Construction and Environmental Management Plan

Proposed Wind Farm Development at Cloncreen and Adjacent Townlands, Co. Offaly

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DOCUMENT DETAILS

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1 INTRODUCTION

This Construction and Environmental Management Plan (CEMP) has been developed by McCarthy Keville O' Sullivan Ltd. on behalf of Bord na Móna Powergen Ltd., who intend to apply to An Bord Pleanála for planning permission, as part of the Strategic Infrastructure Development process, to construct a wind energy development and all associated infrastructure. This CEMP has been prepared in conjunction with the Environmental Impact Statement (EIS) which will accompany the planning application for the proposed development to be submitted to An Bord Pleanála.

Should the project secure planning permission, the CEMP will be updated, in line with all conditions which apply to any grant of permission. The CEMP will also require updating by the selected contractor in order to identify, assess and satisfy the contract performance criteria as set out by the various stakeholders. The CEMP due to its structure and nature will also require constant updating and revision throughout the construction period as set out below. Therefore, this is a working document and will be developed further prior to and during construction. Areas which will be revised and updated are coloured in grey.

Triggers for amendments to the CEMP will include:

- When there is a perceived need to improve performance in an area of environmental impact;
- As a result of changes in environmental legislation applicable and relevant to the project;
- Where the outcomes from auditing establish a need for change;
- Where Work Method Statements identify changes to a construction methodology to address high environmental risk; and
- As a result of an incident or complaint occurring that necessitates an amendment.

This report provides the environmental management framework to be adhered to during the pre-commencement, construction and operational phases of the proposed development and it incorporates the mitigating principles to ensure that the work is carried out in a way that minimises the potential for any environmental impacts to occur. This report has been prepared in accordance with the mitigation measures and commitments made in the EIS, Appropriate Assessment Screening Report (AASR), Natura Impact Statement (NIS) and other planning documents for the development.

1.1 Scope of the Construction and Environmental Management Plan

This report is presented as a guidance document for the construction phase of the proposed Cloncreen Wind Farm. It outlines clearly the mitigation measures and monitoring proposals that are required to be adhered to in order to construct the wind farm in an appropriate manner. The report is divided into nine sections, as outlined below.

Section 1 provides a brief introduction as to the scope of the report and the XX no. planning conditions it is intended to satisfy.

Section 2 outlines the site and project details, detailing the targets and objectives of this plan along with providing an overview of anticipated

construction methodologies that will be adopted throughout the proposed project.

Section 3 sets out details of the environmental controls on site which looks at noise and dust controls. Site drainage measures, peat management and a waste management plan are also included in this section.

Section 4 sets out a fully detailed implementation plan for the environmental management of the proposed project outlining the roles and responsibilities of the project team.

Section 5 outlines the Emergency Response Procedure to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

Section 6 consists of a summary table of all mitigation proposals to be adhered to during the implementation of the proposed project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

Section 7 consists of a summary table of all monitoring requirements and proposals to be adhered to during the implementation of the proposed project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

Section 8 sets out an anticipated programme for the timing of the proposed works.

Section 9 outlines the proposals for reviewing compliance with the provisions of this report.

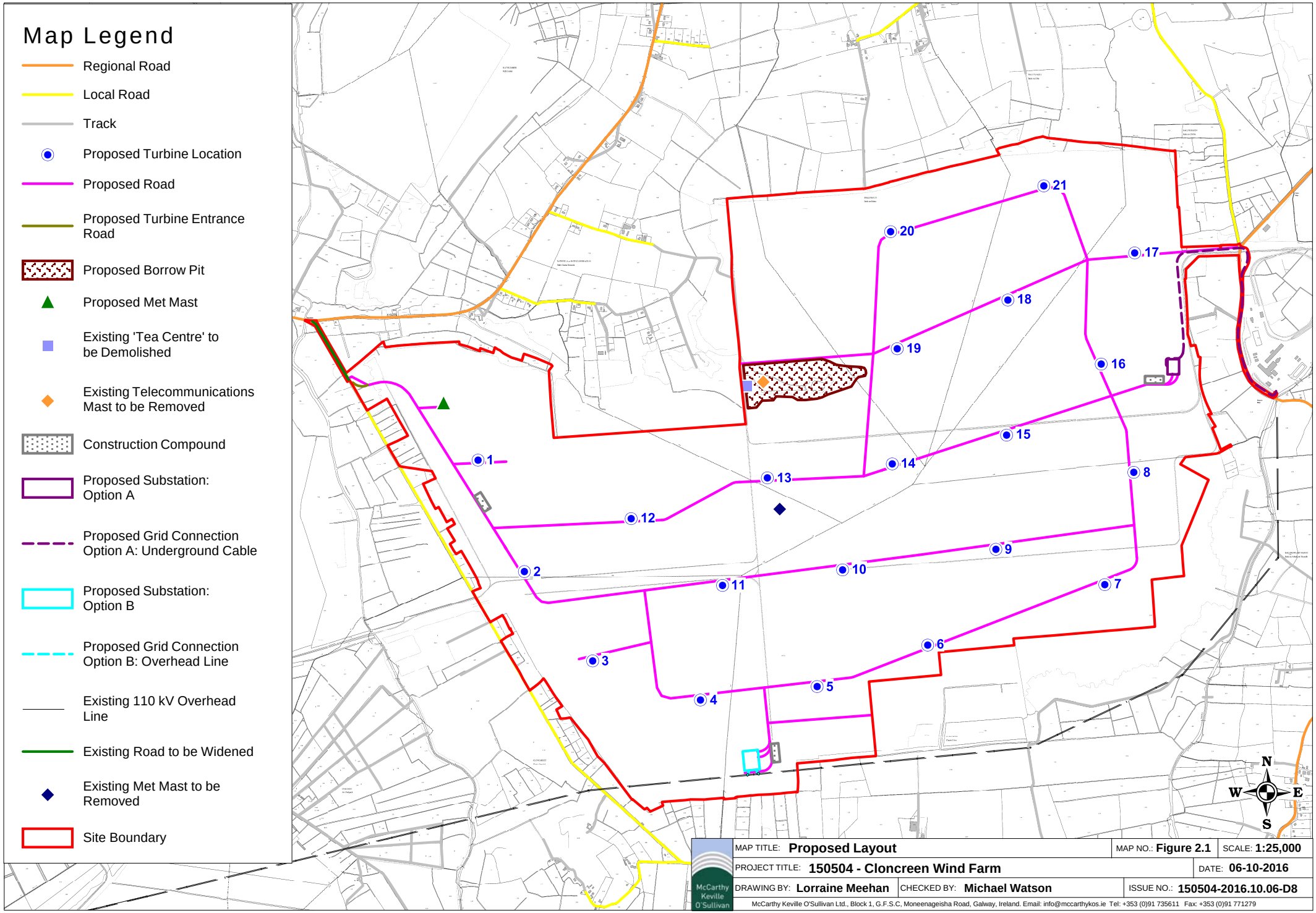
2 SITE AND PROJECT DETAILS

2.1 Site Location and Description

The site of the proposed wind farm development is located in the townlands of Cloncreen, Clongarret, Esker More, Rathvilla or Rathclonbrackan, Ballinrath, Ballynakill and Ballykilleen as well as the townlands of Ballina and Ballinagar where transport route works are proposed, all of which are in Co. Offaly. The proposed wind farm development will comprise of the following:

i. 21 No. wind turbines with an overall blade tip height of up to 170 metres and all associated hard-standing areas.
ii. 1 No. borrow pit.
iii. 1 No. permanent Anemometry Mast up to a height of 120 metres.
iv. Provision of new site access roads and associated drainage.
v. 1 no. 110 kV Electrical substation, which will be constructed at one of two possible locations on site: either Option A in Ballykilleen townland or Option B in Cloncreen townland. The electrical substation will have 2 no. control buildings, associated electrical plant and equipment, and waste water holding tank.
vi. 2 No. temporary construction compounds, one of which will be located in the townland of Esker More and the other at one of two possible locations: either Option A in Ballykilleen townland or Option B in Cloncreen townland.
vii. All associated underground electrical and communications cabling connecting the turbines to the proposed substation at either Ballykilleen or Cloncreen townland.
viii. All works associated with the connection of the proposed wind farm to the national electricity grid, which will be either to the existing Cushaling substation via underground cable (Option A) or to the existing Thornsberry/Cushaling 110 kV line via overhead line (Option B).
ix. Demolition of existing canteen 'tea centre' building.
x. Removal of existing telecommunications mast.
xi. Removal of existing meteorological mast.
xii. New access junctions, improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and construction access, including: temporary upgrade of R420/R402 junction, temporary road widening at 1 no. location on R402 in Ballinagar, upgrade of R402/L1003 junction, road upgrade along the L1003 and new construction phase site entrance, and upgrade of existing site entrance on R401.
xiii. All associated site development works.

The proposed wind farm site measures approximately 1,000 hectares. The Grid Reference co-ordinates for the approximate centre of the site are (E258900 N226400). The proposed wind farm site is located on Cloncreen bog, in eastern Co. Offaly, approximately 4.5 kilometres southwest of Edenderry at its nearest point. The villages of Clonbullogue and Rhode are located approximately 2.0 kilometres southeast and 7.0 kilometres northwest of the site, respectively. The overall layout of the proposed development is shown on Figure 2.1



MAP TITLE: **Proposed Layout**		MAP NO.: **Figure 2.1**	SCALE: **1:25,000**
PROJECT TITLE: **150504 - Cloncreen Wind Farm**			DATE: **06-10-2016**
DRAWING BY: **Lorraine Meehan**	CHECKED BY: **Michael Watson**	ISSUE NO.: **150504-2016.10.06-D8**	

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2.2 Targets and Objectives

In so far as they have been completed to date, or are to be further completed in future, the construction phase works are designed to approved standards, which include specified materials, standards, specifications and codes of practice. The design of the project has considered environmental issues and this is enhanced by the works proposals.

The key site targets are as follows;

- Ensure construction works and activities are completed in accordance with mitigation and best practice approach presented in the EIS, AASR, NIS and associated planning documentation;
- Ensure construction works and activities are completed in accordance with all planning conditions for the development;
- Ensure construction works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure construction works and activities have no adverse effect on the integrity of any European Site;
- Adopt a sustainable approach to construction; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, *e.g.* excavated stone, clay and peat material;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the SuDS drainage design principles;
- Keep impact of construction to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented; and,
- Monitoring of the works and any adverse effects that it may have on the environment. Construction Methods and designs will be altered where it is found there is an adverse effect on the environment;
- Comply with all relevant water quality legislation;
- Ensure a properly designed, constructed and maintained drainage system appropriate to the requirements of the site is kept in place at all times.

2.3 Construction Methodologies Overview

2.3.1 Introduction

An experienced main contractor will be appointed for the civil works for the construction phase. The appointed contractor for the works will be required to comply with this CEMP and any revisions made to this document. An overview of the proposed anticipated Construction Methodologies is provided below.

2.3.2 Overview of Proposed Construction Methodology

The proposed anticipated construction methodology is summarised under the following main headings:

- Temporary Construction Compounds;
- Proposed new Site Access and Roads;
- Hard Standing Areas;
- Turbine and Anemometry Mast Foundations;
- Electricity Substation and Control Building;
- Borrow Pit;
- Drainage System;
- Peat Management;
- Cable Trenching and Grid Connection
- Demolition of Existing Building ('Tea centre'), Meteorological Mast & Telecommunications Mast
- Junction Accommodation and Public Road Works

2.3.2.1 Temporary Construction Compound

The proposed site will consist of a two temporary construction compounds. One will be located along the western boundary of the site, with the other located at one of two possible locations depending on which substation will be constructed. The construction compounds will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors.

The compounds will typically be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound will be established using a similar technique as the construction of the excavated site tracks as discussed below;
- A layer of geo-grid will be installed and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc.;
- If necessary the compound will be fenced and secured with locked gates, although fencing would only be utilised where significant risk of danger to third parties or vandalism/theft is envisaged; and,
- Upon completion of the project the compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with peat as required.
- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor on a regular basis and will be removed from the site on completion of the construction phase.

2.3.2.2 Proposed New Site Access Roads

There is 21.5 kilometres of new access roads to be installed at the site which will be constructed as follows:

- Prior to commencing the construction of the excavated roads movement monitoring posts will be installed in areas where the peat depth is greater than 2.0m.
- Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.
- Excavation of roads shall be to the line and level given in the design requirements. Excavation should take place to a competent stratum beneath the peat (as agreed with the site designer).
- Road construction should be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road should be excavated without replacement with stone fill unless otherwise agreed with the resident engineer on site.
- Excavation of materials will be undertaken with respect to control of peat stability.
- All peat shall be placed/spread alongside the excavations.
- Side slopes in peat shall be not greater than 1 (v): 2 or 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations should be carried out as the excavation progresses.
- The surface of an excavated access road is typically overlaid with up to 500mm of selected granular fill. This may vary depending on designer requirements.
- A layer of geogrid/geotextile may be required at the surface of the competent stratum (to be confirmed by the designer).
- Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e. greater than 1.5m) and where it is proposed to construct the access road perpendicular to the slope contours it is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability. It should be noted however, that slope inclinations at the main infrastructure locations range from 0-2 degrees.
- A final unbound surface layer shall be placed over the excavated road, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic.

2.3.2.3 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard standing areas are typically used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage or turbine components, and generally provide a safe, level working area around each turbine position. The hard stand will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The hardstands will be constructed in a similar manner to the site access roads and will conform to the turbine manufacturer's requirements. The position of the crane pads varies between turbine locations depending on topography, position of the site access road, and the proposed turbine position.

2.3.2.4 Turbine and Anemometry Mast Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground surface. Foundations may be of the gravity, rock anchored and piled type. Based on the geotechnical investigations to date the majority of the foundation at the proposed Cloncreen wind farm will be piled. The size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection

will be the subject of a competitive tender process. Different turbine manufacturers use different shaped turbines foundations, ranging from circular to hexagonal and square. Those shown on drawings included in the EIS are circular, but the final foundation could also be square or hexagonal depending on the requirements of the final turbine supplier. The turbine foundations will be constructed as follows:

- 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;
- No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- All groundwater and surface water arising from turbine base excavation will be pumped to the dirty water system and treated in settlement ponds, and/or specialist treatment systems, prior to discharge from the works area; and,
- Soil excavation shall be observed by a qualified archaeologist in accordance with a scheme of archaeological monitoring, in order to identify any significant remains as they come to light.
- Where a piled foundation is required, the piles will most likely be constructed by coring and inserting a steel sleeve which will be filled with reinforced concrete prior to sleeve removal.

Standard reinforced concrete bases will be completed as follows:

- A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. The concrete should be protected from rainfall during curing and all surface water runoff from the curing concrete should be prevented from entering surface water drainage directly;
- High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools;
- Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required;
- The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base. These checks will be passed to turbine manufacturer for their approval;
- Concrete will be placed using a concrete pump and compacted when in the forms using vibrating pokers to the levels and profile indicated on the drawings. Upon completion of the concreting works the foundation base will be covered and allowed to cure;
- Steel shutters will be used to pour the circular chimney section;
- Earth wires will be placed around the base; and,
- The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the vegetable soil set aside during the excavation. A gravel access will be formed from the access track to the turbine door and around the turbine for maintenance.

One permanent anemometry mast is proposed as part of the proposed development. The mast will be constructed on a hardstanding area sufficiently large to accommodate the crane that will be used to erect the mast, adjacent to a proposed road as per the methodology for turbine foundations as set out above.

2.3.2.5 Electricity Substation and Control Buildings

It is proposed to construct an electricity substation and associated control building within the site at one of two locations (Option A or B as shown in Figure 2.1). The control building will be located within the compound of whichever substation location is selected.

The substation will be constructed by the following methodology:

- The area of the substation will be marked out using ranging rods or wooden posts and the soil stripped and removed to the nearby storage area for later use in landscaping. No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises;
- The dimensions of the substation area will be set to meet the requirements of the ESB and the necessary equipment to safely and efficiently operate the wind farm;
- Wind farm control buildings will also be built within the substation compound;
- The foundations will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concreted will be laid over it. An anti-bleeding admixture will be included in the concrete mix;
- Excavated material will remain on site at all times;
- The block work walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
- The block work will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation;
- The concrete roof slabs will be lifted into position using an adequately sized mobile crane;
- The construction and components of the substation will be to ESB or EIRGRID specifications;
- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.

2.3.2.6 Borrow Pit

It is proposed to develop one borrow pit at the site at a former rehabilitated gravel pit located in the north central section of the site as shown on Figure 2.1.

The borrow pit will typically be excavated as follows:

- The initial borrow pit excavation will involve stripping back of overburden present and stockpiling this material within the footprint of the borrow pit location. These materials will be stored temporarily pending use in the rehabilitation process;
- The sand and gravel material will be extracted from the borrow pit with excavators and stockpiled or used as required;
- The use of material won from the borrow pit will be sequential with new road construction or turbine base formations;
- Temporary stockpiling of aggregates will be required to accommodate the progression of access roads and turbine excavations;
- The borrow pit, once exhausted, will be reinstated with the slopes well graded using the overburden material which will also encourage a return to the existing habitats at the borrow pit (as per the proposed rehabilitation plan).

- A stock-proof fence will be erected around the reinstated borrow pit to prevent access to these areas. Appropriate health and safety signage will also be erected on this fencing and at locations around the fences area.

2.3.2.7 Drainage System

Detailed measures to address surface water management based upon the design criteria and philosophy will be implemented. The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated and settlement ponds constructed to eliminate any material level of suspended solids within surface water running off the site. The drainage regime will be installed in accordance with details submitted in the EIS.

2.3.2.8 Peat Management

It is proposed to place/spread all excavated peat alongside the excavations for the infrastructure elements on site, where possible. The management of excavated peat and the methods of storage are described in detail in AGEC's *Peat Management Plan* in Appendix 7-4 of the EIS.

The guidelines for the proposed methodology as outlined in the AGEC report are summarised below:

- All excavated peat will be placed/spread alongside the excavations for the infrastructure elements on site, where possible. A typical example is given in Figure 3.7 of the EIS which shows a cross section with placed/spread peat either side of an access road.
- During the construction process the peat will be relayed to the side by an excavator and spread on the bog on one or both sides of the excavations.
- The peat will be spread to a depth not exceeding 2.0m in height, shall be tracked in to ensure it is adequately compacted and stable and graded to complement the topography and drainage system on the site.
- Where practical, it should be ensured that the surface of the placed peat is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the spread peat should be carried out as placement of peat progresses. This will reduce the likelihood of debris run-off and ensure stability of the spread peat.
- As a general guide and using the excavated peat volumes in Table 2 of the AGEC report, a spread peat footprint of up to 7.0m is likely each side of the infrastructure elements on site. This will vary across site in line with the in-situ peat within the development footprint.
- The placement of excavated peat is to be avoided without first establishing the adequacy of the ground to support the load. This may involve a visual inspection by competent personnel. The placement of peat may require the use of long reach excavators and low ground pressure machinery in localised areas.
- Where there is any doubt as to the stability of the peat surface then no material shall be placed on to the peat surface.
- Finished/shaped side slopes in the placed peat is likely to be in the region of 1 (v): 2 to 3 (h). This slope inclination should be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes may be required.
- All placed/spread peat will be allowed to revegetate naturally from the extensive seed source of the plants that have already colonised in the area. Alternatively, and possibly in addition, seeding of the placed peat could be carried out which would aid in stabilising the placed peat in the long term.

- Movement monitoring instrumentation may be required in deeper in-situ peat areas. The locations where monitoring is required will be identified prior to construction works commencing on site.
- Supervision by a geotechnical engineer or appropriately competent person is recommended for the works.
- An interceptor drain should be installed upslope of the placed peat areas to divert any surface water away from these areas. This will help ensure stability of the placed peat and reduce the likelihood of debris run-off.
- All the above mentioned general guidelines and requirements should be confirmed by the designer prior to construction.

2.3.2.9 Cable Trenching and Grid Connection

The transformer in each turbine is connected to the substation through a network of buried electrical cables. Fibre-optic cables will also connect each wind turbine to the wind farm control building in the substation compound. The ground is trenched typically using a mechanical excavator. The cables are bedded with suitable material unless the ground conditions are such that no bedding is required. The depth of the cables is to meet all national and international requirements, and will generally be up to 1.2m below ground level depending on the ground conditions that are encountered. A suitable marking tape is installed between the cables and the surface. On completion the ground will be reinstated as previously described above. The route of the cables will generally follow the access tracks to each turbine location.

There are currently two options considered for a connection to the national electricity grid.

Option A will include connection between the proposed substation in the eastern section of the site to the National Grid via an underground cable (approximately 1.7 kilometres in length) to the existing 110 kV Cushaling substation at Edenderry Power Plant, located directly east of the proposed wind farm site.

Option B will include connection between the substation in the southern section of the site to the National Grid via a short section (less than 0.1 kilometres) of overhead line to the existing 110 kV Thornsberry/Cushaling electricity transmission line, located within the site.

Option A Construction Methodology

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

- The area where excavations are planned will be surveyed, prior to the commencement of works, with a cable avoiding tool and all existing underground services will be identified.
- Two teams consisting of two tracked excavators, two dumpers and a tractor and stone cart with side-shoot will dig the trench for and lay approximately 300m of the underground cable ducting per day.
- Both teams will start approximately 150m apart with the team behind finishing at the starting point of the team ahead.
- The excavators will open a trench at the edge of the road surface, the trench will be a maximum of 600mm wide and 1,250mm deep.
- Clay plugs will be installed at 50m intervals to prevent the trench becoming a conduit for surface water runoff.
- Cable joint pits will be located at approximately 500m intervals, each joint pit will be approximately 2.6x8m in size and contain a communications chamber,

an earth link box and a cable joint bay, all of which will be located in the road edge and accessible for cable pulling and future maintenance.

- The excavated material will be loaded into the dumpers to be transported to a designated temporary stockpiling area to be reused as backfilling material where appropriate.
- Once the trench has been excavated, a base layer of blinding will be installed by the tractor and cart and compacted by the excavators.
- The ducting along with marker strips will then be placed in the trench as per relevant specifications.
- Blinding will be installed to 75mm above the cable ducting and compacted.
- The remainder of the trench will be backfilled with granular material and compacted.
- The trench will be surfaced as per the road surface specifications of the national or local public road.

Option B Construction Methodology

The methodology for construction of the short section of overhead line will encompass the following:

- The existing 110kV overhead line will be modified to allow the line to turn into the new 110kV substation, this will involve the removal of one number double pole set and the installation of two number turning angle masts and two number end masts within the substation area.
- Temporary access roads will be required from the substation road to the angle mast location to enable the delivery of stone and concrete required for the angle mast foundations.
- An outage of the existing Cushaling to Mountlucas overhead line will be sought and programed by Eirgrid's on the annual grid outage programme.
- The angle and end mast foundations will then be sheet piled, excavated, blinded, stoned up, prior to concrete shuttering and pouring of base and each angle mast leg.
- After completion of concrete pouring the ground surrounding the mast will be reinstated.
- After a sufficient concrete curing period the angle and end masts will be fully assembled on the ground before being lifted into place using a mobile crane.
- Crews will fix and bolt the masts in place and attach the lightning rod.
- Dead man stays will be installed to support the existing poleset's prior to the breaking overhead line at the location of the new anglemasts.
- The installation of 3no conductors and 2 no shield wires will then tie the existing overhead line into the new station at two points or bays.
- Bird diverters may also be installed on the new conductor as required.
- It is also common for a fiber optic cable which may wrapped around one of the conductors to be terminated into the new substation.

Typical cable trenchs are shown on Plates 2.1 and 2.2.

Plate 2.1 Cable Trench View

Plate 2.2 Cable Trench View

2.3.2.9.1 Existing Underground Services

Any underground services encountered along the route will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300mm will be required between the bottom of the ducts and the service in question. If the clearance cannot be achieved the ducting will pass under the service and again 300 mm clearance between the top of the communications duct and bottom of the service will be achieved. In deeper excavations an additional layer of marker tape will be installed between the communications layer and yellow top level marker tape. If the required separation distances cannot be achieved then a number of alternative options are available such as using steel plates laid across the width of the trench and using 35N concrete surrounding the ESB ducts where adjacent services are within 600mm, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate. All excavations will be kept within the roadway boundaries, i.e. in road or grass margin.

2.3.2.9.2 Joint Bays

Joint bays are pre-cast concrete chambers where lengths of cable ducting will be connected. They will be located at various points along the ducting route approximately every 500 meters approximately. Where possible joint bays will be located in areas where there is a natural widening/wide grass margin on the road in order to accommodate easier construction, cable installation and create less traffic congestion. During construction the joint bay locations will be completely fenced off and will be incorporated into the traffic management system. Once they have been constructed they will be backfilled temporarily until cables are being installed.

2.3.2.9.3 General Precaution

Prior to any works commencing a dilapidation survey will be conducted of the entire route, photographing and noting any existing damage or defects to structure or road

surfaces. A copy of this survey will be submitted to Offaly County Council prior to works commencing.

Communication with the public, local residences and businesses along the route will be an important responsibility of the project supervisor. Keeping all affected parties up to date and informed both shortly prior and during the construction period at all times. Two to three weeks before any work commencing reasonable efforts will be made to inform all affected parties of the oncoming works.

Signage will be erected in the weeks prior to any works commencing along and on adjacent roads to the proposed route notifying the public of the forthcoming construction. Contact details for the contractor and details of license will also be posted along the proposed cable route during construction.

Every effort will be made to minimise the impact of the above works on local residences and traffic. Consideration will also be given to the agricultural community and works will be organised and sequenced so as not to inconvenience any such activities.

- All personnel will be inducted and made familiar with the method statements, risk assessments and traffic management plans involved.
- All site-specific safety rules will be adhered to.
- All plant operators will have appropriate CSCS training.
- All personnel will have FÁS Safe Pass training
- Fire extinguishers and first aid supplies will be available in the work area.
- The road way will be maintained in clean condition at all times.
- Helmets, High Visibility clothing and safety footwear will be worn at all times.
- A competent foreman will be on site at all times.
- Excavations are back filled at the end of each working day.
- The trench will not be over crowded.
- Unauthorised access will be monitored and prevented.
- Pipe work will be lifted into position manually.
- Hand dig will be used to expose any services detected during the survey.

2.3.2.10 Demolition of Existing Building & Disassembly of Meteorological and Telecommunications Masts

An existing single storey building (c 8.5m x 8m) used by the peat production staff as a canteen/tea centre will be demolished and an existing 40m high telecommunication mast and will be disassembled and removed as they are located within the footprint of the proposed borrow pit. The existing 100m meteorological mast located in the centre of the site will also be disassembled and removed. Standard best practice construction methodologies will be adhered to during the demolition process. The building will be demolished by means of mechanical excavator after all services and the electrical supply has been disconnected. The telecommunications and meteorological mast will be dismantled in accordance with best practice with the majority of materials suitable for re-use. The management of waste materials generated during the demolition phase is detailed in Section 3.5 of this document.

2.3.2.11 Junction Accommodation and Public Road Works

Improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads will be required, in particular a temporary upgrade of the R420/R402 junction, temporary road widening at 1 no. location on the R402 in Ballinagar, upgrade of the R402/L1003 junction, road upgrade along the L1003 and the new construction phase site entrance and upgrade of the existing site entrance on the R401.

The upgrade of the R420/R402 junction will be an extension of a previous upgrade carried out as part of the works required to transport large turbine components to the Mountlucas wind farm during its construction in 2014. This upgrade will consist of clearing back the existing vegetation at the junction, excavation of material to allow the placing of stone within the redlined area. Following this the area will be finished in tar and chip. A series of removable bollards will be placed along the existing road edge in order to preserve the structure of the junction outside of those periods when deliveries of components are underway. A permanent fence will be erected once the deliveries are completed restoring the junction to its existing configuration. The hardstanding area created to accommodate the works will be top soiled over and allowed to reseed naturally.

The temporary widening of the R402 in Ballingar is required to accommodate the movement of large components (specifically transportation of blades) around this bend. The temporary works will require the temporary removal of the existing footpath, vegetation and boundary wall that form part of the public park area. Further excavations will be required to allow the importation of suitable fill material to build the area back up to the existing road level. The extended area will then be stoned over that will allow the traverse of the vehicles carrying the large components. Once the deliveries are completed the area will be reinstated in accordance with the requirements of Offaly County Council.

The upgrade to the junction of the R402/L1003 is required to facilitate the movement of vehicles carrying large turbine components off the R402 and onto the L1003. The swept path analysis indicates that road widening will be required at this junction to facilitate these vehicle movements. The land on the southern side of the R402 between the bridge over the Phillipstown River and the junction will be elevated using suitable fill material to the level of the existing road. The required area to accommodate the large turbine component movements will be surfaced and a series of temporary bollards installed. The bollards will be removed when the widened area is required for deliveries and replaced when not in use in order to preserve the junction configuration. Once the deliveries have been completed a permanent fence will be erected in order to preserve the integrity of the junction and prevent unauthorised access to the hard standing area.

It is proposed that the existing L1003 local road is widened to 6m from the junction of the R402 and L1003 to the proposed western entrance to Cloncreen wind farm. This widening will involve the creation of a 0.5m wide verge on the eastern side of the road and extension of the road width a distance of 6m to the west from the newly created verge. In order to accommodate this, the following works will need to be carried out along the western edge of the existing road.

- Removal of the existing vegetation to a maximum distance of 10m from the existing road edge.
- Extension of the road edge to ensure a full 6m width up to the proposed site entrance.
- Realignment of the centreline of the road
- In fill of the required area along the western edge of the L1003 to facilitate these widening works
- The creation of an appropriate side slope from the new edge into the adjacent agricultural land
- The movement of the existing open drainage features to accommodate the works

- A programme of planting along the new drainage feature in parallel to the road
- Installation of a timber post and rail fence to enclose the planting

The proposed works would result in a permanent upgrade of the L1003 from the R402/L1003 junction to the proposed site entrance.

A new site entrance is required along the L1003 to facilitate the delivery of the construction materials and turbine components. There are two proposed components that will make up this temporary entrance:

1. A construction entrance will be located adjacent to the northern boundary of Bord na Móna lands on the eastern side of the road. This entrance will facilitate deliveries of stone, concrete, steel and other equipment/materials.
2. The second component will be a large turbine component entrance that will have a larger footprint that will include the footprint of the proposed construction entrance. This entrance will be used for large turbine component delivery only. Passive screening will be put in place as part of the construction of this element to ensure maximum screening possible between the L1003 and the large turbine roadway as it extends into Bord na Móna Lands. The extent of this entrance will be restricted in a similar fashion to the proposed junction upgrades through the use of temporary bollards that will be removed and reinstated as required.

Appropriate sightlines will be established to both the north and south of the proposed site entrance to accommodate exiting traffic. Once the large turbine components deliveries cease the large turbine component entrance will be permanently fenced off to the road verge. The large turbine component entrance and roadway will be covered in top soil and allowed to reseed naturally. Once the construction phase of the wind farm is completed and the wind farm is fully operational the construction entrance will then be permanently fenced off. In this case as there are other entrances to the site to facilitate operational traffic, the construction roadway will be covered in topsoil and a suitable replanting programme completed to encourage re growth.

3 ENVIRONMENTAL MANAGEMENT

3.1 Site Drainage

3.1.1 Introduction

The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the proposed development. There is an existing drainage system and surface water discharges from the site which is regulated by the Environmental Protection Agency (Licence Ref. P0503-01). The proposed development's drainage design has therefore been proposed specifically with the intention of having no negative impact on the water quality of the site and discharges from the site and its associated rivers and lakes, and consequently no impact on downstream catchments and ecological ecosystems.

No routes of any natural drainage features will be altered as part of the proposed development and turbine locations and associated new roadways were originally selected to avoid natural watercourses. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made via settlement ponds, and over vegetation filters at a significant distance from streams and lakes respectively.

3.1.2 Existing Drainage Features

The topography of the development site is relatively flat with an elevation range of between approximately 68 and 72 mOD (metres above Ordnance Datum). There are two slightly elevated mineral soil ridges at the site. One runs east west at the site compound, and the second is on the center of the eastern portion of the site, just south of the railway line, and it runs in a general north south direction. Along the majority of the site boundary a 1 to 2m high peat bank exists which is a remnant of the original bog. These perimeter peat banks create a boundary berm, forming a basin effect within the extraction area of the overall bog.

The surface of the cutover bog is drained by a network of east / west orientated peat drains that are typically spaced every 15 to 20m. These drains typically slope in both an easterly and westerly direction from the central north / south trending railway track line. Surface water outflows from the bog are located along the western, southern and eastern boundaries of the site and comprise both gravity and pumped outfalls. Other than the designated surface water outfalls, there are no other areas where runoff can leave the site.

Regionally the proposed wind farm development site, including the grid connection route options and haul route upgrades are located in the River Barrow surface water catchment within Hydrometric Area 14 of the South Eastern River Basin District.

On a more local scale the site is located in the Figile River surface water catchment. The Figile River flows in a southerly direction less than 0.5km to the east of the proposed site. The eastern section of the site drains directly to the Figile River via a number of outfall channels which are discussed further below in the site drainage section. The Philipstown River flows in a southerly direction approximately 0.5km to the west of the site prior to flowing in a more easterly direction to the south of the site and merging with the Figile River approximately 2km downstream of the site. The

western section of the site drains to the Philipstown River via a number of channel outfalls which are also discussed further below.

Grid connection Option A exits on the area of the site that drains to the Figile River while grid connection Option B and the proposed haul route junction works drain to the Philipstown River.

3.1.3 Drainage Design Principles

Drainage water from any works areas of the site will not be directed to any natural watercourses within the site. Two distinct methods will be employed to manage drainage water within the site. The first method involves keeping clean water clean by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, to allow attenuation and settlement prior to controlled diffuse release.

The drainage design is intended to maximise erosion control, which is more effective than having to control sediment during high rainfall. Such a system also requires less maintenance. The area of exposed ground will be minimised. The drainage measures will prevent runoff from entering the works areas of the site from adjacent ground, to minimise the volume of sediment-laden water that has to be managed. Discoloured run-off from any construction area will be isolated from natural clean run-off.

A schematic line drawing of the proposed drainage design is presented in Figure 3.1 below.

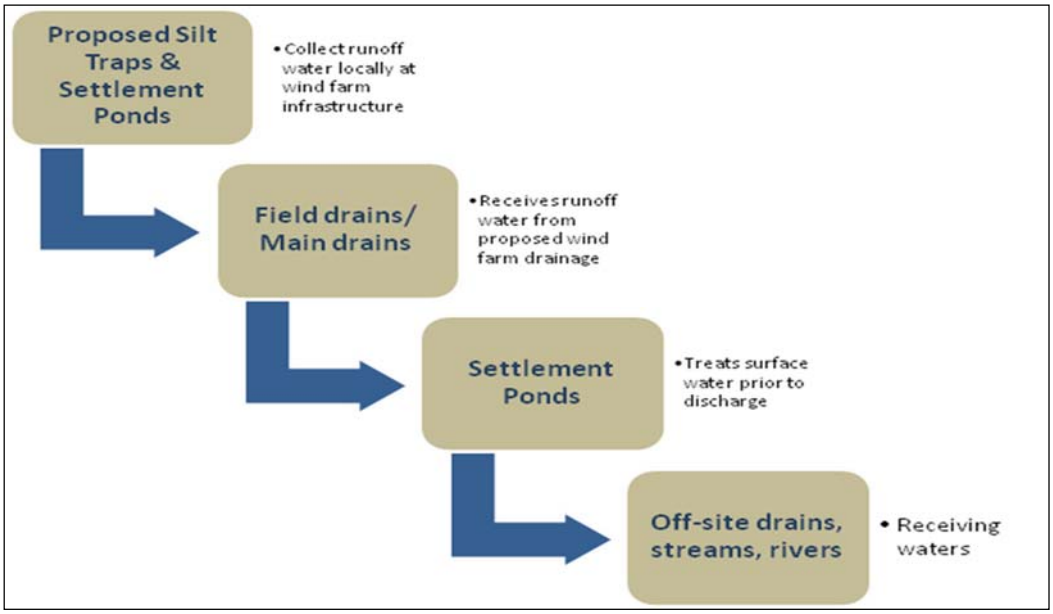


Figure 3.1 Schematic drawing of proposed drainage design

3.1.4 References

The drainage design has been prepared based on experience of the project team of other wind farm sites in peat-dominated environments, and the number of best practice guidance documents referred to in the References section of the EIS.

3.1.5 Drainage Design

Detailed drainage design measures are included in the site layout drawings of the proposed development included in Appendix 3-1 of the EIS. The drainage design employs the various measures further described below.

3.1.5.1 Interceptor Drains

Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area.

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains could be removed. At that stage, there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to allow water infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. Where the drains are to be removed, they will be backfilled with the material from the diversion dike. Interceptor drains may have to be retained in certain locations, for example where roadways are to be installed on slopes, to prevent the roadways acting as conduits for water that might infiltrate the roadway sub-base. In these cases, interceptor drains would be maintained in localised areas along the roadway with culverts under the roadway, which would allow the intercepted water to be discharged to vegetation filters downgradient of the roadway. Similarly, in localised hollows where water is likely to be funnelled at greater concentrations than on broader slopes, interceptor drains and culverts may be left in situ following construction.

The velocity of flow in the interceptor will be controlled by check dams (see Section 3.1.5.1 below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the channel.

Interceptor drains will be installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains to areas downgradient of works areas, where the drain will terminate at a level spreader (see Section 3.1.5.4 below). Across the entire length of the interceptor drains, the design elevation of the water surface along the route of the drains will not be lower than the design elevation of the water surface in the outlet at the level spreader.

3.1.5.2 Collector Drains

Collector drains are shallow drains that will be used to intercept and collect run off from construction areas of the site during the construction phase. Collector drains will remain in place to collect runoff from roads and hardstanding areas of the proposed development during the operational phase. A collector drain is an excavated drainage

channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Collector drains are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains and collector drains described above.

Collector drains will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Collector drains will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses.

Collector drains will be installed in advance of any main construction works commencing. The material excavated to make the collector drain will be compacted on the downslope edge of the drain to form a diversion dike.

3.1.5.3 Check Dams

The velocity of flow in the interceptor drains and collector drains, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the collector drain is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the site.

Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated. Check dams may also be installed in some of the existing artificial drainage channels on the site, downstream of where collector drains connect in.

The proposed check dams will be made up of straw bales or stone, or a combination of both depending on the size of the collector drain it is being installed in. Where straw bales are to be used, they will be secured to the bottom of the collector drain with stakes. Clean 4 to 6-inch stone will be built up on either side and over the straw bale to a maximum height of 600 mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the collector drain with the bucket of an excavator.

The check dams will be installed at regular intervals along the interceptor drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain. The centre of the check dam will be approximately 150 mm lower than the edges to allow excess water to overtop the dam in flood conditions rather than cause upstream flooding or scouring around the dams.

Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the collector drain during extreme rainfall events.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate

performance. Maintenance checks will also ensure the center elevation of the dam remains lower than the sides of the dam.

3.1.5.4 Level Spreaders

A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any proposed works areas in locations where they are not likely to contribute further to water ingress to construction areas of the site, or areas where they are not likely to give rise to peat stability issues.

The water carried in interceptor drains will not have come in contact with works areas of the site, and therefore should be free of silt and sediment. The level spreaders will distribute clean drainage water onto vegetated areas where the water will not be re-concentrated into a flow channel immediately below the point of discharge. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion.

The slope in the channel leading into the spreader will be less than or equal to 1%. The slope downgradient of the spreader onto which the water will dissipate will have a grade of less than 6%. The availability of slopes with a grade of 6% or less will determine the locations of level spreaders. If a slope grade of less than 6% is not available in the immediate area downgradient of a works area at the end of a diversion drain, a piped slope drain will be used to transfer the water to a suitable location.

The spreader lip over which the water will spill will be made of a concrete kerb, wooden board, pipe, or other similar piece of material that can create a level edge similar in effect to a weir. The spreader will be level across the top and bottom to prevent channelised flow leaving the spreader or ponding occurring behind the spreader. The top of the spreader lip will be 150mm above the ground behind it. The length of the spreader will be a minimum of four metres and a maximum length of 25 metres, with the actual length of each spreader to be determined by the size of the contributing catchment, slope and ground conditions.

Clean four-inch stone can be placed on the outside of the spreader lip, and pressed into the ground mechanically to further dissipate the flow leaving the level spreader over a larger area.

3.1.5.5 Vegetation Filters

Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
Vegetation filters will carry outflow from the level spreaders as overland sheet flow, removing any suspended solids and discharging to the groundwater system by diffuse infiltration.

Vegetation filters will not be used in isolation for waters that are likely to have higher silt loadings. In such cases, silt-bearing water will already have passed through stilling (settlement) ponds prior to diffuse discharge to the vegetation filters via a level spreader.

3.1.5.6 Stilling Ponds/Settlement Ponds

Stilling ponds will be used to attenuate runoff from works areas of the site during the construction phase, and will remain in place to handle runoff from roads and hardstanding areas of the proposed development during the operational phase. The purpose of the stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the stilling ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas.

Stilling ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond. The points at which water enters and exits the stilling ponds will be stabilised with rock aprons, which will trap sediment, dissipate the energy of the water flowing through the stilling pond system, and prevent erosion. The primary stilling pond will reduce the velocity of flows to less than 0.5 metres per second to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond via another rock apron. The secondary stilling pond will reduce the velocity of flows to less than 0.3 metres per second. Water will flow out of the secondary stilling pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out.

Water will flow by gravity through the stilling pond system. The stilling ponds will be sized according to the size of the area they will be receiving water from, but will be sufficiently large to accommodate peak flows storm events. The stilling ponds will be dimensioned so that the length to width ratio will be greater than 2:1, where the length is the distance between the inlet and the outlet. Where ground conditions allow, stilling ponds will be constructed in a wedge shape, with the inlet located at the narrow end of the wedge. Each stilling pond will be a minimum of 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume.

The embankment that forms the sloped sides of the stilling ponds will be stabilised with vegetated turves, which will have been removed during the excavation of the stilling ponds area. All material excavated during pond construction will be used locally for landscaping and berm construction around these ponds.

Stilling ponds will be located towards the end of collector drains, close to where the water will be reconverted to diffuse sheet flow. Upon exiting the stilling pond system, water will be immediately reconverted to diffuse flow via a fan-shaped rock apron if there is adequate space and ground conditions allow. Otherwise, a collector drain will be used to carry water exiting the stilling pond system to a level spreader to reconvert the flow to diffuse sheet flow.

A water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the stilling pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity. Stilling ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

3.1.5.7 Silt Bags

Dewatering silt bags allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site.

Dewatering silt bags are an additional drainage measure that can be used downgradient of the stilling ponds at the end of the collector drain and will be located, wherever it is deemed appropriate, throughout the site. The water will flow, via a pipe, from the stilling ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of peaty silt into the stream.

The dewatering silt bag that will be used will be approximately 3 metres in width by 4.5 metres (see Plates 3.1 3.2 below) in length and will be capable of trapping approximately four tonnes of silt. The dewatering silt bag, when full, will be removed from site by a waste contractor with the necessary waste collection permit, who will then transport the silt bag to an appropriate, fully licensed waste facility.

Plate 3.1 Silt Bag with water being pumped through

Plate 3.2 Silt bag under inspection

3.1.5.8 Silt Fences

Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone of a stream.

Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading. The silt fence designs follow the technical guidance document *'Control of Water Pollution from Linear Construction Projects'* published by CIRIA (Ciria, No. C648, 1996). Up to three silt fences may be deployed in series.

The Stage 1 (Coarse) silt fence will consist of a geotextile fabric such as Terram 1000 attached by staples to fixed stakes. The Terram sheets will be folded in an L shape with one metre extending horizontally in towards the works area. This horizontal section will be buried at a distance of approximately 150mm beneath a clean stone surface. Terram 1000 is a permeable fabric through which water can pass, but through which sediment particles cannot. It does however, impede water flow and can lead to the backing up of water and sediment, which reduce its effectiveness.

The Stage 2 (Medium) silt fence will consist of straw bales, embedded 100mm into the soil/ground and fixed in place with stakes. A geotextile fabric will be pegged and stapled to the straw bales and stakes.

The Stage 3 (Fine) silt fence will be similar to the Stage 1 fence, with the addition of a course sand and/or fine gravel at the base of the geotextile.

In the case of all three types of fence, the geotextile fabric will be embedded at least 150mm below the ground surface.

In a small number of locations around the proposed site where space between the works areas and watercourses may be limited, silt fence designs will be combined to increase their effectiveness. For example, a straw bale silt fence (Stage 2) may be double wrapped with geotextile fabric (Stage 1) and course sand/fine gravel added on the upgradient side (Stage 3). The most suitable type, number or combination of silt fences will be determined on a location specific basis for the various parts of the site. Although they may be indicated in the drainage designs shown in Appendix 3-1 of the EIS to be just a single line, silt fences may be installed in series on the ground.

Site fences will be inspected regularly to ensure water is continuing to flow through the Terram, and the fence is not coming under strain from water backing up behind it.

3.1.6 Borrow Pit Drainage

The proposed borrow pit will extract sand and gravel deposits above the local groundwater table and therefore there is no potential to impact on local groundwater levels. There will be no discharges from the borrow pit.

3.1.7 Cable Trench Drainage

Cable trenches are typically developed in short sections, thereby minimising the amount of ground disturbed at any one time, and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the upgradient side of the trench. Should rainfall generate runoff from the excavated material, the material is contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the proposed development, would be transported to one of the on-site borrow pit disposal areas or used for landscaping and reinstatements of other areas elsewhere on site.

On steeper slopes, silt fences, as detailed in Section 3.6.5.8 of the EIS will be installed temporarily downgradient of the cable trench works area, or on the downhill slope below where excavated material is being temporarily stored to control run-off.

3.1.8 Site and Drainage Management

3.1.8.1 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures outlined above will be brought on-site in advance of any works commencing.

An adequate amount of straw bales, clean stone, terram, stakes, etc will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.

3.1.8.2 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the project will also take account of weather forecasts, and predicted rainfall in particular. Large excavations, large movements of overburden or large scale overburden or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

3.1.8.3 Reactive Site Drainage Management

The final drainage design prepared for the proposed development prior to commencement of construction will have to provide for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the environmental clerk of works or supervising hydrologist on-site. The environmental clerk of works or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor or collector drains as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time.

In the event that works are giving rise to siltation of watercourses, the environmental clerk of works or supervising hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

3.1.8.4 Drainage Maintenance

An inspection and maintenance plan for the drainage system onsite will be prepared in advance of commencement of any works. Regular inspections of all installed drainage features will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water at parts of the systems where it is not intended. The inspection of the drainage system will be the responsibility of the Environmental Manager of works or the Supervising Hydrologist.

If necessary, any excess sediment build up behind check dams will be removed. For this reason, check dams will be inspected and maintained weekly during the construction phase of the project to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

Check dams will also be inspected weekly during the construction phase of the project and following rainfall events to ensure the structure of the dam is still effective in controlling flow. Any scouring around the edges of the check dams or overtopping of the dam in normal flow conditions will be rectified by reinforcement of the check dam.

Collector drains will be regularly inspected for evidence of erosion along the length of the drain. If any evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.

A water level indicator such as a simple staff gauge or level marker will be installed in each silt trap with marks to identify when sediment is at 50% of the trap's capacity. Sediment will be cleaned out of the silt trap when it exceeds 50% of trap capacity. Silt traps will be inspected weekly during the construction phase of the project and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

The frequency of drainage system inspections will be reduced following completion of the construction phase of the project. Weekly inspections during the construction phase will be reduced to monthly, bi-monthly and eventually quarterly inspections during the operational phase. The frequency will be increased or decreased depending on the effectiveness of the measures in place and the amount of remedial action required in any given period.

3.2 Refuelling, Fuel and Hazardous Materials Storage

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- Minimal refuelling or maintenance of construction vehicles or plant will take place on site.
- On-site refuelling will take place using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the proposed wind farm. The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use. Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
- Fuels volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor;
- The electrical control building should be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used should be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages will be contained within Emergency Response Plan (Section 5.0). Spill kits will be available to deal with an accidental spillage.

3.3 Peat Stability Management

The total estimated volume of peat and overburden to be excavated during the construction phase of the proposed development of peat and other subsoils is 348,125m^3 (Option A) or 363,605m^3 (Option B). The excavated peat will be spread alongside the infrastructure elements on the site immediately after excavation. The site which is generally flat and extensively harvested by Bord na Móna makes it suitable for this method of peat placement.

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on proposed wind farm development and the surrounding environment. Peat failure excludes localised movement of peat that could occur below an access road, creep movement or erosion type events. In the absence of appropriate mitigation, the consequence of peat failure at the study area may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of access tracks;
- Drainage disrupted;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by sediment particulates; and,
- Degradation of the environment.

3.4 General Recommendations for Good Construction Practise

The peat stability assessment indicates that there is insignificant risk of peat failure.

- Appointment of experienced and competent contractors;
- The site should be supervised by experienced and qualified personnel;
- Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a peat movement);
- Prevent undercutting of slopes and unsupported excavations;
- Maintain a managed robust drainage system;
- Set up, maintain and report readings from peat stability monitoring systems;
- Ensure construction method statements are followed or where agreed modified/ developed; and,
- Revise and amend the Geotechnical Risk Register as construction progresses.

3.4.1 Dust Control

Construction dust can be generated from many on-site activities such as excavation and backfilling. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, *i.e.* soil, sand, peat, etc and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route.
Proposed measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the Site Environmental manager for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;

- All construction related traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of construction sites to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,
- All vehicles leaving the construction areas of the site will pass through a wheel cleansing area prior to entering the local road network.

3.4.2 Noise Control

The operation of plant and machinery, including construction vehicles, is a source of potential impact that will require mitigation at all locations within the wind farm. Proposed measures to control noise include:

- Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All construction plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations;
- Plant with the potential of generating noise or vibration will be placed as far away from sensitive properties as permitted by site constraints.
- Regular maintenance of plant will be carried out in order to minimise noise emissions. In particular, attention will be paid to the lubrication of bearings and the integrity of silencers;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works;
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machines, which are used intermittently, will be shut down or throttled back to a minimum during those periods when they are not in use;
- Training will be provided by the Site Environmental manager/appointed contractor's health and safety officer to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation; and,

3.5 Construction and Demolition Waste Management

This section of the CEMP provides a Construction and Demolition Waste Management Plan (CDWMP) which outlines the best practice procedures during the excavation and construction phases of the project. The CDWMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage. Disposal of waste will be seen as a last resort.

This CDWMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the proposed development.

3.5.1 Legislation

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the proposed development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

The Department of the Environment provides a document entitled, 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects.

3.5.2 Preliminary Plan

The Department of the Environment guidelines state that, at the design stage of the project, only a preliminary CDWMP is required,

> *"Formal production and presentation of the Plan may be at a later stage but a clear 'waste management philosophy' needs to be adopted…at the initial conceptual stage of the Project…"*

This preliminary CDWMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the proposed development.

3.5.3 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing in the following order:

Prevention and Minimisation:
The primary aim of the CDWMP will be to prevent and thereby reduce the amount of waste generated at each stage of the project.

Reuse of Waste:
Reusing as much of the waste generated on site as possible will reduce the quantities of waste that will have to be transported off site to recovery facilities or landfill.

Recycling of Waste:
There are a number of established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.

At all times during the implementation of the CDWMP, disposal of waste to landfill will be considered only as a last resort.

3.5.4 Demolition Waste Management Plan

There is a small single story building (c 8.5m x 8m) used by the peat production staff known as the 'tea centre' which will be demolished as it is located within the footprint of the proposed borrow pit.

The demolition process will generally follow the sequencing shown on Table 3.1.

Table 3.1 Typical Demolition Sequencing

Demolition Sequence	General Description
Services Disconnection	Shut of ESB, Gas, drainage network etc.
Inventory of Hazardous Wastes	e.g. Grease & oils
Removal of furniture/Equipment	Plant & Equipment
Removal of hazardous materials	Drums of oil & grease
Removal of fixtures	Fixtures & fittings
Removal of timber	Floors, trusses, rafters
Demolition of Structures Shells	Manual or mechanical demolition
Removal of groundworks	Foundation, slabs and redundant drainage infrastructure.
Source segregation of material fractions	C&D waste recovery
Transport of materials to authorised facilities	Authorised Waste Collection Permit holders and Waste Facility or Licence holders

Prior to the commencement of any demolition at the site a full audit of waste that will be generated will be carried out. A list of expected waste types that may be generated has been drawn up and the European Waste Catalogue Codes pertaining to each waste type is included in Table 3.2. The lists have been prepared following a visit to the proposed development site and inspection of the existing building.

Table 3.2 Expected waste types arising from the Demolition Phase

Materials type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Concrete	Surfacing, flooring material	17 01 01
Glass	Windows	17 02 02
Metals	Steel roof coverings, window frames	17 04 07
Mixture of inert material	Sand, stones, plaster, rock	17 01 07
Plastic	PVC frames, electrical fittings	17 02 03
Soil & Stones	Overburden, soil, subsoil	17 05 04
Wood	Frames and doors,	17 02 01
Oils & Grease	Drums of oil & grease	13 01 11*

The majority of the waste generated by the demolition of the existing 'tea centre' will consist of concrete rubble and stones from the existing wall structure, floor and foundations. This material will be segregated from all other waste components and sent by an authorised waste collector to an authorised waste recovery facility. The remaining volume of waste material will not be large enough to warrant any further segregation therefore, all waste generated during the demolition of the building will be deposited into a single skip. This waste material will be transferred to a Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be

sorted into individual waste streams for recycling, recovery or disposal. It is anticipated that this remaining material has no potential reuse in the construction phase of the proposed development.

There is a 100m high meteorological mast on site which will be disassembled and removed from site as it will no longer be required due to the presence of the permanent meteorological mast on the western side of the site. The disassembly process will generally follow the sequencing shown on Table 3.3.

Table 3.3 Typical Disassembly Sequencing

Demolition Sequence	General Description
Removal of Equipment	Equipment and monitors on the mast will be removed
Removal of hazardous materials	Electrical cabling, solar panels and other remaining electrical equipment
Removal of Mast Structure	Dissasemble Mast Structure
Removal of Groundworks	Ground anchors will either be dug up and removed or remain in situ
Source segregation of material fractions	C&D waste recovery
Transport of materials to authorised facilities	Authorised Waste Collection Permit holders and Waste Facility or Licence holders

There is also a 40m high telecommunications mast and associated radio equipment container on site which will be disassembled and removed from site as it is located within the footprint of the proposed borrow pit.

The disassembly process will generally follow the sequencing shown on Table 3.4.

Table 3.4 Typical Disassembly Sequencing

Disassembly Sequence	General Description
Services Disconnection	Shut off ESB.
Removal of Equipment	Plant & Equipment in the radio container removed
Removal of hazardous materials	Batteries & Printed Circuit Boards
Removal of antennae, dish's and aerials	Disconnect and remove each of the antennae, dish's and aerials
Removal of mast structure	Disassemble mast structure
Demolition of Structures Shells	Manual or mechanical demolition
Removal of groundworks	Foundation, slabs and redundant drainage infrastructure.
Source segregation of material fractions	C&D waste recovery
Transport of materials to authorised facilities	Authorised Waste Collection Permit holders and Waste Facility or Licence holders

3.5.5 Construction Phase Waste Management

3.5.5.1 Description of the Works

The construction of the proposed development will involve the construction of 21 no. turbines, associated new site roads, substation & control buildings and 1 no. anemometry mast.

The proposed turbines will be manufactured off site and delivered to site where on site erection will occur.

The turbine and anemometry mast foundations will consist of stone from the onsite borrow pit and a concrete base which will contain reinforcing steel. These concrete foundations will be shuttered with steel formwork specifically designed for the works and re-usable off site on similar projects.

The construction of the substation will comprise of a concrete foundation with concrete masonry blocks and a timber roof structure with roof tile or slate covering. The roof structure will be made up of prefabricated roof trusses manufactured off site to minimise timber cutting on site.

The site roads will be constructed with rock won from the onsite borrow pit.

The waste types arising from the construction phase of the proposed development are outlined in Table 3.4 below.

Table 3.5 Expected waste types arising during the Construction Phase

Materials type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Cardboard	Boxes, cartons	15 01 01
Composite packaging	Containers	15 01 05
Metals	Copper, aluminium, lead, iron and steel	17 04 07
Inert materials	Sand, stones, plaster, rock, blocks	17 01 07
Mixed municipal waste	Daily canteen waste from construction workers, miscellaneous	20 03 01
Plastic	PVC frames, electrical fittings	17 02 03
Plastic packaging	Packaging with new materials	15 01 02
Tiles and ceramics	Slates and tiles	17 01 03
Wooden packaging	Boxes, pallets	15 01 03

Hazardous wastes that may occur on site during the construction phase of the proposed development may include oil, diesel fuel, chemicals, paints, preservatives etc. All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility. As mentioned above, hazardous wastes will be kept separate from non-hazardous wastes that contamination does not occur.

3.5.5.2 Waste Arisings and Proposals for Minimisation, Reuse and Recycling of Construction Waste

Construction waste will arise on the project mainly from excavation and unavoidable construction waste including material surpluses and damaged materials and packaging waste.

Appropriate measures should be taken to ensure excess waste is not generated during construction, including;

- Ordering of materials should be on an 'as needed' basis to prevent over supply to site. Co-ordination is required with suppliers enabling them to take/buy back surplus stock.
- Purchase of materials pre-cut to length to avoid excess scrap waste generated on site.
- Request that suppliers use least amount of packaging possible on materials delivered to the site.
- Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal
- Ensuring correct sequencing of operations.
- Use reclaimed materials in the construction works.

Hazardous waste will be kept separate from all other construction waste to prevent contamination and removed appropriately.

3.5.5.3 Waste Arising from Construction Activities

All waste generated on site that will be contained in waste skips at a waste storage area on site. This waste storage area will be kept relatively tidy with a waste skip clearly labelled to indicate the allowable material to be disposed of therein.

The expected waste volumes generated on site are unlikely to be large enough to warrant source segregation at the wind farm site. Therefore, all wastes streams generated on site will be deposited into a single waste skip. This waste material will be transferred to a MRF by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.

The waste generated from the turbine erection will be limited to the associated protective covers which are generally reusable. Considering the specialist nature of this packaging material the majority will be taken back by suppliers for their own reuse. Any other packaging waste generated from the turbine supply will be deposited into the on-site skips and subsequently transferred to the MRF.

It is not envisaged that there will be any waste material arising from the materials used to construct the road as only the quantity of stone necessary will be excavated from the borrow pit or brought on site on an 'as needed' basis.

Site personnel will be instructed at induction that no under no circumstances can waste be brought to site for disposal in the on-site waste skip. It will also be made clear that the burning of waste material on site is forbidden.

3.5.5.4 Reuse

Many construction materials can be reused a number of times before they have to be disposed of:

- Concrete can be reused as aggregate for roads cable trench backfilling material.
- Plastic packaging etc. can be used to cover materials on site or reused for the delivery of other materials.
- Excavated peat can be reused for reinstatement of the areas around turbine foundations and adjacent to site roads.

3.5.5.5 Recycling

If a certain type of construction material cannot be reused onsite, then recycling is the most suitable option. The opportunity for recycling on site will be restricted to the associated packaging from the wind turbines.

All waste that is produced during the construction phase including dry recyclables will be deposited in the on-site skip initially and sent for subsequent segregation at a remote facility. The anticipated volume of all waste material to be generated at the proposed development is low which provides the justification for adopting this method of waste management.

3.5.5.6 Implementation

3.5.5.6.1 Roles and Responsibilities for Waste Management

Prior to the commencement of the proposed development a Construction Waste manager will be appointed by the project team. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the proposed development adheres to the management plan.

3.5.5.6.2 Training

It is important for the Construction Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the waste management plan. All employees working on site during the construction phase of the project will be trained in materials management and thereby, should be able to:

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;
- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and
- Identify and liaise with waste contractors and waste facility operators.

3.5.5.6.3 Record Keeping

The CDWMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The CDWMP can then be adapted with changes that are seen through record keeping.

The fully licensed waste contractor employed to remove waste from the site will be required to provide documented records for all waste dispatches leaving the site. Each record will contain the following:

- Consignment Reference Number
- Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch

- Registration no. of Waste Carrier vehicle
- Weight of Material
- Signature of Confirmation of Dispatch detail
- Date and Time of Waste Arrival at Destination
- Site Address of Destination Facility

3.5.5.7 Conclusion

The CDWMP will be properly adhered to by all staff involved in the project which will be outlined within the induction process for all site personnel. The waste hierarchy will always be employed to ensure that the least possible amount of waste is produced during the construction phase. Reuse of certain types of construction wastes will cut down on the cost and requirement of raw materials therefore further minimising waste levels.

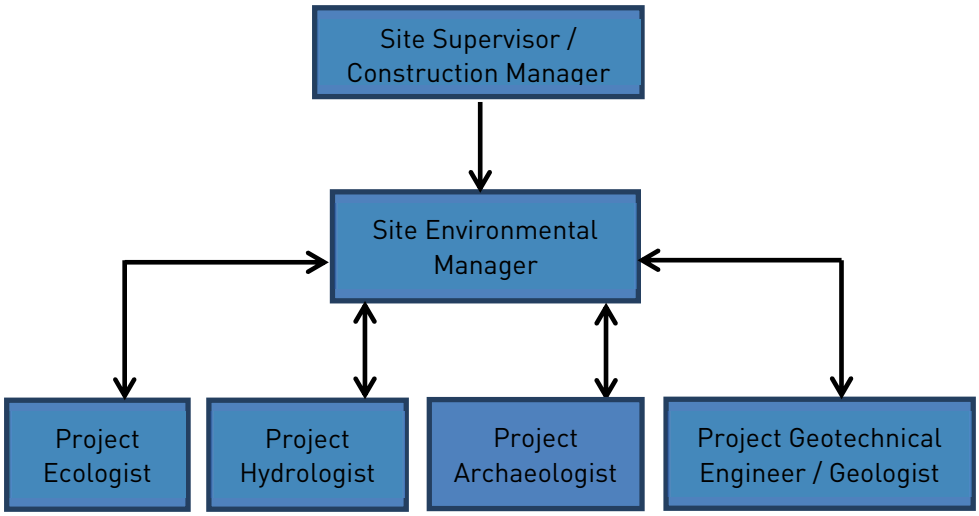
4 IMPLEMENTATION

4.1 Roles and Responsibilities

The Site Supervisor/Construction Manager and/or Environmental Manager are the project focal point relating to construction-related environmental issues.

In general, the Environmental Manager will maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. The Environmental Manager will act as the regulatory interface on environmental matters by reporting to and liaising with Offaly County Council and other statutory bodies as required.

The Environmental Manager will report directly to the Site Supervisor/Wind Farm Construction Manager. A Project Ecologist, Project Hydrologist and Project Geotechnical engineer will visit the site regularly and report to the Site Environmental Office. This structure provides a "triple lock" review/interaction by external specialists. An organogram structure for the construction stage is as follows:



Any requirement of the granted permission, for the works to be supervised by an engineer with professional indemnity insurance, who upon completion of the works, including site stability, shall certify the said works, will be adhered to. Such an engineer will be appointed to oversee and supervise the construction phase of the project.

4.1.1 Wind Farm Construction Manager/Site Supervisor

The Site Supervisor/Construction Manager will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements. The duties and responsibilities of the Site Supervisor/Construction Manager will include:

- Ensure that all works are completed safely and with minimal environmental risk;
- Approve and implement the Project CEMP and supporting environmental documentation, and ensure that all environmental standards are achieved during the construction phase of the project;

- Take advice from the Environmental Manager on legislation, codes of practice, guidance notes and good environmental working practice relevant to their work;
- Ensure compliance through audits and management site visits;
- Ensure timely notification of environmental incidents; and,
- Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

4.1.2 Environmental Manager

The main contractor will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in wind farm construction to fulfil the role of Environmental Manager, and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.

The Environmental Manager will report to the Site Supervisor/Construction Manager. The responsibilities and duties of the Environmental Manager will include the following:

- Preparation of the CEMP and supporting environmental documentation and review/approval of contractor method statements;
- Undertake inspections and reviews to ensure the works are carried out in compliance with the CEMP;
- Monitor the implementation of the CEMP, particularly all proposed/required Environmental Monitoring;
- Generate environmental reports as required to show environmental data trends and incidents and ensure environmental records are maintained throughout the construction period;
- Advise site management/contractor/sub-contractors on:
    - Prevention of environmental pollution and improvement to existing working methods;
    - Changes in legislation and legal requirements affecting the environment;
    - Suitability and use of plant, equipment and materials to prevent pollution;
    - Environmentally sound methods of working and systems to identify environmental hazards;
- Ensure proper mitigation measures are initiated and adhered to during the construction phase;
- Liaise with Project Ecologist, Project Hydrologist and Project Geotechnical Engineer to ensure regular site visits and audits/inspections are completed;
- Ensure adequate arrangements are in place for site personnel to identify potential environmental incidents;
- Ensure that details of environmental incidents are communicated in a timely manner to the relevant regulatory authorities, initially by phone and followed up as soon as is practicable by e-mail;
- Support the investigation of incidents of significant, potential or actual environmental damage, and ensure corrective actions are carried out, recommend means to prevent recurrence and communicate incident findings to relevant parties; and,
- Identify environmental training requirements, and arrange relevant training for all levels of site based staff/workers.
- The level, detail and frequency of reporting expected from the Environmental Manager for the Construction Manager, developer's project manager, and any

Authorities or other Agencies, will be agreed by all parties prior to commencement of construction, and may be further adjusted as required during the course of the project.

4.1.3 Project Ecologist

The Project Ecologist will report to the Environmental Manager and is responsible for the protection of sensitive habitats and species encountered during the construction phase of the wind farm. The Project Ecologist will not be full time on site but will visit the site at least once a month during construction.

The responsibilities and duties of the Project Ecologist will include the following:

- Review and input to the final construction phase CEMP in respect of ecological matters;
- In liaison with Environmental Manager, oversee and provide advice on all relevant ecology mitigation measures set out in EIS and planning permission conditions;
- Regular inspection and monitoring of the development, through all phases of construction/operation and provide ecological advice as required;
- Oversee the implementation of the Hen Harrier Conservation & Habitat Enhancement Plan in liaison with Environmental Manager, developer and landowners; and,
- Carry out ecological monitoring and survey work as may be required by the planning authority.

4.1.4 Project Hydrologist

The Project Hydrologist will report to the Environmental Manager and is responsible for inspection and review of drainage and water quality aspects associated with construction of the wind farm. The Project Hydrologist will not be full time on site but will visit the site at least once a month during construction.

The responsibilities and duties of the Project Hydrologist will include the following:

- Assist in compiling a detailed drainage design before construction commences and attend the site to set out and assist with micro siting of proposed drainage controls. This will be completed over several site visits at the start of the construction phase;
- Review and input to the final construction phase CEMP in respect of drainage and water quality management;
- Following the initial stage of drainage construction regular site visits will be required, at least once a month, to complete hydrological and water quality audits and reviews and report any issues noted to the Site Supervisor/Construction Manager; and,
- Complete ongoing inspection and monitoring of the development, particularly in areas of drainage control, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIS, and in relevant planning conditions.

4.1.5 Project Archaeologist

The Project Archaeologist will report to the Environmental Manager and is responsible for archaeological monitoring of the site during the construction phase. This will include monitoring of site investigations and excavation works as well as the monitoring and metal detection of spoil during construction

If new archaeological material is detected, during the pre-construction re-inspection, testing or monitoring, the project archaeologist will be responsible for ensuring they are preserved by record (archaeologically excavated) and therefore permanently removed with a full record made.

4.1.6 Project Geotechnical Engineer / Geologist

The Geotechnical Engineer or Project Geologist will report to the Environmental Manager and is responsible for inspection and review of geotechnical aspects associated with construction of the wind farm. The Geotechnical Engineer will not be full time on site but will visit site at least once a month during construction phase.
The responsibilities and duties of the Geotechnical Engineer or Geologist will include the following:

- Visit site regularly, or at least once a month during the construction phase, to complete geotechnical audits and reviews and report any issues to the Site Supervisor/Construction Manager;
- Ensuring that identified hazards are listed in the Geotechnical Risk Register and that these are subject to ongoing monitoring; and,
- Ongoing inspection and monitoring of the development, particularly in areas of peatland and at the borrow pit and peat repository areas, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIS, and in relevant planning conditions.

4.2 Water Quality and Monitoring

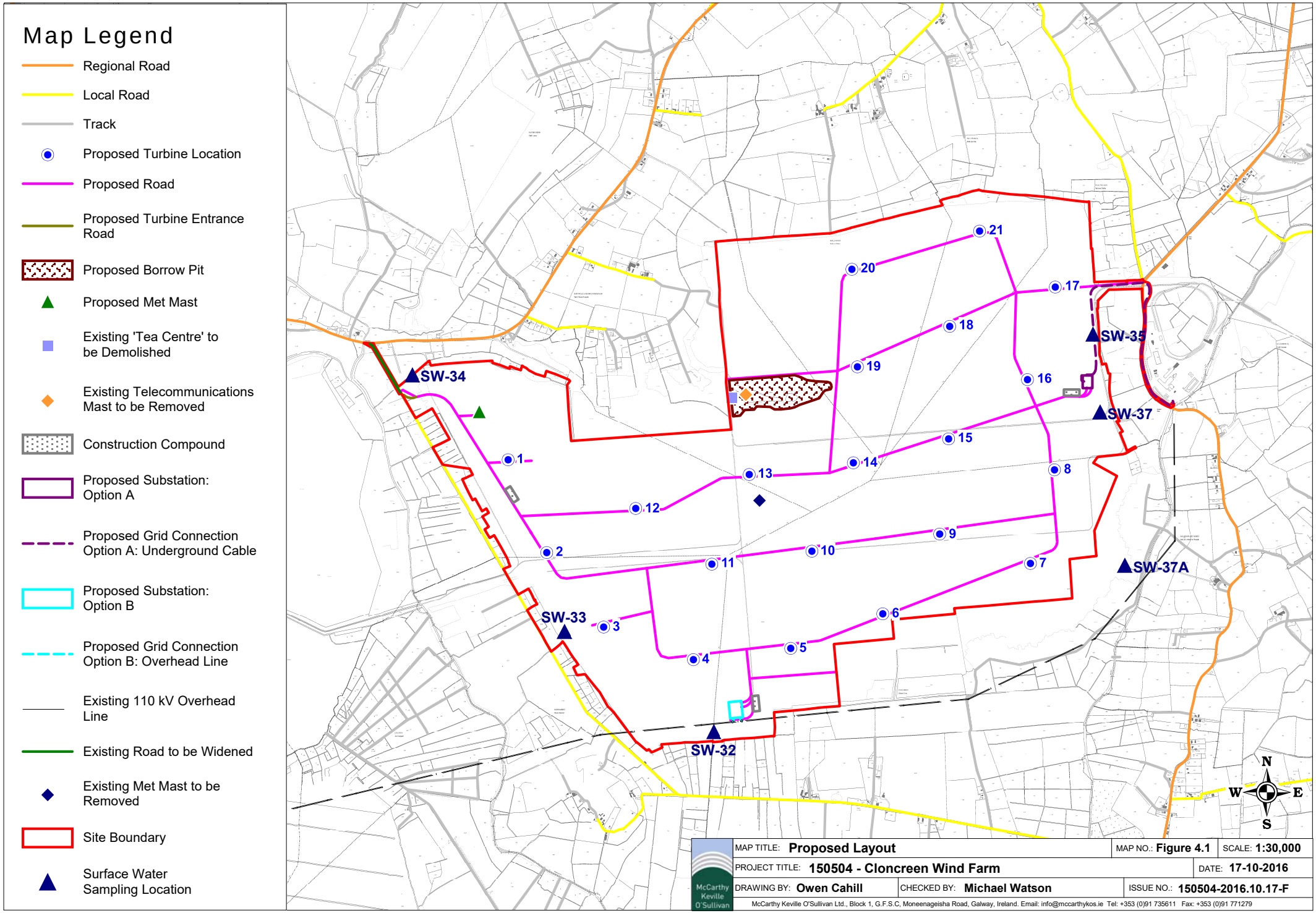
As part of the Integrated Pollution Control (IPC) licence for the peat harvesting operation (P0503-01) surface water quality monitoring is currently carried out at Cloncreen bog. A water quality monitoring programme will be prepared in advance of any wind farm construction commencing on site and will be consistent and complimentary to the existing monitoring programme that is ongoing for the IPC licence.

This will be monitored independently by the supervising hydrologist who will provide the necessary guidance on the monitoring requirements. Considering this CEMP is a working document, the specifics of a water monitoring programme are not outlined in detail. However, a general overview of the water monitoring programme is outlined as follows:

4.2.1 Pre-Construction Monitoring:

4.2.1.1 Monthly Laboratory Analysis Sampling

Baseline laboratory analysis for the parameters listed below with relevant regulatory limits and Environmental Quality Standards (EQSs) will be undertaken for each watercourse *e.g.* at SW32, SW33, SW34, SW35, SW37 & SW37A as outlined in Figure 4.1. This will not be restricted to just these six locations and further sampling points will be added as deemed necessary by the environmental manager in consultation with the project hydrologist.



4.2.2 Construction Monitoring

4.2.2.1 In-situ Field Monitoring

Field chemistry measurements of unstable parameters, (visual, pH, conductivity, temperature) will be taken at the six locations outlined in Figure 4.1. These analyses will be carried out by either the Environmental Manager or the Project Hydrologist. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be completed after major rainfall events as required, i.e. after events of >25mm rainfall in any 24-hour period. The supervising hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

4.2.2.2 Monthly Laboratory Analysis Sampling

Laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will continue throughout the construction phase for each watercourse downstream of the bog outfalls *e.g.* at SW32, SW33, SW34, SW35, SW37 & SW37A as outlined in Figure 4.1. All samples will be sent for analysis to an independent laboratory. This sampling will also be completed on an event based basis as required, *i.e.* after major rainfall events (>25mm rainfall in any 24-hour period). The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.

4.2.2.3 Weekly Visual Inspections

Inspection sheets and photographic records will be kept on site. Inspection points will include the in-situ field monitoring point locations and the laboratory analysis sampling point. Inspection points will depend on works being completed within the catchment upstream of the identified monitoring locations. Visual inspections will also be completed after major rainfall events, *i.e.* after events of >25mm rainfall in any 24-hour period and data including photographs will be collected by visual inspections and independently assessed by the supervising hydrologist who will monitor and advise on the records being received.

4.2.3 Post-Construction Monitoring:

4.2.3.1 Monthly Laboratory Analysis Sampling

Monthly sampling for laboratory analysis for a range of parameters adopted during pre-commencement and construction phases will continue for six months after construction is complete. The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.

The range of parameter for which surface water samples will be tested for are as follows:

- pH
- Flow
- Total Solids
- Suspended Solids (mg/l)
- Total Ammonia as N (mg/l)
- Total Phosphorus (as P) (mg/l)
- COD
- Colour

When the final CEMP report is prepared further details will be provided which will include an inspection and maintenance plan for the on-site drainage system which will be prepared in advance of commencement of any works. Regular inspections of all

installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended.

4.3 Environmental Awareness and Training

4.3.1 Environmental Induction

The Environmental Induction will be integrated into the general site induction on a case by case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site. Where necessary, the Environmental Induction will as a minimum include:

- A copy of the Environmental Management Site Plans and discussion of the key environmental risks and constraints;
- An outline of the CEMP structure;
- A discussion of the applicable Works Method Statement;
- The roles and responsibilities of staff, including contractors, in relation to environmental management; and,
- An outline of the environmental Incident Management Procedure.

4.3.2 Toolbox Talks

Tool box talks would be held by the Environmental Manager/Construction Manager at the commencement of each day, or at the commencement of new activities. The aims of the tool box talks are to identify the specific proposed work activities that are scheduled for that day. In addition, the necessary work method statements and sub plans would be identified and discussed prior to the commencement of the day's activities. The toolbox talks will include training and awareness on:

- Ecological Sensitivities on site
- Buffers to be upheld – watercourses, archaeology, ecology
- Sediment and Erosion Control
- Good site practice
- On-site Traffic Routes and Rules
- Keeping to tracks – vehicle rules
- Strictly adhering to the development footprint
- Fuel Storage
- Materials and waste procedures

Site meetings would be held on a regular basis involving all site personnel. The objectives of the site meetings are to discuss the coming weeks proposed activities and identify the relevant work method statements and sub plans that will be relevant to that week's activities. Additionally, any non-compliance identified during the previous week would also be discussed with the aim to reduce the potential of the same non-compliance reoccurring.

5 EMERGENCY RESPONSE PLAN

An Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

5.1 Emergency Response Procedure

The site specific Emergency Response Plan (ERP) will be developed prior to the construction of the facility and will include details on the response required and the responsibilities of all personnel in the event of an emergency. The ERP in terms of health and safety will require updating and submissions from the various contractors and suppliers on appointment as the proposed project progresses.

5.2 Environmental Emergency Response Procedure

An outline of the ERP in terms of an environmental emergency are presented in following sections which include peat movement, pollution control and notification to relevant authorities.

5.2.1 Excessive Peat Movement

Where there is excessive peat movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

1. All construction activities shall cease within the affected area.
2. Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.
3. Re-commencement of limited construction activity shall only start following a cessation of movement and the completion of a geotechnical risk assessment by a geotechnical engineer.

5.2.2 Onset of Peat Slide

Where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out.

1. On alert of a peat slide incident, all construction activities will cease and all available resources will be diverted to assist in the required mitigation procedures.
2. Where considered possible action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain, the possible short run-out length to watercourses, speed of movement and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.
3. For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

5.2.3 Spill Control Measures

Every effort will be made to prevent an environmental incident during the construction and operational phase of the proposed project. Oil/Fuel spillages are one of the main environmental risks that will exist on the proposed site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident.

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the Environmental Manager immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The Environmental manager will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The Environmental Manager will notify the appropriate regulatory body such as Offaly County Council, and the Environmental Protection Agency (EPA), if deemed necessary.

Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The Environmental manager must be immediately notified.
- If necessary, the Environmental manager will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on an ecologically sensitive receptor, such as a sensitive habitat, protected species or designated conservation site (pSPA or cSAC), the Environmental manager will liaise with the Project Ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the Environmental manager will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the Environmental manager and the Main Contractor. These records will be made available to the relevant authorities such as Offaly County Council, EPA if required.

The Environmental 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 as appropriate.

6 MITIGATION PROPOSALS

All mitigation measures relating to the pre-commencement, construction and operational phases of the proposed development were set out in the relevant chapters of the EIS.

This section of the CEMP groups together the mitigation measures presented in the EIS. It is intended that the CEMP would be updated prior to the commencement of the development, to include all mitigations measures, conditions and or alterations to the EIS and application documents that may emerge during the course of the planning process, and would be submitted to the Planning Authority for written approval.

For the purposes of demonstration, a table of selected mitigation measures providing the structure of how the measures are presented is outlined in Table 6.1. The selected mitigation measures have been grouped together according to environmental field/topic, as follows:

- Environmental Manager
- Run-off, Sediment and Erosion Control
- Fuel and Oil Control
- Dust Control
- Hydrological Impacts on the Ecological Value of the Site

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the future phases of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits.

Table 6.1 Site preparation and Mitigation Measures (Example Format)

Mitigation Measure	Reference	Mitigation Measure	Audit Result	Action Required
Pre-Commencement Phase				
		Environmental Manager		
1	CEMP 4.1.2	The main contractor will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in wind farm construction to fulfil the role of Environmental Manager, and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.		
		Run-off, Sediment and Erosion Controls		
2	EIS 3.6.5.2 CEMP 3.1.5	Collector drain will be installed in advance of any construction works commencing.		
3	-	To be populated with further mitigation measures prior to commencement		
4	-	To be populated with further mitigation measures prior to commencement		
5	-	To be populated with further mitigation measures prior to commencement		
Construction Phase				
		Fuel and Oil Control		
6	EIS 3.3.12.2 CEMP 3.2	On-site refuelling will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the proposed wind farm. The 4x4 towing vehicle will also carry fuel absorbent material and pads in the event of any		

Mitigation Measure	Reference	Mitigation Measure	Audit Result	Action Required
		accidental spillages. The fuel bowser will be parked on a level area in the construction when not in use.		
		Dust Control		
7	EIS 3.3.13.5 CEMP 3.4.1	If necessary, water will be taken from settlement ponds in the site's drainage system, and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression.		
8	-	To be populated with further mitigation measures prior to commencement		
9	-	To be populated with further mitigation measures prior to commencement		
10	-	To be populated with further mitigation measures prior to commencement		
Operational Phase				
		Hydrological Impact on the Ecological Value of the Site		
11	EIS 3.3.7	Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.		
12	EIS 8.4.2.2	During the operational phase of the wind farm runoff from individual turbine hardstanding areas will be not discharged into the existing drain network but discharged locally at each turbine location through silting ponds and buffered outfalls onto vegetated surfaces.		
13	-	To be populated with further mitigation measures prior to commencement		
14	-	To be populated with further mitigation measures prior to commencement		
15	-	To be populated with further mitigation measures prior to commencement		

7 MONITORING PROPOSALS

All monitoring proposals relating to the pre-commencement, construction and operational phases of the proposed development were set out in the relevant chapters of the EIS.

This section of the CEMP groups together the monitoring measures presented in the EIS. It is intended that the CEMP will be updated prior to the commencement of the development, to include all monitoring measures, conditions and or alterations to the EIS and application documents that may emerge during the course of the planning process, and would be submitted to the Planning Authority for written approval.

For the purposes of demonstration, a preliminary table of selected monitoring measures providing the structure of how the measures are presented can be found in Table 7.1.

The monitoring proposals are presented in terms of frequency of monitoring, reporting measures and monitoring responsibility.

A timeline for the implementation of environmental monitoring can be found in Section 8 of this document.

Table 7.1 Schedule of Monitoring Measures (Example Format)

Monitoring Measure	Reference	Survey/Monitoring	Frequency	Reporting Measures	Responsibility
Pre-Commencement Phase					
		Hydrological			
1	EIS Sec 8.3.6	Surface water sampling will be completed prior to commencement	As necessary	Quarterly	Environmental Manager
2	EIS Sec 8.4.2.	An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works.	Once	Quarterly	Environmental Manager
3	-	To be populated with further monitoring measures prior to commencement	-	-	-
4	-	To be populated with further monitoring measures prior to commencement	-	-	-
5	-	To be populated with further monitoring measures prior to commencement	-	-	-
Construction Phase					
		Hydrological			
6	EIS Sec 8.3.6	Surface water sampling will be completed for the parameters listed at SW 1 – 4 throughout the construction phase on a monthly basis or after rainfall events.	Monthly	Quarterly	Environmental Manager
7	EIS Sec 8.4.2.	During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each primary watercourse, and specifically following heavy rainfall events (i.e. weekly, monthly and event based).	Weekly/Monthly	Quarterly	Environmental Manager
8	-	To be populated with further monitoring measures prior to commencement	-	-	-
9	-	To be populated with further monitoring measures prior to commencement	-	-	-
10	-	To be populated with further monitoring measures prior to commencement	-	-	-

Monitoring Measure	Reference	Survey/Monitoring	Frequency	Reporting Measures	Responsibility
Operational Phase					
		Birds			
11	EIS Sec 6.8	Post-construction monitoring will be carried out in years 1, 2, 3, 5, 10 and 15 of the life of a wind farm which will include ongoing breeding bird/activity surveys (that can be compared with the baseline studies to indicate any changes on bird activity within the study area) and similar surveys should also be carried out in areas of similar habitats outside the wind farm and the immediate environs of the turbines post construction for comparison. A programme of regular corpse searching should be carried out (at least as regularly as once per month) at the wind turbine sites in the same years to find the corpses of birds and bats that may be struck by the operating turbines	Annually	Annually	Project Ecologist
12	EIS Sec 5.5.3	Ideally, post-construction monitoring will include ongoing breeding bird/activity surveys and similar surveys should also be carried out in areas of similar habitats outside the wind farm and the immediate environs of the turbines post construction for comparison.	Annually	Annually	Project Ecologist
13	-	To be populated with further monitoring measures prior to commencement	-	-	-
14	-	To be populated with further monitoring measures prior to commencement	-	-	-
15	-	To be populated with further monitoring measures prior to commencement	-	-	-

8 PROGRAMME OF WORKS

8.1 Construction Schedule

It is estimated that the construction phase will take approximately 18months from starting on site to the commissioning of the electrical system. In the interest of breeding birds, construction will not commence during the breeding bird season (1st of March to 31st of August). Construction may commence at any stage from September onwards to the end of March, so that construction activities are ongoing by the time the next breeding bird season comes around, and can continue throughout the next breeding season.

The anticipated phasing and scheduling main construction task items are outlined in Figure 8.1 below.

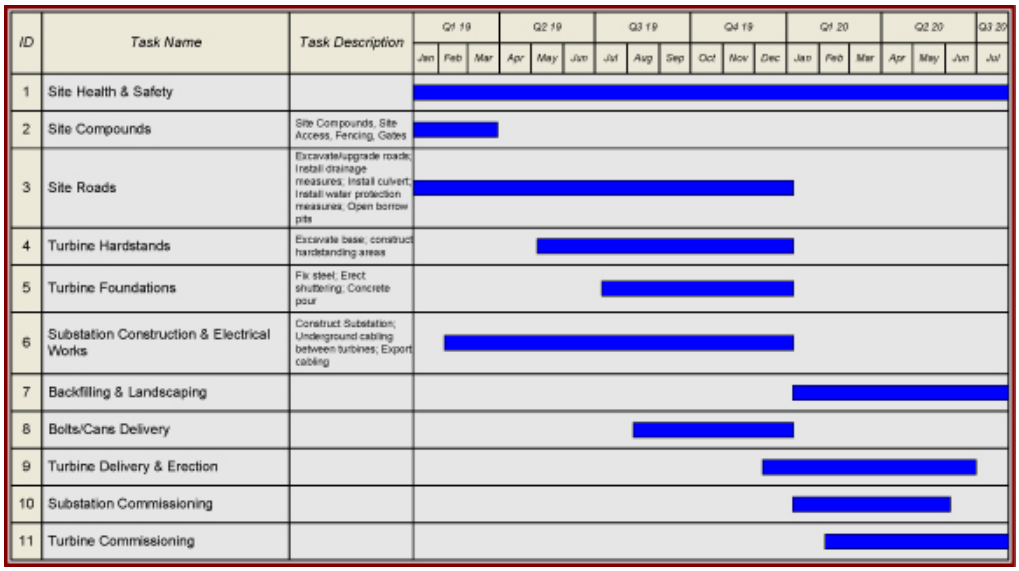


Figure 8.1 Indicative Construction Schedule

9 COMPLIANCE AND REVIEW

9.1 Site Inspections and Environmental Audits

Routine inspections of construction activities will be carried out on a daily and weekly basis by the Site Environmental Manager and the Construction Manager to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this CEMP and any subsequent updates to this document. Environmental site inspections will be carried out by suitably trained staff.

9.2 Auditing

Environmental audits will be carried out during the construction phase of the project. In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by contractor staff or alternatively by external personnel acting on their behalf. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the CEMP is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

9.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during construction of the wind farm:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the EMP.

9.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Construction Manager, as advised by the Site Environmental manager. Corrective actions may be required as a result of the following;

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Construction Manager and the Site Environmental manager will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

9.5 Construction Phase Plan Review

This CEMP will be updated and reviewed prior to commencement of construction, and also every six months thereafter during the construction phase of the project.