Appendix 2B

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

MWP

Construction Environmental Management Plan (CEMP)

Brittas Wind Farm,

Co. Tipperary

November 2024

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23318	6003	A	02/10/2023	KB/MT	MT	MT	DRAFT for Client review
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1. Introduction

This Construction Environmental Management Plan (CEMP) outlines the scope of construction works, construction methodologies and environmental management measures which are to be implemented and followed for the Brittas Wind Farm project in order to ensure that the project is constructed in accordance with best practice and with the minimum impact on the surrounding environment. The Brittas Wind Farm project includes:

- The Wind Farm site which includes ten (10) wind turbines, associated tracks and infrastructure, an on-site 110kV electrical substation, Battery Energy Storage System (BESS) and a Grid Connection Route (GCR) which consists of an underground electrical grid connection from the Wind Farm Site to the existing Thurles 110kV substation;
- A Turbine Delivery Route (TDR) which is the route between the Port of Foynes and the Wind Farm Site along which turbine components will be transported. This will include temporary accommodation works along the public road to allow for delivery of wind turbine components.

This CEMP has been developed specifically for this project and outlines construction practices and environmental management measures which will be implemented during the construction phase, in order to ensure that the project is constructed in accordance with best practice, with the minimum impact on the surrounding environment.

An Operational Environmental Management Plan has also been included in this document in Annex 2.

1.1 Report Purpose and Objectives

The purpose of this CEMP is to outline how the Contractor(s) will implement a Site Construction Management System to meet the specified requirements which include contractual, regulatory and statutory requirements, environmental mitigation measures and planning conditions.

In essence this CEMP is to provide the Developer and the Main Project Contractor with a practical guide to ensure compliance by all parties with Planning and Environmental requirements. The contractor will be contractually obliged to comply with all measures contained in the CEMP.

The CEMP achieves this by providing the environmental management framework to be adhered to during the pre-commencement and construction phases of the Brittas Wind Farm. It outlines the work practices, construction management procedures, management responsibilities, mitigation measures and monitoring proposals that are required to be adhered to in order to construct the works in an appropriate manner and comply with the environmental commitments outlined in the EIAR.

All site personnel will be required to be familiar with the plan's requirements as related to their role on site. There will be a requirement on the Appointed Contractor that details are updated with progress, including the roles and responsibilities of those appointed on the site for the construction of the project.

This CEMP is intended to be a live document whereby different stages will be completed and submitted as the development progresses. In the event planning permission is granted for the development, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for written approval.

1.2 Scope

The CEMP defines the approach to environmental management at the site during the construction phase. Compliance with the CEMP, the procedures, work practices and controls will be mandatory and must be adhered to by all personnel and contractors employed on the construction phase of the project.

This CEMP seeks to:

- Promote best environmental on-site practices for the duration of the construction phase.
- Comply with any planning conditions that may apply.

1.3 Live Document

The CEMP is considered a 'live' document, and as such, will be reviewed on a regular basis. Updates to the CEMP may be necessary due to any changes in environmental management practices and/or contractors but will implement the measures in this version of the CEMP as a minimum. As explained in more detail in the later sections, the procedures agreed in this CEMP will be audited regularly throughout the construction phase to ensure compliance.

2. Overview of Project

2.1 Wind Farm Site

The wind farm development site includes the 10 wind turbines, substation, gird connection route (GCR) and associated tracks and infrastructure. The area of the proposed Wind Farm is located in a rural area of Brittas, located approximately 3km north of Thurles town in County Tipperary in the following townlands: Brittas, Rossestown, Clobanna, Brownstown, Kilkillahara and Killeenleigh, County Tipperary. Refer to Figure 2-1 and Figure 2-2 which shows the site location and layout.

The lands of the Wind Farm Site are made up of agricultural fields bounded by hedgerows and treelines. An area of broadleaf forestry is located within the southwest portion of the site. The River Suir transects the site from north to south.

Access to the site will be from four site entrances, 2 existing/upgraded entrances and 2 new entrances, Figure 2-3. Three of the site entrances will be for access during the construction phase to the proposed wind farm on the L8017 Rossestown Road (Site Access 1, Site Access 2 and Site Access 3). The fourth site entrance will be for the proposed wind farm sub-station access point and will be off L4120-18 also known as Rossestown Road. This entrance will be for operational use only and will not be used for access during the construction phase.

The wind farm site will use 7.7km of new tracks which will be constructed as part of the proposed project. The aggregate for the construction of the internal access tracks, hardstands and sub-station compound will be sourced from a combination of the proposed on-site borrow pit, suitable excavated aggregate material obtained from associated earthworks and local quarries.

The site layout is shown on in Figure 2-1 and on Planning Drawings 23318-MWP-00-00-DR-C-5005. A schedule of the proposed wind turbines and their corresponding grid co-ordinates (ITM) is set out in Table 2-1.

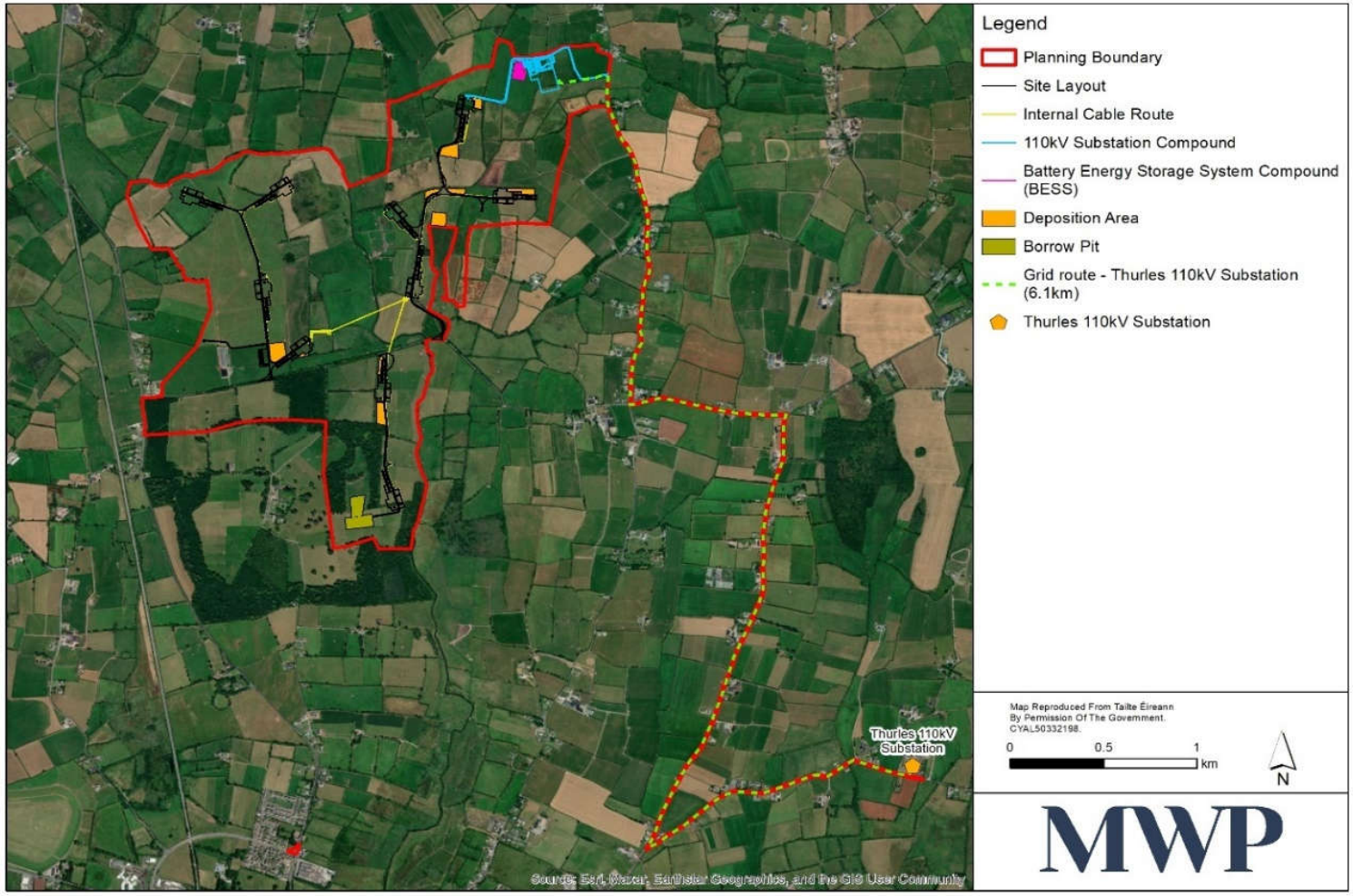


Figure 2-1: Proposed Project Red Line Boundary

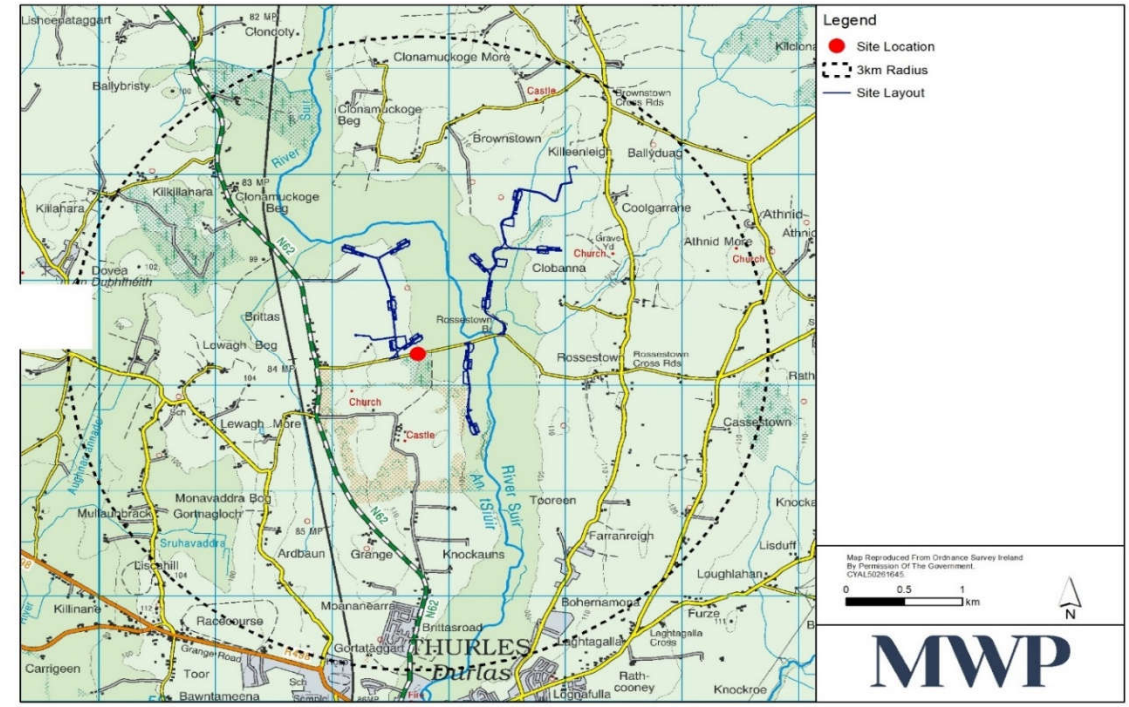


Figure 2-2: Site Location Map

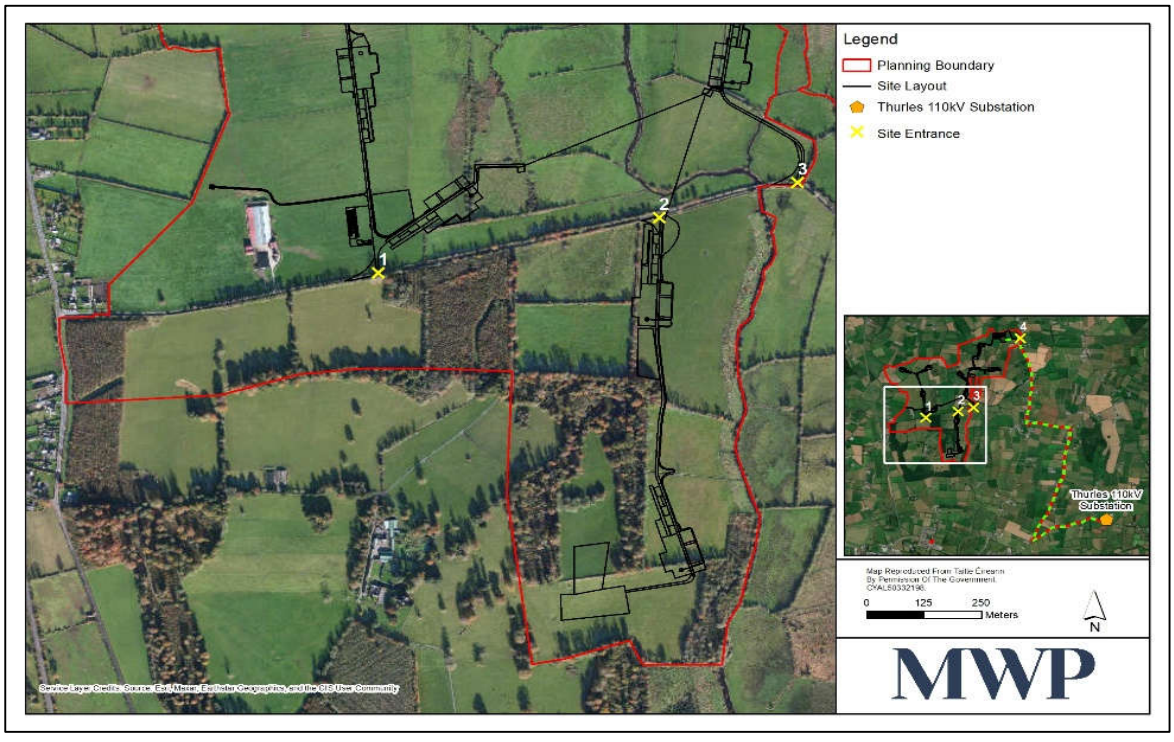


Figure 2-3: Three Site Entrances along Rossestown Road (L-8017)

Table 2-1: Characteristics of the three candidate turbines used to provide the range of parameters proposed and assessed in the EIAR.

Turbine Type	Rotor Diameter	Tip Height	Blade length	Hub Height
A (1)	150m	180m	73.7m	105m
B (2)	155m	180m	76m	102.5m
C (3)	149m	180m	73m	105m

Table 2-3 Proposed Turbine Heights and ITM Co-ordinates

Turbine No	Height	X Coordinate	Y Coordinate
T1	180m	612041	663334
T2	180m	612606	663390
T3	180m	613136	663262
T4	180m	613561	663879
T5	180m	613713	663346
T6	180m	612472	662850
T7	180m	613279	662778
T8	180m	612712	662499
T9	180m	613093	662195
T10	180m	613167	661578

2.2 Grid Connection Route (GCR)

The proposed Grid Connection Route (GCR) of approximately 7km of a 110kV underground cable is located within the public road between the Wind Farm site and the existing Thurles 110kV substation in the townland of Ballygammane. The grid route also passes through agricultural fields within proposed new access tracks at the northeast of the site. The GCR is located in the following townlands: Killeenleigh, Coolgarrane, Clonbanna, Athnid More, Rossestown, Cassestown, Laghtagalla, Farranreigh, Furze, Loughlahan and Ballygammane, Co. Tipperary.

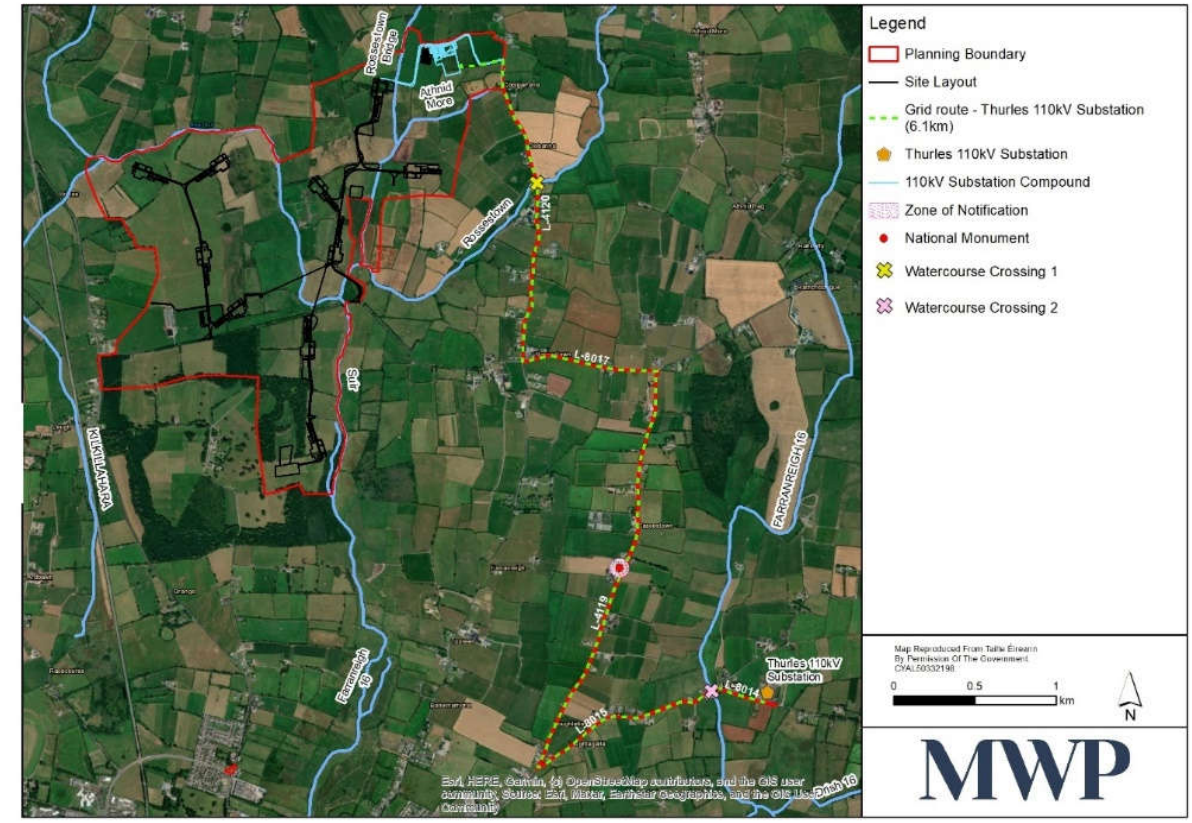


Figure 2-4: Grid Connection Route

The GCR works will consist of the installation of ducts and joint bays in an excavated trench within the public road network to accommodate cables. The proposed grid connection will require a Road Opening License (ROL) prior to commencement of any grid connection works on the public road. The road surface of the public roads will be reinstated to the standards set out by the Department of Transport, Tourism and Sport Guidelines on the Opening, Backfilling and Reinstatement of Trenches on Public Roads (April 2017).

3. Construction Works

3.1 Wind Farm Site

Construction will be carried out in a phased manner in order to minimise disruption to the local community, minimise environmental impact and create the safest working conditions possible. The construction of the proposed project will comprise of the following works:

- Felling of 1.4 ha of forestry plantation and removal of 4086m of hedgerows necessary to facilitate construction works;
- Construction of four site entrances and any sections of internal access tracks necessary to facilitate access to the temporary construction compound and proposed on-site borrow pit location;
- Construction of temporary construction compounds including fencing (for security and ecology, water and archaeological exclusion zones), site offices, parking, material laydown and storage areas, etc;
- Establishment of the on-site borrow pit and temporary storage of stockpiled overburden and surplus excavated materials within the material storage areas.
- Earthworks and drainage infrastructure associated with construction of new and upgraded internal access tracks, crane hardstand, turbine foundations and substation compound;
- Construction of upgraded and new watercourse crossings for construction of internal access tracks and underground cables;
- Excavation of turbine bases and permanent met lidar foundations, and associated turbine hardstand areas;
- Installation of sections of underground cabling between turbines;
- Installation of sections of underground cabling to connect to the national grid;
- Construction of the substation compound;
- Turbine delivery, installation, and commissioning; and
- Meteorological lidar delivery, installation, and commissioning;
- Temporary accommodation works at 22 no. locations adjacent to the public road to facilitate delivery of turbine components to site. The works primarily relate to trimming and clearing of vegetation, temporary removal of street furniture and fencing, and installation of temporary stone hard standing. Two locations where land take and hard surface is required for deliveries are located within the townlands of Brittas and Brittasroad, Co. Tipperary.

3.2 Grid Connection Route

The construction of the proposed grid connection route will comprise of the following works:

- Pre-commencement activities including site investigation work and pre-construction surveys;
- The active construction area will be a 100-200m stretch along the public road;
- Cable trenches will be constructed within the public road;
- Once the trenches are complete, the joint bays will be opened up and electrical cables pulled through the ducts and joined; and
- Reinstatement of the public road.

3.3 Construction Schedule

The proposed construction phase duration is expected to be 18 months. The wind farm construction works will be phased as outlined in Table 3-1 below. A number of these phases will run concurrently as follows:

- As the internal site access roads are constructed up to each turbine, hardstand areas for the crane, turbine foundations and building foundations will be prepared.
- Once the tracks are completed, the trenching and laying of underground cables will begin.
- Construction of the site substation and control houses will commence so that they will be ready to export power as turbines are commissioned.

Table 3-1: Wind Farm Construction Schedule

Phase	Activity	Duration
Phase 1	Clearfelling (to be complete ahead of construction site mobilisation)	2 months (prior to construction)
Phase 2	Prepare site, pre-construction activities, site entrance, temporary compound	1 month
Phase 3	Access road construction + Drainage plan implementation	3 months
Phase 4	Hard standing construction for turbines	2 months
Phase 5	Turbine Foundation construction	4 months
Phase 6	On site trenching and ducting (underground electrical collection system)	2 months
Phase 7	Substation and BESS construction	4 months

Phase	Activity	Duration
Phase 8	Permanent meteorological lidar compound preparation and unit installation	1 month
Phase 9	Underground grid connection route within the public road	5 months
Phase 10	Turbine delivery	3 months
Phase 11	Turbine erection	4 months
Phase 12	Wind Farm Commissioning	4 months (approx.)

3.4 Working Hours

Construction at the wind farm site will occur within the hours 07.00am – 7.00pm, Monday to Saturday. Due to the requirement for the concrete pours to be continuous, the working day may extend outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are normally complete in a single day per turbine. Turbine and crane erections may also occasionally occur outside of these times in order to take advantage of low wind periods. Working hours will be confirmed at the outset of the project and any changes in hours will be agreed in advance with Tipperary County Council.

GCR Construction and TDR accommodation works activities will operate between the hours 7:00 a.m. and 7:00 p.m., Monday to Saturday or as otherwise conditioned as part of the consent.

3.5 Construction Personnel

During the construction phase, the number of on-site construction personnel will vary for each phase of the development. Overall, it is envisaged that the proposed development would generate employment for up to 60 persons during the construction phase to include site contractors, on-site vehicle and plant operators, engineers, materials delivery personnel, environmental personnel, health and safety personnel.

It is expected that the civil works for the grid connection route will require at least 10 personnel to complete the works. The electrical works will require less heavy machinery but more labour personnel, with typically 25 personnel to complete the electrical works.

4. Construction Methodology

4.1 Wind Farm Site

Key elements of the civil works and activities with the construction phase of the wind farm development are as follows:

4.1.1 Tree Felling

Felling of some hedgerows and portions of existing woodland is required within and around wind farm infrastructure to accommodate the construction of the turbine foundations and associated hardstands, access tracks, and turbine assembly and turbine delivery routes. Trees in a radius of 105m around each turbine will be felled as part of the project. One additional section of forestry felling will be needed on the south side of the junction between L-8017 Rossestown road and the N67 for the delivery of the turbines. Additional tree line and hedge removal will be needed in some areas for the new access roads and construction areas. Overall forestry felling of 1.4ha and 4086m of hedgerow removal will be undertaken.

All tree felling will be undertaken in accordance with the Ecological Environmental Management Plan (EMP 9 in Appendix 1) and the tree felling licence, using good working practices as outlined by the Department of Agriculture, Food, and the Marine (DAFM) Standards for Felling and Reforestation (2019). These standards deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel, and machine oils. All conditions associated with the felling licence will be complied with. A felling licence application will only be submitted once planning permission is received for the proposed development.

4.1.2 Confirmatory Surveys

Any detailed ground investigations, confirmatory surveys and archaeological testing required to support the construction process will be carried out and finalised prior to the commencement of works. The details of these are included in the relevant Environmental Management Plans (EMPs 1, 2, and 9), but include the following:

- Assessment of hedgerows, treelines, woodlands and root protection zones adjacent to the works corridor to be undertaken by a qualified arborist
- Habitat Monitoring of Annex 1 Molinia meadows habitats (8 permanent quadrants for monitoring)
- A due diligence ecological walkover survey of the proposed works corridor, including the grid connection route, TDR areas that include tree felling and hedgerow removal, and bat feature buffers.

Figure 4-1: Forest Felling at Turbine 4

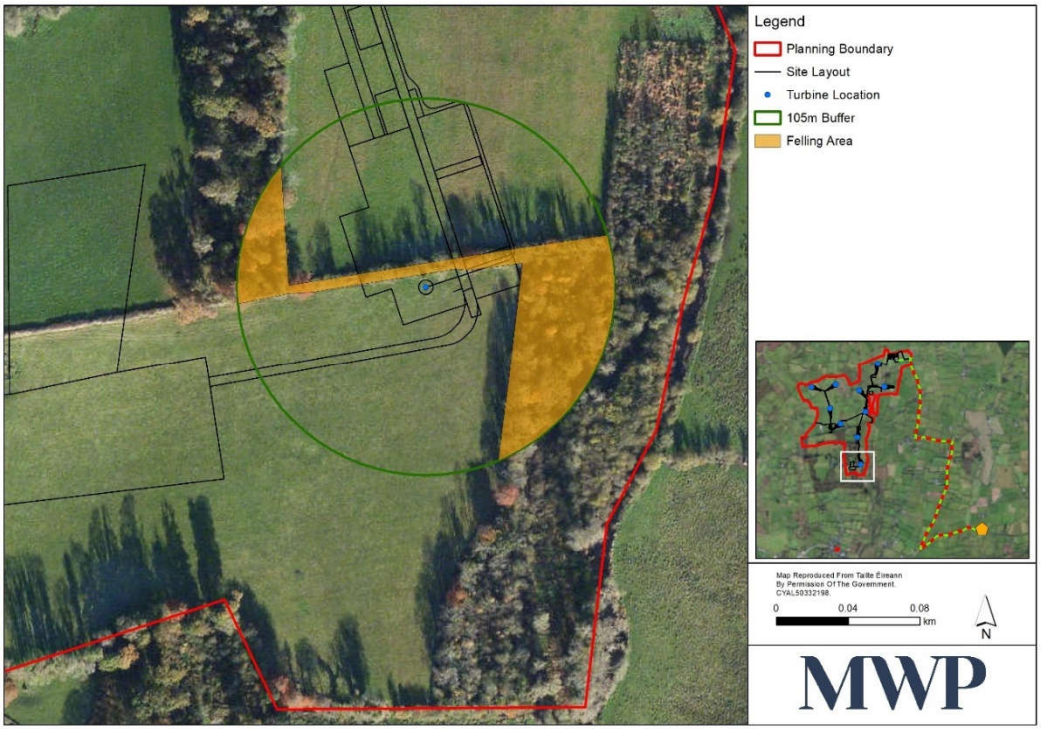


Figure 4-2: Forest felling at Turbine 10

Figure 4-3: Forest Felling for Turbine delivery route at junction between N62 and local Rossestown (L-8017) Road

- Pre-construction bat roost surveys of structures and trees will be carried out at the project site, including along the route of the proposed grid connection in advance of construction commencing. Emergence/re-entry surveys may be required at structures/trees, pending the results of the surveys.
- Amphibian surveys will be carried out by an ecologist in advance of construction works.
- A programme for water monitoring will be prepared in consultation with Inland Fisheries Ireland prior to the commencement of the construction of the wind farm. The plan will include monitoring of water during the pre-construction, throughout construction and in the immediate post construction phases.
- Grid Route Pre-Construction surveys of all electrical, water and other services within the public road, consultations with the relevant authorities and the construction works designed to avoid any existing infrastructure under the roads.
- TDR preconstruction baseline surveys of structural integrity of the proposed haulage route road network.

4.1.3 Enabling Works

Prior to construction commencing, on-site demarcation of the construction site boundary will be undertaken to prevent equipment tracking outside of the planning boundary.

4.1.4 Temporary Site Construction Compound

Two temporary construction compounds will be used for the construction phase of the proposed wind farm. The main temporary construction compound will have dimensions of 95m x 50m and the additional temporary construction compound will have dimensions of 55m x 25m as shown on **Planning Drawings 23318-MWP-00-00-DR-C-5411** and **23318-MWP-00-00-DR-C-5412.** All excavated material will be taken to the on-site deposition areas. The locations of the temporary compound are shown in **Figure 4-4.**

The exposed surface will be levelled out by cutting and filling and will be overlain with a layer of crushed stone from the proposed on-site borrow pits. The finished surface will be formed with a layer of Clause 804 or similar aggregate imported from local quarries. The compound will be graded and compacted out before the welfare container facilities are installed.

Figure 4-4: Location of the two construction compounds

The compound will be used as a secure storage area for construction materials and will also contain temporary site cabins to provide welfare facilities for site personnel. Facilities will include office space, meeting rooms, canteen area and mobile sanitary facilities. Any surface water management, bunding, waste management measures etc will also be put in place at the outset. Site security will be put in place adjacent to the entrance and will be maintained throughout all phases of the work. The proposed development will include an enclosed wastewater management system at the temporary compounds capable of handling the demand during the construction phase. A holding tank is proposed at each compound for wastewater management. The holding tanks will be emptied by a licensed permitted contractor only. Upon completion of the project the compounds will be decommissioned by backfilling the area with the material arising during excavation and landscaping with topsoil.

The compound will be in place for the duration of the construction phase and will be removed once commissioning is complete.

Areas within the compound will be constructed as access roads and used as vehicle hard standings during deliveries and for parking;

1. A bunded containment area will be provided within the compound for the storage of lubricants, oils, and site generators etc.;
2. The compound will be fenced and secured with locked gates,
3. During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor on a regular basis and will be removed from the site on completion of the construction phase.

Figure 4-5: Temporary site construction compound on a wind farm

4.1.5 Borrow Pit and Material Storage Areas

Excavated spoil will be reused for the backfilling, landscaping, and restoration around the proposed wind farm infrastructure such as turbines and hardstands. Dedicated spoil storage areas and a borrow pit are proposed within the site. The borrow pit will be used for generating material for the construction of access tracks and hardstands, and the spoil deposition areas will be used for spoil storage. The proposed locations for the borrow pit and spoil storage are shown on Planning Drawings 23318-MWP-00-00-DR-C-5005.

Drainage and siltation control measures have been designed and will be put in place in all spoil storage areas. This will include a dedicated drainage network, temporary silt fences and settlement ponds designed to cater for the size of each storage area. Further details of the drainage philosophy that will be applied as well as siltation control systems and attenuation systems is given in Section 4.1.8 and EMP 2 in Appendix 1 of this report.

There is one (1) no. proposed on-site borrow pit location which has been identified to provide fill material for internal roads, passing bays, hardstands, foundations, and temporary compound. It is estimated that this will provide 15.5% of the fill material required for the development. The location of

this proposed borrow pit is shown in **Figure 4-6**. It is estimated that approximately 22,319 m³ of aggregate will be won from this borrow pit. The extraction of rock from the borrow pit is proposed to be undertaken by a combination of rock breaking, ripping, and blasting.

During the construction period, and post-excavation, the borrow pit area and the other deposition areas will act as material storage areas for the management of excess material generated on the site during construction.

Post-construction, the borrow pit will be filled with excess material generated on the site during construction and thereafter topped with topsoil recovered from construction areas and stored for later use in landscaping. The borrow pit site will then be revegetated and restored to its current use as pasture. The revegetation of the site is detailed in the Biodiversity Enhancement Plan and the landscaping plan.

Figure 4-6: Borrow Pit/Material Storage Location west of Turbine 10

4.1.6 Site Access

Primary access to the proposed project site will be provided from the local public Rossestown road (L-8017). There will be four site entrances. Three of these are located along the L-8017 road (**refer to Figure 4-7)** and will provide site access during the construction, operational and decommissioning phases. The most westerly of these three site entrances provides access to turbines 1, 2, 6 and 8 as well as the Lidar and the main construction site compound to the north of the public road. The middle entrance provides access to Turbines 9 and 10 and the borrow pit to the south of the L-8017. The third eastern entrance on the L-8017 provides access to turbines 3, 4, 5 and 7 as well as another construction compound and the proposed substation. The fourth entrance is to the substation only and will only be used for operations and maintenance access during the operational phase. This entrance is located along the section of the L-4120 road in the townland of Killeenleigh, located at the north-east of the Wind Farm (**refer to Figure 4-8).**

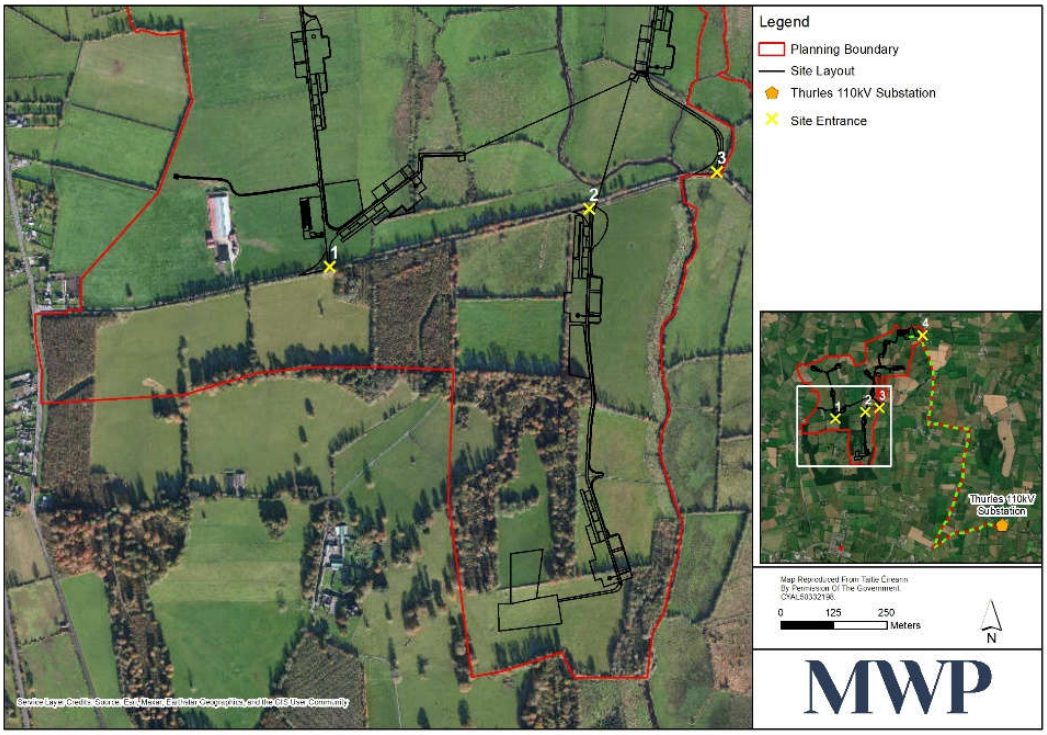


Figure 4-7: Three Site Access Points

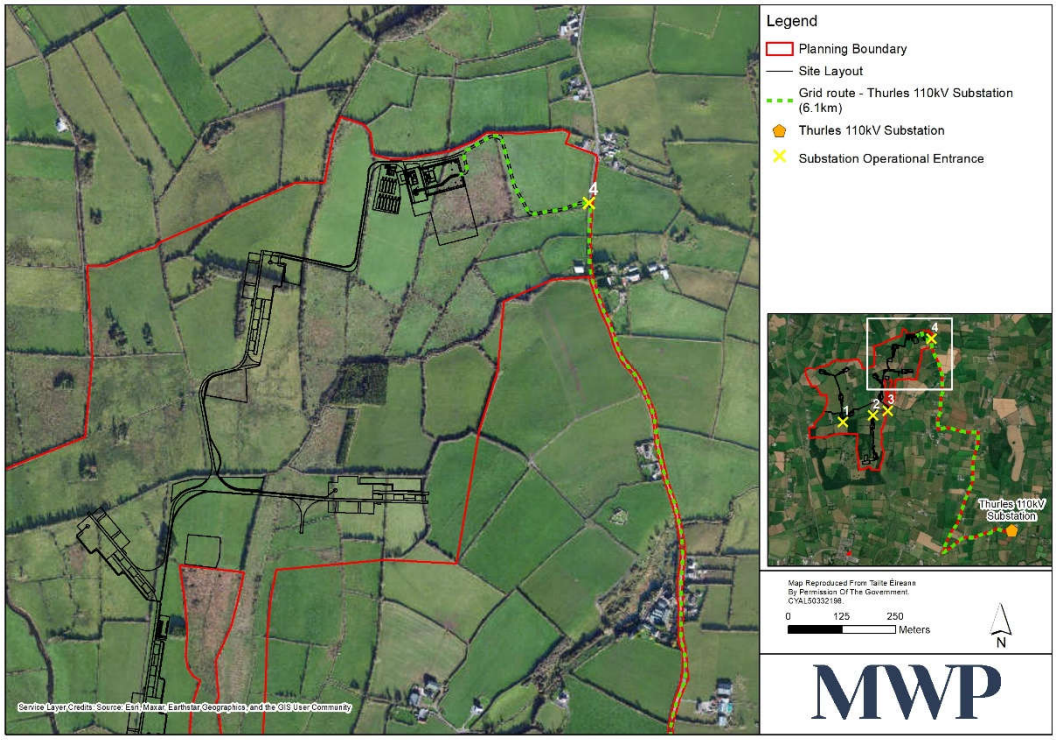


Figure 4-8: Substation Operational Entrance (not to be used during construction) along the L-4120 Road

The requirements for junction sight distances are set out in Transport Infrastructure Ireland (TII) "DN-GEO-03060: Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions)". Sight distance is measured from a point 2.4m from the near edge of the major road along the centre of the minor approach road. This distance is referred to as the 'x-distance'. The visibility distance along the major road is referred to as the 'y-distance' and is measured to the near edge of the major road in both directions. The required sight distance in the vertical plane is based on eye and object heights of 1.05m. The 'y-distance' requirement depends on the design speed of the major road. This is the 85th percentile speed which is the speed below which 85% of vehicles travel.

The statutory speed limit on the local road is 80km/h but the design speed is likely to be somewhat lower. Based on observations on site, a design speed of 60km/h has been taken as being appropriate for entrances 1, 2 and 3 along the L8017 Rossestown Road. At these locations a minimum sight distance of 70m is deemed appropriate due to the restricted horizontal alignment of the local road, presence of an arch bridge which restricts vertical alignment and the tight bends to the east of the proposed entrances onto the local road. A speed survey was carried out along this section of roadway near entrances 1, 2 and 3 and this yielded an 85th percentile speed of 58km/h which provides further justification to the selected design speed. A design speed of 70km/h has been taken as being appropriate along the L4120 at the sub-station entrance. At this location a sight distance of the 120m has been provided.

The sightline distance will be achieved by installing a timber post and rail fence and keeping an area outside the fence free of vegetation or other obstructions. The sight distance splays in both directions are achieved and are shown in Planning Drawings 23318-MWP-00-00-DR-C-5034 to 5035. These improvements will remain in place permanently and will benefit users of the proposed wind farm when exiting the site onto the public road.

4.1.7 Internal Wind Farm Site Roads

4.1.7.1 Upgrading and Widening of Existing Roads

For the construction of the wind farm it is proposed to utilise existing internal roads where possible. These roads will be widened by removing organic material and soft subsoil to formation level and constructing a road on a layer of geogrid or geotextile. This road construction will be similar in build up to the excavated road construction which is outlined in detail in Section 4.1.7.2 below. The new width of road and the existing road surface, where required, will be capped with a 150mm layer of crushed stone of Clause 804 or similar aggregate type material.

This road type will have a crossfall of 2.5% from one edge to the other. The existing roadside drains on the lower side of the road will be used as part of the dirty water drainage system for the site. The existing roadside drains on the higher side of the road will be retained as clean water drains.

The proposed sequence for upgrading and widening existing access roads will comprise the following:

1. The appointed contractor will liaise with the wind turbine supplier prior to the commencement of the works to ensure that the design of the tracks conforms with the wind turbine supplier's specifications and no works beyond that which have received planning permission will be undertaken.
2. The appointed contractor will survey the area for any unforeseen hazards prior to the commencement of works and set up warning signage as appropriate.
3. Drainage measures to ensure the separation of overland clean water flow from construction run-off will be implemented as outlined in Section 4.1.8.
4. The material required for widening and upgrading the existing site roads is proposed to be used from either the proposed on-site borrow pit, suitable excavated stone material within the wind farm site and imported stone from the nearby quarry. All roads will be finished with imported 150mm crushed stone of Clause 804, or similar aggregate type material. Sufficient passing bays will need to be constructed to allow for the safe movement of site traffic along the existing roads.
5. Where the extraction of stone aggregate from the proposed borrow pit is used it will be undertaken by 30-60 Ton 360° excavators and loaded onto articulated dumper trucks that will deliver the aggregate to the required road widening / upgrading locations.
6. Widening works will begin with the use of excavators that will first remove any topsoil / vegetative layer which may be present. This material will be transported to an agreed temporary storage area (within turbine hardstand areas) and maintained for re-use during the restoration phase of the wind farm construction. Topsoil / vegetative removal will be kept to a minimum to prevent any runoff of silt during heavy rainfall.
7. Excavators will continue to strip and excavate the soft subsoil underneath which will be temporarily stored adjacent to the access roads in accordance with approved methods with the use of an articulated dumper truck. Excavated material will only be temporarily stored on slopes under 5° and to a maximum height of under 1.0m until they are transported to the selected deposition area where they will be permanently stored.
8. Once a section of the widened access road is exposed to suitable formation; a layer of geogrid or geotextile material may be placed along its formation depending on ground conditions.
9. The stone to be used for the widening works will be delivered to the required work area and spread out locally with the use of excavators on top of the geogrid / geotextile material. This will be compacted with the use of a roller which will roll the stone aggregate in maximum 250mm layers to achieve the required design strength.
10. The road upgrading works will involve the use of a roller compacting the site won stone aggregate in maximum 250mm layers laid over the existing road pavement. A layer of geogrid or geotextile material may be placed along the existing road pavement prior to the placement of the stone aggregate to achieve the required design strength.
11. All upgraded / widened access roads will be constructed to a minimum drivable width of 5.0m with a maximum crossfall of 2.5% in order that water can flow off the roads and reduce the risk of rutting / potholes occurring.

12. Roadside drains as per Section 4.1.8 will be constructed to manage clean and dirty water runoff along widened and upgraded access roads.
13. The final running surface of the new widened / upgraded access roads will be capped with a minimum 150mm layer of crushed stone Clause 804 material or similar using a road grader.
14. Any surplus spoil material generated from the road widening works will be transported back to the borrow pit to aid final reinstatement. Excavated topsoil and subsoil will be kept separate at the excavation and storage areas.
15. All excavations to be carried out will be battered back to a safe angle of repose (a max slope angle of 45°).
16. Where drop offs greater than 1.0m in height occur alongside road edges; physical edge protection will be constructed to reduce the risk of vehicles overturning. Roadside marker posts will also be erected to delineate road edges in poor weather.
17. The appointed contractor will ensure that all on-site personnel are aware of environmental constraints / sensitive areas within the wind farm site in which works are to be avoided.

Figure 4-9: Upgraded road on a wind farm

4.1.7.2 New Excavated Roads

New excavated roads will be constructed using stone aggregate obtained from either the proposed on-site borrow pit or imported from the nearby quarry. The stone aggregate will be placed over a layer of geogrid, where required, after all organic and soft subsoil material is excavated to formation level. Geotextile material, used to separate the road building material from the subsoil, will also be laid at formation level. The road will be finished with imported 150mm crushed stone of Clause 804, or similar aggregate type material.

The proposed sequence of constructing new excavated access roads will comprise the following:

1. The appointed contractor will liaise with the wind turbine supplier prior to the commencement of the works to ensure that the design of the new excavated roads conforms with the wind turbine supplier's specifications and no works beyond that which have received planning permission will be undertaken.
2. The appointed contractor will survey the area for any unforeseen hazards prior to the commencement of works and set up warning signage as appropriate.
3. Drainage measures to ensure the separation of overland clean water flow from construction run-off will be implemented as outlined in Section 4.1.8.
4. Excavators will first remove any topsoil / vegetative layer which may be present. This material will be transported to an agreed temporary storage area and maintained for re-use during the restoration phase of the wind farm construction. Topsoil / vegetative removal will be kept to a minimum to prevent any runoff of silt during heavy rainfall.
5. Excavators will continue to strip and excavate the soft subsoil underneath which will be temporarily stored adjacent to the access roads in accordance with approved methods with the use of an articulated dumper truck. Excavated material will only be temporarily stored on slopes under 5° and to a maximum height of under 1.0m until they are transported to the selected deposition areas where they will be permanently stored.
6. All excavations to be carried out will be battered back to a safe angle of repose (slope angle of 45°) but where excavations are in solid rock the safe angle of repose may be increased to a slope angle of 60°.
7. Once a section of the excavated access road is exposed to suitable formation; a layer of geogrid or geotextile material may be placed along its formation depending on ground conditions which will be covered with site won aggregate stone as required compacted in maximum 250mm layers.
8. The material required for the excavated access roads is proposed to be used from either the proposed on-site borrow pit, suitable excavated stone material within the wind farm site and imported stone from the nearby quarry. All roads will be finished with imported 150mm crushed stone of Clause 804, or similar aggregate type material. Sufficient passing bays will need to be constructed to allow for the safe movement of site traffic along the existing roads.
9. Where the extraction of stone aggregate from the proposed borrow pit is used it will be undertaken by 30-60 Ton 360° excavators and loaded onto articulated dumper trucks that will deliver the aggregate to the required road widening / upgrading locations.

10. The stone will be delivered to the required work area and spread out locally with the use of excavators and compacted with the use of a roller which will roll the stone aggregate in maximum 250mm layers on top of the geogrid / geotextile material to achieve the required design strength.
11. All new excavated access roads will be constructed to a finished carriageway width of 5.0m with a maximum crossfall of 2.5% in order that water can flow off the roads and reduce the risk of rutting / potholes occurring.
12. Roadside drains as per Section 4.1.8 will be constructed to manage clean and dirty water runoff along excavated access roads.
13. The final running surface of the new widened / upgraded access roads will be capped with a minimum 150mm layer of crushed stone Clause 804 material or similar using a road grader.
14. Any surplus spoil material generated from the excavated access road works will be transported back to the borrow pit to aid final reinstatement. Excavated topsoil and subsoil will be kept separate at the excavation and storage areas.
15. Where drop offs greater than 1.0m in height occur alongside road edges; physical edge protection will be constructed to reduce the risk of vehicles overturning. Roadside marker posts will also be erected to delineate road edges in poor weather.
16. The appointed contractor will ensure that on site personnel will be aware of environmental constraints / sensitive areas within the wind farm site in which works are to be avoided.

Figure 4-10: New excavated road on a wind farm

4.1.7.3 New Floating Roads

Floating roads may be utilised where peaty soils exist and gradient and topographical conditions are suitable. The use of floating road methods will minimize the excavation of material and reduce interference with the existing drainage regime in these areas of the site. A combination of geogrid and geotextile will be placed over the vegetation on the existing surface to be traversed with the floating road. A minimum thickness of 450mm of site won stone, will be placed over the bottom layer of geogrid / geotextile. This will be overlain with a 150mm surface layer of Clause 804 or similar material.

Where new access tracks will be constructed through forested areas, the felled trees may be used in the construction of the floating roads as outlined in the Coford Forest Road Manual (2004, see references at end of document). This construction method involves layering the brash from the felling process on the existing ground surface and placing the felled trees perpendicular to the direction of travel to benefit from the load spread thereby provided. A combination of geogrid and geotextile will be placed on top of the felled trees and the road construction completed using the same construction method as that outlined above. Refer to Planning Drawings 23318-MWP-00-00-DR-C-5406 for further details.

The proposed sequence of constructing floating roads will comprise the following as per best practice guidance from the Scottish Natural Heritage / Forestry Commission Scotland (Forestry Civil Engineering - FCE) on the construction of floated roads:

1. The appointed contractor will mark out the line of the proposed floated road using a GPS / total station.
2. Drainage measures to ensure the separation of overland clean water flow from construction run-off will be implemented as outlined in Section 4.1.8.
3. The intended floating road area is cleared of major protrusions such as rocks, trees, bushes etc down to ground level but residual stumps and roots are left in place.
4. The local surface vegetation and soils are left in place where possible as the existing vegetation and root mat may be the strongest layer in the system and care should be taken to preserve this layer if possible.
5. Any local hollows and depressions are filled in with a suitable local lightweight fill such as tree brash, logs, or geogrid / geotextile material with stone aggregate.
6. A formation, 7 to 8m, wide is prepared where a layer of geogrid / geotextile is laid out by hand along the line of the proposed floated road.
7. The specification for geotextiles will be finalised by the design engineer at construction stage but past empirical experience on previous constructed wind farms within Ireland and Scotland has proven the suitability of floated road construction.
8. Where there is a drainage requirement, suitably sized HDPE (high-density polyethylene) drainage pipes shall be laid on top of the installed geogrid / geotextile prior to the placement of stone aggregate. Cross drains will be laid at appropriate intervals to maintain the existing drainage regime on the site.

9. The material required for the floated access roads is proposed to be used from either the proposed on-site borrow pit, suitable excavated stone material within the wind farm site and imported stone from the nearby quarry. All roads will be finished with imported 150mm crushed stone of Clause 804, or similar aggregate type material.
10. Where the extraction of stone aggregate from the proposed borrow pit is used it will be undertaken by 30-60 Ton 360° excavators and loaded onto articulated dumper trucks that will deliver the aggregate to the required road widening / upgrading locations.
11. Wide tracked 360° excavators will be used for constructing the floated roads by cascading a minimum 450mm thickness of stone aggregate over the geogrid / geotextile. The stone aggregate will be suitably sized to achieve a sound interlock with the geogrid / geotextile material. It is common practice for floated road construction on wind farms that the compaction of the stone aggregate is done by the wheels and tracks of construction plant alone.
12. An additional layer of geogrid / geotextile may be placed over the stone aggregate, if necessary, before a minimum capping layer of 150mm of Clause 804 or similar material is laid out with excavators.
13. All floated access roads will be constructed to a minimum drivable width of 5.0m with a maximum crossfall of 2.5% in order that water can flow off the roads and reduce the risk of rutting / potholes occurring.
14. Roadside drains as per Section 4.1.8 will be constructed to manage clean and dirty water runoff along floated roads.
15. Where drop offs greater than 1.0m in height occur alongside road edges; physical edge protection will be constructed to reduce the risk of vehicles overturning. Roadside marker posts will also be erected to delineate road edges in poor weather.
16. To allow for the safe movement of site traffic during the construction of floated roads; a site traffic management plan will be prepared by the appointed contractor in accordance with the TMP (Volume III, Appendix 16A) submitted with this application. Care will be taken when reversing vehicles on floating roads to ensure that they do not run along the edge of the road but stay within the delineated safe running zone.
17. The appointed contractor will ensure that on site personnel will be aware of environmental constraints / sensitive areas within the wind farm site in which works are to be avoided.

Figure 4-11: Floated road on a wind farm

4.1.8 Site Drainage System

4.1.8.1 Design Principles

The site drainage system was designed integrally with the wind farm infrastructure layout as a measure to ensure that the proposal will not change the existing flow regime across the site, will not deteriorate water quality and will safeguard existing water quality status of the catchments from wind farm related sediment runoff.

A fundamental principle of the drainage design is that clean water flowing in the upstream catchment, including overland flow and flow in existing drains, is allowed to bypass the works areas without being contaminated by silt from the works. This will be achieved by intercepting the clean water and conveying it to the downstream side of the works areas either by piping it or diverting it by means of new drains or earth mounds.

This process will cause the normally dispersed flow to be concentrated at specific discharge points downstream of the works. To disperse this flow, each clean water drain will be terminated in a discharge channel running parallel to the ground contours that will function as a weir to disperse the flow over a wider area of vegetation. An alternative method is to allow the water to discharge through perforated pipes running parallel to the ground contours. Both methods will prevent erosion of the ground surface

and will attenuate the flow rate to the downstream receiving waters. The specific drainage measures to be used at each location are shown on the drainage drawings, 23318-MWP-00-00-DR-C-5025, included with the planning application. The clean water interceptor drains, or earth mounds are all positioned upslope to prevent any mixing of the clean and dirty water. The outflow from these drains is then piped under the road at suitable intervals and at low points depending on the site topography.

Separating the clean and dirty water will minimise the volume of water requiring treatment. The dirty water from the works areas will be collected in a separate drainage system and treated by removing the suspended solids before overland dispersal. Dirty water drains will be provided on both sides of the access roads and along the periphery of the turbines, crane hardstands, substation compound, Lidar compound, borrow pit and the temporary site construction compounds.

The treatment system will consist of a series of settlement ponds at designated locations throughout the site (refer to Section 4.1.9.3 below). The outflow from the treatment system will be dispersed over vegetation in the same manner as the clean water dispersion and will become diluted through contact with the clean water runoff in the buffer areas before eventually entering the downstream watercourses.

An extract from the drainage drawings is illustrated in Figure 4-13. The clean water interceptor drains, or earth mounds are all positioned upslope to prevent any mixing of the clean and dirty water. The outflow from these drains is then piped under the road at suitable intervals and at low points depending on the site topography. In the illustration 'dirty water' drains collect all incident rainwater that falls on the infrastructure. This water then drains to settlement ponds for removal of sediment before it is discharged via overland dispersal to the downstream watercourse.

The site drainage layout is presented in Planning Drawings 23318-MWP-00-00-DR-C-5025 to 5033 with drainage details presented in Planning Drawing 23318-MWP-00-00-DR-C-5407. The drainage layout is overlaid on background OSI mapping in the A1 drawings that accompany the planning application.

4.1.8.2 Flood Attenuation

The creation of impermeable areas within a development site has the effect of increasing rates of runoff into the downstream drainage system and this may increase flood risk and flood severity downstream. This applies particularly to urban areas that drain to closed pipe systems which do not have the capacity to cater for increased hydraulic loads. The Brittas Wind Farm development is located within a large rural catchment with an open drainage system. The footprint of the impermeable areas and the associated increase in runoff rate is very small in the context of the catchment size and therefore represents a negligible increase in downstream flood risk. However, it is proposed to provide some attenuation to limit the flow rate into the settlement ponds during high intensity storm events so that they do not become overloaded. This will also attenuate the flow to the downstream watercourses.

Figure 4-12: Separation of Clean and Dirty Water Drainage on a Wind Farm Site

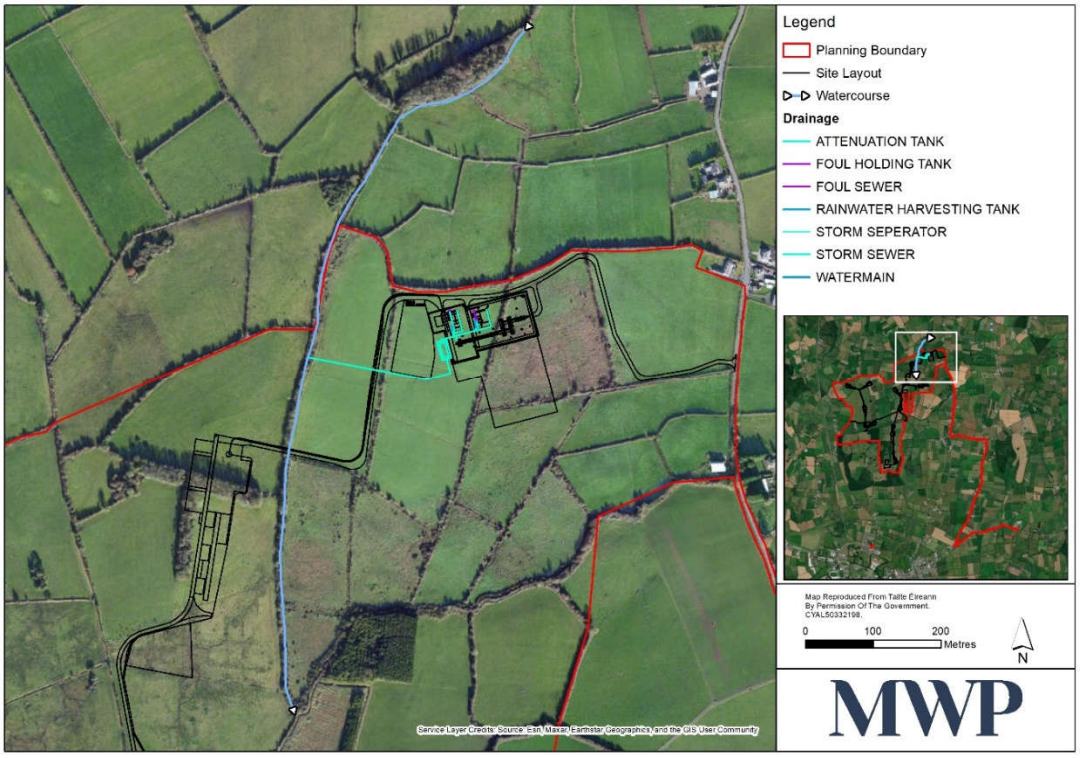


Figure 4-13: Extract from Drainage Drawings

The volume of water requiring attenuation relates to direct precipitation on the roads and other infrastructure footprint only. The developed surfaces have some permeability, and this reduces the attenuation requirement. Conventional attenuation systems use proprietary flow control units, but these can become blocked with debris and vegetation and require regular maintenance. They are, therefore, not appropriate for use within a forestry environment or where long-term routine maintenance would not be practical.

It is proposed to provide temporary storage within the drainage channels by creating stone dams within them at regular intervals. The spacing of the dams is conventionally 100 metres but depends on the channel slope, with steeper channels requiring shorter intervals. The dams, which are constructed with small sized aggregate held in place by large aggregate, also reduce the flow rate through the drainage system and are an effective means of providing flow control. Silt fences will also provide storage and flow control.

To ensure that there is no unacceptable flood risk, the following design flood levels will be implemented:

- The design flood level for the proposed substation is the 0.1%AEP MRFS 95% CI flood level plus 500mm freeboard; and
- The design flood level for the proposed 10 no. turbines is the 1%AEP MRFS flood level plus 300mm freeboard.

In the Flood Risk Assessment undertaken (attached as Appendix 9A in Volume III of the EIAR), it was concluded that, once the above flood levels are implemented, the proposed project would not have an adverse impact on flooding elsewhere.

4.1.8.3 Drainage/Stream Channel Crossings

No work will take place within 50m buffer zones of watercourses, except for drainage / stream crossings and associated road construction. Working near watercourses during or after intense or prolonged rainfall events will be avoided and work will cease entirely near watercourses when it is evident that there is a risk that pollution could occur. All construction method statements will be developed in consultation with Inland Fisheries Ireland and in accordance with the details outlined in this CEMP.

The selection criteria for crossing natural / artificial drains and streams within the site were:

- Avoid crossing drains or streams at acute angles where possible;
- Avoid meanders at the crossing location;
- Cross where foundations could be constructed without excess excavation;
- Consider vertical alignment requirements;

Where crossings are cut into relatively deep channels these channels would require significant upfill to maintain vertical alignment criteria for turbine deliveries along access tracks. Clear span pre-cast

concrete culverts are advantageous in several manners for this type of installation. As spans increase the height can increase accordingly allowing significant light penetration under the culvert. The increase in height is complimentary to the vertical alignment requirements for access road design. The contractor may opt for a different method, such as a HDPE pipe, if the site conditions restrict the use of clear span pre-cast concrete culverts. The site restricts can be, but are not limited to, boundary encroachment, existing vegetation or proximity to protected.

The design of a clear span pre-cast concrete culvert crossings will ensure that:

- The existing channel profile within the watercourse is maintained;
- Gradients within the watercourse are not altered;
- There is unrestricted passage for all size classes of fish by retaining the natural watercourse stream / riverbed;
- There are no blockages within the watercourse. The large size of a clear span culvert allows for the passage of debris in the event of flood flow conditions;
- The watercourse velocity is not changed;
- The clear span of a culvert will ensure that the existing stream / riverbank is maintained during construction which will in turn avoid the occurrence of in-stream works;

Construction of any clear span crossings will be supervised by the Construction Manager, a suitably qualified engineer, the project manager, and the Environmental Manager in accordance with Inland Fisheries Ireland *"Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters, 2016"* and Office of Public Works *"Construction, Replacement or Alteration of Bridges and Culverts, 2013"*.

The proposed installation works for a clear span pre-cast concrete culvert will comprise the following:

I. Prior to the commencement of works the design of the culvert will be submitted for approval to the Office of Public Works (OPW) under Section 50 of the Arterial Drainage Act, 1945 and to Inland Fisheries Ireland (IFI);
II. Upon design approval the extent of the excavations required for the culvert foundations at either side of the watercourse will be marked out. The foundations are to be set to an agreed minimum distance by IFI from the existing watercourse so as not to impact on the riparian habitat. Health and safety measures such as lifebuoys on stakes will be installed and where appropriate life jackets will be provided to persons working near the watercourse;
III. Appropriate environmental control measures such as silt curtains, silt traps, mats etc. will be erected on both sides of the watercourse. Refer to EMP 2 in Appendix 1 for details. These environmental control measures will reduce the potential for sedimentation of the watercourse;
IV. Excavators will begin to excavate the foundations to formation level where all excavations will be battered back to a safe angle of repose (minimum slope angle of 45°). All excavation works will stop in the event of heavy rainfall.

V. All excavated material will be transported to the on-site deposition areas located outside of the 50m hydrology buffer zone at the proposed borrow pit. Some of the excavated material will subsequently be reused as backfill around the culvert abutments and structure upon installation. Bare ground will be minimised.

VI. Once formation is reached at suitable ground conditions; steel reinforcement and shuttering will be installed. The culvert abutments will be prepared for the pouring of concrete by dewatering standing water within the excavations, which is likely to contain suspended solids, via a pump to an adequately sized settlement pond located outside of the 50m hydrology buffer zone. The standing water will be treated through the settlement pond and clean filtration stone prior to outfall over vegetation away from the watercourse;

VII. Ready-mix concrete will be delivered to the culvert abutments by ready-mix concrete trucks and placed into each abutment by means of excavators. During the concreting works the watercourse will be temporary covered over with a tarpaulin to protect the watercourse from concrete spills. Upon completion the abutments will be covered and allowed to cure;

VIII. Following curing, the shuttering around the abutments will be struck and removed. A small temporary hardstand will be constructed so that a lifting crane, which will install the pre-cast concrete culvert components onto the abutments, can be set up;

IX. Deliveries of the pre-cast concrete culvert components will arrive to site. These components will be individually fitted and manoeuvred into position by the lifting crane onto the concrete abutments. The components will be inspected to ensure that each unit is level and secure;

X. Backfilling on either side of the culvert will commence using excavated material, in particular larger rock of a uniform size will be placed along the edge;

XI. The access road surface will be laid over the culvert structure using stone aggregate and compacted in maximum 250mm layers with the use of 10-20 Ton rollers. An internal cable trench will be installed within the carriageway of the culvert so that it can cross over the watercourse;

XII. Vegetated soil bunds will be installed to divert dirty water generated on the section of road over the culvert crossing into the dirty water system outside of the 50m hydrology buffer zone. This will ensure that dirty water will not enter the clean watercourse;

XIII. Steel parapet railings and timber post and rail fencing will be installed at the sides and on the approaches to the culvert. This will prevent persons or vehicles falling into the watercourse while travelling across the culvert.

A precast concrete or HDPE pipes may be used for crossing existing natural or artificial drainage / stream channels if the site conditions restrict the use of clear span pre-cast concrete culverts. The site restrictions can be, but are not limit to, boundary encroachment, existing vegetation or proximity to protected structures/areas. The same installation works as for the clear span pre-cast concrete units will be required and applied if this construction method is used.

Figure 4-14: A clear span pre-cast concrete units in place over an existing watercourse

All crossings will be designed for a minimum 1 in 200-year return rainfall event. The invert of the pipe is submerged approximately $^{1}/_{4}$ of its diameter below the original drainage bed. Where natural gradients allow, a nominal back fall in the pipe will be incorporated to prevent scour and promote the settling of natural material along the invert of the pipe. An example of a permanent drain crossing is illustrated in Figure 4-15. New turbine service roads will be required to cross several minor drains / streams within the site. All such water crossings described above will be in accordance with this application and/or conditions attached to a grant of planning permission and agreed with the OPW and Inland Fisheries Ireland prior to construction.

Figure 4-17 shows an approach to be put in place at drainage and watercourse crossings to ensure dirty water does not enter clean watercourses. For the Brittas Wind Farm, the proposal is to use vegetated soil bunds to divert dirty water generated on the section of road over the crossings to the dirty water system. Alternatively, where the vegetated soil bunds are not feasible or appropriate, silt curtains, as shown in Figure 4-18, can be placed along the existing roads within the 50m buffer zone. These silt curtains can run longitudinal to watercourses with a layer of stone placed along the bottom to prevent any seepage if there is a risk of silted runoff.

Figure 4-15: Completed clear span pre-cast concrete culvert crossing over existing watercourse

Figure 4-16: A concrete pipe channel crossing

Figure 4-17: Dirty Water containment at watercourse crossings

Figure 4-18: Silt curtain containment along existing roads near watercourses

4.1.9 Water Quality Management Systems

4.1.9.1 Watercourse/Drainage Crossings

Sediment such as clay or silt can cause pollution during the construction phase of a civil engineering project due to the erosion of exposed soil by surface water runoff. The water quality management system has been prepared in order to control erosion and prevent sediment runoff during the construction phase of the Brittas Wind Farm development. The implementation of sediment and erosion control measures is essential in preventing sediment pollution. The system was designed having regard to:

- Knowledge of the site's environmental conditions;
- Previous experience of environmental constraints and issues from construction of wind farms in similar environmental conditions;
- Technical guidance and best management practice manuals (see references).

The following site-specific information was used in the design of the drainage and treatment system:

- High resolution aerial photography;
- LiDAR ground surface information;
- Wind farm infrastructure layout (turbines, service roads and ancillary development);
- Hydrology maps (watercourses and buffer zones);
- Soil and land use maps;
- Baseline water quality assessments; and
- Met Éireann extreme rainfall data.

The settlement ponds and check dams described in the following subsections provide the essential mechanism for the removal of silt from construction related runoff and the controlled return of the treated runoff to the downstream watercourses.

The drainage and treatment system will ensure that the construction and early post-construction phases of Brittas Wind Farm will not create adverse effects on the aquatic environment.

4.1.9.2 Construction Works Area

Runoff from the internal roadways, hardstands and other wind farm infrastructure will be isolated from the clean catchment runoff by means of a series of open drains that will be constructed within the works areas. These drains will be directed to settlement ponds that will be constructed throughout the site, downhill from the works areas and as shown on the drainage layout planning drawings Planning Drawing 23318-MWP-00-00-DR-C-5025 to 5033 submitted with this application. Each drain will incorporate a series of check dams that will attenuate the flow and provide storage for the increased runoff from exceptional rainfall events. The ponds have been designed to a modular size to cater for a single turbine and hardstand area or a 1,200m^2 area of internal access road.

Dewatering of turbine base excavations can result in significant flow rates to the drainage and settlement system if high-capacity pumps are used. To avoid the need for pumping it is proposed to

provide drainage channels from the excavations to prevent a build-up of water. Where this is not feasible, temporary storage will be provided within the excavations and dewatering carried out at a flow rate that is within the capacity of the settlement ponds.

Figure 4-19: A stone check dam with large aggregate on downstream side

4.1.9.3 Treatment Process

Contaminated runoff can be generated on the site access roads, borrow pit, Lidar compound, construction compounds, substation site and turbine hard standing areas and is mainly due to excavation for the infrastructure or movement of delivery vehicles and on-site traffic.

Drains carrying construction site runoff will be diverted into settlement ponds that reduce flow velocities, allowing silt to settle and reducing the sediment loading. A modular approach has been adopted for the design of the settlement ponds which have been sized to cater for a catchment area of 1,200m^2 works area.

The settlement ponds have been designed as a three-stage tiered system and this has been proven to work effectively on wind farm construction sites. The three-stage system also facilitates effective cleaning with minimal contamination of water exiting the pond.

The settlement ponds have been designed with regard to the following:

- Runoff flow rate for the modular catchment area;
- Met Éireann Extreme Rainfall Data (statistical rainfall intensity / duration table);

- Character of the impermeable areas (runoff coefficients); and
- Design particle size and density.

The treatment process consists of primary, secondary and tertiary treatment as follows:

- The *primary treatment* consists of a three-stage settlement pond with an over-topping weir at each stage. The first chamber will remove most of the sediment load, while the remaining two chambers will remove most of the remaining load.
- Before the water is released onto the existing ground surface, it passes through a *secondary treatment* system in the form of a graded gravel filter bed.
- The outflow from each interceptor is dispersed across a wide area of vegetation so that the velocity is minimised and the vegetation can filter out the residual sediment. This is the final or *tertiary* stage of the treatment process. Existing rills and collector drains within the tertiary treatment area are blocked off to prevent concentration of the flow.

Each sediment treatment unit has been micro-sited using the contour maps and aerial photos to avail of any locally level areas and to ensure that the outflow is spread over as much vegetation as possible before entering an aquatic buffer zone.

Settlement ponds will be inspected regularly and cleaned where necessary. This will be carried out under low or zero flow conditions so as not to contaminate the clean effluent from the pond. The water level will first be lowered to a minimum level by pumping without disturbing the settled sediment. The sediment would then be removed by mechanical excavator and disposed of in areas designated for deposition of spoil. Settlement ponds will have perimeter fencing and signage installed to ensure there are no health and safety risks.

Figure 4-20 shows a well-constructed and maintained tiered settlement pond. This example is in an upland environment with significant ground surface slope and operates efficiently if it is well maintained. The design has been developed in conjunction with Inland Fisheries Ireland personnel and local authority engineers.

The design of the settlement pond system for the Brittas site is detailed in the Planning Drawing 23318-MWP-00-00-DR-C-5407. The hydraulic design of the settlement ponds is outlined in Appendix 3A of the EIAR.

The effluent from each settlement pond will discharge to an open channel, 8 to 10 metres in length, running parallel to the ground contours. This will form a weir that will overflow on its downhill side and disperse the flow across the existing vegetation. A minimum buffer width of 20m will be provided between the overflow weir and downstream watercourses. Buffer widths are designed in line with *Forests and Water, UK Forestry Standard Guidelines (Forestry Commission, 2011)* on protection of watercourses during forestry operations and management. This method buffers the larger volumes of run-off discharging from the drainage system during periods of high precipitation, further reducing suspended sediment load to surface watercourses. The outflow weirs will not be located on slopes steeper than 3:1. Existing drains within the dispersion zone will be blocked off where necessary to

provide additional attenuation, disperse the flow across a larger area of ground and prevent the re-concentration to a single flow.

Figure 4-20: A Multi-tiered settlement pond with stone filter

4.1.9.4 Inspection and Maintenance

The drainage and treatment system for the proposed wind farm will be managed and monitored at all times and particularly after heavy rainfall events during the construction phase. The drainage and treatment system will be regularly inspected and maintained to ensure that any failures are quickly identified and repaired so as to prevent water pollution. A programme of inspection and maintenance will be designed prior to the commencement of construction and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed and records kept of inspections and maintenance works. These drainage controls for exposed soils will be kept in place during the operational phase of the wind farm until the vegetation is re-established.

4.1.9.5 Weather Monitoring

Weather monitoring is a key input to the successful management of the drainage and treatment system during the construction of the wind farm. This, at a minimum, will involve 24 hours advance meteorological forecasting (Met Éireann download) and on-site rain gauge linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded (e.g., 1 in 5-year storm event), planned responses will be undertaken. These responses will involve control measures including:

- Checking the drainage systems prior to the storm and ensuring it is secure and operating optimally;
- The cessation of construction until the storm event has passed over and flood flows have subsided; and
- Post-storm event checks and repairs where needed.

Dedicated construction personnel will be assigned to monitor weather.

4.1.9.6 Water Quality Monitoring

A programme for water monitoring will be prepared in consultation with Inland Fisheries Ireland prior to the commencement of the construction of the wind farm. The plan will include monitoring of water during the pre-construction activities, throughout the proposed construction, and post construction phases.

Further baseline water quality monitoring of all streams near the development site will be undertaken prior to construction to confirm existing conditions at the time of construction. This baseline data will include the main components of a full hydrograph for the streams including both high spate flow and base flow where possible.

During the construction phase of the project, a surface water monitoring schedule, finalised prior to construction, will be followed. In summary, weekly field monitoring of surface water quality chemistry will be carried out at the identified and agreed surface water quality monitoring locations. The following parameters will be measured:

- pH (field measured);
- Electrical Conductivity (field measured);
- Temperature (field measured);
- Dissolved Oxygen (field measured);
- Total Dissolved Solids (TDS) (field measured); and
- Turbidity (field measured).

Continuous, in-situ, monitoring equipment will be installed at selected locations. The monitoring equipment will provide continuous readings for turbidity levels, flow rate and water depth in the watercourses.

Each month, the Ecological Clerk of Works (EcoW see Section 5.2.5.2) will take samples from each location and bring to a laboratory for analysis on a range of parameters with relevant regulatory limits and EQSs. This will be compared with the baseline data obtained prior to construction from the EPA and from sampling. If the measured value exceeds the baseline values, the cause will be determined, and remedial measures put in place as necessary.

The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations (as amended) and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (as amended). The suite of determinants will include:

- pH;
- Total Petroleum Hydrocarbons (TPH);
- Temperature;
- Total Phosphorus;
- Chloride;
- Nitrate;
- Nitrite;
- Total Nitrogen;
- Orthophosphate;
- Ammonia N;
- Biochemical Oxygen Demand; and
- Total Suspended Solids.

Periodic visual observations at each of the monitoring points will be recorded with specific reference to flow, stream substrate and water colour. Photos will be taken to support visual observation, and inspection sheets including visual observation results and photographic records will be kept on site.

Visual observations will also be completed after major rainfall events along with photographs which will be collected and assessed by the EcoW.

The elements which will be included in the visual checklist are as follows:

- Appropriate period visual inspection of all watercourses which drain the proposed development by the ECoW or a suitably qualified and competent person delegated by the EcoW;
- Groundwater seepage, water ponding and wetting of previously dry spots;
- All elements of drainage system will be monitored including settlement ponds, check dams, interceptor drains etc. Corrective action will be carried out if there is a visual indication of discolouration, oily sheen, odour or litter.
- Event based visual inspections by the ECoW as follows:

- Following a high intensity localised rainfall event (10mm/hr);
- Heavy rainfall within a day (25mm in a 24 hour period); and
- Higher than monthly rainfall within a week period.

- A record of all visual inspections will be added to Construction Environmental Management Plan (CEMP) and maintained on site since it is a live document.

The ECoW will be responsible for presenting the surface water monitoring results at or in advance of regular site meetings.

The reports will include results from field monitoring as well as visual inspections and laboratory analysis completed for that period. The reports will describe how the results compare with baseline results. Any deterioration in water quality deemed to be caused by construction activity will be flagged and appropriate remediation or corrective actions recommended.

4.1.9.7 Surface Water Quality and Cementitious Material

It is important to prevent raw cement from entering waterways within and near the proposed wind farm.

Cement is required as a constituent for concrete. Concrete will be used for construction of the 10 no. turbine bases, Joint Bays, BESS, IPP and substation buildings as well as culvert crossings.

The primary method of reducing the potential effect from cementitious material on the hydrology of the proposed wind farm is the selection of ready-mixed concrete as opposed to site batching of concrete. Site batching requires the delivery and storage on site of significant quantities of raw cement. The chemical reactivity of cement is at its most vigorous in the early stages of its activation by water (hydrolysis, typically in the first 15 minutes). In the batching plant water is added to the cement at the correct water/cement ratio to fully activate the cement hydration process.

By removing cement in its raw state from the site the potential for a significant effect from hydrolysis of cement in the surrounding watercourses is eliminated. When ready-mixed concrete is used the hydrolysis stage of the cement process has already been completed during the batching process and the chemical reaction undergoes a dormancy period during which it enters a plastic state. During this period the concrete is delivered and placed. After approximately 3 hours the cement in the concrete enters a third stage of the chemical process where it hardens, primarily due to the hydration of tricalcium silicate. This process increases in activity for approximately 12 hours and then decreases over the following 20 hours. After approximately 36 hours the concrete is considered to have set. Therefore, on-site batching will not be carried out.

As part of the curing process the top exposed surface of poured concrete is covered in a curing blanket which eliminates the effect of rain washing down uncured cement from the top surface. Concrete placement for a truck load is typically complete within 3 hours of batching. The truck operator will wash out the drum and chutes of the truck on site. This typically requires approximately 250 litres of water

to complete. This concrete washout contains cement that has not fully completed the hydration process and as a result can have an elevated pH level (higher alkalinity).

Concrete truck washouts for the proposed wind farm will be limited to washing down chutes only, reducing water volume to approximately 25 litres. The chute wash down area, which will retain the washout water, will be located within the construction compounds and there will be no other chute wash down activity on any other part of the proposed wind farm.

Washout of concrete truck drums will be carried out at the source quarry. There will be no on-site batching of concrete; concrete requirements will be met by ready-mix suppliers.

The environmental manager will monitor the pH of the water in the chute wash out bund and, if needed, will dose with CO_2 or acidic water from the drains until the wash out water achieves neutrality before discharge. Any overflow of water will be collected in the site compound drainage system which will be connected to a settlement pond for treatment prior to discharge to the external drainage system. The concrete sediment in the construction compound washout area will be removed at regular intervals.

4.1.9.8 Sediment Pond Design

Generally, high-intensity rainfall events have a short duration and lower-intensity rainfall events tend to have a longer duration. The Met Éireann Extreme Rainfall Data for the area (see appendix 3B of the EIAR[1]) demonstrates that the chance of occurrence of a storm event of a given duration decreases (higher return period) as intensity increases.

For a given return period the total depth of rainfall increases with storm duration but the actual rainfall rate over that period of time decreases. For the operation of the settlement ponds, it is the rate of flow rather than the total rainfall that is relevant. The return period is a measure of the likelihood that a storm of a particular intensity will occur in a given year. However, it is important to note that the chances of occurrence of a storm event with a particular return period are the same in each year but should on average occur once in that time period. For instance, a storm event with an intensity of 168mm/hour and a 5-minute duration would be expected to occur once in a 100-year period. This is more appropriately expressed as an annual exceedance probability (AEP) of 1%; that is, it has a 1% chance of being equalled or exceeded in any year.

The runoff control measures for the wind farm site have been designed in the context of storm events of varying duration and intensity. The settlement ponds have been designed to cater for a maximum continuous flow rate associated with a medium-intensity rainfall event. Higher intensity runoff will be attenuated by the open drain collection system which provides temporary storage and limits the rate at which it enters the settlement ponds. This is achieved by the use of check dams within the open

[1] Data Source: Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin', Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

drains as described in Section 4.1.9.14 below. Longer duration storms of 24 hours or more generally have very low intensity and are not critical in terms of the runoff rates that they generate.

The modular settlement ponds are designed to operate effectively for the runoff rate associated with a continuous high rainfall rate of 20 mm/hour. This is approximately equal to a 60-minute duration storm event with a 10-year return period (M10-60). These rates are taken from the Met Éireann Point Rainfall Frequency table for the site location.

The design runoff rate, used for the drainage design, is calculated using the Modified Rational Approach formula:

$Q = 2.78\ C_v\ C_r\ i\ A_i$

where c_v is the volumetric coefficient which is dependent upon the catchment characteristics it is assumed to be 0.84 for the winter profiles as stated in the Flood Risk Assessment Report (see appendix 9A of the EIAR),

c_r is the routing coefficient, the Wallingford recommends this to be 1.3.

i is the rainfall intensity in mm/hr, and

A_i is the impervious area drained surface area in ha. The percentage imperviousness (PIMP) obtained by dividing the total directly connected impervious area (A_i) by the total contributing area (A). PIMP is assumed to be equal to 70% for the hardcore surface. (A_i =PIMP x A)

For a rainfall intensity of 20mm/hour and a total drained area of 1,200m^2 the runoff rate is:

Q = 2.78 x 0.84 x 1.3x 20 x (0.70 x 1,200) litres/second

= 5.10 litres/second (0.0051m^3/s)

The main design parameter for the settlement pond is the water surface area. The required surface area is the design flow rate in m^3/s divided by the particle settlement velocity (V_s) in m/sec (Area = Q/V_s m^2)

The particle settlement velocity is determined using the formula derived by Stokes in 1851 as follows:

$V_s = 2\ r^2\ (D_p - D_f) / (9\ n)$

where V_s is the particle settlement velocity (m/sec),

r is the radius of the particle (metres),

D_p is the density of the particles (kg/m^3),

D_f is the density of the fluid (kg/m^3), and

n is the viscosity of the fluid (0.000133 kg sec/m^2 @ 10°C).

For a particle density of 2,400kg/m^3, water density of 1,000kg/m^3 and particle diameter of 20 microns (radius=1*10^{-5} metres) the settlement velocity, V_s, is:

V_s = $2 \times (10^{-5})^2 \times (2,400 - 1,000) / (9 \times 0.000133)$

= $2 \times 10^{-10} \times 1,400 / 0.001197$

= 0.000234 m/sec.

The required settlement pond surface area is

A_p = Q/V_s

= 0.0051/0.000234

= $21.79m^2$

Theoretically, the pond depth is not relevant but in practice, a minimum depth is required to ensure laminar flow and to allow temporary storage of settled silt. The modular settlement pond has been designed with a surface area of $24m^2$ (12m x 2m) and a depth of 1.25m. This is divided into three chambers of equal length and in practice, it has been found that most of the settlement occurs in the first chamber with very low turbidity levels being achieved in the final effluent. The design is conservative and therefore has sufficient redundancy to cater for occasional higher runoff rates or sediment loads.

4.1.9.9 Sediment Pond Attenuation Design

For rainfall intensities above the design value of 20mm/hour, the excess runoff needs to be temporarily stored. The storage can be provided in the drainage channels by installing check dams at intervals along the channel as described below.

The storage volumes required for 10-year storm events of various durations are shown in Table 4-1. The volumes are based on a catchment area of $1,200m^2$ and a runoff coefficient of 0.70. The maximum storage volume required is $6.61m^3$ for 15 minutes storm duration. This is equivalent to 24 minutes of flow through the settlement pond at the design-through flow rate of 5.10 litres/second. The stored water will drain off gradually as runoff from the works area subsides. The storage volume represents an average depth of 0.055m in a 200m long, 0.60m wide open drain and can therefore be easily accommodated in the drainage system.

Table 4-1: Calculated Drainage Storage Volumes

Storm Event	Duration (minutes)	Rainfall rate (mm/hour)	Excess (mm/hour)	Storage Volume (m^3)
M10-60min	60	19.60	00.00	0.00
M10-30min	30	30.8	10.80	4.96

Storm Event	Duration (minutes)	Rainfall rate (mm/hour)	Excess (mm/hour)	Storage Volume (m^3)
M10-15min	15	48.80	28.80	**6.61**
M10-10min	10	62.40	42.40	6.49
M10-5min	5	88.80	68.80	5.26

The ability to limit flow rates is fundamental to the control of sediment during extreme storm events. It is not proposed to use any proprietary mechanical devices for this purpose but instead to rely on the check dams to effectively limit flow rates to the required values. The check dams will be constructed with gravel or other suitable material and will be of sufficient length and height to provide the required attenuation rates. The number of dams will vary depending on the gradient of the drainage channel with higher gradients requiring a greater number of dams with larger dimensions. Their ability to retain water and release it slowly can be confirmed visually. Drainage details can be found on **Planning Drawing 23318-MWP-00-00-DR-C-5407.**

4.1.9.10 Access Track Construction

On-site experience in wind farm construction and forestry development across the country has shown that the most effective method of reducing the volume of sediment created by construction is the finishing of all service tracks with high quality, hard wearing crushed aggregate such as basalt, granite or limestone laid to a transverse grade. When surface water drains transverse across a road constructed from hard wearing aggregate, as opposed to low class aggregate, the level of suspended solids is reduced significantly. The internal tracks will be finished with a hard-wearing aggregate. This can have the added benefit of contributing a balancing pH to help protect water quality from acidic runoff. The proposed project is serviced by local quarries, mentioned in **Chapter 3** of the EIAR which will be used as a source of hard-wearing aggregate for road construction.

4.1.9.11 Wheel Washes

Wheel washes will be provided for heavy vehicles exiting the site to ensure that roads outside of the site boundary are clean. These can take the form of dry or wet wheel wash facilities. In the case of a wet wheel wash, a designated bunded and impermeable wheel wash area will be provided, and that the resultant wastewater is diverted to a settlement pond for settling out of suspended solids.

4.1.9.12 Engineered Deposition Areas

Temporary engineered deposition areas will be designated where necessary at the turbine and hardstand locations to hold temporary stockpiles. These will be located away from drains and

watercourses. Stockpiles that are at risk of erosion will be protected by a silt trapping apparatus such as a geo-textile silt fence to prevent contamination of runoff.

4.1.9.13 Tree Felling

Felling of conifer forestry is required within and around wind farm infrastructure to accommodate the construction of foundations, hardstands and access roads as well as to facilitate assembly of turbines. It is proposed to fell to a distance of 105m around turbines. The proposed felled areas are shown in Section 4.1.1 above.

All tree felling will be undertaken in accordance with a tree felling licence, using good working practices as outlined by the Department of Agriculture, Food, and the Marine (DAFM) Standards for Felling and Reforestation (2019). These standards deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel, and machine oils. All conditions associated with the felling licence will be complied with.

4.1.9.14 Check Dams

Check dams will be placed at regular intervals, based on gradient, along all drains to provide flow attenuation, slow down runoff to promote settlement and to reduce scour and ditch erosion. Check dams are relatively small and constructed with gravel, straw bales, or other suitable material. They will be placed at appropriate intervals and heights, depending on the drain gradient, to allow small pools to develop behind them. Examples of check dam or swales are shown below in Figure 4-21.

4.1.9.15 Silt Fences

Silt fences placed along drains are an alternative method of reducing the volume of suspended sediment, where the vegetated soil bunds are not feasible or appropriate. They will be placed at the end of any locally steep section of drain. They have the double benefit of effectively producing a localised swale to reduce scour effects and attenuating and filtering the discharge. An example of a silt fence installation is shown in Figure 4-22.

Figure 4-21: Check dams along roadside drainage channels

Figure 4-22 A silt fence used in conjunction with check dams along roadside drainage channels

4.1.10 Traffic Management

A Traffic Management Plan has been prepared (see Appendix 16A of EIAR). This plan seeks to minimize potential traffic impacts of the works on local residences and users of the public road networks. In the event An Bord Pleanála (the Board) decides to grant approval for the proposed development, the Traffic Management Plan (TMP) will be updated prior to commencement of construction to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board. The Traffic Management Plan will ensure controls are in place with all suppliers coming to the project site.

The Turbine Delivery Route (TDR) is described in Section 4.1.18. Besides the turbine components, other construction materials such as stone, gravels and other fill and excavation materials as well as concrete will be transported to and from the project site via the Rossestown road (L-8017) and other roads in the locality such as the N62, R498, N75, and M8. The roads used will depend on the location of the suppliers, however, the majority of HGV deliveries will approach the site from the N62 and enter the L8017 from the west (N62, L8017 junction). There are three quarries located within 10-15km of the project site and 2 concrete suppliers within 12 and 20km of the site.

4.1.11 Spoil Management and Material Volumes

4.1.11.1 Excavated Spoil Storage

Excavated spoil will be reused for the backfilling, landscaping, and restoration around wind farm infrastructure such as turbines and hardstands.

The calculated volume of excavated material is summarised in Table 4-2.

Dedicated spoil storage areas and a borrow pit are proposed within the site These will be used for generating material for the construction of access roads and hardstands and for spoil storage. The proposed locations for the borrow pit and spoil storage are shown on Planning Drawings 22318-MWP-00-00-DR-C-5005.

Spoil will also be stored around the turbines to a maximum height of 1m. The felled areas around the turbines have been identified as a potential additional area that will be used to store material; however, priority will be given to restoration of the borrow pits and the dedicated spoil storage areas.

Berms will be formed along sections of access roads and hardstands that will act as a physical edge protection measure to prevent vehicles falling off where a drop off greater than 1m exists from the road / hardstand edge. Spoil generated onsite will be used to create these berms.

A summary of the construction material and spoil storage volumes are shown in Table 4-2 below.

Drainage and siltation control measures will be put in place in all spoil storage areas. This will include a dedicated drainage network, temporary silt fences and settlement ponds designed to cater for the size of each storage area. Further details of the drainage philosophy that will be applied as well as siltation control systems and attenuations systems is given in Section 4.1.8 of this report.

Table 4-2: Spoil Excavation and Construction Material Volumes

Item	Unit	Quantity
Total Excavation Volume	**m^3**	**163752**
Excavated Material Stored or Reused Onsite	m^3	128350
Excavated Material Removed from Site	m^3	35402
Total Aggregate Volume	**m^3**	**143945**
Imported Aggregate	m^3	121625
Site Won Aggregate	m^3	22319
Total Concrete Volume	**m^3**	**20040**
Total Reinforcement Volume	**Tonnes**	**1379**

4.1.11.2 Temporary Storage of Excavated Material

No permanent stockpiles will be left on site after the completion of the construction phase works. After completion of the turbine base reinstatement works all remaining stockpiles are to be removed for permanent disposal at the proposed deposition area within the site.

Any materials excavated during the construction phase which are to be used in the site reinstatement and landscaping process shall, in the first instance, be stored on site in an environmentally safe manner that will not result in the pollution of waters or the smothering of ecologically sensitive habitats (see management principles and measures listed below).

The following principles will be adhered to in respect of the temporary storage of excavated materials;

- Spoil disposal will take place within a 30m radius of each structure.
- Preparation of the spoil disposal site will involve the removal of the “top mat” which will be transplanted to suitable area and maintained for re-use during restoration operations.
- Spoil will be deposited, in layers of 0.5m and will not exceed a total thickness of 1m.
- Spoil will only be deposited on slopes of less than 5 degrees to the horizontal and greater than 10m from the top of a cutting. The exact location of such areas will be confirmed on consultation with the geotechnical engineer.
- Once reinstatement is complete the disposal sites will be re-vegetated with the “top mat” removed at the commencement of disposal operations.
- Prior to the commencement of the restoration phase, a restoration methodology and programme will be agreed with input from a suitably qualified environmental professional.

It is proposed that any temporary onsite stockpiles of soil, rock and other excavated material shall be removed and utilised in the site reinstatement programme to infill any excavated areas which will then be mounded and capped with sod prior to the completion of works.

4.1.11.3 Permanent Deposition Areas

On completion of extraction activities in any cell at the borrow pit; the pit will be used for the permanent storage of the excavated spoil material from the turbine bases, crane hardstands and internal access road construction. The proposed deposition areas will be subdivided into a series of cells. Each cell will be bunded by an embankment of engineered fill material capable of allowing a tracked excavator to move between the cells during deposition activities. The size of each cell will be dictated by the maximum working length of the excavators working the borrow pit. Each cell will be bunded on all downslope sides. The bund will be of adequate strength to retain the spoil stored within each cell.

Water build up within the disposal area will not be permitted. Water will free drain to the sump of the pit from where it will be discharged utilising a 6" pump discharging to a settlement pond constructed for this purpose. Permanent design features are proposed to allow drainage function correctly over the deposition areas. These are shown on 23318-MWP-00-00-DR-C-5025 to 5033. Upon completion of each cell the surface of the deposited spoil will be profiled to a gradient not exceeding 5% and vegetated with either harvested turves where available or allowed to vegetate naturally as indicated by the project ecologist.

4.1.12 Wind Turbines

4.1.12.1 Wind Turbine Locations

The final step in positioning turbines was to minimise the volume of excavated spoil and to achieve as close as possible to a balance of cut and fill of the underlying strata at each turbine location. This was achieved by orientating the turbine base and crane hardstanding area with its long axis parallel to the ground contours as much as possible while taking account of access criteria for delivery of turbine components. This generally required some adjustment to the position of the access road on the approach to the turbine site. Table 4-3 gives information of the site, ground slope and spoil depth at and in the vicinity of each of the proposed turbines.

Table 4-3: Ground Parameters at Turbine Sites

Turbine	Land Use Category	Slope	Peat Depth
T1	Agricultural Area - Pastures	<3°	0.0m
T2	Agricultural Area - Pastures	<3°	0.0m
T3	Agricultural Area - Pastures	<3°	0.3m
T4	Agricultural Area - Pastures	<3°	0.0m
T5	Agricultural Area - Pastures	<3°	0.0m
T6	Agricultural Area - Pastures	<3°	0.0m
T7	Agricultural Area - Pastures	<3°	0.0m

Turbine	Land Use Category	Slope	Peat Depth
T8	Agricultural Area - Pastures	<3°	0.0m
T9	Agricultural Area - Pastures	<3°	0.0m
T10	Agricultural Area - Pastures	<3°	0.0m

4.1.12.2 Turbine Hardstands

The layout of the crane hardstand is designed to accommodate the delivery of the turbine components prior to their erection and to support the cranes during erection, as shown in Figure 4-23. Hardstands are also used for maintenance during the operation of the turbine. The hardstands will be rectangular in shape with additional lay down areas to store the turbine blades prior to erection, and crane pads for construction and maintenance. Refer to Planning Drawing 23318-MWP-00-00-DR-C-5404 for further details of the hardstand layouts. Due to the significant loads that will be imposed by the outriggers of the main lifting crane during the turbine erection process; it is proposed that the hardstands will be constructed using excavation methods over the footprint of the hardstand area / turbine base.

The proposed works will be restricted to the turbine locations and will comprise the following:

1. Each crane hardstand will be formed on competent subgrade of the underlying subsoil / rock which will comprise of stone aggregate laid on a geotextile filter membrane. Stone aggregate will be obtained from either the on-site borrow pit, excavated works, or imported from a nearby quarry.
2. Any existing unsuitable soil found within the footprint of the turbine hardstand will be excavated out during formation works. The excavation works will be carried out using hydraulic excavators where surplus subsoil material will be transported to the on-site deposition areas via articulated dumper trucks or tractor and trailer for subsequent reuse in the permanent reinstatement of the borrow pits.
3. The stone aggregate for the turbine hardstands will be compacted in 250mm layers and will vary from approximately 300mm to 900mm deep depending on the gradient of the underlying subgrade.
4. Temporary set down areas will be formed to facilitate the storage of the turbine components at each crane hardstand (e.g., the turbine blades, the turbine towers, and nacelle). Each temporary set down area will be constructed using compacted stone aggregate which will be fully removed and reinstated after all turbines have been erected.
5. Plate bearing test results will be undertaken on the finished hardstand surface to check if ground bearing strengths are to the wind supplier's specifications. Once complete the assembly cranes will be set up on the hardstand and erect the wind turbine into place.
6. Where drop offs greater than 1.0m in height occur alongside hardstand edges; physical edge protection will be constructed to reduce the risk of vehicles overturning or persons falling.

Figure 4-23: A finished hardstand on a wind farm

4.1.12.3 Turbine Bases

It is proposed the 10 no. wind turbines will have a reinforced concrete base pad foundation with a central pedestal above the base, that will in turn support the wind turbine tower. Each turbine base will bear onto rock or other such suitable bearing stratum, depending on the strength at formation level and will be constructed utilising a spread foundation, which is wide and shallow. A standard foundation will be approximately 32m in diameter and will be installed to a depth of approximately 4.0m below ground level. Approximately 1200m^3 of concrete and 140 tonnes of steel will be used in the construction of each turbine base. Estimated material quantities required for the construction of the turbine bases are shown in Table 4-2. Refer to Planning Drawing 23318-MWP-00-00-DR-C-5403 for further details.

The proposed works will be restricted to the turbine locations and will comprise the following:

I. The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter.
II. Any existing subsoil found within the footprint of the turbine base will be excavated out during formation works at the adjacent crane hardstand area. The excavation works will be carried out using hydraulic excavators where surplus subsoil material will be transported to the on-site deposition areas via articulated dumper trucks or tractor and trailer for subsequent reuse in the permanent reinstatement of the borrow pit.
III. Blasting at turbine locations and hardstands may be necessary to enable excavation of the rock if encountered at less than 3m depth. Any blasting will be carried out by a suitably qualified specialist under licence with a suite of mitigation measures in place. Blasting, and mitigation measures associated with the process, is discussed in further detail in the EIAR in Chapter 8: Land and Soils.
IV. Standing water may build up within the turbine excavations during the works. Dewatering of turbine base excavations will be carried out using pumps or gravity flow where possible. Any

water pumped from the turbine bases will be put through settlement ponds to ensure suspended solids are removed from the water prior to entering any water courses; dewatering is discussed in further detail in the EIAR in Chapter 9: Water.

V. The excavated surface will be levelled, and adequate drainage measures (as per section 4.1.8 and 4.1.9) will be put in place along with suitable set back areas to facilitate placing of aggregate and ultimately the erection of shuttering for the turbine base.

VI. If poor ground conditions are encountered during excavation and a significant depth to sub-formation is required, a piled foundation may be used. A piled foundation requires the use of a piling machine equipped with an auger drill to rotary bore a number of holes around the area of the turbine base to the sub-formation depth determined at construction stage. Once all the holes have been bored, reinforcement steel is inserted into each with concrete poured afterwards.

VII. Suitable aggregate will be used to form a solid level working foundation surface. The aggregate will be rolled and compacted to a suitable formation level.

VIII. Shutters and steel reinforcement will then be put in place and the foundation of the turbine will be prepared for pouring of concrete.

IX. A layer of concrete blinding approximately 75mm thick will be laid directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. The concrete will be protected from rainfall during curing and all surface water runoff from the curing concrete will be prevented from entering surface water drainage directly.

X. High tensile steel reinforcement will be fixed in accordance with the design drawings and schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools.

XI. Ductwork will be installed for services, such as but not limited to power and drainage and formwork erected around the steel cage and propped from the backside as required.

XII. The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base. These checks will be passed to the turbine supplier for their approval. Figure 4-24 shows a turbine base ready for pre-pour inspection.

XIII. Ready-mix concrete will be delivered to each turbine base by a fleet of ready-mix concrete trucks via the internal access tracks. Concrete will be placed into each base by means of a concrete pump where vibrating pokers will be used to ensure that full and proper compaction of the concrete around the reinforcement in the turbine base has been made. Upon completion of the concreting works the foundation base will be covered and allowed to cure.

XIV. Steel shutters will be used to pour the circular chimney section.

XV. Following curing, the shuttering around the turbine base will be struck and removed.

XVI. Earth wires will be placed around the base; and,

XVII. The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the vegetated soil set aside during the excavation. A gravel footpath will be formed from the access track to the turbine door and around the turbine for maintenance.

Figure 4-24: Construction of a wind turbine base

4.1.13 Internal Collector Cables

A network of underground cabling serving each turbine with electrical power and signal transmission will be installed within the site. The distribution system will electrically connect the wind turbines to the grid connection point. Cable jointing bays will be required to allow cables to be jointed from the turbines to the selected grid connection point.

Cabling on site is likely to consist of single or twin cable trenches for open ground sections and for trenches within internal access roads. A cable marker post will be installed on top to protect and identify the cable trench underneath. The build up for the internal site cable trenches will consist of selected excavated backfill on top of bedding material. The minimum cover depth over the ducts will be 750mm which is measured from the top of the cable duct to existing ground level. Where ducting is within internal access roads; the cable trench will be backfilled with lean-mix concrete to protect ducting from being damaged by heavy axle loads that will pass above. The excavated material generated from the trenches will be reused as backfill where possible or alternatively it will be deposited within the proposed on-site borrow pits as part of their reinstatement.

Where an open drain or watercourse is to be crossed during the installation of the internal site cable trenches; the cable trenches will cross the open drain or watercourse within the road carriageway via new or existing road crossings points to minimise the requirement for in-stream works. Marker tapes

of non-corrodible material in bright red and yellow colour will be placed within the trench after backfilling for identification and safety purposes in accordance with ESB Networks guidelines. An earth berm will be placed over the cable trench with a marker post installed on top in a secure and robust manner to prevent the post from being damaged by animals or prevailing ground conditions. Cable marker posts will either be made of concrete, recycled plastic, or timber material. Each marker post will contain appropriately worded warning signage highlighting to persons the presence of high voltage electricity cables underneath. Refer to **Planning Drawing 23318-MWP-00-00-DR-C-5408** for further details.

4.1.14 Grid Connection

The grid connection route of the proposed project runs between the proposed Brittas on-site substation within the wind farm site in the townland of Killeenleigh and the existing Thurles 110kV substation in the townland of Ballygammane. The overall 110kV connection cable route will be approximately 7.0km and is outlined in **Figure 4-25.**

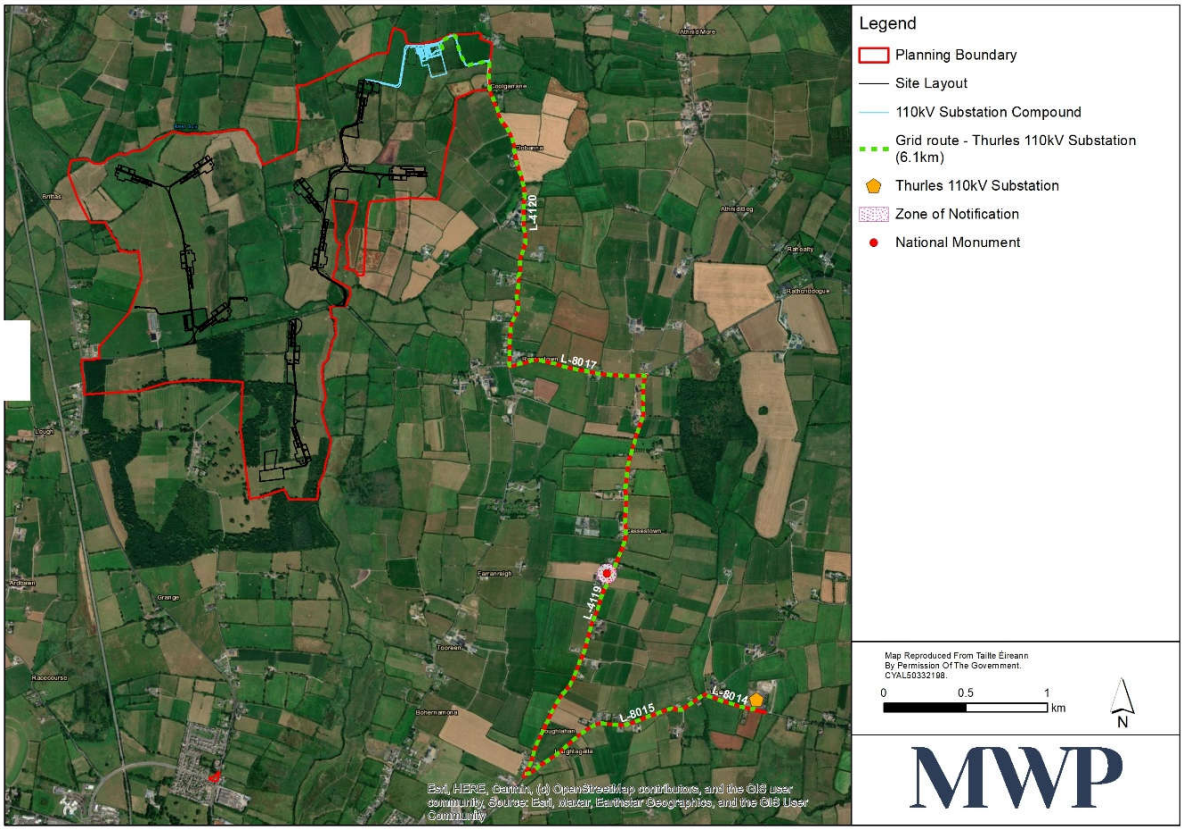


Figure 4-25: Grid Connection Route

4.1.14.1 Excavation and Duct Installation

The grid connection route will consist of an underground 110kV cable that will be carried within a single cable trench as shown in Planning Drawing 23318-MWP-00-00-DR-C-5427.

The installation of the grid connection involves the following process.

- Prior to works commencing, the area where excavations are planned will be surveyed and all existing services will be confirmed. All relevant bodies i.e., ESB Networks, EirGrid, Gas Networks Ireland, Eir, and Tipperary County Council (TCC) will be contacted and drawings for all existing services sought. A road opening licence will be obtained from TCC for the relevant road sections. All plant operators and general operatives will be inducted and informed as to the location of any services.
- Prior to works commencing a dilapidation survey will be carried out photographing and noting any existing damage or defects to structures or road surfaces. A copy of this survey will be submitted to TCC prior to works commencing.
- Prior to works commencing, the route will be inspected and marked out on the ground. Standard good practice preparatory measures are then put in place along the extent of the route. This will include any required warning notices, temporary barriers, etc.
- Prior to works commencing a TTMP will be prepared by the appointed contractor and agreed with Tipperary County Council. The proposed TTMP is included in Appendix 16A of Volume III of the EIAR.
- During construction works, the trench within the road will be excavated using a wheeled or rubber tracked excavator and hydro vac for crossings services, see Figure 4-26. As stone fill is removed it is temporarily stockpiled adjacent to the trench for re-use in backfilling. In some instances, some soil or unsuitable material may be encountered in the trench, and this is removed from site and brought to an appropriate licensed facility for disposal.
- The trench is then prepared to receive concrete bedding and surround for the ducts. The ducts are surrounded by concrete with adequate cover over the duct.
- Once the concrete is suitability set, appropriate imported aggregate material is placed over the concrete surround and filled back up to the top of the trench. Suitable warning tapes will also be installed in the trench. This method is shown in Figure 4-27.
- Once the trench is filled, the trenching and ducting process will move along the road in planned stages.
- The trench surface receives a temporary dressing of macadam or spray and chip. Once the overall scheme is completed, the grid connection route and associated road areas will receive a new permanent macadam finish as agreed with Tipperary County Council (see Figure 4-28).
- Joint bays are to be installed at maximum spacings of 750m centres along the grid connection route in the public road or along the grass margin of the public road. Once installed they are temporarily reinstated until they are opened again to allow for pulling cables through the ducts and jointing the cables afterwards. The joint bays will then be permanently backfilled and reinstated to the satisfaction of Tipperary County Council.

- Horizontal Directional drilling will be used where there is insufficient cover on a bridge crossing to allow the grid connection route pass over the crossing in a standard or flatbed trefoil formation. Proposed locations of horizontal directional drilling are described in Table 4-44 below. The launch and reception pits to be made in the public road or grass margin will be permanently backfilled and reinstated to the satisfaction of Tipperary County Council.
- The as-built location of the ducting will be surveyed using a total station / GPS.
- A condition survey will be carried out on the tracks affected by the grid connection route, both pre and post construction. This will include a video survey of the road extent with any significant dilapidations further recorded by photography and local surveying as required.

Figure 4-26: Excavation works for a grid connection cable trench

Figure 4-27: Ducting installation works for a grid connection cable trench

Figure 4-28: A permanent reinstatement works for a grid connection cable trench

4.1.14.2 Grid Construction – Water Crossings

The grid connection route crosses 2 watercourses (see Figure 4-29). Both watercourse crossings are along public roads.

The watercourse crossing on L4120-18 (Rossestown Road) is a single span masonry arch bridge. The 110kV cable will cross the bridge in a flatbed formation in a trench or alternatively a horizontal directional drill (HDD) methodology will be used. The choice of method will depend on the preferences of the relevant authorities, the physical constraints over the crossing and practical considerations. Descriptions of the methodologies proposed for crossing this bridge are given in sections 4.1.14.3 and 4.1.14.4. No instream works will be required.

The watercourse crossing on L8015-0 (Furze Road) is a single span masonry arch span bridge. The 110kV cable will cross the bridge in a flatbed formation in a trench or alternatively a horizontal directional drill (HDD) methodology will be used. The choice of method will depend on the preferences of the relevant authorities, the physical constraints over the crossing and financial and practical considerations. Descriptions of the methodologies proposed crossing this bridge are given in sections 4.1.14.3 and 4.1.14.4. No instream works will be required.

Overall, in-stream works are not required along the proposed grid connection route.

Table 4-4: Summary of Watercourse Crossing Methodologies

Crossing Number	Crossing Type	Cover Assessment	Crossing Methodology	In-Stream Works Required	Watercourse Crossing Notes
1	Single span arch stone	Unknown	HDD/Flatbed	No	Heavily vegetated in the vicinity of the bridge
2	Single span arch stone	Low cover	HDD/Flatbed	No	A detailed survey of the existing services crossing the bridge is required to determine if a corridor is available for the proposed cable. If a corridor is available, then separation distances from existing services will need to be maintained

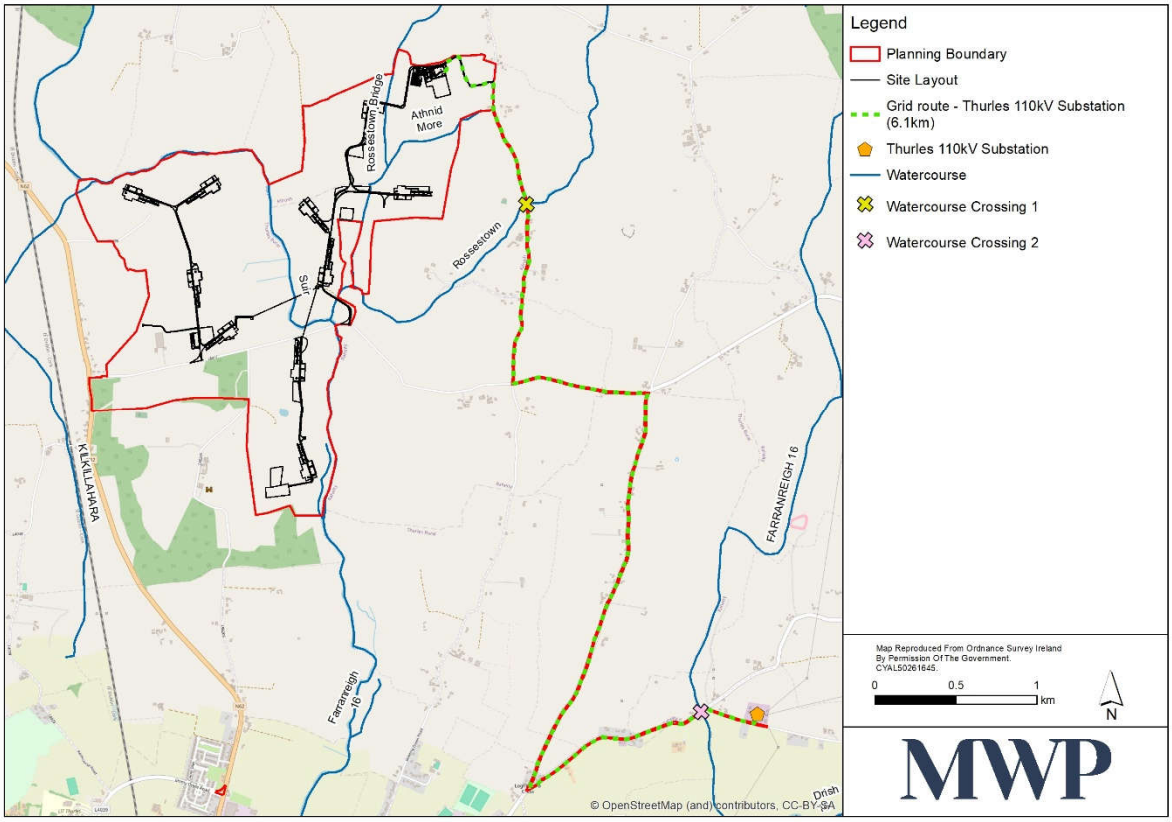


Figure 4-29: Watercourse Crossings Points

4.1.14.3 Option 1 - Flatbed Formation over Water Courses and Services

Where ducts are to be installed over an existing bridge and sufficient cover cannot be achieved by installing a standard trefoil arrangement (min 600mm cover required for Trefoil), the ducts will be laid in a much shallower trench. The ducts will be laid in a flatbed formation over the existing bridge and encased with galvanized steel plates in a concrete surround. This methods of duct installation are shown on Planning Drawing 23318-MWP-00-00-DR-C-5427.

It may be necessary to locally raise the level of the existing road to achieve the required cover over the ducts. The increased road level will be achieved by overlaying the existing road with a new wearing course where any addition of new pavement will be tied back onto the existing road. Any works to locally raise the level of the existing road and potentially the bridge parapets will be agreed with TCC prior to commencement with all works and reinstatement carried out to their satisfaction. Once the ducts have crossed the bridge the ducts will resume to the standard trefoil arrangement.

4.1.14.4 Option 2 – Horizontal Directional Drilling under Bridges, Watercourses and Services

If putting the ducts in a flatbed arrangement is not feasible or is not preferred by the Local Authority, directional drilling will be utilised, which will require a service trench (launch pit) for the drill within the road corridor, either side of the watercourse. The directional drill process will require that the depth of the service trench will deepen in a defined slope as it approaches the watercourse crossing on either

side, as to have sufficient passing depth under the watercourse. This method of duct installation is shown on Planning Drawing 23318-MWP-00-00-DR-C-5429.

Horizontal directional drilling will be carried out as follows:

- The directional drilling machine will set up at a launch and reception pit (an enlarged portion of on-road trench, i.e., a service trench on either side of the crossing point at an appropriate distance back from the watercourse). The drill will then bore in an arc under the watercourse feature.
- The drilling head of the boring tool has a series of nozzles that feed a liquid bentonite mix along the bore direction, which provides both lubrication and seals the cut face of the bore.
- Once the bore reaches the far side, the duct is then attached to the drill head and the duct is pulled back along the route of the bore to the original drilling point.
- Any bentonite mix is deposited within the bore shaft and spillage is collected at either end of the bore with a dedicated sump; all excavated material and excess bentonite will be removed from site and brought to an authorised waste facility.
- Once the duct is in place under the watercourse, the normal process of road trenching can continue from either side of the watercourse structure.
- The launch and reception pits will be backfilled in accordance with normal specification for backfilling excavated trenches and to the satisfaction of Tipperary County Council.

Photographs and schematics of the directional drilling process are provided in Figure 4-30 and Figure 4-31.

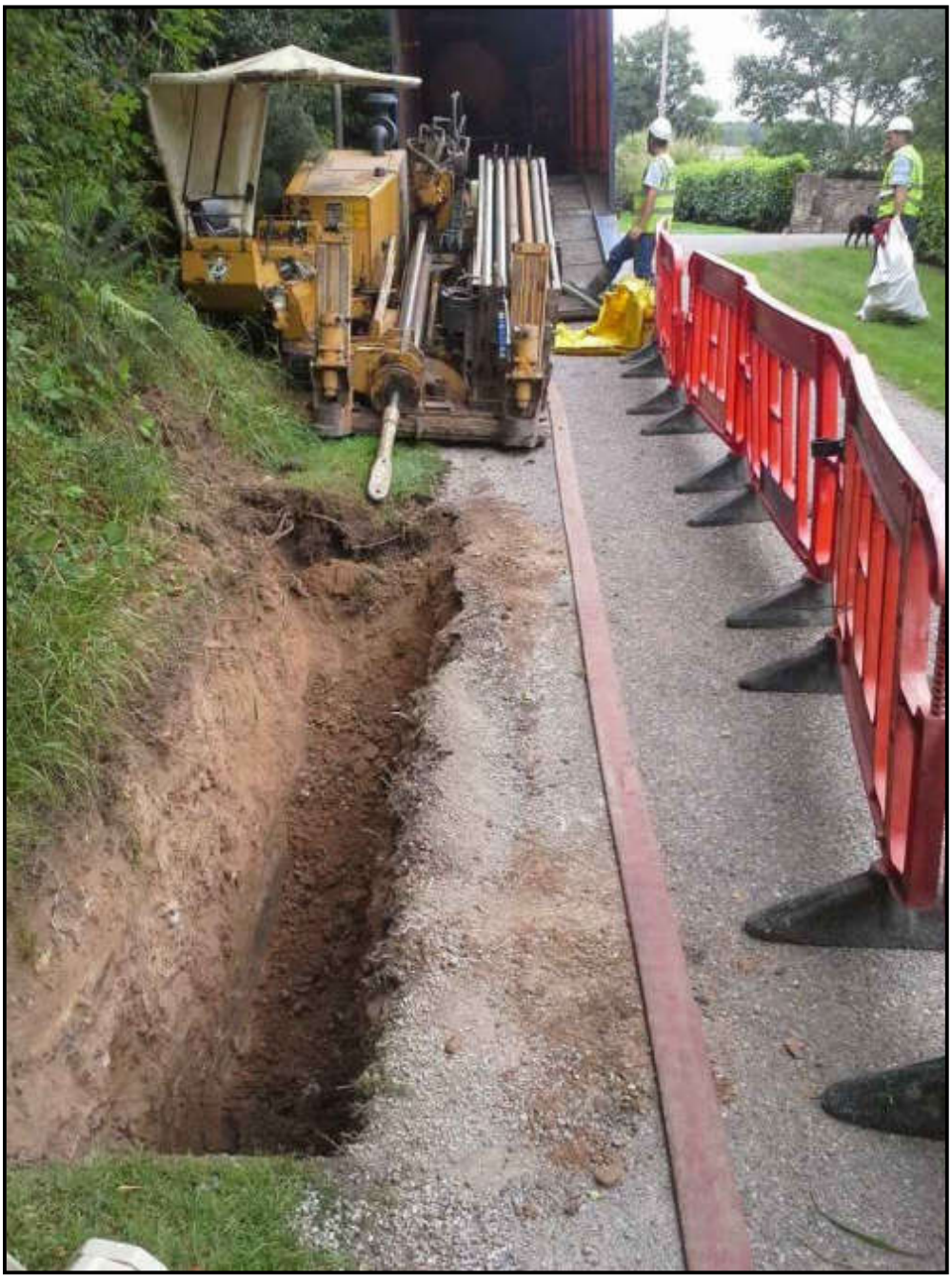


Figure 4-30: A Grid Route of horizontal directional drilling rig and launch pit

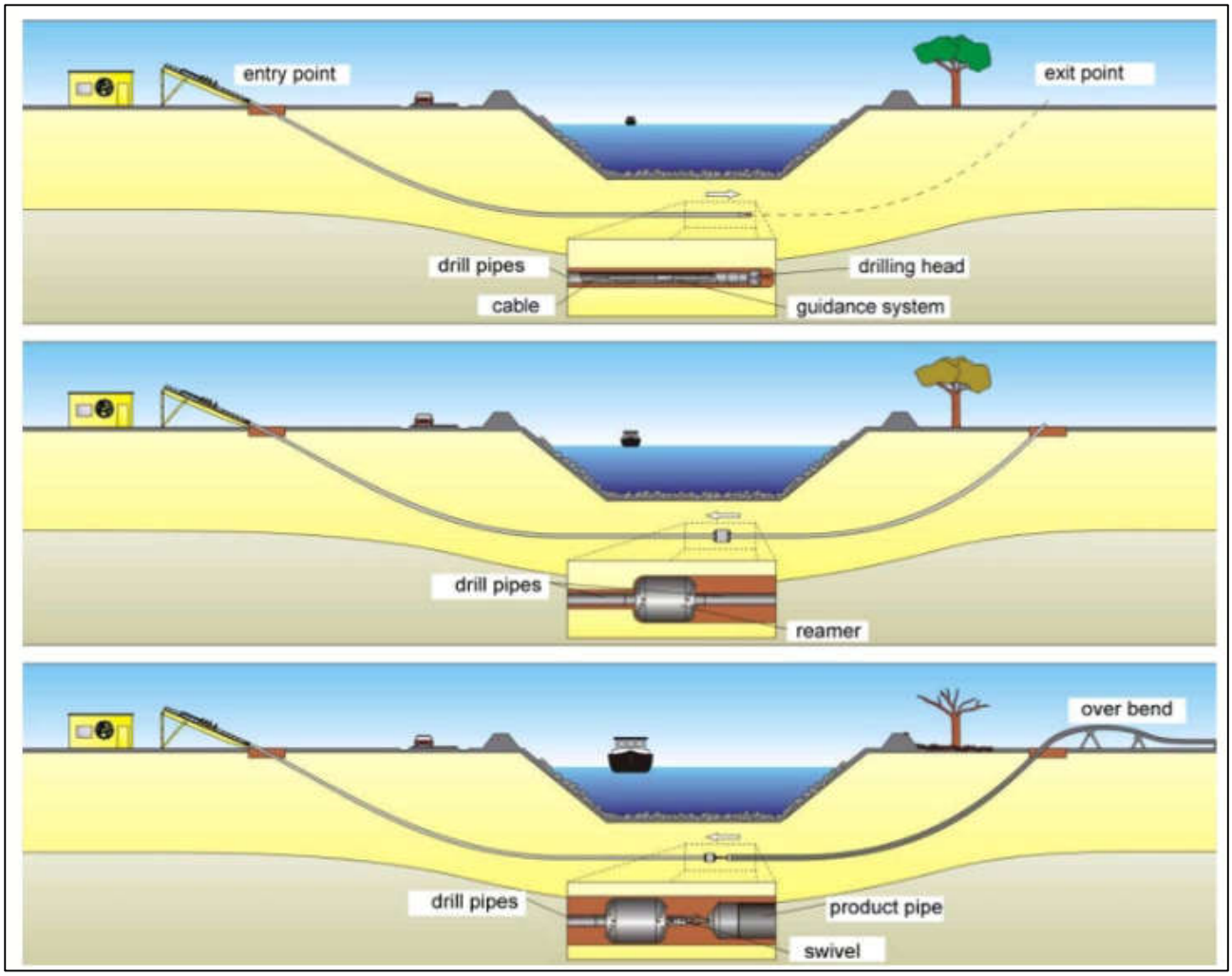


Figure 4-31: Horizontal directional drilling rig and launch pit (From Bayer, H.J. HDD practice handbook (2005), Vulkan-verlag GmbH, Essen Germany)

Grid Connection Construction – Land Drainage Ditches

Where land drains are encountered on the proposed grid connection route there are two scenarios, as follows:

I. If there is adequate cover over the drain crossing, then the new ducts and trench will pass over the drain without interruption to the drain. No works will be required within the drain at these locations. The trench at these locations will be installed in the existing public / access road.

II. In the event where there is insufficient cover over a drain crossing point, the new grid connection route will have to be installed underneath the existing drain crossing. To do this, the following approach is adopted:

- The drain is blocked upslope of the crossing, and a sump is formed using sandbagging and stable clay soil material. This sump will accumulate water flow in the drain and will facilitate the use of a 50mm or 100mm submersible pump to over pump (fluming) the drain water across the road and back into the drain on the down flow section below the road.

- Two silt fences and filters will be put in place on the downslope of the crossing point to prevent siltation/sedimentation. Once the sump and over-pumping mechanism is in place, then the service trench excavation will progress.
- A section of drain crossing (pipe or stone culvert) is temporarily removed to allow the trench and duct to continue. The duct will pass under the drain and once in place it will be surrounded with lean mix concrete and then the trench will be backfilled with suitable stone from excavations or imported.
- The drain will then be put back in place, surrounded with stone/lean mix concrete and the track restored to its finished level. The over-pumping measure can then be removed and normal drain flow resumes. The duct/trench work can then progress over the remaining length of the public / access road.

Grid Connection Construction – Existing Underground Services

All relevant bodies i.e., ESB Networks, EirGrid, Uisce Éireann, Gas Networks Ireland, Eir, and Tipperary County Council. will be contacted and drawings for all existing underground services along the grid connection route sought prior to the commencement of any GCR construction works. Any underground services encountered will initially be surveyed for levels to determine if there is adequate cover available for ducting to pass over these services. A minimum clearance of 300mm is required from the bottom of the ducting to the top of any underground service as per ESB Networks requirements. If this clearance cannot be achieved, the ducting will pass below the service with a minimum 300mm clearance maintained from the top of the ducting to the bottom of the service.

If the required separation distances cannot be achieved by either going above or below the underground service, then a number of alternative construction options are available as outlined in the previous sections for watercourse and drain crossings. All excavations will be kept within the public roadway boundaries i.e. in road or grass margins. Refer to planning drawing 23318-MWP-00-00-DR-C-5427.

Grid Connection Construction – Joint Bays and Communication Chambers

Joint bays are pre-cast concrete chambers that will be required along the grid connection route over its entire length. They are required to join cables together to form one continuous cable. They will be located at various points along the grid connection route approximately every 500 - 1,000 metres depending on gradients, bends etc. It is proposed to install 12 no. joint bays and communication chambers along the proposed grid connection route. This method of duct installation is shown on Planning Drawing 23318-MWP-00-00-DR-C-5428. The final locations of the joint bays are subject to confirmatory investigations and agreement with TCC prior to construction.

Where possible, joint bays will be in areas where there is suitable widening or grass margin on the road to accommodate easier construction and disrupt less traffic. During construction, the joint bay locations will be fenced off and will be incorporated into the grid connection traffic management plan. A traffic management plan is included in Appendix 16A of Volume III of the EIAR. The traffic management plan will be finalised and agreed with Tipperary County Council prior to the commencement of works. Once

the joint bays have been constructed, they will be temporarily backfilled until they are re-excavated later to allow for the pulling and jointing of cables at each joint bay. Once complete, the joint bays will be fully backfilled and permanently reinstated to the satisfaction of Tipperary County Council.

The joint bays and communication chambers will be either precast or cast *in situ*. In order to place the boxes, the area of excavation will first be marked out on the ground and any necessary preparatory protection measures put in place to avoid any runoff or loss of soil materials. These include appropriate siltation measures along roadside drainage (silt fences, check dams etc.).

The material excavated from the joint bay chambers will be removed from site and brought to a suitably licensed facility. Prior to the chamber being installed in a compacted layer of suitable stone or lean mix concrete, appropriate material will be placed in the excavation to a level surface. The boxes are then positioned *in situ* and backfilled around them with imported crushed stone material. The precast concrete joint bay chamber cover is then put in place at a suitable level to allow for a new road surface and chamber cover over. Figure 4-32 shows a joint bay installation.

Figure 4-32: A joint bay construction

4.1.15 Substation Compound and Buildings

This section describes the construction methodologies that will be used for both the EirGrid and Independent Power Producer (IPP) substation buildings as well as the substation and BESS compounds.

The proposed works will be restricted to the site construction area and will comprise the following:

- Prior to construction, interception ditches will be installed upslope of the proposed substation compound to intercept any existing overland flows (clean water) and convey it downslope to limit the extent of surface water coming into contact with the works. The clean water conveyed will be discharged via a level spreader downslope of the works over existing vegetation.
- The area of the substation compound will be marked out using ranging rods or wooden posts and the soil stripped and removed to a temporary storage area (in development footprint) for later use in landscaping. All remaining excavated material will be brought to the on-site borrow pits / storage areas for final deposition. The area will be surveyed and all existing services will be identified. All plant operators and general operatives will be inducted and informed as to the location of any services.
- Perimeter drains will be installed or upgraded to collect surface water run-off from the substation compound which will include the installation of check dams, silt traps and level spreaders to cater for surface run-off.
- All soils on the substation site will be removed and replaced with site won compacted crushed rock or granular fill;
- Formation of the substation compound will be achieved where the compound will be constructed with compacted layers of suitable hardcore;
- The foundations for both substation buildings will be excavated and appropriately shuttered. Reinforced concrete will be laid over it.
- The blockwork walls for each building will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
- The blockwork will then be raised to wall plate level and the gables and internal partition walls formed. Scaffold will be erected around the outside of the two buildings for this operation;
- The concrete roof slabs will be lifted into position using an adequately sized mobile crane;
- The construction and components of the substation buildings will be to EirGrid and ESB Networks specifications;
- The timber roof trusses at each building will then be lifted into position using a telescopic loader or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled, and sealed against the weather.
- Installation of a domestic wastewater holding tank to hold effluent from the toilets within the substation buildings.

- Installation of a Class 1 full retention oil separator to collect and treat oil spills within the substation compound.
- Installation of a rainwater harvesting tank to collect rainwater from the roofs of the substation buildings for toilet flushing and hand washing.
- Commencement of civil works associated with the construction of the transformer bund, equipment plinths etc. within the substation compound.
- Commencement of civil works associated with construction of underground cable ducts and trenches within the substation compound.
- Installation of electrical equipment within the substation compound and buildings including transformers, busbars, circuit breakers, cable supports, switchgear, panels etc. and all associated cabling.
- Installation of palisade fencing and associated gates to perimeter of the substation compound, such as Figure 4-33.

Figure 4-33: A substation building and compound

4.1.16 Permanent Meteorological Lidar Monitor

A permanent meteorological Lidar is proposed for the site to monitor the wind regime while the wind farm is in operation. This is to be located west of T8 and T6 close to the large existing farm shed. The lidar will have a base foundation and hardstanding area as well as its own access track. The meteorological lidar will be surrounded by a galvanised steel palisade fence, 2.4m in height. The meteorological lidar will have an antenna for internal radio communications for the SCADA (Supervisory

Control and Data Acquisition) equipment on site. Further details are provided in Section 3.10 of Chapter 3 of the EIAR. See planning application Drawing No. 22156-MWP-00-00-DR-C-5405 for details. There will be communication links between the wind turbines, meteorological Lidar, and the substation. The links will use ducted fibre optic cables laid in the same trench as the network of underground electrical cables around the site.

Figure 4-34: Photograph of a meteorological lidar facility on a wind farm with palisade fencing

4.1.17 Re-Routing of ESB 38kV overhead powerline

The re-routing of the permitted ESB 38kV overhead powerline that crosses the Brittas Wind farm site will be the subject of a separate planning application. Permission for this re-routing will be required to proceed with the development of the wind farm. While the developer is proposing to re-route the line underground along the proposed access tracks between T10 and T1, the ultimate permitted re-routing will depend on negotiations with the ESB and the outcome of the planning application. Some overhead options have been considered and may be permitted.

The construction of the permitted re-routed 38kV line will comply with the terms of the planning permission for that project.

If the underground re-routing of this overhead line through the wind farm site is progressed, the developers propose to underground the powerline along the proposed access tracks between Turbines 1 and 10 with end masts at either end connecting to the existing OHL route. Figure 4-35 maps one section of the underground route which crosses the Rossestown road. This will involve horizontal directional drilling to pass under the road and across a section of field from the site entrance north of Turbine 9 to Turbine 8.

If an overhead re-routing option is progressed, then this would involve placing a new set of pole and lines through the wind farm site and connecting this to the existing OHL route at both ends of the diversion.

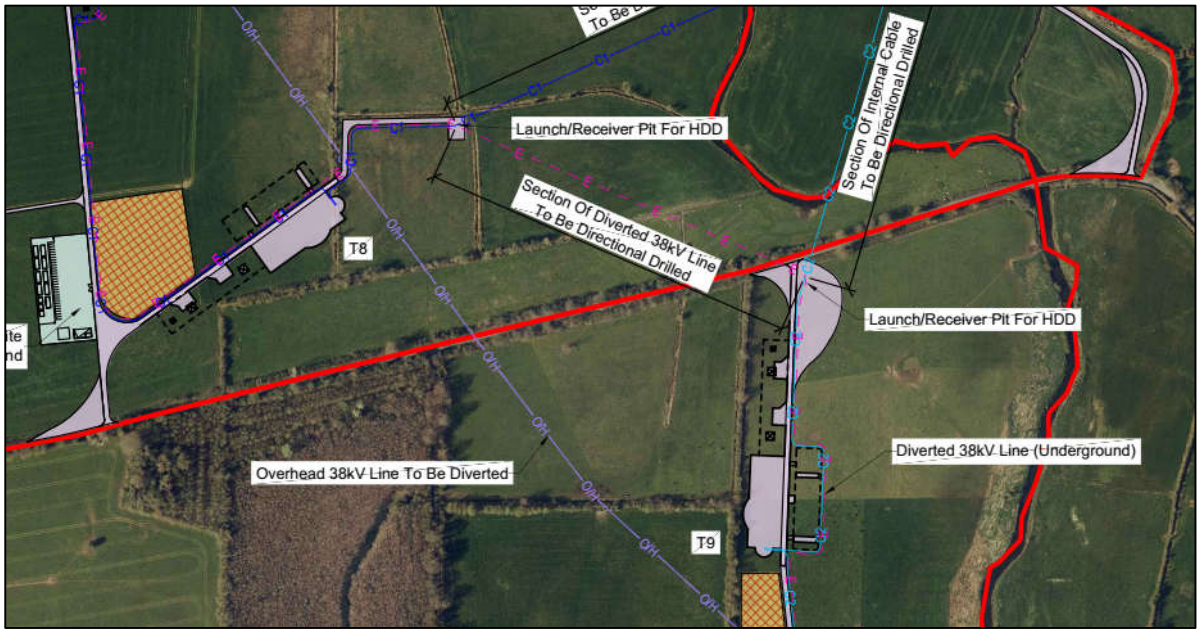


Figure 4-4-35: Aerial drawing of section of proposed underground re-routing of 38kv ESB powerline using HDD under Rossestown road and the adjacent field (see pink line between Turbine 8 and the site entrance north of Turbine 9).

4.1.18 Turbine Delivery

The components for each turbine are expected to be delivered in approximately 100 No. deliveries in total. Due to their abnormal size, blades and towers will be delivered at night to avoid disruption to daytime traffic. The turbine blades will be the longest components to be transported from port to site at approximately 76m in length. The components are expected to be delivered by sea to the Port of Foynes in County Limerick and transported to site along the national, regional and local road network.

The first section of the proposed route to the site will be along the N69 and M7 from the Port to Junction 25 (Nenagh Centre). A description of the rest of the turbine delivery route is provided, and an overview of the proposed section is shown in Figure 4-36.

- Exit M7 at Junction 25
- M7/R498/ Roundabout, Exit travelling southeast
- Travelling southeast along R498 to Borrisoleigh
- Travelling southeast along R498 to Thurles
- R498/Jimmy Doyle Rd Roundabout, 1st Exit travelling northeast
- Turn left at Jimmy Doyle Rd/N62 (Brittas Rd) junction
- Travelling north along N62 (Brittas Rd) to Brittas
- Turn right at N62 (Brittas Rd)/L-8017 Rossestown Rd junction

- Travelling east along L-8017 Rossestown Rd
- Turn left at site entrance for wind turbines 1 - 8
- Turn right at site entrance for wind turbines 9 – 10

Twenty-two pinch points have been identified along the route where various works will be required. These include the following:

- The temporary removal of traffic signs and lights
- The temporary removal of electricity poles, bollards and lamp posts
- Hedges and tree removal or trimming
- Temporary land take
- Lowering of some roadside banks
- Temporary Fence removal
- Road widening

Two points have been identified where hardstanding areas are required, and these are included in the redline planning boundary for this SID application. Most of the temporary works mentioned above can be completed through a road opening licence. Specifics of the accommodation works required at each pinch point are provided in the Turbine Delivery Route Report (see Appendix 2A of the EIAR). A permit for moving abnormal loads to the wind farm site will be sought from An Garda Síochána and Tipperary County Council on the proposed haulage route. A detailed transportation plan with a breakdown of the timing of deliveries will be established prior to the commencement of construction a detailed transportation plan with a breakdown of the timing of deliveries will be established at construction stage.

The temporary accommodation works will be completed one month prior to initiation of the delivery of turbine components in agreement with the Local Authority. These will include trimming or removing trees, remove road signs, street light poles, electrical poles and fences at the 22 pinch points along the delivery route. This will result in some temporary inconvenience for existing road users and some potential traffic safety risks at these pinch points as well as some temporary alterations to public road infrastructure.

The Contractor will undertake pre and post-construction haul road surveys to ensure the structural integrity of the selected haulage route. Repairs will be carried out on the public road network, as necessary, during the construction phase, to ensure that the condition does not deteriorate below a standard that could affect the use of the site, as required. Following completion of construction, the condition of the public road network will be of at least the same standard as it was prior to commencement of construction.

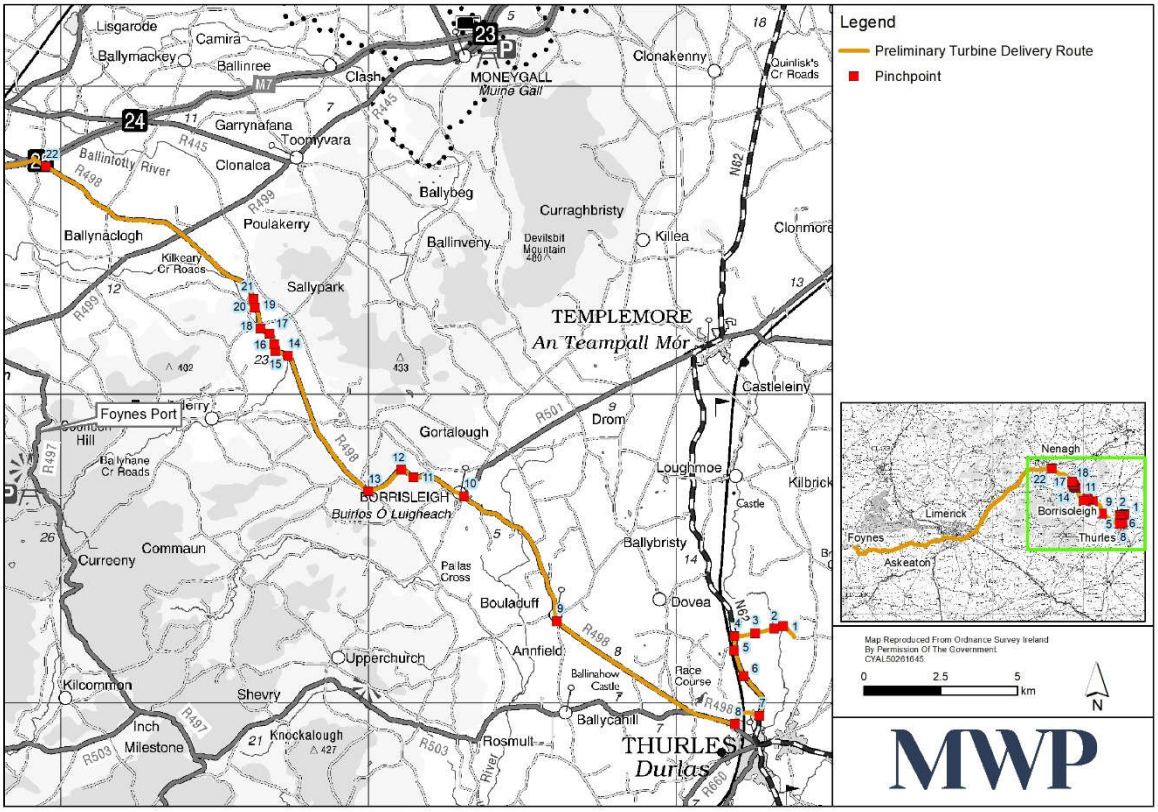


Figure 4-36: Proposed Turbine delivery Route and Pinch Points

4.1.19 Turbine Erection

The erection of turbines will occur in the last month of the construction phase. The erection of turbines is phased at an average of one turbine erected per week. The erection of turbines is a specialist process with specially designed large-scale cranes required to erect the turbine components. The cranes themselves have to be built up on site at the turbine hardstand location and will have to be dismantled substantially before progressing to the next turbine base location for erection of the next turbine.

Components can be placed on hardstands prior to assembly. Large cranes will be required for erecting the turbines, supported by smaller assist cranes. The tower of the turbine is erected first followed by the nacelle. Once the nacelle is in place, the blades are then assembled on the ground and fitted to the hub. The hub with blades attached is then lifted into place on the nacelle. The turbine erection process is a carefully managed and precision operation and is heavily dependent on specialist plant and good weather windows. Once the turbine is in place, electrical commissioning and final energisation follows.

The Project Manager for the site will notify Tipperary County Council and the Irish Aviation Authority (IAA) at least 30 days prior to erection of the wind turbines.

After the turbines have been put in place, the project manager will provide confirmation of the coordinates of the as constructed positions of the turbines and the highest point of the turbines to the top of blade spin to the IAA.

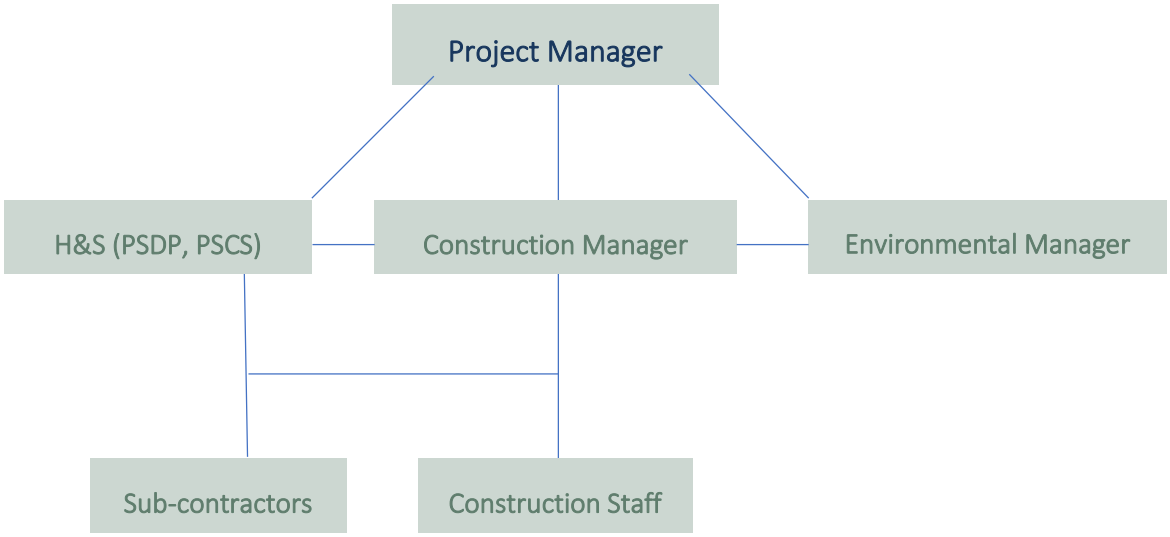
4.1.20 Wind Farm Commissioning

The final stage of the project construction consists of commissioning of the wind farm. It will include testing of the turbines for compliance with standards and for compliance with the National Electricity Grid Code. Once the tests results are satisfactory, the wind farm will be authorised by ESB Networks / EirGrid to export electricity to the national grid.

5. Construction & Environmental Management – Organisational Structure, Duties and Responsibilities

5.1 On Site Organisational Structure and Responsibility

The Organisational Structure for the Contractor's Project Team is included below. This structure is defined by the Contractor and includes the names of the assigned personnel with the appropriate responsibility and reporting structure reflected.



The Contractor will select the Project Team for the construction of the Project. The Contractor's Project Team will include an overall Project Manager, whose duties will stretch beyond the day-to-day works to budgetary, procurement and scheduling matters. The selected Construction Manager will have overall responsibility for the construction site personnel carrying out the works and the Construction Manager will report to the Project Manager.

A qualified and competent Environmental Manager will be appointed for the duration of the works and will report to the Project Manager. The Construction Manager will communicate regularly with the Environmental Manager to ensure mitigation measures are applied to specific works. The Environmental Manager will carry out tasks as required (see section 5.2.4 below), including monitoring, making all construction staff aware of environmental management controls and procedures and ensuring compliance, installation and maintenance of sediment control measures and implementing

and maintaining approved waste management control measures. The use of dedicated staff, under the direction of the Environmental Manager, will ensure the environmental controls are in situ ahead of the works on site.

5.2 Duties and Responsibilities

The general role of key people on site implementing the CEMP will be:

- The Project Manager - liaises with the Project Team in assigning duties and responsibilities in relation to the CEMP to individual members of the main contractor(s)'s project team.
- The Construction Manager - liaises with the Environmental Manager when preparing site works where there is a risk of environmental damage and manages the construction personnel and general works.
- The Design Engineer - undertakes and certifies the Design and supervises the standard of works, including geotechnical aspects (Geotechnical engineer may need to be consulted).
- The Environmental Manager - ensures that the CEMP is developed, implemented and maintained. The Environmental Manager's tasks at the construction site are described below at Section 5.2.4. To ensure adequate cover of environmental tasks, waste management tasks and responsibilities, dedicated construction staff will be assigned to the Environmental Manager to implement and maintain the Sediment and Erosion Plan and any other measures required.

Other roles include:

- Health and Safety (PSDP and PSCS)
- Waste Management Coordinator (report to the Environmental Manager)
- Geotechnical Engineer (as required by Design Engineer)

5.2.1 Project Manager

Name: TBC

A Project Manager is to be appointed on behalf of the main Contractor(s) to manage and oversee the entire project. The Project Manager is responsible for:

- Implementing of the Construction and Environmental Management Plan (CEMP)
- Implementing the Health and Safety Plan
- Management of the construction project
- Liaison with the client/developer
- Liaison with the Project Team
- Assigning duties and responsibilities in relation to the CEMP

- Production of construction schedule
- Materials procurement
- Maintaining a site project diary

5.2.2 Construction Manager

Name: TBC

The Construction Manager manages all the works to construct the project, on behalf of the Contractor. The Construction Manager reports to the Project Manager. In relation to the CEMP, the Construction Manager is responsible for:

5.2.2.1 Site-Specific Method Statements

- Liaising with the Environmental Manager in preparing site-specific Method Statements for all Works activities where there is a risk of environmental damage, by incorporating relevant Environmental Control Measures and referring to relevant Environmental Control Measure Sheets;
- Liaising with the Environmental Manager in reviewing and updating site-specific Method Statements for all Works activities where Environmental and Waste Management Control Measures and Environmental Control Sheets have been altered, and
- Liaising with the Environmental Manager where third party agreement is required in relation to site-specific Method Statements, Environmental & Waste Management Control Measures and/or Environmental Control Measure Sheets.

5.2.2.2 General

- Being aware of all project Environmental Commitments and Requirements
- Ensuring that all relevant information on project programming, timing, construction methodology, etc., is communicated from the Project Manager, to the Environmental Manager in a timely and efficient manner in order to allow pre-emptive actions relating to the environment to be taken where required;
- Programming and planning of excavation works and communicating this schedule to the Environmental Manager;
- Ensuring that adequate resources are provided to design and install any environmental interventions;
- Liaising with the Design Engineer and providing information on environmental management to the Design Engineer during the course of the construction phase;
- Liaising with the Project Team in assigning duties and responsibilities in relation to the CEMP to individual members of the Contractor's project staff;

- Ensuring that the Environmental Manager performs regular and frequent environmental site inspections; and
- Reviewing and approving all waste management control measures ensuring compliance with National and International Waste legislation and best practice.

5.2.3 Design Engineer

Name: TBC

The Design Engineer is responsible for:

- Design of the Works;
- Review and approval of relevant elements of the method statements – assist the Construction Manager with the overall review;
- Participating in Third Party Consultations; and
- Liaising with Third Parties through the Environmental Manager.

5.2.4 Environmental Manager

Name: TBC

The Environmental Manager is responsible for:

- General
  - Being familiar with the project environmental commitments and requirements;
  - Being familiar with baseline data gathered for the various environmental assessments and during pre-construction surveys;
  - Assisting the Construction Manager in liaising with the Design Engineer and the provision of the information on environmental management to the Design Engineer during the course of the construction phase, and
  - Liaising with the Project Team in assigning duties and responsibilities in relation to the CEMP to individual members of the Contractor's project staff.
  - Implementing the environmental procedures, controls, mitigation and monitoring measures of the CEMP;
  - Liaising with the Construction Manager to ensure that the control measures set out in the Schedule of Environmental Mitigation are implemented;
  - Liaising with the client/developer in relation to environmental issues
  - Auditing the construction works from an environmental viewpoint

- Site-Specific Method Statements
  - Liaising with the Construction Manager in preparing site-specific Method Statements for all Works activities where there is a risk of environmental damage. These site-specific Method statements will incorporate relevant Environmental Control Measures and take account of relevant Environmental Control Measure Sheets;
  - Liaising with the Construction Manager in reviewing and updating site-specific Method Statements for all Works activities where Environmental Control Measure and Environmental Control Sheets have been altered, and
  - Liaising with the Construction Manager where third party agreement is required in relation to site-specific Method Statements, Environmental Control Measures and/or Environmental Control Measure Sheets.
- Third Party Consultations
  - Overseeing, ensuring coordination and playing a lead role in third party consultations required statutorily, contractually and in order to fulfil best practice requirements;
  - Ensuring that the minutes of meetings, action lists, formal communications, etc., are well documented and that the consultation certificates are issued to the Design Engineer as required;
  - Liaising with all prescribed bodies during site visits, inspections and consultations;
  - Where new Environmental Control Measures are agreed as a result of third party consultation, ensuring that the CEMP is amended accordingly;
  - Where new Environmental Control Measures are agreed as a result of third party consultation, the Environmental Manager will liaise with the Construction Manager in updating relevant site-specific Method Statements, and
  - Where required, liaising with the Construction Manager in agreeing site-specific Method Statements with third parties.
- Licensing
  - Ensuring that all relevant works have (and are being carried out in accordance with) the required permits, licences, certificates, planning permissions, etc,;
  - Liaising with the designated licence holders with respect to licences granted pursuant to the Wildlife Act, 1976, as amended (if required);
  - Bringing to the attention of the Project, Design and Construction Team any timing and legal constraints that may be imposed on the carrying out of certain tasks.
- Waste Management Documentation
  - Holding copies of all permits and licences provided by waste contractors;
  - Ensuring that any operations or activities that require certificates of registration, waste collection permits, waste permits, waste licences, etc., have appropriate authorisation, and

- Gathering and holding documentation with the respect to waste disposal.

- Legislation
  - Keeping up to date with changes in environmental legislation that may affect environmental management during the construction phase;
  - Advising the Construction Manager of these changes, and
  - Reviewing and amending the CEMP in light of these changes and bringing the changes to the attention of the Contractor's senior management and subcontractors.
- Specialist Environmental Contractors
  - Identifying requirements for specialist environmental contractors (including ecologists, waste contractors and spill clean-up specialists) before commencement of the project;
  - Procuring the services of specialist environmental contractors and liaising with them with respect to site access and report production;
  - Ensuring that the specialist environmental contractors are competent and have sufficient expertise to co-ordinate and manage environmental issues, and
  - Co-ordinating the activities of all specialist environmental contractors on environmental matters arising out of the contract.
- Environmental Induction Training and Environmental Toolbox Talks
  - Ensuring that Environmental Induction Training is carried out for all the Contractor's site personnel. The induction training may be carried out in conjunction with Safety Induction Training,
  - Providing toolbox talks on Environmental Control Measures associated with Site-specific Method Statements to those who will undertake the work.
- Environmental Incidents/Spillages
  - Prepare and be in readiness to implement at all times the Emergency Response Plan attached to this document in Appendix 1.
  - Notifying the relevant statutory authority of environmental incidents, and
  - Carrying out an investigation and producing a report regarding environmental incidents. The report of the incident and details of remedial actions taken should be made available to the relevant authority, the Design Engineer and the Construction Manager.
  - The Site Environmental Manager shall notify the Client of any complaints or environmental incidents within 24 hours of occurrence. Where significant incidents occur requiring the involvement of statutory authorities or emergency services or where any pollution events occur, the Client shall be notified within 1 hour.
- Site Environmental Inspections and Auditing

- Carrying out regular documented inspections of the site to ensure that work is being carried out in accordance with the Environmental Control Measures and relevant site-specific Method Statements, etc.,
- Carrying out inspections of the site drainage system.
- Appending copies of the inspection reports to the CEMP.
- Liaising with the Construction Manager to organise any repairs or maintenance required following the daily inspection of the site.
- Accommodate audits by the Employer and/or independent auditing consultants during the project.
- Accommodate third party environmental auditing when required.
- During audits, the Environmental Site Manager shall make the necessary staff available during each audit and provide access to all documentation and site areas (and provide necessary induction and training to allow access where required).
- If there are any adverse findings arising from the environmental audits, the Environmental Site Manager shall be required to take prompt mitigation actions and provide written reports to the Employer detailing such mitigation.
- The Environmental Site Manager shall notify the Employer of any complaints or environmental incidents within 24 hours of occurrence. Where significant incidents occur requiring the involvement of statutory authorities or emergency services or where any pollution events occur, the Employer shall be notified within 1 hour.

Note: Communication in respect of the project to regulatory or statutory bodies shall be undertaken by the Developer, unless otherwise agreed, except in the case of incident notification.

- Environmental Records
  - The Construction Environmental Manager will provide all CEMP documentation to the Developer on completion of the site works. Reports arising during the site works, such as verification reports or waste disposal records shall be provided to the Developer within one month of completion of the activity and may be subject to review.

5.2.5 Other Roles

5.2.5.1 Health and Safety Personnel – To be updated upon appointment of Contractor(s)/finalisation of CEMP

The Health and Safety personnel for the construction project is appointed by the Contractor in line with the Construction Regulations:

- Carrying out duty of Project Supervisor Construction Stage (PSCS)
- Responsible for safety induction of all staff and personnel on site
- Implementing the Health and Safety Plan

- Auditing and updating the Health & Safety Plan
- All other required legal duties

5.2.5.2 Project Ecologist - Ecological Clerk of Works (ECoW)

A suitable qualified (degree in ecological science) and experienced Project Ecologist/ECoW will be employed during the construction phase of the project. Duties will include the review of all method statements, delivery of toolbox talks, undertaking of all required pre-construction surveys for protected species and monitoring of works throughout the construction phase to ensure all environmental controls and EIAR mitigation is implemented in full. As part of toolbox talks, contractor staff and other site personnel, as relevant, will be made aware of the procedure to follow if a protected species or their resting or breeding site, is encountered. The Project Ecologist/ECoW will closely work with the Environmental Manager.

The Project Ecologist/ECoW will be awarded a level of authority and will be allowed to stop construction activity if there is potential for adverse environmental effects other than those predicted and mitigated for in the EIAR. The project ecologist/ECoW will be responsible for pointing out boundaries of exclusion zones as outlined further below.

The appointed Project Ecologist/ECoW will have demonstrated professional experience in managing large-scale construction works affecting ecological receptors identified within the EIAR.

5.2.5.3 Project Archaeologist

The Archaeologist will be appointed by the Developer or the Contractor(s) and is responsible for:

- ensuring implementation of archaeological mitigation measures
- monitoring of groundworks associated with the development
- liaison with the Environmental Manager/Construction Manager
- liaison with the Project Manager/client/developer

5.2.5.4 Project Ornithologist

The Ornithologist will be appointed by the Developer or the Contractor(s) and is responsible for:

- Ensuring all pre-construction (completed) and construction phase avian monitoring is conducted at the site.
- Advice on any mitigation required and ensuring the implementation of ornithology mitigation measures.
- Consultations with National Parks and Wildlife Service (NPWS).

5.2.5.5 Geotechnical Engineer

The Geotechnical Engineer will be appointed by the Developer or the Contractor(s) and is responsible for:

- Assisting the Design Engineer as required

- Providing advice on geotechnical aspects of the works and ensuring implementation of mitigation measures.

5.2.5.6 All Site Personnel – To be updated upon appointment of Contractor(s)/finalisation of CEMP

The site personnel appointed by the Contractor are responsible for:

- Adhering to the relevant Environmental Control Measures and relevant site-specific Method Statements
- Adhering to the Health and Safety Plan
- Reporting immediately to the Environmental Manager and Construction Manager any incidents where there has been a breach of agreed procedures including:
    - a spillage of a potentially environmentally harmful substance;
    - an unauthorised discharge to ground, water or air, damage to a protected habitat, etc.

5.3 Contacts

5.3.1 Main Contractor Contacts

Table 5-1: Main Contractor Contacts

Position Title	Name	Phone	Email
Main Contractor	TBC		
Project Manager	TBC		
Construction Manager	TBC		
Design Engineer	TBC		
Environmental Manager*	TBC		
Safety (PSCS)*	TBC		
Safety Officer*	TBC		
Site Emergency Number*	TBC		

Position Title	Name	Phone	Email
Project Ecologist/Ornithologist	TBC		
Project Archaeologist	TBC		
Overall Project PSDP	TBC		

**24 hour contact details required*

5.3.2 Employer Contacts

Table 5-2: Employer Contacts

Position Title	Organisation	Name	Phone	Email
Project Ecologist	Employers Ecologist			
Project Archaeologist	Employers Archaeologist			
Overall Project PSDP	Safety (PSDP)			
Project Liaison Officer	Employers Public Liaison Officer			

5.3.3 Third Party Contacts

Table 5-3: Third Party Contacts

Organisation:	Position:	Name/Address:	Phone:	Email Address:
Inland Fisheries Ireland	Limerick	Ashbourne Business Park, Dock Road, Limerick, Ireland.	(061) 300238	limerick@fisheriesireland.ie

Organisation:	Position:	Name/Address:	Phone:	Email Address:
Inland Fisheries Ireland	Clonmel	Anglsea Street, Clonmel, Co. Tipperary	(052)6180055	clonmel@fisheriesireland.ie
National Parks and Wildlife Service	Mid South Division	District Conservation Officer	(01) 539 3152	nature.conservation@chg.gov.ie
Environmental Protection Agency (EPA)	EPA	EPA Headquarters	(053) 9160600	info@epa.ie
Local Authority	Tipperary County Council	Tipperary County Council	(065) 682 1616	customerservices@tipperarycoco.ie
Health and Safety Authority	Health and Safety Authority		(01) 6147000	wcu@hsa.ie
An Garda Síochána	An Garda Síochána	St. Michael's Road, Tipperary E34 Y402	(062) 80670	CT.TipperaryCentral.CE@garda.ie
Emergency Services	Ambulance and Fire Service	Ambulance and Fire Service	999 or 112	

6. Environmental Commitments

6.1 Environmental Management Plans

A number of environmental management plans (EMP) have been prepared for managing the impacts of Construction Activities associated with the Project. See Table 6-1 below and refer to Annex 1. These EMPs profile all the mitigation measures relevant to specific types of environmental effects such as ecological, pollution or traffic effects. The mitigation measures that are standard best practice construction methods have already been incorporated into the construction methodologies described in section 4 above. However, each EMP provides specific guidance on all the measures needed to avoid or minimise adverse environmental effects that are specific to the focus of that EMP. EMPs 11-16 also provide measures to address emergencies, accidents, monitoring/auditing and complaints. These plans are to be implemented by the Appointed Project Manager and/or Project Contractor(s) as relevant.

Once appointed, it is the Contractor's responsibility, to update and add (where required) project specific control measures relevant to the environmental management plans and procedures. The Contractor will ensure that plans/procedures are communicated to all site staff, including sub-contractors, through induction, training and at relevant meetings.

Table 6-1: Environmental Management Plans

Ref:	Procedure:
EMP-1	Management of Excavations
EMP-2	Surface Water Management and Run-off Control
EMP-3	Fuels and Oils Management
EMP-4	Management of Concrete
EMP-5	Construction Noise Management
EMP-6	Construction Waste Management Plan
EMP-7	Construction Traffic Management Plan
EMP-8	Construction Dust, Emissions and Air Quality Management
EMP-9	Ecological Management Plan Protection of Habitats and Fauna

Ref:	Procedure:
EMP-10	Archaeological and heritage Protection
EMP-11	Emergency Response
EMP-12	Site Environmental Training and Awareness
EMP-13	Monitoring and Auditing
EMP-14	Environmental Accidents, Incidents and Corrective Actions
EMP-15	Environmental Complaints

7. Auditing, Monitoring and Response

The environmental Monitoring Schedule (Table 7-1) will monitor the implementation and effectiveness of all mitigation measures outlined in the Environmental Report. The Monitoring Schedule for construction will also provide for the checking of equipment, materials storage and transfer areas and specific environmental controls.

The Contractor will assign a full-time Environmental Manager who will visit the site regularly to monitor the construction activities on a day-to-day basis. The duties will include completing the required checklists (sample checklist included below) and coordinating with the relevant personnel (e.g. Design Engineer as required) ensuring all environmental monitoring is carried out.

Table 7-1: Environmental Monitoring Schedule

Aspect	Area of Inspection	Monitoring Required	Note/Checks	Frequency	Responsibility
Surface Water Run-off Controls	Settlement ponds	Visual inspection	• Leaks • Cracks/broken plastic piling • Build-up of sediment & peat	Regular/daily/weekly during the construction phase as well as during and after significant rainfall events	Environmental Manager
	Weather Forecast	Met Éireann download	• Pre-determined rainfall trigger levels (e.g. 1 in 5-year storm event or heavy rainfall at >25mm/hr)		Environmental Manager
	Discharges from on-site sediment and erosion controls	Visual inspection	• Colour, presence of silts		Environmental Manager
	Borrow Pit	Visual Inspection	• Review work practices and erosion and siltation protection measures		Geotechnical Engineer
Water quality monitoring	Discharges from on-site sediment and erosion controls	Visual inspection	• Unacceptable level of sediment/silt on the road surface • Presence of waste	Weekly	Environmental Manager
	Internal site road Site Entrance	Visual inspection	• Unacceptable level of sediment/silt on the road surface • Presence of waste • Surface Condition	Daily	Environmental Manager
	Water quality sampling at watercourses draining site	Water Samples	• Minimum parameters: pH, Suspended Solids, metals, nitrates, phosphates	Monthly	Environmental Manager

Aspect	Area of Inspection	Monitoring Required	Note/Checks	Frequency	Responsibility
	Areas of concrete pours	Visual inspection	• Monitoring of concrete pours to ensure no discharge of concrete to watercourses	To be scheduled with pours	Environmental Manager
Archaeology	Area of ground works & excavations	Visual Inspection	• Archaeological monitoring during ground works & excavations	To be scheduled with ground works & excavations	Archaeologist
Ecology	Material and Waste Storage	Daily	• Quantities, separation, storage and appropriate disposal of wastes	Daily	Project Manager/Environmental Manager
	Ecology		• Pre-construction root protection, habitat and ecological surveys • Due diligence ecological walkover surveys prior to works commencing and demarcation of exclusion zones where needed. • Adherence to ecological buffers and controls • Compliance with day light working hours	Prior to construction commencing & weekly monitoring	Ecologist and Environmental Manager
Roads	Fuel & Oil Storage areas	Visual inspection	• Damage to containers or ancillary equipment • Leakages • Unlocked storage container • Fuels stored within bunded area	Daily	Project Manager
	Construction Materials Storage Areas	Visual inspection	• Damage • Untidiness	Daily	Environmental Manager
Operation Control	Concrete pours	Visual inspection	• Run-off / spills	Weekly	Project Manager
	Dust generation	Visual Inspection	• Cleanliness of roads and compound area • Dust at stockpiles • Dust from delivery vehicles	Weekly	Project Manager

8. Environmental Performance Indicators

The Contractor will outline the key performance indicators for the site in gauging successful site management in the prevention of pollution and the protection of the environment.

Environmental performance indicators will include:

- Number of environmental accidents/incidents logged;
- Breach of procedure and corrective actions;
- Number of environmental complaints received;
- Results of monthly water quality monitoring;
- Results of noise and vibration monitoring, and
- Results of site audits.

The performance indicators will be communicated to all relevant personnel and sub-contractors. The review periods for analysing site performance indicators will also be specified.

8.1 Response Procedure/ Corrective Action

In the event of an environmental incident, or breach of procedure, or where a complaint is received, or in the event of encountering buried waste or contaminated soils/groundwater, the contributing factors will be investigated and remedial action taken as necessary. The Contractor will ensure that the following respond actions will take place:

1) The Project Manager must be informed of any incident, breach of procedure and/or complaint received and details must be recorded in the incident/complaint register
2) The Project Manager is to conduct/co-ordinate an investigation to determine the potential influence that could have led to the non-compliance.
3) The Project Manager is to notify and liaise with the appropriate site personnel where required, e.g. Site Environmental Manager, Project Ecologist, Project Archaeologist
4) The Project Manager shall notify the Client of any complaints or environmental incidents within 24 hours of occurrence. Where significant incidents occur requiring the involvement of statutory authorities or emergency services or where any pollution events occur, the Client shall be notified within 1 hour.
5) If necessary, the Project Manager will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
6) The details of the incident will be recorded on an Incident / Complaints Form which is to record information such as the cause, extent, actions and remedial measures used

following the incident/complaint. The form will also include any recommendations made to avoid reoccurrence of the incident.

7) The Project Manager will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Designer and Client as appropriate.

8) The Site Project Manager is to ensure that the relevant environmental management plans/procedures are revised and updated as necessary.

Appendix 1

Environmental Management Plans

Construction Environmental Management Plans

EMP-1 Management of Excavations

EMP-2 Surface Water Management and Run-off Control

EMP-3 Fuels and Oils Management

EMP-4 Management of Concrete

EMP-5 Construction Noise Management

EMP-6 Construction Waste Management Plan

EMP-7 Construction Traffic Management

EMP-8 Construction Dust, Emissions and Air Quality Management

EMP-9 Ecological Management Plan for the Protection of Habitats and Fauna

EMP-10 Archaeological and Heritage Protection

EMP 11 Emergency Response Plan

EMP-12 Site Environmental Training and Awareness

EMP-13 Monitoring and Auditing

EMP-14 Environmental Accidents, Incidents and Corrective Actions

EMP-15 Environmental Complaints

EMP 1: Management of Excavations

Purpose

To describe measures for the management of all excavations and excavated soil and rock on the site.

Procedure

General

Bulk excavations will be completed during dry weather periods so as to avoid run off from exposed excavation areas. Weather will be monitored during the construction phase and no excavation works will be allowed during severe or heavy rainfall events.

All temporary cuts/excavations will be carried out such that they are stable or adequately supported (as per procedures outlined in section 4.1.7.1). Where erosion risks exist , cuts and excavations will be protected against ingress of water or erosion by the use of cut off drains around the excavation works. Temporary works will be constructed to ensure they do not adversely interfere with existing drainage channels/regimes.

Plant and materials will be stored in approved locations only (such as the proposed site compound) and will not be positioned or trafficked in a manner that would surcharge existing or newly formed slopes.

Vehicular movements will be restricted to the footprint of the permitted development and to the newly constructed access roads. Machinery must be kept on existing roads/hardstands/yard areas and aside from advancing excavations do not move onto areas that are not permitted for the development.

Management of Borrow Pit

The borrow pit proposed within the site will be used to obtain site won stone aggregate for use in the construction of the proposed wind farm. This borrow pit will be located within the southern area of the site where it will be used as a source of hardcore for the construction of access tracks, crane hardstands and construction compounds. The proposed location and plan of the borrow pit is shown on Planning Drawings 22156-MWP-00-00-DR-C-5415.

Prior to commencement of excavation works, an interceptor drain will first be excavated upslope to intercept existing overland flows and divert them around the borrow pit prior to discharge via a buffer zone on the downslope side. Any subsoil material overlying the rock will be excavated and stockpiled. The stockpile will be sealed, and a perimeter drain installed to intercept any run-off so that it can be discharged through an appropriately designed silt trap.

Standing water, any surface water runoff or water pumped from within the borrow pit is likely to contain an increased concentration of suspended solids. Runoff or pumped water from the borrow pit will be isolated from the clean catchment runoff by means of a series of open drains that will be constructed within the area. These drains will be of check dams that will attenuate the flow and provide storage for the increased runoff from exceptional rainfall events. The settlement ponds have been designed to a modular size where if larger areas of runoff must be catered for at a single discharge point the size of the settlement pond will be increased pro rata.

Inspections of the borrow pit will be made by a geotechnical engineer through regular monitoring of the opening works. The appointed contractor will review work practices at the borrow pit where periods of heavy rainfall are expected where work will be stopped to prevent excessive runoff from being generated. Excavators will extract the stone using buckets and a ripper attachment or rock-breaker attachments may be utilised in the borrow pit location. It is expected that excavators will be utilised in tandem in the extraction of rock from the borrow pit.

Once all the obtainable rock has been removed from the borrow pit, it will be backfilled by spoil from the onsite excavation works, covered with topsoil, revegetated and reinstated as pasture land. This will reinstate the existing land use.

Management of Rock Blasting

- In order to mitigate against possible slope instability close to the borrow pit, blasting will not occur after periods of heavy rainfall. In particular, no blasting will take place for at least 24 hours following a period of rainfall which exceeds 25mm within the previous 24 hours.
- Rock blasting will only take place within the borrow pit if extraction using rippers or hydraulic breakers is deemed impractical. Circumstances include where the rock strength is such that other means of extraction are not possible and production rates need to be increased to keep up with the construction programme.
- If rock blasting proves to be necessary, a detailed blasting design will be undertaken by a suitably qualified and experienced specialist for each location to ensure that a peak particle velocity (PPV) of 10 mm/s is not exceeded at a distance of greater than 20m from the blast holes as per BS 7385 Part 2: 1993. If this cannot be achieved, blasting will not be permitted at this location.
- To mitigate against the risk of slope failure occurring, blasting will not be permitted at turbine locations unless robust mitigation measures are put in place, similar to those at the proposed borrow pit.
- To mitigate against the risk of excessive dust within the vicinity of the borrow pit, the blast areas will be lightly sprayed with water prior to blasting.
- A Blast Management Plan will ensure compliance with the Explosive Act 1923 (amended by Part 6 of the Criminal Justice Act 2006) and related legislation, and BS 7385 will be complied with during any blasting. Tipperary County Council, An Garda Síochána, and adjoining landowners will be notified in advance of any blasting activities on the site. The Blast Management Plan will be prepared by the appointed contractor prior to the construction phase and in consultation with Tipperary County Council, An Garda Síochána and adjoining landowners. Additionally, the NPWS and any other required consultees will be consulted as part of the general consultation and blasting permitting process, in order to keep them informed of any blasting proposals for the site.

Management of Excavations associated with Tree Felling

Topsoil removed from felled areas for the construction of the proposed project will be used in landscaping works or placed in the deposition areas. Where possible, the vegetative layer will be stored with the vegetation and soil facing the right way up to encourage regrowth. The felling areas will then be monitored and maintained following construction and into the operational phase of the development.

Any runoff from the clear-felled areas will be treated using the same design philosophy as that for the access tracks and hardstands. This includes the separation of clean and dirty water by the installation of berms, channelling dirty water to silt traps and settlement ponds and ensuring that the discharge rate of the drainage system is no higher than the existing condition by using engineered settlement ponds.

Where practicable, brash mats will be used to support vehicles on soft ground, reducing soil erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along off-track routes where practicable, to protect the soil from compaction and rutting.

All works will be completed to standard forestry guidelines (Department of Agriculture, Food and the Marine [Teagasc], 2019, Standards for Felling and Reforestation), and in accordance with licence conditions issued by the Forest Service.

Management for Slope Failure/Ground Instability

All site excavations and construction will be supervised by a suitably qualified and experienced engineer. A competent project geotechnical engineer or engineering geologist will be employed during the construction phase of the works. As part of the detailed design and assessment, identification of potential planes of weakness will be made in the overburden such as discrepancies in the material type and foliation direction in the bedrock. Earthworks will be constructed to safe stable angles in accordance with the detailed design and best practice. Horizontal directional drilling (HDD) will be carried out by an experienced HDD specialist.

The Contractor's method statements for each element of work will be reviewed and approved by the engineer prior to site operations. Specific method statements will be developed for each turbine and hardstanding location within the site.

Prior to excavation, drains will be established to effectively intercept overland flow prior to earthworks.

The existing network of drainage within the site will be utilised whenever possible.

From examination of factual evidence to date, the majority of landslides occur after an intense period of rainfall. An emergency response system, EMP 11, will be developed for the construction phase of the project, particularly during the early excavation phase. This, as a minimum, will involve 24 hour advance meteorological forecasting (Met Éireann download) linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded (e.g. 1 in 100-year storm event or very heavy rainfall at

>25mm/hr), planned responses will be undertaken. These responses will include cessation of construction until the storm event including storm runoff has passed over.

From a desk-top review, the GSI's Landslide Events database has no records of any landslide events recorded within or in proximity to the site.

Management and Storage of Excavated Materials and Soil Management

Site management will include the checking of equipment, materials storage and transfer areas, drainage structures and their attenuation ability on a regular basis during the construction phase of the project. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations.

Plant and materials will be stored in approved locations only (such as the proposed temporary site compound) and will not be positioned or trafficked in a manner that would surcharge existing or newly-formed slopes.

Excavated Spoil Storage

Excavated spoil will be reused for the backfilling, landscaping, and restoration around wind farm infrastructure such as turbines and hardstands.

The calculated volume of excavated material is summarised in Table 8-1.

Dedicated spoil storage areas and a borrow pit are proposed within the site. These will be used for generating material for the construction of access roads and hardstands and for spoil storage. The proposed locations for the borrow pit and spoil storage are shown on Planning Drawings 23318--MWP-00-00-DR-C-5005.

Spoil will also be stored around the turbines to a maximum height of 1m. The felled areas around the turbines have been identified as a potential additional area that will be used to store material; however, priority will be given to restoration of the borrow pit area and the dedicated spoil storage areas.

A summary of the construction material and spoil storage volumes are shown in Table 8-1.

Drainage and siltation control measures will be put in place in all spoil storage areas (see EMP 2). This will include a dedicated drainage network, temporary silt fences and settlement ponds designed to cater for the size of each storage area. Further details of the drainage philosophy that will be applied as well as siltation control systems and attenuations systems is given in section 3.14 of Chapter 3 of this EIAR.

Table 8-1: Summary of Construction Material and Spoil Storage Volumes

Item	Unit	Quantity
Total Excavation Volume	**m3**	**163752**
Excavated Material Stored or Reused Onsite	m3	128350
Excavated Material Removed from Site	m3	35402
Total Aggregate Volume	**m3**	**143945**
Imported Aggregate	m3	121625
Site Won Aggregate	m3	22319
Total Concrete Volume	**m3**	**20040**
Total Reinforcement Volume	**Tonnes**	**1379**

Temporary Storage of Excavated Material

No permanent stockpiles will be left on site after the completion of the construction phase works. After completion of the turbine base reinstatement works all remaining stockpiles are to be removed for permanent disposal at the proposed deposition areas within the site.

Any materials excavated during the construction phase which are to be used in the site reinstatement and landscaping process shall, in the first instance, be stored on site in an environmentally safe manner that will not result in the pollution of waters or the smothering of ecologically sensitive habitats (as per construction methods described in section 4.1.5).

The following principles will be adhered to in respect of the temporary storage of excavated materials;

- Stockpiles of stripped topsoil will be in locations with minimum trafficking to prevent damage and dusting
- Spoil disposal will take place within a 30m radius of each structure.
- Preparation of the spoil disposal site will involve the removal of the “top mat” which will be transplanted to suitable area and maintained for re-use during restoration operations.
- Spoil will be deposited, in layers of 0.5m and will not exceed a total thickness of 1m.
- Spoil will only be deposited on slopes of less than 5 degrees to the horizontal and greater than 10m from the top of a cutting. The exact location of such areas will be confirmed on consultation with the geotechnical engineer.
- Once reinstatement is complete the disposal sites will be re-vegetated with the “top mat” removed at the commencement of disposal operations.
- Prior to commencement of the restoration phase, a restoration methodology and programme will be prepared with input from a suitably qualified environmental professional.

It is proposed that any temporary onsite stockpiles of soil, rock and other excavated material shall be removed and utilised in the site reinstatement programme to infill any excavated areas which will then be mounded and capped with sod prior to the completion of works.

Permanent Deposition Areas

On completion of extraction activities in any cell at the borrow pit; the pit will be used for the permanent storage of the excavated spoil material from the turbine bases, crane hardstands and internal access road construction. The proposed deposition areas will be subdivided into a series of cells. Each cell will be bunded by an embankment of engineered fill material capable of allowing a tracked excavator to move between the cells during deposition activities. The size of each cell will be dictated by the maximum working length of the excavators working the borrow pit. Each cell will be bunded on all downslope sides. The bund will be of adequate strength to retain the spoil stored within each cell.

Water build up within the disposal area will not be permitted. Water will free drain to the sump of the pit from where it will be discharged utilising a 6" pump discharging to a settlement pond constructed for this purpose. Permanent design features are proposed to allow drainage function correctly over the deposition areas, these are shown on 23318-MWP-00-00-DR-C-5025 to 5033. Upon completion of each cell the surface of the deposited spoil will be profiled to a gradient not exceeding 5% and vegetated with either harvested turves where available or allowed to vegetate naturally as indicated by the project ecologist.

Grid Connection Route Excavations

Excavated material from the grid connection route will be used to reinstate the area around the cable trench following backfilling of the trench with approved materials. Any excess material from the grid connection route will be removed and disposed of to the onsite deposition areas or to an appropriate facility licensed to accept such waste.

Turbine Delivery Route

In terms of the turbine delivery route, the following mitigation measure will be implemented:

- Use of the existing road network to reduce soil/subsoil excavation volumes;
- The soil/subsoil which will be excavated during the construction phase will be localised to the proposed 2 no. locations along the turbine delivery route;
- A minimal volume of soil/subsoil will be excavated/landscaped and the areas of ground where works will occur is small;
- Excess excavated material will be used for local landscaping; and
- Temporary hardstand area will be reinstated to original condition on completion of the works.

Monitoring

This is to be detailed in the Contractors Final Method Statement.

Responsibility

- The Environmental Manager will monitor the excavation areas and associated drainage.
- The Construction Manager will monitor vehicle movements throughout the construction phase
- The Project Manager will oversee the phasing of the excavation and machinery movement across the site.
- Construction personnel will be informed of the measures to prevent pollution of water courses,
- The Design Engineer, Geotechnical Engineer and Sub-contractors will have responsibilities as appropriate (see section 5.2 of CEMP).
- All responsibilities will be finalised by the Appointed Contractor.

EMP 2: Surface Water Management and Run-off Control

Purpose

To describe measures for the management of all surface water and run-off on the site, for the protection of watercourses and in particular, sediment and erosion control.

The following management and mitigation measures regarding Surface Water Management and Run-Off Control will be implemented:

- Suitable weather windows (dry, no weather warnings or heavy rainfall expected within 5 days of works) will be chosen when undertaking the HDD at watercourse crossings.
- No work will take place within 50m buffer zones of EPA mapped watercourses except for construction works detailed in Section 4.1.8.3 of the CEMP.
- Any works taking place in the vicinity of unmapped watercourses or land drains will be undertaken in accordance with the mitigation measures set out in Section 4.1.8.3 of the CEMP. Working near watercourses during or after intense or prolonged rainfall events will be avoided and work will cease entirely near watercourses when it is evident that there is a risk that pollution could occur. All construction method statements will be developed in consultation with Inland Fisheries Ireland. Any crossing of watercourses will be subject to a Section 50 application to ensure flood risk upstream and downstream of the crossing is not increased.
- Implement erosion control to prevent runoff flowing across exposed ground and become polluted by sediments (see sections 4.1.8; 4.1.9 and 4.1.11);
- Intercept and divert clean water runoff away from construction site runoff to avoid cross-contamination of clean water with soiled water;
- Implement sediment control to slow down runoff allowing suspended sediments to settle in situ particularly on roads (see sections 4.1.8; 4.1.9 and 4.1.11);
- Implement the erosion and sediment controls before starting site clearance works;
- Minimise area of exposed ground by maintaining existing vegetation that would otherwise be subject to erosion in the vicinity of the wind farm infrastructure and keeping excavated areas to a minimum;
- Delay clearing of soil until immediately before the relevant part of the construction works commence rather than stripping the entire site months in advance particularly during road construction;
- Avoid working near drains during or after prolonged rainfall or an intense rainfall event and cease work entirely near drains when it is evident that pollution is occurring;
- Install a series of silt fences or other appropriate silt retention measure (as outlined in sections 4.1.8; 4.1.9 and 4.1.11)where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather period or if working during intense rainfall event. These measures will be inspected and confirmed to be of sufficient capacity to prevent any potential emissions to water entering the watercourses on Site. These will be inspected weekly by the Environmental Manager and cleaned regularly as required as directed by the Environmental Manager;
- Implement sediment control measures that includes for the prevention of runoff from adjacent intact ground that is for the separation of clean and 'dirty' water (see sections 4.1.8; 4.1.9 and 4.1.11);

- Install appropriate silt control measures such as silt-traps, check dams and sedimentation ponds;
- Monitor and clear any silt and sediment that accumulates on roads and in the vicinity of drains; and
- Controls will be regularly inspected and maintained in order to avoid failure, such as a build-up of silt or tear in a fence, which will lead to water pollution so controls must work well until the vegetation has re-established; inspection and maintenance is critical after prolonged or intense rainfall.
- All forestry felling will be undertaken in accordance with a forestry felling licence, using good working practices as outlined by the Department of Agriculture, Food, and the Marine (DAFM) Standards for Felling and Reforestation (2019). These standards deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel, and machine oils. All conditions associated with the felling licence will be complied with.

Drainage arrangements along internal access/service tracks

The following gives an outline of drainage management arrangements along internal services roads:

- The surface water run-off drainage system will be implemented along all internal access routes, to separate and collect 'dirty water' run-off from the roadway and to intercept clean over land surface water flows from crossing internal roadways;
- To achieve separation, clean water drains will be positioned on the upslope and dirty water drains positioned on the downslope of roadsides, with road surfaces sloped towards dirty drains; and
- Clean water will be piped under both the access roads and downslope collection drains to avoid contamination. Piping the clean water under the service road allows the clean water to follow the course it would have taken before construction thus mimicking the existing surface water over land flow pattern of the site and thus not altering the natural existing hydrological regime on site.
- The access track surface can become contaminated with clay or other silty material during construction. Access track cleaning will, therefore, be undertaken regularly during wet weather to reduce the volume of sediment runoff to the treatment system. This is proposed to be achieved by scraping the track surface with the front bucket of an excavator and disposing of the material at designated locations within the site.

Temporary stockpiles of excavated spoil, stored in the footprint of the excavation areas, will be directed for use in backfilling and restoration or placed in the deposition areas on site. Reusable excavated sub-soils and aggregate will be stored in temporary stockpiles at suitably sheltered areas to prevent erosion or weathering and shall be shaped to ensure rainfall does not degrade the stored material. Stockpiles will be stored away from any open surface water drains, managing height and slope of all stockpiles and minimising soil movement. Estimated volumes of material can be found in Chapter 03 Civil Engineering of the EIAR and EMP 1.

Whenever possible, existing access tracks have been utilised to access turbine locations. This reduces the volume of excavated material and imported crushed rock for track construction. Excavations and

material removal that will take place during the construction phase will be localised to the turbine locations and access tracks.

Management

The integrity of the drainage and treatment system will be managed and monitored on an ongoing basis but particularly before and after extreme rainfall events during the construction phase. Controls will be regularly inspected and maintained. A programme of inspection and maintenance will be designed and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed and records kept of inspections and maintenance works. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations.

Monitoring

- The Environmental Manager will monitor the general level of suspended solids at designated sampling points in the rivers/streams downslope of the active construction areas using a turbidity meter.
- The Environmental Manager will walk the site regularly and check the cross-drain pipes, dirty water drains and outlets, settlement ponds, interceptor drains and silt fences for any damage or blockages. Any damage or blockages will be repaired or cleared promptly.
- As detailed above, weather forecasts will be monitored during the construction phase. The 24 hour advance meteorological forecasting service from Met Éireann will be used and on site rain gauge linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded (e.g., 1 in 5-year storm event), planned responses will be undertaken. These responses will involve control measures including:
    - Checking the drainage systems prior to the storm and ensuring it is secure and operating optimally;
    - the cessation of construction until the storm event has passed over and flood flows have subsided; and
    - Post-storm event checks and repairs where needed.
- The cessation of construction until the storm event has passed over and flood flows have subsided. Dedicated construction personnel will be assigned to monitor weather.
- Water quality monitoring will take place prior to and during the construction phase and for the first 6 months of the operational phase. The location of sampling points and the programme of monitoring of water quality will be agreed with the Planning Authority prior to the commencement of construction. This monitoring, together with visual monitoring, will help to ensure that the mitigation measures that are in place to protect water quality are effective.
- Water Monitoring Programme to include monitoring of streams and from end points of Sediment and Erosion Control system and visual monitoring of Sediment and Erosion Control measures (as per requirements in EMP 13).
- Baseline water quality monitoring will be updated prior to commencement of the development. Water quality field testing and laboratory analysis will be undertaken prior to

commencement of felling and construction at the site. The monitoring programme will be subject to agreement with Tipperary County Council but will be based on the planning stage programme already outlined in the EIAR and in EMP 13 of the CEMP.

- Continuous, in-situ, monitoring equipment will be installed at selected locations upstream and downstream of the proposed project. The monitoring equipment will provide continuous readings for turbidity levels, flow rate and water depth in the watercourses.
- Each month, the EcoW will take samples from each location and bring to a laboratory for analysis on a range of parameters with relevant regulatory limits and EQSs. This will be compared with the baseline data obtained prior to construction from the EPA and from sampling. If the measured value exceeds the baseline values, the cause will be determined, and remedial measures put in place as necessary.
- The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations (as amended) and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (as amended). The suite of determinants will include:
  - pH;
  - Total Petroleum Hydrocarbons (TPH);
  - Temperature;
  - Total Phosphorus;
  - Chloride;
  - Nitrate;
  - Nitrite;
  - Total Nitrogen;
  - Orthophosphate;
  - Ammonia N;
  - Biochemical Oxygen Demand; and
  - Total Suspended Solids.
- Periodic visual observations at each of the monitoring points will be recorded with specific reference to flow, stream substrate and water colour. Photos will be taken to support visual observation, and inspection sheets including visual observation results and photographic records will be kept on site. Visual observations will also be completed after major rainfall events along with photographs which will be collected and assessed by the EcoW.The elements which will be included in the visual checklist are as follows:
  - Appropriate period visual inspection of all watercourses which drain the proposed project by the ECoW or a suitably qualified and competent person delegated by the EcoW;
  - Groundwater seepage, water ponding and wetting of previously dry spots;

- All elements of drainage system will be monitored including settlement ponds, check dams, interceptor drains etc. Corrective action will be carried out if there is a visual indication of discolouration, oily sheen, odour or litter.
- Event based visual inspections by the ECoW as follows:
    - Following a high intensity localised rainfall event (10mm/hr);
    - Heavy rainfall within a day (25mm in a 24 hour period); and
    - Higher than monthly rainfall within a week period.
- A record of all visual inspections will be included in the Construction Environmental Management Plan (CEMP) and maintained on site.

- The ECoW will be responsible for presenting the surface water monitoring results at or in advance of regular site meetings.
- The reports will include results from field monitoring as well as visual inspections and laboratory analysis completed for that period. The reports will describe how the results compare with baseline results. Any deterioration in water quality will be flagged and investigated, and appropriate remediation or corrective actions recommended.

Responsibility

- The Environmental Manager is responsible for ensuring that appropriate water pollution prevention measures are put in place and that water sampling is carried out. Where standards are breached and remedial action is taken, an investigation must be carried out in conjunction with the Construction Manager, and further samples must be taken to verify that the situation has returned to normal.
- The Environmental Manager is responsible for ensuring spill kits are readily available in vulnerable locations and that booms for watercourses are long enough and have adequate anchorage.
- The Construction Manager (or a designate) is responsible for ensuring the spill kits are adequately stocked and should inform the Environmental Manager when items have been used.

Reference

See planning application Drawing No. 23318-MWP-00-00-DR-C-5025 to 23318-MWP-00-00-DR-C-5033 for details of the drainage layout and Drawing No. 23318-MWP-00-00-DR-C-5407 for specific drainage details.

EMP 3: Fuel and Oils Management

Purpose

To describe measures for the management of all fuel and oils on site for the protection of watercourses from any spills.

Procedure

Construction machinery and vehicles:

The following will be undertaken in relation to plant and refuelling:

- Only qualified persons shall operate machinery or equipment;
- Machinery and equipment shall be checked on a regular basis to ensure they are working properly (no oil/fuel leaks etc.);
- No refuelling shall take place within 50m of any watercourse;
- Fuel will be stored in doubly-bunded bowsers or in bunded areas at the site compound;
- Plant nappies and spill kits will be readily available on plant equipment or when working with fuel operated heavy tools;
- To mitigate against sources of contamination, refuelling of plant and vehicles will only take place within designated areas of the site compound or in other areas specifically designated for this purpose;
- Only emergency breakdown maintenance will be carried out on site;
- Appropriate containment facilities will be provided to ensure that any spills from breakdown maintenance vehicles are contained and removed off site;
- There will be no discharge of any priority or hazardous substances to groundwater and surface waters; and
- A suitable permanent fuel and oil interceptor will be installed to deal with all substation surface water drainage. Temporary petrol and oil interceptors will be installed at the site compound for plant repairs/storage of fuel/temporary generator installation.
- For deliveries and dispensing activities, it will be ensured that:
    - Site specific management procedures are in place for bulk deliveries;
    - Delivery points and vehicle routes are clearly marked;
    - Emergency procedures are displayed and a suitably sized spill kit is available at all delivery points, and staff are trained in these procedures and the use of spill kits.
- Potential leaks from delivery vehicles will be reduced by visually inspecting all delivery vehicles for major leaks. Contractors supplying concrete and crushed stone to the site will be contractually required to supply their products using roadworthy vehicles.

- Vehicles and plant will not park near or over drains and will be washed in accordance with the commitments set out above.
- Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits; the nearby dirty water drain outlet will be blocked with an oil absorbent boom until the fuel/oil spill has been cleaned up and all oil and any contaminated material removed from the area. This contaminated material will be properly disposed of in a licensed facility.
- The Environmental Manager will be immediately informed of the oil leak/spill, and will assess the cause and the management of the clean-up of the leak or spill. They will inspect nearby drains for the presence of oil, and initiate the clean-up if necessary.
- Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery.
- Correct action in the event of a leak or spill will be facilitated by training all vehicle/machinery operators in the use of the spill kits and the correct containment and cleaning up of oil spills or leaks. This training will be provided by the Environmental Manager at site induction.
- In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery.

Oil storage during the construction phase

- The scale of potential impacts on downstream water quality will be reduced by only storing the required volume of oils for the works taking place at the time.
- Fuel containers will be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores. materials in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as hoses and pipes will be contained within the bunded storage container. Taps, nozzles or valves will be fitted with a lock system.
- Access to oil stores will be controlled by the storage of oils within a locked steel container within the site compound. The site compound will be surrounded by a palisade fence and locked when there are no site personnel present.
- Collision with oil stores will be prevented by locating oils within a steel container in a designated area of the site compound away from vehicle movements.
- Leakages of oil from oil stores will be prevented by storing these oils in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as hoses and pipes will be contained within the bunded storage container. Taps, nozzles or valves will be fitted with a lock system.

- The volume of leakages will be prevented through monitoring oil storage tanks/drums for leaks and signs of damage. This will be carried out daily by the Environmental Manager.
- Long term storage of waste oils will not be allowed on site. These waste oils will be collected in leak-proof containers and removed from the site for disposal or re-cycling by an approved service provider.
- Any other relevant guidelines that may need to be implemented during the construction phase as outlined in Best Practice Guidelines BPGCS005 – Oil Storage Guidelines (Enterprise Ireland).

Responsibilities

The Construction Manager and Environmental Manager are responsible for ensuring Fuel and Oils are managed in line with this procedure. The Contractor, in updating the CEMP, must designate personnel to the tasks relating to Fuels and Oil, as outlined above.

Reference

Best Practice Guidelines BPGCS005 – Oil Storage Guidelines (Enterprise Ireland).

EMP 4: Management of Concrete

Purpose

To describe measures for the management of concrete on site for the protection of watercourses from any spillages.

Procedure

Supervision of concrete pours

- To reduce the potential for cementitious material entering watercourses, concrete pours will be supervised by the Construction Manager, a suitably qualified Engineer and the Environmental Manager.
- The Construction Manager will ensure that the area of the pour is completely drained of water before a pour commences.
- Pours will not take place during forecasted heavy rainfall.
- Incidental rainfall from light showers during the period of a pour is typically absorbed into the concrete matrix but heavier showers can result in some run off from the top surface of the concrete pour. If run-off is encountered the Environmental Manager will block the outflow from the drains to retain or treat the run-off until the pH is neutral before discharge to the drainage network.
- In the event of a spillage on site, the Environmental Manager will temporarily block the dirty water drains in the immediate area and monitor the pH levels of the water in the associated settlement ponds and if necessary will adjust the pH levels using CO2 entrainment. Any spillage will be cleared immediately and deposited in the Chute wash down area.

Concrete Water

- Pours will not take place during heavy rainfall.
- To reduce the volume of cementitious water, only concrete truck chutes will be washed down on site. The concrete trucks will wash down their chutes at a designated chute wash down area in the site compound.
- There will be a dedicated concrete chute washout area on site. The wash down area will consist of a polythene lined bunded area with a capacity of about 20m^3. This capacity will be sufficient to accommodate the chute washdown from the various anticipated concrete pours. The system is sealed with no overflow discharge to the drainage system.
- Concrete trucks will be washed out off site at the source quarry. Wet concrete operations will not be carried out for the proposed project within or adjacent to watercourses or aquatic zones. No batching will take place on site. However, if wet concrete operations are required in such locations, a suitable risk assessment will be completed prior to works being carried out.

Responsibilities

- All concrete pours will be supervised by suitable personnel.
- The Environmental Manager is responsible for ensuring that appropriate water pollution prevention measures are put in place and that water sampling is carried out. Where standards are breached he/she will carry out an investigation and in conjunction with the Construction Manager, he/she will ensure remedial action is taken and further samples taken to verify that the situation has returned to normal.
- The Environmental Manager is responsible for ensuring spill kits are readily available in vulnerable locations and that booms for watercourses are long enough and have adequate anchorage.

EMP 5: Construction Noise Management

Purpose

To describe measures for the management of impacts from construction noise

Procedure

Control of Noise at Source

Regarding construction activities, *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise,* which offers guidance on the control of noise and vibration from construction activities, will be complied with throughout the construction phase. Best practices will be adopted during construction as required, including the following:

- The construction programme will be managed to ensure that plant with the highest levels of noise and vibration emissions are not operated simultaneously and for the minimum amount of time as practicable;
- Channels of communication between the contractor/developer, Local Authority and residents will be established;
- A site representative responsible for matters relating to noise and vibration will be appointed; and
- Keeping the surface of the site access roads even to mitigate the potential for vibration from lorries.

Furthermore, a variety of practicable noise control measures will be employed. These include:

- Selection of plant with low inherent potential for generation of noise and/or vibration;
- Placing of noisy/vibratory plant as far away from sensitive properties as permitted by site constraints

Construction Phase Noise & Vibration Mitigation

The contract documents shall specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures when deemed necessary to comply with the recommendations of *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction on open sites – Noise.* The following list of measures will be implemented to ensure compliance with the relevant construction noise criteria:

- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working for the duration of the contract.
- Compressors will be attenuated models, fitted with properly lined and sealed acoustic convers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.

- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.
- During the construction programme, supervision of the works will include ensuring compliance with the limits as detailed in Chapter 12 of the EIAR, using methods outlined in *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.*
- The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall be restricted to between 07:00hrs and 19:00hrs weekdays and between 07:00hrs and 14:00hrs on Saturdays. However, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e., concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the local Planning Authority.
- Vibration: Distances between construction locations and the nearest noise sensitive locations (NSLs) are such that vibration levels as a result of construction activities including any necessary piling will be below the 8mm/s PPV vibration limit. No mitigation measures are therefore proposed.
- Blasting: The following mitigation measures will be employed to control the impact during blasts:
    - Trial blasts will be undertaken to obtain scaled distance analysis.
    - Ensuring appropriate burden to avoid over or under confinement of the charge.
    - Accurate setting out and drilling.
    - Appropriate charging.
    - Appropriate stemming with appropriate material such as sized gravel or stone chipping.
    - Delay detonation to ensure small maximum instantaneous charges.
    - Decked charges and in-hole delays.
    - Blast monitoring to enable adjustment of subsequent charges.
    - Good blast design to maximise efficiency and reduce vibration.
    - Avoid using exposed detonating cord on the surface.
-

Responsibility

The Construction Manager will be familiar with the noise sensitive receptors and alert the Environmental Manager in good time prior to work commencing in the areas closest to any noise sensitive receptors.

In the event that planning permission is granted, the Environmental Manager will review any relevant planning conditions and update this plan as required.

References

BS5228 –1&2:2009, Code of Practice for the Control of Noise and Vibration on Construction and Open Sites

IOA GPG Supplementary Guidance Note 5: *Post Completion Measurements* (July 2014).

Details of management of noise on the site to be finalised by Appointed Contractor

EMP 6: Construction Waste Management Plan

Purpose

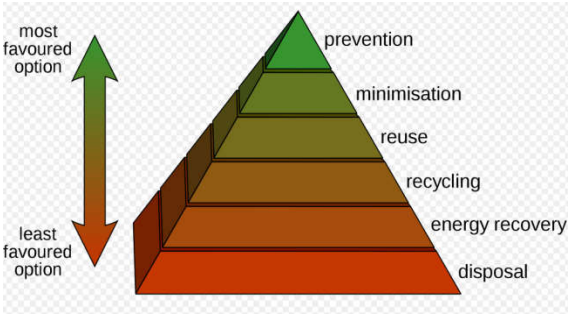
To describe measures for the management of all wastes associated with the construction of the wind farm.

Procedure

Waste Management Plan

The Waste Management Hierarchy (illustrated below) has been assessed and applied in the preparation and maintenance of this Construction Waste Management Plan. The Construction Phase Waste Management Plan addresses the following aspects of the Project:

- Analysis of the waste arising/material surpluses;
- Specific waste management objectives for the project;
- Methods proposed for prevention, reuse and recycling of wastes, and
- Material handling procedures.



Construction Methodology and Raw Materials

The construction phase of the wind farm will require a variety of construction methodologies. The anticipated phasing of the construction phase will be as follows;

Activity
Prepare site, Pre-construction activities, Site entrance
Access road construction + Drainage plan implementation
Crane hardstand construction
Turbine foundation construction

Activity
Substation and BESS construction
Internal trenching and ducting
External grid connection trenching and ducting
Turbine delivery
Turbine erection
Permanent meteorological mast erection
Reinstatement/Landscaping
Wind farm commissioning
Project closeout

Construction

Contractors working on site during the works will be responsible for the collection, control and disposal of all waste generated by the works. Construction phase waste may consist of hardcore, stone, concrete, steel reinforcement, shuttering timber, food waste from the canteen and unused oil, diesel and building materials. This waste will be collected at the end of the construction phase and taken off site to be reused, recycled and disposed of in accordance with best practice procedures at an approved facility. Domestic wastewater from the on-site holding tank will be collected on a regular basis by approved contractors and disposed of in an authorised facility in accordance with best practice. Plastic waste will be taken for recycling by an approved contractor(s) and disposed or recycled at an approved facility.

General Waste Management on Site

The waste management strategy for the construction phase is based on the following actions:

- Ordering the correct amount of materials to be delivered when needed.
- Ensuring materials are not delivered to site damaged and unusable.
- Reducing the amount of packaging used by suppliers.
- Where possible, establish a ‘take back’ system with suppliers.
- Ensuring wastes are handled and stored correctly.
- Limiting the amount waste going to landfill by reusing and recycling where possible.

Construction Compound

Construction compound / waste storage area will be created for storage of waste materials, plant, and equipment and for site offices, and welfare facilities.

Wastes Generation

Best practice procedures in general will minimise waste generated on-site (refer to Ireland's National Waste Policy 2020-2025: A waste Action Plan for a Circular Economy). Measures including good site management will be taken to limit the quantity of waste generated during construction phase. Waste such as excavated material on-site will be recycled where possible.

Surplus materials will include materials generated by the excavation works during construction of tracks, construction compounds and pipe outfall, mainly comprising excavated excess sub-soils.

Waste streams will include wastes generated by plant, machinery and construction workers over the period of the works, for example waste oils, sewage, refuse (paper, carton, plastic etc), wooden pallets, waste batteries, fluorescent tubes etc.

Minimisation, Reuse, Recycling, and Management of Construction Waste

The primary aim of this Waste Management Plan is to ensure that wastes generated during the course of the project are managed in a systematic manner in accordance with Waste Management Legislation and the principles of the waste Hierarchy, i.e. Prevention, Minimisation, Reuse, Recovery, and Recycling.

Wastes generated during the construction phase will be identified and segregated according to their category as described by the European Waste Catalogue (EWC). Designated waste storage areas will be created at the site construction compound, other suitable locations, for storage and segregation of wastes prior to transport for recovery/disposal at suitably licensed/permitted facilities. Suitably sized containers for each waste stream will be provided and will be supervised by the Waste Management Coordinator (WMC). The WMC will be responsible for the management of wastes during the entire project. The numbers and sizing of the containers will be agreed with the Waste Contractors/Hauliers in advance of the commencement of the works. Source segregation of the wastes generated will result in cost savings, in addition to providing an environmentally sound route for the management of all the Construction and Demolition Waste.

Under Waste Management (Collection Permit) Regulations 2007 a waste collection permit, for appropriate waste codes and destinations is required by the waste haulier, to transport the waste from one site to another. The contractor will ensure the movement of all wastes are carried out in compliance with relevant waste regulations.

Wastes will only be treated or disposed of at waste facilities to carry out a specific activity (i.e. chemical treatment, landfill, incineration etc.) for the specific waste types. Records of all waste movements and associated documentation will be held on site. It is planned that all waste activities at the site will comprise of:

- source,
- segregation,
- storage, and
- collection

In order to prevent/minimise the generation of wastes, the Contractor will ensure that raw materials are ordered so that the timing of the delivery/quantity delivered, and the storage is not conducive to the creation of unnecessary waste.

The Contractor will continuously seek to improve the waste management process on the site during all stages of the construction phase and maximise opportunities for reuse/recycling wherever they exist. In relation to waste packaging, the Contractor will seek to negotiate take back of as much packaging waste as possible at source, to ensure maximum recycling. The Construction Waste Management Plan will be included in the Construction Team weekly meetings. In addition, the plan will be communicated to the whole construction team regularly on site, including any updates form earlier revisions of the plan.

An overview of the methods to manage the primary waste streams is presented in the following sections:

Soils and Spoil

Any materials excavated on site in the course of the construction works (i.e. soil/peat stripping for track construction, turbine foundations/hardstanding areas) will be stored on site and re-used on site. As such, off-site disposal of this material is not expected.

Excavated materials from all construction activities will be temporarily stockpiled at hardstand locations during construction and subsequently reused on site for backfill/re-grading or re-vegetation.

It is anticipated that no waste soils, subsoils, bedrock will require disposal outside the overall boundary of the Brittas project site. All excavated material will be reused within the site.

Concrete

Concrete waste may potentially occur. There shall be no washout of trucks at site. Excess concrete will be returned to the supplier for reuse. Concrete trucks will be washed out off site at the source quarry. To reduce the volume of cementitious water, only concrete truck chutes will be washed down on site. The concrete trucks will wash down their chutes at a designated chute wash down area in the site compound. The wash down area will consist of a polythene lined bunded area with a capacity of about 20m³. This capacity will be sufficient to accommodate the chute wash down from the various anticipated concrete pours.

The environmental manager will monitor the pH of the water in the chute wash down bund(s) and can dose with CO2 or acidic water from the drains until the wash out water achieves neutrality before discharge.

Waste-Water Treatment / Effluent disposal

During the construction time period, the maximum wastewater production is estimated to be 3,000 litres per day. The project will include an enclosed wastewater management system at the temporary compounds capable of handling the demand during the construction phase when as many as 60 people may be working on site. A holding tank is proposed for wastewater management.

During the construction phase, staff facilities will be provided at the site compounds/other suitable locations. A cabin comprising a canteen, washroom and toilets will be provided. This cabin will contain three integrated holding tanks; one for clean water, one for wastewater and the third for sewage. The wastewater tank and sewage tank will be emptied as required by a vacuum tanker and removed from site to a licensed facility. These staff facilities will be removed at the end of the construction phase.

Hazardous and Other Waste

Table 8-2 lists some of the waste types that may be generated during the construction works. Although some waste types may be generated in locations other than the construction compounds (for example if absorbent filters are required at construction locations etc., such waste materials will be stored within the construction compounds only. Waste materials generated out with the construction compounds will be taken to the compounds on a daily basis.

Table 8-2: List of the waste types that may be generated during the construction works

Common Construction Wastes					
Concrete	Wood	Cables	Ducting	Metallic packaging/tins	Cardboard Packaging
Paper packaging	Plastic packaging	Wooden packaging	Office paper	Non-hazardous detergent	Plastic containers
Plastic bottles	Mixed waste	Septic tank sludge	Ferrous metal	Non-hazardous waste electrical(s)	
Hazardous Waste, as categorised by the European Waste Catalogue					
13 01 10: Used mineral hydraulic oil (non-chlorinated)			13 02 08: Other waste engine, gear or lube oil		
13 02 05: Waste engine, gear or lube oil (non-chlorinated)			13 02 08: Other waste engine, gear or lube oil		
16 01 07: Oil filters			20 01 23: Discarded equipment containing CFCs		

Common Construction Wastes	
16 06 01: Lead batteries	16 07 08: Oily waste from transport and storage tanks
16 10 01: Hazardous liquid wastes to be treated off-site	20 01 21: Fluorescent tubes and other mercury-containing waste
20 01 33: Hazardous batteries and accumulators that are collected separately	15 02 02: Absorbents, filter materials, wiping cloths, clothing contaminated by dangerous substances

If hazardous waste / contaminated ground is encountered, then appropriate handling, storage, transportation, and disposal will be carried out. Works to the area where the hazardous waste/contaminated ground is encountered will stop. The ground will be assessed by an Environmental Engineer. Prior to being removed from the site, the waste will undergo a comprehensive waste assessment and classification by suitably trained/qualified person(s), in accordance with the European Waste Catalogue hazardous waste list. If non-hazardous waste becomes contaminated with hazardous waste, the entire load will be considered hazardous. Hazardous wastes will be identified, removed and kept separate from other wastes in order to avoid cross contamination. Specific method statements detailing the necessary mitigation measures during the excavation/handling, transportation, and disposal of hazardous materials encountered at the site will be prepared as required if hazardous ground material is identified during the detailed site investigations and design process.

Oils, paints, adhesives and chemicals will be kept in a separate contained secured storage area. Lids will be kept on containers to avoid spillage/evaporation. Waste oils, adhesives etc will be handled, and disposed of appropriately. This will include separate bunded storage facilities and regular disposal via appropriate licensed waste disposal service providers and facilities. Every effort will be made at the site to avoid long-term storage of hazardous materials / fuels / oils / chemicals and wastes at the site.

Gravel/Stone/Asphalt/ Bituminous Materials

Asphalt/bitumen materials will not be stored on site. Road surface materials will be delivered to site as required, with excess returned to supplier.

Metals

Metal used during the construction phase will be segregated for reuse and recycling. One of primary sources of metal on sites is rebar. Waste of rebar will be reduced by ordering ‘made to measure’ from the source and detailed scheduling of all reinforced concrete structural elements. Any waste metals will be recycled where possible.

Timber

Timber waste will be stored separately. Any pallets will be returned to the supplier for reuse. Off-cuts/trimmings will be used in formwork where at all possible. A container for waste wood, covered where possible will be located at compound/other storage areas. This waste will be collected by the waste contractor and will be brought or sent to an appropriate wood recycling facility.

- Timber waste will be kept to a minimum through the re-use of shutters etc. throughout the job. At the end of the job, the majority of timber will be sent onto a new site for re-use. Any timber that cannot be re-used because of poor quality etc. will be recycled by Higgins waste.
- A 40 cubic metre open skip will be put in place to collect at the temporary site construction compound.
- Timber will be segregated into treated and untreated fractions.
- The following timber materials are considered as waste by timber recyclers - plywood, painted timber and pressure treated timber. This waste timber fraction will be disposed of in a mixed waste skip.
- This material will be collected by the contracted and licensed non-hazardous waste collectors and brought to a licensed waste recycling facility.

Blocks, Bricks, and Tiles

The careful stacked storage of these materials will significantly reduce the volumes of wastes occurring at the site. Every effort will be made to use broken blocks/off-cuts. Final quantities of these wastes generated will be stockpiled (possibly crushed/screened),and reused at the site as sub-base materials for road/other suitable hardstanding locations.

Packaging/Plastic

Double handling will be avoided by segregating packaging wastes immediately after un-wrapping. Waste packaging will be segregated and in separate containers, at storage area for collection by the waste contractor for disposal to licensed facility.

Mixed Waste

- This waste stream will arise from waste packaging of electrical and engineering components.
- A 40 cubic metre open skip will be put in place to collect mixed waste within a designated waste area at the temporary site construction compound.
- This skip will accept plastic packaging, plastic piping, cardboard and timber waste.
- No green waste or food waste will be disposed of in this skip. The purpose of this arrangement is to stop birds scattering food items across the site and therefore prevent vermin infestation.
- This material will be collected by contracted and licensed non-hazardous waste collectors.

Mixed Waste/Canteen Waste

Staff canteens have the potential to generate food waste and packaging waste. Designated receptacles will be provided at the canteen(s) to allow for segregation, and storage of individual waste streams. These will include receptacles for food waste, dry recyclables, and residual bin. All offices and canteens will be equipped with black plastic refuse bags and wheelie bins for the purpose of collecting and delivering this waste stream to the compactor. This material will be collected by the contracted waste management company/transported to licensed facility.

Dry recyclable collection from welfare facilities

- All offices and canteens will be equipped with clear plastic bags and wheelie bins for the purpose of collecting dry recyclables. This will be strictly managed to prevent any food waste entering the dry recyclable stream.
- Recycling wheelie bins will be located at all welfare facilities and offices associated with the project.
- This material will be collected by the contracted and licensed non-hazardous waste collectors.

Other waste

Other wastes which may be generated may include residual non-recyclable waste such as paper, cloth, some cardboards, or plastics. Others may include fibreglass and geotextiles, and polystyrene. These types of materials will be stored in a dedicated container at the site compound. All residual wastes will be dispatched to suitably licensed facility for disposal. Other construction and demolition waste will be collected and disposed of appropriately.

Management of General Waste

- Access to materials will be controlled. A dedicated storage area will be provided in the site construction compound for building materials such as cables, plastic piling for the settlement ponds, geotextile matting, blocks, tools and equipment, fence posts and wire, booms, pipes etc.
- Access to stored materials will be restricted; the site compound will be securely fenced from the outset and will be locked when there are no site personnel present.
- To contain and manage construction phase waste, multiple skips will be provided at the temporary site construction compounds; one for recyclable waste and others for various construction waste. These skips will be emptied when required by a licensed waste management company. Waste oil and waste oil drums will be collected and stored in containers and on a bunded tray within the storage container.
- At the end of each phase, the completed works areas will be tidied of any unused material or waste; this material will be brought to the site compound for storage and reuse or placed in the appropriate skip for disposal.

Assignment of Responsibilities

A Waste Management Coordinator (WMC) will be assigned at the site, to have an overall responsibility for the management of waste that may be generated at the site. As part of the record keeping procedures, the WMC will keep records of all waste being removed from site. This information will be recorded in a standard format. The effectiveness and accuracy of the documentation will be monitored on a regular basis. The Waste Management Plan will be updated on a regular basis where required and made available as required (i.e. sub-contractors). The WMC will be qualitied, experienced and informed about the legal requirements of all aspects of materials wastes management, and the site personnel will be in a position to:

- Distinguish reusable materials from materials suitable for recycling
- Ensure maximum segregation at source
- Cooperate with Site Management, on locations for stockpiling reusable materials
- Separate materials for recovery
- Identify and liaise with operators for recovery outlets.

The WMC will be responsible for educating site personnel, sub-contractors, and suppliers, about the best alternatives to conventional waste disposal/Waste Management Regime at the Project site. Training will also be given to site personnel in materials management on site. The WMC will continually identify waste minimisation actions on site, and these will be updated in the plan.

Training

Copies of the Waste Management Plan will be available to all site personnel. All site personnel and sub-contractors will be instructed about the objectives of the Waste Management Plan for the site and informed of the responsibilities which fall upon them as a consequence of its provisions. This will be carried out during the site induction process for all site personnel. Where source segregation and materials reuse techniques apply, each member of the construction team will be given instructions on how to comply with the Waste Management Plan for the site. Site notices will be designed to reinforce the key messages of the waste management plan and will be displayed prominently for the benefit for all on site personnel.

Waste Records

All details of wastes (arising/generated/movement, etc) will be recorded during the project. Each consignment of waste removed from the site will be documented in the form of a waste management movement record form which will ensure full traceability of the material to its final destination. All records will be retained at a designated location at the site office/construction compound and made available for auditing of the waste management plan.

Brittas Waste Management Plan Summary

Wastes will inevitably be generated during the construction phase of the project. A certain amount of surplus soils/materials will be generated. These materials will be reused as backfill/landscaping around within the site boundaries or brought to a licensed waste facility.

Other than spoils from excavations, waste arising during the construction phase will be minimised by site management, by timing the ordering of materials required at the site, in a manner which reduces the likelihood of over ordering or damaging during storage. Furthermore, several of the traditional waste streams arising will be re-used at the site where appropriate. Waste will be segregated and stored on site at designated locations/in containers prior to transport to appropriate licensed facilities.

A Waste Management Coordinator will be appointed to ensure the Waste Management Plan is followed. Training will be given to all site personnel, so that they are aware of the Waste Management Regime at the site, and know their responsibilities.

Records will be kept to trace the inputs and outputs of the construction works at the site. These records will be made available to relevant authorities, should it be required.

The design and implementation of the Waste Management Plan will provide for the optimum planning/management and handling of wastes generated during the construction phase of the Brittas Wind Farm Development.

References

Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG, July 2006).

Design Out Waste: A design team guide to waste reduction in construction and demolition projects (EPA, 2015)

A waste Action Plan for a Circular Economy: Ireland's National Waste Policy 2020-2025. Available at: https://www.gov.ie/pdf/?file=https://assets.gov.ie/86647/dcf554a4-0fb7-4d9c-9714-0b1fbe7dbc1a.pdf#page=null

EMP 7: Construction Traffic Management

Purpose:

To provide a summary description of measures for the management of all traffic, including construction traffic and oversized loads, for the minimization of disturbance and nuisance to the local community.

This EMP should be used in conjunction with the stand-alone Traffic Management Plan submitted as part of the planning application (see Appendix 16A of the EIAR).

Scope:

All Site Construction Areas, approach roads to the Wind farm site and internal road traffic, as well as the grid connection route and the turbine delivery route.

Procedure:

The following measures will be incorporated to ensure a safe and regulated traffic management system is enforced during the construction phase:

- A dedicated traffic management coordinator will be appointed for the duration of the project construction and this person will be the main point of contact for all matters relating to traffic management on the project.
- Final TMP will clearly identify roads that will be used to access the project site and roads that are not to be used. Turbine components and quarry material deliveries shall use the N62 and the western 1.6km section of the L-8017 roads as the primary haul route.
- Prior to the grid route construction works commencing, the area where excavations are planned will be surveyed and all existing services will be identified. All relevant bodies i.e., ESB Networks, EirGrid, Uisce Éireann, Gas Networks Ireland, Eir, and Tipperary County Council . will be contacted and drawings for all existing services sought. A road opening licence will be obtained where required from the council for the relevant road sections. All plant operators and general operatives will be inducted and informed as to the location of any services;
- Prior to works commencing a dilapidation survey will be carried out photographing and noting any existing damage or defects to structures or road surfaces. A copy of this survey will be submitted to the council prior to works commencing;
- Pre-construction and post-construction surveys will be carried out to ensure the structural integrity of the proposed haulage route road network. Repairs will be carried out on the public roads, as necessary, during the construction phase, to ensure that the condition does not deteriorate below a standard that could affect the safe use of the road, as required;
- Haulage traffic will share the same route with local residents, and other road users, which would present risks. Advance warning will be given to the local residents for specific times when large volumes of HGV traffic may occur and appropriate signage will be placed at the approach to the site or where temporary works are planned;
- All signage relating to the proposed construction traffic routes for construction traffic will be agreed with the planning authority;
- A delivery programme will avoid peak local traffic periods;

- Ensure a strict protocol for HGV drivers to follow the designated haulage route and timing restrictions are implemented and monitored by the contractor with the suppliers and deliveries;
- Adequate parking will be provided on site for both employees and visitors at the temporary compounds during the construction and decommissioning phases and at the EirGrid substation and IPP substation compounds for the operational phase to ensure parking will not occur on the public road;
- The construction phase of the wind farm will require the delivery of turbine components, concrete, steel and aggregate to the site via the public road network. The key timing periods when use of the public road network will be at its peak for residents is between 08.15 and 09:15. It is proposed to allow routine deliveries such as aggregate into the site outside of peak hours to minimise any impact on surrounding network peak traffic. The initial early morning delivery trucks will exit the wind farm site empty with the run of traffic, but they will be delayed from delivering again until the peak hour has fully subsided as instructed and coordinated by the contractor once appointed.
- To mitigate the impact of the delivery of large turbine components, the deliveries will be undertaken under garda and traffic management escort during off-peak (i.e. night-time) hours. The arrangement of the appropriate abnormal load licenses will be obtained by the appointed contractor. The appointed contractor will liaise with the relevant road's authorities and An Garda Síochána on the delivery schedule for the oversized loads.
- A road sweeping vehicle will be provided as required to remove any mud that may be deposited on the local road in the vicinity of the site access.
- A proprietary construction vehicle wheel wash facility will be installed on the exit of the wind farm site as detailed within the Traffic Management Plan (TMP) section 4.8.1.5 attached in Appendix 16.A of the EIAR. All vehicles entering and exiting the site will be required to use this facility in order to avoid creating dirt on local roads.
- All roads will be reinstated expeditiously on completion of the construction works. Roads will be reinstated to their pre works condition or better and to the satisfaction of the roads authority.
- All construction workers will receive a comprehensive site induction which will include a section on traffic management and clear guidance on the routes to be used/ not used to access the site.
- 24-hour emergency contact phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for the grid connection) and the site entrance for the wind farm site.

General Measures

The Traffic Management Plan (see Appendix 16A) details the proposed general traffic management and control procedures, including:

- Excavation, backfilling and reinstatement of trenches in roads will be completed within the shortest possible time frame.

- The planning of road closures and traffic diversions will ensure that reinstatement of the trenches, joint bays, launch and reception pits are completed, and all temporary traffic measures (lane and road closures/diversions) are removed in progressive stages.

Access for Residents and Commercial /Business properties (along the proposed Grid Route)

- The appointed contractor shall make provision for safe access at all times to private residences in proximity to the construction works.
- Where it is required that trenches in the public road are left open overnight in proximity to a residence, steel plates or stone will be used to bridge the trench and allow access to residential properties. This will be done in co-operation / communication with local residents in the area.
- The appointed contractor will inform local residents of the programme of works in their area and local access will be catered for where possible.

Pedestrian Safety

- The appointed contractor shall ensure that throughout the course of the works its operations do not put pedestrians at risk.
- Where the construction work necessitates the restriction, partial closure or closure of a pedestrian walkway where they may exist, the appointed contractor shall provide adequate safety barriers, signposts, lighting and temporary surfacing (if applicable) to ensure safe passage for pedestrians.
- With respect to pedestrians, the appointed contractor shall refer to and observe the requirements of the updated version of the Traffic Signs Manual 2019 titled Temporary Traffic Measures and Signs for Roadworks, or any guidance that supersedes this.

Responsibility

Project Manager

Construction Manager

Construction personnel

Sub-contractors as appropriate

Delivery personnel

EMP 8: Construction Dust Emissions, and Air Quality Management

Purpose

To describe the measures for the management of nuisance impacts on air quality from construction generated dust.

Procedure

The dust minimisation plan described below has been formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within several hundred metres of the construction area.

Ongoing good practice measure for the management of dust on site is to be implemented as set out below. Ongoing visual monitoring of dust will be carried out by Site Management.

Construction phase generated dust will be minimised by the following measures:

- Water will be used as a dust suppressant where required e.g. a water bowser to spray access tracks and crane hardstanding areas during any extended dry periods when fugitive dust emissions could potentially arise;
- Public roads will be inspected regularly for cleanliness and cleaned as necessary;
- All loads entering and leaving the site will be covered during dry periods, to protect from dust;
- Vehicle speeds will be controlled when passing over access tracks and crane hardstanding areas within the site;
- Wheel wash facilities will be implemented at the site entrance from the public road to facilitate removal of any material collected by vehicles entering or leaving the site and preventing its deposition on public roads;
- Site stockpiling of materials will be designed and laid out to minimise exposure to wind;
- Daily site inspections will take place during dry periods to examine dust measures and their effectiveness.

Construction traffic emissions will be reduced using the following measures that will be implemented in full:

- Ensure regular maintenance of plant and equipment. Carry out periodic technical inspection of vehicles to ensure they perform most efficiently;
- Implementation of the Traffic Management Plan (Volume III, Appendix 16A) to minimise congestion;
- All site vehicles and machinery will be switched off when not in use, and no idling of engines will be permitted;

Some of the aggregate materials for the construction of the proposed project will be obtained from an on-site borrow pit. This will reduce the number of delivery vehicles to site, thereby reducing emissions associated with vehicle movements.

The dust minimisation plan will be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.

Responsibility

- The Environmental Manager is responsible for reviewing the site dust minimisation measures.
- The Construction Manager is responsible for:
  - Organising dust suppression through use of bowsers and cleaners
  - Keep site fencing, barriers and scaffolding clean using wet methods
  - Remove materials that have the potential to produce dust from site as soon as possible
  - Cover seed of fence stockpiles to prevent wind whipping
  - Ensure all vehicles switch off their engines when stationary – no idling vehicles
  - Use enclosed chutes and covered skips
- The Project Manager is responsible for:
  - Recording all dust and air quality complaints, identify causes and take appropriate measures to reduce emissions in a timely manner
  - Make a compliant log available to Tipperary County Council when requested
  - Record any exceptional incidents that cause dust or air emissions

References

Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (Consultation Draft, National Roads Authority, October 2006).

Control of Dust from Construction and Demolition Activities (BRE, 2003).

EMP 9: Ecological Management Plan for the Protection of Habitats and Fauna

Purpose

To describe measures for the management and protection of habitats and fauna on the site

Procedure

- Ensuring implementation of ecological protection measures outlined below
- Advising on re-vegetation onsite
- Monitoring of success of re-vegetation

Ecological Protection Measures

Protection of watercourses and designated (Natura) sites and Qualifying Interests

- Proposed mitigation measures required to prevent adverse effects on the downstream Lower River Suir SAC during construction are outlined in the Natura Impact Statement (NIS) for the proposed development - see APEM (2024). The mitigation measures included in the NIS relate to protection of water quality flowing into the Lower River Suir SAC. These mitigation measures are considered sufficient to also avoid impacts on other aquatic ecology Key Ecological Receptors (KERs) including salmonids. No further measures are deemed to be required to avoid impacts on watercourses. The NIS mitigation measures are also included in this section for clarity:
- Both the GCR and TDR have been designed to use the existing road network therefore using existing infrastructure and avoiding sensitive habitat types and avoiding unnecessary impacts on watercourses.
- To avoid in-stream works, HDD will be used at two locations on the wind farm site and two locations along the GCR.
- Turbine locations and associated infrastructure will be placed at a minimum set-back distance of 50m from the EPA mapped watercourses. Any works taking place in the vicinity of unmapped watercourses or land drains will be undertaken in accordance with the mitigation measures set out in section 4.1.8 and 4.1.9 of the CEMP. The buffer zone will avoid physical damage to watercourses and associated release of sediment; and avoid the entry of suspended sediment from earthworks into watercourses.
- Seven water crossing will be required (see Chapter 9 Figure 9-23), including five crossings at the Wind Farm site for the internal underground cables and access tracks. The cable river crossings will involve Horizontal Directional Drilling (HDD) under the River Suir (see Chapter 2 Figure 2-25 – 2-27). The cable river crossings will occur at:
    1. 52.715389, -7.8064687 (underground cable crossing)
    2. 52.713628, -7.8051775 (underground cable crossing))
    3. 52.715096, -7.8025279 (access track crossing)
    4. 52.721177, -7.7993980 (underground cable and access track crossing)
    5. 52.726091, -7.7981416 (underground cable and access track crossing)
- Two additional stream crossings will be needed for the grid connection route. This will involve Horizontal Directional Drilling (HDD) under the river/stream courses. The watercourse crossing

on L4120-18 (Rossestown Road) is a single span masonry arch span bridge. The 110kV cable will cross the bridge in a flatbed formation or alternatively a horizontal directional drill (HDD) methodology will be used. Descriptions of the methodologies proposed for crossing this bridge are given in subsequent sections of this report. No instream works will be required. The watercourse crossing on L8015-0 (Furze Road) is a single span masonry arch span bridge. The 110kV cable will cross the bridge in a flatbed formation or alternatively a horizontal directional drill (HDD) methodology will be used. Descriptions of the methodologies proposed crossing this bridge are given in subsequent sections of this report. No instream works will be required. Overall, in-stream works are not required along the proposed grid connection route.

- Flood attenuation will be provided to limit the flowrate into the settlement ponds during high intensity storm events so that the settlement ponds do not become overloaded. This will also attenuate the flow to the downstream watercourses. The volume of water requiring attenuation relates to direct precipitation on the tracks and other infrastructure footprint only. Temporary storage will be provided within the drainage channels by creating stone dams within them at regular intervals. The spacing of the dams is typically 100 metres but depends on the channel slope, with steeper channels requiring shorter intervals. The dams, which are constructed with small sized aggregate held in place by large aggregate, also reduce the flow rate through the drainage system and are an effective means of providing flow control. Silt fences will also provide storage and flow control.
- Working near watercourses during or after intense or prolonged rainfall events will be avoided and work will cease entirely near watercourses when it is evident that there is a risk that pollution could occur. All construction method statements will be developed in consultation with Inland Fisheries Ireland and in accordance with the details in the CEMP accompanying this application. The selection criteria and other details of the proposed crossings can be found in Chapter 03 Civil Engineering. These crossings will be subject to a Section 50 application to ensure flood risk upstream and downstream of the crossing is not increased.
- Where possible the layout of the wind farm has utilised already existing infrastructure such as access tracks, minimising the number of crossings required across the water course.
- To avoid in-stream works, HDD will be used at two locations on the Site and two locations along the GCR, for electrical cable crossings.
- The main contractor appointed for the project will be required to designate a member of staff, or engage a specific person, with experience of environmental management and monitoring of construction at wind farm sites, referred to hereafter as the “Environmental Manager” (EM). The EM will assume responsibility for overseeing the implementation of the environmental protective measures and mitigation measures set out in this document and in the EIAR. The EM will be responsible for employing good working practice during all phases of the project and for providing a briefing on environmental protection measures and ecological sensitivities of the Site to all site personnel in advance of commencement of works.
- An Ecological Clerk of Works (ECoW) will be appointed to oversee all aspects of work. The ECoW will be a suitably experienced ecologist with knowledge and practical experience of wind farm development projects. The ECoW will deliver Toolbox Talks to contractors and will undertake audits of the site offering guidance and due diligence and ensure that ecological mitigation measures set out in all documents are implemented, working and reviewed.
- The names and contact details of the individuals with responsibility for implementation and supervision of mitigation measures during all phases of the works will be clearly identified and

displayed on notice boards at the site compounds as well as set out in documents such as the finalised CEMP and method statements.

- The Construction and Environmental Management Plan (CEMP) will be updated in accordance with any planning conditions during the preconstruction and construction phases and implemented on site.
- Good work practices such as those set out in Guidelines on Protection of Fisheries During Construction Works In and Adjacent to Waters (IFI, 2016), Environmental Good Practice on Site Guide (CIRIA, 2015) will be employed at all times on site during the construction of the proposed project. The CEMP submitted as part of the documentation supporting the planning application will be finalised by the appointed contractor and will be treated as a live document to be updated as required throughout the lifetime of the proposed project.
- All personnel involved with the proposed project will receive an on-site induction relating to operations and the environmentally sensitive nature of the Lower River Suir SAC and to re-emphasize the precautions that are required as well as the measures to be implemented.
- All staff and subcontractors have the responsibility to:
    - Work to agreed plans, methods and procedures to eliminate and minimise environmental impacts;
    - Attend Toolbox talks (with written confirmation of attendance) which explain the importance of avoiding emissions on-site, including pollutants, sediments and noise, and how to respond in the event of an incident to avoid or limit environmental impact;
    - Respond in the event of an incident to avoid or limit environmental impact;
    - Report all incidents immediately to their site environmental manager;
    - Monitor the workplace for potential environmental risks and alert the immediate line manager if any are observed; and
    - Co-operate as required, with site inspections.
- A Surface Water Management Plan (SWMP) has been developed and includes all mitigation measures required to protect surface water.
- A felling licence will be applied for, which will set out how to deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils. All associated conditions must be complied with within this licence.
- Only qualified persons shall operate machinery or equipment, with machinery and equipment checked on a regular basis to ensure they are working properly (no oil/fuel leaks etc.).
- Only qualified persons shall operate machinery or equipment, with machinery and equipment checked on a regular basis to ensure they are working properly (no oil/fuel leaks etc.).
- No refuelling shall take place within 50m of any watercourse. Fuel will be stored in doubly-bunded bowsers or in bunded areas at the site compound;
- Plant nappies and spill kits will be readily available on plant equipment or when working with fuel operated heavy tools;
- To mitigate against sources of contamination, refuelling of plant and vehicles will only take place within designated areas of the site compound or in other areas specifically designated for this purpose;
- Only emergency breakdown maintenance will be carried out on site;

- Appropriate containment facilities will be provided to ensure that any spills from breakdown maintenance vehicles are contained and removed off site;
- There will be no discharge of any priority or hazardous substances to groundwater and surface waters; and
- A suitable permanent fuel and oil interceptor will be installed to deal with all substation surface water drainage. Temporary petrol and oil interceptors will be installed at the site compound for plant repairs/storage of fuel/temporary generator installation.
- For deliveries and dispensing activities, it will be ensured that:
    - Site specific procedures are in place for bulk deliveries;
    - Delivery points and vehicle routes are clearly marked;
    - Emergency procedures are displayed and a suitably sized spill kit is available at all delivery points, and staff are trained in these procedures and the use of spill kits.
- Potential leaks from delivery vehicles will be reduced by visually inspecting all delivery vehicles for major leaks. Contractors supplying concrete and crushed stone to the site will be contractually required to supply their products using roadworthy vehicles.
- Vehicles and plant will not park near or over drains and will be washed in accordance with the commitments set out above.
- Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits; the nearby dirty water drain outlet will be blocked with an oil absorbent boom until the fuel/oil spill has been cleaned up and all oil and any contaminated material removed from the area. This contaminated material will be properly disposed of in a licensed facility.
- The Environmental Manager will be immediately informed of the oil leak/spill and will assess the cause and the management of the clean-up of the leak or spill. They will inspect nearby drains for the presence of oil and initiate the clean-up if necessary.
- Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery.
- Correct action in the event of a leak or spill will be facilitated by training all vehicle/machinery operators in the use of the spill kits and the correct containment and cleaning up of oil spills or leaks. This training will be provided by the Environmental Manager at site induction.
- In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery.
- In the case of an environmental incident or spillage, the following procedure is to be followed:

    - Prepare and be in readiness to implement at all times an Emergency Response Plan (see Appendix 2B CEMP: EMP 11).
    - Notifying the relevant statutory authority of environmental incidents, and
    - Carrying out an investigation and producing a report regarding environmental incidents. The report of the incident and details of remedial actions taken should be made available to the relevant authority, the Design Engineer and the Construction Manager.
    - The Site Environmental Manager shall notify the Client of any complaints or environmental incidents within 24 hours of occurrence. Where significant incidents

occur requiring the involvement of statutory authorities or emergency services or where any pollution events occur, the Client shall be notified within 1 hour.

- No in-stream crossing of rivers or streams by machinery will be permitted, all machinery must stay within the designated routes.
- The proposed surface water management system, including existing and proposed infrastructure, will be inspected prior to commencement of works and confirmed to be of sufficient capacity to prevent any potential emissions to water entering the watercourses on Site. Drainage measures will be implemented to attenuate runoff and guard against soil erosion / soil compaction, safeguarding local water quality.
- No in-stream works will be undertaken, and no works shall take place during periods of high rainfall in order to reduce risk of runoff into watercourses. Suitable weather windows (dry, no weather warnings or heavy rainfall expected) will be chosen when undertaking the HDD at watercourse crossings.
- There will be no concrete batching on the Site and a dedicated, bunded area will be created to cater for concrete wash-out. Any excess construction material shall be disposed of off-site in a fully licensed landfill.
- A wheel wash facility will be set up on Site for biosecurity measure to reduce the likelihood of spreading IAS. All vehicles entering / exiting the Site will be required to use the wheel wash facility. Once machinery arrives on Site, it will be checked for any vegetative material such as roots or seeds that could contain IAS. If found, this will be removed and appropriately disposed of before using the machinery on Site.
- Triple layer silt fencing will be used in the areas of highest risk of surface water run-off, and single- or double-layer silt fencing at frequent intervals along pathways towards aquatic zones. It will be the responsibility of the EM and / or the ECoW to determine which locations require triple, double- or single-layer silt fences. Silt fencing will be removed only when bare soil is revegetated, and sediment movement is no longer a risk. This will act to prevent entry to the existing drainage network of sand and gravel-sized sediment in surface water runoff. Inspection and maintenance of these structures during construction phase is critical to ensure they are fit for purpose and as such inspection will be carried out on a regular basis. They will remain in place throughout the entire construction phase. All surface water run-off within the Site will be directed into a planned drainage system. A silt fence will be erected around any spoil heaps as part of surface water management for the Site.
- The silt curtain will be installed before any works commence and will be checked daily by the EM or ECoW.
- Depending on the timing of the proposed works, different life stages of migratory fish species may be impacted by factors such as noise and disturbance associated with the installation of hardstands, or by increased sediment ingress into the watercourse during works involving excavation. Spawning and egg incubation for salmon occurs from October to February and for lamprey species from March to May, therefore, works required for the watercourse crossing (and any other works required within 50m of watercourse), , will be carried out over summer and under supervision of the EM or EcOW, bearing in mind that juveniles of these species may be present at any time of year.
- While no plant species listed under the Third Schedule of the European Communities (Birds and Habitats) Regulations 2011 as ‘non-native species subject to restrictions under Regulations 49’ were recorded on the Site, there is potential for IAS to be introduced to the Site. The EM and ECoW will be responsible for monitoring potential introduction of IAS to the Site. If IAS are identified, the areas of IAS will be screened (fenced) off, including an appropriate buffer and

no personnel or machinery will enter this area. Should the IAS be within or adjacent to the proposed construction areas or corridors, they will be managed and removed by a contractor with appropriate experience in dealing with IAS and disposed of appropriately. This will prevent machinery hitting and spreading the IAS. All personnel and machinery will follow biosecurity measures to prevent the spread of IAS.

- The 'check, clean dry' method from the Northern Ireland Environment Agency[2] and the 'Inspect, Remove, Dispose, Clean and Disinfect' method from the IFI[3] will be employed as general biosecurity measures on site for any works required within the 50m watercourse buffer, including any watercourse crossings and HDD. Any machinery, tools or equipment required within this buffer will also use the above methods post-works to avoid any contamination to other locations. This will also provide appropriate protection with regards to the spread of crayfish plague which is known to be present within the catchment.
- Depending on the timing of the proposed works, different life stages of migratory fish species may be impacted by factors such as noise and disturbance associated with the installation of hardstands, or by increased sediment ingress into the watercourse during works involving excavation. Spawning and egg incubation for salmon occurs from October to February and for lamprey species from March to May, so works within 50m of watercourses, including the watercourse crossings required, will be carried out over summer if possible, bearing in mind that juveniles of these species may be present at any time of year.
- To reduce noise and vibration impacts, as outlined in Network Rail (2019), the following measures will be employed:
  - Road vehicles should not wait or queue up with engines running on the site
  - Noise from reversing alarms should be controlled and limited through adoption of the following:
    - Site layout designed to limit and where reasonably practicable, avoid the need for reversing vehicles by installing one-way systems or turning circles.
    - The contractor shall ensure that drivers are familiar with the site layout
    - Reversing alarms should be set to the minimum output noise level required for healthand safety compliance
  - Equipment, including vehicles, should be shut down when not in use
  - Engine compartments should be closed when equipment is not in use
  - Plant and equipment should be examined for defects daily prior to the start of works and under no circumstances is defective plant to be used
  - Generators, compressors and pumps etc. required for 24-hour operation should be super silenced and screened/enclosed as appropriate modern, silenced and well-maintained plant fitted with efficient attenuators, mufflers or acoustic covers, where appropriate, should be used
  - The appointed EM will perform weekly checks on Site to ensure that noise and vibration is

[2] https://invasivespeciesni.co.uk/what-can-i-do/check-clean-dry/check-clean-dry-resources/ (last accessed 10/09/2024)

[3] https://www.fisheriesireland.ie/what-we-do/education-and-outreach/safeguarding-and-governance/biosecurity#:~:text=Biosecurity%20is%20the%20prevention%20of,boats%2C%20protective%20gear%20and%20clothing. (last accessed 10/09/2024)

monitored on a regular basis and if noise or vibration is found to be above acceptable levels, this will be remedied immediately

- Artificial lighting will be kept to a minimum as required for security. Light spill will be minimised near any watercourses by employing lighting restrictions. Consideration should be given to restrictions during dark hours from 9pm to 5am such as reducing light levels, turning off lights, or using motion sensor lighting only near access roads beside watercourses. White LED lighting has been shown to have greater impacts on wildlife and so alternative warmer colour wavelengths will be used, between 2700 and 3000 Kelvin (Institute of Lighting Professionals 2018). Lighting installed near watercourses should also be directional, i.e. pointing towards the access road, with no lighting directed along the surface of the watercourse.
- While no plant species listed under the Third Schedule of the European Communities (Birds and Habitats) Regulations 2011 as 'non-native species subject to restrictions under Regulations 49' were recorded on the Site, there is potential for IAS to be introduced to the Site. The EM and ECoW will be responsible for monitoring potential introduction of IAS to the Site. If IAS are identified, the areas of IAS will be screened (fenced) off, including an appropriate buffer and no personnel or machinery will enter this area. Should the IAS be within or adjacent to the proposed construction areas or corridors, they will be managed and removed by a contractor with appropriate experience in dealing with IAS and disposed of appropriately. This will prevent machinery hitting and spreading the IAS. All personnel and machinery will follow biosecurity measures to prevent the spread of IAS.
- The 'check, clean dry' method from the Northern Ireland Environment Agency[4] and the 'Inspect, Remove, Dispose, Clean and Disinfect' method from the IFI[5] will be employed as general biosecurity measures on site for works required within the 50m watercourse buffer, at the proposed watercourse crossings. Any machinery, tools or equipment required within this buffer will also use the above methods post-works to avoid any contamination to other locations. This will also provide appropriate protection with regards to the spread of crayfish plague which is known within the catchment.
- All works will follow the best practice guidance outlined in the following documents:
  TII/NRA 'Guidelines for the crossing of Watercourses During Construction of National Road Schemes (2008); and,
- Inland Fisheries Ireland requirements publication" Guidelines on protection of fisheries during construction works in and adjacent to waters" (2016). The NRA publication details design and construction requirements for watercourses which interact with national road schemes which is also relevant to these works.
- In addition to this guidance, there is also a requirement to consult and comply with the relevant statutory authority e.g. Inland Fisheries Ireland (IFI) for works within and adjacent to watercourses. Prior to the commencement of works, IFI will be consulted on proposed

[4] https://invasivespeciesni.co.uk/what-can-i-do/check-clean-dry/check-clean-dry-resources/ (last accessed 10/09/2024)

[5] https://www.fisheriesireland.ie/what-we-do/education-and-outreach/safeguarding-and-governance/biosecurity#:~:text=Biosecurity%20is%20the%20prevention%20of,boats%2C%20protective%20gear%20and%20clothing. (last accessed 10/09/2024)

construction methods and mitigation measures to be employed for all works within 50 m of watercourses, including the watercourse crossings. This consultation will ensure that IFI are included going forward and any additional measures required or suggested as a result of this consultation will be employed. Additional mitigation may not be recommended for the protection of qualifying interests of Natura 2000 sites but may relate more generally to aquatic species outside of these protections.

- The environmental measures set out above are proven to work and provide certainty that the integrity of the Lower River Suir SAC will not be affected by the proposed works. Each mitigation measure has been proposed to reduce the significance of potential impacts identified which could affect QIs of the Lower River Suir SAC. The mitigation measures proposed cover the protection of surface water, the reduction of disturbance impacts, and protection of biosecurity, i.e. reducing the potential for significant effects with respect to IAS.
- These measures will ensure that suspended solids or other pollutants will not be discharged to surface waters during construction, operation and decommissioning and that there will be no effect on the water quality downstream of the Site. The measures proposed for disturbance ensure that noise, vibration and human disturbance are reduced insofar as no significant impacts relating to disturbance will negatively affect QIs of the SAC. Finally, measures proposed to ensure IAS are not introduced or spread are considered to be sufficient to ensure that no significant impacts arise with respect to IAS.

Protection of habitats

Within the proposed development, there are several areas supporting important habitats. Annex I habitat *Molinia* meadows, poor fen and flush habitat and marsh habitats were identified.

These sensitive habitats were identified in site scope surveys and the original site layout was re-designed to avoid these areas. This involved altering the layout of the substation in the proposed substation fields. One proposed turbine was also re-located away from the southern mature woodland in which it was first placed. These areas of the southern woodlands will be retained and additional post-construction monitoring for bats will be undertaken at these locations to determine if the residual habitat feature draws bats towards the rotor swept area.

The proposed development layout was designed to utilise existing tracks, and the infrastructural footprint largely targets lower value habitats, including improved grassland. Areas where felling is required to implement bat feature buffers and the lengths of treelines and hedgerows that will be removed has been keep to a minimum. Likewise, the number of locations where access tracks are required to punch through hedgerows/treelines has been limited and the areas removed will be kept to a minimum.

To avoid widespread disturbance to habitats, access within the construction site will be restricted to the footprint of the proposed works corridor. Access routes will be agreed on site and no access between different parts of the infrastructure will be permitted, except via the proposed works corridor. An Ecological Clerk of Works (ECoW) will be employed from the commencement to completion of construction works and will be tasked with monitoring work practices, which will ensure that construction activities are tightly restricted to within the works corridor.

To avoid construction damage from excavation or compaction to the roots of plants in hedgerows, treelines and woodlands adjacent to the proposed infrastructure that will be retained post-construction, appropriate root protection area (RPAs) will be implemented, in accordance with BS 5837:2012 *Trees in relation to design, demolition and construction -Recommendations*, as outlined in National Roads Authority - NRA (2006)[6]. To this effect an appropriately qualified arboriculturist will undertake a pre-construction assessment to ensure impacts to vegetation are avoided.

In addition, it is noted that impacts to roots will be avoided at most locations, as construction of wind farm access tracks will largely target upgrading of existing farm and forestry tracks. Where new sections of track are being laid these are in improved grassland where soil adjacent to hedgerows/treelines has been subject to recurring disturbance and therefore roots will be less sensitive. Root protection buffers will also be in place.

Protection of other taxa

It is considered that mitigation measures to protect water quality and habitats will be sufficient to avoid potential impacts on protected Marsh fritillary that may forage on the site.

Protection of terrestrial mammals

Potential impacts on aquatic mammals, specifically for otter which are a qualifying interests (QI) of the Lower River Suir SAC, is covered in the NIS (APEM, 2024) and outlined above in mitigation for watercourses. Mitigation was also included in the NIS to avoid disturbance to otters on the site, as follows:

- Before works commence, the Site and up to the 150 m buffer of the works areas will be checked for evidence of otter by a suitably experienced ecologist. The ecologist will have demonstrated professional experience in managing large-scale construction works affecting ecological receptors identified within the EIAR. Should an otter holt be recorded, no works will be undertaken within 150 m of the identified holt until a suitably experienced and qualified ecologist has advised on Site specific measures.
- The following measures will be implemented to minimise as far as possible the disturbance to aquatic species:
    - Methods to reduce noise and vibration[7];
        - Soft-start techniques will be employed during working hours; and
        - Machinery will not be used early in the day or late in the day (i.e., they will not start until at least one hour after sunrise and will cease not later than one hour prior to sunset). Lamprey species typically migrate in darkness, so this restriction will benefit them particularly. In addition to the above, to further minimise the potential for disturbance to be caused.

7)

- To reduce noise and vibration impacts, as outlined in Network Rail (2019)[8] the following measures will be employed:
  - Road vehicles will not wait or queue up with engines running on the site
  - Noise from reversing alarms will be controlled and limited through adoption of the following:
  - Site layout designed to limit and where reasonably practicable, avoid the need for reversing vehicles by installing one-way systems or turning circles.
  - The contractor shall ensure that drivers are familiar with the site layout
  - Reversing alarms should be set to the minimum output noise level required for health and safety compliance
- Equipment, including vehicles, will be shut down when not in use
- Engine compartments will be closed when equipment is not in use
- Plant and equipment will be examined for defects daily prior to the start of works and under no circumstances is defective plant to be used
- Generators, compressors and pumps etc. required for 24-hour operation will be super silenced and screened/enclosed as appropriate
- Modern, silenced and well-maintained plant fitted with efficient attenuators, mufflers or acoustic covers, where appropriate, will be used
  - The appointed EM will perform weekly checks on Site to ensure that noise and vibration is monitored on a regular basis and if noise or vibration is found to be above acceptable levels, this will be remedied immediately

The proposed layout for site infrastructure has been designed to minimise impact on features which are important for mammals such as hedgerows and drains. As much old growth woodland and treelines as possible have been avoided. While some felling is necessary, care has been taken to ensure that overall connectivity between the existing woodland and linear features will be retained throughout the construction and operational phased of the project.

It is acknowledged that the distribution of mammal resting places can change over time. Therefore, in order to avoid accidental disturbance during the construction phase of the project, prior to works commencing these will be preceded by a due diligence ecological walkover survey of the proposed works corridor, including the grid connection route. If any mammal resting places are identified then appropriate exclusion zone will be implemented and felling operations will be timed to avoid sensitive periods for the species affected, i.e. the breeding season.

Likewise, inappropriately timed vegetation removal required to implement bat feature buffers has the potential to directly impact on the resting sites of borrowing and arboreal mammals. Although during baseline surveys, no mammal resting places were identified within the proposed felling areas, a due diligence ecological walkover survey will be undertaken prior to commencement of felling operations.

[8] https://safety.networkrail.co.uk/wp-content/uploads/2019/11/NR_GN_ESD25-Guidance-on-Best-Practicable-Means-BPM-for-the-Control-of-Noise-and-Vibration.pdf (last accessed 28/08/2024. This is adopted in Ireland in the absence of equivalent Irish Guidance.

Confirmatory surveys will cover all suitable habitat for protected mammals including within 50 m of the works corridor for badgers and 100 m for pine martin. The aim of the surveys is to identify the resting sites of protected mammals and implement appropriate exclusion zone buffers, if required.

Setts, trails and feeding signs of badgers were recorded during site scoping surveys. Setts identified included one inactive sett with five entrances and an active outlier sett and active main sett. The following mitigation measures will be applied to avoid disturbance to badgers:

- No works will be undertaken within 20 m of active badger sett(s), as measured from all the entrances to burrows.
- A 10 m buffer zone will be set out along the River Suir on both sides, and existing drainage channels within the proposed development where no works can occur to reduce disturbances for otters.
- All heavy machinery will be excluded from areas within 30 m of active badger sett(s), as measured from all the entrances to burrows.
- Exclusion zone buffers of 30 m around all sett entrances will be marked off prior to commencement of construction works to ensure protection of these locations. Buffer zones will be appropriately signposted and will be marked out using fencing posts and rope.
- To avoid the period of time when badgers are particularly sensitive to disturbance (birthing and raising young cubs); no heavy construction works, including tree felling will be undertaken during the badger breeding season (December to June inclusive) near confirmed setts. Therefore, all felling and heavy construction works for the substation will be undertaken in July to November inclusive.

Disturbance to foraging mammals will be avoided by:

- Construction works being largely limited to daylight hours allowing nocturnal animals like badgers and otters to forage through the night.
- Minimising the risk of mammals becoming trapped if falling into excavated holes and trenches through the provision of egress points, e.g. placing escape planks or spoil runs. In addition, the length of time holes will be exposed will be limited.

Protection of bats

Mitigation to avoid potential direct impacts on roosting bats

Throughout the proposed development site vegetation removal will be required to facilitate construction of wind farm infrastructure, mainly for access tracks and hardstands. Trees within the southern semi-natural woodland have potential roost features ranging from low to high. Given that the species present here are capable off fission and fusion, this woodland could be seen as a roost resource of high potential. It would be fair to assume that the majority of these trees could be used throughout the different seasons, from hibernation roosts (the high classes trees) to just day roosts, transitional roosts or even night roosts if weather turns bad. There is a risk that any trees identified as supporting potential roost features (PRFs), which are earmarked for removal during construction, could become occupied prior to works commencing. Each tree proposed for felling will be inspected by a bat specialist under a roost disturbance licence using an endoscope before any felling occurs, to ensure no bat is occupying the tree roost at that time. To ensure the tree inspection can be fully carried out by the bat specialist, the use of tree climbing equipment, or the use of a mobile elevated work platform (MEWP)

will be required for any high potential features which are not accessible from the ground level. Any tree found to have a bat roosting will be left and re-checked again after a few days to see if they have left that roost. The fission and fusion behaviour mean usually bats will only spend a few days, sometimes only a single night in a tree roost (Kaňuch *et al.* 2022).

The woodland planted at Brittas estate contains multiple mature broadleaved trees some are veteran or even ancient. The design and layout of the proposed project, as described in sections above, ensures that this woodland is avoided as much as possible, to further protect these trees during the construction phase of the project, primarily the excavation of the borrow pits and access tracks, a root protection area (RPA) has been established to preserve and protect them. The method of calculating RPA is compliant with the BS:5387:2012.This root protection area (RPA) is 30 m. Works will not commence within this 30 m RPA before an updated PRF survey has been completed by a suitably licensed ecologist has inspected the tree. The proposed felling at the "T"-shaped treeline at T.4 is made up of live and dead ash trees. There are mainly ivy clad trees, with mainly trees of low potential. There is the occasional moderate classed tree here and so, it is anticipated that much occupancy of any PRFs will be limited to transitional roosts, e.g. autumn mating roosts. It is also considered that the surrounding area holds a number of structures offering higher suitability for the formation of significant maternity and hibernation roosts, e.g. Britta's castle.

Under the Wildlife Act and European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) (S.I No. 477 of 2011) it is an offence to intentionally disturb, injure or kill a bat or disturb its resting place. Under this legislation it is unlawful to destroy, alter or disturb known bat roosts without an appropriate derogation licence, as issued by the NPWS.

While no roosts have been confirmed within the proposed project, due to the transient nature of tree dwelling bat species, using a precautionary approach, there is a risk that any trees identified as supporting bats (having PRFs), which are earmarked for removal during construction, could become occupied prior to works commencing. Therefore, a pre-construction survey is required for all trees to be removed. Pre-construction surveys will determine whether a derogation licence is required. If a derogation licence is required, it will be sought from NPWS prior to any construction works being undertaken.

While acknowledging the limited likelihood of the treelines where vegetation removal/cutting is proposed to facilitate wind farm infrastructure; the mature trees identified as supporting PRFs will require further preconstruction roost surveys and assessment in acknowledgement that they have the potential to be utilised by bats in the future. The following locations have been highlighted as requiring this:

- Trees requiring felling at turbine T.10 location (at the south of the site)
- "T"-shaped treeline at T.4 (north east of the site)

Areas listed above which are earmarked for vegetation removal will be thoroughly re-assessed for PRFs during pre-construction surveys. Surveys will be conducted by an appropriately experienced ecologist. Any trees, outside of the "high" classed woodland roost resource, supporting PRFs will be targeted with further surveys, including emergence/re-entry surveys and/or roost inspections (using endoscopes and thermal imaging cameras) to determine occupancy of any moderate to high PRFs identified.

1. If any bat roosts are identified, further assessment will be required to determine the type of roost (e.g. maternity, hibernation, mating, transitional), species using the roost and the level of occupancy.
2. For any roost sites occupied, these surveys will inform the application of a derogation license from NPWS to undertake appropriate mitigation actions as required to ensure the conservation of bats. Subject to agreement with NPWS, it is proposed that these will include measures to exclude bats from potential roost holes prior to vegetation removal and provision of alternative roost sites.
3. Reporting of pre-construction bat surveys will be required to demonstrate due diligence regarding avoidance of disturbance to potential bat roosts

Table 8-3: Optimal season for works at different roost types (Source: Kelleher & Marnell (2006))

Bat usage of site	Optimum period for carrying out works (some variation between species)
Maternity	01-Oct to 01-May
Summer (not a proven maternity site)	01-Sep to 01-May
Hibernation	01-May to 01-Oct
Mating/swarming	01-Nov to 01-Aug

The presence of high-risk collision species such as Leisler's bats, common pipistrelles and soprano pipistrelles, showing medium to high activity levels on site, will result in likely significant effects on these species during the operational phase.

As recommended by NatureScot *et al*. (2021), a basic calculation formula is used to estimate bat feature buffers for this project. These buffers are provided as the distance from turbine towers to the feature, with the separation distance being dependent on feature heights in relation to turbine dimensions. Refer to Figure 8-1.

As recommended by NatureScot *et al*. (2021), a minimum 50 m separation distance from habitat features used by bats and the tips of operational turbine blades must be maintained as bat feature buffer. Larger buffers may be appropriate when turbines are near important bat features such as swarming, maternity or hibernation sites (NatureScot *et al*., 2021). EUROBATS (Rodrigues *et al*., 2015) recommend buffers up to 200 m, therefore providing a compromise between NatureScot and EUROBATS buffers, a 100 m buffer was also calculated (named here as NatureScot "extended"). Table 8-4 provides the bat feature buffer for the three turbine models assessed for the proposed project. The alternative turbine types are described in Section 2.4.1 of this EIAR.

Table 8-4: Bat buffers calculations using three turbine models in relation to feature height and the buffers recommended by NatureScot et al. (2021) and EUROBATS (Rodrigues et al., 2015)

Turbine model	Feature height (m)	Turbine buffer distance (m)		
		NatureScot (50 m)	NatureScot "extended" (100 m)	EUROBATS (200 m)
Turbine Type A blade length = 73.7 m Hub height = 105 m, Lowest rotor swept = 31.3 m	0	65.4	138.4	252.8
	2	68.5	139.9	253.6
	5	72.8	142.0	254.8
	15	84.9	148.6	258.5
	25	94.4	154.2	261.7
Turbine Type B blade length = 76 m Hub height = 102.5 m, Lowest rotor swept = 26.5 m	0	73.3	143.1	256.3
	2	76.0	144.5	257.1
	5	79.8	146.5	258.2
	15	90.6	152.7	261.8
	25	99.3	158.0	264.9
Turbine Type C blade length = 73 m Hub height = 105 m, Lowest rotor swept = 32 m	0	64.1	137.5	252
	2	67.2	139.0	252.8
	5	71.6	141.2	254.0
	15	83.8	147.7	257.7
	25	93.4	153.4	261.0

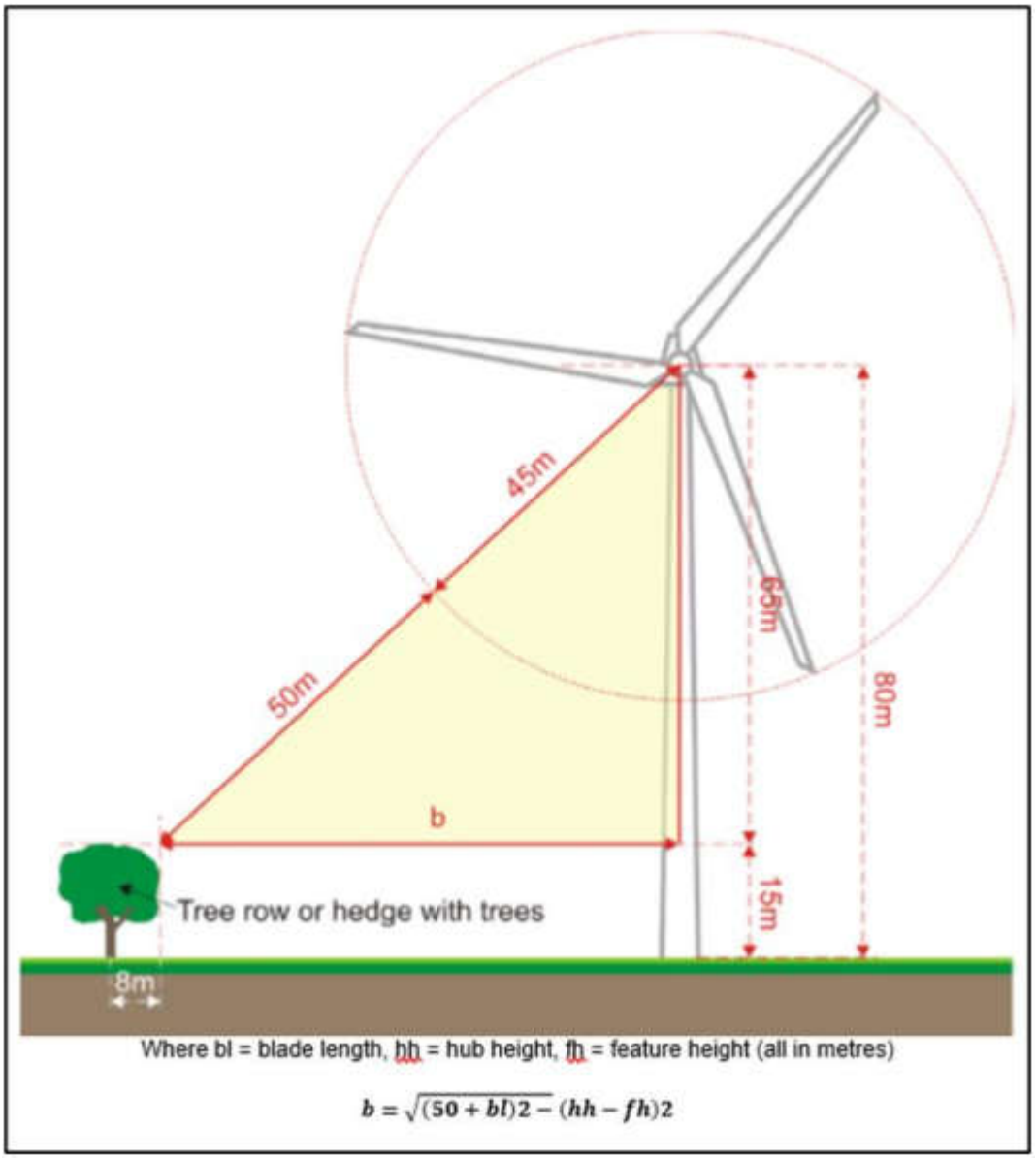


Figure 8-1 : Schematic representation and calculation formula to estimate bat buffers around turbines using turbine specification and habitat feature height

The area where trees/scrub are cleared to create the bat feature buffers must be rendered as unsuitable for roosting and foraging bats as much as possible and maintained as such throughout the lifetime of the wind farm. To achieve this, felled timber and branches must be removed, and stumps should be brushed to ground level. Any excess spoil from excavation works during construction can be broadcast to cover over any ground stumps, creating a more homogeneous surface. Additionally, to prevent the area from scrubbing up again, a mowing or grazing regime will be implemented and closely monitored as part of the Habitat Management Plan.

Mitigation by Remedy

Following implementation of the construction-phase habitat protection measures described monitoring of the success of habitat restoration will be undertaken. A monitoring programme, and requirements for remedial measures, will be incorporated for the site.

As stated in IWEA (2012), any tree felling, with a certain few exceptions, requires a tree felling licence from the Forest Service. The licensing requirements are set out in the Forest Service Policy on Felling Licences for Wind Farm Development. These include information on replanting requirements as well as compensatory afforestation (compensatory afforestation describes new planting on lands not previously forested. The current policy is to require compensatory afforestation of an area equal to the area of deforestation and/or of an area equal to 10% of the area of turbulence felling. S.I. 558 of 2010 requires that afforestation requires prior approval from the Forest Service. The Forestry Act, 1946 requires that any land proposed for compensatory afforestation must, at the time of the granting of the licence, be in the ownership of the applicant for the relevant Felling Licence).

While the environmental impact of felling is considered at the planning application stage, felling can only occur after the grant of a felling licence by the Department of Agriculture, Food and the Marine (DAFM). However, the extent of felling required is determined by the grant of planning permission. Therefore, the scope of the licence required can only be determined after the grant of planning permission. It follows that details of the area size and location of the replant lands will not be capable of being determined until after planning permission is granted. It is environmentally prudent to process felling and afforestation licences closest to the time when those activities are to occur. For example, if a licence is obtained at the planning application stage, it is probable that the licence would expire before the planning process and post planning delivery preparations could not be completed. Moreover, the identification and licensing of replant lands after the grant of planning permission has the benefit of ensuring that the licence is compliant with up to date legislation and environmental information, and that the cumulative environmental assessment considers the wider environmental impacts at that point in time. This reflects the fact that key environmental issues relating afforestation (i.e. water, soils, biodiversity, archaeology, landscape, and climate) are subject to regular updates in terms of best practice, guidelines, standards, and national policies. Therefore, delaying the identification of replant lands until such time as they are required enables identification of optimum lands available from an environmental perspective.

If Planning Permission has been granted for the development by the consenting authority, a copy of the full Planning Permission, EIAR and NIS will be submitted to support the felling licence application.

Protection of Birds

Embedded mitigation or mitigation by design was implemented as part of the iterative design process and this ensured that areas of wetland habitat have been avoided by the Proposed Project. As detailed in Chapter 6 of the EIAR Vol. 2 this includes areas associated with the River Suir floodplain that support FS1: reed and large sedge swamp, GM1: marsh habitats and PF2: poor fen and flush habitat, with land take within GS4: wet grassland being minimised where possible. Avoiding these habitats minimises potential for long-term effects on the areas of highest ecological value for wintering waterbirds and a

range of grounding nesting species with unfavourable conservation status, including lapwing, snipe, meadow pipits and skylark.

As part of the iterative design process (embedded mitigation) areas of older growth woodland have been avoided as much as possible within the requirements to maintain turbine-bat feature buffers and this habitat will be retained and enhanced over the life of the project. These areas were identified as important for woodland birds, including red listed species like breeding stock dove and a range of amber listed breeding passerines, such as spotted flycatcher and goldcrest, as well as green listed species such as great spotted woodpeckers that have recently colonised the area, wintering woodcock and birds of prey, including breeding buzzard, sparrowhawk and long-eared owl.

Chapter 2: Description of the Project and Chapter 3 Civil Engineering of this EIAR provide details of proposed mitigation measures that have been developed through the design of the proposed project (mitigation through design) to protect water resources. These are not repeat here, as measures to protect of water quality as covered in the following the sections.

The proposed grid connection route has been selected to utilise built infrastructure for the majority of its length, i.e. cables to be laid within public roads. Avoiding the use of overhead electrical cabling for the grid connection limits potential avian collision risk. Cables will be laid underground to avoid effects on roadside hedgerows and disturbance to nesting birds.

Both the GCR and TDR have been designed to use the existing road network, therefore by using existing infrastructure and avoiding sensitive habitat types and avoiding unnecessary impacts on watercourses.

Protection of Water Quality: Birds

Mitigation measures proposed to protect water quality during construction are set out in the Construction Environmental Management Plan (CEMP) - see Appendix 2B. These measures implemented in full will avoid any adverse effects on birds that rely on good quality water in downstream aquatic habitats, including cormorant, grey heron, little egret and kingfisher, as well as grey wagtail. The mitigation measures detailed within the CEMP are in accordance with measure detailed in Chapter 6: Biodiversity (Section 6.5.1), Chapter 9: Water (Section 9.5.1) and the NIS (APEM, 2024) designed to protect water quality.

Avoidance of direct and indirect disturbance/displacement

Prior to commencement of works a due diligence ecological walkover survey will be undertaken of the proposed works corridor, including areas where vegetation removal is proposed along the grid connection route, TDR and to implement turbine-bat feature buffers. To ensure any potentially sensitive ornithological receptors are identified in timely fashion and allow for appropriate control measures to be implement, bird surveys will be undertaken within one month of the commencement of construction works and walkovers will target all suitable habitats out to 500 m from the works corridor. Surveys will be undertaken by a suitability experience ornithologist.

To avoid widespread disturbance to birds, access within the Proposed Project Site will be restricted to the footprint of the proposed works for all construction activities and no access between different parts of the site will be permitted except via the areas identified for proposed works.

To avoid direct and indirect disturbance to breeding birds, the following restrictions on timings of construction works will, where feasible, be applied:

- Construction will be timed to commence outside the bird breeding season (March to August inclusive). This does not preclude construction continuing during the breeding season, but would allow sensitive bird species to choose nesting sites away from sources of potential disturbance;
- Where removal of suitable nesting habitat is required to facilitate the works, habitat clearance works will be undertaken prior to the 1 March in the construction year(s);
- Vegetation removal required for creation of bat feature buffers around turbines will be undertaken outside the bird breeding season;
- Once vegetation has been removed within the works area, these areas will be retained in a condition that limits suitability for nesting birds for the remainder of the construction phase. Any areas of potential cover, particularly cover for ground nesting species, will be rendered unsuitable by cutting vegetation or tracking over with an excavator;
- Should the clearance of vegetation suitable for nesting birds be required during the bird breeding season, the relevant area(s) of vegetation will be surveyed in advance by the ECoW (with ornithological survey experience);
- Any construction works proposed during the breeding bird season will be preceded by a survey and will ensure the implementation of buffer zones (if nests/territories are identified) and measures required in order to avoid disturbance. Particular attention will be given to sensitive bird species (including breeding raptors and waders). Ongoing monthly site visits will be undertaken during the breeding season (mid-March to early-July, inclusive) and the frequency of monitoring may be increased to weekly if required. Monitoring will target all suitable habitats out to 500 m from the works corridor, and particular attention will be paid to the area ahead of construction works. Surveys will be undertaken by a suitability experience ornithologist;
- If works are scheduled to commence in February, a pre-construction visit will be required to monitor potential lapwing breeding sites identified in Appendix 7G: Figure 7G.1 in EIAR Vol. 3., as this species can be present on territories early in the season (late-February/early March). Appropriate buffers will be implemented around any lapwing breeding sites identified and access for construction works restricted. Lapwing are considered relatively tolerant of disturbance (Cutts et al., 2009, Woodward et al., 2015, Goodship & Furness, 2019) and birds nesting in farmland habitats are habituated to a level of agricultural activity on the site. Therefore, taking account of on-site conditions buffers of 100-200 m on lapwing breeding sites will be applicable and this can be revised upwards or downwards based on professional judgement of the site ECoW (ornithologist), with consideration given to the behaviour of any pairs present and the nature of the works being undertaken.
- The proposed borrow pit is within 500 m of the known peregrine nest site, and therefore lies within the minimum recommended breeding season buffer zone (Goodship & Furness, 2022). To avoid disturbance during the breeding season, works in the borrow pit will commence prior to the onset of the bird breeding season, i.e. prior to the 01 March. This will allow the resident pair to habituate to the disturbance factors and relocate to an alternative site, if necessary. It is considered unlikely that this pair will be significantly affected by the works given the secure position of the nest in relation the works, the separation distance (> 340 m) combined with a

level of natural screening provided by woodland and slope, as well as a high tolerance of this species to certain construction related disturbance factors, e.g. works in quarries. As a precaution, if the site is occupied, no works will be permitted within 500 m of the peregrine nest during egg laying and early incubation, which are considered to be the most sensitive stage in the breeding season. Typically, this occurs over April to mid-May. Nest site monitoring will be undertaken in April to determine what stage the birds are at and to manage when restrictions are no longer required. Fledging success and dispersal will be surveyed to investigate how fledged birds disperse into the wider area in relation to the turbines being constructed. Observations over the baseline study suggests that young birds do not disperse towards the turbines.

Ecological Monitoring Measures

Pre-construction due diligence ecological monitoring

In order to avoid accidental disturbance to the resting places of protected mammals, during the construction phase of the proposed project, including badgers, hares and pine martens; prior to works commencing, a due diligence ecological walkover survey will be completed of the proposed works corridor, including the grid connection route, TDR areas that include tree felling and hedgerow removal, and bat feature buffers.

In order to limit accidental disturbance to bat roosts during the construction phase of the proposed project; prior to works commencing, trees within the works corridor previously assessed as supporting moderate to high PRFs will be re-assessed. Initially this will involve a ground level visual assessment, which will be followed up by inspections under licence and re-entry/emergence surveys, as required.

Ecological monitoring during construction

Construction works in areas of maternity bat roost potential should be avoided to prevent disturbance during the maternity season and until mothers and pups have moved on in search of hibernation roosts.

Monitoring of water quality during construction

In order to verify the efficacy of pollution prevention and mitigation works during construction, water quality monitoring is required. Monitoring with be undertaken by a suitable qualified independentthe Ecological Clerk of Works (ECoW). Monitoring will be conducted prior to, during and post completion of construction works. Survey locations will target watercourses within the catchment of the construction area and monitoring will comprise visual, hydrochemistry and grab sampling. A water monitoring programme will be prepared with Inland Fisheries Ireland before construction works.

A surface water monitoring schedule will be prepared and followed during the construction phase. This will involve weekly field monitoring of surface water quality chemistry. The following parameters will be tested:

- pH (field measured);
- Electrical Conductivity (field measured);
- Temperature (field measured);

- Dissolved Oxygen (field measured);
- Total Dissolved Solids (TDS) (field measured); and
- Turbidity (field measured).

There will also be continuous, in-situ monitoring equipment will be installed at selected locations upstream and downstream of the proposed project. The monitoring equipment will provide continuous readings for turbidity levels, flow rate and water depth in the watercourses.

Habitat monitoring of Annex I Molinia meadows habitats – pre-construction and construction

Pre-construction eight permanent quadrats (10x10 m squares) will be set up within the area of Annex I habitat in the proposed substation field for long-term vegetation monitoring. To ensure quadrats can be relocated on subsequent visits, accurate grid references of the square will be taken and these will be marked using permanent metal pins. Quadrats will be distributed through the habitat to sample central areas and areas around the edge of the Molina meadows habitat.

Baseline conditions will be confirmed re-construction and for each quadrat:

- Photographs will be taken to visually document any changes in site conditions over time;
- Vegetation type will be recorded;
- All species present will be listed, together with an indication species abundance, both in terms of % cover and rating on the DOMIN scale;
- The presence of both positive and negative indicator species for the habitat type will be noted;
- Other factors including vegetation height, ground conditions and management will be recorded;

During construction surveys will be repeated to ensure that the habitat is not impact by constructions works, especially by any drainage in the vicinity of tracks leading to T4 from the substation field.

Post-construction surveys will be under taken in Years 1, 2, 3, 5 and 10.

Surveys will be undertaken by a suitable qualified botanist and at the optimal time of year for surveying *Molinia* meadow habitat.

Post-construction Bat Monitoring

The aim for bat feature buffers around turbines is to ensure that habitats are as featureless as possible to avoid bats flying next to operating turbines. However, due to the extensive habitat changes often necessary at wind farm sites, particularly regarding vegetation removal and resulting edge effects and habitat connectivity disruptions, it is recognized that post-construction patterns of bat activity can be unpredictable (Rodrigues *et al.,* 2015, NatureScot *et al.*, 2021). Therefore, NatureScot *et al.* (2021) recommends a three-year post-construction monitoring program for bats, involving monitoring in each of the first three years to assess the effectiveness of the bat feature buffers and the SMART curtailment plan.

Initially, regular monitoring will be conducted in Year 1, 2 and 3 to ensure that vegetation clearance measures and ongoing management efforts result in the desired habitat conditions. Following the establishment of optimal conditions (after year 3), a habitat maintenance plan will be implemented. Annual compliance checks in spring (April) and late summer (August) will be carried out throughout the proposed project's lifespan to ensure that buffers are maintained in suitable conditions. Regular monitoring during Year 1, 2 and 3 will also include bat activity monitoring and carcass searches. Three-year post-construction monitoring also includes bat activity monitoring and carcass searching. The bat activity monitoring will include the deployment of 10 bat detectors in the same locations as pre-construction surveys. Carcass searches will also be conducted during the same time as activity monitoring. Areas around operational turbines will be searched by an ecologist with a high observer efficiency rate to look for bat casualties. These surveys will be carried out as early as possible to avoid possible predation.

Bat activity monitoring in years 1, 2 and 3 will involve three seasonal deployments of 10 static bat detectors operating for a minimum of 10 nights under compliant weather conditions. Ten detectors will be positioned, one at each turbine location to monitor bat activity post-construction. Deployment will cover the following periods:

- early May and mid-June
- mid-June and mid-August
- early September

Similar to pre-construction surveys, a fully automated weather station with 3G connectivity will be deployed to generate real-time rainfall, wind speed, and temperature data. This can be supplemented with wind speed data collected from wind turbines.

NIEA guidance recommends carcass searching which involves the detection of bat (and bird) casualties around the turbine blades (NIEA, 2024). These searches will be conducted by appropriately trained operational staff and will be carried out early in the morning during high-risk periods at the site (i.e., during summer and autumn). While not mandatory, the proposed project will employ the use of trained dogs with handlers as they are considerably more efficient and quicker than humans (alone) in locating carcasses around turbines, therefore, providing better results. Observer efficiency will not fall below 50%, necessitating observer efficiency tests to minimize the risk of high false negative results. Alongside these observer efficiency tests, the carcass removal rate by predators will also be quantified to mitigate bias resulting from scavenging.

Pre-Construction Bird Monitoring

SNH (2009)[9] provides guidance on post-construction monitoring requirements for onshore wind farms.

[9] SNH (2009). *Guidance note: Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms*. January 2009. Scottish Natural Heritage, now NatureScot

SNH (2009). Guidance note Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms January 2009. Scottish Natural Heritage, now NatureScot

All surveys monitoring birds will be undertaken by an appropriately experience ornithologist.

SNH (2009) states in relation to ornithological monitoring during construction of onshore wind farms:

Monitoring should also take place during construction, where these effects are likely to be more than temporary, for example where disturbance and habitat loss (before mitigation) may have longer term impacts. Temporary effects are different in nature to those during the operation of the wind farm, and as they are not strictly part of the monitoring protocol, they are best dealt with through compliance monitoring of planning conditions.

Construction phase monitoring will involve the following actions:

- Bird surveys, as part of a pre-construction due-diligence ecological survey will be undertaken within one month of the commencement of construction works and walkovers will target all suitable habitats out to 500 m from the turbine layout and works corridor.
- Should the clearance of vegetation suitable for nesting birds be required during the bird breeding season, the relevant area(s) of vegetation will be surveyed in advance by the ECoW (with ornithological survey experience).
- Any construction works proposed during the breeding bird season will be preceded by a survey and will ensure the implementation of appropriate buffer zones, if nests/territories are identified and measures required in order to avoid disturbance. Particular attention will be given to sensitive bird species, including breeding raptors and waders. Ongoing monthly site visits will be undertaken during the breeding season (mid-March to early-July, inclusive) and the frequency of monitoring may be increased to weekly as required, if for example, works are occurring within 500 m of the known peregrine nest over a sensitive period, e.g. egg laying and incubation. Monitoring will target all suitable habitats out to 500 m from the works corridor, and particular attention will be paid to the area ahead of any construction works.
- If works in the northern part of the Proposed Project Site are scheduled to commence in February, a pre-construction visit will be required to monitor potential lapwing breeding sites identified in Appendix 7G: Figure 7G.1 in EIAR Vol. 3., as this species can be present on territories early in the season (late-February/early March).
- The peregrine nest will be monitored during the breeding season while construction works are occurring in the southern part of the Proposed Project Site. Nest site monitoring will commence in April to determine what stage the birds are at and to manage when restrictions are no longer required. Fledging success and dispersal will be surveyed to investigate how fledged birds disperse into the wider area in relation to the turbines being constructed.

Responsibility

Environmental Manager

Construction Manager

Ecological Clerk of Works

EMP 10: Archaeological and Heritage Protection

The purpose of this plan is to describe measures for the management and protection of the archaeological and cultural heritage sites that have been found on the development site. There are four sites listed on the Sites and Monuments Record (SMR) located within the development boundary. The proposed infrastructure has been set back from these sites to avoid potential impacts.

Archaeological Management Measures During Construction

- All groundworks associated with the construction works, turbines hardstands, temporary compound, Met Lidar, spoil deposition areas, borrow pit and internal grid connection/access tracks should be archaeologically monitored under licence from the NMS;
- All ground works associated with the Grid Connection Route should be archaeologically monitored within the ZON of the ringfort TN041-026 and under the license from NMS;
- Groundworks associated with cuttings through the townland/parish boundaries must be kept to a minimum. The cutting locations of these boundaries should be archaeologically monitored and include photographs, survey and written descriptions;
- All ground disturbance works associated with Turbine Delivery Route should be archaeologically monitored under the license from NMS;
- Where possible, it is proposed to excavate external grid connection trench to the East side of the road to minimalize potential physical impact to the recorded ringfort TN041-026.

Responsibility

Project Archaeologist

Environmental Manager

Construction Manager

References

- Council of Europe Convention on the Protection of the Architectural Heritage of Europe (the 'Granada Convention') ratified by Ireland in 1997.
- Framework and Principles for the Protection of the Archaeological Heritage, 1999, Department of Arts, Heritage, Gaeltacht and the Islands.
- The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous) Provisions Act, 1999, as amended.
- The conservation principles as set out by International Council on Monuments and Sites (ICOMOS) in the Venice and Burra Charters.
- Planning and Development Act, 2000, as amended.
- Architectural Heritage Protection-Guidelines for Planners by the Department of the Environment Heritage and Local Government 2011 (DoEHLG)

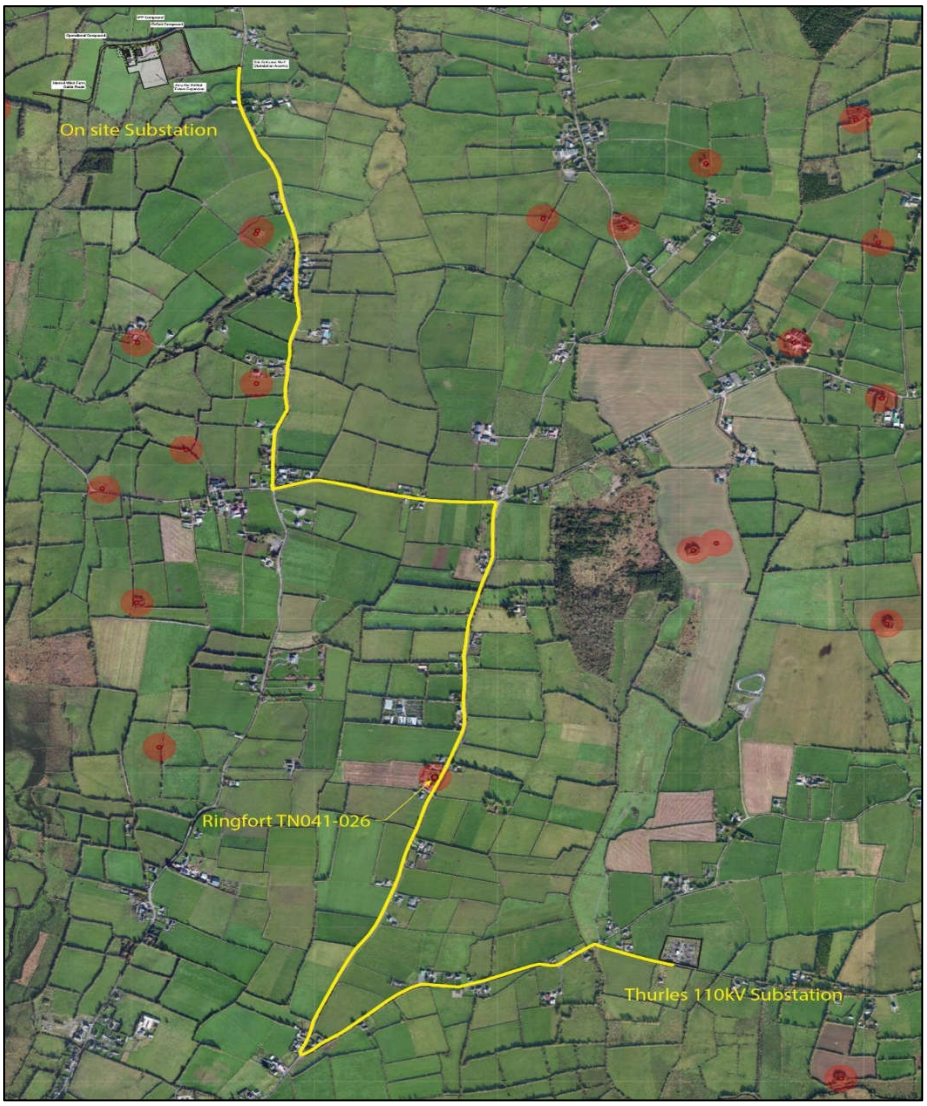


Figure 8-2: Location of the ringfort TN041-026 abutting proposed grid connection route

EMP 11: Emergency Response Plan

Purpose

To describe measures for the prevention of an environmental accident or incident and the response required to minimise the impact of such an event.

Procedure

In the event of an environmental emergency, all personnel will react quickly and adhere to this procedure. All site personnel will be inducted in the provisions of this Emergency Response Plan.

The following outlines some of the information, on the types of emergency, which must be communicated to site staff:

- Release of hazardous substance – Fuel and oil spill,
- Concrete spill or release of concrete or silt
- Flood event – extreme rainfall event
- Environmental buffers and exclusion zones breach
- Housekeeping of materials and waste storage areas breach
- Stop works order due to environmental issue or concern (risk of floods or threat to archaeological or ecological feature)
- Fire on site (cross-reference site Safety Emergency Plan as appropriate)

As an emergency risk management measure, continuous 24 hour advance meteorological forecasting (Met Éireann download) will be undertaken and linked to an emergency trigger-response system. When a pre-determined rainfall trigger level is exceeded (e.g. 1 in 100-year storm event or very heavy rainfall at >25mm/hr), planned emergency responses will be undertaken. These responses will include:

- pre-storm checks on erosion and sediment control measures
- cessation of construction until the storm event including storm runoff has passed over.
- post-storm checks on erosion and sediment control measures and undertaking any repair or maintenance works required.

If any of the above emergency situations occur; the Emergency Response Plan is activated. The Environmental Manager will most likely be responsible for overseeing the Emergency Response Plan (to be confirmed by the Appointed Contractor(s)) and will be prepared and ready to implement the plan at all times. The Environmental Manager will be immediately informed and report to the scene. He / she must be aware of the:

- Nature of the situation – brief description of what has happened;
- Location of the incident;

- Whether any spill has been released;
- Whether the situation is under control.

Oil Spillages

In the event of an oil spill, the following procedures will be complied with:

- Site staff will report the spillage immediately to the Environmental Manager or Construction Manager;
- Where relevant, the Environmental Manager will report the spillage to Inland Fisheries Ireland and Tipperary County Council;
- Where possible, the source of pollution will be identified;
- Switch off all sources of ignition;
- Stop the spillage spreading:
- Use absorbent materials from the spill kit to mop up the spill (sand or absorbent materials should be used rather than detergents);
- Place boom across watercourse or in nearby downstream existing drains as a precaution;
- Do not wash spillage into drainage system. Washing will only make the situation worse and extend the pollution to other water bodies/drainage systems;
- If the spill has already reached drains, block the inlet of the dirty water cross pipes in the nearby drainage outflow points on the roadside drains with oil absorbent booms, which will prevent oils flowing into the existing drains;
- Shovel contaminated sand/earth/absorbent granules into sacks or skips;
- A specialist oil removal company will be instructed to remove any pooled oil.

Concrete Spillages

In the event of a concrete spill, the following procedures will be complied with:

- Site staff will report the concrete spillage immediately to the Environmental Manager or Construction Manager;
- Where relevant, the Environmental Manager will report the spillage to Inland Fisheries Ireland and Tipperary County Council;
- If there is a risk of concrete spreading into the drainage system, the inlet of the dirty water cross pipes in the nearby drainage outflow points on the roadside drains will be blocked using the absorbent booms, which will prevent concrete flowing into the existing drains;
- Do not wash spillage into drainage system. Washing will make the situation worse and extend the pollution to other water bodies/drainage systems;
- If the spill has already reached drains, acid may be added to the drains by the Environmental Manager to neutralise the alkalinity of the concrete;

- Shovel contaminated concrete granules into sacks or skips for treatment in the Roadside Concrete Wash unit.

Contacts

As an Environmental Control Measure, the Environmental Manager will append the relevant contact details to this EMP document. Examples of such contact details include:

- Environmental Manager
- Specialist oil removal company
- Tipperary County Council
- Inland Fisheries Ireland
- National Parks and Wildlife Service

Location of Emergency Spill Kits

- A map indicating the location of all emergency spill kits will be attached to this EMP document.
- Emergency oil spill kits will also be carried in all site vehicles and machinery and in the site office.

Responsibility

- The Environmental Manager will finalise this Emergency Response Plan to be ready to respond to any incident.
- All site personnel will report any spillages of oil or chemicals to the Environmental Manager and Construction Manager immediately.
- As appropriate, the Environmental Manager will report the spillage to the Regional Fisheries Board, Tipperary County Council and any other relevant authority.

EMP 12: Site Environmental Training Awareness

Purpose

To describe measures for informing the public of restricted access to the construction site and the training of all site personnel in the protection of the environment and the relevant controls.

Scope

Notification to the public of restricted access to the site. All site personnel and construction teams which may influence environmental impacts.

Procedure

An initial site environmental induction and ongoing training will be provided to communicate the main provisions of the CEMP including this EMP to all site personnel. Two-way communication will be encouraged to promote a culture of environmental protection.

The following outlines some of the information which will be communicated to site staff:

- Environmental procedures of the CEMP;
- Housekeeping of materials and waste storage areas;
- Environmental Emergency Response Plan.

Site signage will be provided at the entrance to the site to inform the public that access to the site is restricted to those directly involved in the construction of the new facility.

In the event of the identification of Invasive Alien Species on site, or in proximity to the proposed works, the area will be clearly barriered off with signage warning that access to the area is not permitted.

Housekeeping and Storage of hazardous materials

- Hazardous materials marked with the appropriate hazardous material warning signs will only be stored in a secure storage container in the temporary site construction compounds.
- Sub-contractors will provide a copy of the Material Safety Data Sheets for all hazardous substances brought on site.

All finalised CEMP policies will be adhered to, in the management of fuels and oils, concrete, and installation of sediment and erosion controls and drainage features. All finalised details will be communicated with site personnel. Environmental Training including spill kit training, installation of silt fence training is to be provided by the Appointed Contractor(s). Environmental training records will be retained in the site office.

Responsibility

Construction Manager

Environmental Manager

All site personnel

EMP 13: Monitoring and Auditing

Purpose

To describe measures for environmental monitoring during the construction works and audit of control measures to ensure environmental protection.

Procedure

All mitigation measures, any planning conditions and relevant construction methods will be monitored on site (see monitoring schedule in Table 8-5). The Contractor will nominate an Environmental Manager for the works. The Environmental Manager will provide Audit Checklists to ensure regular checks of the site's control measures for the ongoing protection of the environment.

Monitoring will be carried out to ensure adherence with the following;

EMP-1 Management of Excavations

EMP-2 Surface Water Management and Run-off Control (Sediment and Erosion Control)

EMP-3 Fuels and Oils Management

EMP-4 Management of Concrete

EMP-5 Construction Noise Management

EMP-6 Construction Waste Management Plan

EMP-7 Construction Traffic Management

EMP-8 Construction Dust Management

EMP-9 Ecological Management Plan Protection of Habitats and Fauna

Checklists for daily, weekly or monthly site audits will be finalised by the Environmental Manager prior to the commencement of construction, and the relevant personnel informed of their duties. Checklists will include (but are not limited to) confirmation that fuel is stored appropriately, waste management rules are adhered to, all environmental buffers are maintained, surface water and run-off control measures are in place and functioning, and concrete chute wash-out procedure is being followed. Checklists will be finalised with the Contractor's Environmental Operating Plan.

All environmental records, including completed checklists, will be retained at the site office.

Responsibility

Project Manager

Environmental Manager

Construction Manager

Ecological Clerk of Work

Project Archaeologist

Table 8-5: Schedule of Pre-Construction Monitoring

PRE CONSTRUCTION PHASE	ENVIRONMENTAL MITIGATION		PERSONS RESPONSIBLE	RELEVANT CHAPTER /ACTION REQUIRED
PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS	Biodiversity Assessment of Root Protection Area	A confirmatory survey of hedgerows, treelines and woodland adjacent to works corridor, targeting sections that will be retained post-construction, will be undertaken by an appropriately qualified arboriculturist.	Project Ecologist	Chapter 6 Biodiversity
PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS	Biodiversity Habitat Monitoring of Annex 1 Molinia meadows habitats (pre-construction and construction)	Pre-construction eight permanent quadrats (10x10 m squares) will be set up within the area of Annex I habitat in the proposed substation field for long-term vegetation monitoring. To ensure quadrats can be relocated on subsequent visits, accurate grid references of the square will be taken and these will be marked using permanent metal pins. Quadrats will be distributed through the habitat to sample central areas and areas around the edge of the Molina meadows habitat. Baseline conditions will be confirmed pre-construction and for each quadrat: - Photographs will be taken to visually document any changes in site conditions over time; - Vegetation type will be recorded; - All species present will be listed, together with an indication species abundance, both in terms of % cover and rating on the DOMIN scale; - The presence of both positive and negative indicator species for the habitat type will be noted; - Other factors including vegetation height, ground conditions and management will be recorded; During construction surveys will be repeated to ensure that the habitat is not impact by constructions works, especially by any drainage in the vicinity of tracks leading to T4 from the substation field. Surveys will be undertaken by a suitable qualified botanist and at the optimal time of year for surveying Molinia meadow habitat.	Project Ecologist	Chapter 6 Biodiversity
PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS	Biodiversity Non-volant mammals (Badger and Otter) - Pre-Construction survey	In order to avoid accidental disturbance to the resting places of protected mammals, during the construction phase of the proposed project, including badgers, hares and pine martens; prior to works commencing these will be preceded by a due diligence confirmatory ecological walkover survey of the proposed works corridor, including the grid connection route, TDR areas that include tree felling and hedgerow removal, and bat feature buffers. In order to limit accidental disturbance to bat roosts during the construction phase of the proposed project; prior to works commencing trees within the works corridor previously assessed as supporting moderate to high PRFs will be re-assessed. Initially this will involve a ground level visual assessment, which will be followed up by inspections under licence and re-entry/emergence surveys, as required.	Project Ecologist	Chapter 6 Biodiversity

PRE CONSTRUCTION PHASE	ENVIRONMENTAL MITIGATION		PERSONS RESPONSIBLE	RELEVANT CHAPTER /ACTION REQUIRED
PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS	Biodiversity Bats – Pre-construction Surveys	A number of trees were identified as Potential Bat Roosts (PBRs) within the proposed project site and along the grid route and TDR. Confirmatory roost surveys of structures and trees will be carried out at the project site, including along the route of the proposed grid connection in advance of construction commencing. Emergence/re-entry surveys may be required at structures/trees, pending the results of the surveys. Prior to the felling of any trees identified as PBRs, detailed physical inspections of the trees Potential Roost Features (PRFs), using endoscope and high-powered torch, and/or dusk/dawn surveys will be undertaken at each affected tree to determine if roosting bats are present.	Project Ecologist	Chapter 6 Biodiversity
PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS	Biodiversity Amphibians – Pre Construction Survey	Amphibian surveys will be carried out by an ecologist in advance of construction works. These surveys will focus on breeding areas potentially used by amphibians. Methodology for frog surveys will follow Reis et al. (2013).	Project Ecologist	Chapter 6 Biodiversity
PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS	Water	A programme for water monitoring will be prepared in consultation with Inland Fisheries Ireland prior to the commencement of the construction of the wind farm. The plan will include monitoring of water during the pre-construction, throughout construction and in the immediate post construction phases. Further baseline water quality monitoring of all streams near the development site will be undertaken prior to construction to confirm existing conditions at the time of construction. This baseline data will include the main components of a full hydrograph for the streams including both high spate flow and base flow where possible.	Project Ecologist/ECOW	Chapter 6 Biodiversity Chapter 8 Water

PRE CONSTRUCTION PHASE	ENVIRONMENTAL MITIGATION		PERSONS RESPONSIBLE	RELEVANT CHAPTER /ACTION REQUIRED
PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS	Ornithology Pre-Construction Bird Survey	SNH (2009)10 provides guidance on post-construction monitoring requirements for onshore wind farms. SNH (2009). Guidance note Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms January 2009. Scottish Natural Heritage, now NatureScot All surveys monitoring birds will be undertaken by an appropriately experience ornithologist. SNH (2009) states in relation to ornithological monitoring during construction of onshore wind farms: Monitoring should also take place during construction, where these effects are likely to be more than temporary, for example where disturbance and habitat loss (before mitigation) may have longer term impacts. Temporary effects are different in nature to those during the operation of the wind farm, and as they are not strictly part of the monitoring protocol, they are best dealt with through compliance monitoring of planning conditions. Construction phase monitoring will involve the following actions: Bird surveys, as part of a pre-construction due-diligence ecological survey will be undertaken within one month of the commencement of construction works and walkovers will target all suitable habitats out to 500 m from the turbine layout and works corridor. Should the clearance of vegetation suitable for nesting birds be required during the bird breeding season, the relevant area(s) of vegetation will be surveyed in advance by the ECoW (with ornithological survey experience). Any construction works proposed during the breeding bird season will be preceded by a survey and will ensure the implementation of appropriate buffer zones, if nests/territories are identified and measures required in order to avoid disturbance. Particular attention will be given to sensitive bird species, including breeding raptors and waders. Ongoing monthly site visits will be undertaken during the breeding season (mid-March to early-July, inclusive) and the frequency of monitoring may be increased to weekly as required, if for example, works are occurring within 500 m of the known peregrine nest over a sensitive	Project Ornithologist and/or ECoW	Chapter 7 Ornithology

[10] SNH (2009). *Guidance note: Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms*. January 2009. Scottish Natural Heritage, now NatureScot

PRE CONSTRUCTION PHASE	ENVIRONMENTAL MITIGATION		PERSONS RESPONSIBLE	RELEVANT CHAPTER /ACTION REQUIRED
		period, e.g. egg laying and incubation. Monitoring will target all suitable habitats out to 500 m from the works corridor, and particular attention will be paid to the area ahead of any construction works. If works in the northern part of the Proposed Project Site are scheduled to commence in February, a pre-construction visit will be required to monitor potential lapwing breeding sites identified in **Appendix 7G: Figure 7G.1 of EIAR Vol. 3**, as this species can be present on territories early in the season (late-February/early March). The peregrine nest will be monitored during the breeding season while construction works are occurring in the southern part of the Proposed Project Site. Nest site monitoring will commence in April to determine what stage the birds are at and to manage when restrictions are no longer required. Fledging success and dispersal will be surveyed to investigate how fledged birds disperse into the wider area in relation to the turbines being constructed.		
PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS	Material Assets – Pre-Construction surveys	- Grid Route: Pre-Construction surveys will be carried out to ensure that all electrical, water and other services within the public road are identified prior to construction of the 110kV underground grid route cable and the construction works designed to avoid any existing infrastructure under the roads. - Turbine Delivery Route: Pre-Construction surveys will be carried out to ensure the structural integrity of the proposed haulage route road network. Repairs will be carried out on the public roads, as necessary, during the construction phase, to ensure that the condition does not deteriorate below a standard that could affect the use of the site, as required.	Appointed Project Contractor	Chapter 15 Material Assets

Schedule of Construction Phase Monitoring

CONSTRUCTION PHASE	ENVIRONMENTAL MONITORING		PERSONS RESPONSIBLE
DURING CONSTRUCTION	Biodiversity and invasive alien species	While no plant species listed under the Third Schedule of the European Communities (Birds and Habitats) Regulations 2011 as 'non-native species subject to restrictions under Regulations 49' were recorded on the Site, there is potential for IAS to be introduced to the Site. The EM and ECoW will be responsible for monitoring potential introduction of IAS to the Site.	Appointed Project Contractor Appointed Ecological Clerk of Works
DURING CONSTRUCTION	Biodiversity/ Protection of Habitats	Within the proposed project, there are several areas supporting important habitats. Annex I habitat Molinia meadows, poor fen and flush habitat and marsh habitats were identified. These sensitive habitats were identified in site scope surveys and the original site layout was re-designed to avoid these areas. This involved altering the layout of the substation in the proposed substation fields. One proposed turbine was also re-located away from the southern mature woodland in which it was first placed. These areas of the southern woodlands will be retained and additional post-construction monitoring for bats will be undertaken at these locations to determine if the residual habitat feature draws bats towards the rotor swept area. The proposed project layout was designed to utilise existing tracks, and the infrastructural footprint largely targets lower value habitats, including improved grassland. Likewise, areas where felling is required to implement bat feature buffers and the lengths of treelines and hedgerows that will be removed has been keep to a minimum. Likewise, the number of locations where access tracks are required to punch through hedgerows/treelines has been limited and the areas removed will be kept to a minimum. To avoid widespread disturbance to habitats, access within the construction site will be restricted to the footprint of the proposed works corridor. Access routes will be agreed on site and no access between different parts of the infrastructure will be permitted, except via the proposed works corridor. An Ecological Clerk of Works (ECoW) will be employed from the commencement to completion of construction works and will be tasked with monitoring work practices, which will ensure that construction activities are tightly constraint within the works corridor. To avoid construction damage from excavation or compaction to the roots of plants in hedgerows, treelines and woodlands adjacent to the proposed infrastructure that will be retain post-construction, appropriate root protection area (RPAs) will be implemented, in accordance with BS 5837:2012 Trees in relation to design, demolition and construction -Recommendations, as outlined in National Roads Authority - NRA (2006) . To this effect an appropriately qualified arboriculturist will undertake a pre-construction assessment to ensure impacts to vegetation are avoided. In addition, it is noted that impacts to roots will be avoided at most locations, as new sections of track are in improved grassland where soil adjacent to hedgerows/treelines has been subject to recurring disturbance and therefore roots will be less sensitive. Root protection buffers will also be in place.	Appointed Project Contractor Appointed Ecological Clerk of Works

CONSTRUCTION PHASE	ENVIRONMENTAL MONITORING		PERSONS RESPONSIBLE
DURING CONSTRUCTION	Land & Soils – Borrow Pit	Inspections of the borrow pit will be made by a geotechnical engineer through regular monitoring of the opening works. The appointed contractor will review work practices at the borrow pit where periods of heavy rainfall are expected where work will be stopped to prevent excessive runoff from being generated.	Principal Contractor and appointed Project Environmental Manager
DURING CONSTRUCTION	Weather	Weather monitoring is a key input to the successful management of the drainage and treatment system during the construction of the proposed wind farm. This will involve 24 hour advance meteorological forecasting (Met Éireann download) and on site rain gauge linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded (e.g., 1 in 5 year storm event), planned responses will be undertaken. These responses will involve control measures including the cessation of construction until the storm event has passed over and flood flows have subsided. Dedicated construction personnel will be assigned to monitor weather.	Appointed Project Contractor
DURING CONSTRUCTION	Protection of Water Quality -Water Quality Monitoring	In order to verify the efficacy of pollution prevention and mitigation works during construction, water quality monitoring is required. Monitoring with be undertaken by a suitable qualified independent Ecological Clerk of Works (ECoW). Monitoring will be conducted prior to, during and post completion of construction works. Survey locations will target watercourses within the catchment of the construction area and monitoring will comprise visual, hydrochemistry and grab sampling. A programme for water monitoring will be prepared in consultation with Inland Fisheries Ireland prior to the commencement of the construction of the proposed wind farm. The plan will include monitoring of water during the pre-construction, throughout and post construction phases. Further baseline water quality monitoring of all streams near the development site will be undertaken prior to construction to confirm existing conditions at the time of construction. This baseline data will include the main components of a full hydrograph for the streams including both high spate flow and base flow where possible. During the construction phase of the project, a surface water monitoring schedule, finalised prior to construction, will be followed. In summary, weekly field monitoring of surface water quality chemistry will be carried out at the identified and agreed surface water quality monitoring locations. The following parameters will be measured: • pH (field measured); • Electrical Conductivity (field measured); • Temperature (field measured); • Dissolved Oxygen (field measured); • Total Dissolved Solids (TDS) (field measured); and • Turbidity (field measured). Continuous, in-situ, monitoring equipment will be installed at selected locations upstream and downstream of the proposed project. The monitoring equipment will provide continuous readings for turbidity levels, flow rate and water depth in the watercourses.	Principal Contractor and appointed Project Environmental Manager

CONSTRUCTION PHASE	ENVIRONMENTAL MONITORING		PERSONS RESPONSIBLE
		Each month, the EcoW (refer to the CEMP in Volume III of the EIAR for details of the person to be appointed) will take samples from each location and bring to a laboratory for analysis on a range of parameters with relevant regulatory limits and EQSs. This will be compared with the baseline data obtained prior to construction from the EPA and from sampling. If the measured value exceeds the baseline values, the cause will be determined, and remedial measures put in place as necessary. The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The suite of determinants will include: • pH; • Total Petroleum Hydrocarbons (TPH); • Temperature; • Total Phosphorus; • Chloride; • Nitrate; • Nitrite; • Total Nitrogen; • Orthophosphate; • Ammonia N; • Biochemical Oxygen Demand; and • Total Suspended Solids. Periodic visual observations at each of the monitoring points will be recorded with specific reference to flow, stream substrate and water colour. Photos will be taken to support visual observation, and inspection sheets including visual observation results and photographic records will be kept on site. Visual observations will also be completed after major rainfall events along with photographs which will be collected and assessed by the EcoW. The elements which will be included in the visual checklist are as follows: - Appropriate period visual inspection of all watercourses which drain the proposed project by the ECoW or a suitably qualified and competent person delegated by the EcoW; - Groundwater seepage, water ponding and wetting of previously dry spots; - All elements of drainage system will be monitored including settlement ponds, check dams, interceptor drains etc. Corrective action will be carried out if there is a visual indication of discolouration, oily sheen, odour or litter.	

CONSTRUCTION PHASE	ENVIRONMENTAL MONITORING		PERSONS RESPONSIBLE
		- Event based visual inspections by the ECoW as follows: o Following a high intensity localised rainfall event (10mm/hr); o Heavy rainfall within a day (25mm in a 24 hour period); and o Higher than monthly rainfall within a week period. • A record of all visual inspections will be included in the Construction Environmental Management Plan (CEMP) and maintained on site. The ECoW will be responsible for presenting the surface water monitoring results at or in advance of regular site meetings. The reports will include results from field monitoring as well as visual inspections and laboratory analysis completed for that period. The reports will describe how the results compare with baseline results. Any deterioration in water quality deemed to be caused by construction activity will be flagged and appropriate remediation or corrective actions recommended.	
DURING CONSTRUCTION	Noise Monitoring	Construction Noise and vibration monitoring in accordance with the guidance contained in BS 5228-1:2009 during the construction and decommissioning phases shall be undertaken to ensure compliance with the criteria. Should a noise complaint be received, this will also be investigated.	Appointed Project Contractor Project Environmental Manager

EMP 14: Environmental Accidents, Incidents and Corrective Actions

Purpose

To describe measures for the recording, investigating and close-out of any environmental accidents or incidents on the site

Procedure

- The Environmental Manager or Construction Manager will be contacted as soon as possible where there is any incident that carries the possibility of negative environmental consequences (e.g. minor oil leakage or blockage of drainage pipe).
- The Emergency Response Plan and standard emergency procedures will be applied to get the incident under control and prevent injury or loss of life in the first instance.
- Work in the area will be halted and the Environmental Manager will be called to the scene to assess the situation and to decide on initial responses and remedial measures.
- Once the situation is under control, the environmental accident or incident will be recorded and the cause investigated.
- Any remedial action required will be taken to mitigate any damage and prevent a reoccurrence.
- Corrective actions will be communicated to personnel and sub-contractors where relevant – particularly where it results to a change in procedure.

Example list of environmental accidents & incidents

- Accidents involving large spill of fuel or concrete from delivery truck (emergency response required)
- Spills of fuel and oil (minor)
- Waste or rubbish left around the site (not in dedicated waste areas)
- Breach of any buffers (archaeological, ecological, watercourse)
- Failure of any control measures (silt fences collapsed in a storm)
- Concrete chute wash out in a non-dedicated area
- Unplanned vehicle movement off the access tracks
- Unplanned vehicle movement within a buffer zone

Responsibility

- Site staff will contact the Environmental Manager or Construction Manager and ECoW as soon as possible where there is any incident that carries the possibility of negative environmental consequences.
- The Environmental Manager is responsible for alerting the relevant authorities.

EMP 15: Environmental Complaints

Purpose

To describe measures for the recording and resolving complaints by third parties, including local residents or members of the public.

Procedure

Any environmental complaints received, whether internal or external, will be recorded and investigated. Immediate action will be taken as relevant to resolve environmental complaints to avoid any nuisance to the local community or any environmental damage.

This procedure includes:

- Recording of any complaints to a Site Log
- Follow up by the relevant site representative – Environmental Manager
- Remedial measures where required
- Ongoing communication with complainant to confirm resolution
- Any required training or communication with site personnel and sub-contractors as a result

Responsibility

Project Manager

Environmental Manager

Construction Manager