4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the development and its component parts which is the subject of a proposed application for planning permission to An Bord Pleanála . This chapter also describes elements of the overall project which are not subject to this planning application but are assessed in this EIAR. Construction methodologies for the main infrastructural components of the development are also included in this chapter of the EIAR.

The development description as per the site and newspaper notices is as follows:

1. *The construction of 22 no. wind turbines and all associated hard-standing areas with the following parameters:*
    a. *A total blade tip height of 180m,*
    b. *Hub height of 99m, and*
    c. *Rotor diameter of 162m.*
2. *1 no. permanent Meteorological Anemometry Masts with a height of 99 m and associated hardstanding area;*
3. *Upgrade of existing tracks and roads, provision of new permanent site access roads and upgrade of 1 no. existing site entrance including the provision of 1 no. security cabin with automatic traffic barriers;*
4. *Temporary widening of sections of public road in the townland of Ballyglass;*
5. *The provision of a new temporary roadway in the townland of Ballyglass to facilitate the delivery of turbine components and other abnormal loads;*
6. *1 no. wind farm operation and maintenance control building in the townland of Glenora;*
7. *3 no. borrow pits.*
8. *13 no. permanent peat placement areas.*
9. *5 no. temporary construction compounds with temporary site offices and staff facilities;*
10. *Permanent recreation and amenity works, including marked trails, seating areas, amenity car park, and associated amenity signage;*
11. *Site drainage;*
12. *Site Signage;*
13. *Ancillary forestry felling to facilitate construction and operation of the proposed development;*
14. *All works associated with the habitat enhancement and biodiversity management within the proposed wind farm site;*
15. *All associated site development works and ancillary infrastructure.*

This application is seeking a ten-year permission and 35 year operational life from the date of commissioning of the renewable energy development.

For the purposes of this EIAR, all of the elements listed above and the intended substation and grid connection route and turbine delivery route accommodation works are collectively referred to as the “Proposed Development”.

4.2 Development Layout

The layout of the Proposed Development has been designed to minimise the potential environmental effects of the wind farm, while at the same time maximising the energy yield of the wind resource

passing over the site. A constraints study, as described in Section 3.5.1 of Chapter 3 of this EIAR, has been carried out to ensure that turbines and all ancillary infrastructure are located in the most appropriate areas of the site. The Proposed Development layout makes maximum use of the existing access roads and tracks within the site, thereby minimising the extent of proposed new roads required.

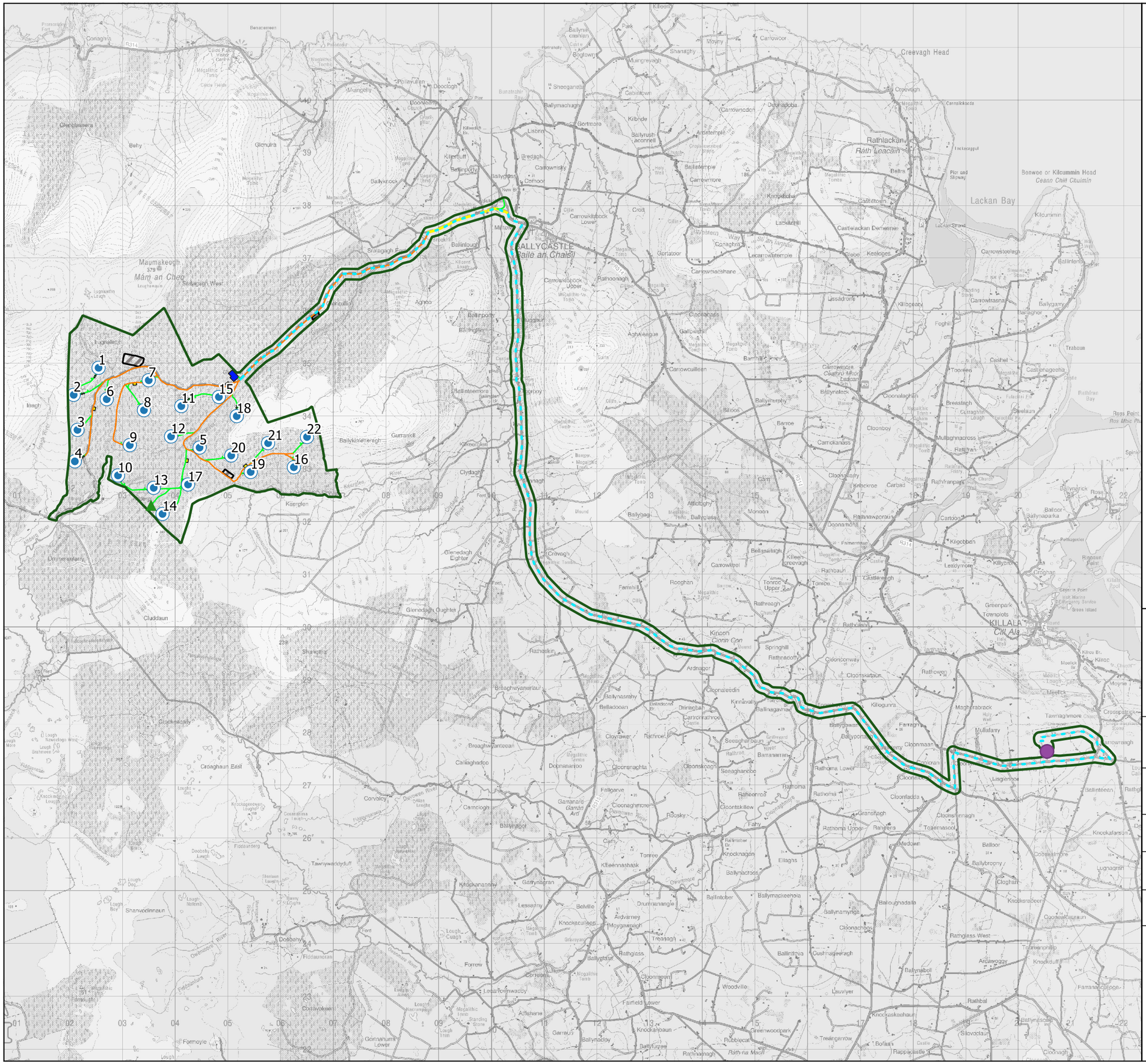
The overall layout of the Proposed Development is shown on Figure 4-1a. This drawing shows the proposed locations of the wind turbines, electricity substation, grid connection route, borrow pits, peat and spoil repository, construction compounds, internal roads layout, the turbine delivery route link roads and the main site entrance. A drawing focusing on the core of the development site is shown on Figure 4-1b. Detailed site layout drawings of the Proposed Development are included in Appendix 4-1 to this EIAR.

4.3 Development Components

4.3.1 Wind Turbines

4.3.1.1 Turbine Locations

The proposed wind turbine layout has been optimised using industry standard wind farm design software to maximise the energy yield from the site, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance. The Grid Reference coordinates of the proposed turbine locations are listed in Table 4-1 below.



Map Legend

- EIAR Site Boundary
- Glenora Met Mast
- Tawnaghmore Substation
- Indicative Turbine Layout
- Proposed Hardstand Footprints
- Intended Grid Connection Route
- Existing Roads - Upgrade Proposed
- Proposed New Roads
- Temporary Road Widening Works
- Proposed Construction Compounds
- Peat Placement Areas
- Intended Substation Location
- Proposed Borrow Pit Locations

Drawing Title

Proposed Site Layout

Project Title

Glenora Wind Farm

Drawn By	Checked By
ER	EMC
Project No.	**Drawing No.**
201120	Figure 4-1a
Scale	**Date**
1:70,000	2023-12-13

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email:info@mkoireland.ie
Website: ww.mkoireland.ie

Map Legend

- EIAR Site Boundary
- Glenora Met Mast
- Indicative Turbine Layout
- Proposed Hardstand Footprints
- Intended Grid Connection Route
- Existing Roads - Upgrade Proposed
- Proposed New Roads
- Temporary Road Widening Works
- Proposed Construction Compounds
- Peat Placemment Areas
- Intended Substation Location
- Proposed Borrow Pit Locations

Drawing Title: Core Site Layout

Project Title: Glenora Wind Farm

Drawn By	Checked By
ER	EMC
Project No.	**Drawing No.**
201120	Figure 4-1b
Scale	**Date**
1:30,000	2023-12-11

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email:info@mkoireland.ie
Website: ww.mkoireland.ie

Table 4-1 Proposed Wind Turbine Locations and Elevations

Turbine No.	Irish Transverse Mercator (ITM) Co-ordinates		Elevation (m OD)
	Easting (m)	Northing (m)	
1	502518	834923	219
2	502047	834410	212
3	502119	833745	180
4	502069	833148	154
5	504436	833410	179
6	502673	834328	164
7	503470	834687	216
8	503379	834119	200
9	503111	833456	150
10	502887	832881	149
11	504089	834197	222
12	503894	833620	177
13	503565	832645	171
14	503732	832150	220
15	504802	834370	220
16	506225	833037	161
17	504216	832709	195
18	505141	834006	218
19	505406	832947	167
20	505036	833259	216
21	505736	833494	221
22	506474	833610	219

4.3.1.2 Turbine Type

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

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

Plate 4-1 Wind turbine components

The proposed wind turbines to be installed on the site will have the following dimensions:

- Turbine Foundation-to-Blade Tip Height: 180 metres
- Hub Height: 99 metres
- Rotor Diameter: 162 metres

Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics, with only minor cosmetic differences differentiating one from another. The wind turbines that will be installed on the 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 off-white or matt grey in colour.

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

Drawings detailing the proposed wind turbine dimensions are shown in Figure 4-2. The individual components of a geared wind turbine nacelle and hub are shown in Figure 4-3 below.

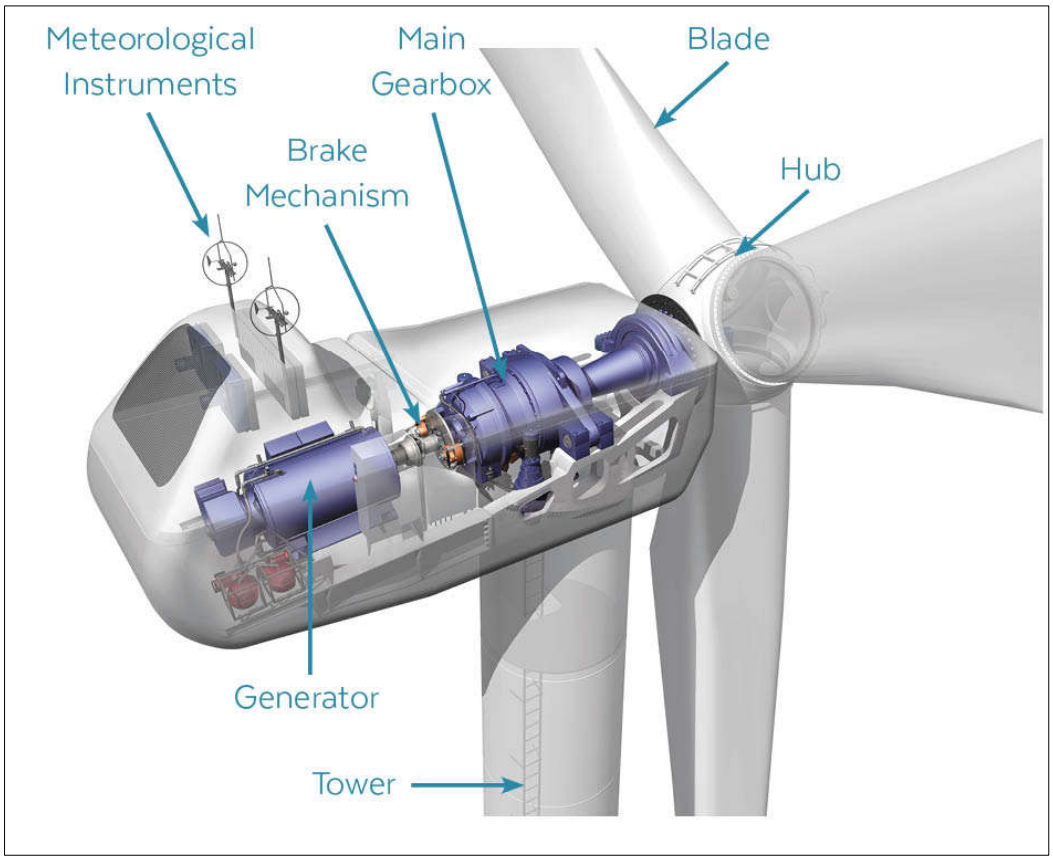
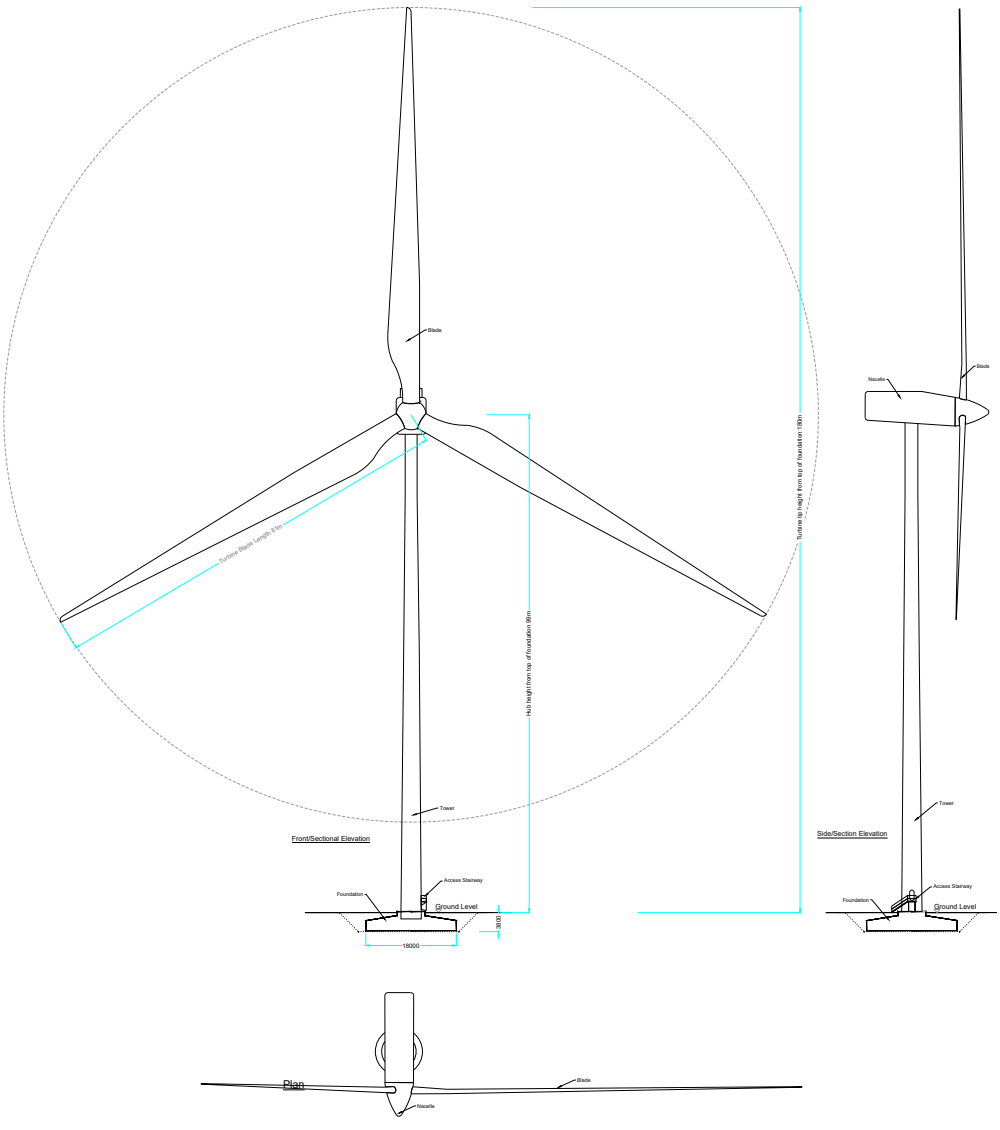


Figure 4-3 Turbine nacelle and hub components

4.3.1.3 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation. 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 turbine foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier and a foundation area large enough to accommodate modern turbine models has been assessed in this EIAR. The turbine foundation transmits any load on the wind turbine into the ground. The horizontal and vertical extent of a turbine's foundation is shown in Figure 4-2. The proposed foundation footprint, at each proposed turbine location, is assessed in this EIAR.

After the foundation level of each turbine has been formed on competent strata (i.e bedrock or subsoil of sufficient load bearing capacity) or using piling methods, the bottom section of the turbine tower "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 temporary formwork to allow the pouring of concrete and is backfilled accordingly with appropriate granular fill to finished surface level (Plate 4-2 below).



Drawing Notes

1. Proposed wind turbines to have a maximum ground to blade tip height of 180m.
2. Exact make and model of the turbine to be dictated by a competitive tender process.
3. Installed wind turbine not to exceed maximum size envelope set out above in any blade length and hub-height configuration.
4. Turbine foundation diameter may vary.
5. Ground level represents the top of turbine foundation.

Figure 4-2

DRAWING TITLE:
Wind Turbine Elevations & Plan

PROJECT TITLE:
Glenora Wind Farm, Co.Mayo

DRAWING BY:	CHECKED BY:
Joseph O Brien	Eoin McCarthy
PROJECT No: 201120	DRAWING No: 201120 - 53
SCALE: 1:500 @A1	DATE: 13.12.2023

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

4.3.1.4 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base. These will facilitate access, turbine assembly and turbine erection. The hard-standing areas are used to accommodate cranes used in the assembly and erection of the turbine. The hardstands also allow for the offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations, once completed, by placing crushed stone over the foundation. The arrangement and positioning of hard standing areas are dictated by turbine suppliers. Figure 4-4 shows a turbine base layout, including turbine foundation, hard standing area, assembly area, access road and surrounding works area.

The proposed hard standing areas for each individual turbine are shown as part of the detailed layout drawings included in Appendix 4-1 and represent the proposed sizes required. However, the extent of the required areas at each turbine location may be optimised on-site within the parameters set out and assessed in this EIAR. This will depend on the turbine supplier's exact requirements. The maximum size of the required areas have been assessed in this EIAR

4.3.1.5 Power Output

For the purposes of assessment in this EIAR, it is assumed that the proposed wind turbines will have an electrical power output in the 6 to 9 megawatt (MW) range depending on further wind data analysis and power output modelling. Therefore, the potential output of the proposed wind farm will range from 132MW up to 198MW. Turbines of the exact same make, model and dimensions can also have different power outputs depending on the capacity of the electrical generator installed in the turbine nacelle.

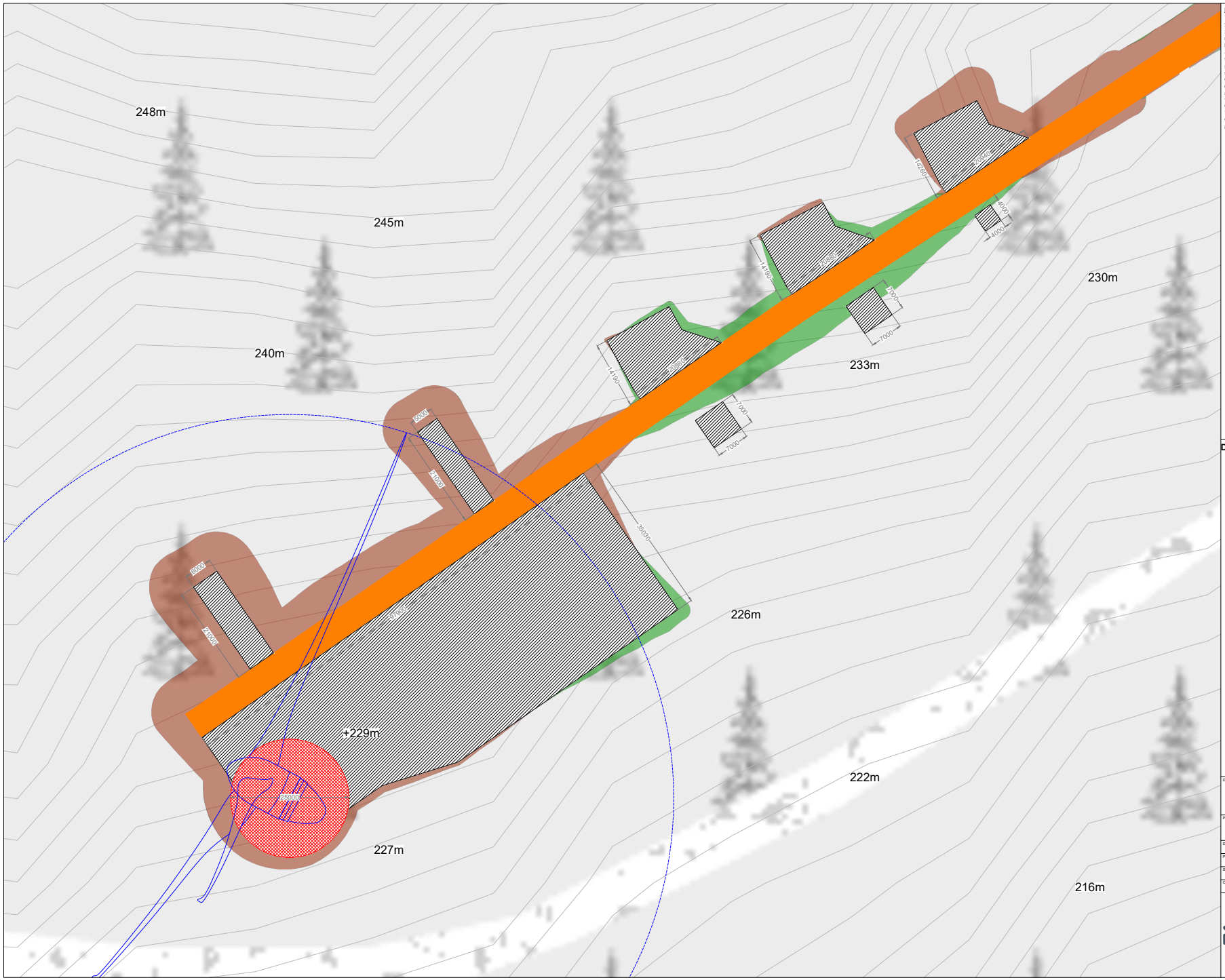
Assuming a maximum installed capacity of 198MW, the Proposed Development therefore has the potential to produce 607,068 MWh (megawatt hours) of electricity per year, based on the following calculation:

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 standard capacity factor of 35% is applied here

C = Rated output of the wind farm: 198MW



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
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.

Drawing Legend

- Proposed Road
- Crane Pad Hardstanding Area
- Turbine Foundation
- Turbine Sweep Area
- Cut
- Fill

N

Figure 4-4

DRAWING TITLE:

Turbine 11 Layout

PROJECT TITLE:

Glenora Wind Farm, Co. Mayo

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No: 201120	DRAWING No: 201120 - 35
SCALE: 1:500 @ A2	DATE: 13.12.2023
OS SHEET No: 939, 940, 941, 942, 943, 995, 996, 997, 998, 999, 1054, 1055, 1056, 1057, 1058, 1114, 1115, 1116, 1117, 1118	

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The 607,068 MWh of electricity produced by the Proposed Development would be sufficient to supply 144,540 Irish households with electricity per year, based on the average Irish household using 4.2 MWh[1] of electricity.

If the installed capacity is the minimum proposed (132MW), the electricity produced by the proposed development would be sufficient to supply approximately 96,360 households or approximately 73% of all houses in Co. Mayo.

4.3.2 Site Roads

4.3.2.1 Road Construction Types

To provide access within the site of the Proposed Development and to connect the wind turbines and associated infrastructure approximately 15.4 kilometres of existing roads and tracks will need to be upgraded and approximately 10.5 kilometres of new access roads will need to be constructed.

The 2 no. road construction types proposed are as follows:

- Existing Roads to be Upgraded
  - Excavate and Replace
- Proposed New Roads
  - Excavate and Replace
  - Floating

The locations where the above construction types are proposed is shown in Figure 1-1 of Fehily Timoney & Company's (FT) Peat & Spoil Management Plan. This document is included as Appendix 4-2 of this EIAR.

The road construction design has taken into account the following key factors:

1. *Buildability considerations*
2. *Serviceability requirements for construction and wind turbine delivery and maintenance vehicles*
3. *Minimise excavation arising*
4. *Requirement to minimise disruption to peat hydrology*

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

The proposed upgrade to existing roadways and construction of new roadways will incorporate passing bays (wider sections) to allow traffic to pass easily while traveling around the site.

4.3.2.1.1 *Upgrade to Existing Roads or Tracks*

The existing access tracks on site were constructed using the excavate and replace construction technique. Based on the site walkover carried out by FT the existing access tracks were typically noted as being in relatively good condition. Upgrading works will involve widening and resurfacing of the existing access track. The construction methodology for upgrading existing sections of excavated is detailed in Section 3 of FT's Peat & Spoil Management Plan in Appendix 4-2.

A cross–section of existing excavated road for upgrade is shown in Figure 4-5.

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

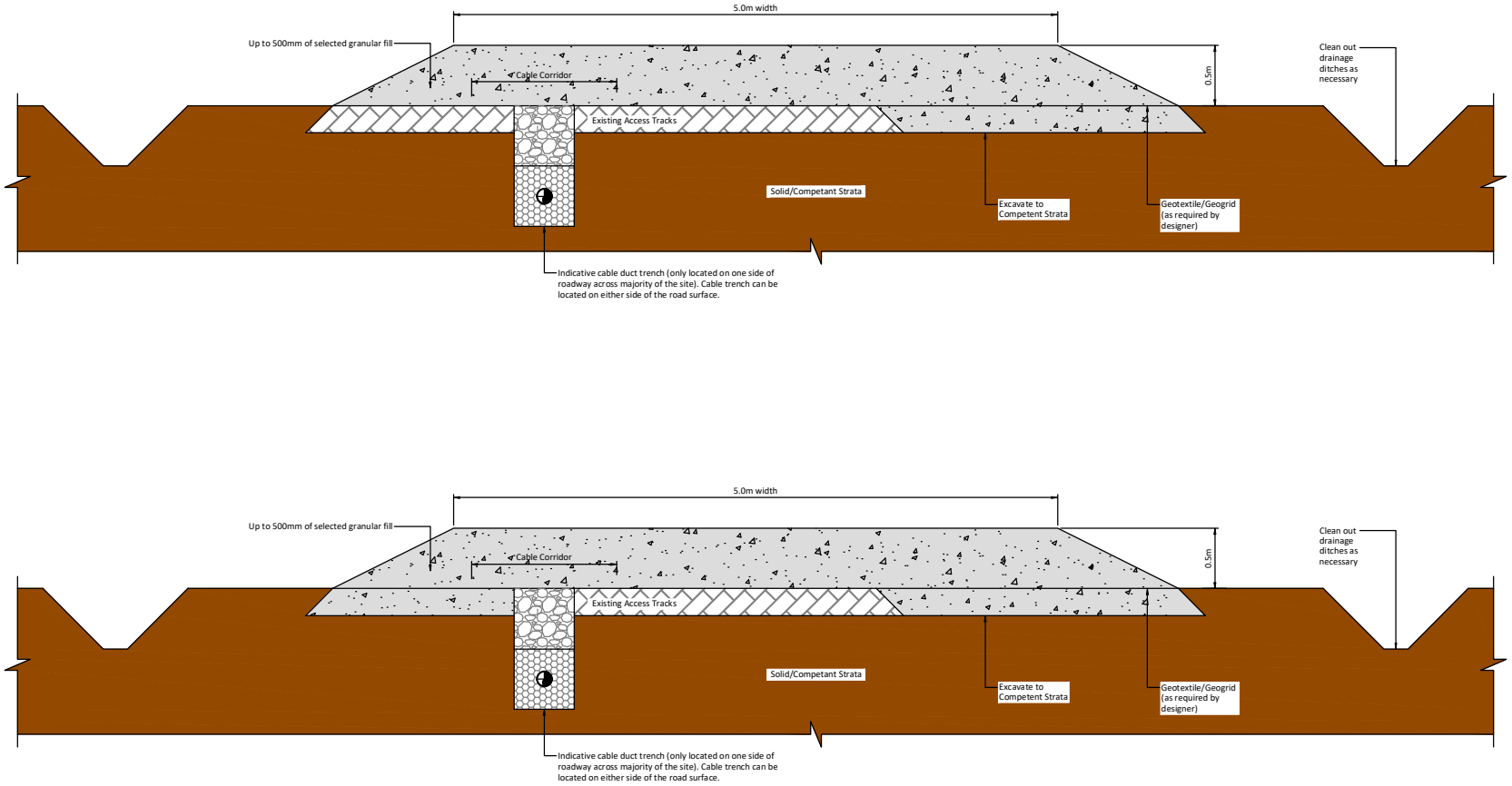

Figure 4-5

Scale 1:40

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Rev.	Description	App By	Date
A	FOR INFORMATION	BDH	12.05.23

PROJECT: GLENORA WINDFARM

CLIENT: MKO

SHEET: TYPE A - UPGRADE OF EXISTING EXCAVATED ACCESS TRACKS

Date: 12.05.23
Project number: P20-213
Scale (@ A3): As Shown
Drawn by: POR
Drawing Number: P20-312-0600-GLEN-0006
Rev: A
Checked by: IH

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12 May 2023

4.3.2.1.2 *Construction of New Excavated Roads*

The excavation of peat and spoil and founding of access roads on competent stratum (below the peat) for new access roads will be carried out at various locations on the site. Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat (<2.0-2.5m) provided sufficient placement/ reinstatement capacity is available on site for the excavated peat.

The methodology for the construction of new excavated roads is detailed in Section 4 of the Peat & Spoil Management Plan in Appendix 4-2. This methodology includes construction procedures that will minimise any adverse impact on peat stability.

A cross-section of a new excavated road is shown in Figure 4-6.

4.3.2.1.3 *Construction of New Floating Roads*

Floating roads are only proposed in areas of flatter ground, where the peat stability assessment indicates that this construction method is suitable. The majority of the access roads will be founded on competent ground employing the methodologies outlined above.

Where floating roads are proposed, a confirmatory inspection will be carried out by a suitably the Project Geotechnical Engineer, along with the Project Hydrologist and Ecologist in advance of the construction, to reconfirm that there are no localised areas of weak/saturated peat, evidence of blocked drains, or evidence of existing peat instability.

Floating roads minimise impact on the peat, particularly peat hydrology. As there is no excavation required no peat arisings are generated. However, where the underlying peat has insufficient bearing capacity or due to topographic restrictions, an excavated type access road may be more suitable.

The construction methodology for the construction of floating roads is detailed in Section 5 of the Peat and Spoil Management Plan in Appendix 4-2. This methodology includes construction procedures that will minimise any adverse impact on peat stability.

A section of a new floating road is shown in Figure 4-7.

4.3.3 Borrow Pits

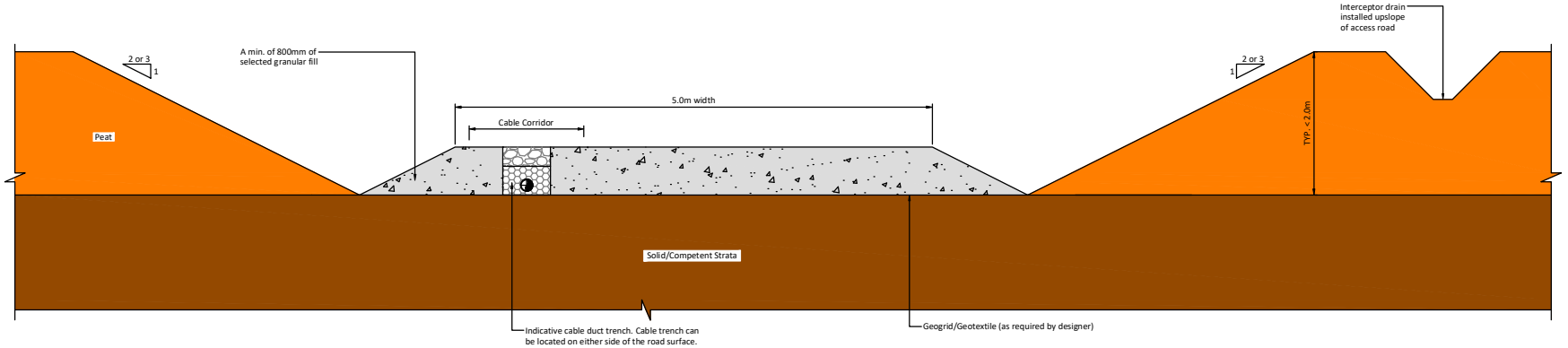
4.3.3.1 Description

It is proposed to develop 3 no. on-site borrow pits as part of the Proposed Development. The borrow pits will provide the majority of all rock and hardcore material required during construction of the wind farm development. Usable rock may also be won from other infrastructure construction, including the turbine base excavations.

Borrow Pit No. 1 measures approximately 9,932m^2. It is located within 10m of an existing forest road to be upgraded, which provides access to the site from the east.

Borrow pit No. 2 measures approximately 16,189m^2. It is located approximately 280m south of T20 and is adjacent to an existing forestry road to be upgraded, providing access to T19.

Borrow Pit No. 3 measures approximately 67,483m^2. It is located approximately 310m north west of T7 and is located 10m of an existing forestry road to be upgraded, providing access to T6 and the west of the site.



Scale 1:50

Figure 4-6

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Rev.	Description	App By	Date
A	FOR INFORMATION	BDH	12.05.23
B	FOR INFORMATION	BDH	05.12.23

PROJECT: GLENORA WINDFARM

CLIENT: MKO

SHEET: TYPE B - NEW EXCAVATE AND REPLACE ACCESS ROAD

Date: 05.12.23
Drawn by: POR
Checked by: IH
Project number: P20-213
Scale (@ A3): As Shown
Drawing Number: P20-312-0600-GLEN-0007
Rev: B

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5 December 2023

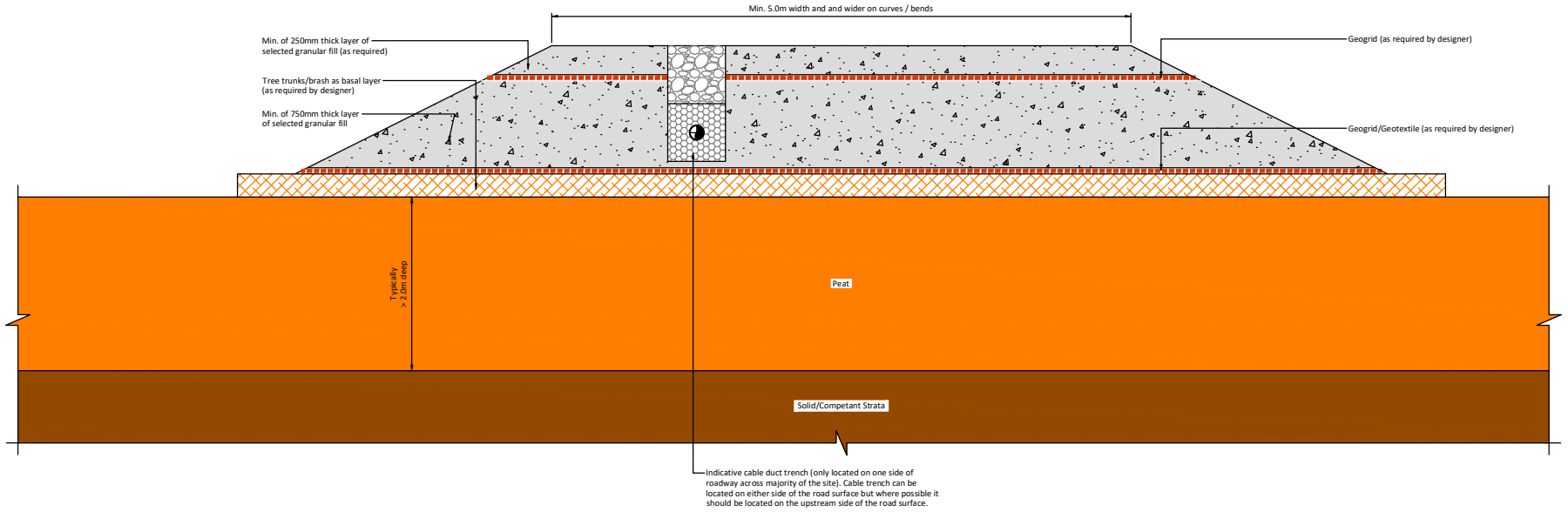

Figure 4-7

Scale 1:40

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Rev.	Description	App By	Date
A	FOR INFORMATION	BDH	12.05.23
B	FOR INFORMATION	BDH	07.12.23

PROJECT: GLENORA WINDFARM

CLIENT: MKO

SHEET: TYPE C - NEW FLOATED ACCESS TRACK

Date: 07.12.23
Project number: P20-213
Scale (@ A3): As Shown
Drawn by: POR
Drawing Number: P20-312-0600-GLEN-0008
Rev: B
Checked by: IH

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7 December 2023

3The 3 no. borrow pits are shown on Figure 4-1 and on the detailed site layout drawings included as Appendix 4-1 to this EIAR. Figure 4-8, Figure 4-9 and Figure 4-10 below shows detailed sections through the proposed borrow pits. The borrow pits will be reinstated with excavated peat and subsoils as described in Section 4.3.4 below.

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

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

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

The estimated volume of crushed stone to be extracted from the borrow pit and required for the construction of the proposed development is 810,000m^3.

The two proposed extraction methods are detailed below.

4.3.3.2 Rock Extraction Methods

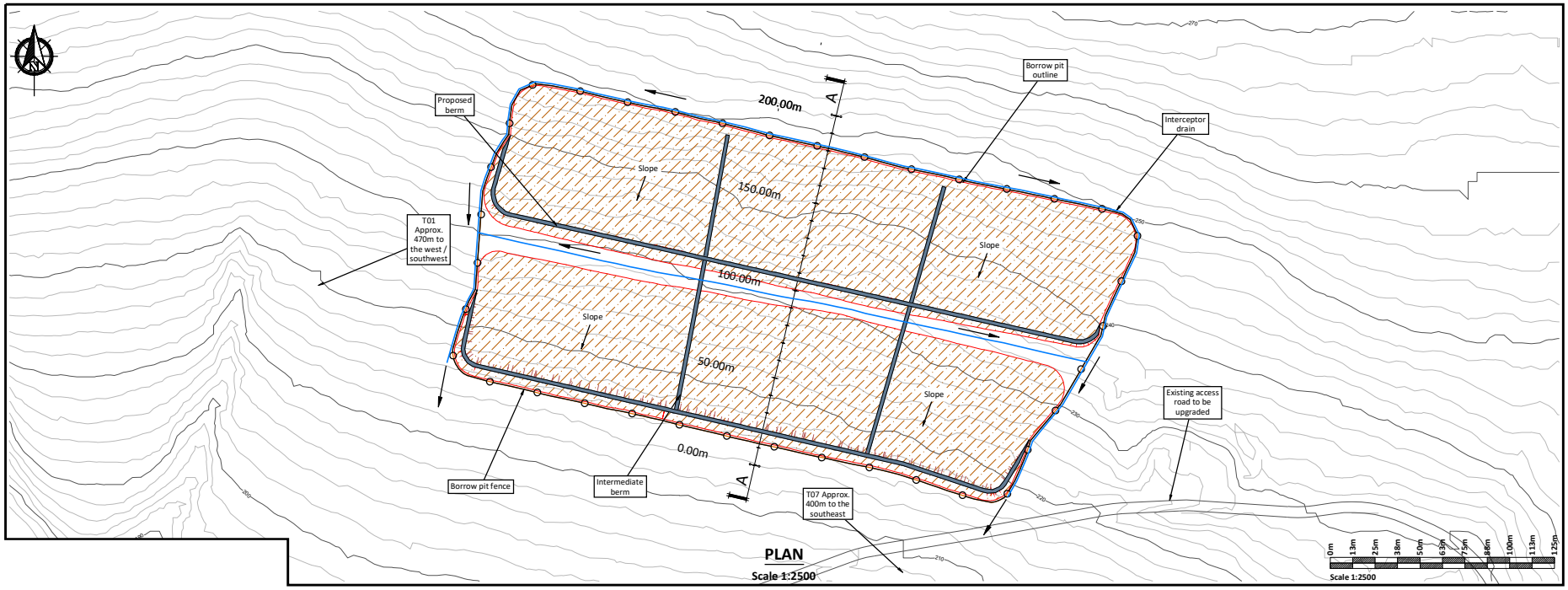
The extraction of rock from the borrow pit will be a temporary operation during the construction phase of the proposed development. There is a layer of peat and subsoil present at the borrow pit location, which will be stripped back and temporarily stockpiled using standard tracked excavators. Two extraction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

4.3.3.2.1 *Rock Breaking*

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

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

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



PLAN

Scale 1:2500

Borrow Pit Construction Notes:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.

(2) Slopes within the excavated rock formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ rock conditions.

(3) Infilling of the peat & spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress.

(4) A rock buttress is required at the downslope edge of the borrow pit to safely retain the infilled peat and spoil. The height of the rock buttresses constructed will be greater than the height of the infilled peat & spoil to prevent any surface peat & spoil run-off. A buttress up to 9m (approx.) in height is likely to be required.

(5) The rock buttress will be founded on competent strata. The founding stratum for the rock buttress will be inspected and approved by the project geotechnical engineer.

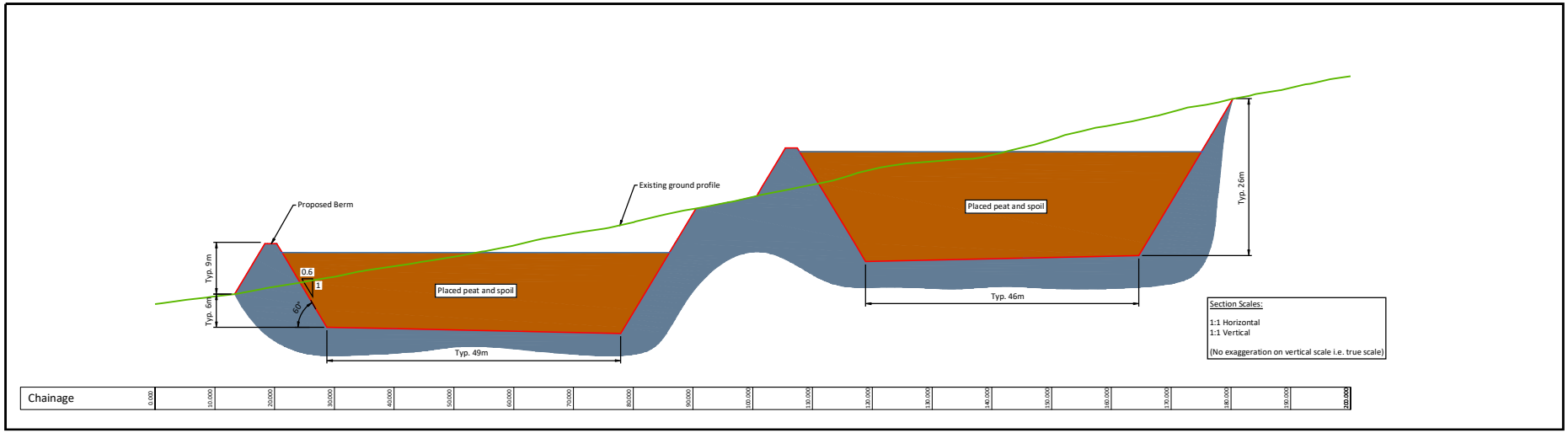
(6) In order to prevent water retention occurring behind the buttresses, the buttresses will be constructed of coarse boulder fill with a high permeability.

(7) The surface of the placed peat & spoil will be shaped to allow efficient run-off of surface water from the placed arising's.

(8) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.

(9) All the above-mentioned general guidelines and requirements will be confirmed by the designer prior to construction.

(10) Further guidelines on the construction of the borrow pit are included within Section 7.5 of the Peat & Spoil Management Plan



SECTION A - A

Scale 1:750

Figure 4-8

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Rev.	Description	App By	Date
A	FOR INFORMATION	BDH	06.10.22
B	FOR INFORMATION	BDH	27.04.23
C	FOR INFORMATION	BDH	03.05.23
D	FOR INFORMATION	BDH	30.11.23

PROJECT: GLENORA WINDFARM

CLIENT: MKO

SHEET: BORROW PIT 1 PLAN AND SECTION

Date: 30.11.23

Project number: P20-213

Scale (@ A3): As Shown

Drawn by: POR

Checked by: IH

Drawing Number: P20-312-0600-GLEN-0009

Rev: D

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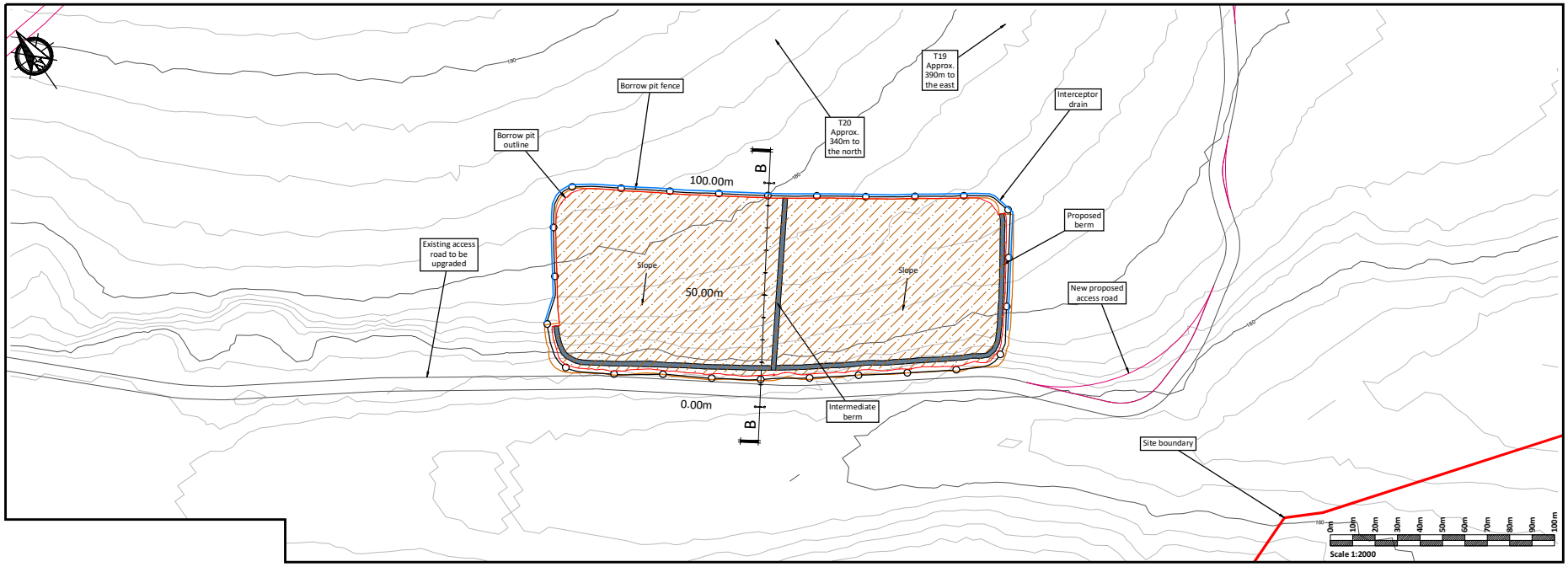
7 December 2023



PLAN

Scale 1:2000

Borrow Pit Construction Notes:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.

(2) Slopes within the excavated rock formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ rock conditions.

(3) Infilling of the peat & spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress.

(4) A rock buttress is required at the downslope edge of the borrow pit to safely retain the infilled peat and spoil. The height of the rock buttresses constructed will be greater than the height of the infilled peat & spoil to prevent any surface peat & spoil run-off. A buttress up to 5m (approx.) in height is likely to be required.

(5) The rock buttress will be founded on competent strata. The founding stratum for the rock buttress will be inspected and approved by the project geotechnical engineer.

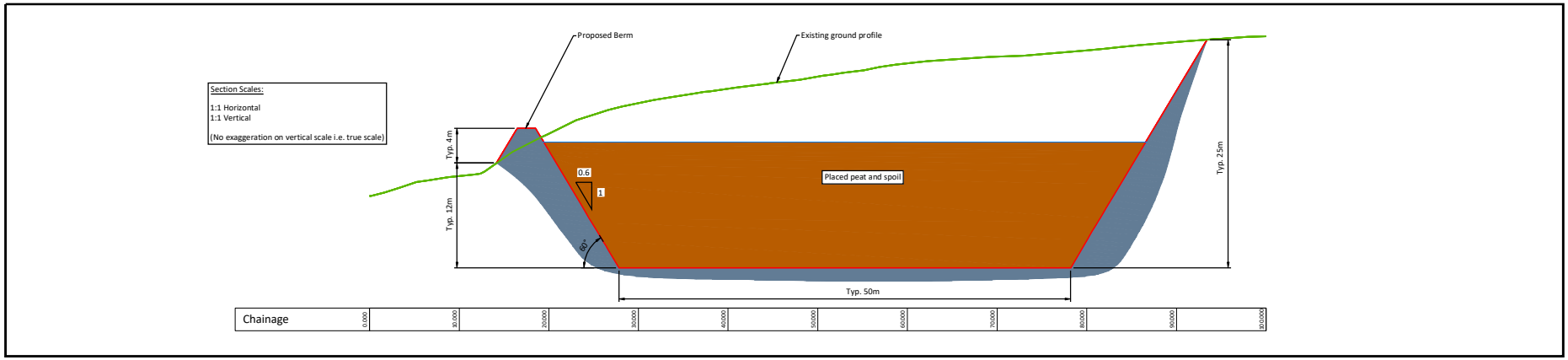
(6) In order to prevent water retention occurring behind the buttresses, the buttresses will be constructed of coarse boulder fill with a high permeability.

(7) The surface of the placed peat & spoil will be shaped to allow efficient run-off of surface water from the placed arising's.

(8) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.

(9) All the above-mentioned general guidelines and requirements will be confirmed by the designer prior to construction.

(10) Further guidelines on the construction of the borrow pit are included within Section 7.5 of the Peat & Spoil Management Plan



SECTION

Scale 1:500

Figure 4-9

FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

Rev.	Description	App By	Date
A	FOR INFORMATION	BDH	06.10.22
B	FOR INFORMATION	BDH	27.04.23
C	FOR INFORMATION	BDH	03.05.23
D	FOR INFORMATION	BDH	30.11.23

PROJECT: GLENORA WINDFARM

CLIENT: MKO

SHEET: BORROW PIT 2 PLAN AND SECTION

Date: 30.11.23

Project number: P20-213

Scale (@ A3):

Drawn by: POR

Drawing Number: P20-312-0600-GLEN-0010

Rev: D

Checked by: IH

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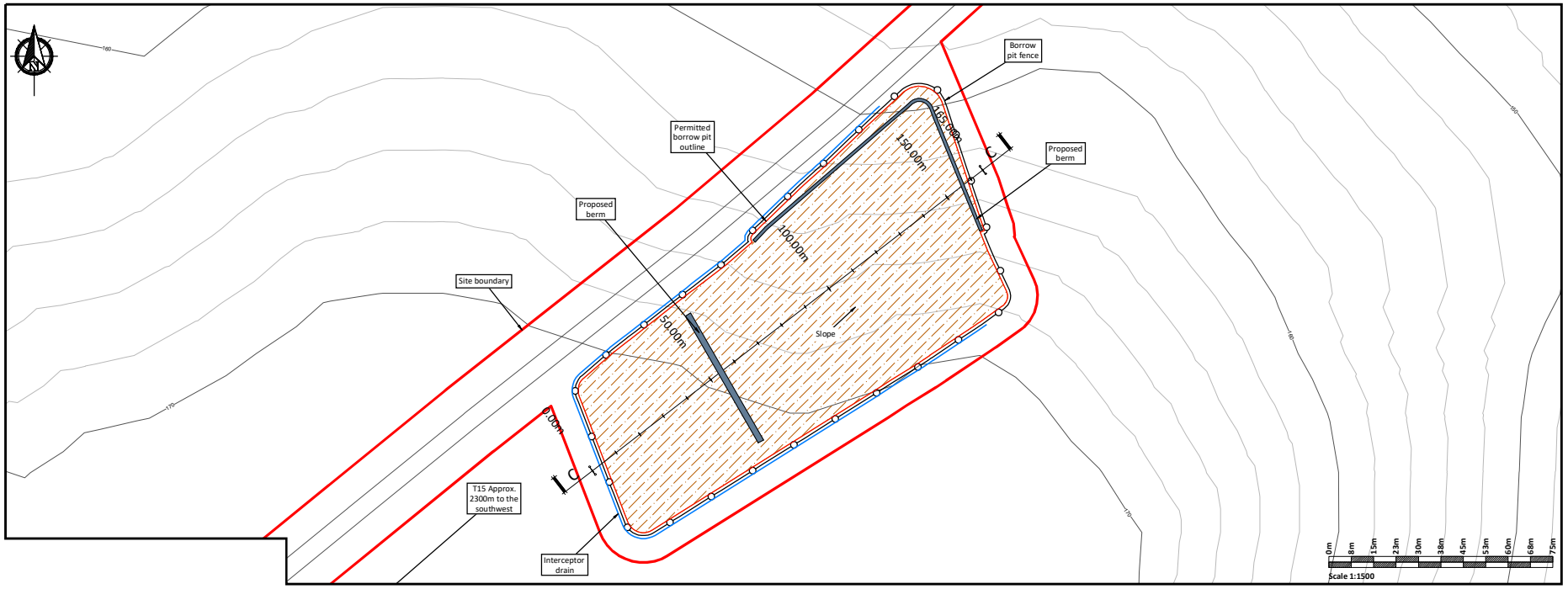
7 December 2023



PLAN

Scale 1:1500

Borrow Pit Construction Notes:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.

(2) Slopes within the excavated rock formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ rock conditions.

(3) Infilling of the peat & spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress.

(4) A rock buttress is required at the downslope edge of the borrow pit to safely retain the infilled peat and spoil. The height of the rock buttresses constructed will be greater than the height of the infilled peat & spoil to prevent any surface peat & spoil run-off. A buttress up to 3m (approx.) in height is likely to be required.

(5) The rock buttress will be founded on competent strata. The founding stratum for the rock buttress will be inspected and approved by the project geotechnical engineer.

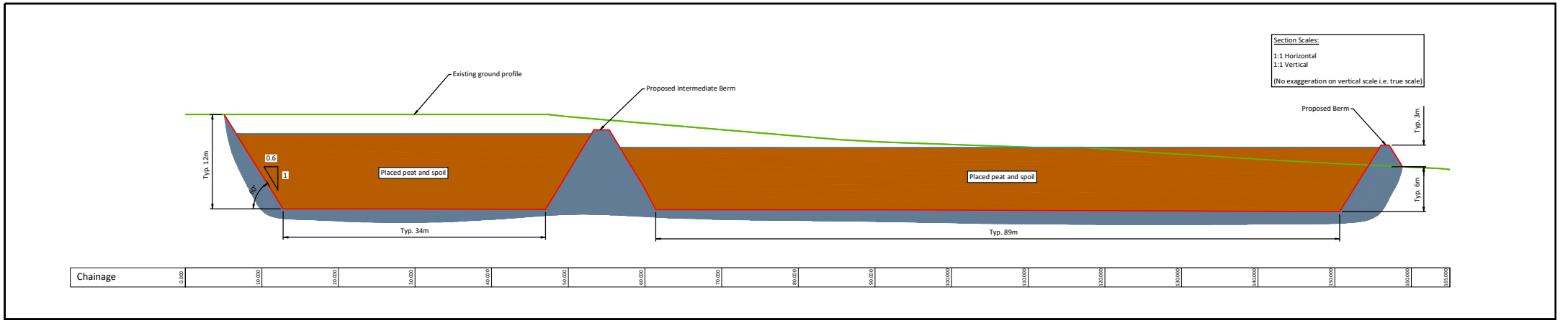
(6) In order to prevent water retention occurring behind the buttresses, the buttresses will be constructed of coarse boulder fill with a high permeability.

(7) The surface of the placed peat & spoil will be shaped to allow efficient run-off of surface water from the placed arising's.

(8) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.

(9) All the above-mentioned general guidelines and requirements will be confirmed by the designer prior to construction.

(10) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan



SECTION

Scale 1:500

Figure 4-10

FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

Rev.	Description	App By	Date
A	FOR INFORMATION	BDH	06.10.22
B	FOR INFORMATION	BDH	27.04.23
C	FOR INFORMATION	BDH	03.05.23
D	FOR INFORMATION	BDH	30.11.23

PROJECT: GLENORA WINDFARM

CLIENT: MKO

SHEET: BORROW PIT 3 PLAN AND SECTION (OFFSITE BORROW PIT)

Date: 30.11.23 | Project number: P20-213 | Scale (@ A3): | Drawn by: POR | Checked by: IH | Drawing Number: P20-312-0600-GLEN-0011 | Rev: D

O:\ACAD\2020\P20-312\P20-312-0600-GLEN-0010

12 December 2023

4.3.3.2.2 Rock Blasting

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

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

A properly designed blast should generate rock of a size that can be loaded directly into a mobile crusher, using the same wheeled loader outlined above. The same method is used for processing the rock generated from a blast, as would be used to process rock generated by rock breaking. Generally, the drilling rig will recommence drilling blast holes for the next blast as soon one blast finished. The potential impacts and control measures associated with noise and vibration from this extraction method are assessed in Chapter 11: Noise and Vibration. Any blasting will be carried out in accordance with the *Guidance on the Safe Use of Explosives in Quarries* (Safety and Health Commission for the Mining and Other Extractive Industries, 2002)[2] and the British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*[3].

4.3.4 Peat and Spoil Management Plan

4.3.4.1 Quantities

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

Table 4-2 Peat and Spoil Volumes requiring management

Development Component	Peat Volume (m3) (approx.)	Spoil Volume(m3) (approx.)
22 No. Turbines and Hardstanding Areas	309,000	135,000
1 No. Substation Platform & Building	44,300	7,900
Meteorological Mast Platform	900	200
Access Roads	212,000	30,500
3 No. Borrow Pit	60,200	25,800

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

Development Component	Peat Volume (m3) (approx.)	Spoil Volume(m3) (approx.)
5 No. Construction Compound Platform	29,000	5,200
Totals	655,400	204,600
Total Peat and Spoil Volume to be managed	**860,000**	

4.3.4.2 Peat and Spoil Usage in Restoration of Borrow Pits

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

Stone buttresses will be constructed within the borrow pits prior to the reinstatement of peat. These buttresses which will form individual restoration areas within the borrow pit which will be filled once the required volume of rock has been extracted from each individual area. The buttresses will be wide enough to allow construction traffic access for the tipping of peat into the individual cells. Refer to Figure 4-8 to Figure 4-10 above.

A temporary access track (comprising bog mats) will be placed around the perimeter of the borrow pit area to allow for the tipping of peat over the edge of the borrow pit area.

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

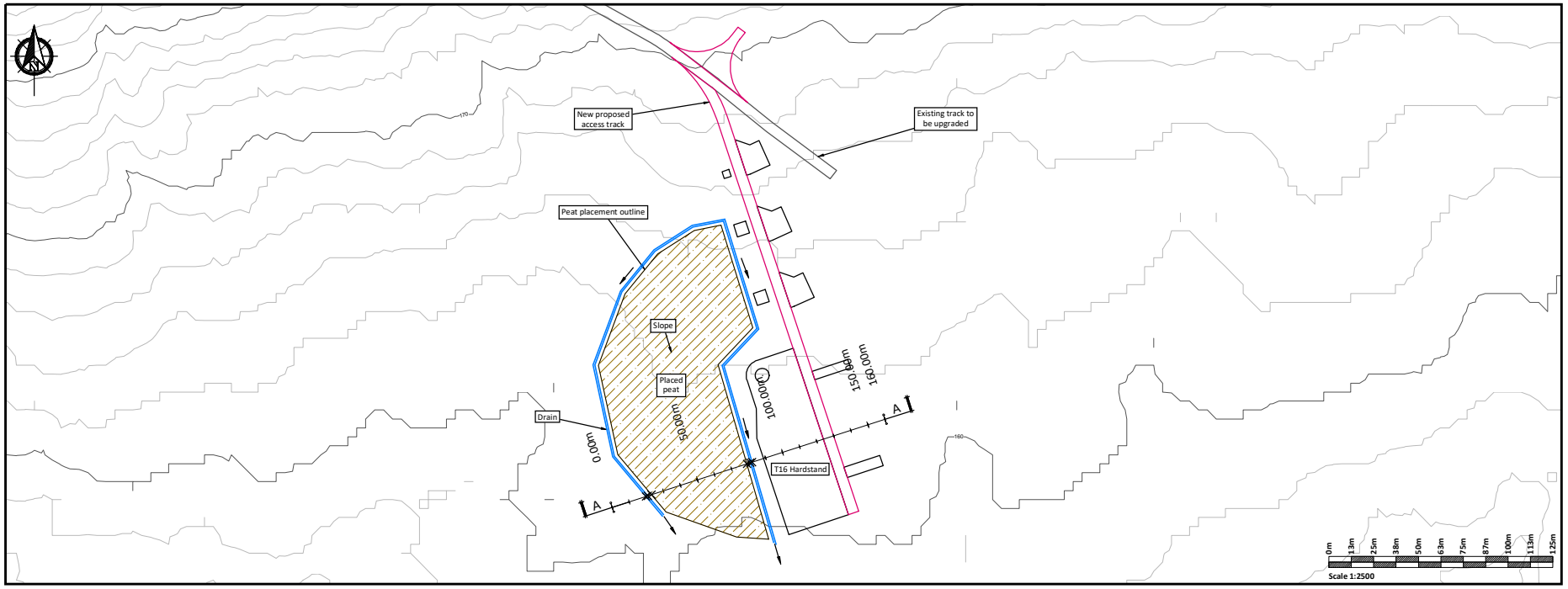
The rock buttress will be constructed as per the methodology outlined in Section 7.5 of the Peat and Spoil Management Plan, Appendix 4-2 of this EIAR.

4.3.4.3 Peat and Spoil Placement Areas

It is proposed that any excess peat and spoil generated through construction activities, not used to reinstate the borrow pits or for landscaping, be placed around selected turbines bases and hardstands. The areas around 9 no. turbine bases and hardstands (14 no. individual peat placement areas proposed) have been assessed as suitable locations for peat and spoil placement due to suitable ground conditions including peat depths and slope angles.

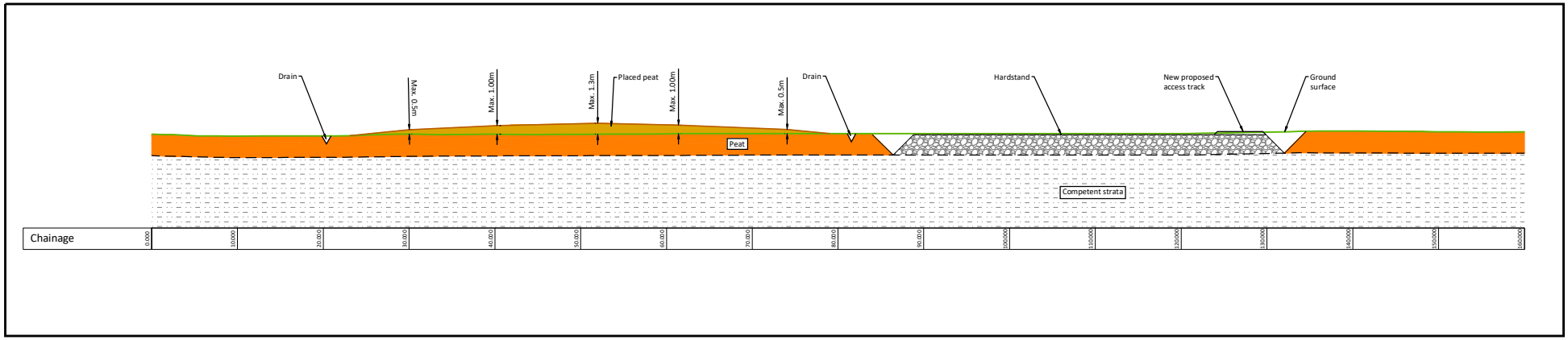
The locations of these peat and spoil placement areas are shown on Figure 4-1b and in the site layout drawings in Appendix 4-1 of this EIAR. An example cross-section of a peat placement area is shown in Figure 4-11.

The storage areas will be constructed as per the methodology in Section 7.6 of the Peat and Spoil Management Plan, Appendix 4-2 of this EIAR.



PLAN

Scale 1:2500



SECTION A - A

Scale 1:500

Construction Notes Peat Storage Areas:

(1) An interceptor drain will also be installed upslope of the repository areas.

(2) A silting pond will be required at the lower side of the peat storage areas.

(3) It is important that the surface of the stored peat be shaped to allow efficient run-off of water from the stored spoil.

(4) Supervision by a geotechnical engineer or appropriately competent person is recommended for the construction of the peat storage area.

(5) All the above-mentioned general guidelines and requirements will be implemented during construction.

(6) Further guidelines on the construction of the peat storage area are included within Section 7.5 of the Peat & Spoil Management Plan.

Figure 4-11

FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

Rev.	Description	App By	Date
A	FOR INFORMATION	BDH	12.05.23

PROJECT	GLENORA WINDFARM
CLIENT	MKO
SHEET	PEAT PLACEMENT WITHIN CLEAR FELL AREAS – TYPICAL DETAILS
Date	12.05.23
Project number	P20-213
Scale (@ A3)	As Shown
Drawn by	POR
Drawing Number	P20-312-0600-GLEN-0012
Rev	A
Checked by	IH

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12 May 2023

4.3.5 Electricity Substation

It is intended to construct a 110kV electricity substation within the site of the Proposed Development as shown in Figure 4-1a. The intended substation site is located within forestry, adjacent to the northeastern boundary of the wind farm development site, adjacent to an existing forestry road which is the main access for the Proposed Development. Access to the substation will be off the existing forestry road.

The footprint of the onsite electricity substation compound measures approximately 21,500m^2 and will include 2 no. wind farm control buildings and the electrical components necessary to consolidate the electrical energy generated by each wind turbine and export that electricity from the wind farm to the national grid. Section 4.3.6 provides further details regarding the connection of the onsite substation to the national electricity grid.

The layout and elevation of the onsite substation is shown on Drawings No. 05795-DR-300 and 05796-DR-303 in Appendix 4-6 of this EIAR. The substation compound will be surrounded by an approximately 2.6-metre-high steel palisade fence, and internal fences will also segregate different areas within the main substation. The construction and exact layout of electrical equipment in the onsite electricity substation will be to Eirgrid specifications. It should be noted that this 110kV electricity substation is not included in the planning application for the proposed wind farm, however, it has been assessed in this EIAR as part of the overall project.

It should be noted that this 110kV electricity substation is not included in the planning application for the proposed wind farm, however, it has been assessed in this EIAR as part of the overall project.

4.3.5.1 Wind Farm Control Buildings

Two wind farm control buildings will be located within the substation compound. The Independent Power Provider (IPP) Control Building will measure 20.1 metres by 10.7 metres and 6.9 metres in height. The Eirgrid Control Building will measure 25 metres by 18 metre and 8.4 metres in height. Layout and elevation drawings of the control buildings are included in Drawings No. 05795-DR-305 and 05795-DR-304 in Appendix 4-6.

The wind farm control buildings will include staff welfare facilities for the staff that will work on the Proposed Development during the operational phase of the project. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the Proposed Development there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the Proposed Development does not necessitate a potable source. It is proposed to either harvest rainwater from the roofs of the buildings 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 building. 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 storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. It is not proposed to treat wastewater on-site

Such a proposal for managing the wastewater arising on site 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.

The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system can be submitted to the Planning Authority in advance of any works commencing on-site. The wastewater storage tank alarm will be part of a continuous stream of data from the site's 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 site.

As the wind farm control buildings are part of the electricity substation, they also do not form part of the planning application for the wind farm.

4.3.5.2 Battery Storage

A battery-based energy storage system (BESS) will be located within the 110kV substation compound. The BESS primarily consists of 25 no. steel containers and 10 no. power supply units assembled in rows at the development site.

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

In addition to the modular steel containers, other components of the development include:

- A grid transformer within the electrical compound;
- Above ground cable junction boxes/ cabling cabinets and cable racks/steel trunking facilitating the necessary electrical connections between containers;
- Underground ducting and cabling;
- A security fence around the perimeter of the proposed development;
- Communications equipment; and,
- Lightning protection poles.

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

The BESS containers are shown in Drawings No. 05795-DR-300 and 05795-DR-303 in Appendix 4-6 of this EIAR.

4.3.5.3 Site Cabling

Each turbine will be connected to the on-site electricity substation via an underground 33/66kV (kilovolt) electricity cable. Fibre-optic cables will also connect each wind turbine to the wind farm control building at the onsite substation compound. The electricity and fibre-optic cables running from the turbines to the onsite substation compound will be run in trenches that will be approximately 1.2 metres in depth and 0.6metres in width, within the wind farm access roadways. The route of the cable ducts will follow the access track to each turbine location. A cross section of a site cabling duct within a forestry road is shown in Figure 4-12 below.

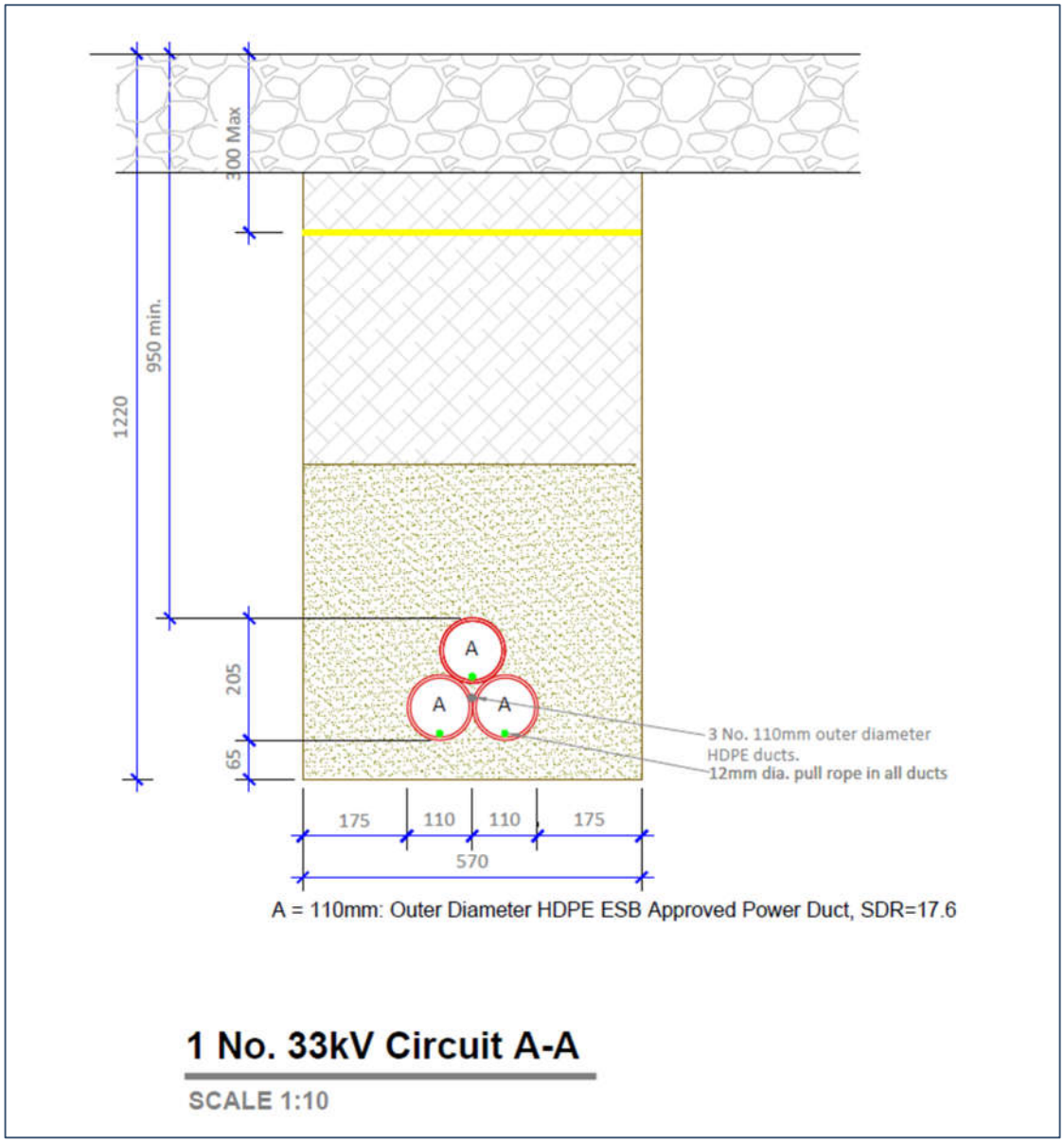


Figure 4-12 Section Through Forestry/Wind Farm Site Road

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

4.3.6 Grid Connection Cabling

A 110kV connection between the Proposed Development and the national electricity grid will be necessary to export electricity from the proposed wind farm. This underground cable connection will originate at the proposed onsite substation located within the north-eastern corner of the site, adjacent to an existing forestry road. The underground cable connection will run north eastwards from the substation along the existing forestry road for approximately 4.7km before meeting the unnamed local road in the townland of Ballyglass.

The proposed grid connection cabling route will then continue north along the local road for approximately 1.6km before turning southeast onto the R314 Regional Route for 390m before turning south onto the R315 Regional Route. The cabling route will then head in a southerly direction along the R315 Regional Road for approximately 7.5km before turning east on to the local road in the townland of Creevagh More for and continuing for 8.4km in a southeasterly direction. The grid route then runs northward for approximately 600m before travelling east along the local road in the townland of Lisglennon for approximately 3km. The grid connection route then turns north onto the R314 for a short distance before turning west into the existing 110kV Tawnaghmore substation in townland of Tawnaghmore Upper. The grid connection cabling route measures approximately 28 kilometres in length. This connection route is illustrated in Figure 4-1a.

110kV grid connection cabling trench cross sections are included in Appendix 4-6 of this EIAR. Further details in relation to the grid connection for the Proposed Development are outlined in Section 4.9.7 below and in Appendix 4-5.

As per the on site 110kV substation, the grid connection cabling route is not included in the planning application for the proposed wind farm, however, it is assessed in this EIAR as part of the overall project.

4.3.7 Meteorological Mast

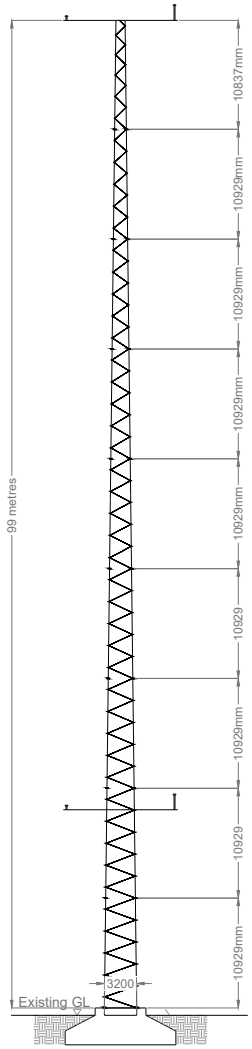
One permanent meteorological (met) mast is proposed as part of the Proposed Development. The met mast will be equipped with wind monitoring equipment at various heights. The mast will be located E503515, N832315 as shown on the site layout drawing in Figure 4-1. The mast will be a slender structure and will be 99m in height. The mast will be a free-standing structure. The mast will be constructed on a hard-standing area sufficiently large to accommodate the crane that will be used to erect the mast, adjacent to an existing track. An elevation drawing of the proposed met mast is shown in Figure 4-13.

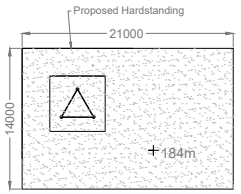
4.3.8 Temporary Construction Compounds

Five temporary construction compounds measuring approximately 45 metres by 70 metres and 3,100m^2 in area are proposed as part of the wind farm development.

- Compound No. 1 is located at the site entrance along an existing road within 320m of Turbine No. 15 and approximately 50m west of the substation compound. (Primary Construction Compound)
- Compound No. 2 is located along an existing road approximately 230m of Turbine No. 7.
- Compound No. 3 is located along an existing road approximately 260m southwest of Turbine No. 6.
- Compound No. 4 is located along a proposed new road approximately 300m south of Turbine No 5.
- Compound No. 6 is located along an existing road and approximately 140m northwest of Turbine No. 19.

The locations of the proposed construction compounds are shown on the site layout drawing in Figure 4-1b. The layout of construction compounds will be the same for all five proposed compounds. The layout of the primary construction compound is shown in Figure 4-14. The general layout of the remaining four construction compounds is shown in Figure 4-15. The construction compounds will consist of temporary site offices, staff facilities, construction materials storage and car-parking areas for staff and visitors. Turbine components will be brought directly to the proposed turbine locations following their delivery to the site.





Met Mast Compound Plan

Figure 4-13

DRAWING TITLE:
Met Mast
Free Standing Mast

PROJECT TITLE:
Glenora Wind Farm, Co. Mayo

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No.: 201120	DRAWING No.: 201120 - 52
SCALE: 1:500 @ A3	DATE: 13.12.2023

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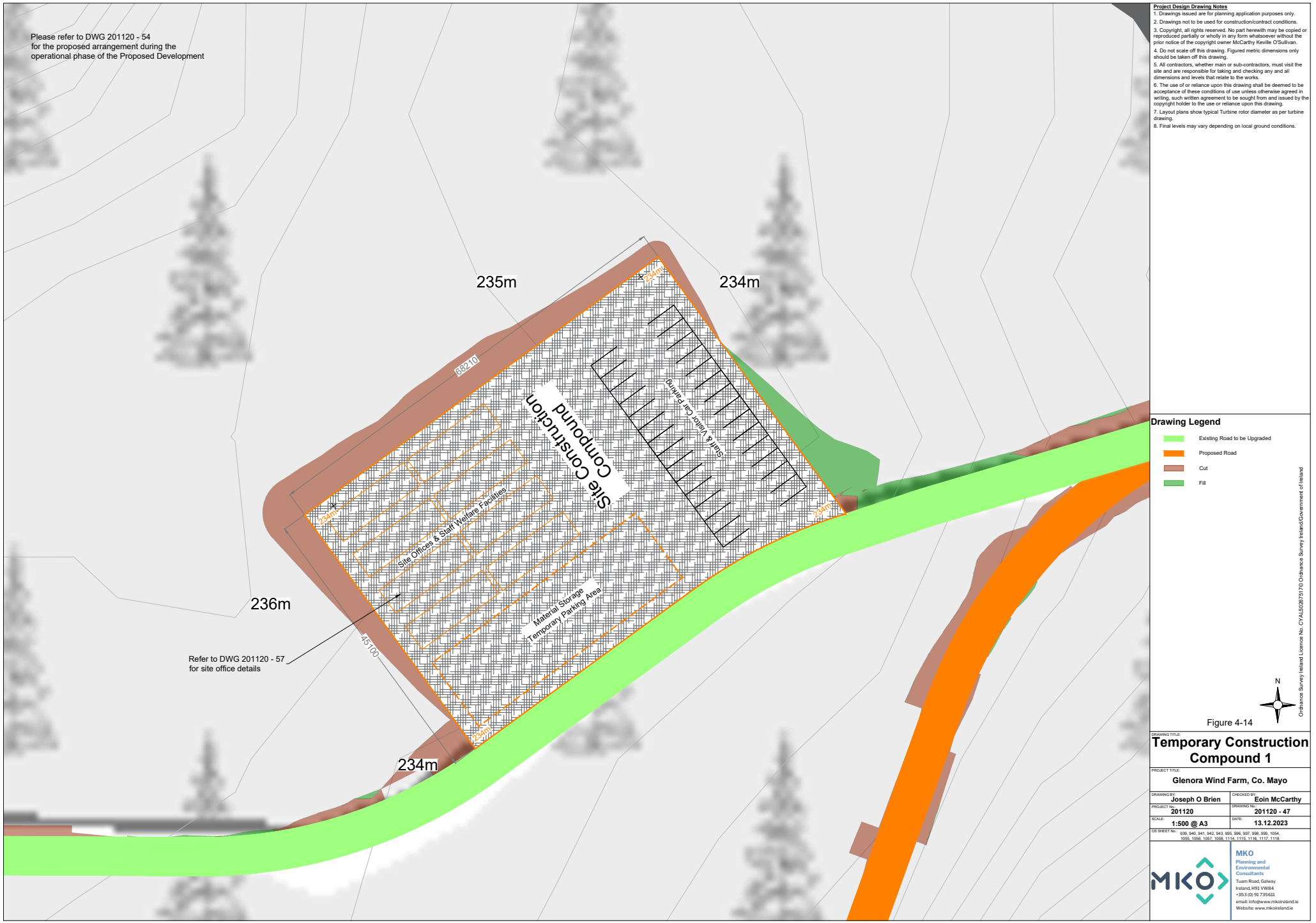
Website: www.mkoireland.ie



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

Drawing Legend

- Existing Road to be Upgraded
- Proposed Road
- Cut
- Fill

N

Figure 4-14

DRAWING TITLE:
Temporary Construction Compound 1

PROJECT TITLE:
Glenora Wind Farm, Co. Mayo

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No.: 201120	DRAWING No.: 201120 - 47
SCALE: 1:500 @ A3	DATE: 13.12.2023
OS SHEET No.: 939, 940, 941, 942, 943, 995, 996, 997, 998, 999, 1054, 1055, 1056, 1057, 1058, 1114, 1115, 1116, 1117, 1118	

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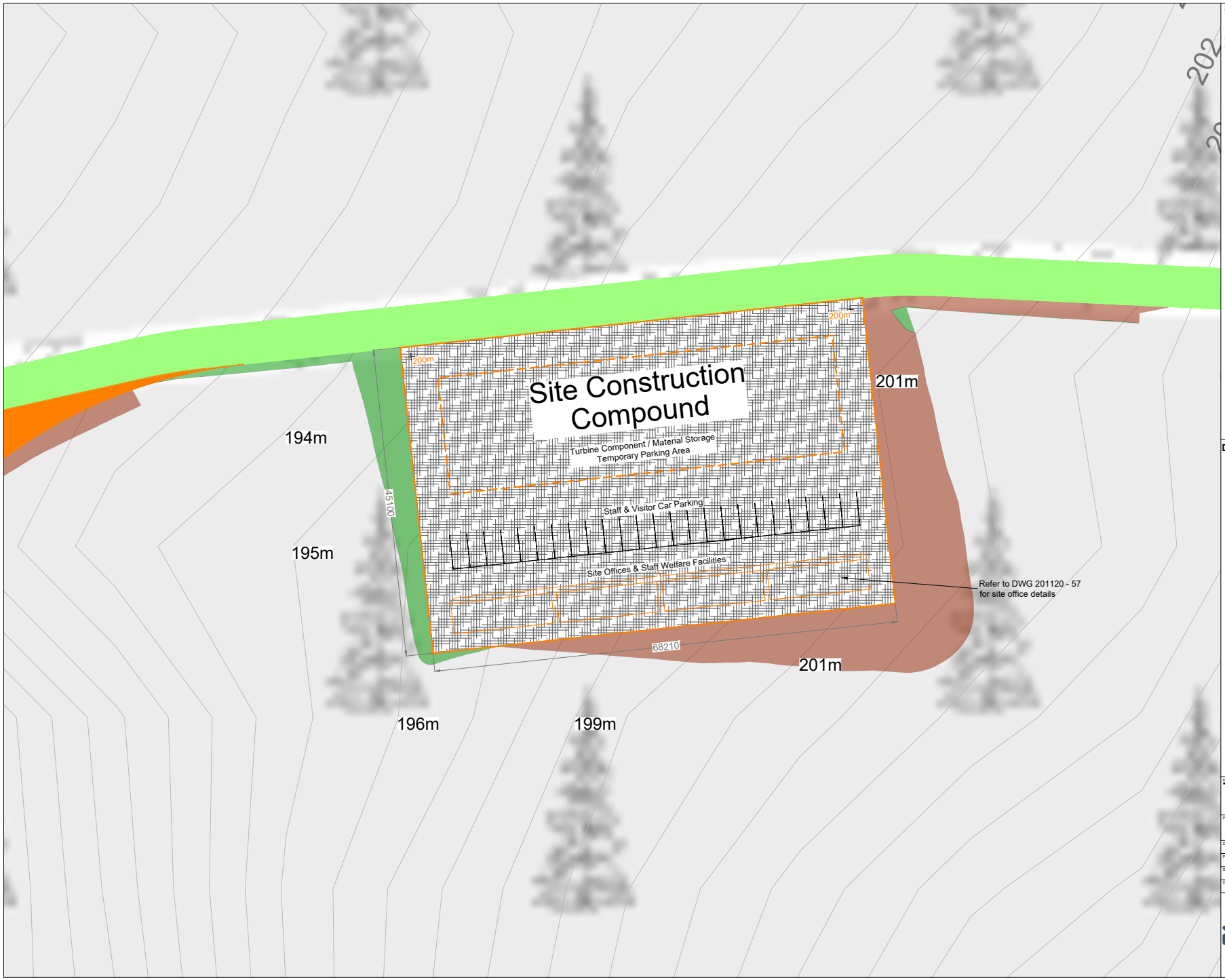

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6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this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

Drawing Legend

- Existing Road to be Upgraded
- Proposed Road
- Cut
- Fill

N

Figure 4-15

DRAWING TITLE:
Temporary Construction Compound 2

PROJECT TITLE:
Glenora Wind Farm, Co. Mayo

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No.: 201120	DRAWING No.: 201120 - 48
SCALE: 1:500 @ A3	DATE: 13.12.2023
OS SHEET No.: 939, 940, 941, 942, 943, 995, 996, 997, 998, 999, 1054, 1055, 1056, 1057, 1058, 1114, 1115, 1116, 1117, 1118	

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Website: www.mkoireland.ie

Temporary toilets, located within staff portacabins, 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 a permitted waste collector to wastewater treatment plants.

Once the proposed wind farm has been commissioned, all but Construction Compound No. 1 will be removed. Half of Construction Compound No. 1 will be used as an amenity car park (refer to Section 4.6 below) while the Operation and Maintenance Building (refer to Section 4.10.1 below) will be located within the remaining half of the compound.

The remaining four areas will be reinstated with previously excavated peat and spoil and either be reseeded or left to revegetate naturally.

4.3.9 Tree Felling

The majority of the site (approximately 64%) currently comprises commercial coniferous forestry plantation. As part of the Proposed Development, tree felling will be required within and around the development footprint to allow the construction of turbine bases, access roads and the other ancillary infrastructure.

A total of 116 hectares of forestry will be permanently felled within and around the footprint of the Proposed Development in order to facilitate infrastructure construction and turbine erection. Figure 4-16 shows the extent of the areas to be permanently felled as part of the Proposed Development.

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

4.3.9.1 Forestry Replanting

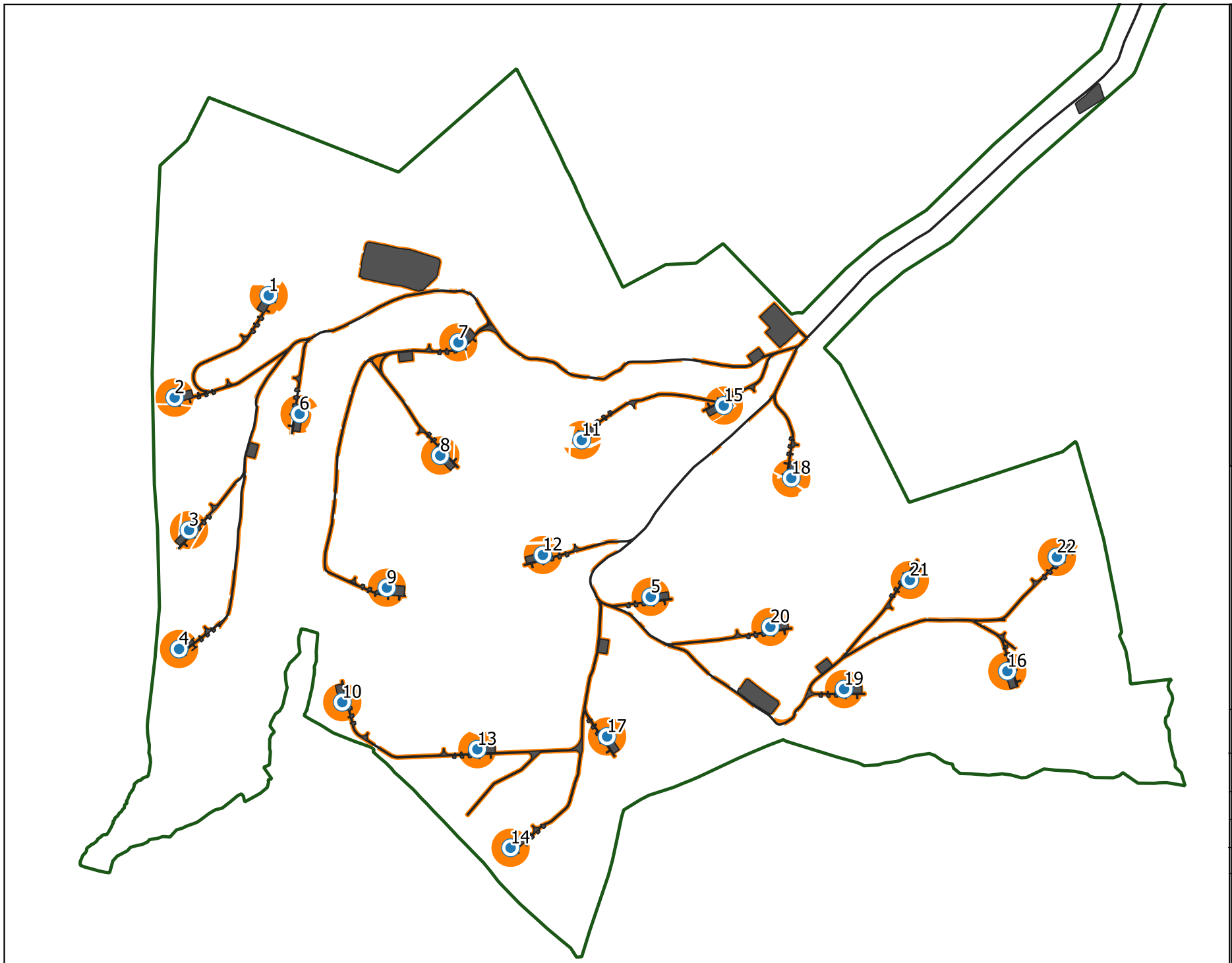
In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for turbine bases, access roads, and any other wind farm-related uses will have to be replaced by replanting at an alternative site or sites.

The Forest Service policy requires replacement or replanting on a hectare for hectare basis for the footprint of the turbines and the other infrastructure developments.

The estimated 116 hectares that will be permanently felled for the footprint of the turbines and the other infrastructure and turbine erection will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that might be issued in respect of the proposed wind farm development. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that are under the control of the Forest service.

The replacement of the 116 hectares of forestry can occur anywhere in the State subject to licence. The area size and location of the replant lands will not be capable of being determined unless and until after planning permission is granted. The replacement of forestry, felled as part of the proposed development, may occur on any lands, within the state, benefitting from Forest Service Technical Approval[4] for afforestation, should the proposed development receive planning permission. Under the Forestry Regulations 2017, all applications for licences for afforestation require the prior written

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



Map Legend

- EIAR Site Boundary
- Development Footprint
- Glenora Indicative Felling (116ha)

N

Drawing Title

Proposed Felling Area

Project Title

Glenora Wind Farm

Drawn By	Checked By
ER	EMC
Project No.	Drawing No.
201120	Figure 4-16
Scale	Date
1:25,000	11.12.23

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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 Environmental Impact Assessment 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). Indeed it is environmentally prudent to process felling and afforestation licences closest to the time when those activities are to occur. For example, if a licence is obtained at the planning application stage, it is probable that the licence would expire before the planning process and post planning delivery preparations could be completed. Moreover, the identification and licensing of replant lands after the grant of planning permission has the benefit of ensuring that the licence is compliant with up to date legislation and environmental information, and that the cumulative environmental assessment considers the wider environmental impacts at that point in time. This reflects the fact that key environmental issues relating afforestation (ie water, soils, biodiversity, archaeology, landscape, and climate) are subject to regular updates in terms of best practice, guidelines, standards, and national policies. Therefore, delaying the identification of replant lands until such time as they are required enables identification of optimum lands available from an environmental perspective. If an EIA and/or AA are required the Minister is the competent authority for same. It will be ensured that the location of the replanting will not give rise to any significant cumulative environmental effects, or any adverse effect on the integrity of a European Site, in combination with the other elements of this Project.

Further details in relation to forestry replanting are included in Section 2.8 of Chapter 2 and Appendix 2-4.

4.3.10 Site Activities

4.3.10.1 Environmental Management

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

4.3.10.2 Refuelling

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

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

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

4.3.10.3 Concrete Deliveries

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

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

Plate 4-3 Concrete washout area

Plate 4-4 Concrete washout area

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

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

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

- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout.
- Site roads will be constructed to a high standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork

from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete locally to the location where it is needed.
- The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, confirming routes, prohibiting on-site washout and discussing emergency procedures.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.

4.3.10.4 Concrete Pouring

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

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain.
- Disposing of any potential, small surplus of concrete after completion of a pour in suitable locations away from any watercourse or sensitive habitats.

4.3.10.5 Dust Suppression

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

4.3.10.6 Vehicle Washing

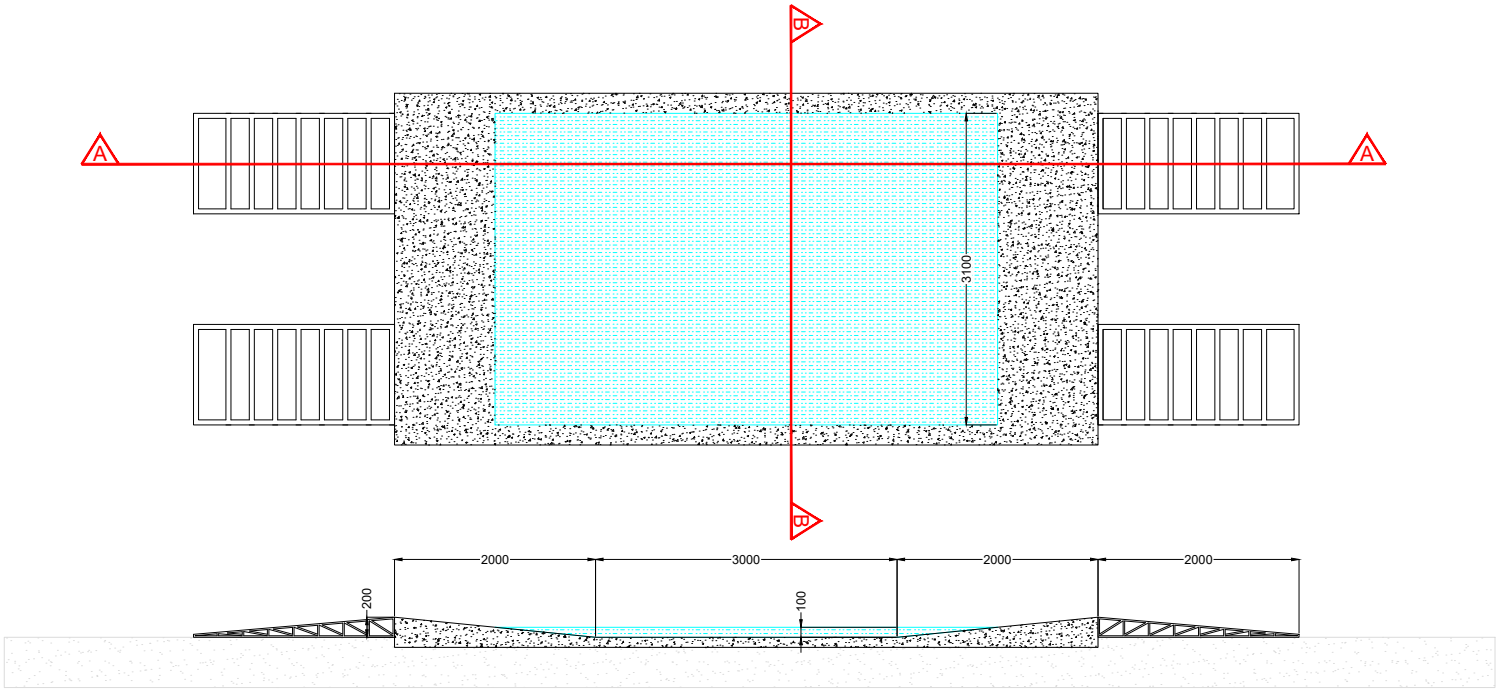
Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. A wheelwash facility will be provided and a layout of the same is shown in Figure 4-17. The site roads will be well finished with non-friable, compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

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

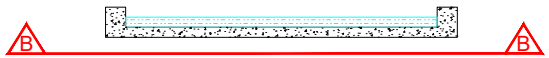
4.3.10.7 Waste Management

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

Note
Wheel washes will be appropriately located at all entrances used during construction of the wind farm



Section A-A



Section B-B

Figure 4-17

DRAWING TITLE:
Wheel Wash Detail

PROJECT TITLE:
Glenora Wind Farm, Co. Mayo

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No. 201120	DRAWING No. 201120 - 61
SCALE: 1: 50 @ A3	DATE: 13.12.2023

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

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

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

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

4.4 Access and Transportation

4.4.1 Site Entrances

During the construction phase, the proposed development site will be accessed via an existing entrance off an existing forestry access road which runs along the eastern boundary of the site in the townland of Glenora. The existing forestry access road merges with the Ballyglass local road approximately 4.7km to the northeast of the site in the townland of Ballyglass. The Ballyglass local road meets the R314 approximately 1.6km further east.

This existing entrance will be widened to accommodate turbine component deliveries and will also be used as the primary site entrance for HGVs and other abnormal loads during the construction phase of the proposed development.

Once the proposed Glenora Wind Farm is operational, this entrance will remain in place and will be used for forestry operations. The entrance will be used in the event of the delivery of a replacement turbine component or other abnormal load required for the operational maintenance of the wind farm. It will also be used by operational and maintenance staff and by the visiting public in order to access the recreation and amenity facilities.

The on-site substation will be accessed via the existing site entrance off the existing forest road running along the eastern boundary of the site.

The site entrance is shown on Figure 4-1b and on the layout drawings included in Appendix 4-1 of this EIAR.

4.4.1.1.1 *Security Cabin*

A security cabin with automatic traffic barriers for the control of traffic into and out of the wind farm site during the construction phase will be located along the existing access road into the site, approximately 450m northeast of T15 and close to Construction Compound No. 1. The detail of the proposed security cabin is shown in Figure 4-18.

4.4.2 Turbine and Construction Materials Delivery Route

It is intended that the port of entry for large turbine components will be Galway Port. Vehicles delivering large turbine components and other abnormal loads to the site will depart from Galway Port and travel northwest through Galway City along the R339 and R336 Regional Roads before reaching the N6 National Road at the Bothar na dTreabh/Tuam Road junction. The delivery vehicles will continue west along the N6/M6 Motorway before merging onto the M17 at the M6/M17/M18 intersection. From here, the delivery vehicles will continue north on the M17 and N17 Tuam bypass. The delivery vehicles will continue on the N17 northwards through Claremorris and on to Charlestown where they will merge onto the N5 heading west to Ballyvary, before turning north onto the N58 to Foxford. The vehicles will then turn west onto the N26 and continue north to Ballina before turning west onto the N59. The vehicles will follow the N59 westwards to Crossmolina until they reach Bangor and continue on the R313 before travelling north on the L1204 to the R314. The delivery vehicles will travel north east along the R314 before travelling southwest along the Ballyglass local road finally merging onto the existing forestry road turning west towards the proposed development site entrance. The turbine delivery route is shown on Figure 4-19.

Traffic movements generated by the proposed development are discussed in Section 15.1 of Chapter 15, Material Assets.

It is envisaged that standard blade transporters will carry the turbine blades as far as the N58, south of Foxford. The blades will then be transferred to transporters with blade-lift adapter technology which can transport the blade at an angle of up to 60 degrees in order to shorten the load on the horizontal plane. These transporters will carry the turbine blades to the site of the proposed development.

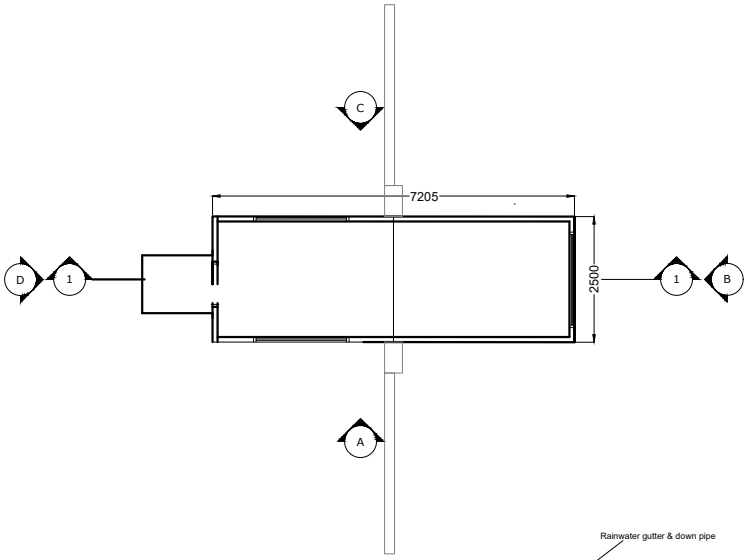
The autotrack assessment of the turbine delivery route was undertaken by Collett & Sons Ltd. and the drawings, referred to below, are included as Appendix 15-1 of this EIAR.

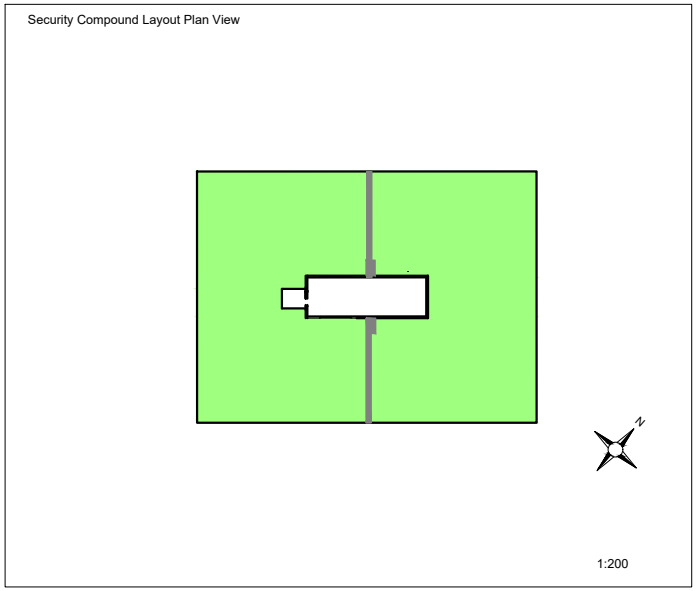
4.4.2.1 Turbine Component Delivery Accommodation Works

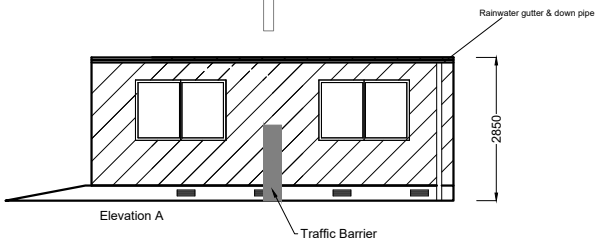
In order to accommodate the delivery of turbine components and other abnormal loads between the R314 and the main site entrance, a bypass or link road will be constructed south of the R314 across agricultural land to the existing Ballyglass local road in the townland of Ballycastle. Steel gates and stockproof fencing will be used to close off this bypass road when large turbine components or other abnormal loads are not being delivered during the construction phase. All other construction traffic will use the existing local road junction with the R314. Upon completion of the construction phase of the proposed development, the boundaries along the public road corridor will be reinstated as per landowner specifications.

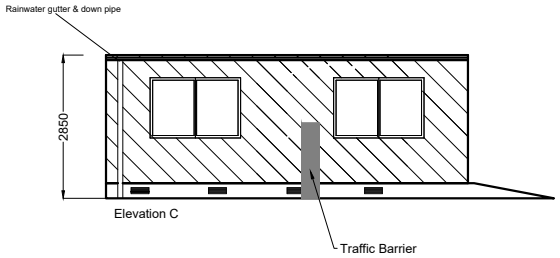
The section of the proposed bypass that is to be constructed is shown on Figure 4-1a.

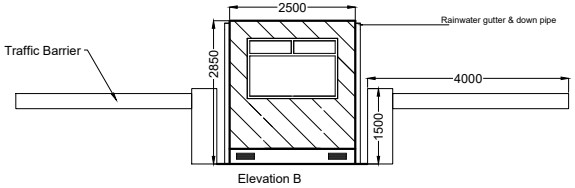
Road widening works are also required at the junction between the local road and the existing Glenora forestry access track in the townlands of Ballyglass and Aghoo. The location and extent of these widening works are shown in the site layout work drawings in Appendix 4-1 of this EIAR. Approximately 1.3km of hedgerow will be removed as part of the widening works, however, this will be replaced on the northern edge of the widened areas. The boundary between the public road corridor will be reinstated with post and wire fencing following the completion of the construction phase of the Proposed Development.

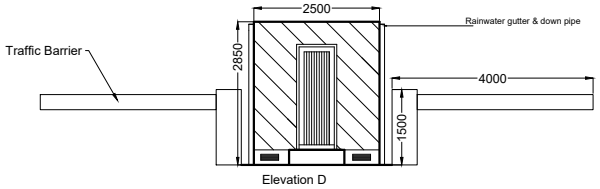












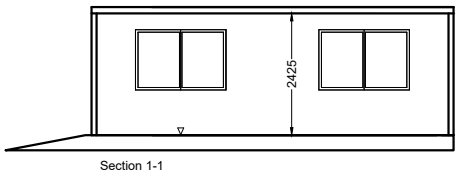


Figure 4-18

DRAWING TITLE:
Security Cabin and Traffic Barriers Detail

PROJECT TITLE:
Glenora Wind Farm, Co. Mayo

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No.: 201120	DRAWING No.: 201120 - 58
SCALE: 1:100 @ A3	DATE: 13.12.2023

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Ballina

Charlestown

Tuam

Galway

Map Legend

- EIAR Site Boundary
- Proposed Turbine Delivery Route

Drawing Title

Overall Turbine Delivery Route

Project Title

Glenora Wind Farm

Drawn By	Checked By
ER	EMC
Project No.	**Drawing No.**
201120	Figure 4-19
Scale	**Date**
1:430,000	2023-12-13

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The temporary relocation of overhead cables will be required at a limited number of locations, along the turbine delivery route, that will be navigated by turbine blade transporters with blade-lift adapter technology. This work will be carried out by the authorised utility provider(s). The relocation works will be appropriately scheduled so as to minimise any disruption to services for local utility users.

4.4.3 Traffic Management

A turbine with a blade length of 81 metres has been used in assessing the traffic impact of the Proposed Development. The regular blade transporter for such a turbine blade would have a total vehicle length of 92.7 metres, including the blade which overhangs the back of the vehicle. The total length of the tower transporter is approximately 60m with the axles located at the front and rear of the load with no overhang. The vehicles used to transport the nacelles will be similar to, but shorter than the tower transporter.

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

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

An outline of the Traffic Management Plan (TMP) has been prepared and set out in Appendix 15-2 of this EIAR. In the event planning permission is granted for the Proposed Development, the final Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned. The plan will include:

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

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

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

Prior to the Traffic Management Plan being finalised, a full dry run of the transport operation along the proposed route will be completed using vehicles with attachments to simulate the dimensions of the wind turbine transportation vehicles. This dry run will inform the Traffic Management Plan submitted for agreement with the local authority. All turbine deliveries will be provided for in a transport management plan which will have to be prepared in advance of the construction stage, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. Such a

transport management plan will be submitted to the Planning Authority for agreement in advance of any abnormal loads using the local roads, and will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

4.5 Community Gain Proposal

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

4.5.1 Renewable Energy Support Scheme

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

1. *a minimum of €1,000 shall be paid to each household located within a distance of a 1 kilometre radius from the Project;*
2. *a minimum of 40% of the funds shall be paid to not-for-profit community 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;*
3. *a maximum of 10% of the funds may be spent on administration. This is to ensure successful outcomes and good governance of the Community Benefit Fund.*
4. *the balance of the funds shall be spent on initiatives successful in the annual application process, as proposed by clubs and societies and similar not-for-profit entities, and in respect of Onshore Wind RESS 1 Projects, on "near neighbour payments" for households located outside a distance of 1 kilometre from the Project but within a distance of 2 kilometres from such Project.*

4.5.2 Community Benefit Fund

Glenora Renewable Energy DAC expects that for each megawatt hour (MWh) of electricity produced by the wind farm, the project will contribute €2 into a community fund for the RESS period i.e. first 15 years of operation If this commitment is improved upon in upcoming Government Policy, we will adjust accordingly.

If this project is constructed as currently designed, we estimate that a total of approximately €7 million will be available in the local area for community funding over the lifetime of the project. The above figure is indicative only and will be dependent on the generation capacity of the wind farm which is influenced by a number of factors including:

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

4.5.2.1 Administration of the Benefit Fund

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, our 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. Glenora Renewable Energy DAC aims to commence this work once the planning application has been submitted to An Bord Pleanála.

4.5.3 Community Investment Opportunity

The Renewable Energy Support Scheme (RESS) sets out that future renewable energy project proposals enable the possibility for local communities to invest in projects in a meaningful way as a means to directly gain from the financial dividends that a project can provide should it be consented, built and operated. In response to this, the applicant has been working hard with external agencies to develop workable models of Community Investment. As with the benefit fund, the applicant aims to take this work into the community during 2024/2025, to continue to explore this exciting possibility and see how best to embed its design within the community.

4.6 Recreation and Amenity Proposals

The proposal to develop a wind farm on the subject site, provides an opportunity and a mechanism to open the area for recreational and amenity use by the local community and general public. The scale of the site, extent of infrastructure already in place and proposed as part of the wind farm development, and the accessibility of the area from the public road network, provides a recreation and amenity opportunity of great potential. The recreational and amenity proposals for the site follow an emerging international trend to make wind farm sites accessible to the general public by providing recreation opportunities that complement the wind farm development. Although the site consists of a rural working landscape under commercial forestry plantation with many wind farm developments already permitted in the immediate vicinity and surrounding area, the site has a secluded and isolated feel, which adds to the attractiveness and potential of the area as a recreation location. The Western Way walking route also runs through the site of the Proposed Development.

The recreation and amenity facilities proposed for the Glenora Wind Farm development are intended to appeal to walkers, cyclists, trail runners, amongst others, and are outlined in the below.

4.6.1 Recreation and Amenity Facilities

The proposed recreation and amenity facilities consist of a series of marked walkways complimented by waypoint signage, a viewing point and a trailhead and visitor car park, each of which are detailed below. The following proposals should be read in conjunction with Figure 4-20 which maps the proposed recreation and amenity proposals for the site of the Proposed Development and Appendix 4-8 of this EIAR (Glenora Wind Farm Recreation Plan) which details the amenity proposal in full.

4.6.1.1 Visitor Entrance and Car Park

Access to the site for visitors during the operational phase, will be via the proposed upgraded entrance off the existing forest road to the northeast of the site boundary in the townland of Glenora. The proposed upgraded entrance will have adequate visibility splays for safe access and egress for passenger vehicles or cyclists.

It is proposed repurpose the construction compound nearest the main site entrance for use as a visitor car park for recreational users of the area. At the end of the wind farm's construction, the surface

Map Legend

- Proposed Site Entrance and Info Signage
- Proposed 'You are Here' Signage
- Proposed Viewing Platform
- Proposed Parking Area
- Proposed Directional Signs
- Altderg Walk
- Western Way Mayo
- Existing Road No Upgrade Proposed
- Infrastructure
- Infrastructure Locations
- Proposed Borrow Pit Locations
- EIAR Site Boundary

Drawing Title

Recreation and Amenity Proposal Map

Project Title

Glenora Wind Farm

Drawn By	Checked By
ER	EMC
Project No.	**Drawing No.**
201120	Figure 4-20
Scale	**Date**
1:20,000	2023-12-13

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dressing of a portion of the construction compound will be upgraded to provide a level, compacted car park surface. It is not intended to delineate individual car parking spaces, however there will be sufficient space to safely accommodate up to 24 vehicles. A suitably sized hydrocarbon interceptor and grit trap will be installed as part of the drainage system for the car park.

The car park will act as a landing point or trailhead for recreation and amenity users arriving at the site. The car park will provide a safe and easily accessible landing point, allowing visitors to orientate themselves on the site or demount bicycles from cars. A layout of the proposed car parking area is shown in Figure 4-21.

4.6.1.2 Amenity Walkways

It is proposed to create dedicated marked trails and walking loops for walkers, cyclists, trail runners and general outdoor recreation. All trails and loops will make use of the proposed wind farm site road network and no additional tracks are required to be constructed. The Altderg Walk/Cycle Route comprises an approximate 6km walking loop through the site complete with benches and information posts. The amenity carpark will be located at the start of this loop. An additional route providing a view of the turbines is a 2km linear route which starts from the amenity car park to the viewing platform located at Turbine No. 1. Both links will link up to the existing Western Way which runs along the site. The proposed trail loops are shown on Figure 4-20. Please see Appendix 4-8 for details on the Glenora Wind Farm Recreation Plan.

4.6.1.3 Seating Areas

Seating areas will be provided at different locations across the site, as indicated in Figure 4-26, to allow visitors to rest and take advantage of the scenic views of the wider area from the site. The type of wooden bench proposed is shown in Figure 4-22.

The trailhead will also include a picnic bench. The type of picnic bench proposed is also shown in Figure 4-22.

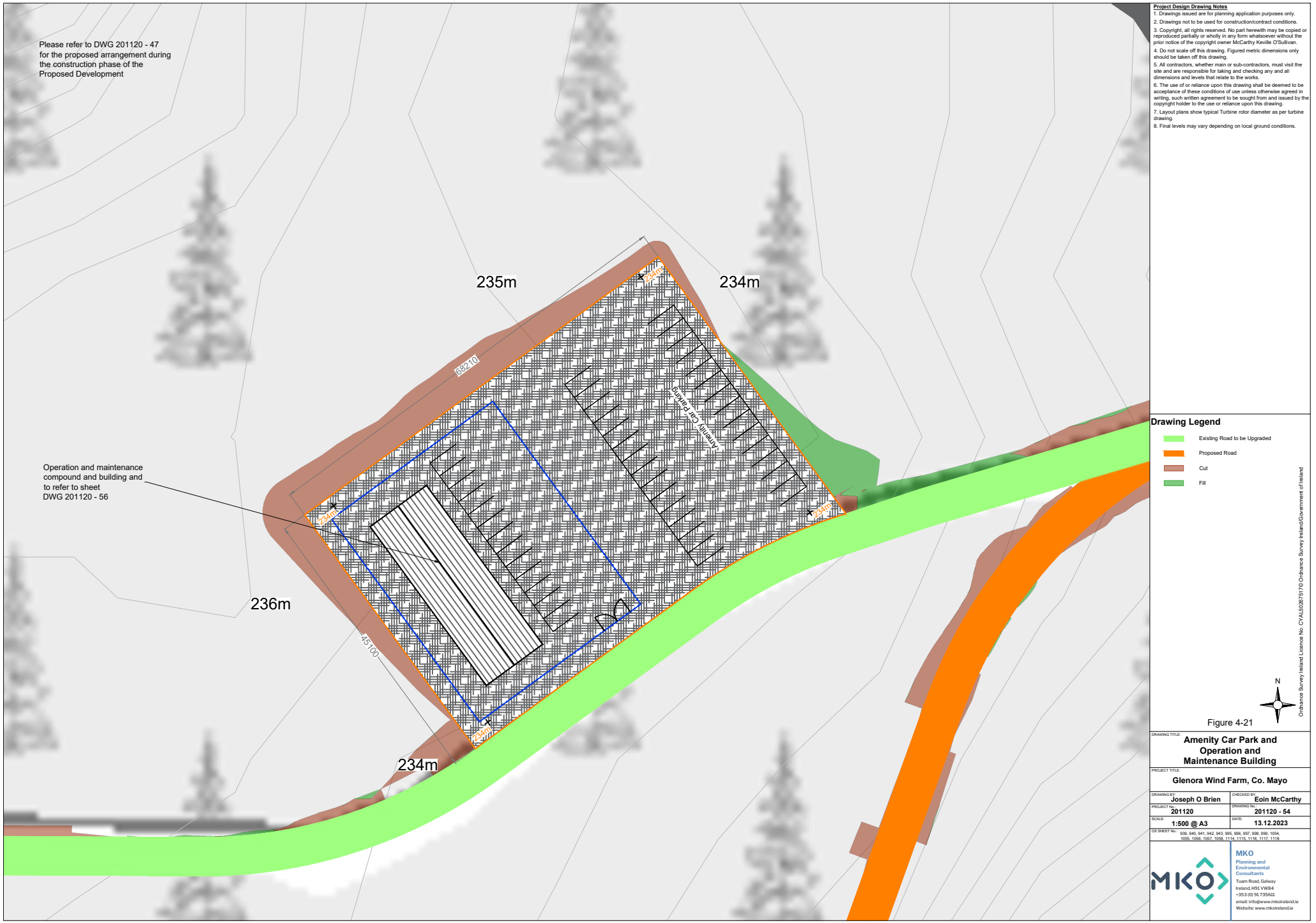
4.6.1.4 Viewing Point

The hardstanding area at Turbine No. 1 is proposed a viewing point of the surrounding landscape and wind farm. This is the one of the most elevated of the proposed turbine locations. The viewing point will comprise a labelled panorama photograph of the available view, a seating area and information signage highlighting the heritage of the wider area and the importance of renewable energy. The viewing point location is marked on Figure 4-20.

4.6.1.5 Visitor Information and Waypoint Signage

Three different forms of information and waypoint signage will be provided across the proposed recreation and amenity area. The proposed locations of the signage are indicated on Figure 4-25.

Entry point signage will be provided at the site entrance, where recreation will access the site. The entry point information board will clearly indicate each of the marked trails on a map, as well as outlining the distance, suitability and length of each trail. The signage will also indicate the principles of 'Leave No Trace'. Waypoint map information signage indicating the location of the sign in the context of the overall site will be provided at five locations across the site, which will indicate to users "You Are Here" and outline the options available to them for continuing through the recreation area and provide information in relation to wind energy and the flora and fauna present along the walkways and within the local area. Waypoint direction signage will be provided at the locations shown in Figure 4-20 as reassurance way markers, to indicate the recommended direction of travel and distance to trail end and return distance to trailhead and will be colour coded to indicate the marked trail(s) on the route being followed. Elevation drawings of the proposed amenity signage is shown on Figure 4-23.



Project Design Drawing Notes

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

Drawing Legend

- Existing Road to be Upgraded
- Proposed Road
- Cut
- Fill

Figure 4-21

DRAWING TITLE: **Amenity Car Park and Operation and Maintenance Building**

PROJECT TITLE: **Glenora Wind Farm, Co. Mayo**

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No.: 201120	DRAWING No.: 201120 - 54
SCALE: 1:500 @ A3	DATE: 13.12.2023
OS SHEET No.: 939, 940, 941, 942, 943, 995, 996, 997, 998, 999, 1054, 1055, 1056, 1057, 1058, 1114, 1115, 1116, 1117, 1118	

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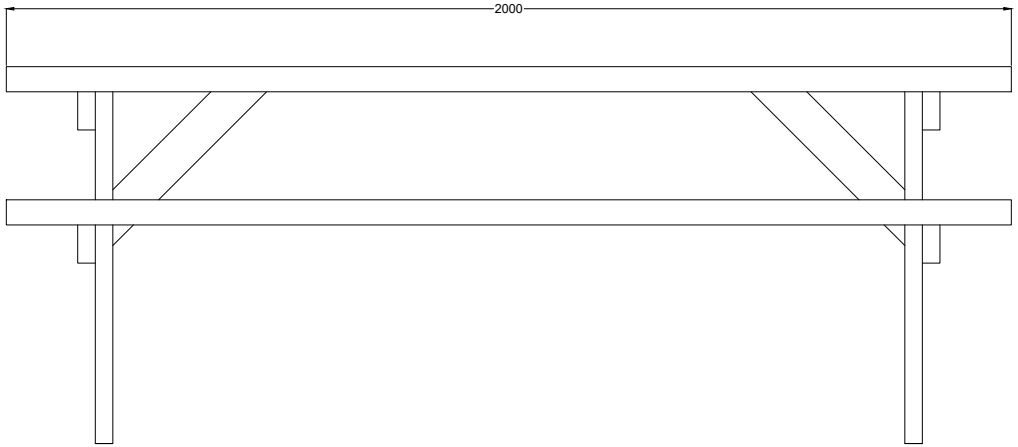
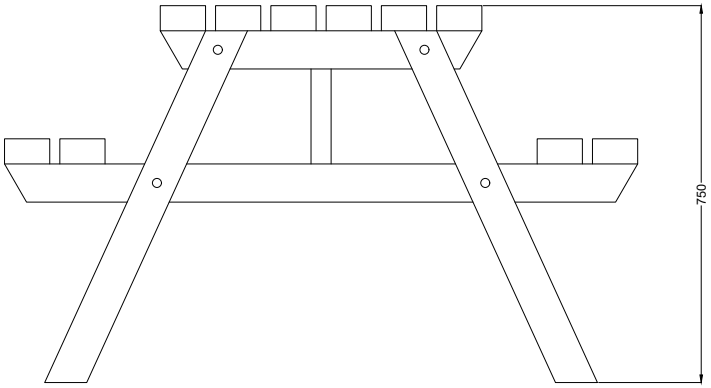
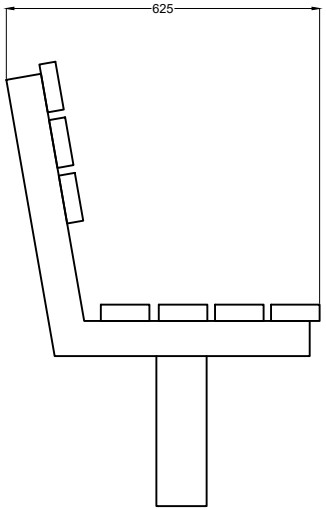


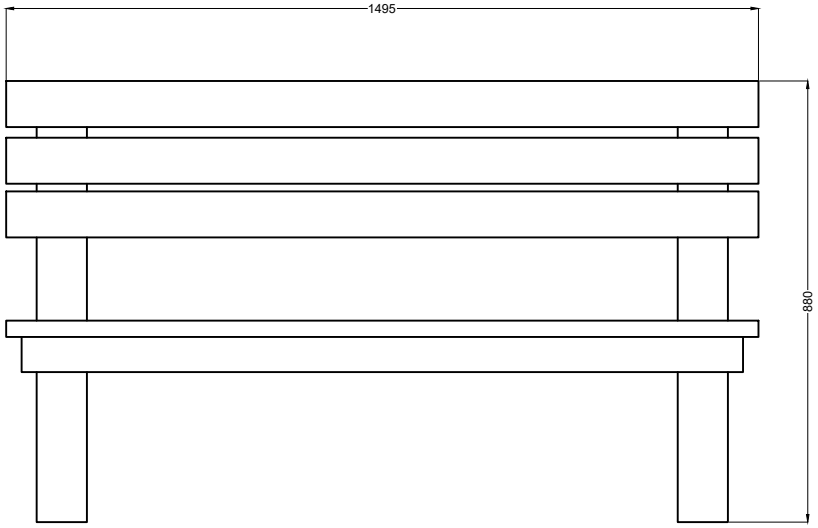
Bench Front Elevation



Bench Side Elevation



Bench Side Elevation



Bench Front Elevation

Figure 4-22

DRAWING TITLE:

Proposed Bench Detail

PROJECT TITLE:

Glenora Wind Farm, Co. Mayo

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No: 201120	DRAWING No: 201120 - 59
SCALE: 1:10 @ A3	DATE: 13.12.2023

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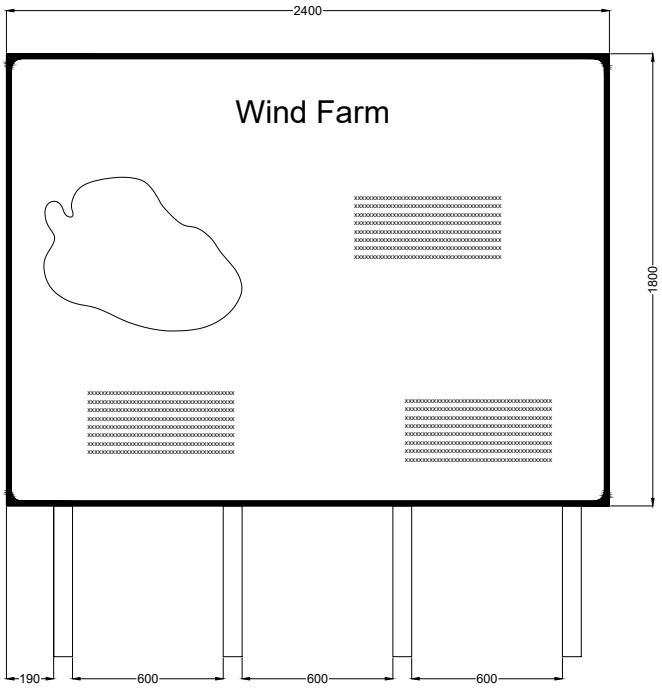
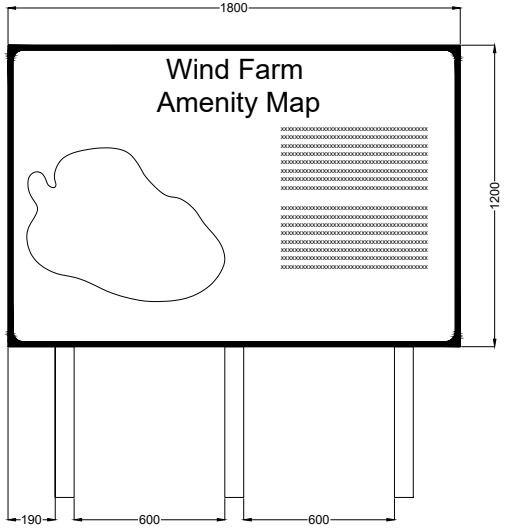
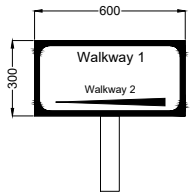
Note
For illustrative purposes only
exact details to be confirmed



Signage Type A - Entry Point Signage



Signage Type B - Waypoint Map Signage



Signage Type C - Way Point Direction Signage

Figure 4-23

DRAWING TITLE:
Amenity Signage Detail

PROJECT TITLE:
Glenora Wind Farm, Co. Mayo

DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No: 201120	DRAWING No: 201120 - 60
SCALE: 1: 20 @ A3	DATE: 13.12.2023

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4.6.2 Further Potential

The proposed recreation and amenity proposals outlined above form part of the Proposed Development and will be provided subject to planning permission being granted. It is acknowledged that any investment in the creation of recreation and amenity proposals on the site of the Proposed Development will have to be matched by an ongoing commitment from the wind farm developer to maintain the recreation amenities once they are put in place. The amenity proposals which have been included as part of the Proposed Development can operate as standalone destination amenity walks, however, they would also facilitate and augment any future amenity proposals which may be brought forward in the wider area in the future.

Given the sites relative isolation and remoteness, it is considered that the project will support the development of the wider area, attracting local and new visitors to the area which could be uncovered as part of a wider regional strategy.

4.7 Site Drainage

4.7.1 Introduction

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

4.7.2 Existing Drainage Features

The routes of any natural drainage features will not be altered as part of the Proposed Development. Turbine locations have been selected to avoid natural watercourses. Up to 2 no. new watercourse crossings and 8 no. watercourse crossing upgrades will be required as part of the Proposed Development.

There will be no direct discharges to natural watercourses. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from natural watercourse and lakes. Buffer zones around the existing natural drainage features have informed the layout of the Proposed Development 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 must be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas,

check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

4.7.3 Drainage Design Principles

Drainage water from any works areas of the site of the Proposed Development 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 must be managed. Discoloured run-off from any construction area will be isolated from natural clean run-off.

The proposed wind farm drainage process flow is presented in Figure 4-24 below.

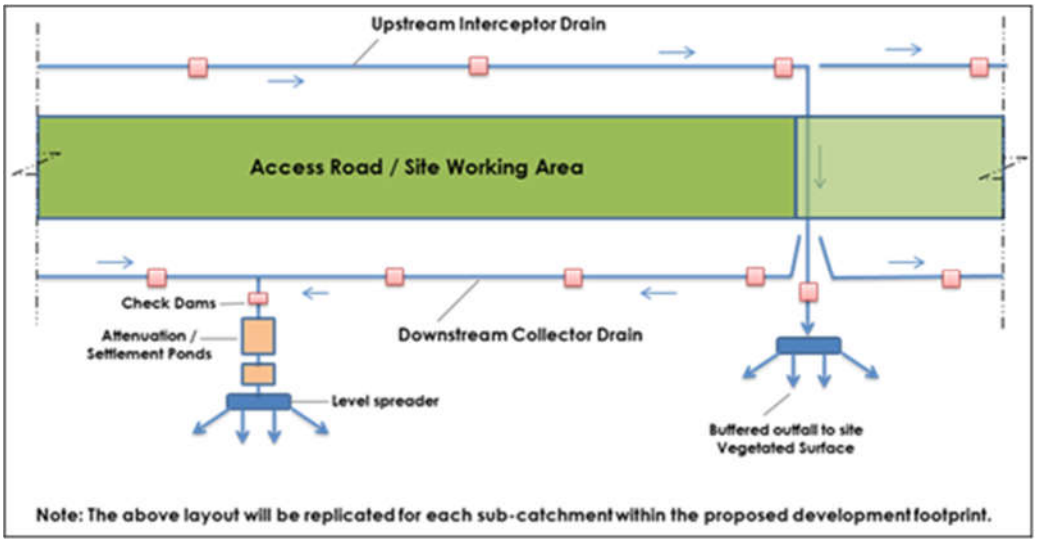


Figure 4-24 Proposed Wind Farm Drainage Process Flow

4.7.4 Best Practice Guidance

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

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

- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations & Water Protection Guidelines;
- Forest Service (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;
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- COFORD (2004): Forest Road Manual – Guidelines for the design, construction and management of forest roads;
- MacCulloch (2006): Guidelines for risk management of peat slips on the construction of low volume low cost roads over peat (Frank MacCulloch Forestry Civil Engineering Forestry Commission, Scotland);
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Wind Farm Development Guidelines for Planning Authorities (September 1996);
- Eastern Regional Fisheries Board: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works Adjacent to Waters;
- Scottish Natural Heritage, 2010: Good Practice During Wind Farm Construction;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);
- CIRIA Report No. C648 (2006): CIRIA (Construction Industry Research and Information Association) guidance on 'Control of Water Pollution from Linear Construction Projects';
- CIRIA Report Number C532 (2001): Control of water pollution from construction sites - Guidance for consultants and contractors.; and,
- Control of water pollution from linear construction projects -Technical guidance. CIRIA C648 London, 2006.

4.7.5 Drainage Design

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

4.7.5.1 Interceptor Drains

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

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains could be removed. At that stage, there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to

allow water to infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. Where the drains are to be removed, they will be backfilled with the material from the diversion dike. Interceptor drains may have to be retained in certain locations, for example where roadways are to be installed on slopes, to prevent the roadways acting of conduits for water that might infiltrate the roadway sub-base. In these cases, interceptor drains will be maintained in localised areas along the roadway with culverts under the roadway, which will allow the intercepted water to be discharged to vegetation filters downgradient of the roadway. Similarly, in localised hollows where water is likely to be funnelled at greater concentrations than on broader slopes, interceptor drains, and culverts may be left in situ following construction. The Project Hydrologist will confirm, prior to the completion of the construction phase, the interceptor drains that are to remain in place during the operational phase of the Proposed Development.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.7.5.3 below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the channel.

Interceptor drains will be installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains to areas downgradient of works areas, where the drain will terminate at a level spreader (see Section 4.7.5.4 below). Across the entire length of the interceptor drains, the design elevation of the water surface along the route of the drains will not be lower than the design elevation of the water surface in the outlet at the level spreader. An illustration of an interceptor drain is shown in Figure 4-25.

4.7.5.2 Swales

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

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

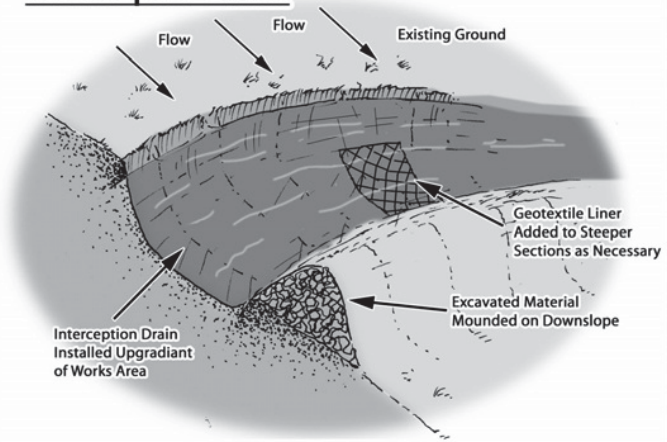
Drainage swales will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike. An illustration of a drainage swale is shown in Figure 4-25

4.7.5.3 Check Dams

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

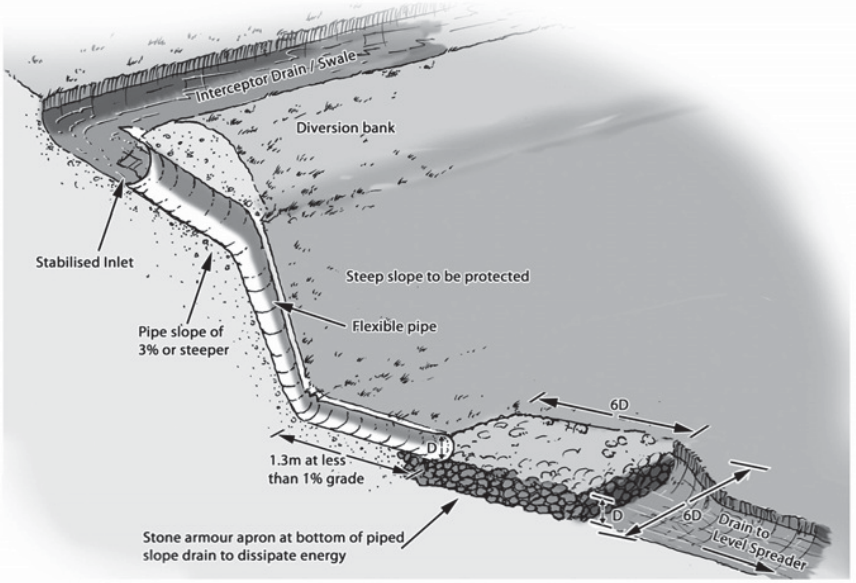
Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated.

Interceptor Drain

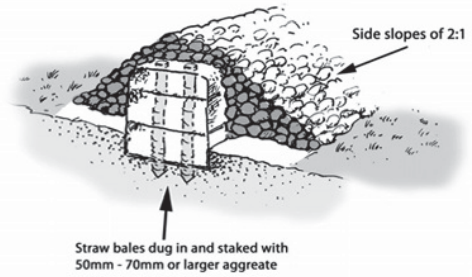


Check Dam (Stone Dam in Drain)

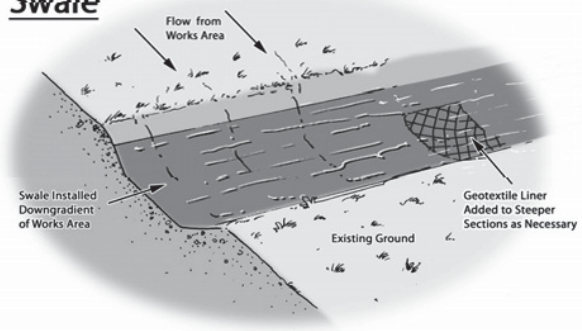
Slope Pipe Drain



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

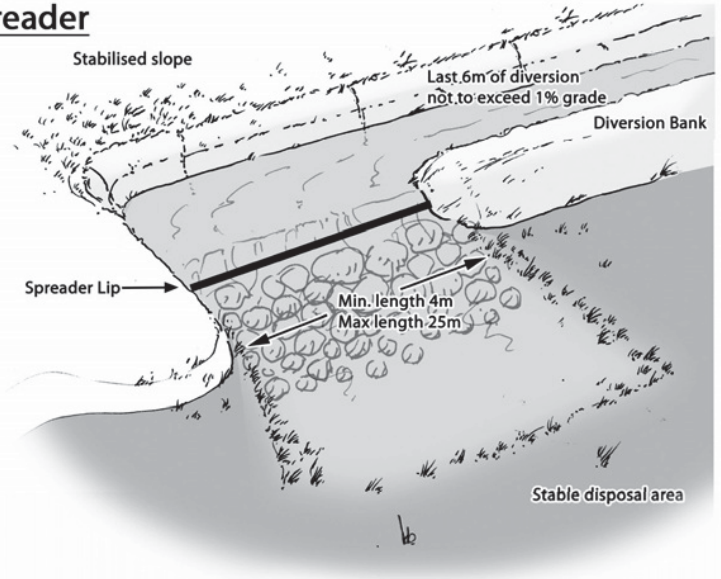


Swale

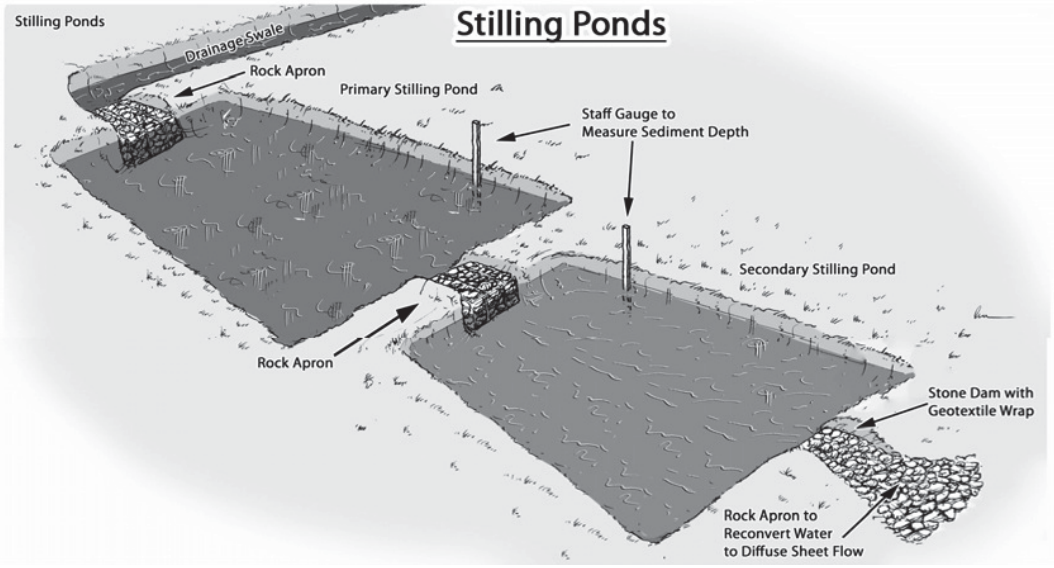


Drainage Design Measures

Level Spreader



Stilling Ponds



Drawing Title: Drainage Design Measures	Drawing No.: Figure 4-25	Scale: NTS
Project Title: Glenora Wind Farm		Date: 12.12.2021
Drawn By: Eoin McCarthy	Checked By: Michael Watson	Project No.: 201120

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

The check dams will be installed at regular intervals along the 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. An illustration of an check dam is shown in Figure 4-25.

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.

4.7.5.4 Level Spreader

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

The slope in the channel leading into the spreader will be less than or equal to 1%. The slope downgradient of the spreader onto which the water will dissipate will have a grade of less than 6%. The availability of slopes with a grade of 6% or less will determine the locations of level spreaders. If a slope grade of less than 6% is not available in the immediate area downgradient of a works area at the end of a diversion drain, a piped slope drain (see Section 4.7.5.5 below) will be used to transfer the water to a suitable location.

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

Clean four-inch stone can be placed on the outside of the spreader lip and pressed into the ground mechanically to further dissipate the flow leaving the level spreader over a larger area. An illustration of a stilling pond is shown in Figure 4-25.

4.7.5.5 Piped Slope Drains

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

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

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

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

Piped slope drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockages. Stake anchors or fill over the pipe will be checked for settlement, cracking and stability. Any seepage holes where pipe emerges from drain at the top of the pipe will be repaired promptly. An illustration of a piped slope drain is shown in Figure 4-25.

4.7.5.6 Vegetation Filters

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

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

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

4.7.5.7 Stilling Ponds

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

Stilling ponds will be excavated/constructed to the appropriate size at each required location as shown on the drainage design drawings included in Appendix 4-4 of this document. The points at which water enters and exits the stilling ponds will be stabilised with rock aprons, which will trap sediment, dissipate

the energy of the water flowing through the stilling pond system, and prevent erosion. The stilling ponds will reduce the velocity of flows in order to allow settlement of silt to occur. Water will flow out of the stilling pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out.

Water will flow by gravity through the stilling pond system. The stilling ponds have been sized according to the size of the area they will be receiving water from and are large enough to accommodate a 10-year return rainfall event. The settlement ponds are designed for 11hr and 24hr retention times used to settle out medium silt (0.006mm) and fine silt (0.004mm) respectively (EPA, 2006)[5]. 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 approximately of 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume.

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

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

A water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the stilling pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity. Stilling ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows. An illustration of a stilling pond is shown in Figure 4-25.

4.7.5.8 Siltbuster

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

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

The unit stills the incoming water/solids mix and routes it upwards between a set of inclined plates for separation. Fine particles settle onto the plates and slide down to the base for collection, whilst treated water flows to an outlet weir after passing below a scum board to retain any floating material. The inclined plates dramatically increase the effective settling area of the unit giving it a very small footprint on site and making it highly mobile. Figure 4-26 below shows an illustrative diagram of the Siltbuster.

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

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

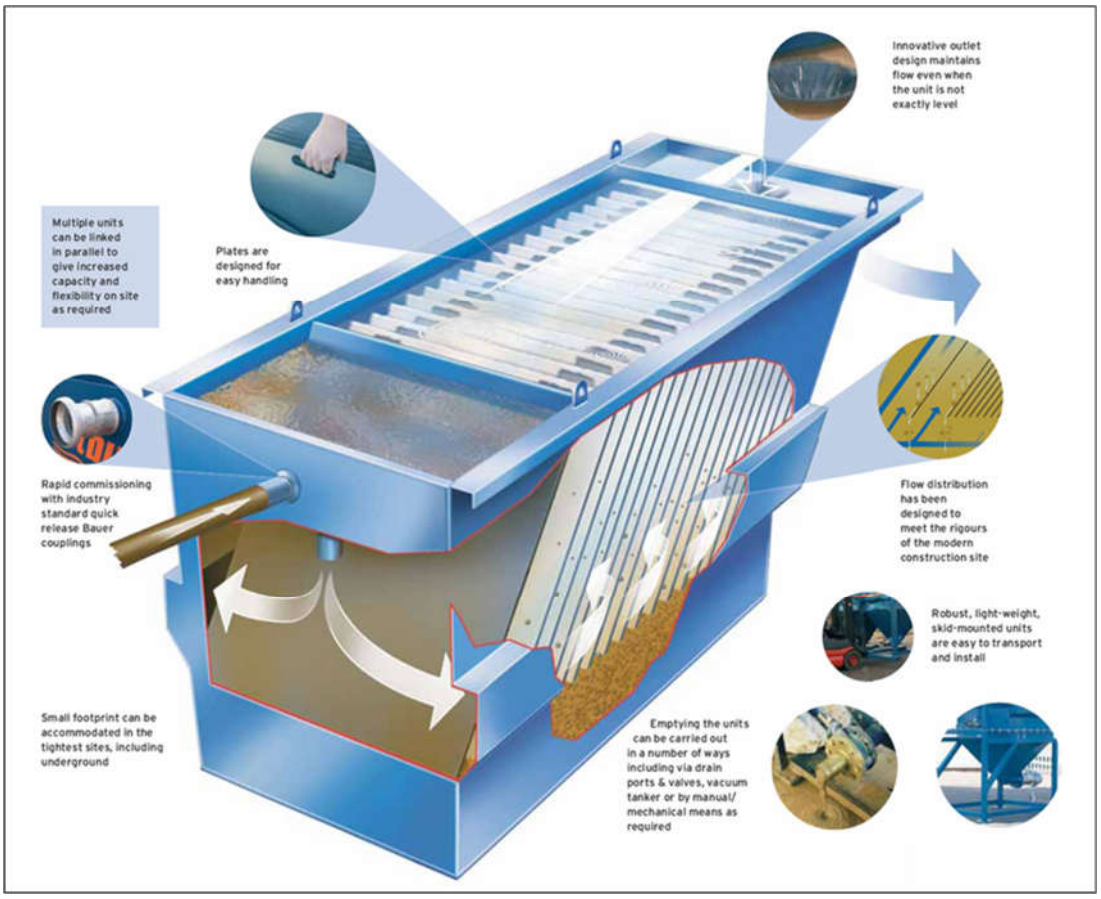


Figure 4-26 Siltbuster (Source: https://www.siltbuster.co.uk/sb_prod/siltbuster-fb50-settlement-unit/)

4.7.5.9 Silt Bags

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

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

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

Plate 4-3 Silt Bag with water being pumped through

Plate 4-4 Silt bag under inspection

4.7.5.10 Sedimats

Sediment entrapment mats, consisting of coir or jute matting, will be placed at the outlet of the silt bag to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure as shown in Plate 4-5 below.

Plate 4-5 Typical Sedimat Details (Source: https://www.hy-tex.co.uk/)

4.7.5.11 Culverts

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

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

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

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

4.7.5.12 Silt Fences

Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone of a natural watercourse, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the proposed development. These areas include around existing culverts, around the headwaters of watercourses, and the proposed locations are indicated on the detailed drainage design drawings included in Appendix A of Appendix 4-5 of this EIAR.

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

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

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

Site fences will be inspected regularly to ensure water is continuing to flow through the fabric, and the fence is not coming under strain from water backing up behind it. Standard silt fence details are shown below in Plate 4-6.

Plate 4-6 Silt Fence Details

4.7.5.13 Hydrocarbon Interceptors

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

4.7.6 Drainage Management and Maintenance

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

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

- Forestry Felling
- Borrow pit
- Peat Placement Areas
- Floating Roads
- Cabling Trench
- Refuelling, Fuel and Hazardous Material Storage
- Cement Based Product Handling

4.8 Construction Phasing and Timing

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

4.8.1 Construction Sequencing

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

Civil Engineering Works

- Create new entrance(s) and hardcore existing entrances (where required).
- Felling of forestry (as outlined in Section 4.3.9)
- Construct new site roads (permanent and temporary), drainage ditches and culverts.
- Clear and hardcore area for temporary site offices. Install same.
- Construct remaining new site roads and hard-standings and crane pads.
- Construct the substation, control buildings and groundworks for the substation compound.

- Excavate/pile for turbine bases where required. Store soil/peat locally for backfilling and re-use. Place blinding concrete to turbine bases. Fix reinforcing steel and anchorage system for tower section. Construct shuttering. Fix any ducts etc. to be cast in. Pour concrete bases. Cure concrete. Remove shutters after 1-2 days.

Electrical Works

- Construct bases/plinths for transformer.
- Excavate trenches for site cables, lay cables and backfill. Provide ducts at road crossings.
- Install external electrical equipment at substations
- Install transformer at compound.
- Erect stock proof and palisade fencing around substation area.
- Install internal collector network and communication cabling.
- Construct grid connection.

Turbine Erection and Commissioning

- Backfill tower foundations and cover with suitable material.
- Erect towers, nacelles and blades.
- Complete electrical installation.
- Install anemometry masts and decommission and remove existing 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 5.9.2.1 of this EIAR), including the preparation of the Health & Safety Plan, erection of the relevant and appropriate signage on site, inductions and toolbox talks will take place prior to and throughout the construction phase of the proposed development. Further details of on-site health, safety and welfare are included in Chapter 5 of this EIAR.

The phasing and scheduling of the main construction task items are outlined in Figure 4-27 below, where 1st January has been selected as an arbitrary start date for construction activities.

ID	Task Name	Task Description	Q1 2028	Q2 2028	Q3 2028	Q4 2028	Q1 2029	Q2 2029	Q3 2029
1	Site Health and Safty								
2	Site Compounds	Site Compounds, site access, fencing, gates							
3	Site Roads	Construction/upgrade of roads, construct underpasses install drainage measures, install water protection measures							
4	Turbine Hardstands	Excavate/pile for turbine bases where required							
5	Turbine Foundations	Fix reinforcing steel and anchorage system, erect shuttering, concrete pour							
6	Substation Construction and Electrical Works	Construct substation, underground cabling, grid connection							
7	Backfilling and Landscaping								
8	Turbine Delivery and Erection								
9	Substation Commissioning								
10	Turbine Commisioning								

Figure 4-27 Indicative Construction Schedule

4.8.2 Construction Phase Monitoring and Oversight

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

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

The on-site construction staff will be responsible for implementing the mitigation measures specified in the EIAR and compiled in the Audit Report. Their implementation will be overseen by the ECoW 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.

4.9 Construction Methodologies

4.9.1 Keyhole Forestry Felling

As part of the proposed development, keyhole felling of forestry will be required within and around the development footprint to enable the construction of turbine bases, access roads and the other ancillary infrastructure. Felling is also required around turbine bases for the reduction of potential effects on bats (refer to Appendix 6-2 of this EIAR). A total of 116 hectares of forestry will be permanently felled within and around the footprint of the Proposed Development in order to facilitate infrastructure construction and turbine erection.

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

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

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

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

- The extent of all necessary forestry felling areas will be identified and demarcated with markings on the ground in advance of any felling commencing.
- All roads and culverts will be inspected by the ECoW and contractor prior to any machinery being brought on site to commence the felling operation.
- Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt/sediment traps (ie. check dam / silt fence) will be constructed to ensure collection of all silt within felling areas. These temporary silt traps will be cleaned out and backfilled once felling works are complete. This ensures there is no residual collected silt remaining in blocked drains after felling works are completed.
- New collector drains and sediment traps will be installed during ground preparation to intercept water upgradient of felling areas and divert it away. Collector drains will be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities.
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated.
- Sediment removed from traps will be carefully disposed of in the peat repository areas.
- Machine combinations (i.e. hand-held or mechanical) will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance; however, the general proposed machine combination will comprise a harvester and a low-ground pressure harvester with a 14-tonne bunk capacity.
- Trees will be cut manually inside the 50m construction watercourse buffer and using machinery to extract whole trees only;
- Brash mats will be put in place to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur.

- Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting.
- No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings.
- Brash which has not been pushed into the soil may be moved to facilitate the creation of mats elsewhere within the site.
- Extraction routes, and hence brash mats, will be aligned parallel to the ground contours where possible.
- Harvested timber will be stacked in dry areas, and outside any 50-metre watercourse buffer zone prior to removal off site to authorised saw mills.

4.9.2 Turbine Foundations

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

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

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

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

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

Formwork to concrete bases will be propped/supported sufficiently to prevent failure. Concrete for bases will be poured using a concrete pump. Each base will be poured in three stages. Stage 1 will see the concrete being poured and vibrated in the centre of the anchor cage to bring the concrete up to the required level inside the cage. Stage 2 will see the centre of the steel foundation being poured and vibrated to the required level. Stage 3 will see the remaining concrete being poured around the steel

foundation to bring it up to the required finished level. After a period of time when the concrete has set sufficiently the top surface of the concrete surface is to be finished with a float.

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

4.9.3 Site Roads and Crane Pad Areas

Site roads will be constructed to each turbine base and at each base a crane hard standing will be constructed to the turbine manufacturer's specifications and the largest predicted area has been assessed in this EIAR. Tracked excavators will carry out excavation for roads with appropriate equipment attached. The excavations shall follow a logical route working away from the borrow pit locations. Excavated material will be transported back to the borrow pits in haul trucks. A two to three-metre-wide working area will be required around each hardstanding area, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. The excavated material will be covered with polythene sheets and surrounded by silt fences to ensure sediment-laden run-off does not occur.

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

The local rod widening works will be constructed using a similar methodology.

4.9.4 Proposed Clear-span Watercourse

There are a number of natural watercourses within the site of the Glenora Wind Farm development.

It is proposed to construct clear-span crossings watercourse crossings along the wind farm access roads at 2 no. locations using a bottomless box culvert. The locations of these crossings are shown on the layout drawings included in Appendix 4-1 of this EIAR. The clearspan watercourse crossing methodology presented below will ensure that no instream works are necessary.

The standard construction methodology for the installation of a pre-cast concrete bottomless box culvert crossing is as follows:

- The access road on the approach either side of the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- A foundation base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. For watercourse crossings, 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 pre-cast concrete slab 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 box culvert will be installed using a crane which will be set up on the bank of the watercourse and will be lifted into place with no contact with the watercourse.
- Where the box culvert is installed in sections, the joints will be sealed to prevent granular material entering the watercourse,
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the top of the box culvert above the foundations.

Section drawings of a pre-cast concrete, clear span crossings are shown in Figure 4-28.

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. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

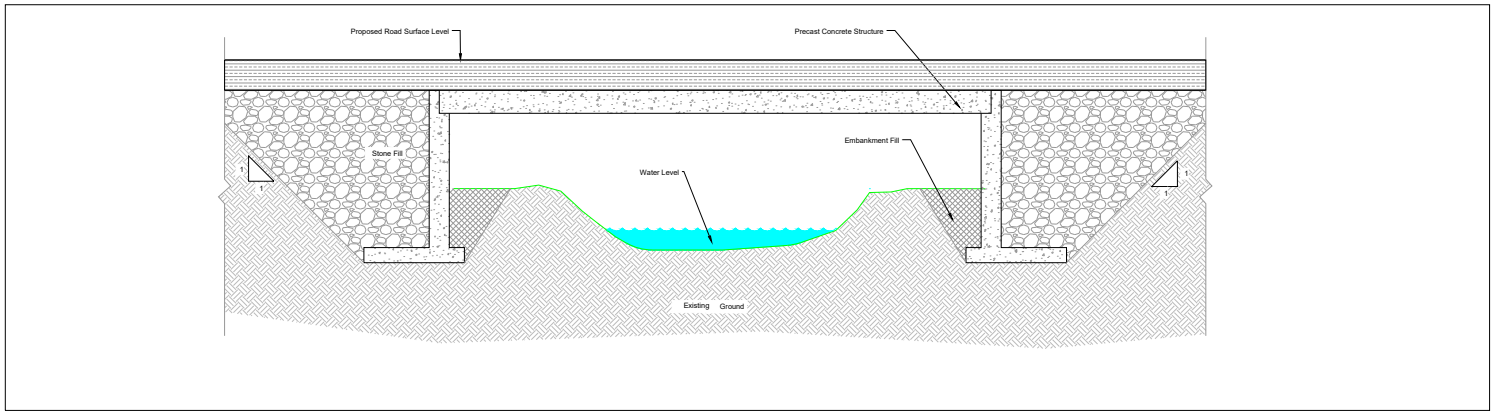
Confirmatory inspections of each proposed new watercourse crossing location will be carried out by the project civil/structural engineer and the project hydrologist prior to the construction of each crossing.

4.9.5 Onsite Electricity Substation and Control Building

Once tree felling as described in Section 4.3.9, above, is completed, the onsite substation will be constructed by the following methodology:

- The area of the onsite substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and removed to nearby temporary storage area for later use in landscaping. Any excess material will be sent to one of the on-site peat repositories or the proposed borrow pit, for reinstatement purposes.
- The dimensions of the onsite substation area have been designed to meet the requirements of the Eirgrid and the necessary equipment to safely and efficiently operate the proposed wind farm;
- A control building will be built within the onsite 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 electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected.
- The construction and components of the substation are to Eirgrid specifications.

Pre-Cast Concrete Clearspan Watercourse Crossing



Pre-Cast Concrete Bottomless Box Watercourse Crossing

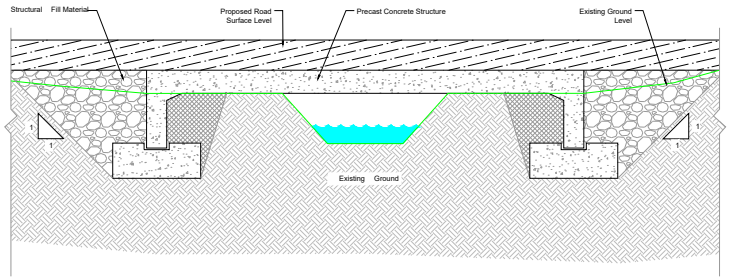


Figure 4-28

DRAWING TITLE:
Pre-cast Concrete Clearspan Watercourse Crossing

PROJECT TITLE:
Glenora Wind Farm, Co. Mayo

DRAWING BY:	CHECKED BY:
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PROJECT No. 201120	DRAWING No. 201120 - 64
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4.9.6 Temporary Construction Compounds

The temporary construction compounds will be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound platform will be established using a similar technique as the construction of the substation platform discussed above;
- A layer of geo-grid will be installed, and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- The compound will be fenced and secured with locked gates if necessary; and,
- Upon completion of the Proposed Development the temporary construction compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required.

The car park that is proposed as part of the recreation and amenity facilities will be constructed in a similar manner to the proposed temporary construction compounds.

4.9.7 Grid Connection Cable Trench

The underground cabling (UGC) works will consist of the installation of 6 No. ducts in an excavated trench to accommodate 3 No. power ducts, 2 No. fibre communications ducts to allow communications between the Glenora Wind Farm Substation and the existing Tawnaghmore 110kV substation and 1 No. earth continuity conductor duct.

The power cable ducts will accommodate the power cables and the communications duct will accommodate a fibre cable to allow communications between the 110kV Glenora Wind Farm substation and the existing 110kV Tawnaghmore substation. The ducts will be installed and the trench will be reinstated in accordance with landowner or local authority specification, and then the electrical cabling/fibre cable is pulled through the installed ducts in approximately every 700m to 850m. Construction methodologies to be implemented and materials to be used will ensure that the UGC is installed in accordance with the requirements and specifications of Eirgrid.

The underground cabling required to facilitate the grid connection will be laid beneath the surface of the site and/or public road using the methodology outlined in detail in Section 8 of TLI Group's Glenora Wind Farm 110kV Grid Connection – Construction Methodology. This report is included as Appendix 4-5 of this EIAR.

4.9.7.1 Site Cable Trenching

The transformer in each turbine is connected to the substation through a network of buried electrical cables. The ground is trenched using a mechanical excavator. The top layer of soil is removed and saved so that it is replaced on completion. The cables will be bedded with suitable material. The cables will be laid at a depth that meets all national and international requirements and will generally be approximately 1.3m below ground level; a suitable marking tape is installed between the cables and the surface (see Plate 4-7 below). On completion, the ground will be reinstated as previously described above. The route of the cable ducts will follow the access track to each turbine location and are visible on the site layout drawings included as Appendix 4-1 of the EIAR.

Plate 4-7 Standard Cable Trench View

4.9.7.2 Existing Underground Services

In order to facilitate the installation of an underground grid connection, 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 pre-commencement 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 specifications of the relevant utility provider.

4.9.7.3 Joint Bays

Joints Bays are to be provided approximately every 750m - 850m along the UGC route to facilitate the jointing of 2 no. lengths of UGC. Joint Bays are typically 2.5m x 6m x 1.75m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible.

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

and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located in close proximity to Joint Bays. Earth Sheath Link Chambers and Communication Chambers will be pre-cast concrete structures with an access cover at finished surface level. The locations of the joint bays and chambers are shown on the site layout drawings in Appendix 4-1.

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

4.9.7.4 Grid Connection Watercourse/Culvert Crossings

The cable route will involve 10 No. bridge crossings, all of which will be HDD crossings. Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies. The cable will be located within the bridge deck where there is sufficient depth and width available on the bridge, where there is insufficient depth and width available horizontal directional drilling (HDD) may be employed as an alternative. Drawings of all 10 no. bridge crossings are included in Appendix 4-6 of this EIAR.

The underground cable will encounter 30 no. culverts along the route. Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies. Existing culverts will be crossed using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert. A confirmatory site survey of all culverts has been completed as part of this phase of the project prior to planning to confirm the crossing methods. The locations of the bridges and culvert are shown on the site layout drawings included in Appendix 4-6. The schedule of culvert crossing methodologies is shown in Appendix A of Appendix 4-5 of the EIAR.

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

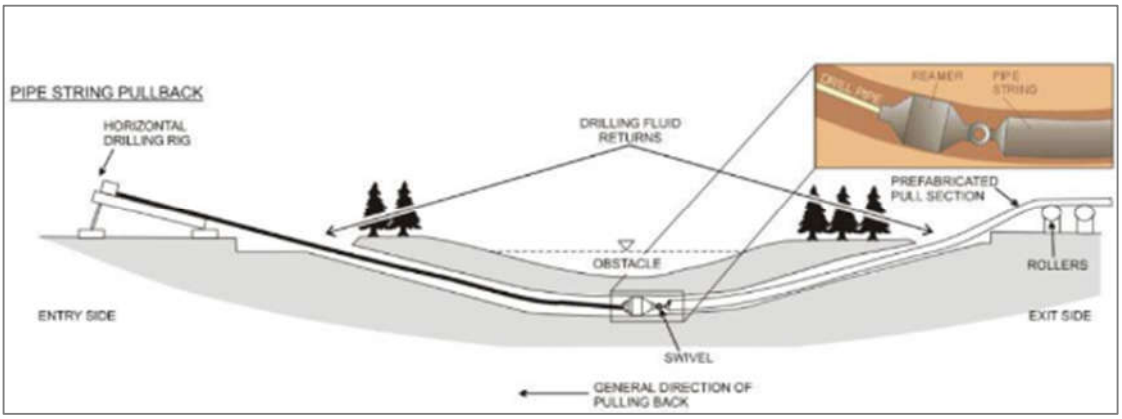


Figure 4-29 Horizontal Directional Drilling Methodology

4.10 Operation

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

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

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

4.10.1 Operation and Maintenance Building

It is proposed to construct a welfare facility for personnel involved in the operation and maintenance of the Proposed Development. This building will measure 30.7 metres by 10.9 metres and 6.9 metres in height. As well as providing welfare facilities for operation and maintenance staff during the lifetime of the Proposed Development, will provide storage and workshop facilities. The location of the building within the compound area is shown within Figure 4-20, above and the layout of the building is shown in Figure 4-30.

As with the substation control buildings described in Section 4.3.5.1, above, toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the Proposed Development there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the Proposed Development does not necessitate a potable source. It is proposed to either harvest rainwater from the roofs of the buildings 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 building. Bottled water will be supplied for drinking, if required.

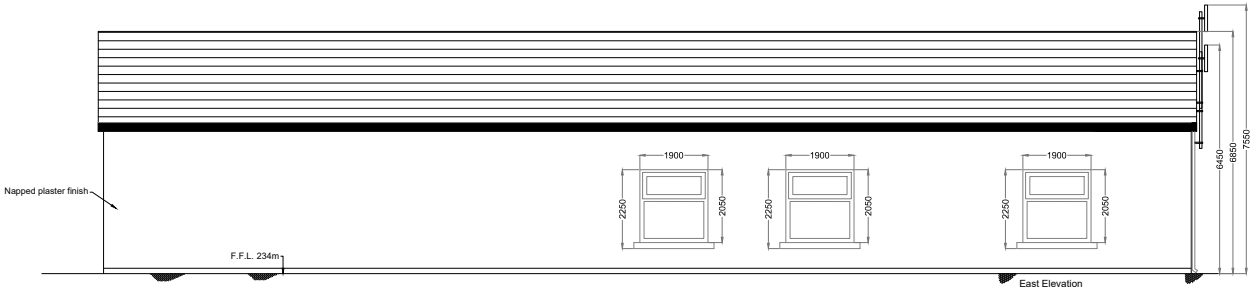
Similarly, it is not proposed to treat wastewater on site. Wastewater from the staff welfare facilities in the control buildings will be managed by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. It is not proposed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

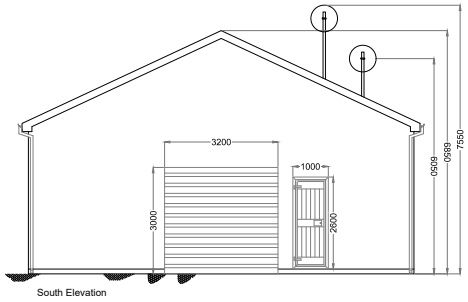
Such a proposal for managing the wastewater arising on site has become almost standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment would be challenging and has been accepted by numerous Planning Authorities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

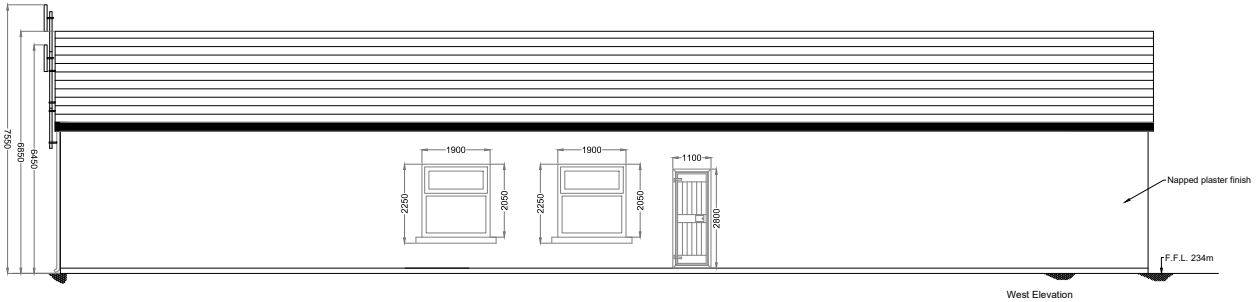
The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system can be submitted to the Planning Authority in advance of any works commencing on-site. The wastewater storage tank alarm will be part of a continuous stream of data from the site's 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 site.

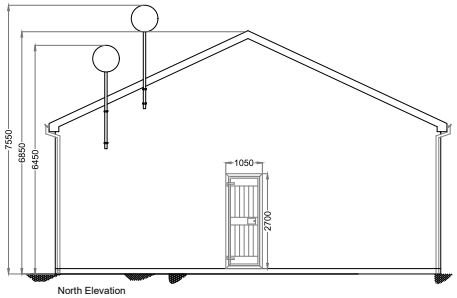
4.11 Decommissioning

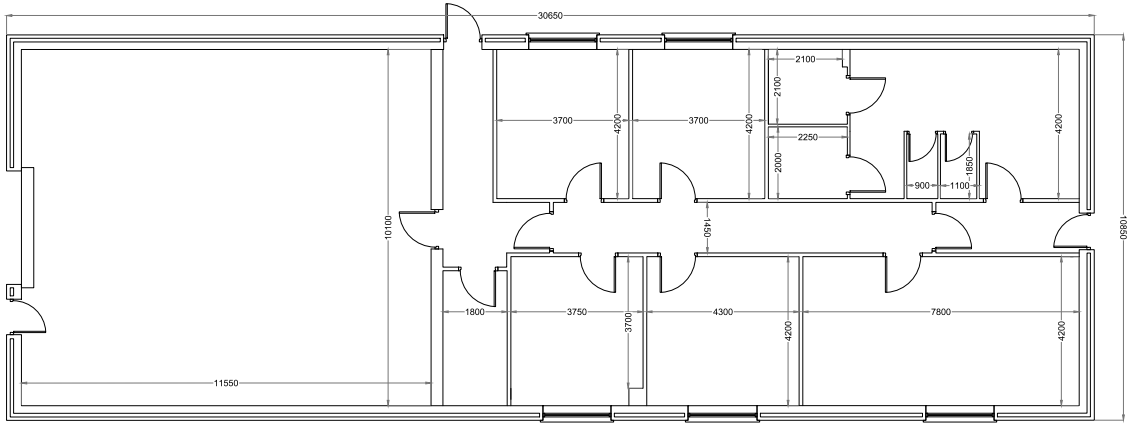
The wind turbines proposed as part of the Proposed Development are expected to have a lifespan of approximately 35 years. Following the end of the operational life of the wind farm, the wind turbines may be retained and the operational life extended or replaced with a new set of turbines, subject to











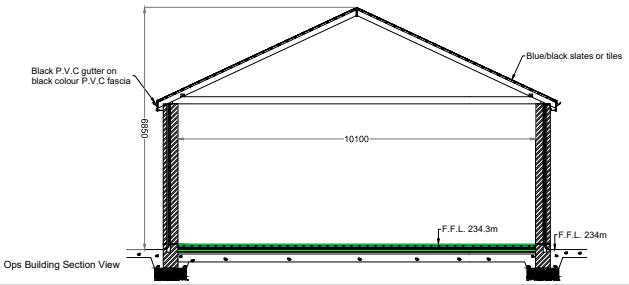


Figure 4-30

DRAWING TITLE:
Operation & Maintenance Control Building

PROJECT TITLE:
Glenora Wind Farm, Co. Mayo

DRAWING BY:	CHECKED BY:
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planning permission being obtained. In the event that neither of the above options are implemented, the Proposed Development will be decommissioned fully as agreed with the Planning Authority. The onsite substation will remain in place as it will be under the ownership of the ESB and will form a permanent part of the national electricity grid.

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

A Decommissioning Plan has been prepared and included as Appendix 4-7 of this EIAR, which will be agreed with the local authority prior to any decommissioning. The plan provides details of the methodologies that will be adopted, throughout decommissioning, the environmental controls that will be implemented, the Emergency Response Procedure to be adopted, methods for reviewing compliance and an indicative programme of decommissioning works.

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

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

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