Appendix 2-1

Construction Environmental Management Plan

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Shronowen Wind Farm

Construction and Environmental Management Plan (CEMP)

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Appendix 1 Environmental Management Plans

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 Shronowen 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. For the purposes of the CEMP, the Shronowen Wind Farm project includes the wind farm, substation and the grid connection options.

Prior to construction, the Appointed Main Contractor will prepare a detailed CEMP taking into account methods/requirements outlined in this report. This CEMP will form the basis of the construction management approach on site, while the works are being completed; ensuring environmental management measures are in place, 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.

1.1 CEMP PURPOSE AND OBJECTIVES

This CEMP details the construction works and environmental management measures, which will be implemented during the construction phase of the Shronowen Wind Farm project.

The primary objective of this CEMP is to provide a framework for actions, responsibilities and protocols associated with environmental management with which the Appointed Contractor(s) are required to adhere in order to construct the project in accordance with regulatory requirements and to reduce and/or avoid any adverse environmental impacts.

The CEMP document will be revised if necessary to address, for example, any conditions stipulated in the planning permission should it be granted. The version presented here is to set out the fundamental work practices, construction management procedures, management responsibilities, mitigation measures and monitoring proposals that are required to be adhered to.

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(s) that details are updated with progress, including the roles and responsibilities of those appointed on the site for the construction of the project, if their respective roles change during the project.

While this version of the CEMP provides a benchmark for good practice, where avoidance or further minimisation of risks to the environment can be demonstrated through use of alternative methods or improvements to current practices, the Contractor will implement these wherever possible.

2 PROJECT OVERVIEW

The development proposed by Shronowen Wind Farm Limited (the Applicant), is a 12 No. turbine wind farm in the townlands of Tullamore, Coolkeragh, Ballyline West and Dromalivaun, Co. Kerry. The site of the proposed Wind Farm is situated within the rural locale between Listowel and Ballylongford in north County Kerry on an area of open low peatland east of the R552 Regional Road, approximately 4km southeast of Ballylongford village and 6km north of Listowel town.

The following sets out the elements of the project for which development consent is being sought and all other associated project components, which would be included within the scope of the CEMP.

Proposed Development for which consent is sought	• Twelve (12) No. Wind Turbines (maximum turbine tip height 150m) with associated foundations and crane hardstand areas. • One (1) No. Permanent Meteorological Mast (90m height) and associated foundation and hardstand area. • New and upgraded internal site service roads (4.43km of existing tracks to be upgraded and 6.85km of new internal access tracks to be constructed). • Underground 33kV electric cabling systems between turbines within the wind farm site and wind farm substation. • Six (6) No. peat deposition areas located across the wind farm site • Two (2) No. site entrances – one permanent and one temporary. • 225m underground cable connection from the 110kV wind farm substation to the existing 110kV transmission line due east of the wind farm site. • One (1) No. proposed 110kV substation including: an outdoor electrical yard, two single storey buildings (one for the system operator and one for the wind farm operator) containing associated facilities (control, switchgear and metering rooms, welfare facilities, workshop and office). Security fencing and all associated works. • New junction off the L-6021 at the north east of the site to facilitate construction and access. • New junction off the L-1009 on the west of the site to facilitate construction and access. • Two (2) No. Temporary construction site compounds (95m x 50m and 55m x 25m in size). • Associated surface water management systems. • Tree felling of 3.15ha of conifer trees to facilitate site development. • Temporary works on sections of the public road network along the turbine delivery route (including hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening).

The site layout is shown on in Figure 2.1 below and on **Planning Drawings 19876-MWP-00-00-DR-C-5005 to 5010**.

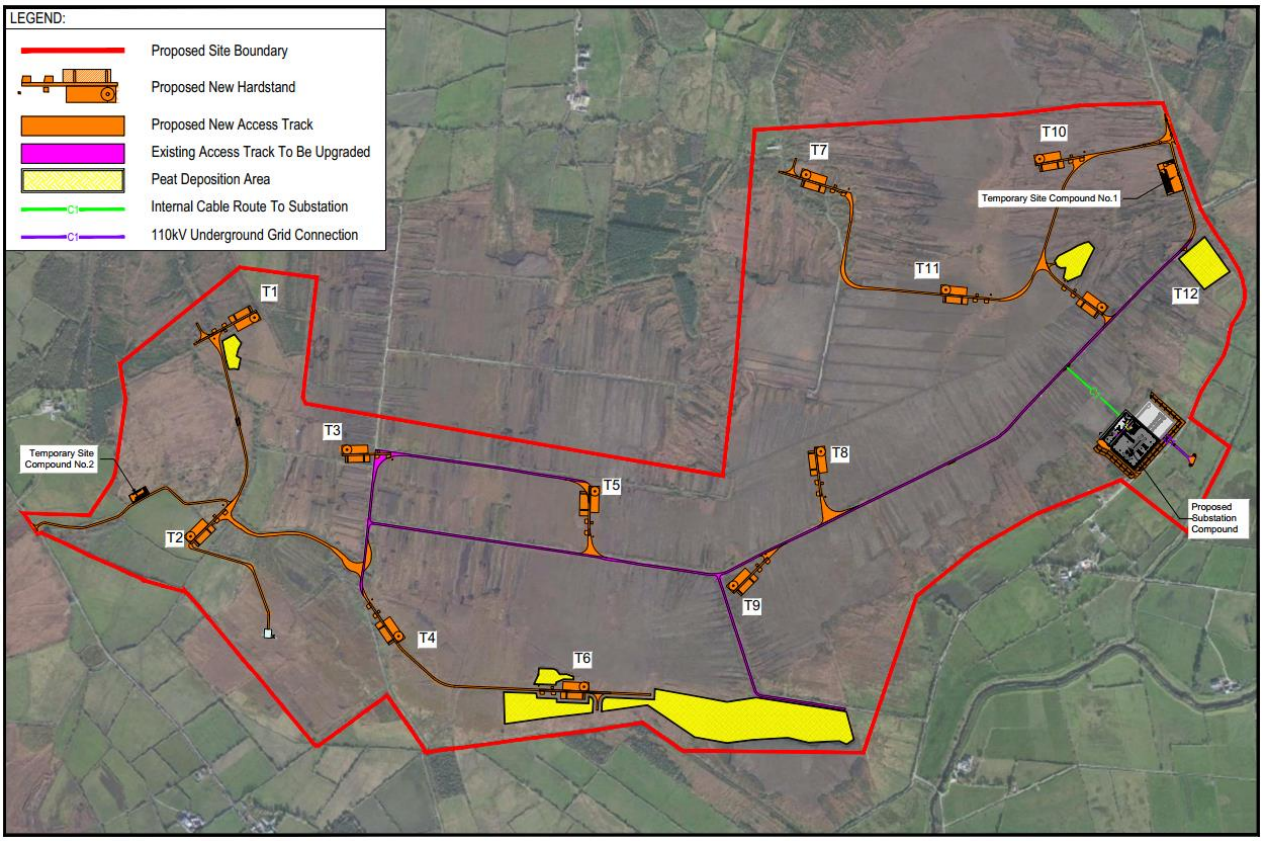


Figure 2.1 Site Layout

3 CONSTRUCTION WORKS

3.1 CONSTRUCTION SCHEDULE

The proposed project duration would be of the order of 18 months. The wind farm construction works will be phased as outline 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 will be prepared.
- Once the roads are completed, the trenching and laying of underground cables adjacent to the roads will begin.
- Construction of the site substation compound and substation buildings will commence so that they will be ready to export power as turbines are commissioned.

Table 3.1 Project Construction Schedule

Phase	Activity	Duration
Phase 1	Clear felling (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	Trenching and ducting (internal underground electrical collection system)	2 months
Phase 7	110kv Substation construction	4 months
Phase 8	Permanent meteorological mast erection	1 month
Phase 9	Under cable Connection to the existing 110kv Eirgrid line *(Alternative Grid Connection to Drombeg Substation)*	1.5 months *(3 months)*
Phase 10	Turbine delivery	3 months
Phase 11	Turbine erection	4 months
Phase 12	Wind Farm Commissioning	4 months
TOTAL		18 months

3.1.1 Working Hours

Construction is proposed to occur within the following hours:

- 7.00am – 7.00pm* (Monday – Saturday inclusive)
- 7.00am - 2.00pm* (Saturday)

There will be restrictions between these hours to facilitate the residents and ensure public safety.

* The working day may extend occasionally at times when critical elements of work need to be advanced. Longer working days will occur for concrete pours for turbine bases and for turbine erection works which may spill over into weekends depending on how low wind windows fall.

3.1.2 Personnel

It is expected that the construction works for the turbines will require at least 30-35 personnel including site contractors, engineers, materials delivery personnel, environmental personnel, health and safety personnel and the civil works for the cable route will require a further 3-5 personnel. The electrical works will require less heavy machinery but more labour personnel. It is likely that both the onsite civil and grid connection works will take place simultaneously.

4 CONSTRUCTION METHODOLOGIES

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

4.1 SITE PREPARATION AND PRE-CONSTRUCTION SURVEYS

4.1.1 Pre-Construction Surveys

Any detailed ground investigations, environmental surveys and archaeological testing required to support the construction process will be carried out and finalised.

4.1.2 Enabling Works

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

4.1.3 Tree Felling

Felling of circa 3.15ha of 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 at T1 and T7. It is proposed to fell to a distance of 93m around turbines (to mitigate against any disturbance to bat if present). The felling operation has the potential to generate significant amounts of contaminated runoff. This will be intercepted and treated as part of the site drainage system. Details of the drainage system which will be applied on site are given in Section 4.1.7.

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 in their '*Standards for Felling and Reforestation' (2019)*. The guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils. Any excess trees, brash and minor branch residues will be gathered from the site. Felling residue will be transferred to a truck for disposal via chipping or baling and removed from the site. Any requirements for replanting will be discussed and agreed with the Forest Service. All conditions associated with a proposed felling licence will be complied with.

4.1.4 Temporary Site Construction Compounds

Two temporary site construction compounds will be set up upon commencement of the construction phase. The 2 no. site compounds will have dimensions of approximately 95m x 50 m and 55m x 25m respectively as shown on **Planning Drawings 19876-MWP-00-00-DR-C-5407 and 5408**. The compounds will be used as a secure storage area for construction materials and also contain temporary site units to provide welfare facilities for site personnel. Facilities will include office space, meeting rooms, canteen area, a drying room and sanitary provisions.

The peat and excavated materials will be stored locally on a temporary basis and will be used for reinstatement following completion of the temporary construction compound works.

The compounds will be constructed early in the project in order to provide site offices and accommodation for staff and for the delivery of materials. Any surface water management, bunding, waste management measures etc will also be put in place at the outset. Site security will have to be put in place adjacent to the entrances and will have to be maintained throughout all phases of the work.

The compounds will typically be constructed as follows:

1) The areas to be used as the compounds will be marked out at the corners using ranging rods or timber posts.
2) Drainage runs and associated settlement ponds will be installed around the perimeter;
3) The compounds will be established using a similar technique as the construction of the excavated access roads;
4) A layer of geogrid / geotextile will be installed and compacted layers of imported crushed stone aggregate will be spread and lightly compacted to provide a hard area for site offices and storage containers;
5) The finished surface will be formed with a layer of Class 6F aggregate imported from local quarries.

Each of the site compounds will be graded and compacted out before the welfare container facilities are installed. A bunded containment area will be provided within the compounds for the storage of lubricants, oils and site generators etc. If necessary, the compounds will be fenced and secured with locked gates. During the construction phase, a self contained toilet block with a waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor(s) on a regular basis and will be removed from the site on completion of the construction phase.

Upon completion of the project the compounds will be decommissioned by backfilling the area with the material / peat arising during excavation and landscaping with topsoil as required.

Figure 4.1 Typical temporary site construction compound on a wind farm

4.1.5 Site Access

Access to the wind farm site during the construction phase will be from an existing entrance off the L-6021 Local road to the east of the site, and from a proposed new entrance off the L-1009 Local road to the west of the site. The western access onto the L-1009 Local road is only a temporary measure to be used during the early construction phase only. A large splay will be required at the existing entrance to facilitate turbine component deliveries. This splay will be coned off to a 10m radius for use by regular construction traffic upon completion of the works. The eastern entrance is proposed as the main access point to the wind farm until decommisioning. Access will also be required for the proposed substation compound via a proposed new access point from the L-6021 Local road.

4.1.6 Internal Access Roads

From the site entrances, an internal road network of existing and new tracks will service the infrastructure on site. Following construction, access roads will be maintained to provide long-term access for maintenance of the wind turbines.

The total length of internal access roads required to facilitate the site is 10.9km and is broken down as follows:

- 4.43km of existing tracks to be widened and upgraded,
- 6.85km of new access roads (excavated and floating) roads to be constructed,

Typical service road cross-sections are shown on **Planning Drawing 19876-MWP-00-00-DR-C-5403**, which includes details of each of the road types.

Widened / Upgraded Roads:

- 150mm thick imported limestone capping or similar layer on,
- Minimum 450mm thick imported stone aggregate on,
- Suitable geogrid or geotextile material or timber logs as required on,
- Existing access track / road build up where suitable.

Excavated Roads:

- Minimum 150mm thick imported limestone capping or similar layer on,
- Minimum 450mm thick imported stone aggregate on,
- Suitable geogrid or geotextile material as required where poor ground bearing occurs.

Floating Roads:

Option 1 – Stone and Geogrid Construction

- Minimum 150mm thick imported limestone capping or similar layer on,
- Minimum 450mm thick imported stone aggregate on,
- Suitable geogrid or geotextile material.

Option 2 – Timber Logs, Stone and Geogrid Construction

- Minimum 150mm thick imported limestone capping or similar layer on,
- Minimum 450mm thick imported stone aggregate on,
- Timber logs placed in orthogonal layers on,
- Suitable geogrid or geotextile material.

On the approach of access roads to public roads the gradient will be such that runoff from the access roads will not flow out onto the public road. Existing roadside drainage will be piped across the site entrances.

4.1.6.1 Widened and Upgraded Road Construction

Typical road construction and build-up for upgrading and widening existing access roads is as follows:

I. The appointed contractor will set out the extents of the area to be widened.
II. The material required for widening and upgrading the existing site roads will be sourced from external quarries. Sufficient passing bays will need to be constructed to allow for the safe movement of site traffic along the existing roads.
III. 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 and maintained for re-use during the restoration phase of the wind farm construction. Topsoil / vegetative removal will be kept to a minimum in order to prevent any runoff of silt during heavy rainfall.
IV. Excavators will continue to strip and excavate the soft subsoil / peat 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 2.0m until they are transported to the selected deposition areas where they will be permanently stored.
V. Once a section of the widened access road is marked out; a layer of geogrid or geotextile or timber logs will be placed over the existing track and extend to the widened areas.
VI. Imported stone aggregate 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 / timber logs. This will be compacted with the use of a roller which will roll the stone aggregate in maximum 250mm layers in order to achieve the required design strength.
VII. The road upgrading works will involve the use of a roller compacting the imported 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 in order to achieve the required design strength.
VIII. 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.
IX. Roadside drains will be constructed to manage clean and dirty water runoff along widened and upgraded access roads.
X. The final running surface of the new widened / upgraded access roads will be capped with a minimum 150mm layer of hard wearing Class 6F stone or similar using a road grader.
XI. Any surplus spoil material generated from the road widening works will be transported to the peat deposition areas to aid final reinstatement. Excavated topsoil and subsoil will be kept separate at the excavation and storage areas.
XII. All excavations to be carried out will be battered back to a safe angle of repose (minimum slope angle of 45°)
XIII. Where drop offs greater than 1.0m in height occur alongside road edges; physical edge protection will be constructed in order to reduce the risk of vehicles overturning. Roadside marker posts will also be erected to delineate road edges in poor weather.

XIV. The appointed contractor will ensure that all on-site personnel are aware of environmental constraints / sensitive areas (if present) within the wind farm site in which works are to be avoided. The NIS for the project can be used as the source for this information.

Figure 4.2 Typical upgraded forestry road on a wind farm

4.1.6.2 Excavated Road Construction

Typical road construction and build-up for new excavated roads is as follows:

I. The appointed contractor will set out the area of the proposed road.
II. 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 in order to prevent any runoff of silt during heavy rainfall.
III. Excavators will continue to strip and excavate the soft subsoil / peat 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.
IV. All excavations to be carried out will be battered back to a safe angle of repose (minimum slope angle of 45°).
V. 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 imported aggregate stone as required, compacted in maximum 250mm layers.
VI. The material required for construction of new excavated roads will be sourced from local quarries.

VII. Imported stone aggregate 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 in order to achieve the required design strength.

VIII. All new excavated access roads will be constructed to a minimum drivable width of generally 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.

IX. Roadside drains will be constructed to manage clean and dirty water runoff along excavated access roads.

X. The final running surface of the new excavated access roads will be capped with a minimum 150mm layer of hard wearing Class 6F stone or similar using a road grader.

XI. Any surplus spoil material generated from the excavated access road works will be transported to the peat deposition areas to aid final reinstatement. Excavated topsoil and subsoil will be kept separate at the excavation and storage areas.

XII. Where drop offs greater than 1.0m in height occur alongside road edges; physical edge protection will be constructed in order to reduce the risk of vehicles overturning. Roadside marker posts will also be erected to delineate road edges in poor weather.

XIII. The appointed contractor will ensure that on site personnel will be aware of environmental constraints / sensitive areas (if present) within the wind farm site in which works are to be avoided. The NIS for the project can be used as the source for this information.

Figure 4.3 Typical new excavated road on a wind farm

4.1.6.3 Floating Road Construction – Option 1 – Stone and Geogrid Construction

Option 1 floating access roads will generally be constructed as follows:

I. The appointed contractor will mark out the line of the proposed floated road using a GPS / total station;
II. 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.
III. 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 at all possible.
IV. 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.
V. 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.
VI. 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 over peat.
VII. Where there is a drainage requirement, suitably sized HDPE 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.
VIII. The material required for construction of new floated roads will be sourced from external quarries.
IX. Wide tracked 360° excavators will be used for constructing the floated roads by cascading a minimum 450mm thickness of imported stone aggregate over the geogrid / geotextile. The suitable imported stone aggregate should be suitably sized in order 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.
X. An additional layer of geogrid / geotextile may be placed over the stone aggregate if necessary, before a minimum capping layer of 150mm of Class 6F or similar material is laid out with excavators.
XI. 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.
XII. Roadside drains will be constructed to manage clean and dirty water runoff along floated roads.
XIII. Where drop offs greater than 1.0m in height occur alongside road edges; physical edge protection will be constructed in order to reduce the risk of vehicles overturning. Roadside marker posts will also be erected to delineate road edges in poor weather.
XIV. 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. 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.
XV. The appointed contractor will ensure that on site personnel will be aware of environmental constraints / sensitive areas (if present) within the wind farm site in which works are to be avoided. The NIS for the project can be used as the source for this information.

Figure 4.4 Option1 - Typical floated road on a wind farm

4.1.6.4 Floating Road Construction – Option 2 – Timber Logs, Stone and Geogrid Construction

Option 2 floating access roads will generally be constructed as follows:

I. The appointed contractor(s) will mark out the line of the proposed log road using a GPS / total station;
II. 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.
III. 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 at all possible.
IV. 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.
V. 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 log road.
VI. 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 log road construction over peat.
VII. Where there is a drainage requirement, suitably sized HDPE drainage pipes shall be laid on top of the installed geogrid / geotextile prior to the placement of the lumber. Cross drains will be laid at appropriate intervals to maintain the existing drainage regime on the site.
VIII. The material required for construction of new log roads will be sourced from on site (eg felled trees from T1 area) or imported from external sources.
IX. Timber logs are then placed in rows perpendicular to the road direction through the use of excavators and forestry equipment on top of the geogrid/ geotextile placed on the existing ground.

X. Vertical sections of lumber are then driven at generally 6m spacings into the peat. These are to prevent the upper layer from rolling off the base layer and their spacing will be dictated by the length of the lumber in this upper layer.

XI. The upper layer is then placed on top of the bottom layer but this time parallel to the road direction.

XII. A geogrid/ geotextile layer is then rolled by hand along this upper layer.

XIII. Wide tracked 360° excavators will be used for constructing the floated roads by cascading a minimum 450mm thickness of imported stone aggregate over the geogrid / geotextile. Suitable stone aggregate should be suitably sized in order 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.

XIV. An additional layer of geogrid / geotextile may be placed over the stone aggregate if necessary, before a minimum capping layer of 150mm of Class 6F or similar material is laid out with excavators.

XV. All log roads will be constructed to a minimum drivable width of generally 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.

XVI. Roadside drains will be constructed to manage clean and dirty water runoff along floated roads.

XVII. Where drop offs greater than 1.0m in height occur alongside road edges; physical edge protection will be constructed in order to reduce the risk of vehicles overturning. Roadside marker posts will also be erected to delineate road edges in poor weather.

XVIII. 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. 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.

XIX. The appointed contractor(s) will ensure that on site personnel will be aware of environmental constraints / sensitive areas (if present) within the wind farm site in which works are to be avoided. The NIS for the project can be used as the source for this information.

Figure 4.5 Option 2 -Typical floated road using Timber Log Construction on a wind farm

4.1.7 Site Drainage System

A site drainage system will be constructed on the site so as to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The drainage system will be implemented along all internal site access roads, storage areas, crane hardstand areas and site construction temporary compounds. Details of the proposed site drainage system are given in **Planning Drawings 19876-MWP-00-00-DR-C-5011 to 5016.**

The drainage system will be excavated and constructed in conjunction with the road and crane hardstand construction.

The concepts and details pertaining to the drainage philosophy are included in the Surface Water Management Plan, which is included in **Chapter 3 of the EIAR** prepared as part of this planning application.

The following gives an outline of drainage management arrangements:

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 road sides, with road surfaces sloped towards dirty drains.

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.

Measures addressed in the drainage design include:

- Check dams will be placed at regular intervals, based on slope gradient, along all drains to slow down runoff and to encourage settlement and to reduce scour and ditch erosion.
- Consideration will be given to the use of check dams constructed in accordance with best practice utilising clean stone at points along the drainage channel during the construction phase to further mitigate against any sediment escaping to nearby watercourses.
- Low gradient drains will be provided. These reduce the velocity of flow in the drains, thus reducing soil and subsoil erosion and reducing hydraulic loading to watercourses.
- Where possible existing drains will remain untouched.
- Regular buffered outfalls that consist of numerous small drains off the main drain which end by fanning out into the surrounding vegetation by tapering drains. The drain will contain hardcore material to entrap suspended sediment.
- Drains carrying construction site runoff will be diverted into settlement ponds, which will promote sediment deposition and reduce hydraulic loading by slowing flow velocities allowing sediment to settle. Settlement ponds have been designed in the form of a three-stage tiered pond system. The design of the settling pond system for the site is detailed in the **Planning Drawing 19876-MWP-00-00-DR-C-5404 and 5405**. These will be maintained by the contractor(s) to the satisfaction of Inland Fisheries Ireland for the entire construction period.

- Flow from the settlement ponds will enter the sediment traps where runoff will be cleaned further by a series of graded gravel filters. Silt traps will require regular inspection and cleaning and removed material will be disposed of at an appropriate location.
- Drainage ditch outfalls from silt traps will discharge at regular intervals to mimic the natural hydrology by encouraging percolation and by decreasing individual hydraulic loadings from discharge points. The drainage ditches will flow onto the existing ground by fanning out onto the surrounding vegetation via tapering drains.
- The access roads will be graded so that all runoff is directed to the dirty water drains. A low mound will be constructed between the road and the clean water drain to ensure that runoff from the road cannot flow into the clean water system.
- No disturbance will be permitted to the natural vegetative buffer. They can be fenced where necessary.

Best practice and practical experience on other similar projects suggests that in addition to the above outlined drainage plans there are additional site based decisions and plans that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. In relation to decisions that are made on site it is important to stress that these will be implemented in line with the associated drainage controls and mitigation measures outlined above and to ensure protection of all watercourses.

4.1.8 Drainage / Stream Crossings

None of the works within the wind farm will cross any watercourse mapped by the OSI but crossings will occur over existing drains. See **Planning Drawing 18976-MWP-00-00-DR-C-5407** for typical details and Surface Water Management Plan, which is included in **Chapter 3 of the EIAR** for further information on proposed drainage measures.

Where the crossing of an existing natural or artificial drainage / stream channel is unavoidable, a suitable crossing will be implemented. Typically, this will be in the form of precast concrete or HDPE pipes. All crossings will cater for a minimum 1 in 100 year return rainfall event. The invert of the pipe is submerged approx $^{1}/_{4}$ 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 4.6 below. New turbine service roads will be required to cross several minor drains / streams within the site. All such crossings and widening will be agreed with Inland Fisheries Ireland prior to construction. All construction method statements for crossings will be approved by Inland Fisheries Ireland.

Figure 4.6 Typical drainage channel crossing

4.1.9 Traffic Management

Material required for the construction of the roads, crane hardstands and the substation compound will come from local quarries. Material to be delivered to site will consist of stone aggregate for the construction of access roads and hardstands, limestone capping material for the capping of roads and hardstands, and reinforced concrete for the construction of the 12 no. turbine bases. It is anticipated that a succession of 20T and/or 8m³ trucks will transport the material at a peak frequency of 8 to 12 trucks/hour. Peaks in construction traffic are typically associated with the pouring of turbine foundations. Specialist vehicles will be used for the delivery of the wind turbine components and substation transformers.

The vast majority of construction deliveries for the wind farm site will be via the L-1009 Local Road, the L-6021 Local Road, the N69 National Secondary Road, the R551 Regional Road and the R552 Regional Road.

A Traffic Management Plan, which is included in **Appendix 2-2 of Volume 3 of the EIAR** can be viewed for further information on proposed traffic management.

4.1.10 Peat / Excavated Material Deposition Areas

It has been calculated that there will be approximately 207,376m^3 of material excavated during the construction of Shronowen Wind Farm.

In the first instance, excavated peat and spoil will be reused for the backfilling, landscaping and restoration around wind farm infrastructure such as turbines and hardstands. Berms will be formed along sections of floated roads in order to store an additional volume of excavated peat. These berms will also act as a physical edge protection measure to prevent vehicles falling off the raised floated road edge. This

form of storage will be provided on both sides of the internal floated roads where the overall dimensions of the berms will generally be 1m high by 2.5m wide.

The remainder of the surplus excavated peat and spoil material will be stored within the 6 no. on site deposition areas. The deposition areas will be filled with peat where an engineered retaining rockfill berm will be formed on the perimeter of each area. Construction of the initial outside retaining berm will take place using the 'excavate and replace' methodology with the excavated peat being side cast to the inner edge of the berm footprint. The deposited peat will be bound in cells and landscaped at a nominal fall in order to maintain the existing rainfall catchment regimes. Additionally, storage will be provided for peat that is stripped at the deposition areas.

4.1.11 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. Hardstands are also used for maintenance during the operation of the turbine. The hardstands will be rectangular in shape with additional minor hardstand fingers to lay the turbine blades across once delivered. The area of a single hardstand is approximately 62.5m long by 25m wide. Refer to **Planning Drawing 19876-MWP-00-00-DR-C-5401** for further details. Hardstands for support cranes are also required. The two support crane hardstands included measure approximately 10m x 12m in area. A typical layout of a hardstand is shown in Figure 4.7.

Significant loads will be imposed on the crane hardstands by the outriggers of the lifting crane during the turbine erection process. The hardstands need to withstand the high bearing pressures from these cranes. The peat onsite will not provide strong enough resistance to these loads. For this reason, the peat will either need to be removed and replaced with compacted stone or the hardstand will need to be piled such that the loads are transferred to a stronger material under the peat. Both options are described below.

4.1.11.1 Turbine Hardstand Construction – Option 1 – Removal of Peat

The proposed works will be restricted to the turbine locations and will comprise the following in areas where sheet piling is not required (typically where peat is less than 3m in depth):

I. Temporary berms are constructed around the perimeter of the proposed crane hardstand by removing the peat and replacing with stone fill. The berm is only required where peat is greater than 1.5m in depth. The side of the excavation is sloped to a safe stable angle without a berm where peat is less than 1.5m
II. Excavation then takes place within the hardstand area to a competent subgrade of the underlying subsoil / rock.
III. The excavated material is removed to peat deposition areas or used as berms alongside the roadside.
IV. The excavation is then filled with a suitable imported stone aggregate, obtained from external quarries, laid on a geotextile filter membrane. The top layers of the crane hardstanding will be formed from imported Class 6F2 fill.
V. The imported stone aggregate will be compacted in 250mm layers and will vary in depth depending on the depth of peat and gradient of the underlying subgrade.
VI. Temporary set down areas will be formed to facilitate the storage of the turbine components at each crane hardstand (e.g. the rotor hub assembly, the turbine blades, the turbine towers and

nacelle). The temporary lay down areas will be cleared of vegetation, graded and generally left unfinished. Some sections of the lay down area will be surfaced using compacted stone aggregate. These sections will be recovered with soil after all turbines have been erected.

VII. 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.

Figure 4.7 Typical finished hardstand on a wind farm

In areas of larger peat depth typically greater than 3.0m, the use of sheet piling would be considered to reduce the excavated quantities and safety risk associated with large excavations. The typical methodology for this approach is as follows:

I. Temporary sheet piling platform/mats are set up along the perimeter of the hardstand. Sediment control measures are set up also. The sheet piles are then installed from this mat/platform. See typical images of this process in Figure 4-8 to Figure 4-11.

II. Excavation of peat from within sheet piled cofferdam. As each load of peat is removed to a suitable formation, it is replaced with crushed rock, excavate and replace methodology, along the inside edge of the sheet pile wall to provide support to the sheet piles prior to carrying out bulk excavation in the central area of the cofferdam, Figure 4-10. Sediment control measures put in place prior to commencement of excavation.

III. Excavation is then advanced towards the central area of the sheet pile cofferdam using the traditional excavation methodology, Figure 4-11. This may occur while stage II is ongoing. Pumps are used to keep the excavation dry with the pumped water being passed through a silt pond or through silt traps prior to discharge. Each crane hardstand is excavated to a formation on competent subgrade of the underlying subsoil / rock which will comprise of imported stone aggregate, obtained from external quarries, laid on a geotextile filter membrane. The top layers of the crane hardstanding will be formed from imported Class 6F2 fill. The excavated material is removed to material storage areas or used as berms alongside the roadside.

IV. The imported stone aggregate will be compacted in 250mm layers and will vary in depth depending on the depth of peat and gradient of the underlying subgrade.

V. Temporary set down areas will be formed to facilitate the storage of the turbine components at each crane hardstand (e.g. the rotor hub assembly, the turbine blades, the turbine towers and nacelle). The temporary lay down areas will be cleared of vegetation, graded and generally left unfinished. Some sections of the lay down area will be surfaced using compacted stone aggregate. These sections will be recovered with soil after all turbines have been erected.

VI. 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.

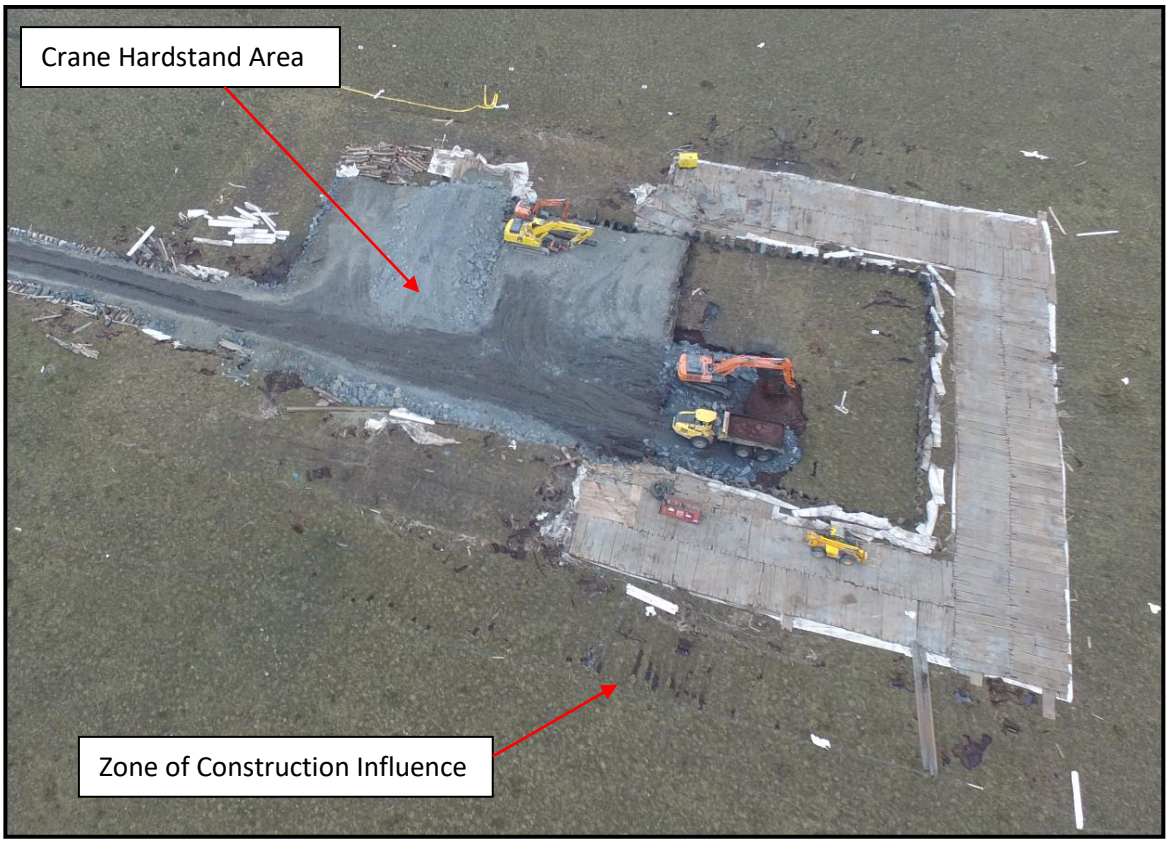


Figure 4-8 Photo of typical zone of construction influence around a hardstand in deep peat

Figure 4-9 Sheet Pile Installation

Figure 4-10 Excavating beside the Sheet Pile Cofferdam

Figure 4-11 General Excavation towards the centre after fill is placed beside the sheet piles

4.1.11.2 Turbine Hardstand Construction – Option 2 – Piling Through Peat

In areas where the peat depth is excessive or space constraints are present, a piled/floated hardstand method may be adopted. This is to mitigate against the excavation of peat and thereby avoid the risk of sediment release posed by the works. The crane outriggers are placed on platforms which are supported by piles due to the crane outriggers' high loads while general traffic can be supported by the remaining floated areas of the hardstand. This platform can be a large single pad or split into four smaller pads, see Figure 4-12 for an example of a floating piled hardstand with 4 No. platforms for the crane outriggers. This system involves:

I. Installing a layer of geo-grid/geotextile directly onto the top of the existing organic layer.
II. Placement and compaction of a layer of well graded coarse stone including additional layers of geogrid/geotextile if deemed necessary by the designers.
III. Placement of a finer well graded stone for the top surface.
IV. Installation of concrete piles at a determined spacing on the hardstand which coincide with the proposed outrigger locations for the crane. These piles could be driven or bored.
V. Concrete pads are then cast on top of the piles and will typically be 4m x 4m in area and 0.6m deep. The pads are cast within shuttering to avoid concrete escaping into the surrounding area.
VI. Shuttering is removed when the concrete reaches a predetermined strength and aggregate backfilled.

Figure 4-12 Typical Floating / Piled Hardstand Option

4.1.12 Turbine Bases

It is proposed that the 12 No. wind turbines will have a reinforced concrete base with a central pedestal above the base that will in turn support the wind turbine tower. The concrete base will bear onto rock, imported 6N fill to a suitable depth using a spread foundation or sit on a piled foundation. Further ground investigation will be required prior to detailed design to inform the foundation design. A worst case of 8m excavation for spread turbine bases has been assessed. Piled foundations have also been assessed to cater for situations where spread foundations cannot be used. Details of peat depths are provided in the Peat Stability Risk Assessment included in **Volume 3 Appendix 6-A of the EIAR**.

A typical spread foundation will be approximately 28m in diameter and will generally be installed to a depth of approximately 3.0m below grade. Approximately 800m^3 of concrete and 85 tonnes of steel will be used in the construction of each turbine base.

A typical piled foundation consists of a ring of piles around the edge of the base. Piles are typically auger bored, 750mm in diameter, made from reinforced concrete. The depth of the piles is dictated by the depth to a solid stratum. The final dimensions of the turbine bases will be determined as part of detailed engineering design at pre-construction stage following confirmation of the turbine supplier and by using detailed geotechnical data (including boreholes) that will be conducted at each turbine location. A conservative base size of 28m diameter, i.e. the same as that for the spread foundation, has been assessed to capture a worst-case.

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 peat found within the footprint of the turbine base will be excavated out during the course of formation works at the adjacent crane hardstand area. The excavation works will be carried out using hydraulic excavators where surplus peat / 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 peat deposition areas. Sheet piling may also be considered for some of the formations but is dependent on the depth of peat present at each respective location. The methodology for this is similar to that for the crane hardstands.

III. Standing water in turbine base excavations is likely to contain an increased concentration of suspended solids. Dewatering of turbine base excavations can result in significant flow rates to the drainage and settlement system if high capacity pumps are used. In order to avoid the need for pumping it is proposed to provide drainage channels from the excavations so as 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. Sediment control measures will be provided to prevent siltation;

IV. The excavated surface will be levelled and adequate drainage measures will be put in place along with suitable set back areas to facilitate placing of stone and ultimately the erection of shuttering for the turbine base;

V. In the event that poor ground conditions are encountered during confirmatory ground investigations and a significant depth to sub-formation is required, a piled foundation may be considered. A piled foundation requires the use of specialist piling equipment which typically uses an auger drilling technique. A number of holes are drilled around the area of the turbine base to the suitable sub-formation depth determined at detailed design stage. The piles typically extend 2 to 4m into competent rock. Once all the holes have been bored, reinforcement steel is inserted into each with concrete poured afterwards.

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

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

VIII. 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;

IX. 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;

X. Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required;

XI. The foundation anchorage system will be checked both for level and line prior to the concrete being poured in the base. These checks will be passed to the turbine supplier for their approval;

XII. Ready-mix concrete will be delivered to each turbine base by a fleet of ready-mix concrete trucks via the internal access roads. Concrete will 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;

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

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

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

XVI. The foundation will be backfilled using material arising during the excavation where possible and the surrounding area landscaped using the vegetated soil set aside during the excavation. A gravel access track will be formed from the main access track and hardstand to the turbine door and around the turbine for maintenance.

A Traffic Management Plan, which is included in **Appendix 2-2 of Volume 3 of the EIAR** can be viewed for further information on proposed traffic management.

Figure 4.13 Typical construction of a wind turbine base

4.1.13 Internal Site 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 proposed substation compound by underground electrical cables.

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 typically be installed on top in order to protect and identify the cable trench underneath. The typical build-up for the internal site cable trenches will consist of selected excavated backfill on top of bedding material that will be specified by the electrical designer at construction stage. 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 in order 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 else it will be deposited within the proposed on-site deposition areas following their reinstatement. In areas of poor strength, the bedding material will be wrapped in a

geotextile, and for timber log roads the cable will sit within the structure of the road to avoid the need to excavate peat.

Where an open drain is encountered during the installation of the internal site cable trenches; the cable trenches will cross the open drain within the road carriageway via new or existing road crossing points to ensure that no in-stream works occur. 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 may be placed over the cable trench with a marker post installed on top in a secure and robust manner so as 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.

4.1.14 Substation Compound and Buildings

The development is proposed to include a substation compound within the proposed development lands. The substation compound will contain two buildings, connection points and associated equipment, incoming and outgoing circuit breakers, earth fault, over-current and other protection devices, metering equipment and other items of switchgear for exporting power from the wind farm via either an underground grid connection to the existing 110kV transmission line located to the east of the site.

The substation compound will be accessed via a proposed new access point from the L-6021 Local road. The compound will consist of two sections, one for the Transmission System Operator (TSO), which is EirGrid, and one for the Independent Power Producer (IPP), which is for the operator of the wind farm. The TSO section comprises of an EirGrid substation building, external electrical equipment and a hardstand area while the IPP section will comprise of an IPP substation building, external electrical gear (such as a transformer) and a similar hardstand area.

The EirGrid substation building within the TSO section of the compound will be made up of a control room, a battery room, a generator room, a store room, an office / canteen and a toilet. The EirGrid substation building will be 440m^2 in area. The IPP substation building within the IPP section of the compound will be made up of a store room, a control room, a switchgear room and a toilet. The IPP substation building will be 111m^2 in area.

The external doors for both buildings will be flat steel with a three-point locking system and wind restraints. The floors of each building will consist of a concrete slab with ducts to house electrical cabling. Each building will have a dark coloured, pitched tile roof with a plastered external finish that may be painted to an agreed colour to minimise visual impact. The discharge from the toilet within each building will go to a holding tank located within the substation compound where the effluent will be temporarily stored and removed at regular intervals. Parking for each building will be located within the compound area.

The daily average wastewater production during the operational phase is estimated from the average number of workers on site, which is expected to be a maximum of two workers, resulting in a typical wastewater production rate of 60 litres per day. The wastewater generated during the operational phase will be managed by a holding tank which is of twin-hull design and fitted with an alarm to indicate levels and when it is due for empty. The holding tank will be emptied by a permitted contractor only.

The substation compound will be surrounded by a hardstand area for storage and parking etc. covering an area of approximately 1.35 hectares. The substation compound and buildings will be contained within 2.6m high galvanised steel palisade fencing. Access to the fenced off compound shall be through similar styled palisade double gates. Landscaping will be provided with 4.5m high screening bunds formed around the southern, eastern, and western elevations of the substation compound. Layout drawings of the proposed substation compound and associated buildings are provided in the planning drawings accompanying this planning application (see **Planning Drawings 19876-MWP-00-00-DR-C-5409 to 5413**).

The substation compound as well as the two substation buildings will be constructed by the following methodology:

I. 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 in order 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;
II. 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 for later use in landscaping. All remaining excavated material will be brought to the on-site deposition 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;
III. 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;
IV. All soils/peat on the substation site will be removed and replaced with imported compacted crushed rock or granular fill;
V. Formation of the substation compound will be achieved where the compound will be constructed with compacted layers of suitable hardcore;
VI. The foundations for both substation buildings will be excavated down to the level indicated by the designer and appropriately shuttered. Reinforced concrete will be laid over it;
VII. The blockwork walls for each building will be built up from the footings to (damp proof course) DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow-on mechanical and electrical contractors;
VIII. The blockwork will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the two buildings for this operation;
IX. The concrete roof slabs will be lifted into position using an adequately sized mobile crane;
X. The construction and components of the substation buildings will be to EirGrid and ESB Networks specifications;
XI. 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;
XII. Installation of a domestic wastewater holding tank to hold effluent from the toilets within the substation and control buildings;
XIII. Installation of a Class 1 full retention oil separator to collect and treat oil spills within the substation compound;
XIV. Installation of a rainwater harvesting tank to collect rainwater from the roofs of the substation buildings for toilet flushing and hand washing;

XV. Commencement of civil works associated with the construction of the transformer bund, equipment plinths etc. within the substation compound;

XVI. Commencement of civil works associated with construction of underground cable ducts and trenches within the substation compound;

XVII. Installation of electrical equipment within the substation compound and buildings including transformers, busbars, circuit breakers, cable supports, switchgear, panels etc. and all associated cabling; and

XVIII. Installation of palisade fencing and associated gates to perimeter of the substation compound.

Figure 4.14 Typical substation building

Figure 4.15 Typical substation compound

4.1.15 Meteorological Mast

A permanent meteorological mast is proposed for the site to monitor the wind regime while the wind farm is in operation. The mast will be located close to T2 and T4 in an area of cut-away peat. The meteorological mast will be installed to a height of up to 90m which will be representative of the hub height of the turbines. The meteorological mast will be surrounded by a galvanised steel palisade fence, 2.4m in height. Details of the meteorological mast are shown in **Planning Drawing 19876-MWP-00-00-DR-C-5402.** Excavated material will be used for backfill/adjacent landscaping or will be relocated to the on-site deposition areas.

Figure 4.16 Typical meteorological mast on a wind farm

4.1.16 Turbine Delivery

The components for the 12 no. turbines will be delivered by cargo ships to Foynes Port in County Limerick. The components for each turbine will be delivered in separate loads, some of which are abnormal in terms of their width and length. The components will be transported from Foynes Port to the site along the national, regional and local road network.

Pre and post-construction surveys will be carried out 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.

A permit for moving abnormal loads to the wind farm site will be sought from An Garda Síochána and the applicable local authorities on the selected haulage route with a transportation plan for the time of deliveries established at construction stage.

Refer to **Appendix 3-1 of Volume 3 of the EIAR** for a detailed description of the proposed turbine delivery route from Foynes and its transport assessment.

The road route for starting at Foynes Port, which is shown on **Planning Drawing 19876-MWP-00-00-DR-C-5018**, is as follows:

I. Starting at Foynes Port;
II. N69 National Secondary road to the R551 Regional road at Tarbert;
III. Tarbert to the Junction of the R551 Regional road / L-6021 Local road at Cross of the Wood;
IV. L-6021 Local road to the site entrance at Shronowen.

The existing site entrance to the wind farm on the L-6021 Local road will require widening on its northern side to allow the long turbine component loads to turn south at this point. The widened area of the junction will be cordoned off to a radius of 10m for normal traffic and the space will only be made available specifically for turbine delivery. Following completion of the project the widened area will remain in place by cordoning off the area with a permanent fence installed to a 10m junction radius. This area will only be made available for any replacement turbine component deliveries. The position of this permanent fence will be consistent with the junction sight distance requirements as outlined in Chapter 3 of the EIAR. The design of the widened junction for the turning movement of the longest load, which is the turbine blade truck, has been verified using swept path analysis software.

The majority of the turbine delivery route will follow National Secondary and Regional roads as described. There may be a requirement, pending final confirmation of the transport delivery configuration at construction stage, for the temporary removal of road signage and/or temporary widening of grass road verges in order to cater for the swept path of these abnormal delivery vehicles. The developer will consult with the Road / Area Engineers of the relevant local authorities to temporarily remove any road signage and provide temporary grass verge widening where this may be required.

4.1.17 Turbine Erection

The erection of turbines will occur in the last month of the construction phase. The erection of turbines is typically 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 and hub. Once the nacelle and hub is in place, the blades are added to the hub in a series of single blade lifts. The turbine erection process is a carefully managed and precise 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 Kerry 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 is to 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.

4.1.18 Wind Farm Commissioning

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

4.1.19 Grid Connection

To facilitate a grid connection and export of renewable electricity to the National Electricity Grid (NEG), the proposed wind farm will connect to the existing 110kV transmission line to the east of the site by means of an underground grid connection from the proposed wind farm substation. The final selected grid route and connection strategy will be confirmed by way of a future grid connection offer process and as determined by EirGrid.

The construction techniques and methodologies which will be implemented during construction of the proposed Shronowen Wind Farm 110kV grid connection are detailed below.

4.1.19.1 Option 2 - Substation Compound, Buildings and Underground Cable Connection

The substation compound and buildings construction steps are as per those discussed in Section 4.1.14.

The underground grid connection along the public road between the proposed substation and the permitted Drombeg substation will be carried within a single cable trench which will be approximately 1.25m in depth and 0.6m in width. Photographs of typical cable installation works on public roads are shown in **Figure 4-17** to **Figure 4-19**. The photographs show typical trenching operations for a cable laid longitudinally along a roadway, however the option proposed in the planning application only involves a trench across one section of local road and is small in scale. The installation will involve the following process:

- Prior to works commencing, the area where excavations are planned will be surveyed and all existing services will be confirmed. A road opening licence will be obtained where required from Kerry County 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 Kerry County Council 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 traffic management plan will be prepared by the appointed contractor and agreed with Kerry County Council. A traffic management plan is included in Volume 3 Appendix 2-2 to this EIAR.
- During construction works, the trench will be excavated down through the existing stone in the road using an excavator machine. 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 appropriately 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 stone material is placed over the concrete surround and filled back up to the top of trench. Suitable warning tapes will also be installed in the trench. Once the trench is filled, the trenching and ducting process will move along the road in planned stages.
- The trench surface receives a temporary surface dressing of either spray and chip or macadam. Once the overall scheme is completed, the underground cable route and associated road areas will receive a new permanent macadam finish as agreed with Kerry County Council.
- Joint bays are to be installed where required along the cable 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 Kerry County Council.
- Directional drilling will be used where there is insufficient cover on a bridge or culvert crossing to allow the grid connection route pass over the crossing in a standard trefoil formation. 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 Kerry County Council.
- The as-built location of the ducting will be surveyed using a total station / GPS. Marker posts will be installed along the grid connection route to also denote the location of ducting on the ground.
- A condition survey will be carried out on the roads impacted by the 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 4-17 Typical excavation works for a grid connection cable trench on public road

Figure 4-18 Typical ducting installation works for a grid connection cable trench on public road

Figure 4-19 Typical permanent reinstatement works for a grid connection cable trench on public road

4.1.19.2 Duration of construction for grid route options

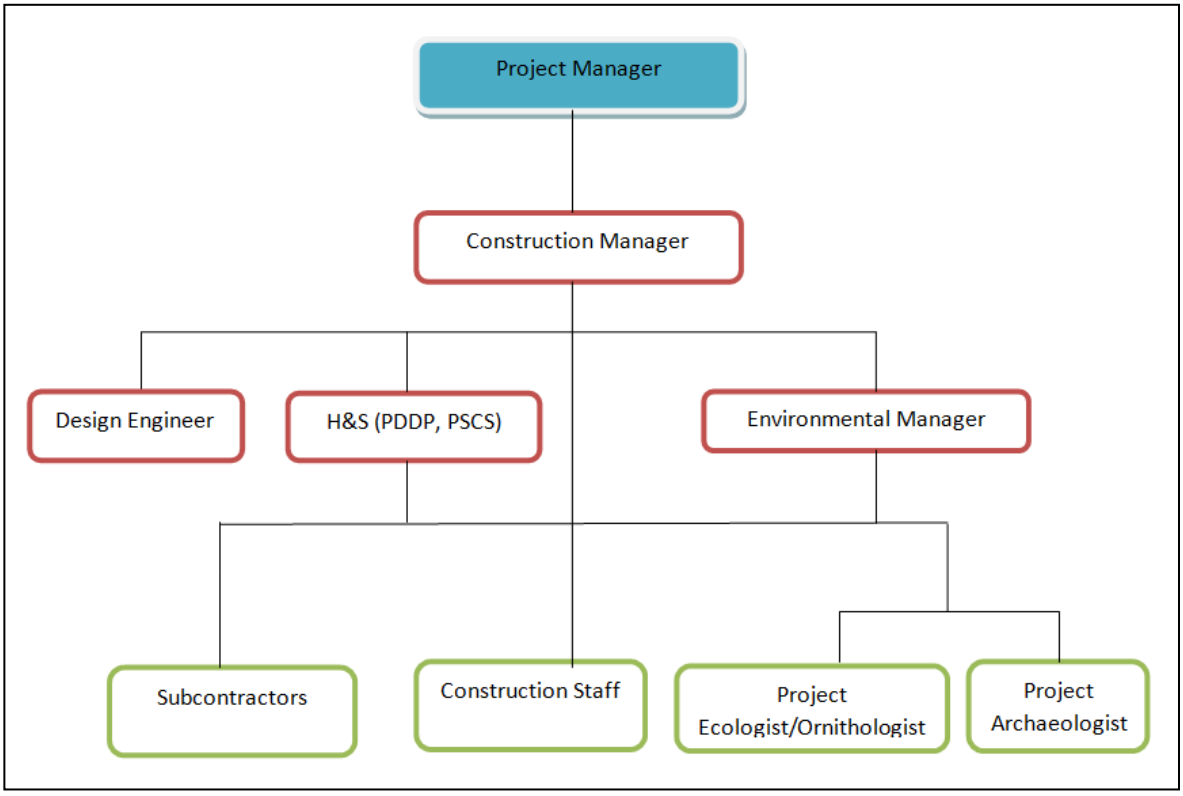
Overall the works for the cable route are estimated to take approximately 2 months. During the first 6 weeks, masts will be constructed in the field on the opposite side of the road to the proposed substation. During the last two weeks, overhead lines will be installed on the new masts.

5 CONSTRUCTION & ENVIRONMENTAL MANAGEMENT - ORGANISATIONAL STRUCTURE, DUTIES & RESPONSIBILITIES

5.1 ON SITE ORGANISATIONAL STRUCTURE AND RESPONSIBILITY

An example of an Organisational Structure for the Appointed Contractor(s)'s Project Team is included below. This structure will be defined by the Appointed Contractor(s) and will include the names of the assigned personnel with the appropriate responsibility and reporting structure reflected.

The Appointed Contractor(s) will be *required to finalise the Organisational Structure* for the project to oversee this CEMP and to outline the specific responsibilities for the roles required.



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.

Other roles may be outlined as follows;

- Health and Safety (PSDP and PSCS)
- Project Archaeologist (report to the Environmental Manager)
- Project Ecologist / Ornithologist (report to the Environmental Manager)
- Geotechnical Engineer (as required by Design Engineer)

The roles and responsibilities outlined below are indicative and will be updated on the appointment of the main contractor(s). Details of the personnel and their responsibilities must be added to the CEMP. *An outline of potential roles is provided below but will require revision.*

5.2.1 Project Manager

To be updated upon appointment of Contractor(s)/finalisation of CEMP

Name: _____

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

To be updated upon appointment of Contractor(s)/finalisation of CEMP

Name: _____

The Construction Manager manages all the works to construct the project, on behalf of the main contractor(s). 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 Control Measure 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 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 main contractor(s)'s project staff; and
- Ensuring that the Environmental Manager performs regular and frequent environmental site inspections.

5.2.3 Design Engineer

To be updated upon appointment of Contractor(s)/finalisation of CEMP

Name: _____

The Design Engineer is appointed by the Contractor(s) for the works.

The Design Engineer reports to the Project Manager and 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

To be updated upon appointment of Contractor(s)/finalisation of CEMP

Name: _____

The Environmental Manager is appointed by the Contractor(s) and reports to the Project Manager.

The Environmental Manager is responsible for:

5.2.4.1 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;
- Liaising with the Project Team in assigning duties and responsibilities in relation to the CEMP to individual members of the main contractor(s)'s project staff;
- Implementing the environmental procedures 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; and
- Auditing the construction works from an environmental viewpoint

5.2.4.2 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 should 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.

5.2.4.3 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 should 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.

5.2.4.4 *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); and
- 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.

5.2.4.5 *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 respect to waste disposal.

5.2.4.6 *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 main contractor(s)'s senior management and subcontractors.

5.2.4.7 *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.

5.2.4.8 *Environmental Induction Training and Environmental Tool Box Talks*

- Ensuring that Environmental Induction Training is carried out for all the main contractor(s)'s site personnel. The induction training may be carried out in conjunction with Safety Induction Training; and

- Providing Tool Box Talks on Environmental Control Measures associated with Site-specific Method Statements to those who will undertake the work.

5.2.4.9 Environmental Incidents/Spillages

- Prepare and be in readiness to implement at all times an Emergency Response Plan;
- 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.

5.2.4.10 Site environmental inspections

- 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 a daily inspection of the bunded areas and site drainage system;
- Appending copies of the inspection reports to the CEMP and
- Liaising with the Construction Manager to organise any repairs or maintenance required following the daily inspection of the site.

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(s) in line with the Construction Regulations:

- carrying out duty of Project Supervisor Construction Stage (PSCC);
- responsible for safety induction of all staff and personnel on site;
- implementing the Health and Safety Plan
- auditing and updating the Health & Safety Plan; and
- all other required legal duties.

5.2.5.2 Project Archaeologist

To be updated upon appointment of Contractor(s)/finalisation of CEMP.

The Archaeologist may 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; and
- liaison with the Project Manager/client/developer.

5.2.5.3 Project Ecologist

To be updated upon appointment of Contractor(s)/finalisation of CEMP.

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

- ensuring implementation of ecological mitigation measures;

- advising on re-vegetation onsite; and
- monitoring of success of re-vegetation.

5.2.5.4 *Project Ornithologist*

To be updated upon appointment of Contractor(s)/finalisation of CEMP.

The Ornithologist may 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.
- Consultations with National Parks and Wildlife Service (NPWS).

5.2.5.5 *Geotechnical Engineer*

To be updated upon appointment of Contractor(s)/finalisation of CEMP.

The Geotechnical Engineer may 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

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(s) 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(s) Contacts

Position Title:	Name:	Phone:	Email:
Main Contractor(s)			
Project Manager			
Construction Manager*			
Design Engineer			
Environmental Manager*			
Safety (PSCS)*			
Safety Officers*			
Site Emergency Number*			
Project Ecologist/Ornithologist			
Project Archaeologist			
Overall Project PSDP			

*24 hour contact details required

5.3.2 Employer Contacts

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

5.3.3 Third Party Contacts

Organisation:	Position:	Name:	Phone:	Email Address:
Inland Fisheries Ireland				
National Parks and Wildlife Service				
Environmental Protection Agency				
Kerry County Council				
Department of Culture, Heritage and the Gaeltacht				
Health and Safety Authority				
Emergency Services				
Other, as appropriate.				

6 ENVIRONMENTAL COMMITMENTS

6.1 SCHEDULE OF ENVIRONMENTAL REQUIREMENTS (MITIGATION MEASURES)

A number of Environmental Commitments, in the form of mitigation measures, were identified in the project EIAR. These commitments are summarised in a Schedule of Environmental Mitigation in Chapter 17 of the EIAR.

The Appointed Project Manager and/or Environmental Manager will be required to update the Schedule of Environmental Mitigation if any modifications or additional requirements arise.

6.2 ENVIRONMENTAL MANAGEMENT PLANS (EMP)

A number of environmental management plans (EMP) have been prepared for managing the impacts of Construction Activities associated with the wind farm development project. See Table 6—1 below and refer to Appendix 1. 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)'s responsibility, to update and add (where required) project specific control measures relevant to the environmental management plans and procedures. The Appointed Contractor(s) will ensure that plans/procedures are communicated to all site staff, including sub-contractors, through induction, training and at relevant meetings.

Ref:	Procedure:
EMP-1	Managing 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	Waste Management
EMP-6	Traffic Management Plan
EMP-7	Wheel wash Management Procedure
EMP-8	Dust Management
EMP-9	Noise Management
EMP-10	Archaeological & Heritage Protection
EMP-11	Ecological Management Plan for the Protection of Habitats and Fauna
EMP-12	Invasive Species Management Plan
EMP-13	Emergency Response
EMP-14	Site Environmental Training and Awareness
EMP-15	Monitoring and Auditing
EMP-16	Environmental Accidents, Incidents and Corrective Actions
EMP-17	Environmental Complaints

Table 6—1 Plans for managing Impacts of Construction Activities

7 AUDITING, MONITORING AND RESPONSE

The Monitoring Schedule for construction will also provide for the checking of equipment, materials storage and transfer areas and specific environmental controls.

A *Preliminary Monitoring Schedule* is provided below and will be finalised pending appointment of the Contractor(s). The Contractor(s)'s developed daily Site Checklists must have the following information included at a minimum:

Table 7—1 Preliminary Monitoring Schedule

Aspect	Monitoring Required	Frequency	Note	Responsibility
Water	Sediment & Erosion Controls (Drainage Performance)	At least weekly during the construction phase as well as during and after significant rainfall events	-	Environmental Manager
Water	Fuel & Oil Storage inspection	Daily	-	Environmental Manager
Ecology	Material and Waste Storage	Daily	-	Environmental Manager
Water	Water quality monitoring	Monthly	Minimum parameters: pH, Suspended Solids, metals, nitrates, phosphates	Environmental Manager
Water	Concrete Pours	As Required	To be scheduled with pours	Environmental Manager
Archaeology	Archaeological Monitoring	As Required	Monitor ground works & excavations	Archaeologist

The Contractor(s) will assign an on-site Environmental Manager to monitor the construction activities on a day to day basis. The duties will include completing the required checklists and coordinating with the relevant personnel (e.g. Project Ecologist, Project Archaeologist and the Design Engineer as required) ensuring all environmental monitoring is carried out.

The Contractor-developed daily Site Checklists will have the following information included at a minimum:

Table 7-2: Site Checklist

• Area of Inspection	• Environmental Hazards
• **Settlement ponds**	• Leaks • Cracks/broken plastic piling • Build up of sediment & peat
• **Silt filters**	• Missing filters • Blocked filters - build-up of sediment & peat
• **Roadside drains**	• Damage • Silt build-up • Blockages in the pipes conveying the runoff to the settlement pond drains
• **Cross drains – located under the drain crossings**	• Damage • Silt build-up • Blockages in the pipes
• **Post and wire boundary fence**	• Signs of movement (i.e. not in a straight line) • Damaged or fallen sections of fence
• **The land/bog adjacent to the development**	• Presence of waste • Presence of construction equipment • Presence of invasive species identified during the preconstruction survey
• **Site roads**	• Unacceptable level of sediment/silt on the road surface • Presence of waste
• **Site compound – storage area**	• Damage • Untidiness
• **Site compound – waste collection area**	• Damage • Untidiness • Full skips
• **Site compound – oil storage area**	• Damage to containers or ancillary equipment • Leakages • Unlocked storage container
• **Dry wheel wash**	• Build-up of sediment
• **Waste water facilities**	• Holding tank requiring emptying
• **Concrete chute washout area**	• Damages • Leakages • Unacceptable level of concrete washings
• **Site Entrance**	• Unacceptable level of sediment/silt on the road surface • Presence of waste

7.1 ENVIRONMENTAL PERFORMANCE INDICATORS

The appointed Project Contractor(s) 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 must also be specified.

7.2 RESPONSE PROCEDURE/CORRECTIVE ACTION

In the event of an environmental incident, or breach of procedure, or where a complaint is received, the contributing factors are to be investigated and remedial action taken as necessary. The Main Contractor(s) will ensure that the following response 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) If necessary, the Project Manager will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
5) 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.
6) 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 Main Contractor(s) as appropriate.
7) The Site Project Manager is to ensure that the relevant environmental management plans/procedures are revised and updated as necessary.

8 SUMMARY

This preliminary CEMP provides the information which will be contained in the final Contractor(s)-developed Plan at the construction stage of the project. The requirement on the Contractor(s) to update these details has been explained, and there is a particular requirement for an update to the roles and responsibilities of those appointed on the site for the construction of the project.

Appendix 1

Environmental Management Plans

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 Waste Management Plan
EMP-6	Construction Traffic Management
EMP-7	Wheel Wash Management Procedure
EMP-8	Construction Dust Management
EMP-9	Construction Noise Management
EMP-10	Archaeological and Heritage Protection
EMP-11	Ecological Management Plan for the Protection of Habitats and Fauna
EMP-12	Management of Invasive Species
EMP-13	Emergency Response Plan
EMP-14	Site Environmental Training and Awareness
EMP-15	Monitoring and Auditing
EMP-16	Environmental Accidents, Incidents and Corrective Actions
EMP-17	Environmental Complaints

EMP 1: MANAGEMENT OF EXCAVATIONS

Purpose

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

Peat

- To reduce the risk of peat failure in areas of deeper peat (>2m), an 'excavate and replace' system will be used. Shortly after an area has been excavated, it will be backfilled with crushed stone. This stone will provide support to the adjacent peat mass.
- To reduce the construction impact on peat, the movement of machinery throughout the site will be controlled by requiring that construction vehicles and machinery do not encroach onto cutover bog beyond the proposed development footprint. These vehicles will also be required to travel via the constructed roads when moving between works areas. To emphasise this requirement, the boundaries of the footprint of the development will be fenced off with post and wire. The Environmental Manager will monitor vehicle movements throughout the construction phase.
- Temporary engineered deposition areas will be designated where necessary at the turbine and crane hardstands locations to hold temporary stockpiles. In order to ensure the stability of the temporary stockpiles, acceptable slope angles will be specified as part of the temporary works designs. These will be completed on a case by case basis by a suitably qualified designer.
- To prevent sedimentation of local watercourses by excavated peat, excavation works in an area will not commence until the surrounding existing drainage regime is protected by interceptor drains and settlement ponds/silt fencing.
- Excavated peat will be reused where appropriate on site for re-grading or re-vegetation
- Surplus excavated peat remaining after localised landscaping requirements will be deposited in the peat deposition areas.
- Peat will be handled as little as possible. The peat will be handled three times in most instances; excavated into a dump truck, transported and dropped at its final position and shaped by an excavator. In order reduce the weight borne by excavated peat.
- Peat turves, where identified by the project ecologist, should be separated and stored with the vegetated side upwards, peat stacks should not be higher than 1m.

Rock

- To minimise the requirement for stockpiling rock and to reduce the volume of crushed stone imported onto site, excavated rock can be reused in the construction of the turbine hardstands where found and is suitable.
- A rock rippability assessment should be carried out following completion of detailed ground investigation. This will inform the choice of excavation methodology for rock.
- A detailed, site specific method statement for excavation of rock will be required from the Contractor(s) prior to commencement of works.

Responsibility

- The Environmental Manager will monitor the 0 bog and 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, particularly at stream crossings.
- The Design Engineer, Geotechnical Engineer and Sub-contractors will have responsibilities as appropriate.
- All responsibilities will be finalised by the Appointed Contractor(s).

EMP 2: SURFACE WATER MANAGEMENT AND RUN-OFF CONTROL (SEDIMENT AND EROSION 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 plan will:

- Implement erosion control to prevent runoff flowing across exposed ground and become polluted by sediments;
- 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;
- 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 and peat until before construction begins 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 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;
- 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;
- Install appropriate silt control measures such as silt-traps, check dams and sedimentation ponds;
- Provide recommendations for public road cleaning where needed particularly in the vicinity of drains; and
- Controls need to be regularly inspected and maintained otherwise a failure may result, 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.

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 each day 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.
- 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.

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.

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 potential for hydrocarbons getting into the existing drains and local watercourses will be mitigated by only refuelling construction machinery and vehicles in designated refuelling areas using a prescribed re-fuelling procedure.
- Refuelling will be carried out using 110% capacity double bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained in using.
- Plant nappies or absorbent mats to be place under refuelling point during all refuelling to absorb drips. Plant nappies to be provided beneath small mobile plant (e.g. small generators, pumps etc).
- Mobile bowsers, tanks and drums should be stored in secure, impermeable storage area, away from drains and open water;
- To reduce the potential for oil leaks, only vehicles and machinery will be allowed onto the site that are mechanically sound. An up to date service record will be required from the main contractor(s).
- 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.
- Potential leaks from the cranes used for turbine erection will be mitigated by contractually requiring the crane suppler to supply cranes to site that are in good working order, up to date in servicing and free of leaks.
- 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 must be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- 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.

Responsibilities

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

_____ is the designated person for _____ area responsible for being present during tanker refilling operations of oil storage tanks.

_____ is the designated person responsible for checking bunds weekly.

_____ is the designated person authorised to pump from the bund only when accumulated rainwater is clear.

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 CO_2 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, washout of concrete trucks will not take place on site. 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 $20m^3$. This capacity will be sufficient to accommodate the chute wash down for two turbine base pours.
- The environmental manager will monitor the pH of the water in the chute wash down bund and can dose with CO_2 or acidic water from the drains until the wash out water achieves neutrality before discharge.

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 should carry out an investigation and in conjunction with the Construction Manager, he/she should 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 WASTE MANAGEMENT PLAN

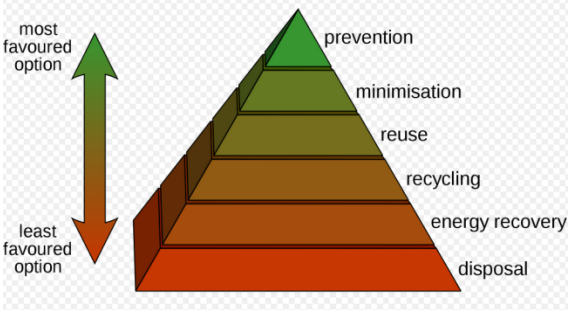
Purpose

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) will be assessed and applied in the preparation and maintenance of the Construction Phase Waste Management Plan.
- The Construction Phase Waste Management Plan will address 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
Substation construction
Internal trenching and ducting
External grid connection
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

To manage waste effectively, focus on the following:

- 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(s)

Construction compound(s)/waste storage area(s) 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. 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/extraction works during construction of tracks, construction compounds and turbine foundations, mainly comprising excavated excess peat and 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). In order to affect this designated waste storage areas will be created at Construction Compound(s), 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 road improvement 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 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(s) 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(s) 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(s) 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 where ever they exist. For example in relation to waste packaging, the contractor(s) 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 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;

<u>Soils and Spoil</u>

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 while surplus peat soils will be segregated and replaced within the designated 6 no. on-site deposition areas.

The deposited peat will be bound by engineered berms constructed from surplus excavated or imported rock. The geometry of the bunds has been designed to withstand the equivalent hydraulic loading of the peat. These berms will also act as a means of access to place the peat with the width at the top of the

berm being 3m. There will be a dirty water drain at the down slope side of the deposition area. Peat will also be deposited in engineered berms. These berms will be up to 2m high.

No waste soils, subsoils, bedrock will require disposal outside the overall boundary of the Shronowen development 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 for two turbine base pours.

The environmental manager will monitor the pH of the water in the chute wash down bund(s) and can dose with CO_2 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 the same as the maximum water consumption (3,000 litres per day). The project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase when as many as 100 people will be working on site. A holding tank is proposed for wastewater management.

During the construction phase, staff facilities will be provided at the site compound/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 waste water and the third for sewage. The waste water 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

The following Table 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 foundation/track 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.

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
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 is encountered, then appropriate handling, storage, transportation, and disposal will be carried out. 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. At the site every effort will be made to segregate waste, and properly segregate hazardous waste from non hazardous and inert waste arising. Hazard wastes will be identified, removed and kept separate from other wastes in order to avoid cross contamination. Specific method statement detailing the necessary mitigation measures during the excavation/handling, transportation, and disposal of hazardous materials encountered at the site will be prepared as required.

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 handled, and disposed of appropriately. Every effort will be made at the site for no long term storage of hazardous materials/fuels/oils/chemicals, etc. There shall be no long term storage of waste oils etc. at the site.

Gravel/Stone/Asphalt/ Bituminous Materials

There will be no requirement for the storage of Asphalt/bitumen materials on site. Road surface materials will be delivered to site as required, with excess returned to supplier.

Metals

It is now common practice to segregate metals for reuse and recycling, however there are still sites where waste metal is thrown away in the general rubbish. 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.

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 forward it for wood recycling.

- A 40 cubic metre open skip will be put in place to collect at the temporary site construction compounds.
- Special care will be taken to segregate the timber 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 to 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 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 compounds.
- This skip will accept plastic packaging, plastic piping, cardboard and timber waste.
- Special care will be taken to ensure that 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 wind farm 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 compounds for building materials such as cables, plastic piling for the settlement ponds, geotexile 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.

Construction Phase General Waste

- Construction waste (timber, steel, concrete etc) These elements will be segregated and stored in dedicated bins on site for recycling.
- 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.
- All waste steel reinforcing will be stockpiled and at the end of each work unit, it will be collected for recycling by Licensed Facility.
- Plastics and packaging will be segregated and stored in dedicated bins on site for recycling.
- Waste oil stored on site will be stored in labelled containers and will be collected by licensed facility/licensed oil-recycling contractor as necessary. Records will be maintained on the volumes of waste oil generated.
- Paper / cardboard, this material will be recycled.
- Wastewater from office and welfare facilities. These facilities will be regularly emptied by licensed/suitable contractors.

Assignment of Responsibilities

A Waste Management Coordinator (WMC) will be assigned at the wind farm 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 appropriately

trained/suitably qualified in 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 Shronowen Wind Farm 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.

Shronowen Wind Farm Waste Management Plan Summary

Wastes will inevitably be generated during the construction phase of the project. There shall be no requirement to remove peat/spoil etc from the site. A certain amount of surplus soils/materials will be generated. These materials will be reused as backfill/landscaping around turbine bases and hardstands and permanently stored at the 6 no. on-site deposition areas.

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 maybe 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 Shronowen Wind Farm Development.

References

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

EMP 6: CONSTRUCTION TRAFFIC MANAGEMENT

Purpose:-

To describe Measures for the management of all traffic, including construction traffic and oversized loads, for the minimization of disturbance and nuisance to the local community.

Scope:-

All Site Construction Areas, approach roads to the site and internal road traffic.

Procedure:

General

The Appointed Contractor(s) will prepare a detailed Traffic Management Plan prior to the works commencing. This Plan will be finalised in agreement with An Garda Síochána and Kerry County Council.

The plan will include provision for:

- Communicating with the community, An Garda Síochána and Kerry County Council.
- Details of site access and any site traffic rules, including security, parking, loading and unloading, required speed or other relevant details.
- Details of the turbine component delivery and any road closures.
- Programme of maintenance and upkeep of public roads.
- Site operating hours (including delivery) to be outlined.

Public Roads

- In order to mitigate from a significant impact during peak traffic hours, the majority of staff will either arrive on-site before or after the peak morning traffic and finish work before or after the evening peak traffic hours.
- The condition of the public roads will be monitored on an on-going basis and a road sweeper provided to clean the public roads if required.

Site Entrance

- There will be no parking of any vehicles on the public road near the wind farm site entrance.
- Adequate parking will be provided on site for both employees and visitors.
- The condition of the site entrances will be monitored on an on-going basis and a road sweeper provided to clean the public road if required.

Responsibility

Project Manager
Construction Manager
Construction personnel
Sub-contractors as appropriate
Delivery personnel

References

Preliminary Traffic Management Plan

EMP 7: WHEEL WASH MANAGEMENT PROCEDURE

Purpose:
To describe Measures for the protection of Watercourses and the Public Roads from dirty water from vehicles.

Responsibility:-
Construction Project Manager

Procedure:-
The Appointed Contractor(s) will reduce the potential for the roads being dirtied by heavy vehicle traffic, by including the following:

- A dry Wheel Wash facility will be provided at the Site Entrances
- Wheel washes will be cleaned as required

Dry Option: At assigned locations at the site entrances a wheel wash will be installed for wheel washing prior to vehicles leaving site. A dry wheel wash (vibrating) will be used to remove any mud from the vehicle's wheels, with excess mud / etc. being collected and treated/disposed of following treatment.

The wheel wash station will remain on site until the development is complete. The wheel cleaning procedure will consist of;

1) Before leaving the site, vehicles will enter the wheel wash and be inspected for any heavy deposits left on wheels. If present, these will be removed manually.
2) Following inspection, all wheels are to be cleaned down with the vibration system, until clear of all deposits.
3) Vehicles will be permitted to leave site following approval of the operating manager/ site representative that the above steps have been completed to a satisfactory standard.

Daily inspections of the wheel wash will be completed to check it is operating as described above, and to make sure there is no excess material collected posing risk during periods of rain. The washout area will be cleaned as required, with excess material disposed of appropriately (Deposition area), or used as back fill within the site. If required, drainage ditches/berms will divert dirty water to sedimentation pond for treatment, prior to outfall to vegetated area (preventing sedimentation (runoff /rainwater washing material away).

On site roads/local roads will be kept as free of mud as is practicable during ground working operations. Machine trafficking around the site will be kept to a minimum in order to reduce the effects of rain on 'broken' ground.

If wheel wash facility is not sufficient, a road sweeper will also be used in the immediate area which will be ordered directly via the site manager.

Responsibility

The Construction Manager/Environmental Manager will monitor the Wheel Wash Area/Sediment Controls, and carry out corrective action where required.

Details of Site Wheel Wash to be finalised by Appointed Contractor(s).

EMP 8: CONSTRUCTION DUST MANAGEMENT

Purpose

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

Procedure

A dust minimisation plan 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.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented:

- Site roads will be regularly cleaned and maintained as appropriate.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface.
- Furthermore, any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Speeds will be restricted on hard surfaced roads as site management dictates.
- Public roads in the vicinity of the site will be regularly inspected for cleanliness, and cleaned as necessary.
- A temporary vehicle wheel wash facility will be installed in proximity to the site entrance.

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 Plan.
- The Construction Manager is responsible for organising dust suppression through use of bowsers and cleaners.

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: CONSTRUCTION NOISE MANAGEMENT

Purpose

To describe measures for the management of impacts from construction noise.

Procedure

Control of Noise at Source

- Only sound plant/equipment will be permitted on site.
- No unnecessary revving of machinery on site.
- Plant will be properly used and regularly maintained.
- Compressors, if needed, will be 'sound related' models fitted with properly lined and sealed acoustic covers which will be kept closed whenever machines are in use.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers.

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.
- The Environmental Manager will review any relevant planning conditions in updating this plan.

References

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

EMP 10: ARCHAEOLOGICAL AND HERITAGE PROTECTION

Purpose

To describe measures for the management and protection of archaeological and cultural heritage on the site

Procedure

- During the course of development, all excavations will be monitored by a suitably qualified archaeologist, under licence to the National Monuments Service at the Department of Culture, Heritage and the Gaeltacht.
- In the event of archaeological material being uncovered consultation will take place with the National Monuments Service and the National Museum of Ireland to decide on an appropriate course of action.

Responsibility

Project Manager
Environmental Manager
Construction Manager
Project Archaeologist

EMP 11: ECOLOGICAL MANAGEMENT PLAN FOR THE PROTECTION OF HABITATS AND FAUNA

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

Purpose

To describe measures for the management and protection of flora 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

General Habitats

- Habitat degradation will be limited by controlling the movement of construction vehicles and machinery. Construction vehicles and machinery will not encroach onto habitats beyond the proposed development footprint and will be required to travel via the constructed roads when moving between works areas. To emphasise this requirement, the boundaries of the footprint of the development will be fenced off with post and wire. The Environmental Manager will also monitor vehicle movements.

Monitoring

- The following pre-construction surveys will be undertaken:
- Pre construction bird surveys breeding season.
- Pre construction terrestrial mammal survey, particularly, for badgers.
- Bird surveys will be carried out prior to, during the construction phase and post construction in accordance with the approved Bird Monitoring Programme.
- Water quality monitoring will take place prior to, during the construction phase and post construction in accordance with the approved Water Quality Monitoring Programme.
- Routine inspections and maintenance of sediment and erosion control measures will take place regularly during the construction phase and during the operational life of the project. Silt traps and settlement ponds will be cleaned on a regular basis to ensure their effectiveness.
- To reduce the level of disturbance to fauna, construction activities will be restricted to between 7.00am and 7.00pm, Monday to Saturday. Construction work will not take place outside of these hours unless in exceptional circumstances.
- In the unlikely event that protected faunal species are found actively using the Site for breeding/roosting during the construction phase, works will cease immediately, and the area will be cordoned off until advice is sought from a suitable qualified expert/NPWS.

Responsibility

Environmental Manager
Construction Manager
Project Ecologist

EMP 12: MANAGEMENT OF INVASIVE SPECIES

Purpose

To describe measures for the management of invasive species on site

Procedure

Areas where invasive species are present will be identified and demarcated prior to commencement of construction:

Invasive Species Control

The following principles will be applied during the management of Invasive Species at the Development site:

- Prevention/Bio-security: Preventing invasive species from arriving on site/preventing spread of invasive species.
- Response: Regular monitoring combined with a rapid response to treat/ eradicate invasive species that are identified encroaching on the site, to ensure that they do not become established.
- Eradication: Aiming to eradicate invasive species on site will prevent the problem increasing.
- Containment: It may not be realistic to completely eradicate invasive species from a particular site. This could be due to level of infestation or the species involved, and resourcing limitations (both financial and personnel required).

Informing

- Invasive Species 'Tool Box Talks'/Site Inductions will be delivered to ensure all site personnel are of aware of/what invasive species looks like that are potentially at the location/greater area, i.e. Japanese Knotweed/Zebra Mussel, and issues associated with the same. To reduce the likelihood of invasive species spreading, the construction personnel involved in works will be trained in basic relevant invasive species prevention and management ('Tool Box talk').
- Prior to the commencement of construction, the development footprint will be surveyed for the presence of invasive species. If invasive species are present, the Project Manager/Environmental Manager will manage their control. The control methods will be specific to the local site conditions as well as the invasive species being managed. Control methods can include physical and/or chemical control methods and monitoring.
- Where any non-native species is present, a management plan will be put in place, to manage the risks, the risks and implications of the species, along with legal requirements.
- A distribution map of the invasive alien plant species at the development site has been developed, and will be incorporated into the CEMP.
- Where a non-native species is identified as a risk of being introduced, spread within, or moved off site, mitigation measures will be in place to prevent spread of the species.
- If required, the project will be phased, to allow time to deal with the presence and/or risk of spread of non-native species.
- Where a species requires long-term management (e.g. Japanese knotweed), a site management plan will be developed that addresses all issues associated with it.
- Locations of invasive species within the overall site will be highlighted and excluded from the works.

- To reduce the likelihood of invasive species being introduced to the site from quarries, the aggregate will be crushed stone which will be biologically inert and would not be expected to have a seed bank.
- No machinery will be permitted to park within demarcated/exclusion areas.
- If excavations are required/movement of invasive species such as Japanese Knotweed, relevant licenses will be obtained, and any excavations/movement of the same will be in line with current beast practice.

Bio-security

- To reduce the likelihood of invasive species being introduced to the site from construction works on other sites, it will be required that vehicles and tools will arrive on site clean. Work boots will be dipped in or scrubbed with a disinfectant solution and thoroughly dried afterwards before being used on the site for the first time (Also requirement during water quality sampling between different catchments). All PPE will be visually inspected and any attached vegetation or debris removed. PPE and tools will remain on site for the duration of construction. Any machinery or equipment returning from a different construction site will cleaned, power washed/steam washed and visually inspected again before re-entering the site.

Equipment/Machinery

To maintain good site hygiene when dealing with any non-native species:

- A fence/signage that can be clearly seen will mark out any area of issue. Signs should be erected to warn people working there that the area is infested / contaminated. No entry signage etc will be put in place.
- Where contaminated soil, materials or water are located, signage should be erected to indicate them.
- Personnel working on or between sites will ensure their clothing and footwear are cleaned where appropriate to prevent spread.
- Tracked vehicles should not be used within the area of infestation.
- All vehicles leaving the infested area and / or transporting infested soil/materials must be thoroughly pressure-washed in a designated wash-down area before being used for other work.
- Where cross-contamination is possible (i.e. from one site to another), vehicles or machinery will be designated to specific sites where possible to prevent spread.
- Material / water left after vehicles have been pressure-washed must be contained, collected and disposed of appropriately.
- All chemicals used for the control of non-native species should be stored and used in an appropriate manner carried out by specialist/suitability trained personnel.

Methodologies

- Invasive species management methodologies and plans outlining Best Available Techniques (BAT) will be sourced from the National Invasive Species Database, from previously published documents/current best practice, and from the Invasive Species Ireland and Inland Fisheries Ireland websites.

A Site Specific Invasive Species Management Plan will be developed, and will be incorporated into the Appointed Contractor(s) CEMP.

Responsibility

Project Manager
Environmental Manager
Construction Manager
Project Ecologist

References

Information on invasive species is provided in the National Road Authority (NRA) (now Transport Infrastructure Ireland (TII))[1], and Invasive Species Ireland (ISI)[2] documents provided in Annexes I and II, in relation to identification, control and eradication of Japanese Knotweed.

[1] http://www.tii.ie/technical-services/environment/construction/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf

[2] http://invasivespeciesireland.com/

EMP 13: 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 the **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
- Peat movement
- 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 (threat to archaeological or ecological feature)
- Fire on site (cross-reference site Safety Emergency Plan as appropriate)

If any of the above 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

The following list outlines issues likely to be appropriate for inclusion the plan:

- 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 Kerry 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 should remove pooled oil.

Concrete Spillages

The following list outlines issues likely to be appropriate for inclusion in such a plan:

- 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 Kerry 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 only 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 the Emergency Response Plan document. Examples of such contact details include:

- Environmental Manager
- Specialist oil removal Company
- Kerry 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 the Emergency Response Plan 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 prepare and finalise an 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, Kerry County Council and any other relevant authority.

EMP 14: SITE ENVIRONMENTAL TRAINING AND AWARENESS

Purpose

To describe measures for the training of all site personnel in the protection of the environment and the relevant controls.

Scope

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
- Environmental buffers and exclusion zones
- Housekeeping of materials and waste storage areas
- Environmental Emergency Response Plan

Housekeeping and Storage of hazardous materials

- Hazardous materials marked with the following symbols will only be stored in the secure storage container in the temporary site construction compounds.

- Subcontractors 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

Details of Induction and Training to be finalised by Appointed Contractor(s)

EMP 15: 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. The Appointed Contractor(s) 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 to ensure adherence with the following;

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 Waste Management Plan
EMP-6	Construction Traffic Management
EMP-7	Wheel Wash Management Procedure
EMP-8	Construction Dust Management
EMP-9	Construction Noise Management
EMP-10	Archaeological & Heritage Protection
EMP-11	Ecological Management Plan Protection of Habitats and Fauna

Checklists for daily, weekly or monthly site audits will be finalised by the Environmental Manager 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 of the are in place and functioning, and concrete chute wash-out procedure is being followed. Checklists will be finalised with the Final Contractor(s)'s EOP.

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

Responsibility

Project Manager
Environmental Manager
Construction Manager
Project Ecologist
Project Archaeologist

Details of Monitoring Procedure and Checklists to be finalised by Appointed Contractor(s)'s Environmental Manager

EMP 16: 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 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.

Details of Environmental Accidents, Incidents and Corrective Actions Procedure, including a chain of responsibility, to be finalised by Appointed Contractor(s) and communicated to all personnel and sub-contractors

EMP 17: 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. It is recommended that immediate action is 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

Details of Environmental Complaints Procedure to be finalised by the Appointed Contractor(s)