Planning and Environmental Consultants

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Environmental Impact Assessment Report

Briskalagh Renewable Energy Development, Co. Kilkenny

Chapter 4 – Description of the Proposed Development

Table of Contents

4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the proposed development (the Proposed Project) and all its component parts. The planning application for the Proposed Project will be made to Kilkenny County Council. Construction methodologies for the main infrastructural components of the Proposed Project are also included in this chapter (or its associated appendices) of the EIAR.

The development description for the current planning application as appears in the public notices is as follows:

The development will consist of the provision of the following:

i. *7 no. wind turbines with an overall turbine tip height of 185 metres; a rotor blade diameter of 163 metres; and hub height of 103.5 metres, and associated foundations and hard-standing areas;*
ii. *A permanent 38kV substation compound (control building with welfare facilities, all associated electrical plant and apparatus, security fencing, underground cabling, storage containers, wastewater holding tank, site drainage and all ancillary works);*
iii. *Permanent underground electrical (38kV) and communications cabling to the existing Ballyragget 110kV substation in the townland of Moatpark (including joint bays, communication and earth sheath link chambers and all ancillary works along the route) This cabling route is primarily located within the public road corridor which includes Protected Structures (Kilkenny RPS Ref. C89);;*
iv. *Underground electrical (33kV) and communications cabling connecting the wind turbines and meteorological mast to the on-site substation;*
v. *3 no. temporary construction compounds (including site offices and welfare facilities) ;*
vi. *A meteorological mast with a height of 30 metres, security fencing and associated foundation and hard-standing area;*
vii. *A new temporary site entrance on the L1009;*
viii. *A new gated site entrance on the L5024;*
ix. *Upgrade of existing site tracks/ roads and provision of new site access roads, junctions and hardstand areas.*
x. *A borrow pit;*
xi. *Spoil Management;*
xii. *Tree felling and hedgerow removal;*
xiii. *Biodiversity Management and Enhancement Plan measures (including establishment of a riparian buffer and hedgerow enhancement);*
xiv. *Site Drainage;*
xv. *Operational Stage site signage; and*
xvi. *All ancillary works and apparatus.*

This application seeks a ten-year planning permission and a 35-year operational life from the date of commissioning of the entire wind farm.

Section 1.1.1 of Chapter 1 of this EIAR provides a definition of the various project references used throughout the document. The 'Proposed Project', which encompasses the 'Proposed Wind Farm' and 'Proposed Grid Connection' has been assessed within this EIAR. The Proposed Project is located within the EIAR Site Boundary or the 'Site' which measures approximately 1,000 hectares (ha). The 'Proposed Wind Farm site' refers to the portion of the Site surrounding the Proposed Wind Farm but excluding the portion of the site surrounding the Proposed Grid Connection underground cabling route. The Proposed Project layout is illustrated on Figure 4-1.

4.2 Proposed Project Layout

The overall layout of the Proposed Project is shown on Figure 4-1, this includes the Proposed Wind Farm site and the Proposed Grid Connection.

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 3.2.5 of this EIAR, has been carried out to ensure that turbines and ancillary infrastructure are located in the most appropriate areas of the Site and makes use of the existing access tracks within the Site where appropriate. Similarly, as described in Section 3.2.6 of this EIAR, a route selection constraints study was undertaken to ensure that the most appropriate route for the Proposed Grid Connection underground electrical cabling was selected. The Proposed Wind Farm site layout is shown in Figure 4-2. The Proposed Grid Connection layout is shown in Figure 4-3.

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

4.3 Proposed Project Components

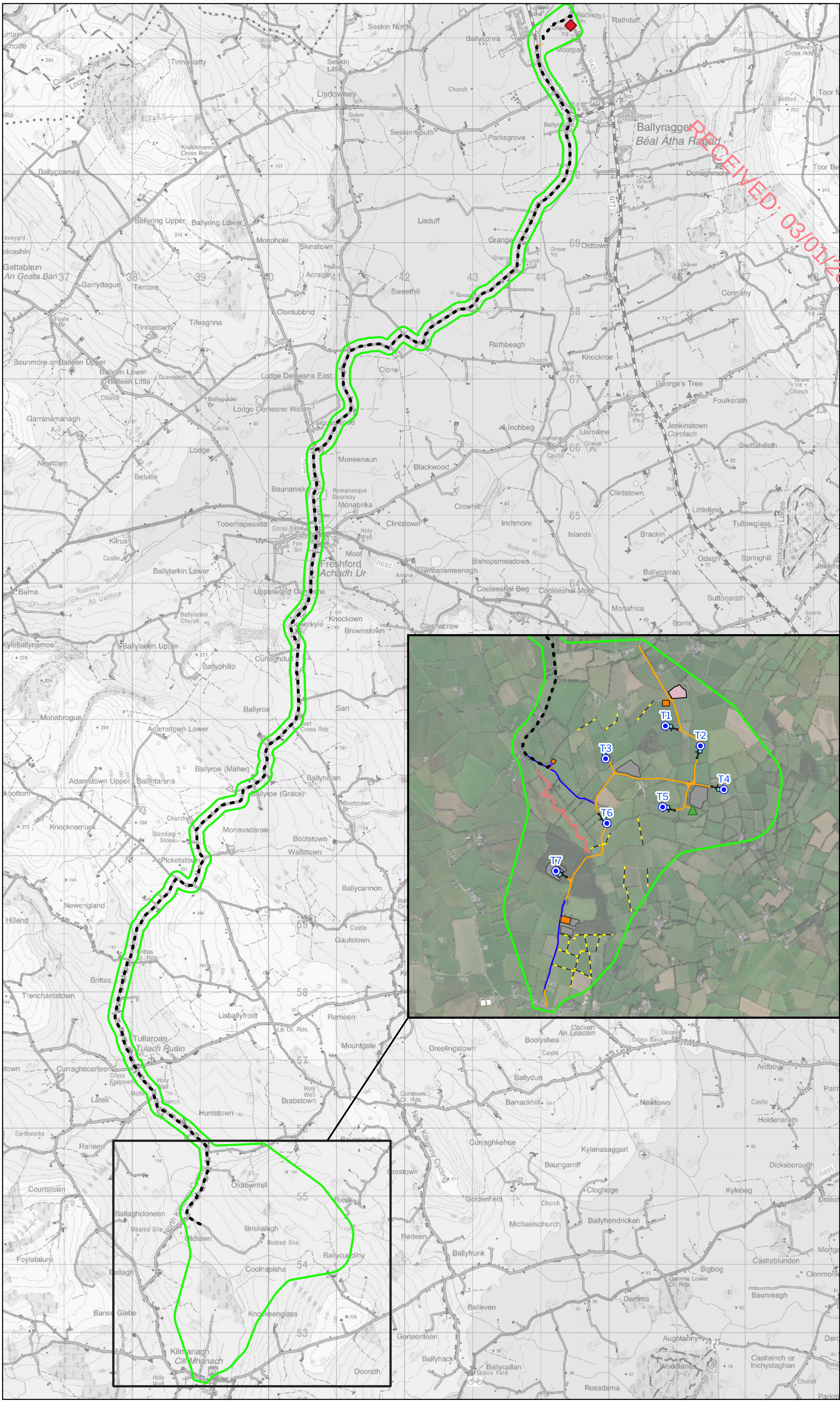
This section of the EIAR describes the components of the Proposed Project. Further details regarding Access and Transportation (Section 4.4), Site Drainage (Section 4.5), Construction Management (Section 4.6) and Construction Methodologies (Section 4.7) are provided subsequently in this chapter.

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 wind farm design software (WindPro) 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 ITM Grid Reference coordinates of the proposed turbine locations are listed in Table 4-1 below. The final finished top of foundation level of the turbine foundations will be determined by the actual ground conditions at each proposed turbine location and may differ slightly from those levels listed in Table 4-1.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Met Mast
- Proposed Hardstands
- Existing Roads to be Upgraded
- Proposed New Roads
- Proposed Borrow Pit
- Proposed Spoil Management Area
- Proposed Temporary Construction Compound
- Proposed Riparian Buffer
- Proposed Hedgerow Planting and Enhancement Measures
- Proposed 38kV Substation
- Proposed 38kV Underground Grid Connection Cabling
- Proposed Horizontal Directional Drilling
- Existing 110kV Ballyragget Substation

Drawing Title	
Proposed Project Layout	
Project Title	
Briskalagh Renewable Energy Development	
Drawn By: MC	Checked By: EMC
Project No.: 230502	Drawing No.: Figure 4-1
Scale: 1:50,000	Date: 2024-09-09

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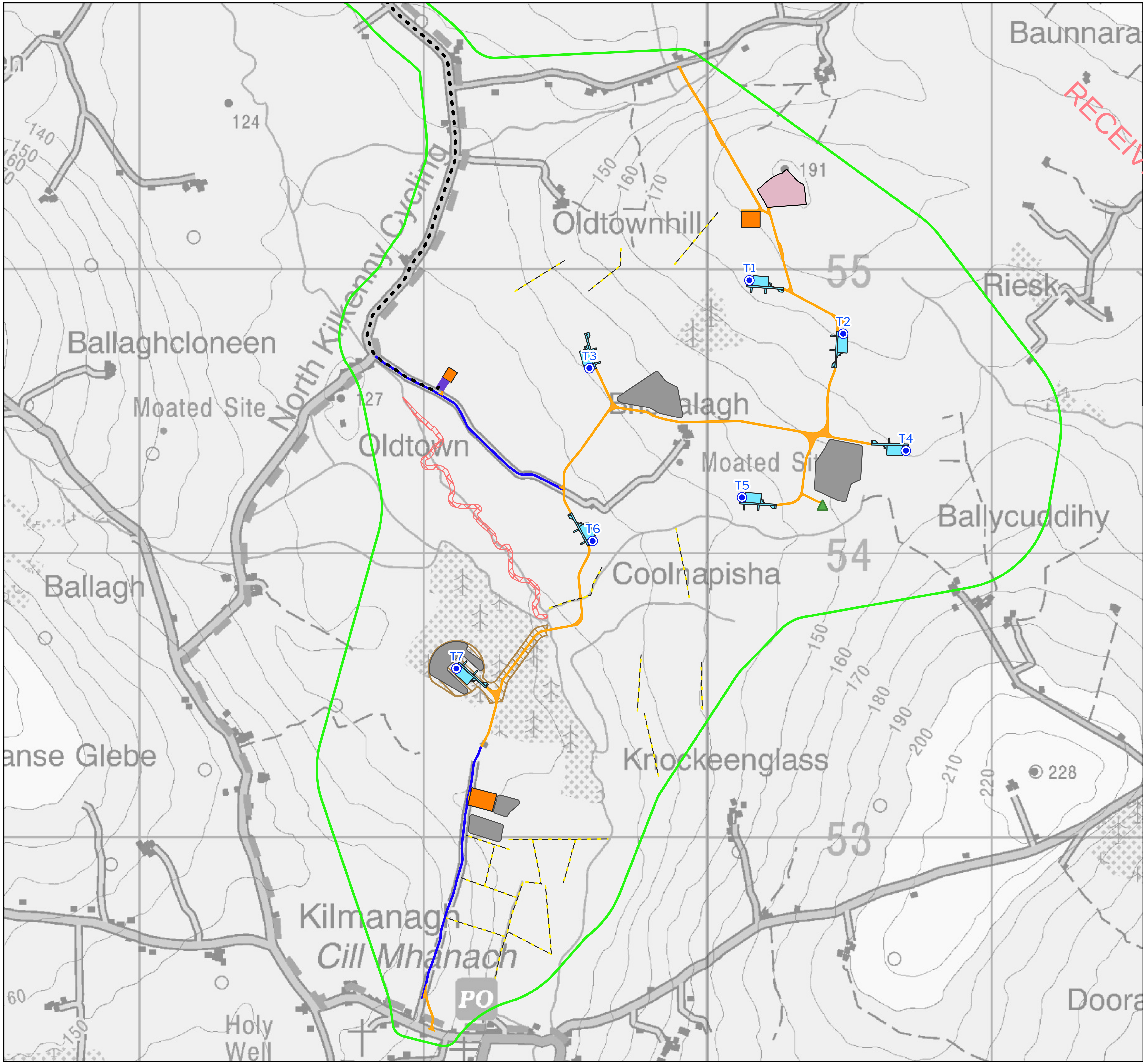

Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Met Mast
- Proposed Hardstands
- Existing Roads to be Upgraded
- Proposed New Roads
- Proposed Borrow Pit
- Proposed Spoil Management Area
- Temporary Construction Compound
- Proposed Riparian Buffer
- Proposed Felling Area
- Proposed Hedgerow Planting and Enhancement Measures
- Proposed 38kV Substation
- Proposed 38kV Underground Grid Connection Cabling

N

Drawing Title	Proposed Wind Farm Layout
Project Title	Briskalagh Renewable Energy Development
Drawn By: MC	Checked By: EMC
Project No.: 230502	Drawing No.: Figure 4-2
Scale: 1:13,000	Date: 2024-09-09

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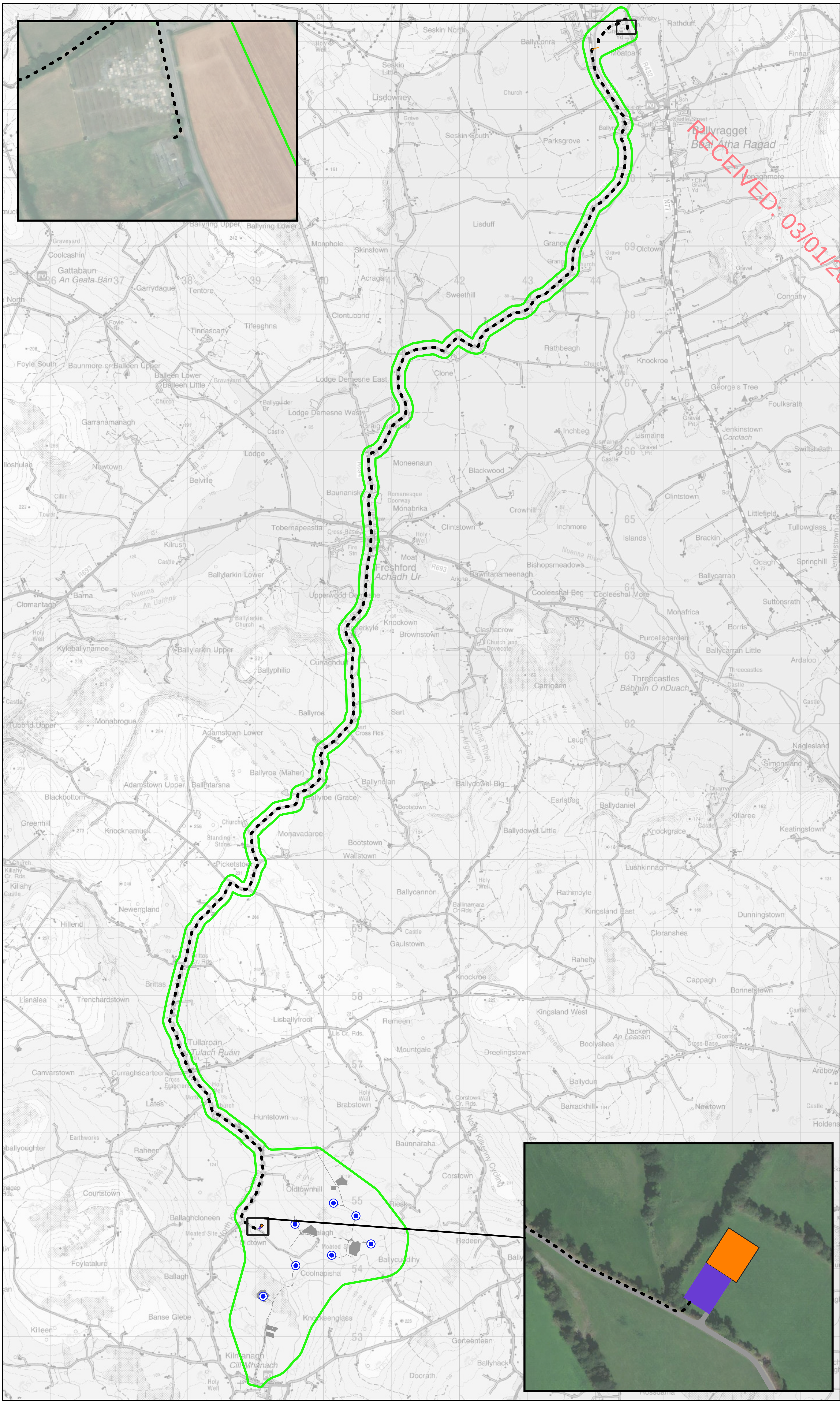

Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Project Infrastructure
- Proposed Temporary Construction Compound
- Proposed 38kV Substation
- Proposed 38kV Underground Grid Connection Cabling
- Proposed Horizontal Directional Drilling

N

Drawing Title: Proposed Grid Connection Layout	
Project Title: Briskalagh Renewable Energy Development	
Drawn By: MC	Checked By: EMC
Project No.: 230502	Drawing No.: Figure 4-3
Scale: 1:50,000	Date: 2024-09-09

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Table 4-1 Proposed Wind Turbine Locations and top of foundation level

Turbine	ITM X	ITM Y	Top of Foundation Levels (metre OD)
1	640090	655005	171
2	640421	654817	167
3	639527	654696	130
4	640641	654405	159
5	640064	654240	132
6	639538	654087	116
7	639059	653638	111

4.3.1.1.2 Turbine Locations and Site Investigation

As part of the design process for the Proposed Project, numerous intrusive site investigations were undertaken across the Proposed Wind Farm site, to provide detail and clarity on the nature and extent of subsoils and bedrock as a means of characterising the Proposed Wind Farm site. This assisted in providing additional information on the most suitable location for turbines and associated infrastructure.

Geotechnical ground investigations (i.e. trial pitting and borehole drilling) were undertaken on the 18th, 19th December 2023, under the supervision of HES. Further trial pitting investigations (8 no.) were carried out at proposed borrow pit locations on 7th February 2024 under the supervision of HES. The combined geological and hydrological dataset collected by HES has been used in the preparation of this EIAR Chapter.

The objectives of the intrusive site investigations included mapping the subsoil lithology for all proposed turbines and other key locations (i.e. internal access tracks) and assessing the underlying bedrock. This data was used to inform the final layout of the Site.

In summary, site investigations included the following:

- A total of 22 no. trial pits, supervised by HES, at all proposed turbine locations and at other key locations (i.e. internal access roads and borrow pit location) to investigate the underlying mineral soil lithology and subsoil/bedrock interface;
- A total of 2 no. boreholes carried out by Peterson Drilling Services Ltd and supervised by HES, in order to understand the groundwater regime within the Site and the depth to bedrock;
- Logging of subsoil exposures across the site where mineral soils were exposed;
- Mineral subsoils and peat were logged according to BS: 5930.

4.3.1.1.3 Turbine Type

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

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

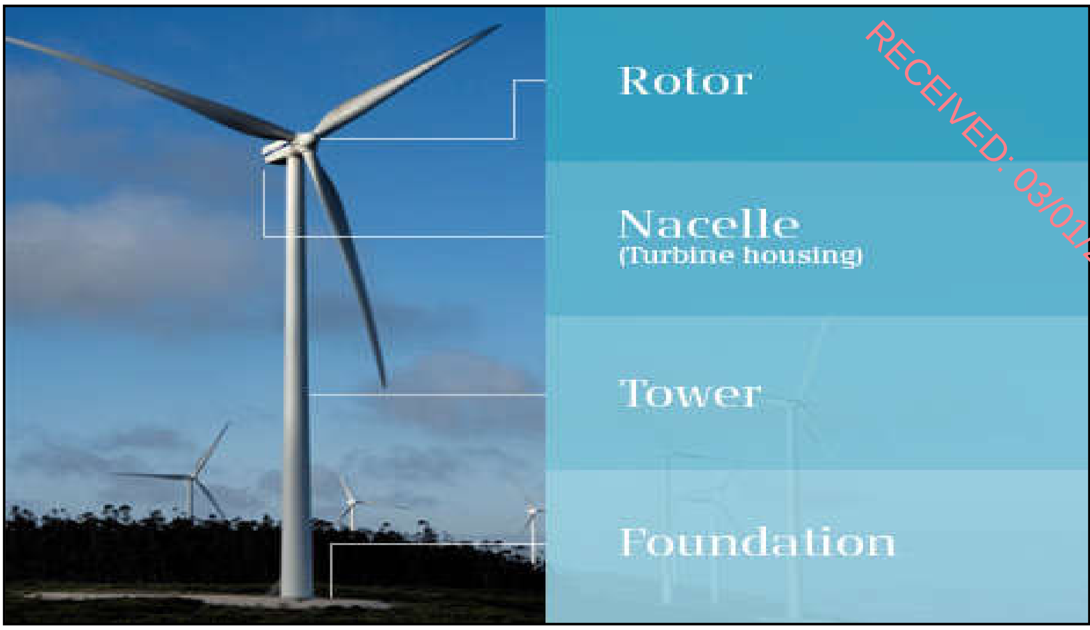


Plate 4-1 Wind Turbine Components

The proposed wind turbines to be installed on the Proposed Wind Farm will have the following dimensions:

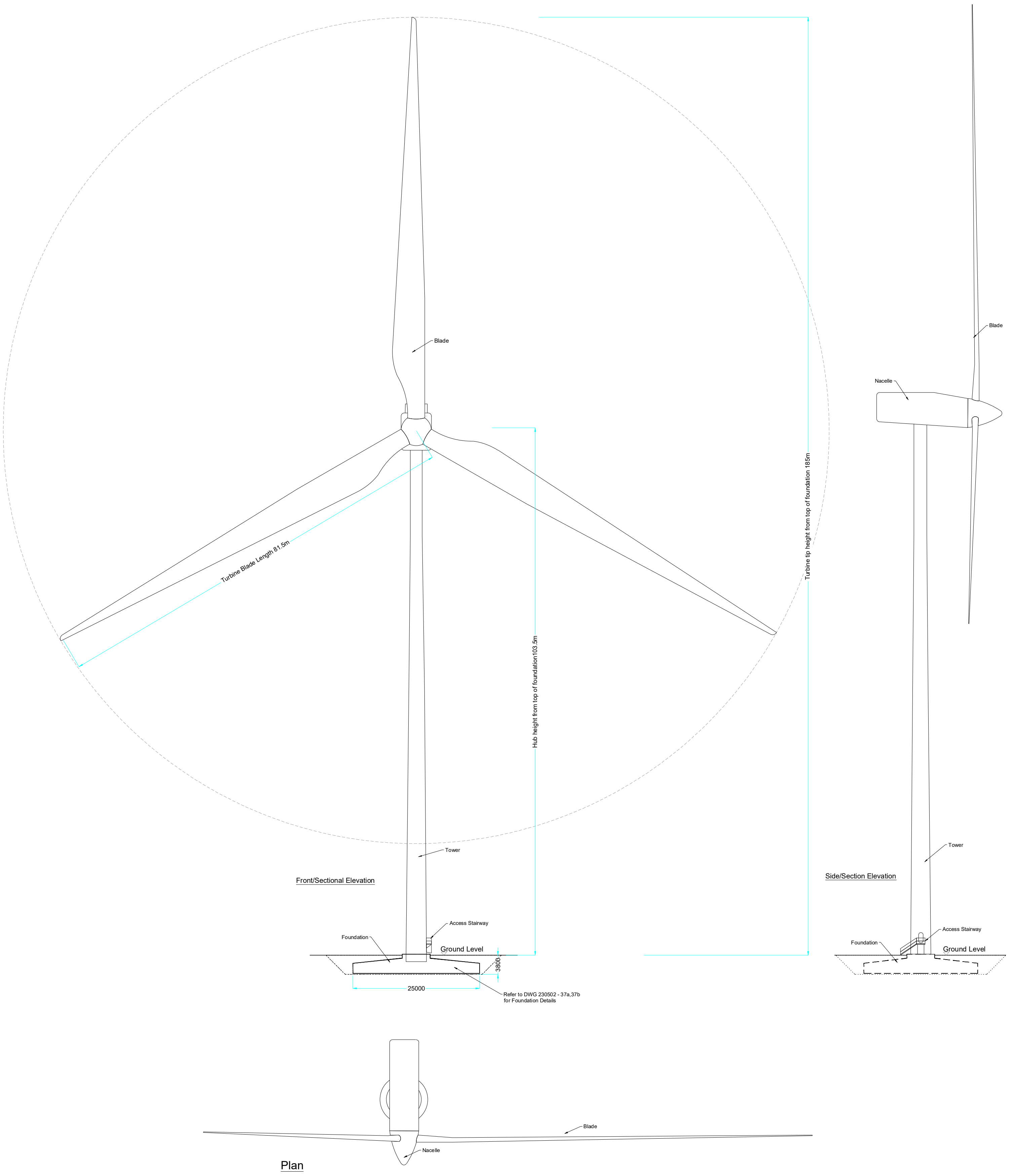
- Turbine Tip Height – 185 metres
- Hub Height – 103.5 metres
- Blade Rotor Diameter: – 163 metres

Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics. The wind turbines that will be installed on the Site will be conventional three-blade turbines, which will be geared to ensure the rotors of all turbines rotate in the same direction at all times.

The turbines will be multi-ply coated to protect against corrosion. It is proposed that the turbines would be of a light grey colour to blend into the sky background to minimise visual impact as recommended in the Guidelines and '*The Influence of Colour on the Aesthetics of Wind Turbine Generators*' (ETSU, 1999).

A drawing of the proposed wind turbine is shown in Figure 4-4.

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



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DRAWING TITLE: **Wind Turbine Elevation & Plan**			
PROJECT No.: **230502**		DRAWING No.: Figure 4-4	SCALE: **1:500 @ A1**
DRAWN BY: **KD**	CHECKED BY: **EmcC**	DATE: **07.10.2024**	REVISION.: P01

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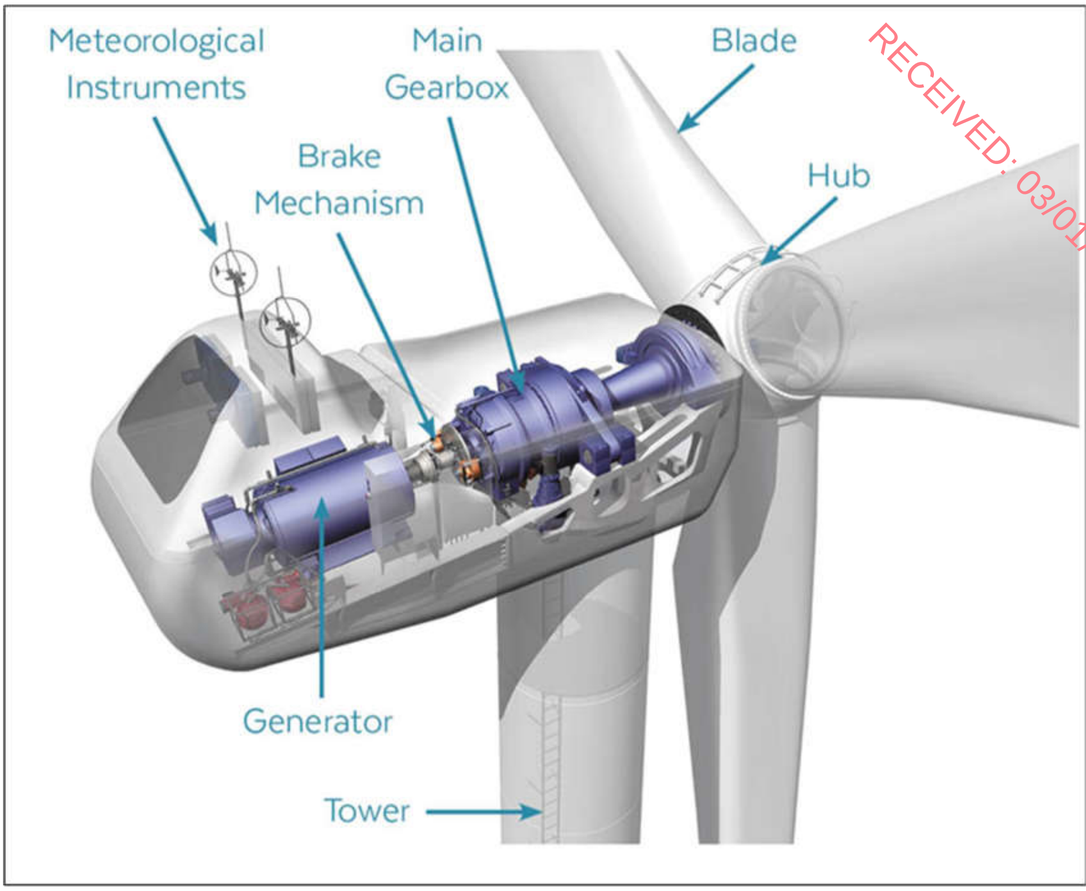
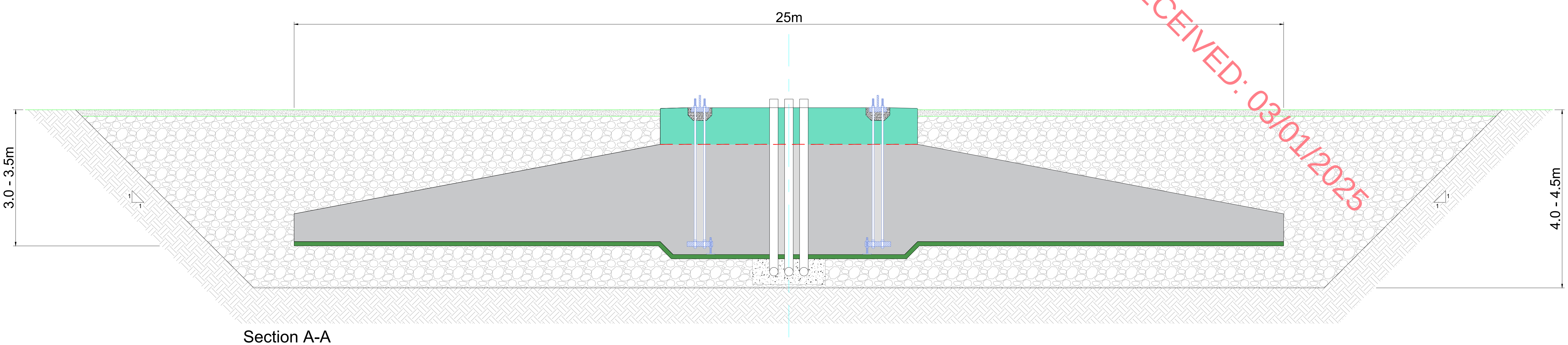


Figure 4-1 Turbine nacelle and hub components

4.3.1.1.4 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level. The size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process. Different turbine manufacturers use different shaped turbines foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. The turbine foundation transmits any load on the wind turbine into the ground. The horizontal and vertical extent of the turbine foundation will be 25m and 3 to 3.5m respectively. Where ground conditions are unfavourable to excavate and replace, piles will be installed to formation level. Both foundation options have been assessed in this EIAR and are shown in Figure 4-6 and Figure 4-7.

After the foundation level of each turbine has been formed on competent stratum (i.e bedrock or subsoil of sufficient load bearing capacity), or piled formation, 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 and Plate 4-3 below).



Section A-A

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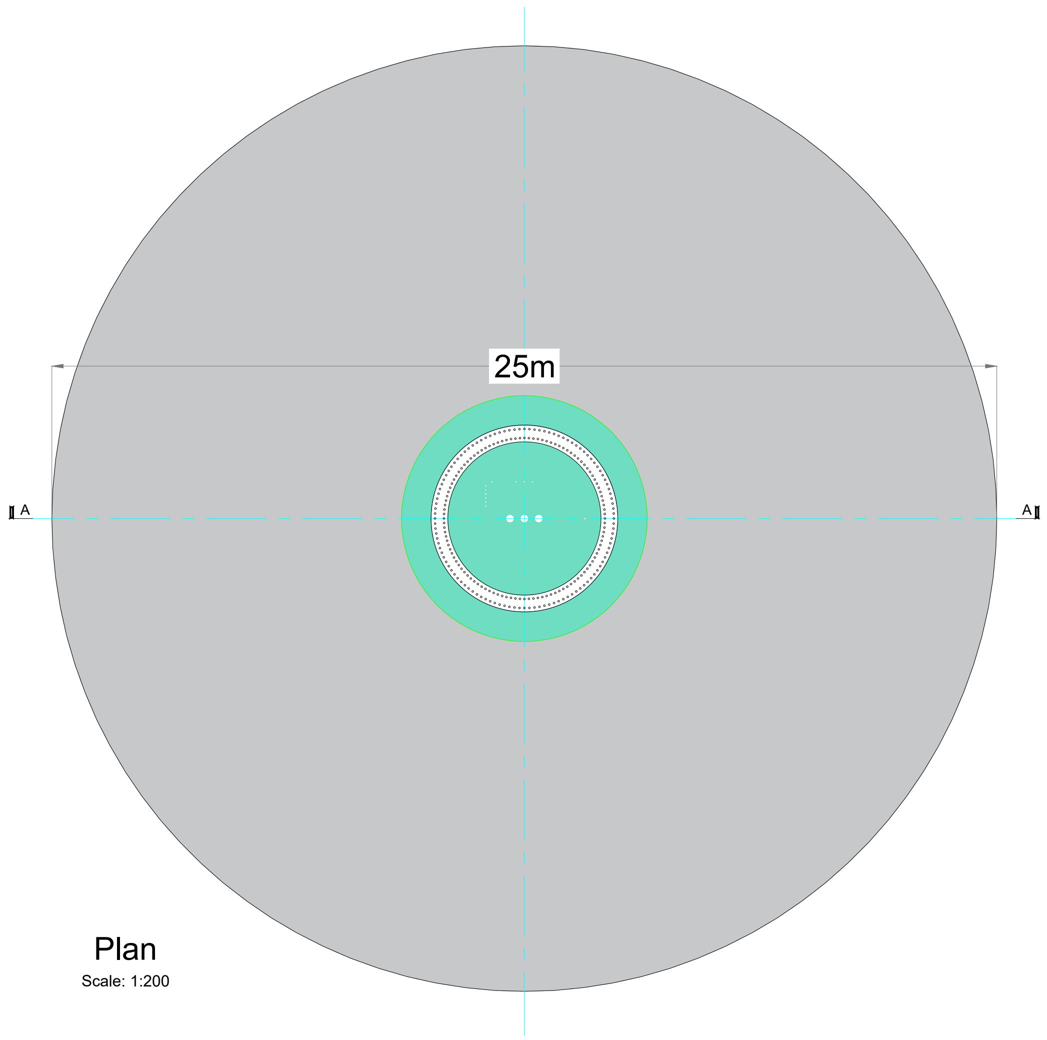

Plan

Scale: 1:200

PROJECT TITLE: Briskalagh Renewable Energy Development				
DRAWING TITLE: Gravity Foundation Detail				
PROJECT No.: 230502		DRAWING No.: Figure 4-6		SCALE: As Shown @ A3
DRAWN BY: KD	CHECKED BY: EmcC	DATE: 07.10.2024		REVISION.: P01

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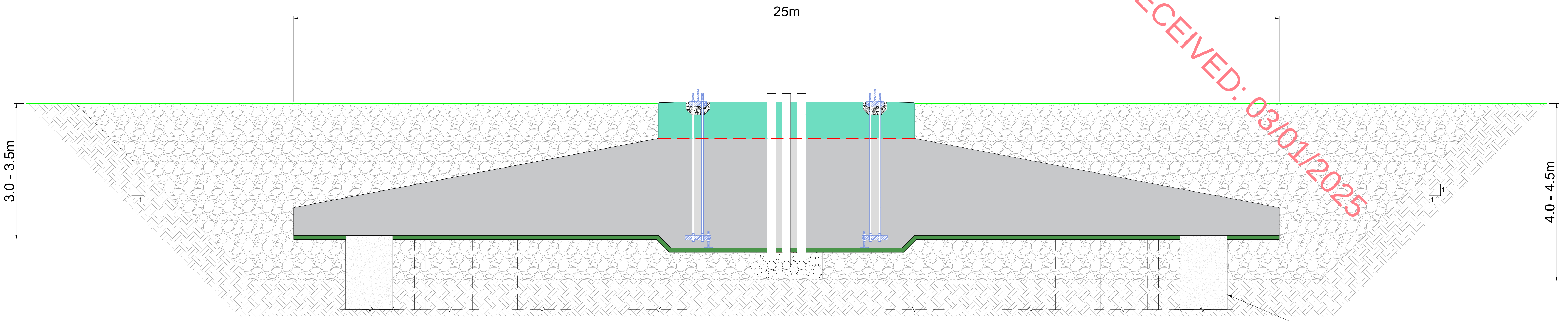
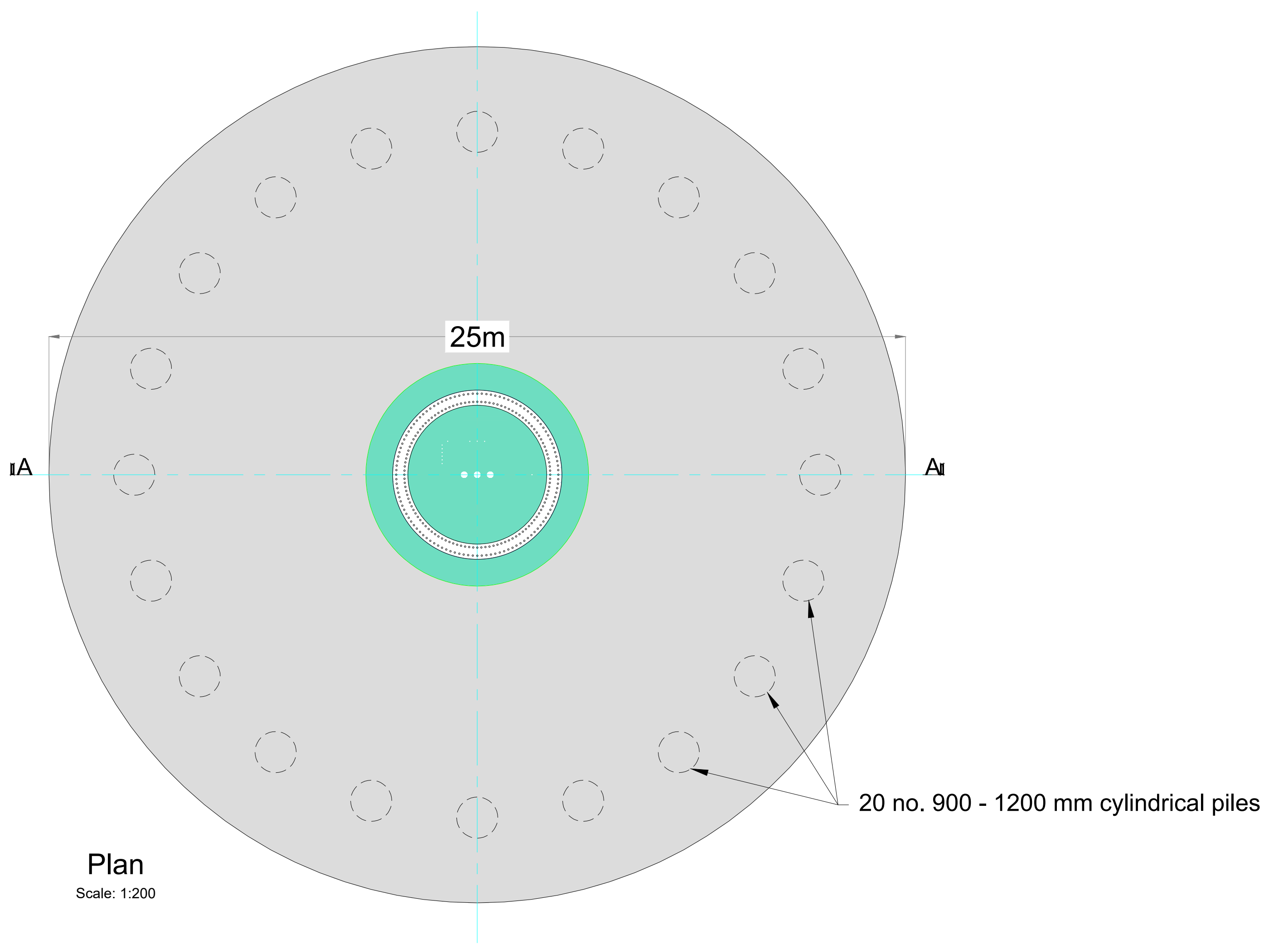


Section A-A
Scale 1:100



Plan
Scale: 1:200

PROJECT TITLE: Briskalagh Renewable Energy Development			
DRAWING TITLE: Bored Pile Foundation Detail			
PROJECT No.: 230502	DRAWING No.: Figure 4-7	SCALE: As Shown @ A3	
DRAWN BY: KD	CHECKED BY: EmcC	DATE: 07.10.2024	REVISION.: P01

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Plate 4-2 Turbine Foundation Anchor Cage surrounded by reinforcing steel.

Plate 4-3 Finished Turbine Foundation

4.3.1.1.5 Hard Standing Areas

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

4.3.1.1.6 Assembly Area

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

4.3.1.1.7 Generating Capacity

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 generating potential depending on the capacity of the electrical generator installed in the turbine nacelle. The exact generating capacity of the installed turbine will be determined by the selected manufacturer.

For the purposes of this EIAR, a rated output of 7 MW has been chosen to calculate the potential generating capacity of the proposed 7-turbine renewable energy development, which would result in an estimated installed capacity of 49MW.

Assuming an installed capacity of 49 MW, the Proposed Wind Farm therefore has the potential to produce up to 137,356 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 32%[1] is used here.

C = Rated output of the wind farm: 49 MW

[1] *https://www.eirgridgroup.com/site-files/library/EirGrid/ECP-2-2-Solar-and-Wind-Constraints-Report-Area-I-v1.0.pdf*

The 137,356 MWh of electricity produced by the Proposed Wind Farm would be sufficient to supply approximately 32,703 Irish households with electricity per year, based on the average Irish household using 4.2 MWh of electricity[2] (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 36,787 occupied households in Co. Kilkenny. Per annum, based on a capacity factor of 32%, the Proposed Project would therefore produce sufficient electricity for the equivalent of 89% of the households in Co. Kilkenny.

4.3.1.2 Site Roads

4.3.1.2.1 *Road Construction Types*

To provide access within the Proposed Wind Farm 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 has taken into account the following key factors:

1. Buildability considerations;
2. Making use of existing infrastructure where possible;
3. Minimising excavation arisings;
4. Serviceability requirements for construction and wind turbine delivery and maintenance vehicles;

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 Wind Farm site makes use of the existing road network insofar as possible. It is proposed to upgrade approximately 1.8 kilometres of existing roads and tracks, and to construct approximately 6 kilometres of new access road on the Proposed Wind Farm site. It is proposed to construct passing bays along the proposed access road network in order to allow construction traffic to safely pass each other while travelling in opposite directions. Areas such as wide junctions and proposed hardstands will also be used as passing bays throughout the construction phase of the Proposed Wind Farm site.

Upgrade of Existing Access Roads or Tracks

As noted above, approximately 1.8km of existing roads and access tracks will be upgraded as part of the Proposed Wind Farm construction phase. The existing tracks onsite were constructed using the excavate and replace construction technique, therefore proposed road widening will be founded on competent stratum. Cross section details of the upgrade of existing roads are shown as Figure 4-8. Details on the construction methodology for the upgrading of existing tracks and roads is outlined below in Section 4.8.1.2.2.

Construction of New Roads

As noted above, approximately 6km of new roads will be constructed in order to facilitate the Proposed Wind Farm. Due to the ground conditions, new access tracks proposed on site are proposed to be founded and located on competent stratum. The make-up of the founded access tracks is a stone thickness of c. 400mm. A cross section detail of a new excavated road is also shown in Figure 4-9.

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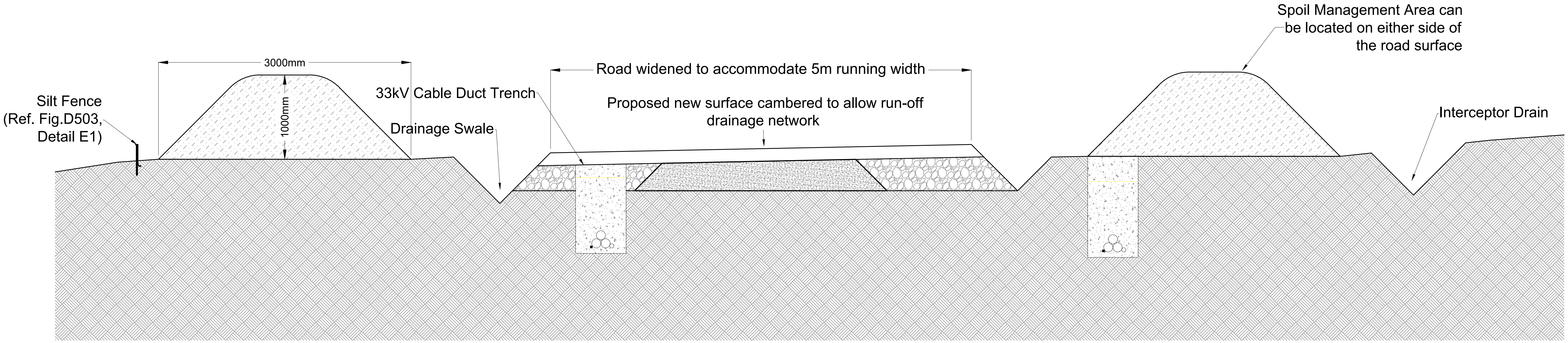
[2] *March 2017 CER (CRU) Review of Typical Consumption Figures Decision Paper https://www.cru.ie/document_group/review-of-typical-consumption-figures-decision-paper/*

Drawing Notes:

1. Widening can occur to either side of existing roads dependent on site conditions.
2. Depths of road fill to vary dependent on site conditions.
3. 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.
4. The placement of the spoil berm will be avoided within the flood zone



Existing Excavated Road Widening Section

PROJECT TITLE: **Briskalagh Renewable Energy Development**			
DRAWING TITLE: **Upgrade of Existing Excavated Access Roads Section**			
PROJECT No.: 230502	DRAWING No.: Figure 4-8		SCALE: 1:50 @ A3
DRAWN BY: KD	CHECKED BY: N/A	DATE: 07.10.2024	REVISION.: P01

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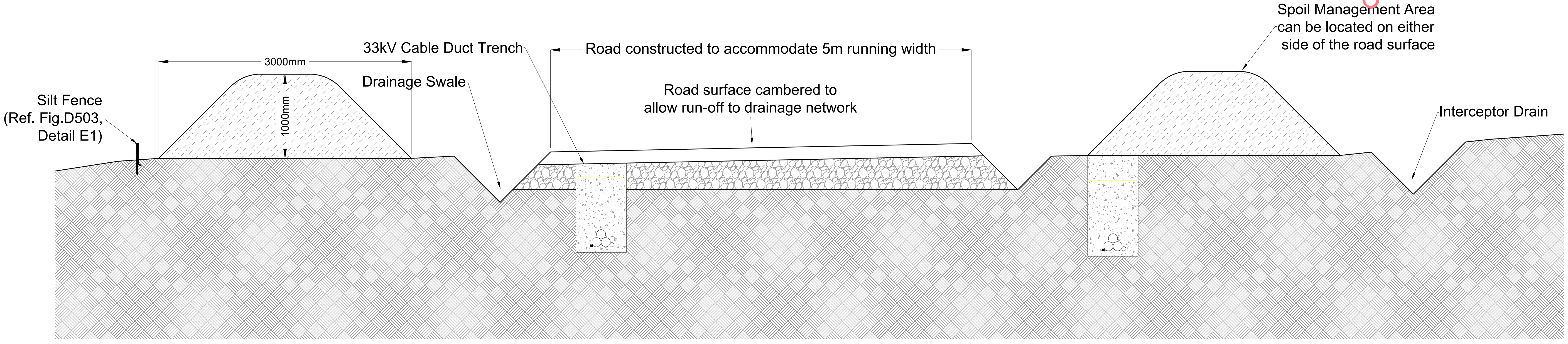
Drawing Notes:

1. Widening can occur to either side of existing roads dependent on site conditions.
2. Depths of road fill to vary dependent on site conditions.
3. 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.
4. The placement of the spoil berm will be avoided within the flood zone



Excavated Road Section

PROJECT TITLE: Briskalagh Renewable Energy Development			
DRAWING TITLE: New excavate and replace access road section			
PROJECT No.: 230502		DRAWING No.: Figure 4-9	SCALE: 1:50 @ A3
DRAWN BY: KD	CHECKED BY: N/A	DATE: 07.10.2024	REVISION.: P01

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The details on the construction methodology for new excavated roads is outlined below in Section 4.8.1.2.1.

4.3.1.3 Underground Electrical (33kV) and Communications Cabling

Each turbine and the meteorological mast (refer to Section 4.3.1.4 below) will be connected to the on-site 38kV substation (part of the Proposed Grid Connection) via underground 33 kV electricity cabling. Fibre-optic cables will also connect each wind turbine and the met mast to the onsite 38kV 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 and/or under the roadways. The route of the cable ducts will follow the access track to each turbine location and are illustrated on the detailed site layout drawings included as Appendix 4-1, the exact number and configuration of cable ducting may vary within the cabling route. Figure 4-10 below shows two variations of a standard 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 and/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.

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 Wind Farm site should sufficient volumes of suitable material not be encountered during the excavation phase of the proposed infrastructure.

4.3.1.4 Meteorological Mast

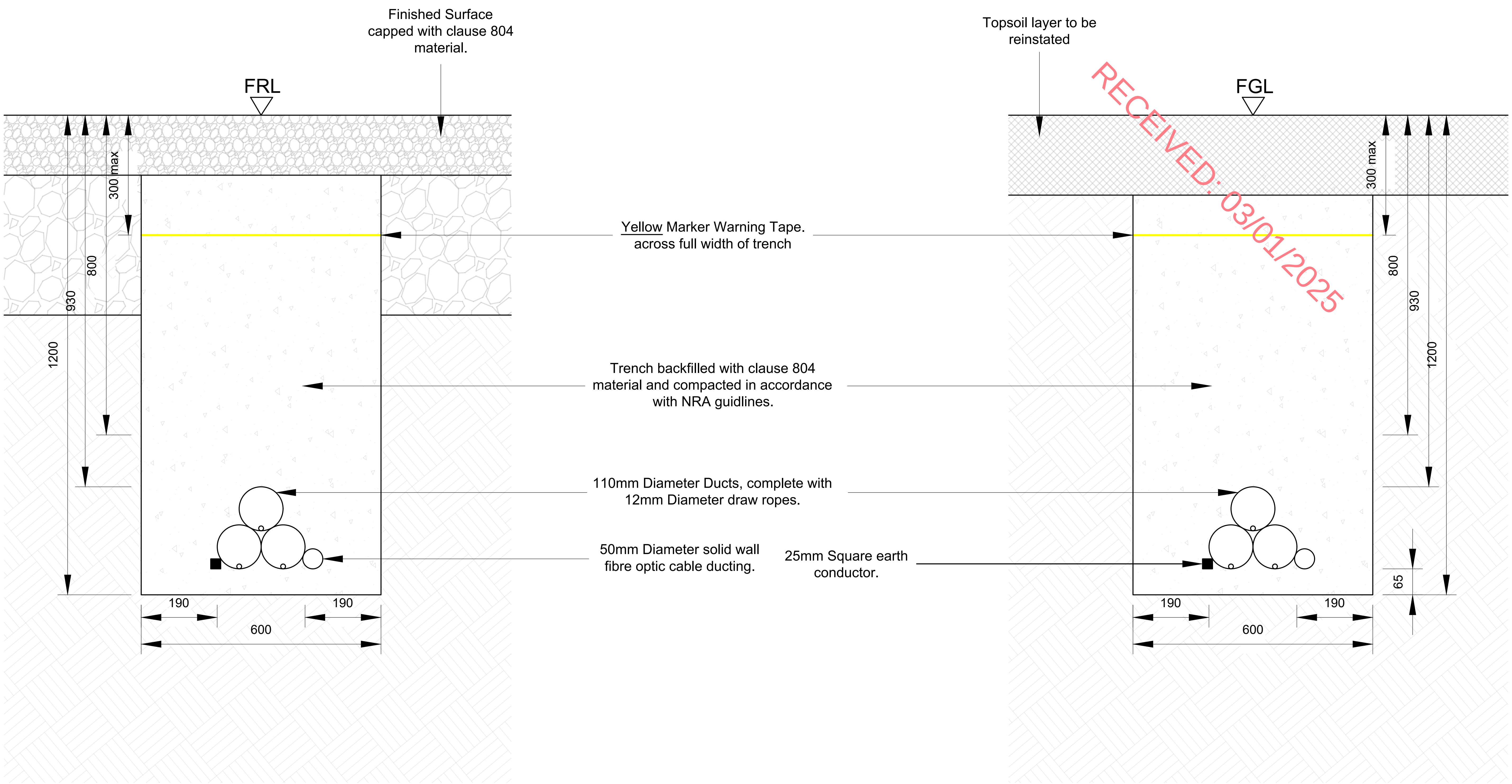
One meteorological (met) mast is proposed as part of the Proposed Wind Farm. The met mast will be equipped with wind monitoring equipment at various heights. The proposed met mast will be located at E640347, N654213 (ITM) as shown on the Proposed Wind Farm site layout drawing in Figure 4-2 and the detailed site layout drawings included as Appendix 4-1. The met mast will be a free-standing slender lattice structure 30 metres in height. It will be constructed on a hard-standing area sufficiently large to accommodate the equipment that will be used to erect the mast. A standard detail of a meteorological mast is shown in Figure 4-11.

4.3.1.5 Temporary Construction Compounds

Two temporary construction compounds will be located in the northern and southern section of the Proposed Wind Farm site, along the proposed road adjacent to the proposed borrow pit, and to the south of T07. The locations of the proposed construction compounds are shown on the Proposed Wind Farm site layout drawing in Figure 4-2. The layouts of these construction compounds are shown on Figure 4-12 and Figure 4-13. The northern temporary construction compound will measure approximately 3,625m^2 and the southern temporary construction compound will measure 5,585m^2.

The construction compounds will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. Temporary port-a-loo toilets and toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered 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. The construction compound will also include a bunded refuelling and containment area for the storage of oil, lubricants and site generators etc, and full retention oil interceptor.

Construction materials and turbine components will be brought directly to the proposed use and turbine locations following their delivery to the Proposed Wind Farm site.



33kV Cable - On Road Trench Detail - Cross Section

33kV Cable - Off Road Trench Detail - Cross Section

PROJECT TITLE: **Briskalagh Renewable Energy Development**			
DRAWING TITLE: **33kV Cable Trench Sections**			
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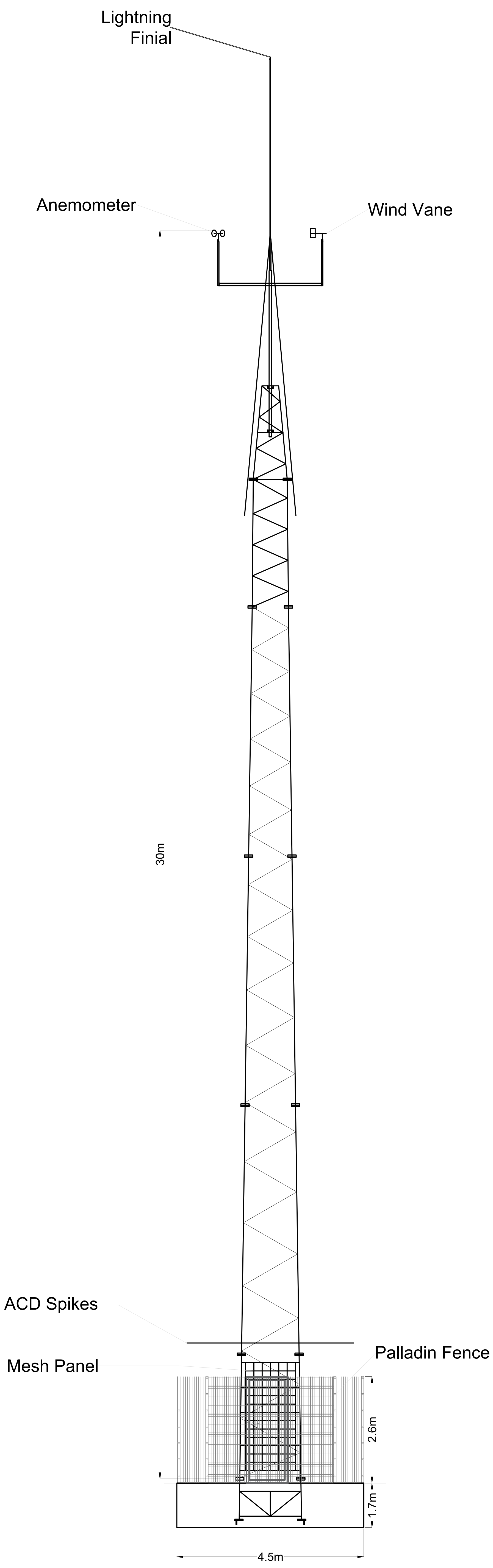

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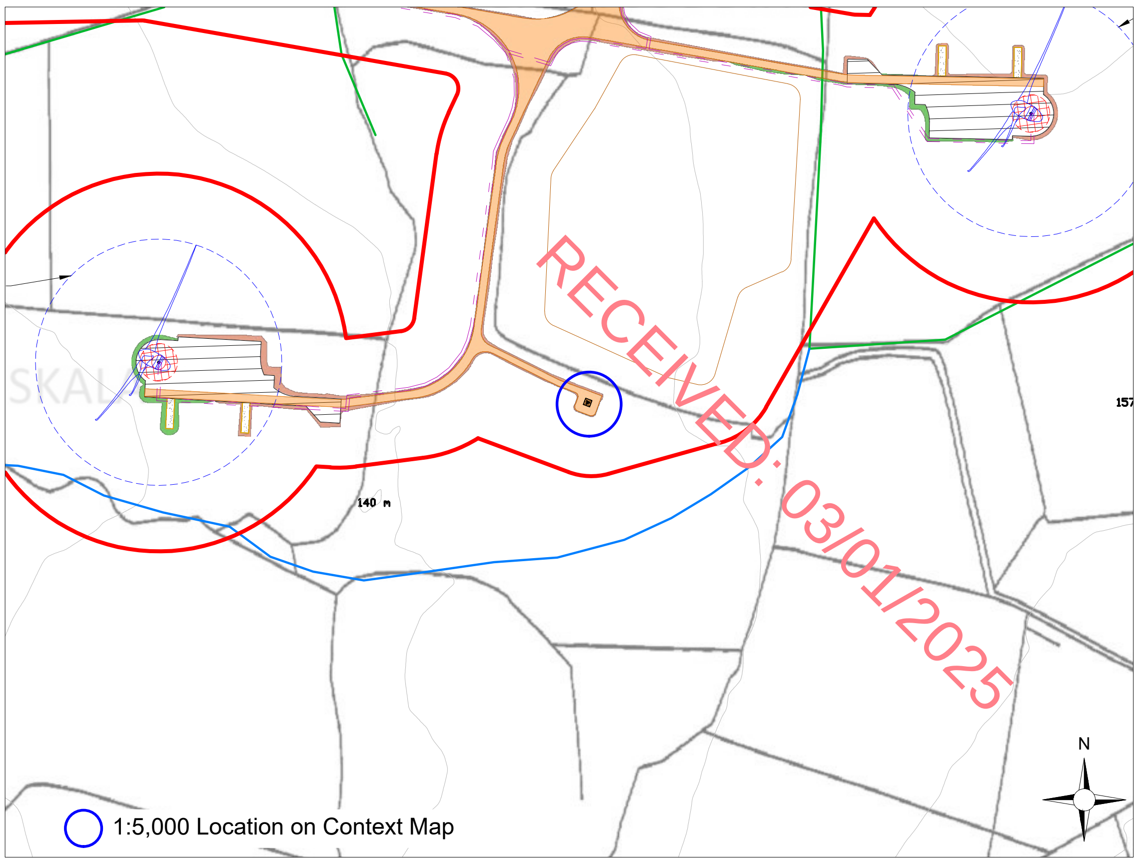

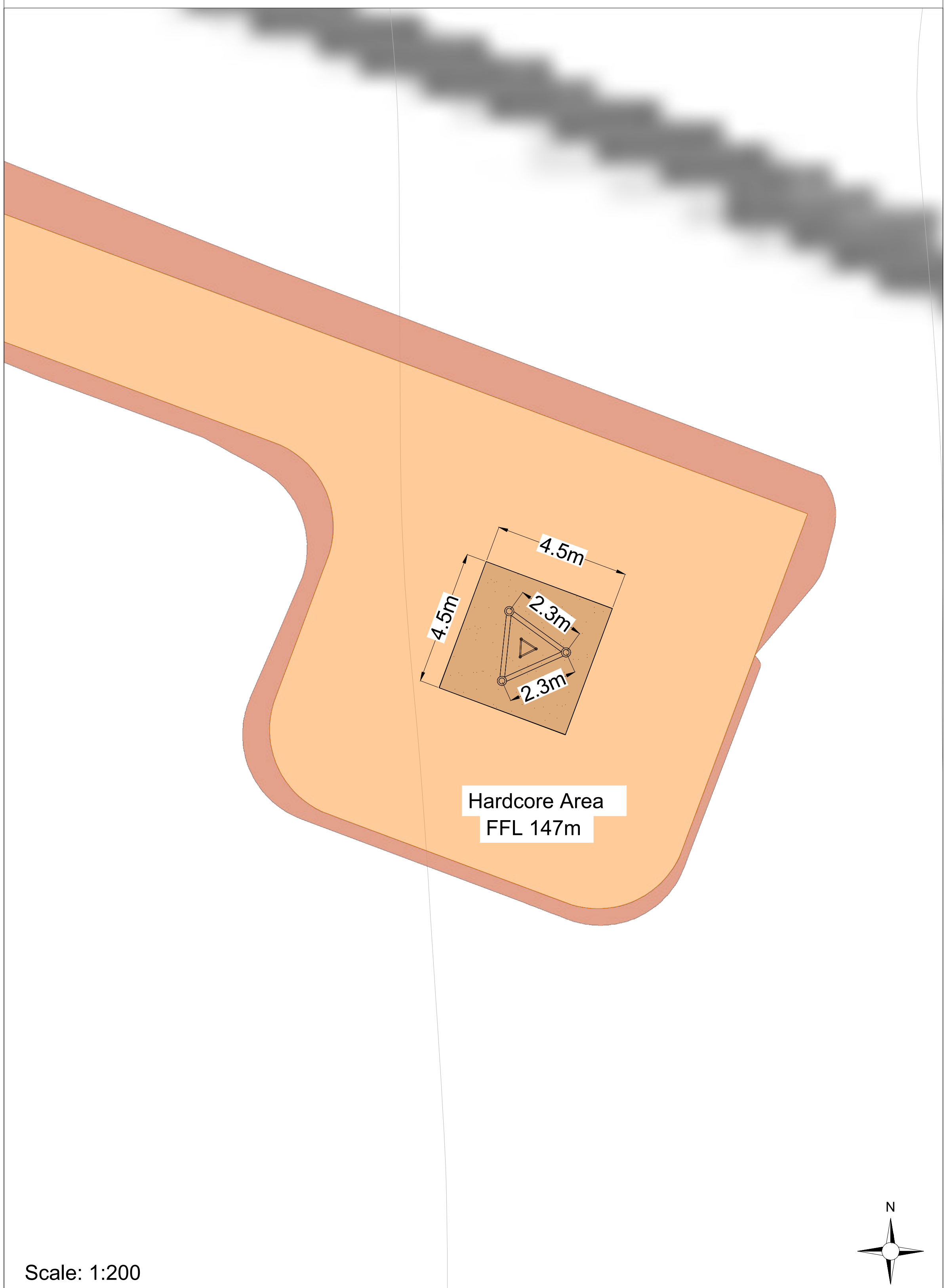

Scale: 1:200

Note:

1. Met Mast exact detail may differ depending on the selected manufacturer.
2. Finished level of the mast to match ground conditions.
3. Mast/foundation orientation to be confirmed with met mast supplier.
4. Earthing and ducting requirements to be confirmed with met mast supplier and forwarded to foundation designer

PROJECT TITLE: **Briskalagh Renewable Energy Development**		
DRAWING TITLE: **Metrological Mast**		
PROJECT No.: 230502	DRAWING No.: Figure-11	SCALE: As shown @ A3
DRAWN BY: KD / CHECKED BY: EmcC	DATE: 07.10.2024	REVISION.: P01

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7. Layout plans show typical Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.
9. For Wind Farm Drainage Layouts and Details Refer to HES drawings P1657-0_D101 to P1657-0_D503

Drawing Legend

- Planning Application Boundary
- Proposed Road
- Cut
- Fill
- Borrow Pit
- Drains

PROJECT TITLE:
Briskalagh Renewable Energy Development

DRAWING TITLE:
Temporary Construction Compound 02

PROJECT No.:		DRAWING No.:	SCALE:
230502		Figure 4-12	1:500 @ A3
DRAWN BY: KD	CHECKED BY: EmcC	DATE: 07.10.2024	REVISION.: P01

OS SHEET No.:
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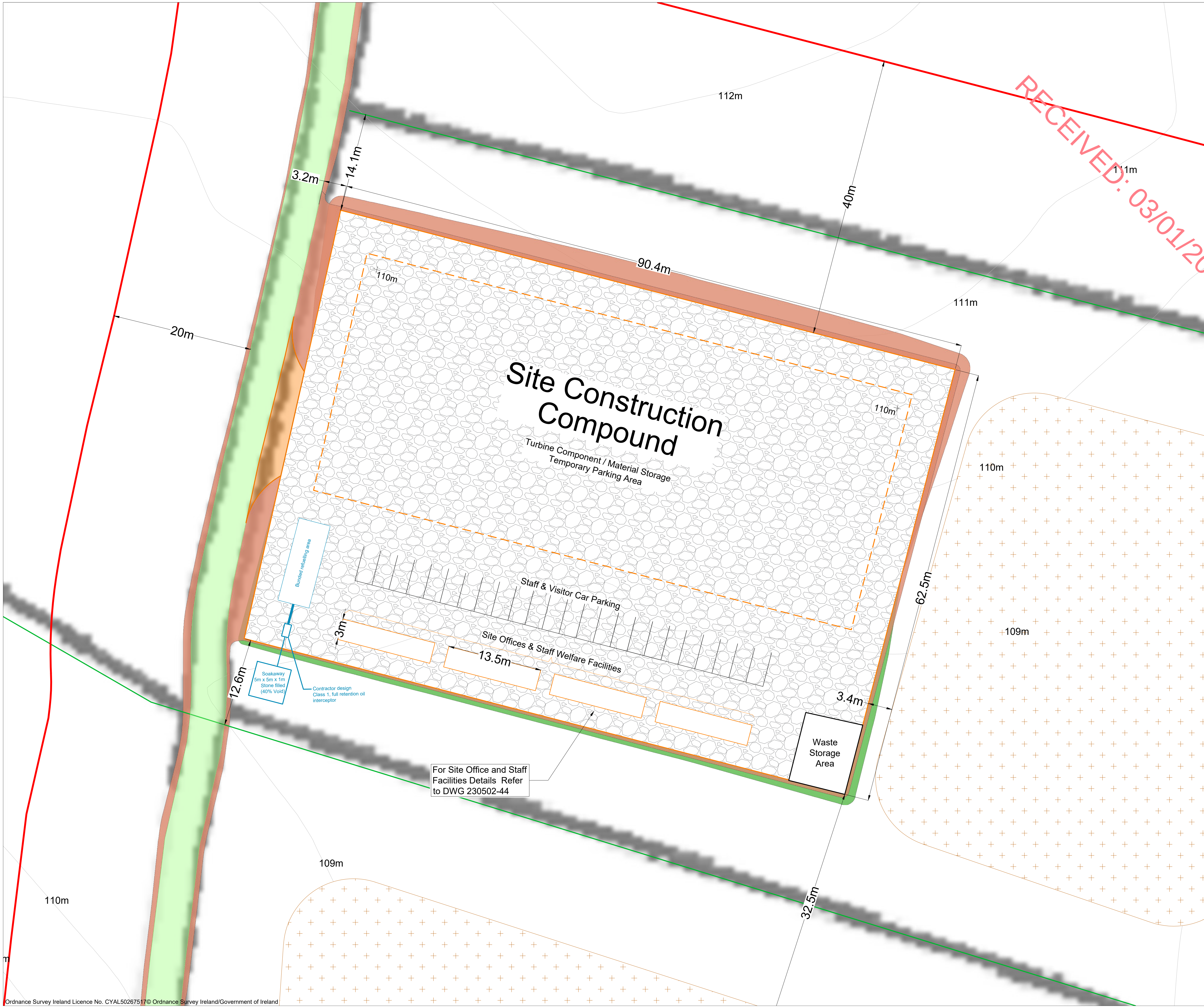

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7. Layout plans show typical Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.
9. For Wind Farm Drainage Layouts and Details Refer to HES drawings P1657-0_D101 to P1657-0_D503

Drawing Legend

- Planning Application Boundary
- Existing Road to be Upgraded
- Proposed Road
- Drains
- Cut
- Fill
- Spoil Management Area

PROJECT TITLE:
Briskalagh Renewable Energy Development

DRAWING TITLE:
Wind Farm Temporary Construction Compound 01

PROJECT No.: 230502	DRAWING No.: Figure 4-13	SCALE: 1:500 @ A3
DRAWN BY: KD / CHECKED BY: EmcC	DATE: 07.10.2024	REVISION: P01

OS SHEET No.:
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4762,4763,4764,4765,4822,4823,4824,48254763,4764,4823,4824

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4.3.1.6 Biodiversity Management Plan

4.3.1.6.1 *Hedgerow Enhancement*

The vast majority of field boundaries within the Proposed Wind Farm site are delineated by mature (managed and unmanaged) hedgerow and treeline habitats. It is anticipated approximately 1388m of hedgerow habitat will be removed to accommodate the Proposed Project, including turbines and associated bat buffers, wind farm roads and other key infrastructure. The majority of the existing hedgerows in the southern section of the Proposed Wind Farm site are heavily managed and do not support high levels of biodiversity or provide adequate commuting and foraging corridors for local wildlife. The locations of hedgerow loss are shown in Figure 1.1 of Appendix 6-4 of the EIAR.

To increase the ecological condition of these habitats, approximately 3640m of heavily managed hedgerow will be enhanced through additional planting with native species. It is proposed to plant some native tree species within the hedgerow habitat to further increase the biodiversity value within the Site. New native hedgerow habitat will be created within the Proposed Wind Farm site , approx. 270m. The enhancement of existing hedgerows and hedgerow creation will improve the ecological value and provide benefits for local biodiversity.

Existing hedgerow locations identified as suitable for enhancement planting and hedgerow creation are shown in Figure 4-2. Native species suitable for hedgerow planting include:

- Hawthorn (*Crataegus monogyna*)
  - Proportion of hedgerow mix: 75%
  - Age class to be planted: combination of whips and advanced nursery stock (10cm – 12 cm girth trees) to increase structure diversity.
- Hazel (*Corylus avellana*)
- Blackthorn (*Prunus spinosa*)
- Guelder rose (*Viburnum opulus*)
- Holly (*Ilex aquifolium*)
- Elder (*Sambucus nigra*)
- Spindle (*Euonymus europaeus*)
- Wild cherry (*Prunus avium*)
- Downey birch (*Betula pubescens*)
- Oak (*Quercus robur*)
- Goat Willow (*Salix caprea*)
  - Proportion of hedgerow mix: 25%
  - Age class to be planted: Whips predominantly

The proposed enhancement of 3,840m of exiting hedgerow habitat and the planting of 270m of new habitat hedgerow habitat will improve the ecological value and provide benefits for local biodiversity. Improving hedgerow availability will increase the commuting and foraging habitat available for bats within the Project Site. Linear features allow bats to navigate across a landscape while providing protection from predators like Owls and Hawks. Predators rely on hunting bats where gaps or open space exist. Bolstering hedgerow and treelines reduce and remove gaps to provide more consistently safe commuting routes for bats. Bats have been shown to avoid crossing a linear feature gap with a distance of 3m. Improving the diversity of the hedgerow and treelines will allow a more diverse and abundant habitat for insect species. Insect species that breed and exist within the tree habitat are an important food source for bats and birds.

4.3.1.6.2 *Riparian Buffer Zone*

It is proposed to create a new native riparian woodland buffer zone adjacent the Tullaroan stream within the Proposed Wind Farm site. Approximately 1.7ha of riparian woodland planting is proposed to be planted on both banks of the Tullaroan stream. The proposed ribarian buffer zone is shown on Figure 4-2.

Planting and management will be guided primarily by conservation, water quality protection and other ecological considerations. The areas will be allowed to develop as undisturbed native riparian buffer zones. Vegetation management and protection against grazing is essential as deer utilise the woodland habitats in the west of the Proposed Wind Farm site and cattle graze the grasslands adjacent the Tullaroan stream. The control and management of the proposed planted areas following planting is critical for riparian establishment and success. The focus will be on minimising disturbance i.e. trampling and grazing. Tree guards are appropriate and will provide protection against grazers and will be inspected regularly.

Species most tolerant to flooded areas include:

- Alder (*Alnus glutinosa*)
- Black poplar (*Populus nigra*),
- Downey birch (*Betula pubescens*),
- Willow spp. (*Salix spp.*),
- Aspen (*Populus tremuus*)
- Hazel (*Corylus avellana*).

All saplings will be planted by hand to reduce to potential for bare soil exposure and sediment runoff. Once these areas are established the riparian woodland buffer will benefit wildlife in the local area and may help reduce alluvial erosion. By protecting the young tree species grazers, the chances of establishing a mature riparian buffer zone will increase. Further, this riparian buffer zone will be managed such that it remains uncultivated and ungrazed and future cutting will be avoided.

The management, maintenance and monitoring required to ensure the establishment of the above biodiversity enhancement measures is detailed in Appendix 6-4: Biodiversity Management and Enhancement Plan of this EIAR.

4.3.1.6.3 *Hand Planting Methods*

This section detailed the planting methods to be used for the above Biodiversity Management Plan. Planting will be by hand. The main forms of planting, as described in the Forestry Schemes Manual, are set out as follows.

Slit Planting

A spade is used to make a vertical slit in the ground. The tree roots are carefully positioned in the slit to ensure that roots are equally spaced in the vertical slit created. The slit is closed and firmed up ensuring the tree is vertical and upright. It is important to ensure that roots are not bent over which can lead to poor development, e.g., J root. This form of planting can be suitable for ribbons, mounds and ripped ground.

Angle Notch

A spade is used to cut a T or L-shaped slit in the ground. The spade is used to lift the slit and the tree roots placed underneath to ensure good root distribution without causing damage. The slit is closed and firmed up to ensure that stem is left vertical and upright.

Pit Planting

A spade is used to dig a hole and the tree roots placed in the centre. Soil is placed around the tree and firmed in, ensuring that it is upright and straight. This form of planting can be used in sensitive sites where no ground preparation has taken place. It may also be appropriate for steep slopes where other types of preparation may lead to sediment runoff.

4.3.1.7 Tree Felling and Replanting

4.3.1.7.1 *Tree Felling*

Tree felling will be required within and around the Proposed Wind Farm infrastructure footprint to allow for the construction of the proposed turbines, access roads underground cabling, and the other ancillary infrastructure.

Approximately 4.3 hectares of forestry (comprising both 3.57ha conifer plantation (WD4) and 0.73ha mixed broadleaved/conifer plantation (WD2)) will be felled to accommodate Turbine 7 and its associated infrastructure. Figure 4-14 shows the extent of the commercial forestry to be permanently felled as part of the Proposed Wind Farm.

The forestry felling activities required as part of the Proposed Wind Farm 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 Wind Farm 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 Wind Farm.

In addition, approximately 1.3km of hedgerows and tree lines require removal to facilitate the construction of wind farms roads and ancillary infrastructure, and to achieve the required Bat foraging buffers from the proposed turbines. Please see Appendix 6-2 and Appendix 6-4 of the EIAR for details.

4.3.1.7.2 *Forestry Replanting*

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

The identified 3.57 hectares of conifer plantation that will be permanently felled for the Proposed Wind Farm 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 Wind Farm felling. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that are under the control of the Forest service. The replacement of the felled forestry as part of the Proposed Wind Farm may occur on any lands, within the State benefitting from Forest Service Technical Approval[3] for afforestation, should the Proposed Wind Farm receive planning permission. Under the Forestry Regulations 2017, all applications for licences for afforestation require the prior written approval (technical approval) of the Minister for Agriculture, Food and the Marine. Before the Minister can grant approval, he/she must first determine if the project is likely to have significant effects on the environment (for EIA purposes) and assess if the development, individually or in combination with other plans or projects is likely to have a significant effect on a European site (for Appropriate Assessment purposes).

As outlined in Section 4.3.1.6 above, it is proposed to plant by hand, approximately 1.7 hectares of riparian woodland planting is proposed to be planted on both banks of the Tullaroan stream to create a riparian woodland buffer zone and offset the loss of the 0.73ha mixed broadleaved/conifer plantation to

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[3] *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.*

Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Proposed Project Infrastructure
- Proposed Felling Area

N

Drawing Title: Proposed Forestry Felling	
Project Title: Briskalagh Renewable Energy Development	
Drawn By: MC	Checked By: EMC
Project No.: 230502	Drawing No.: Figure 4-14
Scale: 1:12,000	Date: 2024-09-09

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be felled. Please see Chapter 6 Biodiversity and Appendix 6-4 Biodiversity Management and Enhancement Plan for details. In addition to this, approximately 3.64km of existing hedgerow will be enhanced and 270m of new hedgerow will be replanted within the Site.

The applicant commits to replanting the 3.57 hectares of conifer forestry, outside the hydrological catchments within which the Site is located. On this basis, it is reasonable to conclude that there will be no cumulative effects associated with the replanting of 3.57 hectares of forestry. Therefore, the forestry replanting is not considered further in the impact assessment chapters of this EIAR. In addition, the applicant commits to not commencing the Proposed Project until both a felling and afforestation licence(s) is in place and, therefore, this ensures the afforested lands are identified, assessed and licenced appropriately by the relevant consenting authority.

4.3.1.8 Borrow Pit

It is estimated that approx. 65,370m^3 of stone material will be required to construct the Proposed Project. It is intended to obtain the majority of materials for the construction of the Proposed Project from the proposed onsite borrow pit (engineer's specified material may be imported onto the Site should sufficient volumes of suitable material not be encountered during the excavation phase of the proposed infrastructure, to come from local licenced quarries). Please see Figure 4-15 for details of the proposed borrow pit. The proposed onsite borrow pit is located approximately 270m north of T1 and measures approximately 15,270m^2 with an estimated volume of 70,000m^3.

Access to the borrow pit will be via a proposed new access road from the north. Please see Figure 4-2 for details. Post-construction, the borrow pit will be backfilled with excavated spoil, then reseeded or left to vegetate naturally. A stock-proof fence will be erected after construction materials have been extracted to prevent unauthorised access.

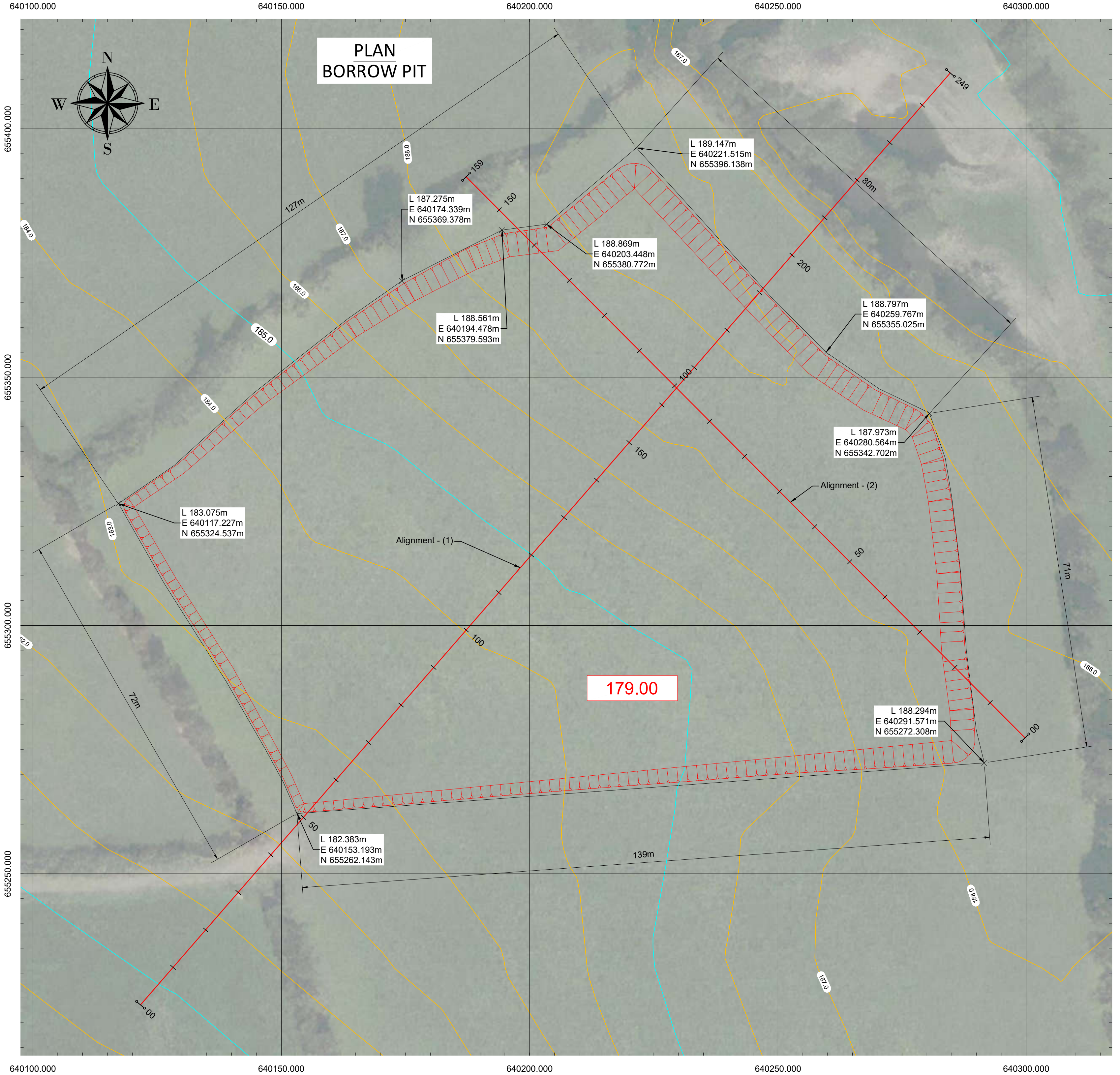
The extraction of material from the borrow pit is a construction phase activity only of the Proposed Project which will be a temporary operation run over a short period of time. Hardcore materials will be extracted from the borrow pit (and some turbine locations, if necessary), principally by means of rock breaking. Depending on the hardcore volume, blasting may also be used as a more effective rock extraction method, capable of producing significant volumes of rock in a matter of milliseconds. Blasting will only be carried out after notifying any potentially sensitive receptors. These two rock extraction methods are discussed below. The processing and crushing of boulders may be required to achieve the grading requirements for use in construction. 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. Post-construction, any unsafe areas around the borrow pit area will be permanently secured and a stock-proof fence will be erected around the borrow pit area to prevent access to this area. Appropriate health and safety signage will also be erected on this fencing and at locations around the fenced area.

The extraction of rock from the borrow pit will be a temporary operation during the construction phase. The topsoil and subsoil will be stripped back and temporarily stockpiled using standard tracked excavators. Two extraction methods have been assessed for breaking out the useful rock below: rock breaking and blasting. Please see Section 4.8.1.7 below for the borrow pit construction methods.

4.3.1.9 Spoil Management Areas and Placement of Spoil Alongside Access Roads

It is proposed to manage overburden generated through construction activities for the Proposed Project locally within the Site, through backfilling of the proposed borrow pit void in the first instance, and following that within identified spoil management areas, as shown in Figure 4-2 and cross section details shown in Figure 4-16 and Figure 4-17 Linear berms will be placed along access roads and turbine hardstand areas where appropriate.

PLAN BORROW PIT



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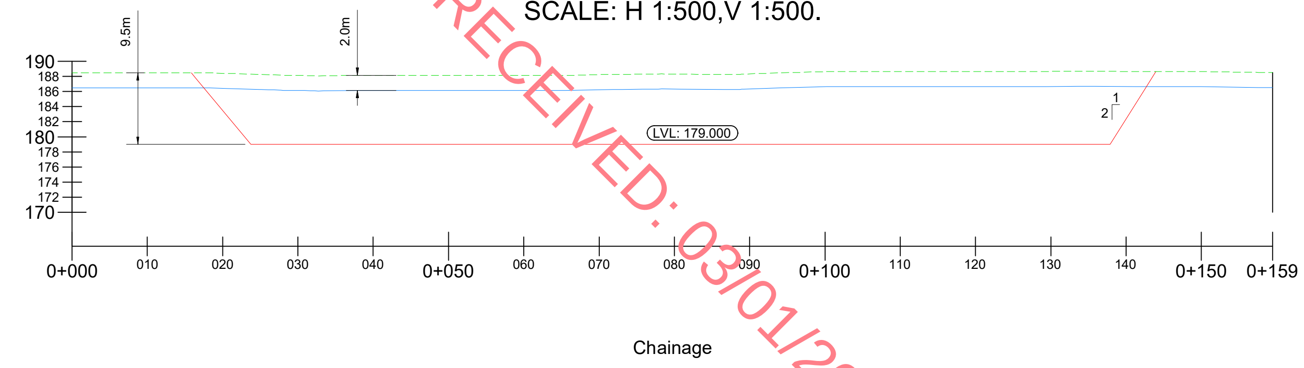

RECEIVED: 03/01/2025

Volumes Dashboard	
OVERBURDEN QUANTITIES	29 649 m3
BEDROCK QUANTITIES (below 2 m)	70 049 m3

Figure 4-15

NOTE:
Coordinate system - ITM

ALIGNMENT - (1) - LONGSECTION
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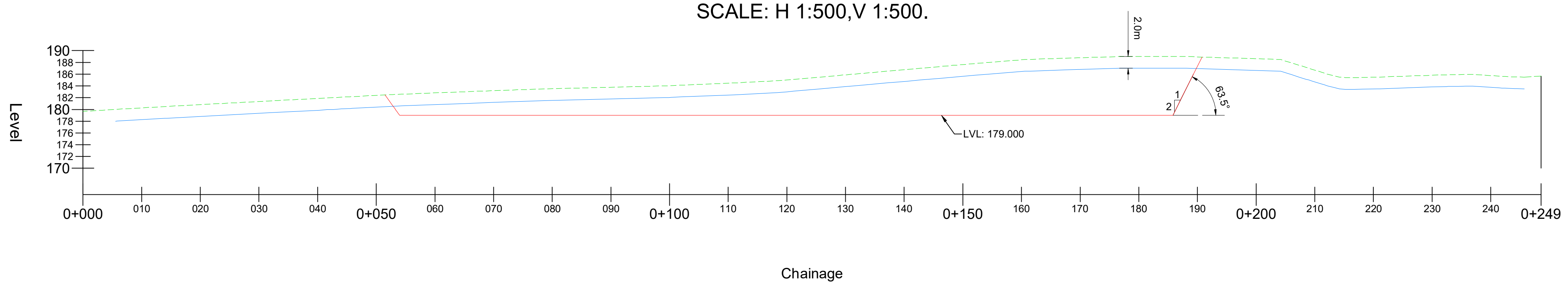

ENGINEER: Danu Energy CONSULTING www.danuenergy.ie	CLIENT: Briskalagh Ltd
PROJECT: BRISKALAGH WIND FARM	
TITLE: BORROW PIT	
SCALE: 1:500	STATUS: APPROVAL
PAPER SIZE: A1	DRAWN BY: A. ZOLOTAROV — CHECKED AND APPROVED: C. Ó DUBHTHAIGH
PROJECT PHASE: PLANNING	DATE: 20/06/2024 — DATE: 20/06/2024
DRAWING NUMBER: DANU-BSK-D004.1	REVISION: V4

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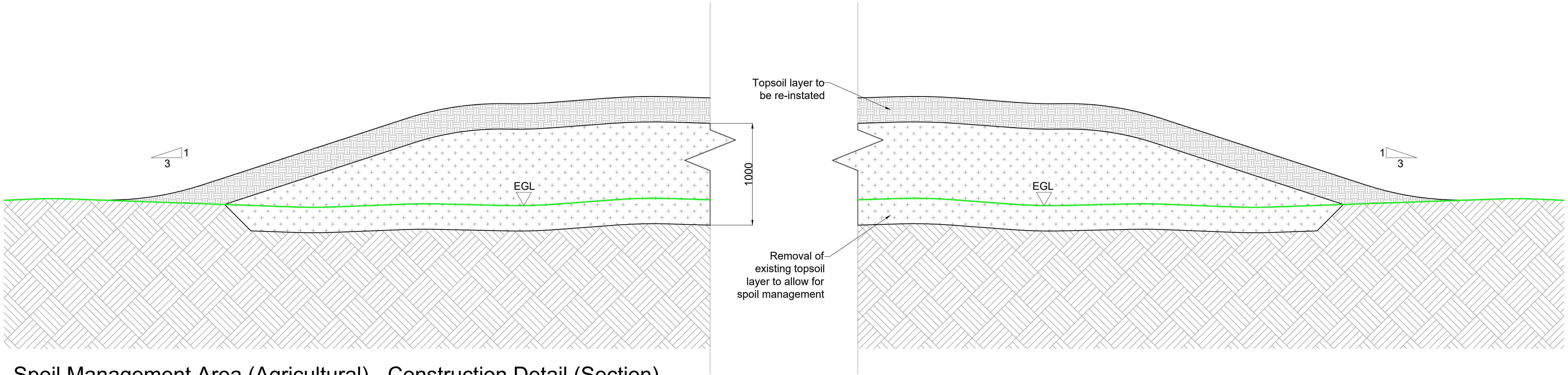

Spoil Management Area (Agricultural) - Construction Detail (Section)

Scale 1:40

PROJECT TITLE: **Briskalagh Renewable Energy Development**			
DRAWING TITLE: **Spoil Management Areas In Agricultural Lands**			
PROJECT No.: 230502		DRAWING No.: Figure 4-16	SCALE: 1:40 @ A3
DRAWN BY: KD	CHECKED BY: EmcC	DATE: 08.10.2024	REVISION.: P01

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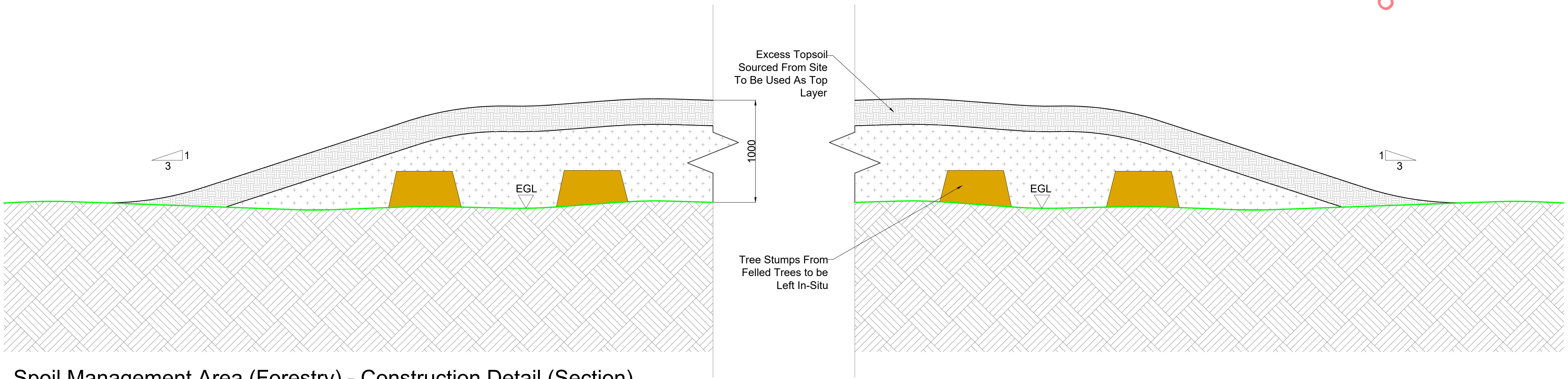

Spoil Management Area (Forestry) - Construction Detail (Section)

Scale 1:40

PROJECT TITLE: Briskalagh Renewable Energy Development			
DRAWING TITLE: Spoil Management Areas In Forestry			
PROJECT No.: 230502	DRAWING No.: Figure 4-17		SCALE: 1:40 @ A3
DRAWN BY: KD	CHECKED BY: EmcC	DATE: 08.10.2024	REVISION.: P01

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The total estimated volume of spoil to be managed following excavations during the construction phase of the Proposed Project is approximately 70,700m^3. Some material arising from the construction of the Proposed Grid Connection underground cabling route will be sent to an appropriate licenced facility. The total capacity of the identified spoil management areas within the Site is approx. 74,000m^3 and therefore, in conjunction with the borrow pit void and linear berms, there is more than enough capacity to manage the total volume of spoil requiring management for both the Proposed Wind Farm and the Proposed Grid Connection as detailed in Table 4-3 below. The spoil management areas have been selected based on the locations of spoil generation, areas suitable for spoil management and avoiding environmentally constrained areas.

The predicted spoil generated during construction has been calculated and is outlined in Table 4-3 below. The construction methodology for the spoil management areas is outlined below in Section 4.8.1.8.

4.3.1.10 Watercourse / Culvert Crossings

The Proposed Wind Farm site is extensively drained by a network of natural watercourses and manmade land drains. The majority of watercourses and manmade drains at the Proposed Wind Farm site drain into the Tullaroan Stream which flows southeasterly through the southern part of the site. In addition, the Bregagh stream flows from the northeast of the Proposed Wind Farm site in an easterly direction, with both the Tuallroan Stream and the Bregagh joining the River Nore downstream. There is no infrastructure proposed within 235m of the Bregagh watercourse.

To facilitate the construction of the Proposed Wind Farm roads, 4 no. new watercourse crossings are required.

4.3.1.10.1 *Clear Span Crossing*

The new watercourse crossings will comprise either clear span watercourse crossings or bottomless box culverts. The construction methodology for these crossings have been designed to eliminate the requirement for in-stream works at these locations. The watercourse crossings 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.

For the crossing of the Tullaroan Stream to the northeast of T7, a clear span crossing will be constructed. 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 locations will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing. Please see Figure 4-1 for the location of the proposed clear span crossing, Figure 4-32 for the design details and Section 4.8.1.3 for the construction methodology.

4.3.1.10.2 *Culvert Crossing*

All new proposed culverts and proposed culvert upgrades at field drain crossings required for the Proposed Wind Farm 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 Wind Farm, 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 all cases, culverts will be oversized to allow mammals to pass through the culvert. Culverts will be constructed as per the methodology detailed in Section 4.8.1.4. All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance. Please see Figure 4-1 for the location of these crossings and Figure 4-33 below for design details.

4.3.2 Proposed Grid Connection

4.3.2.1 Onsite 38 kV Substation

It is proposed to construct a 38kV electricity substation within the Proposed Wind Farm site, as shown in Figure 4-1, Figure 4-2 and Figure 4-3. The proposed onsite 38kV substation is located within agricultural land and will be accessed via the Proposed Wind Farm access roads.

The footprint of the proposed onsite 38kV substation compound measures approximately 1,780square metres in area and will include 1 no. control building, 2 no. storage containers and the electrical substation components necessary to consolidate the electrical energy generated by each wind turbine, and export that electricity from the onsite 38kV substation to the national grid. The layout and elevations of the proposed onsite 38kV substation are shown on Figure 4-18 to Figure 4-19. The construction and exact layout of electrical equipment in the onsite 38kV substation will be to ESB Networks specifications.

The onsite 38kV substation compound will include steel palisade fencing (approximately 2.6 metre high or as otherwise required by ESB), and internal fences will also segregate different areas within the main substation.

Further details regarding the underground cabling connection to the national electricity grid are provided in Section 4.3.2.4 below. Construction methodologies for the Proposed Grid Connection (including the onsite 38kv substation, temporary construction compound, underground electrical and communication cabling and joint bays) are outlined below in Section 4.8.2.
Substation Control Building

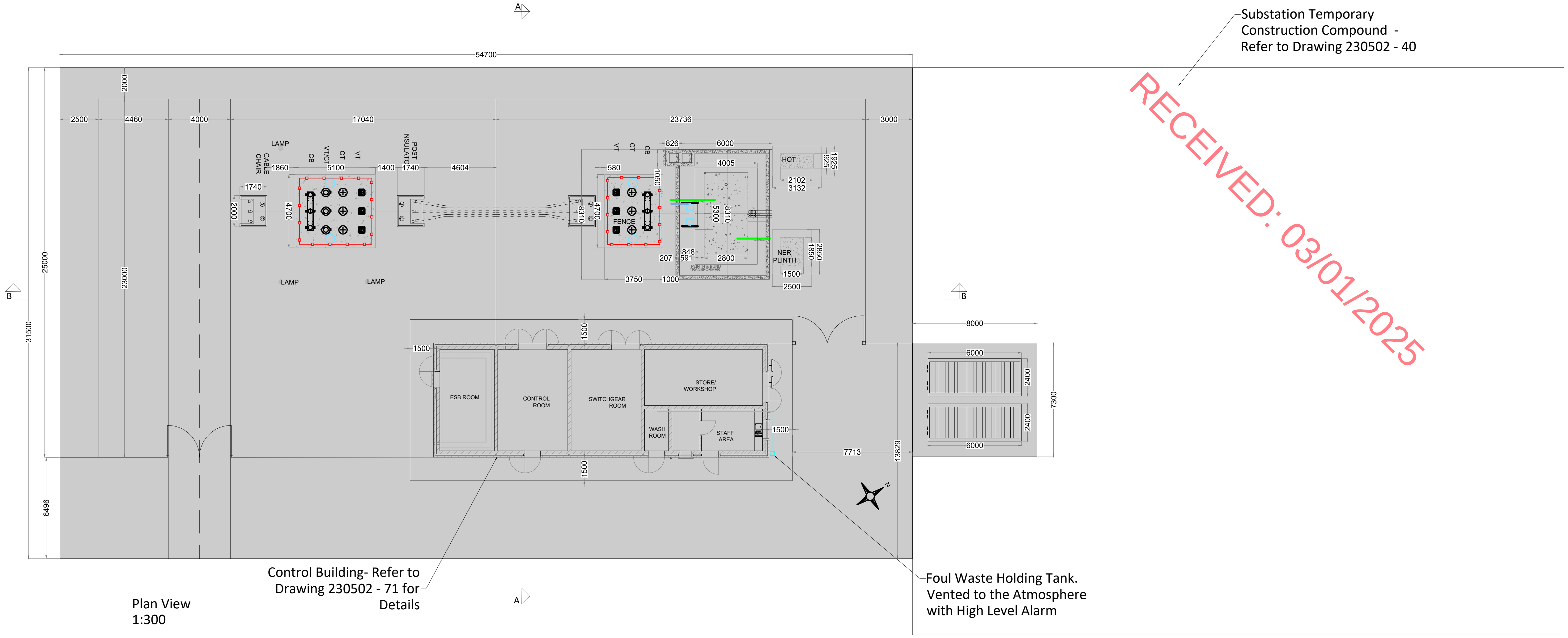
The substation control building will be located within the substation compound and will measure 21.5 metres x 7.3 metres x 6.1 metres. Layout and elevation drawings of the control building are included in Figure 4-20.

4.3.2.1.1 *Water Supply and Wastewater Treatment*

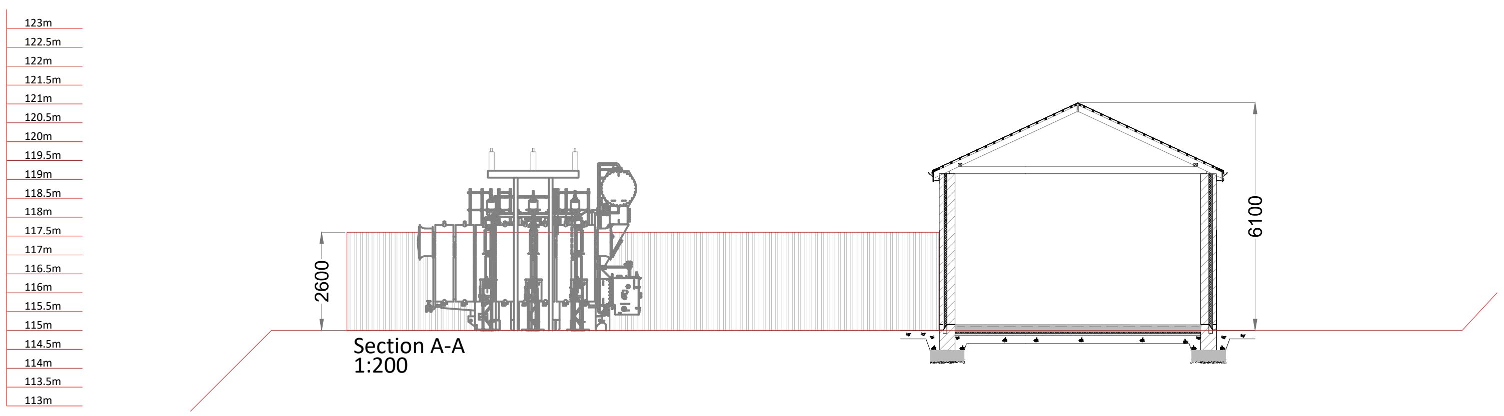
The substation control building will include staff welfare facilities for the operational phase of the Proposed Project. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the proposed substation, there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the Proposed Grid Connection does not necessitate a potable source. It is proposed to either harvest rainwater from the roofs of the building or, alternatively, install a groundwater well adjacent to the substation in accordance with the Institute of Geologists Ireland, Guide for Drilling Wells for Private Water Supplies (IGI, 2007). The well will be flush to the ground and covered with a standard manhole. A pump house is not required as an in-well pump will direct water to a water tank within the roof space of the control buildings. Bottled water will be supplied for drinking, if required.

It is not proposed to treat wastewater on site. Wastewater from the staff welfare facilities in the control buildings will be managed by means of a sealed underground storage tank, with all wastewater being tankered off site by permitted waste collector to a licenced wastewater treatment plant.

Such a proposal for managing the wastewater arising at substation compounds has become almost standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment would be challenging and has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal.



Plan View
1:300



Section A-A
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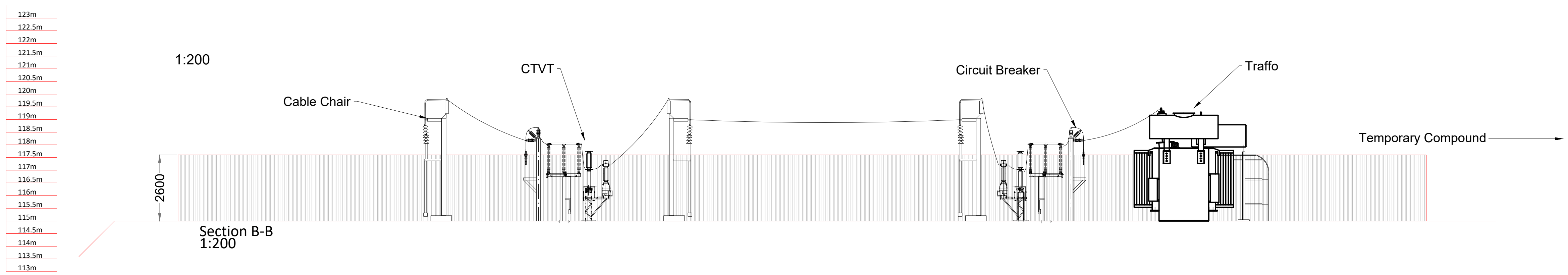

Section B-B
1:200

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DRAWING TITLE: **Substation Compound Layout and Sections**		
PROJECT No.: 230502	DRAWING No.: Figure 4-18	SCALE: As Shown @ A3
DRAWN BY: KD / CHECKED BY: EMC	DATE: 08.10.2024	REVISION.: P01

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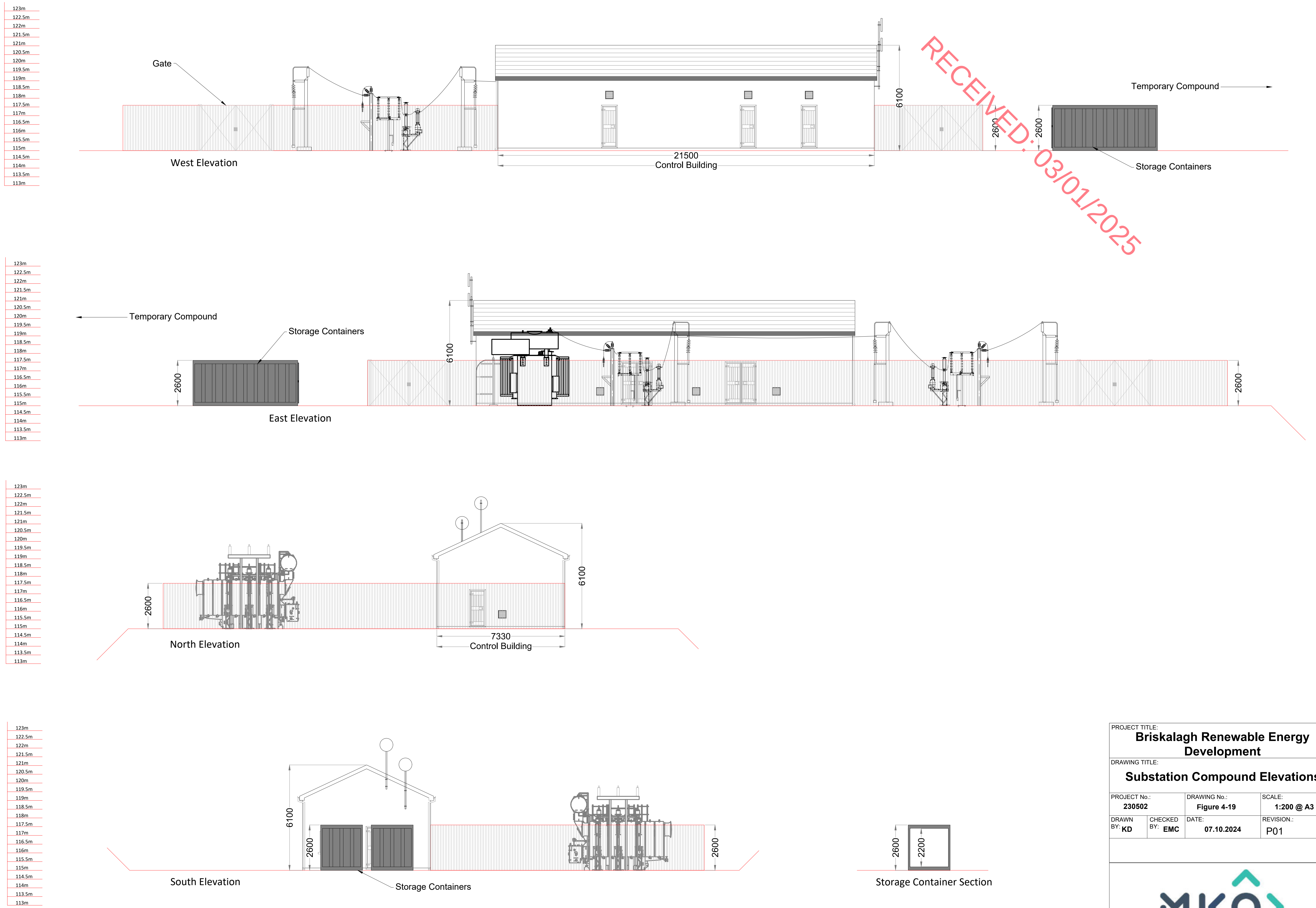

PROJECT TITLE:

Briskalagh Renewable Energy Development

DRAWING TITLE:

Substation Compound Elevations

PROJECT No.:	DRAWING No.:	SCALE:
230502	Figure 4-19	1:200 @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
KD	EMC	07.10.2024	P01

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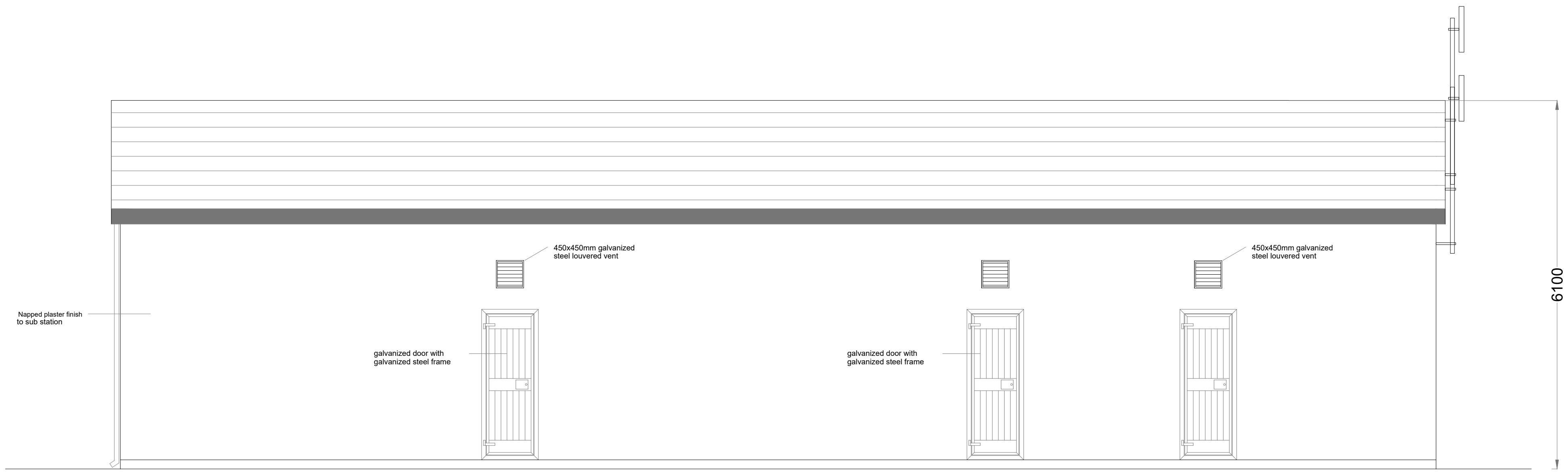
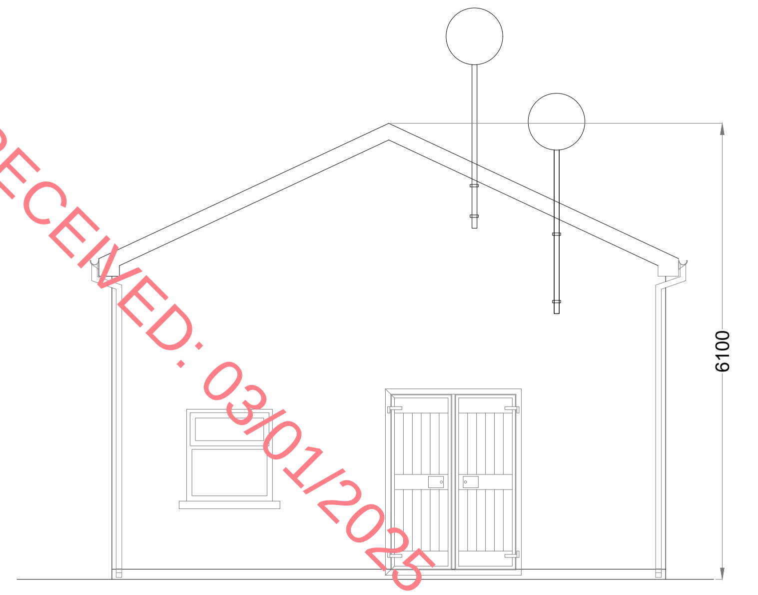
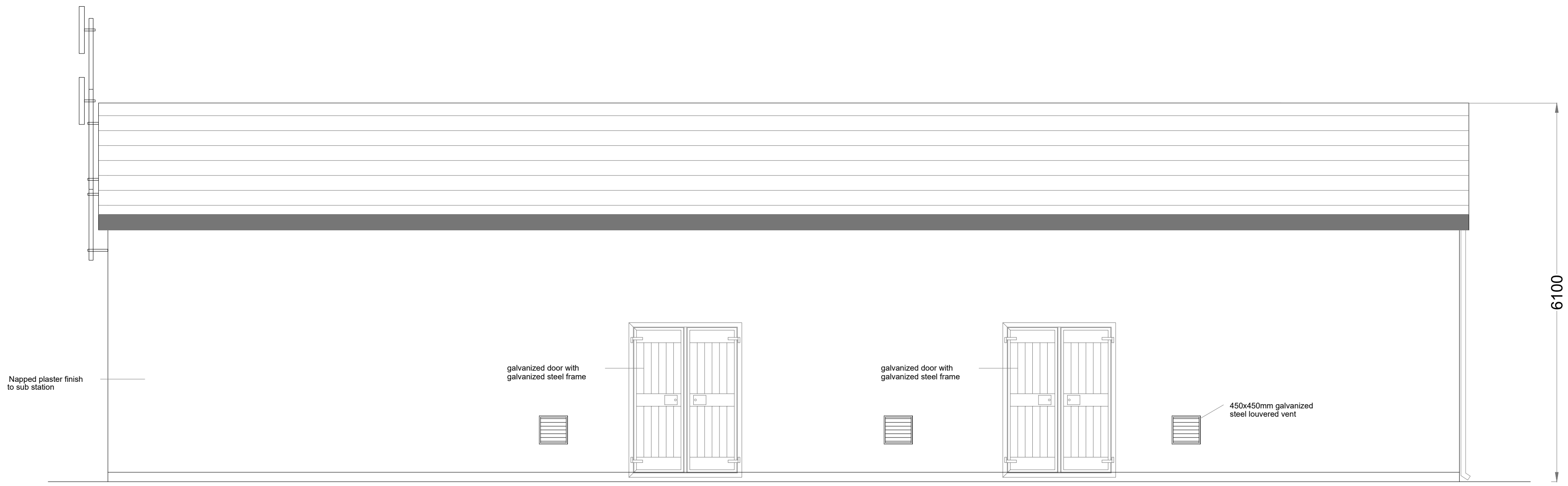


FRONT ELEVATION (West Elevation) 1:100



SIDE ELEVATION (South Elevation).



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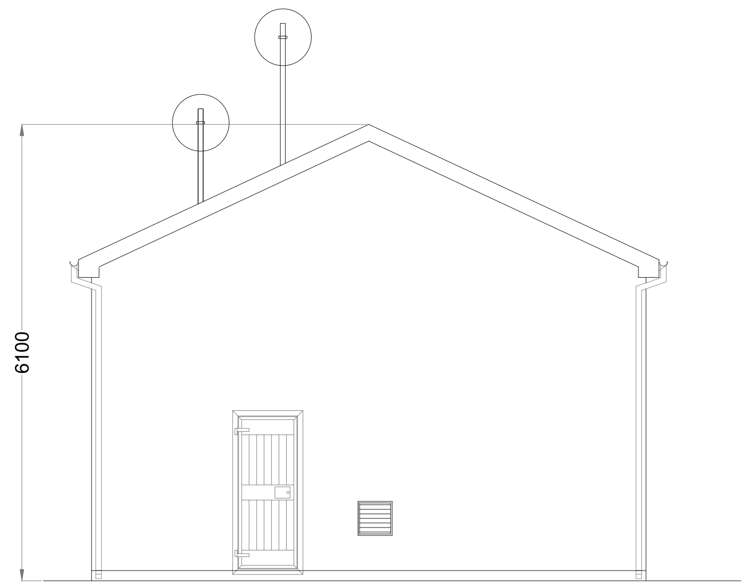

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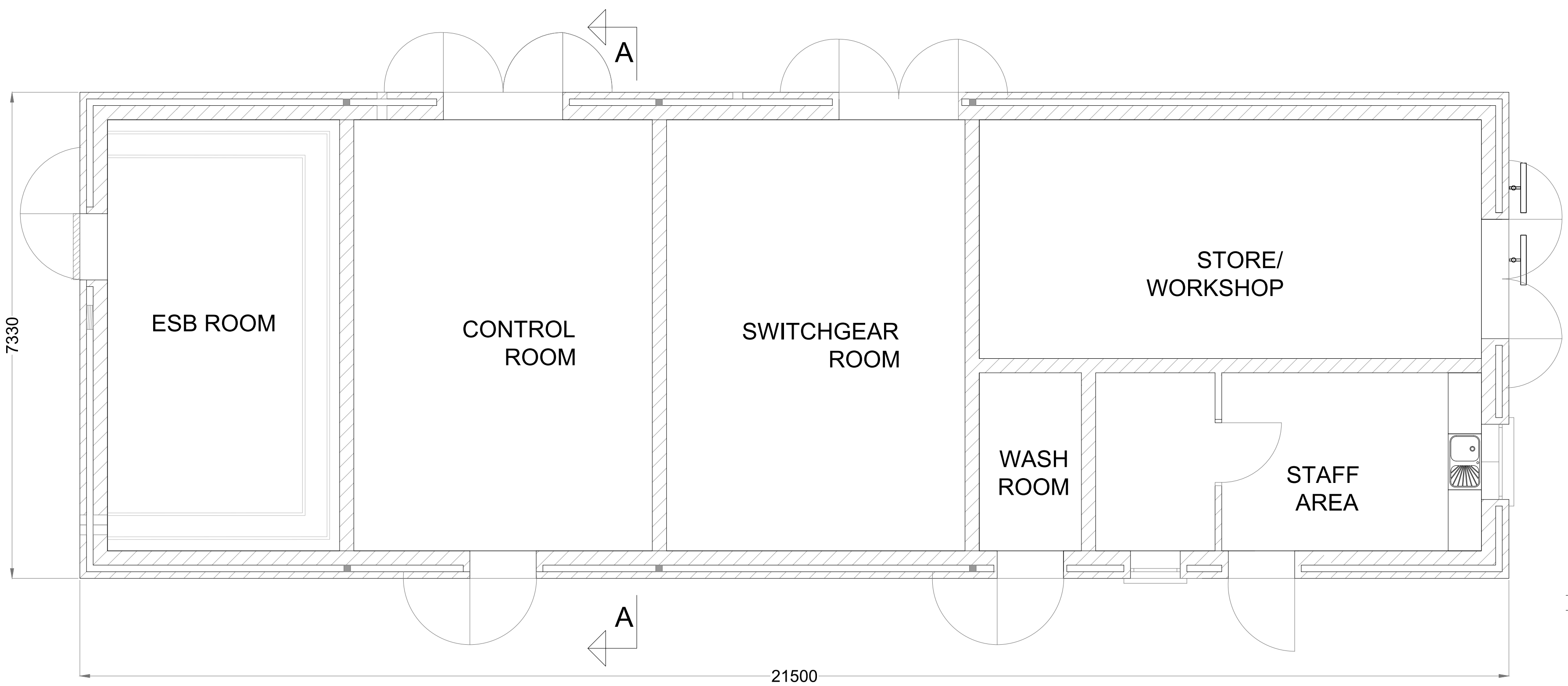
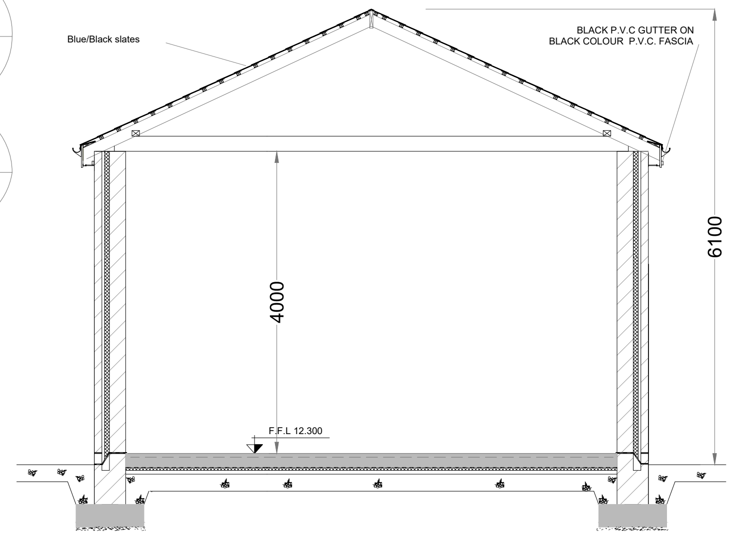


Proposed 38 kV Control Building Layout Plan 1:100



SECTION A-A

PROJECT TITLE: **Briskalagh Renewable Energy Development**			
DRAWING TITLE: **Control Building Plan Elevations and Section**			
PROJECT No.: 230502		DRAWING No.: Figure 4-20	SCALE: 1:100 @ A3
DRAWN BY: KD	CHECKED BY: EMC	DATE: 08.10.2024	REVISION.: P01

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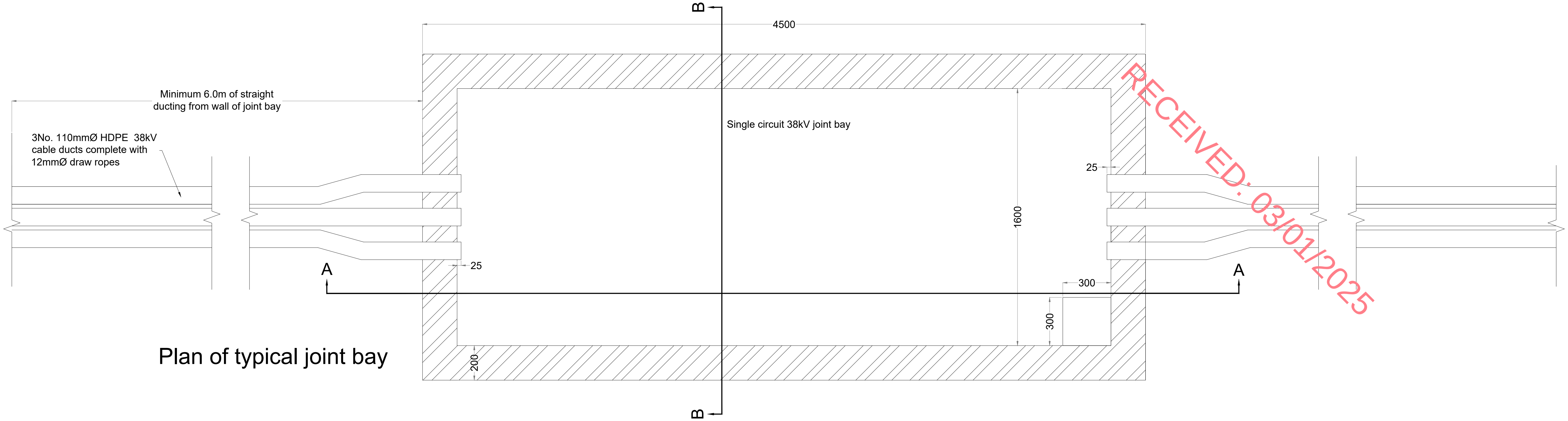
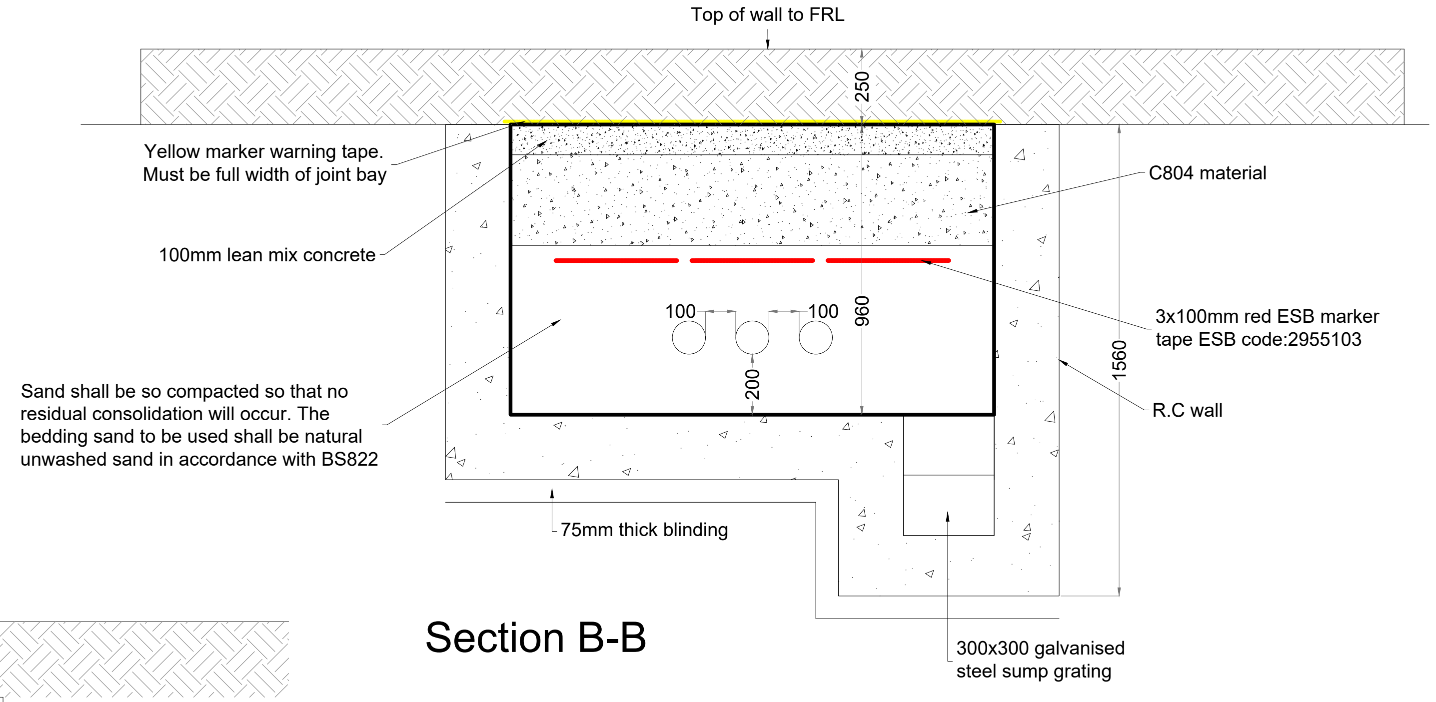
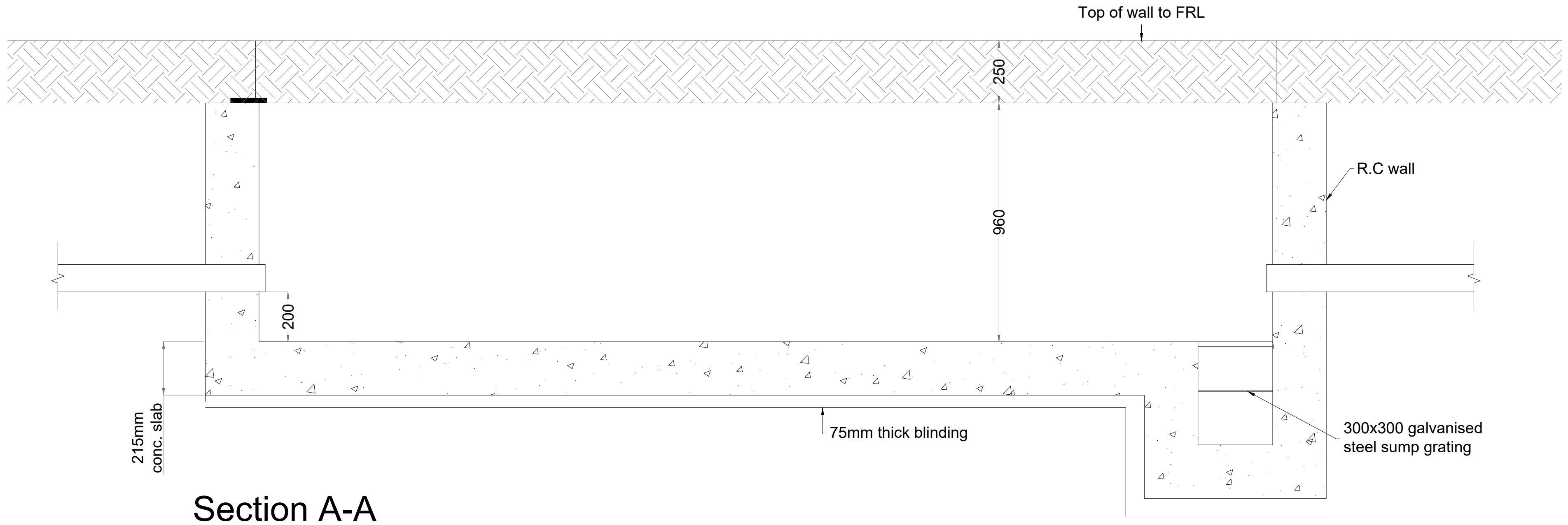


Plan of typical joint bay



Section B-B



Section A-A

PROJECT TITLE: **Briskalagh Renewable Energy Development**

DRAWING TITLE: **Standard 38kV Joint Bay Detail**

PROJECT No.:	DRAWING No.:	SCALE:
230502	Figure 4-23	1:25 @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
KD	EmcC	08.10.2024	P01

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The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. The wastewater storage tank alarm will be part of a continuous stream of data from the Proposed Wind Farm turbines, wind measurement devices and electricity substation that will be monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007(as amended), will be employed to transport wastewater away from the substation underground storage tank.

4.3.2.1.2 *Storage Containers*

Two storage containers will be located adjacent to northern boundary of the proposed on-site substation compound. Each container will measure 6m x 2.4m x 2.6m in height and will be used for the storage of dry goods including spare electrical equipment necessary for the ongoing operation and maintenance of the substation. The location and elevation of the storage containers is shown in Figure 4-19.

4.3.2.2 Substation Temporary Construction Compound

A temporary construction compound measuring approximately 1,520 square metres in area will be located adjacent to the northeastern boundary of the proposed onsite 38kV substation. This construction compound will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. Temporary port-a-loo toilets and toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered 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. The construction compound will also include a bunded refuelling and containment area for the storage of oil, lubricants and site generators etc, and full retention oil interceptor.

The location of the proposed construction compound is shown on the Proposed Grid Connection layout drawing in Figure 4-3. The layout of this construction compound is shown in Figure 4-21, and within Appendix 4-1.

4.3.2.3 Underground Electrical Cabling

It is proposed to connect the onsite 38 kV substation to the existing 110 kV Ballyragget substation in Moatpark, Co Kilkenny via 38 kV underground electrical cabling. The underground electrical cabling route is illustrated in Figure 4-3, is approximately 23km in length and located primarily within the public road corridor, with a short section (approximately 260m) located within a private road southwest of the proposed on-site substation and another short section (approximately 660m) passing through a number of agricultural fields and a private access track north of the Ballyragget substation.

The underground electrical cabling route will originate at the proposed onsite 38kV substation and run west for approximately 260m through a Site road towards the L5023 local road. The underground cabling route continues underneath the local road network for approximately 12.3km before following the R694 north for 8.6km. The underground cabling route then follows the N77 national road north for 1.1km before crossing the River Nore via directional drilling. On the eastern side of the River Nore, the proposed cable route then passes through agricultural fields and private access track , for a distance of approximately 660m, before joining the R432 for the remainder of the route, a stretch of approximately 135m. From the R432 the cable route turns right into the existing 110kV Ballyragget Substation compound in the townland of Moatpark.

The methodology for construction of the Proposed Grid Connection underground electrical cabling is presented in Section 4.8.2.3 below. The underground electrical cabling route is illustrated in Figure 4-1 and Figure 4-3. 38kV underground cabling trench cross sections are shown in Figure 4-22.

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 typical Turbine rotor diameter as per turbine drawing.
8. Final levels may vary depending on local ground conditions.
9. For Wind Farm Drainage Layouts and Details Refer to HES drawings P1657-0_D101 to P1657-0_D503

Drawing Legend

- Planning Application Boundary
- Existing Road to be Upgraded
- Proposed Road
- River/Stream
- 33kV Underground Cable Route
- Cut
- Fill
- 38kV Underground Cabling Trench

PROJECT TITLE:
Briskalagh Renewable Energy Development

DRAWING TITLE:
Substation Temporary Construction Compound

PROJECT No.: 230502	DRAWING No.: Figure 4-21	SCALE: 1:500 @ A3
DRAWN BY: KD / CHECKED BY: EmcC	DATE: 08.10.2024	REVISION.: P01

OS SHEET No.:
4405,4406,4407,44084463,4464,4465,4466,4522,4523,4524,4525,4582,4583,4584,4585,4642,4642,4643,4644,4701,4702,4703,4704,4762,4763,4764,4765,4822,4823,4824,48254763,4764,4823,4824

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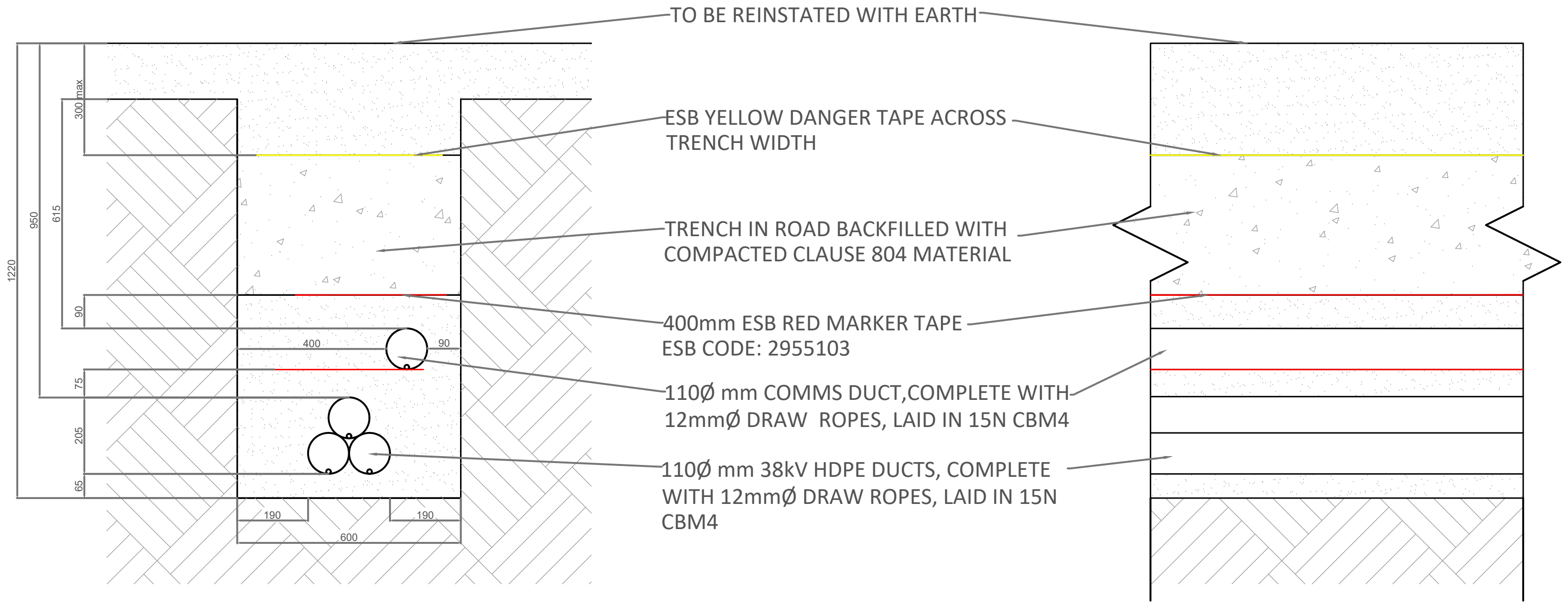
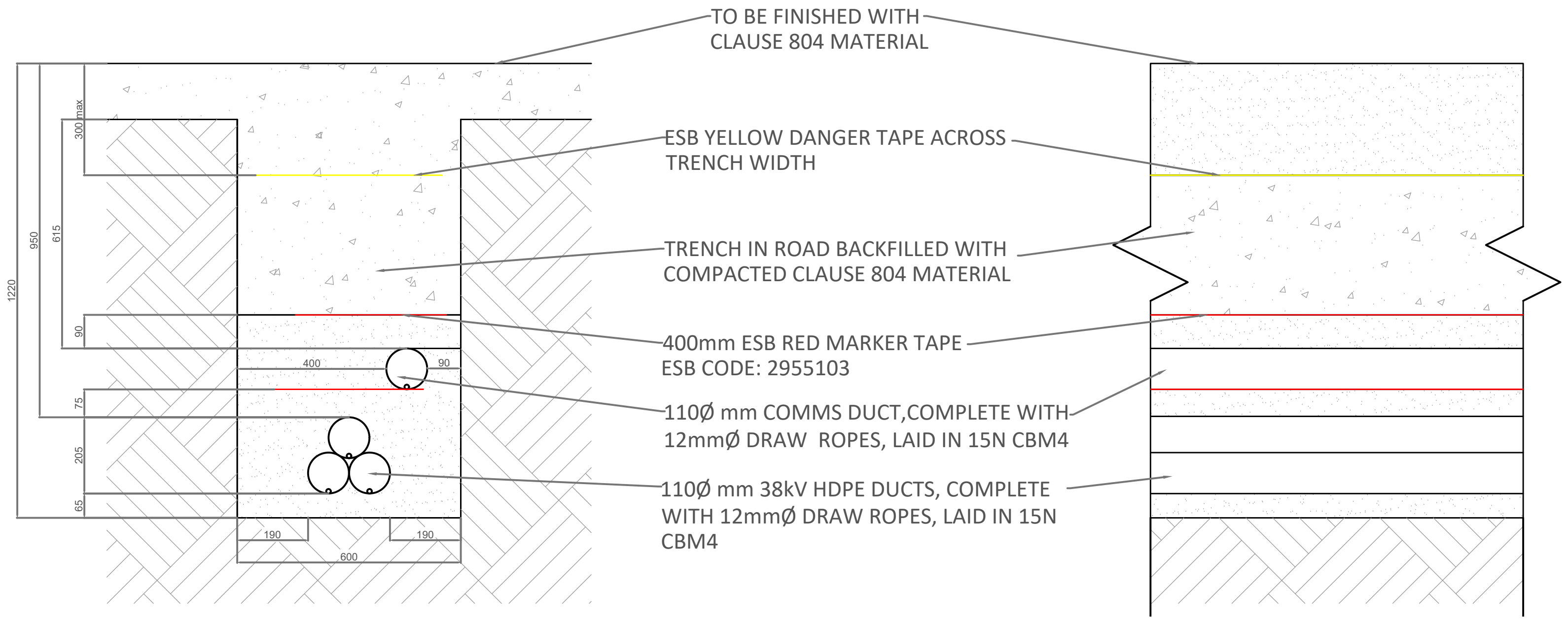


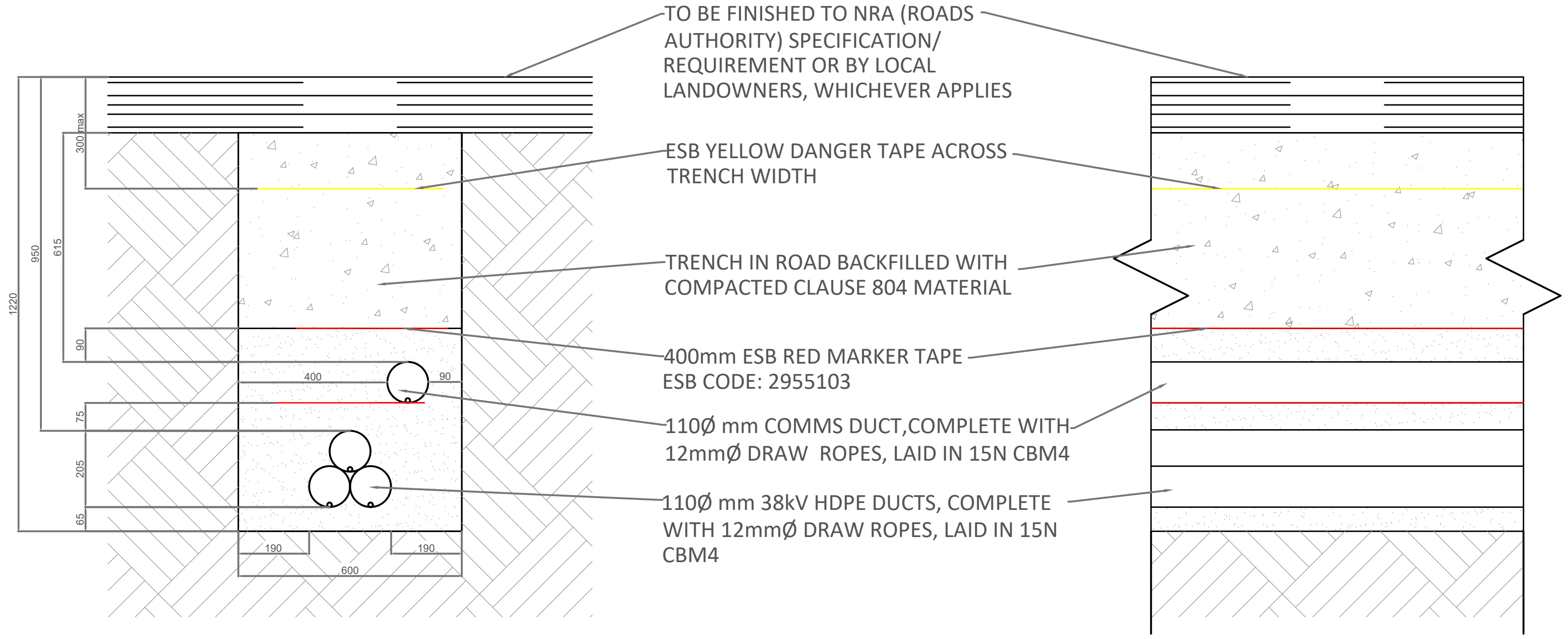
Option A - Standard 38kV Trench Detail Off-Road

SCALE 1:20



Option A - Standard 38kV Trench Detail in Site Road

SCALE 1:20



Option A - Standard 38kV Trench Detail in Public Road

SCALE 1:20

PROJECT TITLE: **Briskalagh Renewable Energy Development**

DRAWING TITLE: **Standard 38kV Trench Details**

PROJECT No.:	DRAWING No.:	SCALE:
230502	Figure 4-22	As Shown @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
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4.3.2.4 Joint Bays

There are 31 no. joint bays proposed along the Proposed Grid Connection underground cabling route, approximately 600 to 800 metres apart or as otherwise required by ESBN and electrical requirements. There are no joint bays proposed within the Proposed Wind Farm access roads, 16 no. joint bays are proposed along the existing local road network, 12 no. joint bays are proposed along the R694 regional road, 1 no. joint bay is proposed along the N77 national road, and 2 no. joint bays are proposed within private agricultural fields. Please see Figure 4-23 for details and Section 4.8.2.7 for joint bay construction methodology.

4.3.2.5 Watercourse and Service Crossings

There are 13 no. identified watercourse crossings along the Proposed Grid Connection underground cabling route. Of these, 10 no. watercourse crossings are referenced on EPA/OSI mapping. An additional 3 no. watercourse crossings were identified during surveys of the underground cable route. The construction methodology for the 13 no. EPA/OSI mapped and the unmapped watercourse crossings has been designed to eliminate the requirement for in-stream works at these locations. The various crossing methodologies to be employed along the Proposed Grid Connection underground cabling route include the following:

- Type A: Crossing using standard trefoil formation (Figure 4-22)
- Type B Flatbed formation under (Figure 4-24)
- Type C: Flatbed Formation over (Figure 4-25)
- Type D: Horizontal Directional Drilling(Figure 4-26)

A general description of the construction methods employed at watercourse crossings are described in Section 4.8.2.8 below. An illustration of the proposed crossing methodology at the 10 no. EPA/OSI mapped crossing locations is included within the detailed site layout drawings in Appendix 4-1. A description of proposed methodologies for the crossing of services along the proposed underground cable route is included in Section 4.8.2.3 below.

4.3.3 Quantities of Spoil and Crushed Stone

4.3.3.1 Crushed Stone

The quantity of crushed stone required for the construction of the Proposed Project has been calculated, as presented in Table 4-2 below.

Table 4-2 Crushed Stone Requirement

Development Component	Crushed Stone Requirement (m^3) (approx.)
Proposed Wind Farm	
7 no. Turbines and Hardstanding Areas (including foundations)	31,190
Access Roads (including met mast and hardstand)	16,660
Temporary Construction Compounds	3,690
Total	**51,540**

Development Component	Crushed Stone Requirement (m^3) (approx.)
Proposed Grid Connection	
Onsite Substation (including temporary construction compound)	1,660
Cabling Trench	6,230
Total	7,890
Total	59,430
Total (including 10% contingency)	65,370

Note: A contingency factor of 10% has been applied and is included in the crushed stone requirements volumes above to allow for a variation in ground conditions across the Site.

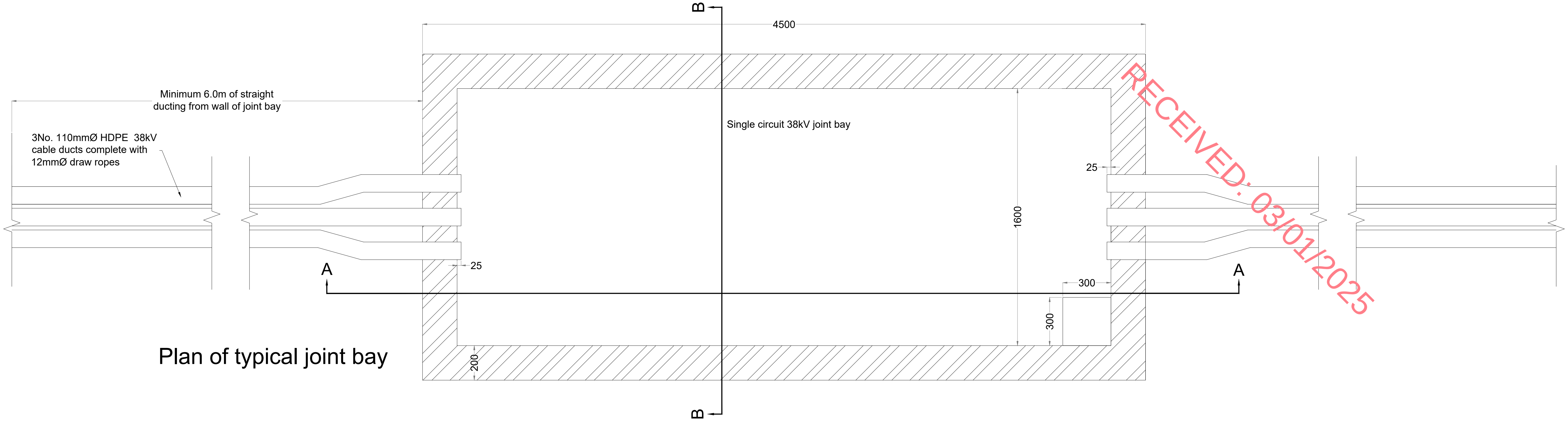
4.3.3.2 Spoil Management

The quantity of spoil generated and requiring management on the Site has been calculated, as presented in Table 4-3 below.

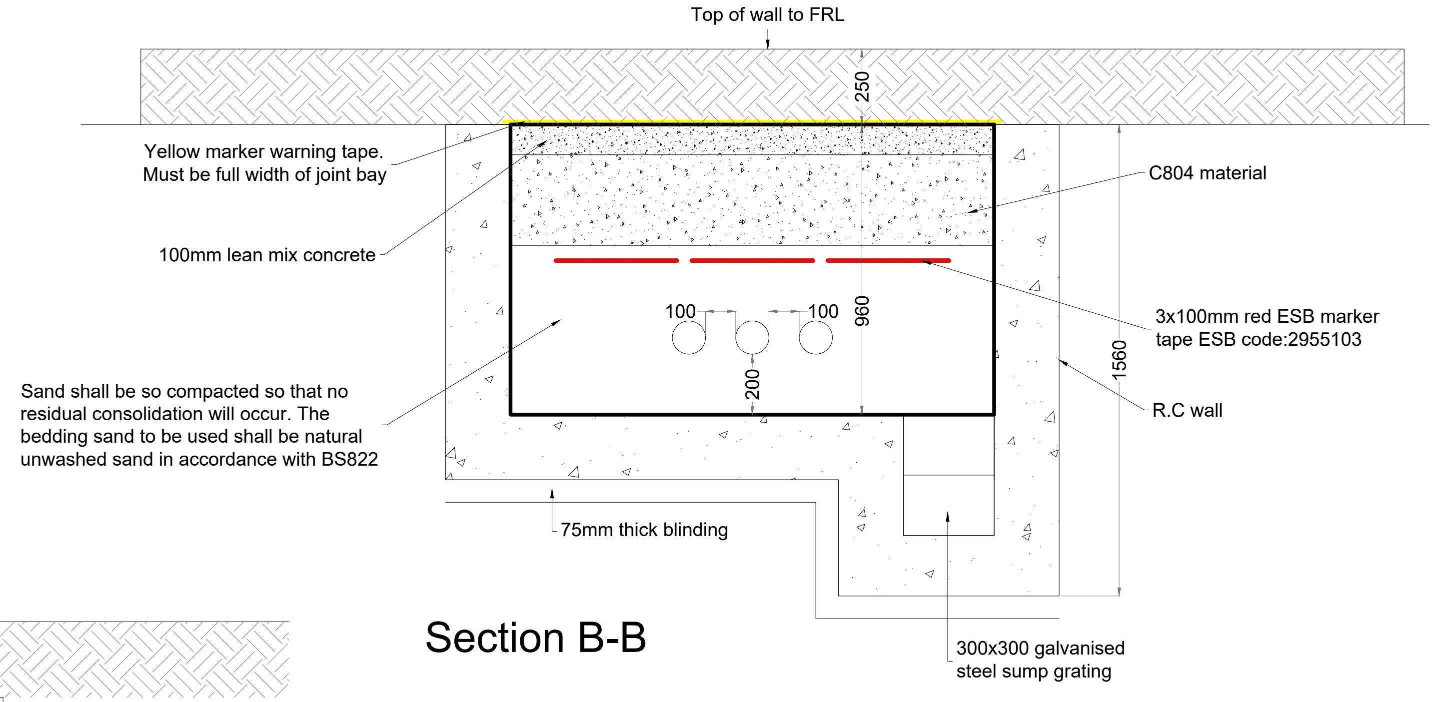
Table 4-3 Spoil Volumes

Development Component	Spoil Volume(m3) (approx.)
Proposed Wind Farm	
7 no. Turbines and Hardstanding Areas (including foundations)	33,850
Access Roads (including met mast and hardstands)	12,490
Temporary Construction Compounds	2,770
Total	49,110
Proposed Grid Connection	
Onsite Substation (including temporary construction compound)	1,330
Cabling Trench	13,830
Total	15,160
Total	64,270
Total (including 10% contingency)	70,700

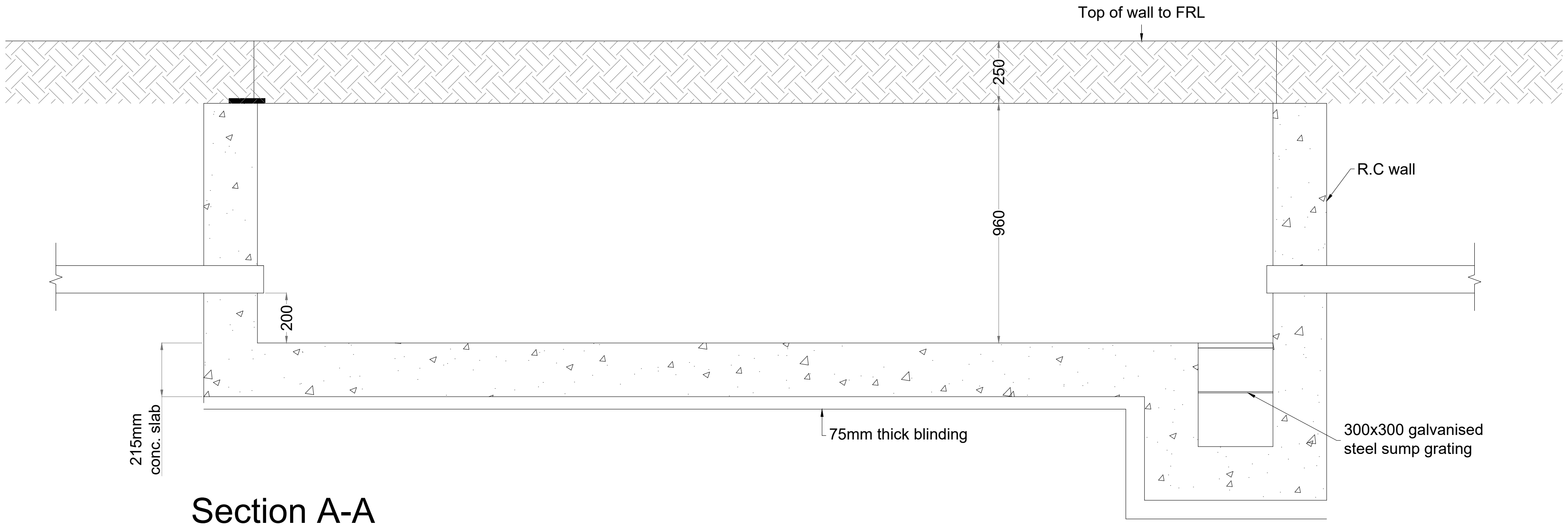
Note: A contingency factor of 10% has been applied and is included to the excavated spoil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the Site.



Plan of typical joint bay



Section B-B



Section A-A

PROJECT TITLE: **Briskalagh Renewable Energy Development**

DRAWING TITLE: **Standard 38kV Joint Bay Detail**

PROJECT No.:	DRAWING No.:	SCALE:
230502	Figure 4-23	1:25 @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION:
KD	EmcC	08.10.2024	P01

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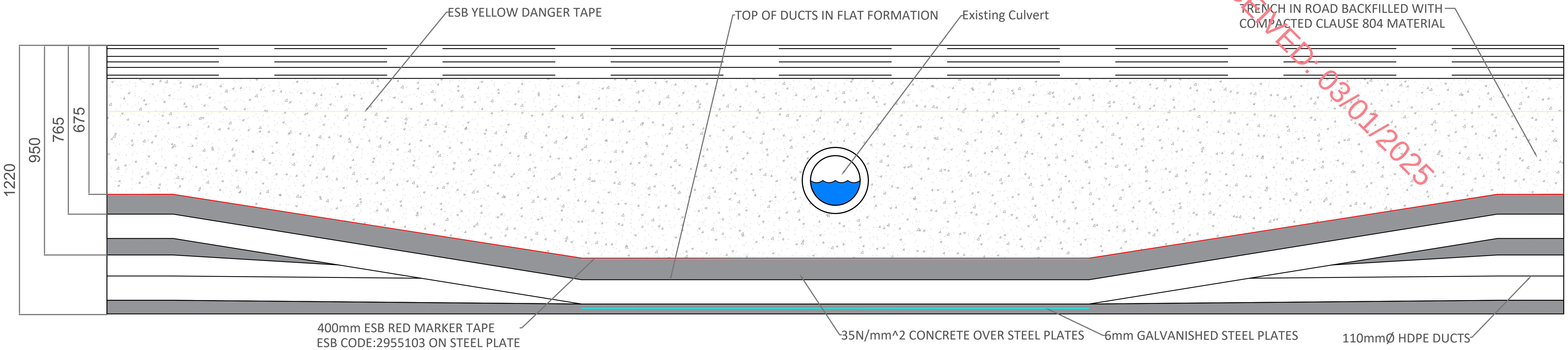
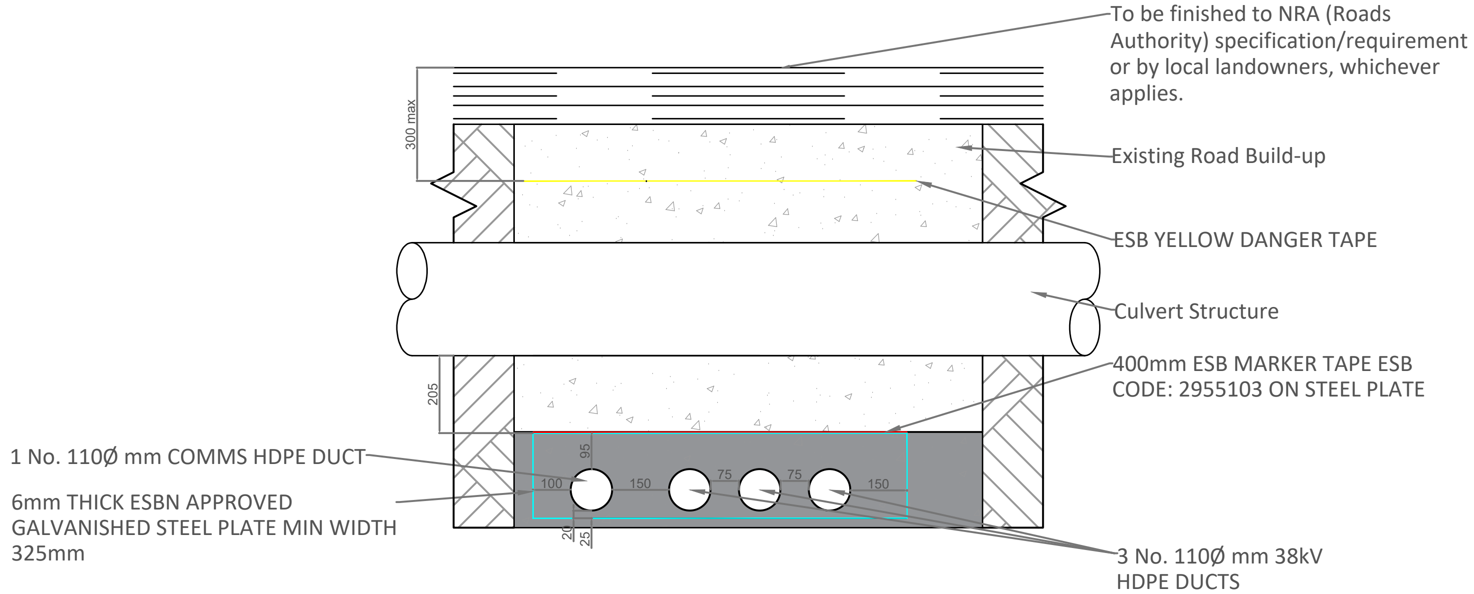


Option B - Flatbed Under Existing Culvert 38kV

SCALE 1:20



Option B - Flatbed Under Existing Culvert 38kV

SCALE 1:20

PROJECT TITLE: Briskalagh Renewable Energy Development			
DRAWING TITLE: Standard 38kV Culvert Detail - Flatbed Under Existing Culvert			
PROJECT No.: 230502	DRAWING No.: Figure 4-24	SCALE: As Shown @ A3	
DRAWN BY: KD	CHECKED BY: EmcC	DATE: 07.10.2024	REVISION.: P01

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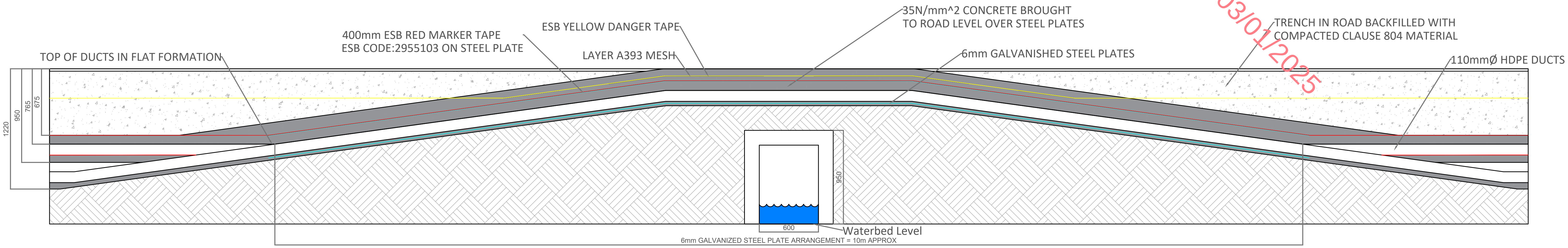
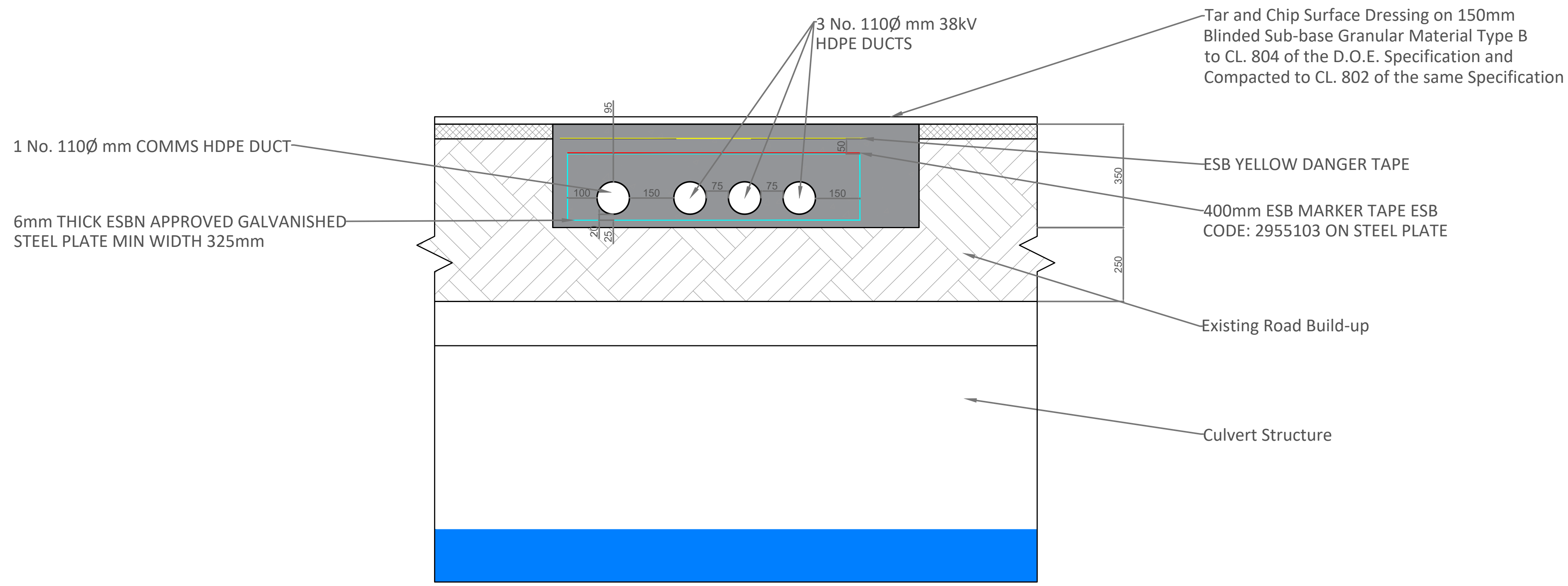


Option C - Flatbed Over Existing Culvert 38kV

SCALE 1:40



Option C - Flatbed Over Existing Culvert 38kV

SCALE 1:20

PROJECT TITLE: **Briskalagh Renewable Energy Development**			
DRAWING TITLE: **Standard 38kV Culvert Detail - Flatbed Over Existing Culvert**			
PROJECT No.: 230502		DRAWING No.: Figure 4-25	SCALE: As Shown @ A3
DRAWN BY: KD	CHECKED BY: EmcC	DATE: 07.10.2024	REVISION.: P01

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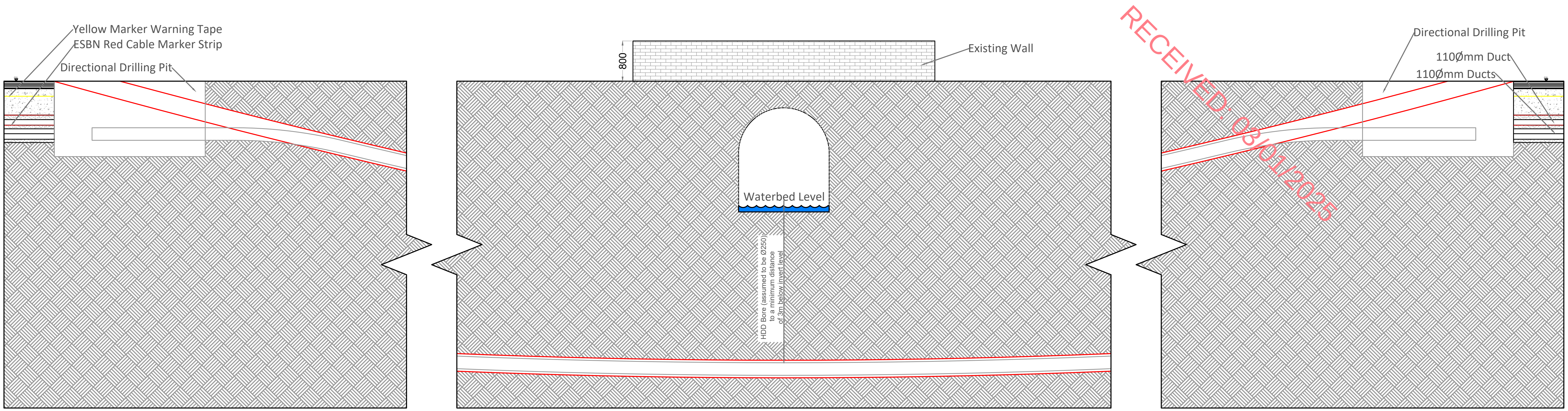
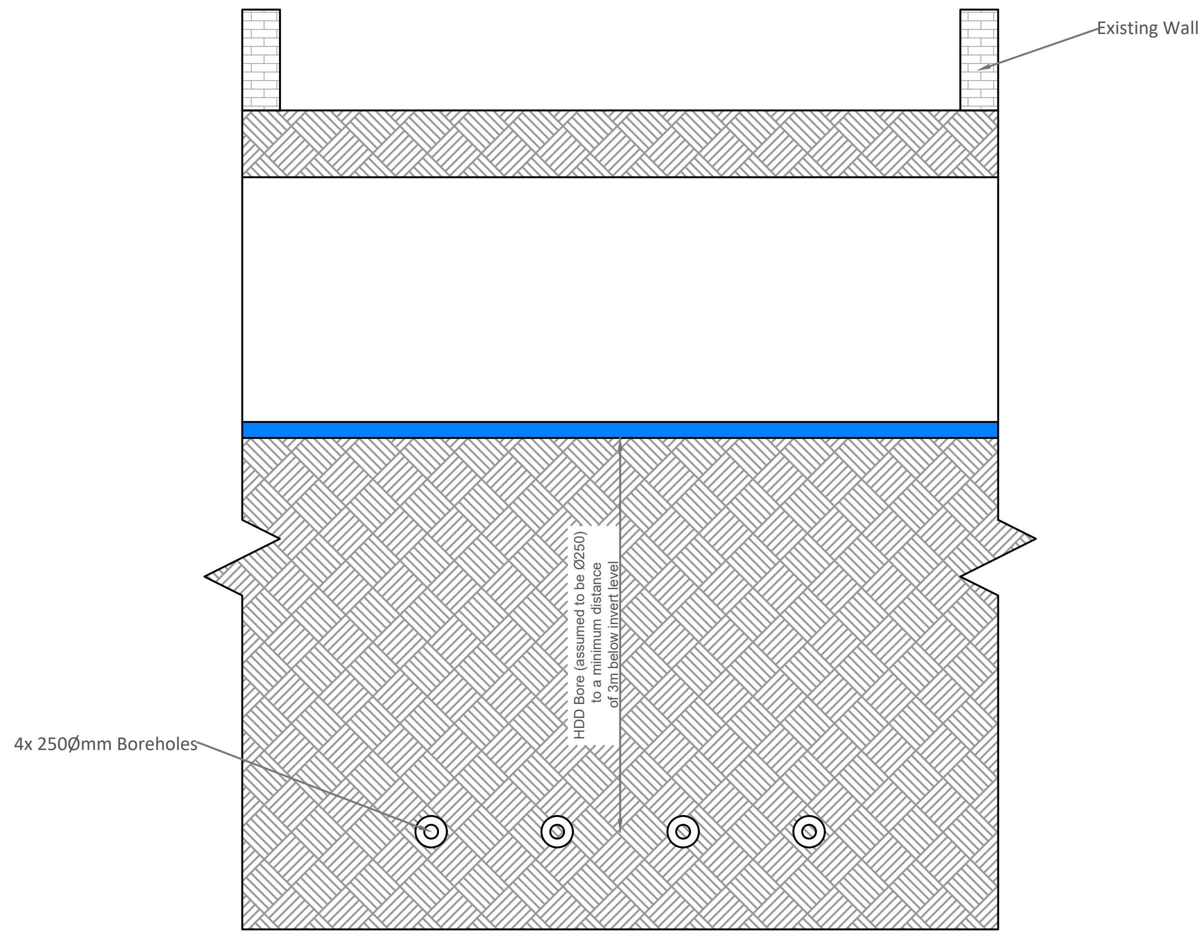


Option D Standard Horizontal Directional Drill Under Existing Watercourse Crossing

SCALE 1:80



Option D Standard Horizontal Directional Drill Under Existing Watercourse Crossing

SCALE 1:60

PROJECT TITLE:
Briskalagh Renewable Energy Development

DRAWING TITLE:
Standard 38kV Detail - Horizontal Directional Drill

PROJECT No.:	DRAWING No.:	SCALE:
230502	Figure 4-26	As Shown @ A3

DRAWN BY:	CHECKED BY:	DATE:	REVISION.:
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It is considered that any spoil generated by the proposed cabling trench will be removed and either accommodated within the Spoil Management Areas within the Proposed Wind Farm site or transported to a Materials Recovery Facility (MRF) where necessary. Any road material containing tar will be managed separately. Further detail on this can be found in Chapter 15: Traffic and Transport.

There will be a requirement to remove some sections of forestry and linear vegetation i.e. treelines and hedgerows to facilitate the Proposed Project infrastructure, however, this will not involve the excavation of tree stumps outside of the infrastructure footprint and as such does not affect the excavation volumes.

4.4 Site Activities

4.4.1 Environmental Management

All proposed activities on the Site will be provided for in a Construction and Environmental Management Plan (CEMP). A CEMP has been prepared for the Proposed Project and is included in Appendix 4-2 of this EIAR. The CEMP sets out the key environmental considerations to be considered by the contractor during construction of the Proposed Project. The CEMP includes details of drainage, spoil management and waste management, and details the mitigation and monitoring measures to be implemented in order to comply with the environmental commitments outlined in the EIAR. The contractor will be contractually obliged to comply with all such measures. In the event planning permission is granted for the Proposed 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.

4.4.2 Refuelling

Wherever possible, vehicles will be refuelled off-site, particularly for regular road-going vehicles. On-site refuelling of machinery will be carried out at designated refuelling areas at various locations throughout the Site. Heavy plant and machinery will be refuelled on-site by a fuel truck that will come to the Site as required on a scheduled and organised basis. All refuelling will be carried out outside designated watercourse buffer zones. 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 used during refuelling operations as required. All plant and machinery will be equipped with fuel absorbent material and pads to deal with any event of accidental spillage.

4.4.3 Concrete Deliveries

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching.

Before leaving the Site, washing of the delivery truck will be minimised and restricted to designated wash out areas. Wash out will be restricted to the concrete lorry's chute only. Concrete trucks will be washed out fully at the off-site batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit or equivalent. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids will be removed off-site by an appropriately authorised waste collector for disposal at an authorised waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plates 4-4 and Plate 4-5 below.

Plate 4-4 Concrete washout area


Plate 4-5 Concrete Wash Out Area

The areas are 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 to an appropriately authorised facility as necessary. Any residual 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, as noted above, by an appropriately authorised waste collector for disposal at an authorised waste facility.

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries may be carried out outside normal working hours 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 completed in a single day per turbine.

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

- Concrete truck bodies will not be washed out on the Site but will be directed back to their batching plant for washout.
- 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 foundations 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.
- 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.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted at the Site.

4.4.3.1 Concrete Pouring

Given the scale of the turbine foundation concrete pours the pours will be planned approximately 1 week in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These will include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- Restricting concrete pumps and machine buckets from slewing over watercourses (including drains and ditches) while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- Ensuring that covers are available, and used, when necessary, 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 or equivalent.

4.4.4 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads and the Proposed Grid Connection underground cable route 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 temporary construction compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, as 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.

4.4.5 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. It is not anticipated that vehicle or wheel washing facilities will be required as part of the construction phase of the Proposed Project as site roads will be formed before road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). The

Proposed Wind Farm site roads will be well finished with 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.

4.4.6 Waste Management

The CEMP, Appendix 4-2 of this EIAR, provides a waste management plan (WMP) which outlines the best practice procedures during the construction phases of the project. The WMP outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Project. Disposal of waste will be seen as a last resort. The WMP was produced in line with the EPA's 2021 document '*Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' 2021*[4].

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

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

The WMP 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.

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[4] *EPA 2021 Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects. Available at: https://www.epa.ie/publications/circular economy/resources/CDWasteGuidelines.pdf*

4.5 Site Access and Transportation

4.5.1 Site Entrances

The location of construction phase and operational phase Site access points are shown in Figure 4-2. A Traffic Management Plan is included in Chapter 15 and Appendix 15-2 of this EIAR. In the event planning permission is granted for the Proposed Project, an updated Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

Main Construction and Operational Site Entrance

A general construction entrance will be constructed on the L-5024 at the north of the Site. This entrance will be used as the main entrance for construction traffic throughout the construction phase. Appropriate sightlines will be established at the proposed Site entrance for the safe egress of traffic during the construction phase. On completion of the construction phase, this Site entrance will be reduced in size and gated for security, and will be used as an operational Site entrance.

Temporary Access Road

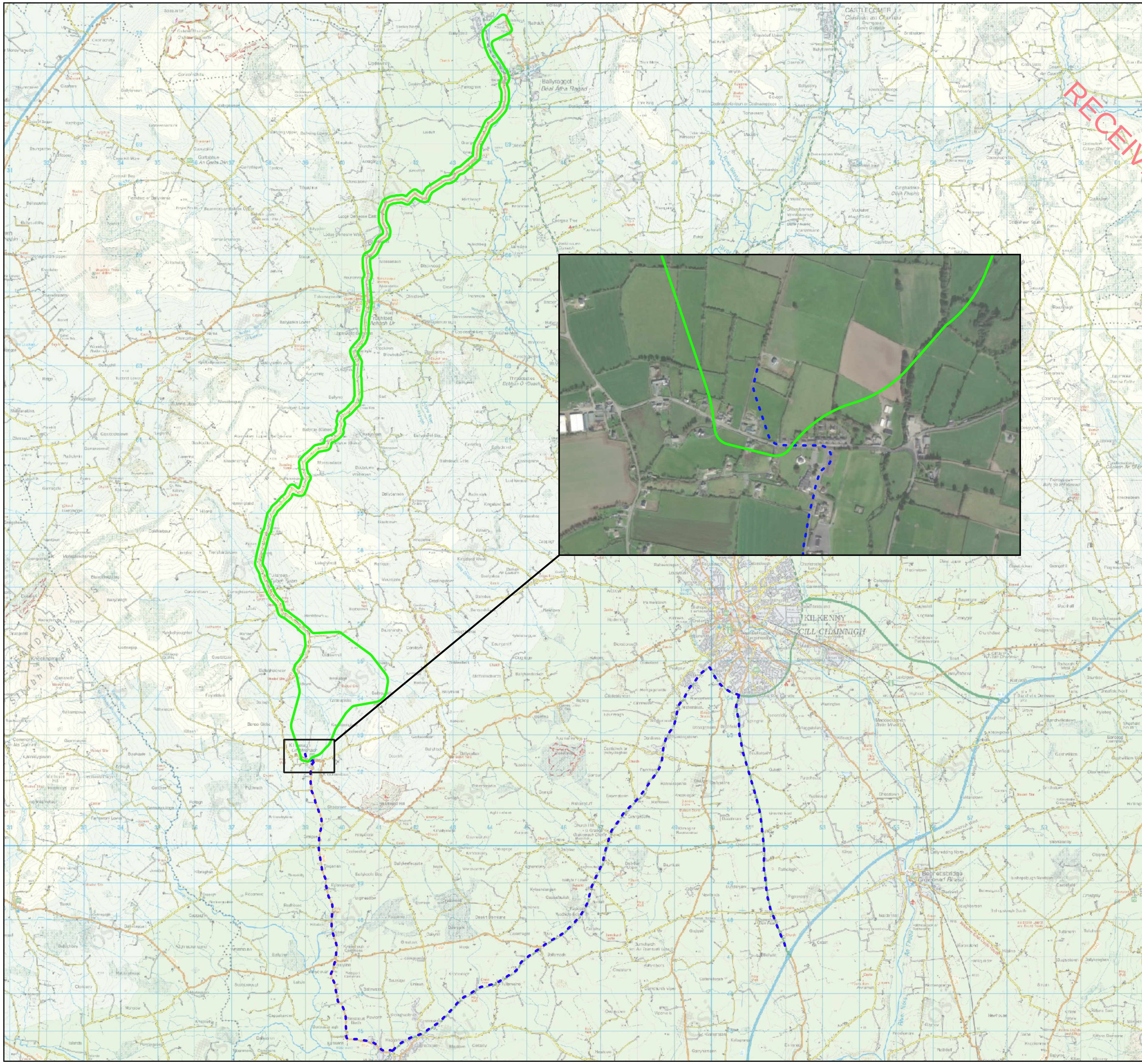
A temporary access road will be constructed on the L-1009 in the south of the Site. This will facilitate the delivery of abnormal loads and concrete deliveries for the turbine foundations. This new entrance was subject to an autotrack assessment to identify the turning area required, as described in Chapter 15, Section 15.2 of the Traffic and Transport Assessment. Appropriate sightlines will be established to the east and west of the temporary access road for the safe egress of traffic. Following the turbine commissioning, this entrance will be reinstated. This temporary access road will not be used for general construction traffic, or HGV deliveries (except concrete deliveries).

4.5.2 Turbine Component Transport Route

There are a range of ports within the island of Ireland that have proven capability to accept and store large wind turbine components. These ports include Cork, Foynes, Galway and Dublin ports. Furthermore, subsequent access to the national motorway network during transportation from these ports has been demonstrated. The facilities within the ports and access to and from the ports is continually being upgraded as part of general improvements. It is on this basis that it is not foreseen that this project will require any material change to the port selected should the project be consented and enter into the construction phase.

For the purpose of this EIAR, Waterford has been selected and assessed to facilitate turbine delivery to the Site. It is proposed that the large wind turbine components will be delivered from Belview Port, Waterford to the Site via the M9, exiting at Junction 9 onto the N10 heading north, joining the N76, a combined stretch of 22.4km along the national road network. The turbine components will then turn on to the R695 north of Callan, travelling along the regional road for approx. 9.2km, before turning onto the L1009 in Kilmanagh for approx. 150m before reaching the proposed new turbine component entrance at the south of the Site. The proposed route is shown on Figure 4-27. All deliveries of turbine components to the Site will follow this route.

A turbine with the maximum blade length of 81.5 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 86.9 metres, including the blade which overhangs the back of the vehicle. The total length of the tower transporter is 47.7 metres with the axles located at the front and rear of the load with no overhang.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Delivery Route

N

Drawing Title: Proposed Turbine Delivery Route	
Project Title: Briskalagh Renewable Energy Development	
Drawn By: MC	Checked By: EMC
Project No.: 230502	Drawing No.: Figure 4-27
Scale: 1:100,000	Date: 2024-10-09

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The vehicles used to transport the nacelles will be similar to the tower transporter. All other vehicles requiring access to the Site will be smaller than the large turbine component transport vehicles. The turbine delivery vehicles have been modelled in the swept path assessments of identified pinch points along the proposed turbine delivery route, as detailed in Chapter 15: Material Assets of this EIAR.

There are no significant turbine delivery route accommodation works required to facilitate the delivery of components to the Site.

4.5.3 Construction Materials Transport Route

Construction materials will be delivered to the Site via selected haul routes that will be determined based on the source of the construction material. Quarries within a 20km range of the Site that could potentially provide stone and concrete are illustrated on Figure 4-28. Traffic movements generated by the Proposed Project are discussed in Section 15.1 of Chapter 15, Material Assets.

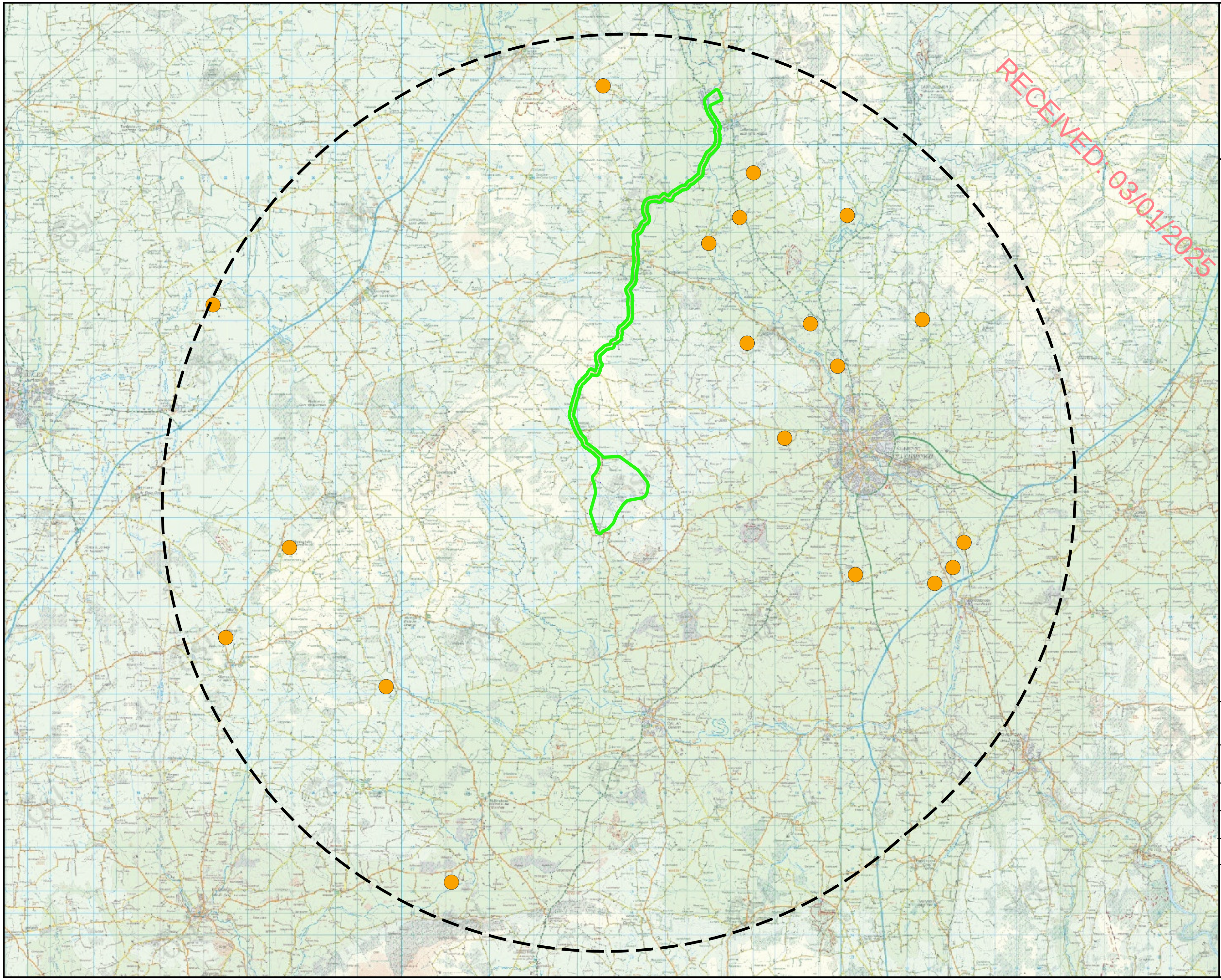
4.5.3.1 Traffic Management

The need to transport turbine components on the public roads is not an everyday occurrence in the vicinity of the Site. 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 deliver oversized loads from origin to destination. With just under 400 No. wind farms already built and operating in Ireland (Republic and Northern Ireland combined, as per latest available figures on www.windenergyireland.com), transport challenges are something the wind energy industry and specialist transport sector has become particularly adept in finding solutions to.

As an alternative solution for transport of turbine blades, alternative delivery systems are available. For example, delivery vehicles fitted with blade adapters 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 4-6 below shows an example of a blade adapter.

Plate 4-6 Blade Adaptor Transport System

A detailed Traffic Management Plan (TMP) will be provided specifying details relating to traffic management and included in the Construction Environmental Management Plan (CEMP) prior to the commencement of the construction phase of the Proposed Project. The TMP will be agreed with the local authority and An Garda Síochána prior to construction works commencing on-site. The TMP will include:



Map Legend

- EIAR Site Boundary
- Quarries
- 20km Proposed turbine buffer

Drawing Title	Licensed Quarries within 20km
Project Title	Briskalagh Renewable Energy Development
Drawn By: MC	Checked By: EMC
Project No.: 230502	Drawing No.: Figure 4-28
Scale: 1:225,000	Date: 2024-10-09

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- 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 Proposed Wind Farm site may be made in convoys of three to four vehicles at a time, and 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, usually at night, to avoid disruption to work and school-related traffic.

Prior to the Traffic Management Plan being finalised, a full dry run of the transport operation along the potential routes 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 the relevant Authorities. All turbine deliveries will be provided for in a Traffic Management Plan which will be finalised in advance of oversized load deliveries, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. Such a traffic management plan is typically submitted to the relevant Authorities 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.

General construction deliveries and staff will access the site via the proposed new general construction entrance on the L-5024 at the north of the Site, as described in Section 4.5.3 above. As set out in Chapter 15, Section 15.1.2.3 and shown in Figure 15-1a of this EIAR, in order to separate traffic movements travelling to and from the site it is proposed that all traffic accessing the site will travel east along the L5024 and turn right into the site, with all traffic exiting the site turning right out onto the L5024. It is proposed that temporary traffic management measures will be introduced at this location during the construction phase, including signs and the presence of a Flagman on days with high volumes of construction material deliveries.

4.6 Site Drainage

4.6.1 Introduction

The drainage design for the Proposed Project has been prepared by Hydro Environmental Services Ltd (HES). The drainage design has been prepared based on experience of the project team on other wind farm sites and the best practice guidance documents referred to in the References section of the EIAR.

The protection of the watercourses within and surrounding the Site, and downstream catchments that they feed is important to establish the most appropriate drainage proposals for the Proposed Project.

The drainage design for the Proposed Project has been planned with the intention of having no significant negative impact on the water quality of the Site and its associated rivers, and consequently no impact on downstream catchments and ecological ecosystems. The assessment of potential impacts on hydrology and hydrogeology due to the construction, operation and decommissioning of the Proposed Project is included in Chapter 9: Hydrology and Hydrogeology.

No routes of any natural drainage features will be altered as part of the Proposed Project. Turbine locations and associated new roadways were designed to avoid natural watercourses with existing roads to be used wherever possible. There will be no direct discharges to any natural watercourses or land drains, 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 and drains. Buffer zones of 50m around the existing natural drainage features have been used to inform the layout of the Proposed Project.

4.6.2 Existing Drainage Features

It is proposed that 4 no. new clear span or bottomless box culverts watercourse crossings are required. while 11 no. drain crossings will be required or upgraded for the Proposed Project. The drains are typically field drains which run along hedgerows and field headlands.

There will be no direct discharges to natural watercourses or drains. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from watercourses. 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 post treatment, 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.

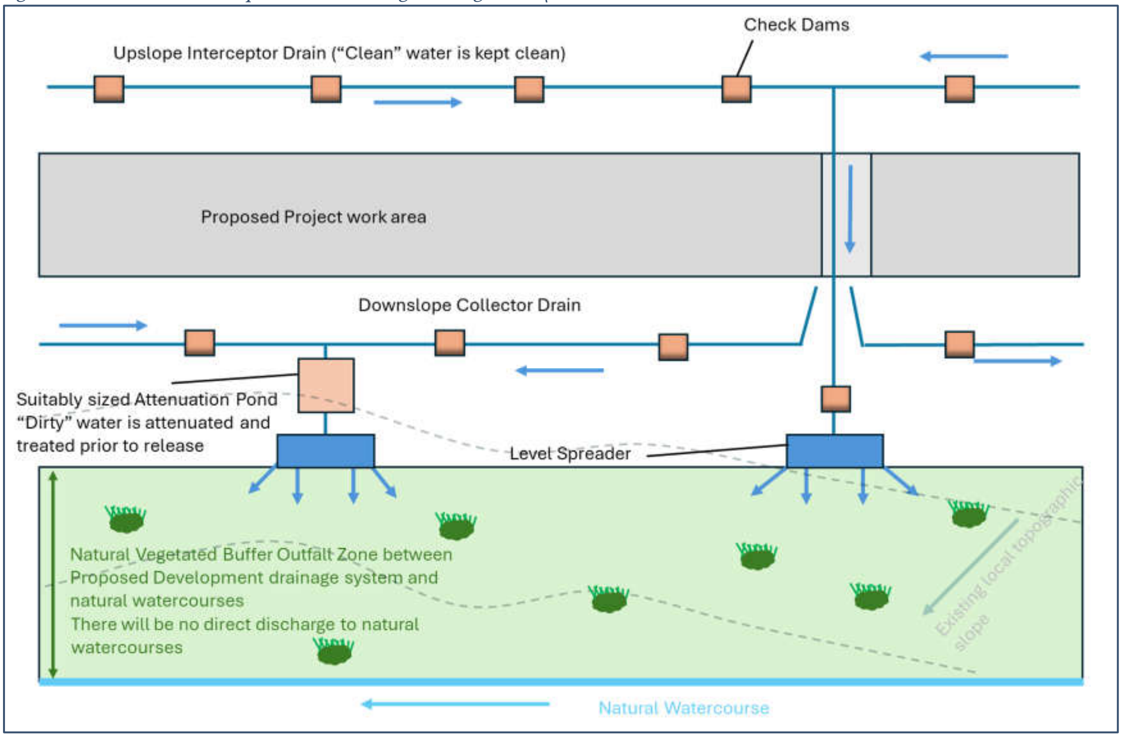
4.6.3 Drainage Design Principles

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 drainage as appropriate.
- Daily inspection and recording of surface water management system by on-site Environmental 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 or equivalent system if required.

Drainage water from any works areas of the Site 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 schematic of the proposed site drainage management is presented in Figure 4-29 below.

Figure 4-29 Schematic of Proposed Site Drainage Management (



4.6.4 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 Appendix 4-3 to this EIAR. The drainage design employs the various measures further described below and is cognisant of the following guidance documents:

- Forestry Commission (2011): Forests and Water UK Forestry Standard Guidelines, Fifth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte Forest (2013): Operations and 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;
- Scottish Natural Heritage, 2019 Good Practice During Wind Farm Construction
- UK Guidance Note 2020 GPP1 - General Guide to Prevention of Pollution (UK Guidance Note);
- UK Guidance Note 2018 GPP5 – Works or Maintenance in or Near Watercourses
- Construction Industry Research and Information Association (CIRIA) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006); and,
- Construction Industry Research and Information Association (CIRIA) 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

4.6.4.1 Interceptor Drains

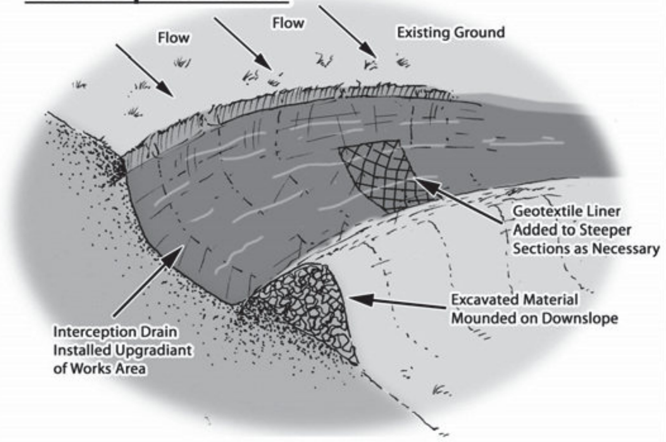
Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the Site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert 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, turbines 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 as 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 4-30 below shows an illustrative drawing of an interceptor drain.

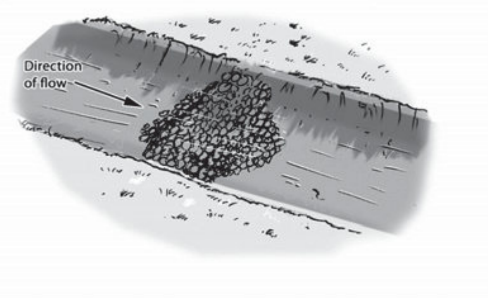
The velocity of flow in the interceptor will be controlled by check dams (discussed further below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the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

Drainage Design Measures

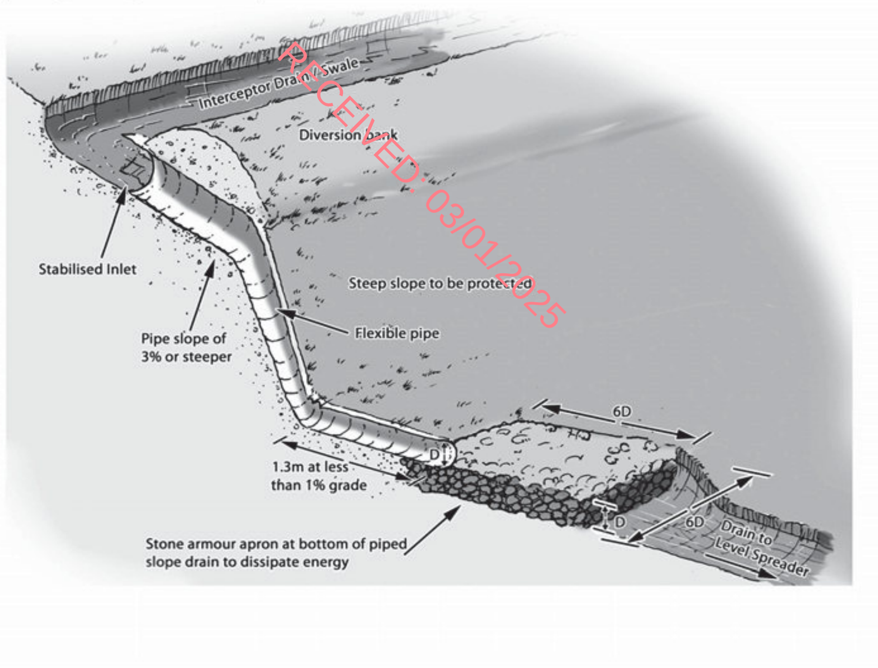
Interceptor Drain



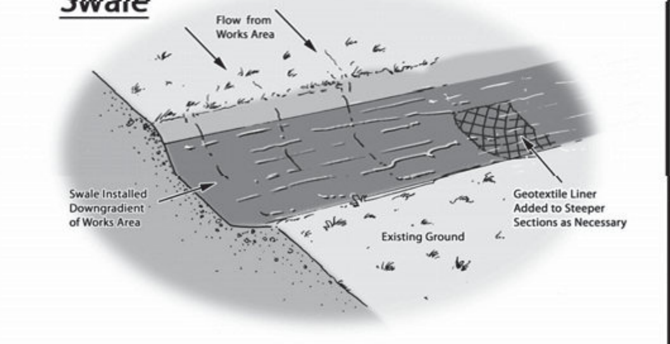
Check Dam (Stone Dam in Drain)



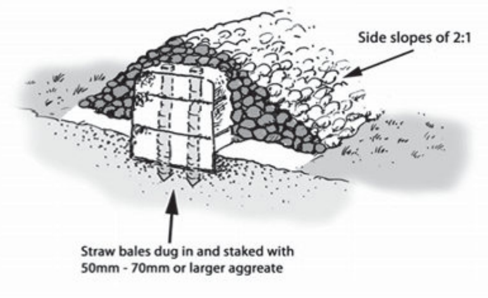
Slope Pipe Drain



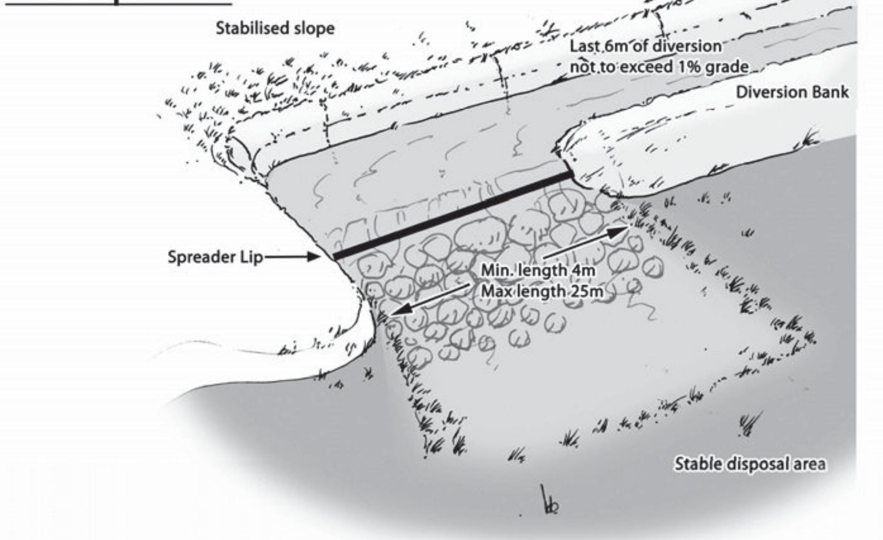
Swale



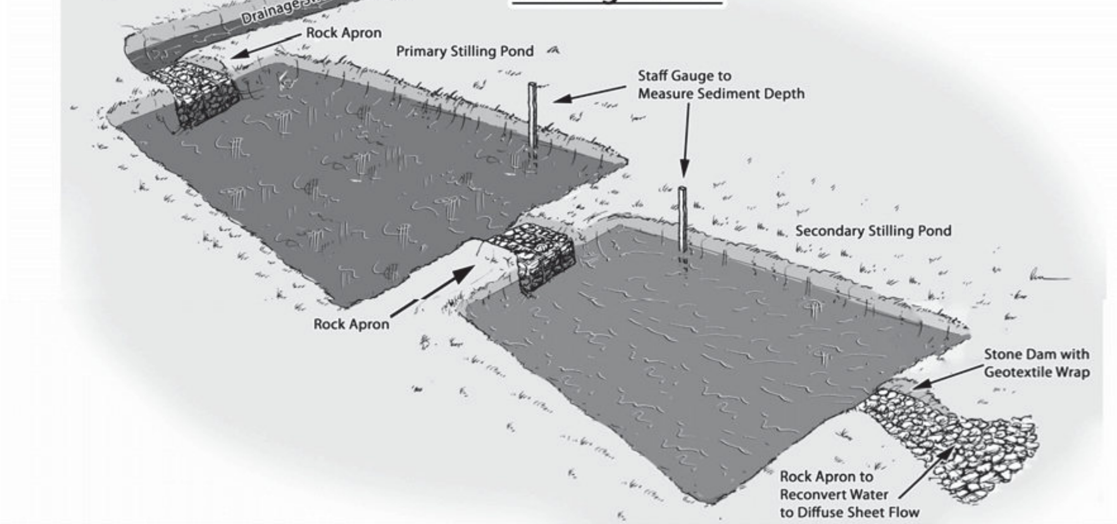
Check Dam
(Straw Bale & Stone Dam - Cross Section)



Level Spreader



Stilling Ponds



MKO	Drawing Title: Drainage Design Measures		Drawing No. Figure 4-30		Scale: NTS
	Project Title: Briskalagh Renewable Energy Development				Date: 1.10.2024
	Drawn By: Eoin McCarthy	Checked By: Michael Watson		Project No. 230502	

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4.6.4.2 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 4-30 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.

4.6.4.3 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 4-30 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.

4.6.4.4 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 4-30, 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 (discussed below) will be used to transfer the water to a suitable location.

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

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

4.6.4.5 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 4-30 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 the drain at the top of the pipe will be repaired promptly.

4.6.4.6 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.

4.6.4.7 Stilling Ponds (Settlement Ponds)

Stilling ponds will be used to attenuate runoff from works areas of the Site 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 4-30, 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.

4.6.4.8 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 4-31 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.

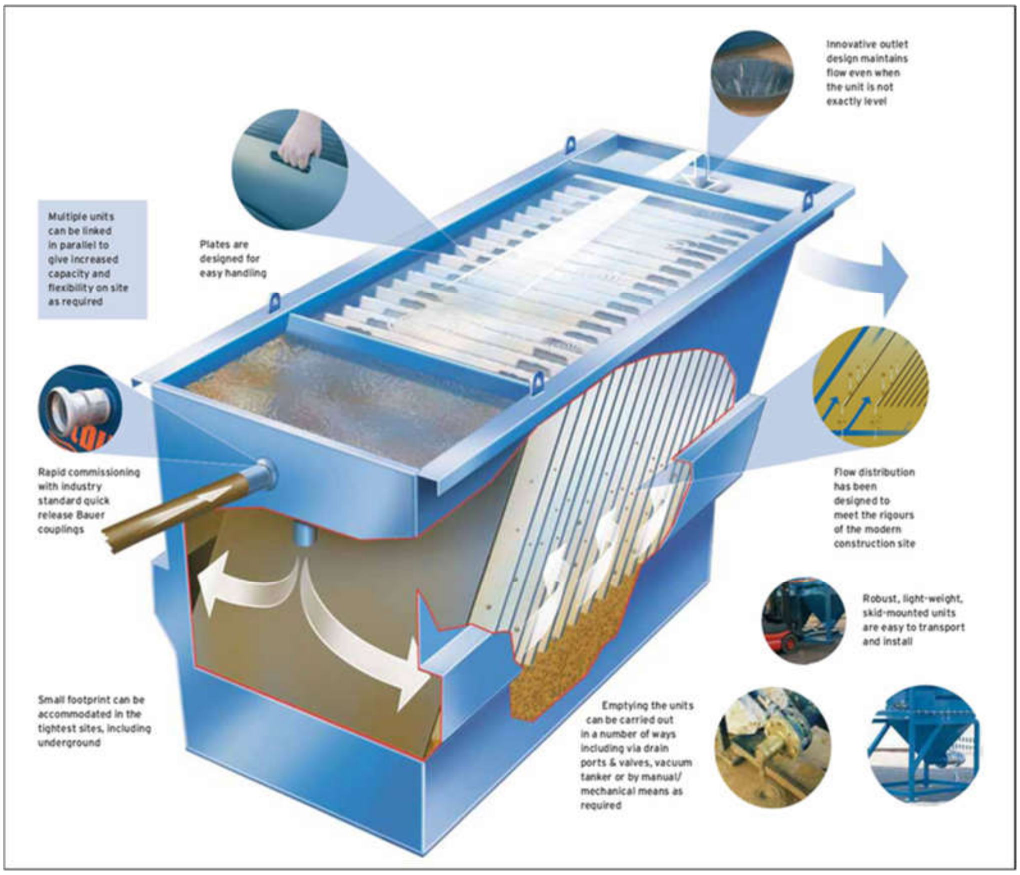


Figure 4-31 Siltbuster (Source: https://www.siltbuster.co.uk/sb_prod/siltbuster-fb50-settlement-unit/)

4.6.4.9 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 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 4-7 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. Silt Bag with water being pumped through.

Plate 4-7 Silt Bag with water being pumped through.

4.6.4.10 Sedimats

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

4.6.4.11 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 all cases, culverts will be oversized to allow mammals to pass through the culvert.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling 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.

4.6.4.12 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, 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 Appendix 4-3.

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.

4.6.4.13 Oil Interceptor

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

4.6.4.14 Tree Felling Drainage

Tree felling will be required within and around Proposed Project footprint to allow for the construction of the proposed turbines, access roads, underground cabling, and the other ancillary infrastructure. The felling will not be undertaken simultaneously with construction groundworks. Keyhole felling to facilitate construction works will take place prior to groundworks commencing. A Harvest Management Plan is included as Appendix 4-4.

During tree felling there is a potential to generate silts and sediments in surface water runoff due to tracking of machinery and disturbance of the ground surface etc, however mitigation is provided in Chapter 9 Hydrology and Hydrogeology with regard surface water quality protection for this activity which is summarised below. Also, prior to the commencement of tree felling for subsequent road construction the following key temporary drainage measures will be installed:

- All existing dry forestry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using forestry check dams/silt traps;
- Clean water diversion drains will be installed upgradient of the works areas;
- Check dams/silt fence arrangements (silt traps) will be placed in all existing forestry drains that have surface water flows and also along existing forestry roadside drains; and,
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone.

To protect watercourses, the following measures will be adhered to during all keyhole/tree felling activities.

- All relevant measures, best practice methods and requirements set out in Chapter 9 of the EIAR will be adhered to including Forestry & Water Quality Guidelines, Forest Harvesting & the Environment Guidelines and the Forest Protection Guidelines.
- 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 collecn 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.

4.6.5 Cable Trench Drainage

Cable trenches are typically constructed in short, controlled 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 up-gradient side of the trench and is temporarily sealed/smoothed over, using the back of the excavator bucket. Should any rainfall cause runoff from the excavated material, the material is therefore collected and 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 one of the on-site designated spoil management areas or used for landscaping and reinstatement of other areas elsewhere on-site. Along sections of the Proposed Grid Connection underground cabling route that are further removed from the Proposed Wind Farm site it may be more practical to transport excess excavated material to a nearby licenced facility.

On steeper slopes, silt fences, as detailed in Section 4.6.4.12, 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.

4.6.6 Site Drainage Management

4.6.6.1 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures detailed above, will be brought on-site in phases as they are required during the construction phase. A sufficient number of straw bales, clean drainage stone, terram, stakes, etc. will be kept on-site at all times to implement the drainage design measures as necessary. The drainage measures detailed in the above will be installed prior to, or at the same time as the works they are intended to drain.

4.6.6.2 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. 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.

4.6.6.3 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 Environmental Clerk of Works (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.

4.6.7 Drainage Maintenance

An inspection and maintenance plan for the drainage system on-site will be prepared in advance of commencement of any works on the Proposed Project. Regular inspections of all installed drainage features will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water at parts of the systems where it is not intended. The inspection of the drainage system will be the responsibility of the ECoW or the Project Hydrologist. The drainage inspection and maintenance plan are included in the CEMP in Appendix 4-2 of this EIAR.

If necessary, any excess sediment build up behind check dams will be removed. For this reason, check dams will be inspected and maintained weekly during the construction phase of the Proposed Project to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

Check dams will also be inspected weekly during the construction phase of the Proposed Project and following rainfall events to ensure the structure of the dam is still effective in controlling flow. Any scouring around the edges of the check dams or overtopping of the dam in normal flow conditions will be rectified by reinforcement of the check dam.

Drainage swales will be regularly inspected for evidence of erosion along the length of the swale. If any evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.

Silt traps will be inspected weekly during the construction phase of the Proposed Project and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

The frequency of drainage system inspections will be reduced following completion of the construction phase of the Proposed Project. The Project Hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system.

4.7 Construction Management

4.7.1 Construction Timing

It is estimated that the construction phase of the Proposed Project will take approximately 18-24 months from commencement of civil works to the commissioning of the wind turbines. The commencement of works where the removal of vegetation is required, or where works take place in sensitive breeding habitats will be scheduled to occur outside the bird breeding season (1st of March to 31st of August) to avoid any potentially significant effects on nesting birds. Construction where removal of vegetation is required, or where works take place in sensitive breeding habitats may commence from September to March so that construction activities are ongoing by the time the next bird breeding season comes around and can continue throughout that bird breeding season.

Construction activities will be carried out during normal daytime working hours (i.e., 0700 – 1900hrs Monday to Saturday). However, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e., concrete pours) or to accommodate delivery of large turbine components along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be notified in advance to the Local Authority.

4.7.2 Construction Sequencing

The construction phase can be broken down into three main overlapping phases and will take approximately 12-18 months to complete 1) civil engineering works - 10 months, 2) electrical works including grid connection works - 9-12 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 entrances.
- Construct new Site roads to temporary compound.
- Clear and hardcore area for temporary Site offices. Install same.
- Construct bunded area for oil storage.
- Construct new Site roads and hard-standings and crane pads.
- Construct drainage ditches, culverts etc. integral to road construction.
- Excavate for turbine foundations. Place blinding concrete to turbine foundation 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 concrete cures.
- Excavate trenches for Site cables, lay cables and backfill. Provide ducts at road crossings.
- Backfill turbine foundations, and landscape 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

- Clear and hardcore area for temporary Site offices. Install same
- Clear and Hardcore area for substation footprint
- Construct bases/plinths for substation 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 cabling.

Turbine and Meteorological Mast Erection

- Commission erection crane(s) and deliver components to turbine hardstands.
- Erect towers, nacelles and blades.
- Complete electrical installation.
- Install meteorological mast.
- Commission and test turbines.
- Complete Site works, reinstate Site.
- Remove temporary Site offices. Provide any gates, landscaping, signs etc. which may be required.

All relevant Site Health & Safety procedures, in accordance with the relevant Health and Safety Legislation and guidance (listed in Section 5.10.2.2.1 of this EIAR), including the preparation of the Health & Safety Plan, erection of the relevant and appropriate signage on site, inductions and toolbox talks will take place prior to and throughout the construction phase of the Proposed Project. Further details of on-site health, safety and welfare are included in Chapter 5 of this EIAR.

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

Table 4-4 Indicative Construction Schedule

		Year 1				Year 2	
ID	**Task Name**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**
1	Site Health and Safety	■	■	■	■	■	■
2	Grid Connection	■	■	■	■	■	
3	Site Compounds	■					
4	Site Roads	■	■	■	■	■	
5	Substation and Electrical Works		■	■	■	■	■
6	Turbine Hardstands		■	■	■		
7	Turbine Foundations			■	■	■	
8	Backfilling and Landscaping				■	■	■
9	Turbine Delivery and Erection				■	■	■
10	Substation Commissioning						■
11	Turbine Commissioning						■

4.7.3 Construction Phase Monitoring and Oversight

The requirement for a CEMP to be prepared in advance of any construction works commencing on any wind farm development site and submitted for agreement to the Planning Authority is now well-established. The procedures for the implementation of the mitigation measures outlined in the CEMP and their completion is audited by way of a CEMP Audit Report.

The CEMP Audit Report will list 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 adherence to mitigation measures must be the subject of regular review and audit during the full construction stage of the project. If 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 4-2 of this EIAR. The CEMP includes details of drainage, 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 the CEMP 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.

4.8 Construction Methodologies

This section of the chapter outlines the construction methodologies to be used for the various elements of the Proposed Wind Farm and Proposed Grid Connection. Further details in relation to construction methodologies is included in Section 2 of the CEMP, included as Appendix 4-2 of this EIAR.

4.8.1 Proposed Wind Farm

4.8.1.1 Turbine and Met Mast Foundations

Each of the turbines to be erected on the Site will have a reinforced concrete base that is installed below the finished ground level. It is anticipated that the turbine foundations will be formed on competent strata (i.e., bedrock or subsoil of sufficient load bearing capacity). Where the ground conditions do not have a competent stratum of sufficient load bearing capacity, piling method will be utilised. A methodology for piled foundations is included in Section 2 of the CEMP, Appendix 4-2 of this EIAR.

Overburden will be stripped off the foundation area to a suitable formation using a 360^{o} excavator and will be stored locally for later reuse in backfilling around the turbine foundation. A two-metre-wide working area will be required around each turbine foundation, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. Material excavated to create the working area will be stored locally for later reuse in backfilling and/or landscaping the working area around the turbine foundation. The excavated material will be sealed using the back of the excavator bucket and surrounded by silt fences to ensure sediment-laden run-off does not occur.

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

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

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

The anchor cage is delivered to the Site in 2 or more parts depending on the turbine type. A 360° excavator or crane with suitable approved lifting equipment will be used to unload sections of the anchor cage and reinforcing steel. The anchor cage is positioned in the middle of the turbine foundation base and is assembled accordingly. When the anchor cage is in final position it is checked and levelled by using an appropriate instrument. The anchor cage is positioned 250mm – 300mm from formation level by use of adjustable legs. Reinforcement bars are then placed around the anchor cage, first radial bars, then concentric bars, shear bars and finally the superior group of bars. Earthing material is attached during the steel foundation build up. The level of the anchor cage will be checked again prior to the concrete pour and during the concrete pour. As noted in Section 4.8.1.6 below, the transformer in each turbine is connected to the on-site substation through a network of buried electrical cables which are installed through the centre of the anchor cage.

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

Once the base has sufficient curing time it will be backfilled with suitable fill up to existing ground level and finished with the original material that was excavated.

4.8.1.2 Site Roads and Hardstand Areas

4.8.1.2.1 *New Site Access Road*

The construction methodology for the proposed new access roads and turbine hardstands is outlined as follows:

- Establish alignment of the new road from the construction drawings and mark out the centrelines with ranging rods or timber posts;
- All drainage measures prescribed in the detailed drainage design for the Proposed Project will be implemented around the works area;
- The road layout has been designed to avoid crossings of natural watercourses where possible;
- Where existing culverts are to be upgraded or extended, the works will be carried out to follow a method statement to be prepared in consultation with Inland Fisheries Ireland;
- The access tracks will be of single-track design with a width of 5m with localised widening at bends and changes in direction. (depending on the location within the Site)
- All spoil excavated will be managed on-site. It will be placed within the identified spoil management areas within the Site. Some topsoil may be temporarily stockpiled locally for reuse for landscaping purposes.
- The subsoil will be excavated down to a suitable formation layer of competent stratum;
- The road will be constructed using well-graded granular fill (imported or site-won), spread and compacted in layers typically of 200mm and a suitable capping layer to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be subject to detailed design by Project Engineer in

consultation with the Construction Manager based on the characteristics of the material and the compaction plant to be used;
- The new access roads will be constructed with a camber to aid drainage of surface water;
- Excavations side slopes shall not generally be greater than 1(V): 2 (H). Design slopes will be informed by the Geotechnical Engineer;
- At bends or steep inclines from the road, reflective snow poles will be erected to warn traffic on dark mornings and evenings that there is a turn in the road or a sharp incline beyond the road
- .Where underground services are to be traversed during the construction of new roads throughout the Proposed Wind Farm site, they will be traversed as per the methodology as outlined above, as it is not anticipated that any existing services will be encountered when excavating the proposed new site access roads due to the nature of the works.

4.8.1.2.2 *Upgrading of Existing Site Access Road*

Approximately 1.8km of the existing roads will require upgrading which will comprise widening of the roadway to a total running width of approximately five metres, with wider sections at corners and the laying of a new surface dressing on the existing section of roadway where necessary. The road widening will be undertaken as follows:

- If it is considered that the current road formation level is adequate to support required bearing, then no upgrade or widening works will be completed.
- Otherwise, where required, the subsoil in the existing road verge will be excavated down to a suitable formation layer.
- All spoil excavated will be managed on-site. It will be placed within the identified spoil management areas within the Site (which will be located outside identified watercourse 50m buffers). Some topsoil may be temporarily stockpiled locally for reuse for landscaping purposes.
- All drainage measures prescribed in the detailed drainage design for the Proposed Project will be implemented around the works area.
- Well-graded granular fill (imported or site-won) will be spread and compacted in layers up to 200mm to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the compaction plant to be used.
- These layers of granular fill will be brought to the same level as the top of the existing road surface.
- Where required, a layer of geogrid will be installed directly onto the top of the granular fill layer and the existing road surface.
- A layer of finer well graded stone for the running surface will be laid on the geogrid and compacted.
- Upon completion the upgraded roads will be a single-track design with a width of 5m with localised widening at bends and changes in direction (depending on the location within the Site).
- Prior to any works commencing on the upgrade of existing roads, the requirement for additional roadside drainage will be considered by the Project Hydrologist in line with the proposals outlined in the CEMP.

4.8.1.3 Clear-Span Watercourse Crossing

It is proposed to construct a clear-span watercourse crossing at two of the four locations where new watercourse crossings are required within the Proposed Wind Farm site. The locations of these crossings are shown on the layout drawings included in Appendix 4-1 and Appendix 4-3. The clear-span watercourse crossing methodology presented below will ensure that no instream works are necessary. The standard construction methodology for the installation of a clear-span 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 each 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.
- Once the foundation base has been completed, the pre-cast concrete clear-span structure 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.
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.
- Underground cabling ducting will be contained within the road make-up of the proposed crossing.

A standard design drawing of a pre-cast concrete, clear span crossing is shown in Figure 4-32.

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 locations will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.

4.8.1.4 Culvert Crossing

All new proposed culverts and proposed culvert upgrades at field drain crossings required for the Proposed Wind Farm 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 Wind Farm, 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 but will have a minimum 900m diameter. In all cases, culverts will be oversized to allow mammals to pass through the culvert.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling 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. Please see Figure 4-33 for details.

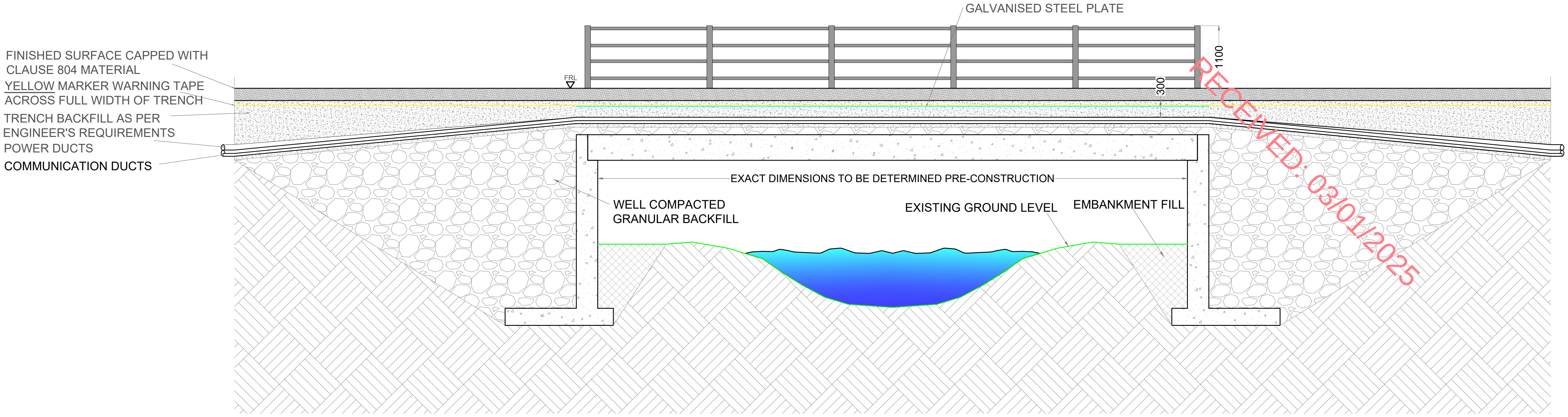
4.8.1.5 Temporary Construction Compound

As discussed in section 4.3.1.5, there are two proposed construction compounds; one in the south of the Site and one in the north of the site, that form part of the Proposed Wind Farm. There is also one construction compound adjacent to the proposed 38kV substation that forms part of the Proposed Grid Connection. The compounds will be constructed in the same manner 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 as discussed below in Section 4.8.2.1;
- A layer of geo-grid will be installed where deemed necessary by the designer 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;
- A limited amount of fuel will have to be stored in appropriately bunded containers and a designated area for oil storage will be constructed within the compound.
- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc;
- A waste storage area will be provided within the compound;
- 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.

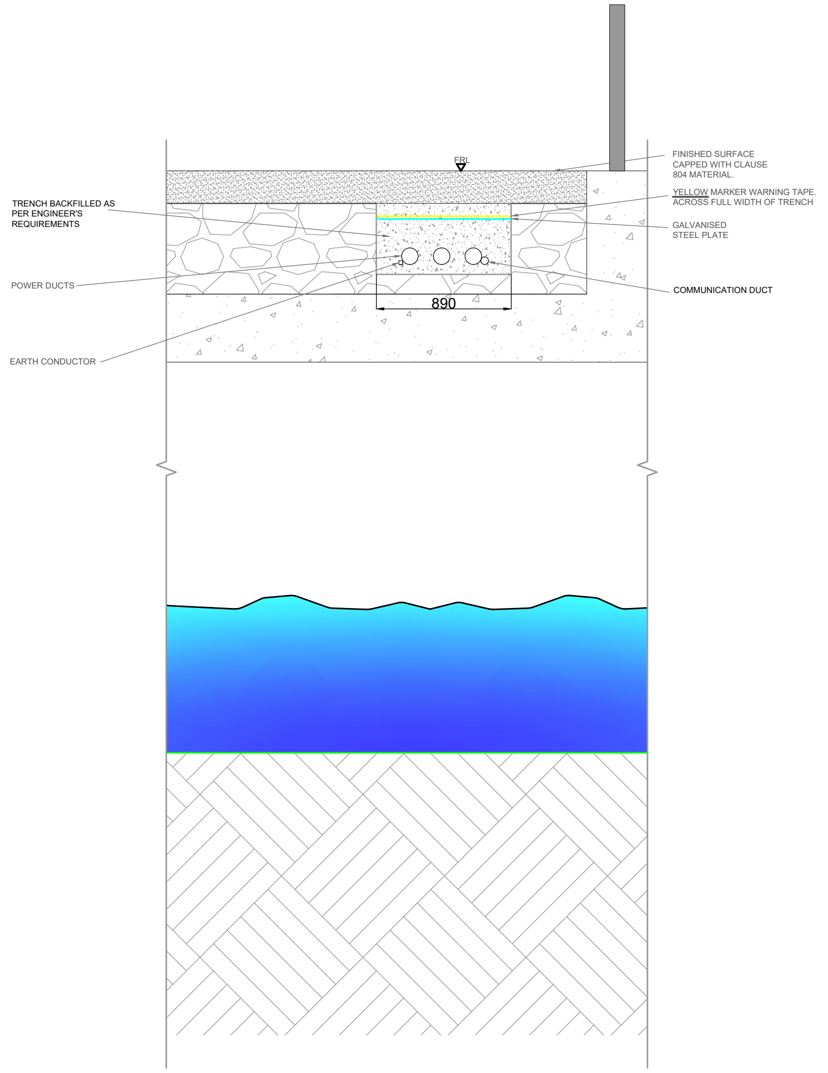
4.8.1.6 Underground Electrical (33kV) and Communication Cabling

The transformer in each turbine and the met mast is connected to the on-site substation through a network of buried electrical and communication cabling. The ground is trenched using a mechanical excavator. The top layer of soil (or road surface) is removed and saved so that it is replaced on completion. The cables will be bedded with suitable material. The cables will be laid at a depth of approximately 1.2m below ground level; a suitable marking tape is installed between the cabling and the surface (see Plate 4-8 below illustrating an example of a single cable trench). On completion, the ground will be reinstated. The route of the underground electrical and communication cabling will follow the access tracks as illustrated on the Proposed Wind Farm layout drawings included as Appendix 4-1 of the EIAR. The cabling may be placed on either side of the road footprint, on both sides of the road and/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.



Clear Span Watercourse Crossing - 33kV - Longitudinal Section

SCALE: 1:75



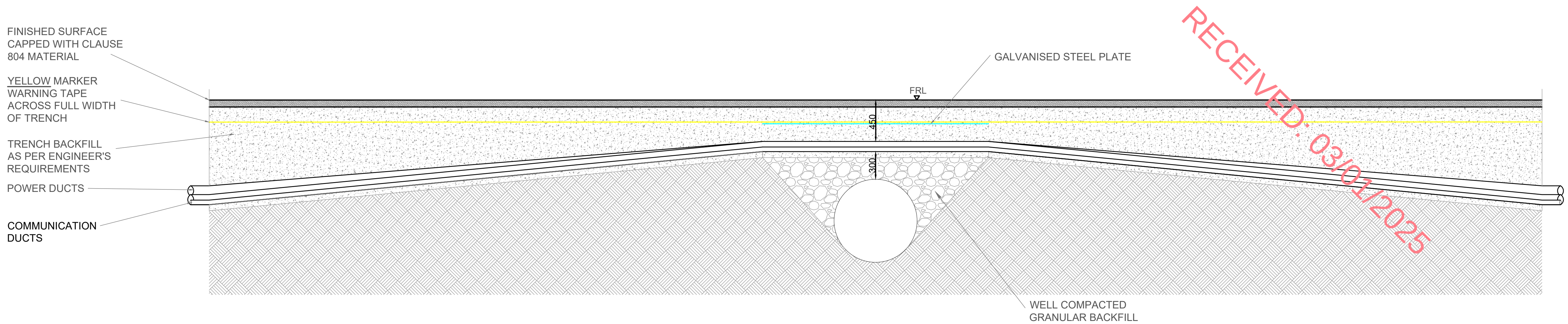
Clear Span Watercourse Crossing - 33kV - Cross Section

SCALE: 1:50

PROJECT TITLE: **Briskalagh Renewable Energy Development**			
DRAWING TITLE: **Standard 33kV Culvert Crossing**			
PROJECT No.: **230502**		DRAWING No.: **Figure 4-32**	SCALE: **As Shown @ A3**
DRAWN BY: **KD**	CHECKED BY: **EmcC**	DATE: **08.10.2024**	REVISION.: P01

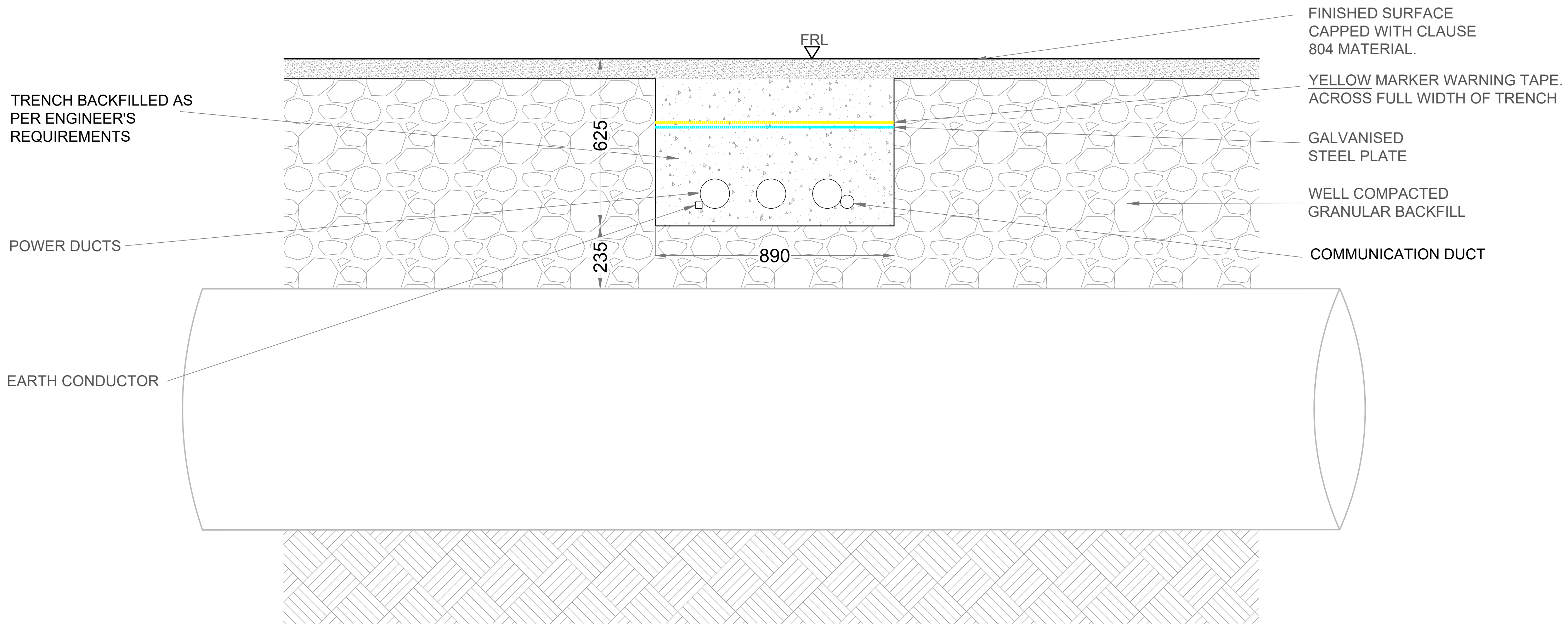
MKO

Email: info@www.mkoireland.ie /Website: www.mkoireland.ie



Culvert Crossing - 33kV - Longitudinal Section

SCALE 1:50



Culvert Crossing - 33kV - Cross Section

SCALE 1:20

PROJECT TITLE: **Briskalagh Renewable Energy Development**			
DRAWING TITLE: **Standard 33kV Culvert Crossing**			
PROJECT No.: 230502		DRAWING No.: Figure 4-33	SCALE: As Shown @ A3
DRAWN BY: KD	CHECKED BY: EmcC	DATE: 08.10.2024	REVISION.: P01

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Plate 4-8 Typical Cable Trench View

4.8.1.7 Borrow Pit

The estimated volume to be extracted from the borrow pit for the construction of the Proposed Wind Farm is up to 70,000 m^3. This figure presented is the anticipated maximum volumes; however, the actual volumes to be removed from the borrow pit will be confirmed at the time of construction and following detailed pre-construction site investigation works.

The borrow pit will be excavated and backfilled as follows:

- The area to be used for the borrow pit 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 initial borrow pit excavation will involve removal of soil to the top of bedrock. These materials will be stored temporarily in selected spoil management areas, ;
- All drainage measures prescribed in the detailed drainage design for the Proposed Project will be implemented around the works area;
- The bedrock material will be extracted by breaking and blasting (section 4.8.1.8.1 and 4.8.1.8.2 below) from the borrow pit and stockpiled or used as required;
- The use of material won from the borrow pit will be sequential with new road construction or turbine foundation formations;
- Temporary stockpiling of aggregates will be required to accommodate the cut and fill operations within the borrow pit, and the progression of access roads and turbine excavations;
- As the borrow pit excavation progress and become deeper, surface water and groundwater ingress will be removed via pumping to settlement ponds, and re-distribution locally across natural vegetated areas. Where required, additional specialist water treatment measures will be employed to ensure no deterioration in downstream water quality occurs;
- When extraction ceases within the borrow pit, the borrow pit will be backfilled with excavated spoil and its associated drainage measures will be removed.
- The extraction area of the borrow pit will have to be permanently secured and a stock-proof fence will be erected around the borrow pit to prevent access to these areas as well as the installation of appropriate health and safety signage.

Two extraction methods have been assessed for breaking out the useful rock below: rock breaking and blasting.

4.8.1.7.1 Rock Breaking

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

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

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

4.8.1.7.2 Rock Blasting

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

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

A properly designed blast should generate rock of a size that can be loaded directly into a mobile crusher, using the same wheeled loader outlined above. The same method is used for processing the rock generated from a blast, as would be used to process rock generated by rock breaking. Generally, the drilling rig will recommence drilling blast holes for the next blast as soon as one blast is finished. The potential impacts and control measures associated with noise and vibration from this extraction method are assessed in Chapter 12: Noise and Vibration. Any blasting will be carried out in accordance with the *Guidance on the Safe Use of Explosives in Quarries* (Safety and Health Commission for the Mining and Other Extractive Industries, 2002)[5] and the British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*[6].

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

4.8.1.8 Spoil Management Areas

The following recommendations and best practice guidelines for the placement of spoil in identified spoil management areas and in linear berms will be adhered to during the construction of the Proposed Project:

- At the identified spoil management areas, the vegetative top-soil layer will be removed to allow for spoil to be placed and upon reaching the recommended height, the vegetative topsoil layer will be reinstated.
- The identified spoil management areas will be developed in a phased approach, with the topsoil removed and temporarily stockpiled within the defined area while the spoil is being placed. The stockpiled topsoil will then be reinstated over the placed spoil, and the exercise will continue within the same spoil management area until the area is full.
- The placement of spoil will be restricted to a maximum height of 1.0m, subject to confirmation by the Geotechnical Engineer.
- The material will be backfilled into the spoil management areas and will be spread evenly across the area.
- It will be compacted to reduce air voids and reduce the migration paths for infiltration by precipitation. This will reduce the amount of potentially silt laden surface water run-off from these spoil management areas.
- Where practical, the surface of the placed spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the spoil will be carried out as placement of spoil within the area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed spoil.
- Finished/shaped side slopes of the placed spoil will be not greater than 1 (v): 3 (h) in the dedicated spoil management zones and not greater than 1 (v): 1 (h) for linear berms.
- Inspections of the spoil management areas will be made by a Geotechnical Engineer through regular monitoring of the works. The appointed contractor will review work practices at spoil management areas when periods of heavy rainfall are expected so as to prevent excessive dirty water runoff from being generated.
- An interceptor drain will be installed upslope of the identified spoil management areas to divert any surface water away from these areas where necessary.
- Silt fences and double silt-fences will be emplaced down-gradient of spoil management areas and will remain in place throughout the entire construction phase, or until reseeding has been established to a sufficient level.
- The surface of the deposited spoil will be profiled to a gradient to be agreed with the Geotechnical Engineer and vegetated or allowed to vegetate naturally as indicated by the Project Ecologist.

All the above-mentioned general guidelines and requirements will be confirmed by the Geotechnical Engineer prior to construction.

4.8.2 Proposed Grid Connection

4.8.2.1 Onsite 38kV Electricity Substation and Control Buildings

A detailed drawing of the proposed onsite 38kV substation is shown in Figure 4-18. The proposed onsite 38kV substation will be constructed by constructed by the following methodology:

- The area of the on-site substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and temporarily stockpiled for later use in landscaping. Any excess material will be sent to one of the designated spoil management areas.
- 1 no. control building will be built within the on-site substation compound.
- The foundations will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix.
- The block work walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors.
- The block work will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation.
- The roof slabs will be lifted into position using an adequately sized mobile crane.
- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on-site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.
- The transformer, electrical equipment, and storage container plinths will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix.
- Lightning poles will be erected at appropriate locations adjacent to the substation. All lightning poles will be appropriately earthed.
- The electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected.
- The construction and components of the substation will be built to ESBN specifications.

4.8.2.2 Temporary Construction Compound

The temporary construction compound adjacent to the proposed onsite 38kV substation will be constructed as outlined above in Section 4.8.1.6.

4.8.2.3 Underground Electrical (38kV) and Communication Cabling

The underground cabling works will consist of the installation of ducts in an excavated trench to accommodate electrical and fibre communications cables to facilitate a connection between the proposed 38kV on-site substation and the existing 110kV Ballyragget Substation. Please see Appendix 4-1 for details.

The underground electrical cabling will be laid beneath the surface of the existing farm access road to be upgraded and the public roads using the following methodology:

- Before works commence, updated surveying will take place along the proposed cable route, with all existing culverts and services identified. All relevant bodies i.e., ESBN, Kilkenny County Council etc. will be contacted and all up to date information for all existing services sought.

- When the cable is located on public roads, a traffic management plan will be prepared 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 1.2m, 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 from 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 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 cabling.

4.8.2.4 Existing Underground Services

Any underground services encountered along the underground cable route 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, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate.

4.8.2.5 Site Preparations

Prior to beginning construction work the contractor will scan the proposed route with a cable avoidance tool (CAT), carry out visual inspection of the area and may carryout out further below ground surveys if deemed necessary. If any previously unidentified services are discovered the site engineer will inform the design of the issues and possibly recommend a solution that works with the new constraints.

In some instances, it may be necessary to relocate existing underground services such as water mains or existing cables. In advance of any construction activity, the contractor will undertake additional surveys of the proposed route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

If existing low voltage underground cables are found be present, a trench will be excavated, and new ducting and cabling will be installed along the new alignment and connected to the network on either end. The trench will be backfilled with suitable material to the required specification. Warning strip and marking tape will be laid at various depths over the cables as required. Marker posts and plates will be installed at surface level to identify the new alignment of the underground cable, the underground cables will then be re-energised.

In the event that water mains are encountered the water supply will be turned off by the utility so work can commence on diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the utility standards.

4.8.2.6 Trenching and Ducting

The proposed cable will be installed in a series of ducts in an excavated trench. Trenching will be achieved using a mechanical excavator. The top layer of soil or road surfacing will be removed and stockpiled separately for reuse. Material stockpiles should be stored at least 15 m back from drains and watercourses on level ground with a silt fence inserted at the base to prevent runoff.

The trench base will be graded and smoothed once the required depth and width is achieved. A layer of bedding material will be placed and compacted to the required specification on the trench floor prior to laying the ducts in trefoil formation.

The ducting surrounds will be carefully backfilled and compacted in accordance with the required specification. Cable protection strips will be placed on compacted material directly above the ducting. A secure cap will be placed at the end of each duct to prevent the ingress of dirt or water.

Ground water and surface water accumulating in the base of trenches will not be pumped directly to roadside drains or watercourses unless it is clean and free from solids. Contaminated water will be either treated onsite prior to discharge or tankered offsite to a suitably licensed disposal facility.

For concrete and asphalt/bitumen road sections, surfaces will be permanently reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with local authorities. All trench works carried out in public roadways will be carried out in accordance with *'Guidelines for Opening, Backfilling and Reinstatement of trenches in Public Roads'* and any other conditions imposed by the relevant road authority.

For unsurfaced/grass sections, trenches will be backfilled with suitable excavated material to ground level leaving at least 100 mm topsoil or match existing level at the top to allow for seeding or replace turves as per the specification of the local authority or landowner.

Ducting will be cleaned and tested in accordance with the specification by pulling through a brush and mandrel. A draw rope will be installed in each duct in preparation for cable installation at a later date.

4.8.2.7 Joint Bays

Joint bays are typically pre-cast concrete chambers where lengths of cable will be joined to form one continuous cable. They will be located at various points along the ducting route generally between 600 to 800 metres intervals or as otherwise required by ESBN and electrical requirements. Joint Bays are typically 2m x 4.5m x 1.5m pre-cast concrete structures installed below finished ground level.

Where possible, joint bays will be located in areas where there is a natural widening/wide grass margin on the road in order to accommodate easier construction, cable installation and create less traffic congestion. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible. During construction the joint bay locations will be completely fenced off once they have been constructed they will be backfilled until cables are being installed. Once the cabling is installed the joint bays will be permanently backfilled with the existing surface re-instated and there will be no discernible evidence of the joint bay on the ground.

In association with joint bays, Communication Chambers are required at every joint bay location to facilitate jointing of the communication cabling. Earth Sheath Link Chambers are also required approximately every second joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground electrical cabling, installed in a flat formation, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located in proximity to Joint Bays. Earth Sheath Link Chambers and Communication Chambers will be pre-cast concrete structures with a steel access cover at finished surface level. The locations of the joint bays and chambers are shown on the Grid Connection Infrastructure drawings in Appendix 4-1. Please see Figure 4-23 above for a standard joint bay.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers within the underground cabling route corridor assessed is subject to approval by ESBN.

4.8.2.8 Watercourse/Service Crossings on the Proposed Grid Connection Underground Cabling Route

A total of 13 no. existing watercourse crossings will be traversed along the proposed grid connection cable route to cater for the proposed collector cable and external grid connection cabling towards the existing Ballyragget 110 kV substation. The locations of the watercourse crossings are shown on the detailed layout drawings in Appendix 4-1 and details of each crossing method are show in Figures 4-24 to 4-26. The watercourse crossing methodologies for the provision of the underground Proposed Grid Connection component of the Proposed Project at these locations is set out below with the most appropriated option being selected for each crossing. Instream works are not required at any watercourse crossing along the Proposed Grid Connection underground cabling route.

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

4.8.2.8.1 *Crossing Using Standard Trefoil Formation Over – Option A*

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above a bridge/culvert or where a new bottomless box culvert or clear-span structure has been installed at a sufficient depth, the standard ESB approved trefoil arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench.

4.8.2.8.2 Flatbed Formation Under– Option B

Where cable ducts are to be installed under an existing watercourse or service crossing where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench, the depth of which will be determined by the location of the top of the obstacle or the depth of excavatable material under it. The ducts will be laid in this trench in a flatbed formation under the existing watercourse/ service and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

4.8.2.8.3 Flatbed Formation over– Option C

Where cable ducts are to be installed over a watercourse or service crossing where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the obstacle or the depth of excavatable material over it. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

Where a bridge/culvert or service has insufficient cover depth to fully accommodate the required trench, the ducts can be laid in a flatbed formation partially within the existing road surface. Where this option is to be employed, the ducts will also be encased in steel with a concrete surround as per ESB Networks specifications. In order to achieve cover over these ducts and restore the carriageway of the road, it may be necessary to raise the pavement level locally to fully cover the ducts. The increased road level will be achieved by overlaying the existing pavement with a new wearing course as required. Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench.

4.8.2.8.4 Horizontal Directional Drilling – Option D

The horizontal directional drilling method of duct installation is carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant. The launch and reception pits will be approximately 2.5mm wide, 2.5m long and 2.0m deep. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator will commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore will continue with the addition of 3.0m long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water is pumped through the centre of the drill rods to the reamer head and is forced in to void and enables the annulus which has been created to support the surrounding subsoil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as Clear Bore™ is intended to negate any adverse impacts arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to a licensed recovery facility.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. Sufficient controls and monitoring, as listed below, will be put in place during drilling to prevent frack-out, such as the installation of casing at entry points where reduced cover and bearing pressure exits.

- The area around the Clear Bore™ batching, pumping and recycling plants shall be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences shall be placed between the works area and adjacent rivers and streams on both banks;
- Accidental spillage of fluids shall be cleaned up immediately and transported off site for disposal at a licensed facility; and,
- Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush

Table 4-5 Watercourse Crossing Types

Crossing No.	Watercourse Type	Width of Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Type Description	Watercourse Crossing Type	Extent of in-channel works
WC 1 (EPA Mapped WC)	River	NA	NA	Horizontal Directional Drilling	D	None. No in-stream works required.
WC 2 (EPA Mapped WC)	Stone Arch Bridge	15	0.45	Horizontal Directional Drilling	D	None. No in-stream works required.
WC 3 (EPA Mapped WC)	Stone Culvert	1	1.3	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.
WC 4	Stone Arch Bridge	1.5	1.4	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.
WC 5 (EPA Mapped WC)	Stone Arch Bridge	8	0.6	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.
WC 6	Stone Arch Bridge	1	0.9	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.
WC 7 (EPA Mapped WC)	Stone Arch Bridge	1.5	0.7	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.

Crossing No.	Watercourse Type	Width of Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Type Description	Watercourse Crossing Type	Extent of in-channel works
WC 8	Stone Culvert	0.5	0.9	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.
WC 9 (EPA Mapped WC)	Stone Arch Bridge	3	0.69	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.
WC 10 (EPA Mapped WC)	Concrete Pipe	0.3	0.4	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.
WC 11 (EPA Mapped WC)	Stone Arch Bridge	3.5	1.3	Crossing Using Standard Trefoil Formation	A	None. No in-stream works required.
WC 12 (EPA Mapped WC)	Stone Arch Bridge	2	0.5	Flatbed Formation over Bridges/Culverts	C	None. No in-stream works required.
WC 13 (EPA Mapped WC)	Stone Arch Bridge	3	0.4	Horizontal Directional Drilling	D	None. No in-stream works required.

4.9 Community Gain Proposal

4.9.1 Background

The Proposed Wind Farm 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 a renewable energy development, which Briskalagh 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 Wind Energy Ireland (WEI) among others. While it may be simpler and easier to put a total fund aside for a wider community area, Briskalagh 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 Wind Farm.

The applicant company has given careful consideration to the issue of community gain arising from the Proposed Wind Farm, 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 Proposed Wind Farm 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 Wind Farm 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 and direct payments could be made to nearby households.

4.9.2 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 RESS Terms and Conditions, published by the Department of Communications, Climate Action and Environment make some high-level provisions for how this type of benefit fund will work. Any project which wants to export electricity to the national grid must abide by these broad principles. These include the following:

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. *in respect of Onshore Wind RESS 2 Projects, a minimum of €1,000 shall be paid to each household located within a distance of a 1 kilometre radius from the Onshore Wind RESS3 Project. The 1 kilometre distance specified is measured from the base of the nearest turbine of the RESS 3 Project to the nearest part of the structure of the household, the location of which is identified in the An Post's GeoDirectory;*
3. *a minimum of 40% of the funds shall be paid to not-for-profit community enterprises whose primary focus or aim is the promotion of initiatives towards the delivery of the*

UN Sustainable Development Goals, in particular Goals 4, 7, 11 and 13, including education, energy efficiency, sustainable energy and climate action initiatives;

4. *a maximum of 10% of the funds may be spent on administration. This is to ensure successful outcomes and good governance of the Community Benefit Fund. The Generator may supplement this spend on administration from its own funds should it be deemed necessary to do so; and*
5. *The balance of the funds shall be spent on: (i) initiatives successful in the annual application process, as proposed by clubs and societies and similar not-for-profit entities; and (ii) in respect of Onshore Wind RESS 3 Projects, on "near neighbour payments" for households located outside a distance of 1 kilometre from the RESS 3 Project but within a distance of 2 kilometres from such RESS 3 Project. The distance specified is from the base of the nearest turbine to the nearest part of the structure of the occupied residence, the location of which is identified in the An Post's GeoDirectory.*

4.9.3 Community Benefit Fund

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

The Community Benefit Fund belongs to the local community. The premise of the fund is 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. This group will then work on designing the governance and structure of a community entity that would administer the Community Benefit Fund.

The types of projects and initiatives that could be supported by such a Community Benefit Fund could include youth, sport and community facilities, schools, educational and training initiatives, and wider amenity, heritage, and environmental projects.

Should the Proposed Project be developed under the current RESS T&C's, it would attract a community contribution in the region of €275,000/year for the local community (estimated based on an average energy yield) over the first 15 years of operation of the Proposed Project. The value of this fund would be directly proportional to the electricity generated by the wind farm. Under the current RESS T&Cs, the following is the recommended breakdown of the fund:

- **Direct payments** – to those living closest to the Proposed Wind Farm. A minimum €1,000 payment per annum for houses within 1km of the Proposed Project.
- **Energy Efficiency** – 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 the elderly, local community buildings, and the development of sporting facilities such as all-weather playing pitches etc.
- **Administration costs** – a maximum of 10% per year will be made available for the administration and governance costs of the fund.
- **Support for Local Groups** – The remaining balance of this 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 each year.-

Should the Proposed Project not be developed under RESS, the Applicant is committing that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €1 into a community fund for the entire operational life of the Proposed Project. This would equate to an estimated annual fund of €137,000 (using the same formula as above), which across the 35-year operational lifespan would result in funding in the order of €4.8 million to the local community which is a substantial contribution. The number and size of grant allocations will be decided by a Community Fund liaison committee with various groups and projects benefiting to varying degrees depending on their funding requirement. Please see Appendix 2-1 Briskalagh Renewable Energy Development Community Report for details.

4.10 Operation

As part of the Proposed Wind Farm planning application, permission is being sought for a 35-year operation period commencing from the date of full operational commissioning of the proposed turbines. 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, and data relayed from the wind turbines to a central control unit at the on-site substation which will facilitate off-site remote monitoring of the wind farm. Each turbine will be monitored off-site by the appointed Operations and Maintenance contractor (typically the wind turbine manufacturer) and a wind farm operations management company. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored off-site by both parties 24-hours per day. Regular on-site visual inspections will also be carried out by the wind farm operations management company.

4.10.1 Maintenance

Each turbine will be subject to a routine maintenance programme involving several checks and changing of consumables, including oil changes. The meteorological mast will be subject to a routine maintenance programme involving several checks and changing of instrumentation when required. In addition, there will be 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. Maintenance of the site roads will involve filling potholes and maintaining road edge markers. Drainage maintenance will typically involve cleaning of drainage ditches when required to prevent water backing up.

The electricity substation and site tracks will also require periodic maintenance. The 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.

- Periodic service and maintenance works which include some vehicle movement.
- For operational and inspection purposes, substation access is required.
- Servicing of the substation equipment will be carried out in accordance with the manufacturer's 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.

4.10.2 Monitoring

Section 8 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 summary of the key information is provided below:

- Monthly water sampling and laboratory analysis will be undertaken for the first 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 Plan provided in Appendix 7-6.
- 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 three years of growth.
- Monitoring for shadow flicker at properties within the Study Area as outlined in Chapter 5.
- Post turbine commissioning noise monitoring will be commenced within 6 months of commissioning the wind farm.

4.11 Decommissioning

The proposed wind turbines 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 Wind Farm will be decommissioned fully.

Upon decommissioning of the Proposed Wind Farm, the wind turbines and the meteorological mast would be disassembled. All above ground turbine and mast components would be separated and removed off-site for recycling. Turbine and mast foundations would remain underground and would be covered with earth and allowed to revegetate. Leaving the foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant temporary environment nuisances such as noise, dust and/or vibration. Site roadways will be used during the operational phase by farm machinery and will provide a useful means of extracting the commercial forestry crop which exists on at the Site and therefore will be retained post decommissioning to facilitate these activities.

The underground electrical cabling connecting the turbines to the on-site substation will be removed from the cable ducts. The cabling will be pulled from the cable ducts using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at the original cable jointing pits which will be excavated using a mechanical excavator and will be fully re-instated once the cables are removed. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance. The cable materials will be transferred to a suitable recycling or recovery facility.

The Proposed Grid Connection infrastructure, including the onsite 38kV electricity substation, will remain in place as it will be part of the Electricity Grid under the ownership and control of the ESB Networks.

A Decommissioning Plan has been prepared (Appendix 4-5). 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 agree with the competent authority at that time. The potential for effects during the decommissioning phase of the Proposed Wind Farm 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 Proposed 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".*