2 PROJECT DESCRIPTION

2.1 INTRODUCTION

This Chapter of the EIAR provides a description of all elements of the proposed Garrane Green Energy Project (the Project). This includes all elements within the Redline Boundary, the wind turbines, Substation, Access Tracks, Met Mast, turbine hardstands and all site infrastructure. This Chapter also provides a description of the temporary accommodation requirements along the proposed Turbine Delivery Route (TDR) which are outside the Redline Boundary and which together with the works within the Redline Boundary are defined as the Project which form the basis of the assessments presented within Chapters 5 to 18. This Chapter provides details of the construction, operational and decommissioning phases of the Project.

This Chapter includes an overview of the Project followed by a detailed description of the main components and their method of construction. Measures that have been built into the design of the Project to reduce effects, also known as 'Embedded Mitigation', measures, are set out in the various technical chapters and in this chapter. In addition to these Embedded Mitigation measures, Chapters 5 to 18 also present mitigation and enhancement measures where specifically relevant to their assessment topic.

This Chapter of the EIAR is supported by supporting Figures in **Volume III** and the following Appendix documents provided in **Volume IV**:

- Construction Environmental Management Plan (CEMP) in **Appendix 2.1**
- Suir Grid Construction Report in **Appendix 2.2**
- Bridge Construction Method Statement (WC01 & WC02) in **Appendix 2.3**

Common acronyms used throughout this EIAR can be found in **Appendix 1.4**.

2.2 PROJECT DESCRIPTION

Permission is being sought by the Developer for the construction of 9 No. wind turbines, a permanent Met Mast, an on-site 110kV Substation with a 'loop in' Grid Connection to the existing 110kV OHL between Charleville and Killonan, and all ancillary works. Temporary accommodation requirements at locations along the TDR are not included in the planning application but are assessed as part of the EIAR.

The proposed works within the Redline Boundary will include the following main components:

- Erection of 9 No. wind turbines with a tip height of 170m. The wind turbines will have a rotor diameter of 150m and a hub height of 95m.
- Upgrade of existing Access Tracks and construction of new permanent Access Tracks, permanent turbine hardstand areas and turbine foundations.
- Construction of two new bridge crossings on-site, one over the River Maigue and one over the Charleville Stream.
- Upgrade of existing site drainage network and installation of new site drainage.
- Wind Farm Internal Cabling connecting the wind turbines to the electrical substation.
- Construction of a permanent on-site AIS 110kV Substation, with a 'loop in' Grid Connection to the existing 110kV overhead line between Charleville and Killonan, including two single-storey control buildings with welfare facilities, all associated electrical plant and equipment, security fencing, gates, signage, all associated underground cabling, private well for water supply, wastewater holding tank, and all ancillary structures and works.
- Construction of a permanent double circuit 110kV underground cable and two steel cable interface masts to connect to the existing overhead line.
- Erection of a permanent 60m Meteorological Mast for monitoring wind speeds.
- Construction of a Temporary Construction Compound for use during construction.
- Upgrade of the existing entrance on the N20 (Site Entrance 1) (to be used for abnormal loads and turbine component delivery) and upgrade of an existing site entrance on the L1537 (Site Entrance 2) (to be used for all construction traffic except for abnormal loads and turbine component delivery).
- 6 No. temporary spoil storage areas and 1 No. permanent spoil storage area.
- Biodiversity enhancement and improvements associated with the Project.
- Landscaping, fencing and all associated ancillary works.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire wind farm is being sought. However, the onsite Substation and the Grid Connection will be handed over to ESB networks to own and operate. As part of the national grid infrastructure, permission is sought for the Grid Connection and the Substation in perpetuity.

The EIAR assesses the Project which includes the works within the Redline Boundary as outlined above as well as the temporary accommodation requirements at 6 No. locations along the proposed TDR from Foynes Port. A TDR option from the Port of Galway was also assessed for the delivery of turbine blades only which includes temporary accommodation works at 11 No. locations.

2.3 SITE LOCATION AND ENVIRONS

2.3.1 Introduction / Existing Land Use

The Site, as shown in **Figure 1.1**, is located within an agricultural landscape between Ballynagoul, Creggane and Garrane, Co. Limerick. The Site is in private ownership of multiple landowners and situated within an area of pasture farmland. The Site is located 22.9km south of Limerick City, 46.9km north of Cork City and 2.5km (closest turbine) north of Charleville, Co. Cork.

Temporary accommodation requirements (6 No.) will be required to accommodate the delivery of the turbine components from Foynes Port. These temporary works are not included as part of the planning application but are assessed as part of this EIAR. These areas are within the existing public road corridor and are located in the townlands of Corgrig, Court, Ballybrown, Ballylicky, Skehacreggaun, Ballykeeffe, Rossbrien, Ballybronoge South, and Garrane. Temporary accommodation requirements (11 no.) will be required on the Galway Port TDR will be required to accommodate blades from Foynes Port. These temporary works are not included as part of the planning application but are assessed as part of this EIAR. These areas are within the existing public road corridor and are located in Galway City and the townlands of Caraunduff, Rathmorrissy, Rossbrien, Ballybronoge South and Garrane. These works are detailed further in **Chapter 17: Traffic and Transportation**, **Section 17.2.10**.

The Site has a total area of 158.75ha (392 acres). The areas designated for temporary spoil storage extend to 2.19ha. The permanent spoil storage area (berm) located beside the Substation is 0.405ha. All spoil storage areas fall within the Redline Boundary. The land is private property and the principal land use in the general area is comprised of agricultural pasture grazing farmland.

There are 166 sensitive receptors within 2km of the proposed turbines. This includes 3 No. commercial properties, 6 No. derelict houses and 157 No. residential receptors of which 5 No. are involved in the Project. The closest inhabited dwelling not involved in the Project is (H33) located 702m from the nearest turbine (T8). The closest dwelling involved in the Project is H28 located 529m from T3. All sensitive receptors located within 2km of the proposed turbines are shown on **Figure 1.3**.

2.3.2 Wind Farms in the Area (Cumulative)

There are 10 No. wind farms within 20km of the Site of which 7 No. are operational, 1 No. is consented and 2 No. are proposed wind farms within 20km of the Site. The 20km search

area was selected in accordance with best practice and guidance. **Figure 2.1** shows the location of proposed, permitted and operational wind farms within a 20km radius of the proposed turbines and **Table 2.1** below provides further information on these wind farms. The nearest operational wind farm is Rathnacally Wind Farm which is located 5.9km to the south of the Site.

Table 2.1: Wind Farms within 20km of the Site

Wind Farm	Status	No. of Turbines	Distance to the Site Boundary	Direction from the Wind Farm
Rathnacally Wind Farm	Operational	2	c. 5.9km	South
Boolard Wind Farm	Operational	2	c. 9.0km	Southwest
Kilmeedy Wind Farm	Operational	2	c. 16km	Northwest
Slieveragh Wind Farm	Operational	2	c. 19.3km	East
Knocknatallig Wind Farm (formerly Buttevant Wind Farm)	Operational	6	c. 11.3km	South
Castlepook Wind Farm	Operational	14	c. 14km	Southeast
Kilberehert Wind Farm	Operational	3	c. 18.8km	Southwest
Annagh Wind Farm	Proposed	6	c. 8.6km	South
Tullacondra Wind Farm	Consented (appealed to the Commission)	9	c. 20.7km	Southwest
Ballinlee Wind Farm	Proposed	17	c. 7.7km	Northeast

2.3.3 Other Developments (Cumulative)

All other proposed, permitted or approved developments with potential for cumulative effects that are located within 10km are listed below in **Table 2.2**. The 10km radius distance search area selected for other development, other than wind farms, is considered to be reasonable for cumulative impact assessment for EIAR and consistent with the EPA "Guidelines on the information to be contained in environmental impact assessment reports" (2022) and best practice.

Table 2.2: Other Major Developments or Proposed Developments (bigger than a one-off house) within 10km of the proposed Site.

Other Developments	Status	Planning Reference	Decision Date	Distance to the Site Boundary	Direction from the Wind Farm
Erection of a 30m high lattice telecommunications support structure together with antennae,	Permission	21986	15/03/2022 LCC	2.2km	North

Other Developments	Status	Planning Reference	Decision Date	Distance to the Site Boundary	Direction from the Wind Farm
dishes and associated telecommunications equipment, all enclosed in security fencing and extend existing access track.					
The development will consist of A) construction of a production building (approx. floor area 4200 sq.m) which will also include employee welfare facilities, plantrooms and storage area to facilitate additional capacity for the production of their existing Cheestrings product at this site and B); site works ancillary to the above including demolition of a store building (approx. floor area 37 sq.m), works to service roads, footpaths, car park and truck loading bay facilities, installation of drainage and utility services together with installation of external CIP storage tanks and pipe bridge structure, all in the vicinity of the proposed building.	Permission	224226	27/07/2022 CCC	2.5km	Southwest
Ball wall, astro turf pitch with perimeter fence including netting, astro turf LED lights and gravel path LED lights.	Permission	23403	05/11/2023 LCC	2.9km	Northeast
The erection of a 24m high lattice tower together with antennae, dishes, and associated telecommunications equipment, all enclosed by security fencing.	Permission	2360822	17/03/2024 LCC	3km	Northwest
The construction of 114KWP photovoltaics solar farm system, underground cable, an inverter building and all associated site works. These works are being carried out within the curtilage of a Protected Structure.	Permission	19455	02/07/2019 LCC	3.8km	North
The construction of a residential development of 56 no. units which will consist of the following: - 12 no. 3-bed semi-detached, 14 no. 3-bed end-terrace, 5 no. 3-bed mid-terrace and 9no. 2-bed mid terrace 2-storey dwelling houses along with 16 no. 1-bed maisonettes. Access to the proposed development is to be provided via the existing road serving the adjoining Brindle Hill residential development. Planning permission is also sought for connection to all necessary public	Permission	224578	01/12/2022 CCC	3.9km	South

Other Developments	Status	Planning Reference	Decision Date	Distance to the Site Boundary	Direction from the Wind Farm
services, secure bicycle parking and bin storage, associated landscaping and all ancillary works necessary to facilitate the development.					
The construction of an anaerobic digestion facility to produce renewable biomethane, CO_2 (which will be captured), and a bio-based fertiliser from organic material.	Refused	2560239	18/05/2025 LCC	6km	Northeast
The construction of a 110kV 'Single Bay Tail Fed' Substation, 110kV Underground Grid Connection and all associated works	Permission	314431	19/02/2024 ACP	8.7km	Southwest
Development of a 67.8ha Solar PV Farm	Permission	306915	01/03/2021 ACP	8.7km	Southwest
Construction of the new proposed M20 Motorway from Limerick to Cork	N/A	N/A Design	N/A LCC & CCC	1.6km	West
Permission for Retention to retain the following:- (a) Site floodlighting, (b) 2 no. ancillary single storey maintenance buildings, (c) 1 no. mobile tent structure for storage of battery powered lift machines, (d) Increase in concrete hardstanding area inside gated entrance and along north-east boundary and its use as an ancillary outdoor storage area and (e) All associated site works. Permission for the provision of a washdown separator to the existing power wash bay located on the extended concrete hardstanding.	Permission	254252	07/07/2025 CCC	2.4km	Southwest
Foynes to Limerick Road (including the Adare Bypass) including all ancillary and consequential works.	Permission	306146	30/08/2022 ACP	Interacts with the TDR	N/A
A retail warehouse building, associated car parking, bike shelter, site perimeter fencing, connection to existing foul and storm sewers on public access road and associated site works	Further Information	256032	05/10/2025	5.8	East

There are numerous developments within 10km which are of considerable size, such as the proposed M20 Motorway, roundabout at O' Rourke's Cross, two solar farm developments, located 3.8km north, 8.7km southwest respectively and a 56 - unit residential development located 3.9km south. Other developments in the area are generally for change of use of

existing buildings and the construction of a recreational 'Astro Turf' football pitch. On the TDR, the most significant proposed development is the proposed Foynes to Limerick Road (which includes the Adare bypass).

2.3.4 Land Ownership

The Site is located on lands under the ownership of third-party private landowners who have formally consented to the application and the Project.

2.4 WIND RESOURCE

Due to its location in the southwest of Ireland, and elevation, the Site experiences high average annual wind speeds. The Irish Wind Atlas produced by Sustainable Energy Ireland shows average wind speeds for the country and it shows that wind speeds on the Site are consistent with windfarm development (5.4m/sec at 30m, 6.8m/sec at 75m, 7.2m/sec at 100m and 8m/sec at 150m) of the nature of the Project being viable at this location.

2.5 SITE INFRASTRUCTURE AND CONSTRUCTION

2.5.1 Proposed Layout Design

The layout of the Project has been designed to minimise the potential environmental effects of the Project while utilising the maximum energy yield from the Site's wind resource as detailed in **Chapter 3 Alternatives**. The layout design was informed by the following constraints and buffers selected in accordance with best practice and guidance:

- Distance to watercourses of at least 50m.
- Distance to land drains of at least 10m, where possible.
- Distance to recorded archaeological monuments and structures of at least 20m from the outer edges of all known and potential archaeological sites within the Site (professional judgement based on experience)
- Distance from turbines to inhabited houses of at least 500m for involved landowners and 680m for non-involved houses.
- Existing high voltage overhead powerlines on the south of the site where 2 x fall over distance buffer to wind turbines is applied.
- Avoidance of more sensitive habitats, e.g., hedgerows and watercourses.
- Consideration of the mapped flood event extents on Site.
- Minimising interaction with the existing industrial outflow pipeline passing through the Site from south to north.
- Setback distance of blade tip height plus 10% from turbines to the national road (N20).

The overall layout of the Site is shown in **Figure 1.2**. This figure shows the proposed locations of the wind turbines and associated hardstanding areas, Substation, Met Mast, temporary construction compound, Access Tracks and the Site Entrances. The coordinates (in ITM and ING) of the nine turbines are listed in **Table 2.3**.

Table 2.3: Turbine ITM Coordinates

Turbine No.	ITM Easting (m)	ITM Northing (m)	ING Easting [m]	ING Northing [m]	Top of Foundation Level (m OD)
T1	554494	626040	154539	126005	61.60
T2	554358	626367	154403	126332	58.80
T3	554070	626632	154115	126597	58.10
T4	554378	626844	154423	126809	57.81
T5	554107	627092	154152	127057	57.81
T6	554452	627196	154497	127161	57.81
T7	554352	627558	154397	127523	57.81
T8	553804	627520	153849	127485	57.81
T9	554073	627806	154118	127771	57.95

2.5.2 Flood Zone

The Site is partly located in a flood zone according to the Catchment Flood Risk Assessment and Management (CFRAM) OPW Flood Risk Assessment Maps associated with the River Maigue and its tributaries, in particular, the Charleville Stream.

A Stage III level site-specific FRA has been carried out for the Site to assess the capacity and design flood levels of the river channel network at the Site (Maigue River, River Loobagh and Charleville Stream). Proposed turbines **T4, T5, T6, T7,** and **T8** are located in the 100-yr and 1000-yr design flood events. The northern parts of the main Access Track through the Site is located in the mapped flood zone and hence has been designed relative to existing ground levels to reduce the footprint of the Access Track and hardstand infrastructure in the floodplain during construction. The Hardstands will be reduced in size during the operational phase and the reduced footprint will be constructed above 1:20yr flood level. During the operational phase the Access Tracks in the floodplain will be constructed be above the 1 in 20 year level to allow access to all parts of the Site for

maintenance and emergency service vehicles in the event of a flood. The top of foundation levels for all turbines within the flood zone will be designed so that the top of the plinth will be 150mm above the 1:1,000-year flood levels plus climate change (cc). This is due to having electrical equipment in the turbines positioned outside the flood level of 1:1,000 year + cc events. The arrangement is shown on Drawing No. **6839-JOD-GGE-XX-DR-C-503.** As discussed further in **Section 2.5.4** and **Section 2.5.6**, design measures have been implemented that minimise both environmental and infrastructure risks associated with the Project. In the event of forecasted extreme flooding, a construction phase and operational phase flood event emergency response procedure has been prepared, further details can be found in **Management Plan 3: Surface Water Management Plan**. This will be further updated by the appointed contractor to take into consideration any planning conditions prior to construction activities commencing.

Further details in relation to the flood zones and mitigation measures proposed can be found in **Chapter 10: Hydrology and Hydrogeology** and **Appendix 2.1: CEMP.**

2.5.3 Wind Turbine Generator

The proposed turbines will be of typical modern design and will be a three-bladed, rotor up wind of the tower, variable speed, pitched blade regulated machine. Turbine appearance will be a matt non-reflective finish in a white, off-white or grey colour. The foundation-to-tip height will be 170m.

The turbine will have a circular based tower, sitting on a reinforced concrete foundation. The tower will support the nacelle, rotor hub, and rotor blades. Commercial wind turbine towers are typically made of steel or a hybrid of steel and concrete. The nacelle is mainly metal (steel, copper, aluminium, etc.) with a metal/plastic/glass-reinforced plastic (GRP) body, while the blades can be made of a matrix of glass-fibre reinforced polyester or wood-epoxy or similar composite materials.

Each turbine will have a generator with a maximum capacity of 6MW giving an overall capacity of 54MW. The turbines may be direct drive machines or may contain a gearbox. The turbine model will be chosen in a competitive tendering process as part of the Project financing process, after all necessary consents have been secured but will adhere to the parameters set out in **Table 2.4**.

The final choice of turbine model is unknown at this stage, given that the competitive tender for turbines on any project commences at construction stage. The dimensions and attributes

of the turbine, for which planning permission is being sought and that has been assessed for the purposes of this EIAR, is comparable to a Vestas V150 turbine model. A schematic drawing of the proposed turbine is shown on Planning Drawing: **6839-JOD-GGE-XX-DR-C-0504**.

For the purposes of the assessments, the dimensions of the turbine for which planning permission is being sought, are presented in **Table 2.4**

Table 2.4: Turbine Parameters

Turbine Parameter	Dimensions
Turbine Blade Tip Height	170m
Rotor Diameter	150m
Hub Height	95m

2.5.4 Turbine Foundation and Turbine Hardstands

All turbine suppliers have a requirement for a turbine hardstand area to be constructed beside each turbine. The layout of the turbine hardstand is designed to accommodate the delivery, laydown, and assembly of turbine components (in particular rotor assembly) prior to turbine lifting and assembly and is shown **Drawing No. 6839-JOD-GGE-XX-DR-C-0501** The turbine hardstands are needed to support the cranes during turbine construction, operational and decommissioning phases. The turbine hardstands will be constructed in advance of the turbine foundation and will be used to facilitate foundation construction, such as steel reinforcement delivery and pouring of concrete. Site investigation works show the bedrock geology type at the turbine locations to be limestone rock.

Construction of the turbine foundations and hardstands will require the excavation of overburden material to the area and depth outlined below, the laying of a geotextile material on the formation surface and placing engineered stone and a top dressing. The main turbine hardstands will be 3,867m^2 for T1, T2 and T9. The turbines located within the floodplain will have reduced footprint of 1,700m^2 (T3), 2180m^2 (T4, T6, T7 & T8) and 1,889m^2 (T5). Hardstands will be a maximum depth of 0.85m depending on the local bedrock profile and the varying soil depth giving a surface area of 23,910m^2 for nine turbines and will require a material volume of 20,323.5m^3.

The reduced turbine hardstand size for T3 and T5 is due to the presence of an outflow pipeline and existing farm access track. 'Just in time' delivery of turbine components will be required at these two turbines. The arrangements of these are shown on **Drawings No**. **6839-JOD--GGE-XX-DR-C-0205** T3 and **6839-JOD-GGE-XX-DR-C-0204** T5.

The turbine hardstands that are inside the flood zone (T4, T5, T6, T7 and T8) will be mostly reinstated post construction. The reinstatement of these hardstand areas post construction will reduce the hardstand area in the flood zone and will reduce the downstream flood risk. Each of the hardstands in the flood zone will have a reduced strip of hardstand which will not be reinstated post construction to allow access to the turbines for maintenance vehicles during the operational phase. These hardstands will have an operational area of 1,120m^2, except for T5 which will have a post construction hardstand area of 940m^2. During the operational phase, turbine hardstand areas will be reduced, with the reduced hardstand area being built up to the 1:20-year flood level. The reinstatement of these hardstand areas post construction will reduce the hardstand area in the flood zone and will reduce the downstream flood risk. The arrangement is shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0215**.

The turbines within the flood zone, T4, T5, T6, T7 and T8, will require piled foundations, comprising rotary bored piles into bedrock supporting the concrete base slab with a central upstand to support the tower. The turbines will use a buoyant foundation type using 16 No. 10m long piles bored at least 3m into intact limestone bedrock. The foundations for each turbine will be designed by the appointed Designer. Piled foundation bases are a maximum of 21m in diameter with detailed foundation design being dictated by the local ground conditions. The construction methodology for the turbine foundations is detailed **Appendix 2.1 - CEMP**. The top of foundation levels for all turbines within the flood zone will be designed so that the top plinth will be above the 1:1000-year flood level plus climate change plus 150mm freeboard. The arrangement is shown on Drawing No. **6839-JOD-GGE-XX-DR-C-503.**

After the foundation level of each turbine has been formed using piling methods, the bottom section of the turbine tower or cage reinforcing steel is then built up around and through the cage and the outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete.

The turbine foundations for turbines outside of the flood zones, that is T1, T2, T3, and T9, will be 27.2m in diameter and have a depth of 3.5m. The Turbine Foundation design will

depend on the turbine model type and will be decided by the structural engineers prior to construction but will fall within the above dimensions. The central part of the foundation will be 6m in diameter, will be raised from the main Turbine Foundation below ground level and will encompass cast-in bolts to connect to the bottom of the turbine tower and reinforced bar structural elements.

The volume of concrete and steel required for each turbine foundation will be 950 m³ and 85 tonnes respectively. The area around and above the turbine foundation will be backfilled with compacted granular material and the only portion exposed in the long term will be the central foundation section. Material will be sourced from a local quarry such as one of those identified in **Table 2.5** below.

Table 2.5: Local Quarries and Concrete Suppliers

Quarry	ITM (Easting)	ITM (Northing)	Distance (km)	Direction	Comments
Shane Foley Plant Hire Ltd.	553935	617622	7	S	Quarry products, sand and gravel, contract crushing
Ballyhea Ready mix	553610	617588	7.1	S	Concrete, gravel
Costello Quarry	550036	633520	9	NW	N/A
Ballyorgan Quarry	567915	619790	14	E	N/A
Kilmeedy Sandstone Building Stone Quarry	538364	630066	16.5	NW	Building stones, crushed stones and decorative stones
Liam Lynch (Quarries) Ltd	545816	639954	17	NW	Crushed stone, ready-mix concrete, aggregates for concrete
Rockmills Limestone Quarry	572177	606552	26	SE	Building stone, agricultural lime, various stone sizes
Croom Concrete Limited	549774	639633	12.3	NW	Precast Concrete
Granagh Concrete Products	548402	634164	8.1	NW	Concrete, sand & gravel chippings
Ballyhea Readymix	553589	617558	7.2	S	Ready-mix concrete and stone products
Ducon Concrete Limited	537978	599324	31.2	SW	Crushed stone, ready-mix concrete, aggregates for concrete
White Rock Quarries	547800	603358	23	SW	Crushed limestone aggregate

Quarry	ITM (Easting)	ITM (Northing)	Distance (km)	Direction	Comments
Roadstone Mallow	559589	599935	25	S	Ready-mix concrete, aggregates, asphalt and macadam, mortar and plaster, concrete blocks and masonry, paving products

Trial pitting and geophysical surveys were carried out on site as detailed in Chapter 9 Soils and Geology. Shallow rock was not encountered during the SI Trial Hole campaign however, analysis of geophysical survey data indicates depth to intact limestone varies from 4m to >18m at the main infrastructure. Confirmatory site investigations will be undertaken post consent to confirm the depth to bedrock and to facilitate detailed design. Traditional gravity foundations are assessed for EIA purposes for T1, T2, T3, and T9, as this represents the most conservative scenario due to the amounts of concrete required, but it should be noted that where solid competent rock is found to be available at foundation level, that rock anchor foundations instead of gravity foundations will be progressed for these turbine foundations as this methodology has the potential to further reduce potential environmental effects. As discussed above, turbines within the flood zone will require piled foundations.

The construction methodology for the turbine foundations will depend on the strength and depth of the substrata (layers of rock or soil beneath the surface) specific to each location. Turbine foundations will need to be taken down to competent bearing strata by excavating through the soil, subsoil and rock (if necessary). The construction methodology is based on desktop studies and site investigations. The construction methodology for the turbine foundations is detailed **Appendix 2.1 – CEMP.**

The method of construction for gravity turbine foundation is described as follows:

- Set out turbine foundations and required finish levels etc.
- Construct formation and/or supporting structures.
- Construct drainage as required.
- Provide a minimum of 100mm concrete blinding.
- Place bottom mat of steel reinforcing.
- Place free issue turbine base insert or anchor cage.
- Fix cable ducting and foundation earthing.
- Complete reinforcing steel.
- Fix shuttering to base sidewalls.
- Fix ducts and earthing wires between insert and walls of base.

- Carry out any corrective works as directed by Engineer.
- Check weather conditions and schedule concrete deliveries.
- Place concrete and take quality control slumps and cubes.
- Concrete surface finishing.
- Apply curing and protection of concrete.
- Strip formwork.
- Placing of any earthing wires around and over the base.
- Backfill base sides and place overburden.
- Confirm that cube results are satisfactory[1].
- Grout the top flange.

The method of construction specific for the piled foundations is described as follows:

- Excavate approximately 300mm to 500mm of topsoil and Install approximately 500mm of crushed stone, compacted in two layers to form a stable platform used to support the piling rig during drilling.
- Set out pile locations.
- Construct piles by drilling vertical holes of approximately 900 mm in diameter to a minimum depth of 3 m into bedrock and installing steel reinforced cage and structural concrete.
- Excavate the footprint of the turbine foundation including working width for formwork and duct installation to formation level.
- Construct 100 mm thick concrete blinding layer.
- Prepare top of piles for connection to foundation reinforcement
- Once formation level, pile preparation and concrete binding is in place, the methodology will be the same construction methodology as outlined for gravity turbine foundations above.

For the Turbines within the flood zone T4, T5, T6, T7 and T8 the foundations will be piled. The foundations will be constructed so that the top of the foundation will be above current ground level so that the plinths are above the 1:1,000 year flood level + cc plus 150mm, top of foundation levels are detailed **Table 2.3**.

[1] Concrete cubes made during the pouring of the base are crushed to confirm that the required concrete strength has been reached.

2.5.5 Access to the Site

This EIAR assesses the preferred TDR from Foynes Port to Site for blades and turbine components and an alternative TDR which includes blade delivery only from the Port of Galway with all other components transported from the Port of Foynes

While not part of this planning application, this EIA assesses the temporary accommodation requirement works at 6 No. locations along the TDR from Foynes Port to the Site as outlined in **Table 2.6**. An additional location (Location 7) is within the Redline Boundary of the Project. No other third party lands are required for the temporary accommodation requirements along the TDR. A trial run will be undertaken prior to delivery of turbine components, this will include assessment of the road network. If the vertical alignment is not sufficient for the length of the blade delivery vehicles, a dolly type vehicle can be utilised.

Enabling works required along the Port of Galway route are shown in **Table 2.7** and detailed in **Appendix 17.4**.

Full details of the works locations on the TDR between Shannon Foynes Port and the Site are outlined in **Appendix 17.3** of the EIA. Full details of the works locations on the TDR between the Port of Galway are shown in **Appendix 17.4** of the EIA.

Temporary accommodation requirements will be required to accommodate the delivery of the turbine components. These temporary works are assessed as part of this EIAR and are located in the townlands of Corgrig, Court, Ballybrown, Skehacreggaun, Ballykeeffe, Rossbrien, Ballybronoge south, Attyflin and Garrane. The works locations are outlined in **Table 2.6** and **Table 2.7** and also detailed in **Appendix 17.2**.

Table 2.6: Enabling Works for Foynes Port Turbine Delivery Route

Location	ITM (Easting)	ITM (Northing)	Works Required
1 - N69 / L6188 Junction at Foynes Port	525840	650938	Existing boundary to be set back. Verge strengthening to withstand wheel loading on inside of bend. Tree trimming for blade oversail. Temporary removal / relocation of signs, street furniture and lighting columns at junction

Location	ITM (Easting)	ITM (Northing)	Works Required
2 - N69 Roundabout at Clarina	550358	653665	Temporary removal / relocation of signs, and street furniture at junction Over-run to be reinstated through roundabout central island.
3 - N69 / N18 /R510 Dock Road West Roundabout	554511	655141	Over-run to be constructed through roundabout central island to withstand wheel loading from abnormal load vehicles. Tree trimming for blade oversail. Temporary removal / relocation of signs, street furniture and lighting columns at junction.
4 - N69 / N18 /R510 Dock Road East Roundabout	554664	655250	Temporary removal / relocation of signs, street furniture and lighting columns at junction. Modifications to roundabout central island for blade oversail. Tree trimming for blade oversail.
5 - N18 Junction 1 – M20 Slip Road	557880	654779	Temporary removal / relocation of signs, street furniture and lighting columns for blade oversail. Tree trimming for blade oversail.
6 - M20 Junction 5 N20 Exit	551160	648462	Temporary removal / relocation of signs and street furniture for blade oversail. Tree trimming for blade oversail.
7 – N20 Site Entrance 1 (These works are included in the Redline Boundary)	553394	627567	New site entrance constructed to accommodate the swept path of abnormal vehicles. Removal of vegetation from N20 verges. Tree trimming for blade oversail.

Table 2.7: Enabling Works for Galway Port Turbine Delivery Route (Blades Only)

Location	Works Required
1 -Galway Docks	Parking restrictions in Galway Port Car Park, temporary alterations to existing fencing, loadbearing surface to be provided.
2 -Lough Atalia Road / R339 College Rd Junction	Existing signs and traffic lights to be temporarily removed during abnormal load deliveries. Contraflow to avoid traffic island.
3 - R338 / R339 Junction	Contraflow at junction to avoid traffic island and traffic lights on central island.

Location	Works Required
4 - R339 / L5034 Junction	Location of traffic lights and street furniture to be checked prior to transportation. Existing hedge to be trimmed.
5 - L5034 / R336 Junction	Lighting column on inside of bend to be moved during transportation. Vegetation to be trimmed for load oversail.
6 - N6 / N83 / R336 Junction	Vehicles to contraflow slip lane at junction to avoid traffic islands. Pedestrian railing to be removed at inside of bend during transportation. Traffic light to be removed at inside of bend during transportation. Directional sign to be relocated during transportation.
7 - N6 / N67 Roundabout Segregated Left Turn Lane	Lighting column to be removed during transportation. Road sign to be removed during transportation. Road sign on splitter island to be removed during transportation.
8 - N6 / M18 Junction – Entry Slip Road	Signs at entry to be removed during transportation.
9 - N6 / M18 Junction – Exit Slip Road	Lighting Column at exit to be relocated during transportation. Barrier to be set back during transportation. Sign at exit to be relocated during transportation.
10 - M20 / M18 Junction – Exit Slip Road	Vegetation to be removed from inside of slip lane.
11 - L2025 M20 / N20 Junction – Exit Slip Road	Sign in verge relocated during transportation. Signs on splitter island to be removed during transportation.

Abnormal loads for the Project will be shipped to Shannon Foynes Port or to the Port of Galway (turbine blades only). The turbine components will be transported on the public road network using abnormal load vehicles between the landing port and Site Entrance 1 on the N20.

Abnormal loads will enter the Site via an existing entrance on the N20 (Site Entrance 1) which will be upgraded to allow vehicles to turn into the Site. Due to the fact that the N20 is a very busy National road, the Site Entrance 1 off the N20 will only be used for the transportation of abnormal loads to the Site. These vehicles will enter the Site via this entrance and exit the Site via Site Entrance 2 on the L1537 as they will have unloaded and shortened and will no longer be oversize and will therefore be able to exit onto the L1537. The two Site Entrances are shown on **Figure 2.2**.

The delivery of the turbines will require co-ordination with Limerick City and County Council's Roads Department, An Garda Siochána, Transport Infrastructure Ireland (TII) and Motorway Operators. Efforts will be made to avoid peak times such as school drop off times, church services, peak traffic times where it is considered this may lead to unnecessary disruption, and abnormal loads may travel at night and outside the normal construction times as may be required by An Garda Síochána. The process has been set out in the Traffic Management Plan contained in **Appendix 17.2** which will be implemented in full and will be further developed prior to the commencement of construction by the Contractor. The proposed Turbine Delivery Route is shown on **Figure 2.3**.

All material deliveries will have a maximum axle load of 12 tonnes per axle and a maximum gross vehicle weight of 139 tonnes . The vehicle weights do not exceed 180 tonnes and are therefore not subject to a Category 3 structural assessment as defined in Section 1.3 of DN-STR-03001 published by TII for exceptional abnormal loads.

2.5.6 Access Tracks

Access Tracks are necessary to allow access for cranes and delivery trucks during construction of the Project and also during servicing/repairs to the operational wind turbines. The Access Track layout follows the existing Access Track into the Site as far as possible, avoids environmental constraints, and follows the natural contours of the land. Every effort has been made to minimise the length of track necessary.

Access Tracks will be upgraded and constructed so that the width will be 5m but will be wider at bends where a width of 5.5m is to be provided. A stone layer will be provided so as to provide a good grip during wet weather. The Access Tracks will also be upgraded to carry a minimum 12 tonne axle construction loading. The design will consist of 150mm of 50mm UGM A on an average of 300mm Down Crushed Run Rock. The proposed Access Track construction detail is shown on Drawing No. **6839-JOD-GGE-XX-DR-C-0401: Access Track Construction Details** and the Access Tracks are shown in **Figure 1.2.**

The Access Tracks within the floodplain will be kept at existing ground level during the construction phase and will be marked out using snow poles. During the operational phase, the roads will be set to the 1 in 20-year flood level. In the event of a flood event, the maximum flooded depth along access roads will be between 200 and 400mm. Access tracks will be marked with snow poles to allow for emergency vehicular access. The proposed access point for emergency access is from the southern end of the Site which is unlikely to be affected during flood events.

A length of 1,080m of existing farm track will be used for the Project. The upgraded Access Tracks will be 540m^2 in surface area. The existing farm track from the N20 and the track leading from the Met Mast location to T5 will be upgraded and used to minimise additional land take.

There will also be 4,100m of new Access Tracks required for the Project. These will be constructed to provide a width of 5m and will cover an area of 20,500m^2. These tracks will be excavated to firm bearing strata and constructed using rock from the turbine foundation excavations or imported to Site from a nearby quarry as outlined in **Table 2.8**. Access Tracks are shown on **Figure 2.1**.

The surface of the Access Tracks will be maintained during the construction phase. All imported stone to the Site will have undergone appropriate quality testing to Transport Infrastructure Ireland (TII) specifications.

There are two proposed crossings of natural watercourses along the Access Tracks. The construction will involve the construction of a clear span bridge at the two locations. The bridges will be constructed with precast reinforced concrete and will join to the gravel Access Tracks. The bridges will range from 7.4m to 14.0m in width. Timber post and rail fencing will be included with galvanised chain link fence on the internal face. The crossings have been designed in line with Inland Fisheries Ireland (IFI) guidance and will avoid in stream works in accordance with detail (including design levels) shown on Planning Drawings No. **6839-JOD-GGE-XX-DR-C-0402** and **6839-JOD-GGE-XX-DR-C-0403**.

The bridge crossings at watercourse crossing 1 (WC01) and watercourse crossing 2 (WC02) will only be constructed from the east bank of the watercourse. The following methodology will apply:

- Excavation for abutments will be carried out on both sides of the watercourse, and blinding placed to ensure a smooth and accurate base for the precast units.
- The L shaped precast concrete abutment units will be delivered to the working space on the east bank of each crossing using the local road network and lifted into place on both sides of the river using a crane located on the east bank.
- In-situ concrete stitches between the units will be formed. The quantity of wet concrete to be transported across the watercourse will be c. 1m^3 in each case. Equipment will be washed out into the silt-buster i.e. there will not be any discharge of concrete washout to the local environment.

- The 8 precast bridge beams will be delivered to the working space on the east bank using the local road network.
- Precast bridge beams will be lifted into place by crane and supported on steel shims on the abutments.
- A concrete pump will be brought to site and parked in the working space on the east bank. Approx. 47m^3 of concrete will be required to complete the bridge deck of WC01. Approx. 20m^3 of concrete will be required to complete the bridge deck of WC02 as the beams are shallower.
- A bituminous sealing coat will be painted onto the bridge deck. Once this has cured, the crushed stone Access Track will be constructed over the bridge.
- All temporary boundary delineation markers will be removed and the Access Track to the west of the bridge will be completed.

A CEMP has been prepared for the construction phase which include mitigation measures in relation to water crossings. Method Statements have been produced for the watercourse crossings and these are contained in **Appendix 2.1 CEMP** and **Appendix 2.3**.

2.5.7 Met Mast

As part of the grid code[2] requirements, all wind farms with an installed capacity of greater than 10MW are required to supply continuous, real-time data for the wind farm location. The data required is the wind speed and wind direction at turbine hub height, air temperature and air pressure. The data required for the Project will be provided by a dedicated Meteorological Mast of 60m in height (location as detailed in **Figure 1.2**).

The Met Mast will be located on the southwest of the Site and will be a free-standing lattice type structure as shown in Drawing No. **6839-JOD-GGE-XX-DR-C-0701**. The Met Mast foundation will be 8.85m by 8.85m, with a depth of 2.25m and will be designed and constructed similar to the turbine foundations. It will encompass a cast-in insert or bolts to connect to the bottom of the Met Mast and reinforced bar structural elements. The area around and above the foundation will be backfilled with compacted granular material. The Met Mast will be linked to the 110kV Substation via buried Wind Farm Internal Cabling for power and communication and will be required for the full operational duration of the Project.

[2] EirGrid (13 March 2023). EirGrid Grid Code Version 12

2.5.8 Electrical Substation, Control Building and Associated Compound

It is proposed to construct a 110kV electricity Substation on the Site, as shown on **Drawing No. 3337-SUIR-SS-DR-C-2401**. Together with a 'loop in' Grid Connection to the existing 110kV overhead line between Charleville and Killonan. The length of the double-circuit Grid Connection between the Substation and the 'loop-in' connection point is 771m.

The Substation will serve two main functions:

1) provide housing for switchgear, control equipment, monitoring equipment, and storage space necessary for the proper functioning of the wind farm; and
2) provide a substation for metering and for switchgear to connect to the national electricity network.

The construction and electrical components of the Substation will be to ESB and EirGrid specifications within the parameters assessed. The Substation compound will be c.11,875m^2 and the area of the compound will be excavated to a depth of 0.85m and will be constructed from engineered stone material using similar construction techniques as for the crane hardstands. The overall compound will be enclosed by a 2.6m high palisade fence and will contain two single storey control buildings, ancillary equipment, including the transformers, switch gear, fault protection, metering, car parking and other ancillary elements necessary for the operation of the Project.

The Substation compound (finished compound level) will be constructed 100mm above the 1:1,000 year flood event levels to prevent the possibility of any flood events affecting the electrical equipment. The finished floor level of the Substation will be 150mm above the 1:1,000 year flood event levels.

The control buildings will contain an ESB room, control room, switchgear room, small store, an office and toilet. The control components housed at the Substation will include metering equipment, switchgear, the central computer system and electrical control panels. The control buildings will be a single story pitched roof structures with traditional rendered finishes and measure 2 5m x 18m with a floor area of 450m^2 and 22m x 11m with a floor area of 242m^2 . Details of the control buildings are shown on Drawing No. **3337-SUIR-SS-DR-C-2401** and **3337-SUIR-SS-DR-C-2402.** The appearance and finish of the Substation buildings will be similar to an agricultural building with a slated roof and nap plaster finished proposed. It will have a suitably sized footpath around it and an adjacent parking area. The final finish of the control buildings will be an off-white or grey colour.

There will be two lightning monopole protection masts which will be 15m in height and associated site works. Warning / health & safety signage will be displayed as is normal practice for such installations. Motion sensitive lighting only will be used.

Water for the welfare facilities at the Substation will be supplied by a bored well at the Substation compound. The proposed water abstraction will be approximately 3m^3/day. This is described in **Chapter 10: Hydrology and Hydrogeology**.

Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank. All wastewaters will be tankered off-site by a licensed waste collector to a suitable plant in the vicinity of the Project. There will be no onsite treatment or disposal of wastewater.

A telecommunication antenna will be fixed externally to the Substation control building for communication and control purposes (e.g. for the Supervisory Control and Data Acquisition (SCADA) System) for the Developer, turbine suppliers and ESB networks. There will be a small area outside the compound and adjacent to the access road that will be a hard-surfaced area for operation and maintenance for parking spaces, subject to EirGrid specifications at the construction phase.

2.5.9 Transformers and Wind Farm Internal Cabling

The power generated by each wind turbine will be transmitted via underground Wind Farm Internal Cabling to the new 'loop-in' Substation. Fibre-optic communication cables will be installed in the same trench. The Wind Farm Internal Cabling network will be installed in trenches 0.6m wide by 1m in depth and there will be 4,700m of Wind Farm Internal Cable trenching (giving a surface area of 2,820m²). A cross-sectional drawing is shown in Drawing No. **6839-JOD-GGE-XX-DR-C-0901: Proposed Cable Trench Details**.

The electrical and fibre-optic cables running from the turbines to the Substation compound will be run within the Access Tracks and/or their verges.

The Wind Farm Internal Cabling will be installed in trefoil ducts which will be bedded in surplus excavated soil material. Danger tape, incorporating a metallic strip, will be laid during backfilling. Permanent posts up to 0.5m in height will mark the trenches at regular intervals and at all changes in direction. An as built layout plan showing the location of underground Wind Farm Internal Cabling will be on permanent display within the control building.

Clay plugs or concrete cut offs will be installed at regular intervals in the cable ducting trenches where they are located on slopes to prevent the trenches from becoming preferential flow paths for runoff from the Site.

All electrical equipment will be located above the 1:1,000 year flood zone as detailed in **Section 2.5.2**. The transformers in most modern turbines are located in the Nacelle.

Excavated material will be stored upgradient of the trench excavations (where relevant) which will prevent any sediments from being washed downhill as they will be contained in the trench. Silt fences will be installed between excavations and watercourses/drains to prevent silt runoff. Spoil will be temporarily stored in the temporary spoil storage area (berm) shown on Figure 1.2. Where any spoil cannot be used for reinstatement and landscaping works it will be permanently stored in the permanent spoil storage area (berm) located at the back of the Substation**.** This is further detailed in the **Spoil Management Plan** in **Appendix 2.1: Construction Environmental Management Plan** and fully assessed in **Chapter 9: Soils and Geology**.

2.5.10 Grid Connection

Connection will be sought from the national electricity network operators by application to the transmission operator Eirgrid. Possible grid connection options for the Project were assessed and it was found that a 'loop in' Grid Connection to the existing 110kV OHL between Charleville substation and Killonan substation was the most viable option. Grid connection options are assessed in **Chapter 3: Alternatives**.

The Grid Connection can be summarised as follows:

- Underground ducting Grid Connection from the on-site 110kV Substation to the lattice end masts (as shown on Drawing No. **3337-SUIR-SS-DR-C-2411**) with a 'loop in' Grid Connection to the existing 110kV OHL between Charleville substation and Killonan substation.

The above Grid Connection design is shown in **Figure 2.4**.

2.5.10.1 Underground Electricity Line

The proposed Substation is located c. 170m (in a straight line) west of the existing Charleville-Killonan overhead electricity transmission line. In order to connect the Project and provide the 'loop in/loop out' infrastructure, it is proposed to install two new end masts and a double circuit of underground 110kV electricity transmission line to each end mast.

The underground cable (UGC) will be located fully within the Redline Boundary, within or alongside the proposed Access Tracks. The UGC will be installed within ducting in excavated trenches of approximately 1.3m deep and 0.6m wide. Cables will be pulled through the ducting in a single length thus eliminating the requirement for joint bays. Ground levels will then be reinstated. Further details can be found in the Suir grid construction methodology report **Appendix 2.2.**

2.5.10.2 End Masts

The end masts will be lattice-type and will be located immediately beneath the Charleville to Killonan 110kV overhead electricity transmission line. The masts will have a maximum height of 21m and a permanent above-ground footprint of c. 300m^2 (total; c. 150m^2 per mast) with concrete foundations below ground to a depth of 20m. The crane pads at the end masts will be 300m^2 and the assembly pad will be 500m^2. However, it should again be noted that the precise specifications of the proposed end masts may be immaterially altered to ensure compliance with any future revised EirGrid specifications. There will also be a turning head located at the two end masts, covering an area of 119m^2 as shown on Drawing No. **6839-JOD-GGE-XX-DR-C-0208: Proposed Windfarm Layout Plan - Sheet 8 Of 12**.

2.5.11 Borrow Pit

No borrow pit/s are proposed for this Project.

2.5.12 Turbine Foundation Rock Breaking

Significant bedrock excavations will not be required for the construction of turbine foundations, which is generally at a depth considered to be beyond shallow excavations. However, locally, some excavations may encounter rock, but this will be exceptional and highly localised. Site investigation works show the bedrock geology type at the turbine locations to be limestone rock as detailed in **Chapter 9 Spoils & Geology – Section 9.3.5**.

Weaker rock will be extracted using a hydraulic excavator and a ripper. Upon the completion of further confirmatory site investigation, where stronger rock is encountered and cannot be extracted using an excavator, then rock breaking equipment will be employed. This will involve the use of a 40-60 tonne 360-degree hydraulic excavator with a rock breaker. The rock breaker is supported by a smaller 30-40 tonne rock breaker which breaks the rock down further down into the correct grade of crushed stone for use in the civil construction of Access Tracks, turbine hardstands and foundation infill.

2.5.13 Onsite Drainage

The Site is drained by the Maigue River and its tributaries. The Site is mapped in the Charleville Stream_020 and Maigue_030 WFD river sub-basins. There are three watercourses within/draining the Site, i.e. the Charleville (Stream) (Segment Code: 24_119), the Maigue River (Segment Code:24_190) and the Loobagh 24 River (Segment Code: 24_12989) as shown on **Figure 10.3**. A buffer zone of at least 50m will be in place for the watercourses , with the exception of the sections of proposed Access Tracks to be constructed across the Maigue River and the Charleville (Stream) see Drawing No. **6839-JOD-GGE-XX-DR-C-0202** and Drawing No. **6839-JOD-GGE-XX-DR-C-0205**. Other watercourses on site consist of manmade drainage channels and headwaters of the Maigue River, some of which are ephemeral.

CFRAM River Flood Extents for the present day are mapped extensively along the Maigue River and all of its tributaries that are within the northern portion of the Study Area with 'Low', 'Medium' and 'High' probabilities. CFRAM River Flood extents are also mapped along the channel of the Charleville Stream that extends north from the southern section of the Site. A Stage III level site-specific FRA (Refer to **Appendix 10.1**) was carried out for the Site which concluded that the locations of 3 no. turbines in the east of the Site are (T4, T6, T7) are located in the 100-year fluvial flood zone (Flood Zone A). In addition, T5, T8 and T9 are mapped in very close proximity (but not inside) to Fluvial Flood Zone B (1,000-yr flood zone). 3 no. turbines (T1, T2 and T3) are located outside of mapped flood zones (100-yr and 1000-yr present-day and HEFS). The proposed soil storage areas are not located in any mapped flood zones (100-yr and 1,000-yr present-day and HEFS). Also, the proposed Substation in the south of the Site and the Grid Connection are located outside of any mapped Flood Zones (100-yr and 1,000-yr present-day and HEFS) and are distant from any fluvial flood zones. T5 is located outside of the 100-yr present-day flood zone, but part of its hardstand is located within 100-yr present-day flood zone. T5 and T5 hardstand are located within both HEFS flood zones (i.e. the 100-yr and the 1,000-yr). T8 is located outside of the 100-yr and the 1,000-yr present-day flood zones. However, part of its hardstand is located within the 100-yr and the 1,000-yr present-day flood zones. T8 and T8 hardstand are located within both HEFS flood zones (i.e. the 100-yr and the 1000-yr).

The surface water runoff contained within natural and artificial drainage channels includes stream and river waterbodies, drainage ditches, and other minor natural and artificial manmade drainage features. Drainage measures will be provided to attenuate runoff, guard against soil erosion, soil compaction, and safeguard local water quality. Drainage maintains existing overland flow routes and channels. Existing natural flow paths are maintained

through the use of piped crossings under road alignments at natural depressions and at regular intermediate intervals. Details of the drainage system are shown on Drawing Nos. **6839-JOD-GGE-XX-DR-C-0301**, **6839-JOD-GGE-XX-DR-C-0302**, **6839-JOD-GGE-XX-DR-C-0303** and **6839-JOD-GGE-XX-DR-C-0304** and outlined in detail in the Surface Water Management Plan, part of the CEMP attached as **Appendix 2.1**. With the implementation of the listed mitigation measures detailed in **Chapter 10: Hydrology and Hydrogeology** and **Appendix 10.1 Stage III Site Specific Flood Risk Assessment**, it was concluded that no significant effects on downstream surface water quality or flood risk will occur.
Sustainable Urban Drainage System (SuDS) principles will be employed as follows:

Source controls for surface water:

- Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sandbags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems
- Small working areas, covering stockpiles with geotextiles layering to protect against water erosion and runoff in rainy weather, and/or cessation of works in certain areas such as working on a high gradient during wet and windy weather.

In-line controls for surface water:

- In line controls are controls which are directly applied to the surface water body, including interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sandbags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriates systems.

Treatment systems for surface water:

- Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbusters and/or other similar/equivalent or appropriate systems.

The works programme for the construction stage of the Project will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

Further details on drainage management and mitigation can be found in **Chapter 10: Hydrology and Hydrogeology** and the Surface Water Management Plan attached in the CEMP as **Appendix 2.1.**

2.5.14 Table of Key Project Infrastructure Metrics

The Key Project Infrastructure Metrics are contained in **Table 2.8**. The information in this table is used to inform the EIAR Chapters for the Project.

Table 2.8: Key Project Infrastructure Metrics

Description	Length [m]	Width [m]	Depth [m]	No.	Area [m^2]
Upgraded Existing Access Track (4.5 to 5m)	1,080	5	0.65	-	540
New Access Track	4,100	5	0.50	-	20,500
Junctions	-	-	0.50	9	2,675
Turning Heads	-	-	0.50	4	1,385
Wind Farm Internal Cabling (power & communications)	4,700	0.6	1	-	2,820
Turbine hardstands – hardstand areas (allows for reduced areas for T3 and T5)	-	-	0.85	9	23,910
Turbine hardstands – Aux Cranes	-	-	0.85	9	3,888
Turbine hardstands – Main Cranes	-	-	0.85	9	6,525
Turbine hardstands – Blade Fingers (Blade Laydown Area)	-	-	1.00	7	1,485
Turbine hardstands – Access Track	1,600	-	0.5	-	8,000
Turbine foundations Pile Based (21m diameter)	-	-	2.25	5	1732.5
Turbine foundations Gravity Based (27.2m diameter)	-	-	3.50	4	2,328
Met Mast foundation	8.85	8.85	2.25	1	80
Substation	125	95	0.85	1	11,875
Site compound	-	-	0.5	1	2,976
Grid Connection cable length from Substation to 110kV OHL	771	0.6	1	-	442
End Masts (GC Towers)	17.40	17.40	0.85	2	606

Description	Length [m]	Width [m]	Depth [m]	No.	Area [m^2]
Crane pads at GC Towers	15	10	0.85	2	300
Assembly Pad at GC	20	22	0.85	1	500
Permanent Spoil Storage Area	-	-	2 (above ground)	1	4,050
Temporary Spoil Storage Areas	-	-	2(above ground)	6	21,900
Total					118,518

Taking the above figures into consideration the total land-take of the Project is as follows:
11.256Ha (7.1% of total Site 158.75Ha) – Construction Phase (all infrastructure excluding cabling).
5.095Ha (3.2% of total Site 158.75Ha) – Operational phase (new Access Tracks, reduced hardstands, Substation, Met Mast, Permanent Spoil Area and Met Mast).
1.598 Ha (1.0% of total Site 158.75Ha) – Decommissioning Phase (new Access Tracks and Substation).

2.5.15 Site Signage

Signs will be placed at each of the Site Entrances showing directions to the Site. Additional signage will be placed on the road, warning of construction vehicles entering and egressing the Site for road safety measures. Site Entrances 1 and 2 will have a sign confirming that they will be used to enter the Site during construction and the onsite speed limit of 30km/h. There will also be additional signs during the construction phase confirming that construction works are taking place and proper precautions must be taken by anyone entering the Site. The permanent site entrance (Site Entrance 2) will also have signage for the operational phase of the Project. There will be no entry to unauthorised persons or the general public during construction. Additional details can be found in **Chapter 17: Traffic and Transport.**

2.5.16 Spoil Management

2.5.16.1 Spoil Quantities

The quantities of spoil likely to be generated at the Project have been calculated by Jennings O'Donovan & Partners and Whiteford Geoservices Ltd. It is estimated that the amount of spoil predicted to be generated during construction of the wind farm is 46,405m^3 of spoil. This is detailed further in **Chapter 9: Soils & Geology** and **Appendix 2.1 CEMP – Spoil Management Plan (MP4)**.

2.5.16.2 *Landscaping & Reinstatement*

As part of the design process, significant consideration has been given to the level of excavations required to construct the Project in order to minimise the generation of spoil and, subsequently, to the management of excavated material.

There are 6 no. temporary spoil storage locations which will be used to manage spoil on site during the construction phase. The temporary spoil storage areas cover a total area of 21,900m^2 and spoil can be stored to 2m in height. Therefore, the capacity of the temporary spoil storage areas is 43,800m^3. The location of the storage areas were selected due to the general absence of environmental constraints, available separation distances to watercourses, generally flat or gently sloping gradient and close proximity thus avoiding traffic movements on the public road network. Spoil will be transported to the storage area where it will be placed in layers in accordance with best-practice methods. Appropriate drainage management measures will be implemented to ensure that the deposited spoil does not become waterlogged. Following the completion of construction, the storage area will be graded to match the profile of surrounding land, covered with topsoil and reseeded. Works at the spoil storage area will be monitored, on a weekly basis during the construction phase and monthly for a six-month period thereafter, by an appropriately qualified engineer.

It is envisaged that spoil generated can be used as structural fill in Access Tracks, turbine hardstands, turbine foundation construction, reinstatement, roadside berms, hedgerow and tree planting and landscaping.

Where excess topsoil or subsoil material is generated which cannot be utilised for reinstatement or landscaping purposes, it is proposed to develop a permanent spoil storage area (berm) where excess soil and subsoil will be stored permanently. The permanent spoil area (berm) is 4,050m^2 and will be 2m in height with a storage capacity of 8,100m^3.

A detailed Spoil Management Plan (**Appendix 2.1, Management Plan 4**) has been prepared and will address the re-use, reinstatement, storage and restoration of all material excavated during the construction phase including detailed methodologies regarding the establishment and management of the spoil storage area for the entire Project.

2.5.17 Biodiversity Enhancement

Habitat retention, replacement and landscaping measures are proposed as part of the Project. This will involve the following:

- Planting an area of woodland of c.0.67ha on two plots north of the Substation

- Planting of c. 1,620m of hedgerow to compensate for the loss of existing hedgerow for infrastructure and from bat buffers
- Enhancement and re-vitalisation of 5,433m of existing degraded hedgerow

Further details on this can be found in **Chapter 6: Biodiversity** and in **Appendix 6.2 Biodiversity and Enhancement Management Plan**.

2.6 CONSTRUCTION

The first phase of the Project will comprise the construction phase. This phase will begin with site preparation works and will be complete when the turbines are built and commissioned, when all wastes have been removed from the Site and when general site reinstatement and landscaping has been carried out. For this Project, it is envisaged that the construction phase will last approximately 16-18 months. The proposed construction programme is set out at **Table 2.9**.

Table 2.9: Indicative Construction Programme

Activity	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Site Establishment/ Fencing off	X																	
Internal Access Tracks Upgrade & Construction		X	X	X	X													
Substation Buildings & Compound Construction				X	X	X	X	X	X									
Substation Electrical Works										X	X	X	X	X	X			
Substation Commissioning														X	X			
Excavation & Construction of Turbine Foundations & Hardstands		X	X	X	X	X	X	X	X	X								
Wind Farm Internal Cabling Installation										X	X	X						
Turbine Delivery and Erection											X	X	X	X	X	X		
Grid Connection												X	X	X	X	X		
Energisation																X		
Turbine Commissioning																	X	X
Site Restoration																	X	X

2.6.1 Construction and Environmental Management Plan (CEMP)

A CEMP is appended to the EIAR in **Appendix 2.1**. The CEMP includes an emergency response plan, spoil management plan, surface water management plan, surface water quality and inspection management plan and a waste management plan. The CEMP includes all the mitigation measures proposed within the EIAR and the NIS. A Summary of the mitigation measures is also included in **Appendix 18.1**.

In the event that planning permission is granted for the Project, the CEMP provides a commitment to mitigation and monitoring and reduces the risk of pollution whilst improving the sustainable management of resources. The environmental commitments of the Project will be managed through the CEMP and will be secured in contract documentation and arrangements for construction and later phases, such that there will be a robust mechanism in place for their implementation. The CEMP addresses the construction phase, and will be continued through to the commissioning, operation and final decommissioning phases (refer to Decommissioning Plan as part of the CEMP in **Appendix 2.1**)

An Ecological Clerk of Works (ECoW) / Environmental Manager with appropriate experience in overseeing wind farm construction projects will be appointed by the Developer for the duration of the construction phase so that the CEMP is effectively implemented.

In the event planning consent is granted for the Project, 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 following sections describe key activities that, without the introduction of the appropriate mitigation measures described in this EIAR, may cause harm or nuisance to the public. The potential impacts of each are considered in the relevant chapters of this EIAR.

2.6.2 Refuelling

Vehicles will be refuelled off-site where possible. For vehicles that require being refuelled on-site, fuels will be stored in the temporary construction compound and bunded to at least 110% of the storage capacity of fuels to be stored. Refuelling will take place via a mobile double skinned fuel bowser. The bowser will be a double axle refuelling trailer which will be towed to the refuelling locations by a 4x4 vehicle. The 4x4 will carry a drip tray, spill kit and absorbent mats in case of any accidental spillages. Only designated competent personnel will refuel plant and machinery on the Site.

2.6.3 Concrete

There will be no concrete batching on the Site. Instead, it will be transported to the Site as it is required. A dedicated, bunded area will be created to cater for concrete wash-out and this will be within the onsite temporary construction compounds. This will be for the wash-out of the chutes only after the pour. Concrete trucks will then exit the Site via Site Entrance 2 and return to the supply plant to wash out the mixer itself.

The main concrete pours at the turbine locations will be planned in advance and proposed mitigation measures (are detailed in **Chapter 10: Hydrology and Hydrogeology**) will be as follows:

- Avoiding large concrete pours, for turbine foundations for example, on days when temperatures are not optimal as per (BS 8110) (EN1992-1-2) or when heavy or prolonged rainfall is forecast i.e., during a period in which a Met Éireann Status Red weather event will/has occurred.
- Providing that all concrete pour areas are dewatered prior to pouring concrete and while the concrete is curing.
- Making covers available so that areas can be covered if heavy rain arrives during the curing process which will prevent runoff of concrete which has a high pH.

The chutes wash out on-site will require a small volume of water. This water will be directed to the concrete washout area which will be a temporary lined impermeable containment area or a siltbuster type washout unit[3] or similar. The unit catches solid concrete and filters and contains the washout liquid for pH adjustment and solid separation. The residual liquids and sediments will be disposed of at an appropriately licenced wastewater treatment facility with adequate capacity.

If a temporary lined impermeable containment area is used, these are usually constructed using straw bales and lined with an impermeable geotextile membrane. An example is shown on **Plate 2.1**. An alternative construction method would be to dig a hole in the ground and place an impermeable geotextile membrane in the hole so that no wastewater can penetrate the cover and seep into the soil and groundwater.

[3] https://www.siltbuster.co.uk/solutions/concrete-washwater/

Plate 2.1: Typical Temporary Concrete Washout Area

The washout area is covered when not in use or during periods when wet weather is forecast to prevent ponding of rainwater. During periods of dry weather, the area can be left uncovered to allow evaporation of water. Once concrete pours have been completed, the remaining water will be tankered off site to a licenced wastewater treatment facility for disposal. Solid concrete can be broken up and disposed of at a licenced facility along with other construction waste. It is estimated that there will be 1-2m^3 of solid concrete waste per turbine foundation pour that will need to be disposed of, or a maximum of 18m^3 in total.

It is proposed that the underground components of the turbine foundations will be left *in-situ* during decommissioning and so will not require breaking up and disposal. The plinth will be removed and the foundation will be reinstated to grassland Further details can be found in **Section 2.10** and **Appendix 2.1 CEMP - Decommissioning Plan (MP6)**.

Deliveries of concrete for turbine foundation construction generally begin outside of normal working hours (i.e. early morning) to limit impacts on traffic and local road users. Deliveries will continue throughout the day, with the continued timing of deliveries dependent on foundation size and quarry location. Each turbine pour can take place in a single day, so deliveries of concrete for the nine turbine Project will take place over nine days. This is detailed further in **Chapter 17: Traffic and Transport**.

Further measures that will be used to mitigate the risk of pollution from concrete pours are as follows:

- The concrete trucks will not be washed out on site but will be washed out on return to the batching plant.

- Access Tracks will be constructed so that all concrete trucks will be able to access all areas of Site with ease and no concrete will be transported around the Site on open trailers or dumpers to avoid the risk of spillages.
- All concrete for the turbine foundations will be pumped directly into the shuttered formwork with rebars from the delivery vehicle. If this is not possible, the concrete will be pumped into a hydraulic concrete pump or into an excavator bucket for transfer to the required location.
- The TMP specifies the routes and arrangements for concrete delivery as well as outlining emergency measures to be taken. Refer to TMP in **Appendix 16.2**. Quarries and concrete suppliers in the area are shown on **Figure 16.1**.
- Signage will be erected near concrete pour areas to advise drivers that concrete washout on site is not permitted.

2.6.4 Waste Generation

The Waste Action Plan for a Circular Economy4 is Ireland's National Waste Policy 2020 – 2025 and is the roadmap for waste planning and management. This Plan shifts focus away from waste disposal and looks instead to how we can preserve resources by creating a circular economy.

In terms of construction and demolition wastes, the Plan aims to

- Streamline by-product notification and end-of-waste decision making.
- Revision of the 2006 best practice guidelines for Construction and Demolition Waste.
- Working group to develop national end-of-waste applications for priority waste streams.

During construction a number of types of waste will be generated from the Project. The types and estimated quantities are shown in **Table 2.10**. The principles of the circular economy and the waste hierarchy will be strictly adhered to avoid and minimise production of excavated soil, and to ensure that all materials are recovered and reused on site. Further details can be found within **Appendix 2.1 CEMP**, **Management Plan 5: Waste Management Plan.**

Table 2.10: Types of Waste from Construction

4 Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020-2025 (2020) Department of Climate, Energy and the Environment Available here: https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/waste-action-plan-for-a-circular-economy/ [Accessed 15/04/2025]

Waste Type	Estimated Quantities
General (canteen, plastic, cardboard)	1 skip/month
Concrete	20 m^3
Plastic (10kg/turbine blade)	270 kg
Timber Pallets	20 - 30
Timber Cable Drums	30 - 40
Oils/Fluids	None
Metals	1 skip/month

The Contractor will avoid or minimise the volume of waste generated. Waste will be stored a minimum of 50m from nearby watercourses at the Site.

Waste storage and disposal of residual waste will be carried out in a way which prevents pollution in compliance with legislation.

All residual waste to be transported off-site to a licensed disposal site. The nearest licenced waste facility is over 16km to the southeast of the Site in Ballyguyroe Landfill Site. Duty of Care Waste Control dockets must be produced and filed on site with each load. These must detail:

- An adequate description of the waste
- Where the waste came from
- The appropriate code from the List of Wastes Regulations for the waste (commonly referred to as the European Waste Codes)[5]
- Information on the quantity and nature of the waste and how it is contained
- Names and addresses of the transferor at Garrane Green Energy Project (the person currently in control of the waste) and the transferee (usually either a registered waste carrier or a waste management licence holder (waste manager)
- The Standard Industry Classification code (2007 or 2003 for hazardous waste only) of the business from where the waste was received
- Where applicable, indicate that the Waste Hierarchy has been complied with

[5] https://www.epa.ie/publications/monitoring--assessment/waste/2019--FULL-template.pdf

- The place, date and time of transfer of the waste. If using a season ticket, the period for which it is valid (i.e., valid from dd/mm/yyyy to dd/mm/yyyy)

All oil storage facilities will have secondary containment facilities of 110% storage capacity (e.g., bund, enclosure, drip tray). All of these will be regularly inspected for visual signs of leaks or something that would impact on their capacity – e.g., a drip tray full of rainwater. Waste storage areas will be clearly located and signed. Key waste streams will be separated.

All waste will be transported from site at appropriate frequency by a registered waste contractor to prevent over-filling of waste containers.

The contractor will ensure that all storage facilities are checked on a weekly basis.

2.6.5 Dust Suppression

During periods of dry and windy weather, there is potential for dust to become friable and cause nuisance to nearby residences and users of the local road network, assessed in detail in **Chapter 13: Air and Climate**. Damping down (wetting of the surface) may be required to see that dust does not become friable.

A wheel cleaning facility will be employed on-site where mud and debris (Drawing No. **6839-JOD-GGE-XX-DR-C-0803**) will be removed from vehicles egressing the Site and reduce mud and debris from getting onto the local road network where it could dry out, become friable and potentially cause a nuisance. HGVs entering the Site carrying rock will be covered to prevent dust generation. A road sweeper will be available and utilised on the approach roads to the Project in case of any mud or debris making it onto the public road network.

Further details are set out in set out in **Chapter 13: Air and Climate** and **Chapter 17: Traffic and Transport.**

2.6.6 Construction Hours

It is estimated that the Project will have approximately 58 construction workers during the construction phase, increasing to 60 at peak construction Working hours for construction will be from 07:00 to 19:00 on weekdays, with reduced working hours at weekends, from 08:00 to 13:00 on a Saturday. No work will be carried out on Sundays or Public Holidays.

It should be noted that critical weather-dependent events, such as turbine erection, may need to take place outside those hours to ensure safe and efficient operation at the Site. Hours of working for turbine foundation construction will be agreed with Limerick City and County Council prior to the commencement of turbine foundation construction. The TMP (**Appendix 17.2**) will be updated to incorporate the agreed hours of working and will be submitted to and agreed with the Planning Authority, prior to the construction phase, so that all controls as described herein are in place with all suppliers coming to the Site.

2.6.7 Construction Compound and Temporary Works Area

The temporary construction compound will be 2,976m^2. The temporary construction compound will be set up upon commencement of the construction phase. The proposed location for the temporary construction compound is at the southeast of the Site as shown in Drawing No. **6839-JOD-GGE-XX-DR-C-0801**. The compound will be used as a secure storage area for construction materials and to contain temporary site accommodation units for sealed type staff welfare facilities. The compound will contain cabins for offices space, meeting rooms, canteen area, a drying room, parking facilities, and similar personnel type facilities.

An area within the compound will be used for the storage of fuel and oils and this will be suitably bunded and the bund will be lined with an impermeable membrane in order to prevent any contamination of the surrounding soils, vegetation and water table. Double protection containers / equipment will be used along with drip trays and details are included in the CEMP, included as **Appendix 2.1**.

During the construction phase, water will be supplied by water bowser. The maximum wastewater production is estimated to be the same as the maximum water consumption (up to 2,000 litres per day).

The Project will include an enclosed wastewater management system at each temporary compound capable of handling the demand during the construction phase with 90 construction workers on site at peak. A holding tank is proposed for wastewater management at the compound and will be fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank. Wastewater which will be removed off-site and disposed of at suitable wastewater treatment plant that has sufficient capacity.

2.6.8 Construction Turbine Assembly

Once the turbine components are delivered to the Site, using the TDRs assessed in **Section 2.5.5,** the wind turbine components will follow a detailed route and plan to minimise manoeuvring within the Site. Components will be placed on turbine hardstands prior to assembly. It is proposed that a 'just in time' delivery strategy will be in place for turbine blades for T3 and T5 to reduce the need for temporary set down areas. Typically, one large crane (750-1,000 tonnes) will be required for erecting the turbines, assisted by a smaller crane (150-200 tonnes). Similar cranes will also be required for maintenance during the operational phase. As with all other vehicles, refuelling of cranes will be carried out in accordance with site procedures to minimise the risk of spillage or pollution.

The towers will be delivered in sections, and work on assembly will not start until a suitable weather window is available, e.g., in wind conditions of 10-minute average wind speed of less than $8ms^{-1}$. The bottom tower section will be bolted onto the concrete foundations. The two mid tower sections will then be lifted into position, with one being bolted to the bottom tower section. Finally, the top tower section will be lifted into position and bolted to the upper mid tower section. The nacelle, hub and blades are assembled and installed in accordance with the turbine supplier's specific procedure.

2.6.9 Construction Traffic

Chapter 17: Traffic and Transport calculates that during civil construction, approximately 7,965 fully loaded Heavy Goods Vehicle trips will be required for the development. Full details are described in full in **Section 17.3** in **Chapter 17: Traffic and Transport.**

The first month of the wind farm construction period will involve deliveries of materials for site access works, temporary construction compound, site offices and site security. This period will include deliveries of fencing materials for site boundaries and compounds, temporary fencing to protect trees, hedges and ecological buffer zones, road construction materials for temporary construction compound and Site Entrances 1 and 2, and delivery of temporary site office units. It is anticipated that a maximum of 30 HGV vehicles (60 HGV movements) will visit the Site on a daily basis during the first month of the contract.

Months 2 to 10 will involve deliveries of materials for turbine hardstands, turbine foundations, Access Tracks, the Substation, Wind Farm Internal Cabling and the watercourse crossings. This period will include deliveries of road construction materials for Access Tracks and turbine hardstands, ready mix concrete and steel reinforcement for turbine foundations. It is anticipated that a maximum of 165 HGV vehicles (330 HGV

movements) will visit the Site on a daily basis during the period. The peak traffic will occur on 9 days during the 9-month period between months 2 to 10 when turbine foundations for the nine proposed turbines are poured. Concrete pours for individual turbine foundations will generate 120 HGV arrivals (240 HGV movements).

Months 10 to 18 will involve HGV movements for works associated with turbine delivery, turbine erection, turbine commissioning, electrical works, Grid Connection works, road reinstatement, road surfacing, site landscaping and the removal of temporary works materials such as offices and fencing from site. It is anticipated that a maximum of 18 HGV vehicles (36 HGV movements) will visit the site on a daily basis during this period.

Prior to construction commencing on site, the Traffic Management Plan (TMP) will be developed by the Contractor and submitted to Limerick City and County Council for agreement. This Plan will contain details of all proposed signage on the N20 (Site Entrance 1) and at the proposed entrance on the L1537 (Entrance 2) warning of the entrance to the construction site/Project. The TMP is contained in **Appendix 17.2**. In the event planning permission is granted for the Project, the final TMP by the Contractor will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

It is proposed to access the Site from the L1537 (Entrance 2) for the main site construction works and for the Substation and Grid Connection infrastructure.

Abnormal loads will use Site Entrance 1 for access into the Site only and will then exit the Site via Site Entrance 2. Further information can be found in **Chapter 17: Traffic and Transport**.

2.6.10 Construction and Management of Site Drainage

Drainage measures will be implemented to the Site to attenuate runoff, guard against soil erosion, soil compaction, and safeguard local water quality. Details of the proposed drainage system are shown in Drawing No**. 6839-JOD-GGE-XX-DR-C-0301** to Drawing No. **6839-JOD-GGE-XX-DR-C-0304**. Please note that the drainage plan will be subject to further design refinement at pre-construction phase but will conform to design and mitigation measures set out in the EIAR. Full details are provided in **Chapter 10: Hydrology and Hydrogeology** and **Appendix 2.1, Management Plan 3: Surface Water Management Plan**.

A buffer zone of 50m will be in place for main watercourses where possible as shown On **Drawing No 6839-JOD-GGE-XX-DR-C-0200** to **Drawing No. 6839-JOD-GGE-XX-DR-C-0210**. Unmapped watercourses/drains will have a reduced buffer of 10m applied as per professional judgement based on experience. The main watercourses are the Charleville Stream (Segment Code: 24_119) which flows through the Site in a northerly direction and the Maigue River (Segment Code: 24_171) which flows through the Site in an easterly direction. Best practice Sustainable Urban Drainage System (SuDS) principles will be employed as follows:

- Source controls for surface water:
  - Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sandbags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems.
  - Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.
- In-line controls for surface water:
  - Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sandbags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriates systems.
- Treatment systems for surface water:
  - Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbusters and/or other similar/equivalent or appropriate systems.

If heavy rainfall is predicted, then works will be suspended or scaled back.

2.6.11 Watercourse Crossings

There are 2 no. watercourse crossings required on the proposed Access Tracks which cross watercourse locations. Water Crossing 1 (WC01) is located on the Maigue River on the Access Track northwest of T7 and Water Crossing 2 (WC02) is located on the Charleville (Stream) on the Access Track east of T3. These will be a clear span bridge type construction. The Maigue River and Charleville (Stream) crossings are shown on Drawing No. **6839-JOD-GGE-XX-DR-C-0402** and Drawing No. **6839-JOD-GGE-XX-DR-C-0403.**

Abnormal loads will enter the Site via an existing entrance on the N20 (Site Entrance 1) which will be upgraded to allow vehicles to turn into the Site. Due to the fact that the N20 is a very busy National road, the Site Entrance 1 off the N20 will only be used for the transportation of abnormal loads into the Site. These vehicles will enter the Site via this entrance and exit the Site via Site Entrance 2 on the L1537 as they will have unloaded and shortened and will no longer be oversize and will therefore be able to exit onto the L1537.

Water Crossing 1 (WC01) and Water Crossing 2 (WC02) will involve the construction of the bridges accessing the crossing location with plant and equipment from the eastern side only, using Site Entrance 2.. The methodology for the crossings WC01 and WC02 is outlined in **Section 2.5.6**. Further details of the proposed bridge construction methodology are contained in the **CEMP** in **Appendix 2.1** and **Appendix 2.3 Bridge Construction Method Statements**.

2.6.12 Reinstatement and Monitoring

Following completion of construction, all plant and machinery will be removed from the Site. The temporary works areas needed for the construction period such as temporary widening and temporary track required for the TDR and blade laydown areas, will be reinstated using the excavated material removed and stockpiled on site, as soon as construction activities have been completed. As discussed further in **Section 2.5.4**, the turbine hardstands that are inside the flood zone (T4, T5, T6, T7 and T8) will be mostly reinstated post construction as detailed in **Section 2.5.**4 reduce the downstream flood risk.

During reinstatement work stockpiles of material will be restricted to less than 2m in height and located outside of the surface water buffer zones as shown on Drawing No. **6839-JOD-GGE-XX-DR-C-0200 - 0209**. All stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW). The temporary works areas will be reinstated to their previous land use.

All on-site installed drainage network will be left in place, i.e. interceptor drains and settlement ponds. This will be visually inspected daily during the construction phase and periodically during the operational phase to ensure that it is operating to its stated design purpose. Water monitoring on nearby natural watercourses will be undertaken during and post construction to confirm efficacy of the mitigation measures, and to confirm, in consultation with IFI, that no additional measures are required :

- Various combinations/adaptations of the runoff control and drainage management measures during the operational phase will be employed at the Site depending on the

local conditions and topography. Natural vegetation filters will be used regularly across the Site where the local drainage and topography allow attenuation of surface water runoff. Where possible, interceptor drains are installed up-gradient of infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It is now directed to areas where it can be re-distributed onto natural vegetation by buffered outfalls or level spreaders. Swales/trackside drains will be used to collect runoff from Access Tracks and turbine hardstands, likely to have entrained suspended solids and channelled it onto natural vegetation.

- The pre-existing and newly established drainage infrastructure will be sufficiently maintained for the discharge rates associated with all areas of the Site. Any blockages which may adversely impact upon the drainage regime at the Site will be immediately removed during the operational phase of the Project.

2.6.13 Construction Supervision and Monitoring

The construction activities will be monitored by a Geotechnical Engineer, a qualified archaeologist and an ECoW. The Geotechnical Engineer will be contracted for the detailed design phase and their services retained throughout the construction and reinstatement phases. The Geotechnical Engineer will oversee all earthworks and excavation activities and monitor for issues such as ground stability, water ingress into excavations etc. Roles and responsibilities are further detailed in **Appendix 2.1**.

The ECoW will be employed prior to the commencement of the construction phase and will monitor the working corridor (the area inside which construction works and plant and equipment manoeuvring will take place) and review the pollution control measures and working practices during construction and have input into site remediation. The ECoW will have stop work authority if, for example, a sensitive habitat feature is proximal to the works or there is the possibility of silt/pollution runoff to natural watercourses.

The potential exists for the presence of unrecorded, sub-surface archaeological features within greenfield locations in proposed construction areas within the Site. A series of pre-construction and construction phase archaeological investigations under licence by the National Monuments Service (NMS) will be carried out by a suitably qualified archaeologist. The archaeologist will have responsibility for providing that potential archaeological features are protected should any be discovered during excavations. If any potential archaeological features are discovered, the archaeologist will inform the NMS. The Site will be accessible to the appointed archaeologist at all times during working hours and the nominated

archaeologist will monitor all invasive works. Further details are detailed in **Chapter 15: Archaeology and Cultural Heritage.**

In the event that any sub-surface archaeological remains are identified during site investigations, they will be cleaned, recorded and left to remain *in situ* within cordoned off areas while the NMS are notified and consulted in relation to appropriate future mitigation strategies, which may entail preservation *in situ* by avoidance or preservation by record by archaeological excavations.

Regular weekly inspections of the installed drainage system will be undertaken, especially after heavy rainfall events, to check blockages and see that there is no build-up of standing water in any part of the system where is it not designed to be. A report will be produced monthly (which will be available for the Local Authority as requested) during the construction phase detailing the results of the water quality monitoring.

Excess build-up of silt will be removed at check dams, attenuation/settlement ponds or any other drainage feature by scraper or excavator and under the supervision of the ECoW.

During the construction phase, field testing and laboratory analysis of a range of parameters with relevant regulatory limits and Environmental Quality Standards (EQSs) will be undertaken for each watercourse close to the site, and specifically following heavy rainfall events (i.e. weekly, monthly and event based).

The CEMP (**Appendix 2.1**) will be further detailed once the Contractor has been appointed. This will set out the proposed Site organisation, sequencing of works, methodologies and will incorporate all mitigation measures and monitoring measures included in the application.

Daily monitoring of excavations by the Geotechnical Engineer will occur during the construction phase. Based on the comprehensive assessment undertaken as part of the EIAR, high levels of seepage inflow are not expected to occur, however in the unlikely event they occur excavation work will immediately be stopped, and a geotechnical assessment undertaken. Further details are outlined in **Appendix 2.1: CEMP.**

Site Entrance 2 will be used to transport construction materials and will be monitored during construction, so that any damage caused by construction traffic associated with the Project can be identified and repaired, as soon as possible, to avoid issues or inconvenience for

other road users. It is envisaged that rock will be sourced from a local quarry and concrete may be sourced from further afield such as those sources listed in **Table 2.5**, depending on the supplier. This is assessed in **Chapter 17: Traffic and Transportation**.

2.6.14 Construction Sequencing

An indicative sequence for the construction phase is as follows :

1. Temporary construction compound
2. Site preparation
3. Site Entrances
4. Access Tracks
5. Drainage
6. Water Crossings
7. Substation
8. Turbine hardstands
9. Turbine foundations
10. Wind Farm Internal Cabling
11. Installation of the Grid Connection
12. Erection of wind turbines
13. Commissioning and energisation
14. Reinstatement

Following the site preparation, the Access Tracks and associated drainage will be constructed according to the turbine manufacturer specifications. The proposed wind farm drainage will not significantly alter the existing drainage regime at the Site. Any existing drains will be routed under/around the proposed Access Tracks using culverts as required as detailed in **Appendix 2.1 CEMP** – **MP3 SWMP**. Runoff from Access Tracks, turbine foundations, and developed areas (temporary construction compound, Met Mast) will be collected and treated in local (proposed) silt traps and settlement ponds/swales and then discharged over buffered outfalls. Site drainage control measures are detailed in **Chapter 10: Hydrology and Hydrogeology**.

Access Tracks from Site Entrance 1 will be constructed from the east bank of WC01, including a working space to facilitate the construction of the bridge. Due to the fact that the N20 is a very busy National road, Site Entrance 1 off the N20 will only be used for the transportation of abnormal loads to the Site and all construction traffic will use Site Entrance 2. After the transportation of abnormal loads, Site Entrance 1 will be reinstated to its pre-construction condition as shown on **Drawing No. 6839-JOD-GGE-XX-DR-C-0212**. Further

information on the construction of water crossings on Site can be found in **Section 2.5.6** and **Appendix 2.3 Bridge Construction Method Statements**.

The next step will involve construction of the crane hard-standing areas for the nine turbines according to the turbine manufacturer specifications. The nine turbine foundations can then be excavated and foundations constructed using reinforcing bar (rebar) and imported concrete. No concrete batching will take place on Site. Following the construction of the turbine foundations, Wind Farm Internal Cabling from the turbine locations to the Substation will be installed in cable ducting laid in trenches along or in the constructed Access Tracks. The Grid Connection will be a 'loop in' connection to the existing 110kV OHL between Charleville Substation and Killonan Substation.

The Substation will be constructed in parallel with the turbine hardstands, turbine foundations and Wind Farm Internal Cabling. The first step will be to construct the temporary construction compound and welfare facilities to be located to the north of the Substation compound. Site Entrance 2 will be used for access to construct the temporary construction compound and for construction of the Substation. The next step will be to prepare the areas of the Site where site infrastructure is to be located by marking out the construction works corridor and the relevant environmental buffer zones as required.

The last step will be to erect the nine wind turbines on the foundations using two cranes. Commissioning and testing of the turbines can then proceed.

2.6.15 Construction Employment

It is estimated that there will be approximately 58 construction workers during the construction phase, increasing to 60 during the peak period of turbine foundation construction.

2.7 COMMISSIONING

When the Substation is energised by the transmission system operator, wind farm commissioning can take in the region of 2 months to complete to the commercial exportation of power to the national grid. It involves commissioning engineers working through an entire schedule of SCADA (Supervisory Control and Data Acquisition) and electrical and mechanical testing and control measures to check that the wind turbines will perform and export power to the national grid, as designed. This work will be undertaken on site and remotely.

2.8 AERONAUTICAL LIGHTING

The IAA have been consulted at the scoping stage and their requirements taken into account. If planning permission is granted for the Development the IAA will be consulted and upon their request, any specified turbine or obstacle 100m or greater will be installed with a warning light system under direct specification and in accordance with International Civil Aviation Organisation (ICAO) Annex 15 requirements. A summary of the scoping responses received from IAA and the Department of Defence can be viewed in **Chapter 1: Introduction**, **Table 1.7** and the responses can be found in **Chapter 15: Material Assets – Section 16.8**

The following data will be supplied to the IAA:

- The WGS84 coordinates (In degrees, minutes and seconds) for each turbine.
- Height above ground level (to blade tip) and elevation above mean sea level (to blade tip) in both meters and feet.
- Horizontal extent (rotor diameter) of turbines and blade length where applicable in both meters and feet.
- Lighting of the wind farm, which turbine(s) is/are lit, and what type of lighting.

As per the requirements of the Department of Defence, all turbines will be illuminated by Type C, Medium intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of azimuth and to be operational H24/7 days a week. The lighting will be incandescent or of a type visible to Night Vision equipment. Obstacle lighting used must emit light at the near Infra-Red range of the electromagnetic spectrum, specifically at or near 850 nanometres (nm) of wavelength. The light intensity to be of similar value to that emitted in the visible spectrum of light. Aeronautical lighting requirements will be finalised prior to the erection of turbines, in compliance with any condition of planning, and following consultation and agreement with the Department of Defence and IAA..

2.9 OPERATION AND MAINTENANCE

During the operation of the wind farm, the turbine manufacturer, the wind farm operator, or a service company will carry out regular maintenance of the turbines. In addition, operation and monitoring activities will be carried out remotely with the aid of computers connected via a telephone broadband link. Routine inspection and preventative maintenance visits will be necessary to provide for the smooth and efficient running of the wind farm and Substation.

The Project will create two full-time jobs during the operational phase. In addition to these jobs, various personnel will be required for the successful and continued operation of the wind farm. During the operational phase of the wind farm, the operation and reliability, maintenance (turbines, civil works and electrical infrastructure) finance, ongoing compliance with permissions and permits, safety, security, community relations and benefits and land-owner agreements shall be continually managed.

2.10 DECOMMISSIONING

The Developer is seeking consent for a period of 35 years. At the end of this period several options will exist:

- Continued operation of the existing turbines;
- Refurbishment/replacement of the turbines and continued operation; or
- Decommissioning of the wind farm.

Any further operation beyond 35-years would be subject to a further planning application and EIA. This EIAR assumes full decommissioning of the proposed wind farm will take place after 35-years. All structures above ground level shall be demolished and removed from the site for reuse/recycling; however, Access Tracks are likely to be retained for continued use by the landowners for agricultural purposes.

Further details on the decommissioning phase and specific mitigation measures are provided in each chapter of this EIAR as they relate to each environmental topic.

Hardstand areas will be remediated to match the existing landscape as closely as possible. The Decommissioning Plan (**Appendix 2.1 CEMP**) specifies that the turbine hardstands will be allowed to naturally revegetate. The habitat that would be expected to develop is likely to fall into a mosaic of semi-natural grassland (GS).

The Grid Connection and the Substation will become an asset of the national grid under the management of ESB and& EirGrid and will likely remain in place upon decommissioning of the wind farm as required by ESB/EirGrid.

Biodiversity enhancement measures as set out in the Biodiversity Enhancement Management Plan (**Appendix 6.5 BEMP**) will have become part of the fabric of the local ecology and will be retained for the benefit of the local wildlife.

Decommissioning phase effects are likely to be broadly similar to construction phase impacts, in terms of disturbance through ground clearance works, and reinstatement. There will also be the potential for surface water quality impacts from ground disturbance, refuelling and the storage of potentially hazardous materials onsite.

Certain aspects of activities occurring during the construction phase are anticipated to occur at reduced levels during decommissioning, such as excavation of turbine foundations that will be left in situ and covered with soil for reinstatement. Access Tracks will also remain for ongoing usage as farm tracks. In addition, the use of building materials, including concrete and aggregates will not be required.

These potential issues will be mitigated through the implementation of the CEMP for the decommissioning phase of the project. A comprehensive Decommissioning Plan (**Appendix 2.1 CEMP**) has been prepared and it includes all of the mitigation measures detailed in the submitted documentation, including the EIAR and the NIS, save as may otherwise be required by conditions in any grant of permission, to manage and control the component removal and ground reinstatement.