2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 INTRODUCTION & BACKGROUND

This section of the EIAR describes the overall site and the main components of the proposed project and provides details on the construction, operation and decommissioning of the wind farm and associated infrastructure.

Springfield proposes to develop the Castlebanny Wind Farm in Co. Kilkenny. It is proposed to supply the power from the Castlebanny Wind Farm to the Irish electricity network via loop-in 110kV underground cables (approximately 4km length) to the existing overhead 110kV power line in the townland of Ballyvool, Co. Kilkenny.

A summary of the proposed development is as follows:

- Erection of 21 no. wind turbines with an overall blade tip height of up to 185m and all associated foundations and hard-standing areas in respect of each turbine;
- Improvement of existing site entrance with access onto the R704 regional road, vertical realignment of the R704 in proximity to this entrance, and creation of two new site entrances on the L7451 to form a new crossing point;
- Improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and turbine delivery and construction access at two locations on the R704 in the townland of Ballynoony West;
- Construction of 2 no. temporary construction compounds with associated temporary site offices, parking areas and security fencing;
- Installation of 1 no. permanent meteorological mast up to a height of 100m;
- 3 no. borrow pits;
- Construction of new internal site access roads and upgrade of existing site roads, to include passing bays and all associated drainage;
- Construction of drainage and sediment control systems;
- Construction of 1 no. permanent 110kV electrical substation including:
  - 2 no. control buildings containing worker welfare facilities and equipment store;
  - All electrical plant and infrastructure and grid ancillary services equipment;
  - Parking;
  - Security Fencing;
  - Wastewater holding tank;
  - Rainwater harvesting equipment;
  - All associated infrastructure and services including site works and signage;
- All associated underground electrical and communications cabling connecting the wind turbines to the proposed wind farm substation;
- All works associated with the connection of the proposed wind farm to the national electricity grid, which will be via a loop-in 110 kV underground cable connection approximately 4km in length to the existing overhead 110 kV line in the townland of Ballyvool, Co. Kilkenny, with two new 16m high steel lattice loop-in/out masts at the connection point;
- All related site works and ancillary development including berms, landscaping, and soil excavation;
- Ancillary forestry felling to facilitate construction and operation of the proposed development and any onsite forestry replanting;

- Development of a permanent public car park with seating/picnic tables at the end of the construction phase of the development on the footprint of the southern temporary construction compound; and
- Permanent recreational facilities including marked walking and cycling trails along the site access roads, and associated recreation and amenity signage and outdoor fitness equipment.
- A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought.

The proposed project includes all elements of the proposed development as listed above, in addition to any works required on public roads to accommodate turbine delivery. The entire proposed project and the offsite forestry replanting has been considered and has been addressed as part of this EIAR.

2.1.1 The Proposed Project Site

The proposed wind farm site (as shown in Figure 1-2 of this EIAR) is located within an agricultural and forested landscape, between Mullinavat, Inistioge and Ballyhale, in Co. Kilkenny. The site of the proposed wind farm is located approximately 20km south of Kilkenny City, and 15km north of Waterford City. Throughout this EIAR, reference may be made to the EIAR Study Area. The EIAR study area will be separately defined within each chapter if required, but where this is not the case, it refers to the areas outlined in Figure 1-1 of this EIAR.

The site of the proposed wind farm is located within townlands of Castlecosker, Derrynahinch, Kiltorcan, Coolroe Beg, Baunskeha, Castlebanny, Kilvinoge, Cappagh, Coolnahau, Ballytarsna, Mullennakill, Glenpipe, Ballymartin, Ballyvatheen, Ballynoony West and Derrylacky, Co. Kilkenny. The proposed grid connection is located within the townlands of Castlebanny (proposed substation also located here), Cappagh, Coolnahau, Garrandarragh, Ballygegan and Ballyvool (proposed connection with existing 110kV overhead line here), Co. Kilkenny.

There are a number of locations which require temporary additional works to accommodate oversize load delivery to site (for turbine components). The current application includes temporary works at two locations in the townland of Ballynoony West. A number of other temporary works areas are not forming part of the current application but are assessed as part of this EIAR and are located within the townlands of Garrandarragh, Granny, Kilmurry, and Rathpatrick, Co Kilkenny, and Ballyduff East, Co. Waterford.

The land use/activities on the site of the proposed wind farm are primarily commercial forestry, with some areas of pastoral agriculture. The surrounding landscape is a mixture of agricultural land and forestry, with some existing wind farms, Ballymartin Wind Farm and Rahora Wind Farm, located approximately 1.1 and 4.2 kilometres respectively to the south and southeast of the proposed wind farm site. The landscape is predominately undulating in the wider area, with the proposed wind farm site being located on an elevated area with a topography of between 145m and 265m OD. A number of other areas to the east and south of the site are also elevated. The most significant features in the surrounding landscape are the River Arrigle valley, the upland areas on which the proposed wind farm is proposed and the upland areas to the east of the proposed wind farm, towards Inistioge.

The proposed development site is approximately 7.3km long in the north/south direction and is approximately 2.7km wide in an east/west direction at the widest point. The site lies between the settlements of Mullinavat, Inistioge and Ballyhale, which are located approximately 4.1km southwest, 5.7km northeast and 1.9km northwest of the site of the proposed wind farm respectively.

The main urban centre in the region is Waterford City, located approximately 15.5km to the south of the proposed wind farm site. The site of the proposed wind farm (Figure 1-2 of this EIAR) has an area of approximately 1,434 hectares and comprises a single elongated land parcel. These lands lie between the M9 and the River Nore, and just north of the R704 Regional Road which runs from Mullinavat in the west to New Ross in the east. The site runs in a north-south direction. The River Arrigle is located approximately 1.1km to the east of the proposed wind farm site at its nearest point, while the proposed grid connection route crosses this river at one location. The River Nore is located approximately 5.5km east of the site of the proposed development at the nearest point, and approximately 3.9km east of the proposed grid connection at its nearest point.

2.2 COMMUNITY BENEFIT PROPOSAL

Castlebanny Wind Farm has the potential to bring significant positive benefit to the local community. The project will contribute annual rates to the local authority and it will provide opportunity for local community investment in the project in line with the new Renewable Energy Support Scheme. A community benefit fund will be put in place for the lifetime of the project to provide direct funding to those areas surrounding the project.

Two important areas of Government policy development are nearing completion which will have a bearing on the establishment of future community benefit funds, the updated Wind Energy Development Guidelines and the Renewable Energy Support Scheme (RESS). The RESS1 Terms and Conditions were published in February 2020 and provide details on the Government requirements for community benefit funds for renewable energy projects that participate in the scheme.

A significant annual community benefit fund will be established in line with Government policy which will include funding for both wider community initiatives and a Near Neighbour scheme focused on houses in close proximity to the project.

A useful amenity facility will be developed at the site as part of the proposed development, as detailed in Section 2.6.11 below. This will also provide a further benefit to the local community and the wider area.

Fund usage and administration

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

Community Investment

The proposed Renewable Energy Support Scheme (RESS) High Level Design[1] sets out that future renewable energy project proposals enable the possibility for local communities to invest in projects in a meaningful way as a means to directly gain from the financial dividends that a project can provide should it be consented, built and operated. In response to this, the Developer has been working hard with external agencies to develop workable models of Community Investment. This element was not included in the RESS1 scheme but it is expected to form part of later RESS schemes which will apply to this project.

[1] https://assets.gov.ie/77091/0c8db804-e10c-47c3-8a11-9a45777601fd.pdf

2.3 LAND OWNERSHIP

The majority of the proposed development is located on lands under the ownership and control of Coillte. The proposed development also has a significant number of third-party private landowners who have consented to the application and proposed development.

2.4 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. In 2003, the Sustainable Energy Authority of Ireland (SEAI) produced a Wind Atlas with information on wind speed modelled at 50m, 75m and 100m height above the ground. With turbine technology innovation, turbine models can now capture more of the wind current and have bigger rotors that radically change the economic viability of wind power. This has been reflected in the updated SEAI 2013 Wind Atlas which re-modelled wind speed data for a much wider range of 30m-150m height above ground level. The 2013 SEAI Wind Speed Atlas identifies the site as having a wind speed of between approximately 8 m/s and 8.8 m/s at 100m above ground level. This indicates that the site has a suitable wind resource for a commercial wind energy development.

2.5 PROPOSED DEVELOPMENT

The proposed development will comprise the construction of 21 no. wind turbines and all associated ancillary works. The turbines will have a maximum blade tip height of up to 185m above the top of the foundation level and will be accessible from internal access routes within the site.

Springfield intends to apply for a ten-year planning permission for the following:

- Erection of 21 no. wind turbines with an overall blade tip height of up to 185m and all associated foundations and hard-standing areas in respect of each turbine;
- Improvement of existing site entrance with access onto the R704 regional road, vertical realignment of the R704 in proximity to this entrance, and creation of two new site entrances on the L7451 to form a new crossing point;
- Improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and turbine delivery and construction access at two locations on the R704 in the townland of Ballynoony West;
- Construction of 2 no. temporary construction compounds with associated temporary site offices, parking areas and security fencing;
- Installation of 1 no. permanent meteorological mast up to a height of 100m;
- 3 no. borrow pits;
- Construction of new internal site access roads and upgrade of existing site roads, to include passing bays and all associated drainage;
- Construction of drainage and sediment control systems;
- Construction of 1 no. permanent 110kV electrical substation including:
  - 2 no. control buildings containing worker welfare facilities and equipment store;
  - All electrical plant and infrastructure and grid ancillary services equipment;
  - Parking;
  - Security Fencing;
  - Wastewater holding tank;
  - Rainwater harvesting equipment;
  - All associated infrastructure and services including site works and signage;

- All associated underground electrical and communications cabling connecting the wind turbines to the proposed wind farm substation;
- All works associated with the connection of the proposed wind farm to the national electricity grid, which will be via a loop-in 110 kV underground cable connection approximately 4km in length to the existing overhead 110 kV line in the townland of Ballyvool, Co. Kilkenny, with two new 16m high steel lattice loop-in/out masts at the connection point;
- All related site works and ancillary development including berms, landscaping, and soil excavation;
- Ancillary forestry felling to facilitate construction and operation of the proposed development and any onsite forestry replanting;
- Development of a permanent public car park with seating/picnic tables at the end of the construction phase of the development on the footprint of the southern temporary construction compound; and
- Permanent recreational facilities including marked walking and cycling trails along the site access roads, and associated recreation and amenity signage and outdoor fitness equipment.
- A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought. Given the recent advances in turbine technology, and the anticipated lifespan of wind turbines, this is considered to be the optimal operational life for the proposed development. The duration of this operational life allows the proposed turbines to be used to generate clean renewable energy until they have reached the end of their life, rather than being removed prematurely.

The application includes an onsite 110kV substation with a loop-in underground grid connection to the existing 110kV overhead line in Ballyvool. Two new masts will be required in Ballyvool to allow for the connection, drawings of which can be seen in Appendix 2-1 of this EIAR. The overall length of the grid connection between the proposed substation and the existing overhead line is approximately 4km, of which, approximately 1km is within the site of the proposed wind farm, and approximately 0.3km is located along the public road corridor. The remaining approximately 2.7km is located off road.

The proposed underground grid connection will run from the proposed onsite substation in an easterly direction towards the boundary of the proposed wind farm site. The first 370m will be located within a proposed new site access road, after this it will move off road across a field and forestry until it crosses the L-7451 local road in the townland of Cappagh. It continues eastwards across fields and forestry, crossing a small stream, the L-8273 local road and then crossing the River Arrigle and along a field until it reaches the L-3418 local road in the townland of Garrandarragh. The route runs in the field alongside this road northwards for approximately 200m, then enters the road corridor to continue northwards for approximately 300m until it turns eastwards, off road again in the townland of Ballyvool across pasture fields. From here it sweeps in an arc to the east where it crosses the L-8276 local road and reaches the existing overhead 110kV line in Ballyvool.

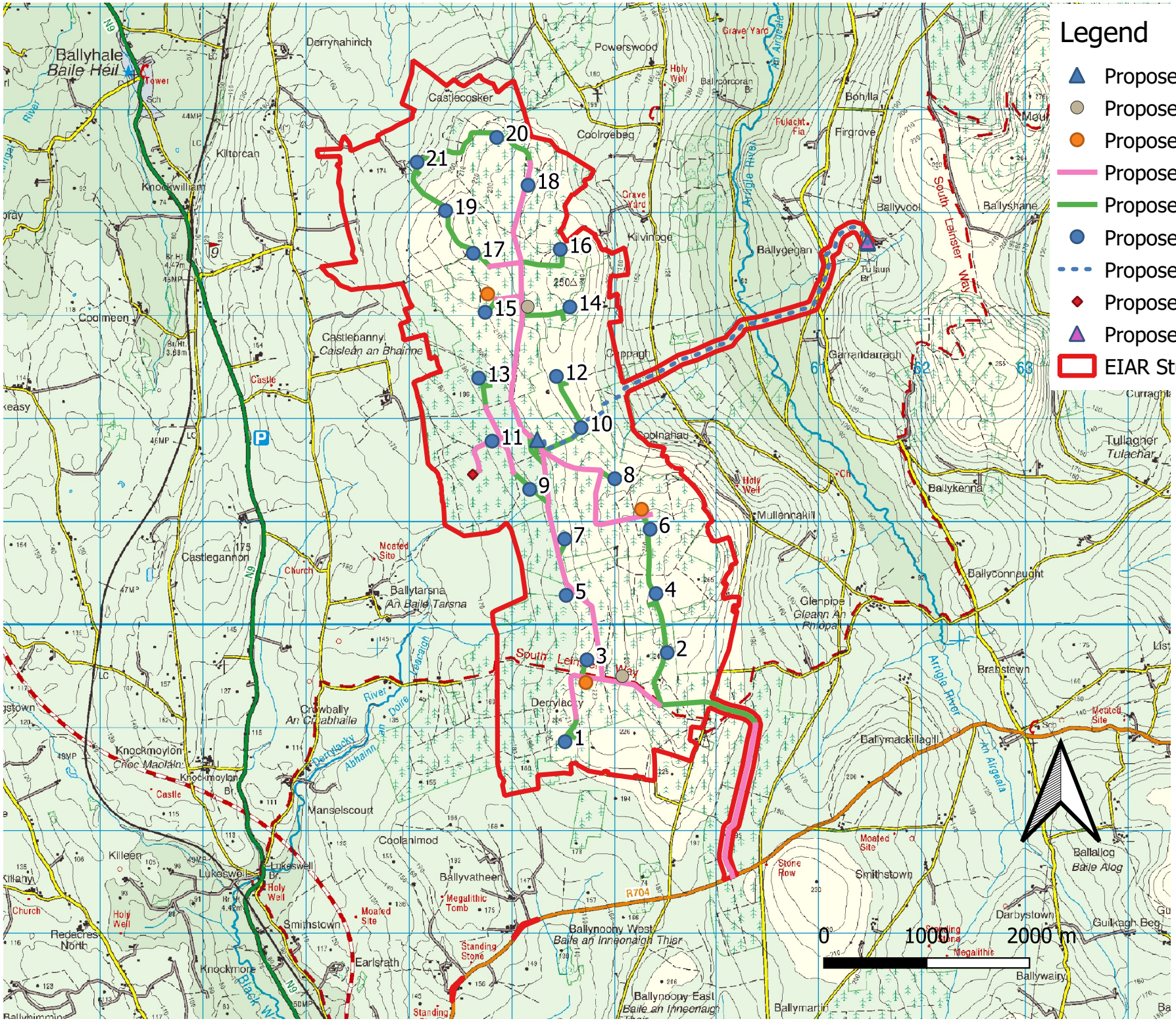
2.6 DEVELOPMENT LAYOUT

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.

The overall layout of the proposed development is shown in Figure 2-1. This figure shows the proposed locations of the wind turbines and associated hardstanding areas, passing bays, electrical substation, meteorological mast, temporary construction compounds, borrow pits internal access roads and the main site entrance. Site layout drawings of the proposed development are included as Appendix 2-1 of this EIAR.

The layout reflects the outcome of the iterative design process. Further detail on the design philosophy, constraints and alternative turbine layouts and dimensions considered is detailed in Chapter 3 of this EIAR.

The Grid Reference co-ordinates of the proposed turbine locations are listed in Table 2-1 below.



Map by: JS
Checked by: ST
Rev: 1

Client: Coillte
Job: Castlebanny WF

TOBIN
CONSULTING ENGINEERS

Figure: 2-1
Title:
Proposed Wind Farm Layout
08.12.20

Table 2-1: Turbine Location Details

Turbine ID	Easting's (m)	Northing's (m)
T1	658464	628904
T2	659458	629770
T3	658677	629701
T4	659349	630345
T5	658475	630328
T6	659292	630971
T7	658460	630876
T8	658948	631462
T9	658120	631359
T10	658620	631958
T11	657754	631828
T12	658380	632457
T13	657625	632441
T14	658512	633132
T15	657687	633081
T16	658418	633693
T17	657571	633655
T18	658105	634316
T19	657303	634069
T20	657800	634781
T21	657025	634541

2.6.1 Power Output

The proposed wind turbines will have an assumed rated electrical power output of between 5-6 MW. This may vary as a result of the final turbine type, power output modelling and turbine development over the period leading up to construction. For the purposes of this EIAR, a minimum rated output of 5 MW and a maximum rated output of 6 MW has been used to calculate the power output of the proposed wind farm, which will result in an estimated installed capacity of between 105-126 MW.

Based on the above, the proposed wind farm has the potential to produce up to between 303,534 and 364,241 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 is the number of hours in a year: 8,760 hours
- B is the capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc: 33%
- C is the rated output of the wind farm: minimum 105 MW, maximum 126 MW

The capacity factor of a wind farm takes into account the intermittency of the wind and is based on average wind speeds. The capacity factor of 33% is based on an EirGrid study of wind and solar energy in Region H2 from January 2020[2].

The 303,534 to 364,241 MWh of electricity produced by the proposed wind farm will be sufficient to supply the equivalent of between 66,072 and 79,286 Irish households with electricity per year. This is based on the Sustainable Energy Authority of Ireland *"Energy in Ireland 2019 Report"* from December 2019, which details domestic consumption values for electricity customers in 2018. This report updates the average annual household electricity consumption figure to 4,594 kWh.

2.6.2 Wind Turbine Specification

The proposed turbines will have a tip height of up to 185m. Detailed drawings, which accompany the planning application, show a typical 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 of the various turbines on the market at the time, but will not exceed the maximum size envelope set out within the development description (i.e. tip height up to 185m, and rotor diameter of up to 155m).

A drawing of the typical size envelope of the proposed wind turbine is shown in the detailed drawings in Appendix 2-1 of this EIAR.

Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics with only minor cosmetic details differentiating one from another.

The wind turbines that will be installed on site will be conventional three-blade turbines, geared to ensure that the rotors of all turbines rotate in the same direction at all times. Each discipline within this EIAR has assessed various types and sizes of turbines within the 185m tip height envelope based on the relevant worst-case scenario. The turbine dimensions to be assessed will

[2] http://www.eirgridgroup.com/site-files/library/EirGrid/ECP-1-Solar-and-Wind-Constraints-Area-H2-v1.1.pdf

be specified in each chapter, but where it is not specified, for the purposes of the EIAR assessments, a worst case of up to 185m tip height and up to 155m rotor diameter has been used. Turbine design parameters have a bearing on the assessment of shadow flicker, noise, visual impact, traffic and transport and ecology (specifically birds).

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. At this stage, new turbine models or variants may be available that were not on the market at the pre-planning / EIAR stage, but which will fit within the assessed turbine envelope.

The Wind Energy Development Guidelines (2006) are currently in force and are also the subject of a targeted review. The current design has had cognisance of the draft 2019 guidelines, in particular in relation to:

- Shadow flicker – it is proposed to eliminate shadow flicker;
- Electrical grid connection – grid connection cables are proposed to be underground; and
- Proximity to sensitive receptors – a minimum turbine set-back of 4 times the maximum tip height is provided.

Should the revised Wind Energy Guidelines be finalised in advance of a planning decision being made on the proposed development with current noise and shadow flicker limits being amended, the proposed development is capable of complying with revised noise and shadow flicker requirements through the use of turbine control systems. Further to this, the proposed layout has achieved a high level of separation between dwellings and turbines by providing a minimum separation distance of >750m which is in excess of the setback requirements in the 2006 and Draft 2019 Guidelines.

2.6.2.1 Turbine Blades and Nacelle

The turbines 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 the nacelle. The nacelle typically holds the following turbine components:

- Generator
- Electrical components
- Aviation lighting to IAA specifications

The blades of modern turbines are generally made of fibreglass or carbon fibre reinforced polyester and are aerodynamically shaped to improve efficiency and lower noise production.

A typical turbine blade begins generating electricity at wind speeds of 2 to 4m/s with optimum power generation at wind speeds of approximately 9 to 16m/s. Turbines usually shut down at wind speeds greater than 25m/s in order to protect themselves from excessive wear, although some turbines are designed to operate at up to 30m/s. Modern turbines typically turn at between 3 and 20 revolutions per minute (rpm) depending on wind speed and design of turbine.

The entire nacelle (shown in Figure 2-2) and rotor are designed to rotate, or 'yaw', in order to face the prevailing wind. A wind vane located on the nacelle of the turbine controls the yaw mechanism. Rotors of all the proposed turbines will rotate in the same direction. A control unit is typically located at the base of the turbine and an internal ladder or lift leads up to the nacelle where the shaft, gearbox and generator are located.

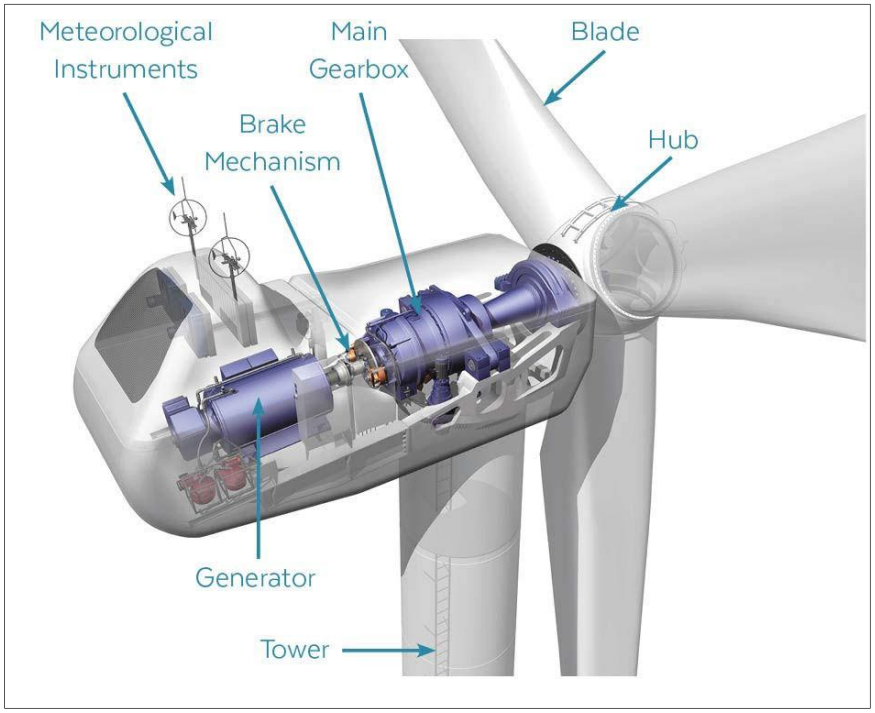


Figure 2-2: Turbine nacelle and hub components

2.6.2.2 Turbine Tower

The turbine tower is typically a conical steel tube with multiple-layer paint finish. Modern tower design also provides for the use of concrete sections. Towers generally comprise a steel ring at the base of the tower which is assembled on top of the concrete foundations using locally supplied concrete and then pre-stressed. The tower is typically delivered to site in three to six sections. The first section is bolted to the steel base, which is cast into the concrete foundation. The base of the tower is typically around 5m in diameter, tapering to approximately 2-3m where it is attached to the nacelle (Figure 2-2). The tower is accessed by a galvanised steel hatch door, which will be kept locked except during maintenance. The nacelle is typically 4m in width and varies in length depending on the final hub height. The exact details of the turbine tower will be dictated by final selection of the turbine make and model, but will be within the design envelope assessed, as described above.

2.6.2.3 Turbine Transformer

When operating, the rotational energy of the blades is utilised to drive the wind turbine generator. The generated power is in the form of low voltage (approximately 660 volts) and connected via low voltage cables to the wind turbine transformer located within the tower or in the turbine nacelle. This transformer steps up the generated low voltage to medium voltage (approximately 33kV) which supports a reduction of electrical losses when transmitting power over large distances. The medium voltage from the wind turbine transformers connects to the proposed on-site substation which again will be stepped up to high voltage for connection to the transmission system.

2.6.2.4 Turbine Foundations

Construction of the turbine bases will require excavation of the surrounding soil from the foundation and crane hardstanding area to founding level with access being provided from adjacent roads at or near the surrounding ground level. The soil will be replaced with granular fill where required.

Each wind turbine will require a reinforced concrete (RC) foundation comprising a base slab bearing onto rock or other competent substrata with a central upstand to support the tower. The foundations for each turbine will be designed by the appointed Civil Designer. The exact size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process. It is anticipated to be approximately 24m in diameter. Different turbine manufacturers use different shaped turbines foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. For the purposes of this EIAR impact assessments, we have assumed a worst-case volume of up to 660m^3 of concrete.

The turbine foundation transmits any load on the wind turbine into the ground. After the foundation level of each turbine has been formed on competent strata, the bottom section of the turbine tower or "can" is levelled (Plate 2.1 below). Reinforcing steel is then built up around and through the can (Plate 2.2 below), and the outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete.

Plate 2-1:Levelled turbine tower "can" *Plate 2-2: Steel reinforcement being added*

2.6.2.5 Turbine Colour

The turbines are multi-ply coated to protect against corrosion. It is proposed that the turbines will be of an off-white or light grey colour to blend into the sky background. This minimises visual impact as recommended by the following guidelines on wind energy development:

- *Wind Farm Development – Guidelines for Planning Authorities* (2006);
- *Draft Revised Wind Energy Development Guidelines* (2019);
- "The Influence of Colour on the Aesthetics of Wind Turbine Generators" – ETSU W/14/005333/00/2000.
- Planning Advice Note 45, Annex 2: Spatial Frameworks and Supplementary Planning Guidance for Wind Farms (2008). The Scottish Office Environment Department
- Planning Policy Guidance Note 22: Renewable Energy Annex on wind energy. (1993) PPG22, Department of the Environment, Welsh Office.
- Technical Advise Note (TAN) 8: Renewable Energy (2005) Welsh Assembly Government

2.6.3 Turbine Delivery route, Internal Access Roads and Hardstanding

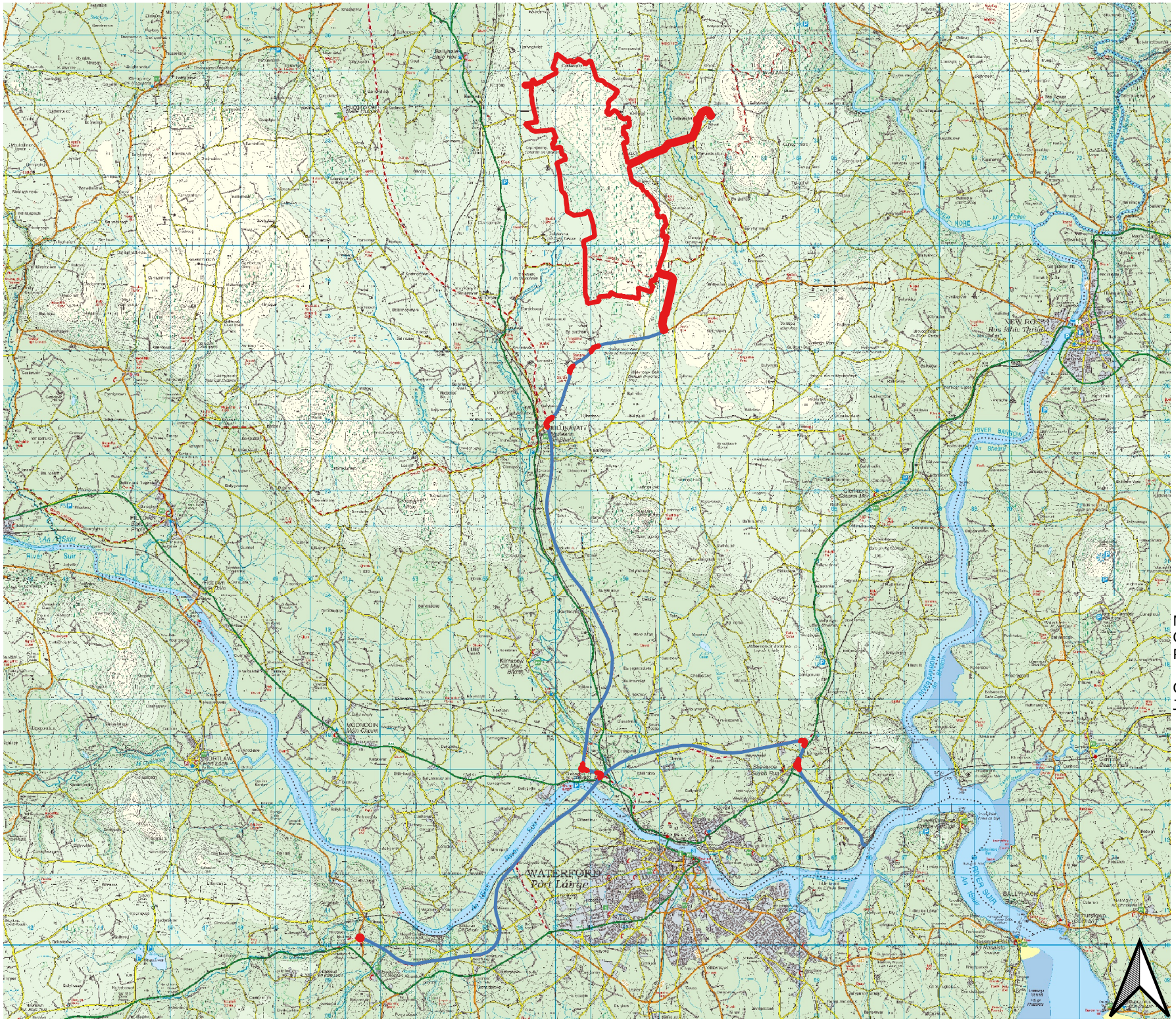
2.6.3.1 Turbine Delivery route

It is proposed that the turbine components will be delivered to the site via Belview Port in southern County Kilkenny as shown in Figure 2-3. The route heads north from the port on the N29 where it turns westwards onto the N25. From here there are two potential options to turn onto the N9. The first option would be to continue westwards on the N25 to the Carrick Rd. Roundabout (Co. Waterford), where it makes a U-turn to return eastwards on the N25 (this allows easier exit from the N25 later). The route returns to Co. Kilkenny on the N25 before turning north onto the N9, and then the M9. The second option would turn from the N25 westbound carriageway directly onto the N9, and then the M9. From here it continues northwards to junction 11, where it exits the M9 and turns onto the R704, traveling in a north-easterly direction to the site entrance for the proposed development.

An assessment of the route between Belview Port and the site of the proposed wind farm has been carried out. A number of potential pinch points have been assessed (see the Turbine Delivery Route Assessment as Appendix2-2 to this EIAR). An assessment was carried out using site visits and Autotrack to determine what, if any, temporary works are required at these pinch points to allow the turbine components to be moved to the site. The outputs of this autotrack assessment are provided in the drawings of Appendix 2-3. Works range from hedgerow trimming/clearing to facilitate oversail to the temporary placement of hardcore to allow the oversize vehicles pass. The required works at each location are detailed in Appendices 2-2 and 2-3.

The current application includes the proposed temporary works along the R704, and further consents/agreements will be obtained for other works areas along the route, as required. All works along the route are assessed as part of this EIAR.

At the end of the construction phase, any areas which were given temporary hardcore surfaces will be reinstated by being covered in topsoil and reseeded. Stock proof fences will be erected along the property boundary. It is not anticipated that there will be any requirement to use these areas in the operational phase of the proposed development, except in the very unlikely event that a turbine requires a large replacement part such as a rotor or tower. This will need to be agreed with the local authority and involved landowners, and relevant consents obtained if such a situation arose.



Legend

Eiar Study Area

Turbine Delivery Route

Map by: JS
Checked by: JS
Rev: 1

Client: Coillte
Job: Castlebanny WF

TOBIN
CONSULTING ENGINEERS

Figure: 2-3
Title: Proposed Turbine Delivery Route

0 2843.12 5686.23 m

2.6.3.2 Internal Access Roads

The proposed development site will be accessed via the R704 regional road. The site entrance access track will intersect the L-7451 local road in order to access the main wind farm site, and at this crossing point traffic control measures will be implemented to ensure the safety of public road users and site traffic. This will include manning the junction with flagmen during particularly busy periods such as turbine pours. Internal access roads will be constructed as part of the initial phase of the construction of the wind farm. Material will be sourced from the proposed onsite borrow pits to provide the required base material of the internal roads. The final graded surface material may be sourced from local quarries (such as Roadstone Kilmacow, Kent Quarry, Kiltorcan and quarries at Bennettsbridge, to the southeast of Kilkenny Town), which are discussed in Chapter 16 (Traffic & Transportation). The internal roads will be permanent (construction/operational) roads.

New roadways will have a running width of approximately 5 metres (5.5m including shoulders), with wider sections at corners and on the approaches to turbine locations. The proposed new roadways will incorporate passing bays to allow traffic to pass easily while traveling around the site. Soil excavated as part of the construction of the internal roads will be sidecast, bermed and profiled on either side of the roadway as detailed in the Spoil Management section within the CEMP (Appendix 2-7). It is proposed that the majority of excavated material will be used locally on site for landscaping, with the remainder being used for borrow pit reinstatement.

All new roadways will be constructed with a 2.5% camber to aid drainage and surface water runoff. A drainage design has been provided for the proposed site roads. Road Construction Details and associated drainage design are included in the drawings of Appendix 2-1.

Excavated road designs can be used in all areas of mineral soil or shallow (i.e. <1m) peat. There were no significant amounts of peat found on site beneath the proposed development footprint in surveys undertaken in 2020, as described in Chapter 8 (Land, Soils & Geology). Therefore, it is proposed that all access tracks will be of the excavated type.

Occasional surface maintenance may be required in the operational phase of the proposed wind farm, but this is anticipated to be very minimal and will be dependent on the level of use on any section.

2.6.3.3 Hardstands

Hardstand areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are used to accommodate large cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations once the turbine foundation is in place. The size, arrangement and positioning of hard-standing areas are dictated by turbine suppliers, but for the purposes of this planning application, a worst case design has been used to cover a range of different turbine models, measuring not greater than 170m at the longest point and 60m at the widest point. The turbine hard-standing areas are shown on drawings in Appendix 2-1. The hard-standing area is intended to safely accommodate a large 350-750 tonne SWL crane during turbine assembly and erection.

The hard-standing areas shown on the detailed layout drawings are indicative of the sizes required, but the extent of the required areas at each turbine location may be optimised within the area which has been assessed depending on topography, position of the site access road, the

proposed turbine selection and the turbine supplier's requirements. The designs shown represent a worst case based on a number of typical designs from various manufacturers. The hardstands that will be constructed will be smaller than the proposed hardstand areas and will be located within the footprint of this. Occasional surface maintenance may be required in the operational phase of the proposed wind farm, but this is anticipated to be very minimal and infrequent. The EIAR utilises this worst case when determining the quality, significance, extent and duration of potential impacts.

2.6.3.4 Assembly Area

Unbound, levelled assembly areas will be located on either side of each hard-standing area, as shown on Drawings in Appendix 2-1. These assembly areas are required for offloading turbine blades, tower sections and hubs from trucks until such time as they are ready to be lifted into position by cranes. They will be surfaced with clause 804 material or similar.

2.6.4 Electrical Grid Connection

2.6.4.1 Onsite Electricity Substation

It is proposed to construct one onsite 110kV electricity substation within the site, as shown on the site layout drawings in Appendix 2-1. This will provide a connection point between the wind farm and the proposed grid connection point at the existing 110kV overhead line in Ballyvool.

The construction and electrical components of the substation will be to EirGrid specifications within the parameters assessed. Further details regarding the connection between the substation and the national electricity grid are provided in Section 2.6.4. The dimensions of the proposed substation compound will be up to 150m in length by120m in width. The substation footprint will include one control building and electrical components necessary to export generated power from the wind to the transmission system. A second smaller building will be required for site offices and welfare facilities.

The main control building will measure up to 18m by 20m and 8.7m in height. A second smaller switchgear building will measure up to 20.2m by 10.8m. Layout drawings of the control buildings are shown in the planning drawings in Appendix 2-1.

The substation and compound will be surrounded by steel palisade fencing which will be approximately 2.6m in height. 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.

The wind farm control buildings will include the (Independent Power Producer) IPP and ESB control room, as well as an office space and welfare facilities for staff during the operational period. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the proposed development, there will be a very small water requirement for occasional toilet flushing and hand washing. It is proposed to install a rainwater harvesting system as the source of water for this, with all potable water being brought onsite in bottles.

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off-site by a permitted waste collector to a wastewater treatment plant. It is not proposed to treat wastewater on-site, and therefore the EPA's *'Code of Practice: Wastewater Treatment and Disposal Systems Serving*

Single Houses' (EPA, 2009) does not apply. Similarly, the EPA's manual on *'Treatment Systems for Small Communities, Business, Leisure Centres and Hotels'* (EPA, 1999) also does not apply, as it too deals with scenarios where it is proposed to treat wastewater on-site.

Such a proposal for managing the wastewater arising 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 would be challenging and has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal. The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system will be submitted to the Planning Authority in advance of any works commencing on-site.

The wastewater storage tank alarm will be integrated with the on-site electrical equipment for alarm notification that will be monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended), will be employed to transport wastewater away from the site. It is anticipated that this material would be collected by a waste collector in Waterford or Kilkenny cities. It is envisaged (and for the purposes of this EIAR assumed) that any such contractor will access the site via the M9.

2.6.4.2 Internal Underground Cabling

Each turbine will be connected to the proposed on-site substation at Castlebanny via underground MV cables. Fibre-optic cables will also connect each wind turbine to the wind turbine control system located within the Control Building. The electrical and fibre-optic cables running from the turbines to the onsite substation compound will be run in cable ducts up to 1.5 metres below the ground surface within the proposed internal roads and/or their verges.

2.6.4.3 Grid Connection Route

Connection will be sought from the grid system operators by application to EirGrid. It is proposed that the proposed onsite substation will connect via underground 110 kV cable to an existing overhead line, though no new sections of overhead lines are required for this connection.

The proposed route of this underground grid connection if provided in Figure 2-4. The overall length of the grid connection between the proposed substation and the existing overhead line is approximately 4km, of which, approximately 1km is within the site of the proposed wind farm, and approximately 0.3km is located along the public road corridor. The remaining approximately 2.7km is located off road in third party lands. Two new overhead masts will be required at the loop-in and loop-out points on the existing line, to allow the connection be made. Further information of these masts can be seen in the drawings of Appendix 2-1.

The grid connection construction methodology is described in Section 2.10.6 below.

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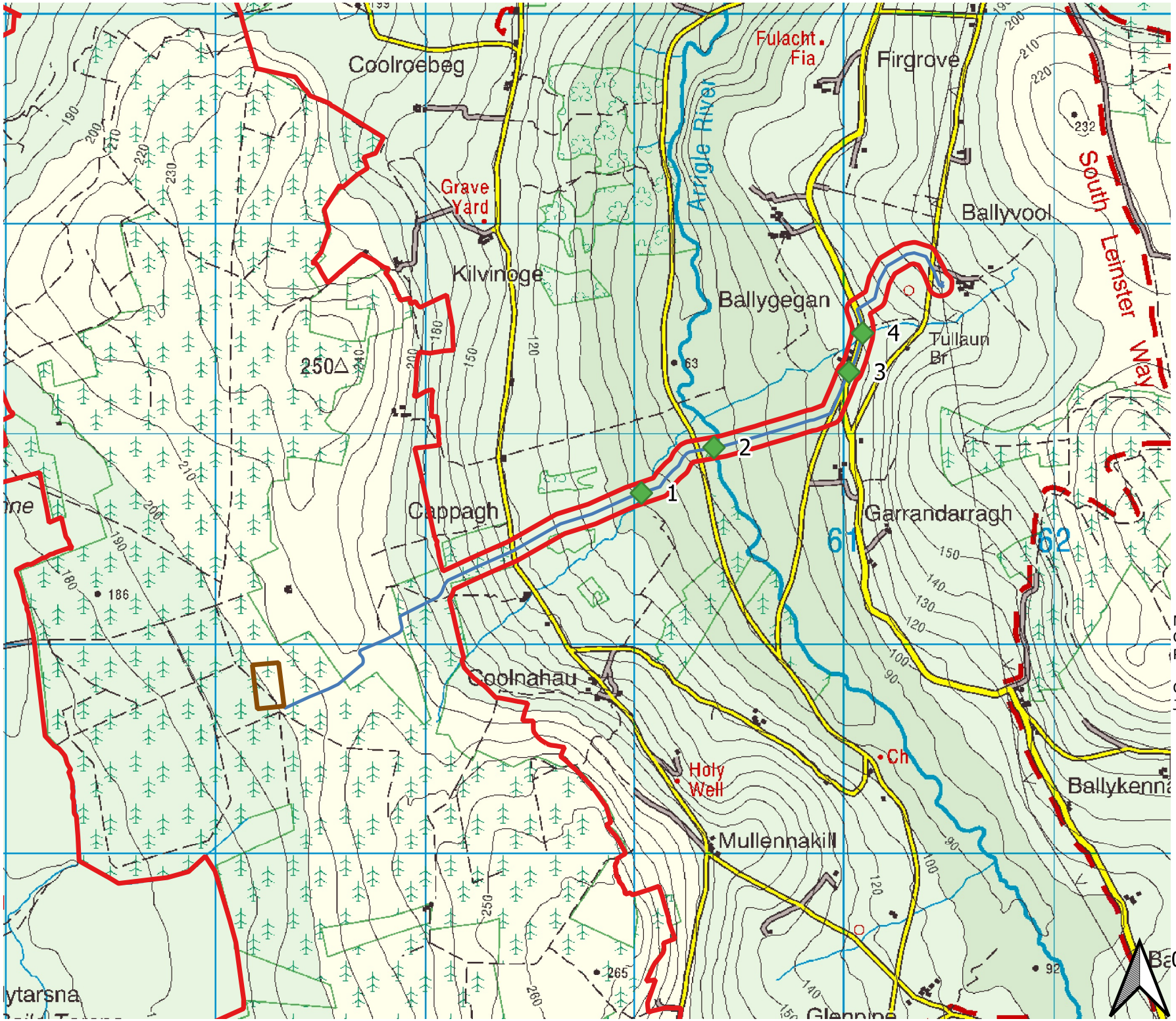

Legend

- Watercourse Crossings
- Substation
- Grid Connection Route
- EIAR Study Area

Map by: JS
Checked by: JS
Rev: 1

Client: Coillte
Job: Castlebanny WF

TOBIN
CONSULTING ENGINEERS

Figure: 2-4
Title: Proposed Grid COnnection Route and Watercourse Crossings

0 473.852 947.704 m

The proposed underground grid connection will partly follow the existing public road network and proposed onsite access roads, but the majority will be off-road. The cables will be laid in trenches as per EirGrid Specification (See Typical Trench Bedding Details in Appendix 2-1). There will be 4 no. watercourse crossings along the grid connection route. No instream works are proposed for any natural watercourse. The main watercourse crossings will be at the River Arrigle and one of its tributaries, where it is proposed that hydraulic directional drilling will be used. A drainage ditch crossing and stream will also be crossed towards the eastern side of the route, but these watercourses can be crossed using open trenches over the existing stream/ditch culverts. Further information on the Grid connection watercourse crossings can be found in Section 2.10.6 below

2.6.4.3.1 Joint Bays

Joint bays are pre-cast concrete chambers where individual lengths of cables are joined to form one continuous cable. Joint bay locations have been selected to maximise the lengths of cables, following consideration of cable detailed design issues, the space requirements for cable drums and cable pulling equipment as well as the impact on local residents and road users. The joint bays will be located at various points along the ducting route as specified by EirGrid requirements and as shown in the drawings of Appendix 2-1.

A joint bay will be constructed in a pit. The bay will measure up to 6m x 2.5m x 2m deep as shown in the drawings of Appendix 2-1. A reinforced concrete base and sides 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.

2.6.4.3.2 Watercourse Crossings

There are 4 no. watercourse crossings on the proposed grid connection route. The locations of these crossings are shown on Figure 2-4. Two of the crossings are traverse small streams, while 1 no. is across the River Arrigle and one crossing is over a drainage ditch. Two of these locations have an existing culvert. A number of minor forestry and shallow artificial agricultural field drainage channels were also present, though these remain dry for the vast majority of the time. Section 2.10.6 below provides further details on the methods proposed to cross each location.

2.6.5 Rural (Local) Electricity Supply

As part of the development, a rural/local supply will be required as a back-up power supply to the proposed substations for light, heat and power purposes. The rural/local supply will be designed and constructed by ESB Networks. The exact source of supply is to be confirmed, however, the supply will enter the site by either MV overhead line or MV cable. The rural/local supply will have an associated step-down transformer (i.e. MV to LV) and will enter the substation building by underground cable and terminate onto the control building distribution board.

2.6.6 Meteorological Mast

One permanent meteorological mast is proposed as part of the proposed development. The mast will be equipped with wind monitoring equipment at various heights. The mast will be located as

shown on the site layout drawing in Figure 2-1 and will be a slender, free-standing lattice structure up to 100 metres in height, as shown in the drawing of Appendix 2-1.

The mast will be constructed on a hardstanding area of up to approx. 25m x 25m and will be used to erect the mast, adjacent to an existing site road.

2.6.7 Forestry

A portion of the proposed works are located within an area which is currently planted with forestry. The majority of this area is located within Coillte lands, while some is located within private lands. As part of the proposed development, there will be a requirement to fell some of this forestry in the areas immediately around the footprint of the wind farm infrastructure. The total area of forestry to be felled is estimated to be approximately 82.9ha, as shown in Appendix 2-4. As a commercial crop, this forestry is scheduled to be felled in the future regardless of the proposed wind farm being constructed or not.

A report detailing the forestry felling and onsite replanting is provided as Appendix 2-4.

The proposed development must have obtained planning consent before an application can be made for a felling license from the Forest Service as per their policy on tree felling for wind farms. As part of this process, an area of at least an equivalent size to that which was felled must be replanted. This replanting land can be located anywhere within the state, provided an afforestation license is granted for the land. The sites identified as potentially suitable for replanting for the proposed development are in the townlands of Burrish, Moyne, Coolnagun and Treanmanagh in Co Mayo, Roscommon, Westmeath and Clare respectively. These replanting lands, which are suitable for planting of 75ha, will accommodate the 75ha replanting requirement for the Castlebanny Wind Farm. In the event that planting cannot occur on any/all of these sites, other similarly suitable / technically approved sites will be used.

An assessment of the replanting of these lands is provided as Appendix 2-5 of this EIAR. This includes a description of each replanting site and impact assessments (including cumulative impacts) under a variety of headings.

2.6.8 Spoil Management

The use of the borrow pits shall be phased. This will then allow materials to be placed in the first borrow pit thereby minimizing the volume of soils requiring temporary storage. In order to further reduce temporary storage requirements, reinstatement of soils and turves around infrastructure, and in restoration and landscaping works on areas of excavated / disturbed ground, will be carried out during the construction phase or as soon as is practical after the completion of the works in any one area of the site. Approximately 164,300m^3 will be excavated from the borrow pits onsite. A total of 211,500m^3 will be used to reinstate the borrow pit area as well as landscaping areas.

Topsoil and sub-soil are to be stockpiled separately. Turves must be stored turf side up and must not be allowed to dry out. Stockpiles are to be isolated from any surface drains and a minimum of 50m away from watercourses. Measures such as interceptor ditches around the bases of these areas, sediment traps and seeding of the bunds shall be incorporated to prevent runoff of suspended solids laden surface water and soil erosion. No permanent spoil or stockpiles will be left on site.

The method for restoration of excavated or disturbed areas is to encourage stabilisation and early establishment of vegetation cover, where available, vegetative sods/turves or other topsoil in

keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.

To prevent erosion and run-off and to facilitate vegetation reinstatement, any sloped embankment will be graded such that the slope angle is not too steep and that embankments match the surrounding ground profile.

2.6.9 Stone and Fill Requirements

As part of construction of the proposed development, a significant amount of stone and aggregate fill material will be required. This will be used under and around key infrastructure including the turbines, substation, site roads, hardstands and construction compounds. The following are the approximate estimates of the material requirements at the various main infrastructure locations:

- Internal Access Tracks – 50,325m^3 of which 33,000m^3 will come from onsite borrow pits;
- Substation and Construction Compounds – 24,569m^3, all of which will come from onsite borrow pits;
- Turbine Foundations – 14,785m^3 from external source; and
- Turbine Hardstand, Blade set-down area and vehicle turning area – 121,803m^3, of which 106,703m^3 will come from onsite borrow pits.

By sourcing the majority of the required stone volume from the onsite borrow pits as described above, the volume of traffic that will occur on public roads in the area will be significantly reduced. Further information on the proposed traffic volumes and impacts are discussed in Chapter 16 of this EIAR (Traffic & Transportation).

Hardstands and site roads will be constructed to be above the existing ground level. The lower layer of this will be lower grade stone, with the top 150mm being high quality compacted gravel. Internal cable trenches which connect each turbine to the proposed onsite substation will be up to a maximum of 1500mm deep, with the first 600mm being backfilled with sand. The excavated material will be used to complete the backfilling to the surface.

2.6.10 Borrow Pits

It is proposed that up to 3 no. borrow pits will be constructed as part of the proposed development, in order to provide a source for the majority of stone material requirements within the site itself. These are located near T3, T6 and T15, with each covering an area of approximately 17,000m^2. The locations of these borrow pits can be seen on the site layout drawings in Appendix 2-1. Having three borrow pits onsite will minimise material transport on site and will minimise the depth to which the borrow pit excavations will be required.

Further details of the site investigations that were carried out and the stone type/suitability are provided in Chapter 7 (Land, Soils & Geology).

Once the required rock has been extracted from each borrow pit, they will be reinstated using any surplus inert material from the site and made secure using permanent stock proof fencing. It is also proposed to replant forestry in these areas on the spoil which will have been used to reinstate them.

Rock and fill material may need to be extracted from a number of proposed turbine foundation locations as part of the required excavations there. In that case, this material will be used where possible to replace the material requirements from borrow pits, meaning the figures above may be lower than mentioned above.

2.6.10.1 Rock Extraction methods

The rock will be extracted from the proposed borrow pits using two main methods: Rock breaking and rock blasting. It is anticipated that the primary method will be rock breaking.

2.6.10.1.1 Rock Breaking

Rock breaking can be used to extract rock in many situations and is particularly suitable for any brittle rock and rock near the surface. A hydraulic rock breaking attachment is fitted to the arm of a large tracked excavator, and this breaks large pieces of rock from the ground. These large rocks are broken down into smaller pieces using these hydraulic rock breaking attachments, until they are small enough for use or to fit into a rock crusher. At that point, a large loader feeds them into a mobile rock crusher, where they are crushed, graded into various sizes, and removed by the loader for use on site.

2.6.10.1.2 Rock Blasting

Rock blasting is an effective way to produce a large volume of broken stone in a very short time, as the blasts only last a number of milliseconds. All parts of the blasting process from drilling to explosives handling to execution of the blast itself will be designed and carried out/overseen by a specialist engineer. In order to carry out a blast, a number of holes are drilled into the rock over several days. Once these are prepared, the required amount of explosives will be brought to the site and installed in the holes. The explosive material will not be stored on site, and the transport and handling of the material, as well as the carrying out of the blast will be carried out with agreement and supervision of An Garda Siochána. The charges will be set, the area will be cleared and the blast carried out by a specialist engineer.

After a blast, the rock should be able to be loaded into a crusher with a loader and processed for use on site.

In the event that blasting is required, local residents and noise sensitive locations will be notified of the upcoming blast. The potential noise impacts of blasting have been assessed in Chapter 12 (Noise & Vibration).

2.6.11 Recreation Plan

Springfield is committed to enhancing the recreation experience currently on offer in Castlebanny Forest as part of the proposed wind farm development. A summary of the proposed recreation plan is set out below. Further information is provided in the full recreation plan (Appendix 2-6).

Castlebanny forest is an accessible and largely level or gently sloping area with existing forest road infrastructure. A commercial forest, it is also used by some nearby residents for walking and to a lesser extent equestrian activities. The forest also hosts the 'Glenpipe to Mullinavat' section of the South Leinster Way, however, aside from this section of trail, there is limited use of the forest for walking by outlying communities possibly due to the complex trail network, the absence of signage and insufficient awareness of the opportunities.

The relative lack of gradient in Castlebanny forest allied to its elevated nature and its location within a 10-kilometre radius of a number of small communities, makes it an appropriate location for walking and gravel trail cycling. There is also an opportunity to link Castlebanny Forest with other outdoor recreation venues in the wider area via the South Leinster Way which ribbon-like connects these venues.

Following an examination of the current use of the forest and the opportunities for enhancement and connection to surrounding walks and greenways in consultation with key stakeholders a recreational plan has been incorporated into the proposed wind farm development.

The main themes of walking, cycling, signage, car parking and associated trail infrastructure identified have been addressed as follows:

- Walking: 2 no. trail loops of different lengths and thus differing degrees of difficulty have been proposed:
  - Mullenakill loop (6km)
  - Castlebanny branch (a 2km extension of the Mullenakill loop)
- A portion of a 3rd loop, the Derrylackey loop will also be upgraded completing this 5km loop and providing access to turbine no. 1.
- Cycling: Existing forest trails within the proposed development site including a section of South Leinster Way, will be enhanced to provide a hard-packed gravel and a dust finish that will also be suitable for cycling. New trails will also be finished in this way.
- Outdoor exercise stations: 8 no. outdoor exercise stations are proposed along the Mullenakill loop close to its junction with the South Leinster Way.
- Car parking: A permanent public car park with seating/picnic tables is proposed at the end of the construction phase of the development on the footprint of the southern temporary construction compound. This will provide a trailhead/landing point for visitors to the forest and enable visitors from the surrounding settlements to visit the forest. It is adjacent to the South Leinster Way and the start of the Mullenakill loop and Derrylackey loop.
- General information and wind farm information signs are also proposed proximate to active zone junction to attract visitors to the forest and promote interest in the provision of renewable energy at this location. A general information/welcome sign is also proposed at the main operational wind farm entrance.
- Directional signs along the Castlebanny forest trails are proposed at junctions to direct visitors appropriately.

2.7 ACCESS AND TRANSPORTATION

2.7.1 Site Entrance

The upgrade of the existing site entrance for the proposed development is located along the R704 road between Mullinavat and New Ross. This entrance will be the main construction phase entrance to the site. It will facilitate material deliveries to the site (stone, steel and concrete) and staff access, as well as large oversize components such as turbine blades, tower sections and substation components. The access track leading from the site entrance to the proposed wind turbines will include the crossing of one local road (L-7451). The construction vehicles will have a straight crossing here, and the crossing will comply with all road safety requirements. Suitable traffic control methods will be used as detailed in Chapter 16 (Traffic & Transportation) and the Traffic Management Plan (included with the Construction and Environmental Management Plan (CEMP) in Appendix 2-7).

The proposed site entrance on the R704 and both sides of the crossing point on the L-7451 will have adequate visibility as also discussed in Chapter 16 (Traffic & Transportation). At the R704 site entrance, this will be achieved by vertically re-grading the road surface in the area around the entrance (approximately 200m total length). The footprint of the road surface will not be affected, and works will be contained within the road corridor, and there will be no loss of any hedgerows

or trees associated with this work. This will improve the road safety here for the purposes of site access, as well as permanently improving general road safety at this location by removing an existing hidden dip. Further details are provided in Appendix 2-2 drawings and it is also discussed in Chapter 16 (Traffic & Transportation). This element of the proposed project will be subject to further consultation and agreement with the local authority prior to construction.

During the operational phase, the entrance along the L-7451 will be used for access to the amenity car park as well as access to the wind farm for light service vehicles (cars and small vans), with the entrance on the R704 and associated site road to the L-7451 only being used occasionally for any large/heavy vehicles.

2.7.2 Turbine and Construction Material Transport Routes

Turbine and Construction materials will be restricted to the following routes:

- Construction materials coming from the direction of the M9/Mullinavat/Ballyhale along the R704 accessing the site entrance from the southwest;
- Construction materials coming from the direction of Inistioge and New Ross along the R704, accessing the site entrance from the northeast; and
- Turbine and oversized loads will access the site from the M9 along the R704 accessing the site entrance from the southwest.

2.7.3 Traffic Management

As described further in Chapter 16 of this EIAR, Traffic and Transport, the successful completion of this project will require significant co-ordination and a comprehensive set of mitigation measures. As outlined in Chapter 16 of this EIAR, these mitigation measures will be put in place before and during the construction and operational phase of the project in order to minimise the effects of the additional traffic generated by the proposed development. A Traffic Management Plan proposed for the Castlebanny Wind Farm is included in the CEMP, in Appendix 2-7.

2.8 SURFACE WATER MANAGEMENT

2.8.1 Existing Site Drainage

The site topography of the proposed wind farm is generally varying with a number of surface watercourses. There are also a number of local drainage ditches (including forestry drains). In general, the watercourses flow radially away from the elevated centre of the site. Those flowing to the west of the site discharge to the Derrylacky River, which in turn flows into the River Black Water, and ultimately the Suir. Those that flow to the east eventually enter the River Arrigle, which in turn discharges to the River Nore. A number of watercourses cross through the grid connection route including the River Arrigle and a number of smaller streams. Further details on the existing and proposed site drainage are provided in Chapter 8 of this EIAR, Hydrology & Hydrogeology.

2.8.2 Drainage Design Concept

The proposed surface water drainage system utilises sustainable drainage devices and methods where appropriate.

The drainage layout for the operational stage of the proposed development has been designed to collect surface water run-off from roads, crane pads and hardstanding areas for treatment and to maintain the existing site discharge rates. Run-off arising from the development will discharge

into settlement ponds specifically constructed for managing surface water from the wind farm. Details and locations of the proposed settlement ponds are shown on the drawings of Appendix 2-1. Once treated in the settlement pond the treated surface water will then be allowed to spread across the adjacent lands via a level spreader /diffuser which will minimise any risk of soil erosion and allow further filtration of any remaining sediment particles. This treated water will ultimately percolate to ground or travel over-ground and be assimilated into the existing drainage network within the boundary of the proposed development at appropriate greenfield run-off rates. There will be no direct discharges from the wind farm to any existing natural watercourse.

During the construction phase, all run-off from construction areas will be controlled and treated to reduce suspended solids concentration prior to being discharged into the existing drainage network or overland. A number of temporary settlement ponds will be established during the construction phase along roadways and in areas of high construction activity to minimise silt laden run-off entering the drainage network. The settlement lagoons will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of a very small particle size to fall out of suspension prior to allowing the water to outfall to the receiving environment. Further information on the runoff calculations and site drainage is provided in Chapter 9 (Hydrology & Hydrogeology). The proposed locations of the permanent and temporary settlement ponds, and typical details of same are shown on the drawings of Appendix 2-1.

Subject to potential planning conditions and prior to commencement of construction activity, this drainage design (including construction specific measures) will be reviewed and verified by the appointed Contractor as part of the review of the CEMP, Appendix 2-7.

A Surface Water Management Plan (SWMP) has been prepared as part of the CEMP. The purpose of this plan is to ensure that all site works are conducted in an environmentally responsible manner so as to minimise any potential adverse impacts from the proposed development on surface water quality. The plan will incorporate the following specific objectives:

- Provide overall surface water management principles and guidelines for the construction phase of the proposed development;
- Address erosion, sedimentation and water quality issues; and
- Present measures and management practices for the prevention and/or mitigation of potential downstream impacts.

During the operational phase of the project, the management of surface water will be carried out in accordance with the proposed design and associated management features such as settlement ponds which will have been installed during the construction phase, and will be maintained through the operational phase. The drainage design will ensure that any surface water arising from the proposed wind farm during operation will be contained and treated to ensure it can be dispersed out from the proposed development without any significant impact on existing downstream activities.

The decommissioning phase will not require any significant works that will impact on the drainage network. Works in this phase will primarily involve disassembling the turbines and removing off-site. It is not envisioned that site roads, turbine foundations or the grid connection infrastructure would be removed. The site roads would remain as part of an amenity facility while the hardstand material could be removed and along with the turbine foundations, covered in topsoil and revegetated. The substation and grid connection infrastructure will form part of the permanent national grid network.

The protection of water quality and prevention of pollution events requires a sustained and concentrated input from the Contractor with regard to the provision and maintenance of sediment control structures. The drainage system is described in further detail in Chapter 9 of this EIAR (Hydrology & Hydrogeology).

2.8.2.1 Silt Control

Silt control measures e.g. check dams and silt bags, will be installed as required during the construction process.

Dewatering silt bags (See Figure 2-5) allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing silt from silt-laden water collected from works areas within a construction site. Silt bags are easily disposed of by a licensed waste contractor.

In specific locations, silt fences (See Figure 2-5) will be installed as an additional water protection measure around existing watercourses, particularly where works cannot be avoided within the 50-metre buffer zone of a natural watercourse. These trap sediment particles in a fine mesh and allow water to pass through. Works within 50m of such watercourses are avoided where possible.

If required, a mobile silt-buster (See Figure 2-5) can be employed at the site, which uses advanced filtration technology to remove suspended particles from the water. Such a measure is most likely to be deployed in the turbine excavations or borrow pits during periods of activity but can be used at any excavation location) This is very effective, with a small footprint, and is also very mobile with the potential to move around the wind farm site. These units are recommended by the Scottish Environmental Protection Agency and the UK Environmental Agency for use on construction sites for the treatment of pumped dirty water.

Check dams (also known as silt traps) will be used as required throughout the proposed site drainage system to minimise sediment transport (See Figure 2-5). They will generally be spaced at regular intervals along the proposed drainage network. These will slow down the movement of water in site drains, and thereby reduce the amount of sediment transported by the water. Stones are used at each dam to reduce soil erosion, to stabilise the dam and aid in filtration. Settlement ponds (See Figure 2-5) will be constructed at various locations around the site of the proposed development, particularly in areas of high activity as described in further detail in Section 2.8.2 above. Depending on this area being drained and the site conditions, there may be multiple settlement ponds positioned in sequence. These ponds cause the water velocity to slow down significantly, allowing suspended solids to precipitate out, with rock curtains and geotextile membranes positioned to capture any sediments that do not settle out. They are constructed using an excavator, with regular inspections and maintenance to ensure they are operating efficiently. They will be emptied as required to remain effective. They will be constructed and maintained as per the *Good Practice during Wind Farm Construction* document[3].

Level spreaders/diffusers are used where overland discharge of water is carried out. They prevent soil erosion at these locations by spreading out and slowing down the water flow before it reaches the vegetated topsoil.

[3] https://www.nature.scot/sites/default/files/2018-08/Guidance%20-%20Good%20Practice%20during%20wind%20farm%20construction.pdf

Figure 2-5: Examples of Proprietary Silt Control Measure

2.8.2.2 Trench Drainage

Trenches will be required as part of the proposed development, primarily for installation of ducting and cables between each wind turbine and the onsite substation, and as part of the grid connection works to connect to the existing 110kV overhead line. It is not anticipated that drainage will be a significant issue in the proposed development trenches, but the following measures will be employed to reduce the potential for water build up in trenches, and to deal with any water that does arise.

- Trenches will be dug in short sections at any one time to avoid potential for water flowing through them.
- Excavation works will not be carried out during periods of heavy precipitation.
- In the event that some surface water does accumulate in the trench, this will be allowed to percolate into the ground naturally. In the unlikely event that this is too slow, the water can be pumped/vacuum tanked out and released into the proposed wind farm drainage system for subsequent treatment.
- Any excavated material which is not transported away will be stored on the up-gradient side of the trench so that the downgradient trench will collect any runoff that does occur. This sidecast material will be sealed with the back of an excavator bucket to reduce the potential for runoff. In the event that unusually heavy precipitation is forecast, this will be temporarily covered with a protective plastic sheet.

- Clay plugs (small deposits of clay) will be installed at regular intervals to prevent conduit flow of water through the trench after construction

2.8.3 Culverts & Clear-Span Bridges

Culverts will be required where site roads or hardstands cross minor forest drain networks. The use of culverts will only be employed for minor field/forest drains (which are dry or stagnant) or proposed new site drainage channels and will not be used to cross any natural watercourses on site. There are two significant drain crossings required for the proposed site road network, for which the proposed crossing methodology is a clear-span bridge. The use of a clear-span bridge here will avoid the requirement for in-stream works.

Where culverts are required, precast concrete or plastic culverts of between 300-600mm in diameter shall be provided, a typical detail of which is shown in Appendix 2-1. Clear-span bridges will comprise a precast reinforced concrete bridge bed placed on foundations either side of the watercourse. The construction method will ensure that there is no requirement for in-stream works. This will be sufficiently high off the stream to allow unrestricted flow of water beneath. The proposed clear-span bridge location and design detail are provided in Appendix 2-1. The construction method for these structures is described in Section 2.10 below.

2.9 CONSTRUCTION MANAGEMENT

2.9.1 Construction Activities and Timing

A CEMP is included as Appendix 2-7 of this EIAR. This sets out the main environmental considerations and mitigation measures to be incorporated into and complied with during each phase of the proposed development and will be referred to by the main contractor onsite. The CEMP will be updated prior to construction to account for any alterations to mitigation measures that may have been added during the planning process and to comply with any conditions.

It is anticipated[4] that up to 100 persons will be employed during the peak construction period and it is estimated that the construction phase will take approximately 24 months from starting onsite to completion of commissioning of the turbines. All vegetation clearance that is required during construction works will commence outside the breeding birds season, which runs from the 1st of March to the 31st of August.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs weekdays and between 7:00hrs and 14:00hrs on Saturdays.

However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours) or to accommodate delivery of large turbine components along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the Local Authority.

The construction phase can be broken down into 5 no. main phases as follows:

- 14 months – Civils
- 12 months – Electrical
- 4 months – Turbine deliveries

[4] http://www.ewea.org/fileadmin/files/library/publications/reports/Wind_at_work.pdf

- 4 months – Installation
- 2 months – Commissioning

The phasing and scheduling of the main construction task items are outlined in Figure 2-6, where January 2024 has been selected as an arbitrary start date for construction activities. Where there is overlap between phases, this reflects the anticipated progression of work through the site, with different areas within the site at different stages of completeness.

ID	Task Name	Task Description
1	Site Health and Safety	
2	Site Compounds	Site compounds, site access, fencing, gates
3	Site Roads	Construct roads, install drainage measures, install culvert, install water protection measures
4	Turbine Hardstands	Excavate base, construct hardstanding areas
5	Turbine Foundations	Fix steel, erect shuttering, concrete pour
6	Substation Construction & Electrical Works	Construct substation, underground cabling between turbines, export cabling
7	Backfilling & Landscaping	
8	Turbine Delivery and Erection	
9	Substation Commissioning	
10	Turbine Commissioning	

Figure 2-6: Indicative Construction Schedule

2.10 CONSTRUCTION METHODOLOGIES

2.10.1 Site Roads (including passing bays)

Site roads will be constructed to each turbine location, and to all proposed site infrastructure as shown in the site layout drawings of Appendix 2-1, with a proposed running width of 5m. Passing bays will be included along roads strategically, as indicated in Appendix 2-1. There are three road construction methodologies to be considered at the proposed development: upgrading of existing site roads; and excavated new road. These are described below in further detail.

Typical sections of new roads and upgraded roads are shown on drawings in Appendix 2-1. Where required, the road widths will be increased to a maximum of 9.5m to form the indicated passing bays.

2.10.1.1 Excavated New Road

Tracked excavators will carry out excavation for roads with appropriate equipment attached. Any surplus excavated material will be dealt with as set out in the spoil management section within the CEMP (Appendix 2-7 of this EIAR). The proposed development footprint is anticipated to be based on mineral-based soil, and this material can be side-cast, profiled and bermed as close to the excavation areas as practical. The sides of the excavated areas will be battered/sloped sufficiently to ensure that slippage does not occur.

When the topsoil has been removed and/or the formation layer has been reached, stone from the onsite borrow pits shall be placed to form the road foundation. In the event of large clay deposits being encountered in sections of road, a geotextile layer will be required at subbase level. The sub grade will be compacted with the use of a roller or other approved compaction method. The final top dressing of unbound material will not be provided until all turbine bases have been poured. This prevents damage to the wearing course due to stone and concrete trucks movements. This capping surface may be required to be sourced from local quarries.

Once no further stone material is required from the proposed on-site borrow pits (i.e. at the end of the civil works stage of the project construction phase), any material which had been temporarily stored on the site will be used to re-instate the borrow pits.

All on-site roads will be maintained for the duration of the construction and operational phases of the project.

2.10.1.2 Upgrade of Existing Site Road

The site of the proposed development has an existing network of site roads present which have been incorporated into the proposed design as much as possible.

Where an existing road needs to be widened, it will be carried out on one or both sides as required, and the same steps as described in the new road construction above will generally be followed. Tracked excavators will carry out excavation for roads with appropriate equipment attached. Any surplus excavated material will be dealt with as set out in Section 2.10.1.1 above. When the topsoil has been removed and/or the formation layer has been

reached, stone from the onsite borrow pits shall be placed to form the road foundation. The foundations will be built up to the same height as the existing road and if appropriate the entire width of the road will be built up to the required level. In the event of large clay deposits being encountered in sections of road, a geotextile layer will be required at subbase level. The sub grade will be compacted with the use of a roller or other approved compaction method. The final top dressing of unbound material will not be provided until all turbine bases have been poured. This prevents damage to the wearing course due to stone and concrete trucks movements. This capping surface may be required to be sourced from local quarries.

Once no further stone material is required from the proposed on-site borrow pits (i.e. at the end of the civil works stage of the project construction phase), any material which had been temporarily stored on the site will be used to re-instate the borrow pits.

All on-site roads will be maintained for the duration of the construction and operational phases of the project.

Further details of the construction methodology for upgrading existing site roads is provided in the Spoil Management Plan, provided as part of the CEMP in Appendix 2-7.

2.10.2 Proposed Clear-Span Bridge & Culverts

There are two clearspan bridges proposed as part of the proposed works near T9 and T5, as shown on the site layout drawings (Appendix 2-1). This crossing method will avoid in-stream works entirely at these watercourse crossing locations. Firstly, the site access tracks will be constructed as far as possible to allow easy access to the works area. Following this, the topsoil will be stripped from the foundation footprint on either side of the watercourse, taking care to avoid disturbing any part of the watercourse bed or banks. Suitable stone fill material (clause 804 or similar) will be added in layers and compacted to form the base of the foundation. The precast clear-span bridge will be placed onto this either as one or more pieces. There will be no requirement for large-scale casting of wet concrete. Following this, barriers will be attached to the sides of the bridge structure, and the site access tracks will be constructed over the structure.

Where plastic culverts are required on site, they will be over-sized for the expected water flow rates, and to allow passage of fauna through. They will be installed with a minimum gradient of 1%. The plastic pipe will be placed into the drain bed, and some of the substrate will be placed within the pipe to benefit biodiversity. The use of corrugated culverts will aid in the retention of sediment, thereby naturalising the culvert bed. Large stones will be placed at the culvert outfall to dissipate any flow and reduce the potential for erosion. The culverts will be inspected regularly to ensure they do not become blocked.

2.10.3 Proposed Site Drainage

The site of the proposed wind farm will have both temporary (for the duration of the construction phase) and permanent drainage infrastructure installed as part of the proposed site development. These features include site drains and silt control measures (check dams/silt dams) as described in Section 2.8 above.

The site drainage measures will be installed from the outset, being constructed at the same time as the initial civils works (site roads, hardstands, etc.). This will ensure that there is no uncontrolled runoff from the site during proposed works. Excavators will be used to

construct the main drainage features (drains, settlement ponds, etc.), while small items such as silt dams/check dams will be constructed manually. Silt fences which trap suspended particles will be erected manually ahead of civil works as required on particularly steep ground, or near watercourses.

2.10.4 Temporary Compounds

At the commencement of the construction phase, a temporary compound area will be constructed to provide office space, welfare facilities, car parking and hardstands for storing materials. At a later stage of the site development (when the construction works reach the northern end of the site) a second compound area will be constructed there as per the proposed site layout to provide additional facilities onsite. These will cover approximately 1.7ha each, and the 2 no. locations are shown on the site layout drawings (Appendix 2-1). During the operational phase of the proposed development, the southern compound will be re-purposed as a public car park for the proposed amenity trails. The northern compound will be removed, with any stone being used towards reinstatement of the nearest onsite borrow pits. After removal of the compound, the area will be replanted with forestry as described in Appendix 2-4.

The site accommodation will consist of temporary porta-cabins constructed on a granular platform. The topsoil will be stripped where development of the temporary compounds are proposed. The compounds shall be constructed to heights of up to approximately 0.5m above existing ground level.

2.10.5 Turbine Hardstand, Foundations and Erection

The topsoil will be stripped where development of the hardstands are proposed. The hardstands shall be constructed to heights of up to approximately 0.5m (on average) above existing ground level.

Ground investigations in the form of trial pitting have been carried out along the proposed turbine locations and hardstanding locations to inform the depth of excavation and upfill required. Following site visits and site design, volume calculations provide an estimation of worst-case fill required for the hardstands.

This is predicted to be up to 64,449m^3 of material including for wastage. This material volume will be obtained primarily from the onsite borrow pits with only the surface 150 mm layer to come from local quarries which are within reasonable proximity to the site (see Section 2.6.8).

Trial pitting has been carried out in the vicinity of each of the turbine base locations. The geotechnical investigations to date indicate that the foundations at the proposed wind farm will be excavated. Piling is not anticipated to be required.

Each of the turbines to be erected on site will have a reinforced concrete base. Overburden will be stripped off the foundation area to a suitable formation using a 360º excavator and will be stored as detailed in the Spoil Management Plan within the CEMP (Appendix 2-7). The sides of the excavated areas will be sloped sufficiently (2:1 or as determined by a suitably qualified site engineer) to ensure that slippage does not occur. Precise excavation depths and batter requirements will depend on soil types locally and the turbine manufacturer requirements. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation, or for

reinstatement elsewhere on site. The excavated material will be smoothed with the back of an excavator bucket and surrounded by silt fences to minimise the potential for sediment-laden run-off occurrence. It is not anticipated to find any notable quantities of peat at any turbine locations.

In the case of gravity foundations, if the formation level is reached at a depth lower than the depth of the foundation, the ground level will have to be raised with clause 804 hardcore material and/or lean mix concrete, compacted in layers as required, with sufficient compaction effort. Drainage measures will be installed to protect the formation by forming an interceptor drain around the perimeter of the base which will outfall out at the lowest point level with the spreader or settlement pond. It is not anticipated that piled foundations will be required.

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

Approved lifting equipment will be used to unload reinforcing steel to required areas. The bottom matt of steel will be fixed prior to the tower cans, if used, being lifted into position and reinforcing steel will be positioned and fixed in accordance with the turbine suppliers' requirements. The detailed design and exact dimensions will be determined once a turbine manufacturer has been selected following a competitive procurement process.

Formwork to concrete bases will be propped/supported sufficiently so as to prevent failure. Concrete for bases will be poured using a concrete pump. After a period of time when the concrete has set sufficiently, the top surface of the concrete surface is to be finished with a power float.

Once the base has sufficient curing time it will be filled with suitable fill (i.e. hardcore) up to existing ground level. The working area around the perimeter of the foundation will be backfilled with suitable material (hardcore). These hardstand areas around the turbines will be levelled, compacted and finished with a suitable surface material for traffic (clause 804 or similar) as per the site access tracks and remainder of the hardstand areas.

2.10.6 Grid Connection

As stated above, the proposed wind farm will connect to the existing national grid via the onsite substation and associated underground grid connection. The onsite substation and associated grid connection has been assessed in this EIAR, along with the required works to allow connection to the grid at the existing overhead line in Ballyvool.

Once fixed into position, all electrical connections will remain off and be commissioned prior to the wind farm entering into service.

Full details of the description of the Grid Connection works, and the construction methodologies for each element are provided in Appendix 2-8. The construction methodologies for the various elements of the grid connection are summarised below.

2.10.6.1 110 kV Substation and Electrical Works

The proposed substation will be designed and constructed to meet all the required EirGrid standards within the parameters assessed in this EIAR. An area will be levelled and built to the required level with stone fill material, capped by high quality compacted stone. Two control buildings will be constructed using traditional techniques for constructing small buildings (i.e. concrete block walls, timber and slate tile roof). Foundations will be built for all of the proposed electrical infrastructure. All the electrical equipment will be installed to EirGrid requirements. Perimeter fencing will be constructed around the substation compound for security and safety purposes. The substation and electrical infrastructure will be commissioned. Further information and drawings of the substation and electrical infrastructure are provided in Appendix 2-1 while the associated construction methodologies are provided in Appendix 2-8.

2.10.6.2 110 kV Underground Cable Trenches

The number and layout of cables is an important consideration in the design of the site. Minimum safety distances and angles etc. must always be maintained. This has been a fundamental consideration in determining the final location of the substation buildings and electrical infrastructure. Further information and drawings of the underground 110kV cable trenches (including a figure from EirGrid 110 kV cable installation specifications) are provided in Appendix 2-1 while the associated construction methodologies are provided in Appendix 2-8

The cables will be installed mostly off-road, and partly within the existing public road corridor as indicated on the site layout drawings in Appendix 2-1 and described in Section 2.6.4 above. A short section of the route will also be located within/adjacent to the proposed site access road. It should be noted that works within the public road corridor will also be subject to further consents/agreements with local authorities, for example a Road Opening Licence as appropriate.

A Traffic Management Plan (TMP) has been prepared for the proposed development. This is a living document and will be updated ahead of construction to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board, in the event planning permission is granted. Also, a confirmatory survey of road condition, including the condition of all road water crossings on the route, will be carried out along the grid connection route in advance of any works.

All cables will be laid in underground ducts. Ducts will be installed mostly by open trenching. The typical sequence of operations for installing ducts in trenches is to strip off the ground material and topsoil (if present). A trench is then formed to the required depth and width. The ducts are generally laid on a bed of lean mix concrete and surrounded with lean mix concrete. Any surplus soil (after trench reinstatement) will be used for local restoration and landscaping or used for borrow pit reinstatement on site. Where contaminants are found (or where bitumen-based materials are present) the material will be removed from site and disposed at an appropriately licenced facility. The top of the trench will generally be finished at ground level with a surface suitable for vehicular use as per EirGrid specifications. The use of gravel in this instance will ensure the track is permeable and eliminate the potential for surface water runoff.

The underground cable required to facilitate the grid connection will be laid beneath the ground surface and/or public road using the following methodology:

- The area where excavations are planned will be the subject of a confirmatory survey, prior to the commencement of works, with a cable locating tool and all existing underground services will be identified.
- A verification condition survey will be carried out for all parts of the route within the public road. This will focus on the existing condition of the road corridor, include bridge surveys. Details of this survey will be agreed with the local authority in advance of the survey.
- A trench will be opened using an excavator to accommodate the formation required.
- The excavated material will be cast to the side to be reused as backfilling material where appropriate. This material will not be stored in the vicinity of any watercourse and will be smoothed with the back of an excavator bucket to minimise runoff. It will be cast on the upgradient side of the trench, so if any runoff did occur it will run into the downgradient trench. Excess material will be used on the site of the proposed development for local landscaping, borrow pit reinstatement.
- Silt fences will be installed alongside the road/works areas as required near watercourses.
- Clay dams/plugs will be installed at regular intervals (depending on the gradient) to prevent conduit flow of water within the trench.
- Works will not be carried out during periods of heavy precipitation. In the event that some surface water does accumulate in the trench, this will be allowed to percolate into the ground naturally.
- The trench will be surfaced as per the road surface specifications of the local public road, the wind farm road, or (in the case of off road section) an EirGrid specification gravel access track capable of supporting maintenance vehicles if required.
- Cable joint pits are typically located at regular intervals as shown in the site layout drawings (Appendix 2-1). Each joint pit will be approximately 2.5m x 6m in size with a communications chamber and an earth link box in close proximity to the joint pit as shown in the detail drawing (Appendix 2-1). They have been located where possible in accessible areas away from watercourses. They will be constructed off the public road. A temporary surface is provided over these for safety and to allow easy access until the cables are pulled, after which time the area will be permanently reinstated/surfaced as appropriate. The location of these joint pits are provided on site layout drawings provided in Appendix 2-1.
- It is anticipated that construction will be carried out by a single team (with plant items likely to include excavators and dumpers) along the route, but there is a possibility to use two separate teams to speed up the construction. It is expected that each team could lay approximately 150m of the route per day.

Further details on the design for the grid connection cable trenches are provided in Appendix 2-1 while the associated construction methodologies are provided in Appendix 2-8.

2.10.6.3 Overhead Line End Masts

The loop-in and loop-out masts at the eastern end of the proposed grid connection will generally be constructed by installing the foundations and lower section of the mast first. The upper sections of the masts will only be constructed when the rest of the grid connection infrastructure is ready to become live. This approach will minimise the amount of time the main 110kV line must be switched off. Further details on the design for these

end masts are provided in Appendix 2-1 while the associated construction methodologies are provided in Appendix 2-8.

2.10.6.4 Watercourse & Culvert Crossings

The proposed grid connection contains 4 no. natural watercourse crossings (of which 3 no. are streams and 1 no. is a river), 1 no. drainage ditch. These are shown in Figure 2-4 and the site layout drawings in Appendix 2-1. Only 2 no. of these crossings have existing culverts in place, this being the stream along the short section of public road near the eastern end of the route, and the drainage ditch to the south of this. Table 2-2 below details the proposed methodologies for crossing the given watercourses shown in Figure 2-4.

Table 2-2: Watercourse crossing details

Watercourse Crossing No.	Culvert type and dimensions	Cover from top of opening to road/surface	Proposed crossing methodology	In Stream works required?
1	N/A	N/A	2	No
2	N/A	N/A	2	No
3	450mm concrete pipe	1400mm	1	No
4	Twin Concrete Box (600 x 900) and Plastic Pipe (950mm dia) combination	From 1120mm – 1500mm	1	No

The construction methodologies for the crossings are provided below. The route also contains numerous minor forestry drains and field drains which are usually dry, and only contain water during periods of heavy rainfall. These will be crossed using open trench crossings during dry periods.

2.10.6.4.1Crossing Methodology 1: Flatbed formation over culvert/bridge

Where the underground grid connection will traverse over a bridge/culvert without sufficient cover to allow for a standard trefoil duct formation, a flatbed duct formation can be employed. The ducts are placed side-by-side and encased in a 6mm galvanised steel casing, and covered in 35N concrete as per the EirGrid specifications. This will allow for a shallow trench to be used when crossing the bridge/culvert, and the ducts can revert to a standard trefoil formation once they have passed the location.

Further details of this proposed method are provided in Appendix 2-1 while the associated construction methodologies are provided in Appendix 2-8.

2.10.6.4.2 Crossing Methodology 2: Directional Drilling

A launch and reception pit is required for directional drilling, with each measuring approximately 1m wide, 2m long and 1m deep. Two ducts will be required at each crossing location. A specialised directional drill machine will be anchored to the ground and will drill at a suitable shallow angle to allow it to achieve the required depth for the bore. If ground conditions are unfavourable, the drilling process may need to be repeated using progressively larger drill heads until the required size is achieved. The drilling process involves pumping a drilling fluid through the drill head which is inert, natural and biodegradable (e.g. Clear Bore™). This fluid will be used sparingly and only as required to avoid an excess and will be appropriately stored when not in use. This fills voids locally around the drill head and enables the drill to progress without the hole collapsing. Should any excess drilling fluid occur, it will be contained and removed for disposal at a licensed waste facility. The duct will be positioned, and the launch and reception pits will be refilled.

Further details of this crossing method are provided in Appendix 2-1 while the associated construction methodologies are provided in Appendix 2-8.

2.10.7 Turbine Delivery Accommodation Works Areas

Where a new surface is needed along the public road corridor to facilitate deliveries to site, they will be agreed in advance with the local authority and carried out to the appropriate standard (TII, purple book, etc.).

Where a temporary surface is needed for the turbine delivery route, works will start with the clearing of any vegetation, and the topsoil will be stripped and either used locally for landscaping purposes or used for borrow pit reinstatement onsite. Where local use for landscaping does occur it will be smoothed off with the back of a bucket and seeded with a suitable grass seed mix. Silt control curtains will also be employed within 50m of a surface watercourse. Topsoil material will not be used locally within 50m of a watercourse, and peat material will not be used if found to be present at any location. It is anticipated that the majority of material will be taken to the wind farm site for borrow pit reinstatement. It may also be taken to a local licensed/permitted waste facility if found to contain any contaminants such as bitumen. Suitable fill material (broken stone and clause 804) will be used to create a firm running area for the passage of turbine delivery vehicles. The areas will be fenced off when the delivery is not occurring. After the delivery of turbines to site, the site will be re-instated to the original condition with removal of the temporary surface, and any removed vegetation will be reseeded/replanted with a similar native species composition.

2.11 ENVIRONMENTAL MANAGEMENT

2.11.1 Construction Phase Monitoring and Oversight

The requirement for a Construction and Environmental Management Plan (CEMP) to be prepared in advance of any construction works commencing on any wind farm site and submitted for agreement to the Planning Authority is now well-established.

A CEMP has been prepared for the proposed development and is included in Appendix 2-7. The CEMP will be updated prior to commencement of development to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the planning authority for written approval.

The construction contractor will be responsible for implementing the mitigation measures specified in the EIAR and CEMP and for communicating the requirements with all staff on-site. Their implementation of the mitigation measures will be overseen by the supervising Ecological Clerk of Works (ECoW), ecologists, archaeologists and/or geotechnical engineers, as appropriate.

The surface water drainage system will require regular inspection during construction works and during operations to ensure that it is working optimally. This is discussed further in the CEMP (Appendix 2-7).

2.11.2 Concrete Deliveries & Pouring

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place. The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area. These residual liquids and solids will be disposed of off-site at an appropriate waste facility near Kilkenny City. Where temporary lined impermeable containment areas are used, such containment areas are either excavated and lined with an impermeable membrane or involve creating a temporary pool with a ring of straw square bales covered in a heavy gauge plastic sheet. This washout will be located near the site entrance so that it is easily accessed when departing all turbine locations. The location is shown on layout drawings in Appendix 2-1.

Due to the volume of concrete required for each turbine foundation (assumed approximately 650m^3 as a worst case per turbine, but the exact figure will vary according turbine manufacturers requirements and may be less than this), and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours. Such activities are limited to the day of turbine foundation concrete pours, which are completed in a single day per turbine.

Because of the scale of the main concrete pours that will be required to construct the proposed wind farm, the main pours will be planned weeks in advance, and refined in the days leading up to the pour. Disposing of surplus concrete after completion of a pour will be off-site at the concrete production facility.

The CEMP (Appendix 2-7) provides further details of best practice and environmental considerations in relation to concrete deliveries and concrete pouring.

2.11.3 Refuelling

Any easily manoeuvrable road-going vehicles will be refuelled off-site. For any vehicles which are slow moving or tracked or those for whom regular trips off-site to refuel will not be practical, on-site fuelling will be required.

A limited amount of fuel will need to be stored on the site within the construction compounds for this purpose, and this will be within a double skinned and bunded mobile tank which can be moved around the site using a 4x4 vehicle to refuel, but will be stored in the construction compound when not in use.

A spill kit in the form of a supply of fuel absorbent material and mats and a drip tray will be kept with the tank at all times. The drip tray and fuel absorbent mats will be used at all times during refuelling. Similar spill kits will be stored in each construction compound, and at the on-site substation in case of emergency.

No refuelling will be carried out within 50m of a watercourse.

Only designated trained and competent operatives will be authorised to refuel plant on site.

In the event of an accidental fuel spill, the source of the spill will be fixed, fuel will be contained and cleaned as quickly as possible using the fuel absorbent material in the spill kits. The incident will be reported to the site manager and Environmental Clerk of Works, and appropriate remediation will be carried out (i.e. soil removal for safe disposal at a licensed waste facility near Kilkenny City, etc.).

The CEMP (Appendix 2-7) provides further details of best practice and environmental considerations in relation to this.

2.11.4 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads and along the site roads to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this will transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff. The CEMP (Appendix 2-7) provides further details of best practice and environmental considerations in relation to this.

2.11.5 Waste Management

A Waste Management Plan (WMP) is provided as part of the CEMP in Appendix 2-7 and details the best practice in waste management during all phases of the proposed development, with a view to reducing, reusing, recycling and recovering waste produced, in that order of preference. Waste disposal will be avoided where possible. The WMP and waste management practices associated with the proposed development will be in accordance with relevant provisions of the Waste Framework Directive (Directive 2008/98/EC on waste), the Waste Management Act 1996 as well as all other Irish and EU legislation.

The main site contractor will appoint a Waste Manager who will ensure that all waste contractors have the correct permits for any waste streams they are removing from site, and that they are taking it to the appropriately licensed/permitted waste facilities. They will also ensure that all parts of the WMP will be implemented onsite.

2.11.6 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. Site roads will be already formed using on-site materials before other road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). The site roads will be well finished with compacted hardcore, and so

the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

However, in the interest of best practice and to avoid the potential for the transfer of alien invasive plant species into the site, it is proposed to install a self-contained wheel-wash system near the project site entrance. The drawings in Appendix 2-1 include typical details and proposed location of a proposed self-contained wheel-wash system which will be installed as part of the construction phase of works.

A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the proposed development.

The CEMP (Appendix 2-7) provides further details of best practice and environmental considerations in relation to this.

During the operational phase, the onsite access tracks will be maintained in good condition, and any vehicles that need to access the site will be generally keeping on these surfaces. As a result of this, and the low volume of traffic expected on site, it is not anticipated that a wheel washing facility would be required during the operational phase.

2.1.1 Major Accidents and Natural Disasters

A complete EIAR should consider the potential impacts of major accidents caused by the proposed development (or associated works), as well as the potential vulnerability of the proposed development (and associated works) to natural disasters. In this regard, the most likely major accidents that could occur as a result of the proposed development (and its associated works) include:

- Significant hydrocarbon spillage;
- Turbine collapse; and
- Turbine or substation fire.

The most likely natural disasters that might occur and potentially impact the proposed development (and its associated works) include:

- Fire; and
- Landslide.

Given the topography of the wind farm site, and the nature of the proposed infrastructure/works, it is not anticipated that flooding would cause a significant threat to the proposed project. A Flood Risk Assessment was carried out and is provided as Appendix 9-1 to this EIAR.

The above potential major accidents and natural disasters are considered where relevant throughout the EIAR chapters. Landslide risk is discussed in Chapter 8 (Land, Soils & Geology), risk of hydrocarbon spillages are discussed in Chapter 9 (Hydrology & Hydrogeology) while the risk or fires and turbine collapse in terms of human health are discussed in Chapter 5 (Population & Human Health).

2.12 HEALTH AND SAFETY

The proposed Castlebanny Wind Farm will be constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation as described in the CEMP (Appendix 2-7).

Aspects of the development that will present health and safety issues include:

- Health and safety aspects of construction activities;
- General construction site safety (e.g. slip/trip, moving vehicles etc);
- On site traffic safety (during construction and operational phases) associated with localised high road embankments;
- Traffic safety during the transport of oversized loads to the site;
- Lifting of heavy loads overhead using cranes;
- Working at heights; and
- Working with electricity during commissioning.

A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared prior to the construction stage. Further details are provided in the CEMP (Appendix 2-7).

The scale and scope of the project requires that a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) are required to be appointed in accordance with the provisions of the Safety, Health and Welfare at Work (Construction) Regulations. The PSDP role has been performed by TOBIN Consulting Engineers up to the end of the planning stage of the project.

The PSDP and PSCS appointed for the project shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations as described in the CEMP (Appendix 2-7).

None of the construction, operational or decommissioning phases of the project are anticipated to cause a significant negative impact to safe practice of agricultural and commercial activities outside the development footprint.

It is not anticipated that the operation of the wind farm will present a danger to the public and livestock. Rigorous safety checks are conducted on the turbines during design, construction, commissioning and operation to ensure the risks posed to staff, landowners and general public are negligible.

Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits.

Signs will be erected at suitable locations across the site as required for the ease and safety of operation of the wind farm. Further details are provided in the CEMP (Appendix 2-7).

The emergence of the Covid-19 virus in Ireland in the early part of 2020 has presented a new human health risk and concern amongst the general public across the country and within the proposed development study area. Proposals relating to Covid-19 are discussed in Chapter 5 (Population and Human Health).

An operational phase Health and Safety Plan will be developed to fully address identified Health and Safety issues associated with the operation of the site and providing access for emergency services at all times.

The components of a wind turbine are anticipated to have a useful lifespan up to 35 years or more and are equipped with a number of safety devices to ensure safe operation during their lifetime. During the operation of the wind farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the site's health and safety requirements.

2.13 WIND FARM OPERATION

The proposed wind farm development is expected to have a lifespan of 35 years. This is the anticipated useful lifespan of wind turbines which are being produced for the market today. The lifespan of wind turbines has been increasing steadily in recent years and allowing this duration will improve the overall carbon balance of the development, therefore maximising the amount of fossil fuel usage that will be offset by the wind farm. Leaving the wind turbines in-situ until the end of their useful lifespan would make the most sense from an environmental viewpoint, particularly in relation to carbon savings. During this operational period the wind turbines will generally operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected together, and data relayed from the wind turbines to a control centre off site. Each turbine will also be monitored off-site by the wind turbine supplier or Operations and Maintenance (O&M) service provider. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at a control centre 24-hours per day.

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

Once operational, the wind farm will support 2-3 full-time long term, high quality technical jobs in operation and maintenance as well as a number of jobs in ancillary functions.

2.14 WIND FARM DECOMMISSIONING

As stated previously the wind turbines proposed as part of the proposed development are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site will be decommissioned fully, with the exception of the electricity substation.

Upon decommissioning of the proposed wind farm, the wind turbines will be disassembled in reverse order to how they were erected. All above ground turbine components will be separated and removed off-site for recycling. Turbine foundations will remain in place underground and will be covered with earth and allowed to revegetate or reseed as

appropriate. Turbine hardstands will be removed, and the areas also allowed to revegetate or reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in potentially significant environment nuisances such as noise, dust and/or vibration. The site roadways may be in use for additional purposes to the operation of the wind farm (e.g. for forest/agricultural and recreational access) by the time the decommissioning of the project is to be considered, and therefore it will likely be more appropriate to leave the site roads in situ for future use.

The on-site substation will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network. Therefore, the substation will be retained as a permanent structure and will not be decommissioned.