Planning and Environmental Consultants

Environmental Impact Assessment Report

Proposed Clonberne Wind Farm Development, Co. Galway

Chapter 4 – Description of the Proposed Project

DOCUMENT DETAILS

Client:	**Clonberne Windfarm Limited**
Project Title:	**Proposed Clonberne Wind Farm Development, Co. Galway**
Project Number:	**180740**
Document Title:	**Environmental Impact Assessment Report**
Document File Name:	**Ch 4. Description of the Proposed Project F - 2024.06.20- 180740**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

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Rev	Status	Date	Author(s)	Approved By
01	Final	20/06/2024	JF	OC

4. DESCRIPTION OF THE PROPOSED PROJECT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the Proposed Project and all its component parts. This EIAR, along with Natura Impact Statement (NIS), will assess the Proposed Project, i.e. the Proposed Wind Farm, and the Proposed Grid Connection. This EIAR and NIS will accompany the planning permission applications for the Proposed Wind Farm and Proposed Grid Connection which will be made to An Bord Pleanála in accordance with the provisions of Section 37A and Section 182A of the Planning and Development Act 2000, as amended. Both the EIAR and NIS contain the information necessary for An Bord Pleanála to complete the Appropriate Assessment and Environmental Impact Assessment as required for these planning permission applications. Further detail in relation to the dual consenting process is outlined in Chapter 1 of this EIAR.

Proposed Wind Farm

The proposed development will consist of the provision of the following:

i. *11 no. wind turbines with an overall turbine tip height of 180 metres; a rotor blade diameter of 162 metres; and hub height of 99 metres, and associated foundations, hard-standing and assembly areas;*
ii. *Underground electrical cabling (33kV) and communications cabling;*
iii. *Provision for the undergrounding of a section of proposed 38kV overhead electrical cabling and the provision of 2 no. 38kV Line to Cable Interface End Masts to facilitate the undergrounding of the proposed 38kV cabling.*
iv. *Upgrade of existing tracks roads and provision of new site access roads, junctions and hardstand areas;*
v. *Construction of 1 no. new gated site entrance off the R328 Regional Road to facilitate the delivery of the construction materials and turbine components to site;*
vi. *Construction of 2 no. temporary construction compounds and associated ancillary infrastructure including temporary site offices, staff facilities and car-parking areas for staff and visitors, all to be removed at end of construction phase;*
vii. *Development of 1 no. borrow pit;*
viii. *Provision of 3 no. passing bays adjacent to the L22321 Local Road and an existing access track to facilitate the transport of stone material to the site;*
ix. *Peat and spoil management including the provision of 4 no. peat repository areas and 1 no. spoil repository area;*
x. *Junction accommodation works including temporary accommodation areas adjacent to the N83 National Secondary Road, R328 Regional Road and L6466 Local Road to facilitate the delivery of turbine components to site;*
xi. *Site Drainage;*
xii. *Peatland Enhancement Area;*
xiii. *Biodiversity Enhancement Measures (including the planting of woodland, linear habitat, grassland management and invasive species removal);*
xiv. *Tree felling and hedgerow removal to facilitate construction and operation of the proposed development;*
xv. *Operational stage site signage; and*
xvi. *All ancillary works and apparatus.*

A thirty five-year operational life from the date of full commissioning of the entire wind farm is being sought and the subsequent decommissioning.

The application is seeking a ten-year planning permission. A concurrent planning application in relation to a proposed substation which will comprise of a 220kV Gas Insulated Switchgear (GIS) building, an Independent Power Producer (IPP) compound, a Battery Energy Storage System (BESS) compound, underground grid connection and associated cabling to connect the proposed Clonberne Wind Farm to the national grid via the existing Flagford to Cashla 220kV overhead line in the townland of Laughil is also being lodged to An Bord Pleanála.

Proposed Grid Connection

The proposed development will consist of the provision of the following:

i. *Construction of a permanent substation which will comprise of a 220kV Gas Insulated Switchgear (GIS) building, an Independent Power Producer (IPP) compound, a Battery Energy Storage System (BESS) compound, including 4 no. 18-metre high Lightning Monopoles, welfare facilities, car parking, wastewater holding tank, 36-metre-high Telecommunications Mast, 2.6-metre high palisade fencing, external lighting, underground cabling, and all associated infrastructure and apparatus;*
ii. *All works associated with the connection of the proposed Clonberne Wind Farm to the national electricity grid, including the provision of underground electrical cabling (220kV) to the existing Flagford to Cashla 220kV overhead line, in the townland of Laughil;*
iii. *The provision of 2 no. loop-in towers, 2 no. gantries within 2 no. cable compounds to facilitate the connection of the proposed substation to the existing Flagford to Cashla 220kV overhead line;*
iv. *Construction of 2 no. gated permanent site entrances off the L6501 Local Road to facilitate access to the proposed development and the proposed Clonberne Wind Farm;*
v. *Provision of 4 no. joint bays, communication chambers and earth sheath links along the underground electrical cabling route and temporary accommodation areas to facilitate underground cabling works;*
vi. *Provision of a cable access track to facilitate the installation and maintenance of cabling and provide access to the proposed substation;*
vii. *Reinstatement of the road or track surface above the proposed cabling trench along existing roads and tracks;*
viii. *Operational access road to the proposed development and the proposed Clonberne Wind Farm;*
ix. *Site Drainage;*
x. *Tree felling and hedgerow removal to facilitate construction and operation of the proposed development;*
xi. *Operational stage site signage; and*
xii. *All ancillary works and apparatus.*

The application is seeking a ten-year planning permission. The development subject of this application will facilitate the connection of the proposed 11 no. wind turbine Clonberne Wind Farm to the national electricity grid. A concurrent application in relation to proposed Clonberne Wind Farm is also being lodged to An Bord Pleanála.

Proposed Project

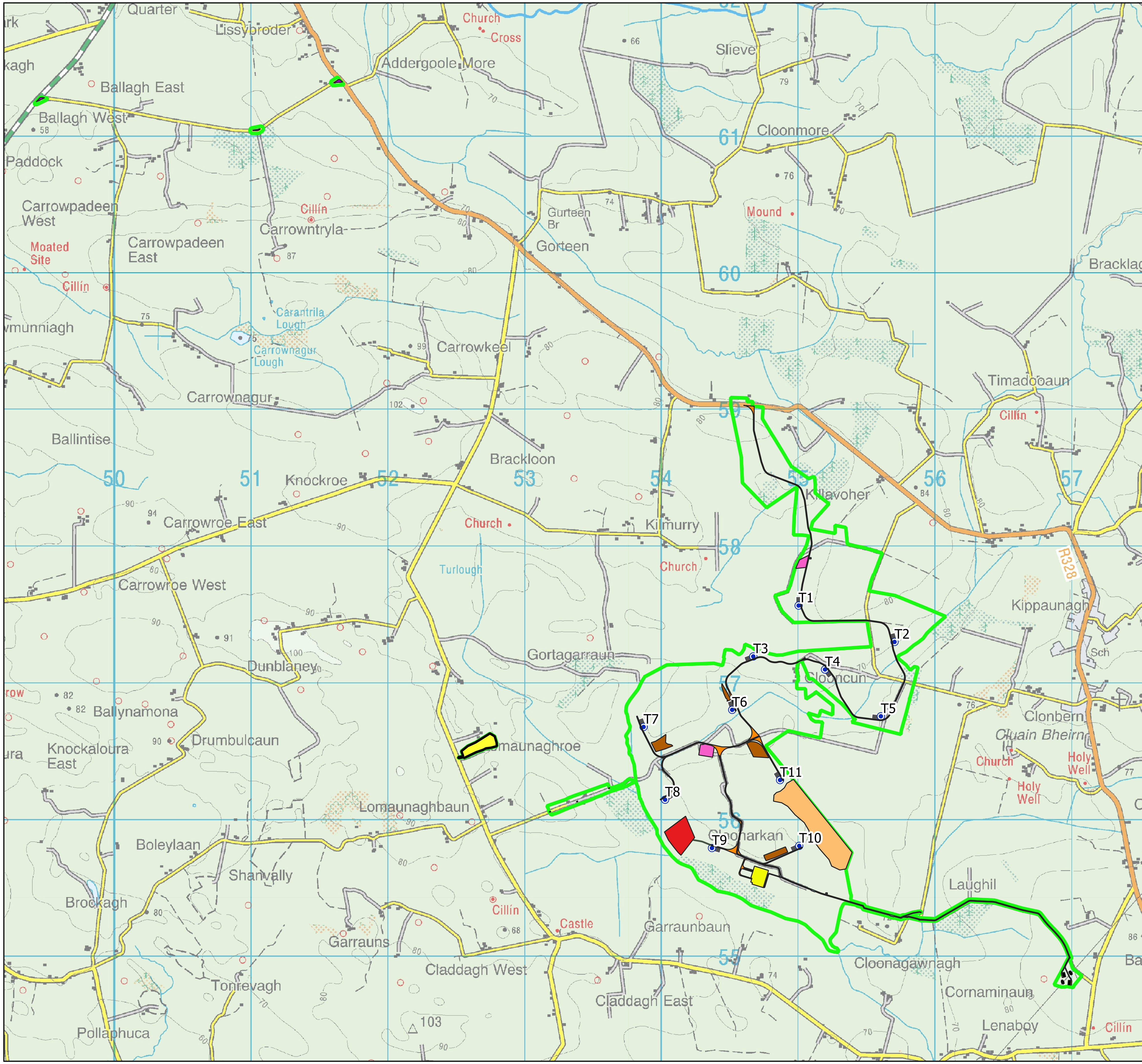
All elements of the Proposed Project, i.e., the Proposed Wind Farm and Proposed Grid Connection, have been assessed as part of this EIAR.

4.2 Development Layout

The overall layout of the Proposed Project is shown on Figure 4-1, this includes the Proposed Wind Farm and Proposed Grid Connection. The Core of the Site Layout is shown in Figure 4-2.

The Proposed Project has been designed to minimise potential environmental effects, while at the same time maximising the energy yield from the Proposed Wind Farm. A constraints study, as described in Section 3.2.6.1 of this EIAR, has been carried out to ensure that turbines and ancillary infrastructure are located in the most appropriate areas of the Proposed Wind Farm and makes use of the existing access tracks within the Proposed Wind Farm where appropriate. Similarly, as described in Section 3.2.8 of this EIAR, a route selection constraints study was undertaken to ensure that the most appropriate route for the Proposed Grid Connection undergound electrical cabling was selected. The Proposed Wind Farm layout is shown in Figure 4-3. The Proposed Grid Connection layout is shown in Figure 4-4.

Detailed site layout drawings of the Proposed Wind Farm are included in Appendix 4-1 to this EIAR. Detailed site layout drawings of the Proposed Grid Connection are included in Appendix 4-2 to this EIAR.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Turbine Foundations
- Proposed Crane Platform Hardstanding
- Proposed New Roads
- Proposed Existing Roads to be Upgraded
- Proposed Turbine Delivery Accommodation Areas
- Proposed Passing Bays
- Proposed Peat Repository Areas
- Proposed Spoil Storage Area
- Proposed Spoil Repository Access Road
- Proposed Peatland Enhancement Area
- Proposed 38kV Line to Cable Interface End Masts
- Proposed Construction Compounds
- Proposed Borrow Pit
- Proposed Substation
- Proposed Grid Connection Masts
- Proposed Grid Connection Compounds
- Proposed Cable Route and Cable Access Track
- Proposed Cable in the Public Road
- Proposed Operational Access Road

N

Drawing Title: Proposed Project	
Project Title: Clonberne WF	
Drawn By: JF	Checked By: OC
Project No.: 180740	Drawing No.: Fig. 4-1
Scale: 1:27,000	Date: 2024-06-20

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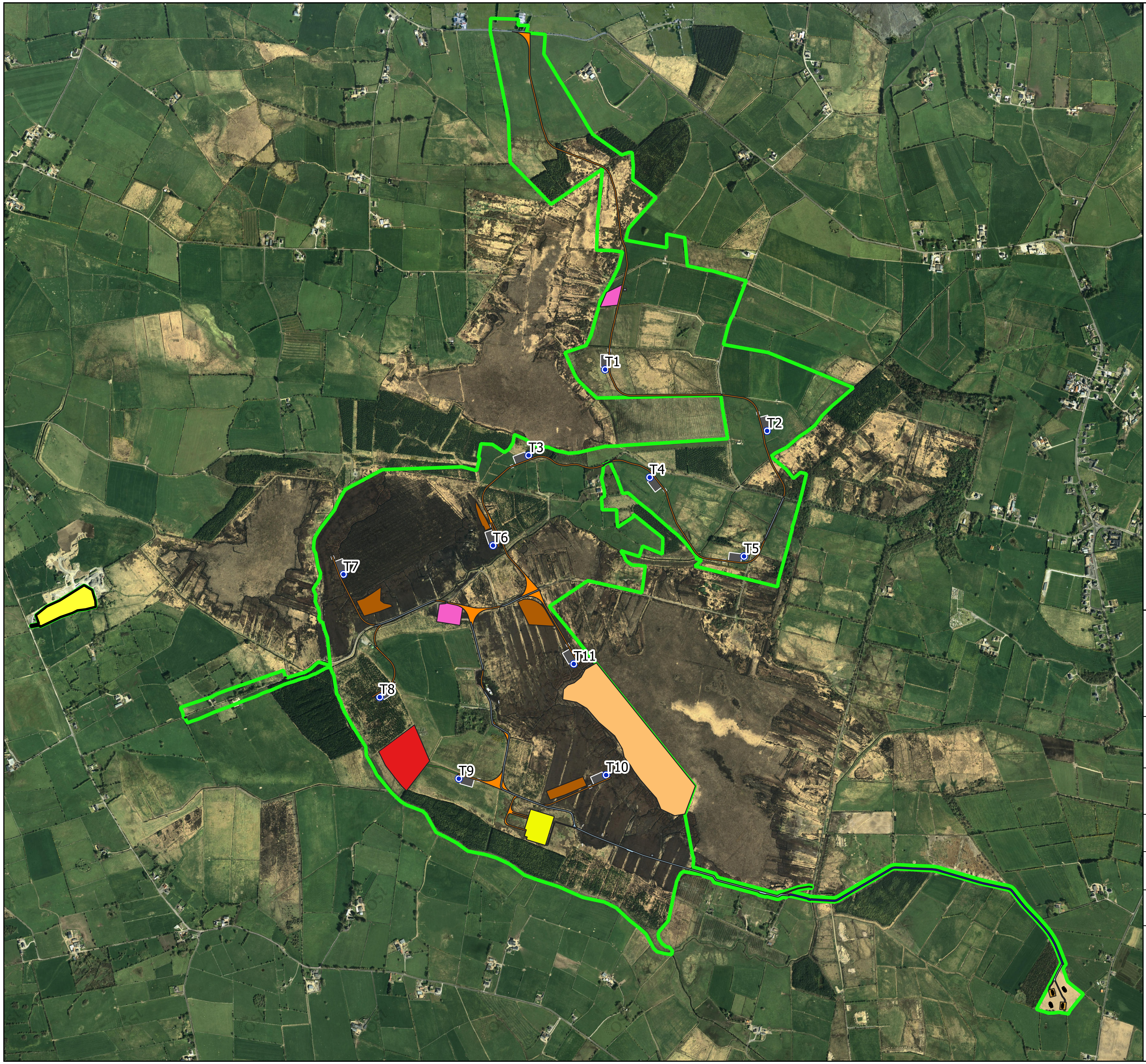

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Turbine Foundations
- Proposed Crane Platform Hardstanding
- Proposed New Roads
- Proposed Existing Roads to be Upgraded
- Proposed Passing Bays
- Proposed Peat Repository Areas
- Proposed Spoil Storage Area
- Proposed Spoil Repository Access Road
- Proposed Peatland Enhancement Area
- Proposed 38kV Line to Cable Interface End Masts
- Proposed Construction Compounds
- Proposed Borrow Pit
- Proposed Substation
- Proposed Grid Connection Masts
- Proposed Grid Connection Compounds
- Proposed Cable Route and Cable Access Track
- Proposed Cable in the Public Road
- Proposed Operational Access Road

N

Drawing Title
Core of the Proposed Project

Project Title
Clonberne WF

Drawn By	Checked By
JF	OC
Project No. 180740	Drawing No. Fig. 4-2
Scale 1:16,000	Date 2024-06-20

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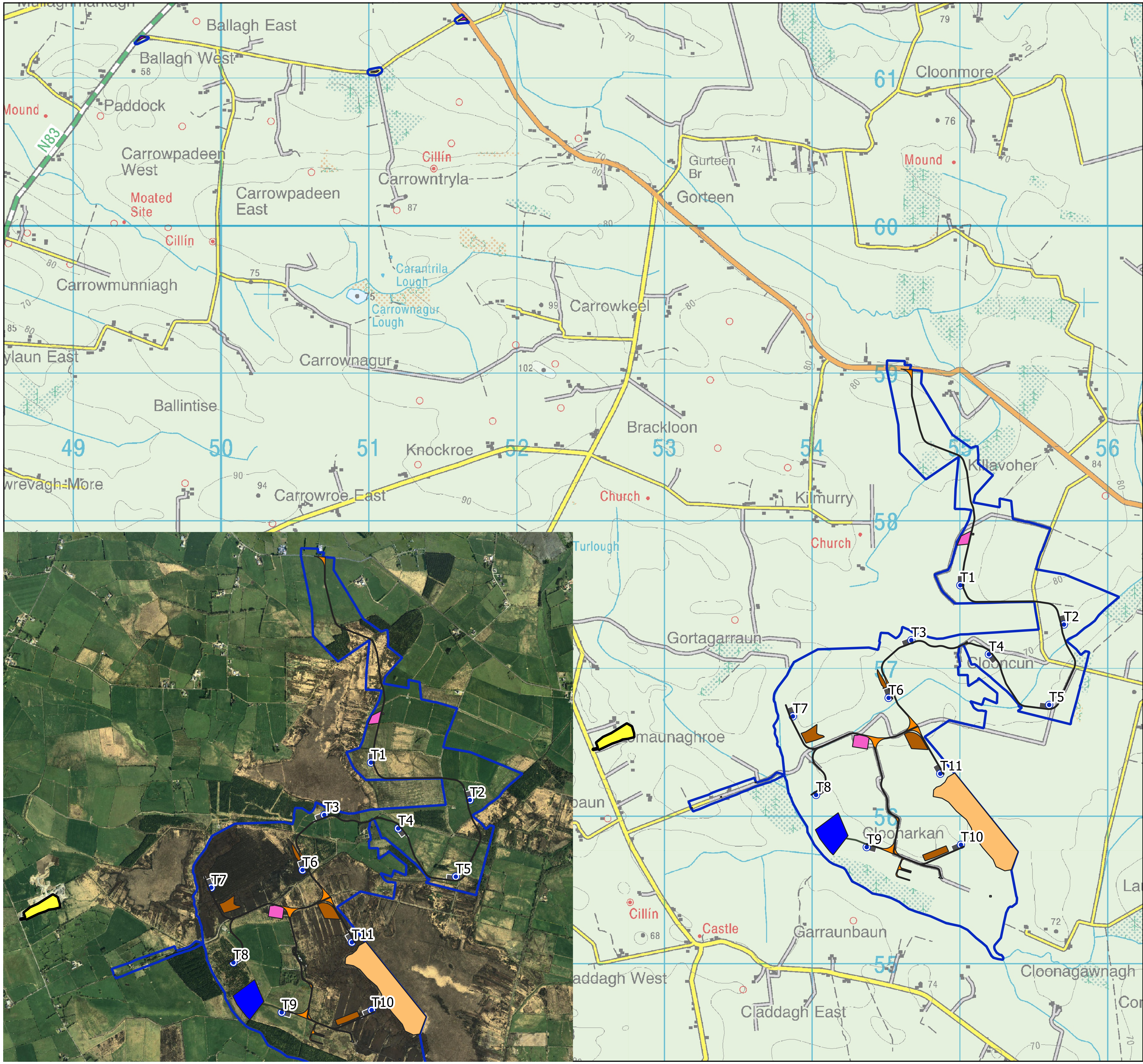

Map Legend

- Proposed Wind Farm
- Proposed Turbine Layout
- Proposed Turbine Foundations
- Proposed Crane Platform Hardstanding
- Proposed New Roads
- Proposed Existing Roads to be Upgraded
- Proposed Turbine Delivery Accommodation Areas
- Proposed Passing Bays
- Proposed Peat Repository Areas
- Proposed Spoil Storage Area
- Proposed Spoil Repository Access Road
- Proposed Peatland Enhancement Area
- Proposed 38kV Line to Cable Interface End Masts
- Proposed Construction Compounds
- Proposed Borrow Pit

N

Drawing Title: Proposed Wind Farm	
Project Title: Clonberne WF	
Drawn By: JF	Checked By: OC
Project No.: 180740	Drawing No.: Fig. 4-3
Scale: 1:25,000	Date: 2024-06-20

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Map Legend

- Proposed Grid Connection
- Proposed Substation
- Proposed Cable Route and Cable
- Proposed Operational Access Road
- Proposed Grid Connection Masts
- Proposed Grid Connection Compounds
- Proposed Cable in the Public Road

N

Drawing Title: Proposed Grid Connection	
Project Title: Clonberne WF	
Drawn By: JF	Checked By: OC
Project No.: 180740	Drawing No.: Fig. 4-4
Scale: 1:8,000	Date: 2024-06-27

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4.3 Proposed Project Components

This section of the EIAR describes the components of the Proposed Project. Further details regarding Access and Transportation (Section 4.4), Site Drainage (Section 4.5), Construction Methodologies (Section 4.6) are provided subsequently in this chapter.

4.3.1 Proposed Wind Farm

4.3.1.1 Wind Turbines

4.3.1.1.1 *Turbine Locations*

The proposed wind turbine layout has been optimised using industry standard wind farm design software to maximise the energy yield from the Proposed Wind Farm, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance. 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 (m OD)
	Easting	Northing	
T1	554967	757585	78m
T2	555669	757319	70.5m
T3	554635	757213	73.5m
T4	555160	757117	72.5m
T5	555569	756775	70.5m
T6	554481	756822	66m
T7	553833	756697	67m
T8	553990	756165	67m
T9	554333	755812	70.5m
T10	554971	755827	69.5m
T11	554831	756309	73m

4.3.1.1.2 Turbine Type

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

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

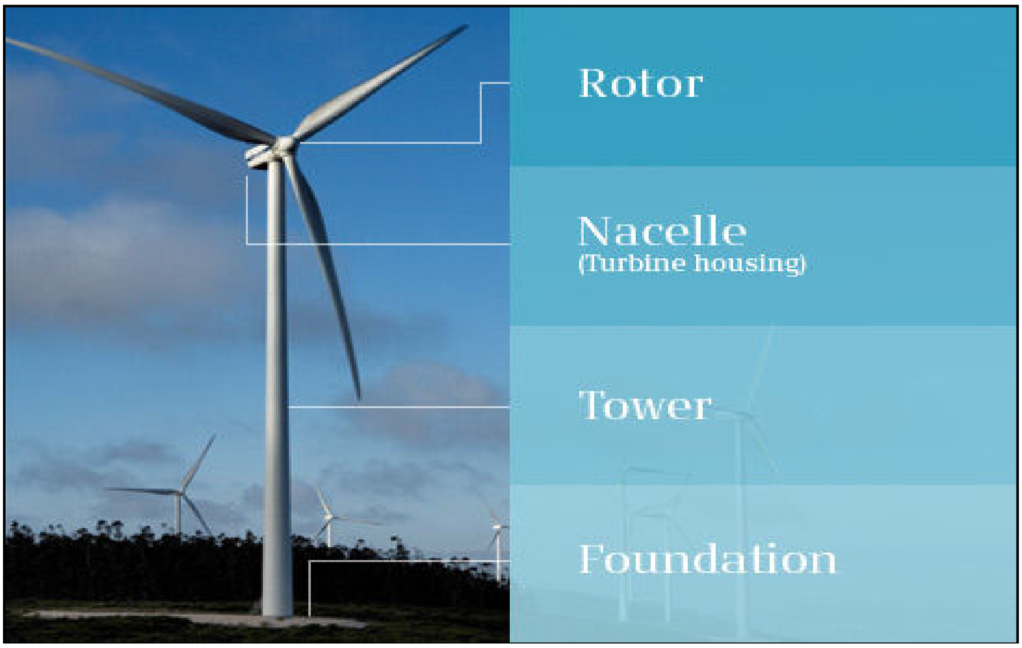


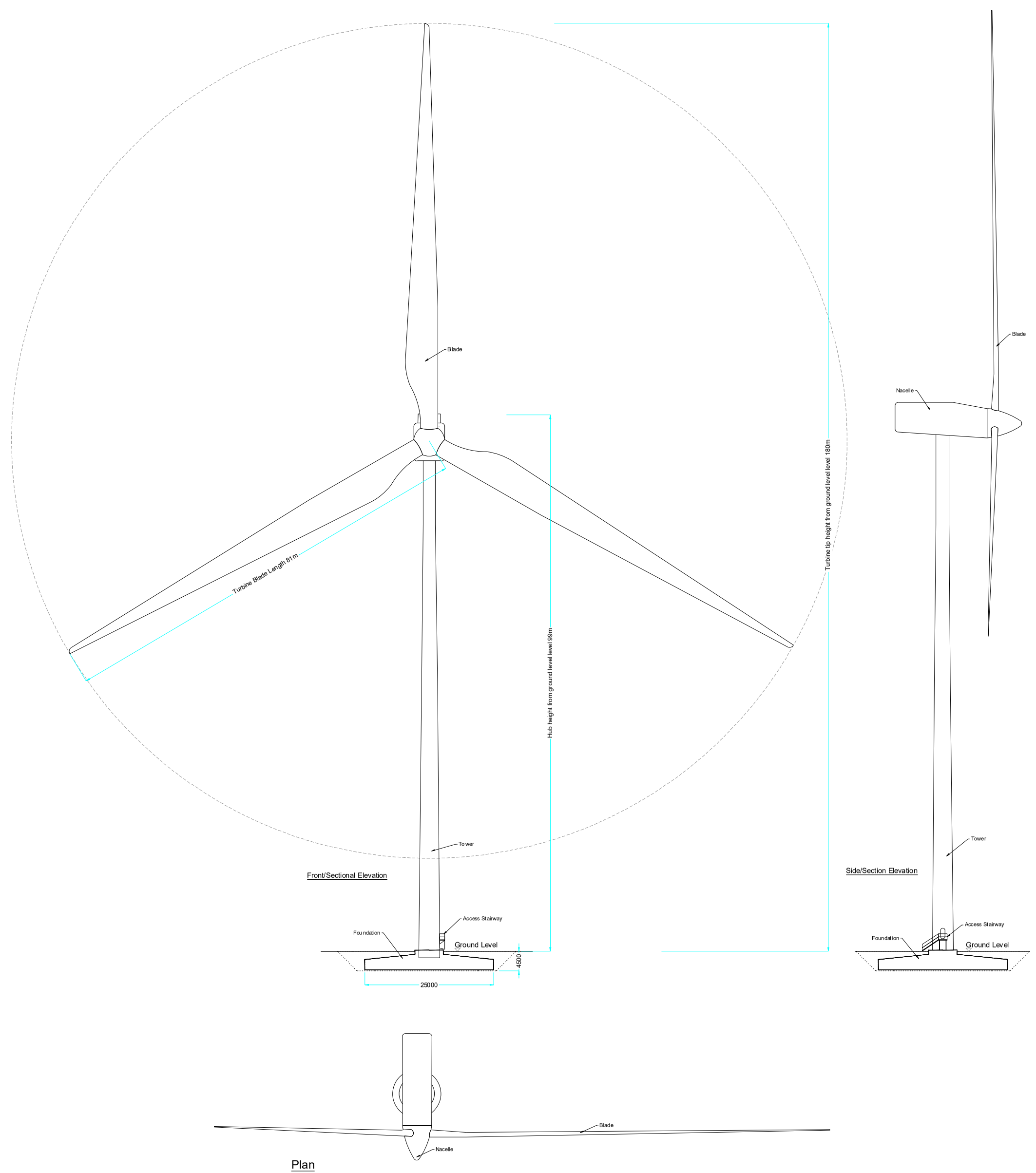
Plate 4-1 Wind turbine components

The turbine model to be installed on the Proposed Wind Farm will have an overall turbine tip height of 180 metres; blade rotor diameter of 162 metres and hub height of 99 metres. 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 on the Proposed Wind Farm 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, the above turbine dimensions have been selected and considered in the relevant sections of the EIAR. Turbine design parameters have a bearing on the assessment of shadow flicker, noise, visual impact, traffic and transport and ecology (specifically birds), as addressed elsewhere in this EIAR.

It should also be noted that the assessment of the development footprint of the Proposed Wind Farm, within this EIAR, is based on the maximum potential footprint for all of the infrastructural elements. This precautionary approach is taken as the assessment of the maximum development footprint will, in the absence of mitigation measures, give rise to the greatest potential for significant effects. Should the development footprint be less than the maximum, the potential for significant effects will also be reduced.

A drawing of the proposed wind turbine is shown in Figure 4-5. Figure 4-5 also shows the turbine base layout, including turbine foundation, hard standing area, assembly area, access road and surrounding works area. The individual components of a geared wind turbine nacelle and hub are shown in Figure 4-6 below.



Refer to DWGs 180740 - 28-30
for Foundation Details

DRAWING TITLE: **Wind Turbine Elevations & Plan**	
PROJECT TITLE: Clonberne Wind Farm, Co. Galway	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-5**
SCALE: **1:500 @A1**	DATE: **10.06.2024**

Drawing Notes

1. Proposed wind turbines to have a maximum ground to blade tip height of 180m, blade length of 81m and hub height of 99m
2. Ground level represents the top of turbine foundation.

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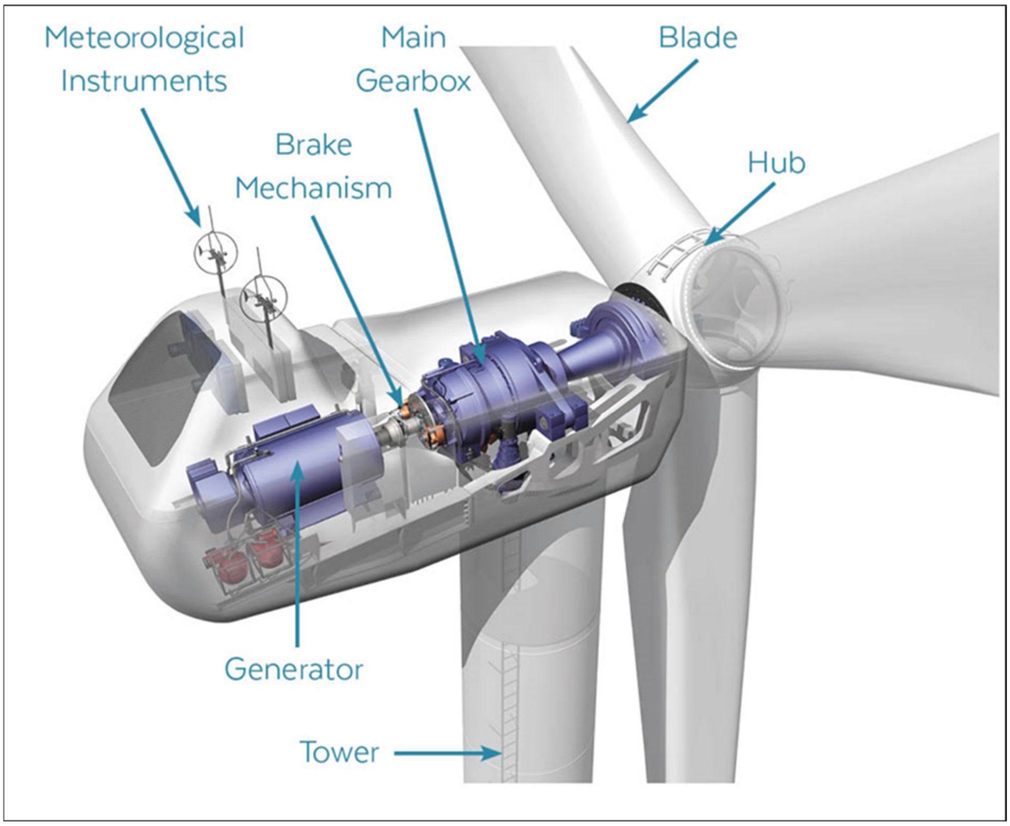

Figure 4-6 - Turbine Nacelle and Hub Components

4.3.1.1.3 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 maximum horizontal and vertical extent of the turbine foundation will be 25m and 4m respectively, which has been assessed in the EIAR and is shown in Figure 4-7.

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

Project Design Drawing Notes

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2. Drawings not to be used for construction/contract conditions.
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4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.

Drawing Legend

- Proposed Road
- Electrical Cable Trench
- Soft Levelled Area
- Crane Pad Hardstanding Area
- Turbine Foundation
- Turbine Sweep Area
- Cut
- Fill

DRAWING TITLE:
Typical Turbine Hardstanding Area

PROJECT TITLE:
Clonberne Wind Farm, Co. Galway

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-7**
SCALE: **1:500 @ A3**	DATE: **10.06.2024**

OS SHEET No.: 2540, 2541, 2542, 2543, 2544, 2607, 2608, 2609, 2610, 2611, 2677, 2678, 2679, 2680, 2681, 2746, 2747, 2748, 2749, 2750, 2814, 2815, 2816, 2817, 2818

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4.3.1.1.4 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base. These will 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. The hardstands also allow for the offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations, once completed, by placing crushed stone over the foundation. The arrangement and positioning of hard standing areas are dictated by turbine suppliers. Figure 4-7 shows a turbine base layout (Turbine No. 1), including turbine foundation, hard standing area, assembly area, access road and surrounding works area.

The proposed hard standing areas are illustrated in the detailed drawings included in Appendix 4-1. The extent of the required areas at each turbine location may be optimised on-site depending on topography, position of the Proposed Wind Farm access road, the proposed turbine position and the turbine supplier's exact requirements.

4.3.1.1.5 Assembly Area

Levelled assembly areas will be located on either side of the hard-standing area as shown on Figure 4-7. These assembly areas are required for offloading turbine blades, tower sections and hub 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 4-7 and the detailed drawing in Appendix 4-1.

4.3.1.1.6 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 Project site and will be determined by the selected manufacturer.

For the purposes of this EIAR, a rated output of 7.2 MW has been chosen to calculate the power output of the proposed 11-turbine Proposed Project, which would result in an estimated installed capacity of 79.2 MW.

Assuming an installed capacity of 79.2 MW, the Proposed Project therefore has the potential to produce up to 242,827 MWh (megawatt hours) 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 35% is applied here.

C = ... Rated output of the wind turbines: 79.2 MW

The 242,827 MWh of electricity produced by the Proposed Project would be sufficient to supply approximately 57,816 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 68,021 households in Co. Galway (including Galway City). Per annum, based on a capacity factor of 35%, the Proposed Project would therefore produce sufficient electricity for the equivalent of approximately 85% of all households in Co. Galway.

4.3.1.2 Site Roads

4.3.1.2.1 *Road Construction Types*

To provide access within the Proposed Project site and to connect the wind turbines and associated, infrastructure, existing roads and tracks will need to be upgraded and new access roads will need to be constructed. The road construction design, as per the Peat and Spoil Management Plan in Appendix 4-3, has taken into account the following key factors:

1. *Constructability;*
2. *Serviceability requirements for construction and wind turbine delivery and maintenance vehicles;*
3. *Peat depth;*
4. *Horizontal longitudinal and cross-fall gradient of the roads;*
5. *Minimisation of excavation arisings; and*
6. *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 Project site makes use of the existing road network insofar as possible. It is proposed to upgrade approximately 2.2km of existing site roads and tracks, and to construct approximately 10km of new access road on the Proposed Project site.

The construction types proposed are as follows:

Construction of New Roads
- Founded
- Floating

Upgrade of existing access roads
- Founded
- Floated

The locations where the above construction types are proposed is shown in Figure A-3-1, Figure A3-2 and Figure A-3-3 of Gavin & Doherty Geosolutions (GDG) Peat and Spoil Management Plan. This document is included as Appendix 4-3 of this EIAR.

Upgrade of Existing Access Roads

The existing access tracks on site were constructed using both excavate and replace and floated construction techniques. Upgrading works will involve both widening and resurfacing of the existing access track. The construction methodology for upgrading existing sections of excavated and floating roads or tracks is detailed in Section 4 of GDG's Peat and Spoil Management Plan in Appendix 4-3. A

[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/

section of existing excavated road for upgrade and a section through an existing floating road to be upgraded is shown in Figure 4-8.

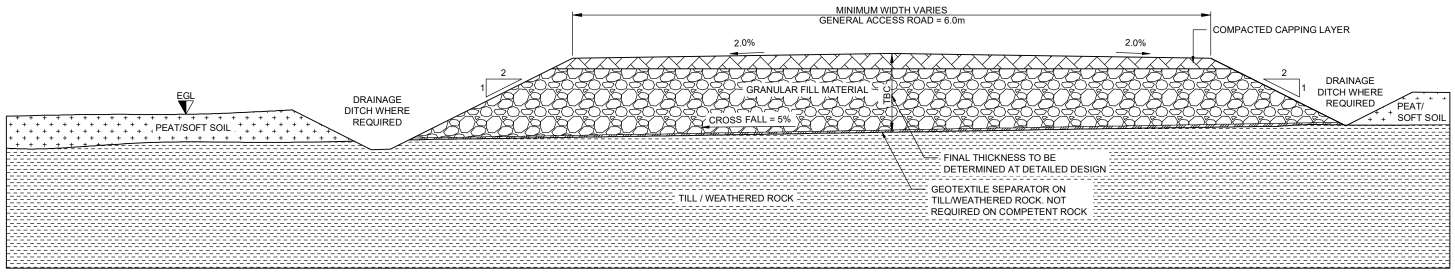
As stated in Peat and Spoil Management Plan in Appendix 4-3 of this EIAR, the design criteria for the suitability of floated access roads used for the Proposed Project site align with the Scottish Executives Best Practice guidelines document. Some sections of the proposed access track are considered suitable for floated construction when the following criteria are met:

- *Maximum slope in any direction is less than 5%,*
- *Peat depths are greater than 1m,*
- *The resulting drained and undrained slope stability assessment factor of safety results are greater than 1.3, without and with a 10kPa surcharge.*

Construction of New Excavated Roads

The excavation of peat and spoil and founding of access roads on competent stratum (below the peat) for new access roads will be carried out at various locations on the site. Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat (<1.0m) provided sufficient placement/reinstatement capacity is available on site for the excavated peat. The methodology for the construction of new excavated roads is detailed in Section 3.1 of the Peat and Spoil Management Plan in Appendix 4-3. This methodology includes construction procedures that will minimise any adverse impact on peat stability.

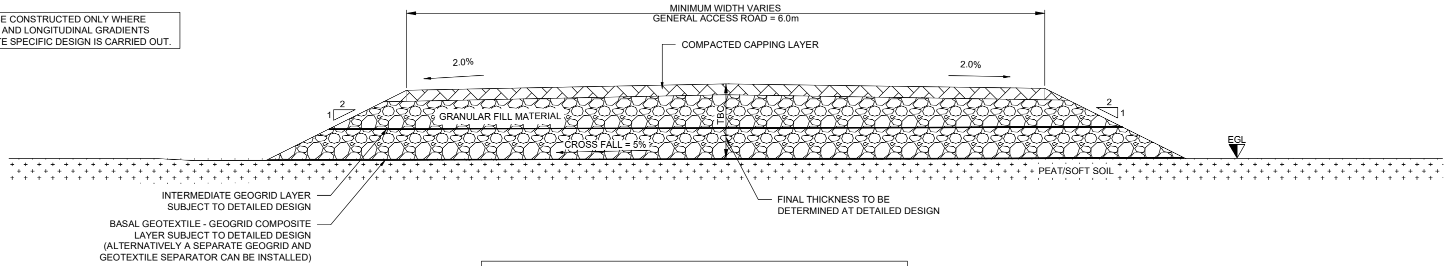
A section of a new founded and floated excavated roads are shown in Figure 4-8.



SECTION THROUGH ACCESS ROAD
NEW CONSTRUCTION: FOUNDED - DETAIL 01

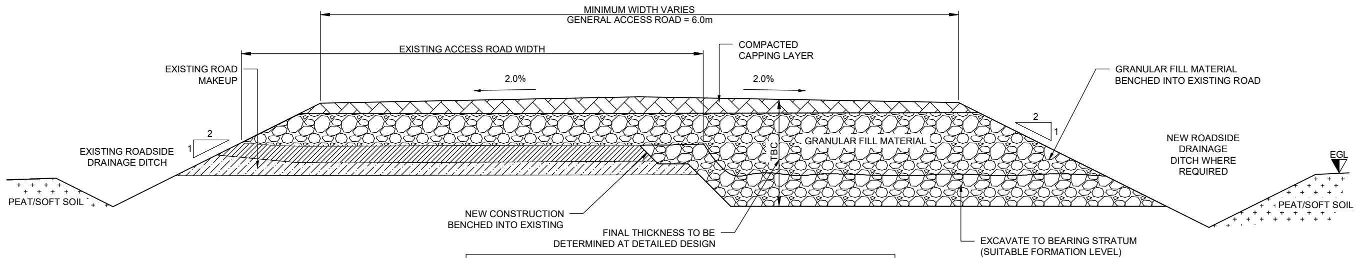
SCALE: N.T.S.

FLOATING ROADS TO BE CONSTRUCTED ONLY WHERE CROSSFALLS ARE <5% AND LONGITUDINAL GRADIENTS ARE <5% UNLESS A SITE SPECIFIC DESIGN IS CARRIED OUT.



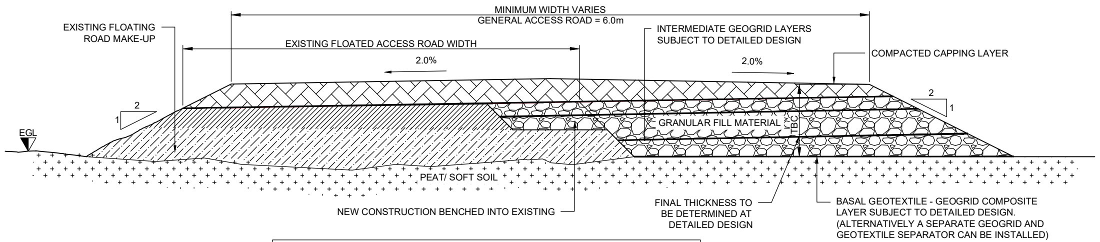
SECTION THROUGH ACCESS ROAD
NEW CONSTRUCTION: FLOATED - DETAIL 02

SCALE: N.T.S.



SECTION THROUGH WIDENING OF EXISTING
ACCESS ROAD: FOUNDED - DETAIL 03

SCALE: N.T.S.



SECTION THROUGH WIDENING OF EXISTING
ACCESS ROAD: FLOATED - DETAIL 04

SCALE: N.T.S.

NOTES:

1. THIS DRAWING IS FOR PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PURPOSES AND SHOULD NOT BE USED AS DETAILED DESIGN OR FOR CONSTRUCTION.
2. DO NOT SCALE FROM DRAWINGS.
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 TO PREVENT WATER DEGRADATION OF THE SUBFORMATION SOILS IN-LINE WITH DRAINAGE STRATEGY.

HEALTH & SAFETY:

1. NO OPERATIVES TO ACCESS ANY UNSUPPORTED TRENCHES. TRENCHES TO BE ADEQUATELY BATTERED BACK OR SUPPORTED WHERE NECESSARY. SAFE TEMPORARY BATTER ANGLES TO BE ASSESSED IN ACCORDANCE WITH CIRIA REPORT 97 "TRENCHING PRACTICE".

REV: S2-P01	DATE: 18/12/23	DRAWN BY: EFC	CHECKED BY: C.E.
DESCRIPTION:	ISSUED FOR INFORMATION		

GDG
GAVIN & DOHERTY GEOSOLUTIONS

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ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

DRAWING No: Fig. 4-8

Revision: -S2-P01

DRAWING TITLE: ACCESS ROAD STANDARD DETAILS

SCALE: N.T.S.	SHEET SIZE: A1	DATE: 18/12/2023
DRAWN BY: EFC	CHECKED BY: C.E.	APPROVED BY: J.O'D.

4.3.1.3 Site Underground Electrical (33kV) and Communications Cabling

Each turbine will be connected to the on-site electricity substation via underground 33 kV (kilovolt) electricity cabling. Fibre-optic cables will also connect each wind turbine to the onsite substation. The electricity and fibre-optic cabling connecting to the onsite substation compound will be run in cable ducts approximately 1.2 metres beneath ground level, along the sides of roadways or under the roadways. The route of the cable ducts will follow the access track to each turbine location and are illustrated on the site layout drawings included as Appendix 4-1, the exact number and configuration of cable ducting may vary within the cabling trench. Figure 4-9 below shows two variations of a typical cable trench, one for off-road trenches and one for on-road trenches. The cabling may be placed on either side of the roads, on both sides of the road or within the road. The exact configuration of the underground cabling will be set by the requirements of the electrical designers at detailed design stage.

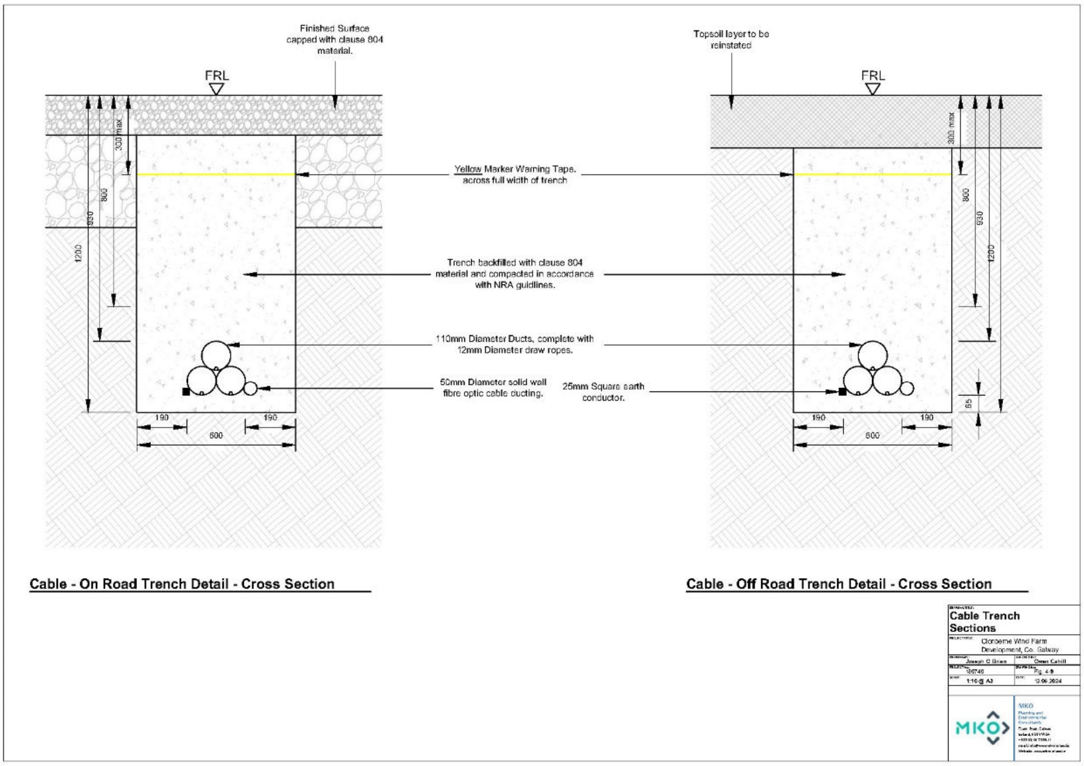


Figure 4-9 - Cable Trench Cross Section Detail

Clay plugs (water flow barrier) will be installed at regular intervals of not greater than 50 metres along the length of the trenches where required to prevent the trenches becoming conduits for runoff water. Backfill material will be compacted in layers with approved engineer's specified material, which may be imported onto the Proposed Project site should sufficient volumes of suitable material not be encountered during the excavation phase of the proposed infrastructure.

4.3.1.4 Site Underground Electrical (38kV) Cabling

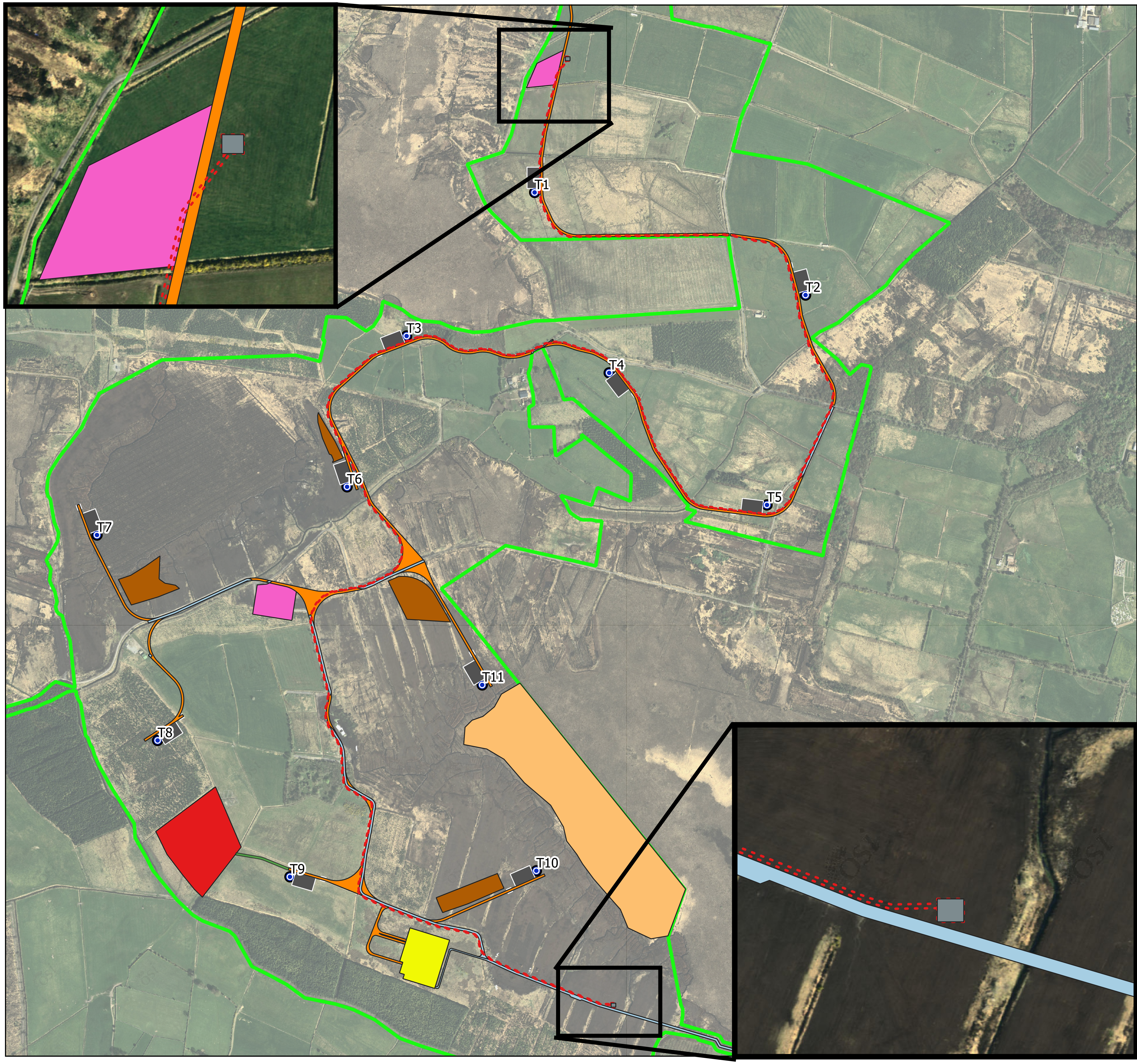
As outlined in Section 2.5 of this EIAR a proposal for a development consisting of a new 38kV overhead line (OHL) from existing Glenamaddy 38kV station to the existing Cloon 110kV station is currently in the planning system as proposed by ESB Networks. The Proposed Project includes for the provision of the undergrounding of a section of this proposed 38kV overhead electrical cabling. The 38kV overhead electrical cabling is currently proposed to traverse the Site in a north-south direction (PL ref no 24/60230). The proposal as detailed in the sections that follow set out details of infrastructure including the provision of 38kV Line to Cable Interface End Masts and 38kV Underground Cabling, as shown in Appendix 4-1, will enable the Proposed Project and the proposed 38kV Overhead Line to co-exist. The Developer will engage with the ESB Networks regarding the proposed design prior to the construction of the Proposed Project, in the event that both proposed developments are consented

38kV Line to Cable Interface End Masts

As part of the Proposed Project, it is proposed to construct 2 no. 38kV Line to Cable Interface End Masts to facilitate the undergrounding of the proposed 38kV cabling. The End Masts will be located adjacent to where Pole no. 101 and Pole no. 118 are currently being proposed as outlined in Figure 4-10. The proposed 38kV Line to Cable Interface End Masts will be up to 16.2m high. These end masts will be used as termination points of the proposed 38kV Overhead Line and the location where the line enters the proposed 38kV Underground Cable trench. Three electrical conductors will be installed on the end masts and will be supported by insulators which will separate the end mast structure from the electrical current travelling through the wires. A 38kV underground cable trench within the proposed internal access road network of the Proposed Project will then route the cabling through the wind farm site.

38kV Underground Cabling and Cable Trench

The proposed underground route, as shown in Figure 4-10, of the 38kV cable and the cable trench, within the proposed access road network will commence at northern end mast at Pole no. 101 and will be approximately 5.5km in length. At the proposed Pole no. 118, the proposed underground 38kV cable will rejoin the proposed 38kV Overhead Line via the proposed 38kV Line to Cable Interface End Masts as part of the Proposed Project. A typical cross section detail for the proposed cable trench is shown above in Figure 4-9.



Map Legend

- EIAR Site Boundary
- Proposed 38kV Underground Cable Route
- Proposed 38kV Line to Cable Interface End Masts
- Proposed Turbine Layout
- Proposed Turbine Foundations
- Proposed Crane Platform Hardstanding
- Proposed New Roads
- Proposed Existing Roads to be Upgraded
- Proposed Passing Bays
- Proposed Peat Repository Areas
- Proposed Spoil Storage Area
- Proposed Spoil Repository Access Road
- Proposed Peatland Enhancement Area
- Proposed Construction Compounds
- Proposed Borrow Pit
- Proposed Substation
- Proposed Cable Route and Cable Access Track
- Proposed Cable in the Public Road
- Proposed Operational Access Road

N

Drawing Title	
Proposed 38kV Line to Cable Interface End Masts and Proposed 38kV Underground Cable Route	
Project Title	
Clonberne WF	
Drawn By: JF	Checked By: OC
Project No.: 180740	Drawing No.: Fig. 4-10
Scale: 1:9,500	Date: 2024-06-20

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4.3.1.5 Temporary Construction Compounds

Two temporary construction compounds are proposed in the north and centre of the site measuring approximately 4,971 and 8,755 square metres respectively (Figure 4-11 and Figure 4-12 respectively). The compound in the northern section of the Proposed Wind Farm will be located adjacent to the proposed new road north of Turbine No. 1. The second temporary construction compound will be located will be located in the centre of the site adjacent to a proposed new road junction, located east of Turbines no. 7 and 8. The location of the proposed construction compounds are shown on the Proposed Project layout drawing in Figure 4-2.

The southern construction compound 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 storage area, 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 wastewaters being tankered off site by permitted waste collector to wastewater treatment plants. There will also be a water supply on site 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 their delivery to the Proposed Wind Farm.

Project Design Drawing Notes

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6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.

Drawing Legend

- Planning Application Boundary
- Proposed Road
- Cut
- Fill

N

DRAWING TITLE:
Temporary Construction Compound 1

PROJECT TITLE:
Clonberne Wind Farm, Co. Galway

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-11**
SCALE: **1:500 @ A3**	DATE: **10.06.2024**

OS SHEET No.: 2540, 2541, 2542, 2543, 2544, 2607, 2608, 2609, 2610, 2611, 2677, 2678, 2679, 2680, 2681, 2746, 2747, 2748, 2749, 2750, 2814, 2815, 2816, 2817, 2818

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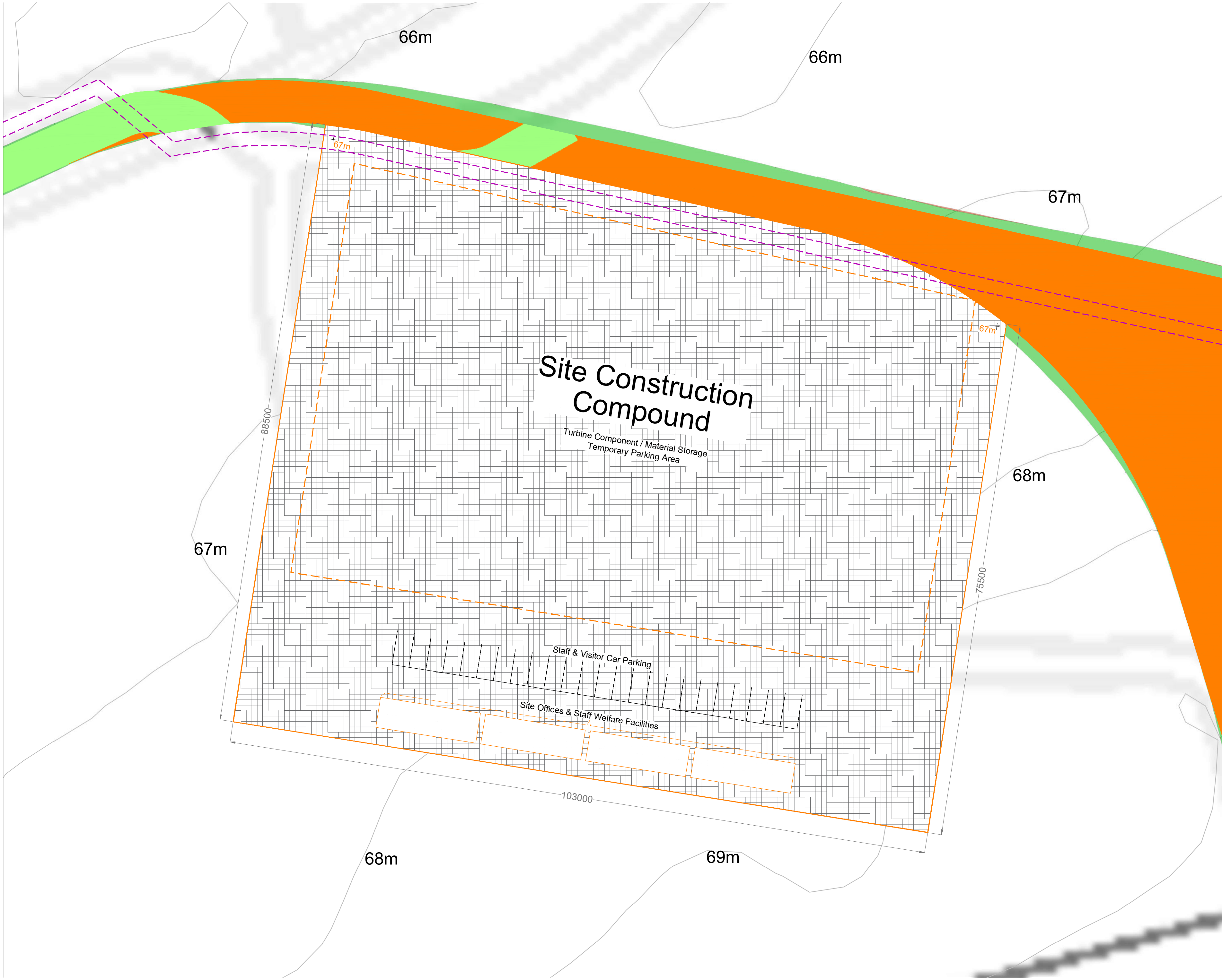
Website: www.mkoireland.ie



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7. Layout plans show 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
- Electrical Cable Trench
- Cut
- Fill

DRAWING TITLE:
Temporary Construction Compound 2

PROJECT TITLE:
Clonberne Wind Farm, Co. Galway

DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 180740	DRAWING No.: Fig. 4-12
SCALE: 1:500 @ A3	DATE: 10.06.2024

OS SHEET No.: 2540, 2541, 2542, 2543, 2544, 2607, 2608, 2609, 2610, 2611, 2677, 2678, 2679, 2680, 2681, 2746, 2747, 2748, 2749, 2750, 2814, 2815, 2816, 2817, 2818

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4.3.1.6 Rock Extraction

4.3.1.6.1 *Description*

It is proposed to develop 1 no. on-site borrow pit (Figure 4-13) as part of the Proposed Project which is located in the western region of the site. The borrow pit will provide the majority of all rock and hardcore material required during construction of the wind farm development with a quantity of material being imported from local quarries and suppliers. The estimated volume of crushed stone to be extracted from the borrow pit and for the construction of the Proposed Project is 106,770m^3. The remainder of crushed stone (6,690m^3) required for the construction of the Proposed Project will be imported from licenced quarries.

Usable rock may also be won from other infrastructure construction, including the turbine base excavations.

The location of the borrow pit are shown on Figure 4-1 and on the detailed site layout drawings included as Appendix 4-1 to this EIAR. The proposed Borrow Pit is located approximately 1,080 metres west of Turbine No. 7 and measures approximately 18,630.5 square meters in area.

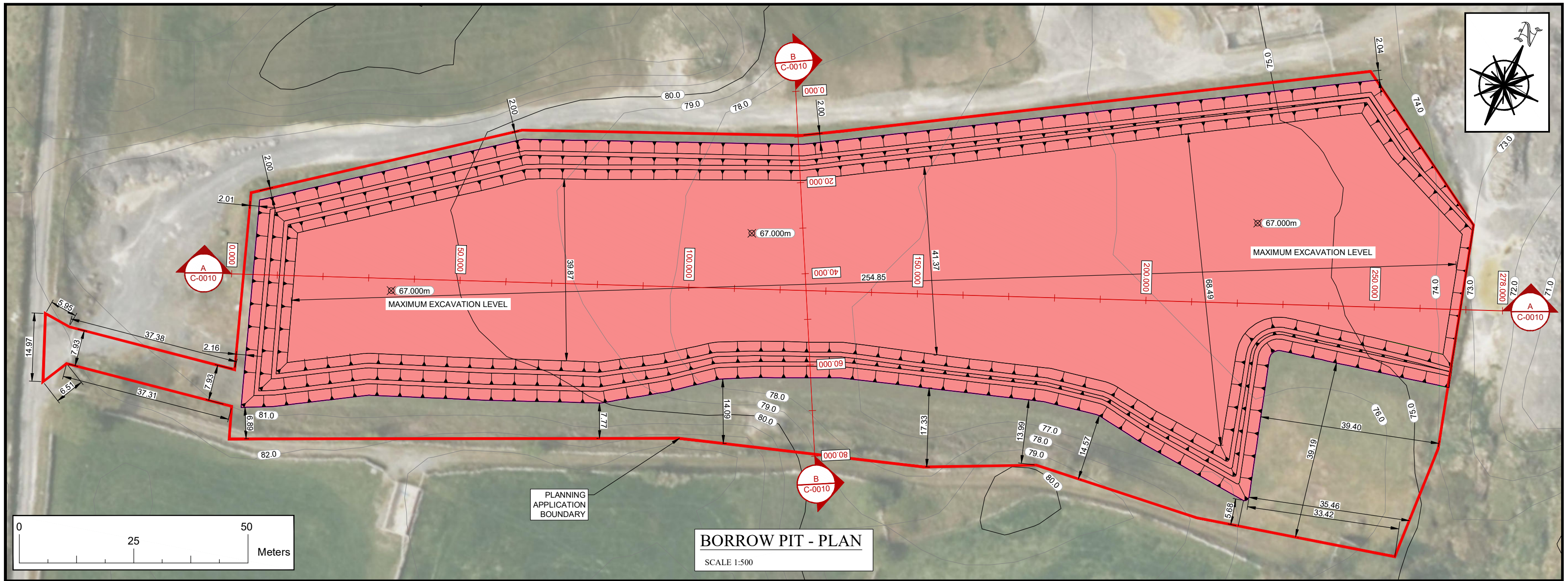
Appendix E in the Peat and Spoil Management Plan in Appendix 4-3 shows detailed sections through the proposed borrow pit. The 14,456m^3 of overburden stripped from the borrow pit area prior to the extraction of rock material will be stored temporarily in an area within the borrow pit. This material will be used for the development of drainage infrastructure during the excavation phase. On completion of the rock excavation, the overburden material will be reused for any reinstatement proposals to promote vegetation within the borrow pit area, particularly on any stepped rock faces. Any surplus material not required will be transported to a licenced waste facility as required over the course of the construction phase.

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

Hardcore materials will be extracted from the borrow pit (and other infrastructure locations, if necessary), principally by means of rock breaking. Depending on the hardcore volume requirements, 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 local residents. The developer is committed to notifying all properties within 1km of any proposed blast location which is greater than the distance stated in in the quarry guidance of 500m, Quarries and Ancillary Activities Guidelines for Planning Authorities April 2004 (DoEHG). 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.

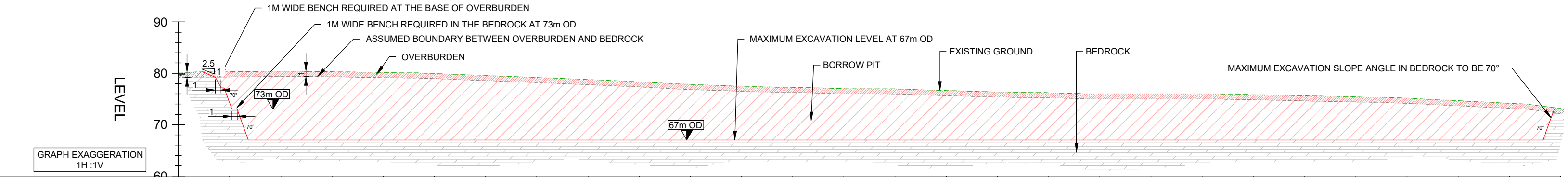
The two proposed extraction methods are detailed below in Section 4.3.1.6.2

.



BORROW PIT - PLAN

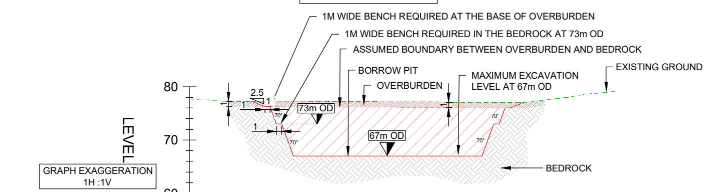
SCALE 1:500



CHAINAGE (m)	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000	230.000	240.000	250.000	260.000	270.000
EXISTING LEVELS (mOD)	80.233	80.329	80.395	80.324	80.177	79.978	79.577	79.196	78.788	78.348	77.848	77.496	77.261	77.000	76.977	76.648	76.387	76.220	76.000	76.000	76.000	75.847	75.635	75.424	75.169	74.668	74.178	73.174

SECTION A-A

SCALE 1:500



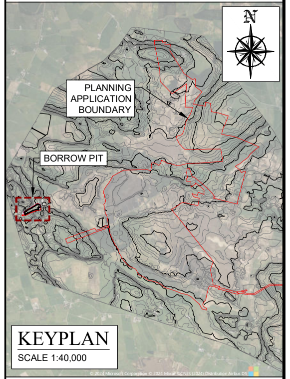
CHAINAGE (m)	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000
EXISTING LEVELS (mOD)	77.687	77.181	77.243	77.196	77.149	77.019	77.000	77.882	79.076

SECTION B-B

SCALE 1:500

NOTES:

1. THIS DRAWING IS FOR PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PURPOSES AND SHOULD NOT BE USED AS DETAILED DESIGN OR FOR CONSTRUCTION DRAWINGS.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. THE OUTLINE AND SECTIONS ARE INDICATIVE AND ARE SUBJECT TO DETAILED DESIGN, SLOPE STABILITY ASSESSMENT AND ADDITIONAL GROUND INVESTIGATION.
4. IN-SITU ROCK SLOPE SHALL BE FORMED AT STABLE INCLINATIONS TO SUIT LOCAL ROCK CONDITIONS AND SUBJECT TO DETAILED DESIGN.
5. THE EXCAVATABILITY OF THE ROCK AND DEPTH TO TOP OF ROCK WITHIN EACH OF THE BORROW AREAS WILL NEED TO BE DETERMINED FROM A GROUND INVESTIGATION.
6. BORROW PIT 3D MODEL BASED ON TOPOGRAPHICAL SURVEY: 1m CONTOURS, RECEIVED 02.10.2023.
7. BORROW PIT EXTENTS TAKEN FROM MKO SHAPE FILE BP 2023.09.21, RECEIVED 21.09.2023. BORROW PIT EXTENT HAS BEEN MODIFIED BY GDG TO REFLECT OFFSETS FROM EXISTING SLOPES.
8. AERIAL MAP SOURCE: ©2024 MICROSOFT CORPORATION ©2024 MAXAR ©CNES(2024) DISTRIBUTION AIRBUS DS MICROSOFT BING.



KEYPLAN

SCALE 1:40,000

LEGEND:

- BEDROCK (IN-SITU)
- BEDROCK (EXCAVATED)
- OVERBURDEN (IN-SITU)
- OVERBURDEN (EXCAVATED)

BORROW PIT VOLUMES	
AREA	VOLUME
OVERBURDEN	14,456m³
BEDROCK	106,770m³
TOTAL EXCAVATION	121,226m³

REV:	DATE:	DRAWN BY:	CHECKED BY:	DESCRIPTION:
S2 -P02	15/03/24	E.F.C.	C.E.	ISSUED FOR PLANNING
S2 -P01	12/03/24	E.F.C.	C.E.	BORROW PIT BOUNDARY AND REVISION NUMEBERING UPDATED
FI -02	23/02/24	R.R.	C.E	UPDATE TO REFLECT UPDATED EIAR BOUNDARY
FI -01	27/11/23	K.H	C.E	REVISED BORROW PIT MODELLING
FI -00	11/02/22	K.H	A.A	ISSUED FOR INFORMATION

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ISSUED AS: FOR PLANNING

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

DRAWING No: Figure 4-13

Revision: S2 P02

DRAWING TITLE: BORROW PIT PLAN & SECTIONS

SCALE: 1:500	SHEET SIZE: A1	DATE: 11/02/2022
DRAWN BY: K.H	CHECKED BY: A.A	APPROVED BY: J.O'D

4.3.1.6.2 *Rock Extraction Methods*

The extraction of rock is a work stage of the Proposed Project which will be a temporary operation run over a short period of time relative to the duration of the entire project. Where there is a layer of overburden present within the area to be excavated, it will be stripped back and stockpiled using standard track mounted excavators. Two extraction methods have been assessed for breaking out the useful rock below; rock breaking and blasting.

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 by a competent operator. In areas where rock of a much higher strength is encountered and cannot be removed by means of excavating then a rock breaking methodology may be used. Where rock breaking is required, a large hydraulic 360-degree excavator with a rock breaker attachment is typically used. 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. The large rock breaker is typically supported by a smaller rock breaker which can often be in the 30-40 tonne size range and works to break the rocks down to a size that they can be fed into a crusher.

The extracted broken rock is typically 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 away from the immediate area of the crusher until it is required elsewhere on the site.

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. The drilling rigs used are normally purpose built, self-propelled machines, designed specifically for drilling blast boreholes. A drilling rig working for 3-4 days would typically drill the necessary number of boreholes required for a single blast. The locations, depth and number of boreholes are determined by the blast engineer, a specialist role fulfilled by the blasting contractor that would be employed to undertake the duties.

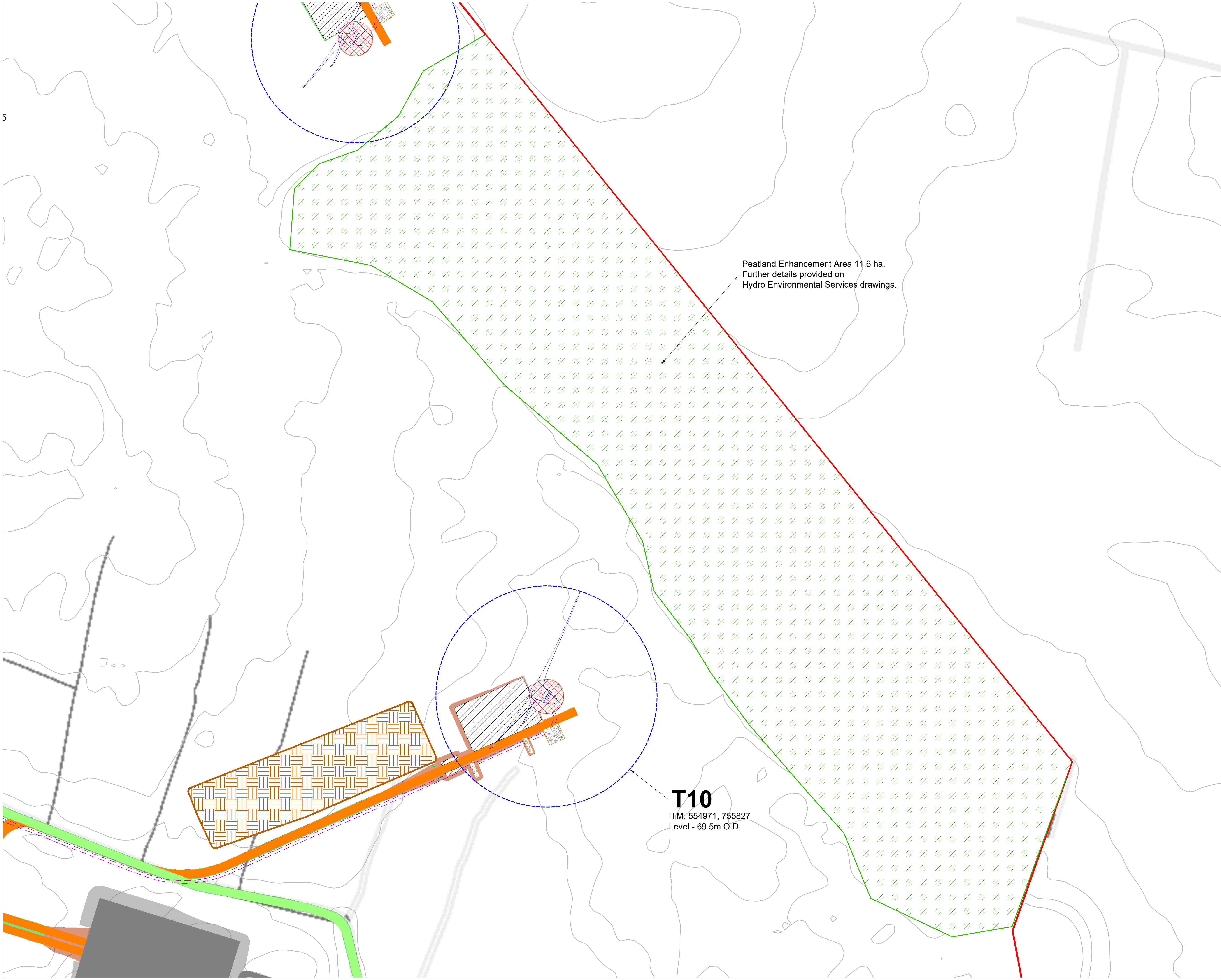
The blast engineer will arrange for the necessary quantity of explosive to be brought to site to undertake a single blast. The management of explosives onsite and the actual blasting operation would be agreed in advance with and supervised by An Garda Siochána. The blast engineer sets the explosives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

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 one blast 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] and the British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*[3].

4.3.1.7 Peatland Enhancement Area

As part of the Proposed Project, an area of 11.6ha of uncut raised bog is proposed for enhancement by installing a number of drain blocks using peat plugs in existing drains which are intended to encourage rewetting of the peatland area. It is proposed to undertake this drain blocking within this area of raised bog. The purpose of this measure is to raise the water table in the drain, and in adjacent areas in order to reduce run-off rates, carbon losses and the potential for subsidence. Drain blocking will be subject to approval and carried out under the supervision of the project geotechnical engineer, project hydrologist and project ecologist. The area proposed as the Peatland Enhancement Area is shown in Figure 4-14. The peat stability at this location is discussed in Appendix 8-1 Peat Stability Risk Assessment report by GDG. The methodology for peatland enhancement is outlined in Section 6.1 of Appendix 4-3 Peat and Spoil Management Plan in this EIAR. It is proposed that the drains within this area will be blocked with peat dams every 20m intervals to reduce the drainage of water from the water and to rise the water table. The rising of the water table will enable the accumulation of peat to occur.

[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



Project Design Drawing Notes

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

Drawing Legend

- Planning Application Boundary
- Existing Road to be Upgraded
- Proposed Road
- Electrical Cable Trench
- Soft Levelled Area
- Crane Pad Hardstanding Area
- Turbine Foundation
- Turbine Sweep Area
- Cut
- Fill
- Peatland Enhancement Area
- Peat Repository Area
- Area Part of Separate Application

N

DRAWING TITLE:

Peatland Enhancement Area

PROJECT TITLE:

Clonberne Wind Farm, Co. Galway

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-14**
SCALE: **1:2,500 @ A3**	DATE: **10.06.2024**

OS SHEET No.: 2540, 2541, 2542, 2543, 2544, 2607, 2608, 2609, 2610, 2611, 2677, 2678, 2679, 2680, 2681, 2746, 2747, 2748, 2749, 2750, 2814, 2815, 2816, 2817, 2818

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Website: www.mkoireland.ie

4.3.1.8 Tree Felling and Replanting

4.3.1.8.1 Tree Felling

As part of the Proposed Project, tree felling will be required within and around development footprint to allow for the construction of the turbine bases, access roads underground cabling, and the other ancillary infrastructure as shown in Figure 4-15 as part of the overall areas to be felled as part of the Proposed Project. A total of 10.3 hectares of proposed tree felling will be permanently felled within and around these turbines and associated infrastructure.

The proposed commercial forestry felling activities required as part of the Proposed Project 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 Project 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 Project.

4.3.1.8.2 Woodland and Hedgerow Felling

As part of the felling in the Proposed Project, the proposed felling of 2.14ha of woodland and scrub felling will be required to accommodate the proposed turbines and the associated bat setback buffers, wind farm roads and other key infrastructure. Section 2.1 in the Biodiversity Management and Enhancement Plan in Appendix 6-6 provides further detail on the felling areas, species and associated infrastructure.

In Section 3.1 in the Biodiversity Management and Enhancement Plan in Appendix 6-6, detail is provided on the proposed hedgerow/treeline felling. The majority of hedgerow/tree habitat loss is associated with habitat buffering measures required to avoid impact on bats as per NatureScot recommendations. The proposed vegetation removal to prevent impacts on bats is summarised in Table 3-1 in the Biodiversity Management and Enhancement Plan in Appendix 6-6. Linear vegetation loss associated with construction of the Proposed Project infrastructure measures 1,061m in total.

4.3.1.8.3 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 the infrastructure developments.

The commercial forestry that will be permanently felled for the footprint of the Proposed Project 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 Project. 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 forestry can occur anywhere in the State subject to licence. The replacement of forestry felled as part of the Proposed Project, may occur on any lands, within the state, benefitting from Forest Service Technical Approval[4] for afforestation, should the Proposed Project receive planning permission. Under the Forestry Regulations 2017, all applications for licences for afforestation require

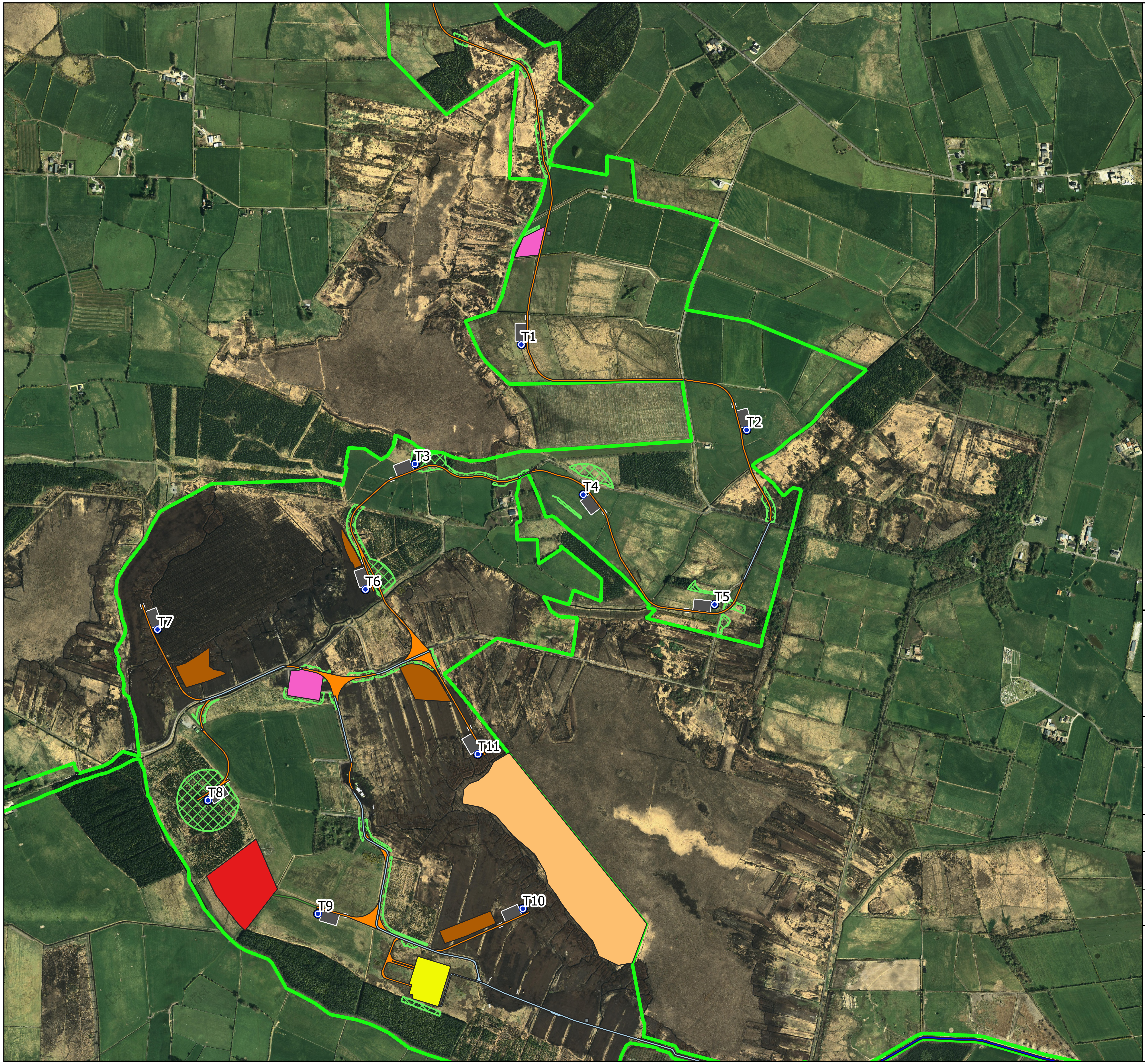
[4] *All proposed forestry developments where the area involved is greater than 0.1 hectare must receive the prior written approval of the Forest Service. The application for approval is known as Pre-Planting Approval – Form 1.*

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).

4.3.1.8.4 *Woodland and Hedgerow Replanting*

Section 2.3 in the Biodiversity Management and Enhancement Plan in Appendix 6-6 outlines the proposed woodland replanting regime. The loss of 2.14ha of woodland and scrub will be offset through the planting of native woodland within the Site. It is proposed to plant approximately 2.89 hectares of native woodland to offset that loss as well as achieving biodiversity net gain, as such this habitat would constitute a high local biodiversity value. The planting of 2.89ha of native tree species will result in an increase of approx. 0.75ha of woodland within the Site, accounting for the felling of wet willow-alder-ash woodland, bog woodland, immature woodland and scrub during the construction phase.

In Section 3.3 in the Biodiversity Management and Enhancement Plan in Appendix 6-6, it is outlined the proposed hedgerow planting regime to be undertaken. The proposed planting of 2,419m of hedgerow habitat will result in the creation of an additional 1,358m of linear vegetation habitat within the Site. Of the proposed 2,419m of hedgerow planting, 544m will be planted along the northern, western and southern perimeter of the proposed borrow pit during the operational phase of the Proposed Project to reduce the landscape and visual impact of the proposed borrow pit.



Map Legend

- EIAR Site Boundary
- Proposed Felling
- Proposed Turbine Layout
- Proposed Turbine Foundations
- Proposed Crane Platform Hardstanding
- Proposed New Roads
- Proposed Existing Roads to be Upgraded
- Proposed Passing Bays
- Proposed Peat Repository Areas
- Proposed Spoil Storage Area
- Proposed Spoil Repository Access Road
- Proposed Peatland Enhancement Area
- Proposed 38kV Line to Cable Interface End Masts
- Proposed Construction Compounds
- Proposed Borrow Pit
- Proposed Substation
- Proposed Cable Route and Cable Access Track
- Proposed Cable in the Public Road
- Proposed Operational Access Road

N

Drawing Title
Proposed Felling

Project Title
Clonberne WF

Drawn By	Checked By
JF	OC
Project No.	**Drawing No.**
180740	Fig. 4-15
Scale	**Date**
1:11,500	2024-06-20

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4.3.1.9 Grassland Management

Molinia Meadow habitat loss

As part of the Proposed Project, approximately 0.21ha of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] will be lost in order to accommodate the construction of new site road located to the east of Turbine 1 as outlined in Section 5.1 in the Biodiversity Management and Enhancement Plan in Appendix 6-6.

Grassland Reseeding measures

As outlined in Section 5.2 in the Biodiversity Management and Enhancement Plan in Appendix 6-6, it is proposed to transplant the areas of *Molinia* meadow habitat to a new location within the Site to encourage expansion of the habitat.

In addition, it is proposed the spoil repository areas will be reseeded with native wildflower meadow mix (from wildflowers.ie) the mix will be agreed with the Project Ecologist and will be a suitable mix according to the substrate within the repository area.

4.3.2 Proposed Grid Connection

4.3.2.1 Proposed Substation

4.3.2.1.1 *220kV Gas Insulated Switchgear Building*

It is proposed to construct a 220kV Gas Insulated Switchgear (GIS) Building as part of the Proposed Project, as shown in the Site Layout Drawings (Grid Connection) which are included in Appendix 4-2. The GIS building will be located within existing agricultural land. The building will be a two-storey structure and will comprise a metal roof cladding as part of its external finishes. The GIS Building, shown in Figure 4-16 and Figure 4-17, will be accessed via a proposed operational access road as shown in Figure 4-1. The building and its surrounds will be enclosed by a 2.6m high palisade fence and post and rail property boundary fence with a total area of circa 3,860m^2. The internals of the building will comprise storage areas, a hoist area for loading equipment to the upper floor workshop, generator room, welfare facilities with further details provided within the Site Layout Drawings in Appendix 4-2 and in the construction methodology report included as Appendix 4-7.

4.3.2.1.2 *Independent Power Producer Building*

It is proposed to construct an Independent Power Producer (IPP) Building as part of the Proposed Project and is shown in Figure 4-18. The IPP Building is shown in Site Layout Drawings (Grid Connection) which are also included in Appendix 4-2. The IPP Building will have a footprint of 5,594m^2 and will be constructed with a masonry built structure comprising a concrete foundation, concrete block external walls with a cavity and a timber framed roof with a slate finish. The internals of the building will comprise a control room, switch room, store areas and welfare facilities.

4.3.2.1.3 *Cable Trenches*

The proposed 220kV cable route between the proposed substation and the public road is considered as part of this Peat and Spoil Management Plan (Appendix 4-3) with the cable route construction within the existing public road is not expected to generate any surplus peat. The cable route is proposed to be constructed within proposed new access roads, varying in width from 3.5m to 6m. Most of the route is proposed to be constructed within a new founded access road; however, part of the proposed route, totalling 460m, passes through an area of peat >1m in thickness. Therefore, it has been proposed that part of the route be constructed within a section of the floated access road.

An indicative methodology to construct cable trenches within both new founded roads and new floated roads is detailed in both Section 4.6.3.3 below and in Section 4.3 of the Peat and Spoil Management Plan in Appendix 4-3.

4.3.2.1.4 Other Infrastructure

A telecommunications mast is proposed within the footprint of the proposed substation. The mast will be a free-standing slender lattice structure 36 metres in height. The mast will be constructed on a hard-standing area sufficiently large enough to accommodate the equipment that will be used to erect the mast.

It is proposed to construct lightning monopoles as part of the Proposed Project and these will be located within the Proposed 220kV GIS compound. The monopoles will be 18m high and provide lightning protection to the substation compound.

The proposed internal substation compound roads will comprise of both the Asphalt Access Roads and Concrete Access Roads. Both types of the internal roads will be 4.5m wide and will comprise of a 2.5% fall for drainage purposes.

During the operational phase of the Proposed Project, the on-site substation will be accessed via a proposed operational access road which adjoins the L6501 Local Road. The proposed operational access road will merge with the cable access track providing access to the proposed GIS compound from the east.

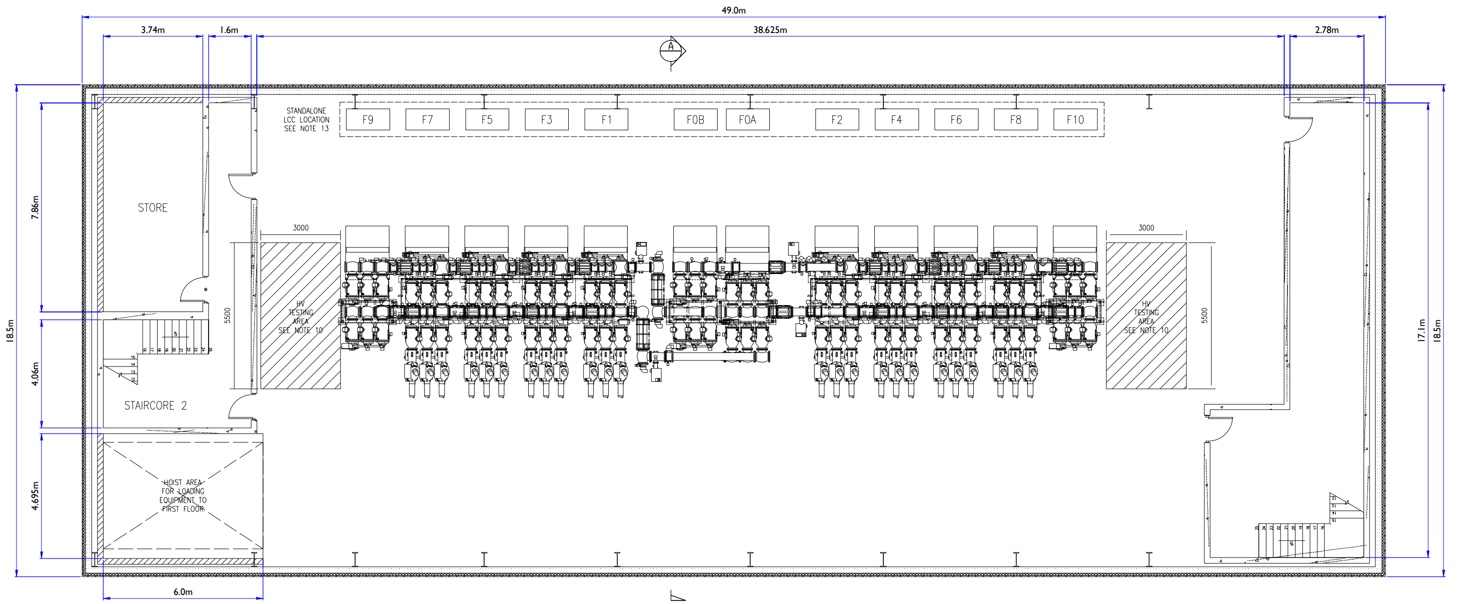
4.3.2.1.5 Battery Storage

As part of the Proposed Project, it is proposed to construct a battery storage compound which is shown in Figure 4-19. The battery storage compound will have a footprint of 4,143m^2. The battery storage compound will include 10 no. Battery Storage modules and 10 no. transformers and 5 no. auxiliary transformers. Each battery storage module will measure 12.2m X 2.89m with a height of 2.58m.

Prior to installing the steel containers, clearance of the site area, levelling off the ground surface and creation of a hard stand will be undertaken. These containers and the adjacent infrastructure house the batteries, inverters, transformers, fire suppression equipment and associated electrical components. The containers will be mounted onto concrete plinth foundations. The containers shall be spaced to allow airflow around the containers, feeding their climate control systems.

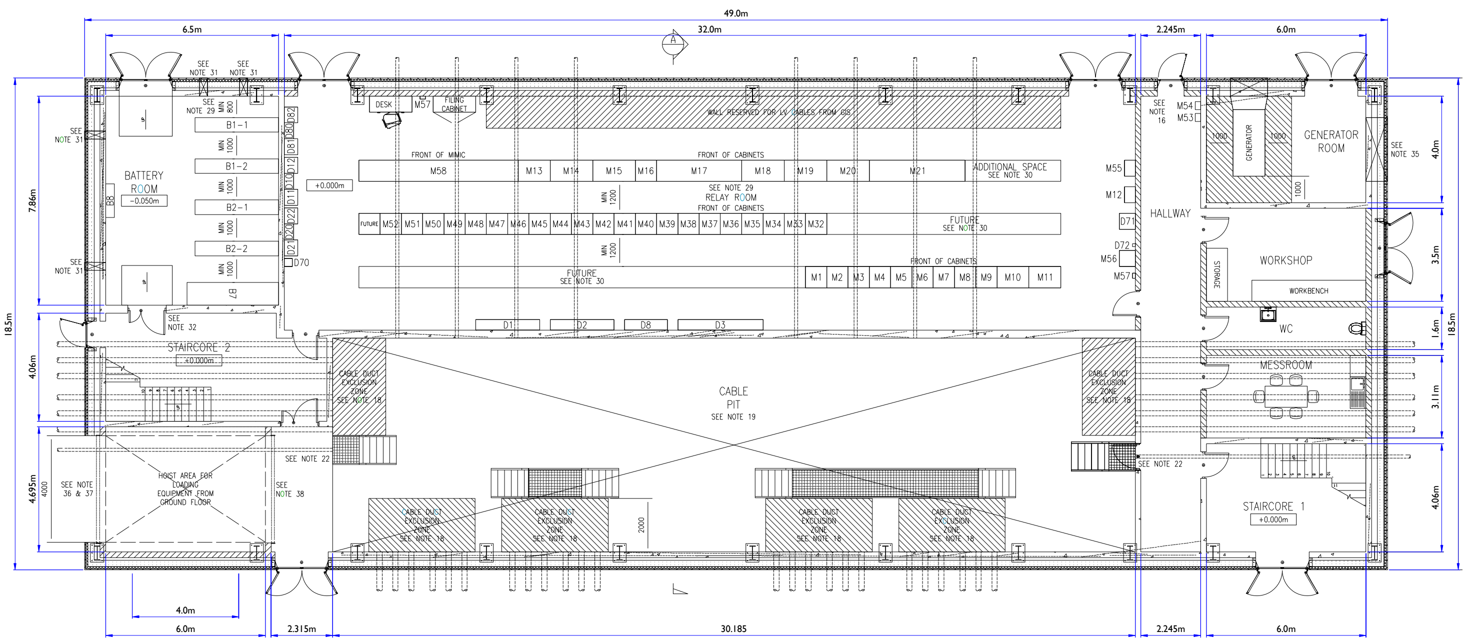
The battery storage compound will operate continuously, linked to the IPP Building. It will be monitored in tandem with the overall development and there will be sporadic maintenance visits as required.

ISO A1 594mm x 841mm



FIRST FLOOR PLAN

SCALE: 1:100



GROUND FLOOR PLAN

SCALE: 1:100

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PROJECT

Clonberne Wind Farm
220kV Grid Connection

CLIENT

Clonberne Windfarm Limited

CONSULTANTS

NOTES: -

LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
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180740

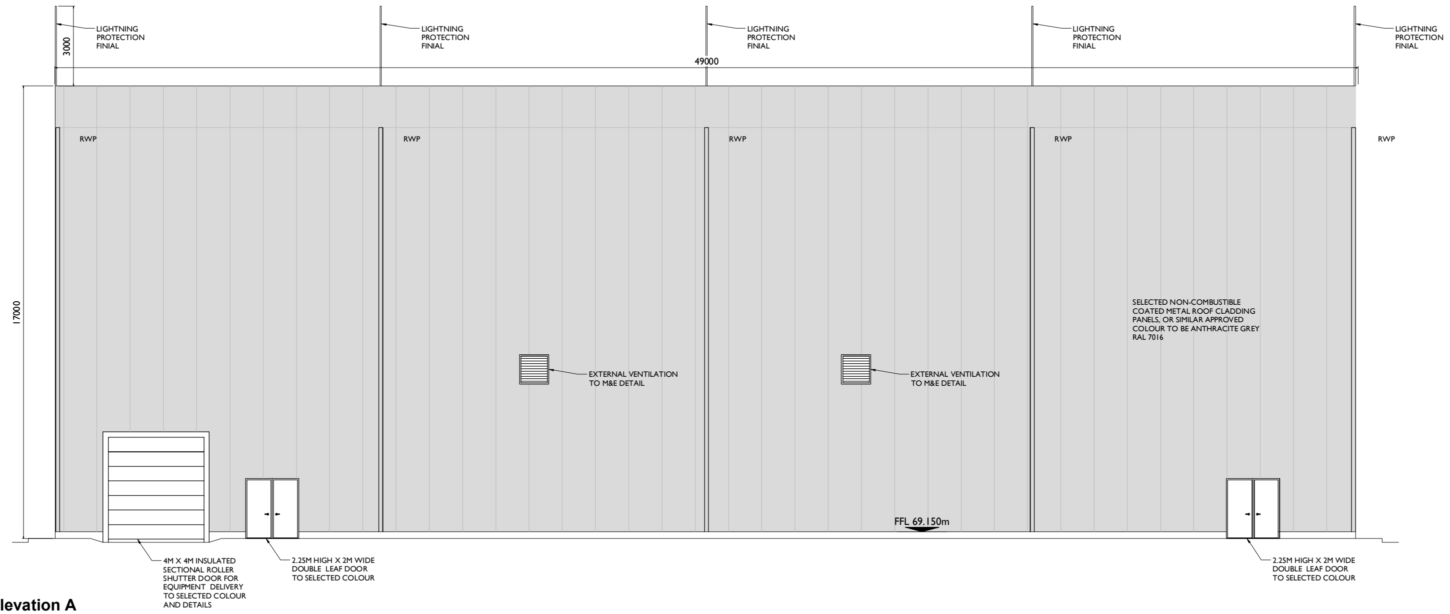
SHEET TITLE

220kV GIS Building
General Arrangement
Ground & First Floor Plans

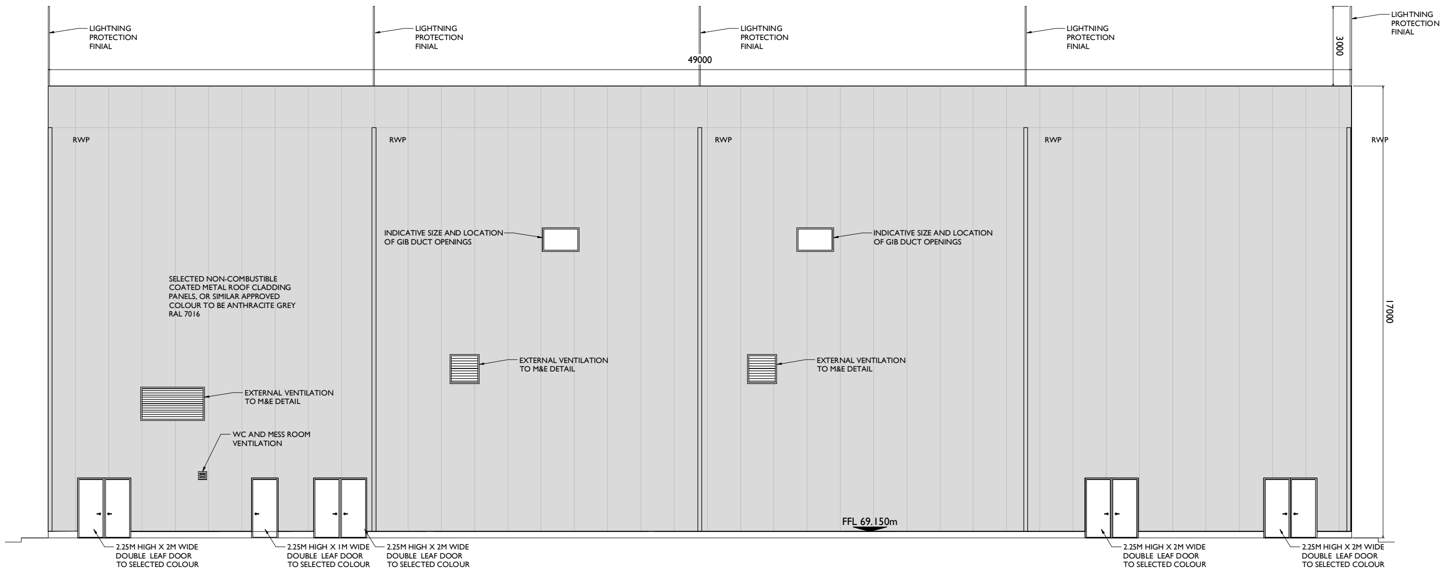
SHEET NUMBER

Fig. 4-16

Project Management Initials: Designer: RR Checked: CH Approved: AC



Elevation A
Scale: - 1:100



Elevation B
Scale: - 1:100

ISO A1 594mm x 841mm

Project Management Initials: Designer: LG Checked: AC Approved: RG

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PROJECT
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220Kv Grid Connection

CLIENT
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LEGEND: -

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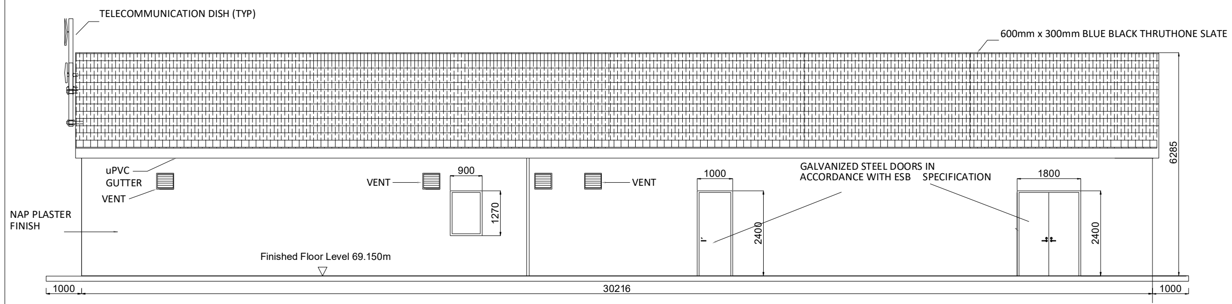
P1	04.06.24	Issued for Planning

PROJECT NUMBER
180740

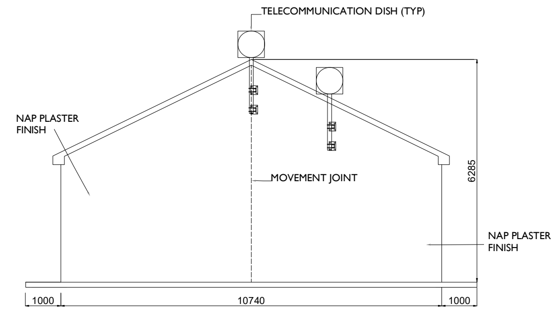
SHEET TITLE
220kV GIS Building
Elevations Sheet 1 of 2

SHEET NUMBER
Fig. 4-17

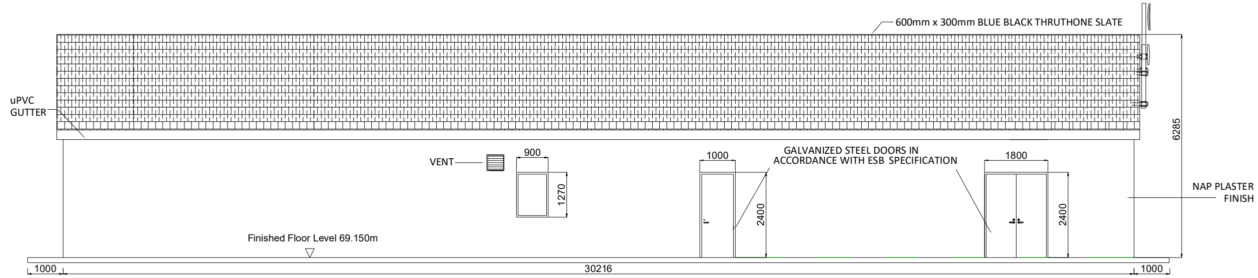
ISO A1 594mm x 841mm



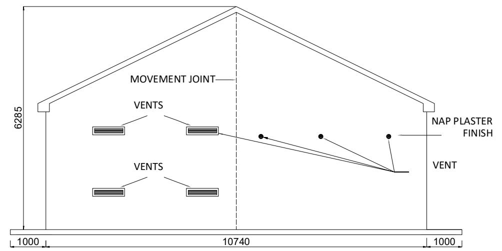
ELEVATION A-A
Scale : 1:75



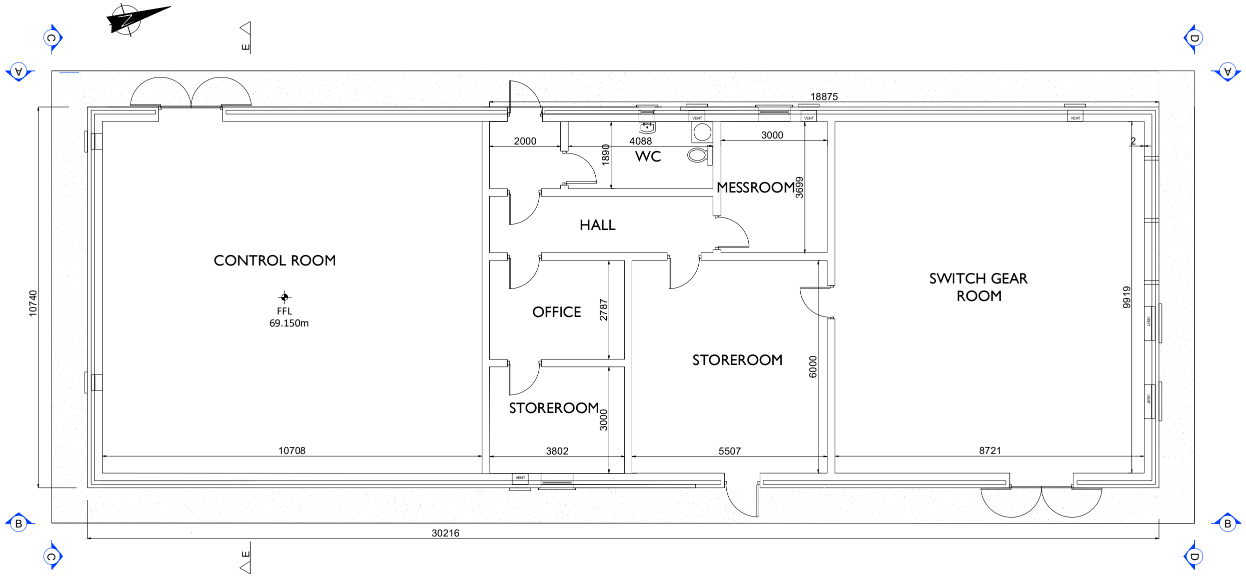
ELEVATION C-C
Scale : 1:75



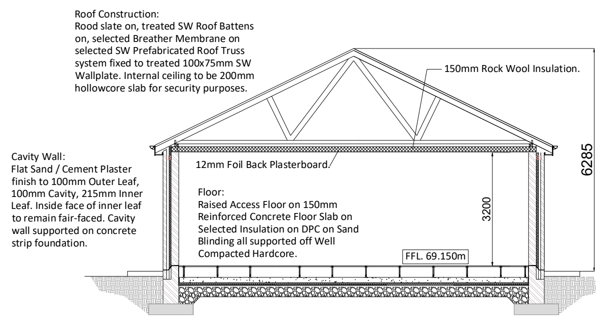
ELEVATION B-B
Scale : 1:75



ELEVATION D-D
Scale : 1:75



PLAN - IPP BUILDING
Scale : 1:75



SECTION E-E
Scale : 1:75

Designer: LG Checked: JF Approved: AC

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PROJECT

Clonberne Wind Farm
220kV Grid Connection

CLIENT

Clonberne Windfarm Limited

CONSULTANTS

NOTES: -

1. Layout and Arrangements of Substation Building and Electrical Equipment is shown indicatively and for illustration purposes only.
2. Dimensions shown are as per current EirGrid Specifications at the time of submission. Dimensions may vary at time of construction to reflect any revisions to EirGrid Specifications.
3. Final Specifications of Buildings and Electrical Equipment is to be as per Eirgrid and ESB Specifications.
4. The Elevation of the Compound will be depicted by localized Topography such that Cut/Fill Earthworks associated with the construction of the Compound are balanced.

LEGEND: -

Levels shown thus 93.340m

Concrete Footpath shown thus

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PROJECT NUMBER

180740

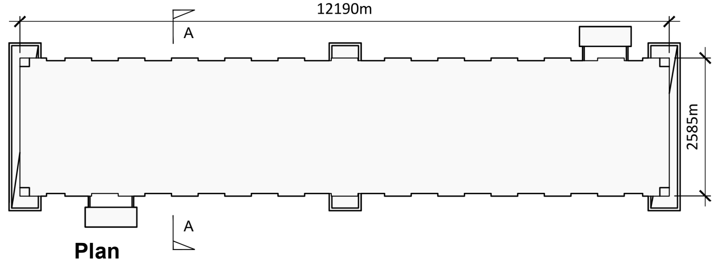
SHEET TITLE

Independent Power Producer
Building Layout And Elevations

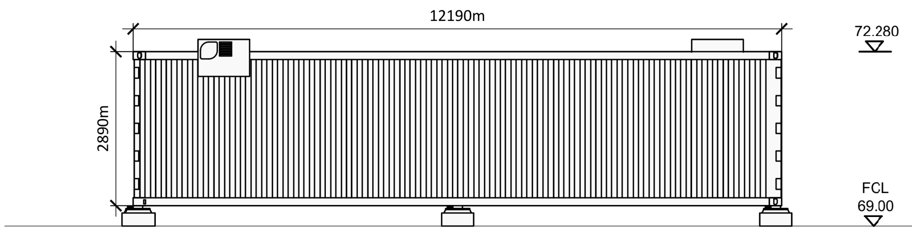
SHEET NUMBER

Fig. 4-18

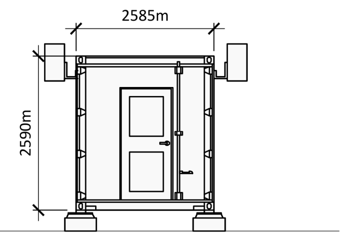
Project Management Initials: Designer: CH Checked: JF Approved: AC ISO A3 297mm x 420mm



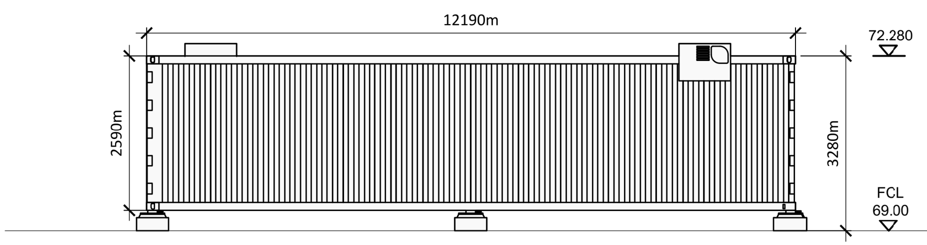
Plan
SCALE 1:100



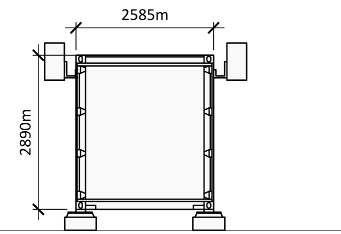
Front Elevation
SCALE 1:100



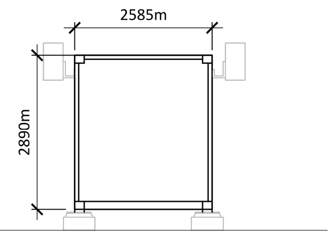
End Elevation
SCALE 1:100



Rear Elevation
SCALE 1:100



End Elevation
SCALE 1:100



Section A-A
SCALE 1:100

Note:
- Project contains 10 modules total.
- Dimensions are in millimeters, unless noted otherwise.
- Drawings are not to be scaled use figured dimensions only.
- All Levels in Meters to Malin Head Datum

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CLIENT
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PROJECT
Clonberne Wind Farm
220V Grid Connection

PROJECT NUMBER
180740

SHEET NUMBER
Fig. 4-19

SHEET TITLE
Battery Container - Plan
Elevations & Section

DRAWING STATUS
For Planning

ISSUE/REVISION

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P1	04.06.24	Issued for Planning

4.3.2.2 Grid Connection

4.3.2.2.1 *Underground Grid Connection Cabling Route and Joint Bays*

A 220kV grid connection between the Proposed Project and the national electricity grid will be necessary to export electricity from the Proposed Wind Farm. It is proposed to connect the Proposed Project to the national electricity grid via a 220kV underground grid connection route (UGC). The proposed UGC will consist of 2 No. trenches each containing 3 No. 200mm diameter High Density Polyethylene (HDPE) power cable ducts, 2 No. 125mm diameter HDPE communications duct and 1 No. 125mm diameter Earth Continuity Conductor duct as shown in Figure 4-20. There will be one watercourse crossing along the proposed grid connection route where the proposed route crosses the Levally Stream. It is proposed to horizontally directional drill beneath the watercourse which forms part of the Lough Corrib Special Area of Conservation. The launch pit will be located to the west of the watercourse and the reception pit will be located to the east of the watercourse. The top of the cable ducts will be a minimum of 1.5m below the watercourse bed as advised by Inland Fisheries Ireland. At this crossing location, it is proposed to construct a temporary accommodation area around the launch and reception pits to facilitate the horizontal directional drilling process.

It is proposed to construct 4 no. Joint Bays along the proposed underground grid connection route. The Joint Bays will be 2.5m by 8m by 1.75m pre-cast structures. Located adjacent to each proposed Joint Bay will be a Link Box Chamber and a C2 Communications Chamber which will both be pre-cast structures.

The proposed UGC is approximately 2.8km in length of which 1.4km is located within the public road network (L6501 and L65011 local roads). The exact location of the grid connection cabling within the curtilage of the public road network may be subject minor modification following confirmatory site investigations, to be undertaken prior to construction of the Proposed Project.

4.3.2.2.2 *Compound Gantry Towers and Steel Mast Structures*

It is proposed to construct 2 no. Compound Gantry Towers and 2 no. Steel Mast Towers (Type 269E Masts) to connect the high voltage underground cable into the existing 220kV Cashla-Flagford Overhead Line. The Compound Gantry Towers and Steel Mast Towers will be situated 2.8km east of the proposed substation within the Proposed Project site.

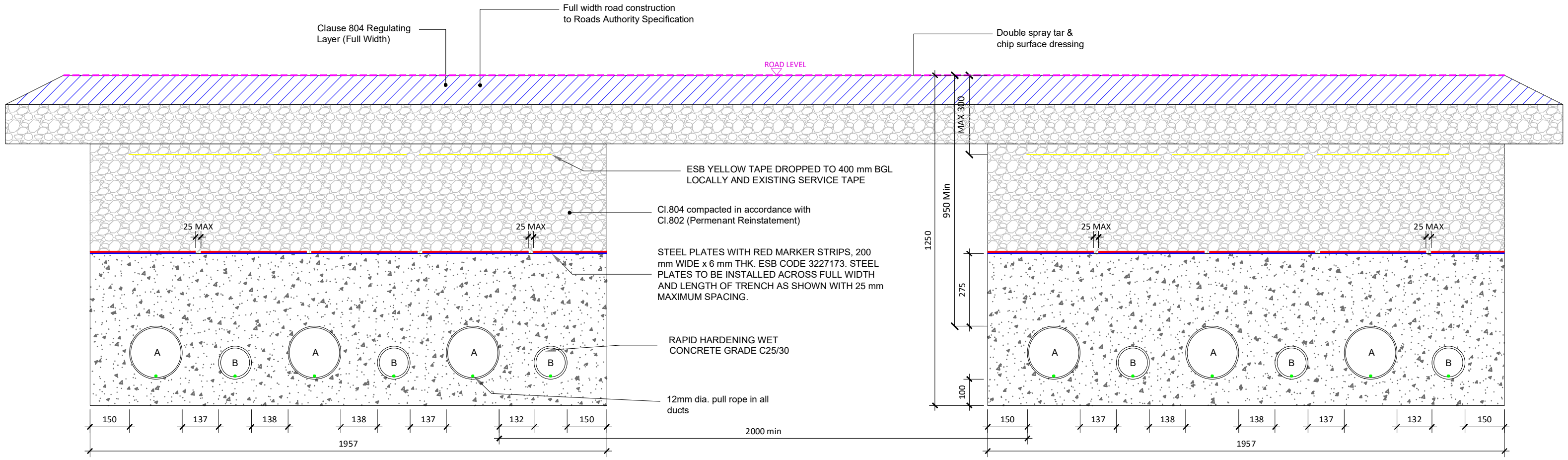
Each Compound will compose of 220kV post insulators, 220kV Gantry Towers, 220kV Surge Insulators and 220kV Cable Sealing Ends. The Compounds will measure 25.8m by 33m and will be surrounded by a 2.6m palisade perimeter fencing. The proposed Gantry Towers will have an overall height of up to 20m and will be situated within the proposed cable compounds.

Each Steel Mast Tower has an overall height of up to 21m. The Steel Mast Towers will be lattice steel structures with cross-arms which can extend over the base footprint and internal bracing and are very similar in size and character to the masts proposed for the overhead line option.

This location will be accessed via a proposed junction off the L6501 Local Road which will be manned during the construction phase. The proposed entrance to this location will be gated once the Proposed Project becomes operational.

The exact final detail and specifications of the grid connection route and method for the Proposed Project will ultimately be decided by ESB/EirGrid.

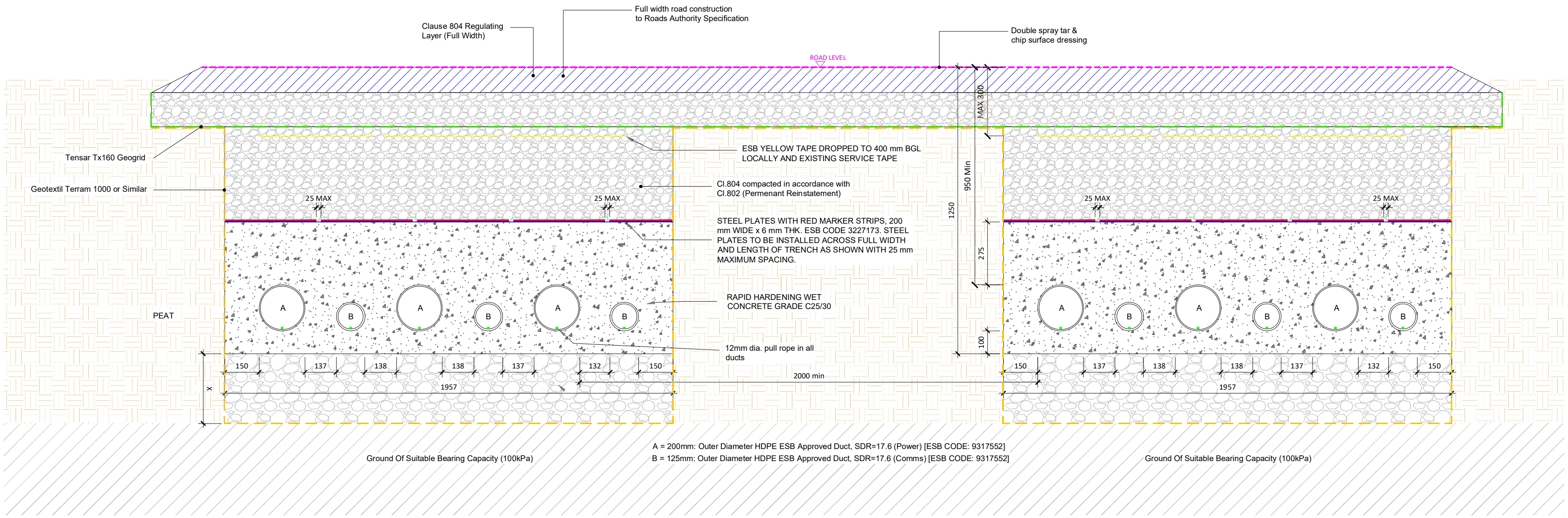
ISO A1 594mm x 841mm



A = 200mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6 (Power) [ESB CODE: 9317552]
B = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6 (Comms) [ESB CODE: 9317552]

Ducting Through Road Cross Section

Scale : 1:50



Ducting Through Road (Shallow Peat)

Scale : 1:50

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LANDOWNER REQUIREMENTS

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD14

Note:
- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

Project Management Initials: Designer: JF Checked: AC Approved: RG

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PROJECT

Clonberne Wind Farm
220kV Grid Connection

CLIENT

Clonberne Windfarm Limited

CONSULTANTS

MKO Planning and Environmental Consultants

NOTES: -

LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
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PROJECT NUMBER

180740

SHEET TITLE

Proposed Grid Cabling
Trench Cross Section

SHEET NUMBER

Fig. 4-20

4.3.3 Peat and Soil Management Plan

4.3.3.1 Quantities

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

Table 4-2 Peat and Spoil Volumes requiring management

Development Component	Area (m2) (approx.)	Peat Volume (m^3) (approx.) *	Spoil Volume(m^3) (approx.)
Proposed Wind Farm			
New Access Roads (founded)	56,100	16,060	350
Upgraded Access Roads – including roads to be widened (founded)	15,500	3,080	0
Turbine Foundations	5,100	7,590	17,270
WTG Hardstands	23,300	18,480	0
Borrow Pit	20,000	0	14,456**
Total (Proposed Wind Farm)		45,210	32,076
Proposed Grid Connection			
Substation	13,600	3,520	13,830
Cable Trenches	7,900	1,520	2,180
Total (Proposed Grid Connection)		5,040	16,010
Total Peat & Spoil to be managed (m^3) (Proposed Project)		98,336	

*The volume of peat material excavated has been estimated using the average peat depth calculated across the footprint of the structure to define the basal surface of the peat.

**A small amount of spoil excavated from the borrow pit is proposed to be reinstated within the borrow pit, with the remainder proposed to be exported to a licenced waste facility over the course of the construction phase of the project. The volume is therefore not considered in the balance calculations below.

Note a factor of 20% (bulking factor of 15% and contingency factor of 5%) has been applied and is included to the excavated peat and spoil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

4.3.3.2 Peat and Spoil Repository Areas

As outlined in the Peat and Spoil Management Plan in Appendix 4-3 of this EIAR, it is proposed to manage any excess overburden generated through construction activities within the Proposed Project site. It is proposed manage excess peat and spoil from the construction phase in 4 no. peat repository areas and 1 no. spoil repository areas as shown in Figure 4-21. The total capacity of the peat repository areas within the Proposed Project is 30,500m^3 and the total capacity of spoil repository areas within the Proposed Project site is 31,530m^3. As stated in the Peat and Spoil Management Plan (Appendix 4-3), a reinstatement volume of 24,980m^3 of the total peat excavation has been considered available for side casting, reinstatement, and re-use across the Proposed Project site. A conservative estimate of 20% 6,740m^3 of the total spoil volumes has been considered as available for re-use in the construction of safety berms across the Proposed Project site. In total, the Proposed Project has a Reinstatement Capacity of 93,750m^3 and this provides enough capacity for the total volume of peat and spoil requiring management for the Proposed Project as detailed in Table 4-2 above. The locations of the proposed peat and spoil repository areas is shown in Figure 4-1.

The following, outlined in the Peat and Spoil Management Plan in Appendix 4-3, particular recommendations/best practice guidelines for the placement of peat with respect to specific aspects of the wind farm will be considered and taken into account during construction.

Access Roads, Hardstands and Other Infrastructure

1. *Controlled quantities of peat and spoil shall be side-cast adjacent to access roads and other infrastructure only where it can be placed in a stable formation, i.e. where the topography and ground conditions allow.*
2. *Side cast peat material shall consist of the acrotelm (upper layer) only and be landscaped and shaped to aid in reinstating the construction into the surrounding environment.*
3. *Cohesive spoil may be used to construct safety berms alongside access roads to heights of no greater than 1m and slopes not exceeding 1(V):2(H), unless a site-specific assessment during detailed design indicates a greater height and angle is safe.*
4. *Peat shall only be cast to safe heights and slope angles, considering the topography and the ground conditions. This height shall be no more than 1m, and the slopes shall be not greater than 1 (V): 3 or 4 (H) unless a site-specific assessment during detailed design indicates a greater height and angle is safe.*
5. *The effect of drainage or water runoff shall be considered when placing peat or spoil adjacent to access roads. Peat and spoil material shall not interfere with drainage, risk blocking of drainage systems or runoff into drainage systems.*

Peat Repository Areas

1. *Peat repository areas have been identified at locations where the topography (slope angle <5°), peat depth, resulting stability assessment (FoS of >1.3 for 1m peat surcharge) and other environmental constraints (including 50m buffer from all watercourses) have allowed. These areas are designated for the permanent placement of up to 1m of peat material.*
2. *A cell berm will be constructed similarly to the peat repository area detail outlined in Appendix B. This cell berm will help to prevent the flow of saturated peat material. The stone berm will be constructed with a sufficiently coarse granular material or rock to enable the drainage of the placed peat material and prevent any instabilities within the repository area.*
3. *The stone cell berm will require a geotextile separator. The stone cell berm will be constructed using low-ground pressure machinery working from bog mats*

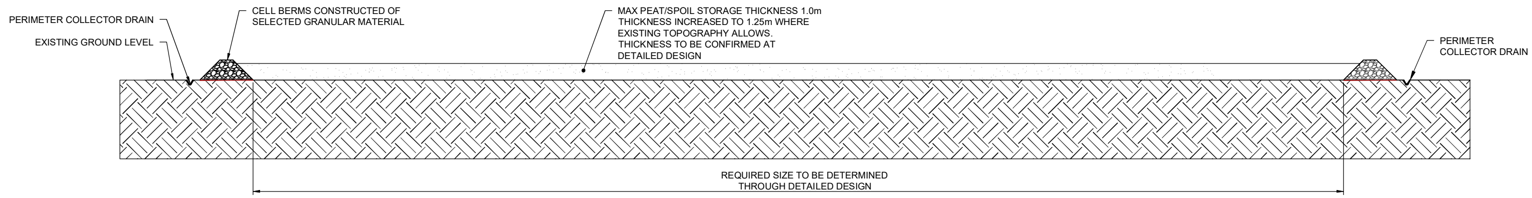
where necessary. The founding stratum for each stone buttress will be inspected and approved by a competent geotechnical engineer.

4. *The height of the cell berm constructed will be greater than the height of the placed peat & spoil to prevent any surface peat runoff. Berms up to 1.25m in height will be required, subject to detailed design.*
5. *The cell berm is subject to the detail designer's specification; however, some peat excavation or installation of a shear key may be required to prevent global instabilities within the stored material. The shear key will comprise an excavation below the existing ground level beneath the cell berm to provide resistance against lateral forces.*
6. *Where possible, the placed peat and spoil surface will be shaped to allow efficient runoff of surface water from the peat and spoil repository areas.*
7. *Silting ponds will be required at the repository area's lower side/outfall location.*
8. *Intermediate berms or buttresses of spoil material may be installed within the peat repository area to aid in the placement and stability of the peat material. These berms will be shaped to align with the contours of the repository area.*
9. *The Contractor shall make every reasonable effort to promote growth in the peat repository areas following the placement of peat and completion of construction stage activities. Upper acrotelm layers shall be placed on the surface the right way up to promote vegetation growth. This growth will aid in stabilising the placed peat material and help in preventing it from becoming saturated following heavy periods of rain.*

Spoil Repository Area

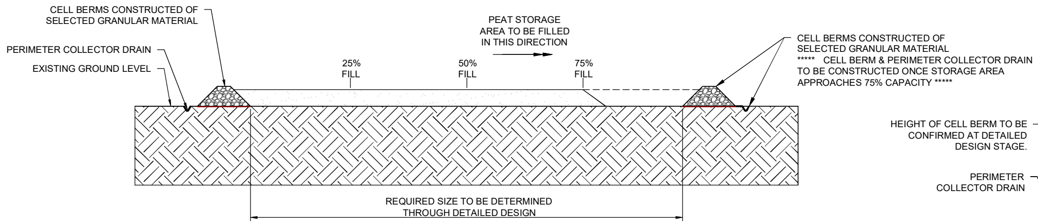
1. *Cohesive glacial tills considered unsuitable for reuse in the Proposed Project will require placement in a separate spoil repository area.*
2. *The spoil repository area has been identified in a location where the topography (slope angle <5°), peat depth, resulting stability assessment (Factor of Safety of >1.3 for 1m peat surcharge) and other environmental constraints (including 50m buffer from all watercourses) have allowed. This area is designated for permanently placing up to 1m of non-peat spoil material.*
3. *Side slopes of placed spoil material are to be no greater than 1(V):2(H).*
4. *Where possible, the surface of the placed spoil will be shaped to allow efficient surface water runoff from the peat placement areas.*
5. *Silting ponds may be required at the repository area's lower side/outfall location.*
6. *Intermediate berms or buttresses of granular material may be installed within the spoil repository area to aid in the placement and stability of the spoil material. These berms will be shaped to align with the contours of the repository area.*

The management of excavated peat and overburden and the methods of placement and/or reinstatement are described in detail in GDG's Peat and Spoil Management Plan in Appendix 4-3 of this EIAR.



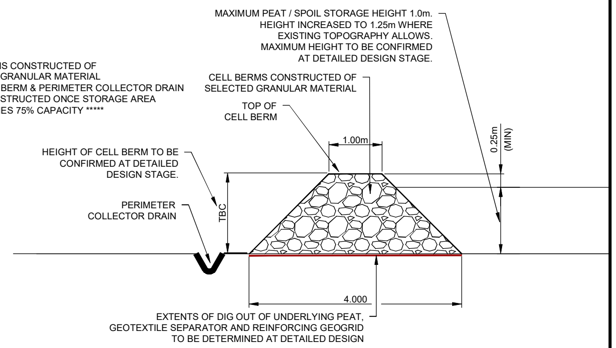
PEAT / SPOIL STORAGE - TYPICAL SECTION A-A

SCALE 1:200



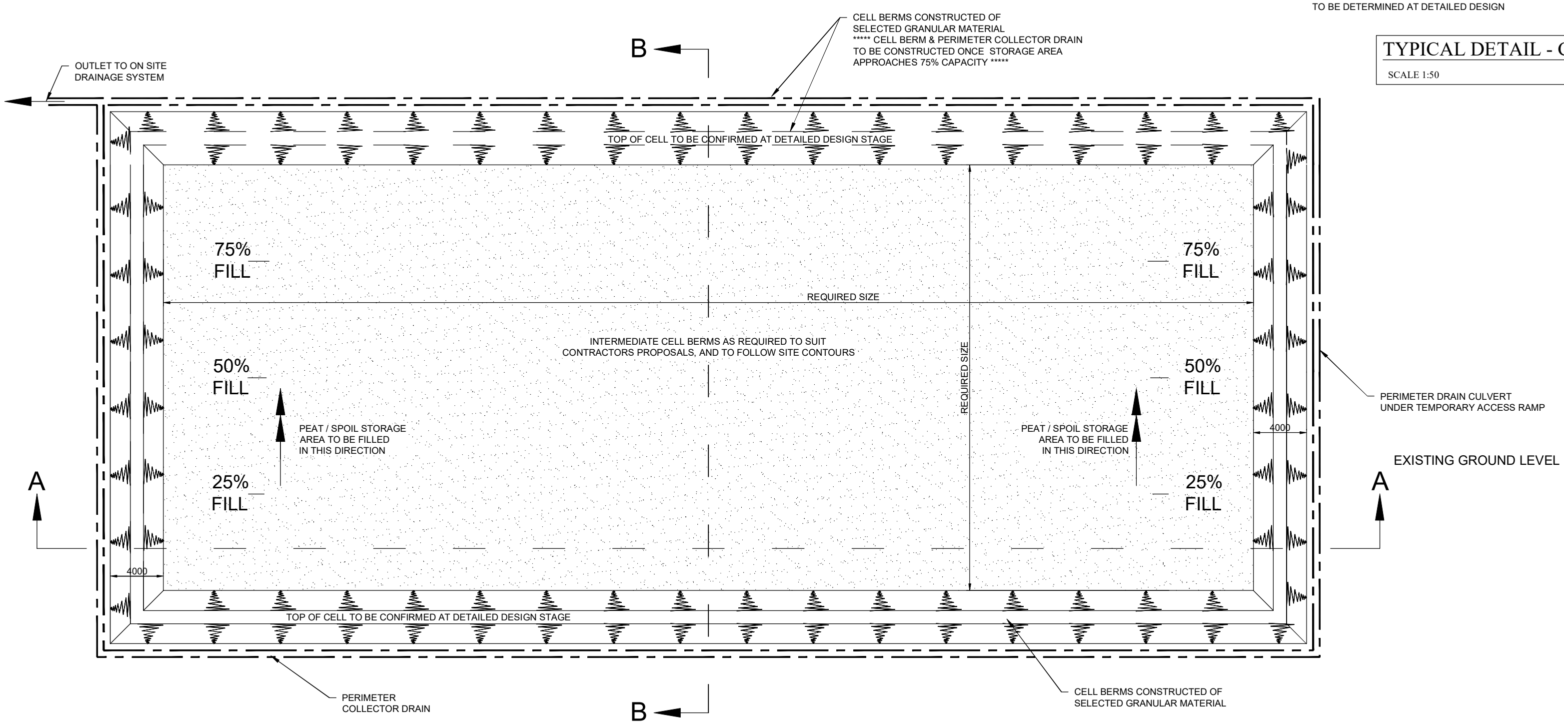
PEAT / SPOIL STORAGE - TYPICAL SECTION B-B

SCALE 1:200



TYPICAL DETAIL - CELL BERM

SCALE 1:50



PEAT / SPOIL STORAGE - TYPICAL PLAN

SCALE 1:200

NOTES:

1. THIS DRAWING IS FOR PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PURPOSES AND SHOULD NOT BE USED AS DETAILED DESIGN OR FOR CONSTRUCTION.
2. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL PLACED MATERIAL WILL BE ALLOWED TO REVEGETATE NATURALLY FROM THE EXTENSIVE SEED SOURCE OF THE PLANTS THAT HAVE ALREADY COLONISED IN THE AREA. ALTERNATIVELY AND POSSIBLY IN ADDITION, SEEDING OF THE PLACED SPOIL COULD BE CARRIED OUT WHICH WOULD AID IN STABILISING THE PLACED SPOIL IN THE LONG TERM.
5. WHERE POSSIBLE, THE ACROTELM SHALL BE STORED WITH THE VEGETATION PART OF THE SOD FACING THE RIGHT WAY UP TO ENCOURAGE GROWTH OF PLANTS AND VEGETATION AT THE SURFACE OF THE STORED PEAT WITHIN THE PEAT STORAGE AREAS.
6. BOG MATS TO BE USED WHERE NECESSARY TO FACILITATE PLANT & MACHINERY ACCESS OVER SOFT GROUND.

REV: S2-P01	DATE: 11/07/23	DRAWN BY: EFC	CHECKED BY: CE
DESCRIPTION:	ISSUED FOR INFORMATION		

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ISSUED AS: FOR INFORMATION

CLIENT: MKO

PROJECT TITLE: CLONBERNE WIND FARM

DRAWING No: Fig. 4-21

Revision: -S2-P01

DRAWING TITLE: PEAT AND SPOIL STORAGE AREA TYPICAL DETAILS

SCALE: SHOWN	SHEET SIZE: A1	DATE: 11/07/2023
DRAWN BY: EFC	CHECKED BY: C.E.	APPROVED BY: J.O'D

4.3.4 Site Activities

4.3.4.1 Environmental Management

All proposed activities on the site of the Proposed Project will be provided for in an environmental management plan. A Construction and Environmental Management Plan (CEMP) has been prepared for the Proposed Project and is included in Appendix 4-4 of this EIAR. The CEMP includes details of drainage, peat and overburden management and waste management. In the event planning permission is granted for the Proposed Project, 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 approval.

4.3.4.2 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 re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel 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. 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 (outside of Gurteen/Cloonmore GWS refined Zone of Contribution (ZoC)) when not in use and only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. On-site refuelling will be carried out by trained personnel only and a permit to the fuel system will be put in place.

Fuels stored on site will be minimised. Fuel storage areas if required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor (outside of Gurteen/Cloonmore GWS refined ZoC). 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 available if necessary, during all refuelling operations.

4.3.4.3 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. 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 Plate 4-3 and Plate 4-4 below.

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.

Plate 4-3 Concrete washout area

Plate 4-4 Concrete washout area

Alternatively, a Siltbuster-type concrete wash unit or equivalent (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/) may be used. 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.

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:

a) Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout.
b) Site roads will initially be constructed with a subgrade and compacted with the use of a roller to allow concrete delivery trucks access all areas where the concrete will be needed. The final wearing course for the site roads will not be provided until all bases have been poured. 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 to the location where it is needed.
c) The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout and discussing emergency procedures.
d) 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.

4.3.4.4 Concrete Pouring

Due to the scale of the main concrete pours that will be required to construct the Proposed Project, 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 may 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.
- 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.
- Disposing of surplus concrete after completion of a pour in agreed suitable locations away from any watercourse or sensitive habitats.

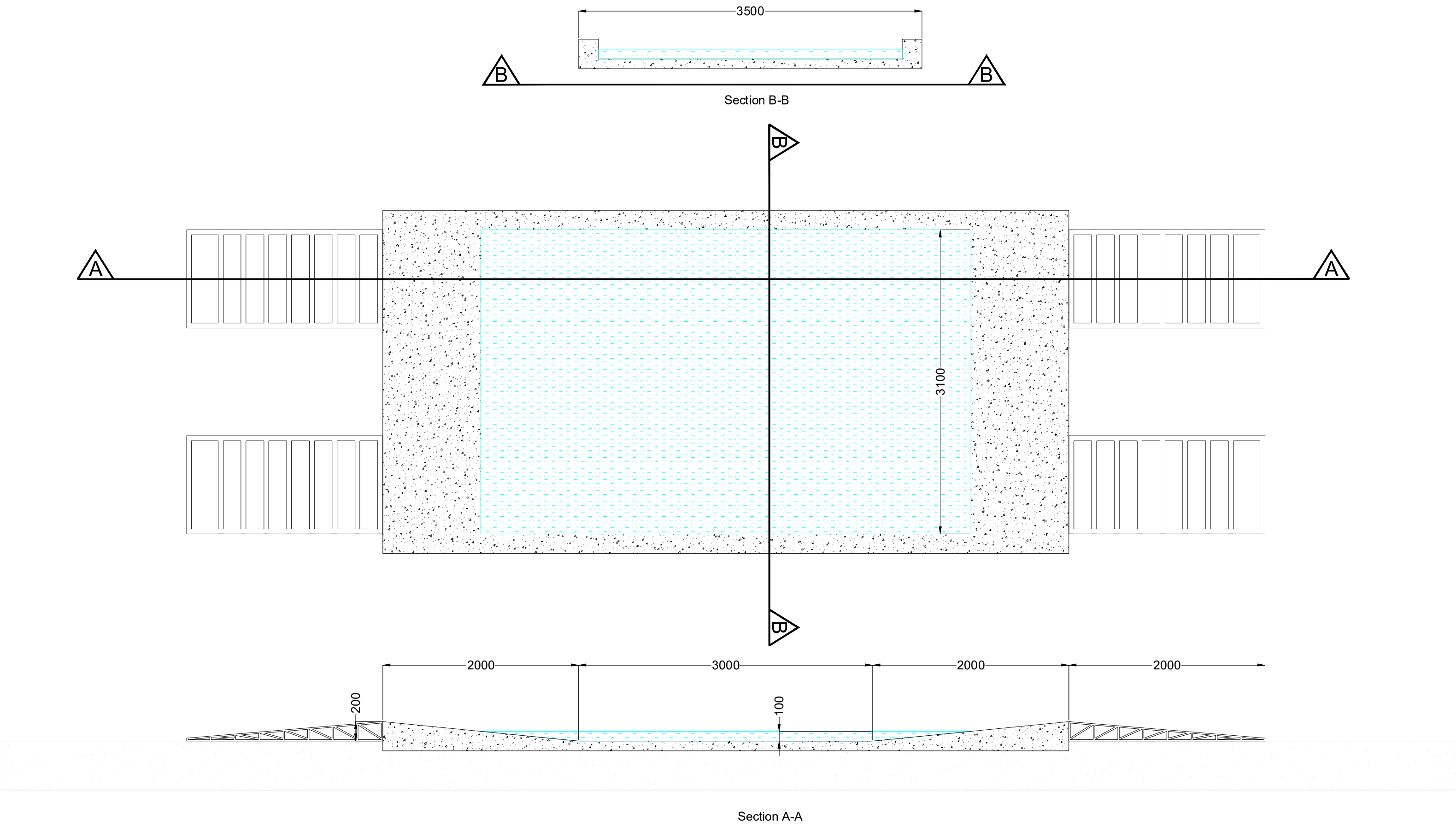
4.3.4.5 Dust Suppression

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.

4.3.4.6 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 wheel wash facility will be provided and a layout of the same is shown in Figure 4-22. 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 requires cleaning due to construction traffic associated with the Proposed Project.



DRAWING TITLE: **Wheel Wash Detail**	
PROJECT TITLE: **Clonberne Wind Farm, Co. Galway**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-22**
SCALE: **1:50 @ A3**	DATE: **10.06.2024**

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4.3.4.7 Waste Management

The CEMP, Appendix 4-4 of this EIAR, provides a waste management plan (WMP) which outlines the best practice procedures during the construction phase 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 Project. Disposal of waste will be 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 Proposed Project to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits 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 Proposed Project, 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 Proposed Project adheres to the management plan.

The WMP will provide 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 will highlight 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 Transport

4.4.1 Site Entrance

It is proposed to access the site of the Proposed Project via a newly developed site entrance off the R328 Regional Road to the north of the site. This proposed entrance (Figure 4-23) will be widened to facilitate the delivery of the construction materials and turbine components. The site entrance was subject to Autotrack assessment to identify the turning area required, as described in Section 15.1 in Chapter 15 Material Assets. It is proposed that this entrance which will act as the main point of entry for construction phase will be manned by a "Flagman" to the safe egress of traffic as outlined in Section 15.1 in Chapter 15 Material Assets. In addition, an existing access road will be utilised to the west of the site via the L-22321 Local Road for the transport of materials from the proposed borrow pit. Details on proposals to install passing bays are included in Section 4.4.2.

It is proposed that the proposed substation will be accessed via a proposed operational access road once the Proposed Project becomes operational. The proposed operational access road will merge with the cable access track providing access to the proposed GIS compound from the east. This proposed operational access road will be accessed off the L-6501 Local Road and it will be gated so to limit access to the relevant staff.

The proposed cable compounds at the proposed grid connection into the existing 220kV Cashla-Flagford Overhead Line will be accessed via a proposed junction and access road that will be accessed off the existing L-6501 Local Road. The proposed access road will be gated during the operational phase of the Proposed Project to limit access to the relevant staff.

The location of these site access points are shown in Figure 4-1. A Traffic Management Plan is included in Appendix 15-1 of this EIAR. In the event planning permission is granted for the Proposed Project, the final Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

4.4.2 Passing Bays

It is proposed that 3 no. passing bays (Figure 4-24) will be constructed along the L-22321 Local Road (1 no. passing bay) and the existing access track to which the L-22321 connects the east (2 no. passing bays). The passing bays will provide 3 no. locations to act as lay-bys which will enable delivery vehicles originating from the borrow pit to pull in off the local road and the access road to the east of the local road in the event there is an oncoming vehicle travelling southwest along this route.

4.4.3 Turbine and Construction Materials Transport Route

It is proposed that large wind turbine components will be delivered to the site of the Proposed Project, from Galway Port, via the motorway network. From Tuam, the turbines will be transported northeast along the N83 National Secondary Road towards Dunmore. In the townland of Ballagh West, the delivery vehicles will turn east onto the L6466 Local Road and will travel along the entirety of this road. In the townland Lissybroder, the delivery vehicles will turn southeast onto the R328 Regional Road and will travel for approx. 4km to the site entrance where they will entrance the Proposed Project site. The proposed turbine transport route to the Proposed Project site is shown on Figure 4-25.

Construction materials such as concrete, steel and construction materials will follow the same transport route as the wind turbines from the National Road network to the Proposed Project site.

Deliveries of stone from the proposed borrow pit will be via the L-2232 Local Road, L-22321 Local Road and the existing access road located to the east of the L-22321 Local Road. To facilitate the delivery of stone, 3 no. passing bays are proposed along the L-22321 and the existing access track as outlined in Section 4.4.2 above.

The number of construction vehicles that will be generated during the construction phase of the Proposed Project is outlined as part of the traffic and transport assessment in Section 15.1 of this EIAR.

4.4.3.1 Turbine Delivery Accommodation Works

Works such as road and junction widening are sometimes required along proposed turbine transport routes to accommodate the large vehicles used to transport turbine components to the Proposed Project site. The proposed transport route for the Proposed Project has been the subject of a route assessment to determine if any works are required along its length. Full details of the assessment are included as part of the traffic impact assessment set out in Section 15.1 of this EIAR and summarised below. The turbine delivery accommodation works areas are shown Figure 4-26. These areas will be temporary in nature and only used for the purposes of abnormal load delivery. These road and junction widening works may also be required in the future to transport replacement components for turbines over the lifetime of the Proposed Project. It may also be required during the decommissioning at the end of the 35-year lifetime of the Proposed Project pending the outcome of this substitute consent process where early decommissioning could be required.

Location 1 – Ballagh West

Junction accommodation works will be completed at the exiting junction between the N83 National Road and the L6466 local road in the townland of Ballagh West. The works comprised a new section of road on the southern site of the junction to reduce the turning area required by abnormal loads. The temporary junction accommodation works will only be used by the turbine delivery/abnormal load vehicles and other vehicles associated with the delivery process. The extent of this junction upgrade is outlined within the Layout Drawings in Appendix 4-1 and in Figure 4-27.

Location 2 – Carrowntryla

A section of the L6466 local road will be temporarily widened on the northern side of the local road in the townland of Carrowntryla. It is proposed that this temporary widening will remain in place during the turbine delivery process. It should be noted that Location 2 - Carrowntryla widening works do not form part of this planning application, however, they are assessed as part of the EIAR and is shown in Figure 4-28.

Location 3 - Lissybroder

Junction accommodation works were completed at the exiting junction between the L6466 and the R328 Regional Road in the townland of Lissybroder. The works comprise a new section of road on the southern site of the junction to reduce the turning area required by abnormal loads. The temporary junction accommodation works will only be used by the turbine delivery/abnormal load vehicles and other vehicles associated with the delivery process. The extent of this junction upgrade is outlined within the Layout Drawings in Appendix 4-1 and in Figure 4-29.

4.4.4 Traffic Management

A maximum turbine blade length of 81 metres has been used in assessing the traffic impact of the Proposed Project. the blade transporter for such a turbine blade would have a total vehicle length of 86.3 metres, including the blade which overhangs the back of the vehicle. The total length of the tower transporter is 46.7 metres 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 the tower transporter. All other vehicles requiring access to the site of the Proposed Project will be smaller than the design test 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 Project. 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 over 340 No. wind farms already built and operating in Ireland (Republic and Northern Ireland combined, as per latest available figures on www.iwea.com), transport challenges are something the wind energy industry and specialist transport sector has become particularly adept in finding solutions to.

As an alternative solution for transport of turbine blades, alternative delivery systems are available. For example, delivery vehicles fitted with blade adapters, as shown in Plate 4-5 below, may be used in order to navigate the existing roads along the turbine delivery route. Blade adaptors allow the turbine blade to be transported at a suitable angle in order to navigate tight bends or obstacles along the delivery route.

Plate 4-5 Blade adaptor transport system

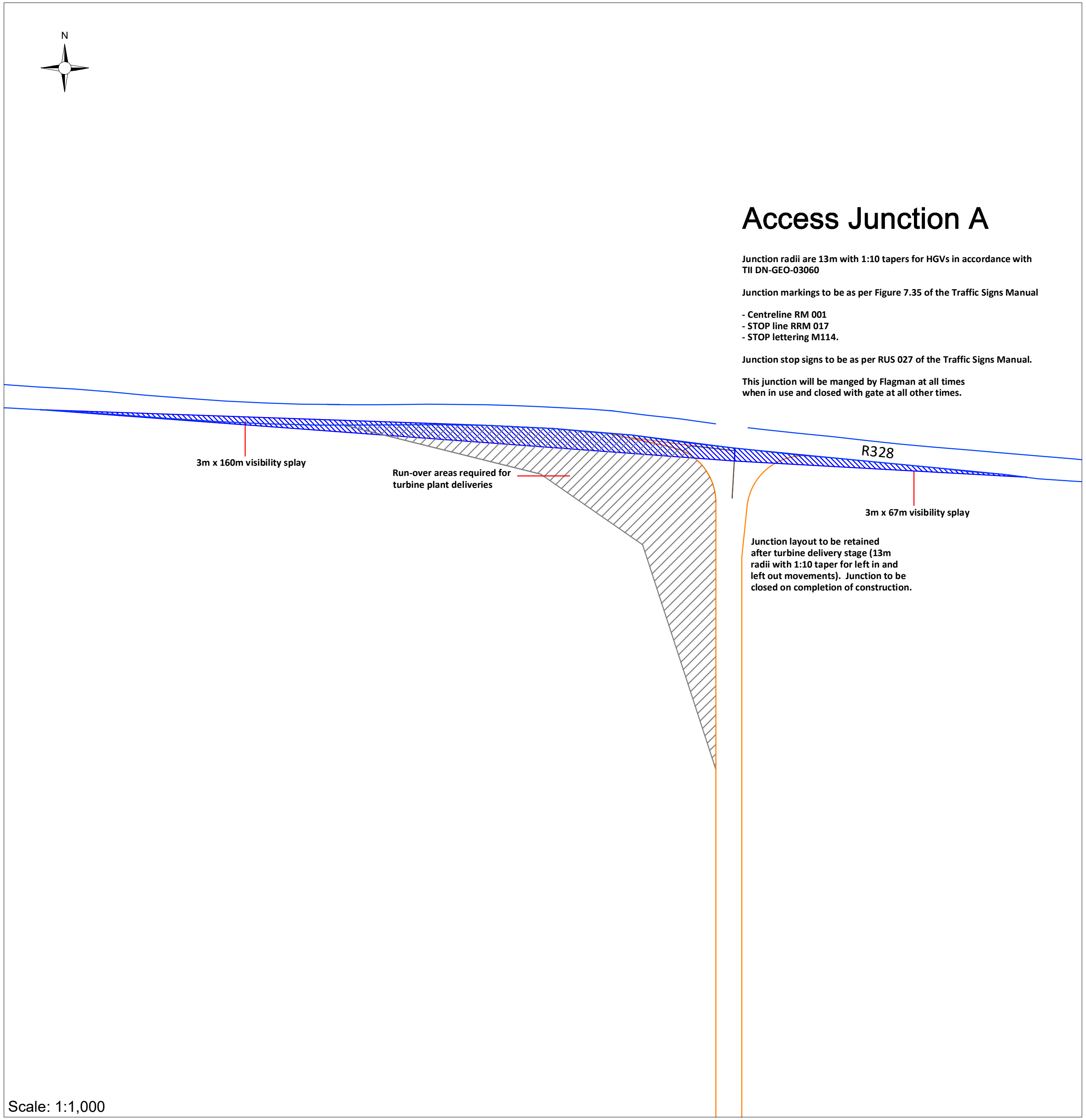
A Traffic Management Plan has been prepared as set out in Appendix 15-1 of the EIAR. Prior to the construction of the Proposed Project, a detailed traffic management plan will be prepared by the haulage company and submitted to Galway County Council for approval. The plan will include:

- 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 (Appendix 15-1) 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 for agreement with Galway County Council. 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 is typically 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.



Access Junction A

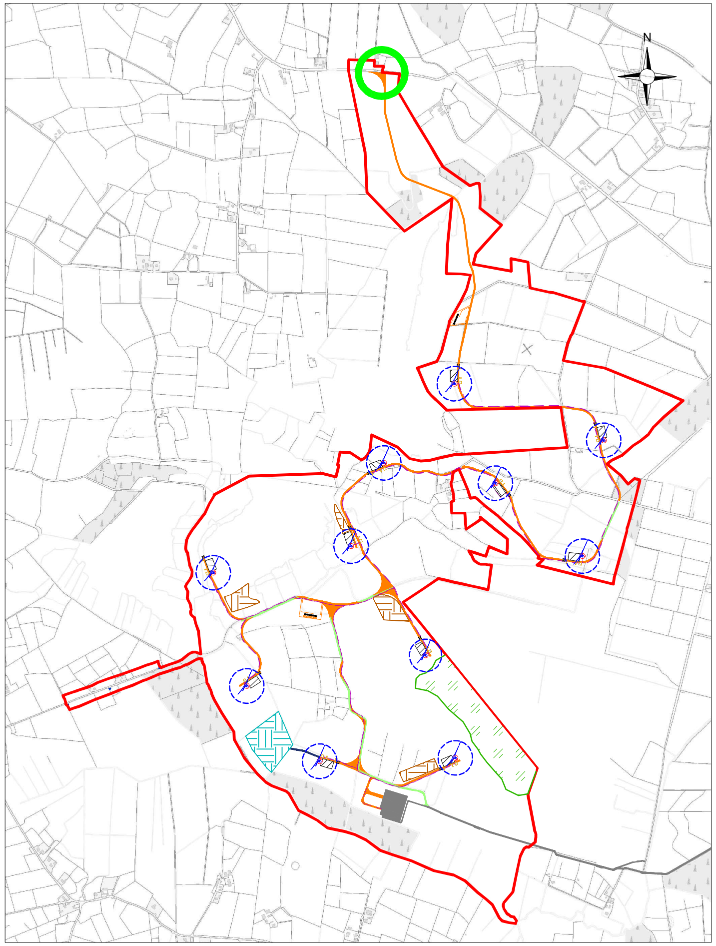
Junction radii are 13m with 1:10 tapers for HGVs in accordance with TII DN-GEO-03060

Junction markings to be as per Figure 7.35 of the Traffic Signs Manual

- Centreline RM 001
- STOP line RRM 017
- STOP lettering M114.

Junction stop signs to be as per RUS 027 of the Traffic Signs Manual.

This junction will be manged by Flagman at all times when in use and closed with gate at all other times.



1:25,000 Location on Context Map

Drawing Legend

- Existing Road Edge
- Proposed Road
- Transport Runover Area
- Sight Line

DRAWING TITLE: **Proposed Site Entrance**	
PROJECT TITLE: **Clonberne Wind Farm, Co. Galway**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-23**
SCALE: **1:1,000 @ A3**	DATE: **10.06.2024**

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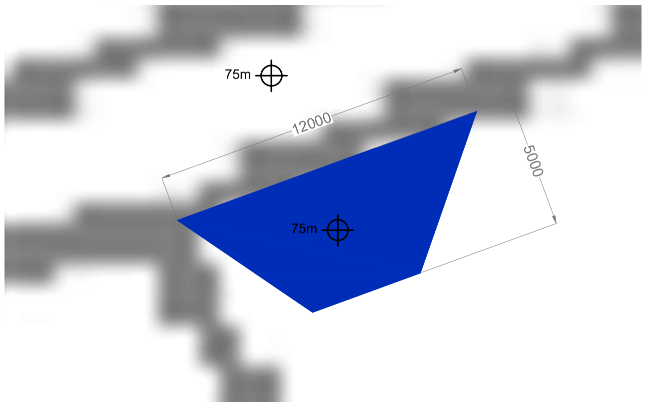
Plan View Passing Bay 1
1:100



Plan View Passing Bay 2
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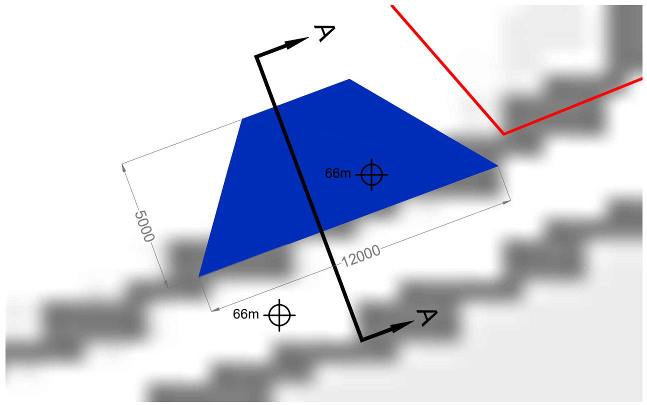

Plan View Passing Bay 3
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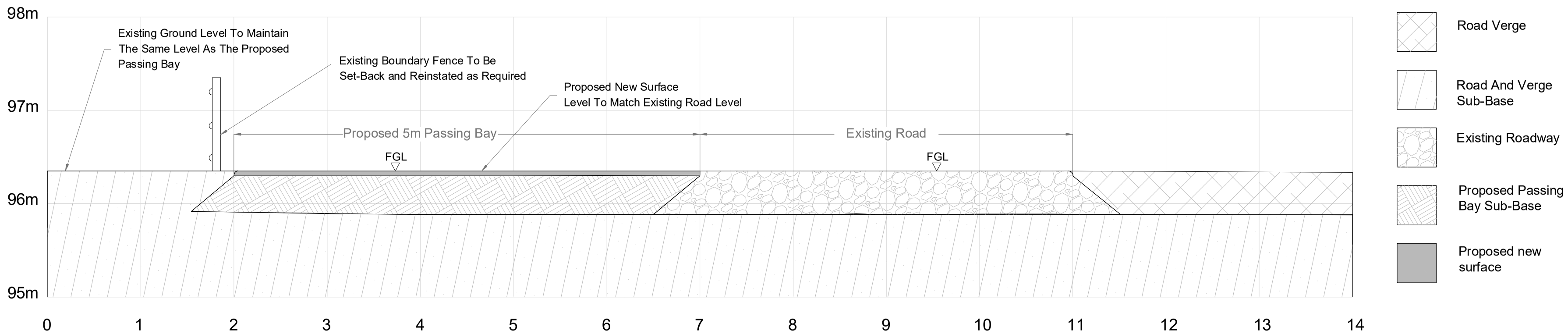

Section A-A
1:50

DRAWING TITLE: **Passing Bay Detail**	
PROJECT TITLE: **Clonberne Wind Farm, Co. Galway**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-24**
SCALE: **As Shown @ A3**	DATE: **10.06.2024**

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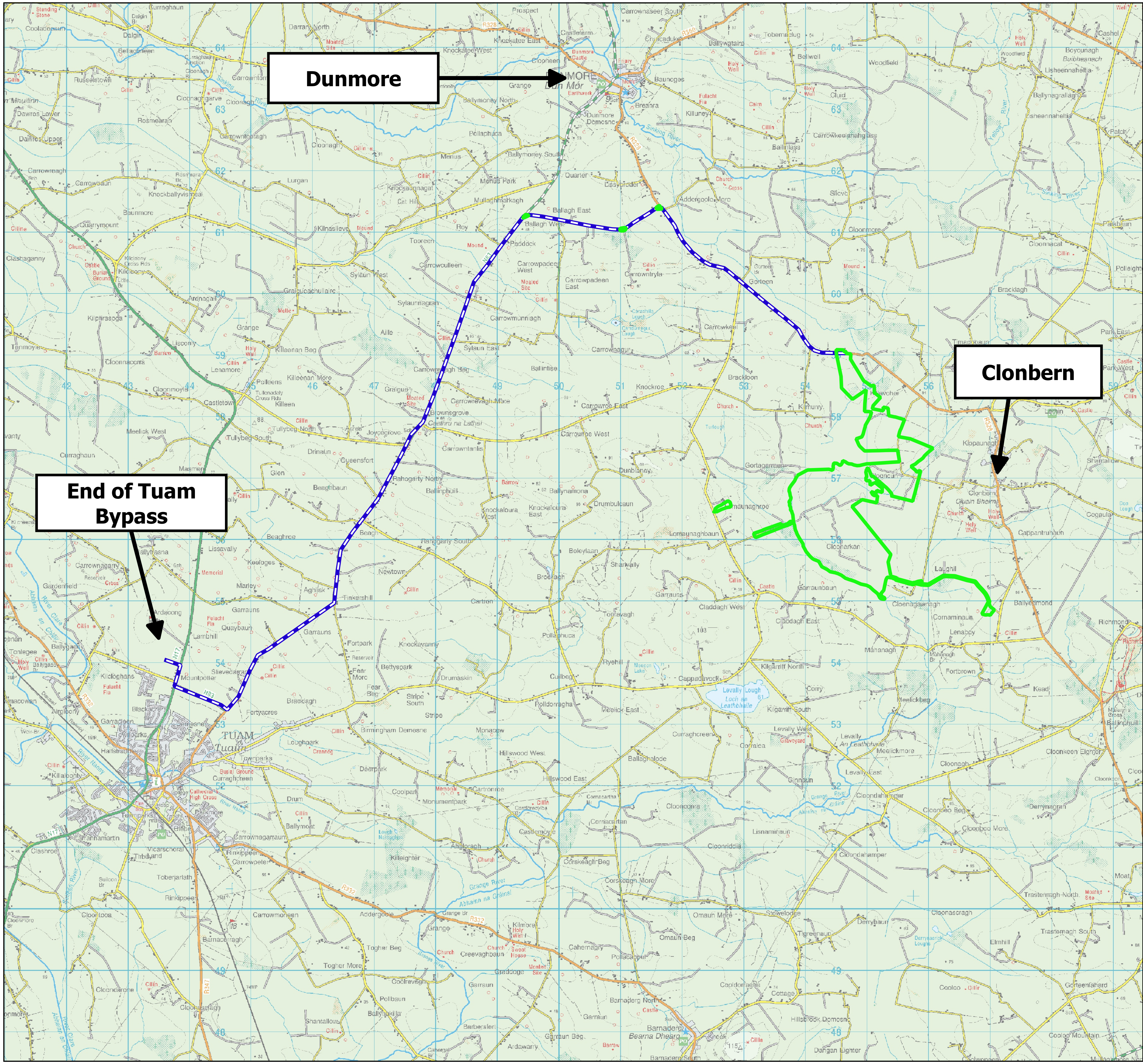

Map Legend

EIAR Site Boundary

Proposed Turbine Delivery Route

N

Drawing Title	Preoposed Turbine Delivery Route
Project Title	Clonberne WF
Drawn By: JF	Checked By: OC
Project No.: 180740	Drawing No.: Fig. 4-25
Scale: 1:60,000	Date: 2024-06-19

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Map Legend

- EIAR Site Boundary
- Proposed Turbine Delivery Accommodation Areas
- Proposed Turbine Delivery Route

N

Drawing Title	Preoposed Turbine Delivery Accommodation Areas
Project Title	Clonberne WF
Drawn By: JF	Checked By: OC
Project No.: 180740	Drawing No.: Fig. 4-26
Scale: 1:8,200	Date: 2024-06-19

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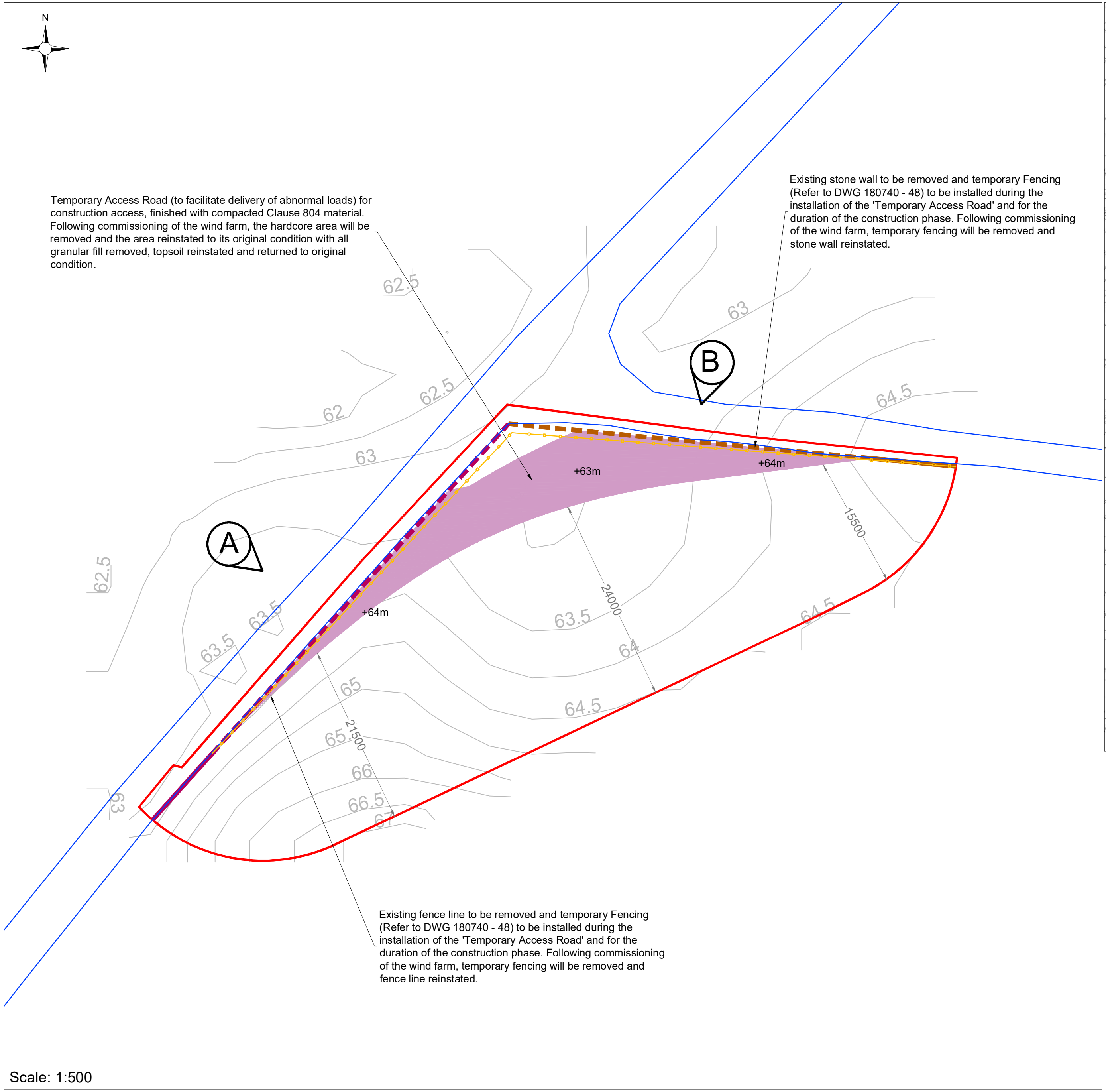

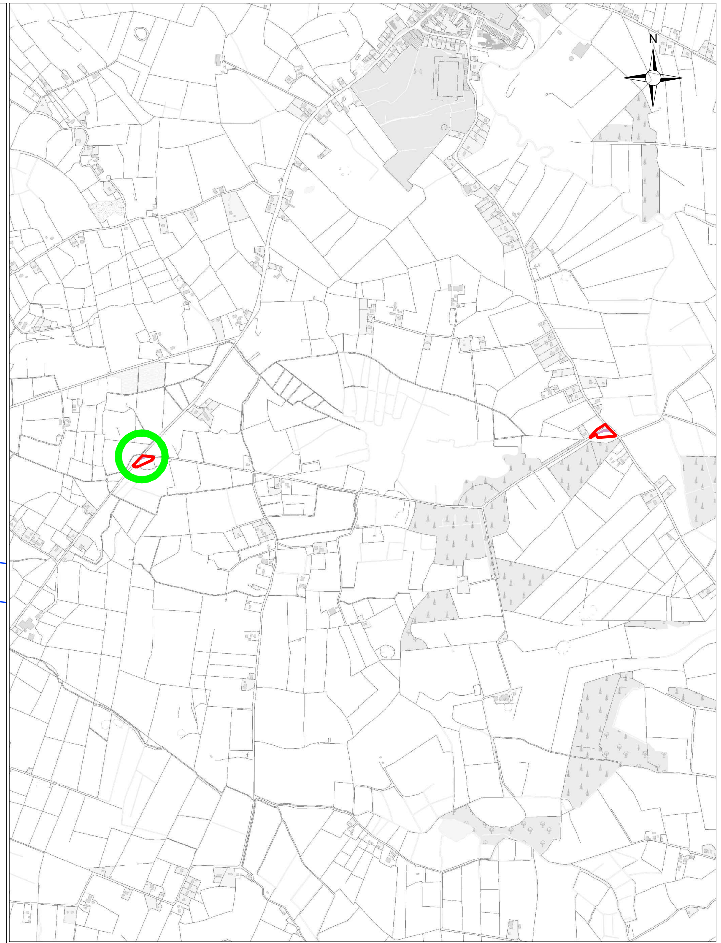

1:25,000 Location on Context Map

Drawing Legend

- Planning Application Boundary
- Temporary New Road (to facilitate delivery of abnormal loads).
- Existing Fencing to be Temporarily Removed/Reinstated
- Existing Stone Wall to be Temporarily Removed/Reinstated
- Temporary Fencing
- Existing Road Edge

DRAWING TITLE: **Proposed TDR Accommodation Area 1**	
PROJECT TITLE: **Clonberne Wind Farm, Co. Galway**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-27**
SCALE: **1:500 @ A3**	DATE: **10.06.2024**

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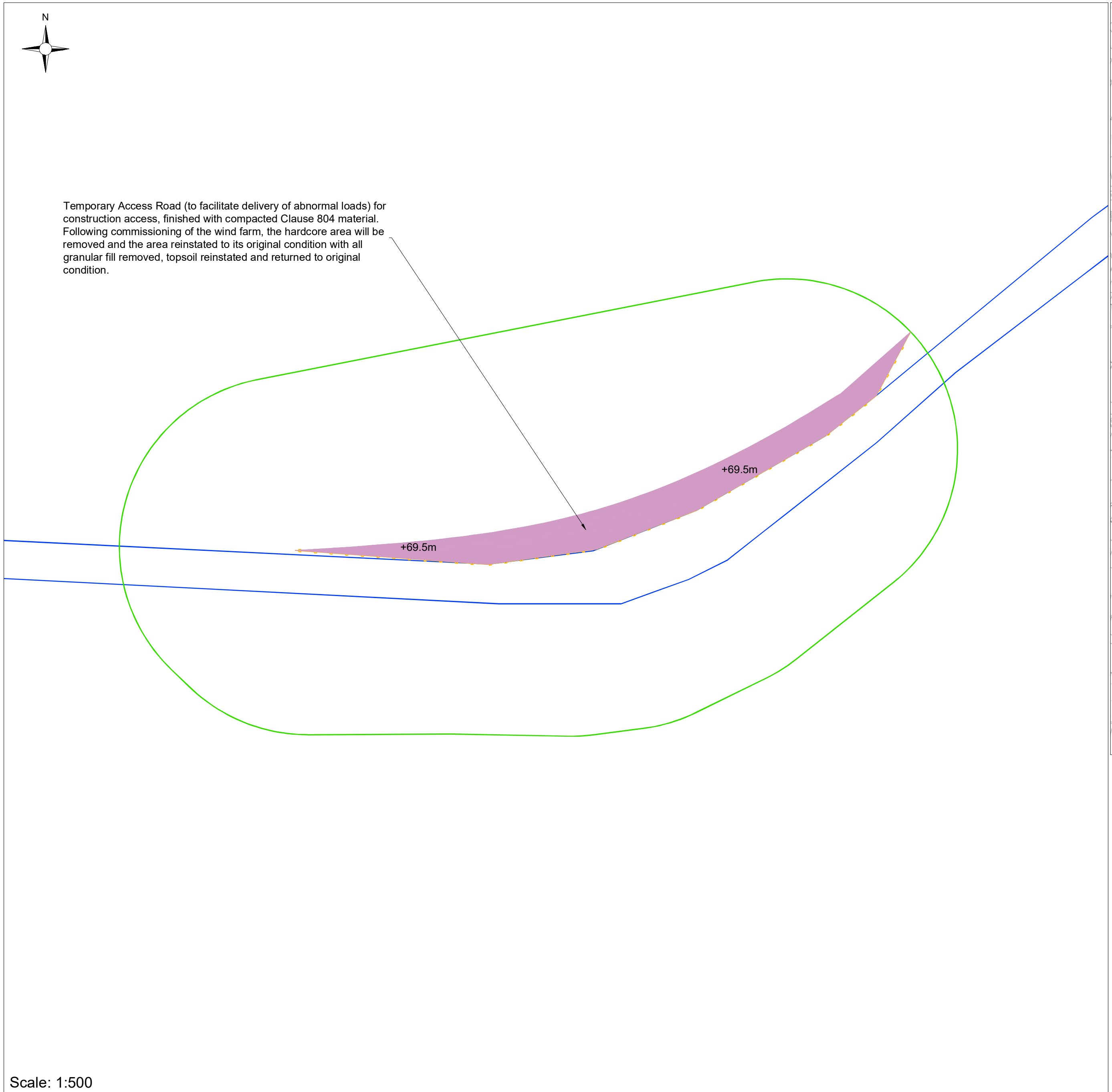

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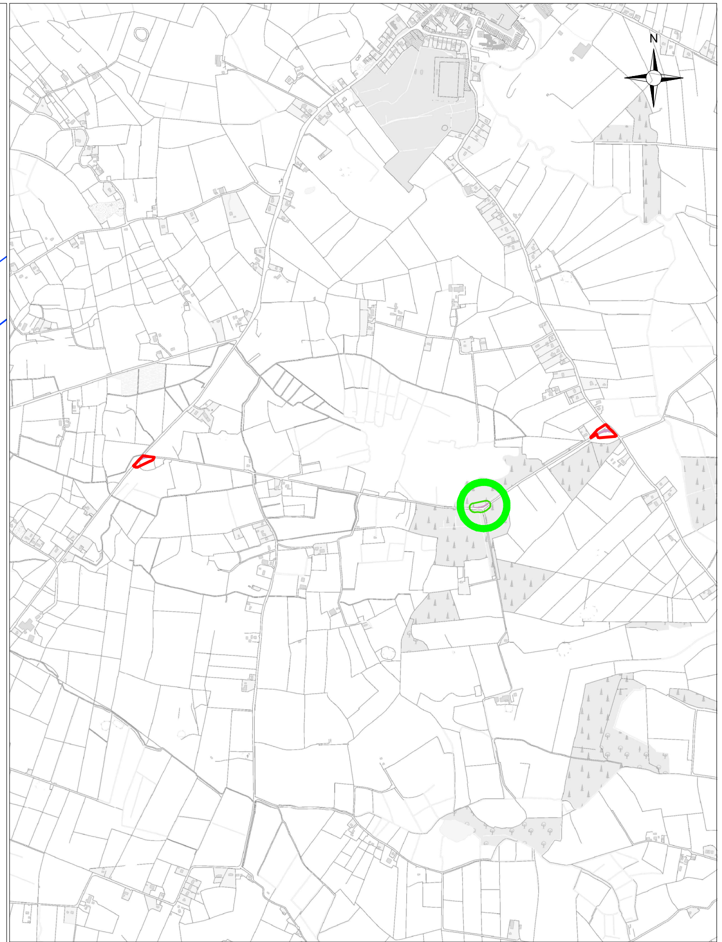

1:25,000 Location on Context Map

Drawing Legend

- EIAR Site Boundary
- Temporary New Road (to facilitate delivery of abnormal loads).
- Temporary Fencing
- Existing Road Edge

DRAWING TITLE: **Proposed TDR Accommodation Area 2**	
PROJECT TITLE: **Clonberne Wind Farm, Co. Galway**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig 4-28**
SCALE: **1:500 @ A3**	DATE: **20.06.2024**

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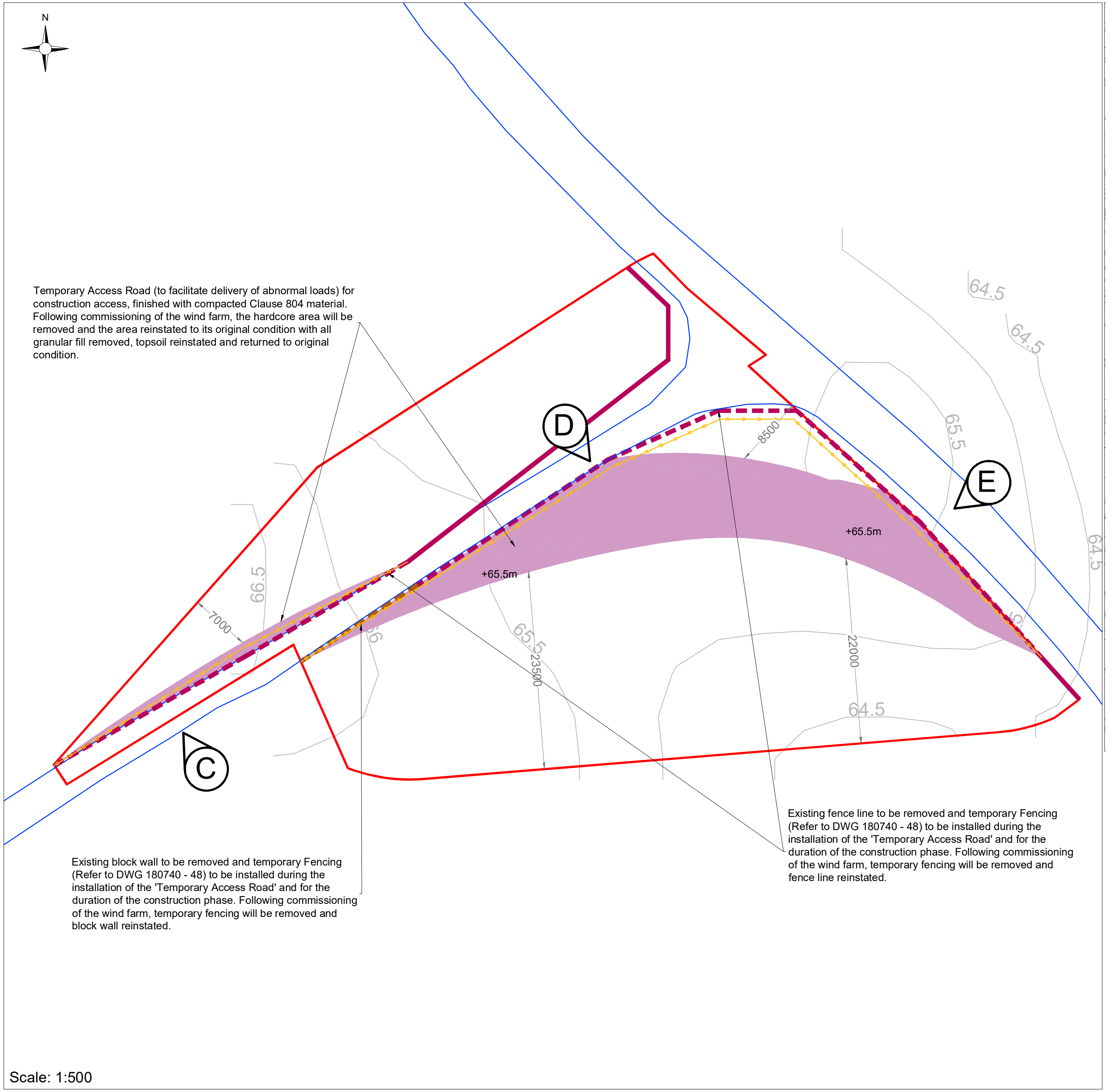

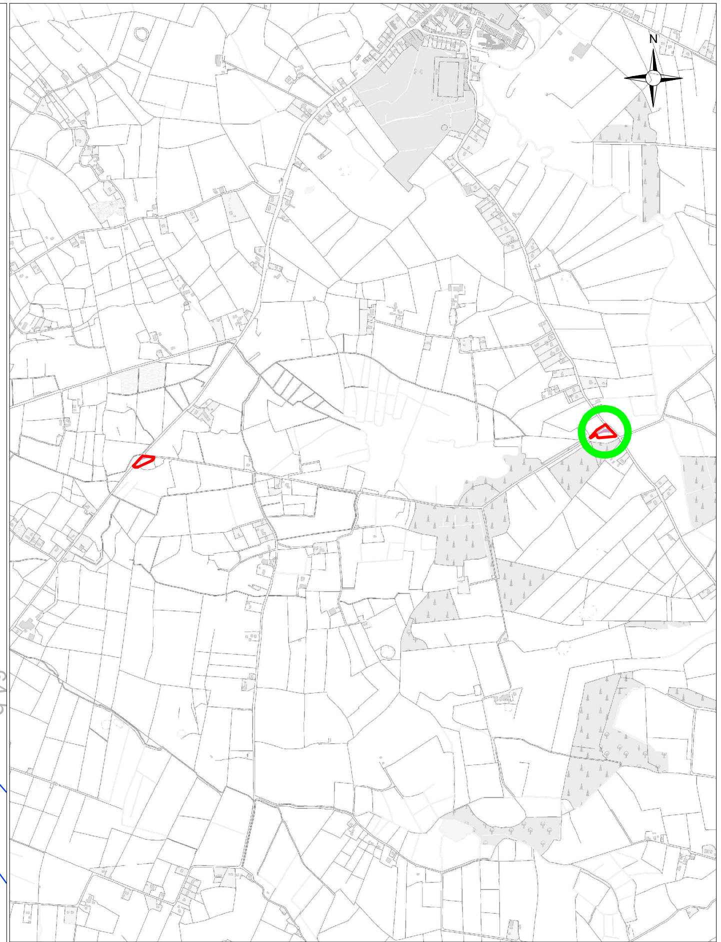

1:25,000 Location on Context Map

Drawing Legend

- Planning Application Boundary
- Temporary New Road (to facilitate delivery of abnormal loads).
- Existing Fencing to be Temporarily Removed/Reinstated
- Existing Stone Wall to be Temporarily Removed/Reinstated
- Temporary Fencing
- Existing Road Edge

DRAWING TITLE: **Proposed TDR Accommodation Area 3**	
PROJECT TITLE: **Clonberne Wind Farm, Co. Galway**	
DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 180740	DRAWING No.: Fig. 4-29
SCALE: 1:500 @ A3	DATE: 10.06.2024

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4.5 Site Drainage

4.5.1 Introduction

The drainage design for the Proposed Project has been prepared by HES who are the Hydrological and Hydrogeological Consultants. The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Project. The Proposed Project'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 Project 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 around the existing natural drainage features have been used to inform the layout of the Proposed Project.

4.5.2 Existing Drainage Features

The routes of any natural drainage features will not be altered as part of the Proposed Project. Turbine locations have been selected to avoid natural watercourses. There will be 5 no. new watercourse crossings and 1 no. crossing upgrades will be required as part of the Proposed Project.

There will be no direct discharges to natural watercourses. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from natural watercourse and lakes. Buffer zones around the existing natural drainage features have informed the layout of the Proposed Project and are indicated on the drainage design drawings.

Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. Where drains have to be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

4.5.3 Drainage Design Principles

The key principles of drainage design that will be implemented and adhered to as part of the Proposed Project are as follows:

- Keep clean water clean by intercepting it where possible, upgradient of works areas, and divert it around the works areas for discharge as diffuse overland flow or for rewetting of land.
- Collect potentially silt-laden runoff from works areas via downgradient collector drains and manage via series of avoidance, source, in-line, treatment and outfall controls prior to controlled diffuse release as overland flow or for rewetting of land.

- No direct hydraulic connectivity from construction areas to watercourses or drains connecting to watercourses.
- Where possible, maintain 50-metre watercourse buffer zones for the wind turbines.
- No alteration of natural watercourses.
- Maintain the existing hydrology of the site.
- Blocking of existing manmade forestry drainage as appropriate.
- Daily inspection and recording of surface water management system by on-site clerk of works and immediate remedial measures to be carried out as required and works temporarily ceased if a retained stormwater/sediment load is identified to have the potential to migrate from the site.
- Use of siltbuster if required.

Drainage water from any works areas of the site of the Proposed Project will not be directed to any natural watercourses within the site. Two distinct methods will be employed to manage drainage water within the site. The first method involves keeping clean water clean by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, to allow attenuation and settlement prior to controlled diffuse release.

The drainage design is intended to maximise erosion control, which is more effective than having to control sediment during high rainfall. Such a system also requires less maintenance. The area of exposed ground will be minimised. The drainage measures will prevent runoff from entering the works areas of the site from adjacent ground, to minimise the volume of sediment-laden water that has to be managed. Discoloured run-off from any construction area will be isolated from natural clean run-off. A drainage process flow of the proposed drainage design is presented in below in Figure 4-30.

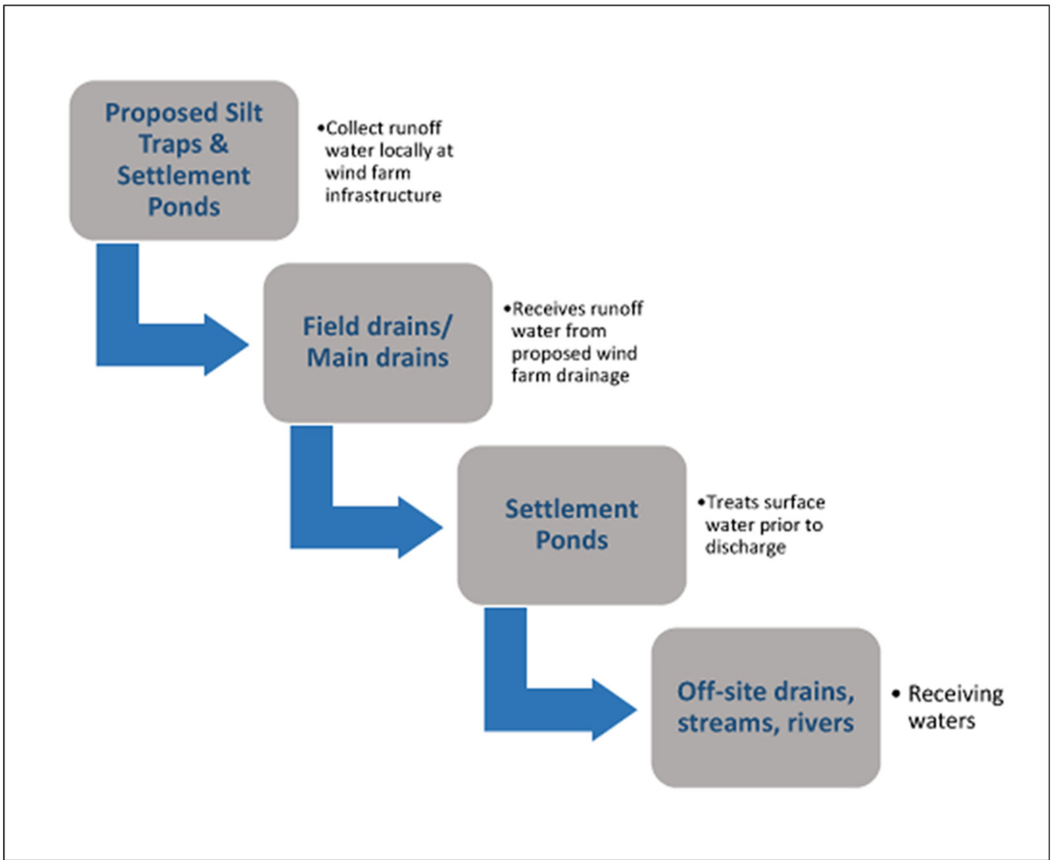


Figure 4-30 Proposed Project Drainage Process Flow

4.5.4 Drainage Design

A drainage design for the Proposed Project, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in the Surface Water Management Plan in Appendix 4-5 to this EIAR. The drainage design employs the various measures further described below and is cognisant of the following guidance documents:

- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations & Water Protection Guidelines;
- Forest Services (Draft) Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures;
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- COFORD (2004): Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- Good Practice During Wind Farm Construction (Scottish Natural Heritage, 2010);
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006); and,
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

4.5.4.1 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 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 compacted 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 the drains are to be removed, they will be backfilled with the material from the diversion dike. 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 would be maintained in localised areas along the roadway with culverts under the roadway, which would 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. Figure 4-31 below shows an illustrative drawing of an interceptor drain.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.5.4.3 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 4.5.4.4 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.

4.5.4.2 Swales

Drainage swales 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 Project 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 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 and collector drains described above. Figure 4-31 below, shows an illustrative example of a drainage swale.

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.

4.5.4.3 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 in the swale is non-erosive.

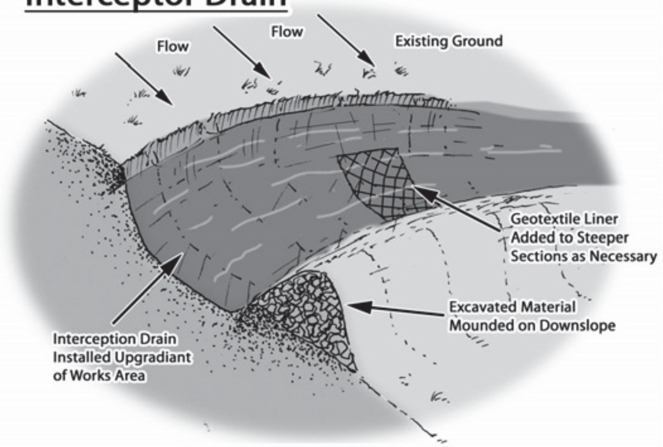
Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated. Check dams may also be installed in some of the existing artificial drainage channels on the site, downstream of where drainage swales connect in.

The proposed check dams will be made up of straw bales 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. Figure 4-31, below, shows illustrative examples of check dams.

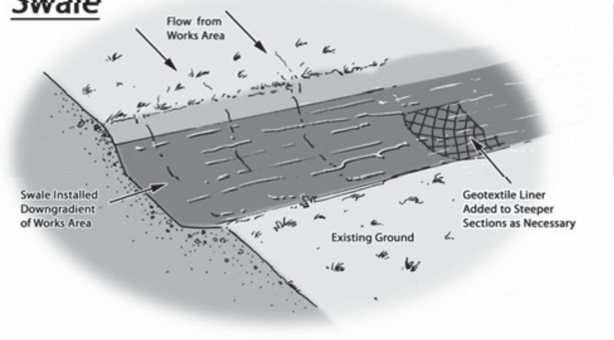
The check dams will be installed at regular intervals along the interceptor drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain. The centre of the check dam will be approximately 150mm lower than the edges 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.

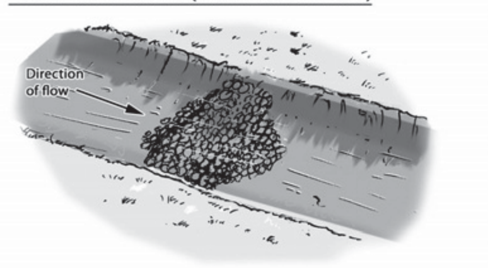
Interceptor Drain



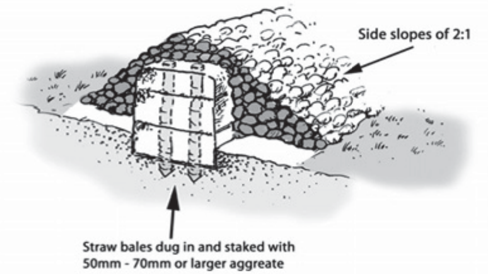
Swale



Check Dam (Stone Dam in Drain)

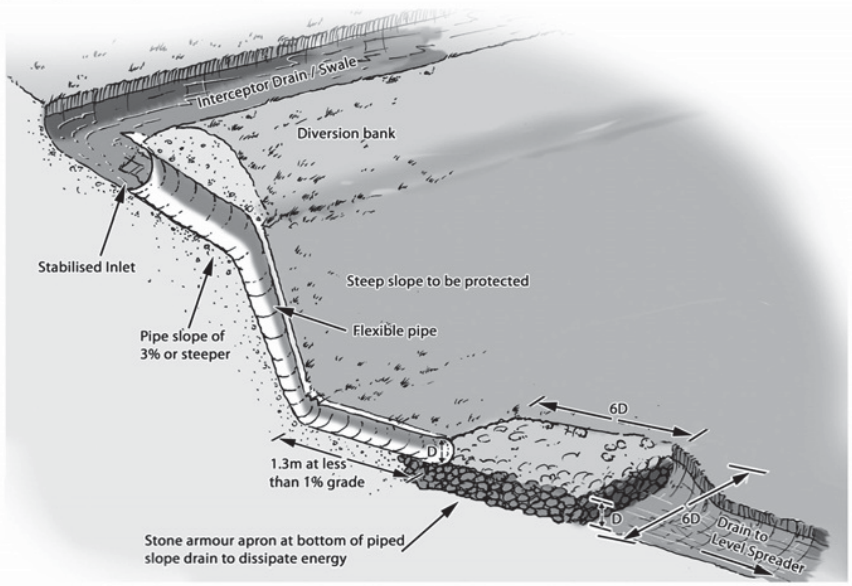


Check Dam
(Straw Bale & Stone Dam - Cross Section)

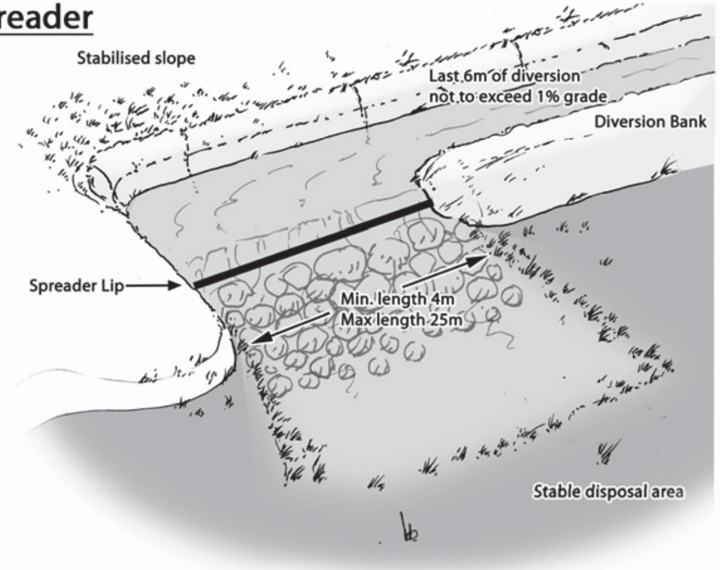


Drainage Design Measures

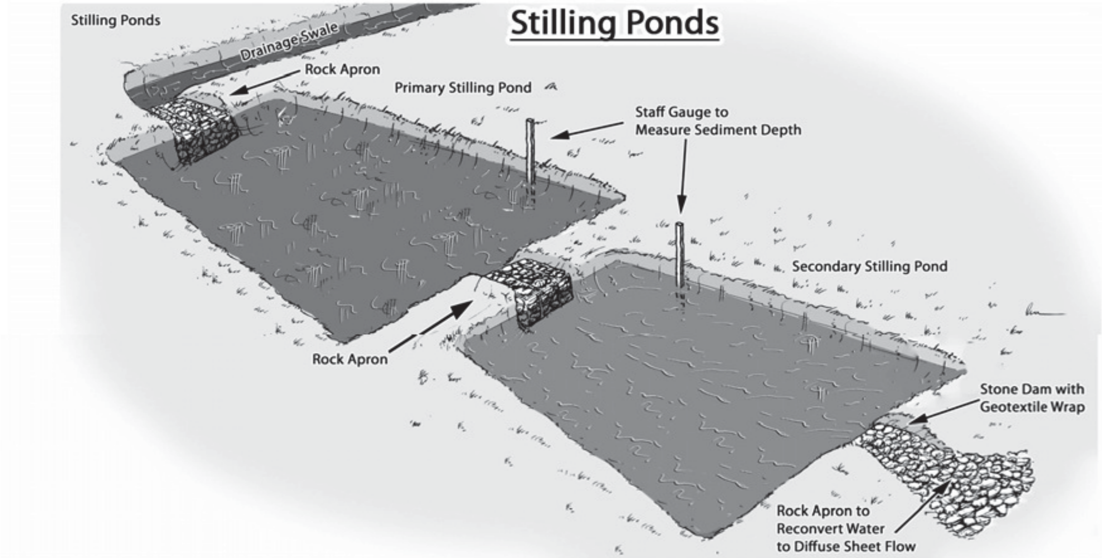
Slope Pipe Drain



Level Spreader



Stilling Ponds



Drawing Title: Drainage Design Measures	Drawing No. Figure 4-31		Scale: NTS
Project Title: Proposed Clonberne Wind Farm			Date: 19.06.2024
Drawn By: Jonny Fearon	Checked By: Owen Cahill	Project No. 180740	

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4.5.4.4 Level Spreaders

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 are not likely to contribute further to water ingress to construction areas of the site.

The water carried in interceptor drains will not have come in contact with works areas of the site, 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. Figure 4-31 above, shows an illustrative example of a level spreader.

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 4.5.4.5 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.

4.5.4.5 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. Figure 4-31, above, shows a diagrammatic example of a piped slope drain and rock apron.

Piped slope drains will only remain in place for the duration of the construction phase of the Proposed Project. 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.

4.5.4.6 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.

4.5.4.7 Stilling Ponds (Settlement Ponds)

Stilling ponds will be used to attenuate runoff from works areas of the site of the Proposed Project during the construction phase and will remain in place to handle runoff from roads and hardstanding areas of the Proposed Project 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 at each required location as two separate ponds in sequence, a primary pond and a secondary pond. 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 primary stilling pond will reduce the velocity of flows to less than 0.5 metres per second to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond via another rock apron. The secondary stilling pond will reduce the velocity of flows to less than 0.3 metres per second. Water will flow out of the secondary 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. Figure 4-31, above, shows an illustrative example of a stilling pond system.

Water will flow by gravity through the stilling pond system. The stilling ponds will be sized according to the size of the area they will be receiving water from but will be sufficiently large to accommodate peak flows storm events. 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. All material excavated during pond construction will be used locally for landscaping and berm construction around these ponds.

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. 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.

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.

4.5.4.8 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 4-32, 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.

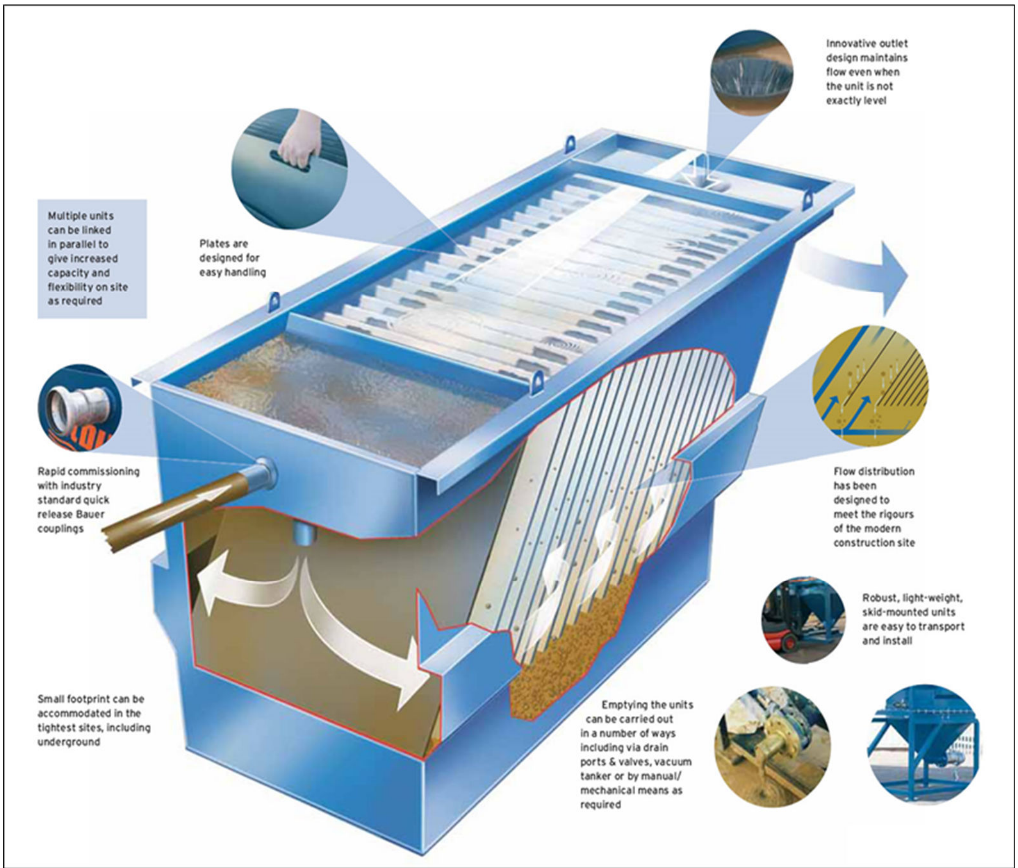


Figure 4-32 – Siltbuster (Source: https://www.siltbuster.co.uk/sb_prod/siltbuster-fb50-settlement-unit/)

4.5.4.9 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 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 4-6 and Plate 4-7 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 4-6 Silt Bag with water being pumped through

Plate 4-7 Silt bag under inspection

4.5.4.10 Sedimats

Sediment entrapment mats (see Plate 4-8 below), 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.

Plate 4-8 Typical Sedimat Details (Source: https://www.hy-tex.co.uk/)

4.5.4.11 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 Project, 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 track or 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 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 does not 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.

4.5.4.12 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 stream or 100m buffer zone of a lake, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the Proposed Project. These areas include around existing culverts, around the headwaters of watercourses, and the proposed locations are indicated on the drainage design drawings included in the Surface Water Management Plan in Appendix 4-5.

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 Construction Industry Research and Information Association (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.

Silt 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.

4.5.4.13 Hydrocarbon Interceptors

A hydrocarbon (or petrol) 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., the southern construction compound) or where it is proposed to park vehicles during the construction and operational phases of the Proposed Project (i.e., construction compounds and substation compound).

4.5.4.14 Forestry Felling Drainage

Tree felling to facilitate the Proposed Project will not be undertaken simultaneously with construction groundworks. Keyhole felling to facilitate construction works will take place prior to groundworks commencing. Some further turbulence felling may take place after all groundworks have been completed but while turbines are being commissioned (depending on the requirements of the selected turbine manufacturer).

Before the commencement of any felling works, an Environmental Clerk of Works (ECoW) shall be appointed to oversee the keyhole and extraction works. The ECoW shall be experienced and competent, and shall have the following functions and operate their record using a Schedule of Works Operation Record (SOWOR):

- Attend the site for the setup period when drainage protection works are being installed and be present on site during the remainder of the forestry keyhole felling works.
- Prior to the commencement of works, review and agree the positioning by the Operator of the required Aquatic Buffer Zones (ABZs), silt traps, silt fencing (see below), water crossings and onsite storage facilities for fuel, oil and chemicals (see further below).
- Be responsible for preparing and delivering the Environmental Toolbox Talk (TBT) to all relevant parties involved in site operations, prior to the commencement of the works.
- Conduct daily and weekly inspections of all water protection measures and visually assess their integrity and effectiveness in accordance with Section 3.4 (Monitoring and Recording) and Appendix 3 (Site Monitoring Form (Visual Inspections)) of the *Forestry & Freshwater Pearl Mussel Requirements*.
- Take representative photographs showing the progress of operation onsite, and the integrity and effectiveness of the water protection measures.
- Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements:
    - Surface water samples shall be collected upstream and downstream of the keyhole felling site at suitable sampling locations.
    - Sampling shall be taken from the stream / riverbank, with no in-stream access permitted.
    - The following minimum analytical suite shall be used: pH, EC, TSS, BOD, Total P, Ortho-P, Total N, and Ammonia.
- Review of operator's records for plant inspections, evidence of contamination and leaks, and drainage checks made after extreme weather conditions.
- Prepare and maintain a contingency plan.
- Suspend work where potential risk to water from siltation and pollution is identified, or where operational methods and mitigation measures are not specified or agreed.
- Prepare and maintain a Water Protection Measure Register. This document is to be updated weekly by the ECoW.

All relevant measures set out in *the Forestry & Freshwater Pearl Mussel Requirements, Forestry & Water Quality Guidelines*, *Forest Harvesting & the Environment Guidelines* and the *Forest Protection Guidelines* will apply. To protect watercourses, the following measures will be adhered to during all keyhole/tree felling activities.

- Works will be overseen by an ECoW as described above.
- The extent of all necessary tree felling will be identified and demarcated with markings on the ground in advance of any felling commencing.
- All roads and culverts will be inspected prior to any machinery being brought on site to commence the felling operation. No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings.
- Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt traps 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. No direct discharge of such drains to watercourses will occur from within felling areas.
- 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.
- All silt traps will be sited outside of buffer zones and have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of away from all aquatic zones.
- All new collector drains will taper out before entering the aquatic buffer zone to ensures the discharging water gently fans out over the buffer zone before entering the aquatic zone.
- Machine combinations, such as mechanical harvesters or chainsaw felling will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance;
- Mechanised operations will be suspended during and immediately after heavy rainfall.
- Where brash is required to form brash mats, it is to be laid out at harvesting stage to prevent soil disturbance by machine movement.
- Brash which has not been pushed into the soil may be moved within the site to facilitate the creation of mats in more demanding locations.
- Felling of trees will be pointed directionally away from watercourses.
- Felling will be planned to minimise the number of machine passes in any one area.
- 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. Straw bales and check dams to be emplaced on the down gradient side of timber storage sites.
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but removing of natural debris deflectors will be avoided.

4.5.5 Borrow Pit Drainage

While surface water will be contained in the borrow pit areas, the design proposal is to control the level of water in the borrow pit area by creating a single point outlet from the basin-like area that will ensure the water does not overtop the pit area. Run-off from the proposed borrow pit areas will be controlled via a single outlet that will be installed at the edge of the borrow pit. The single outfall point will be constructed to control runoff from the borrow pit and its immediate surrounds. Interceptor drains will already have been installed upgradient of the borrow pit area before any extraction begins.

During the construction phase of the project, it will be necessary to keep the borrow pit area free of standing water while rock is still being extracted. This will be achieved by using a mobile pump, which will pump water into the same series of drains, settlement ponds with a level spreader, siltbuster or equivalent, which will receive the water from the single outlet.

4.5.6 Cable Trench Drainage

Cable trenches are typically developed in short sections, thereby minimising the amount of ground disturbed at any one time and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the upgradient side of the trench. Should any rainfall cause runoff from the excavated material, the material is contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the Proposed Project, would be transported to the on-site borrow pit or used for landscaping and reinstatements of other areas elsewhere on site.

On steeper slopes, silt fences, as detailed in Section 4.5.4.12, above, will be installed temporarily downgradient of the cable trench works area, or on the downhill slope below where excavated material is being temporarily stored to control run-off.

4.5.7 Site and Drainage Management

4.5.7.1 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures outlined above, will be brought on-site in advance of any works commencing. An adequate amount of straw bales, clean stone, terram, stakes, etc will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.

4.5.7.2 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the Proposed Project will also take account of weather forecasts, and predicted rainfall in particular, working under a schedule of works operation system (SOWOR) system. The implementation of a SOWOR prior to commencement will provide a series of pre-commencement triggers which set out specific conditions which will be met before the commencement of works in particularly sensitive areas. These pre-commencement triggers will apply to the installation of any drainage infrastructure. The various triggers, both pre-commencement and abandonment, ensure best practice in terms of water quality management is maintained prior to commencement and during the various felling and construction phases. An example of an SOWOR is included in Appendix B of the Surface Water Management Plan in Appendix 4-5.

Large excavations, large movements of overburden or large scale overburden or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

4.5.7.3 Reactive Site Drainage Management

The final drainage design prepared for the Proposed Project prior to commencement of construction will provide for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the ECoW or supervising hydrologist on-site. The ECoW or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor drains, or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time.

In the event that works are giving rise to siltation of watercourses, the ECoW or supervising hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

4.5.8 Drainage Management and Maintenance

A Surface Water Management Plan (SWMP) (Appendix 4-5) has been prepared for the Proposed Project. It is intended, as an accompanying document to the Construction and Environmental Management Plan (CEMP) which is included in Appendix 4-4. It compiles the proposed surface water drainage control and treatment measures, set out in the EIAR, the drainage management and maintenance measures and the proposed surface water monitoring programme, set out in the CEMP, in a single document. The SWMP is included as Appendix 4-5 of this EIAR.

The SWMP also provides details in relation to the activity specific drainage control and mitigation measures including those measures to be implemented for the following:

- Keyhole Felling
- Peat and Spoil Repository Areas Drainage
- Floating Road Drainage
- Cabling Trench Drainage
- Refuelling, Fuel and Hazardous Material Storage
- Cement Based Product Handling

4.5.9 Construction Phasing and Timing

It is estimated that the construction phase of the Proposed Project will take approximately 18-24 months from starting on site to the 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.

4.5.10 Construction Sequencing

The construction phase can be broken down into three main phases, 1) civil engineering works - 10 months, 2) electrical works - 6 months, and 3) turbine erection and commissioning - 8 months. The main task items under each of the three phases are outlined below.

Civil Engineering Works

- Construct new Site roads to temporary compounds.
- Clear and hardcore area for temporary site offices. Install same.
- Construct bunded area for oil storage in Temporary Construction Compound no. 2 (southern Temporary Construction Compound).
- Construct new site roads and hard-standings and crane pads.
- Construct drainage ditches, culverts etc. integral to road construction.
- Excavate for turbine bases. 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.
- Construct bases/plinths for transformer.
- Excavate trenches for site cables, lay cables and backfill. Provide ducts at road crossings.
- Backfill tower foundations and cover with previously stored topsoil.
- Complete site works, reinstate site.

- Remove temporary site offices. Provide any gates, landscaping, signs etc. which may be required.

Electrical Works

- Construct bases/plinths for substation extension building.
- Install external electrical equipment at substation.
- Install transformer at compound.
- Erect stock proof and palisade fencing around substation area.
- Install internal collector network and communication cabling.
- Construct grid connection.

Turbine Erection

- Erect towers, nacelles and blades.
- Complete electrical installation.
- Grid connection.
- Commission and test turbines.
- Complete site works, reinstate site.
- Remove temporary site offices. Provide any gates, landscaping, signs etc. which may be required.

The phasing and scheduling of the main construction task items are outlined in Figure 4-33 below, where the 1st January has been selected as an arbitrary start date for construction activities.

			Year 1				Year 2			
ID	Task Name	Task Description	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Site Health and Safty									
2	Grid Conneciton									
3	Site Compounds	Site Compounds, site access, fencing, gates								
4	Site Roads	Construction/upgrade of roads, construct underpasses install drainage measures, install water protection measures								
5	Felling	Felling of forestry, hedgerows, scrub etc.								
6	Substation and Electrical Works	Construct substation, underground cabling, grid connection								
7	Turbine Hardstands	Excavate/pile for turbine bases where required								
8	Turbine Foundations	Fix reinforcing steel and anchorage system, erect shuttering, concrete pour								
9	Backfilling and Landscaping									
10	Turbine Delivery and Erection									
11	Substation Commissioning									
12	Turbine Commisioning									

Figure 4-33 – Indicative Construction Sequencing

4.5.11 Construction Phase Monitoring and Oversite

The requirement for a Construction and Environmental Management Plan (CEMP) to be prepared in advance of any construction works commencing on any development 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 typically 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 CEMP has been prepared for the Proposed Project and is included in Appendix 4-4 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 Project, 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 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.

4.6 Construction Methodologies

4.6.1 Keyhole Forestry Felling

As part of the Proposed Project, keyhole felling of forestry will be required within and around the 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 Appendix 6-2 of this EIAR). A total of 10.3 hectares of forestry will be permanently felled within and around the footprint of the Proposed Project 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, including the 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.

4.6.2 Proposed Wind Farm

4.6.2.1 Turbine Foundations

Turbines T1-T4 will either be a gravity foundation or pre-cast piling due to the presence of these proposed turbines within the Zone of Contribution (ZoC). The following construction methodology, as outlined in Section 9.3.9 of this EIAR, describes the proposed design measures that will be utilised:

- The gravity foundation option will seek a suitable founding in the glacial tills at a maximum of 3 - 3.5mblg and therefore excavations will only require the removal of overburden to the final base level which will be within the overburden layer.
- A protective layer of overburden will be left in place above the bedrock.
- Gravity foundation is the preferred option unless further site investigations deem it unsuitable. If gravity foundation is not suitable at a depth of 3 - 3.5m or above, precast piling will be the approach.
- Pre-cast piling will involve driving imported concrete piles down onto the top of bedrock below the glacial tills. The piles will not be drilled into the underlying bedrock aquifer nor will they be grouted in place.

- The gravity foundation or pre-cast piling approach will not require excavations or grouting down into the bedrock aquifer and therefore there will be no risk of intercepting potential underlying bedrock conduits/fractures that transmit groundwater to the spring.
- Short term pumping/dewatering of turbine base excavations is likely to be required in the gravity base scenario, but this will only be seepage from the overlying glacial overburden and therefore, with both approaches there will be no potential whatsoever to disrupt underlying groundwater flow paths (conduits/fractures) in the bedrock aquifer that feeds the Gurteen/Cloonmore GWS spring.
- Therefore, with both approaches there will be no potential whatsoever to disrupt underlying groundwater flowpaths (conduits/fractures) in the bedrock aquifer that feeds the Gurteen/Cloonmore GWS Spring.

Outside of Turbines T1-T4, all other proposed turbines will be constructed using gravity based foundations. If these are deemed unsuitable, the standard bored piling will be an option at these turbine locations due to the presence outside of the Gurteen/Cloonmore GWS refined ZoC.

4.6.2.2 Site Roads and Hardstand Areas

Construction Methodology for New Roads

The general methodology to construct new founded roads (i.e. see Detail A of the road construction detail drawings in Appendix C of the Peat and Spoil Management Plan Appendix 4-3) is presented below.

1. *Excavation of the new access road to competent strata (see Section 3 for guidance on correctly handling and storing the different peat layers). Maximum excavation side slopes will be 1:1.5.*
    a. *Drainage shall be installed to divert surface and groundwater from the construction areas.*
2. *A layer of geogrid/geotextile may be required at the base of the excavation. To be confirmed at detailed design.*
3. *Placement of granular fill-in layers following the designer's specification. The fill thickness is 200mm above the existing ground level, which is required to backfill the excavation to a suitable competent strata below the existing ground level.*
4. *Access roads are to be finished with a granular running surface across the full width of the road.*

The general methodology to construct new floating roads (i.e. see Detail B of the road construction detail drawings presented in Appendix C in the Peat and Spoil Management Plan Appendix 4-3) is presented below.

1. *A geotextile-geogrid composite layer is placed directly onto the peat surface following the designer's specification.*
2. *Placement of granular fill up to 800mm 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. *Cross-drains shall be installed within the road to divert surface and groundwater from upslope to downslope.*
    b. *Stone delivered to the floating road construction area shall be end-tipped onto the constructed floating road 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.*

c. *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.*

Further information regarding the construction methodology for the proposed new roads is outlined in Appendix 4-3 Peat and Spoil Management Plan.

Construction Methodology to Upgrade Existing Roads.

An indicative methodology, as presented in Section 4.2 in Peat and Spoil Management Plan Appendix 4-3, to upgrade existing founded roads (i.e. see Detail C of the road construction detail drawings presented in Appendix C in the Peat and Spoil Management Plan Appendix 4-3) is presented below.

1. *Excavation on one or both sides of the existing access road to competent strata.*
2. *Placement of granular fill up to 200m above existing ground level 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.*
3. *Overlay of the existing access road with selected granular fill following the designer's specification.*
    a. *Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid will be placed on top of the existing floated access road.*
4. *Access roads will 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.*

An indicative methodology to upgrade existing floating roads (i.e. See Detail D of the road construction detail drawings presented in Appendix C in the Peat and Spoil Management Plan Appendix 4-3) is presented below.

1. *A geotextile is placed 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 fill placement rate to allow the peat layers to consolidate and increase in strength.*
    b. *It may be necessary to anchor the geogrids into the existing roads, requiring significant benching of existing roads.*
3. *Overlay of the existing access road with selected granular fill following the designer's specification.*
    a. *Where coarse granular fill has been used in the existing floated access road make-up, a layer of geogrid will be placed on top of the existing floated access road.*
    b. *The surface of the existing access road will 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.*
    a. *A layer of geogrid/geotextile may be required at the surface of the existing access road following the designer's specification.*

Further information regarding the construction methodology for the proposed upgrades to existing roads is outlined in Appendix 4-3 Peat and Spoil Management Plan.

4.6.2.3 Proposed Clear-Span Bridge Crossing

It is proposed to construct a clear-span watercourse crossing along the Proposed Project site access roads at 6 no. locations using a clear-span bridge – 5 no. new watercourse crossing locations and 1 no. existing watercourse crossings for upgrading. The location of this crossings is shown on the layout drawings included in Appendix 4-1 of this EIAR. The clear-span watercourse crossing methodologies presented below will ensure that no instream works are necessary.

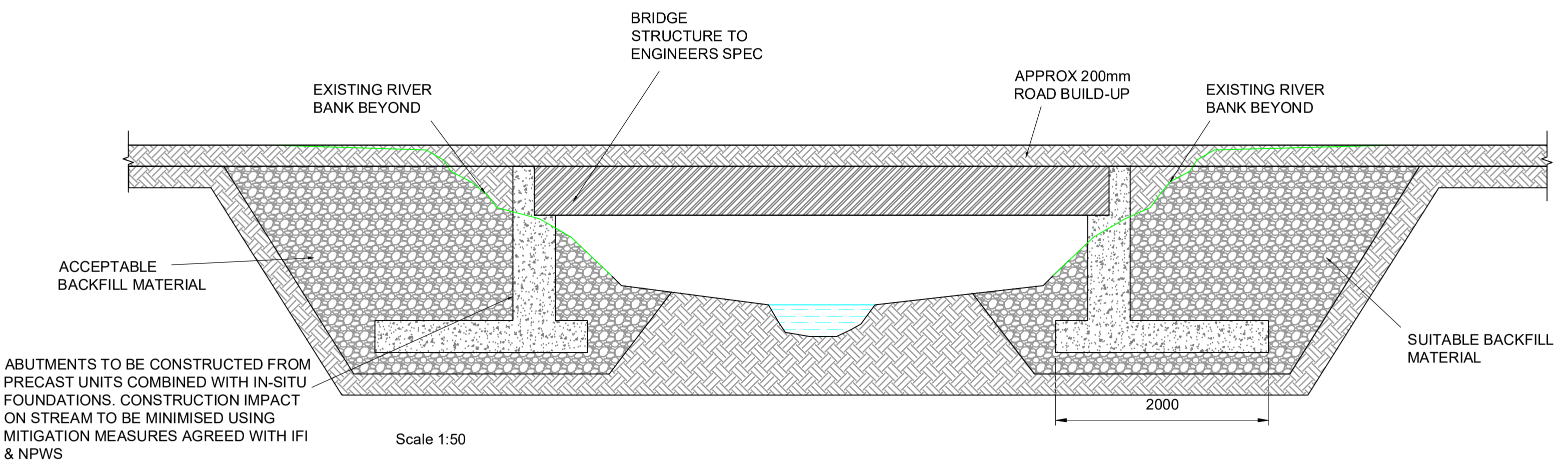
The standard construction methodology for the installation of a clear-span bridge watercourse crossing is as follows:

- The access road on the approach either side of the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.'
- All drainage measures along the proposed road will be installed in advance of the works.
- 'A foundation base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required.
- 'Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of a temporary pre-cast concrete or metal bridge across the watercourse to provide temporary access for the excavator. Plant and equipment will not be permitted to track across the watercourse.
- Concrete abutments will be installed on either side of the watercourse and will be cast in-situ
- Once the foundation base has been completed, the pre-cast concrete elements will be installed using a crane which will be set up on the bank of the watercourse and will be lifted into place from the bank with no contact with the watercourse.
- Where the crossing is completed using a box culvert this will be installed in sections on a similar a concrete foundation, the joints will be sealed to prevent granular material entering the watercourse,
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.

A standard design drawing of a pre-cast concrete, clear-span crossing is shown in Figure 4-34.

The watercourse crossing will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

Confirmatory inspections of the proposed new watercourse crossing location will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.



Scale 1:50

DRAWING TITLE: **Clear Span Watercourse Crossing**	
PROJECT TITLE: **Clonberne Wind Farm, Co. Galway**	
DRAWING BY: **Joseph O'Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Fig. 4-34**
SCALE: **1: 50 @ A3**	DATE: **10.06.2024**

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4.6.2.4 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. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound platform will be established using a similar technique as the construction of the substation platform discussed above;
- 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 Project the temporary construction compounds will be decommissioned and allowed to vegetate naturally.

4.6.2.5 Underground Electrical (33kV) and Communication Cabling

The underground electrical (33kV) and communication cabling will be laid beneath the surface of the site, proposed new road or existing road using the following typical methodology:

- Before works commence, surveying will take place along the proposed cable route, with all existing culverts identified. All relevant bodies i.e. ESB, Galway County Council etc. will be contacted and all drawings for all existing services sought.
- When the cable is located on public roads, a traffic management plan will be set up prior to any works commencing.
- A road opening licence will be obtained where required and all plant operators and general operatives will be inducted and informed as to the location of any services.
- A tracked 360-degree excavator will then proceed to dig out the proposed trench, typically to a depth of 1200mm, within which the ducts will be laid.
- Trench supports will be installed, or the trench sides will be benched or battered back where appropriate and any ingress of ground water will be removed from the trench using submersible pumps, fitted with appropriate silt filtration systems, to prevent contamination of any watercourse.
- Once the trench has been excavated, a base-layer will be laid and compacted, comprising Clause 804, or 15 Newton CBM4 concrete as required.
- The ducting will be installed as per specification, with couplers fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions, the ends of the ducts will be shimmed up off of the bed of the trench, to prevent any possible ingress of water dirt. The shims will be removed again once the next length has been connected. Extreme care will be taken to ensure that all duct collars (both ends) are clean and in good condition prior to ducts being joined.
- As the works progress, the as-built location of the ducting will be recorded using a total station or GPS.
- As per the associated base-layer (Clause 804 material or 15 Newton CBM4 concrete) will be installed and compacted as per approved detail, with care not to displace the ducting.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the ducting.
- The remainder of the trench will be backfilled in two compacted layers with approved engineer's specified material.
- Yellow marker warning tape will be installed across the width of the trench, at 300mm depth, before the finished surface is reinstated, as per original specification. Although

the typical cross section of the off-road cabling trench shows a finished surface level of reinstated topsoil, these revised sections of off-road cabling may be finished with granular fill to facilitate access to the trench for any potential maintenance that is required during the operational phase of the Proposed Project.

- Marker posts will then be placed at regular intervals (generally at joint bays and any change in direction) to denote the location of the underground power cables.

4.6.2.6 Site Underground Electrical (38kV) Cabling and End Masts

38kV Line to Cable Interface End Masts

The working area for construction surrounding both end masts will extend 10m around the footprint of the structures. Excavations for the foundations of each leg for the end masts will typically be 1.85m x 1.85m and 2.5m deep.

- Prior to any construction activities, the proposed end mast sites will be scanned for underground services such as cables, water pipes etc. Consultations with landowners will help to identify hazards and ensure there are no unidentified services in the works area.
- Excavations for the foundations of each leg for the end masts will typically be 1.85m x 1.85m and 2.5m deep. The formation levels (depths) shall be checked by the onsite engineer.
- In areas of poor ground/high water table, it may be necessary to use sheet piles supported by hydraulic frame(s) to prevent collapse of the sides and prevent the excavation becoming too large. In this scenario, the requirement of a concrete pipe (which is typically used in tower foundations) is removed. During any dewatering activities, a standard water filtration system shall be utilised to control the amount of sediment in surface ware runoff.
- Once excavations are completed, the legs of the end masts are placed within the excavated areas and concrete shall be poured into each area. The legs of the end masts will require to be shuttered with metal panels to form its required shape. Once concrete is set, the shuttering is removed along with sheet piles (if required).
- The mast foundations shall be backfilled one leg at a time with excavated material. The backfilled material shall be compacted and placed in layers.
- An earth mat consisting of copper wire will be laid circa 600mm below ground around the end mast. This earth mat is a requirement for the electrical connection of the equipment on the end mast structure.
- A temporary hardstand area shall be constructed and used for the assembly of the end mast structures.
- The upper components of the end mast will be lifted into place on top of the legs using a crane and the body sections will be bolted into position.

38kV Underground Cabling and Cable Trench

The cabling will be routed through the proposed internal access roads and will consist of 3 no. 110mm diameter HDPE power cable ducts and 1 no. 110mm diameter HDPE communications duct to be installed in an excavated trench, typically 600mm wide by 1,220mm deep.

The underground electrical cabling will be laid using the following methodology:

- Before works commence, updated surveying will take place along the proposed cable route, with all existing culverts identified. All relevant bodies i.e. ESB, will be contacted and all up to date drawings for all existing services sought.
- A tracked 360-degree excavator will then proceed to dig out the proposed trench, typically to a depth of 1200mm, within which the ducts will be laid.

- The cable ducts will be concrete surrounded where they pass under the public road and under drains or culverts.
- Trench supports will be installed, or the trench sides will be benched or battered back where appropriate and any ingress of ground water will be removed from the trench using submersible pumps, fitted with appropriate silt filtration systems, to prevent contamination of any watercourse.
- Once the trench has been excavated, a base-layer will be laid and compacted, comprising Clause 804, or 15 Newton CBM4 concrete as required.
- The ducting will be installed as per specification, with couplers fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions, the ends of the ducts will be shimmed up off of the bed of the trench, to prevent any possible ingress of water dirt. The shims will be removed again once the next length has been connected. Extreme care will be taken to ensure that all duct collars (both ends) are clean and in good condition prior to ducts being joined.
- As the works progress, the as-built location of the ducting will be recorded using a total station or GPS.
- As per the associated base-layer (Clause 804 material or 15 Newton CBM4 concrete) will be installed and compacted as per approved detail, with care not to displace the ducting.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the ducting.
- The remainder of the trench will be backfilled in two compacted layers with approved engineer's specified material.
- Yellow marker warning tape will be installed across the width of the trench, at 300mm depth.
- The finished surface is to be reinstated, as per original specification. Off-road cabling may be finished with granular fill to facilitate access to the trench for any potential maintenance that is required during the operational phases of the Proposed Project and the proposed 38kV overhead line.
- Marker posts will then be placed at regular intervals to denote the location of the underground power cables.

4.6.2.7 Borrow Pit

The proposed borrow pit will be constructed following the construction methodology that is outlined in Peat and Spoil Management Plan in Appendix 4-3. Slopes within the excavated rock formed around the perimeter of the pit borrow pit will be formed at stable inclinations to suit local in-situ rock conditions. It is proposed to excavate the borrow pit to 67m Ordnance Datum. Where necessary, an interceptor drain will also be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit, preventing water from ponding and lodging in the borrow pit area. Groundwater management at the proposed borrow pit will be necessary to avoid ponding, and pumping will likely be required. The detailed design will need a drainage and groundwater management plan for the borrow pit area.

Upon removal of the overburden and rock from the proposed borrow pit, it is not proposed to reinstate the borrow pit using surplus excavated peat and spoil generated onsite during the construction of the Proposed Project. The final profile will vary across the base of the borrow pit. The volume assessment at the borrow pit suggests that the available stone fill capacity is lower than the stone requirements at the site, meaning that the import of stone from external sources will be required to complete the development.

An indicative layout of the proposed borrow pit is presented in Appendix E within the Peat and Spoil Management Plan in Appendix 4-3.

4.6.3 Proposed Grid Connection

4.6.3.1 Electricity Substation and Control Building

The proposed substation will be constructed by the following methodology as outlined in Appendix 4-7 Construction Methodology produced by TLI:

- The overall substation and battery compound is circa 107.41m by 131.16m, with a total area of 13,598m^2. This is made up of a Eirgrid 220kV GIS Compound, an IPP compound and a BESS compound.
- The EirGrid 220kV GIS compound is circa 40.5m by 99m (the footprint is irregularly shaped), surrounded by a 2.6m high palisade fence and post and rail property boundary fence with a total area of circa 3,860m^2.
- The IPP compound shall be circa 52.1m x 107.4m, with an area of 5,594m^2.
- A battery storage compound shall be circa 38.6m x 107.4m, with an area of 4,143m^2.
- The substation compound and drainage shall be marked by a qualified engineer.
- A drainage system shall be installed around the compound area.
- Topsoil and subsoil shall be removed from the footprint of the compound using an excavator. The excavated material shall be temporarily stored in adjacent berms for later use during reinstatement works.
- A Layer of geotextile material shall be laid over the footprint of the compound as outlined in Figure 22 of Appendix 4-7.
- Using an excavator, a base of clause 804 material shall be laid followed by a 6F2 layer which will provide a finished surface. Clause 804 material is a specific type of granular material used in road construction and sub-base layers consisting of crushed stone, crushed concrete or a mixture of both. 6F2 material is a granular fill material consisting of crushed concrete crushed brick or reclaimed construction aggregate.
- Each layer shall be compacted using a vibrating roller.
- Earthing cable shall be laid underground around the vicinity of the substation for connection to various electrical components during the electrical fit out phase.
- The construction of the substation compounds consists of a 220kV two-storey switching GIS building and associated outdoor electrical equipment.
- Adequate lighting shall be installed around the compound on the lighting masts.
- Lightning protection masts with an approximate height of 18m shall be installed to provide lightning to the substation compound
- The electrical installation is estimated to last 24 weeks and includes the following:
    - Delivery and installation of all High Voltage Equipment.
    - Wiring and cabling of High Voltage/ Low Voltage equipment, protection and control circuits.
    - Commissioning of all newly installed equipment.

4.6.3.2 Telecommunications Mast

It is proposed to construct a 36m high telecommunications mast within the footprint of the proposed substation. The telecommunications mast is a free-standing structure which will be constructed on a hardstanding area sufficiently large enough to accommodate the equipment that will be used to erect the mast. It is anticipated that the formation level of the telecommunications mast foundations will be on the lower mineral subsoil or bedrock. They will be formed at a suitable level directed by the Geotechnical Engineer/Designer. The foundations will be constructed as follows:

- The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;
- Where practical, the peat will be stripped over the area of the excavation and stored locally for reuse, the subsoil will be excavated and stored to one side for reuse during the landscaping around the finished turbine;

- No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- All groundwater and surface water arising from turbine base excavation will be pumped to the dirty water system prior to discharge from the works area;
- Soil excavation shall be in accordance with the agreed scheme of archaeological monitoring to identify any significant remains as they come to light and,
- The foundation excavation will be raised to formation level by compacted layers of well graded granular material, spread and compacted to provide a hard area for the turbine foundation.

4.6.3.3 Underground 220kV Cable Trench

Underground 220kV Cable Trench within New Founded Roads

An indicative methodology to construct cable trenches, as shown in Plate 4-9 below, within new founded roads, as presented in Section 4.3 of the Peat and Spoil Management Plan in Appendix 4-3, is outlined below:

1. Excavation of the new access road to competent strata. Maximum excavation side slopes will be 1V:1.5H (subject to temporary works design).
    a. Drainage shall be installed to divert surface and groundwater from the construction areas.
2. Cabel trenches are to be dug within the road footprint into the underlying bearing stratum to a suitable depth to allow installation of the ducting (as per cable design requirements).
3. No more than a 50m section of trench is recommended to be opened at any one time. The subsequent 50m will only be excavated once most of the reinstatement has been completed on the preceding section.
4. Grade, smooth and trim the cable trench floor when the required excavation depth and width have been obtained.
5. A layer of geotextile is to be installed at the base of the trench excavation, overlapping with the geotextile layer (if required) at the interface between the access track's granular fill and the natural subgrade. The technical specification of the geotextile is to be confirmed at the detailed design stage.
6. The cable ducts shall be installed to the designer's specification and carefully surrounded and covered by rapid hardening wet concrete (grade C25/30) to specified depths. If the top of the concrete is to be installed above the formation level of the access track, suitable formwork may be required to allow the proposed concrete cross-section to be formed.
7. A layer of geogrid may be required at the base of the access track's granular fill. To be confirmed at detailed design.
8. Placement and compaction of access track fill shall be completed in layers following the designer's specification. The top of the access track is proposed to be 200mm above the existing ground level, with the remainder of the access track's fill thickness to backfill the excavation to a suitable competent strata below the existing ground level. The fill above the cable trench shall be upfilled with Clause 804 material (UGM-A as per Series 600 Specification, TII 2013), while the general fill either side of the Clause 804 is to be a Class 1 material.
9. Access roads are to be finished with a granular running surface across the full width of the road.

Underground 220kV Cable Trench within New Floating Roads

An indicative methodology to construct cable trenches within new floating roads, as presented in Section 4.3 of the Peat and Spoil Management Plan in Appendix 4-3, is outlined below:

1. Bog matts or other temporary access solutions shall be placed on the in-situ material as required.
2. Cable trenches are to be dug within the peat to a suitable depth to allow installation of the ducting (as per the cable design requirements). Peat will be excavated to the required depth and removed for placement in designated peat repository areas elsewhere on site.
3. No more than a 50m section of trench will be opened at any one time. The subsequent 50m will only be excavated once most of the reinstatement has been completed on the preceding section.
4. Grade, smooth and trim the cable trench floor when the required excavation depth and width have been obtained.
5. A geotextile-geogrid composite layer is to be installed at the base and around the sides of the trench excavation, directly onto the peat, as shown in Detail 02 in Appendix D overlapping with the existing geotextile-geogrid composite layer at the base of the granular fill. The technical specification of the geotextile-geogrid composite layer is to be confirmed at the detailed design stage.
6. Ducts are to be installed to the designer's specification and carefully surrounded and covered by rapid hardening wet concrete (grade C25/30) to specified depths.
7. Placement and compaction of granular fill up to 800mm and installation of the 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. The fill above the cable trench shall be upfilled with Clause 804 material (UGM-A as per Series 600 Specification, TII 2013).
    b. The general fill either side of the Clause 804 is to be a Class 1 material.
    c. Cross-drains shall be installed within the road to divert surface and groundwater from upslope to downslope.
    d. Stone delivered to the floating road construction area shall be end-tipped onto the constructed floating road in a manner that will avoid excessive impact loading on the peat due to concentrated end-tipping. Direct tipping of stone onto the peat shall not be carried out.
    e. Stone will be spread and placed from the constructed floating road onto the peat surface using a bulldozer.
8. Access roads are to be finished with a granular running surface across the full width of the road.

In Section 4 of Appendix 4-7 Construction Methodology document produced by TLI and included in this EIAR, greater detail is provided regarding the construction methodology for the proposed underground grid connection route. The construction methodology is also discussed in the Construction Environment Management Plan in Appendix 4-4 of the EIAR.

Plate 4-9 Typical Cable Trench View

4.6.3.4 Joint Bays

Joints Bays are to be installed approximately every 550 - 750m along the underground grid cable (UGC) route to facilitate the joining of UGC. Joint Bays for 220kV are typically 2.5m x 8m x 1.75m pre-cast concrete structures installed below finished ground level. In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between substations. Earth Sheath Link Chambers are also required at every joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located in close proximity to Joint Bays. Earth Sheath Link Chambers and Communication Chambers will typically be pre-cast concrete structures with an access cover at finished surface level. The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to approval by ESBN. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.

The following, as outlined in Section 4.2 of the Construction Methodology report in Appendix 4-7, states the construction methodology for the proposed steel mast structures which form part of the proposed grid connection infrastructure:

- The contractor will excavate a pit for joint bay construction, including for a sump in one corner.
- Grade and smooth floor; then lay a 75 mm depth of blinding concrete (for in situ construction) or 50 mm thick sand (for pre-cast concrete construction) on 200 mm thick Clause 804 granular material.
- In situ construction. Construct 200 mm thick reinforced concrete floor slab with sump and starter bars placed for walls as detailed on the drawings in Appendix 4-2.
- In situ construction. Construct 200 mm thick reinforced concrete sidewalls as detailed on the drawings included in Appendix 4-2.
- In situ construction. Remove formwork and backfill with suitable backfill material in grassed areas or Clause 804 material once ducting has been placed in the bay. Backfill externally with granular material to Co. Council/TII Specification for Roadworks.

- Where joint bays are located under the road surface the joint bay will be backfilled with compacted layers of Clause 804 and the road surface temporarily reinstated as specified by the local authority.
- Precast concrete covers may be used as temporary reinstatement of joint bays at off road locations. These covers are placed over the constructed joint bay and are then removed at the cable installation stage of the project.
- At a later date to facilitate cable installation and jointing, reinstate traffic management signage, secure individual sites, re-excavate three consecutive joint bays and store excavated material for reuse.
- The cable is supplied in pre-ordered lengths on large cable drums (Figure 18) (as shown in Appendix 4-7). Installing "one section" of cable normally involves pulling three individual conductors into three separate ducts. The cable pulling winch must be set at a predetermined cut off pulling tension as specified by the designer. The cable will be connected to the winch rope using approved suitably sized and rated cable pulling stocking and swivel or the pulling head fitted by the cable manufacturer. A sponge may also be secured to the winch rope to disperse lubricant through the duct. Lubrication is also applied to the cable in the joint bay before it enters the duct.
- Once the "two sections" of cable (total of 6 conductors) are pulled into the joint bay, a jointing container is positioned over the joint bay and the cable jointing procedure is carried out in this controlled environment. (Figure 14) (as shown in Appendix 4-7).
- Following the completion of jointing and duct sealing works in the joint bay, place, and thoroughly compact cement-bound sand in approximately 200 mm layers to the level of the cable joint base to provide vertical support. Install additional layers of cement-bound sand and compact each layer until the cement-bound sand is level with the top of the joint. Install an additional 100 mm cement bound sand layer. Install cable protection strip. Backfill with cement-bound sand to a depth of 250mm below surface and carry out permanent reinstatement including placement of warning tape at 400 mm depth below finished surface.

4.6.3.5 Existing Underground Services

Any underground services encountered along the cable routes will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300 mm will be required between the bottom of the ducts and the service in question. If the clearance cannot be achieved the ducting will pass under the service and again 300 mm clearance between the top of the communications duct and bottom of the service will be achieved. In deeper excavations an additional layer of marker tape will be installed between the communications duct and top level yellow marker tape. If the required separation distances cannot be achieved then a number of alternative options are available such as using steel plates laid across the width of the trench and using 35N concrete surrounding the proposed ducting where adjacent services are within 600mm, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate.

4.6.3.6 Underground Cable Watercourse

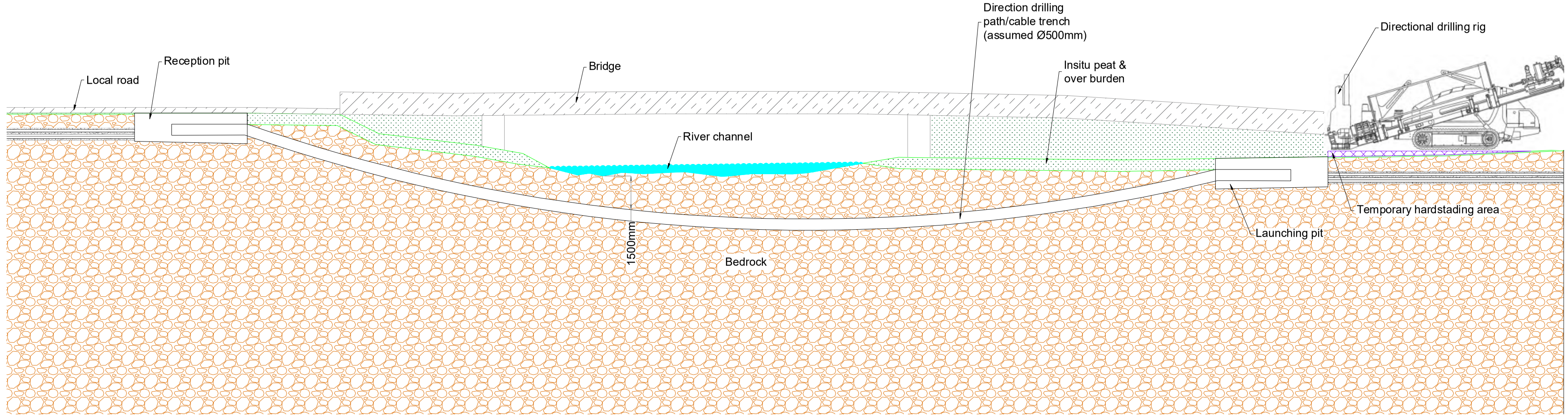
There is a total of 1 No. watercourse along the proposed cable route – a tributary of the Levally Stream. It is proposed to employ horizontal directional drilling (HDD) at this location due to the presence of the watercourse within the Lough Corrib Special Area of Conservation (SAC) and due to there being insufficient cover and depth in the bridge to cross within the bridge deck. The construction methodology has been designed to eliminate the requirement for in-stream works. A general description of the construction method employed at the proposed watercourse crossing is described in Section 4.6.3.6.1 below. The stream crossing location is included as a drawing in Appendix 4-2.

Should an alternative methodology option be required for the individual crossing during the construction process this will be agreed with the relevant authorities including Galway County Council prior to works commencing.

4.6.3.6.1 Horizontal Directional Drilling

In Section 4.2 of Appendix 4-7 Construction Methodology as produced by TLI, the construction methodology for the proposed horizontal directional drilling at the watercourse crossing, as shown in Figure 4-35 below (see also Drawing No. 05-990-DR-127 in the Proposed Grid Connection Planning Application Drawings), along the proposed grid route is outlined. The drilling methodology is as follows:

1. A works area of circa. 500m^2 on the launch area and circa 1100m^2 on the receive area will be fenced.
2. The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
3. Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
4. A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
5. The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
6. A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
7. The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
8. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
9. Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
10. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
11. The ducts will be cleaned and proven and their installed location surveyed.
12. The entry and exit pits will be reinstated to the specification of ESBN, EirGrid and Galway County Council.
13. A transition coupler will be installed at either side of the bridge/ following the horizontal directional drilling as per ESBN and EirGrid requirements, this will join the HDD ducts to the standard ducts.



Typical Directional Drilling Rig

Typical Drilling Rig & Launch Pit

DRAWING TITLE: **Proposed Horizontal Directional Drilling**	
PROJECT TITLE: Proposed Clonberne Wind Farm	
DRAWING BY: **Joseph O'Brien**	CHECKED BY: **Owen Cahill**
PROJECT No.: **180740**	DRAWING No.: **Figure 4-35**
SCALE: **1:200 @ A3**	DATE: **19.06.2024**

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4.6.3.7 Grid Connection Infrastructure

As stated in Section 4.3.2 above, the proposed wind farm will connect to the existing national grid via a substation, in the centre of the wind farm, and associated grid connections. The proposed wind farm will connect to the national electricity grid via a loop-in connection into the existing 220 kV Cashla – Flagford Overhead Line in the townland of Laughil. The existing 220kV Cashla – Flagford Overhead Transmission Line will be broken between tower 87 and 88 and two loop-in towers shall be built to turn the existing Transmission Line into two new gantries within two cable compounds (see Drawings Nos. 05990-DR-131, 05990-DR-132 and 05990-DR-133 in the Proposed Grid Connection Planning Application Drawings). Type 269E towers are required for the loop-in connection. The overhead line will be terminated to Underground Cable to connect into the proposed 220kV on-site substation.

Steel Mast Structures

The following, as outlined in Section 3.3 of the Construction Methodology report in Appendix 4-7, states the construction methodology for the proposed steel mast structures which form part of the proposed grid connection infrastructure:

1. *Mast sites are scanned for underground services such as cables, water pipes etc. Consultations with landowners shall help to identify hazards and ensure that there are no unidentified services within the area.*
2. *For leg of the 2 masts (8 legs in total) a foundation of circa 4.4m by 4.4m by 3.6m deep are required. To allow for safe construction where ground conditions are good, the excavation shall be stepped back which requires additional area to be excavated as outlined in Figure 4 (as shown in Appendix 4-7). The formation levels (depths) shall be checked by the onsite engineer. The excavated material shall be temporarily stored close to the excavation and excess material shall be used as berms along the site access roads.*
3. *To aid construction, a concrete pipe shall be placed into each excavation to allow operatives level the mast at the bottom of the excavation. The frame of the reinforcing bars shall be prepared and strapped to a concrete pipe with spacers as required. The reinforcing bars shall be lifted into each excavated foundation using the excavator and chains/slings. The base and body section of each mast shall then be assembled next to the excavation.*
4. *In areas of insufficient ground and high-water table, it may be necessary to use sheet piles supported by hydraulic frame(s) to prevent collapse of the sides and prevent the excavation becoming too large. In this scenario, the requirement of a concrete pipe (which is typically used in tower foundations) is removed. During any dewatering activities, a standard water filtration system shall be utilised to control the amount of sediment in surface ware runoff.*
5. *A setting template is used to set and hold the tower stubs in position while the concrete is being poured and cured. And water in the excavation shall be poured out prior to any concrete being poured into the foundation.*
6. *Concrete trucks shall pour concrete directly into each excavation in distinct stages.*
7. *A final pour for the mase is the encasing of the mast leg which shall be finished 300mm over finished ground level. The leg of the mast required to be shuttered with metal panels to form its required shape.*
8. *Once concrete is set after five days, the shuttering is removed along with sheet piles (if required).*
9. *The mast foundations shall be backfilled one leg at a time with the material already excavated at the location. The backfill shall be placed and compacted in layers. All dimensions shall be checked following the backfilling processes. All surplus excavated material shall be removed from the mast locations and stored in berms for use across the construction site.*

10. *An earth mat consisting of copper wire will be laid circa 600mm below ground around the mast. This earth mat is a requirement for the electrical connection of the equipment on the mast structure.*
11. *Once the base section of each mast is completed and its concrete is sufficiently cured, it is ready to receive the mast body.*
12. *A hardstand area for the crane shall be created by laying geogrid material on the ground surface and overlaying this geogrid with a suitable grade of aggregate.*
13. *A physical barrier (Heras Fence Site Boundary) shall be put in place to restrict plant from coming too close to the overhead line.*
14. *A temporary access road shall be constructed to allow access to the tower locations.*
15. *A temporary hardstand area shall be constructed to allow the assembly and laydown of the towers.*
16. *The masts shall be constructed lying flat on the ground beside the recently installed mast base on the temporary hardstand.*
17. *The mast section will be lifted into place using the crane and guide ropes.*
18. *The body sections will be bolted into position.*

Gantry Structures

The following, as outlined in Section 3.4 of the Construction Methodology report in Appendix 4-7, states the construction methodology for the proposed gantry structures which form part of the proposed grid connection infrastructure:

1. *Gantry sites are scanned for underground services such as cables, water pipes etc. consultations with landowners shall help to identify hazards and ensure that there are no unidentified services within the area.*
2. *For leg of the 2 gantries (4 legs in total) a foundation of circa 5m by 4m by 2.35m deep are required. To allow for safe construction where ground conditions are good, the excavation shall be stepped back which requires additional area to be excavated as seen in Figure 5 (as shown in Appendix 4-7). The formation levels (depths) shall be checked by the onsite engineer. The excavated material shall be temporarily stored close to the excavation and excess material shall be used as berms along the site access roads.*
3. *The reinforcing bars shall be lifted into each excavated foundation using the excavator and chains/slings. The base and body section of each gantry shall then be assembled next to the excavation.*
4. *A setting template is used to set and hold the gantry J-bolts in position while the concrete is being poured and cured. And water in the excavation shall be poured out prior to any concrete being poured into the foundation.*
5. *Concrete trucks shall pour concrete directly into each excavation in distinct stages.*
6. *A final pour for the base is the encasing of the gantry leg which shall be finished 300mm over finished ground level. The leg of the mast required to be shuttered with metal panels to form its required shape.*
7. *The mast foundations shall be backfilled one leg at a time with a 200mm layer deep compacted T.0 graded granular fill material. A finishing 100mm layer of compound stone is layered on top of a geotextile to finish the compound ground level. The backfill shall be placed and compacted in layers. All dimensions shall be checked following the backfilling processes.*
8. *Once the base section of each gantry is completed and its concrete is sufficiently cured, it is ready to receive the gantry body.*

9. *A hardstand area for the crane shall be created by laying geogrid material on the ground surface and overlaying this geogrid with a suitable grade of aggregate.*
10. *A physical barrier (Heras Fence Site Boundary) shall be put in place to restrict plant from coming too close to the overhead line.*
11. *A temporary access road shall be constructed to allow access to the tower locations.*
12. *A temporary hardstand area shall be constructed to allow the assembly and laydown of the gantries.*
13. *The gantries shall be constructed lying flat on the ground beside the recently installed cable compound on the temporary hardstand.*
14. *The gantry section will be lifted into place using the crane and guide ropes.*
15. *The body section will be bolted into position.*

Cable Compounds

The following, as outlined in Section 3.5 of the Construction Methodology report in Appendix 4-7, states the construction methodology for the proposed cable compounds which form part of the proposed grid connection infrastructure:

1. *The 220kV cable compounds shall be in a compound of circa 25.8m by 33.00m, surrounded by a 2.6m high palisade fence with a total area of circa 851.40m^2.*
2. *Topsoil and subsoil shall be removed from the footprint of the compound using an excavator. The excavated material shall be temporarily stored in adjacent berms for later use during reinstatement works.*
3. *A Layer of geotextile material shall be laid over the footprint of the compound as outlined in Figure 22 (as shown in Appendix 4-7).*
4. *Using an excavator, a base of 6F2 material shall be laid followed by a geotextile layer. Clause 804 material is a specific type of granular material used in road construction and sub-base layers consisting of crushed stone, crushed concrete or a mixture of both. 6F2 material is a granular fill material consisting of crushed concrete crushed brick or reclaimed construction aggregate.*
5. *Each layer shall be compacted using a vibrating roller.*
6. *Earthing cable shall be laid underground around the vicinity of the compound for connection to various electrical components during the electrical fit out phase.*
7. *The construction of the cable compounds consists of a 220kV steel gantry and associated outdoor electrical equipment.*
8. *The electrical installation is estimated to last 22 weeks and includes the following:*
    a. *Construction of gantry masts.*
    b. *Wiring and cabling of High Voltage equipment and protection.*
    c. *Commissioning of all newly installed equipment.*

4.7 Community Gain Proposal

4.7.1 Background

The Proposed Project has the potential to have significant benefits for the local economy, by means of job creation, landowner payments and commercial rate payments. An important part of Proposed Project, which Clonberne Windfarm Ltd. has been at the forefront of developing, is its Community Benefit Package. The concept of directing benefits from wind farms to the local community is promoted by the National Economic and Social Council (NESC) and the Irish Wind Energy Association (IWEA) among others. While it may be simpler and easier to put a total fund aside for a wider community area, Clonberne Windfarm Ltd. is endeavouring to develop new ways to direct increased gain towards the local community with particular focus on those living closest to the Proposed Project.

The applicant company has given careful consideration to the issue of community gain arising from the Proposed Project, if permitted and constructed. Community gain from significant development proposals, including wind farms, whilst a relatively recent approach, is now a common consideration for developers and, indeed, planning authorities. This approach recognises that, with any significant wind farm proposal, the locality in which the site is situated is making a significant contribution towards helping achieve national renewable energy and climate change targets, and the local community should derive some benefit from accommodating such a development in their locality.

Community gain proposals can take a number of forms, generally depending on the nature and location of the Proposed Project and the nature and make-up of the local community. The nature of the community gain proposal will be subject to discussions with and input from the local community. In some instances, funds are paid by the developer, either annually or as a one-off payment, to a community fund that is administered as agreed by the community. These funds may then be used for a variety of projects, such as environmental improvements, local amenities and facilities, voluntary and sporting groups and clubs, educational projects and energy efficiency improvement works.

4.7.2 Renewable Energy Support Scheme

The Renewable Electricity Support Scheme (RESS) is a Government of Ireland initiative that provides support to renewable electricity projects in Ireland. RESS is a pivotal component of the Programme for Government and the Climate Action Plan 2021 and 2023 and is a major step in achieving Ireland's target of at least 80% renewable electricity by 2030. One of the key objectives of RESS is to provide an Enabling Framework for Community Participation through the provision of pathways and supports for communities to participate in renewable energy projects.

The Renewable Energy Support Scheme (RESS) Terms and Conditions, published by the Department of Communications, Climate Action and Environment on in February 2020, make some high-level provisions for how this type of benefit fund will work. Any project which wants to avail of RESS must abide by these broad principles. These include the following:

1. *A minimum of €1,000 shall be paid to each household located within a distance of a 1 kilometre radius from the Project;*
2. *A minimum of 40% of the funds shall be paid to not-for-profit community enterprise 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;*
3. *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.*
4. *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 the 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.*

4.7.3 Community Benefit Fund

Based on the current Renewable Energy Support Scheme (RESS) guidelines, it is expected that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €2 into a community fund for the first 15 years of operation of the Proposed Project. If this commitment is changed in upcoming Government Policy, the fund would be adjusted accordingly.

Should the Proposed Project be developed under RESS, it would attract a community contribution in the region of approximately €400,000 /year for the local community. The value of this fund would be directly proportional to electricity generated by the wind farm. Under current T&Cs of RESS, the following, the following would be required for Clonberne Wind Farm Project:

- **Direct payments** – to those living closest to the Proposed Wind Farm site. A minimum payment of €1,000 payment per annum for houses within 1km of the Proposed Wind Farm turbines.
- **Support for local groups** - a minimum of 40% per year would be available for local groups, clubs and not for profit organisations that provide services in the local area. This would include services for elderly, local community buildings, the development of sporting facilities such as all-weather playing pitches etc.
- **Administration costs** – a maximum of 10% of this fund is to be made available for the administration and governance costs of the fund.
- **Energy Efficiency** – the remaining balance of the Community Benefit Fund would be available for the development of energy initiatives to benefit people living in the local area. This is to be provided to not for profit community enterprises every year.

The Community Benefit fund belongs to the local community. The premise of the fund us that it should be used to bring about significant, positive change in the local area. To make this happen, the first task will be to form a benefit fund development working group that clearly represents both the close neighbours to the project as well as nearby communities. The group will then work on designing the governance and structure of a community entity that would administer the Community Benefit Fund.

4.8 Operation

The Proposed Project 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 Proposed Project. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of meteorological 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 by the wind turbine supplier. 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.

4.8.1 Maintenance

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

The onsite 220kV substation and site tracks will also require periodic maintenance. The proposed substation would be operational 24 hours per day, 7 days a week throughout the year. Substations can be operated remotely and manually. Supervisory operational and monitoring activities will be carried out remotely using a SCADA system, with the aid of computers connected via a telephone modem link. The following maintenance procedures will also be adhered:

1. Periodic service and maintenance works which include some vehicle movement.
2. For operational and inspection purposes, substation access is required.
3. Servicing of the substation equipment will be carried out in accordance with the specifications, which would be expected to entail the following:
    - Six-month service – three-week visit
    - Annual service – six-week visit
    - Weekly visits as required.

Occasional technical problems may require maintenance visits by technical staff. During the six-month and annual service visits, some waste (lubricating and cooling oils, packaging from spare parts or equipment, unused paint, etc.) will arise. This will be recorded and removed from the Site and reused, recycled or disposed of in accordance with the relevant legislation in an authorised facility.

It is estimated that 1-2 daily visits will be made to the Site for authorised persons and vehicles to undertake minor routine maintenance and inspection, if and when required. Although the level of activity required for the maintenance of the both the Proposed Wind Farm and Proposed Grid Connection infrastructure is minimal, the impacts associated with traffic volumes for this period are assessed in Chapter 15 Material Assets: Traffic and Transport.

4.8.2 Monitoring

Section 7 of the CEMP sets out a programme of monitoring required for the operational phase of the project. The CEMP should be consulted for detailed information on the monitoring requirements during the operational phase, however a brief summary of the key information is provided below:

- Monthly sampling and laboratory analysis will be undertaken for six months during the operational phase.
- The drainage system will be monitored in the operational phase until such a time that all areas that have been reinstated become re-vegetated and the natural drainage regime has been restored.
- Post-construction bird monitoring will be carried out in accordance with the Bird Monitoring Programme in Appendix 7-7.
- Post-construction bat monitoring will be carried out in accordance with the Bat Report recommendations in Appendix 6-2.
- Post-construction linear habitat restoration monitoring following the main growing season (i.e., in September) in a given year for the first five years of growth.
- Monitoring for shadow flicker at properties where any exceedance of the shadow flicker limit has been predicted as outlined in Chapter 5.
- Post turbine commissioning noise monitoring will be commenced within 6 months of commissioning the wind farm.

The Biodiversity Management and Enhancement Plan, in Appendix 6-6, includes a suite of monitoring measures that will occur by the Project Ecologist, Project Geologist/Geotechnical Engineer and Project Hydrologist in regard to the proposed biodiversity enhancement measures listed in Appendix 6-6. The monitoring periods will differ across the different enhancement proposals. The monitoring results, across all the proposals, will be reported within an Environmental and Ecological Report. The report will also include any criteria failures that were identified and the corrective actions that were implemented.

As outlined in Section 3.2.1 in the Invasive Species Management Plan in Appendix 6-4, in order to avoid the potential to spread the identified Rhododendron ponticum, the area must be resurveyed and if necessary, re-treated for a minimum of three years following the initial treatment and should continue until no growth is recorded for a period of at least two consecutive years. The intensity of this work will vary according to the severity of the infestation.

4.9 Decommissioning

The wind turbines proposed as part of the Proposed Project are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the equipment may be replaced with a new technology, subject to planning permission being obtained, or the Proposed Project may be decommissioned fully.

Upon decommissioning of the Proposed Project, the wind turbines will be disassembled in reverse order to how they were erected. The turbines will be disassembled with the same model of cranes that were used for their erection. The turbine will be removed from site using the same transport methodology adopted for delivery to site initially. The turbine materials will be transferred to a suitable recycling or recovery facility.

All above ground turbine components would be separated and removed off-site for recycling. Turbine foundations would remain in place underground and would 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 environment emissions such as noise, dust and/or vibration.

Site roadways could be in use for purposes other than the operation of the development by the time the decommissioning of the Proposed Project is to be considered, and therefore it may be more appropriate to leave the site roads in situ for future use. It is envisaged that the roads will provide a useful means of extracting the commercial forestry crop which exists on the site. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed where required.

The electrical cabling connecting the Proposed Project to the national grid in the townland of Laughil will be removed from the underground cable ducting at the end of the useful life of the Proposed Project. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance for an underground element that is not visible.

A Decommissioning Plan has been prepared (Appendix 4-6) the detail of which will be agreed with the local authority prior to any decommissioning. 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 Project has been fully assessed in the 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".*