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CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COOM GREEN ENERGY PARK, COUNTY CORK

VOLUME 2 – MAIN EIAR

CHAPTER 3 – DESCRIPTION OF THE PROPOSED DEVELOPMENT

Prepared for: Coom Green Energy Park Limited

coom green energy

Date: November 2020

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3. DESCRIPTION OF THE PROPOSED PROJECT

3.1 Introduction

This chapter of the EIAR describes the existing site and the main components of the proposed project and provides details on the construction, operation and decommissioning of the energy park in compliance with the EIA Directive.

The proposed turbines are located approximately 12km south east of Mallow, and at the Nagles Mountains, approximately 5km south west of Ballyhooly, County Cork. The proposed Coom Green Energy Park site includes lands contained within the following townlands: Glashaboy North, Coom (Hudson), Tooreen South, Killeagh, Coom (Fitzgerald) , Knuttery, Mullenaboree, Knockacullata, Knoppoge, Carrig, Glannasack, Knockdoorty, Lackendarragh North, Glashaboy South and Toorgarrif, County Cork.

The underground grid route connecting the wind farm to the national grid at Barrymore substation traverses the following townlands; Knockacullata, Tooreen, Commons, Knoppoge, Carrig, Killeagh, Glannasack, Knockdoorty, Lackendarragh North, Moanlahan, Knockauncorrin, Mullentaura, Glanakip, Rathcormack-mountain, Coolnakilla, Knockananig, Coolmucky, Ballynahina, Corrin, Farran North, Farran South, Kill-Saint-Anne-North, Co. Cork..

The proposed grid connection to the national grid is considered as part of the overall project in this EIAR but does not form part of this application for consent.

Temporary accommodation works to facilitate turbine deliveries are proposed at lands contained within the following townlands: Grange West, Ballyhooly South, Glashaboy South and Castleblagh, Shanacloon, Grange east, Castlehyde, Gortroche, Ballygrogan, Slievedotia, Tooreen South and Carrignagohera, Co. Cork.

Coom Green Energy Park Limited (CGEPL) is applying to An Bord Pleanála for consent for the proposed Coom Green Energy Park (CGEP) in County Cork. The proposed energy park is located approximately 12km to the south east of Mallow and approximately 13 km west of Fermoy in County Cork.

The general site layout of the site is shown in Figure 3-1.

3.2 Existing Environment

The proposed energy park is located south of the Nagle Mountains. The main towns and villages within the vicinity of the proposed development include Mallow, Fermoy, Castletownroche, Rathcormac, Watergrasshill, Glenville, Carrignavar, Grenagh, Drommahane. Other settlements in the vicinity are Killavullen, Monanimy, Ballyhooly, Bottlehill, Glashaboy, Burnfort, Ballyknockane, Grange, Kilworth, Glanworth, Castlelyons / Bridebridge.

The site spans across the southern and southwestern extents of the Nagle Mountains, south of the Blackwater River Valley. Both the Nagle Mountains and the Blackwater River valley are the most prominent landscape features within the central study area and its wider surrounds with the Nagle Mountains reaching a height of approximately 420m AOD.

The site is located in a predominantly agricultural area, with elevations within the site ranging from 190m to 390m above sea level. The landcover is classified in Corine as pastures; coniferous forest, transitional woodland shrub and mineral extraction sites. This is illustrated in Figure 3-2.

The energy park site is divided into three distinct areas identified as Bottlehill, Mullanboree and Knockdoorty. These areas are identified clearly in Figure 3-1 and sub-maps.

The southern portion of the proposed development site (Bottlehill) is characterised by elevated lands with elevations of between 270m to 290m AOD with steep to moderate slopes to the west of the site boundary. Slopes within the proposed development and at proposed infrastructure locations generally comprise gentle to moderate slopes.

The central portion of the site (Mullenaboree) is also characterised by elevated lands with gentle slopes within the proposed development boundary. Elevations at this portion of the proposed development are generally lower than those at the south with elevations of between 220m to 260m AOD.

The north potion of the proposed development (Knockdoorty) comprises elevated lands sloping steeply in parts to the south. The Nagle Mountains ridgeline runs along the northern boundary of the proposed development site in an east-west direction reaching a maximum elevation of approximately 420m AOD.

Coom Energy Green Park is located within Hydrometric Area No. HA 18, Blackwater (Munster), of the Irish River Network System. It is situated in the South Western River Basin District (SWRBD).
The Bottlehill area of the site primarily drains to the Coom River which joins the River Bride approximately 6km to the east of the site. The Mullenaboree area of the site primarily drains to the Toor River, which joins the Coom River approximately 3km south-east of the site. Surface runoff from the Knockdoorty part of the site primarily drains to the Bride River which continues to flow in an eastly direction for approximately 40 km where it joins Blackwater River.

The geology present within the development site and wider study area comprise of Till derived from Devonian Sandstones, Bedrock outcrop or subcrop and a limited extent of blanket peat. The majority of the proposed grid connection route is underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop indicated along the proposed route.

In total, 88 existing residential properties are located within 1.39 km of the proposed energy park wind turbines. There are 33 no. residential receptors within 1km of the proposed wind turbines. There are no receptors within 750m of the proposed wind turbines. The closest residential receptor is located 755m from a wind turbine.

The site is accessible from both the east and west via the N72 and N20 national roads respectively and local road network. Access from the east is via the M8 motorway and N72 national road, turning south from the east of the village of Ballyhooly, with the route then travelling along the local road network for approximately 9.0 km. Access to the site from the west is via the N20 national road and along the local road network for approximately 3.5 km to an existing Coillte forestry entrance which will be upgraded and utilised for the project.

3.2.1 Wind Farms in the Surrounding Area

There are no wind farms in the immediate vicinity of Coom Green Energy Park. Figure 3-5 illustrates the wind farms within 20km of the site. Castlepook and Knockacullita is the closest permitted wind farm to the development (ca. 21.8km) and comprises of 14 no. turbines. Pluckanes Wind Farm is ca. 12.6km from the site and comprises 1 no. turbine. Kilberehert Wind Farm (ca.30.1km) comprises 3 no. turbines and Carraigcannon Wind Farm (ca. 23.8km) comprises 10 turbines. All these wind farms have been developed.

There is existing planning consent for a single wind turbine 1km from the site near Glannasack (planning ref. 11/06168). It is unclear if the development will progress but for completeness it has been included as part of the cumulative assessment. A single turbine at the Kepak (Cork) Limited in Watergrasshill, Co. Cork is located 7km from the site. There are no other neighbouring operational or consented wind farm developments within 12.5 km of the proposed Coom Green Energy Park.

In terms of other types of projects and permitted developments the details of projects considered in the cumulative assessment are presented in Appendix 1-1.

3.3 Landownership

Landownership associated with the proposed development is a combination of Coillte and private landholders.

Planning consent is sought for the development as described in Section 3.5.1.

3.4 On-Site Wind Resource

The layout of the proposed wind farm development has been designed to minimise the potential environmental impacts of the wind farm, while at the same time maximising the energy yields of the wind resource passing over the site. Available wind speed is a key factor in determining the economic viability of potential wind energy locations. The 2013 Sustainable Energy Authority of Ireland (SEAI) Wind Speed Atlas identifies the site as having an average wind speed of between 8.5 and 10 m/s at 100 m above ground level.

3.5 Proposed Project

The proposed project will primarily consist of a wind farm of up to 22 no. wind turbine generators (WTG's), up to 2 no. substation compounds and a battery energy storage system along with ancillary civil and electrical infrastructure.

The total Maximum Export Capacity (MEC) of the energy park is approximately 105MW. The exact MEC will be dependent on the output power of the models available at procurement stage.

The exact rating and design of the proposed turbine and preferred battery energy storage system (BESS) unit will be subject to a competitive procurement process that will only commence if the project receives consent. The proposed turbine and BESS will be detailed by the turbine and BESS manufacturer on award of the contract.

However, the proposed CGEP turbines will have the following specifications:

- Three bladed, horizontal axis type turbine;
- Maximum height envelope of 169m from top of foundation to blade tip height;
  Maximum rotor diameter of up to 138m.

The exact make and model of the turbine will be dictated by a competitive tender process, but it will not exceed the maximum size envelope set out above.

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 associated grid connection route (GCR) will consist entirely of underground cable and will connect the on-site substations to an existing 110kV substation at Barrymore, within the townland of Farran South near Rathcormac. The GCR will be ca.24.4km in length, with ca. 16.7km to be constructed within the existing road corridor. The proposed GCR arrangement is illustrated in Figure 3-4. The 110kV grid connection cable will follow public roads and shall feature horizontal directional drilling (HDD) at up to 4 no. locations to cross existing watercourses and the M8 motorway. Watercourse crossing locations are shown in Figure 10-5 and summarised in Tables 3-2 and 3-3.

It is expected that large components associated with the wind farm construction will be transported to site via two separate turbine delivery routes (TDR's). One route will approach from the N20 to the west of the site (the West TDR) and shall enter the site via an existing Coillte forestry access point which will be upgraded as part of the development. The second route (the East TDR) shall come from the M8 motorway at Junction 14 and approach the site from the east along the N72 via Fermoy, Castlehyde, turning south onto local roads just to the east of Ballyhooly and entering the site at an existing Coillte forestry access which will be upgraded as part of the development.

The West TDR shall primarily serve the areas of the wind farm located at Bottlehill and Mullenaboree including a proposed onsite substation at Knockacullata. Components for 15no. WTG's, the substation and ancillary works will be carried to site via this route. In order to access the site via the existing Coillte entrance point on the L-1219-0, turbine delivery vehicles shall pass the final junction to the site entrance between the L-1217 and L-1219-0, turn at a temporary hard standing in Coillte land at Glashaboy South which is located approximately 2km south-east of the proposed site entrance and make their final approach to the site from the east and south. At the offsite turning area, wind turbine blade components shall be transferred via crane from standard extendable trailers to 'Superwing' blade lifting trailers which will allow them to negotiate the L-1217/L-1219-0 junction. Please refer to Appendix 13-2 for detailed information on proposed upgrade works as part of the TDR.

The East TDR shall primarily facilitate the construction of the areas of the windfarm at Knockdoorty and Glannasack including a proposed onsite substation at Lackendarragh North. Components for 7no. WTG's, the substation and ancillary works will be carried to site via this route.

The development shall include the opening of 3no. borrow pits on site. The locations of the proposed borrow pits are shown in Figure 3-1. The proposed borrow pits shall provide site-won stone that will significantly reduce the amount of construction aggregates that would need to be delivered to site. The proposed borrow pits shall also act as soil deposition areas which will avoid the need to export waste spoil to off-site facilities.

Battery energy storage system (BESS) units, to facilitate on site energy storage and to provide ancillary services to the electricity grid, will be situated next to the main onsite substation compound at Lackendarragh North. They will be housed in glass reinforced plastic (GRP) units or modified shipping containers.

The units will be mounted on shallow concrete plinths within a gravel hard standing and shall be bounded in the same fashion as the substation compounds using a galvanised steel security palisade fencing.

3.5.1 Summary of the Proposed Project Assessed in the EIAR

In summary the proposed project will consist of the following:

- Erection of up to 22 no. wind turbines with a tip height of up to 169m;
- Construction of turbine foundations and crane pad hardstanding areas;
- Construction of approximately 15 km of new site tracks and associated drainage infrastructure;
- Upgrading of approximately 10 km of existing tracks and associated drainage infrastructure where necessary;
- 3no. on site borrow pits and associated ancillary infrastructure. (New access tracks serving borrow pits shall be reinstated following completion of construction);
- All associated drainage and sediment control;
- Installation of new watercourse or drain crossings consisting of pre-cast concrete box culverts.
- Re-use or upgrading of existing internal watercourse and drain crossings;
- Construction of up to 2 no. onsite electrical substations and associated compounds including:
    - Welfare facilities;
    - Electrical infrastructure;
    - Parking;
    - Waste water holding tanks;
    - Rainwater harvesting
    - All associated infrastructure, services and site works including landscaping;
- 20 no. of Battery storage units and associated compound;
- Temporary accommodation works associated with the Turbine Delivery Routes to facilitate the delivery of turbine components;
- 3 no. Temporary construction site compounds and associated ancillary infrastructure including parking;
- Tree felling and associated replanting;
- Installation of approximately 30 km of medium voltage (20/33kV) underground cabling between the proposed turbines and the proposed on-site substations and associated ancillary works;
- Installation of approximately 7.7km of high voltage (up to 110kV) underground cabling between the proposed 2no. on site substations and ancillary works within private lands and public roads including up to 7 no. pre-cast joint bays;
- Installation of approximately 16.7km of high voltage (up to 110kV) underground cabling between the proposed on-site substations and the existing Barrymore substation and associated ancillary works within private lands and public roads. The proposed grid connection cable works will include 14 no. existing watercourse and drain crossings and the installation of up to 17 no. pre-cast joint bays.
- Communication cables and associated infrastructure;
- Erection of 2 no. permanent meteorological masts;

3.5.2 Summary of the Statutory Development Description for Consent

The proposed grid connection to the national grid at Barrymore substation proposed on the public road is considered as part of the project's assessment in this EIAR but does not form part of this application for consent. Equally an environmental assessment has been carried out for replant lands at Moneygorm, Co. Cork and Ballard, Co. Wicklow which are also not included in the application for consent.

The lands at Moneygorm and Ballard form part of the overall project and relate to replant lands and these have been assessed in detail in Appendix 3.3 of this EIAR but are considered cumulatively with other elements of the wind farm project in this section.

In addition to the above works, biodiversity lands have been identified and shall be managed throughout the life of the proposed development under a Conservation and Habitat Management Plan. This can be found in Appendix 8-K of this EIAR.

Therefore, the development description as per the newspaper notice and the application form for which consent from An Bord Pleanála is being sought is as follows:

In accordance with section 37E of the Planning and Development Act 2000, as amended, Coom Green Energy Park Limited seeks permission for a period of 10 years, for development consisting the construction of a wind farm and related works within the townlands of Glashaboy North, Coom (Hudson), Tooreen South, Killeagh, Coom (Fitzgerald) , Knuttery, Mullenaboree, Knockacullata, Knoppoge, Carrig, Glannasack, Knockdoorty, Lackendarragh North, Glashaboy South, Toorgarrif, Castleblagh, Ballyhooly South and Grange West, County Cork. The development will consist of:

- The construction of up to 22 no. wind turbines with a maximum tip height of 169 m and a maximum rotor diameter of 138 m and ancillary works including hardstanding areas;
- Upgrade of existing site tracks and the construction of new site tracks and associated drainage infrastructure both permanent and temporary;
- 3 no. on site borrow pits and associated ancillary infrastructure within the townlands of Tooreen South, Mullenaboree and Lackendarragh North;
- Construction of up to 2 no. onsite electrical substations including control buildings and electrical plant and equipment, a battery energy storage facility, welfare facilities, carparking and waste water holding tanks within the townlands of Knockacullata and Lackendarragh North;
- 3 no. Temporary construction site compounds and associated ancillary infrastructure including parking within the townlands of Tooreen South, Knockdoorty and Lackendarragh North;
- All associated underground electrical and communications cabling within private lands connecting the wind turbines to the 2no. proposed on-site substation;
- Upgrade of existing access junctions for temporary construction access from the local roads, L-1219-0 and L-1501 within the townlands of Tooreen South and Lackendarragh North;
- Permanent access junctions; from the local road L-1219-0 within the townland of Tooreen South, and from the local road L-1501 within the townland of Lackendarragh North.
- Erection of 2no. permanent meteorological masts with a maximum height of 100 m for the measuring of metrological conditions within the townlands of Tooreen South and Knoppoge;

- Temporary accommodation works at 5 no. locations to facilitate delivery of abnormal loads on the public road within the townlands of Grange West, Castlehyde, Ballyhooly South, Glashaboy South and Castleblagh. These works will primarily relate to the cutting back of hedgerows and lowering of boundary walls and the temporary installation of hardcore including an off-site turning area;
- All related site works and ancillary development including landscaping and drainage;
- A 10 year planning permission and 30 year operational life from the date of commissioning of the entire wind farm.

3.5.3 Turbine Layout

The layout of the proposed wind farm 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. Figure 3-1 shows the proposed development layout. The layout reflects the outcome of the iterative design process. Further detail on the design philosophy, constraints and alternative layouts is detailed in Chapter 2 of the EIAR: Need for the Development and Alternatives Considered.

Turbines are numbered from T2 – T23. This reflects the original assigned turbine numbering system in which several turbines were removed including T1.

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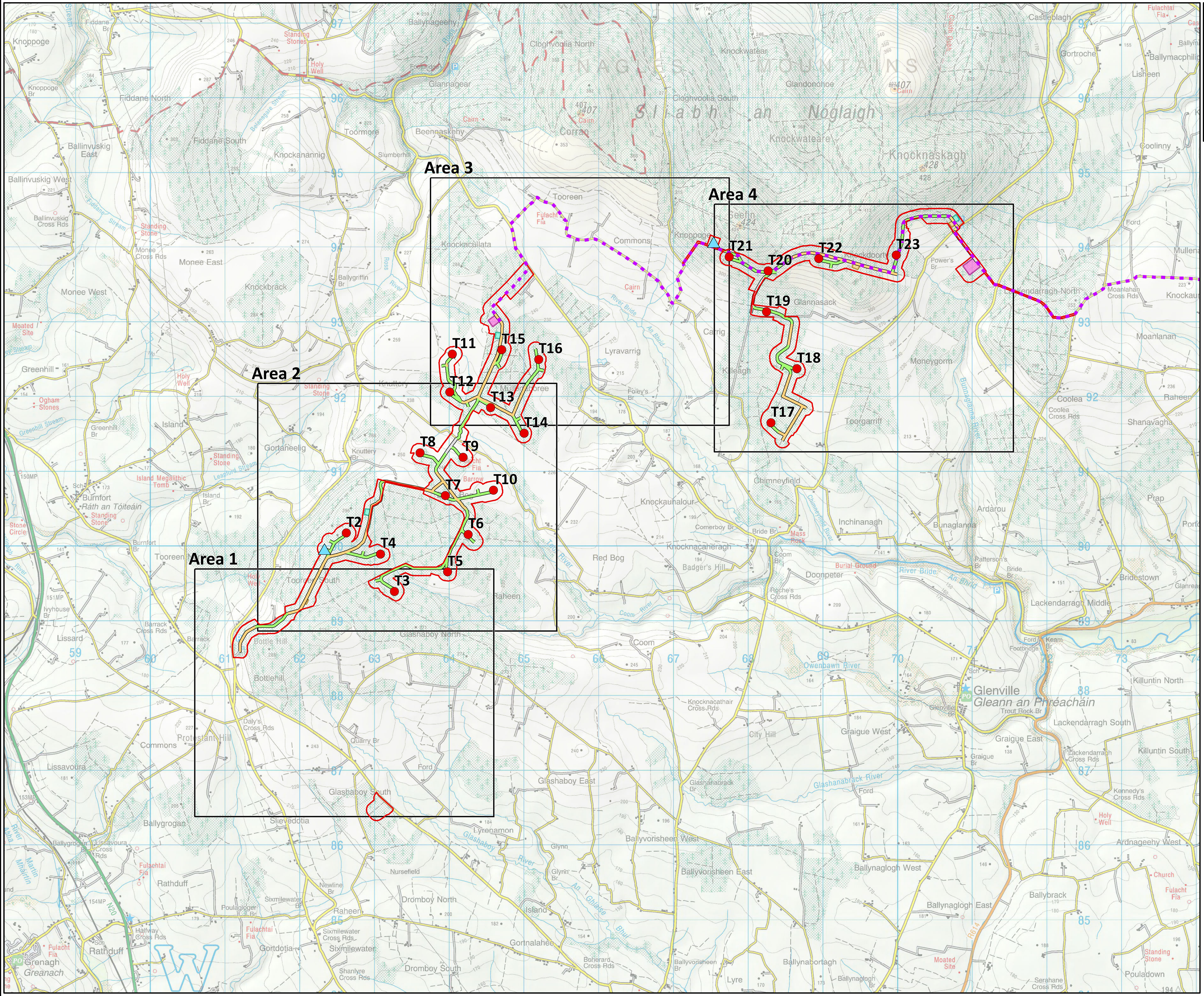

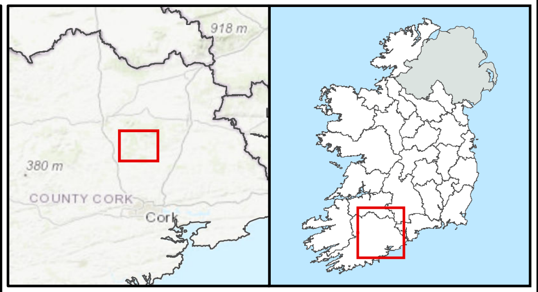

- Proposed Turbine Layout
- Proposed Permanent Met Masts
- Proposed Cable Route
- Proposed Development Boundary
- Existing Road
- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Borrow Pit
- Proposed Temporary Compound
- Proposed Substation

TITLE:	Proposed Site Layout Overview		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.1.1		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:50000	REVISION:	0
DATE:	28/09/2020	PAGE SIZE:	A3

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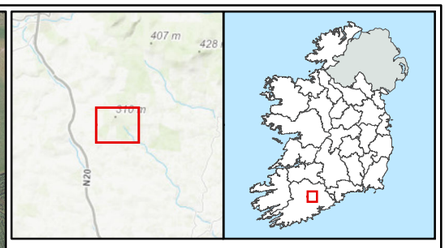

- Proposed Turbine Layout
- Proposed Development Boundary
- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Turning Heads and Passing Bays
- Proposed Turbine Hardstanding Area
- Proposed Temporary Compound

N W E S

0 0.25 0.5 1 Kilometers

TITLE:	Proposed Site Layout Area 1		
PROJECT:	Coom Green Energy Park, Co. Cork		
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CLIENT:	Coom Green Energy Park Ltd.		
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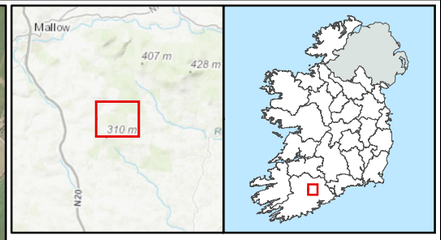

- Proposed Turbine Layout
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- Proposed Existing Road Upgrade
- Proposed New Road
- Proposed Turning Heads and Passing Bays
- Proposed Turbine Hardstanding Area
- Proposed Borrow Pit
- Proposed Temporary Compound

N W E S

0 0.25 0.5 1 Kilometers

TITLE:	Proposed Site Layout Area 2		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.1.3		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:12500	**REVISION:**	0
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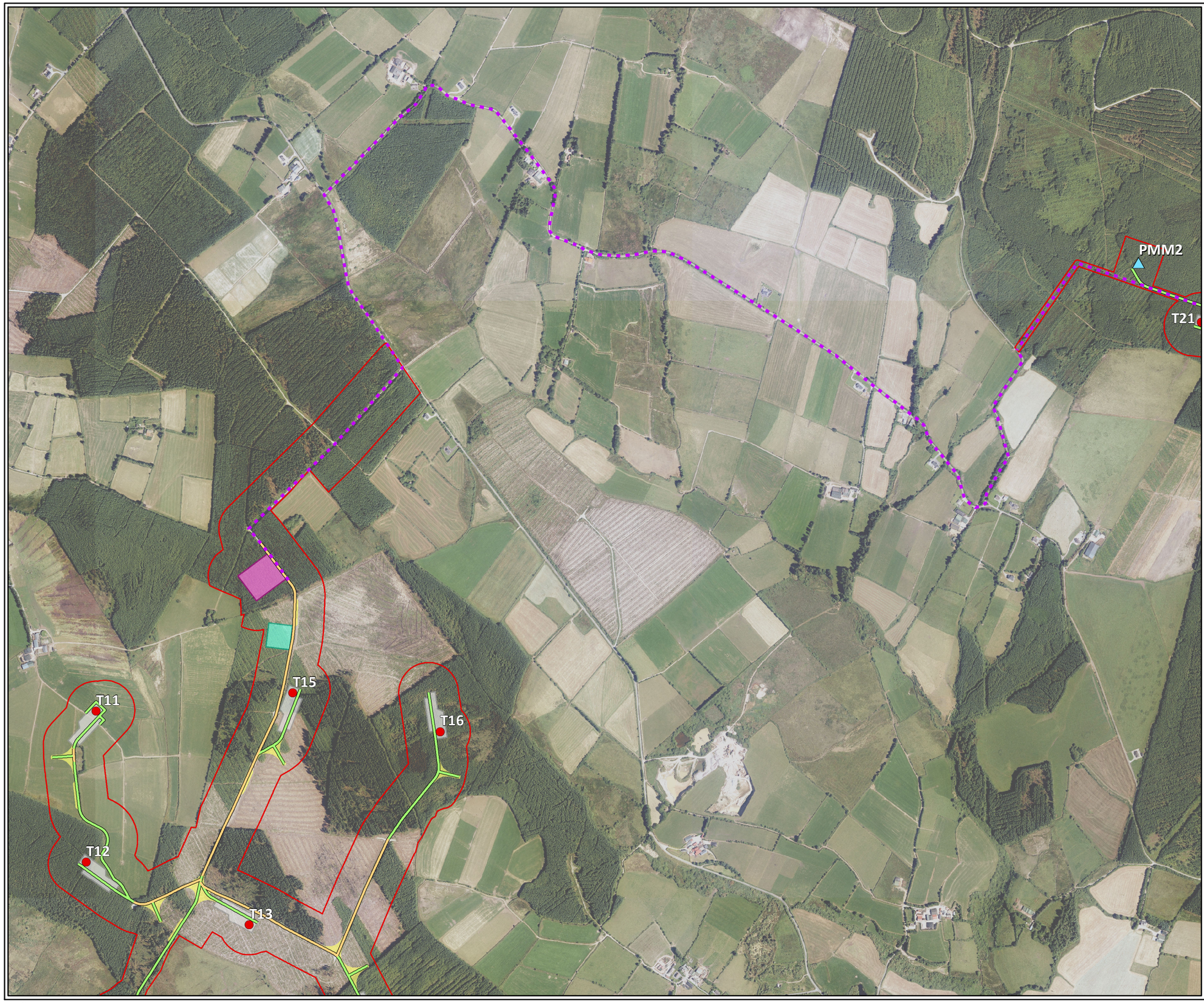

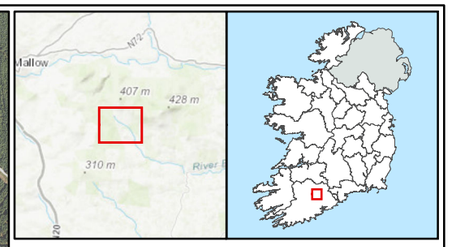

- Proposed Turbine Layout
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- Proposed Turning Heads and Passing Bays
- Proposed Turbine Hardstanding Area
- Proposed Borrow Pit
- Proposed Substation

N W E S

0 0.25 0.5 1 Kilometers

TITLE:	Proposed Site Layout Area 3		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.1.4		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:12500	**REVISION:**	0
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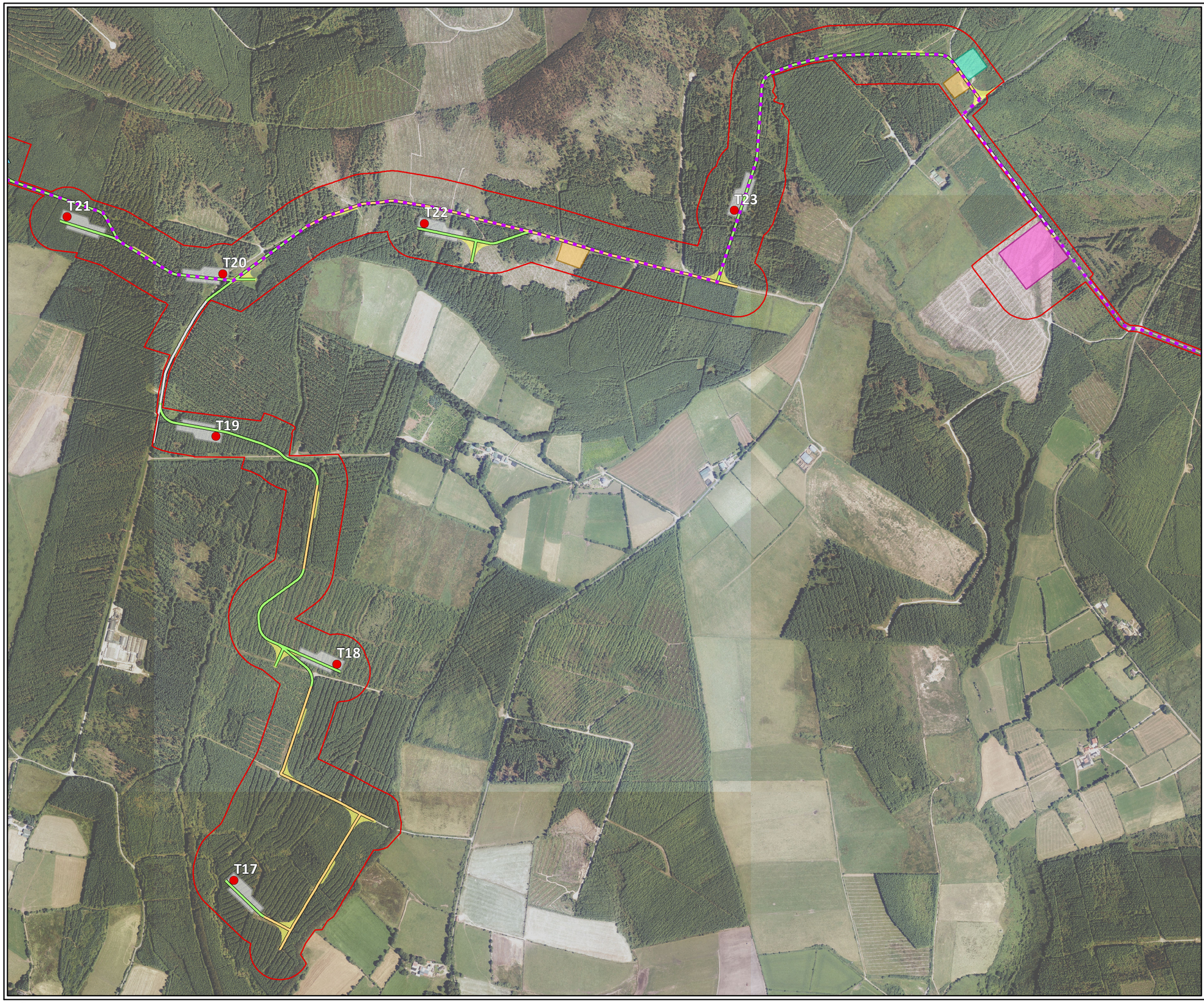

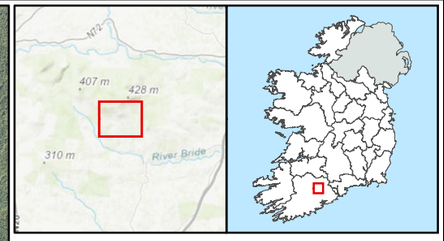

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- Proposed Borrow Pit
- Proposed Temporary Compound
- Proposed Substation

N W E S

0 0.25 0.5 1 Kilometers

TITLE: Proposed Site Layout Area 4

PROJECT: Coom Green Energy Park, Co. Cork

FIGURE NO:	3.1.5		
CLIENT:	Coom Green Energy Park Ltd.		
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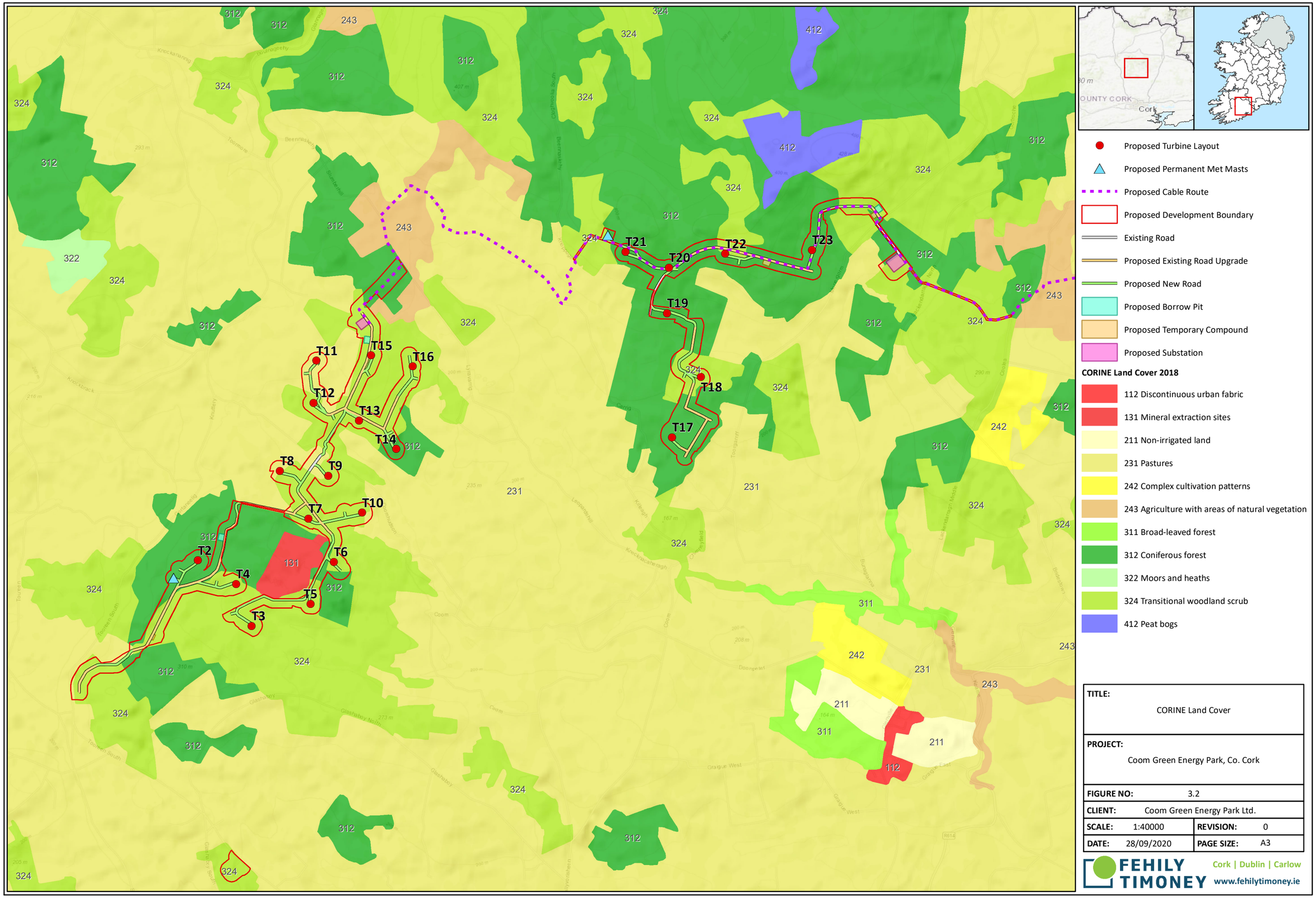

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PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.2		
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The turbines are referenced from T2 to T23 and the co-ordinates in Irish Transverse Mercator (ITM) are detailed in Table 3-1:

Table 3-1: Proposed Coom Green Energy Park Turbine Coordinates

TURBINE ID	X_(ITM)	Y_(ITM)
T2	562583	590234
T3	563227	589449
T4	563039	589951
T5	563936	589713
T6	564212	590214
T7	563907	590734
T8	563567	591306
T9	564146	591247
T10	564550	590806
T11	564002	592625
T12	563969	592119
T13	564515	591909
T14	564961	591567
T15	564661	592686
T16	565156	592556
T17	568267	591705
T18	568612	592430
T19	568206	593193
T20	568229	593738
T21	567708	593928
T22	568905	593906
T23	569943	593950

3.5.4 Power Output

The proposed development will have an estimated Export Capacity (MEC) of approximately 105MW depending on final turbine technology installed. Turbines of the exact same make, model and dimensions can have different power outputs depending on the capacity of the electrical generator installed in the turbine nacelle.

A rated capacity of 105 MW has been used below to calculate the power output of the proposed wind farm. Assuming an installed capacity of 105 MW, the proposed wind farm has the potential to produce approximately 303,500 MWh (megawatt hours) of electricity per year, based on the following calculation:

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

where:

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

B = The capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc. A capacity factor of 33 % is applied here

C = Rated capacity of the wind farm: 105 MW

The 303,500 MWh of electricity produced by the proposed wind farm would be sufficient to supply approximately 72,262 Irish households with electricity per year, based on the average Irish household using 4.2 MWh of electricity (this latest figure is available from the March 2017 CER Review of Typical Consumption Figures Decision).

The Census of Ireland recorded a total of 195,853private households in Cork (City and County) in 2016. Based on a capacity factor of 33%, the proposed wind farm would therefore produce enough electricity for the equivalent of over on third of all households in Co. Cork.

EirGrid in their All Island Generation Capacity Statement (2019-2028) estimates a capacity factor of approximately 28.5% for onshore wind. The capacity factor applied for the proposed development is greater than the EirGrid estimation as a result of improvements in turbine technology and the good wind flows at the site. The proposed turbine type allows for the use of fewer, taller turbines with an increased efficiency and in return greater economic benefit to the consumer.

3.5.5 Turbines

3.5.5.1 Turbine Description

The proposed turbines will have a tip height of up to 169m. Detailed drawings, which accompany the planning application, show a turbine that may be used for the proposed development. However, the exact make and model of the turbine will be dictated by a competitive tender process which is informed by the energy production efficiencies of various turbines on the market at the time but will not exceed the maximum size envelope set out within the development description. The proposed wind turbine design envelope which has been assessed in the EIAR allows for flexibility of the turbine component configuration within the tip height limit.

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 site will be conventional three-blade turbines, that will be designed to ensure the rotors of all turbines rotate in the same direction at all times. Each discipline within the EIAR has assessed various types and sizes of turbines within the overall envelope based on the worst-case scenario for that discipline; that is, the design envelope parameters that would produce the greatest potential impact. For example, modelling for bird collision risk was carried out based on a turbine with the maximum rotor diameter of 138m and the maximum tip height of 169m.

The exact combination of rotor diameter and hub height will be dictated by the final selection of the turbine make and model at turbine selection stage/pre-construction but will in any case comply with the environmental impact limits set out in this EIAR.

The turbine will be of the generic three bladed, tubular tower model with horizontal axis. The rotor blades are bolted to the central hub, which is connected to a generator located in the nacelle. The nacelle holds the following turbine components:

- Generator
- Electrical components
- Control unit.

A glass fibre reinforcing polyester hood covers the nacelle. Earthing and isolation protect all components from lightning strikes.

3.5.5.2 Turbine Blades

The blades of a modern turbine are made up of glass fibre reinforced polyester. They turn at between 5 and 15 revolutions per minute depending on wind speed and make of turbine.

A turbine begins generating electricity at a wind speed of 3 to 4m/s depending on turbine type, with rated power generation at wind speeds of approximately 12 to 14m/s.

The turbines usually shut down at wind speeds greater than 25m/s, although some machines are designed to operate at up to 30m/s. The yaw mechanism turns the nacelle and blades into and out of the wind. A wind vane on the nacelle controls the yaw mechanism. Blades are pitched to match the wind conditions.

3.5.5.3 Turbine Tower and Foundation

The tower of the turbine is a conical steel tube, with multiple painted finish. It is generally delivered to site in four or five sections. The first section is bolted to the steel base, which is cast into the concrete foundation.

The shape and size of the foundation can vary depending on the turbine manufacturer however it is approximately 22m in diameter and approximately 3m in depth.

The upper sections of the tower are bolted to the lower ones in sequence. The base of the tower is around 4-5m in diameter, tapering to approximately 2-3m, where it is attached to the nacelle. The first floor of the tower is approximately 2-3m above ground level it is accessed by a galvanised steel staircase and a steel hatch door which will be kept locked except during maintenance. The exact details of the turbine tower will be dictated by final selection of the turbine make and model for maximum efficiency of wind energy production.

3.5.5.4 Turbine Transformer

The turbine will have a transformer located within the tower. The turbine will generate electricity at approximately 660volts, depending on the machine chosen. The turbine transformer will step up the voltage to approximately 33kV to reduce the electrical loss on the cabling connector circuits that connect to the site substation.

3.5.5.5 Turbine Colour

The turbines have a multiple painted coating to protect against corrosion. They are coloured off-white or light grey to blend into the sky background. This minimises visual impact, as recommended by the following guidelines on wind energy development:

- "Wind Energy Development – Planning Guidelines" (2006), Department of the Environment, Heritage and Local Government
- "The Influence of Colour on the Aesthetics of Wind Turbine Generators", ETSU W/14/00533/00/00
- PAN 45, The Scottish Office Environment Department
- PPG22, Department of the Environment - Welsh Office
- Technical Advice Note 8, Welsh Assembly, 2005.

3.5.6 Turbine Delivery Route Access Tracks and Hardstandings

3.5.6.1 Turbine Delivery Route (TDR)

The proposed turbine delivery routes are presented in Figure 3-3. A Delivery Route Selection and Assessment was carried out to identify the optimum delivery route to site and is presented as Appendix 13-2 of this EIAR.

Turbine deliveries will be from Ringaskiddy and will be delivered along two distinct routes. One route to the west of the site, servicing the Bottlehill and Mullenaboree parts of the site and a second route to the east, servicing the Knockdoorty part of the site.

Turbine Delivery to the West

The port of entry is Ringaskiddy where the turbine components will be offloaded and transported to the site, via the N28 and the N40 to the Dunkettle Interchange. At the Dunkettle Interchange, the components will take the N8 to Silversprings and then take the R635 (north ring road) around the north side of Cork City. At Blackpool, the components will join the N20 and turn off at the junction with the L-1217 towards Bottlehill Landfill.

In order to access the site via the existing Coillte entrance point on the L-1219-0, turbine delivery vehicles shall pass the final junction to the site entrance between the L-1217 and L-1219-0, turn at a temporary hard standing in Coillte land at Glashaboy South which is located approximately 2km south-east of the proposed site entrance and make their final approach to the site from the east and south. At the temporary turning area, wind turbine blade components shall be transferred via crane from standard extendable trailers to 'Superwing' blade lifting trailers which will allow them to negotiate the L-1217/L-1219-0 junction.

Turbine Delivery to the East

The port of entry is the same as above and the turbine components will take the same route to Dunkettle Interchange. At the Dunkettle Interchange, the turbine components will travel north along the M8 motorway. At Junction 14 on the M8, the turbine components will exit the motorway and travel south into Fermoy. Once the turbines reach Fermoy, they will travel west along the N72 and turning south just east of Ballyhooley. From there they will follow local roads across the Blackwater River and to the site entrance at Lackendarragh North.

3.5.6.2 Site Entrances

The Coom Green Energy Park will be served by four site entrances. Two entrances are required to the west to access the Bottlehill and Mullenaboree areas of the proposed development. Two site entrances will be required to the east. One of these is required for access to the turbines and associated infrastructure in the Knockdoorty area and the other is required for access to construct the substation at Lackendarragh North.

One of the western (Bottlehill) access points is located at the Bottlehill Landfill site (off the L-1217 local road) and is already constructed to TII guidelines (DN-GEO03060). The site entrance here will accommodate access to the Bottlehill part of the site for standard construction vehicles. Vehicles entering the site at this point shall only have the right to access turbines T2 – T7.

Access to the remaining turbines in the Bottlehill and Mullenaboree parts of the site shall be via the main site access off the L-1219-0. The main site access serving the Bottlehill and Mullenaboree parts of the site is an existing Coillte forestry access located on the L-1219-0 which will be upgraded to facilitate oversize loads associated with wind turbine component deliveries. All oversize turbine delivery vehicles for the Bottlehill and Mullenaboree areas of the site shall use this entrance.

The existing forestry access from the L-1504 local road at Mullenaboree shall not be used during the construction phase but shall remain as an access point for forestry operations and operational access to the proposed substation at Knockacullata.

The main Knockdoorty site entrance to the east is an existing Coillte forestry entrance which will be upgraded to facilitate the wind farm construction and operations in the Knockdoorty area. This will be a dedicated site entrance located along the L-1501 Ballyhooly to Chimneyfield road. This site entrance has been designed in accordance with TII guidelines and shall be upgraded to achieve sightlines of 160m in both directions at a setback distance of 3m. The Cork County Council requirements for local roads here are 90m sight lines in both directions.

A new entrance will also be located near the Knockdoorty site entrance to facilitate access for the construction of the proposed Lackendarragh North substation off the L-1501 local road. The new site entrance to the proposed Lackendarragh North substation will be constructed in line with Cork County Council requirements.

More details on site access cab be found in Chapter 13.

Temporary Accommodation Works

In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. Any accommodation works will be carried out in advance of the turbine deliveries, following further consultation and agreement with the local authority.

5no. locations have been identified where more extensive works will be required and are described below. The full extent of accommodation works are identified in Appendix 13.2 and described in Chapter 13. The locations requiring additional works are as follows:

- Local widening near Castlehyde along the N72 between Fermoy and Ballyhooly in the townlands of Grange West and Castlehyde (Node 2.3);
- Local widening at the junction of the N72 and the Ballyhooly North Road east of Ballyhooly in the townland of Ballyhooly South (Node 2.5);

- Local widening at the approach road to the Blackwater Bridge south of Ballyhooly in the townland of Ballyhooly South (Nodes 2.6 & 2.7);
- Removal of trees and construction of an aggregate hard standing at Castleblagh south of Ballyhooly in the townlands of Castleblagh (Node 2.8);
- Widening of existing forestry access, tree felling and construction of an off-site turning area at Glashaboy South (Temporary turning and transfer area).

The general location of accommodation works are shown in Figure 3-3 and identified as “TDR Nodes”. The location and nature of proposed temporary accommodation works are described in further detail in Chapter 13.

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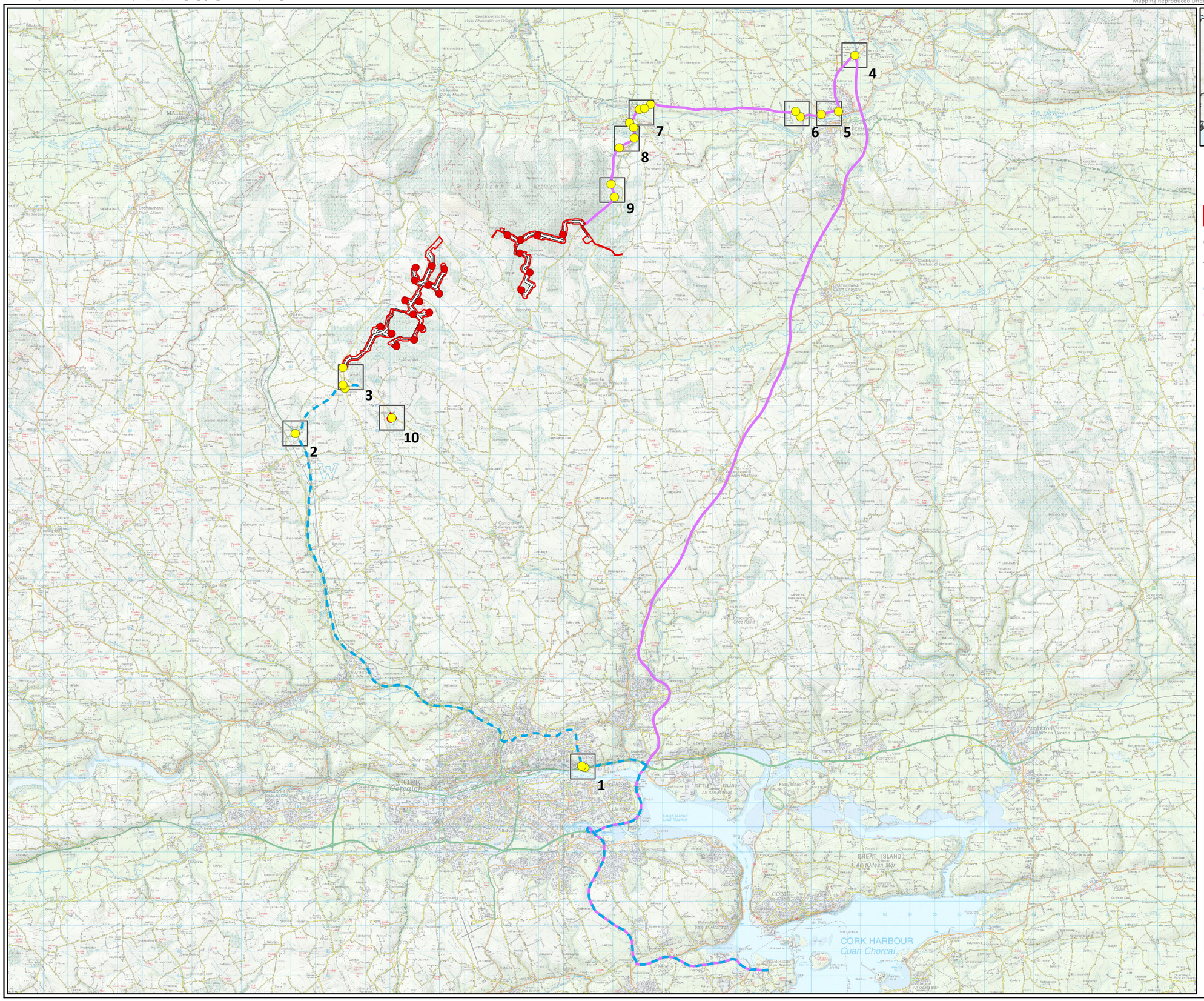

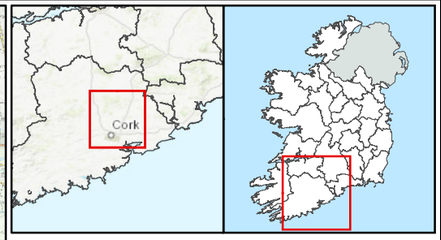

TDR Nodes

Proposed Turbine Layout

Proposed Development Boundary

Proposed Access Roads

Turbine Delivery Route Options

Route 1

Route 2

N
W E
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0 2.5 5 10 Kilometers

TITLE:	Turbine Delivery Routes Overview		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.1		
CLIENT:	Coom Green Energy Park Ltd.		
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DATE:	28/09/2020	**PAGE SIZE:**	A3

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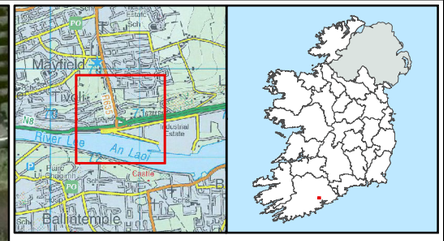

TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 1

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0 50 100 200 Meters

TITLE:	Turbine Delivery Routes Submap 1		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.2		
CLIENT:	Coom Green Energy Park Ltd.		
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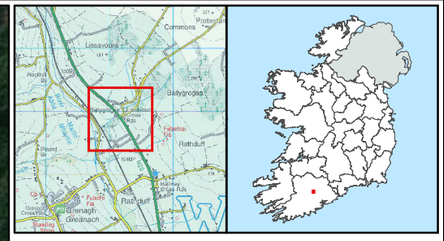

TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 1

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TITLE:	Turbine Delivery Routes Submap 2		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.3		
CLIENT:	Coom Green Energy Park Ltd.		
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TDR Nodes

Proposed Development Boundary

Proposed Nodes Upgrade Areas

Proposed Access Roads

Turbine Delivery Route Options

Route 1

TITLE:	Turbine Delivery Routes Submap 3		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.4		
CLIENT:	Coom Green Energy Park Ltd.		
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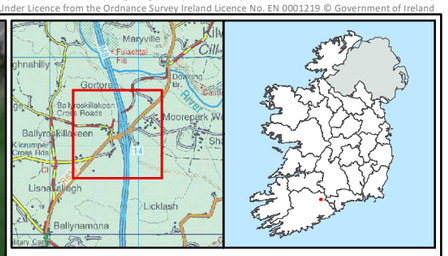

TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

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TITLE:	Turbine Delivery Routes Submap 4		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.5		
CLIENT:	Coom Green Energy Park Ltd.		
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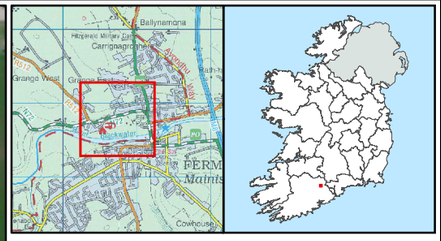

TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

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TITLE:	Turbine Delivery Routes Submap 5		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.6		
CLIENT:	Coom Green Energy Park Ltd.		
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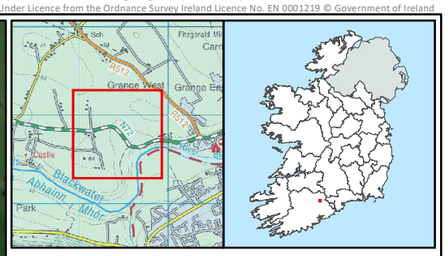

TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

TITLE:	Turbine Delivery Routes Submap 6		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.7		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:2500	**REVISION:**	0
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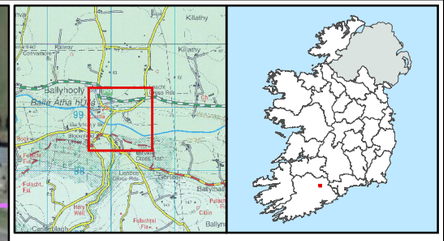

TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

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TITLE:	Turbine Delivery Routes Submap 7		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.8		
CLIENT:	Coom Green Energy Park Ltd.		
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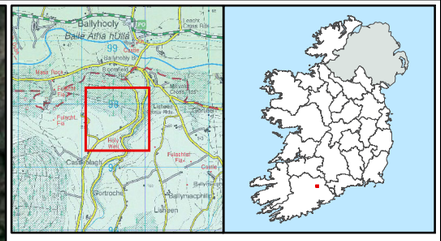

TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

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0 50 100 200 Meters

TITLE:	Turbine Delivery Routes Submap 8		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.9		
CLIENT:	Coom Green Energy Park Ltd.		
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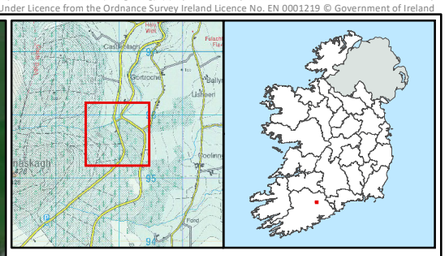

TDR Nodes

Proposed Nodes Upgrade Areas

Turbine Delivery Route Options

Route 2

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0 50 100 200 Meters

TITLE:	Turbine Delivery Routes Submap 9		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.10		
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TDR Nodes

Proposed Nodes Upgrade Areas

N
W E
S

0 50 100 200 Meters

TITLE:	Turbine Delivery Routes Submap 10		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.3.11		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:3500	**REVISION:**	0
DATE:	28/09/2020	**PAGE SIZE:**	A3

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3.5.6.3 Internal Access Tracks

Approximately 10 km of internal access tracks will be required to be upgraded as part of the development and 15 km of new internal access tracks will be required. Figure 3-1 illustrates the internal access tracks within the proposed development site. The proposed internal site track layout will permit access for vehicles during the construction phase, for maintenance during the operational phase and for vehicles to decommission the turbines at the end of the life of the development.

An extensive network of agricultural and forestry access tracks exists within the site. These existing access tracks have been utilised wherever possible for the proposed development.

All access tracks will be approximately 4.5-5m wide along straight sections and wider at bends.. The tracks will be finished with a well graded aggregate. The drainage system will be installed adjacent to the internal access tracks. Existing drainage infrastructure will be maintained and upgraded where necessary.

It is anticipated that the stone required for the construction of the internal access roads will be sourced from quarries in the vicinity and 3no. on-site borrow pits at locations shown in Figure 3-1.

Access track formation will consist of a minimum 500mm hardcore on geo-textile membrane. The construction methodology for newly constructed tracks will be as follows:

- The formation will be prepared to receive the geotextile membrane.
- Stone will be placed and compacted in layers to minimum 500mm depth.
- A drainage ditch will be formed, within the excavated width and along the sides of the track.
- Surplus excavated material will be placed along the side of sections of the tracks and dressed to blend in with surrounding landscaping and partially obscure sight of the track.

3.5.6.4 Turbine Hardstandings

A turbine hardstanding area consists of a main crane pad hardstanding of approximately 40m x 75m with a number of additional smaller hardstandings that act as set down and assembly areas, located as shown on the accompanying planning drawings. This area will accommodate a main crane and an assist crane during the assembly of the turbine, as well as during occasional maintenance periods during the operation of the wind farm.

3.5.7 Temporary Site Facilities

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. The location of the temporary site compounds are shown on Figure 3-1. A wheel wash facility will be provided at site entrances. CGEP will have 3no. temporary compounds, two of which will be located near the entrance to the Bottlehill and Knockdoorty areas of the site with a third located within the Knockdoorty site which shall be used as a temporary storage area. Site welfare facilities and offices shall be located at the main temporary compounds near the site entrances.

Temporary compounds shall be aggregate hard standings, located as shown on the accompanying drawings. Temporary facilities will be removed and the lands reinstated on completion of the construction phase.

Facilities to be provided in the temporary site compounds will include the following:

- site offices, of Portacabin type construction
- portaloos
- bottled water for potable supply
- a water tanker to supply water used for other purposes
- canteen facilities
- storage areas
- employee parking
- bunded fuel storage
- contractor lock-up facility
- diesel generator
- waste management areas

3.5.8 Grid Connection

The CRU introduced a new grid connection policy in April 2018 to replace the older systems of Gates and non-GPA (*Group Processing Approach*) – the Enduring Connection Policy (ECP-1: 2018 Batch). The purpose of the ECP is to provide more frequent opportunities for projects to connect to the network. Applicants are required to have gained planning permission for the wind farm in order to lodge an application for the grid connection The applicant intends to apply for a grid connection as soon as possible as part of the ECP2 application process.

The proposed development will have an export capacity of approximately 105 MW, depending on final turbine and BESS technology installed. Connection will be sought under the Enduring Connection Process (ECP) grid access regime. Following consultation with EirGrid to date and an in-depth examination of grid capacity as part of this project, it is anticipated that the project will connect from the onsite substations via underground 110kV cable to Barrymore 110kV substation in the townland of Farran South. The cable will be installed along the public road and shall feature horizontal directional drilling at up to 4 no. locations to cross existing watercourses and the M8 Motorway. The proposed grid connection is shown in Figure 3-4. No overhead lines are required for this connection.

Electricity generated from wind turbines at the Bottlehill and Mullenaboree parts of the site shall be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks. This circuit shall be terminated at a proposed onsite substation at Knockacullata in the Mullanboree part of the site. The power from this western part of the site shall be transferred to the onsite substation at Lackendarragh via a buried 110kV cable through private lands and a section of public road as shown on Figure 3-4. Electricity generated from wind turbines at the Knockdoorty part of the site shall also be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks and terminated directly into the on-site substation at Lackendarragh and exported to the grid via a 110kV buried cable to the existing Barrymore substation.

The proposed 110 kV grid connection route will cross private lands and will follow the existing road to the substation at Barrymore.

Connection works will involve the installation of ducting, joint bays, drainage and ancillary infrastructure and the subsequent running of cables along the existing road network. This will require delivery of plant and construction materials, followed by excavation, laying of cables and subsequent reinstatement of trenches.

It is expected that full road closures will be put in place to facilitate cabling works rather than partial road closures or stop/go systems. This will enable the works to be completed as quickly and as safely as possible, with minimal disruption time for residents of the area. These would be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section. This is described in more detail in Chapter 13.

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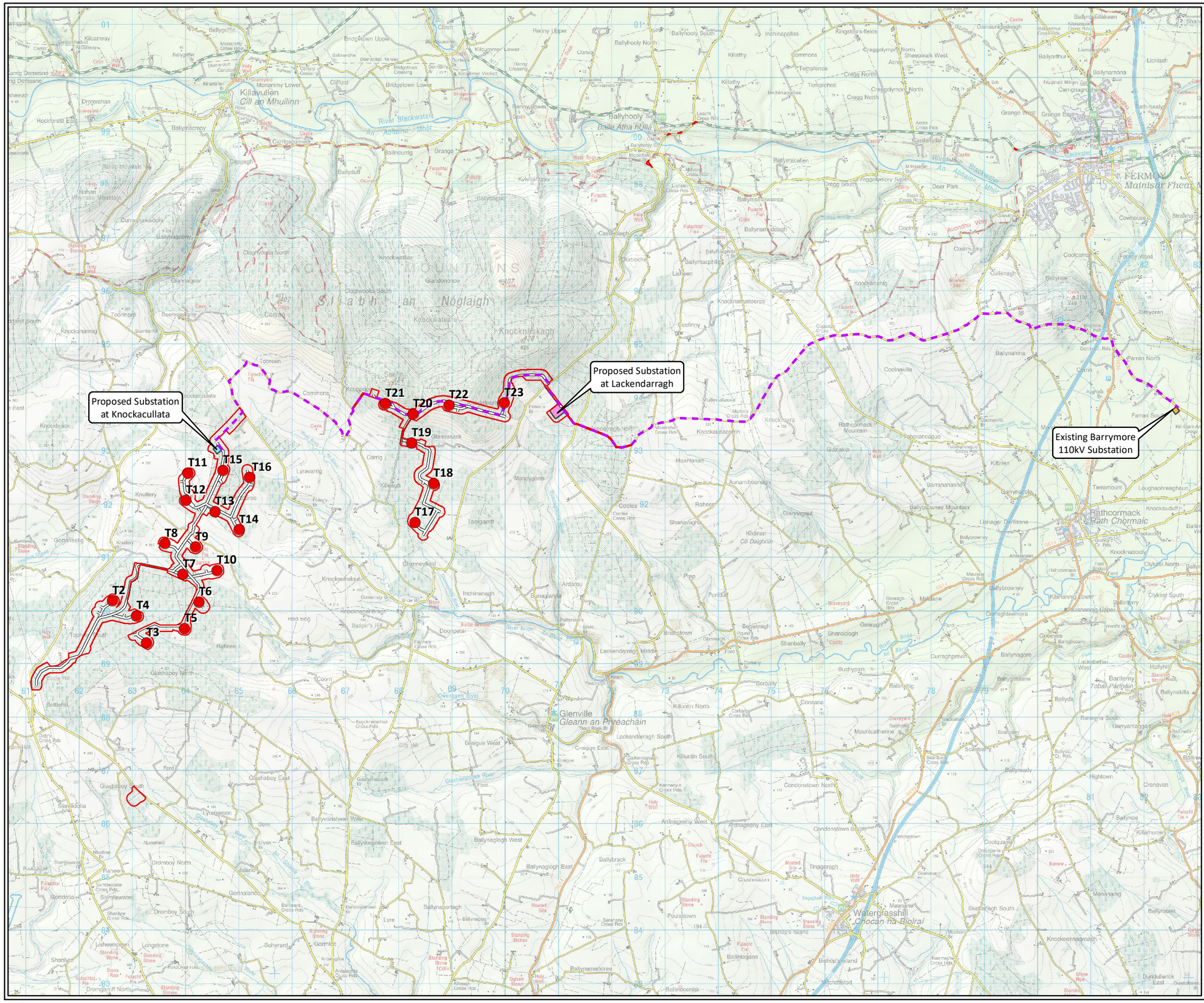

- Proposed Turbine Layout
- Proposed Cable Route
- Proposed Development Boundary
- Proposed Access Roads
- Existing Barrymore 110kV Substation
- Proposed Substation at Knockacullata
- Proposed Substation at Lackendarragh

N W E S

0 0.5 1 2 Kilometers

TITLE:	Grid Connection General Arrangement		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.4		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:70000	**REVISION:**	0
DATE:	28/09/2020	**PAGE SIZE:**	A3

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3.5.8.1 Crossing of the M8 Motorway

Where the grid connection route crosses the M8 motorway, horizontal directional drilling (HDD) will be used, namely a 110kV duct crossing at Corrin View Estate to the South of Junction 15 as shown on drawing P1306-2650-0033.

The locations of the launch and reception pits will be adequately spaced from the carriageway to ensure the bore is at such depth as not to conflict with the drainage or surface of the motorway or associated embankments.

Consideration was given to trying to accommodate the cables in the over-bridge which spans the motorway at this location however following consultation with TII, Direct Route, and Cork County Council, it was deemed preferable to employ the proposed crossing technique.

There is sufficient room available to accommodate the necessary equipment. The cables will be laid at sufficient depth below the motorway to stay below the motorway drainage and without impacting on the road foundations. There will be a detailed consultation and agreement with TII and the PPP Company, Direct Route in advance of completing the works.

The locations of start and finish points for the HDD have been identified following desktop assessments, site visits and consultation with both the local authority, TII and Direct Route. Detailed designs for the motorway embankment and bridge crossing as well as site investigation records were reviewed by FT's geotechnical engineers to confirm the suitability of the proposed crossing method at this location.

3.5.9 Watercourse Crossings

3.5.9.1 Internal Access Track Watercourse Crossings

The proposed development layout will have 9 stream crossings within the site boundary. These crossings are listed in Table 10-11 and shown on Figure 10-5.

Existing crossing WC028 will be replaced with box culvert of minimum 1200 mm width and 400 mm height, with additional height required for embedment and freeboard. The existing crossings are shown on Figure 10-5. There will be one new proposed watercourse crossing WC024 over the unnamed tributary of the Coom River and one new proposed crossings WC025 over the Coom River required as a result of the development. There will be one new proposed watercourse crossing WC027 over the Toor River required as a result of the development. The locations of the stream crossing are shown on Figure 10-5.

Table 3-2: Onsite Access Watercourse Crossings

Feature ID	ITM_X	ITM_Y	Existing/ Proposed	Feature/Activity	Proposed Method of Crossing
WC024	563175.65	589720.58	Pro	Grid cable crossing and proposed new access track crossing over the unknown tributary of the Coom River	New Crossing. Box culvert 900mm x 900mm. Cable over the culvert

Feature ID	ITM_X	ITM_Y	Existing/ Proposed	Feature/Activity	Proposed Method of Crossing
WC025	563250.25	589754.30	Pro	Grid cable crossing and proposed new access track crossing over the tributary of the Coom River	New Crossing. Box culvert 900mm x 900mm. Cable over the culvert
WC027	564133.20	591667.40	Prop	Grid cable crossing and proposed new access track crossing over the Toor River	New Crossing. Box culvert 2000mmx1100mm + freeboard + embedment, cable over the culvert
WC028	564171.10	591981.30	Ext	Grid cable and proposed new access track crossing over the Toor River	Replace existing pipe with a box culvert of min 1200mmx400mm + freeboard + embedment, cable over the culvert
WC030	568492.90	592029.20	Ext	Grid cable and existing forestry track crossing over the forestry ditch, tributary of the Inchinanagh stream	Standard trench crossing above or below existing culvert.
WC031	568375.20	593820.90	Ext	Grid cable and existing forestry track crossing over the forestry ditch, in the proximity of the turbine T35	Standard trench crossing under existing service. Pipe to be extended to facilitate widening of existing access road or replaced with suitable pipe of same or greater diameter
WC035	569019.61	593940.22	Ext	Grid cable and existing forestry track crossing over the forestry ditch, in the proximity of turbine T20	Standard trench crossing under existing service. Pipe to be extended to facilitate widening of existing access road or replaced with suitable pipe of same or greater diameter
WC049	568425.66	593132.46	Prop	Grid cable and proposed new access track crossing over drain east of turbine T19	New Crossing. Box culvert 900mm x 900mm. Cable over the culvert
WC050	570093.25	594420.14	Prop	Grid cable and proposed new access track crossing over drain north of turbine T23	New Crossing. Box culvert 900mm x 900mm. Cable over the culvert

A description of construction methodologies for watercourse crossings is presented in Section 3.5.7 and in the CEMP.

3.5.9.2 Watercourse Crossings Along the GCR

The following table summarises existing watercourse and service crossing locations and the proposed method for crossing same along the 110kV grid connection route.

Table 3-3: Summary of Watercourse and Buried Service Crossings Along GCR

Feature ID	ITM_X	ITM_Y	Feature Type	Proposed Crossing Method
WC006	565856.78	594166.05	Watercourse Crossing	HDD under structure within public road corridor. Alternative: Concrete bridge beam in road deck with ducts in flat profile. Reinstate bridge surface to same level as existing.
WC007	566767.03	593590.72	Watercourse Crossing	HDD under structure within public road corridor.
WC008	566855.33	593463.30	Watercourse Crossing	Trench in road above structure and reinstate road surface to existing levels.
WC009	566953.13	593308.63	Drain Crossing	Standard trench crossing under existing service
WC013	571579.31	593438.66	Drain Crossing	Standard trench crossing under existing service
WC014	571953.73	593251.56	Drain Crossing	Standard trench crossing under existing service
WC015	574302.28	593592.15	Drain Crossing	Standard trench crossing under existing service
WC016	574563.28	593659.12	Drain Crossing	Standard trench crossing under existing service
WC017	578448.83	595314.38	Watercourse Crossing	Standard trench crossing under existing service
WC018	582024.33	594307.32	Watercourse Crossing	Replace existing stone culvert with an RC box culvert and bring ducts underneath.
WC019	582076.81	594271.41	Watercourse Crossing	HDD under structure within public road corridor. Alternative: Concrete bridge beam in road deck with ducts in flat profile. Reinstate bridge surface to approximately 100mm above existing.
WC020	574506.00	593616.00	Drain Crossing	Standard trench crossing under existing service.
WC029	567015.50	593633.90	Drain Crossing	Standard trench crossing above or below existing culvert.

3.5.9.3 Turbine Delivery Route (TDR) Watercourse Crossings

There are 3no. existing watercourse crossings along the TDR between the M8 and the site at the locations shown in the table below. No works are expected to be required at any of these locations.

There are 2no. existing watercourse crossings between the N20 and Bottlehill Area site entrance. No works are expected to be required at either of these locations.

The locations of the above crossings are shown on figure 10-5.

Existing watercourse crossing structures between the proposed port of entry and the respective turn-off points from the M8 and N20 were not assessed as part of this EIAR as they consist of routes which make up part of the national motorway and primary national road network. It is considered that any existing crossing structures located along these routes would be of sufficient design and condition so as to not require any modification works.

Table 3-4: TDR Existing Watercourse Crossings

Feature ID	ITM_X	ITM_Y	Route	Water Framework Directive (WFD) Waterbody Designation
WC001	559419.37	586219.49	TDR West	MARTIN_010
WC002	560960.04	587718.62	TDR West	MARTIN_020
WC032	571881.00	595965.50	TDR East	BLACKWATER (MUNSTER)_180
WC033	572870.50	598793.70	TDR East	BLACKWATER (MUNSTER)_170
WC034	582013.97	598842.80	TDR East	BLACKWATER (MUNSTER)_190

3.5.10 Onsite Electricity Substations

It is proposed to construct 2 no. onsite electricity substations within the proposed development site as shown in Figure 3-1. These will provide a connection point between the wind farm and the proposed grid connection point at the existing Barrymore substation.

As described in Section 3.5.6, electricity generated from wind turbines at the Bottlehill and Mullenaboree parts of the site shall be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks. This circuit shall be terminated at a proposed onsite substation at Knockacullata in the Mullanboree part of the site. The power from this western part of the site shall be transferred to the onsite substation at Lackendarragh North via a buried 110kV cable through private lands and a section of public road as shown on Figure 3-4. Electricity generated from wind turbines at the Knockdoorty part of the site shall also be collected at medium voltage (20/33kV) by an internal circuit of buried cables which will follow on-site access tracks and terminate at the on-site substation at Lackendarragh North and transformed to 110 kV. Electricity from Bottlehill, Mullenaboree and Knockacullata circuits will be exported from Lackendarragh North substation to the existing grid via a 110kV buried cable to the existing Barrymore substation.

The dimensions of the proposed substation compounds will be approximately 178m x 153m and 124m x 104m at Lackendarragh North and Knockacullata respectively and will include a substation control building and electrical components necessary to export the electricity generated from the wind farm to the national grid. The substation compounds will be surrounded by a ca. 2.5 metre high steel palisade fence and internal fences will also be provided to segregate different areas within the main substation compound.

Lighting will be required on site and this will be provided by lighting poles located around the substation and exterior wall mounted lights on the control buildings.

At each of the locations, one control building will be located within the substation compound and will measure approximately 20m by 10m and approximately 6m in height. The control building will include the Independent Power Production (IPP) and grid operator control rooms, an office space and welfare facilities for staff during the operational phase of the wind farm. Due to the nature of the project there will be a small water requirement for occasional toilet flushing/hand washing with a rainwater harvesting tank adjacent to the control building.

A wastewater holding tank will be provided outside the substation compound fence line so that it can be maintained where required without requiring access to the substation compound. The wastewater holding tank will be a sealed storage tank with all wastewater tankered off site as required by an authorised waste collector to a wastewater treatment plant. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007, will be employed to transport wastewater away from the site. The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. 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. This approach for managing wastewater on site has become standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment can be challenging and has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal.

3.5.11 Electrical Cabling

As described in Section 3.5.6, electricity generated from wind turbines at the Bottlehill and Mullenaboree parts of the site shall be collected at medium voltage by an internal circuit of buried cables which will follow on-site access tracks. This circuit shall be terminated at a proposed onsite substation at Knockacullata in the Mullanboree part of the site. The power from this western part of the site shall be transferred to the onsite substation at Lackendarragh via a buried 110kV cable through private lands and a section of public road as shown on Figure 3-4. Electricity generated from wind turbines at the Knockdoorty part of the site shall also be collected at medium voltage by an internal circuit of buried cables which will follow on-site access tracks and terminated directly into the on-site substation at Lackendarragh before being exported to the grid via a 110kV buried cable to the existing Barrymore substation. The proposed grid connection is shown in Figure 3-4.

Internal collector circuit cable routes are shown on the planning application drawings and will generally follow the alignment of the internal access tracks.

The electricity will be transmitted as a three-phase power supply so there will be three individual conductors (or individual cables) in each cable circuit. The three conductors will each be laid in separate ducts which will usually be laid in a trefoil formation but may also be laid in a flat formation. The specification for the cables and cable-laying will be in accordance with ESBN requirements.

The width of a cable trench with a trefoil formation will be 600mm, a flat formation would require a wider trench width. The depth of cover to the ducts carrying the cables will usually be 950mm cover to the top of the upper duct in public roadways and grassed areas. The depth of trench for the cables will be approximately 1220mm and the depth of cover for the cables will usually be 950mm. However, in certain instances, for example when crossing a bridge with shallow cover, a shallower depth of 450-950mm could be utilised. In those circumstances, the particular design will be agreed with Eirgrid and additional cable protection measures such as steel plates or reinforced concrete cover may be required. Cables laid within the site will be laid to a depth of up to 1100mm to the top of the upper duct in field locations.

The diameter of the ducting will be selected to suit the range of cross-sectional areas of electrical cables and is likely to fall between 100mm and 200mm diameter.

3.5.11.1Cable Installation

The specifications for cables and cable installation will be in accordance with Eirgrid requirements. A description of cable installation works is presented in Section 2.8 and the CEMP.

3.5.11.2Buried Drains and Service Crossings

Watercourse crossings required for the proposed 110kV cable route are summarised in Table 3-4. For the crossing of culverts or services, if encountered, the following options for construction may be used:

- Piped Culvert Crossings – Where sufficient cover is available, the cable ducts will be laid above the culvert with a minimum separation distance, typically 300mm to be agreed with the local authority and Eirgrid.
- Piped Culvert Crossings - Where sufficient cover is not available, the cable ducts will be laid under the culvert with a minimum separation distance, typically 300mm to be agreed with the local authority and Eirgrid.
- Flatbed Formation over Culverts - where the cable duct is to be installed over an existing culvert where sufficient cover is not available, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert. The duct will be laid in this trench in a flatbed formation over the existing culvert and will be encased in 6mm thick steel galvanized plate with a 30N concrete surround as per Eirgrid specification.

3.5.11.3Joint Bays

Joint bays are pre-cast concrete chambers where individual lengths of cables are joined to form one continuous cable. Joint bay locations are shown on 2650-Series planning application drawings. These locations may be adjusted slightly at detailed design stage if required in consultation with Eirgrid and Cork County Council. It is expected that 24 no. of joint bays will be required for the UGC. Of these, 17 no. joint bays shall be located in public roads with 7 no. located on private lands.

A joint bay will be constructed in a pit. The bay will be approximately 4.5m x 1.8m x 1.2m deep. A reinforced concrete slab will be constructed in the bay to accommodate the jointing enclosure.

Communication chambers, which are similar to small manholes, will also be installed at the joint bay locations to facilitate connection of fibre-optic communication cables.

3.5.12 Traffic Management

A careful approach will be taken to planning the works to ensure minimal impacts on road users and the general public. As discussed during consultation with Cork County Council, the cable trenching will be carried out with the aid of either a lane closure or road closure, which will ensure that the trenching works are completed as expeditiously as possible. Due to the length of cabling within the road corridor (ca. 16km), these works could be conducted over 10-month period of time (ca. 40weeks).

The road closures will be applied for by the appointed contractor and will outline local diversions whilst maintaining local access at all times for residents, farms and businesses. Road closures will be subject to the applicable statutory processes as implemented by the Roads Authority. Road closures will be facilitated by the good network of roads in the area. 'Rolling road closures' will be implemented, whereby the site will progress each day along a road, which will have the effect of reducing the impact for local residents.

A traffic management plan for the cable trenching will be adopted , in consultation with Cork County Council, to provide a safe environment for road users and construction workers.

A Traffic Management Plan is contained in the Construction Environmental Management Plan (CEMP) which is included in Appendix 3.1 of Volume 3. The Traffic Management Plan shall be finalised following the appointment of the contractor for the main construction works in consultation with Cork County Council and will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board.

3.5.13 Peat Management

There are no peat deposition areas required as part of this development following assessment of the existing environment. Peat excavated for the construction of access roads within the site will be re-used on site in berms and for landscaping purposes and along the margins of the access roads. A number of berms will also be created around turbine hardstandings and parallel to the access tracks.

These berms will be created from suitable excavated material and are located on the opposite side of infrastructure to any interceptor drains. The berms will therefore not obstruct flow or risk siltation to interceptor drains. Berms will be placed outside the roadside drains which drain the new access tracks. Further details on soils and peat management can be found in Chapter 9 of this EIAR and the Soils Management Plan contained within the CEMP in Appendix 3.1.

3.5.14 Drainage

The drainage system will be constructed alongside all turbine hardstands, internal access tracks, substation and the temporary construction compound. The drainage system for the existing tracks and roads will largely be retained. Where the roads require widening, this will involve the slight re-location of existing roadside swales to allow for widening. Further details on the hydrology and drainage are contained in Chapter 10 Hydrology and Water quality, in the CEMP in Appendix 3.1 and in the Planning Drawings.

The number of stilling ponds, dimensions and their locations are provided in SWMP which is located in Appendix 3.1.

3.5.15 Temporary Stockpile Areas

Due to the possibility of soil-borne diseases, all topsoil recovered from each farm property will remain on the same property. These stockpiles will be covered and where required, drainage and sediment controls including temporary silt fencing will be put in place. The topsoil will be re-used for landscaping and will also be used for reinstatement purposes around turbine bases and hardstanding areas.

Further details on soils management can be found in Chapter 9 of this EIAR and the Soils Management Plan contained within the CEMP in Appendix 3.1. Further details on site drainage can be found in Chapter 10 and in the Site Drainage Management Plan contained within the CEMP in Appendix 3.1.

3.5.16 Tree Felling

Much of the proposed development site comprises commercial coniferous forestry. 15no. turbines are located within forestry and consequently tree felling will be required as part of the project. Felling of approximately 62.8 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation. The felling area proposed is the minimum necessary to construct the proposed development and comply with any environmental mitigation (bats in particular).

The felling will be the subject of a Felling Licence Application to the Forest Service prior to construction as per the Forest Service's policy on granting felling licenses for wind farm developments. The proposed areas to be felled are illustrated on Figure 3-1.

The Forest Service Policy requires that a copy of the planning permission for the wind farm be submitted with a felling licence application therefore the felling licence cannot be applied for until planning permission is received for the proposed development site. The licence will include the provision of relevant replant lands to be planted in lieu of the proposed tree felling on the site as discussed in Section 3.5.15 below. It should be noted that the forestry within the proposed wind farm site was originally planted as a commercial crop and will be felled in the coming years should the wind farm proceed or not.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

Before any harvesting works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- the felling plan, surface water management, construction management, emergency plans and any contingency plans;
- environmental issues relating to the site;
- the outer perimeter of all buffer and exclusion zones;
- all health & safety issues relating to the site.

The proposed method of tree felling near 'infrastructure' will be limited to:

- 20m wide corridors for new and upgraded access tracks;
- 10m buffer surrounding hardstandings and compounds;
- 6m corridor for buried cables in private lands;
- 92.4m radius around each turbine located in forestry for bat impact mitigation.

3.5.17 Replant Lands

Replacement replanting of forestry in Ireland is subject to licence in compliance with the Forestry Act 2014 as amended. The consent for such replanting is covered by the Forestry Regulations 2017 (S.I. No. 191 of 2017).

As it is proposed to fell62.8 ha of coniferous forestry for the proposed Coom Green Energy Park development, replant lands of the same area are required. The replacement replanting of forestry can occur anywhere in the State subject to licence. Potential replanting sites have been identified at Moneygorm, Co. Cork and Ballard, Co. Wicklow. The total approved area for replanting is 77.1 ha which has been granted Forest Service Technical Approval for afforestation. These lands have been assessed as part of this EIAR

Appendix 3.3 of this EIAR presents an environmental assessment of these replant lands.

3.5.18 Permanent Meteorological Masts

Two permanent meteorological (Met) masts shall be erected on site at Bottlehill and Knockdoorty as shown in Figure 3-1. These shall replace two existing temporary met masts which are located at Mullenaboree and Knockdoorty. These temporary met masts shall be dismantled and removed from site prior to construction of CGEP.

The temporary met masts are both lattice structures of 100m height which are fixed to ground anchors by guy wires.

The permanent met masts shall be of the following general configuration:

- A 100m high lattice steel mast with a shallow concrete foundation, fixed to ground anchors by 3no. guy-wires;

A construction sequence for the proposed masts is described in Section 3.6.9.

3.6 Project Construction

3.6.1 CEMP

A Construction and Environmental Management Plan (CEMP) is contained in Appendix 3.1 of Volume 3.

The CEMP sets out the key environmental management measures associated with the construction, operation and decommissioning of the proposed wind farm, to ensure that during these phases of the development, the environment is protected, and any potential impacts are minimised. In the event An Bord Pleanála (the Board) decides to grant approval for the proposed development, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board.

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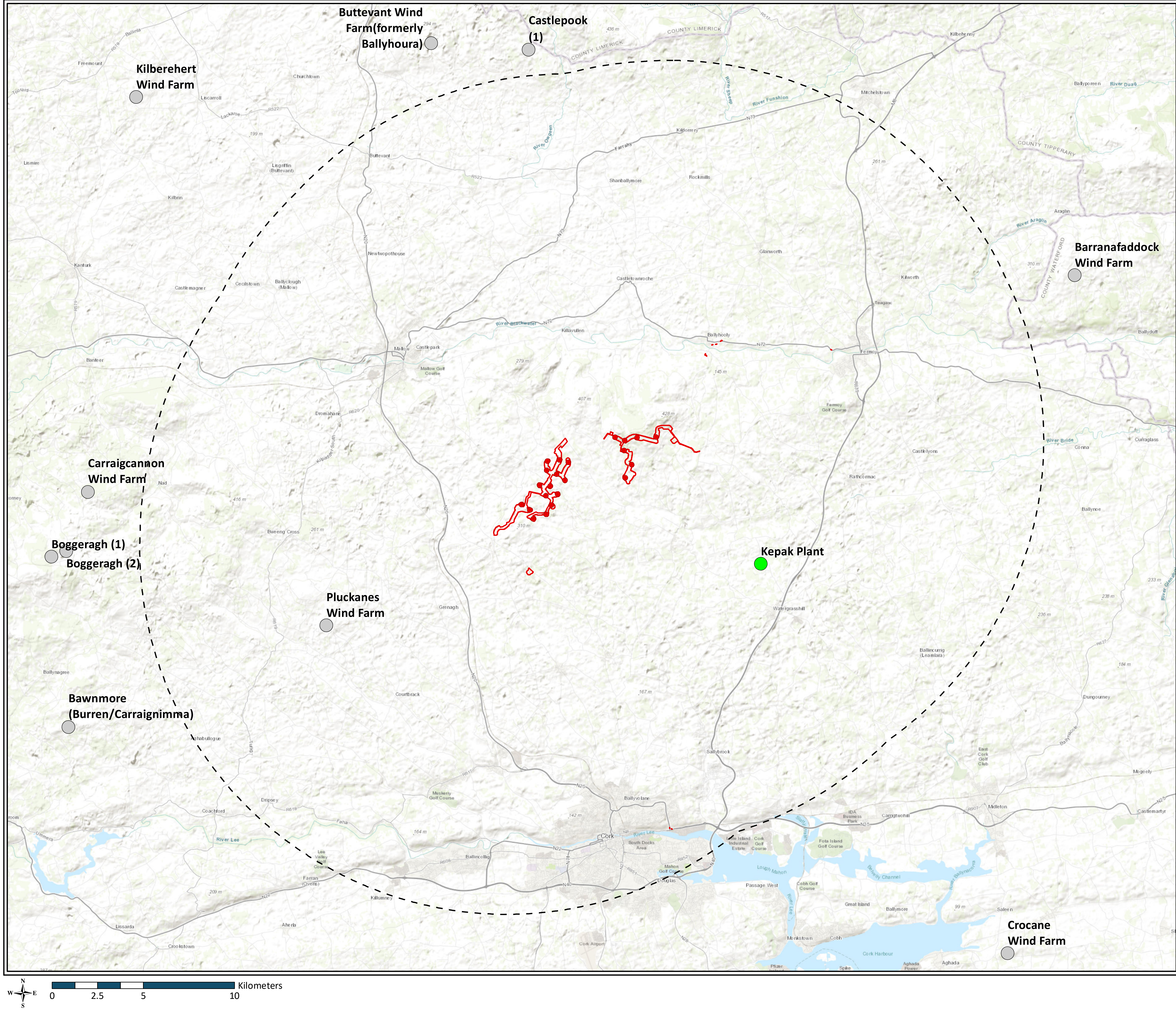

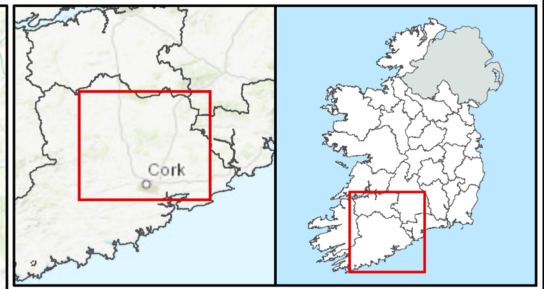

SEAI Wind Farms (2018)

Turbine at Kepak Plant

Proposed Turbine Layout

Proposed Development Boundary

20km Distance from Proposed Development

TITLE:	Renewable Energy Developments in the Vicinity of the Proposed Development
PROJECT:	Coom Green Energy Park, Co. Cork
FIGURE NO:	3.5
CLIENT:	Coom Green Energy Park Ltd.
SCALE: 1:200000	**REVISION:** 0
DATE: 28/09/2020	**PAGE SIZE:** A3

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3.6.2 Construction Activities

The construction sequence will be as follows. Tree felling, upgrading of existing site tracks and the provision of new site tracks will precede all other activities. Drainage infrastructure will be constructed in parallel with the track construction. This will be followed by the construction of the turbine foundations and the provision of the hardstanding areas.

In parallel with these works the on-site electrical works; sub-station and internal cable network and off-site connection works to the national grid will be completed. A description of construction techniques is contained in the CEMP in Appendix 3.1.

3.6.3 Site Access Tracks and Drainage

Access tracks are required to facilitate the construction of the proposed wind farm and to provide access to each of the turbines. Drainage infrastructure will be constructed in parallel with the access track construction.

Access tracks to facilitate turbine and material deliveries for CGEP shall consist of the construction of approximately 15 km of new site tracks and associated drainage infrastructure. The project will incorporate the upgrading of approximately 10 km of existing forest tracks. Existing drainage infrastructure shall be retained where possible and improved as necessary.

3.6.4 Cable Trenches

The proposed cable route is indicated in Figure 3-4. As part of the scoping and consultation process for the development, searches of existing utility services were carried out to identify areas where existing major assets exist such as high voltage electricity cables or gas mains. Private utility and telecommunications companies were also consulted during this period to inform the proposed design. At construction stage, records of services such as watermains, sewers, gas mains and other power cables will again be obtained from the relevant service providers and conditions predicted in the EIAR will be confirmed ahead of construction works. Cable detection tools, a ground penetrating radar and slit trenches will be used, as appropriate, to find the exact locations of existing services. The final locations of the cable routes in the public roads and in the verge along the public road will be selected to minimise conflicts with other services.

A minimum separation distance of 300mm will be maintained with existing services. Usually the new cables will be laid below existing services.

For cable trenches located in public roads, the contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of cement bound material (CBM). A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed above the ducts and the two communication ducts will also be laid. An additional layer of cable marker strips will be laid above the communication ducts and the trench back-filled. Back-filling and reinstatement in public roads will be to a specification to be agreed with the road authority and at least as good as the existing.

A similar construction methodology will apply for cable trenches laid within site access tracks. In this case the cable-ducts will generally be laid when the track is being constructed and will follow the edge of the site access tracks. The trenches within these locations will generally be backfilled using the excavated material.

Plate 3-1: Cable Duct Laying in Trefoil Configuration

The following is a synopsis of the main activities for the installation of cabling:

- All relevant bodies i.e. ESBN, Gas Networks Ireland, Eir, Cork County Council, Irish Water etc. will be contacted and all drawings for all existing services will be sought to confirm the conditions predicted in this EIAR.
- Immediately prior to construction taking place the area where excavations are planned will be surveyed and all existing services will be identified, and temporary warning signs erected where necessary.
- For cable works in the public road, the traffic management plan will be implemented. Clear and visible temporary safety signage will be erected all around the perimeter of the live work area to visibly warn members of the public of the hazards of ongoing construction works.
- An excavator will be used to excavate the trench to the dimensions of approximately 600mm wide by approximately 1.2m deep.
- A silt filtration system will be installed on all existing drainage channels for the duration of the cable construction to prevent contamination of any watercourse.
- Any ingress of ground water will be removed from the trench using submersible pumps and pumped to the nearest available existing drainage channel.
- Once the trench has been excavated, a bedding layer of sand or 15 Newton concrete will be installed and compacted. All concrete will be offloaded directly from the concrete truck into the trench.
- PVC ducts will be installed on top of the compacted base layer material in the trench.
- Once the ducts have been installed, couplers will be fitted and capped to prevent any dirt etc. entering the unjointed open end of the duct.

In poor ground conditions, the open end of the duct will be shimmed up off the bed of the trench to prevent any possible ingress of water and dirt into the duct. The shims will be removed once the next length of duct has been joined to the duct system.

- The as-built location of the installed ducts will be surveyed and recorded using a total station/GPS before the trench is backfilled to ensure recording of exact location of the ducts, and hence the operational electricity cable. These co-ordinates will be plotted on as-built record drawings for the grid connection cable operational phase.
- When ducts have been installed in the correct position on the trench base layer, sand (in road trench) or Lean-mix CBM4 (CL1093) (off road trench) will be carefully installed in the trench around the ducts so as not to displace the duct and compacted.
- Spacer templates will be used during installation to ensure that the correct cover of duct surround material is achieved above, below and at the sides of the duct in the trench.
- A red cable protection strip will be installed above duct surround layer of material and for the full length of the cable route.
- A layer of Lean-mix CBM4 (CL1093) (in road) or excavated material (off road) will be installed on top of the duct surround material to a level 300mm below the finished surface level.
- Yellow marker warning tape will be installed for the full width of the trench, and for the full length of the cable route, 300mm from the finished surface level.
- The finished surface of the road, road verge, or agricultural land will be reinstated as per its original condition or to the requirements of the Cork Area Engineer.
- Precast concrete cable joint bays will be installed within excavations in line with the trench. The cable joint bays are backfilled and the finished surface above the joint bay reinstated as per its original condition. The cable joint bays are re-excavated a second time during cable pulling and jointing, after which the finished surface above the joint bays is reinstated again to its original condition.
- When trenching and ducting is complete, the installation of the grid connection cable will commence between the wind farm onsite sub-stations to the existing Barrymore 110kV substation.
- Construction work areas and traffic management measures will be setup at 2 no. consecutive cable joint bays simultaneously. The underground cable will be pulled through the installed ducts from a cable drum set up at one joint bay and using a winch system which is set up at the next joint bay, the cable is pulled through.
- The cables are jointed within the precast concrete cable joint bays.
- The finished surface above each cable joint bay is reinstated to its original condition, and the construction work area removed.

For simplicity, each cable circuit is referred to as a cable in the remainder of this document.

3.6.5 Watercourse Crossings

Watercourse crossings can generally be classified as follows:

- Existing structures (bridges or culverts) that need to be crossed by infrastructure (access tracks or cables) associated with the proposed development, without a need to modify the existing structure;
- Installation of new structures to facilitate the crossing of existing watercourses by infrastructure associated with the proposed development;
- Existing structures that need to be either replaced or upgraded to facilitate the crossing of existing watercourses by infrastructure associated with the proposed development;

As described in Section 3.5.7, there is 1 no. new watercourse crossing required for new access tracks within the proposed development site. It is proposed to construct a pre-cast concrete box culvert at this location to minimise the environmental impacts. It is also proposed to replace 1 no. existing pipe culvert with a box culvert at one location.

The proposed methods for crossing existing watercourses along the grid connection route are described in Table 3-3. Construction details outlining crossing methods for watercourses listed in Table 3-1can be found in the accompanying drawings.

The sequence of works associated with the proposed watercourse crossing methods are described below.

3.6.5.1 Box Culvert Crossing (Access Tracks and Electrical Cables)

In order that flood flows would not be obstructed, the stream crossings will be sized to convey a 1 in 100-year flood flow with a 20% allowance for Climate Change.

For the construction of the box culvert crossings, the following methodology shall apply:

- The access track construction will finish at least 10m from the nearside bank of the drain.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in the CEMP.
- Culvert installation will only take place during dry periods.
- The bed of the drain will be prepared using a mechanical digger and hand tools to the required levels accordance with the design.
- A bedding layer will be laid in the base of the watercourse using Class 6 aggregate material and blinding to the desired levels in accordance with the design.
- The box culvert is laid in one lift or in sections using a crane in accordance with an approved lift plan.
- Bedding material is placed and compacted around the culvert to the desired levels in accordance with the design.
- 500mm of suitable bedding material in the form of clean round gravel between 10-100mm diameter, shall be laid in the base of the culvert in accordance with the recommendations set out in *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses from* Inland Fisheries Ireland.
- The culvert shall be covered using compacted Class 6N fill material in accordance with the design up to the levels required by the access track sub formation.
- Rock armour headwalls will be constructed where necessary to protect culvert ends and the base of slope embankments on either side of the track.
- The access track construction continues over the crossing in accordance with the design.
- Ductwork will be installed above the box culvert in accordance with the design to carry the grid connection cables across the watercourse.

3.6.5.2 Horizontal Directional Drilling (HDD) Under Existing Structure (Electrical Cables)

HDD will be employed at up to 4no. locations along the grid connection route as part of the development as shown on the site layout plans. 3 no. of these locations will be for the crossing of existing watercourses.

The operation shall take place from one side of the watercourse within the public road corridor or verge and will be carried out by an experienced HDD specialist. Each crossing is expected to take place in a single day under one mobilisation.

A traffic management plan shall be finalised in advance in agreement with the County Council and implemented in advance of the works. A TMP has been prepared as part of this EIAR and can be found in Appendix 3.1.

The process will involve setting up a small tracked drilling rig on one side of the watercourse, within the public road corridor, and at least 10m back from the stream bank.

A shallow starter pit will be excavated at the point of entry and shall be located at a sufficient distance from the watercourse to achieve a minimum clearance depth below the bed of the watercourse.

A pilot hole will be bored as per the agreed alignment and shall be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation is lubricated using a fluid. When the pilot hole has been drilled to the correct profile, its diameter is increased if necessary, to match the external diameter of the cable duct. The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for cable installation.

A detailed method statement with site specific mitigation measures for this activity is included in the CEMP included with the application. Minimum environmental protection measures to be implemented on site shall include the following:

- A site-specific drilling design, risk assessment and method statement shall be prepared by the contractor prior to the works.
- If drilling fluids are required, a biodegradable fluid such as CLEARBORE shall be used rather than Bentonite.
- HDD operations to be limited to daytime hours and conditions when low levels of rainfall are forecast.
- The depth of the bore shall be at least 3m below the bed of the watercourse.
- Visual inspection to take place at all times along the bore path of the alignment.
- A field response plan to minimize loss of returns of drilling fluid and actions to restore returns shall be provided.
- Silt fences will be constructed around proposed work areas prior to commencement of works.
- No refuelling will take place within 50m of the watercourse or any sensitive habitats.
- Pre-construction verification surveys shall take place at drilling sites to confirm the presence of any sensitive species.
- A qualified biological monitor will be onsite for the duration of the drilling operation.

The depth of the bore shall be at least 3m below the level of the public road and stream bed. A detailed survey of buried services within the public road to confirm the conditions predicted in this EIAR will be carried out by the contractor prior to commencement of the operation. The council will be made aware in advance of the operation and invited to oversee the activity.

Where the grid connection route crosses the M8 motorway, horizontal directional drilling (HDD) will be used, namely a 110kV duct crossing at Corrin View Estate to the South of Junction 15 as shown on Figure 3-4 and accompanying planning drawings.

The locations of the launch and reception pits will be adequately spaced from the carriageway to ensure the bore is at such depth as not to conflict with the drainage or surface of the motorway or associated embankments.

Consideration was given to trying to accommodate the cables in the over-bridge which spans the motorway at this location however following consultation with TII, Direct Route, and Cork County Council, it was deemed preferable to employ the proposed crossing technique.

There is sufficient room available to accommodate the necessary equipment. The cables will be laid at sufficient depth below the motorway to stay below the motorway drainage and without impacting on the road foundations. There will be a detailed consultation and agreement with TII and the PPP Company, Direct Route in advance of commencing the works.

3.6.5.3 Alternative: Concrete Bridge Beam in Road Deck with Ducts in Flat Profile (Electrical Cables)

An alternative to HDD at 2no. bridge crossing locations (WC006 and WC019) is to install the cable ducts in flat formation with a concrete encasement referred to as a concrete bridge beam. The methodology for this option is described as follows:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in the CEMP.
- Setting out and location of services will be carried out in the same manner as for trench excavations.
- Traffic management to be set up as per traffic management plan. A TMP has been prepared as part of this EIAR and can be found in Appendix 3.1.
- The road surface along the route will be milled by road plainer and skid steer.
- A 360-degree excavator will first remove the top layer from the route along the roadside and load onto a haulage truck. This material will be recycled, then the excavation of trench will commence and a trained spotter will be used to assist machine operators while reversing or when their visibility becomes restricted.
- Excavator to run at low revs to avoid damage to the existing structure by sudden movement.
- A banksman to dig trial holes after each layer of the road surface is removed. The maximum depth will be exposed to allow for the greatest cover to be achieved.
- Where necessary as per the engineer's design, protective steel plates will be placed at the base of the excavation such as over the top of bridge key stones.
- Ducts will be placed into trench manually, having been delivered to road side embankment/verge areas by way of tractor and pipe trailer and then offloaded by hand.
- Concrete is then poured between and 50mm over the ducts maintaining the required spacing's as per the engineer's design.
- A protective steel plate is placed to the sides and over the newly laid ducts as per the engineer's design.
- Cable marker strips in accordance with ESB code :2955103 are placed on top of the steel plates.
- Additional concrete is then placed over the marker tape followed by steel reinforcing mesh.

- Additional concrete is then placed on top of the mesh to the required finished level.
- Depending on the finished levels, if the finish level is below ground level than the remaining depth will be filled with approved fill material the following day after the concrete has set.
- Warning tape will be placed above the concrete beam. The top level will be finished as per the Local Authority Requirements.

It is expected that if the above method is employed, sufficient cover is in place to facilitate the ducting without any need to raise the level of the road carriageway at one location (WC006) and at the second location (WC019), the potential increase in elevation of the surface level of the road would be less than 150mm and would not result in the need to alter the bridge parapets walls.

3.6.5.4 Standard Trench Crossings of Existing Culverts or Services (Electrical Cables)

For the crossing of buried pipe drains, culverts or services, if encountered, the following options for construction may be used:

- Piped Culvert Crossings – Where sufficient cover is available, the cable ducts will be laid above the culvert with a minimum separation distance, typically 300mm to be agreed with the local authority and Eirgrid.
- Piped Culvert Crossings - Where sufficient cover is not available, the cable ducts will be laid under the culvert with a minimum separation distance, typically 300mm to be agreed with the local authority and Eirgrid.
- Flatbed Formation over Culverts - where the cable duct is to be installed over an existing culvert where sufficient cover is not available, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert. The duct will be laid in this trench in a flatbed formation over the existing culvert and will be encased in a reinforced concrete surround as per Eirgrid specification.

When crossing existing culverts or buried services, the following methodology will be employed.

- The general method of trench construction will follow the procedure outlined above for Installation of cable ducting.
- The service infrastructure shall be located and marked by an engineer in accordance with the Code of Practice for Avoiding Underground Services.
- All services will be safeguarded and protected in accordance with the asset owner's specifications.
- Within 500mm of the existing service, hand digging will be employed to expose it.
- Cable ducts shall pass over or under the existing service, depending on the depth of the service and other constraints. Plate 3-2 shows design details for ducts passing in flat formation above existing culverts and buried services.
- A minimum separation distance of 300mm shall be maintained between the cable ducts and the existing service.
- Existing services within the trench shall be left in the same condition as they were found. Any issues shall be reported to the asset owner immediately.

Piped Culvert Crossing – Ducting Over Culvert

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where sufficient cover exists above the culvert, the trench will be excavated above the culvert and the ducts will be installed in the trefoil arrangement passing over the sealed pipe where no contact will be made with the watercourses. This method of duct installation is further detailed in Plate 3-2.

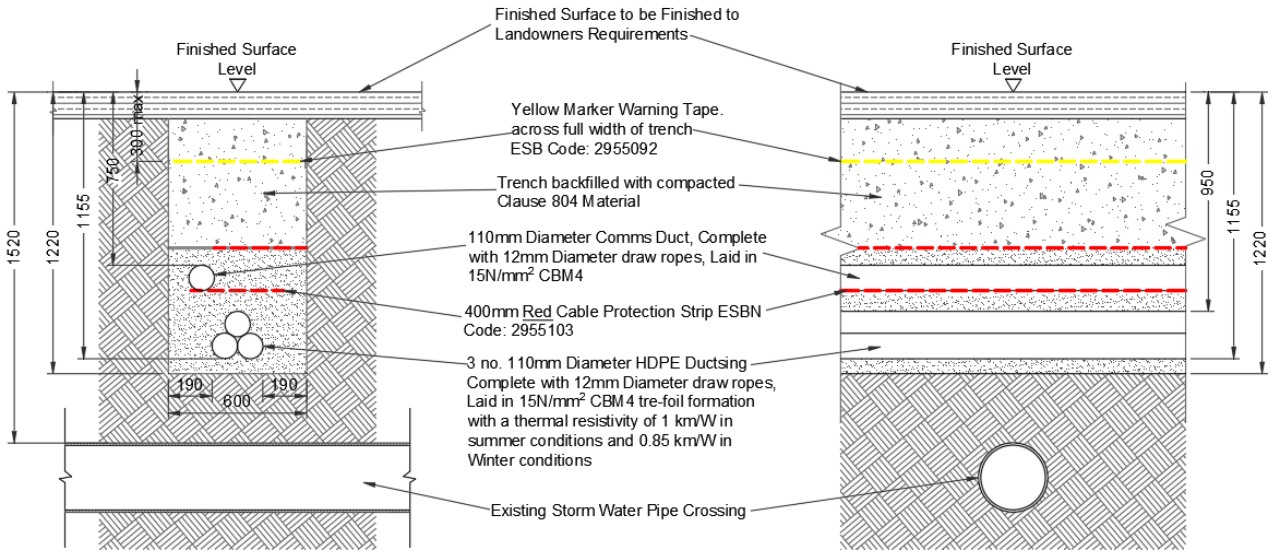

Plate 3-2: Piped Culvert Crossing – Ducting Over Culvert Crossing Details

Piped Culvert Crossings – Ducting Under Culvert

Where the culvert consists of a socketed concrete or sealed plastic pipe where sufficient cover over the culvert does not exist to accommodate the cable trench, a trench will then be excavated beneath the culvert and cable ducts will be installed in the trefoil arrangement under the sealed pipe.

This method of crossing is illustrated in Plate 3-3 below. If these duct installation methods cannot be achieved or utilized, the ducts will be installed by alternative means as set out in the following sections.

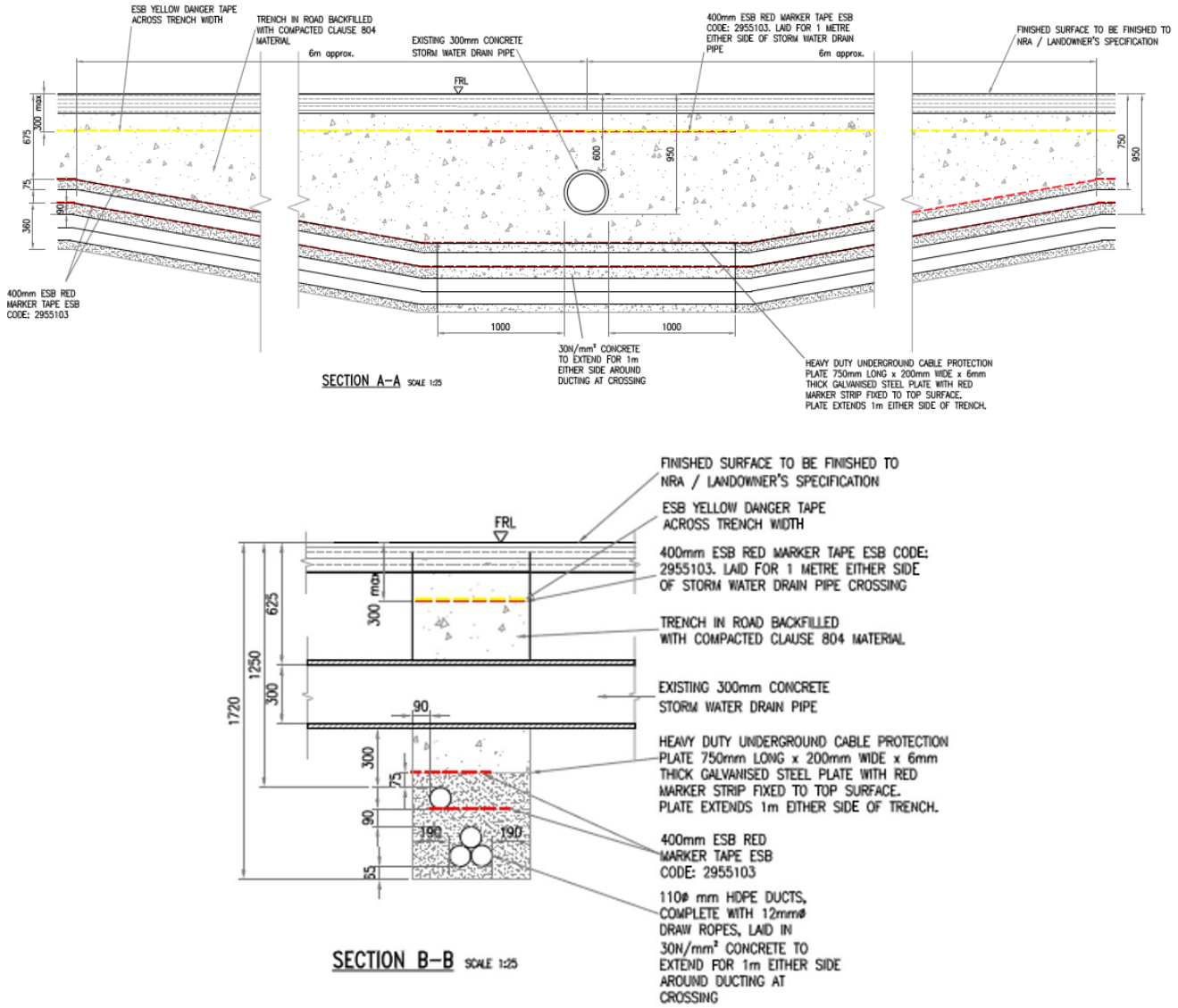

Plate 3-3: Piped Culvert Crossings – Ducting under Culvert Crossing Details

Flatbed Formation Over Culverts

Where cable ducts are to be installed over an existing culvert where sufficient cover cannot be achieved by installing the ducts in a standard trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert. The ducts will be laid in a flatbed formation over the existing service and will be encased in a reinforced concrete surround as per Eirgrid specification.

After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench. This will be done gradually to comply with minimum duct and cable design bend requirements. In transition sections between trefoil and flat formation, the base of the trench shall be graded to eliminate stepping and minimum bedding and surround material will be maintained throughout.

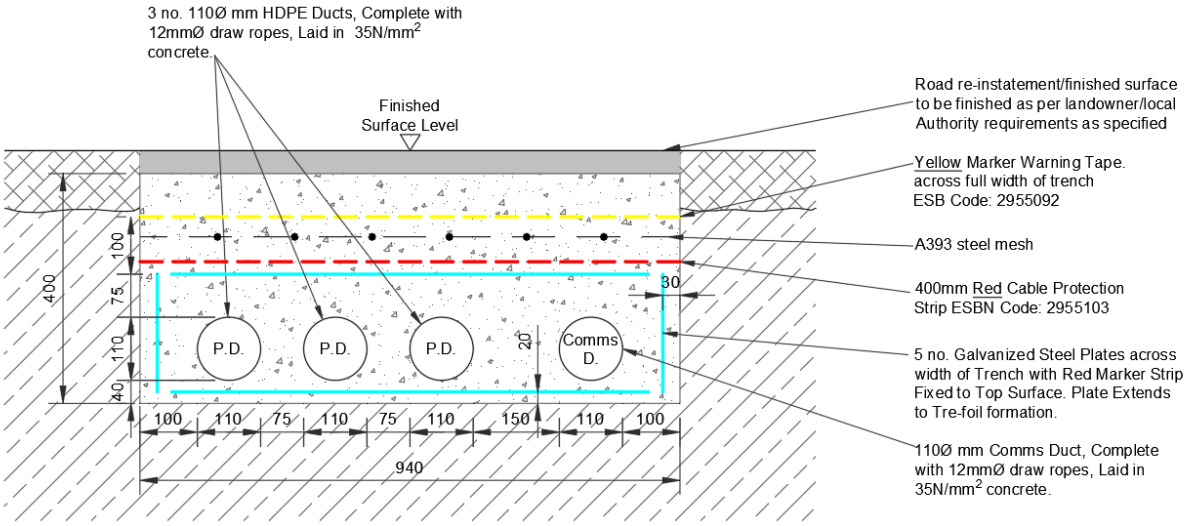

Plate 3-4: Flatbed Formation Detail

3.6.5.5 Minor Watercourses and Drain Crossings (Access Tracks)

All minor watercourse and drain crossings within the site will be crossed using piped culverts. Piped culverts will only be used over very short stretches i.e. at track crossings. Pipe culverts will be sized to take the 1 in 100-year flood flow with a 20% allowance for Climate Change. Concrete or HDPE pipes may be used depending on the size of the watercourse to be crossed.

Pipe culverts will be installed in accordance with the design shown in planning application drawings and Plate 3-5 below.

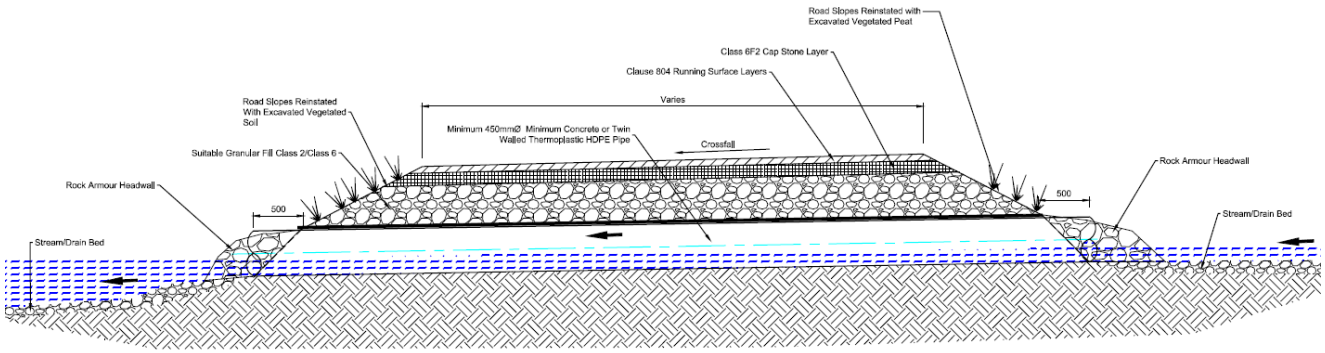

Plate 3-5: Piped Culvert Crossing Long Section

For a minor watercourse/drain crossing using a piped culvert, the following methodology will be used.

- The access track construction will finish at least 10m from the nearside bank of the minor watercourse/drain.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in the CEMP in Appendix 3.1.
- Pipe culvert installation will only take place during dry periods.

- The bed of the watercourse will be prepared using a mechanical digger and hand tools to the required levels in accordance with the design.
- A bedding layer will be laid in the base of the minor watercourse/drain using Class 6 aggregate material and blinding to the desired levels in accordance with the design.
- The pipe is laid in one lift or in sections using a crane in accordance with an approved lift plan.
- Bedding material is placed and compacted around the pipe to the desired levels in accordance with the design.
- Where appropriate 500mm of suitable bedding material in the form of clean round gravel between 10-100mm diameter, shall be laid in the base of the pipe in accordance with the recommendations set out in *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Watercourses from* Inland Fisheries Ireland.
- The pipe is covered using compacted Class 6N fill material in accordance with the design up to the levels required by the access track sub formation.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.
- For small drain crossings, pipes of suitable diameter will be laid directly into the bed of the drain.

In some cases, where existing internal forest tracks need to be widened, it will be necessary to widen, replace or extend existing pipe drains. In such cases, the above measures shall also be employed.

3.6.6 Turbine Hardstands

A turbine hardstanding area will be constructed at the base of each turbine to provide a solid area for the main installation crane that will be used to erect the turbine and for the assembly of the turbine.

It is anticipated that the stone required for the construction of the internal access roads will be sourced from quarries in the vicinity and 3no. on-site borrow pits at locations shown in Figure 3-1.

The surrounding quarries currently in operation and indicative haul routes to the site from each of these have been identified. See Chapter 9 and Chapter 13 for more information on quarries and haul routes from same. The list of quarries is as follows:

- Danesfort, Co. Cork. Located 16km from Bottlehill and 35km from Knockdoorty entrance.
- Mallow, Co Cork. Located 20km from Bottlehill and 20km from Knockdoorty.
- Lyravarrig, Co. Cork. Located between the two site entrances, 13km to the Bottlehill entrance and 9km to the Knockdoorty site entrance.

Hard standing formation will consist of a minimum 500mm hardcore on geo-textile membrane. The construction methodology for newly constructed tracks will be as follows:

- The formation will be prepared to receive the geotextile membrane.
- Stone will be placed and compacted in layers to minimum 500mm depth.
- A drainage ditch will be formed, within the excavated width and along the sides of the hard standing.

- Surplus topsoil will be placed along the side of the hard standing and dressed to blend in with surrounding landscaping.
- Surplus excavated subsoil will be used to reinstate borrow pits.

3.6.7 Turbine Foundation

The base of the foundations are excavated to competent bearing strata or where this depth is excessive piling may be required. However, based on site investigations carried out to date, it is considered that all turbine foundations shall be shallow base types and founded on either rock or glacial till. This will be confirmed with further site investigations prior to construction.

Excavated soil will be placed in the temporary storage areas adjacent to the turbines. Formwork and reinforcement are placed, and the concrete poured. Once the concrete is set the earthing system is put in place and the foundation is backfilled with suitable material.

3.6.8 Turbine Erection

Once the turbine components arrive on site they will be placed on the hardstand and lay down areas prior to assembly. The towers will be delivered in sections and each blade will be delivered in a separate delivery. Once there is a suitable weather window the turbine will be assembled.

It is anticipated that each turbine will take approximately 3 to 4 days to erect (depending on the weather), requiring two cranes. Finally, the turbines will be commissioned and tested.

It is expected that the construction phase, including civil, electrical and grid works, and turbine assembly will take between approximately 18-24 months.

3.6.9 Erection of Permanent Met Masts

The works shall be carried out by a small crew and the following mobile plant:

- Low-loader
- Flatbed trucks
- Works Van
- Telescopic Handler
- Mobile Crane.

The sequence of works for the erection of the permanent met masts is as follows:

- The site of the mast location shall be marked out and the necessary area cleared of vegetation.
- Mark out mast base and anchor positions. Mast anchor positions are at approximately 30m and 50m radius from the mast in the direction of each corner of the mast's triangular base.
- A temporary access track shall be extended towards the mast location from the existing energy park and forest track network. The access track shall be up to 3.5m in width.
- Temporary and permanent drainage infrastructure shall be extended also.

- A small crane pad of approximately 10m x 10m in size shall be constructed in front of the proposed mast location.
- General construction methods for the above access track and hard standing shall match those described in Sections 3.6.3 and 3.6.6 however the dimensions and stone depth requirements of the access infrastructure will be considerably less than that required for that serving the wind turbine construction.
- The foundation shall be excavated followed by shuttering, steel fixing and finally concrete pouring by ready mix truck. Excavation and concrete operations shall be carried out in accordance with the CEMP (Appendix 3.1).
- Excavate holes for anchors and install anchors. These shall not exceed a depth of 2m.
- Following crane setup, the mast sections shall be delivered and unloaded by truck.
- In accordance with an agreed lifting plan, mast sections shall be lifted by crane into place. Wind speeds shall be monitored at all times during lifting operations by the lead climber and crane operator.
- Mast sections shall be bolted together by climbers.
- Before raising of the third mast section, 10mm stainless steel guy ropes are fitted at the lugs on the top triangular section of the mast. These ropes are connected using shackles and are uncoiled to hang down when the section is erected.
- Following erection of main mast sections, lightning protection and other ancillary components shall be fixed to the mast.

The masts will be decommissioned using a similar methodology as the construction except in reverse.

3.6.10 Waste Management

The Developer, in conjunction with appointed contractor, will prevent, reduce, reuse and recover as much of the waste generated on site as practicable and to ensure the appropriate transport and disposal of residual waste off site. This is in line with the relevant National Waste Management Guidelines and the European Waste Management Hierarchy, as enshrined in the Waste Management Act 1996, as amended.

Any waste generated during the development construction phase will be collected, source separated and stored in dedicated receptacles at the temporary compound during construction. It will be the responsibility of the contractor for the main construction works (when appointed) to nominate a suitable site representative such as a Project Manager, Site Manager or Site Engineer as Waste Manager who will have overall responsibility for the management of waste. The waste manager will have overall responsibility to instruct all site personnel including sub-contractors to comply with on-site requirements. They will ensure, at an operational level, that each crew foreman is assigned direct responsibility.

Waste Generated

It is envisaged that the following categories of waste will be generated during the construction of the project:

- municipal solid waste (MSW) from the office and canteen
- construction and demolition waste
- waste oil/hydrocarbons
- paper/cardboard
- timber
- steel.

Sanitary waste will be removed from site by a licensed waste disposal contractor. All portaloo units located on site during the construction phase will be operated and maintained in accordance with the manufacturer's instructions and will be serviced under contract with the supplier. All such units will be removed off-site following completion of the construction phase.

A fully authorised waste management contractor will be appointed prior to construction works commencing. This contractor will provide appropriate receptacles for the collection of the various waste streams and will ensure the regular emptying/and or collection of these receptacles.

The following table lists licensed waste facilities in the surrounding area:

Table 3-5: Licensed Waste Facilities

Facility	Type of wasted accepted	Location
McGill-Glenville	Compostable waste	Glenville
Red Fox	Recyclables, non-recyclables, wood, metal, rubble, junk removal	Churchfield Industrial Estate
Ashgrove recycling	Construction waste, metal, wood, soil, rubble, plastic	Churchfield Industrial Estate
Munster waste management	Domestic, commercial, industrial, agricultural	Mallow
Enva	Construction waste, general waste, hazardous waste	Ringaskiddy
Raffeen civic amenity site dump	Paper, cardboard, metal, green waste, plastic, waste oil, glass, timber	Monkstown

Waste Minimisation/Reduction

All efforts will be made by site management to minimise the creation of waste throughout the project. This will be done by:

- material ordering will be optimised to ensure only the necessary quantities of materials are delivered to site;
- material storage areas will be of a suitable design and construction to adequately protect all sorted materials to ensure no unnecessary spoilage of materials occurs which would generate additional waste;
- all plant will be serviced before arriving on site. This will reduce the risk of breakdown and the possible generation of waste oil/hydrocarbons on site;
- all operators will be instructed in measures to cut back on the amount of wastage for trimming of materials etc. for example cutting of plywood, built into the amount ordered;
- educating foremen and others to cut/use materials such as ply wisely for shutters etc.;
- prefabrication of design elements will be used where suitable to eliminate waste generation on site;
- where materials such as concrete are being ordered, great care will be practiced in the calculation of quantities to reduce wastage.

Waste Reuse

When possible, materials shall be re used onsite for other suitable purposes e.g.:

- re-use of shuttering etc. where it is safe to do so;
- re-use of rebar cut-offs where suitable;
- re-use of excavated materials for screening, berms etc.;
- re-use of excavated material etc. – where possible will be used as suitable fill elsewhere on site for site tracks, the hardstanding areas and embankments where possible;
- excess subsoils from excavations shall be used to reinstate borrow pits on site.

It is important to clarify that any excess excavated material that will be used for fill, re-instatement, or similar activities, within the development site boundary is not categorised as a waste material under relevant waste legislation, rather this material is exempt from waste classification.

Article 2 (1) (c) of Directive 2008/98/EC on waste, transposed through Article 26 (1) (c) of the European Communities (Waste Directive) Regulations (S.I. 126 of 2011) identifies the following as being an exemption from waste regulation:

> *"uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated".*

Surplus material will be re-instated in its natural condition on the site from which it was excavated, this material is not considered as waste.

Waste Recycling, Recovery & Disposal

In accordance with national waste policy, source separation of recyclable material will take place. This will include the provision of receptacles for the separation and collection of dry recyclables (paper, cardboard, plastics etc.), biological waste (canteen waste) and residual waste.

Receptacles will be clearly labelled, signposted and stored in dedicated areas.

The following source segregated materials containers will be made available on site at a suitable location:

- timber;
- ferrous metals;
- aluminium;
- dry mixed recyclables;
- packaging waste;
- food waste.

The materials will be transported off-site by an authorised contractor to a permitted recovery centre and these materials will be processed through various recovery operations.

Residual waste generated on-site may require disposal. This waste will be deposited in dedicated receptacles and collected by the permitted waste management contractor and transported to an appropriate facility. All waste movements will be recorded, which records will be held by the waste manager on-site.

3.7 Operation and Lifespan

During the operational period, the turbines will operate automatically on a day to day basis, responding by means of anemometry equipment and control systems to changes in wind speed and direction. The turbine manufacturer or a service company will carry out regular maintenance of the turbines.

Scheduled services will typically occur twice a year. The operation of the wind turbines will be monitored remotely, and a caretaker will oversee the day to day running of the proposed wind farm.

The expected physical lifetime of the turbine is approximately 30 years, and permission is sought for a 30-year operation period commencing from full operational commissioning of the wind farm. It should be noted that section 7.2 of the Planning Guidelines 2006 includes for the following:

'The inclusion of a condition which limits the life span of a wind energy development should be avoided, except in exceptional circumstances'

In this respect, the applicant requests the grant of permission is on the basis of a 30-year operational period from the date of full operational commissioning of the wind farm.

3.8 Decommissioning

Following the end of their useful life, the wind turbines may, subject to planning permission, be replaced with a new set of turbines or the site may be decommissioned. On decommissioning, cranes will disassemble the above ground turbine components which would be removed off site for recycling. All the major component parts are bolted together, so this is a relatively straightforward process. The foundations will be covered over and allowed to re-vegetate naturally if required. Leaving the turbine foundations in situ is considered a more environmentally sensible option as to remove the reinforced concrete associated with each turbine would result in environmental nuisances such as noise and vibration and dust. It is proposed that the internal site access tracks will be left in place, subject to agreement with Cork County Council and the relevant landowners.

The proposed on-site substations shall be taken in charge by ESBN/Eirgrid upon completion and shall be left in place forming part of the national electricity network.

Underground cables will be cut back and left in place.

A detailed decommissioning plan will be agreed in advance of construction with Cork County Council. A decommissioning plan is contained in the CEMP in Appendix 3.1 of Volume 3.

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