06/1143, 06/2660;*
vi. *Upgrade of existing tracks, hardstand areas and provision of new site access roads and junctions;*
vii. *The extension and reuse of the 1 no. existing borrow pit;*
viii. *2 no. temporary construction compounds;*
ix. *Meteorological mast, with a height of 100m and upgrade of existing associated foundation and hard standing area;*
x. *Forestry felling;*
xi. *Site drainage;*
xii. *Biodiversity Enhancement measures;*
xiii. *Operational stage site signage; and,*
xiv. *All ancillary works and apparatus*

This application seeks a ten-year planning permission and a 35-year operational life from the date of commissioning of the Proposed Development.

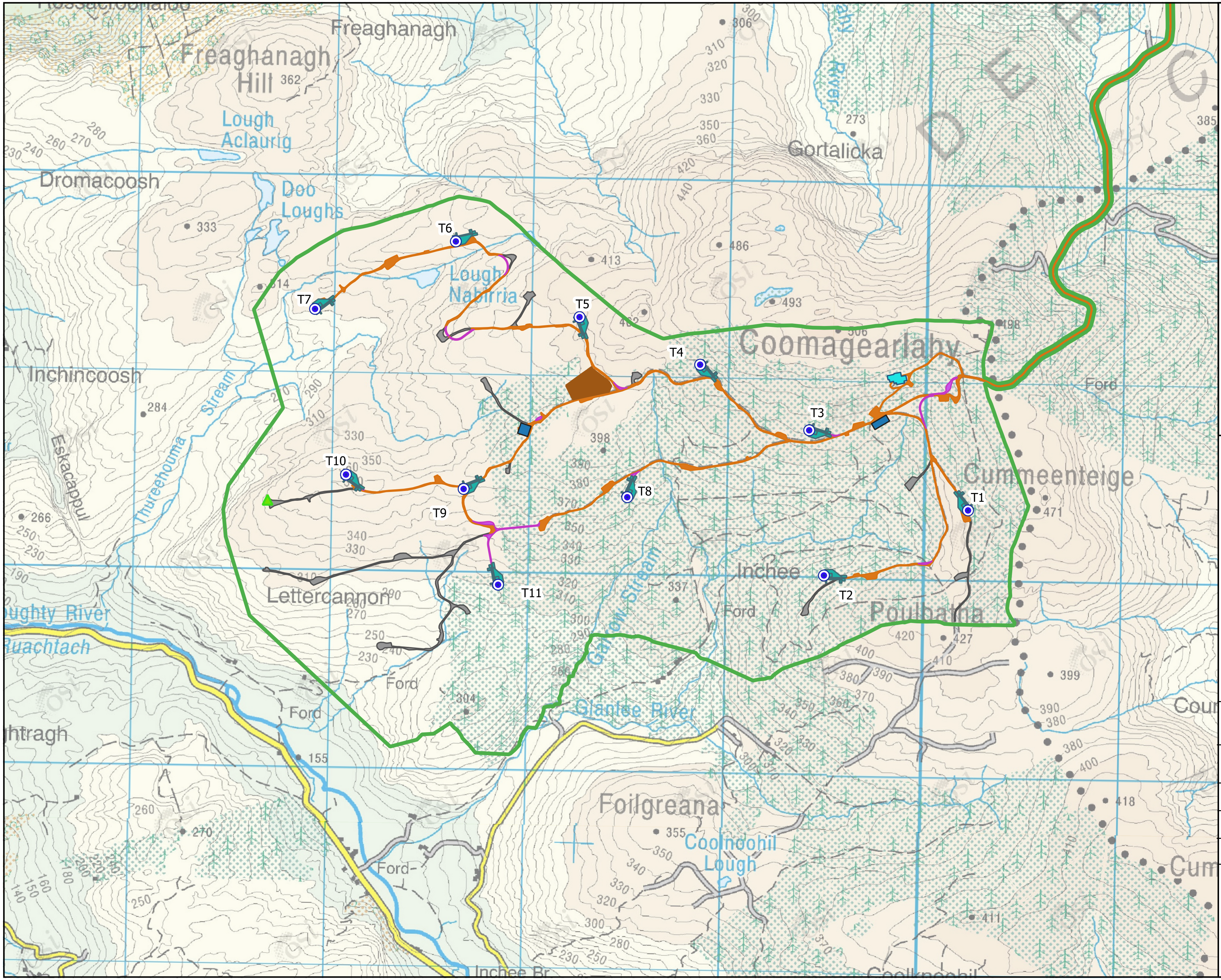
All elements of the Proposed Development in the list above together with the entire turbine delivery route as described in this chapter have been assessed as part of this EIAR.

4.2 Proposed Development Site Layout

The overall layout of the Proposed Development site is shown on Figure 4-1.

The Proposed Development has been designed to minimise potential environmental effects, while at the same time maximising the energy yield from the Proposed Development. As the Proposed Development involves the repowering of an existing wind farm, a particular effort was made to utilise as much of the existing infrastructure (i.e. access roads, grid connection infrastructure, areas of hardstanding) as possible. A constraints study, as described in Section 3.2.6 of this EIAR, has been carried out to ensure that turbines and ancillary infrastructure are located in the most appropriate areas of the site and makes use of the existing infrastructure such as access roads and areas of hardstanding where appropriate.

Detailed site layout drawings of the Proposed Development are included in Appendix 4-1 to this EIAR.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Hardstands
- As Built Substation
- Proposed Met Mast Location
- Proposed Construction Compound
- Proposed Borrow Pit Location
- Proposed Roads and Widening
- Roads to be Upgraded
- Existing Site Roads

Drawing Title: Proposed Development Layout	
Project Title: Proposed Repowering of the Existing Kilgarvan Wnd Farm	
Drawn By: EL	Checked By: NMcH
Project No.: 211107	Drawing No.: Figure 4-1
Scale: 1:25,000	Date: 2024-04-23

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4.3 Development Components

This section of the EIAR describes the components of the Proposed Development. Further details regarding Access and Transportation (Section 4.4), Site Drainage (Section 4.6), Construction Phasing and Timing (Section 4.7), and Construction Methodologies (Section 4.7) are provided subsequently in this chapter.

4.3.1 Existing Kilgarvan Wind Farm

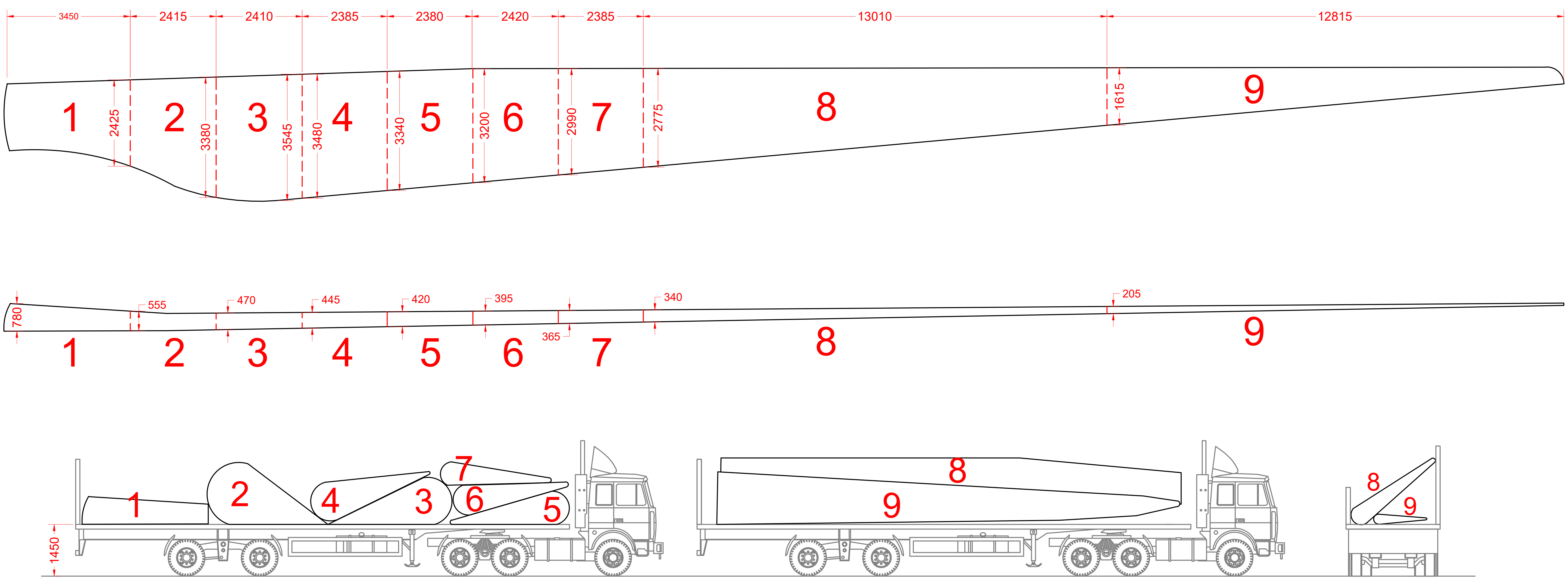
4.3.1.1 Removal of Existing Turbines

The existing 28 no. turbines onsite will be removed from site in accordance with Orsted policy, whereby all elements of the turbines will be recycled and reused, and no components will be sent to landfill. A methodology for the decommissioning of the turbine blades is set out below:

- Blades will be segmented into approximately 9 pieces using an excavator mounted shear;
- Technicians will remove root rings and any other associated metal for recycling;
- The construction crew will ensure that there are no contaminants present (e.g. oils, brake dust, grease rubber hoses);
- Blade segments will then be lifted via telehandler to a suitable container for transport (e.g. 40 cubic yard RORO skips and/or trailer mounted articulated bulk carriers);
- Segments will then be transported to suitable licenced processing facilities, such as Kenmare Transfer Station (W0086), Coolcaslagh Transfer Station (W0072) or Killarney Waste Disposal Unlimited Company (W0217) to be shredded;
- The shredded output will be used in a suitable licenced cement co-processing or a waste-to-energy facility.

Figure 4-2 below illustrates the turbine removal process. The methodology for the removal of turbines from the site is detailed in Section 4.8.1.

The turbine nacelle and tower sections are metallic and can therefore also be recycled. The tower will be broken out into its original tower sections and will be transported offsite to a suitable licenced or waste processing facility, such as Kenmare Transfer Station (W0086), Coolcaslagh Transfer Station (W0072) or Killarney Waste Disposal Unlimited Company (W0217).



DRAWING TITLE: **Turbine Blade Decommissioning Detail**	
PROJECT TITLE: **Kilgarvan 1&2 Wind Farm Repowering, Co. Kerry**	
DRAWING BY: **KD**	CHECKED BY: **NMcH**
PROJECT No.: **211107**	DRAWING No.: **211107-Fig 1.0**
SCALE: **N.T.S @ A3**	DATE: **22.06.2023**

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4.3.1.2 Existing Onsite Electrical Cabling

Removal of the existing onsite electrical cabling will be dependent on how the cabling was placed during the construction of the Existing Kilgarvan Wind Farm. There will be two standard approaches to this based on the two methods of cable laying employed on the site:

- Where the cables have been direct buried in peat soils, they will be cut and left in situ;
- Where the cables have been ducted, the cable will be cut at both ends and pulled from the cable duct.

The 2 no. options above have been determined to be the most environmentally prudent methods to deal with the decommissioning of the onsite electrical cabling. It should be noted that, where onsite electrical cables facilitating the connection of the Proposed Development follow the same route as the Existing Kilgarvan Wind Farm cables, these existing cables will be removed once safe to do so.

4.3.1.3 Reinstatement of Site Infrastructure

The remaining onsite infrastructure includes a number of areas of existing hardstanding associated with the existing turbine foundations, existing met mast hardstand and sections of existing roadway.

4.3.1.3.1 *Existing Road Network*

The Proposed Development will make use of the majority of the existing road network within the site as shown on Figure 4-1 above. Approximately 17.9m of the existing road network will be upgraded to facilitate the Proposed Development. Please refer to Section 4.3.3 below for further detail on this.

There are sections of the existing road network which will not be upgraded to facilitate the Proposed Development. These will remain in use by local landowners to access livestock or will be left to naturally regenerate. This will occur by letting natural ecological regeneration and succession take place. Existing roads not being utilised for the Proposed Development can be seen on Figure 4-1.

4.3.1.3.2 *Existing Turbine Hardstands*

Some of the existing turbine hardstands are being re-used for the construction of the temporary construction compounds and the proposed meteorological mast. For further detail, please refer to Sections 4.3.8 and 4.3.9 respectively.

In addition some of the existing hardstanding areas will be used as part of the new proposed hardstanding for proposed turbines T6 and T7. These areas will be upgraded as detailed in Section 4.3.2 below.

The remaining hardstands which will not be re-used to host elements of the Proposed Development, will be left to naturally regenerate in a similar manner to existing access roads as outlined above in Section 4.3.1.3.1. This is considered the most environmentally prudent option.

4.3.1.3.3 *Existing Met Mast Hardstand*

The existing met mast hardstand will be decommissioned and left to regenerate in a similar manner to that outlined in Section 4.3.1.3.1 above.

4.3.1.3.4 *Existing Borrow Pit*

The existing borrow pit will be extended in size and re-used to facilitate the construction of the Proposed Development. For further detail, please refer to Section 4.3.4 below.

4.3.2 Proposed Wind Turbines

4.3.2.1 Turbine Locations

The proposed wind turbine layout has been optimised using wind farm design software (WindPro) to maximise the energy yield from the wind farm site, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance. The turbine layout was also designed with the existing road network in mind. The Grid Reference coordinates of the proposed turbine locations are listed in Table 4-1 below.

Table 4-1 Proposed Wind Turbine Locations and Elevations

Turbine	ITM Coordinates		Top of Foundation Elevation (mOD)
	Easting	Northing	
T1	510195	576422	434
T2	509471	576080	382
T3	509384	576814	424
T4	508826	577136	429
T5	508211	577367	413
T6	507578	577739	344
T7	506871	577385	301
T8	508469	576459	368
T9	507639	576486	367
T10	507043	576549	366
T11	507822	576004	307

4.3.2.2 Turbine Type

Wind turbines use the energy from the wind to generate electricity. A wind turbine, as shown in Plate 4-1 below, consists of four main components:

- Foundation unit
- Tower
- Nacelle (turbine housing)
- Rotor

Plate 4-1 Wind turbine components

A turbine range is being applied for and assessed within this EIAR as part of the planning application, as laid out in Table 4-2 below. Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics, with only minor cosmetic differences differentiating one from another. The wind turbines that will be installed as part of the Proposed Development will be conventional three-blade turbines, that will be geared to ensure the rotors of all turbines rotate in the same direction at all times.

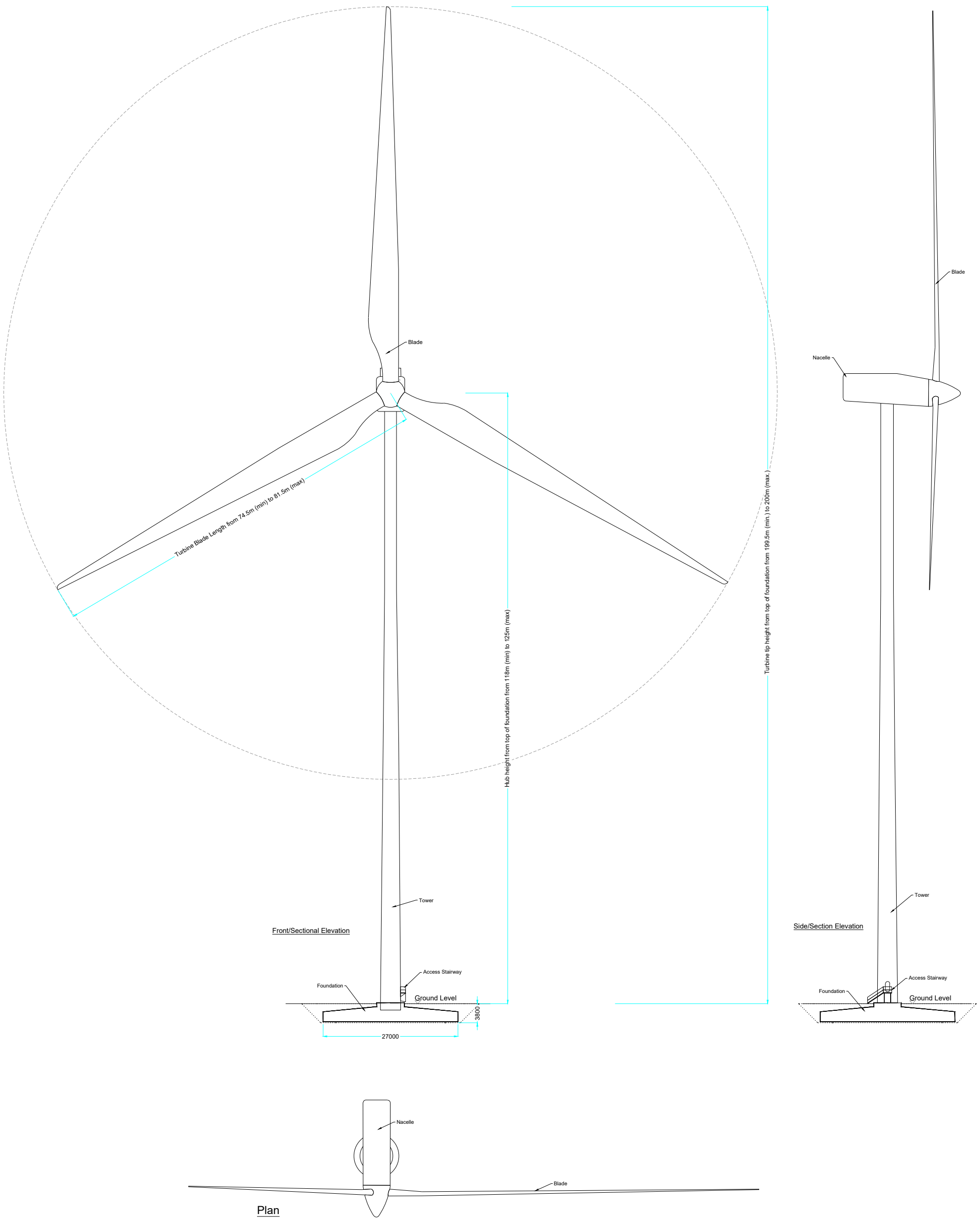
For the purposes of this EIAR, and as a means to comprehensively assess the proposed range being applied for, the below turbine scenarios have been selected, considered and assessed in the EIAR. Turbine design parameters have a bearing on the assessment of all elements being assessed within the EIAR chapters, and so are addressed as appropriate within Chapters 5 to 16).

Table 4-2 Turbine Dimensions for Assessment

Scenario	Tip Height (metres)	Hub Height (metres)	Rotor Diameter (metres)	Blade Length (metres)
Model 1	199.5	125	149	74.5
Model 2	199.5	118	163	81.5
Model 3	200	122.5	155	77.5

Drawings of the proposed wind turbine models within the proposed range are shown in Figure 4-2, Figure 4-3, and Figure 4-4. Figures 4-2 to 4-4 also show the turbine base layout, including turbine foundations, hard standing areas, assembly areas, access roads and surrounding works areas.

The individual components of a geared wind turbine nacelle and hub are shown in Figure 4-5 below.



Drawing Notes

1. Proposed wind turbines to have a maximum ground to blade tip height of up to 200m.
2. Exact make and model of the turbine to be dictated by a competitive tender process.
3. Installed wind turbine not to exceed maximum size envelope set out above in any blade length and hub-height configuration.
4. Turbine foundation diameter may vary.
5. Ground level represents the top of turbine foundation.

DRAWING TITLE: **Wind Turbine Range Elevations & Plan**	
PROJECT TITLE: Kilgarvan Wind Farm Repowering, Co. Kerry	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Orla Murphy**
PROJECT No.: **211107**	DRAWING No.: **Fig 4-3**
SCALE: **1:500 @A1**	DATE: **07.05.2024**

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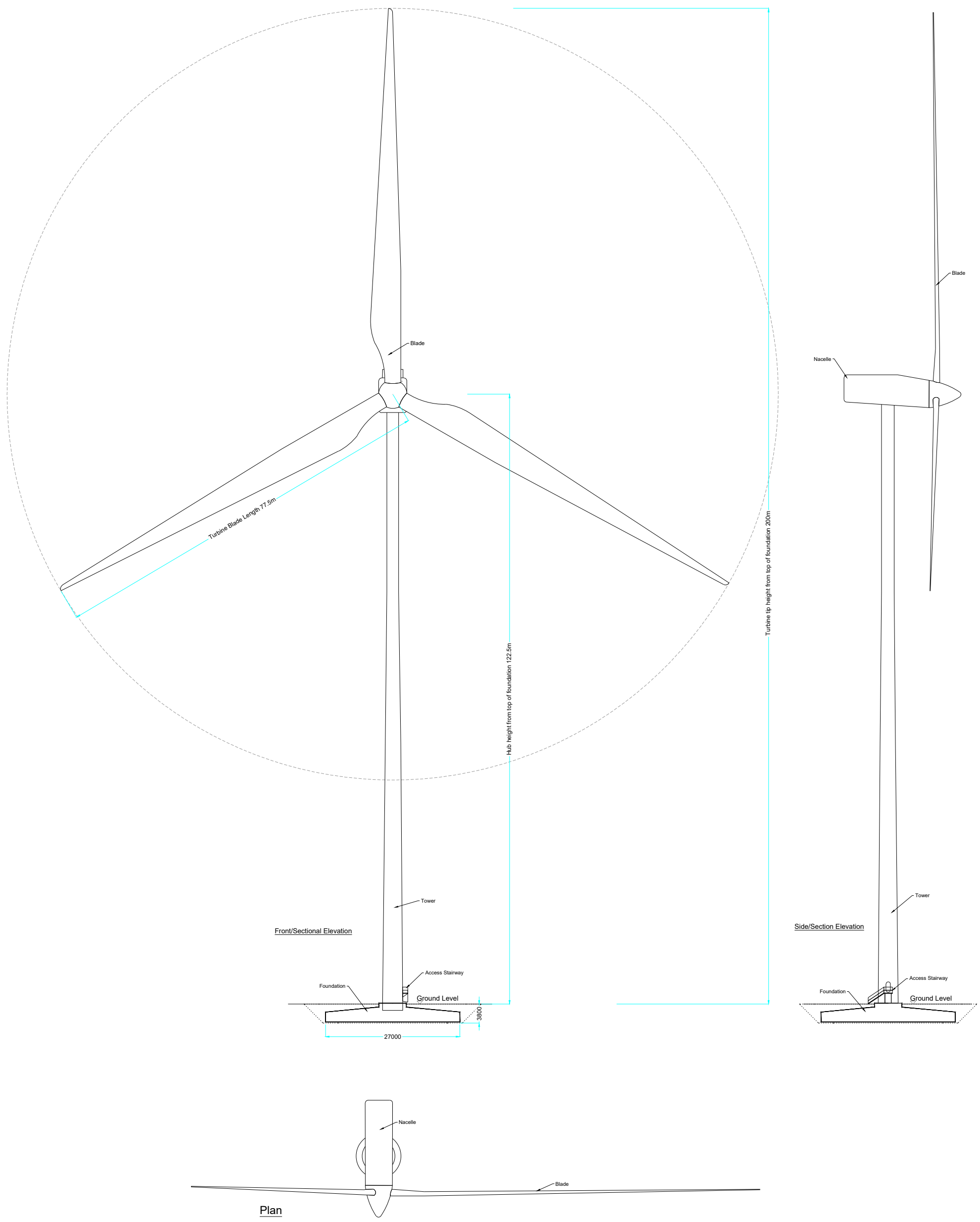

Drawing Notes

1. Proposed wind turbines to have a maximum ground to blade tip height of up to 200m.
2. Exact make and model of the turbine to be dictated by a competitive tender process.
3. Installed wind turbine not to exceed maximum size envelope set out above in any blade length and hub-height configuration.
4. Turbine foundation diameter may vary.
5. Ground level represents the top of turbine foundation.

DRAWING TITLE: **122.5m hub and 77.5m blade Wind Turbine Elevations & Plan**	
PROJECT TITLE: Kilgarvan Wind Farm Repowering, Co. Kerry	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Orla Murphy**
PROJECT No.: **211107**	DRAWING No.: **Fig 4-4**
SCALE: **1:500 @A1**	DATE: **07.05.2024**

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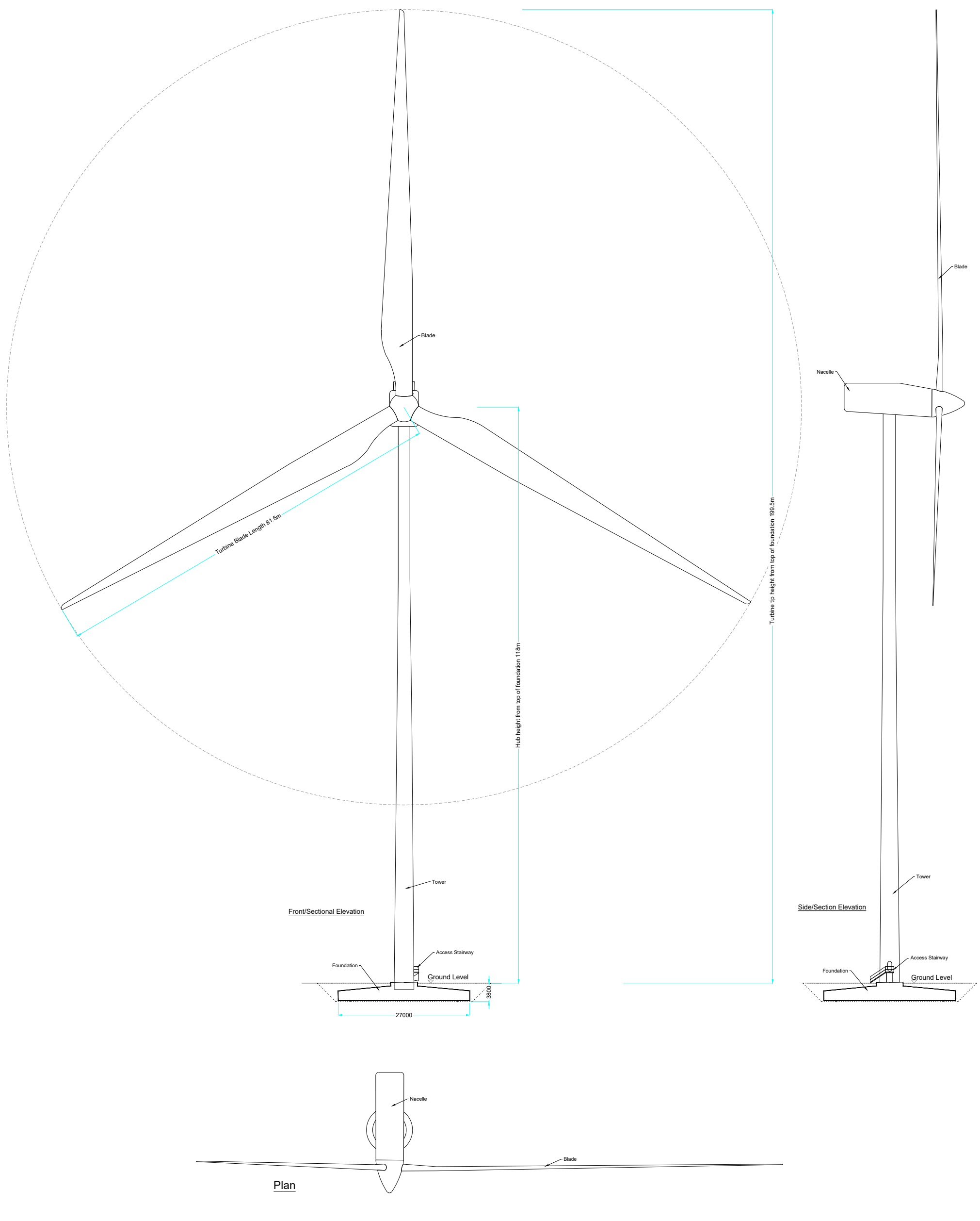

Drawing Notes

1. Proposed wind turbines to have a maximum ground to blade tip height of up to 199.5m.
2. Exact make and model of the turbine to be dictated by a competitive tender process.
3. Installed wind turbine not to exceed maximum size envelope set out above in any blade length and hub-height configuration.
4. Turbine foundation diameter may vary.
5. Ground level represents the top of turbine foundation.

DRAWING TITLE: **118m hub and 81.5m blade Wind Turbine Elevations & Plan**	
PROJECT TITLE: Kilgarvan Wind Farm Repowering, Co. Kerry	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Orla Murphy**
PROJECT No.: **211107**	DRAWING No.: **Fig 4-5**
SCALE: **1:500 @A1**	DATE: **07.05.2024**

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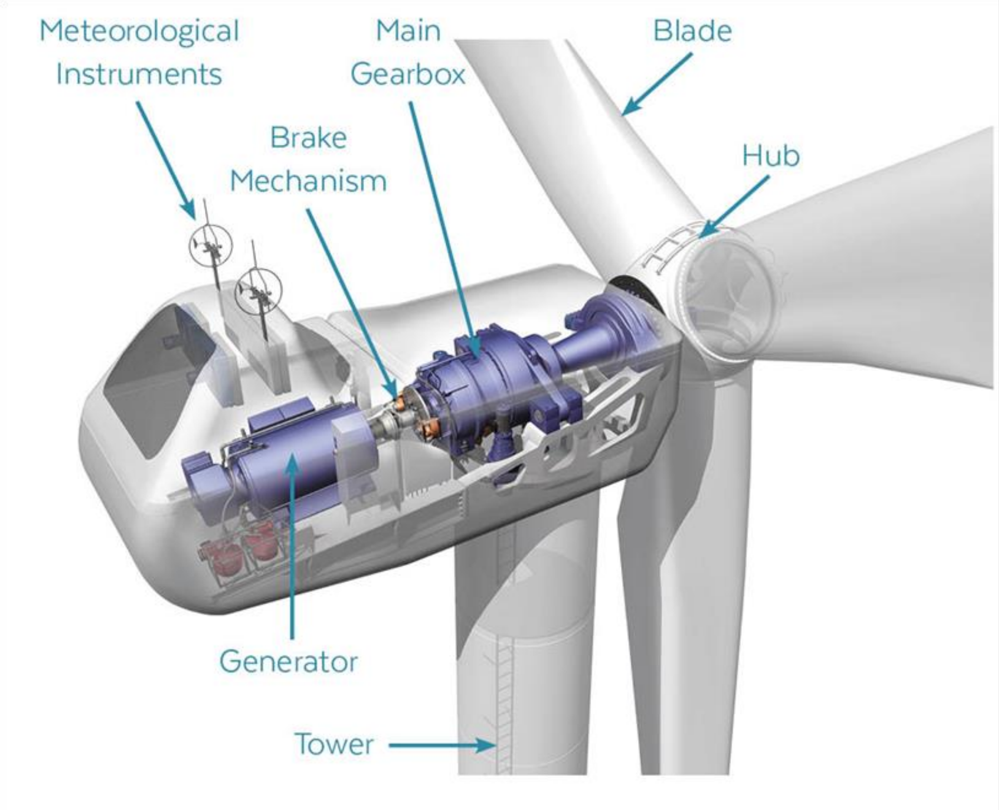


Figure 4-6 Turbine nacelle and-5 hub components

4.3.2.3 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level. The size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process. Different turbine manufacturers use different shaped turbines foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. The turbine foundation transmits any load on the wind turbine into the ground. The horizontal and vertical extent of the turbine foundation will be 27m and 4m respectively, which has been assessed in the EIAR and is shown in Figure 4-4.

After the foundation level of each turbine has been formed using piling methods or on competent strata (i.e. bedrock or subsoil of sufficient load bearing capacity), the “Anchor Cage” is levelled and reinforcing steel is then built up around and through the anchor cage. The outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete and is backfilled accordingly with appropriate granular fill to finished surface level (Plate 4-2 below).

Plate 4-2 Turbine 'Anchor Cage' and finished turbine base.

4.3.2.4 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations once the turbine foundation is in place. All crane hardstand areas will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The crane hardstands will be constructed in a similar manner to the excavated site roads and will measure approximately 40m x 110m. The sizes, arrangement and positioning of hard standing areas are dictated by turbine suppliers. The proposed hard standing areas are illustrated in the detailed drawings included in Appendix 4-1 of this report. The extent of the required areas at each turbine location may be optimised on-site depending on topography, position of the site access road, the proposed turbine position and the turbine supplier's exact requirements.

4.3.2.5 Assembly Area

Levelled assembly areas will be located on either side of the hard-standing area as shown on Figure 4-4. These assembly areas are required for offloading turbine blades, tower sections and hubs from trucks until such time as they are ready to be lifted into position by cranes and to assist the main crane during turbine assembly. The extent of the area required for the assembly areas is shown on Figure 4-4 and the detailed drawing in Appendix 4-1.

4.3.2.6 Power Output

Modern wind turbine generators currently have a typical generating capacity in the 4 to 7 MW range, with the generating capacity continuing to evolve upwards as technology improvements are achieved by the turbine manufacturers. Turbines of the exact same make, model and dimensions can have different power outputs depending on the capacity of the electrical generator installed in the turbine nacelle. The exact power rating of the installed turbine will be designed to match the wind regime on the Proposed Development site and will be determined by the selected manufacturer.

For the purposes of this EIAR, a rated output of 6.6MW has been chosen to calculate the power output of the proposed 11-turbine wind farm, which would result in an estimated installed capacity of 72.6 MW.

Assuming an installed capacity of 72.6 MW, the Proposed Development therefore has the potential to produce up to 235,311 MWh of electricity per year, based on the following calculation:

A x B x C = Megawatt Hours of electricity produced per year

where: A = ... The number of hours in a year: 8,760 hours

B = ...The capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc. A capacity factor of 37% is applied here.

C = ... Rated output of the wind turbines: 72.6 MW

The 235,311 MWh of electricity produced by the Proposed Development would be sufficient to supply approximately 56,026 Irish households with electricity per year, based on the average Irish household using 4.2 MWh of electricity[1] (this latest figure is available from the March 2017 CER Review of Typical Consumption Figures Decision Paper).

The 2022 Census of Ireland recorded a total of 58,317 occupied households in Co. Kerry. Per annum, based on a capacity factor of 37%, the Proposed Development would therefore produce sufficient electricity for the equivalent of over 95% of all households in Co. Kerry.

With regard to the modern turbine range of 4 – 7 MW, the resulting electricity produced would range from 142,613 MWh to 249,572 MWh per annum. The lower end of this range (142,613MWh) would be sufficient to supply approximately 33,955 Irish households with electricity per year, based on the average Irish household using 4.2MWh of electricity. The higher end of this range (33,955MWh) would be sufficient to supply approximately 59,422 Irish households with electricity per year, based on the average Irish household using 4.2MWh of electricity. Based on the 2022 Census of Ireland results for Co. Kerry, the output range would produce sufficient electricity for the equivalent of 58% and over 100% respectively.

4.3.3 Site Roads

As stated above, the proposed turbine layout was designed so as to make use of the existing wind farm road network. As can be seen in Figure 4-1, the existing road network will be upgraded to facilitate the Proposed Development, with only minor upgrades (i.e. resurfacing and widening in places) due to take place.

4.3.3.1 Road Construction Types

To provide access within the Proposed Development site and to connect the wind turbines and associated, infrastructure, existing roads will be upgraded and new access roads will be constructed. The road construction design has taken into account the following key factors:

1. *Buildability considerations;*
2. *Making use of existing infrastructure where possible;*
3. *Minimising excavation arisings;*
4. *Serviceability requirements for construction and wind turbine delivery and maintenance vehicles;*
5. *Peat depths;*
6. *Horizontal longitudinal and cross fall gradient of the roads, and,*
7. *the requirement to minimise disruption to peat hydrology.*

Whilst the above key factors are used to determine the road design, the actual construction technique employed for a particular length of road will be determined on the prevailing ground conditions encountered along that length of road.

The Proposed Development makes use of the existing road network insofar as possible. It is proposed to upgrade approximately 17.9 kilometres of existing site roads, and to construct approximately 1.5 kilometres of new access road on the site. As can be seen on Figure 4-1, there are areas of the existing road network for upgrade which will be wide enough to allow for construction vehicles to safely pass each other on the roads. Some of these areas were constructed as passing bays and formed through the widening of roads to facilitate turbine delivery for the Existing Kilgarvan Wind Farm.

[1] *March 2017 CER (CRU) Review of Typical Consumption Figures Decision Paper* https://www.cru.ie/document_group/review-of-typical-consumption-figures-decision-paper/

4.3.3.1.1 Upgrade of Existing Access Roads

The extensive existing road network was constructed as part of the Existing Kilgarvan Wind Farm. There will be 17.9km of the existing road network upgraded as part of the Proposed Development in order to facilitate site access, turbine delivery, construction and maintenance.

The construction methodology for upgrading of existing sections of founded roads is summarised below.

1. *Excavation on one or both sides of the existing access road to competent strata.*
2. *Benching of existing road and placement of granular fill in layers, following the designer's specification.*
3. *Overlay of the existing access road with selected granular fill following the designer's specification.*
4. *Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid should be placed on top of the existing floated access road.*
5. *Access roads are to be finished with a granular running surface across the full width of the road.*
6. *A layer of geogrid/geotextile may be required at the surface of the existing access road following the designer's specification.*

The construction methodology for the upgrade of existing floated roads is laid out below:

1. *Placement of tree brash and/or a geotextile onto on one or both sides of the existing access road directly onto the peat surface, following the designer's specification;*
2. *Benching of existing road and placement of granular fill and reinforcing geogrids in layers following the designer's specification, with due regard to any settlement of peat anticipated for the widened area;*
   a) *It may be necessary to stage the widening to maintain peat stability – i.e. to reduce the rate of placement of fill to allow the peat layers to consolidate and increase in strength;*
   b) *It may be necessary to anchor the geogrids into the existing roads, which would require significant benching of existing roads.*
3. *Overlay of the existing access road with selected granular fill following the designer's specification;*
   c) *Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid should be placed on top of the existing floated access road;*
   d) *The surface of the existing access road should be graded/levelled before the placement of any geogrid/geotextile, where necessary (to prevent damaging the geogrid/geotextile;*
4. *Access roads are to be finished with a layer of capping across the full width of the road;*
   e) *A layer of geogrid/geotextile may be required at the surface of the existing access road following the designer's specification.*

Where there are cross slopes, any road widening works required will be carried out on the upslope side of the existing access road, where possible. Particular design details will be required at detailed design at the transitions between floating and founded roads to reduce differential settlements between the two construction types.

4.3.3.1.2 Construction of New Roads

There are a few short stretches of new access roads needed in order to facilitate the Proposed Development, as can be seen on Figure 4-1.

Due to the ground conditions, new access roads proposed on the Proposed Development site are proposed to be a combination of founded and floated roads.

The make-up of the founded access roads will be a stone thickness of 500mm. The requirement for a layer of geotextile and geogrid and the necessary stone thickness will be confirmed by the Site Engineer.

The construction methodology for construction of excavated roads is summarised below.

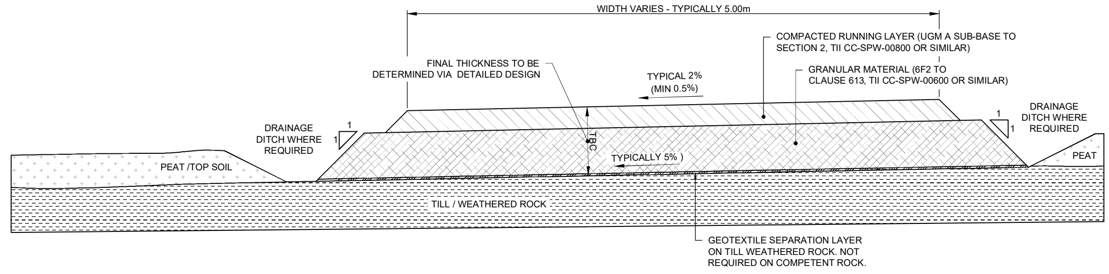
1. *Excavation of the new access road to competent strata (see Appendix 4-2 for guidance on the correct handling and placement of the different peat layers).*
    a) *Drainage shall be installed to divert surface and groundwater from the construction areas.*
2. *Placement of granular fill in layers following the designer's specification.*
3. *Access roads are to be finished with a granular running surface across the full width of the road.*
    a) *A layer of geogrid/geotextile may be required at the surface of the existing access road following the designer's specification.*

The construction methodology for new floating roads is summarised below:

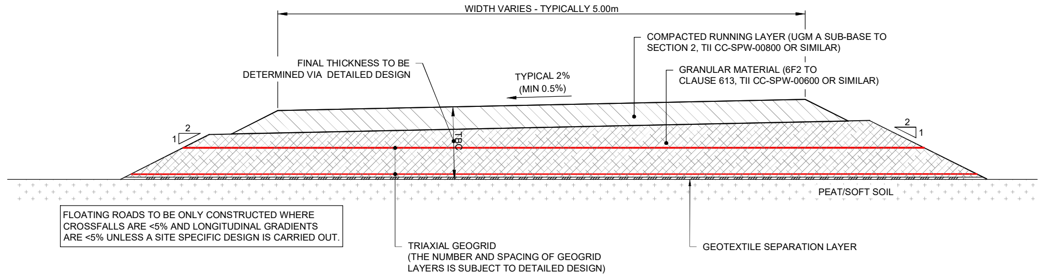
1. *Placement of a geotextile or geogrid directly onto the peat surface following the designer's specification*
2. *Placement of granular fill and reinforcing geogrids in layers following the designer's specification, with due regard to any settlement and deformation of peat anticipated at the access track*
    a) *It may be necessary to stage the road construction to maintain peat stability – i.e. to reduce rate of placement of fill to allow the peat layers to consolidate and increase in strength.*
    b) *Drains shall be installed within the road itself to divert surface and groundwater from upslope to downslope*
    c) *Stone delivered to the floating road construction shall be end-tipped onto the constructed floating road in a manner as to avoid excessive impact loading on the peat due to concentrated end-tipping. Direct tipping of stone onto the peat shall not be carried out*
    d) *Stone will be spread and placed from the constructed floating road onto the peat surface using a bulldozer*
3. *Access roads are to be finished with a granular running surface across the full width of the road.*
4. *A layer of geogrid/geotextile may be required within the stone fill as specified by the detailed designer.*

No excavations (e.g. drainage, peat cuttings) will be carried out within 5m distance of a completed floated access road edge, or at a distance determined following a site inspection. The presence of excavations can destabilise the road. Temporary excavations, where required, should be excavated in short lengths and backfilled as soon as practicable.

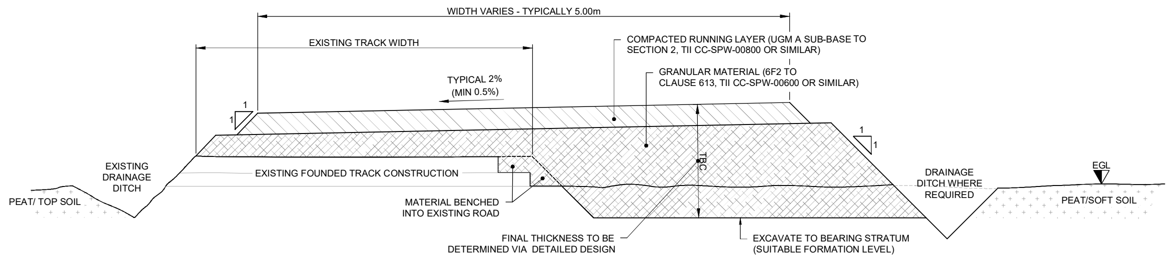
Section of a new excavated road and the upgrade to existing roads are shown in Figure 4-7.



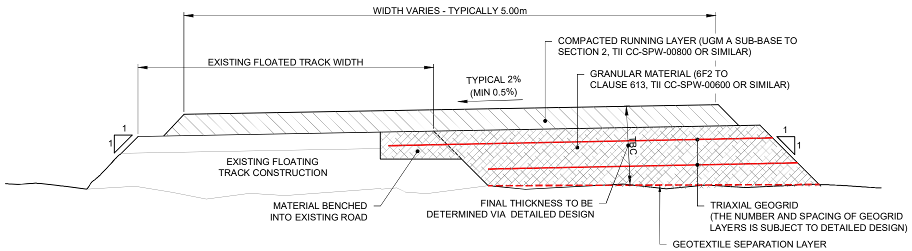
TYPICAL DETAIL A - SECTION THROUGH NEW FOUNDED ACCESS TRACK



TYPICAL DETAIL B - SECTION THROUGH NEW FLOATED ACCESS TRACK



TYPICAL DETAIL C - WIDENING OF EXISTING FOUNDED TRACK



TYPICAL DETAIL D - WIDENING OF EXISTING FLOATING TRACK

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. DO NOT SCALE FROM THIS DRAWING.
3. THE STRENGTH OF THE SUBFORMATION SOILS TO BE ASSESSED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION / PLACEMENT OF FILL.
4. DRAINAGE TO BE PROVIDED IN-LINE WITH DRAINAGE STRATEGY.
5. DRAWING REPRESENTS INDICATIVE DESIGN FOR PLANNING ONLY, **NOT FOR CONSTRUCTION**.

REV: FI -00	DATE: 12/01/22	DRAWN BY: R.R.	CHECKED BY: S.C
DESCRIPTION:	ISSUED FOR INFORMATION		

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ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: KILGARVAN

DRAWING No: 22022-GDG-ZZ-XX-DR-C-0010

Revision: -FI -00

DRAWING TITLE: CROSS SECTION THROUGH GENERAL ACCESS TRACK DETAILS

SCALE: 1:25	SHEET SIZE: A1	DATE: 12/01/2023
DRAWN BY: R.R.	CHECKED BY: S.C	APPROVED BY: P.Q.

4.3.4 Borrow Pit

4.3.4.1 Description

It is proposed to develop 1 no. borrow pit as part of the Proposed Development. The proposed borrow pit is an extension to the existing onsite borrow pit which was used to facilitate the Existing Kilgarvan Wind Farm. The proposed extension to the existing onsite borrow pit will provide the majority of all rock and hardcore material required during construction of the Proposed Development. Usable rock may also be won from other infrastructure construction, including the turbine base excavations.

The borrow pit measures approximately 22,650m^2. It is located alongside an existing access road leading to T9 in the centre of the site.

The borrow pit is shown in Figure 4-1 and on the detailed site layout drawings included as Appendix 4-1 to this EIAR (REF 22022-GDG-ZZ-XX-DR-C-0001). Figure 4-10 below shows detailed sections through the proposed borrow pit. The borrow pit will be reinstated with excavated peat and subsoils as described in Section 4.3.5 below.

Post-construction, the borrow pit area will be permanently secured. A stock-proof fence will be erected around the borrow pit perimeters to prevent access. Appropriate health and safety signage will also be erected on the fencing and at locations around the fenced area.

At certain turbine foundation and hardstand locations, depending on local ground conditions, the extraction of rock may be required in order to obtain a level construction area. Any rock obtained from a turbine location will be used to supply the hardcore materials requirement for that turbine's hardstand and access road.

Hardcore materials will be extracted from the proposed extension to the existing borrow pit (and some turbine locations, if necessary), principally by means of rock breaking. Depending on the hardcore volume, blasting may also be used as a more effective rock extraction method, capable of producing significant volumes of rock in a matter of milliseconds. Blasting will only be carried out after notifying any potentially sensitive residents. The procedure surrounding blasting is detailed below in Section 4.3.4.2.2 The potential noise and vibration impact on sensitive receptors associated with the rock extraction measures, detailed below, are assessed in Chapter 12 of this EIAR.

The estimated volume of crushed stone to be extracted from the proposed extension to the existing borrow pit and required for the construction of the Proposed Development is 369,530m^3.

A section drawing of the proposed borrow pit is shown as Figure 4-8 below.

The two proposed extraction methods are detailed below.

4.3.4.2 Rock Extraction Methods

The extraction of rock from the borrow pit will be a temporary operation during the construction phase of the Proposed Development. There is a layer of peat and subsoil present at some areas at the borrow pit location, which will be stripped back and temporarily stockpiled using standard tracked excavators. Two extraction methods have been assessed for breaking out the useful rock below: rock breaking and blasting.

4.3.4.2.1 *Rock Breaking*

Weathered or brittle rock can be extracted by means of a hydraulic excavator and a ripper attachment. This is a common extraction methodology where fragmented rock is encountered as it can be carefully excavated in layers. In areas where stronger rock is encountered and cannot be removed by means of excavating then a rock breaking methodology may be used. Rock breaking equipment comprises a large hydraulic 360-degree excavator with a rock breaker attachment. Given the power required to break out tight and compact stone at depth, the machines are generally large and in the 40-60 tonne size range. Even where rock might appear weathered or brittle at the surface, the extent of weathering can quickly diminish with depth resulting in strong rock requiring significant force to extract it at depths of only a few metres.

A large rock breaking excavator progressively breaks out the solid rock from the ground in the borrow pit area. A smaller rock breaker, in the 30-40 tonne size range, then breaks the rocks down to a size that can then be fed into a crusher.

The extracted, broken rock is loaded into a mobile crusher using a wheeled loading shovel and crushed down to the necessary size of graded stone required for the on-site civil works. The same wheeled loader takes the stone from the crusher conveyor stockpile and stockpiles it elsewhere within the borrow pit, away from the immediate area of the crusher, until it is required elsewhere within the site.

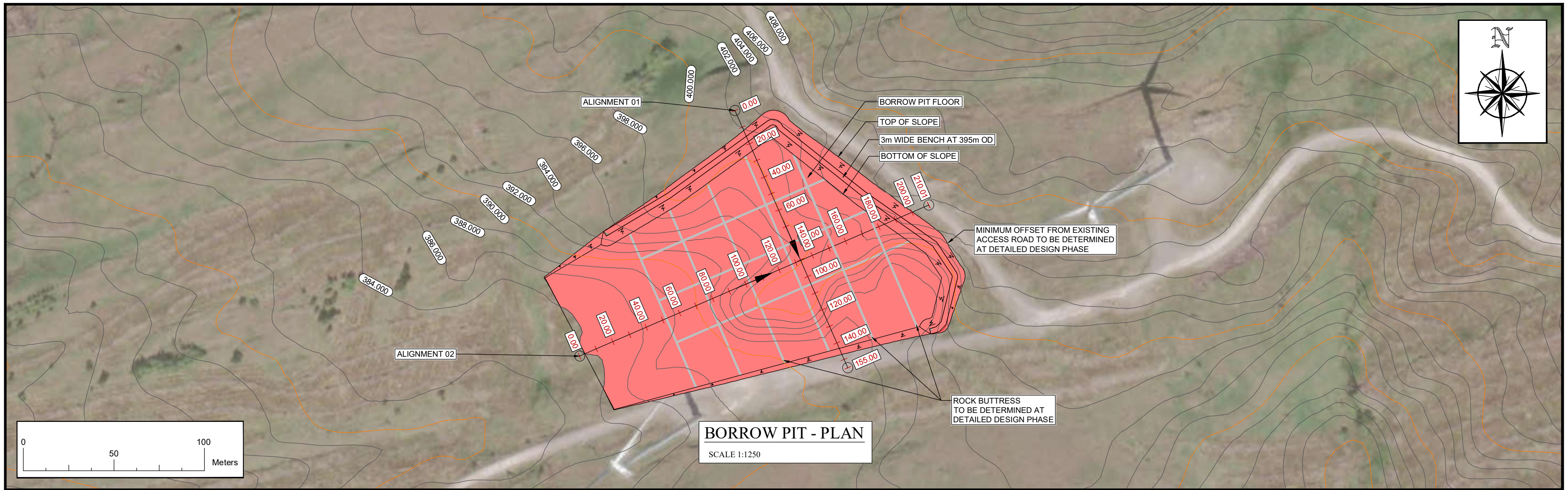
4.3.4.2.2 Rock Blasting

Where blasting is used as an extraction method, a mobile drilling rig is used to drill vertical boreholes into the area of rock that is to be blasted. A drilling rig will drill the necessary number of boreholes required for a single blast in approximately 3 to 4 days. The locations, depth and number of boreholes are determined by the blast engineer. This is a specialist role fulfilled by the blasting contractor.

The blast engineer will arrange for the necessary quantity of explosive to be brought to site to undertake a single blast. The management of explosives onsite and the actual blasting operation will be agreed in advance with and supervised by An Gardaí Siochána. The blast engineer sets the explosives in place in the boreholes, sets the charges, and fires the blast.

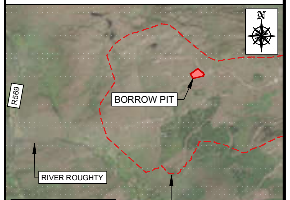
A properly designed blast should generate rock of a size that can be loaded directly into a mobile crusher, using the same wheeled loader outlined above. The same method is used for processing the rock generated from a blast, as would be used to process rock generated by rock breaking. Generally, the drilling rig will recommence drilling blast holes for the next blast as soon as one blast is finished. The potential impacts and control measures associated with noise and vibration from this extraction method are assessed in Chapter 12: Noise and Vibration. Any blasting will be carried out in accordance with the *Guidance on the Safe Use of Explosives in Quarries* (Safety and Health Commission for the Mining and Other Extractive Industries, 2002)[2], the British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*[3] and British Standard BS647-2: 2008 *'Guide to evaluation of human exposure to vibration in buildings. Blast-induced vibration.'*[4]

[2] https://www.hsa.ie/eng/Publications_and_Forms/Publications/Mines_and_Quarries/Guidance%20on%20the%20Safe%20Use%20of%20Explosives%20in%20Quarries.pdf
[3] https://www.thenbs.com/PublicationIndex/documents/details?Pub=BSI&DocID=305965
[4] https://www.thenbs.com/PublicationIndex/documents/details?Pub=BSI&DocID=286768



NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED
2. USE DIMENSIONS ON DRAWINGS (DO NOT SCALE FROM DRAWINGS).
3. EXISTING GROUND LEVEL ARE BASED ON DTM 5m BLUESKY 2018 CONTOURS 2m.
4. PLAN SHOWS BORROW PIT EXCAVATION ONLY.
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS DRAWINGS AND SPECIFICATIONS.
6. THE OUTLINE AND CROSS SECTIONS ARE INDICATIVE AND ARE SUBJECT TO DETAILED DESIGN AND SLOPE STABILITY ASSESSMENT.
7. ENGINEERED ROCK BUTTRESS MAY BE LEFT IN-SITU TO RESTRAIN CELLS OF PLACED PEAT AND OVERBURDEN.
8. EXCAVATION SHOULD BE OPTIMISED TO AVOID AREAS OF DEEPER PEAT.
9. IN-SITU ROCK SLOPE SHALL BE FORMED AT STABLE INCLINATIONS TO SUIT LOCAL ROCK CONDITIONS AND SUBJECT TO DETAILED DESIGN.
10. GEOGRID TO BE PLACED TO STRENGTHEN SURFACE OF PLACED PEAT & SPOIL, AS REQUIRED.
11. THE LOCATION OF THE ROCK BUTTRESSES SHOWN FOR THE BORROW AREAS ARE INDICATIVE ONLY AND SUBJECT TO DETILED DESIGN.
12. THE EXCAVATABILITY OF THE ROCK AND DEPTH TO TOP OF ROCK WITHIN THE BORROW PIT WILL NEED TO BE DETERMINED FROM FURTHER CONFIRMATORY GROUND INVESTIGATION.
13. REINSTATEMENT OF PEAT TO BE CARRIED OUT IN LINE WITH 22022-R-02-PMP-00 PEAT MANAGEMENT PLAN .
14. EXCAVATION TECHNIQUES TO BE CONFIRMED FOLLOWING GROUND INVESTIGATION.
15. GEOGRID REINFORCEMENT TO BE LAID NEAR SURFACE TO MAXIMISE STABILITY FOR SURFACE LAYER.
16. BORROW PIT ACCESS AND DRAINAGE PROVISIONS (UP SLOPE CUT OFF DRAINS ETC.) TO BE DETERMINED THROUGH DETAILED DESIGN.



KEYPLAN

SCALE 1:50,000

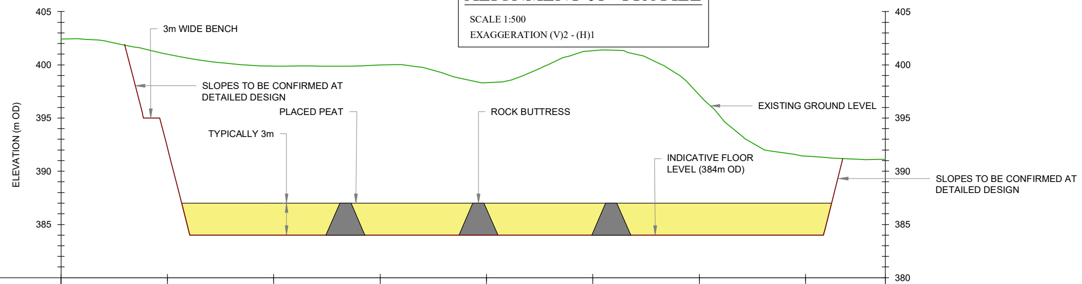
LEGEND:

BORROW PIT CUT AREA (ESTIMATED VOLUME = 207,379 m³)

INDICATIVE DESIGN ONLY, ELEMENTS OF DESIGN MAY NEED TO BE REVISED OR FURTHER DEVELOPED. PLEASE CHECK WITH DESIGN ENGINEER INITIALED IN TITLEBLOCK PRIOR TO REFERRING TO INFORMATION WITHIN THIS DRAWING.

ALIGNMENT 01 - PROFILE

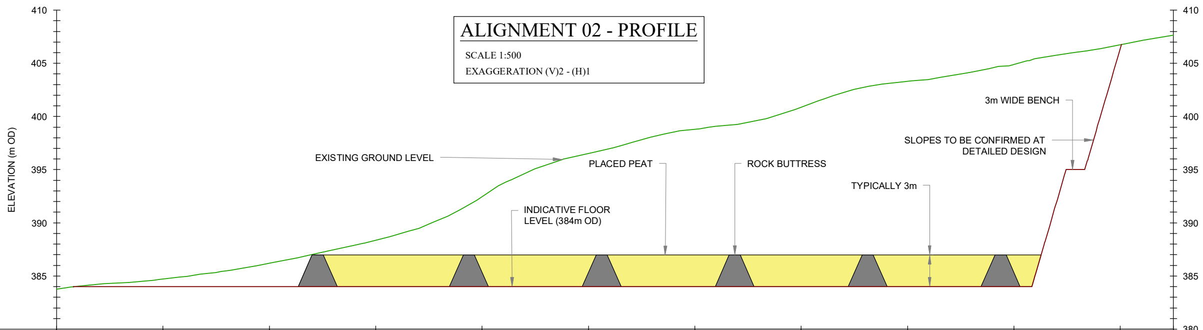
SCALE 1:500
EXAGGERATION (V)2 - (H)1



CHAINAGE (m)	0+00.00	0+20.00	0+40.00	0+60.00	0+80.00	1+00.00	1+20.00	1+40.00	1+55.00
EXISTING LEVELS (m OD)	402.437	400.986	399.881	399.985	398.322	401.318	397.182	391.424	391.134

ALIGNMENT 02 - PROFILE

SCALE 1:500
EXAGGERATION (V)2 - (H)1



CHAINAGE (m)	0+00.00	0+20.00	0+40.00	0+60.00	0+80.00	1+00.00	1+20.00	1+40.00	1+60.00	1+80.00	2+00.00	2+10.00
EXISTING LEVELS (m OD)	383.762	384.719	386.196	388.371	392.464	396.536	398.796	400.872	403.320	404.896	406.746	407.638

REV: FI -01	DATE: 30/11/23	DRAWN BY: E.F.C.	CHECKED BY: C.E.
DESCRIPTION:	UPDATED BORROW PIT LEVELS AND SLOPES		
REV: FI -00	DATE: 24/10/22	DRAWN BY: J.F.G	CHECKED BY: S.C.
DESCRIPTION:	ISSUED FOR INFORMATION		

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ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: KILGARVAN WIND FARM REPOWERING

DRAWING No: 22022-GDG-ZZ-XX-DR-C-0001 Revision: -FI -01

DRAWING TITLE: BORROW PIT PLAN AND SECTIONS

SCALE: SHOWN	SHEET SIZE: A1	DATE: 24/10/2022
DRAWN BY: J.F.G	CHECKED BY: S.C.	APPROVED BY: J.O'D

4.3.5 Peat and Spoil Management Plan

4.3.5.1 Quantities – Peat, Spoil and Stone

The quantity of peat and non-peat material (spoil), requiring management on the site of the Proposed Development has been calculated, as presented in Table 4-3 below. These quantities were calculated by Gavin and Doherty Geosolutions Ltd (GDG) as part of the *Peat and Spoil Management Plan* in Appendix 4-2 of this EIAR.

The total volume of stone required to construct the Proposed Development is based on the required fill volume and the total excavation areas for the various infrastructure elements. The stone needed to construct the Proposed Development will be primarily sourced from the proposed borrow pit onsite. A section of the proposed borrow pit can be seen in Figure 4-8 above. Further detail on the quantities of peat, spoil and stone proposed to be generated as part of the construction phase of the Proposed Development, please refer to Appendix 4-2 of this EIAR.

Table 4-3 Peat and Spoil Volumes requiring management

Infrastructure Item		Excavated Volume (m^3)		Peat Reinstatement Capacity (m^3)	Fill Volume (m^3)
		Total Volume of Peat	Total Volume of Stone		
Access Roads	Existing Roads (Floating and Founded)	10,180	64,480	15,840	117,780
	New Roads (Founded)	3,330	21,800	2,000	4,770
Turbine Foundations and Hardstands (Floated and Founded)		40,520	99,060	5,320	164,230
2 no. Temporary Construction Compounds		3,010	0	1,170	22,320
Borrow Pit		3,040	184,190	38,880	0
Existing Hardstands		0	0	7,380	0
Total		**60,080**	**369,530**	**70,590**	**309,100**

4.3.5.2 Peat and Spoil Usage in Restoration of Borrow Pits

Once the required volume of rock has been extracted from the borrow pit area, it is intended to reinstate this area with peat and overburden excavated from the works areas of the Proposed Development.

The contractor excavating the rock will be required to develop the borrow pit to allow the excavated peat and spoil to be placed safely. The final profile of the peat and spoil will vary across the base of the borrow pit. The volumes assessment carried out at the borrow pit suggests that the available stone fill capacity is in excess of the stone requirements at the site, allowing for contingency should any design changes be required following detail design. Only the stone volumes required for the Proposed

Development will be extracted from the borrow pit. The contractor will develop the proposed borrow pit to ensure that peat placement capacity is maintained.

It may be necessary to construct cells/rock buttresses or leave upstands of intact bedrock within the proposed borrow pit to contain the reinstated peat and overburden. This will allow for the safe placement and grading of the materials using dumper trucks and excavators. The buttresses will be wide enough to allow construction traffic access for the tipping of peat into the individual cells. Refer to Figure 4-8 above.

A geogrid or geotextile material may be used to aid in the strengthening of the upper surface of the deposited material within the proposed borrow pit and to aid in the promotion of growth and rehabilitation of the borrow pit area.

A rock buttress will be constructed at the downslope edge of the borrow pit to safely retain the infilled peat and spoil. The height of the rock buttresses constructed will be greater than the height of the infilled peat and spoil to prevent any surface peat and spoil run-off.

The rock buttress will be constructed as follows:

1. *The rock buttress will be founded on mineral soil or bedrock i.e. competent strata. The founding stratum for the rock buttress will be inspected and approved by the Project Geotechnical Engineer.*
5. *In order to prevent water retention occurring behind the buttresses, the buttresses will be constructed of coarse boulder fill with a high permeability. The buttress will be constructed of well graded granular rock fill of about 100mm up to typically 500mm in size. Alternatively, drains will be placed through the buttresses to allow excess water to drain.*
6. *The side slopes of the rock buttress will be constructed between 45 to 60 degrees.*

These works will be supervised by the project geotechnical engineer.

Where possible, the acrotelm peat that has been excavated and not retained for reinstatement and landscaping works will be stored with the vegetated side facing up so as to promote the growth of vegetation across the surface of the peat within the borrow pit area.

4.3.5.3 Peat and Spoil Placement Areas

It is proposed that any excess peat and spoil generated through construction activities, not used to reinstate the borrow pit, will be used for landscaping or be placed around selected turbines bases and hardstands. The areas around 11 no. turbine bases and hardstands have been assessed as suitable locations for peat and spoil placement due to suitable ground conditions including peat depths and slope angles .Spoil materials will also be side cast along the access road section to embed the access roads into the surrounding environment where slope and ground conditions allow, limiting their ecological and environmental impact. Consideration has been given to the sidecast of materials in areas of potential instability or additional mitigation requirements, as highlighted in Appendix 4-2 to this EIAR. Where permissible, side cast materials will be placed to a maximum height of 1m and placement widths of a minimum of 2 to 3m unless site-specific detail designs allow larger volumes to be placed. Large stockpiles of materials will not be placed on or adjacent to floated access roads. This is to avoid bearing failure of the underlying peat.

Placement or any reinstatement of excavated peat material will be carried out in a fashion which ties in with the existing natural topography and facilitates the reduction of the visual impact on the structures of the Proposed Development. This will be done by landscaping the placed peat with shallow slopes, promoting natural vegetation growth, and allowing for controlled drainage from all structures.

Peat material side casting will not be carried out on areas of planar bedrock outcrop slab as this will create a slip surface and potential washout risk. Peat placement or side casting will be carried out only in areas where it is topographically contained and does not create a propagated landslide risk as outlined in Appendix 4-2. All reinstatement works will be carried out with consideration to potential peat instability, having completed a diligent design and giving consideration to the findings of the associated Peat Stability Risk Assessment Report (Appendix 8-1). Works will be carried out under the supervision of an appropriately experienced geotechnical engineer and ecological Clerk of Works (ECoW).

Particular buffer areas, including construction buffers and peat stockpile restriction areas, have been highlighted in Appendix 4-2 for this development.

4.3.6 Existing 110kV Electricity Substation

It is intended to utilise the existing onsite 110kV Coomagearlahy electrical substation and associated overhead line to Clonkeen 110kV substation in order to connect the Proposed Development to the national grid. There are minor upgrades to the existing onsite 110kV Coomagearlahy substation proposed as part of this application in order to ensure that the existing onsite 110kV Coomagearlahy substation is in compliance with current EirGrid specifications. The upgrade works to the existing substation will include the following works:

- Replacement of existing M switchgear, control and protection equipment in the Coomagearlahy 3 control building to accommodate the change in the number of turbines and the reconfigured export capacity of the repowered site;
- Replacement of the existing MV/110kV 50MVA grid transformer in Coomagearlahy 3 HV compound with an MV/110kV 80MVA grid transformer to accommodate the reconfigured export capacity of the repowered site;
- Installation of a 110kV line/earth disconnector in Coomagearlahy 3 HV compound to EirGrid specification, and;
- Installation of a capacitor bank and harmonic filter in Coomagearlahy 3 HV compound to achieve compliance with the EirGrid Grid Code.

These works will be required to extend the capacity of the existing onsite 110kV Coomagearlahy substation to cater for the Proposed Development, located within the existing substation footprint.

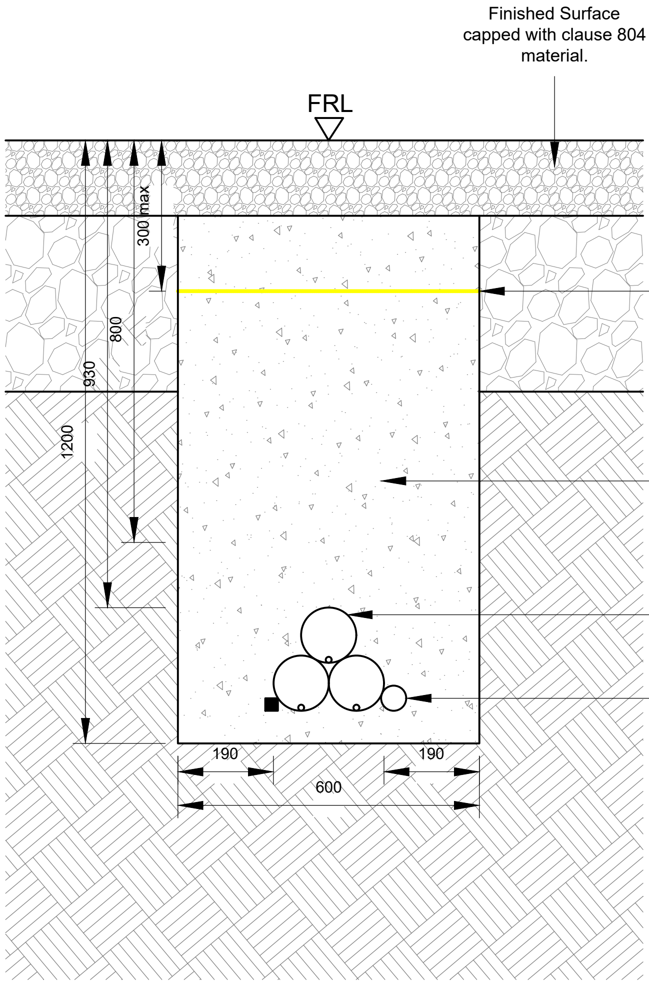
There will be no upgrade works or alterations to the existing overhead line which connects the existing onsite 110kV Coomagearlahy substation to Clonkeen 110kV substation. All upgrades to the existing onsite 110kV Coomagearlahy substation will be within the existing footprint.

4.3.6.1 Wind Farm Control Buildings

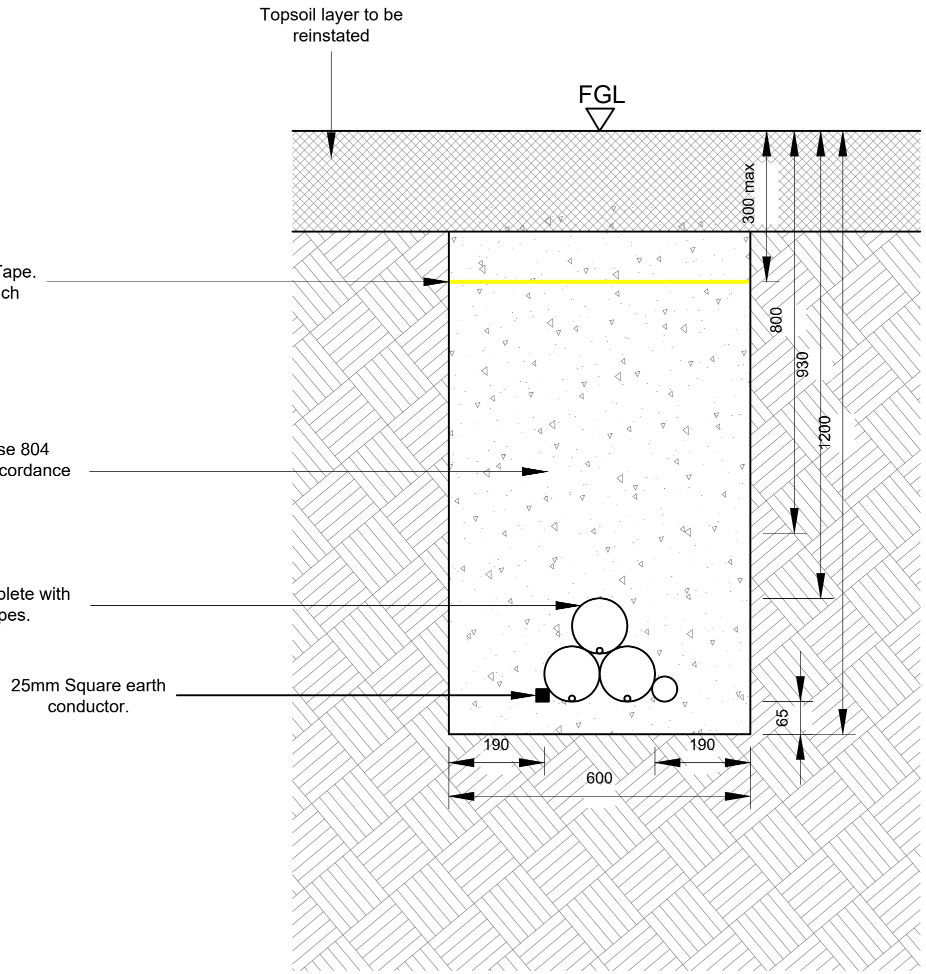
There are currently 3 no. control buildings located within the substation compound. As detailed above, internal upgrades to control building no. 3 are proposed as part of the Proposed Development. The details of these upgrades can be seen above in Section 4.3.6. There will be no further alterations to the existing control buildings onsite as part of the Proposed Development.

4.3.7 Site Cabling

Each turbine will be connected to the on-site electricity substation via an underground 33kV (kilovolt) electricity cable. Fibre-optic cables will also connect each wind turbine to the wind farm control building at the existing onsite 110kV Coomagearlahy substation compound. The electricity and fibre-optic cables running from the turbines to the onsite substation compound will be run in trenches that will be approximately 1.2 metres in depth and 0.6metres in width, within the verge of the wind farm access roadways. The route of the cable ducts will follow the access track to each turbine location. A cross section of a site cabling duct within an access road is shown in Figure 4-9 below.



33kV Cable - On Road Trench Detail - Cross Section



33kV Cable - Off Road Trench Detail - Cross Section

DRAWING TITLE: **33kV Cable Trench Sections**	
PROJECT TITLE: **Kilgarvan Wind Farm Repowering, Co. Kerry**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Orla Murphy**
PROJECT No.: **211107**	DRAWING No.: **Fig 4-9**
SCALE: **1:10 @ A3**	DATE: **14.05.2024**

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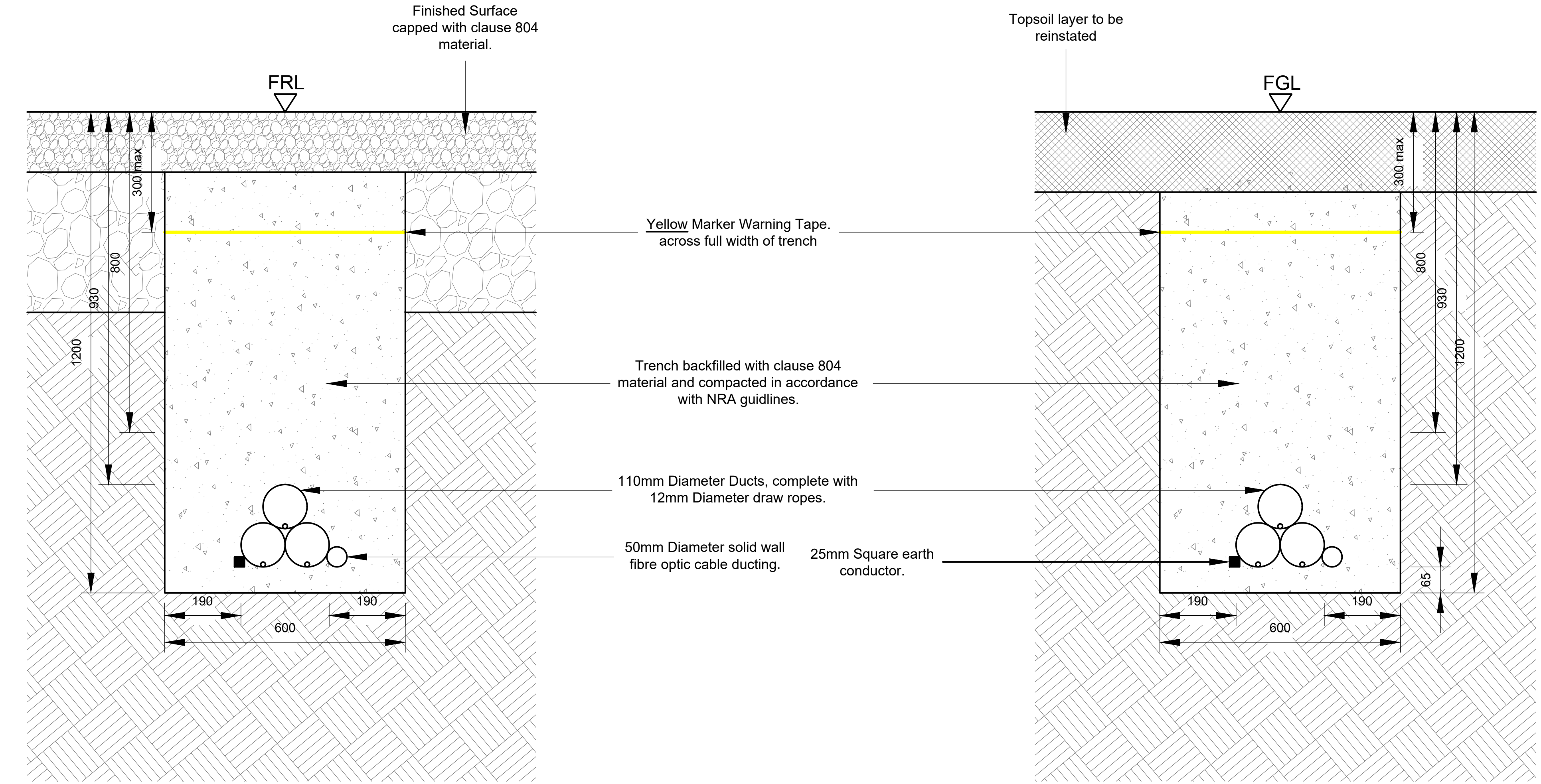

33kV Cable - On Road Trench Detail - Cross Section

33kV Cable - Off Road Trench Detail - Cross Section

DRAWING TITLE: **33kV Cable Trench Sections**	
PROJECT TITLE: **Kilgarvan Wind Farm Repowering, Co. Kerry**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Orla Murphy**
PROJECT No.: **211107**	DRAWING No.: **Fig 4-9**
SCALE: **1:10 @ A3**	DATE: **14.05.2024**

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Clay plugs will be installed at regular intervals of not greater than 50 metres along the length of the trenches to prevent the trenches becoming conduits for runoff water. While the majority of the cable trenches will be backfilled with locally sourced material. Clay subsoils of low permeability will be used to prevent conduit flow in the backfilled trenches. This material will be imported onto the site from local, authorised quarries, such as Doyle's Quarry (sand and gravel), MC Group Quarry, and Gloun Stone Quarries, should sufficient volumes not be encountered during the excavation phase of roadway and turbine foundation construction.

4.3.8 Temporary Construction Compounds

There are 2 no. temporary construction compounds proposed as part of this application. Both of these temporary construction compounds are located on areas of existing hardstanding which will be upgraded and extended in order to accommodate the compounds. Temporary Construction Compound 1 is located approximately 325m east of Turbine No. 3 and measures 3,012m^2 in size. Temporary Construction Compound 2 is located approximately 410m northeast of Turbine No. 9 and measures 2,951m^2. The layout of the temporary construction compounds are shown on Figure 4-11a and 4-11b.

The construction compounds will consist of a bunded refuelling and containment area for the storage of lubricants, oils and site generators, etc, and full retention oil interceptor, waste organic storage area, welfare facilities including temporary site offices, staff facilities and car parking areas for staff and visitors. Temporary port-a-loo toilets and toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered offsite by a permitted waste collector to wastewater treatment plant. There will also be a water supply onsite for hygiene purposes, by way of a temporary storage tank.

Construction materials and turbine components will be brought directly to the proposed turbine locations following delivery to the Proposed Development site.

4.3.9 Meteorological Mast

One meteorological (met) mast is proposed as part of the Proposed Development. The met mast will be equipped with wind monitoring equipment at various heights. The proposed met mast will be located at E506648 N576414 (ITM) as shown in Figure 4-10. The mast will be a free-standing slender lattice structure 100 metres in height. The met mast will be constructed on an area of existing hardstanding upon which an existing turbine (which is proposed to be removed as part of the Proposed Development) is situated. This area of hardstanding is sufficiently large to accommodate the equipment that will be used to erect the mast.

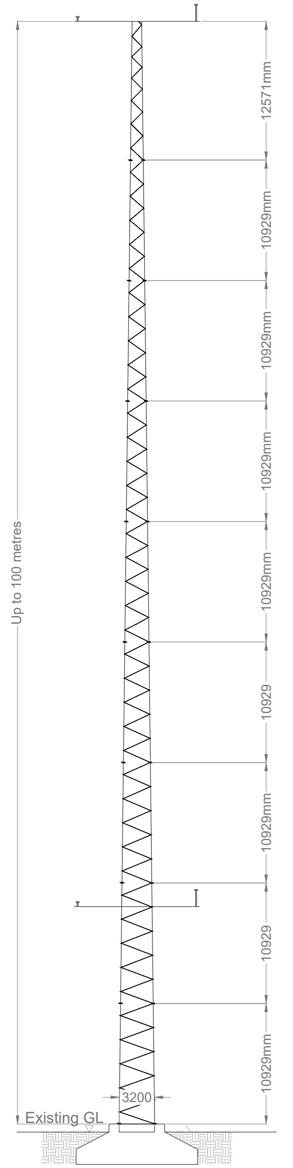
4.3.10 Watercourse Crossings

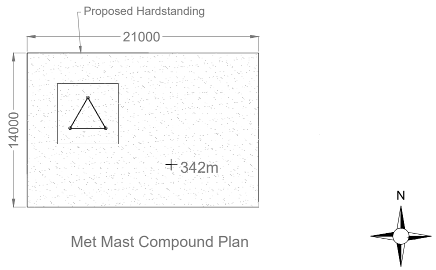
There will be 1 no. culvert upgraded as part of the Proposed Development, which is located along the access road off the N22, in close proximity to the existing 110kV Clonkeen Substation. Any culvert upgrade works will be supervised by a suitably qualified Ecological Clerk of Works, with suitable measures in place to ensure the protection of water quality. Further detail about watercourse crossings can be found in Chapter 7 and Chapter 9 of this EIAR.

In order to facilitate access to the Proposed T11, it will be necessary to cross over an unnamed tributary of the Roughty River. It is proposed to traverse this unnamed stream by constructing a pipe under the proposed new access road. The new pipe will be constructed as per best practice measures outlined by the Inland Fisheries Ireland (IFI) and detailed further in Chapter 7 and Chapter 9 of this EIAR. During the construction of the new pipe, the structural integrity of the banks will be maintained. The pipe will be sufficiently long to traverse the width of the proposed new road and maintain the free flow of water.

Drawing Notes

1. Met mast on site will either be guyed met mast or free standing met mast depending on site conditions. Both options shown only one will be used.





Met Mast Compound Plan

DRAWING TITLE: **Met Mast - Free Standing Mast**	
PROJECT TITLE: **Kilgarvan 1&2 Wind Farm Repowering, Co. Kerry**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Orla Murphy**
PROJECT No.: **211107**	DRAWING No.: **Fig 4-10**
SCALE: **1:500 @ A3**	DATE: **23.04.2024**

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4.3.11 Tree Felling and Replanting

4.3.11.1 Tree Felling

As part of the Proposed Development, tree felling will be required within and around the Proposed Development footprint to allow for the construction of the turbine bases, road widening, access roads, underground cabling, and the other ancillary infrastructure.

Further details on tree felling required within and around the Proposed Development footprint on the Proposed Development site is detailed in Chapter 6 of this EIAR.

A small section of the Proposed Development site is located on commercial forestry, namely Turbine No. 11 and its associated infrastructure. A total of 8.9ha of commercial forestry will be permanently felled within and around Turbine No. 11 and its associated infrastructure, along with existing treeline boundaries as detailed in Chapter 6, Section 6.6.3.1.2. Figure 4-12 shows the extent of the commercial forestry to be permanently felled as part of the Proposed Development.

The commercial forestry felling activities required as part of the Proposed Development will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments. The policy requires that a copy of the planning permission for the Proposed Development be submitted with the felling licence application; therefore the felling licence cannot be applied for until such time as planning permission is obtained for the Proposed Development.

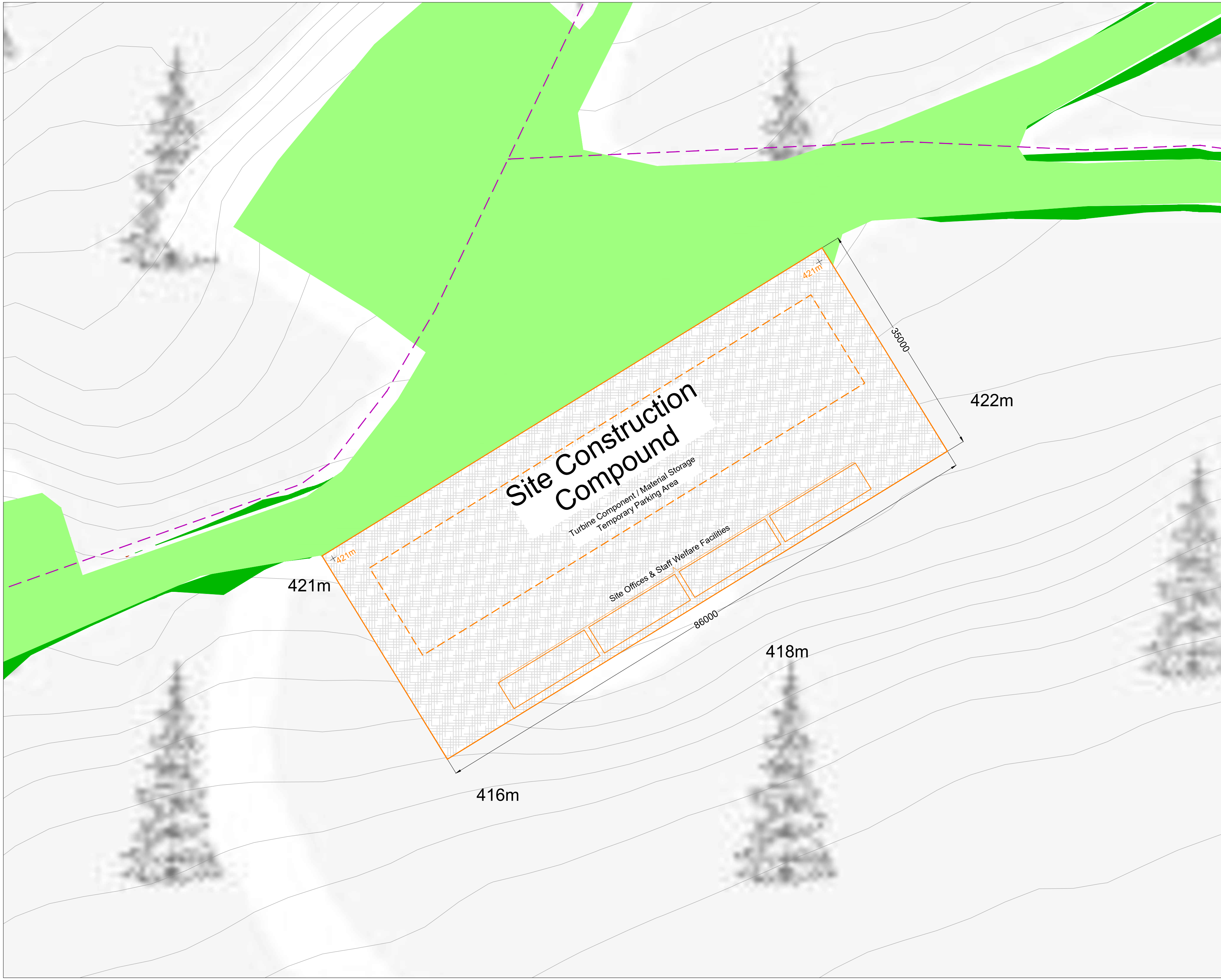
4.3.11.2 Forestry Replanting

In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for access roads, and any other wind farm-related uses will have to be replaced by replanting at an alternative site or sites. The Forest Service policy requires replacement or replanting on a hectare for hectare basis for the footprint of infrastructure developments.

The estimated 8.9 hectares that will be permanently felled for the footprint of the Proposed Development infrastructure will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that will be issued in respect of the Proposed Development. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that are under the control of the Forest service.

The replacement of the 8.9 hectares of forestry can occur anywhere in the State subject to licence. The replacement of forestry, felled as part of the Proposed Development, may occur on any lands, within the state, benefitting from Forest Service Technical Approval[5] for afforestation. Under the Forestry Regulations 2017, all applications for licences for afforestation require the prior written approval (technical approval) of the Minister for Agriculture, Food and the Marine. Before the Minister can grant approval, he/she must first determine if the project is likely to have significant effects on the environment (for EIA purposes) and assess if the development, individually or in combination with other plans or projects is likely to have a significant effect on a European site (for Habitats purposes).

[5] *All proposed forestry developments where the area involved is greater than 0.1 hectare must receive the prior written approval of the Forest Service. The application for approval is known as Pre-Planting Approval – Form 1.*



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7. Layout plans show typical Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.

Drawing Legend

- Existing Road to be Upgraded
- Electrical Cable Trench
- Cut
- Fill

DRAWING TITLE:
Temporary Construction Compound 1

PROJECT TITLE:
Kilgarvan Wind Farm Repowering, Co. Kerry

DRAWING BY: Joseph O Brien	CHECKED BY: Orla Murphy
PROJECT No.: 211107	DRAWING No.: Fig 4-11a
SCALE: 1:500 @ A3	DATE: 25.04.2024

OS SHEET No.: 6179, 6180, 6181, 6227, 6228, 6229, 6275, 6276, 6277, 6322, 6323, 6324

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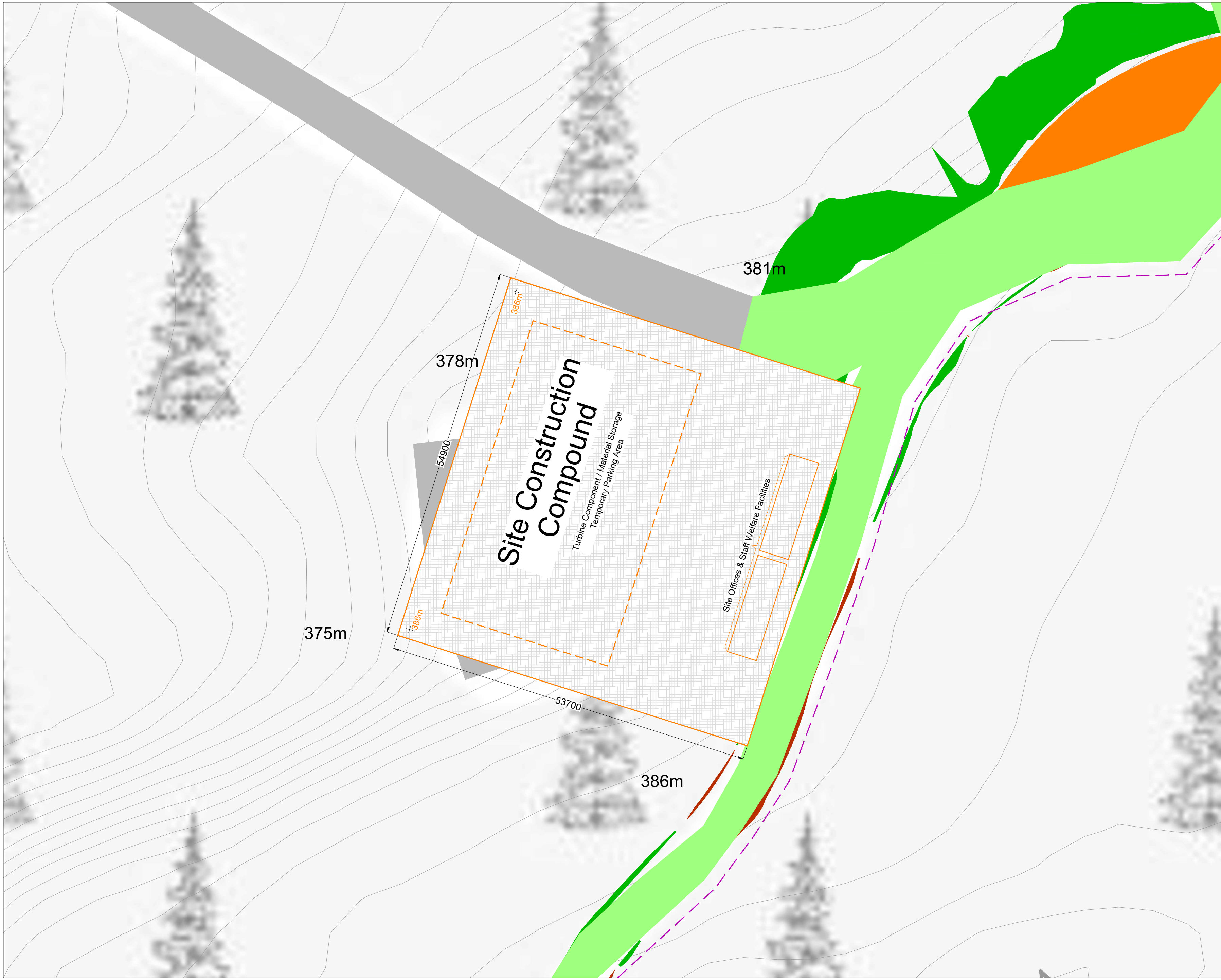

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7. Layout plans show typical Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.

Drawing Legend

- Existing Road to be Upgraded
- Proposed Road
- Existing Infrastructure no Upgrade Proposed
- Electrical Cable Trench
- Cut
- Fill

N

DRAWING TITLE:
Temporary Construction Compound 2

PROJECT TITLE:
Kilgarvan Wind Farm Repowering, Co. Kerry

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Orla Murphy**
PROJECT No.: **211107**	DRAWING No.: **Fig 4-11b**
SCALE: **1:500 @ A3**	DATE: **25.04.2024**

OS SHEET No.: 6179, 6180, 6181, 6227, 6228, 6229, 6275, 6276, 6277, 6322, 6323, 6324

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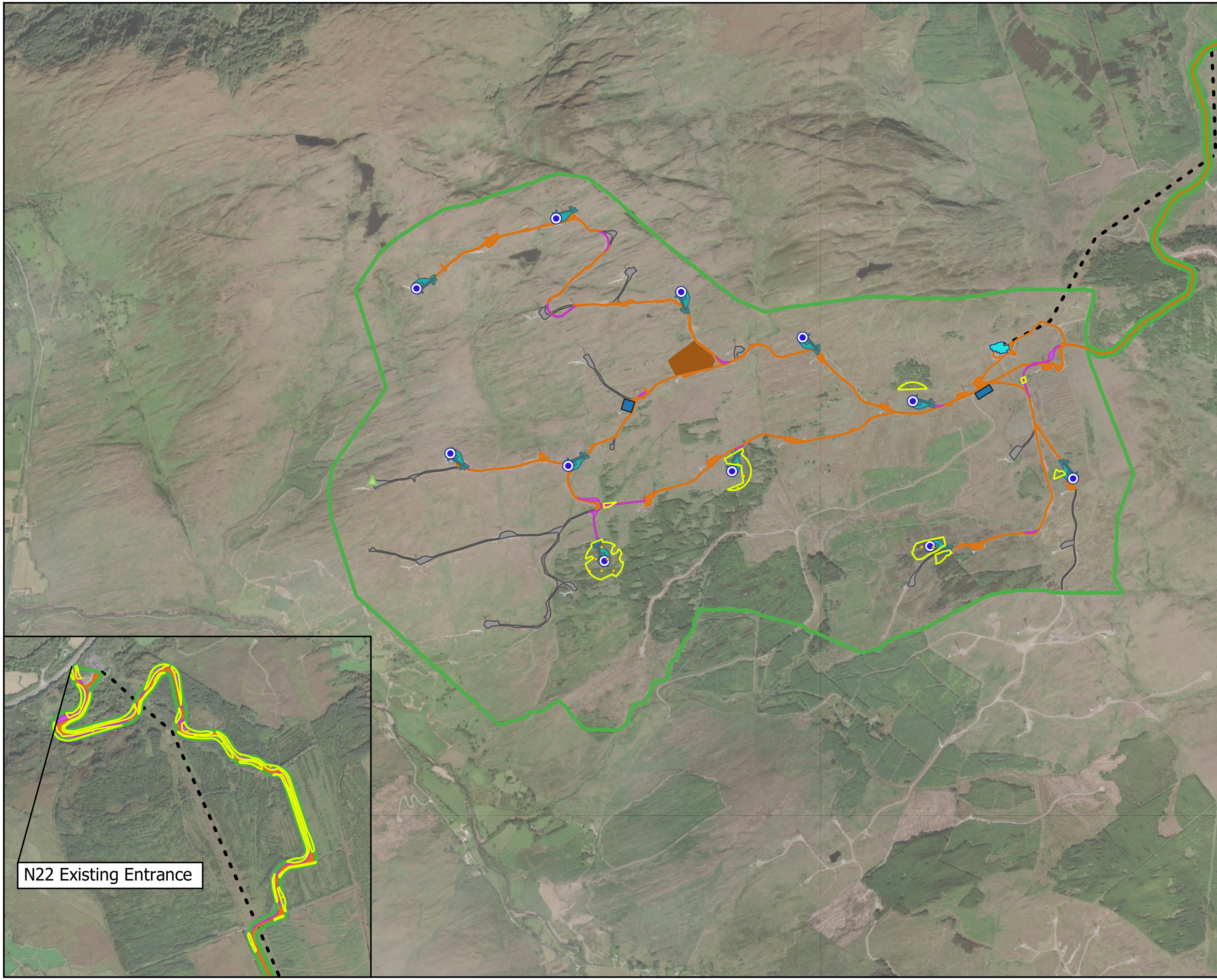

Map Legend

- EIAR Site Boundary
- Turbine Layout
- Proposed Felling Area
- Proposed Hardstands
- As Built Substation
- Proposed Met Mast
- Proposed Borrow Pit
- Proposed Construction Compounds
- Proposed New Roads and Widening
- Roads to be Upgraded
- Existing Site Roads

N

Drawing Title

Proposed Felling

Project Title

Proposed Repowering of the Existing Kilgarvan Wind Farm

Drawn By	Checked By
EL	NMcH
Project No.	**Drawing No.**
211107	Figure 4-12
Scale	**Date**
1:25,000	2024-04-15

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4.3.12 Site Activities

4.3.12.1 Environmental Management

All proposed activities on the site of the Proposed Development will be provided for in an environmental management plan. A Construction and Environmental Management Plan (CEMP) has been prepared for the Proposed Development and is included in Appendix 4-3 of this EIAR. The CEMP sets out the key environmental considerations to be taken into account by the contractor during construction of the Proposed Development. The CEMP also details the mitigation measures to be implemented in order to comply with the environmental commitments outlined in the EIAR. The contractor will be contractually obliged to comply with all such measures. In the event planning permission is granted for the Proposed Development, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for written approval.

4.3.12.2 Refuelling

Wherever possible, vehicles will be refuelled off-site. This will be the case for regular, road-going vehicles. However, for construction machinery that will be based on-site continuously, a limited amount of fuel will have to be stored on site in bunded areas.

On-site refuelling of machinery will be carried out at dedicated refuelling locations using a mobile double skinned fuel bowser. The fuel bowser, a double-axle custom-built refuelling trailer will be re-filled off site and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all construction machinery to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the Proposed Development. The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use.

Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays, spill kits and fuel absorbent mats will be used during all refuelling operations.

4.3.12.3 Concrete Deliveries

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry’s chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/) or equivalent. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids can be disposed of off-site at an appropriate waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plates 4-3 and 4-4 below.

Plate 4-3 Concrete Washout Area

Plate 4-4 Concrete Washout Area

The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents will be tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are normally complete in a single day per turbine.

The risks of pollution arising from concrete deliveries will be further reduced by the following:

- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout.
- Site roads will be constructed to a high standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete locally to the location where it is needed.
- The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, confirming routes, prohibiting on-site washout and discussing emergency procedures.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.

4.3.12.4 Concrete Pouring

Because of the scale of the main concrete pours that will be required to construct the Proposed Development, the main pours will be planned days or weeks in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These will include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.

- Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain.
- Disposing of any potential, small surplus of concrete after completion of a pour in suitable locations away from any watercourse or sensitive habitats.

4.3.12.5 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

4.3.12.6 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. A wheelwash facility will be provided for the site. The site roads will be well finished with non-friable, compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

A road sweeper will be available if any section of the public roads were to be dirtied by trucks associated with the Proposed Development.

4.3.12.7 Waste Management

The CEMP, Appendix 4-3 of this EIAR, includes a waste management plan (WMP) which outlines the best practice procedures to be implemented during the demolition, excavation and construction phases of the project. The WMP outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Development. Disposal of waste will be seen as a last resort.

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity must have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

Prior to the commencement of the development, a Construction Waste Manager will be appointed by the Contractor. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the development adheres to the management plan.

The WMP provides systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It highlights the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

4.4 Access and Transportation

4.4.1 Site Entrance

During the construction phase, the Proposed Development site will be accessed via the existing site entrance from the N22, previously used for the Existing Kilgarvan Wind Farm. The access junction is located approximately 5.1km north of the Proposed Development site in the townland of Cloonkeen.

There are no upgrades or widening proposed to the existing entrance in order to accommodate the delivery of turbine components as it has been established that the existing entrance is sufficient. This entrance will be used as the sole access point to the Proposed Development by HGVs and all other construction traffic during the construction phase.

Once the Proposed Development has completed its construction phase and is operational, this entrance will continue to be utilised for access into the site by the operational and maintenance personnel. This entrance will also be used in the event of the delivery of a replacement turbine component or other abnormal loads required for the operational maintenance of the wind farm.

4.4.2 Turbine and Construction Materials Delivery Route

It is intended that the port of entry for large turbine components will be Ringaskiddy Port. As detailed in Chapter 3 of this EIAR, Ringaskiddy Port was deemed to be the most suitable delivery port due to its proximity to the Proposed Development site and the road network and existing infrastructure that exist between Ringaskiddy port and the Proposed Development site. Vehicles delivering large turbine components and other abnormal loads to the site will depart from Ringaskiddy Port and travel northwest on the M28 towards Cork City, further west along the N25, and subsequently merging onto the N22 heading west towards the site entrance in the townland of Cloonkeen, along the N22.

A route assessment was undertake covering the proposed turbine delivery route, with the route assessment location shown in Figure 15-2a of Chapter 15.

- Location 1 - N28 Pfizer Roundabout, Ringaskiddy
- Location 2 – N28/R611 roundabout
- Location 3 – N22 Macroom Bypass/R584 roundabout
- Location 4 – N22/Kilgarvan Wind Farm Access Junction

Following assessment of the above locations, it was found that no accommodation works would be needed in order to facilitate the turbine delivery vehicles.

It is also envisaged that some general construction traffic (including materials and staff) will travel to the site via the N22 to the north of the site.

Traffic movements generated by the Proposed Development in relation to the above, are discussed in Section 15.1 of Chapter 15, Material Assets.

This option includes placement of turbine blades on a blade adaptor vehicle as they are being transported from Ringaskiddy Port to the Proposed Development site. This strategy would not require any facilitation or upgrade works along the turbine delivery route. Another option which is being considered is to utilise a section of the old N22 approximately 4km from the existing entrance to the Proposed Development, to switch the blade over from the blade trailer to a blade adapter in order to transport the blade from the site entrance to their intended set-down area within the site. While there are no enabling works being applied for as part of this strategy, any potential impacts associated with this strategy will be assessed within this EIAR. In order to utilise this method, existing soil berms, fences, gates and some vegetation will need to be removed. It may also be the case that the turbine transport vehicles may reverse back into this section of the old N22 from the Killarney side. In this case, it will also be necessary to remove some soil berms and place some hardcore surfacing on the verge of the new road section. The removal of these elements is assessed within Chapters 5-15 of this EIAR as appropriate.

If the strategy of swapping the blade in the set down area off the N22 is to be utilised, it will be subject to a separate future planning application.

The autotrack assessment of the turbine delivery route was undertaken by Alan Lipscombe Traffic and Transport. and the drawings, referred to below, are included as Chapter 15 of this EIAR.

4.4.2.1 Turbine Delivery Works

As per the turbine delivery strategies as outlined above in Section 4.4.2, it may be necessary to transfer the blade from a Superwing Carrier to a Blade Adapter trailer. The Blade Adapter will be used to transport the blade from the existing site entrance at the N22 up the access road to their intended destinations. In order to facilitate the transfer of the blade between the standard blade trailer and the Blade Adapter, a set down area will be needed, as detailed above in Section 4.4.2. Upgrade works that will be needed in order to facilitate the operation of the set-down area include the following:

- Removal of sheep-wire fencing and 1 no. set of double gates
- Removal of soil and vegetation from the surface of the road;
- Laying of stone on the surface of the road, and
- Removal of soil berms.

It is intended to reinstate these berms, fences and gates once all turbine components have been delivered to site. As stated above in Section 4.4.2, while these works are being assessed as appropriate within the EIAR, they are not being applied for under the currently Planning Application.

4.4.3 Traffic Management

A turbine with a maximum blade length of 85 metres has been used in assessing the traffic impact of the Proposed Development. The regular blade transporter for such a turbine blade would have a total vehicle length of 94 metres, including the blade which overhangs the back of the vehicle. The total length of the tower transporter is approximately 60m with the axles located at the front and rear of the load with no overhang. The vehicles used to transport the nacelles will be similar to, but shorter than the tower transporter.

All other vehicles requiring access to the site of the Proposed Development will be regular road-going vehicles. The turbine delivery vehicles have been modelled accurately in the autotrack assessments for the site access junctions, as detailed in Section 15.1 of this EIAR.

The need to transport turbine components on the public roads is not an everyday occurrence in the vicinity of the site of the Proposed Development. However, the procedures for transporting abnormal size loads on the country's roads are well established. While every operation to transport abnormal loads is different and requires careful consideration and planning, escort vehicles, traffic management plans, drive tests, road marshals and convoy escorts from the Garda Traffic Corps are all measures that are regularly employed to gets unusual loads from origin to destination. With just under 400 No. wind farms already built and operating in Ireland (Republic and Northern Ireland combined, as per latest available figures on www.windenergyireland.com), transport challenges are something the wind energy industry and specialist transport sector has become particularly adept in finding solutions to.

An outline of the Traffic Management Plan (TMP) has been prepared and set out in Chapter 15 and Appendix 4-3 of this EIAR. In the event planning permission is granted for the Proposed Development, the final Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned. The plan will include:

- A delivery schedule.
- Details of works or any other minor alteration identified.
- A dry run of the route using vehicles with similar dimensions.

The deliveries of turbine components to the site may be made in convoys of three to five vehicles at a time, and mostly at night when roads are quietest. Convoys will be accompanied by escorts at the front and rear operating a “stop and go” system. Although the turbine delivery vehicles are large, they will not prevent other road users or emergency vehicles passing, should the need arise. The delivery escort vehicles will ensure the turbine transport is carried out in a safe and efficient manner with minimal delay or inconvenience for other road users.

It is not anticipated that any section of the public road network will be closed during transport of turbines, although there will be some delays to local traffic at pinch points. During these periods it may be necessary to operate local diversions for through traffic. All deliveries comprising abnormally large loads where required will be made outside the normal peak traffic periods, at night, to avoid disruption to work and school-related traffic.

Prior to the Traffic Management Plan being finalised, a full dry run of the transport operation along the proposed route will be completed using vehicles with attachments to simulate the dimensions of the wind turbine transportation vehicles. This dry run will inform the Traffic Management Plan submitted for agreement with the local authority. All turbine deliveries will be provided for in a transport management plan which will have to be prepared in advance of the construction stage, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. Such a transport management plan will be submitted to the Planning Authority for agreement in advance of any abnormal loads using the local roads, and will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

4.5 Community Gain Proposal

The Proposed Repowering of the Existing Kilgarvan Wind Farm has the potential to bring significant positive benefit to the local community. The project will create sustainable local employment, it will contribute annual rates to the local authority, and it will provide opportunity for local community investment in the project. As with all wind farm projects which the applicant develops, a community benefit fund will be put in place for the lifetime of the project to provide direct funding to those areas surrounding the project.

The Existing Kilgarvan Wind Farm has brought significant funding to the local area. There is currently a fund of €85,000 available to the local community annually. There have been a number of recipients of this fund in the local community, such as:

- Kilgarvan Community Council;
- Kilgarvan Agricultural Show;
- Kilgarvan GAA;
- Top of the Coom Sheep Shearing;
- Macroom Community Hospital;
- Cósan Barr a Chuma;
- Glenflesk GAA;
- Scoil Chúil Aodha;
- Comhaltas Cosanta Gaeltachta Chúil Aodha Teo, and

- The Glen Committee

The Applicant is committed to engaging inclusively with the whole community and developing a responsible project that benefits both society and the local community. The Existing Kilgarvan Wind Farm Community Benefit fund has aided the local community in bringing forward sustainable, long-term community initiatives that meet local priorities, needs and objectives.

If the Proposed Development is granted planning permission, this scheme will continue as detailed in Section 4.5.2 below.

4.5.1 Renewable Energy Support Scheme

The Renewable Energy Support Scheme (RESS) Terms and Conditions, published by the Department of Communications, Climate Action and Environment on the 29th of October 2021, make some high-level provisions for how this type of benefit fund will work. Any project which wants to export electricity to the national grid must abide by these broad principles. These include the following:

- a minimum of €1,000 shall be paid to each household located within a distance of a 1-2 kilometre radius from the Project;
- a minimum of 40% of the funds shall be paid to not-for-profit community enterprises whose primary focus or aim is the promotion of initiatives towards the delivery of the UN Sustainable Development Goals, in particular Goals 4, 7, 11 and 13, including education, energy efficiency, sustainable energy and climate action initiatives;
- a maximum of 10% of the funds may be spent on administration. This is to ensure successful outcomes and good governance of the Community Benefit Fund;
- the balance of the funds shall be spent on initiatives successful in the annual application process, as proposed by clubs and societies and similar not-for-profit entities, and in respect of Onshore Wind RESS 1 Projects, on "near neighbour payments" for households located outside a distance of 1 kilometre from the Project but within a distance of 2 kilometres from such Project.

Further details on the proposed Community Gain proposals are presented in Section 4.5 and Appendix 2-3 of this EIAR.

4.5.2 Community Benefit Fund for the Proposed Development

The Applicant expects that for each megawatt hour (MWh) of electricity produced by the wind farm, the Proposed Development will contribute €2 into a community fund for the RESS period.

If this project is constructed as currently designed, we estimate that a total of approximately €15.5 million will be available in the local area for community funding over the lifetime of the project. The above figure is indicative only and will be dependent on the generation capacity of the wind farm which is influenced by a number of factors including:

1. *Number of wind turbines.*
2. *Capacity and availability of energy production of those turbines.*
3. *Quantity of wind.*

4.6 Site Drainage

4.6.1 Introduction

The drainage design for the Proposed Development has been prepared by Hydro Environmental Services (HES). The protection of the watercourses within and surrounding the Proposed Development, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Development. The Proposed Development's drainage design has therefore been proposed specifically with the intention of having no negative impact on the water quality of the site and its associated rivers and lakes, and consequently no impact on downstream catchments and ecological ecosystems. No routes of any natural drainage features will be altered as part of the Proposed Development and turbine locations and associated new roadways were originally selected to avoid natural watercourses, and existing roads are to be used wherever possible. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. Buffer zones of 50m around rivers and streams, respectively, have been used to inform the layout of the Proposed Development.

4.6.2 Existing Drainage Features

The topography of the Proposed Development site is mountainous with ground elevations sloping to the south/southwest ranging from ~190 to 500mOD (metres above Ordnance Datum). The hydrology of the Proposed Development site is characterised by a high density of surface water features.

The topography of the Proposed Development site is mountainous, with protruding ridges of bedrock outcrop separating areas of peat. Ground elevations slope to the southwest and range from c. 190 to 500mOD (metres above ordnance Datum). Due to the local topography, the coverage of peat and low permeability of the underlying bedrock aquifer, the hydrology of the Proposed Development site is characterised by a high rate of surface water runoff.

The Proposed Development site is drained by several 1st and 2nd order streams. These natural watercourses originate within the Proposed Development site boundaries and flow downslope before discharging into the Roughty River. In places, the natural drainage is further facilitated by a network of manmade drains. These manmade drains are concentrated within areas of coniferous forestry and along sections of the existing access roads.

Chapter 9 of this EIAR provides further details on the existing drainage features on the Proposed Development site.

4.6.3 Drainage Design Principles

Runoff control and drainage management are key elements in terms of mitigation against potential effects on surface water bodies. Two distinct methods will be employed to manage drainage water within the Proposed Development site. The first method involves 'keeping clean water clean' by avoiding disturbance to existing drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, reinstatement areas, construction areas and temporary storage areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, and nutrients, to route them towards new proposed silt traps and settlement ponds (or stilling ponds) prior to controlled diffuse release into the existing drainage network. This allows for attenuation and settlement prior to s diffuse release. There will be no direct discharges to the existing drains.

During the construction phase, all runoff from works areas (i.e., dirty water) will be attenuated and treated to a high quality prior to being released. The proposed wind farm drainage will not significantly alter the existing drainage regime at the site. Any existing drains will be routed under/around the proposed access roads using culverts as required. Runoff from access roads, turbine bases, and developed areas (construction compounds, met masts) will be collected and treated in local (proposed) silt traps and settlement ponds/swales and then discharged over buffered outfalls. Runoff from the decommissioned areas will be treated in local swales before being discharged over buffered outfalls.

A schematic of the proposed site drainage management is shown as Figure 4-13 below.

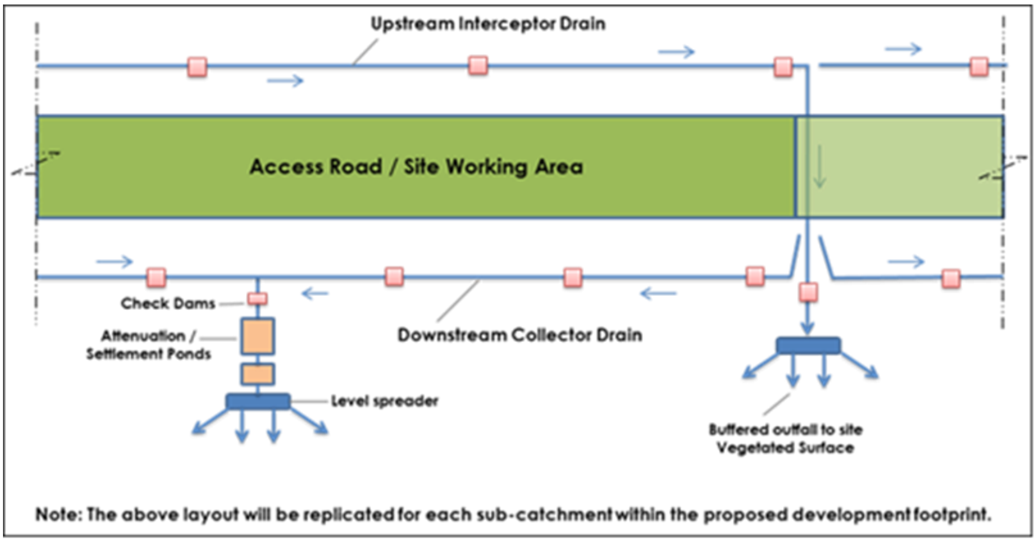

Figure 4-13 schematic of Proposed Site Drainage Management

4.6.4 Best Practice Guidance

The drainage design has been prepared based on experience of the project team of other renewable energy sites in peat-dominated mountainous environments, and in accordance with a number of best practice guidance documents.

There is no one guidance document that deals with drainage management and water quality controls for wind farms and other renewable energy developments. However, a selection of good practice approaches has been adopted in preparation of this drainage design, and these are taken from the various best practice guidance documents listed below. These relate to infrastructure and operational works on forested sites, forest road design, water quality controls for linear projects, forestry road drainage and management of geotechnical risks. To achieve best practice in terms of water protection through construction management all drainage management is prepared in accordance with guidance contained in the following:

- Forest Protection Guidelines (Forest Service, 2002);
- Forest Operations and Water Protection Guidelines (Coillte, 2013);
- Forestry and Water Quality Guidelines (Forest Service, 2000b); and,
- Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018).
- MacCulloch (2006): Guidelines for risk management of peat slips on the construction of low volume low-cost roads over peat (Frank MacCulloch Forestry Civil Engineering Forestry Commission, Scotland);
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Wind Farm Development Guidelines for Planning Authorities (September 1996);
- Eastern Regional Fisheries Board: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites;

- Inland Fisheries Ireland (2016): *Guidelines on Protection of Fisheries During Construction Works Adjacent to Watercourses*;
- Scottish Natural Heritage, 2010: Good Practice During Wind Farm Construction;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);
- CIRIA Report No. C648 (2006): CIRIA (Construction Industry Research and Information Association) guidance on 'Control of Water Pollution from Linear Construction Projects';
- CIRIA Report Number C532 (2001): Control of water pollution from construction sites - Guidance for consultants and contractors.; and,
- Control of water pollution from linear construction projects -Technical guidance. CIRIA C648 London, 2006.

4.6.5 Drainage Design

A detailed drainage design for the Proposed Development, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in Appendix A of Appendix 4-4 of this EIAR. The drainage design employs the various measures further described below

4.6.5.1 Interceptor Drains

Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The interceptor drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area.

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be completed on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains could be removed. At that stage, there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to allow water to infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. Where drains are to be removed, they will be backfilled with material from the diversion dyke. Interceptor drains may have to be retained in certain locations, for example where roadways are to be installed on slopes, to prevent the roadways acting of conduits for water that might infiltrate the roadway sub-base. In these cases, interceptor drains will be maintained in localised areas along the roadway with culverts under the roadway, which will allow the intercepted water to be discharged to vegetation filters downgradient of the roadway. Similarly, in localised hollows where water is likely to be funnelled at greater concentrations than on broader slopes, interceptor drains, and culverts may be left in situ following construction.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.6.5.3 below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the channel.

Interceptor drains will be installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains to areas downgradient of works areas, where the drain will terminate at a level spreader (see Section 4.6.5 below). Across the entire length of the interceptor drains, the design elevation of the water surface along the route of the drains will not be lower than the design elevation of the water surface in the outlet at the level spreader.

4.6.5.2 Swales

Drainage swales (or collector drains) are shallow drains that will be used to intercept and collect run-off from construction areas of the site during the construction phase. Drainage swales will remain in place to collect runoff from roads and hardstanding areas of the Proposed Development during the operational phase. A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any potentially sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Swales are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains described above.

Drainage swales will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses.

Drainage swales will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike.

4.6.5.3 Check Dams

The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the site.

Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the drains are being excavated.

The proposed check dams will be made up of straw bales (temporary use only) or stone, or a combination of both depending on the size of the drainage swale it is being installed in. Where straw bales are to be used, they will be secured to the bottom of the drainage swale with stakes. Clean 4-6 inch stone will be built up on either side and over the straw bale to a maximum height of 600mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the drainage swale with the bucket of an excavator.

The check dams will be installed at regular intervals along the drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain. The centre of the check dam will be approximately 150mm lower than the edges to allow excess water to overtop the dam in flood conditions rather than cause upstream flooding or scouring around the dams.

Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

4.6.5.4 Level Spreader

A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any proposed works areas in locations where they will not contribute further to water ingress to construction areas of the Proposed Development site.

The water carried in interceptor drains will not have come in contact with works areas, and therefore should be free of silt and sediment. The level spreaders will distribute clean drainage water onto vegetated areas where the water will not be reconcentrated into a flow channel immediately below the point of discharge. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion.

The slope in the channel leading into the spreader will be less than or equal to 1%. The slope downgradient of the spreader onto which the water will dissipate will have a grade of less than 6%. The availability of slopes with a grade of 6% or less will determine the locations of level spreaders. If a slope grade of less than 6% is not available in the immediate area downgradient of a works area at the end of a diversion drain, a piped slope drain (see Section 4.6.5.5 below) will be used to transfer the water to a suitable location.

The spreader lip over which the water will spill will be made of a concrete kerb, wooden board, pipe, or other similar piece of material that can create a level edge similar in effect to a weir. The spreader will be level across the top and bottom to prevent channelised flow leaving the spreader or ponding occurring behind the spreader. The top of the spreader lip will be 150mm above the ground behind it. The length of the spreader will be a minimum of four metres and a maximum length of 25 metres, with the actual length of each spreader to be determined by the size of the contributing catchment, slope and ground conditions.

Clean four-inch stone can be placed on the outside of the spreader lip and pressed into the ground mechanically to further dissipate the flow leaving the level spreader over a larger area.

4.6.5.5 Piped Slope Drains

Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.

The piped slope drains will be semi-rigid corrugated pipes with a stabilised entrance and a rock apron at the outlet to trap sediment and dissipate the energy of the water. The base of drains leading into the top of the piped slope drain will be compacted and concavely formed to channel the water into the corrugated pipe. The entrance at the top of the pipe will be stabilised with sandbags if necessary. The pipe will be anchored in place by staking at approximately 3-4 metre intervals or by weighing down with compacted soil. The bottom of the pipe will be placed on a slope with a grade of less than 1% for a length of 1.5 metres, before outflowing onto a rock apron.

The rock apron at the outlet will consist of 6-inch stone to a depth equal to the diameter of the pipe, a length six times the diameter of the pipe. The width of the rock apron will be three times the diameter of the pipe where the pipe opens onto the apron and will fan out to six times the diameter of the pipe over its length.

Piped slope drains will only remain in place for the duration of the construction phase of the Proposed Development. On completion of the works, the pipes and rock aprons will be removed, and all channels backfilled with the material that was originally excavated from them.

Piped slope drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockages. Stake anchors or fill over the pipe will be checked for settlement, cracking and stability. Any seepage holes where pipe emerges from drain at the top of the pipe will be repaired promptly.

4.6.5.6 Vegetation Filters

Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.

Vegetation filters will carry outflow from the level spreaders as overland sheet flow, removing any suspended solids and discharging to the groundwater system by diffuse infiltration.

Vegetation filters will not be used in isolation for waters that are likely to have higher silt loadings. In such cases, silt-bearing water will already have passed through stilling ponds prior to diffuse discharge to the vegetation filters via a level spreader.

4.6.5.7 Stilling Ponds

Stilling or settlement ponds will be used to attenuate runoff from works areas of the site of the Proposed Development during the construction phase and will remain in place to handle runoff from roads and hardstanding areas of the Proposed Development during the operational phase. The purpose of the stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the stilling ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas.

Stilling ponds will be excavated/constructed to the appropriate size at each required location as shown on the drainage design drawings included in Appendix 4-4 of this document. The points at which water enters and exits the stilling ponds will be stabilised with rock aprons, which will trap sediment, dissipate the energy of the water flowing through the stilling pond system, and prevent erosion. The stilling ponds will reduce the velocity of flows in order to allow settlement of silt to occur. Water will flow out of the stilling pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out.

Water will flow by gravity through the stilling pond system. The stilling ponds have been sized according to the size of the area they will be receiving water from and are large enough to accommodate a 10-year return rainfall event. The settlement ponds are designed for 11hr and 24hr retention times used to settle out medium silt (0.006mm) and fine silt (0.004mm) respectively (EPA, 2006)[6]. The stilling ponds will be dimensioned so that the length to width ratio will be greater than 2:1, where the length is the distance between the inlet and the outlet. Where ground conditions allow, stilling ponds will be constructed in a wedge shape, with the inlet located at the narrow end of the wedge. Each stilling pond will be a minimum of 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume.

The embankment that forms the sloped sides of the stilling ponds will be stabilised with vegetated turves, which will have been removed during the excavation of the stilling ponds area.

Stilling ponds will be located towards the end of swales, close to where the water will be reconverted to diffuse sheet flow. Upon exiting the stilling pond system, water will be immediately reconverted to diffuse flow via a fan-shaped rock apron if there is adequate space and ground conditions allow.

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[6] Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006)

Otherwise, a swale will be used to carry water exiting the stilling pond system to a level spreader to reconvert the flow to diffuse sheet flow.

A water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the stilling pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity. Stilling ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

4.6.5.8 Siltbuster

A "siltbuster" or similar equivalent piece of equipment will be available to filter any water pumped out of excavation areas if necessary, prior to its discharge to stilling ponds or swales.

Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction sites.

The unit stills the incoming water/solids mix and routes it upwards between a set of inclined plates for separation. Fine particles settle onto the plates and slide down to the base for collection, whilst treated water flows to an outlet weir after passing below a scum board to retain any floating material. The inclined plates dramatically increase the effective settling area of the unit giving it a very small footprint on site and making it highly mobile. Figure 4-14 below shows an illustrative diagram of the Siltbuster.

The Siltbuster units are now considered best practice for the management of dirty water pumped from construction sites. The UK Environment Agency and the Scottish Environmental Protection Agency have all recommended/specified the use of Siltbuster units on construction projects.

A schematic of a Siltbuster system us shown in Figure 4-14 below.

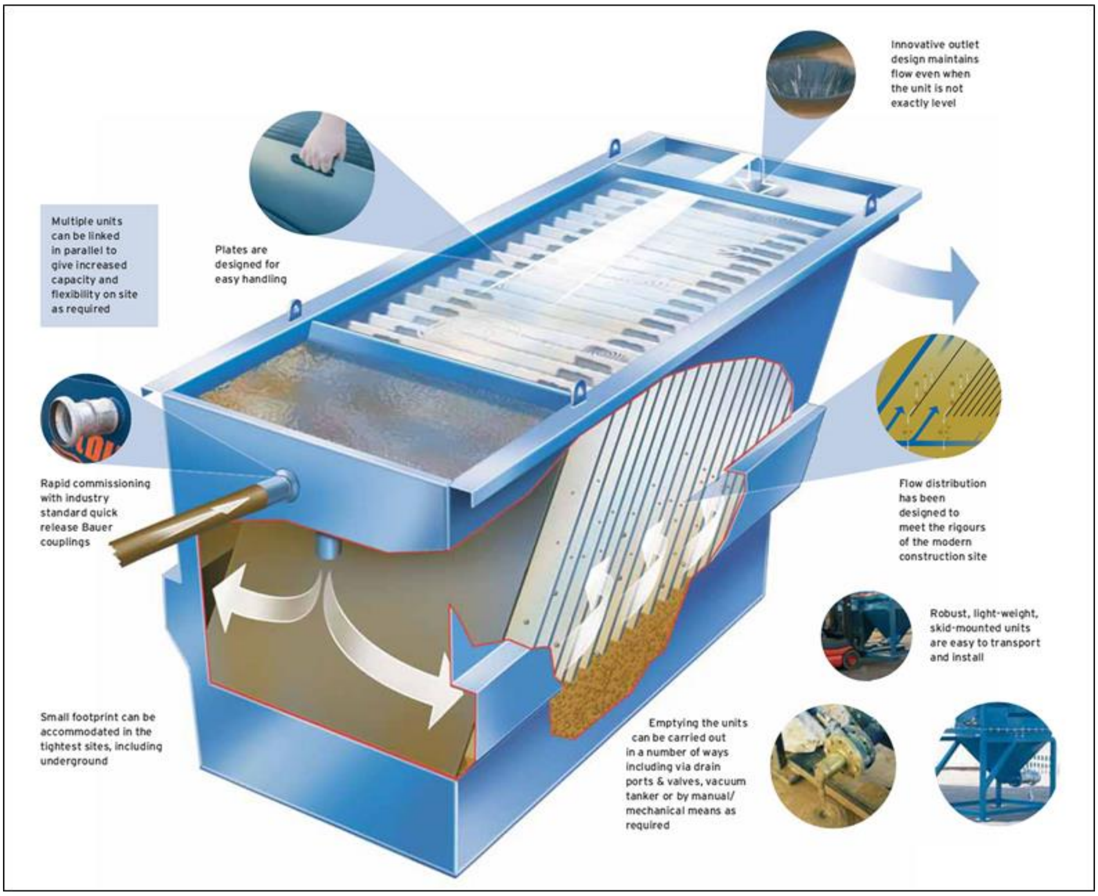

Figure 4-14 Siltbuster (Source: https://www.siltbuster.co.uk/sb_prod/siltbuster-fb50-settlement-unit/)

4.6.5.9 Silt Bags

Dewatering silt bags allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the Proposed Development site.

Dewatering silt bags are an additional drainage measure that can be used downgradient of the stilling ponds at the end of the drainage swale channels and will be located, wherever it is deemed appropriate, throughout the site. The water will flow, via a pipe, from the stilling ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of peaty silt into the stream.

The dewatering silt bag that will be used will be approximately 3 metres in width by 4.5 metres (see Plate 4-5 and Plate 4-6 below) in length and will be capable of trapping approximately four tonnes of silt. The dewatering silt bag, when full, will be removed from site by a waste contractor with the necessary waste collection permit, who will then transport the silt bag to an appropriate, fully licensed waste facility.

Plate 4-5 Silt Bag with water being pumped through

Plate 4-6 Silt bag under inspection

4.6.5.10 Sedimats

Sediment entrapment mats, consisting of coir or jute matting, will be placed at the outlet of the silt bag to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure as shown in Plate 4-7 below.

Plate 4-7 Typical Sedimat Details (Source: https://www.hy-tex.co.uk/)

4.6.5.11 Culverts

All new proposed culverts and proposed culvert upgrades will be suitably sized for the expected peak flows in the watercourse.

Some culverts may be installed to manage drainage waters from works areas of the Proposed Development, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge. The size of culverts will be influenced by the depth of the road sub-base. In some cases, two or more smaller diameter culverts may be used where this depth is limited, though this will be avoided as they will have a higher associated risk of blockage than a single, larger pipe. In all cases, culverts will be oversized to allow mammals to pass through the culvert.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling doesn't occur above or below the culvert and water can continue to flow as necessary.

All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

4.6.5.12 Silt Fences

Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone of a natural watercourse, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the Proposed Development. These areas include around existing culverts, around the headwaters of watercourses, and the proposed locations are indicated on the detailed drainage design drawings included in Appendix A of Appendix 4-4 of this EIAR.

Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading. The silt fence designs follow the technical guidance document 'Control of Water Pollution from Linear Construction Projects' published by CIRIA (Ciria, No. C648, 1996). Up to three silt fences may be deployed in series.

All silt fencing will be formed using Terrastop Premium or equivalent silt fence product.

Site fences will be inspected regularly to ensure water is continuing to flow through the fabric, and the fence is not coming under strain from water backing up behind it.

Site fences will be inspected regularly to ensure water is continuing to flow through the fabric, and the fence is not coming under strain from water backing up behind it. Standard silt fence details are shown below in Plate 4-8.

Plate 4-8 Silt Fence Details

4.6.5.13 Hydrocarbon Interceptors

A hydrocarbon interceptor is a trap used to filter out hydrocarbons from surface water runoff. A suitably sized hydrocarbon interceptor will be installed wherever it is intended to store hydrocarbons and oils (i.e. construction compounds and substation compound) or where it is proposed to park vehicles during the construction and operational phases of the Proposed Development (i.e. construction compounds, substation compound and visitor car park).

4.6.6 Drainage Management and Maintenance

An inspection and maintenance plan for the on-site construction drainage system will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling.

During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each primary watercourse, and specifically following heavy rainfall events (as per the CEMP is included in Appendix 4-3 of this EIAR).

Surface water quality monitoring will also be completed before, during (if the operation is conducted over a protracted period of time) and after the clear felling activities. The 'before' sampling will be conducted within 4 weeks of the felling activity commencing, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e. where an impact has been shown).

All proposed drainage management, maintenance and monitoring are detailed in the CEMP

4.7 Construction Phasing and Timing

It is estimated that the construction phase of the Proposed Development will take approximately 18-24 months from starting onsite to commissioning of the electrical system. In the interest of breeding birds, construction will not commence during the Breeding Bird season from April to July inclusive. Construction may commence at any stage from August onwards to the end of March, so that construction activities are ongoing by the time the next breeding bird season comes around and can continue throughout the next breeding season.

4.7.1 Construction Sequencing

The construction phase can be broken down into two main overlapping phases, 1) Civil Engineering works – 6 months, 2) removal of existing turbines, civil works, electrical works, and turbine delivery, install and commissioning - 10 months. The main task items under both phases are outlined below.

Civil Engineering Works

- Felling of Forestry (as outlined in Section 4.3.11)
- Construction of new site roads, drainage ditches and culverts
- Install 2 no. temporary construction compounds.
- Construct new turbine foundations, hard standings and crane pads where possible;
- Upgrades to existing onsite 110kV Coomagearlahy substation compound;
- Excavate/pile for turbine bases where required. Store soil/peat locally for backfilling and re-use. Place blinding concrete to turbine bases. Fix reinforcing steel and

anchorage system for tower section. Construct shuttering. Fix any ducts etc. to be cast in. Pour concrete bases. Cure concrete. Remove shutters after 1-2 days.

Removal of Existing Turbines, Civil Works and Electrical Works

- The existing 28 no. turbines will be removed from site as described in Section 4.3.1;
- Construction of remaining turbine foundations, hard standings and crane pads;
- Upgrades and widening to existing roads including access road;
- Installation of internal cable ducting;
- Electrical works, substation upgrade, installation of cables and substation commissioning, and
- Turbine delivery, installation and turbine commissioning.

All relevant Site Health & Safety procedures, in accordance with the relevant Health and Safety Legislation and guidance (listed in Section 5.10.2.1 of this EIAR), including the preparation of the Health & Safety Plan, erection of the relevant and appropriate signage on site, inductions and toolbox talks will take place prior to and throughout the construction phase of the Proposed Development. Further details of on-site health, safety and welfare are included in Chapter 5 of this EIAR.

The phasing and scheduling of the main construction task items are outlined in Table 4-4 below, where 3rd March has been selected as an arbitrary start date for construction activities.

Table 4-4 Indicative Construction Schedule

			Year 1				Year 2			
ID	Task Name	Task Description	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Site Health and Safety									
2	Site Compounds	Site compounds, site access, fencing, gates								
3	Site Roads	Construction/upgrade of roads, install drainage measures, install water protection measures								
4	Removal of existing turbines	Removal of existing turbines onsite, segmentation of blades, transport offsite								
5	Upgrades to substation									
6	Turbine Hardstands	Excavate turbine bases								
7	Turbine Foundations	Fix reinforcing steel and anchorage system, erect shuttering, concrete pour								
8	Backfilling and Landscaping									
9	Turbine delivery and erection									
10	Turbine commissioning									

4.7.2 Construction Phase Monitoring and Oversight

The requirement for a Construction and Environmental Management Plan (CEMP) to be prepared in advance of any construction works commencing on any wind farm site and submitted for agreement to the Planning Authority is now well-established. The proposed procedures for the implementation of the mitigation measures outlined in such a CEMP and their effectiveness and completion is audited by way of a Construction and Environmental Management Plan Audit Report. The CEMP Audit Report effectively lists all mitigation measures prescribed in any of the planning documentation and all conditions attached to the grant of planning permission and allows them to be audited on a systematic and regular basis. The first assessment is a simply Yes/No question, has the mitigation measure been employed on-site or not. Following confirmation that the mitigation measure has been implemented, the effectiveness of the mitigation measures has to be the subject of regular review and audit during the full construction stage of the project. If some remedial actions are needed to improve the effectiveness of the mitigation measure, then these are notified to the site staff immediately during the audit site visit, and in writing by way of the circulation of the audit report. Depending on the importance and urgency of rectifying the issue, the construction site manager is given a timeframe by when the remedial works need to be completed.

A Construction Environmental Management Plan (CEMP) has been prepared for the Proposed Development and is included in Appendix 4-3 of this EIAR. The CEMP includes details of drainage, peat and overburden management, waste management etc, and describes how the above-mentioned Audit Report will function and be presented. In the event planning permission is granted for the Proposed Development, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for written approval.

The on-site construction staff will be responsible for implementing the mitigation measures specified in the EIAR and compiled in the Audit Report. Their implementation will be overseen by the ECoW and/or supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation. The system of auditing referred to above ensures that the mitigation measures are maintained for the duration of the construction phase, and into the operational phase where necessary.

4.8 Construction Methodologies

4.8.1 Removal of Existing Turbines

As outlined in Section 4.3.1 of this Chapter, the existing 28 no. turbines onsite will be removed during the construction phase of the Proposed Development. The turbines will be disassembled in reverse order to how they were initially constructed i.e. blades will be removed from the nacelle, the nacelle will then be removed from the top of the tower, and the tower sections will then be removed. A crane will be used to remove the blades from the hub. The blades will then be decommissioned following the methodology set out in Section 4.3.1.1. A more detailed breakdown of the construction methodology is outlined below:

Enabling Works:

- The temporary construction compounds will be established;
- Vegetation and scrub clearance along with some levelling works will be carried out at the turbine hardstand areas and access roads as necessary;
- Improvements to existing roads

Removal of the Existing Turbines:

- Dismantle turbines as per the methodology outlined in Section 4.3.1.1;
- Appropriate running surface for cranes will be constructed;
- Decommissioning of the existing onsite cabling via the method outlined in Section 4.3.1.2.

As is in line with Orsted company policy, none of the turbine components will be sent to landfill after being removed from site. As outlined in Section 4.3.1.1, all turbine components will be broken down before their removal from site and will be reused in varying capacities.

4.8.2 Keyhole Forestry Felling

As part of the Proposed Development, keyhole felling of forestry will be required within and around the Proposed Development footprint to enable the construction of turbine bases, access roads and the other ancillary infrastructure. Felling is also required around turbine bases for the reduction of potential effects on bats (refer to Chapter 6 of this EIAR). A total of 8.9 hectares of forestry will be permanently felled within and around the footprint of the Proposed Development in order to facilitate infrastructure construction and turbine erection.

The proposed methodology for the forestry felling activities is as follows:

Felling works will conform to current best practice Forest Service policies and strategic guidance documents as well as Coillte produced guidance documents, specific guidelines listed below, to ensure that the felling works provides minimal potential impacts to the receiving environment.

- '*Standards for Felling and Reforestation*' (Department of Agriculture, Food and the Marine, 2019)
- '*Forest Operations & Water Protection Guidelines*' (Coillte, 2009)
- '*Methodology for Clear Felling Harvesting Operations*' (Coillte, 2009)
- '*Forestry and Water Quality Guidelines*' (Forest Service, 2000)
- '*Forestry Biodiversity Guidelines*' (Forest Service, 2000)
- '*Forestry Protection Guidelines*' (Forest Service, 2002)
- '*Forestry Harvesting and Environmental Guidelines*' (Forest Service, 2000)

The proposed methodology for the forestry felling activities is as follows:

- The extent of all necessary forestry felling areas will be identified and demarcated with markings on the ground in advance of any felling commencing.
- All roads and culverts will be inspected by the ECoW and contractor prior to any machinery being brought on site to commence the felling operation.
- Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt/sediment traps (i.e. check dam / silt fence) will be constructed to ensure collection of all silt within felling areas. These temporary silt traps will be cleaned out and backfilled once felling works are complete. This ensures there is no residual collected silt remaining in blocked drains after felling works are completed.
- New collector drains and sediment traps will be installed during ground preparation to intercept water upgradient of felling areas and divert it away. Collector drains will be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities.
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated.
- Sediment removed from traps will be carefully disposed of in the peat repository areas.

- Machine combinations (i.e. hand-held or mechanical) will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance; however, the general proposed machine combination will comprise a harvester and a low-ground pressure harvester with a 14-tonne bunk capacity.
- Trees will be cut manually inside the 50m construction watercourse buffer and using machinery to extract whole trees only;
- Brash mats will be put in place to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur.
- Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting.
- No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings.
- Brash which has not been pushed into the soil may be moved to facilitate the creation of mats elsewhere within the site.
- Extraction routes, and hence brash mats, will be aligned parallel to the ground contours where possible.
- Harvested timber will be stacked in dry areas, and outside any 50-metre watercourse buffer zone prior to removal off site to authorised sawmills such as the following:
    - Spellmans Timber, located approximately 21km northwest of the Proposed Development site
    - Duhallow Sawmills Limited, located approximately 23km northeast of the Proposed Development site

4.8.3 Turbine Foundations

Each of the turbines to be erected on site will have a reinforced concrete base. Overburden will be stripped off the foundation area to a suitable formation using a 360° excavator and will be removed to the onsite borrow pit. A five-metre-wide working area will be required around each turbine base, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. Some of the material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. The excavated material will be sealed using the back of the excavator bucket to ensure no water is trapped within the material and it will be surrounded by silt fences to ensure sediment-laden run-off does not occur.

The formation material will have to be approved by an engineer as meeting the turbine manufacturer's requirements. If the formation level is reached at a depth greater than the depth of the foundation, the ground level will be raised with clause 804 or similar hardcore material, compacted in 250 millimetres (mm) layers, with sufficient compacted effort (i.e. compacted with seven passes using 12 tonne roller). Drainage measures will be installed to protect the formation by forming an interceptor drain around the perimeter of the base which will outfall out at the lowest point level spreader or settlement pond.

An embankment approximately 600 mm high will be constructed around the perimeter of each turbine base and a fence will be erected to prevent construction traffic from driving into the excavated hole and to demarcate the working area. All necessary health and safety signage will be erected to warn of deep excavations etc. Access to and from excavated bases will be formed by excavating a pedestrian walkway to 1:12 grade.

There will be a minimum of 100 mm of blinding concrete laid on the formation material positioned using concrete skip and 360° excavator to protect ground formation and to give a safe working platform.

The anchor cage is delivered to site in 2 or more parts depending on the turbine type. A 360° excavator with suitable approved lifting equipment will be used to unload sections of the anchor cage and reinforcing steel. The anchor cage is positioned in the middle of the turbine base and is assembled accordingly. When the anchor cage is in final position it is checked and levelled by using an appropriate instrument. The anchor cage is positioned 250mm – 300mm from formation level by use of adjustable legs. Reinforcement bars are then placed around the anchor cage, first radial bars, then concentric bars, shear bars and finally the superior group of bars. Earthing material is attached during the steel foundation build up. The level of the anchor cage will be checked again prior to the concrete pour and during the concrete pour.

Formwork to concrete bases will be propped/supported sufficiently to prevent failure. Concrete for bases will be poured using a concrete pump. Each base will be poured in three stages. Stage 1 will see the concrete being poured and vibrated in the centre of the anchor cage to bring the concrete up to the required level inside the cage. Stage 2 will see the centre of the steel foundation being poured and vibrated to the required level. Stage 3 will see the remaining concrete being poured around the steel foundation to bring it up to the required finished level. After a period of time when the concrete has set sufficiently the top surface of the concrete surface is to be finished with a float.

Once the base has sufficient curing time it will be filled with suitable fill up to existing ground level. The working area around the perimeter of the foundation will be backfilled with the original material that was excavated.

4.8.4 Site Roads and Crane Pad Areas

As previously noted, the Proposed Development will make use of the majority of the existing road network, with only approx. 1.1km of new road being required on the site. Tracked excavators will carry out excavation for roads with appropriate equipment attached. The excavations shall follow a logical route working away from the borrow pit location. Excavated material will be transported back to the borrow pit in haul trucks. A two to three-metre-wide working area will be required around each hardstanding area, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. The excavated material will be covered with polythene sheets and surrounded by silt fences to ensure sediment-laden run-off does not occur.

When the formation layer has been reached, stone from the on-site borrow pit shall be placed to form the road foundation. In the event of large clay deposits being encountered in sections of road, a geotextile layer will be required at sub-base level. The sub grade will be compacted with the use of a roller. The final wearing course will not be provided until all bases have been poured. This prevents damage to the wearing course due to stone and concrete trucks movements. The road will be upgraded prior to the arrival of the first turbine. All roads will be maintained for the duration of the operation of the Proposed Development.

4.8.5 Onsite Electricity Substation and Control Building

The Proposed Development will be utilising the existing onsite Coomagearlahy 110kV substation and overhead line to Clonkeen 110kV Substation. There are no works proposed to alter or upgrade the overhead line to Clonkeen 110kV Substation, or the substation itself. There will be minor upgrades needed to the existing onsite Coomagearlahy 110kV substation in order to ensure that it is up to date with current EirGrid specifications. The construction methodology for these proposed upgrades are as follows:

- Replacement of existing M switchgear, control and protection equipment in the Coomagearlahy 3 control building to accommodate the change in the number of turbines and the reconfigured export capacity of the repowered site;
- Replacement of the existing MV/110kV 50MVA grid transformer in Coomagearlahy 3 HV compound with an MV/110kV 80MVA grid transformer to accommodate the reconfigured export capacity of the repowered site;

- Installation of a 110kV line/earth disconnector in Coomagearlahy 3 HV compound to EirGrid specification, and
- Installation of a capacitor bank and harmonic filter in Coomagearlahy 3 HV compound to achieve compliance with the EirGrid Grid Code.

4.8.6 Temporary Construction Compounds

The temporary construction compounds will be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. As the compounds are to be located on areas of existing hardstanding, which will be upgraded and extended in order to accommodate the compounds.
- A layer of geo-grid will be installed, and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- The compound will be fenced and secured with locked gates if necessary; and,
- Upon completion of the Proposed Development the temporary construction compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required.

4.8.7 Site Cable Trenching

The transformer in each turbine is connected to the substation through a network of buried electrical cables. The ground is trenched using a mechanical excavator. The top layer of soil is removed and saved so that it is replaced on completion. The cables will be bedded with suitable material. The cables will be laid at a depth that meets all national and international requirements and will generally be approximately 1.3m below ground level; a suitable marking tape is installed between the cables and the surface (see Plate 4-9 below). On completion, the ground will be reinstated as previously described above. The route of the cable ducts will be located within or alongside the Proposed Development site roads.

Plate 4-9 Standard Cable Trench View

4.9 Operation

The Proposed Development is expected to have a lifespan of approximately 35 years. Planning permission is being sought for a 35-year operation period commencing from the date of full operational commissioning of the wind farm. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected together, and data relayed from the wind turbines to an off-site control centre. Each turbine will also be monitored off-site. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at an off-site control centre 24-hours per day.

Each turbine will be subject to a routine maintenance programme involving a number of checks and changing of consumables, including oil changes. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Maintenance traffic will consist of four-wheel drive vehicles or vans. The electricity substation components and site roads will also require periodic maintenance.

4.10 Decommissioning

The wind turbines proposed as part of the Proposed Development are expected to have a lifespan of approximately 35 years. Following the end of the operational life of the wind farm, the wind turbines may be retained and the operational life extended or replaced with a new set of turbines, subject to planning permission being obtained. In the event that neither of the above options are implemented, the Proposed Development will be decommissioned fully as agreed with the Planning Authority. The onsite substation will remain in place as it will be under the ownership of the ESB and will continue to form a permanent part of the national electricity grid.

Upon decommissioning of the Proposed Development, the wind turbines would be disassembled in reverse order to how they were erected. All above ground turbine components would be separated and removed off-site for recycling. Turbine foundations would remain in place underground and will be covered with earth and reseeded as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. Site roadways will be left in situ, for future forestry operations and for local landowners to access their lands. Underground cables will be removed and the ducting left in place.

A Decommissioning Plan has been prepared and included as Appendix 4-5 of this EIAR, which will be agreed with the local authority prior to any decommissioning. The plan provides details of the methodologies that will be adopted, throughout decommissioning, the environmental controls that will be implemented, the Emergency Response Procedure to be adopted, methods for reviewing compliance and an indicative programme of decommissioning works.

The Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will be agreed with the competent authority at that time. The potential for effects during the decommissioning phase of the Proposed Development have been assessed in this EIAR.

As noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

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