TULLAGHMORE WIND FARM LIMITED.

Tullaghmore Wind Farm,
Maam Cross, Co. Galway

CONSTUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

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DOCUMENT APPROVAL

PROJECT	Proposed Tullaghmore Wind Farm	
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1 BACKGROUND TO REPORT

1.1 INTRODUCTION

Jennings O'Donovan & Partners Limited, on behalf of Tullaghmore Windfarm Limited (TWL), has prepared this Construction Environmental Management Plan (CEMP) for the construction of the proposed 6 turbine, Tullaghmore Wind Farm, improvement works to roads to facilitate turbine delivery at 4 no. locations and the construction of underground cable ducting to connect the proposed wind farm substation to the National Grid at Screebe 110kV substation. The Development, as proposed, has been designed to ensure that any environmental impacts which may arise can be appropriately mitigated such that there will be no likely significant environmental effects.

This document will be further developed and expanded following the appointment of the Contractors for the main construction works. Some items of this CEMP can only be finalised with appropriate input from the Contractors who will actually carry out the main construction works. This CEMP identifies, for the incoming Contractors, the key planning, environmental and contract document constraints that must be adhered to in order to deliver optimum environmental reassurance for the site.

The preparation of this document, and its continued development, is considered to be an appropriate mechanism to address the requirements of the aforementioned condition to see that the appropriate management of construction activities is in accordance with the relevant environmental requirements.

This document should be read in conjunction with the Appropriate Assessment Screening Report, Natura Impact Statement, Environmental Impact Assessment Report (EIAR) and Planning Drawings.

1.2 PURPOSE

Jennings O'Donovan & Partners Limited (JOD) on behalf of TWL has prepared this CEMP for the proposed construction of the Tullaghmore Windfarm (the Development). This document will be further developed and expanded following the appointment of a Contractor for the main construction works. Some items of this CEMP can only be finalised with appropriate input from the Contractor who will actually carry out the construction works. In the event planning consent is granted for the proposed development, the CEMP will be updated prior to commencement of development to address the requirements of any relevant planning conditions, including any additional mitigation measures, which are conditioned and will be submitted to the planning authority for written approval.

This CEMP has been developed in accordance with the Institute of Environmental Management and Assessment (IEMA) Practitioner "Environmental Management Plans", Best Practice Series, Volume 12, December 2008 and has been designed to cover the proposed environmental strategies that will be carried out, before and during the Development works. This procedure ensures that whilst work is being carried out that the Contractor is solely responsible for ensuring that all aspects of the environment are managed according to required standards and legislation.

This CEMP defines good practice as well as specific actions required to implement mitigation requirements as identified in the Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR). The principal objective is to avoid, minimise and control adverse

environmental impacts associated with the Development. This document will act as a continuous link and main reference document for environmental issues between the design, decommissioning, construction and the maintenance and operation stages of the project.

The CEMP is considered to be a live document which will be developed further and / or amended where necessary subsequent to planning consent to take account of planning condition requirements.

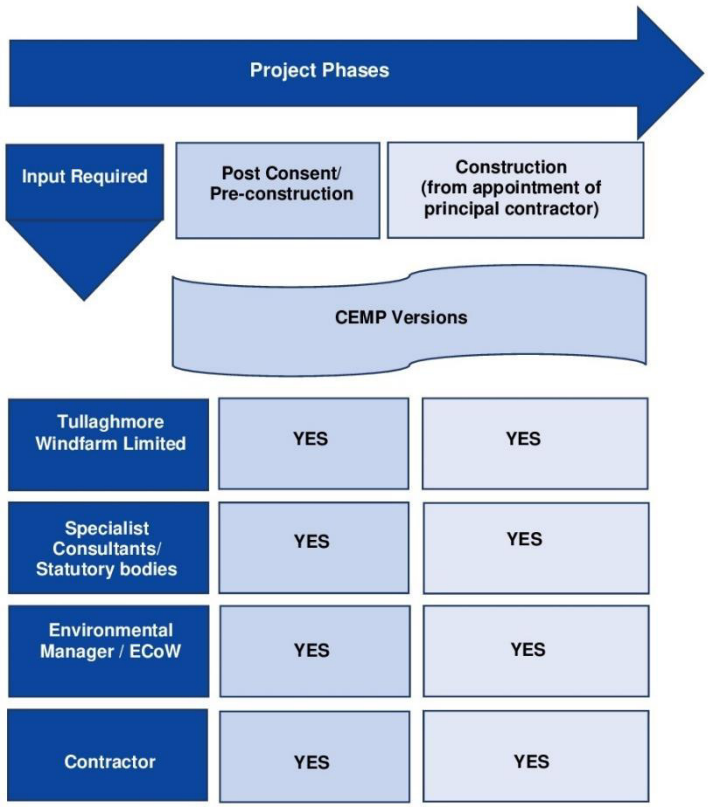

Figure 1.1 Summary of CEMP development process

The CEMP will form part of the main Civil Construction works Contract. The Contractor will take account of the structure, content, methods and requirements contained within the various sections of this CEMP when further developing this document (to include environmental plans and other related Construction Management Plans) as required by the Contract. Site specific sensitivities and requirements of any planning consent, along with updates in legal requirements and construction best practice will also be required to be considered in the development of the site CEMP.

As such, the Developer commits to safeguarding the environment through the identification, avoidance and mitigation of the potential negative environmental impacts associated with the development, decommissioning, construction and operation of the Tullaghmore Windfarm Project by ensuring all of the mitigation measures identified in the EIAR and NIS are implemented in full.

A summary of the CEMP development process and the required input from the main parties involved in the post planning and decommissioning and construction of the windfarm is indicated in **Figure 1.1**.

2 RESPONSIBILITIES FOR ENVIRONMENTAL MANAGEMENT

Environmental Management responsibilities for the site require to be documented. The **Contractor** will be responsible for the environmental management of the TWL site, including the preparation of on-site environmental documentation.

This section shall set out the environmental responsibilities on site, including identification of key site staff and their environmental management responsibilities and how this links in with "Client" responsibilities and that of the project team.

Prior to commencement of construction works, the Contractors will identify a core Environmental Management Group, comprising of specific project personnel and the Ecological Clerk of Works. The Environmental Management Group will meet monthly to discuss the monthly environmental report and will advise site personnel on areas where improvements may be made on site. The group will draw on technical expertise from relevant specialists where required, including the Resident Engineer and will liaise with other relevant external bodies as required.

The Developer will appoint an Ecological Clerk of Works who will be responsible for coordination, compliance monitoring and continued development of the CEMP and any other surveys, reports or method statements required. The Ecological Clerk of Works will also review the Contractors' method statements and environmental plans as required by the CEMP, carry out compliance auditing during the construction phase and coordinate the Environmental Management Group and required liaisons between Tullaghmore Wind Farm Limited, the Contractors, the Planning Authority and other statutory authorities.

3 COMMUNICATION PLAN

Both the Contractor and TWL will appoint Project Managers to the Tullaghmore Windfarm project. These Project Managers will be the main points of contact between the two parties. The Contractor's team will report directly to the Construction Project Manager, with all TWL's staff reporting directly to the Project Manager.

The main project communications will take the form of structured reporting arrangements and meetings.

All issues in relation to environmental management/monitoring will be reported to the Site Environmental Manager/Engineer. The Site Environmental Manager/Engineer shall report to the Contractor and TWL on a regular basis at a minimum.

In advance of any works commencing on site, TWL will appoint a dedicated Project Liaison Officer (PLO) for the duration of construction works. The PLO will be responsible for advising local residents of impending works, road closures, traffic diversions, and any other queries which may be forthcoming from local residents, landowners or businesses.

It is proposed that the PLO will conduct house-to-house calls at all dwellings along the proposed route to advise of the upcoming works and to inform residents of traffic diversions, for example during the grid connection works. Signage will be erected during the works to inform the general public that works are ongoing. These signs/posters will include information about the project and the PLO's contact details to ensure that any queries from the public can be responded to in an appropriate manner.

All staff will be advised to direct any queries from the public to the PLO or developer's Project Manager and to ensure that all interactions are recorded on the site register.

Relevant departments, including the Environment Section, Roads Department and Planning Department, within Galway County Council will be contacted in advance of the commencement of works and will be consulted throughout the duration of construction activities. In addition, where it is deemed necessary to consult with statutory consultees (e.g., Inland Fisheries Ireland), such consultations will take place in advance of and throughout the duration of construction.

TWL will develop a Contact Sheet with a list of all TWL contractors and relevant third-party contact details. This table will be updated prior to construction and kept current by the Contractor for the duration of the Contract.

4 SITE DESCRIPTION AND ASSOCIATED ENVIRONMENTAL SENSITIVITIES

The Project will comprise of the following main components:

- Erection of 6 no. wind turbines with an overall ground to blade tip height of 185m. The candidate wind turbine will have a rotor diameter of 162m and a hub height of 104m
- Construction of site access roads, crane hardstand areas and turbine foundations.
- Improvement of existing site entrance with access onto the N59
- Construction of one no. temporary construction compound with associated temporary site offices, parking areas and security fencing
- Installation of 1 no. permanent meteorological mast with a height of 104m
- Construction of new internal site access tracks and upgrade of existing Site track, to include all associated drainage
- Development of a site drainage network
- Construction of one no. permanent 38kV substation
- All associated underground electrical and communications cabling connecting the wind turbines to the wind farm substation
- All works associated with the connection of the wind farm to the national electricity grid, which will be via 38kV underground cable connection approximately 18.65km in length to the existing ESB Screebe 110kV GIS Substation.
- Biodiversity enhancement measures
- Peat storage and restoration areas

A 10-year planning permission and 30-year operational life from the date of commissioning of the entire wind farm is being sought.

The EIA also assesses the Works at 4 no. locations along the proposed turbine delivery haul route from Galway Port and the proposed underground grid connection from the Site to Screebe 110kV Substation.

The location of the site is shown on **Figure 4.1**.

Figure 4.1 – Site Location

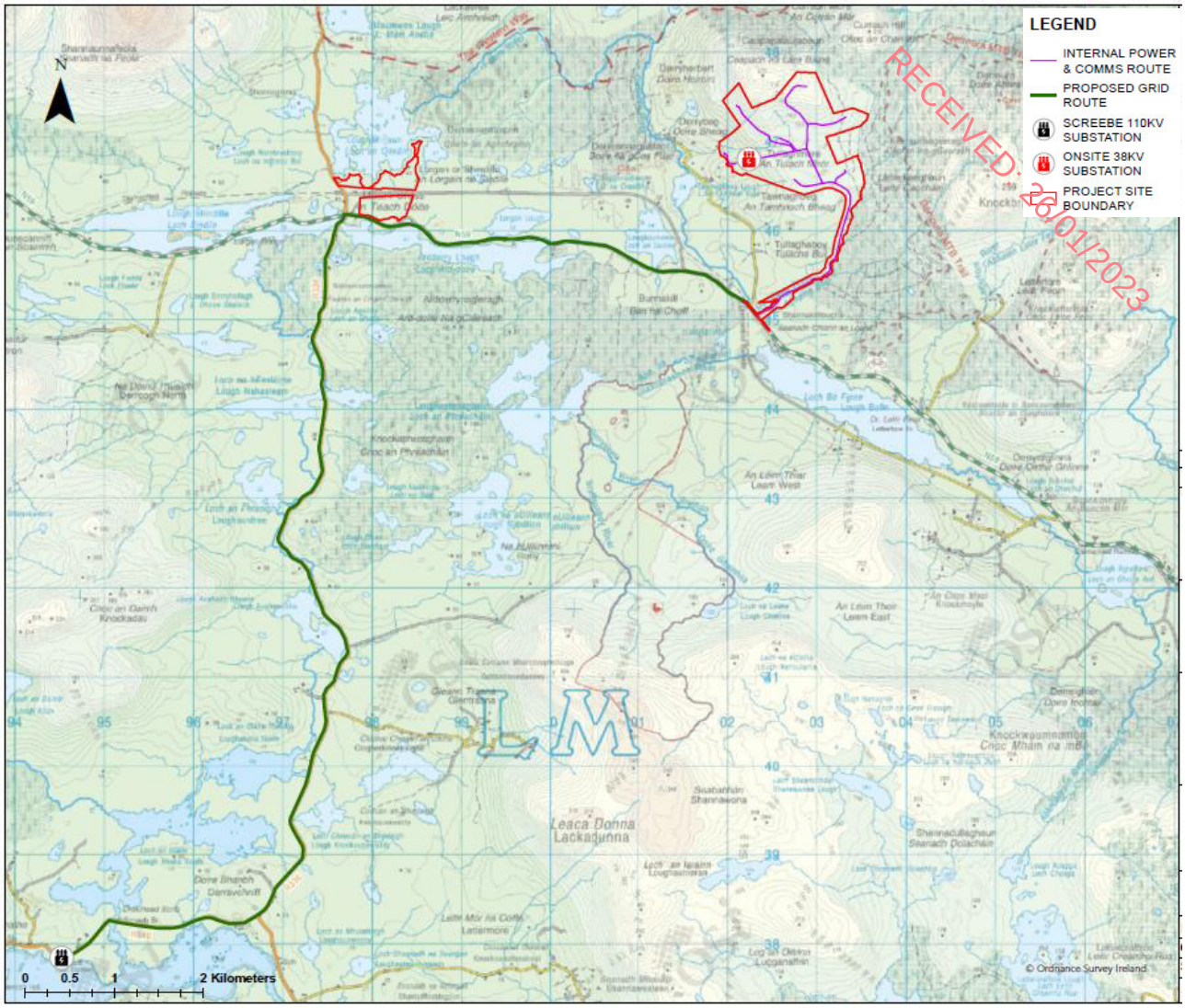

Figure 4.2 – Proposed Site and Grid Connection

5 ENVIRONMENTAL MANAGEMENT

This CEMP is informed by Planning Conditions where the Project is granted planning consent, mitigation measures set out in Environmental Impact Assessment Report (2022) and associated documents and by the guidance documents and best practice measures listed below. This CEMP will be adhered to and further developed by the Contactor and will be overseen by the project representative/foreman.

5.1.1 Guidance Documents

- Construction Industry Research and Information Association (CIRIA) (2006) Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London.
- CIRIA (2006) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).
- COFORD (2004) Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads.
- CIRIA (2015) SuDS Manual, (CIRIA Report C753, 2015)
- Coillte (2009): Forest Operations & Water Protection Guidelines.
- Department of Agriculture, Food and the Marine (2018) DRAFT Plan for Forests & Freshwater Pearl Mussel in Ireland – Consultation Document.
- Forestry Commission (2004) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh.
- Forest Services (2006) Draft Plan for Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures.
- Forest Service (2000) Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.
- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- GPP1 (2020) Understanding your Environmental Responsibilities – Good environmental Practices, NetRegs.
- GPP 5 (2018) Works and Maintenance In or Near Water, NetRegs.
- GPP21 (2021) Pollution Incident Response Planning, NetRegs.
- GPP 22 (2018) Dealing with Spills, NetRegs.

5.2 HUMAN BEINGS AND COMMUNITY

The assessment set out in **Chapter 4: Population & Human Health** has not identified any likely significant effects from the Development on population or human health. The Development has been assessed as having the potential to result in effects of slight positive, long-term impact overall. Cumulative effects are predicted unlikely.

The main mitigation measure is by design or avoidance. A suitable separation distance from turbines and other key infrastructure to properties has been embedded in the EIA Development design. Additional mitigation to protect site personnel and the public will also be implemented in the event of damage to a turbine and subsequent likely turbine or turbine component failure.

These are:

- Physical and visual warnings such as signs will be erected as appropriate for the protection of site personnel and the public.
- The construction of the Proposed Development shall be managed in accordance with the Safety, Health and Welfare at Work Act 2005 (as amended), the Safety, Health and Welfare at Work (General Application) Regulations 2007 (as amended), and the Safety Health and Welfare at Work (Construction) Regulations 2013 (as amended).
- As required under the Safety, Health and Welfare at Work (Construction) Regulations 2013, the Client shall appoint a Project Supervisor for the Design Process (PSDP) and a Project Supervisor for the Construction Stage (PSCS). The PSDP shall compile a Preliminary Safety and Health Plan (PSHP), which details general information about the project and envisaged health and safety risks. The PSHP shall be made available to the PSCS. The PSCS shall develop a Construction Stage Health and Safety Plan (CSHSP) which incorporates the information contained in the PSHP and details how safety and health will be managed during the construction of the project. Pending approval of the application, the PSCS may also develop the following documents during the pre-construction stage of the Proposed Development, for implementation during the construction stage:
    - Emergency Response Plan
    - Detailed Traffic Management Plan
- Measures are set out in **Chapter 15: Transport and Transport** relating to how delivery of goods and services would be managed during works to minimise impacts.

Once the above mitigations are taken into account, the residual risk on population and human health is assessed to be an imperceptible, long-term effect.

5.3 ECOLOGY

All mitigation measures have been developed in the context of national and international legislative guidance for the protection and management of flora, habitats of conservation importance, fauna and aquatic ecological interest.

Guidelines to be adhered to in the delivery of the CEMP and method statements include the following:

- *'Guidelines on protection of fisheries during construction works in and adjacent to waters'* (Inland Fisheries Ireland, 2016)
- *'Guidelines for the treatment of Badgers prior to the construction of National Road Schemes'* (National Roads Authority, 2005)
- *'Guidelines for the protection and preservation of trees, hedgerows and scrub prior to, during and post construction of National Road Schemes'* (National Roads Authority, 2006a)
- '*Guidelines for the treatment of bats during the construction of national road schemes'* (National Roads Authority, 2006b)
- *'Guidelines for the treatment of Otters prior to the Construction of National Road Schemes'* (National Roads Authority, 2006c)
- *'Guidelines for the crossing of watercourses during the construction of national road schemes' (*National Roads Authority*, 2008)*
- *'Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads'* (National Roads Authority, 2010)

The description of mitigation measures is provided in terms of mitigation by avoidance, reduction and remediation.

5.3.1 Monitoring

Monitoring of flora and fauna will be undertaken as part of the daily/weekly site inspections carried out by the on-site Ecological Clerk of Works (ECoW)[1] or environmental advisor/manager. All details from the inspections will be recorded in the form of a monthly report; the report will be issued to TWL and the Contractor; with findings of the report being discussed at the monthly health, safety and environmental meetings.

Depending on the location of the site Consents/Licenses may also be required in relation to Protected Species and Habitats.

5.3.2 Mitigation by Avoidance

The Development has been designed to ensure that an adequate buffer zone is provided for between this infrastructure and watercourses. In addition, the design has sought to minimise the requirement for new watercourse crossings. This has been achieved by restricting the need for watercourse crossing to a total of four crossings within the Site, with one (the crossing of the Owenwee River)

[1] Note The requirement to have an Ecological Clerk of Works will depend on the site sensitivities and planning condition requirements

comprising an upgrade to the existing crossing. The buffer zone implemented between all large-scale infrastructure associated with the wind farm site, such as turbines, hardstand, and access tracks are located at distances of over 50m from any watercourses, except for where the Access Track crosses watercourses at the above three referenced locations. In addition, the best practice construction measures that are described above are designed to avoid impacts on areas that are outside the site including watercourses.

A Surface Water Management Plan (see **Appendix B**) has been prepared for the proposed wind farm and this plan aims to implement a suite of measures that will avoid negative impacts to water quality and the hydrological regime of the Owenwee River.

5.3.3 Protection of Designated Areas

The project is not located within any designated areas and as such the potential for direct impacts to these areas will be avoided. As set out in the accompanying Natura Impact Statement the principal risk posed by the proposed development to designated areas in the surrounding area relate to indirect impacts arising from negative impacts to water quality and associated adverse effects to freshwater dependent habitats and species. Mitigation measures are set out in Section 6.7.2.2.2 of Chapter 5 of the EIAR that aim to protect water quality in receiving watercourses and thereby avoid the potential for adverse effects to the freshwater dependent qualifying habitats and qualifying species of surrounding designated areas.

5.3.4 Protection of Important Habitats

The Development will result in the loss of areas of Annex I (and non-Annex I habitats), including 7130* Active Blanket Bog, 7130 Blanket Bog, 4010 Wet Heath and 7150 Transition Mire as. It is essential that the direct loss of any such habitat is fully minimised (notably also taking account of the international/national nature conservation value of these habitats) and so mitigation by avoidance is essential to limit such losses within the footprint of the Development, and its zone of influence. Mitigation in this respect is:

- The full extent of the infrastructure footprint will be marked out prior to the commencement of works, with an appropriately robust and visible fencing / marker system. Where this meets Annex I habitats, this will also be the full extent of the works corridor, with no machinery access (access will only be allowed on foot and only for the purposes of silt / pollution control if required), storage or other works allowed outside this area.
- The efficacy and coherence of the marker system (and required remediation) will form an essential part of the Site operations.
- A pre-construction Invasive Species Survey will be conducted during the optimal growing season (May to August immediately prior to works occurring at this site for the Development) and shall include data on all locations, extents and potential construction impacts in relation to scheduled and non-scheduled Alien Invasive Species (IAS). This survey will be completed

along with reporting on the best course of action to be implemented to avoid the spread of such IAS on the Site or further afield. Advice will be required from an invasive species specialist, particularly in relation to the appropriate treatment / removal or waste disposal of potentially contaminated materials.

5.3.5 Protection of Important Mammal Species

The Ecological Clerk of Works for the construction phase will complete a pre-construction survey of the construction footprint in order to confirm the continued absence of mammal breeding and resting places within the construction footprint and within 50m of the construction footprint or identify the presence of newly established breeding/resting places. Based upon the results of these surveys, the ECoW will establish whether or not there is a need at that stage for the implementation of further mitigation measures and the requirement for protected species licences. An example of where such a need could arise is where an otter holt becomes established in the immediate vicinity of the proposed bridge crossing of the Owenwee River.

5.3.6 Protection of Bats

Any trees and treelines along approach roads and planned site access tracks will be retained unless felling is unavoidable. Retained trees should be protected from root damage by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing.

5.3.7 Protection of Herpetofauna

The Ecological Clerk of Works for the construction phase will complete a survey of the construction footprint during spring (late February / March / early April) ahead of the proposed works in order to identify any key amphibian breeding areas. This will allow wildlife barriers to be installed where necessary to minimise impacts upon such features where these are likely to be indirectly affected by the works.

5.3.8 Mitigation by Design

5.3.8.1 Protection of Annex 1 Blanket Bog

In order to minimise the impact of the proposed Access Tracks that will traverse across blanket bog habitat, floated roads will be incorporated into the design of the Access Tracks. A general rule of thumb in the industry is for site tracks across peat greater than 1.5m deep to be floated using layers of geosynthetic materials and following the best construction practices and guidance as highlighted, for example, in the guidance produced by Forestry Civil Engineering (FCS) and Scottish Natural Heritage (SNH) (2010) "Floating Roads on Peat".

The aim during floating road construction is to load the road slowly, to achieve a slow and steady settlement as the peat changes volume and water is forced out of the peat mass. This permits the peat to gradually compress and consolidate allowing time for it to gain in strength and take up the new load. Sufficient time must be allowed for the loading phases of the floating road and these loading phases must be carefully controlled in order to keep the stresses induced in the peat below the strength of the peat at the time. This prevents rapid peat failure which has been the cause of the creation of unsuccessful 'sinking' roads in the past.

In recent years a vast amount of experience on constructing floating roads has been gained from methods used in Scandinavian countries (e.g. Munro and MacCulloch, 2006) reporting on experience from the Roadex III Project), and from the experience of construction contractors working in difficult peatland habitats in northern Scotland. These methods have previously been brought together in the FCS and SNH (2006) guidance. When properly implemented these methods produce robust engineering and drainage solutions that cause minimal impact on peat hydrology.

Apart from engineering facility across soft terrain, floating roads are used to minimise potential effects on peat hydrology. Excavating and cutting into peat severs hydrological flow routes and cuts off the sources of water required to maintain peat bog vegetation communities. Well designed and constructed floating roads, with frequently spaced cross-drainage, permit diffuse drainage through the structure of the road throughout the life of the wind farm. It is important that vegetation communities on the upslope side of the road, supported by aerobic acrotelmic peat conditions, are not saturated, and lose their character, while vegetation communities on the downslope side of the road are not dried out through lack of water supply. Incorporation of diffuse drainage also prevents turbulent point sources which can cause erosion and damage vegetation communities.

A number of considerations for the Site have contributed to the choice of routing and design of floating road selection. These are:

- minimising length of peat or mire to be crossed;
- gradient – the shallowest gradients have been sought, using detailed LiDAR mapping. However a shallow gradient assists road drainage; and
- design – the construction method, drainage frequency and materials to be used (particularly the type of geogrid).

Since strength of peat in a deposit is seldom directly related to depth, peat depth was not a prime consideration in choice of routing for sections of floating road. Custom-designed floating road solutions will be used at the Development, which address the site-specific needs of each stretch of track. Where a gradient exists, the permanent drainage for floating roads will be designed with sufficient cross drainage to ensure hydrological connectivity from the upslope side to the downslope side. This will be especially important along the section of floated road that will be provided along the section of the access track in the vicinity of poor flush and transition mire habitat to the south of the proposed turbine T1. The construction and loading of stretches of floating road will progress in phases to allow time for settlement and equilibration of underlying peat, which is vital for long term maintenance of peat strength.

The design of the floating road will incorporate within-road cross drains in addition to culverts where the floated road will cross existing ditches or preferential flow paths. Beyond this, the selection of floated track sections will be made in advance of construction works, and following completion of detailed pre-construction design and with approval of ECoW, Geologist, Hydrologist, etc.

5.3.8.2 Protection of Watercourses

An Ecological Clerk of Works ("ECoW") will be employed from the commencement to completion of construction works, including Access Tracks, On-site Substation and Control Building, Temporary Construction Compound, Turbine Hardstands and Turbine Foundations and Wind Farm Internal Cabling, Spoil Storage and Restoration (Enhancement) areas and grid connection works at a minimum. Primary roles for the ECoW will include the setting out and monitoring of the working corridor and review of pollution control measures and working practices during the active construction period as well as ad hoc input into site remediation.

For the construction of culverts, all activities must adhere to IFI, (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters. Section 9 Planning, Design and Construction Issues details on Best Practice guidance for the installation of culverts on watercourses.

All measures outlined in the accompanying SWMP will befully implemented by the contractor and will be agreed to with the planning authority in advance of construction activities. The objective of the SWMP is to prevent pollution to watercourses and adverse impacts to sensitive fauna. The SWMP has provided sufficient detail so that all activities that could potentially lead to negative impacts on water quality have been identified. The SWMP is based upon a detailed understanding of the hydrology, hydrogeology and geology within and surrounding the proposed wind farm extension.

All watercourses draining the Site will be examined on a repeated scheduled timeframe (i.e. daily/weekly/fortnightly etc.) as deemed appropriate by the Contractor, NPWS and Inland Fisheries Ireland. A log will be kept of these examinations and a water sampling protocol to monitor key water quality parameters will be established in agreement with the NPWS and Inland Fisheries Ireland. The monitoring protocol will be devised so that sediment release (should it occur) from the Site is detected at an early stage. Sediment release to the above watercourses from the site will be restricted to <25mg/l as per the Salmonid Water Regulations.

Method statements outlining the approach to all surface watercourse crossing will be approved in advance with Inland Fisheries Ireland.

Disturbance to natural drainage features will be avoided during the construction phase of the Development. The design of the Development has allowed for the establishment of a 50m wide watercourse buffer zone during the construction phase.

Uncontaminated surface runoff will be diverted away from construction areas through the installation of interceptor drains up-gradient of construction areas.

Drainage waters originating in construction areas will be collected in a closed system and treated prior to controlled, diffuse release. Drainage waters from construction areas will be managed through a

series of treatment stages that include swales, check dams and settlement/attenuation ponds along with other pollution control measures such as silt fences and silt mats.

A three-stage treatment train will be employed to capture, retain and treat discharges during the construction phase. This treatment train is also proposed for discharges from hard surfaces that will be installed as a result of the Development.

Settlement/attenuation ponds will be used to attenuate and treat runoff. A detailed pre-construction peat stability assessment has considered the appropriate location of settlement/attenuation ponds so that these facilities will not increase the risk of slope failure. These will have permanent open water to minimise the risk of sediment washout. Settlement/attenuation pond side slopes will be constructed at shallow grades such as 1 in 3 side slope. Settlement/attenuation ponds will be designed so that outflows are spread diffusely over a wider area so that increases in run-off can be mitigated. Erosion control and detention ponds will be regularly maintained during the construction phase.

Standing water from excavations will not be pumped directly into watercourses. Where dewatering of excavations is required, water will be pumped to the head of a treatment train in order to receive full treatment prior to discharge.

Roadside drains will be shallow with moderate gradients to prevent scouring. In steep areas check dams (possibly in conjunction with settlement ponds and / or check dams and / or cross drains) may be necessary to reduce flow rate.

Oil fuel will be stored within containment areas and emergency response measures for oil spillage on site will be prepared.

Refuelling of plant during construction will be carried out at a designated area, a minimum of 50m from watercourses. Drip trays and spill kits will be available on site. Maintenance of all plant and machinery will be undertaken off-site. Only emergency break-down maintenance will be carried out on site.

Cement will be mixed within containment areas and if Readymix vehicles are used these will be washed in the same area and the water cycled.

All vehicles transporting materials to and from the Site will store materials in a contained load so that the potential for emissions or spillage is reduced during journeys and bridge crossing over watercourses. The measures outlined in the UK's Planning Policy Guidance No. 26: Dealing with Spillages on Highways (a Good Practice Guidance notes proposed of the UK EA/SEPA/EHS) will be adhered to in the event of a spillage or accident during the transportation of materials.

All construction personnel will be trained in pollution incident control response. An emergency response plan has been prepared as part of this CEMP (**Appendix A**) for the proposed development and information outlining response procedures and contingency plans to contain pollution, as set out in the CEMP, will be made available on site.

Access Tracks and turning areas will be confined to areas of shallow peat where possible and will be constructed on a geotextile layer. These areas will also be kept as level as possible to avoid fast run-off. This can be achieved by following contours where possible.

At the proposed spoil storage area, impermeable berms will be put in place surrounding peat spoil receptor cells. The berms will be established in advance of the deposition of peat surplus material. The berms will be designed to account for a bulking factor of 10% of the surplus peat material to be disposed in these areas. In addition, all existing drainage ditch outflows from cutover blanket bog that will be used as receptor cells for surplus peat will be blocked in advance of the deposition of any surplus material within these cells. This will prevent the ongoing loss of water from these cut areas to receiving lakes to the north and south and also prevent the migration of peat spoilt material from the cells to these lakes.

5.3.8.3 Prevention of Spread of Alien Invasive Species

The presence of the non-native invasive species Rhododendron ponticum within the study area provides the potential for the spread of this species by the proposed works. This species is highly invasive and out-compete native flora to form mono-specific stands. Its presence along watercourses is particularly significant, as contaminated soil or vegetative material washed from an infected area can result in the spread of this species downstream. Appropriate mitigation measures including management and control measures are required at all sites within the proposed works area where this species is encountered for the prevention of spread of these species. The mitigation measures for the control of invasive species follow the NRA *Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads* (NRA, 2010). A summary of the physical and chemical control measures for Rhododendron ponticum are as follows:

- Cutting – anytime of the year. This approach can be very labour intensive and does not kill the plant. Regular follow up is required to deal with re-growth.
- Uprooting - anytime of the year. Small plants can be pulled by hand while large stems can be cut and the roots grubbed out by winch or machine.
- Mulch matting - anytime of the year. This approach can be labour intensive and regular follow up is required to deal with re-growth.
- Bud-rubbing – spring to autumn. This approach can be labour intensive and and regular follow up is required to deal with re-growth.
- Glyphosate – during the active growth in late spring or summer. Spot treatment of stands of Rhododendron ponticum on site.
- Triclopyr - during the active growth in late spring or summer. Spot treatment of stands of Rhododendron ponticum on site.

Due to the legislative requirements to control the spread of noxious weeds and non-native invasive plant species, it is important that any activities associated with the planning, construction and operation of wind farm developments comply with the requirements of the Wildlife Acts, 1976-2012. Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) include legislative measures to deal with the dispersal and introduction of Invasive Alien Species (IAS), which are listed in the Third Schedule of the regulations. Regulation 49 deals with the Prohibition on introduction and dispersal of certain species while Regulation 50 relates to Prohibition on dealing in and keeping certain species (Regulation 50 has not yet been commenced). Invasive species listed

under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). The introduction and/or spread of invasive species such as Himalayan Balsam, Giant Rhubarb or Rhododendron for example, could result in the establishment of invasive alien species and this may have negative effects on the surrounding environs. Appropriate spread prevention measures have been incorporated into the design of the project. The following measures address potential effects associated with the construction phase of the project:

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (e.g. Himalayan Balsam, Japanese Knotweed etc.) by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species
- All washing will be undertaken in areas with no potential to result in the spread of invasive species. This process will be detailed in the contractor's method statement.
- Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present.
- All planting and landscaping associated with the Development shall avoid the use on invasive shrubs such as Rhododendron.

5.3.9 Mitigation by Reduction

5.3.9.1 Protection of Important Habitats

This CEMP will be implemented to ensure that potential adverse impacts to upland watercourses flowing through the site are avoided. Minimum buffer zones will be implemented between areas associated with the construction of Turbine Foundations and streams/eroding gullies, except where stream crossings are required.

During the construction phase, spoil will be transferred to the spoil storage areas where it will be used.

5.3.9.2 Protection of Watercourses

All elements of the SWMP and the mitigation measures outlined in Chapter 9 to reduce the amount of silt-laden water generated within the construction footprint will be implemented. These measures will include the provision of clean water catch drains upslope of construction areas and the minimisation of excavation footprints and the time excavations and surfaces are left exposed and denuded.

5.3.9.3 Offsetting – Habitat Restoration

The Site as well as the proposed spoil storage and peatland rehabilitation area provide significant opportunities for habitat restoration and enhancement. A Habitat Management and Peatland Rehabilitation Plan is provided as Technical Appendix 6.6 of the EIAR and all measures set out in this plan will be implemented as part of the Development. The restoration of areas of cutover blanket bog

within the proposed spoil storage area and the implementation of other measures such as the cessation of turbary activity and the installation of drain blocks within the overall peatland rehabilitation area will aim to achieve the restoration of approximately 6.5ha of cutover blanket bog as well as improving the water balance within an area of approximately 30ha of blanket bog habitat occurring within the peatland rehabilitation area.

5.4 HYDROLOGY AND DRAINAGE

The following section details environmental control measures which will be implemented on site in relation to hydrology and drainage and provide the framework within which the targeted CMS must be prepared. In addition, a Surface Water Management Plan (**Appendix B**) has been prepared which provide further details of control measures and monitoring procedures.

5.4.1 Site Drainage

Details of the Site drainage can be found in the **Surface Water Management Plan** (**Appendix B**). The design criteria for the Sustainable Drainage Systems (SuDS) design are as follows:

- To select and install drainage.
- To minimise alterations to the ambient site hydrology and hydrogeology.
- To provide settlement and treatment controls as close to the Site footprint as possible and to replicate the existing hydrological environment of the Site.
- To minimise sediment loads resulting from the Development run-off during the construction phase.
- To preserve Greenfield runoff rates and volumes.
- To provide settlement ponds to encourage sedimentation and storm water runoff settlement.
- To reduce stormwater runoff velocities throughout the Site to prevent scouring and encourage settlement of sediment locally.
- To manage the problems of erosion and allow for the effective revegetation of bare surfaces.
- To control water within the Site and allow for the discharge of runoff from the Site within the limits prescribed in the Salmonid Regulations.

5.4.2 Surface Water Design Philosophy

The SuDS design must be managed and monitored at all times and particularly after storm or heavy rainfall and during construction phase environmental auditing. The design rationale is that of an integrated approach where each element is assessed for its potential contribution to sediment suspension and the appropriate mitigation measures integrated into the layout design. The design principles are as follows:

Minimise → Intercept → Treat → Disperse → Dilute

5.4.2.1 *Minimise*

The main principle of this SuDS design is to minimise the volume of 'dirty' water requiring treatment through means of informed, integrated and sustainable drainage design. It achieves this by keeping 'clean' water clean by interception and separation, and by collecting the 'dirty' water and treating it by removing the suspended sediments. The resultant outflow is dispersed across vegetation and will become diluted through contact with the clean water runoff in the buffer areas before entering site/ roadside drains.

5.4.2.2 *Intercept*

The key sediment control measure is the separation of construction runoff from the clean water runoff that arises in the undisturbed areas of the site and surrounding lands. This significantly reduces the volume and velocity of dirty water that the sediment and erosion control measures need to deal with. To achieve separation, clean water infiltration collector drains or silt fences are positioned on the upslope and dirty water v-drains positioned along the verge, with site surfaces sloped towards dirty water v-drains. The remainder of this clean water will be regularly piped under the site roads and dirty water v-drains to avoid contamination. Piping the clean water regularly under the site roads allows the clean water to follow the course it would have taken before construction thus mimicking the existing surface water sheet flow pattern of the site.

5.4.2.3 *Treat, Disperse and Dilute*

The clean water infiltration interceptor drains are positioned upslope of the development footprint, to prevent any mixing of the clean and 'dirty' water. The infiltration interceptor drains redirect the clean water away from the site infrastructure, as best suits the natural topography of each sector. The clean water outflow is then discharged into either, an existing drainage network or dispersed through an area of vegetation where it can percolate into the ground naturally.

In the drawings, 'dirty water' drains, indicated in orange, collect all incident rainwater that falls on the development infrastructure. These then drain to buffered outfalls or into settlement ponds. The treated effluent from the settlement ponds is then dispersed across vegetation (through buffered outfalls) to further filter the discharge. Dispersal in this manner has the effect of allowing the smaller particle sizes to be taken up by the vegetation.

5.4.3 SuDS Overview

This SuDS adopts a design for the drainage of the site. The following elements in series are proposed:

- Open Constructed drains for development run-off collection and treatment;
- Collection Drains for upslope "clean" water collection and dispersion;
- Filtration Check Dams to reduce velocities along sections of road which run perpendicular to contours;

- Settlement Ponds and Buffered Outfalls to control and store development runoff to encourage settlement prior to discharge at Greenfield runoff rates.

These measures provide a surface water management train that will mitigate any adverse impact on the hydrology of the site and surrounds during the construction phase of the project.

5.4.4 Cut-off Ditches / Collector Drains (Clean Water)

Drainage management will ensure that natural runoff is not permitted to mix with construction runoff from sources such as excavation dewatering or track runoff. Design will ensure that infiltration interceptor drains be installed upslope of development, to intercept and divert clean surface water runoff, prior to it coming in contact with areas of excavation. Design will ensure that natural runoff infiltration interceptor drains are installed ahead of main earthworks wherever practical.

This is intended to reduce the flow of natural runoff onto any exposed areas of peat/soil, thereby reducing the amount of potential silt laden runoff requiring treatment. Installed drainage will allow provision for natural runoff water, upslope of the development, to collect in infiltration interceptor drain and directed away from the development. In certain areas it will be required to pass through under track clean water culverts, separate to drainage provided for track runoff, and be discharged downstream of site development.

Temporary silt / pollution prevention and scour protection measures will be provided in artificial natural runoff drainage installed in order to mitigate potential for scouring and transport of sediment from newly excavated channels which will be formed as part of the construction runoff drainage provisions.

Frequency of outflow points are designed to avoid collection and interception of large catchments creating significant point flows, with associated risks due to scour and hydraulic capacity.

The drains will be max 350mm – 500mm in depth.

5.4.5 Buffered Outfalls

Dirty water will be discharged to land via buffered outfalls. These drainage outfalls will contain hardcore material of similar or identical geology to the bedrock at the Site to entrap suspended sediment. In addition, these outfalls promote sediment percolation through vegetation in the buffer zone, reducing sediment loading to any adjacent watercourses and avoiding direct discharge to the watercourse. It is recommended that a relatively high number of discharge points are established, thus decreasing the loading on any particular outfall. Discharging at regular intervals mimics the natural hydrology by encouraging percolation and by decreasing individual hydraulic loadings from discharge points.

5.4.6 Trackside Drains (Dirty Water)

These are open gently sloping drainage channels to convey dirty water, trap sediment, enhance filtration and slow down the rate and magnitude of runoff that could enter the local watercourses. The

drains will be max 350mm – 500mm in depth and the turve will be taken as a single piece and placed on the downslope side of the drain. Therefore, once construction works are complete the turve can be put back in place with minimal ecological damage. These drains will be reinstated following the works.

5.4.7 Silt Fences

Silt Fences are designed in order to effectively filter the water, holding back the silt and allowing the water through, they require to be installed correctly with the lower part of the fence dug into the ground. Silt fences will also be required to be cleaned out on a regular basis, particularly after periods of heavy rainfall. Silt fences are required to be inspected and maintained on a regular basis in order to ensure that silty water is not running under or around the silt fences. Silt fences can also be used to divert clean water away from the development area, minimising the volume of dirty water.

5.4.8 Filtration Check Dams

Check dams (flow barriers or dams constructed across the drainage channel) will be installed at regular intervals within the dirty trackside drains in order to reduce erosion and allow for greater flow control. These check dams are required in order to reduce the velocity of water and therefore allow settlement of coarser sediment particles as well as silt at low flow conditions. Reduction in flow velocity will also prevent scouring of the drainage channel itself. Rock filter bunds may be used for check dams however, stone can also be used if properly anchored. It is recommended that multiple check dams are installed, particularly in areas immediately downgradient of construction areas.

Settlement build up will be monitored and cleaned during the construction stage when necessary. The number and location of check dams will be dependent on the slope, flow and volume of water, although the following general rules will be applied:

- The maximum spacing between check dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam;
- The centre of the check dam should be at least 0.2m lower than the outside edges;
- Side slopes should be 1:2 or less;
- A Terram membrane barrier or similar non-woven geotextile membrane placed around check dam
- Check dams should be keyed at least 0.1m into the drainage channel bottom in order to prevent the dam washing out; and
- Check dams will be maintained and monitored on a regular basis. Sediment will be removed before it reaches one half the original dam height.

5.4.9 Settlement Ponds

Runoff from the windfarm track surface will be attenuated to mimic natural runoff patterns. To capture runoff generated within the development footprint, it is proposed to use constructed trackside drains. Accumulations of runoff will then be transferred to settlement ponds. All ponds will be kept as shallow as possible so that they pose no health and safety risk to plant or personnel. Settlement ponds are to be securely fenced to prevent easy access.

The ponds are utilised to attenuate and to aid the removal of suspended solids from site runoff water. All the pond locations are displayed within the site drainage drawings. Settlement ponds will be emplaced at twenty four (24) locations along the drainage footprint.

Further details are contained in the accompanying SWMP.

5.4.10 SuDS Design Principles

The design criteria for the SuDS design are as follows:

- To select and install ecologically sensitive drainage.
- To minimise alterations to the ambient site hydrology and hydrogeology.
- To provide settlement and treatment controls as close to the site footprint as possible and to replicate where possible the existing hydrological environment of the site.
- To minimise sediment loads resulting from the development run-off during the construction phase.
- To preserve Greenfield runoff rates and volumes.
- To provide settlement ponds to encourage sedimentation and storm water runoff settlement.
- To reduce stormwater runoff velocities throughout the site to prevent scouring and encourage settlement of sediment locally.
- To manage the problems of erosion and allow for the effective revegetation of bare surfaces.
- To control water within the site and allow for the discharge of runoff from the site within the limits prescribed in the Salmonid Regulations.

Flocculants **-** may also be used to aid settlement of fine particles. These involve a chemical solution that can be used to force very fine particles to clump together and settle out of the water column. The point of treatment will be constructed in such a way to allow controlled dosing and a documented register shall be kept recording the use of chemicals at each treatment location. A settlement area will be provided after the point of treatment to give the flocculants a chance to work and the particles to settle out.

The use of Flocculants will require approval from the EPA, and will be reserved for only if issues are encountered with conventional treatment methods, and if very fine sediment particles (e.g. clay) are being encountered. All surface water management measures on site will be maintained by the Contractor. It is important that maintenance is undertaken in order to ensure that settlement lagoons and silt fences are de-sludged when required as the retention capacity of the system will be affected by a build-up of sediment.

All mitigation measures implemented on site will require to be visually monitored on a regular basis this will be weekly as a minimum (frequency related to risk, site sensitivity, weather conditions, etc), with inspections of mitigation measures also being carried out after periods of heavy rainfall. Inspections of mitigation measures and any required maintenance will be carried out by the Contractor. A record of any findings from the inspections carried out by the Contractor will be recorded including details of any silty water runoff impacting on watercourses or any maintenance required to mitigation measures e.g. such as the cleaning out of silt fences or lagoons.

A mobile siltbuster may also be employed to treat silt laden construction runoff where additional treatment is required.

5.4.11 Design Phase Mitigation

5.4.11.1 Mitigation by Avoidance

The fundamental mitigation measure to be implemented during each stage of the proposed Development will be avoidance of sensitive hydrological or hydrogeological receptors wherever possible, this key principle is referred to as "mitigation by avoidance". This principle has been adopted during the design of the turbine and associated infrastructure layout across multiple design iterations. Hydrological constraints maps have been developed which identified areas of the Site where surface water and drainage constraints resulted in areas of the Site being deemed less suitable for development. The multiple constraints maps are presented in Volume III. The identified constraints have been extensively discussed in consultation with the design team. The final Site layout plan has been identified as the optimal layout design available for protecting the existing hydrological regime of the Site, while at the same time incorporating and overlaying engineering and other environmental constraints.

5.4.12 Construction

5.4.12.1 Earthworks

Mitigation measures to reduce the potential for adverse impacts arising from earthworks and management of spoil include the following:

- Management of excavated material will adhere to the measures related to the management of temporary stockpiles outlined in **Chapter 8: Soils and Geology**
- No permanent or semi-permanent stockpiles will remain on the Site during the construction or operational phase of the Development. Spoil to be taken off site to the designated spoil storage area near Maam Cross
- Suitable locations for temporary stockpiles will be identified on an individual basis. The suitability of any particular location will consider Site specific characteristics, including;
    - The location of drainage networks in the vicinity
    - The slope incline and topography of the downgradient area

- Any other relevant characteristics which are likely to facilitate or increase the potential for entrainment by surface water runoff.

- Construction activities will not be carried out during periods of sustained significant rainfall events, or directly after such events. This will allow sufficient time for work areas to drain excessive surface water loading and discharge rates to be reduced
- Following heavy rainfall events, and before construction works recommence, the Site will be inspected and any required corrective measures implemented
- An emergency response plan will be developed for the construction phase of the project (based on the Plan in **Appendix A**). The plan, at a minimum, will involve 24-hour advance meteorological forecasting linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded such as a very heavy rainfall at >25mm/hr, planned responses will be undertaken. These responses will include cessation of construction until the storm event, including storm runoff has ceased
- Sediment fencing will be erected along proximal and paralleling areas of watercourses, channels and drains spanned by the works to reduce the potential for sediment laden run-off to reach sensitive receptors
- No direct flow paths between stockpiles and watercourses will be permitted at the Site
- Excavated material will be backfilled are transported to the spoil storage area as soon as is reasonably practicable to prevent long duration storage at the Site which increases the risk of adverse effects on aquatic environments
- All mitigation measures related to surface water quality described throughout section 9.5 will be implemented before excavation works commence.

5.4.12.2 Excavation Dewatering

Mitigation measures to reduce the potential for adverse impacts arising from dewatering activities include the following:

- Management of excavations will adhere to the measures outlined in **Chapter 8: Soils and Geology**. Areas of peat and subsoils to be excavated will be drained ahead of excavation works. This will reduce the volumes of water encountered during excavation works and will therefore reduce the volume of water that is required to be dewatered whilst excavations are being carried out.
- Engineered drainage and attenuation features outlined in the Surface Water Management Plan (**Appendix B**) will be established ahead of excavation works
- Dewatering pumping rates will be controlled by an inline gate valve or similar infrastructure which will facilitate a reduction of loading on the receiving environment, thus enhancing the attenuation and settlement of suspended solids

- The direct discharge of dewatered loads to surface waters will not be permitted under any circumstances
- All dewatering will follow a strict procedure of pumping to a settlement tank and then to a dewatering bag, or settlement ponds prior to discharging to receiving environment for overland flow
- Geofabric lined settlement ponds will buffer the run-off discharging from the drainage system which will reduce the hydraulic loading to watercourses. Settlement ponds will be designed to reduce flow velocity to 0.3 m/s at which velocity silt settlement generally occurs. In areas of the Site where the placement of settlement ponds is not feasible, other mitigation measures described below will be implemented
- Check Dams will be constructed across drains and will reduce the velocity of run-off which will in turn promote settlement of solids upstream of potential surface water receivers. An additional benefit of check dams is that they will reduce the potential for erosion of drains. Rock filter bunds may be used for check dams, wood or hay bales can also be used if properly anchored. It is recommended that multiple check dams are installed, particularly in areas immediately down gradient of construction areas
- Overland flow paths of the final dewatered discharge will be maximised to the greatest practical extent to avoid prematurely draining to drainage channels or surface waters. This approach will allow for enhanced settling out of suspended solids entrained in the run-off
- All pumps, tanks, settlement ponds, dewatering bags and check dams used in the dewatering process will be regularly inspected and maintained as necessary to ensure surface water run-off is appropriately treated
- Sediment fencing will be installed up gradient of water courses which may receive the final overland flow
- The final treated dewatered discharge will be directed towards heavily vegetated areas to allow for further natural filtration of suspended solids
- A programme of water quality monitoring will be implemented during the construction phase which is outlined in detail in Section 9.5.2.10 of the EIAR.
- No extracted or pumped water will be discharge directly to the surface water network associated with the Site (this is in accordance with the Local Government (Water Pollution) Act 1977 as amended)
- Any discharges of sediment treated water should meet the requirements of the Surface Water Regulations 2009, as amended.

5.4.12.3 Release and Transport of Suspended Solids

The following mitigation measures to reduce potential impacts from the release of suspended solids to the surface waters will be implemented:

- Collector drains and soil berms will be implemented to direct and divert surface water runoff from construction areas such as temporary stockpiles into established settlement ponds, buffered discharge points and other surface water runoff control infrastructure. This planning and placement of these control measures will be of fundamental importance, especially for the areas where works within the 50m buffer zone will be unavoidable which is discussed in Section 9.5.1.2 of the EIAR.
- Sediment control fences will be implemented significantly upgradient of potential receiving waters and as part of the drainage network. Sediment control fences will also be established upgradient of the Sites pre-existing natural and artificial drains in addition to degraded areas of peat that are likely to receive surface water runoff. This practice will reduce the potential for elevated suspended solids entrained in surface water runoff to discharge to surface waters
- Multiple silt fences will be used in drains discharging to the surface water network. This will be especially important for the areas where works within the 50m buffer zone will be unavoidable which is discussed in section 9.5.1.2 of the EIAR
- The drainage, attenuation and other surface water runoff management systems will be installed prior to the commencement of construction activities. Whenever possible, drainage and attenuation control measures will be installed during seasonally dry conditions to limit the potential for sediment laden run-off to discharge to surface waters during the installation of these measures
- Surface water runoff will be discharged to land via buffered drainage outfalls that will contain hardcore material of similar composition to the geology of the bedrock at the Site. This mitigation measure will promote the capture and retention of suspended sediment
- Buffered drainage outfalls also promote sediment percolation through vegetation in the buffer zone, reducing sediment loading to adjacent watercourses and avoiding direct discharge to the watercourse
- Buffered drainage outfalls will be placed outside of the 50m buffer zone and will not be positioned in areas with extensive erosion and degradation
- A relatively high number of discharge points will be established to decrease the loading on any one particular outfall
- Discharging at regular intervals mimics the natural hydrology by encouraging percolation and by decreasing individual hydraulic loadings from discharge points
- In the event that mitigation measures are failing to reduce suspended solids to acceptable levels, construction works will cease until remediation works are completed
- Fine solids or colloidal particles are very slow to settle out of waters, coagulant or flocculant will be used to promote the settlement of finer solids prior to discharging to surface water networks. Flocculant gel blocks can be placed in drainage channels, these are passive systems that are self-dosing, self-limiting and are environmentally friendly. Flocculant gel blocks bind elevated levels of silt and associated contaminants into masses that are easily separated, captured and then removed from the water

- Surface water runoff controls will be checked and maintained on a regular basis and as soon as any signs of deterioration become visible. Check dams and settlement ponds will be maintained and emptied on a regular basis and as soon as any signs of deterioration become visible.

The adoption of precautionary principles and the implementation of mitigation measures listed above will ensure that the risk of elevated suspended solids to surface waters is low. This in turn will ensure that potential risks to sensitive receptors is also low. Nevertheless, should a significant discharge of suspended solids to surface waters occur, the absence of immediate proximity to designated sites and the assimilative capacity of the localised surface waters will act as a natural hydrological buffer in terms of suspended solids loading. Should such a discharge occur, the dilution and retention time of suspended solids in the localised surface water network will reduce potential impacts on highly sensitive downstream designated sites. It should be noted that this natural mitigation measure is not to be adopted as a first principle and will not be relied upon to prevent adverse impacts on designated sites, it will be rather a last line of defence.

A detailed design of required drainage, collector drainage, stilling ponds and other listed mitigation infrastructure is contained in the Surface Water Management Plan in **Appendix B**. Unsuitable and particularly sensitive areas are identified and presented in various figures contained in **Volume III** of the EIAR.

5.4.12.4 Horizontal Directional Drilling on Grid Route

The following mitigation measures to reduce potential impacts associated with horizontal directional drilling will be implemented:

- Clearbore, which is not toxic to aquatic organisms and is biodegradable will be the drilling fluid used.
- Mud mixing will be monitored to suit the ground conditions encountered and will initially be based on a mud programme developed by the specialised HDD Contractor, the drilling fluid supplier and an Environmental Clerk of Works.
- The drilling fluids will be constantly monitored, any changes required to the mix will be performed on site by specialised HDD Contractor upon consultation with the drilling fluid supplier and Environmental Clerk of Works.
- Mud testing equipment will be available at all times during drilling operations to monitor key mud parameters.
- All equipment will be carefully checked on a daily basis by the Site Supervisor prior to use to ensure plant and machinery is in good working order with no leaks or potential for spillages.
- Spill kits, including an appropriate hydrocarbon boom will be available on the site in the event of any unforeseen hydrocarbon spillages and all staff shall be trained in their use.

- All plant, materials and wastes will be removed from site following the HDD works.
- The launch pit will be reinstated to the original land surface condition and the normal duct trench will continue from this point.
- Test pits and boreholes will not be located directly on, or extend through, the proposed alignment, as these weak points may serve as conduits where inadvertent fluid returns or frac outs occur. At least a 3m offset will be provided between the boreholes and pipe alignment.

5.4.12.5 Release of Hydrocarbons

The following mitigation measures to reduce potential impacts from the environmental release of hydrocarbons and other harmful chemicals to the surface waters will be implemented:

- Refuelling of vehicles will be carried out off site to the greatest practical extent. This refuelling policy will mitigate the potential for impacts by avoidance. Due to the remote location and nature of the Site, it is unlikely that implementation of this refuelling policy will be practical in all circumstances. In instances where refuelling of vehicles on Site is unavoidable, a designated and controlled refuelling area will be established at the Site. The designated refuelling area will enable low risk refuelling and storage practices to be carried out during the works. The designated refuelling area will contain the following attributes and mitigation measures as a minimum requirement:
    - The designated refuelling area will be located a minimum distance of 50m from any surface waters or Site drainage features
    - The designated refuelling area will be bunded to 110% volume capacity of fuels stored at the Site
    - The bunded area will be drained by an oil interceptor that will be controlled by a pent stock valve that will be opened to discharge storm water from the bund
    - Management and maintenance of the oil interceptor and associated drainage will be carried out by a suitably licensed contractor on a regular basis
    - Any oil contaminated water will be disposed of at an appropriate oil recovery plant or licensed tip site
    - Any minor spillage during this process will be cleaned up immediately
    - Vehicles will not be left unattended whilst refuelling
    - All machinery will be checked regularly for any leaks or signs of wear and tear
    - Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed. Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner.

Notwithstanding the management of refuelling and fuel storage at the designated refuelling area, the potential risk of hydrocarbon spills from plant and equipment or other general chemical spills at other areas of the Site remains. To mitigate against potential spills at other areas of the Site, the following mitigation measures will be implemented:

- Oil absorbent booms and spill kits will be available adjacent to all surface water features associated with the Development. The controls will be positioned downstream of each construction area and at principal surface water drainage features. Oil booms deployed will have sufficient absorbency relative to the potential hazard
- Spill kits will also be available at construction areas such as at turbine erection locations, the temporary site compound, on-site substation, spoils storage areas and met mast location etc.
- Spill kits will contain a minimum of oil absorbent pads, oil absorbent booms, oil absorbent granules, and heavy-duty refuse bags for collection and appropriate disposal of contaminated matter
- Should an accidental spill occur during the construction or operational phase of the Development, such incidents will be addressed immediately, this will include the cessation of works in the area of the spillage until the issue has been resolved
- Spill kits will be kept in each vehicle at the Site and will be readily available to all operators
- No materials, contaminated or otherwise will be left on the Site
- Suitable receptacles for hydrocarbon contaminated materials will also be available at the Site

Implementation of the above mitigation measures will significantly reduce the risk of hydrocarbon contamination being released to the surface water network. Nevertheless, the potential risk cannot be entirely eradicated. Therefore, precautionary measures and emergency response protocols are have been included.

5.4.12.6 Construction and Cementitious Materials

The following mitigation measures to reduce potential impacts posed by the use of concrete and the associated effects on surface water in the receiving environment are proposed:

- The procurement, transport and use of any cement or concrete will be planned fully in advance and supervised by appropriately qualified personnel at all times
- Vehicles transporting cement or concrete to the Site will be visually inspected for signs of excess cementitious material prior to being granted access to the Site. This will prevent the likelihood of cementitious material being accidentally deposited on the Site Access Tracks or elsewhere at the Site.

- Drivers of such vehicles will be instructed to ensure that all vehicles are washed down in a controlled environment prior to the departure of the source site, such as at concrete batching plants
- Precast concrete will be used wherever possible, although the use of pre-cast concrete is not viable option for large structures such as Turbine foundations and so concrete will be delivered to the Site
- Concrete will not be poured during periods of rainfall or if any kind of precipitation is forecast. This policy will limit the potential for freshly poured concrete to adversely impact on surface water runoff.
- Raw or uncured waste concrete will be disposed of by removal from the Site
- Washout of concrete trucks shall be strictly confined to the batching facility and shall not be located within the vicinity of watercourses or drainage channels. Only the chutes will be cleaned prior to departure from Site and this will take place at a designated area at the Temporary Site Compound
- Spill kits will be readily available to Site personnel, and any spillages or deposits will be cleaned up as soon as possible and disposed of appropriately
- Pouring of concrete into standing water within excavations will be avoided
- Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the buffered surface water discharge systems in place
- Any surplus concrete will not be stored or deposited anywhere on Site and will be returned to the source location or disposed of appropriately at a suitably licensed facility
- Any required shuttering installed to contain the concrete during pouring will be fully secured around its perimeter to minimise any potential for leaks.

5.4.12.7 Watercourse Crossings

At the Site, two new watercourse crossings / culverts will be constructed as part of facilitating access to the proposed turbines T4 and T5. Both of the required crossings are across small streams that are headwaters of the Owenree River, the locations of the proposed crossings are mapped on **Figure 9.7** in **Volume III**. It is noted that the small stream which will require crossing for access to the T4 turbine position was consistently dry during the water quality monitoring rounds discussed in Section 9.3.10 of the EIAR and it is therefore considered to be an ephemeral stream which may not be in flow during the time at which the construction of a crossing is required. However, detailed planning and consideration as described below, to ensure potential impacts are assessed adequately and in turn mitigated against will be implemented for these locations.

A detailed design stage assessment in terms of bridge or culvert design will be carried out that will have cognisance to both locations including the characteristics of water flow at both locations. The proposed crossing locations will be situated relatively near the headwaters of both of these small streams. As a result, bridge or culvert specification and construction are envisaged to be of relatively low significance in terms of expected flow and culvert diameter. In the absences of a detailed design at this stage of the project's development, the following mitigation measures will be implemented as minimum requirements to ensure any potential impacts of the proposed watercourse crossings are minimised:

- The design of the proposed crossings and a method statement for the proposed construction will be agreed in advance with Inland Fisheries Ireland (IFI)
- This design of all crossings will adhere to relevant available guidance and will be reviewed through consultation with the OPW which will mitigate against any significant impact on surface water flow and in turn the risk of localised or downstream flooding
- Crossings will be designed to minimise in so far as practical and to the extent deemed acceptable by the competent authority, the disturbance or alteration of water flow, erosion and sedimentation patterns and rates
- A Construction Environmental Management Plan has been prepared and is appended to the EIAR in Technical Appendix 2.1. Adherence to this plan will be mandatory throughout the construction of the watercourse crossings.
- Vehicles and plant used in the construction of the proposed crossings will only be refuelled at the Sites bunded and designated refuelling area, no refuelling will be permitted within 50m of any watercourse at the Site
- To mitigate against the potential risk of accidental leaks or spillages from plant and equipment, the Emergency Response Plan will be followed (**Appendix A**). Multiple spill kits will be maintained on the Site at all times within the cabs of vehicles and placed strategically at environmentally sensitive locations across the Site. Spill kits will be routinely inspected to ensure that they are fully stocked with oil absorbent booms and pads at all times. Oil absorbent booms will be installed downstream of channel crossing work areas within 25m of the works location prior to the commencement of works.

Section 50 of the European Communities (Assessment and Management of Flood risks) Regulation SI 122 of 2010 states; *"No Person, including a body corporate, shall construct any new bridge or alter, reconstruct, or restore any existing bridge over any watercourse without the Consent of the Commissioners or otherwise than in accordance with plans previously approved of by the Commissioners*". The same regulations also state that the word "bridge" includes a culvert or other like structure. The OPW is the agency in Ireland responsible for the implementation of the regulations and consent to construct all crossings will firstly be sought from the OPW via their application process. This

OPW application and consent process will mitigate against the potential for the design of the crossings to result in significant adverse impacts on the surface water network at the Site. Relevant guidance documents will also be consulted, and applicable mitigation measures incorporated at the detailed design stage of the proposed crossings with a view to mitigating and reducing any potential impact on the receiving watercourse. The following is a non-exhaustive list of relevant guidance documents:

- OPW (2013) Construction, Replacement, or Alteration of Bridges and Culverts, A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945
- OPW (2019), Environmental Guidance: Drainage Maintenance and Construction
- Inland Fisheries Ireland (IFI) (2016) Guidelines on the Protection of Fisheries During Construction Works in and Adjacent to Waters
- National Roads Authority (NRA) (2008) Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes
- Scottish Environment Protection Agency (SEPA) (2010) Engineering in the water environment: good practice guide – River Crossings.

5.4.12.8 Groundwater Contamination

A combination of the underlying bedrock geology, the associated poor aquifer potential, low permeability subsoils beneath the peat and low recharge rates has resulted in the risk posed to groundwater quality by the Development being considered as low risk. Nevertheless, mitigation measures to reduce potential risks to groundwater will be implemented. A primary risk to the underlying groundwater quality would be through the accidental release of hydrocarbons from fuels or oils during the construction phase of the Development. In order to mitigate against potential groundwater contamination by hydrocarbons, implementation of the following mitigation measures is proposed:

- In the first instance, no fuel storage will occur at the Site whenever feasible and refuelling of plant and equipment will occur off site at a controlled fuelling station
- In instances where on Site refuelling is unavoidable, then the bunded on Site designated refuelling area must be used. The designated refuelling area must be bunded to 110% volume capacity of fuels stored at the Site
- The bunded area will be drained by an oil interceptor that will be controlled by a pent stock valve that will be opened to discharge storm water from the bund
- Management and maintenance of the oil interceptor and associated drainage will be carried out by a suitably licensed contractor on a regular basis
- Any oil contaminated water will be disposed of at an appropriate oil recovery plant or licensed tip Site
- Any minor spillage during this process will be cleaned up immediately
- Vehicles will not be left unattended whilst refuelling

The following mitigation measures are proposed in relation to non-hydrocarbon potential contamination of groundwater:

- All other liquid based chemicals such as paints, thinners, primers and cleaning products etc. will be stored in locked and labelled bunded chemical storage units
- Temporary sanitation facilities such as portaloos used during the construction phase will be self-contained and supplied with water by tank trucks. Portaloos will contain water storage tanks and separate wastewater storage tanks which will be routinely emptied by vacuum removal for offsite disposal via a tank truck. All temporary sanitation facilities will be removed from the Site following the completion of the construction phase
- The controlled attenuation of suspended solids in settlement ponds and check dams etc. will result in inorganic nutrients (if present in elevated concentrations) such as phosphorus and nitrogen being absorbed and retained by the solids in the water column. This will allow for a reduction of peak inorganic discharges in a controlled and stable run off rate. It is noted that the presence of elevated contaminants were not detected during any of the four surface water quality monitoring rounds which are discussed in Section 9.3.10.
- It is considered that there is a low risk of mobilising trace metals that may naturally be present in low concentrations in the baseline environment. The potential for mobilising trace metals is most likely to result from enhanced water percolation associated with excavated bedrock substrate. To mitigate against this potential impact, water quality will be monitored for trace metal concentrations prior to, during and after the construction phase
- The potential for livestock such as cattle and sheep which have been observed grazing at the Site to cause bacteriological contamination of groundwater will be controlled through the implementation of strict grazing control zones, Site perimeter fencing and exclusion zones around all open excavations.

5.4.12.9 Water Quality Monitoring

The following Site monitoring recommendations will be implemented to mitigate against potential impacts on the surface water and groundwater receiving environment:

- A programme of water quality monitoring outlining the selected parameters and monitoring frequency should be agreed with Inland Fisheries Ireland and Galway County Council prior to the commencement of construction
- In order to assist in the detection of any deviations from the baseline hydrochemistry conditions at the Site, regular periodic monitoring of the Sites surface waters will be carried out prior to and during construction

- It is proposed that a programme of operational phase water quality monitoring is also implemented at a monitoring frequency agreed with the competent authority in order to aid the detection of any potential operational phase impacts on surface water quality
- As a minimum requirement, field measured parameters such as pH, conductivity, total dissolved solids (TDS), temperature, dissolved oxygen (DO) and turbidity will be included in the water quality monitoring programme. The results should be compared to the applicable EQS to determine if adverse impacts on water quality are occurring
- Water quality will be monitored for trace metal concentrations prior to, during and after the construction phase
- Water quality monitoring locations will include both upstream and downstream points relative to the works locations. The locations of the water quality monitoring points will be flexible and will be moved as the construction phase progresses so that monitoring points remain representative of the most likely construction impact receptor points
- The watercourses within and adjacent to the proposed spoil storage area will be included within the water quality monitoring programme
- The downstream monitoring locations will be positioned as close as possible downstream of the works location and another positioned further downstream. This approach will allow for an assessment of the dilution of potential contaminations (if present) as the distance from the point of diffuse source location increases
- Watercourses which do not have year round flows such as artificial drains, ditches or ephemeral streams will be avoided as water quality monitoring locations
- During the construction phase, daily visual inspections of excavations, dewatering procedure, settlement ponds, silt traps, buffered outfalls and drainage channels etc. will be carried out by a suitably qualified person. Any excess build-up of sediment at settlement ponds, drains or at any other drainage features that may decrease the effectiveness of the drainage feature will be promptly removed
- During the construction phase of the Development, all development areas will be monitored on a daily basis for evidence of groundwater seepage, water ponding and wetting of previously dry spots
- Following the completion of the construction phase, inspection of silt traps, buffered outfalls and drainage channels will be periodically inspected during maintenance visits to the Site when the operational phase water quality monitoring will also be carried out
- During both the construction and operational phases of the Development, the proposed watercourse crossings discussed in Section 9.5.2.7 of the EIAR will be monitored daily during construction and during each Site visit during the operational phase. The water course crossings will be monitored in terms of their impacts (if any) on the receiving watercourses and in terms of their structural integrity to identify any signs of erosion or potential for sediment release

- It is proposed that a handheld turbidity meter is available at the Site to accurately measure the quality of water discharging from the Site. The meter will be maintained and calibrated frequently.
- Any discharges of sediment treated water should meet the requirements of the Surface Water Regulations 2009, as amended.

5.4.12.10 Emergency Response

Mitigation measures outlined in Chapter 9 of the EIAR will significantly reduce the potential for contamination of surface water or groundwater associated with the Development. Nevertheless, as is the case with all construction projects, a risk of accidental chemical spillages, sediment overloading of control measures or leaks of contaminants from plant or equipment remains a possibility. Emergency response procedures to potential contamination incidents contained in this CEMP will be implemented at the Site prior to the commencement of the construction phase. The following is a non-exhaustive list of potential emergencies and respective emergency responses:

- Spill or leak of hazardous substances (less than 20 litres);
    - All spill incidents will be dealt with immediately as they arise
    - Spill kits will be prepared and available in vehicles associated with the construction phase of the Development
    - Spill kits will also be prepared and made available at primary work areas such as at proposed turbine, hardstand, substation, met mast and construction compound locations
    - Disposal receptacles for hydrocarbon contaminated materials will also be available at the Site
- Major spill of hazardous or toxic substance off Site or to environmentally sensitive areas;
    - Immediate escalation measures will be implemented for all major spill events
    - Escalation measures may include installation of temporary sumps or drains to control the flow or migration of hydrocarbons or other chemicals
    - Attempts to be made to limit or contain the spill using sandbags to construct a bund wall, use of absorbent material, temporary sealing of cracks or leaks in containers, use of geotextile or silt fencing to contain the spill
    - Excavation and disposal of contaminated material will be immediately carried out following any such incidents
    - Evacuation procedures will be implemented to remove non-essential personnel from the area
    - Data gathering and an investigation will commence immediately after the emergency is contained

- If a significant hydrocarbon spillage does occur, the contractor on behalf of the developer must have an approved and certified clean-up consultancy available on 24-hour notice to contain and clean-up the spill
- All major spills of this nature will be reported to the competent authority immediately following such instances.

- Flooding of low lying areas of the Site;
  - Immediately remove all chemicals, fuels and other hazardous substances from low lying areas of the Site
  - Immediately remove plant and equipment from low lying areas
  - Recover materials washed from Site including sediment and other waste
  - Review and address the potential for excess water entering the Site
  - Review and maintain erosion and sedimentation controls.
- Spills of cementitious material;
  - Cement / concrete contamination incidents will be cleaned up immediately as they arise
  - Spill kits will also be established at key construction areas and they will also be readily available in the cabs of plant and equipment
  - Suitable receptacles for cementitious materials will also be available at the Site.

5.5 SOILS AND GEOLOGY

The following section details the environmental control measures which must be incorporated into the Contractors' Construction Method Statement (CMS) to ensure the protection of soils and geology.

5.5.1 Subsoil and Bedrock Removal

Subsoil and bedrock removal will occur throughout the construction of the wind farm and is unavoidable. However, the impacts associated with this removal will be minimised using the following practices.

5.5.1.1 Mitigation by Avoidance

As mentioned previously, areas of deep peat and shallow bedrock have been avoided during construction by careful design of the wind farm.

5.5.1.2 Mitigation by Good Practices

Best practice practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise the amount of soil and rock excavation. All works will be

managed and carried out in accordance with this CEMP, which will be updated by the civil engineering contractor and agreed prior to any works commencing on Site.

Excavated peat will mostly be taken off site and used in the restoration of an area of cutover bog located near Maam Cross. Localised areas of landscaping will be sealed and levelled using the back of an excavator bucket to prevent erosion.

5.5.1.3 Mitigation by Reduction

The disturbance of soil, subsoil and bedrock is an unavoidable effect of the Development, but careful design of the Wind Farm layout has been undertaken to ensure that the amount of earth materials excavated is kept to a minimum in order to limit the effect on the geological aspects of the Site (by avoiding areas of deep peat and shallow bedrock where possible and reducing the length of site tracks). The management of geological materials is an important component of controlling dust and sediment and erosion control.

5.5.1.4 Mitigation by Reuse

Bedrock will be re-used for construction of Site Access Tracks wherever possible. The bedrock will comprise predominantly granite and quartzite which, when crushed and graded, will provide a good sub-base for Site Access Track construction. In addition, where excavated, glacial till and gravel will also be re-used for construction of access tracks.

Peat, overburden, and rock will be reused wherever possible on Site to reinstate excavated areas. Where possible, the upper vegetative layer will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the landscaped peat. These measures will prevent the erosion of peat in the short and long term.

5.5.1.5 Mitigation by Remediation

On completion of the construction stage, any areas not required for operation will be reinstated. This will include the Temporary Construction Compound, turning areas and any materials storage areas. Granular material will be removed as required and reinstated with peat or other soils in keeping with the adjacent soils. Drainage will be reinstated, if required, in order to minimise future erosion of the soils and restore the pre-development state of the environment.

5.5.2 Storage and Stockpiles

5.5.2.1 Mitigation by Avoidance and Good Practice

As discussed previously, the opportunity to mitigate any effect is greatest at the design period. In this respect, a detailed Site selection process was carried out by the Developer. This process identified deep peat and shallow bedrock as specific geotechnical constraints. The detailed Site selection process is described in **Chapter 3: Alternatives**. Furthermore, within the chosen Site, areas of deep peat and shallow bedrock were identified, and the infrastructure design sought to avoid those areas

where possible. In this respect, by minimising volumes of excavation, volumes for storage and stockpiles will also be reduced, thus reducing the impacts associated with them.

Best practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise the amount of soil and rock excavation and therefore also reduce storage and stockpile requirements. All works will be managed and carried out in accordance with this CEMP, which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

5.5.2.2 Mitigation by Reduction

Whenever possible, soil and rock will be re-used on the Site immediately, thereby reducing the need for double handling, which will also reduce the requirements to stockpile soils. Generally excavated rock will be used immediately for Site Access Track construction. Topsoil and peat will be transported to the designated storage area located near Maam Cross. Whenever possible stockpiles will be avoided. Stockpiles of rock on peat soils will be avoided to prevent instability. Peat will only be stockpiled temporarily in areas of thin or absent peat and only in areas which have been confirmed for stability by a suitably experienced geotechnical engineer.

5.5.2.3 Vehicular Movements

Vehicular movements will be restricted to the footprint of the proposed Development, particularly with respect to the newly constructed Site Access Tracks. This ensures that machinery must be kept on tracks and will not move onto areas that are not permitted for the Development.

Vehicular traffic on Site will be reduced through the re-use of excavated material on Site which will reduce the need to source material from external quarries.

5.5.2.4 Mitigation by Avoidance and Good Practice

As discussed previously, excavation volumes have been reduced during the design phase by avoiding areas of deep peat, shallow bedrock and by avoiding excessive cut and fill during construction. This will result in reduced excavation volumes and therefore reduced Site traffic.

Best practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise double handling, again reducing the Site traffic. All works will be managed and carried out in accordance with this CEMP which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

Excavated peat will only be moved a short distance from the point of extraction to the restoration areas near Maam Cross and will be also be used locally for landscaping, thus again reducing the on-Site traffic. Excavated rock (and any glacial till) will be used for access track construction as close to the source of extraction as possible.

5.5.3 Ground Stability

5.5.3.1 Mitigation by Avoidance and Good Practice

As discussed previously, careful design of the wind farm has reduced the amount of construction required in areas of deep peat, high slopes and other areas of potential ground instability. Additionally, the following mitigation measures will also be applied as recommended in the PSRA (included as Appendix 8.1 of the EIAR):

- Avoidance of floating road construction
- Avoidance of stockpiling on the peat
- Avoidance of peat berms in areas of potential instability (highlighted by low safety ratios)
- Additional drainage will be provided in areas of construction
- Avoidance of drains discharging onto areas of weak or deep peat or areas of low safety ratios
- Avoidance of blasting

As noted in the PSRA, vehicular access to any areas of deep peat (>1m) during construction will be restricted to low ground pressure vehicles, with all construction vehicles travelling on existing access tracks whenever possible.

Best practice practice as described in the IWEA and Scottish Best Practice Guidelines will be applied during construction which will minimise the risk of ground instability. All works will be managed and carried out in accordance with this CEMP, which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

A Geotechnical Clerk of Works will be employed during the construction phase in order to continuously monitor areas of peat, in particular areas of deep peat and the areas of potential instability highlighted in the PSRA. Ongoing physical stability checks and calculations will be undertaken in order to verify that safety standards are being met. In particular, construction areas will be checked for signs of cracking, movement, bulking or subsidence which may give rise to subsequent instability. Any areas identified will require a detailed peat stability risk assessment and ongoing monitoring which will include sighting poles and lines to be set-up across slopes in addition to ground surveying to check for any signs of ground movement.

5.5.3.2 Emergency Response

This CEMP includes an Emergency Response Plan (**Appendix A**) to be applied in the event of a landslide or ground instability. In particular, catch fences and other physical barriers (i.e. concrete blocks) will be on Site and available in sufficient quantities to be used in the event of ground instability.

5.5.4 Soil Contamination

Plant, vehicles, fuel bowsers etc. will be checked on a regular basis during the construction phase of the Development. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations.

5.5.4.1 Mitigation by Avoidance and Good Practice

A fuel management will include the following elements:

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, away from drains and open water;
- Fuel containers will be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses, pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Only designated trained operators will be authorised to refuel plant on Site.

5.5.4.2 Mitigation by Reduction

As discussed previously, careful design of the wind farm has reduced the amount of Site traffic required on Site by reducing access tracks lengths, excavation volumes and double handling. Similarly, good Site practice will also result in less traffic and a lower potential for fuel spills and leakages.

5.5.4.3 Emergency Response

Procedures and contingency plans are proposed to deal with any emergency accidents or spills. In particular an emergency spill kit with oil boom and absorbers will be kept on Site in the event of an accidental spill. All Site operatives will be trained in its use. In addition, all vehicles will also contain emergency spill kits.

5.5.5 Material and Waste Management

All materials used on Site and wastes generated on Site will be reduced by good Site practice and attention to this CEMP. A policy of reduce, re-use and recycle will apply. All waste will be segregated and re-used where possible or removed from Site for recycling. Any waste which is not recyclable or compostable will be properly disposed to landfill. Whenever possible, excavated materials will be re-used close to the area of excavation. The careful design which has been achieved will result in minimal excess soil and rock.

5.6 OIL AND CHEMICAL DELIVERY AND STORAGE

Oils and chemicals will only be ordered in manageable quantities and stored responsibly i.e. in a bunded area or suitable container/storage area, in accordance with relevant legislation and containers must be labelled with details of contents. No concrete batching will take place on site but will instead be delivered to site with only the chutes being washed out in a designated area.

All deliveries of oils and chemicals will be met by a competent member of staff who will direct the driver to the delivery point. Fuel oil shall be delivered by a road tanker and transferred to mobile bowsers and/or the static tank(s) within a designated fuel transfer area (refuelling area) in the site compound and/or designated refuelling areas on site for mobile bowsers. Any fuel bowsers or static tanks on site will be required to be bunded to 110% capacity. Spillage kits must be available at or near the delivery point for emergencies.

All fuel tanks will be kept locked when not in use. All oils and chemicals will be returned to the storage area after use.

It is a TWL requirement that storage of static generator(s) and associated fuel tank(s), which are separate with inter-connecting hoses, will be located within a covered impermeable bund – where these will be located on site and follow best practice as set out in PPG 6[2]. Bunds shall be constructed from concrete block work or similar (e.g. a walled containment facility). Rainwater will be prevented from accumulating in bunds as this compromises the containment. If required, drainage of these areas shall be via an oil separator.

Where more than one container is stored, the storage bund will be capable of storing at least 110% of the largest container or at least 25% of the total storage capacity, whichever is the greater. Oil absorbent spill response kits will be immediately to hand and be used to mop up any spillage. The following sets out storage requirements for oils and chemicals;

- All storage containers will be clearly labelled in accordance with Control of Substances Hazardous to Health (COSHH) requirements or appropriate replacement legislation. All containers will be stored in an upright position.
- The Site will maintain a COSHH inventory.
- Storage of oils and chemicals will be controlled (such as segregation) to prevent a reaction between the different types; for example, gas cylinders will be stored separately, as will substances marked flammable.
- When determining storage locations consideration will be made to enable adequate access and egress for plant and manual handling.
- Where external storage is required, locations will be sited at appropriate distances from watercourses, possible routes to watercourses and drains and will consider site sensitivities and

[2]https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/ppg-6-working-at-construction-and-demolition-sites/

the scope of activities being undertaken. Storage areas will be located in areas free from vehicle movements to minimise the risk of collision damage.

- The Contractor will also install oil interceptors within compound drainage where a significant volume of fuel and oil is stored.

A Chemical and Waste Inventory will be kept. This inventory will include:

- List of all substances stored on-site (volume and description);
- Procedures and location details for storage of all materials listed; and
- Waste disposal records, including copies of all Waste Transfer Notes detailing disposal routes and waste carriers used.
- Any tap or valve permanently fixed to the mobile unit through which oil can be discharged to the open or when delivered through a flexible pipe which is fitted permanently to the mobile unit, will be fitted with a lock and locked shut when not in use.
- Sight gauges will be fitted with a valve or tap, which will be shut when not in use. Sight gauge tubes, if used will be well supported and fitted with a valve.
- Mobile units must have secondary containment when in use/out on site.
- Where mobile bowsers are used on site guidelines will be followed so that:
    - Any flexible pipe, tap or valve will be fitted with a lock where it leaves the container and be locked shut when not in use;
    - Flexible delivery pipes will be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use. Where possible, a nozzle designed to dispense oil is used; and
    - The pump or valve will have a lock and be locked shut when not in use.

Diesel is classified as a dangerous substance. Under the EU Directive 95/55/EC all such dangerous substances will be conveyed in a container that complies with the ADR. As such, the manufacturer of each bowser will provide certification to contractors of the following:

- A leak-proof test certificate
- A copy of the IBC approval certificate
- An identification plate attached to the container

For loads in excess of 1,000 litres (220 gallons), the bowser vehicle driver will have undergone training and hold a special license.

5.6.1 Inspection and Maintenance

Oil and chemical storage areas will be inspected, at least weekly for signs of spillage, leaks and damage. Rainwater, materials and general debris in bunds and drip trays will be removed as part of the maintenance programme.

5.7 REFUELLING

Refuelling activities on site will be undertaken by a designated and trained member of staff. Refuelling will only be carried out in designated refuelling areas. These areas will be located away from watercourses and drains and will consider site sensitivities and the scope of activities being undertaken. There will be no fuel stored on site.

Vehicles will be refuelled off-site where possible. For vehicles that require being refuelled on-site (e.g. cranes), fuels will be stored in the temporary construction compound and bunded to at least 110% of the storage capacity of fuels to be stored. High-density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection. This membrane will be inspected and if there is any sign of oil contamination, it will be removed from site by a specialist licensed waste contractor. All vehicles will be well maintained and free from oil or hydraulic fuel leaks. No refuelling will take place within 65m of a watercourse. Refuelling will take place via a mobile double skinned fuel bowser. The bowser will be a double axle refuelling trailer which will be towed to the refuelling locations by a 4x4 vehicle. The 4x4 will carry, a drip tray, spill kit and absorbent mats in case of any accidental spillages. Only designated competent personnel will refuel plant and machinery on the Site.

Used spillage response kit material and waste oil shall be treated as hazardous/special waste and stored appropriately on site. All waste will require will be disposed of off-site to a licensed disposal site, in this case Carrowbrowne Recycling Centre.

5.8 WASTEWATER AND WATER SUPPLY MONITORING AND CONTROL

Wastewater presents a hazard to the environment and can cause contamination of groundwater and pollution of surface waters. In order to manage wastewater and water supply facilities at construction sites a series of monitoring and maintenance control measures will be put in place.

Wastewater Monitoring and Control

The maximum wastewater production is estimated to be the same as the maximum water consumption (of approximately 2,000 litres per day). The Development includes port-a-loos connected to an integrated waste holding tank at the Contractor's Temporary Compound capable of handling the demand during the construction phase, when as many as up to 40 people will be working on site at peak times. The holding tank will be fitted with an alarm so that when it reaches a certain capacity an alarm will warn that the tank will need to be emptied. The tank will be collected by a licenced waste contractor and disposed of at an appropriate licenced facility.

No concrete washout will be undertaken on site. Only the chutes of the trucks will be cleaned prior to leaving site and this will take place at a designated area at the Temporary Compound. Concrete washout areas will be planned to see that they do not cause congestion with site traffic and designed to prevent the escape of run off into the natural environment of the site such as a lined containment system. When washout areas are full, and the concrete has hardened it will be broken out and disposed of in an appropriate manner.

5.9 WATER SUPPLY

Drinking water will be supplied via drinking water coolers and toilet and kitchen facilities will be supplied via rainwater harvesting via holding tanks on the roof of the construction compound or via tankered water.

During the construction phase, water will be supplied by a water bowser which will supply an estimated demand of 1-2,000 litres per day. Drinking water will be supplied by bottled water brought to site daily or as an when required.

5.10 WASTE AND RESOURCE MANAGEMENT

5.10.1 Waste Hierarchy

TWL aims to manage waste in accordance with the waste hierarchy by avoiding waste generation and promoting waste minimisation in the first instance. This will apply to both the TWL construction and operational site. Where waste is produced, we will aim to reuse, recycle or recover where practical and economically feasible prior to considering disposal. We support the Circular Economy and encourage Contractors to also adopt this approach where practicable when considering the management of materials.

TWL together with our Suppliers and subcontractors who generate or dispose of waste as a result of carrying out their agreed activities are required to do so in a controlled manner and in line with current legislation.

5.10.2 Types of Waste

Waste produced on site will generally be regarded as 'controlled' waste, which comprises household, commercial or industrial waste. Waste produced by the construction site will be regarded as commercial waste since it will have been produced from premises used wholly or mainly for trade or business purposes.

Some controlled wastes are often further classified in view of their difficult nature and additional regulatory controls. In general terms and for most practical purposes it is often easiest to consider wastes as either hazardous or non-hazardous.

General waste arising at the site such as waste paper, plastics, wood, metal, packaging, small quantities of waste food and food containers and septic tank waste are likely to fall in the non-hazardous category.

Hazardous wastes produced on site are likely to include oils and fuels, oily rags, solvents, chemicals, and electrical equipment. Absorbent materials used for containing/cleaning spills of substances will be classified as hazardous waste e.g. oil absorbent matting. The materials will be bagged, sealed and labelled and placed in a hazardous waste storage container in the same way, as any other waste contaminated with a hazardous substance must be treated, and disposed of, as hazardous waste.

5.10.2.1 Packaging

Packaging will be brought on site during the construction, operational and decommissioning phases and can include cardboard, wood and plastics used to package turbine components. In accordance with the waste hierarchy, packaging will be returned to the originator ahead of re-use or recycling. Where this is not possible, waste will be separated as appropriate and safely stored on site appropriately site in anticipation of recycling. This waste is non-hazardous, and the effects of this waste are not significant.

5.10.2.2 Metals

Waste metals from concrete reinforcing during construction and removal of metals during decommissioning etc. will have commercial value and will be re-used or recycled with the appropriate licensed waste contractor. This waste is non-hazardous, and effects will be not significant.

5.10.2.3 Excavated Materials

The amount of peat spoil predicted to be generated during construction of the wind farm is approximately 84,760m^3 of peat spoil.

The total amount of cut material below the peat layer estimated from the Development is approximately 218,635m^3 with the amount of fill being estimated at 174,526m^3. This leaves a surplus of 44,109m^3 that it is envisaged can be used as structural fill in Site Access Tracks, Turbine Hardstand and Turbine Foundation construction. More information can be found in Chapter 8 of the EIAR.

Due to the nature of the peatbog habitats on site, it is not envisaged that berms or large designated storage areas can be used for the storage of spoil will not be permitted. However, peat spoil will be used to reinstate exposed areas around infrastructure such as slopes/graded ground around Site Access Tracks and Turbine Hardstands and on the Turbine Foundations or where there is degraded bog that can be enhanced by depositing peat on it. Peat that cannot be used for reinstatement around the Site, will be taken off site to the designated spoil storage area to the east of Maam Cross, approximately 3.5km to the west of the wind farm site.

Works at the spoil storage areas will involve the machinery similar to that used for peat excavation. A 40-60 tonne 360 degree long reach hydraulic excavator and tractors and trailers will be used to place

the spoil in areas of cut away to create level surface. Where these areas are less than 1.5m deep (expected to be the majority), they will be filled with peat to the adjoining ground level and then a containment berm will be created to create cells. The cells will be bermed and will measure a maximum size of approximately 30m x 30m and have outfalls blocked and overflow management with the creation of drainage channels for excess water and sphagnum inoculation. Where the storage is on areas of non cutover peat, then the cells will be provided on the surface of the existing degraded/de-vegetation peat surface. The width of the cell, in an east to west orientation will be dictated by the width of the existing areas of cutover blanket bog either side of the degraded / de-vegetated area, but will not be wider that 45m in width. The length of the cells along their broadly north to south axis will not be longer than 60m in length. More information can be found in Chapter 8 of the EIAR.

Non-Peat Spoil

Non peat spoil will consist of glacial till from granite bedrock / rock is present on site according to the PSRA report by EcoQuest Environmental Services contained in Appendix 8.1 of the EIAR. It is envisaged in the design that all the non-peat material won on Site can be used as fill on site in the following places:

- Subsoil to be used around the blade laydown areas where load capacities required are less; and
- Rock won from excavations to be used within Site Access Track and Turbine Hardstand build up.

There will also be spoil generated from the grid connection works. This will be in the form of tarmacdam/asphalt, Clause 804 running layer material, compacted rock fill material and subsoils. The total amount of spoil material from the grid connection works is estimated to be 12,590m^3. This material will need to be taken off site and recycled/disposed of at Carrowbrowne Recycling Centre which is an appropriate licenced facility to deal with inert waste.

5.10.3 Storage of Waste

Waste will be deposited and contained within suitable labelled storage facilities until its removal from site by an authorised waste carrier. Waste will be segregated as appropriate for recycling such as paper, cans, plastics, wood, metal, packaging.

Labelling on containers must be durable and permanent. When determining storage locations, adequate access and egress for plant and manual handling will be provided.

5.10.4 Transfer of Waste

Only authorised waste carriers will be employed to remove waste from Construction Sites. The Contractor will be responsible to ensure that carriers have the required documentation such as waste carriers licence.

A Waste Transfer Note must accompany and be raised before transfer of any non-hazardous waste off site.

All wastes that are classified as special or hazardous waste are subject to the Consignment Note system for transfer.

Copies of the above documentation shall be required to be retained on site, in line with applicable legal requirements.

5.10.5 Waste Management Plan (WMP)

TWL construction sites shall be required to have a Site Waste Management Plan, which will be the responsibility of the Contractor. The Plan will record the following information, as a minimum:

- The types of waste generated by the site
- The management approach for each waste type (Reuse, Recycle, Recover, Dispose)
- The storage arrangements for each waste type
- Licenced Waste Management companies will be used to deal with waste from the project
- The site waste monitoring and reporting arrangements

5.10.6 Staff Facilities

During the construction, there will be the typical waste generated in an office such as left-over food and sandwich wrappers. This is a non-hazardous waste. All such waste will be stored appropriately and safely from wind, rain and wild animals that often tear apart rubbish bags. Provision for separation of waste streams will be provided so that e.g., paper and cardboard waste and bottles may be recycled. The effects of this waste will be not significant.

5.10.7 Sewage

The self-contained port-a-loo units which will be located in the temporary site compound during the construction phase, will be managed and serviced regularly (by removal of the contents by tanker to a designated sewage treatment plant such as Oughterard Wastewater Treatment Plant) and removed off site on completion of construction. Toilet waste is a non-hazardous waste and effects will be not significant.

5.10.8 Concrete

During the construction phase:

- Precast concrete will be used wherever possible i.e., formed offsite. Where the use of precast concrete is not possible the following mitigation measures will apply.
- The acquisition, transport and use of any cement or concrete on site will be planned fully in advance and supervised at all times.

- Vehicles transporting such material will be relatively clean upon arrival on site, that is; vehicles will be washed/rinsed removing cementitious material leaving the source location of the material. There will be no excess cementitious material on the vehicle which could be deposited on trackways or anywhere else on site. To this end, vehicles will undergo a visual inspection prior to being permitted to drive onto the proposed site or progress beyond the contractor's yard. Vehicles will also be in good working order.
- Any shuttering installed to contain the concrete during pouring will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure this, for example the use of plastic sheeting or other sealing products at joints.
- Concrete will be poured during meteorologically dry periods/seasons. This will reduce the potential for surface water run off being significantly affected by freshly poured concrete. This will require limiting these works to dry meteorological conditions i.e. avoid foreseen sustained rainfall (any foreseen rainfall event longer than 4-hour duration) and/or any foreseen intense rainfall event (>3mm/hour, yellow on Met Éireann rain forecast maps), and do not proceed during any yellow (or worse) rainfall warning issued by Met Éireann. This also will avoid such conditions while concrete is curing, in so far as practical.
- Ground crew will have a spill kit readily available, and any spillages or deposits will be cleaned/removed as soon as possible and disposed of appropriately.
- Pouring of concrete into standing water within excavations will be avoided. Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the buffered surface water discharge systems in place.
- Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g., using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.
- No surplus concrete will be stored or deposited anywhere on site. Such material will be returned to the source location or disposed of off-site appropriately.

5.11 ARCHAEOLOGY AND CULTURAL HERITAGE

The following section details the environmental control measures which will be incorporated into the Contractors' Construction Method Statement in respect of archaeology and cultural heritage. An assessment of the impacts from works on Archaeology and Cultural Heritage can be found in the EIAR, **Chapter 13: Cultural Heritage**.

Ground works during the construction phase of the Development will be subject to archaeological monitoring under licence by the National Monuments Service. In the event that any sub-surface archaeological features are identified during these site investigations they will be recorded and then securely cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation in situ (by avoidance) or preservation by record (archaeological excavation).

The southern section of the roadway forming the grid connection route extends into the Galway Gaeltacht area and any signage erected within the public realm in this area during the construction phase will include Irish and English text.

5.12 AIR, NOISE AND VIBRATION

Emissions to Air

During construction in dry weather, there is the potential for a certain amount of dust to be generated. Measures implemented on site will include, but will not be limited to the following:

- Adherence to the speed limit on site in order to reduce the dust generated from transport on site roads
- Water bowsers – Spraying with water to dampen dust down
- Road sweepers – remove silt from the road surface to reduce the potential for dust on the public road, if required
- Materials with the potential to produce dust must be stored accordingly to prevent dust generation e.g. materials stored out of the wind and covered
- Transport of dust generating material will be covered

5.12.1 Noise and Vibration

There is the potential for noise and vibrations to be generated during the construction process. Measures will require to be implemented on site to minimise any effects and a programme of monitoring may be required. General guidance for controlling construction noise through the use of good practice given in BS 5228 will be followed. Construction and Decommissioning of the Development shall be limited to working times given and any controls incorporated in any planning permission.

6 CONSTRUCTION

The following sections detail an outline construction sequence to provide an overview of the construction process; The construction-stage details of the sequence and methodologies, to be undertaken within the framework of this CEMP, will be determined by the Contractors.

6.1.1 Phasing of Works

It is envisaged that the following will be the sequence of construction for the Development:

1. Site Preparation including drainage

2. Site Access Tracks
3. Contractors Compound and Welfare Facilities
4. Crane hardstands
5. Turbine Foundations
6. Internal cable ducting
7. Installation of the Grid Connection
8. Erection of wind turbines
9. Commissioning and Energisation

6.1.2 Working Hours

The Development will have approximately 50 construction workers during the peak of the construction phase. Working hours for construction will be from 07:00 to 19:00 on weekdays, with reduced working hours at weekends, from 08:00 to 13:00 on a Saturday. It should be noted that during the turbine erection phase, operations will need to take place outside those hours with concrete pours commencing at 05:00 and continuing till 16:00, to facilitate turbine foundation construction and so that lifting operations are completed safely. Hours of working for turbine foundation construction will be agreed with Galway County Council prior to the commencement of turbine foundation construction. **Chapter 14: Traffic and Transportation** refers to this in further detail. A detailed Traffic Management Plan will be implemented for the construction phase. This shall be agreed during the planning compliance stage with the Planning Authority so that strict controls described therein are in place with all suppliers coming to the Site.

6.1.3 Site Management Procedures and Construction Methodologies

Prior to commencement of construction, the appointed Contractors(s) will prepare detailed method statements and work programmes for the construction stage. These method statements will be prepared in the context of measures set out in this CEMP and will take account of mitigation measures as outlined in the planning application and accompanying environment reports, and site investigations to be carried out prior to construction. Any specific requirements will be fully incorporated into the appointed Contractors scopes of work and appropriate supervision and management will be carried out to ensure full compliance.

The method statements produced by the Contractors(s) will be reviewed by the Ecological Clerk of Works (EM) and will be agreed with the appropriate parties, including Galway County Council. The developer will employ a project manager to monitor the construction phase of the project and ensure works are being carried out in accordance with the agreed method statements, safety procedures and pollution control measures.

6.1.3.1 Mobilisation of Contractors Plant

Prior to commencement of construction works, the selected Contractors shall submit to the Developer a full list of plant, equipment and accommodation (site offices etc.) proposed for use during the works.

Dates for mobilisation will be agreed with the developer and/or his representative/Owners Engineer.

6.1.3.2 Site Infrastructure

Site Access Roads / Turbines

Machinery and vehicles used in access track construction are operated from the track only as it is constructed.

The location of all infrastructure required for this Development shall be set out by GPS (Real-Time Kinematicenabled3) equipment to the permitted detail as noted on the approved drawings. The Site will be set out using wooden posts to mark the boundary and extent of construction activities, in accordance with the Site layout and environmental constraints drawings, and with contributions from the appointed ecologist. The boundaries of the buffer zones will be taped/fenced off to prevent construction plant from entering the buffer zones and impacting on water quality. Site personnel will be informed of the buffer zones through toolbox talks onsite, both before and during construction. New personnel will be informed of the construction buffer zones with induction training before commencing work.

6.1.3.3 Establish Pre- Commencement Mitigation Measures

Prior to construction works advancing on site, the Contractors shall confirm to the Employer of their intention to advance the works in a sound practical manner with no undue impact on the receiving environment. The Contractors shall identify all sensitive environmental areas within the Site and confirm their intended method of construction works regarding these areas in line with the methods outlined in this CEMP. All environmentally sensitive areas shall be identified prior to the detailed design/construction phase.

Where the estimated working area is reduced by any sensitive environmental areas i.e., buffer zones, post and tape marking shall be used to set out these locations and thus prevent the entry of Contractors plant within these areas during construction works.

To protect any known ecological features that occur close to the planned infrastructure, a delineated working corridor will be employed throughout the construction. Posts and tape will be used to establish these areas and thus prevent the entry of Contractors plant outside the working corridor during construction works. Locations of ecological significance or where invasive species are identified will also be fenced off.

[3] Real-time kinematic (RTK) processing on a drone **records GPS information and geotags images as they're captured during flight**.

A 50m buffer to natural watercourses will be employed during construction to protect water quality and to see that there is no significant direct effect on existing watercourses. Where temporary spoil storage areas are located in proximity to watercourse buffer zones, silt fencing will be installed along the area facing the buffer zone and maintained in line with the instructions of the manufacturer. Works within the buffer zone will be subject to specific method statements.

6.1.3.4 Site Preparation

Works required at the site entrances will include the following:

- Clearing visibility splays of vegetation / soil to a level surface;
- Extending the entrance to allow HGVs turn into the site from the N59;
- Excavating to solid formation level;
- Installing roadside drainage features;
- Placing entrance sub-base with rockfill material;
- Placing capping layer; and
- Providing surface dressing where necessary to prevent rutting of existing road surface.

The detailed construction method statement for site entrance preparation is included in **Table 6.1**.

Table 6.1: Site Entrance Preparation CMS

Activity	Notes
Video Road Condition Survey.	The Contractors will arrange and provide a video survey to establish the condition of the road prior to mobilisation to site.
Prepare a Traffic Management Plan (TMP) in coordination with Galway County Council and An Garda Síochána and implement.	The Contractors will agree an approved TMP with the Roads Section at Galway County Council and An Garda Síochána and the developer.
Set out the alignment of the site entrance using GPS equipment.	Wooden pegs/posts or similar to be used in setting out, following a site walkover by the Ecological Clerk of Works.
Archaeology Requirements.	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.

Activity	Notes
Install drainage treatment features as per the Surface Water Management Plan.	Required to minimise the transportation of suspended solids generated during the construction stage.
Excavate and/or clear the area which is required to accommodate the visibility splays.	The top layer of vegetated material is set aside for reuse as a sealing layer to prevent sediment runoff and reduce visual impact.
Re-align private fences as required by the visibility splays and detailed design.	Required for stock control, security, and sight line visibility requirements.
Excavate to track formation level along the extent of the site entrance and accommodate drainage.	The Contractors shall provide that soil is carefully distributed and banked adjacent to the entrance within the construction boundary. Soil will be managed as per the spoil management plan. Any storage of material will be located to see that no interference with visibility splays occurs.
Installation of stone foundation and surfacing of apron to be installed.	In the interests of road safety, appropriate construction measures will be implemented to see that site debris is not deposited on the carriageway. In the unlikely event of same occurring, the Contractors shall see that all material is removed immediately in accordance with the provisions of the TMP to be agreed with Galway County Council.
Installation of security gates/hut (where required), tied into the re-aligned fence.	Required for site security.

Contractors Compound and Welfare Facilities

The temporary site compound will be in place for the duration of the construction works only. The compound will be used as a secure storage area for construction materials and to contain temporary site accommodation units for sealed type staff welfare facilities. The compound will contain cabins for offices space, meeting rooms, canteen area, a drying room, parking facilities, and similar personnel type facilities.

An area within the compound will be used for the storage of fuel and oils and this will be suitably bunded to 110% of the storage volume. The bund will be lined with an impermeable membrane in order to prevent any contamination of the surrounding soils, vegetation and water table. Double protection containers / equipment will be used along with drip trays and details

During the construction phase, water will be supplied by water bowser. The maximum wastewater production is estimated to be the same as the maximum water consumption (2,000 litres per day). The project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase with 50 construction workers on site at peak. A holding tank is proposed for wastewater management. Wastewater which will be removed off-site and disposed at an appropriate licenced facility.

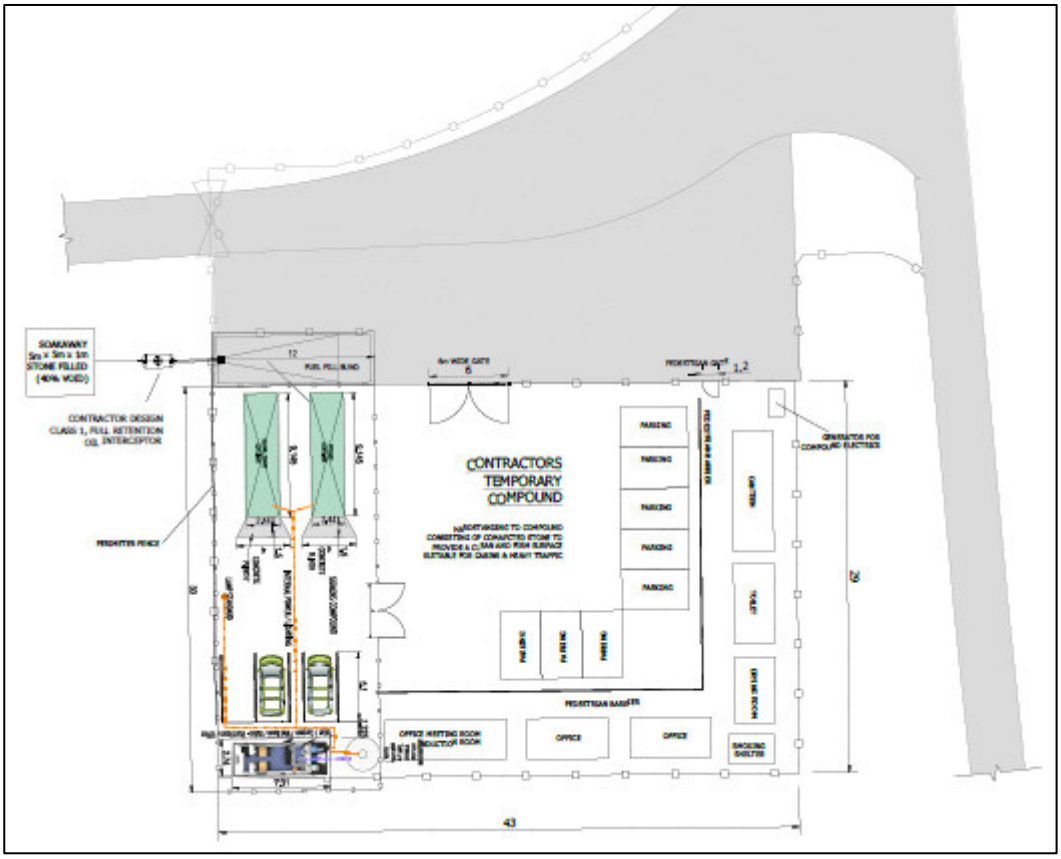

Figure 6.1: Contractor's Temporary Construction Compound

The proposed construction method statement for the construction compound / storage area is detailed in **Table 6.2**.

Table 6.2: Contractors' Compound and Welfare Facilities CMS

Activity	Notes
Set out the perimeter of the site compound using GPS equipment following a site walkover by the Ecological Clerk of Works	Setting out must be undertaken to Irish Grid co-ordinates and to sub-centimetre accuracy in the X, Y and Z plane.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours.

Activity	Notes
	The nominated archaeologist will monitor all invasive works.
Install drainage treatment and flow attenuation features as per the detailed design	Required to minimise the transportation of suspended solids generated during the construction stage.
The top layer of vegetated material will be stripped and stored for re-use onsite.	The top layer of vegetated material is set aside for re-use as a sealing layer to prevent sediment runoff and reduce visual impact. The location for storage of these vegetated turves will be around the perimeter of the site compound away from any sensitive habitats.
Stone will be placed in layers to form the hardstanding area for the site compound.	Hardcore area with Clause 804 stone on geotextile layer (Netlon SS30 or similar) for temporary site offices and for vehicle movements / parking.
The accommodation, eating and sanitary cabins will be installed in accordance with the construction drawings. The site office will be located in the temporary storage area.	Foul drainage from site welfare accommodation will discharge to a holding tank. The holding tank will be fully enclosed with no discharge outlet. The toilets will be the 'portaloo' chemical toilet type. The holding tank will be emptied as required by a licenced waste disposal operator. Temporary power supply and telecommunications will be connected to the relevant cabins.
Construct covered bunded area for oil tanks Construct Plant refuelling Area	Bund to absorb 110% of potential spill volume. Non-permeable concrete refuelling area with petrol interceptor.
Storage units for hazardous products and covered waste skips will be installed as per best industry practice. Complete temporary service provisions – electrical, telecommunications, etc.	All storage units for hazardous products will be fully lockable and bunded proprietary steel containers.
Provide measures for waste management.	Waste segregation skips will be deployed for optimum recycling and re-use of materials. Skips will be covered with lid.

Activity	Notes
Construct an impervious bunded area for plant refuelling and plant maintenance and cleaning operations.	An oil interceptor will be installed on the drainage outlet from the bunded area to separate any oils from the surface run off. Generators and associated diesel tanks are to be installed on such an area.
Parking	Parking areas shall be identified by signage with a handrail system or barrier separating pedestrian areas and vehicle routes.
Reinstatement	Compound areas to be restored to pre-construction condition at completion and demobilisation stage.

Site Security

From an operational point of view, for control of site access and for proper site management, the access to the Site will require passage through a controlled safety barrier/gate or hut. The exact location(s) shall be decided by the Contractors with primary responsibility for safety on the Site. The barrier will be set back sufficiently so that HGVs can enter the Site without stopping.

The Contractors shall be responsible for securing each area of work, so as to ensure the safety and health of all affected persons (Contractor's personnel, site supervision staff, members of the general public, traffic, etc.). The Contractors will provide details to the Developer of security arrangements for the following:

- Fencing specification;
- Provision of personnel to man site access point(s);
- Signage; and
- Signing in/out procedures.

6.2 SITE CLEARANCE AND CONSTRUCTION METHODS

The management of earthworks will be of paramount importance throughout the construction of the project. The general principles that will apply to earthworks include:

- Excavations to only take place following implementation of setting out the working corridor, drainage treatment and flow attenuation provisions.
- Archaeological supervision works will be undertaken.
- Vegetation within the construction corridor shall be cleared as part of the excavation works.
- Suitable plant to be used, particularly when working off road i.e., use of geotextile mats.

- Machinery and vehicles used in access track construction are operated from the track only as it is constructed.
- Vegetated top-mat layer to be removed separately and set aside from other spoil and place around the excavations for use in reinstatement. Spoil storage areas will be located at the designated areas near Maam Cross.
- Topsoil stockpiles shall be no more than 1m in height, smoothed to prevent erosion, and watered to prevent them drying out.
- Apply the vegetated capping layer to permanently exposed excavations or storage areas to mitigate against movement and to avoid sediment run-off. Input from the appointed ecologist will be used to apply the appropriate species of the immediate environment in the capping layer.
- No permanent stockpiles will remain on site after completion of the construction phase.
- Monitor all rock breaking activities and survey areas for indicators of peat/soil movement/slide. The appropriate remedial action will be taken.

The construction method statement for excavation and spoil management is shown in **Table 6.3**.

Table 6.3: Excavation and Spoil Management Method Statement

Activity	Notes
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Install drainage treatment and flow attenuation features as per the detailed design, which includes recommendations of an expert ecologist	Required to minimise the transportation of suspended solids generated during the construction stage. Temporary and permanent ponds and outflow buffers will be constructed as per the attached Surface Water Management Plan (**Appendix B**).
Spoil locations to be identified to machine drivers	Spoil storage and restoration areas to be mapped and pegged out prior to excavation commencing.
A Risk Assessment shall be developed for each and every excavation location to be carried out on site.	Control measures to mitigate safety, stability and environmental risks specific to the local conditions.
The vegetated layer will always be removed and set aside separately from any spoil material.	Required to enhance revegetation.

Activity	Notes
Excavated material will not be stored in areas which have been identified as unsuitable for spoil storage.	Prevent movement of stored material and protect watercourses against harmful run offs.
Excavated material will be separated and stored so that it is not left exposed to the elements. This will be provided for through the immediate application of a vegetated capping layer.	All spoil to be taken to the designated spoil storage areas near Maam Cross unless it is used for landscaping.
Interim (temporary) material storage during the construction stage will be kept to a minimum by the implementation of a continuous construction cycle: 1) Excavate material; 2) Handle material; 3) Permanently store material	Return and re-vegetate the Site to its original state as soon as possible.
Permanent excavated or spoil surfaces shall be re-vegetated without undue delay using seed collected pre-construction, final details of which will be approved by the ecologist. Reseeding will occur within the growing season.	To encourage growth of locally common habitats
Material from excavations in rock, suitable sands and gravels will be carefully managed and re-used as structural fill in the locality of the excavation where possible.	To minimise the volume of imported material required and ensure no impact on the local pH level. No spoil will be permitted to be stored on areas identified as sensitive or high value habitats.

6.2.1 New Site Access Tracks

Carrying capacity will be based on the weight restriction for the installation crane, which typically has a maximum 20 tonne axle weight with a minimum of 12 tonnes.

Prior to advancing any construction works, final road design shall take into account the following:

- Existing Ground Profile
- Existing Ground Soil Type
- Bearing Capacity

- Natural Drainage
- Proposed Turbine Delivery Specification
- Existing Environmental Buffers

As this project will most likely be advanced as Design & Build, the Contractors will be obliged to form the design and construction works with reference to the above and seek final approval from the Engineer for their design prior to advancing any work on site. In any event, it is proposed that the roads are built as follows:

- The alignment of the new Site Access Tracks will be established and the centrelines will be marked out with ranging rods or timber posts.
- Any trees/hedgerow within the construction corridor shall be cleared prior to any construction works. All works will be undertaken outside of the breeding season.
- The first phase of drainage will then be installed in accordance with the detailed drainage design. Track construction will likely require the crossings of a number of cut drains and minor drainage paths.
- The angle of repose of the cut face of excavations shall be battered back approximately 45 degrees. However, where peat is encountered, it will be increased to 26.5 degrees.
- Slopes will not be undercut or excavations left unsupported for periods in excess of 24 hours.
- Soil excavation shall be observed by a qualified archaeologist, in accordance with the approved scheme of archaeological monitoring in order to respond appropriately to identification of any potential archaeological remains.
    - Where necessary, stone will be delivered to site by tipper trucks from approved local quarries and will be placed, spread and compacted in layers to form the running surface. The compaction will be carried out using a dead weight roller.
    - Imported stone will be used throughout for the final surfacing layer.
- Well-graded granular fill (quarry sourced clean stone) will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Site Manager based on the characteristics of the material and the compaction plant to be used.

As is typical with windfarm tracks, the construction method will be Cut and Fill for the majority of the tracks with 2 areas where the peat depths are generally greater than 1.5m.

6.2.2 Cut and Fill (Excavated) Tracks

This form of Track construction is a traditional method whereby the final track construction is formed on a firm bearing strata. This is generally found following removal of the initial vegetation layer and

more than likely the underlying layer of soft material found between the topsoil layer and the firm strata. Typically, this form of Track construction could be founded on relatively shallow excavations. However, if soft spots are encountered locally they will be excavated out and in-filled with selected excavated. Rock will be extracted from the turbine bases. Imported rock will be chemically compatible with the existing geology. It will be tested for compatibility prior to entering the Site. This involves using rock that is similar to the geology of the Site and locally sourced. Construction of Cut and Fill Track sections will be carried out in accordance with detailed design. This system will consist of either 1 or 2 layers of stone depending on the load bearing capacity of base layer and the design loading required with construction traffic. Where the underlying layer is clay, 2 layers of stone are used. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface.

If the vertical alignment requires local infilling for the formation of the Track, the above process of exposing a firm strata is followed and infill material is employed to raise the Track profile in a local embankment.

6.2.3 Road Drainage

A vegetative filter strip and under-road drainage will allow discharge in a controlled manner downslope of the works.

Any crossing of field drains, man-made drains and vegetated drains will be piped directly under the track through appropriately sized drainage pipes. Where appropriate, a lateral drainage ditch (interceptor drain) will be cut along the uphill side of the track to intercept the natural runoff. This lateral drain will be drained under the track at regular intervals through correctly sized cross drains. In cases where the tracks must run significantly downhill, transverse drains ('grips') will be constructed where appropriate in the surface of the tracks to divert any runoff down the road into the drainage ditch. Where the crossing of ditches, field drains, man-made drains and vegetated drains cannot be avoided, the design of the crossing, (in this case culverts) shall be prepared in line with the drainage design philosophy. This is further detailed in the Surface Water Management Plan in **Appendix B**.

Under track drainage will be provided under the excavated tracks at all locations where existing land drainage passes under the proposed tracks. Conventional cross drains will be 150mm diameter and increased to 300mm diameter (minimum) at points for land drainage or natural drainage paths. The spacing of the cross drains will be dependent upon whether the tracks run parallel or tangential with the general contours of the Site.

The detailed design of all under-track drains in areas near flushes will have the input from the Ecological Clerk of Works to see that there is sufficient flow connecting the upstream and downstream habitats. These will be inspected by the Ecological Clerk of Works during construction.

All existing site drainage channels and culverts shall be maintained and any additional drainage design required on-site shall be carried out as per the detailed design. Any such additional requirements will

be reviewed by the Engineer, Ecological Clerk of Works prior to site clearance activities taking place on-site.

There are four proposed water crossings on site, two existing crossings to be upgraded and two new crossings.

6.2.3.1 Turbine Bases/Foundations

Foundation requirements will be provided by the wind turbine supplier, and appropriate factors of safety will be applied to these by the project Structural Design Engineer in accordance with Draft Revised Wind Energy Development Guidelines, 2019[4]. The turbine towers will be anchored to the concrete foundation using a bolt assembly which shall be cast into the concrete.

Each turbine will be constructed on a cast in-situ concrete foundation requiring approximately 590m^3 of concrete which, for the most part, is buried in the ground. The turbine foundations will be constructed so that the top of the foundation is at the existing ground level, with an acceptable tolerance of +/- 1m. The turbine foundation is estimated to be between 2.8m and 3.2m deep and therefore the formation level is 2.8m to 3.2m below existing ground level.

Plate 6.1: Turbine foundation under construction with adjoining crane pad[5]

[4] Draft Revised Wind Energy Development Guidelines, December 2019, [Accessed Online 25/05/2022_ file:///C:/Users/sbradley/Downloads/109102_ae9107b8-6a27-4f26-9a12-6b00632ceaf0%20(1).pdf]

[5] Good Practice during Wind Farm Construction, 2019. Online: https://www.nature.scot/doc/guidance-good-practice-during-wind-farm-construction [Accessed 15/02/2022]

There are two options for design and construction of Turbine foundations as follows:

- **Option 1 – Turbine Foundation constructed directly on in-situ ground:**

  The Contractors shall demonstrate that the soil/rock properties at the formation level are in compliance with the Turbine Foundation Design limiting criteria for a ground bearing base.

- **Option 2 –Turbine Foundation constructed on engineering fill:**

  If it cannot be demonstrated that Option 1 is achievable, the Contractors shall establish and demonstrate a suitable bearing stratum at a lower level, design and construct engineering fill to the formation level of the foundation and demonstrate that the fill properties at the formation level are in compliance with the Turbine Foundation Design limiting criteria for a ground bearing base.

Plate 6.2: Wind turbine foundation[6]

The construction method statement for the turbine bases will generally follow the sequence as defined in **Table 6.4**.

6 https://www.grousemountwindfarm.ie/documents/downloads/EIS%20Vol%201%20-%20Section%203%20-%20Text%20-%20Project%20Implementation.pdf [Accessed 15/02/2022]

Table 6.4: Turbine Base Construction Method Statement

Activity	Notes
Set out the turbine location with the use of GPS (RTK) equipment.	The Contractors shall tape off buffer zones with assistance from the Ecological Clerk of Works, and toolbox talks will be used to inform site staff of the importance of the buffer zones.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Set out and install drainage treatment and flow attenuation features.	Required to minimise the transportation of suspended solids generated during the construction stage.
Remove and locally store the top layer of vegetated material over the excavation area.	This material will be stored for re-use to cover and promote natural re-vegetation of the inorganic spoils that will be deposited at the nearest suitable location to the excavation, monitored by the Ecological Clerk of Works.
Excavate remaining material to 1m depth and segregate organic material from mineral material.	Selected excavated organic material will be considered for re-use as backfilling material.
Excavate to formation level. Complete plate bearing tests.	Any excavated inorganic material will be re-used as structural ballast to minimise the required volumes of spoil and imported stone.
A reinforcement steel cage for the foundation will be assembled after insertion of the turbine foundation insert arrangement (required for fixing steel tower) and formwork will be fixed to surround the cage.	
Reinforcement steel for the top section of the foundation is fixed along with the required number of cable ducts.	Reinforcing steel shall be checked for design compliance and signed off upon acceptance.
Erect the formwork to contain the concrete pour.	Formwork will be re-used and removed offsite when foundation construction is complete.
The foundation anchorage system will be checked both for level and line prior to the	

Activity	Notes
concrete being installed in the base. These checks will be passed to the appointed Turbine Contractors for their approval.	
The foundation will be backfilled with a cohesive material.	Using the material arising during the excavation and landscaped using the vegetated soil set-aside during the excavation.

Plate 6.3: Wind Turbine Erection[2]

Plate 6.4: Assembly of wind turbine blades [2]

6.2.3.2 Turbine Hardstands/Crane Pads

A crane pad hardstand area will be required at each turbine. The hardstands must allow for two cranes (including outriggers) to operate in the vicinity of the turbine to allow for turbine erection. The hardstand must also provide storage and set down areas for turbine components. The hardstand requirements are specified by the turbine supplier and require strict compliance so that there are no stability issues during erection of the turbine sections.

All Turbine Hardstands will be designed to take account of the loadings which will be provided by the appointed turbine and installation Contractors and will consist of a compacted stone structure which is to be installed in accordance with the Transport Infrastructure Ireland (TII) Specification 800 2013.

Two types of hardstands are facilitated:

- Locations that will require a turning head.
- Standard Hardstand arrangement where delivery vehicles do not require a turning area.

Hardstand formation will consist of either 1 or 2 layers of stone depending on the properties of the underlying load bearing layer. Where the underlying layer is clay, 2 layers of stone formation are used, the stone capping layer and, the running layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface (in this case siltstone). The crane pad layout measures c.74m by 58m. The proposed Turbine Hardstand design is shown on **Figure 5.5**.

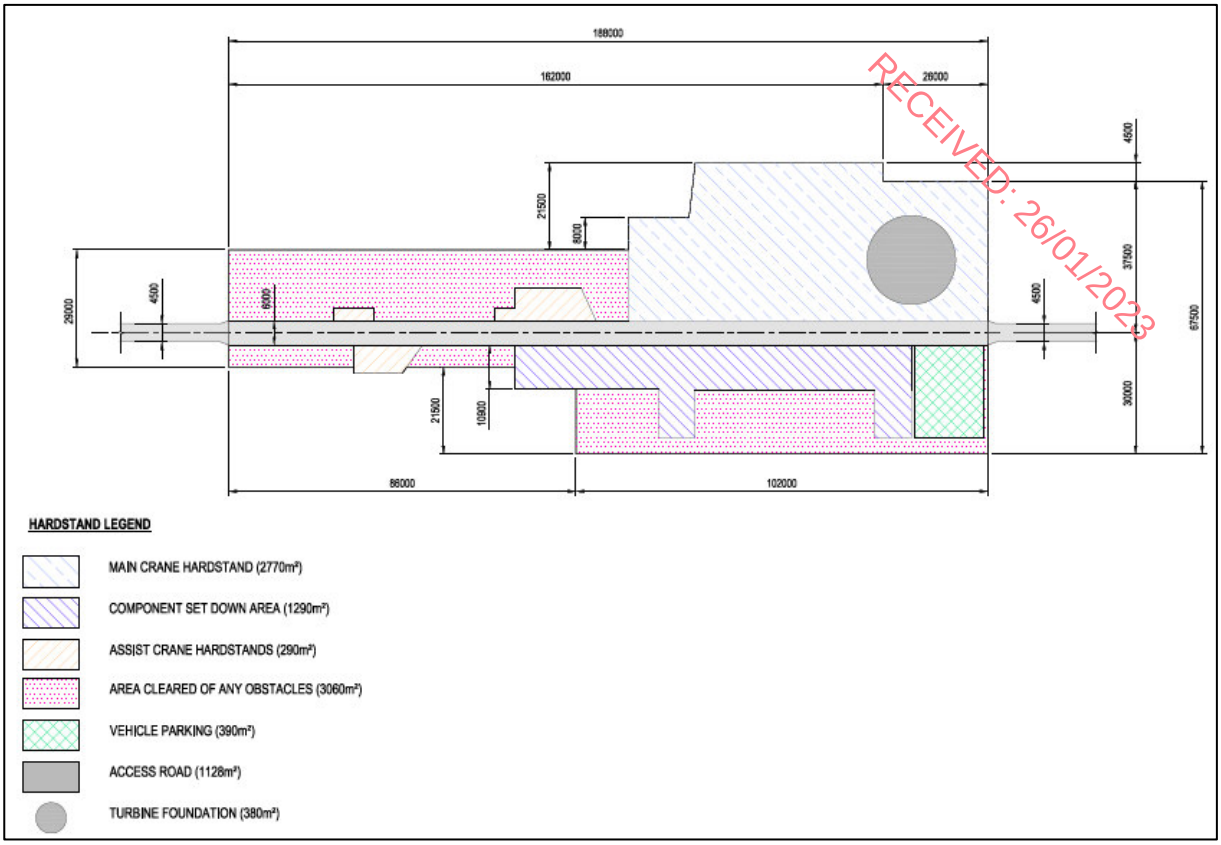

Figure 6.5: Turbine Hardstand

The hardstand area will be excavated to a formation level of weathered rock where possible or on stiff bearing strata on overlaying material.

Following completion of the hardstands, a series of plate load tests will be undertaken to demonstrate compliance with the turbine supplier requirements of 260kN/m^2.

Excavated material will be used for side slope formation local to the hardstands. Material from the excavation of the hardstands will be used to dress exposed areas around the hardstand with the remainder being used for landscaping around the turbine base or for the rehabilitation of the proposed borrow pits in accordance with the attached Spoil Management Plan. A Hardstand construction method statement is set out in **Table 6.5**.

Table 6.5: Typical Hardstands Construction Method Statement

Activity	Notes
Set out the crane hardstands with the use of GPS (RTK) equipment.	The Contractors shall see that buffer zones and areas of restricted working width are taped off with assistance from the ECoW and toolbox talks used to inform site staff of the importance of the buffer zones with identification of areas on drawings and maps.

Activity	Notes
Archaeology	The site will be accessible to the appointed archaeologist at all times during working hours.
Set out and install drainage treatment and flow attenuation features around the crane hardstand and turbine area.	In areas of peat only 'bog master' low ground pressure excavators will be used to minimise the impact on the vegetation layer. Temporary and permanent ponds and outflow buffers will not be constructed in sensitive habitats or buffer zones. Liaison with the ECoW at the detailed design stage will assist in the identification of suitable locations.
Remove and locally store the top layer of vegetated material over the area of the crane hardstand excavation.	This material will be stored for re-use to cover and promote natural re-vegetation of the amorphous peat and /or inorganic spoils that will have to be deposited at the nearest suitable location to the excavation.
Excavate remaining material to 1m depth and segregate organic material from mineral material.	Selected excavated organic material will be considered for re-use as backfilling material.
Excavate material to the required formation level.	The formation level for the crane hardstands will be on weathered rock or stiff overlaying material. Where suitable, the excavated material will be re-used as structural backfill material to minimise the required volumes of spoil and stone.
Place rock fill in accordance with the design to form the crane hardstand structure. Where appropriate, geotextile and/or geogrid should be used to help reduce the volume of stone. Fence off steep edges.	Special consideration will be given towards the stone placement and compaction so that the structural integrity meets the loading requirements.
Plate bearing tests will be undertaken following completion of the hardstand structure.	The number and location of the plate bearing tests shall be specified by the Contractor's designer.

Plate 6.5: Crane for wind turbine erection [2]

6.2.3.3 Handling/Disposal of Excavated Material

Excavated soil will be used for landscaping, stored in the designated areas at Maam Cross or used to restore areas of cutover peat for ecological enhancement at the areas near Maam Cross.

6.3 TRAFFIC AND TRANSPORT

During the construction phase, there will be traffic movements within the site boundary in addition to associated traffic movements on the local road network such as heavy goods vehicles, turbine deliveries. TWL construction sites shall be required to have a Traffic Management Plan (TMP), which will be the responsibility of the Contractor. The detailed TMP will be put in place for the construction phase, which shall be agreed during the planning compliance stage with the Planning Authority so that strict controls are in place with all suppliers coming to the Site. A TMP accompanies the Application and can be found in **Appendix 14.2** of the EIAR. This TMP will be required to be further developed by the appointed contractor in accordance with the relevant conditions of the permission.

6.3.1 Mitigation Measures

The impact of the proposed development has been identified as being temporary in nature and associated with short construction and decommissioning stages only. It is still important that any impact is minimised as far as possible and, in light of this, the following mitigation measures are proposed:

- HGV movements will generally be limited to 08:00 - 18:00 Monday to Saturday. Deliveries will be scheduled to avoid peak times around the morning and evening peak hours. This will avoid HGV traffic arriving during the morning peak hour creating conflict with local residents on their commute/school run. Construction personnel will be encouraged to car-pool, or to travel to site in minibuses.
- Wheel wash equipment will be used on site to prevent mud and stones being transferred from the Development Site to the public highway. All drivers will be required to check that their vehicle is

free from dirt and stones prior to departure from the construction site. In addition, any dust generating activities will be minimised where practical during windy conditions, and drivers will adopt driving practices to minimise dust creation. Finally, loads will be covered into and out of the site where required to ensure that the spillage or deposit of clay, rubble or other debris on the public road network is prevented.

- Construction works on the public road network will be carried out using a traffic management plan (based on this TMP) in accordance with Chapter 8 of the Traffic Signs Manual and agreed with Galway County Council.
- During the construction phase, clear construction warning signs will be placed on the N59, advising the general public as to the presence of the construction site. The site entry points will also be appropriately signed. Access to the construction site will be controlled by on site personnel and all visitors will be asked to sign in and out of the site by security / site personnel. Security gates will be sufficiently set back from the road, so that vehicles entering the site will stop well clear of the public road, thus obviating the queuing of construction traffic on the public road network. Site visitors will all receive a suitable Health and Safety site induction, and Personal Protective Equipment ("PPE") will be worn.
- Grid connection works will proceed at a rate of approximately 100m per work shift, the rate will depend on the ground conditions and the number of existing services encountered in the excavation. The works area will be fully enclosed within the traffic management system. Traffic management using temporary traffic lights shall be kept to the minimum length necessary to accommodate the works being undertaken and to minimise delays to the public.
- Longitudinal trench excavations in the public road shall be straight and parallel to the centre of the road/footway where practicable. Transverse road or footway crossings shall be at right angles to the kerb or property line. Bituminous and concrete road surfaces and footways be cut using a road saw, concrete saw or equivalent mechanical means to the full depth of the bituminous or concrete material prior to any excavation work. The edges of the road shall be trimmed to provide an overlap for permanent road reinstatement in accordance with chapter 7 of the Managing Openings in Public Roads Specification.
- The 38kV cable trench shall be excavated using a rubber tyre excavator on all public roads. The sides of the trench shall be supported to prevent damage to the road. Material arising from trench excavations may be stored at a safe location within the works area and used to backfill trenches, surplus excavated material shall be removed from site and disposed at licenced landfills.
- All excavated trenches in the public road network are to be reinstated at the end of the work shift, A temporary reinstatement shall be carried out in the event that the works are not completed at the end of the work shift.
- Once construction of the Development is completed, all portacabins, machinery and equipment will be removed and temporary hardstanding's excavated and reinstated. The area will be re-graded with the topsoil to a natural profile and allowed to regenerate from the seed bank within the topsoil.

6.4 PLANNING CONDITIONS AND OUTLINE METHOD STATEMENTS

This CEMP and its future versions/revisions will form part of the Contract for Tullaghmore Wind Farm. It will therefore be updated and revised during the different stages of the Development. Where the project is granted planning permission all the planning conditions associated with the Planning Application, applicant Tulaghmore Wind Farm Limited will be listed in **Table 6.6**.

Table 6.6: Relevant Planning Conditions and Related Documentation

Condition No.	Planning Condition	Reason
Planning Ref: INSERT NUMBER		

The Contractors will address all of the mitigation measures and best practice construction methods detailed within the above consent in his design and in any detailed environmental plans as required by this CEMP or the Contract.

6.5 SCHEME AMENDMENTS

Scheme Amendments will be recorded in **Table 6.7**. These amendments do not include changes to the scheme design which are completed in accordance with the existing planning consent. Instead, this refers to changes in the design of the wind farm for which additional approvals and / or consents may be required from Cork County Council. For example, amendments to layouts or in accordance with the current grant of planning permission.

Table 6.7: Scheme Amendments

Reference	Date	Scheme Amendment Description	Environmental Sensitivities potentially impacted by Scheme

6.6 REGISTER OF VARIATIONS

Where any variations to the Management Plans and CEMP are required (either as a result of Scheme Amendments or through corrective actions or improvements noted and undertaken on site) these will be recorded in **Table 6.8**, Register of Variations. Furthermore, all changes to construction methods, design, mitigation and the implications of these changes and authorising personnel will be recorded in **Table 6.8**.

Table 6.8: Register of Variations

No.	Variation Description	Authorising Personnel	Completion Date

7 COMMUNICATION PLAN

7.1 INTRODUCTION

Both the Contractors and the Client will appoint Project Managers to the project. These Project Managers will be the main points of contact between the two parties. This includes the Contractors Construction Project Manager and the Client.

It is envisaged that main project communications will take the form of structured reporting arrangements and meetings.

All issues in relation to environmental management/monitoring will be reported to the Ecological Clerk of Works. The Contractors Ecological Clerk of Works will report to the Contractors and Client on a regular basis.

7.2 CONTACT SHEETS

Table 7.1 provides a list of Tullaghmore Wind Farm Limited, Contractors and relevant third party contact details. This table will be updated and maintained by the Contractors for the duration of the Contract.

Table 7.1: Contact Sheets

Company	Position	Name	Telephone
Tullaghmore Wind Farm Limited	Client Project Manager		
Contractors	Site Manager / EM		
Contractors	Contracts Manager		
Contractors	General Manager		
Contractors	Foreman		
Tullaghmore Wind Farm Limited	Construction Project Manager		

7.3 MEETINGS REPORTS AND CONSULTATIONS

Table 7.2 lists all meetings and consultations as required by the Contract. The table also provides details on the schedule/frequency, scope & objectives and attendees / responsibility for each meeting.

7.4 ROLES & RESPONSIBILITIES

Roles and responsibilities for environmental management, monitoring and reporting are detailed in **Table 7.3**. The Ecological Clerk of Works Contractors will be responsible for the delivery of all elements of the Environmental Management Plan. The Ecological Clerk of Works Contractors will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan.

7.5 REPORTING PROCEDURES

Figure 7.1 provides a diagrammatic outline of the general tasks and communication lines, based on the roles described in **Tables 7.2** and **7.3** and tasks detailed in the Management Plans. The Contractors will update this information as part of the construction stage CEMP.

Emergency Response Plan (Appendix A) includes the communications plan for reporting procedures for all potential environmental risks, hazards or incidents which may relate to ecology, water quality, dust, noise or archaeology. Environmental reporting to statutory bodies, such as Galway County Council will be managed by the relevant Contractors in accordance with an agreed reporting schedule.

Table 7.2: Meetings, Reports and Consultations

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
A Record of all meetings, checks, permissions and licenses will be retained within Section 7 of this CEMP			
Site Inductions	All new site personnel and visitors		Contractors to organize and maintain records
Weekly environmental meetings	Weekly	To provide updates on environmental mitigation measures and performance and identify actions for improvement. The Ecological Clerk of Works Contractors is required to maintain a Pollution Prevention Measures Register in which mitigation measures put into place will be listed and	Attendance required: Ecological Clerk of Works Contractors Site Manager, and any other relevant personnel or statutory consultees where necessary.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		checked weekly to assess the requirement for maintenance. The results of these checks will be discussed at the meeting and corrective actions agreed as required.	
Monthly Environmental Report & Monthly Environmental Management Group Meeting	Monthly	To provide a compiled record of weekly meeting minutes and environmental performance and monitoring results (e.g. air, noise or water quality monitoring as appropriate). To identify any areas / action for improvement.	To be prepared by Ecological Clerk of Works. Report to be issued to the Contractors and Construction Project Manager before the end of each calendar month. Report to be discussed at the monthly meeting with recommendations for improvement passed to the Contractors in written format
Final Environmental Report	Upon completion of construction works	The final report will document the environmental and ecological effects of the construction period. The evidence for effects will be based on findings included in the minutes of weekly meetings and monthly meetings, together with other recording information maintained by the Ecological Clerk of Works. The report will relate results to residual effects predicted in the EIAR.	The Final Report will be prepared by the Ecological Clerk of Works. The report will be made available to the Contractors, Construction Project Manager and Planning Authority, if required.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
Environmental Checks and Monitoring of Mitigation Works	As required in advance of construction works regular checks will also be made at least every 14 days.	Environmental Checks are to be carried out in advance of construction works. This will comprise an on-site meeting / inspection to confirm the appropriate use of identified mitigation measures and highlight any further issues / measures which may be relevant prior to commencement of works in any area. As a minimum, Environmental Checks will be completed at each main piece of site infrastructure (turbine bases, construction compounds, sub-station, control room) prior to works commencing in that area. Environmental Checks will include: • Checks for visual evidence of contamination / sediment alongside watercourses, nearby working areas and in areas of surface water discharge. • Regular checks of all plant and equipment	Environmental checks will be undertaken by the Contractors Ecological Clerk of Works. The Ecological Clerk of Works may also undertake regular checks, either independently or in conjunction with the Contractors checks as required. The Contractors and Ecological Clerk of Works will retain a record of all inspections / findings of Environmental Checks within Section 7 of this CEMP. All records will be made available for audit / review. All records will also be made available for discussion during regular meetings as scheduled herein.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		to identify any oil or fuel leaks to confirm the condition of the plant. • Inspection of drainage and erosion and sediment control measures. Additional checks will be made before, during (where safe to do so) and immediately following anticipated storm events or periods of continuous or heavy intermittent rainfall over one or more days. • Environmental checks will also encompass a review of: - Waste management procedures - General site tidiness - Temporary materials storage (extracted materials stockpiles) and restoration works and - Soil stability	

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		- Signs of any mammal activity on site - Buffer zones (if any) are being maintained	
Environmental Audit	At least once every month.		Environmental Audits may be carried out by the Contractors, or Tullaghmore Wind Farm Limited. at any time during the works. Audit procedures and forms are included within Section 7. These will be followed / completed by the Employer when undertaking environmental audits and may also be adopted by the Contractors, unless alternative procedures and forms are submitted and approved as part of the Contractors' construction stage CEMP.
Liaison with regulator / statutory Consultees	As Required	Provide regular updates to relevant authority on environmental performance and maintain good working relationships with the regulatory bodies.	Contractors and Ecological Clerk of Works where required. Meetings will be initiated as required by Planning Conditions, Management Plans or as agreed throughout the duration of the construction phase. The Contractors is responsible for obtaining all relevant permissions, consents, licenses and permits. Some permits may require application and implementation by an appropriately qualified person. In these instances, the Contractors will consult with the other specialist

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
			Environmental Consultants where required.

Table 7.3: Roles and Responsibilities

Position	Roles and Responsibilities
Construction Project Manager	The Construction Project Manager will: Ensure that the Contractors has obtained the relevant approvals and licenses and consents from regulatory bodies and statutory consultees where required. Ensure that the Contractors has submitted all relevant documentation to t, liaise with the Site Manager and the Ecological Clerk of Works and ensure that corrective actions and variations to the CEMP have been instigated.
Project Site Manager/ Engineer	The Site Manager will provide liaison between the Ecological Clerk of Works and the Contractors where environmental sensitivities, instruction for environmental performance improvements or corrective actions are requested by the Ecological Clerk of Works or other appropriate person(s) as a result of environmental checks or audits conducted by this person(s). The Site Manager will ensure that all notifications of environmental sensitivities and incidents as well as other general observations on environmental performance are reported back to the Construction Project Manager. The Project Site Manager is responsible for review and further development of the CEMP.
Environmental Manager	The Ecological Clerk of Works will be a member of the Environmental Management group and will work with the Contractors to ensure compliance with best practice and with all environmental mitigation and monitoring requirements as detailed within the relevant planning conditions, compliance documents and CEMP during both the pre-construction and construction phases. The main roles of the Ecological Clerk of Works are as follows: • Organise start-up meeting / Toolbox talks with the Contractors to agree working methods, specifically including communications; schedules; monitoring of data storage; and preparation of plans indicating location of key features including mitigation measures, monitoring points and sensitive habitats (where not previously highlighted and approaches agreed).

Position	Roles and Responsibilities
	• Give tool-box talks as agreed with the Contractors to address key areas, including water pollution prevention, protected species management, and on-site biodiversity. Highlight to staff the requirement for compliance with planning conditions. • Undertake a pre-construction walkover with the Site Engineer / Site Manager to confirm that access routes remain appropriate to the conditions present at the time of construction • Delineate any sensitive habitats or features with wooden stakes and high visibility tape • Undertake or delegate to an appropriately qualified person, a pre-construction Invasive Alien Species survey along the works route • Monitor the installation of poles and infrastructure • Inspect pollution control measures during the works • Maintain a presence on site during the pre-construction and construction works, including setting out of access routes. • Organise a minimum of weekly meetings with the Site Environmental Supervisor and / or Foreman, to allow briefing on the programme of works on site and to provide on-site guidance during construction. • Identify environmentally sensitive areas and ecological hazards for demarcation by the Contractors. • Develop written reports / audits and submit to the Contractors and present findings at meetings as required. Prepare updated reports and a final report on mitigation measures, procedures and monitoring. • Monitor potential environmental impacts and the successful implementation of all mitigation as detailed in the NIS and this CEMP. • Maintain a weekly presence on site during the main construction works. • Prepare a pre-construction Invasive Alien Species survey along the works route. • Identify environmentally sensitive areas and ecological hazards for demarcation by the Contractors. • Produce written reports to the Contractors following site visits and meetings. This includes monthly reports and a final report.

Position	Roles and Responsibilities
	The Contractors will provide comprehensive information on all proposed works and all scheduling to the Ecological Clerk of Works in advance, to anticipate and address any issues, especially access to new areas including areas where Invasive Alien Species may occur, vegetation clearance, setting out of buffer zones, excavation and silt mitigation measures, temporary compound works and vegetation reinstatement.
Ecological Clerk of Works and/ or Water Quality Specialist	The Ecological Clerk of Works will work with Tullaghmore Wind Farm Limited, the Contractors to see that compliance is achieved with best practice and with all environmental mitigation and monitoring requirements as detailed within the NIS and CEMP, relevant planning conditions and CEMP. The Ecological Clerk of Works will delegate and oversee the work to ensure competency of tasks achieved. Where a particular ecological concern exists at the Site, or specific habitat management activities are to be undertaken in conjunction with the main civils construction works, a Specialist Ecologist / Environmental Consultant may also be required unless the Ecological Clerk of Works is suitably qualified to undertake the particular ecological responsibilities. The main roles of the Ecological Clerk of Works are as follows: • Organise start-up meeting / Tool box talks with the Contractor to agree working methods, specifically including communications; weekly schedules; monitoring of data storage; and preparation of plans indicating location of key features including mitigation measures, monitoring points and sensitive habitats. • Maintain a weekly presence on site during the main construction works. • Organise a minimum of weekly meetings with the Site Manager and / or Foreman, to allow briefing on the programme of works on site and to provide on-site guidance during construction. Note: It is essential that the Contractor supplies information on works and scheduling to the ECoW in advance in order to anticipate and address any issues, specifically including drainage, buffer /protection zones, silt mitigation measures, cabling, roads, turbine bases, met masts, compounds, landscaping, topsoil removal, storage and replacement, vegetation reinstatement and restoration works, planting, felling and habitat management. • Highlight the need for compliance with planning conditions.

Position	Roles and Responsibilities
	Contractors Note: If failures occur and actions are taken which contravene legislation then the Project Ecologist has the power to stop works in the affected area with immediate effect. These actions will only be taken where appropriate. Notification to stop works will be by verbal means, followed up with written confirmation recording the time and date of the instruction, personnel involved and reasons for the instruction. Upon recommencement of works, details of any corrective actions and / or remedial measures implemented will be recorded within Section 7. • Give tool-box talks as agreed with the site contractor to address key areas, including water pollution prevention, protected species management, and on-site biodiversity. • Monitor potential environmental impacts, including: - Use of and storage of oils and toxic chemicals on site, e.g. cement - Dewatering of excavations (including turbine bases) - Silt control - Water management, including working in or close to watercourses - Protection of ecological interests, e.g. protected species and habitats • Identify environmentally sensitive areas and ecological hazards for demarcation by the Contractor. • Produce written reports to the Contractor following site visits and meetings. This includes monthly reports and a final report.
Specialist Ecologist/ Environmental Consultant	Where a Specialist Ecologist / Environmental Consultant is employed, this person(s) will: • Provide advice and maintain regular liaison with the Project Site Manager, Project Manager, Ecological Clerk of Works and Contractors and / or other specialist Environmental Consultant as and when required. • Undertake specific monitoring activities and reporting as defined in agreed documentation prepared as part of the planning process. • The Ecological Clerk of Works or a Water Quality Specialist will be appointed. They will have responsibility for fulfilling the following requirements re water quality monitoring:

Position	Roles and Responsibilities
	- Daily visual inspection of: access roads for signs of ground damage or solids escape to nearby watercourses in vicinity of construction works - The ground between the structure under construction and the nearest downslope watercourse for signs of solids escape or ground damage - Surface water features in vicinity of construction works - Any pollution control measures at structures and along access roads (e.g. silt fences, drain or stream crossings etc.) for evidence of contaminated run-off or mitigation failure - Attendance at the critical work phases including, access road construction, foundation excavation, watercourse crossings, concrete pouring and back-filling. - Collection and analysis of water samples at a number of monitoring locations (i.e. upstream & downstream of the 4 no. instream work locations) before, during (if potential pollution visually identified) and after construction works at that location. - EPA Q Value Biological Monitoring at monitoring locations (i.e., upstream & downstream of instream construction work locations) before and after construction works.
Archaeological Clerk of Works	The main roles of the Archaeological Clerk of Works (licenced) are as follows: • Maintain regular liaison with the Project Site Manager, Project Manager, Ecologist and Ecological Clerk of Works as appropriate. • Maintain liaison with officers of the Planning Authority, specifically the Council Archaeologist and Planning Officers as appropriate. • Where applicable, apply for licence application; the Minister for Dept of Culture Heritage and Gaeltacht can approve and issue a licence under Section 26 of the National Monuments Act 1930. • Facilitate compliance with planning conditions and agreed Archaeological Programme of Works. • Demarcate any archaeologically sensitive areas and set up exclusion zones as required on site. • Immediately notify the relevant authorities in the event of the discovery of archaeological finds or remains and suspend works in the immediate

Position	Roles and Responsibilities
	area pending consultation. Allowance will also be made for full archaeological excavation if required. • Complete a full report for submission to the Planning Authority and the Department of Housing, Local Government and Heritage on completion of the works.
Geotechnical Clerk of Works or Appointed Geotechnical Consultant	The Geotechnical Clerk of Works will be responsible for preparation and monitoring of a geotechnical risk register as well as specific duties relating to geotechnical issues as they may arise during site construction works. Soil instability and the potential for slide even can have a significant impact on environmental receptors. In completing the geotechnical risk register, the Geotechnical Clerk of Works will work with the Contractors to identify suitable mitigation and monitoring methods. Where possible, construction works will avoid causing change to local hydrological and hydrogeological flow patterns and water levels.
Contractors Appointments	
Construction Manager	[The Contractors is required to specify roles and responsibilities for each individual below]
Site Agent	[To Be Confirmed]
Foreman	[To Be Confirmed]
Other Nominated Person(s)	[To Be Confirmed]

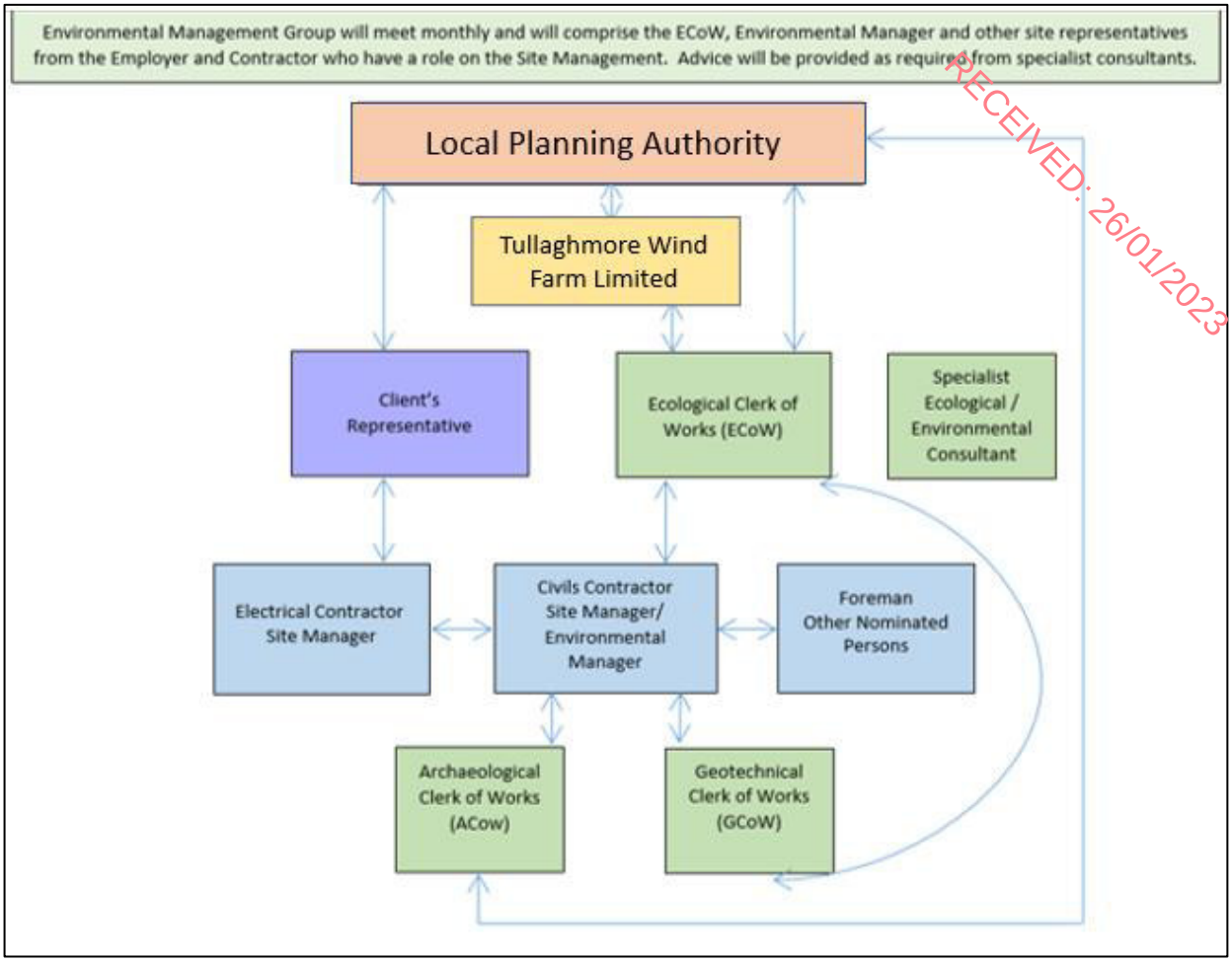

Figure 7.1 General Communication Plan

7.6 TRAINING, AWARENESS AND COMPETENCE

All site personnel will receive environmental awareness information as part of their initial site briefing. The detail of the information will be tailored to the scope of their work on site. This will ensure that personnel are familiar with the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

The CEMP will be posted on the main site notice board during the project. The environmental performance at the Site will be on the agenda of the monthly project management meetings for the project. Elements of the CEMP will be discussed at these meetings including objectives and targets, the effectiveness of environmental procedures etc. Two-way communication will be encouraged by inviting all personnel to offer their comments on environmental performance at the Site.

7.7 EMERGENCY PREPAREDNESS AND RESPONSE

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Suitable spill kits and absorbent material for dealing with oil spills will be maintained on site. In the event of pollution or potential risk of pollution, Galway County Council will be informed immediately. In the case of water pollution, in addition to Galway County Council, Inland Fisheries Ireland will also be informed immediately. Further details in relation to emergency responses are provided in the **Emergency Response Plan** which accompanies this CEMP in **Appendix A**.

7.7.1 Spill Kits

It is an TWL requirement for spill kits to be provided in/with the following on all of TWL construction sites:

1. in all heavy plant and equipment, 4x4 and commercial vehicles
2. with all refuelling bowsers
3. with all static fuel tanks
4. during all refuelling operations, associated transportation and storage

These kits are used as a first response or for the containment and clean-up of small spills.

In addition, spill kits will be strategically located at sensitive areas on site or where activities are being conducted that have the potential for a spill placing booms across sensitive watercourses downstream of work areas will also be implemented A supply of spill kits will be held on site and stocks constantly replenished.

8 CORRESPONDENCE, RECORDS & REPORTS

8.1 REQUIREMENTS

The Contractors will insert / file all communication records and reports associated with Environmental Management and implementation of this CEMP under this Section 8. As a guide, the following sub-sections of filed information will be required (at a minimum):

5-A) Meeting minutes and attendance record

5-B) Weekly Environmental Reports

5-C) Monthly Environmental Reports

5-D) Environmental Checks

5-E) Audit Reports

5-F) Ecology documentation and monitoring records

5-G) Pollution Prevention, including a Pollution Prevention Measures Register

5-H) Water Quality documentation and monitoring records

5-I) Archaeology documentation and monitoring records

5-J) Ground Risk, including a Geotechnical Risk Register

5-K) Waste Management documentation

5-L) Licensing and Consents: copies of all permissions, consents, licenses and permits and related correspondence. A summary record of all such documents shall also be provided in accordance with **Table 8.1** of this CEMP.

5-M) General Correspondence: all other relevant internal and external communication records relating to environmental management issues and implementation of the CEMP.

5-N) Training Records

5-O) Toolbox Talk Records

5-P) Ecological Clerk of Works Reports

All of these documents and records will be made available for inspection in the site office. The documentation will be maintained and will be reviewed on a regular basis with revisions controlled in accordance with the site quality plan.

8.2 ENVIRONMENTAL AUDITS

The Contractors Ecological Clerk of Works will consult and assist with the Client in evaluating compliance with applicable legislation by means of a monthly Environmental Audit. A blank Environmental Audit Report form is included in the **Emergency Response Plan** (**Appendix A**). All

completed audit report forms and records of corrective actions (and close outs) must be filed within this section of the CEMP.

8.3 ENVIRONMENTAL CONSENTS, LICENSES & PERMITS

The Contractors Ecological Clerk of Works (or otherwise nominated responsible person(s)), will complete the summary record for all applicable permissions, consents, licenses and permits obtained for the Site. This record will follow the format provided in **Table 8.1**.

Table 8.1: Record of Environmental Consents, Licenses and Permits Issued

Consents, Licenses & Permits	Governing Legislation	Licensed Activity
Pollution Control & Hydrology		
Biodiversity		
Waste Management / Contaminated Land		
Noise / Vibration		
Archaeology		
Transport		
Other		

8.4 ENVIRONMENTAL MONITORING AND MEASURING

All of the mitigation measures outlined in Section 5.0 will be monitored, where applicable. The Contractors will put in place a program of monitoring for dust, noise, vibration and water sampling in accordance with the requirements of this CEMP.

Copies of all records will be maintained in the site office and will be reviewed by the Contractors.

8.5 NON-CONFORMANCE, CORRECTIVE AND PREVENTATIVE ACTION

Non-Conformance Notices will be issued where there is a situation where limits associated with activities on the project are exceeded, or there is an internal/external complaint associated with environmental performance.

Non-Conformance is the situation where essential components of the CEMP are not met, or where there is insufficient control of the activities and processes to the extent that the functionality of the CEMP, is compromised in terms of the policy, objectives and management programmes.

Correction will be required in order to improve the identified non-conformance. The CEMP must conform to its objectives and targets and the requirements of the ISO 14001 management standard. In the event of non-conformance with any of the above, the following must be undertaken:

- Investigate the non-compliance;
- Develop a plan for correction of the non-compliance;
- Determine preventive measures and ensure they are effective;
- Verify the effectiveness of the correction of the non-compliance.
- Ensure that any procedures affected by the corrective action taken are revised accordingly.

Responsibility must be designated for the investigation, correction, mitigation and prevention of non-conformance.

9 MANAGEMENT PLANS & AVAILABLE INFORMATION

9.1 MANAGEMENT PLANS

Various Management Plans have been prepared. As listed in **Table 9.1**. These are intended to provide a benchmark for best practice and to define Tullaghmore Wind Farm Limited's minimum requirements for environmental management and mitigation.

9.2 CONTRACTORS REQUIREMENTS

The Contractors is required to further develop the Management Plans into detailed site and works specific environmental plans, method statements and procedural documents. **Table 9.1** provides a summary of the content of the Management Plans and the Contractor's obligations for their further development.

Table 9.1: List of Management Plans

No.	Name	Details
1	Emergency Response Plan	The Contractors will further develop the Environmental (Incident and Emergency) Communication Response Plan. This will include procedures for dealing with containment of accidental chemical or fuel spills, potential overload of the drainage system by silt during unforeseen adverse weather conditions etc. The Contractors will prepare a Communication Plan for emergency response in the event of a spillage. Detailed procedures will be outlined in this document. See **Appendix A**.
2	Surface Water Management Plan	The Contractors is obliged to implement the water quality monitoring proposals set out therein. Where changes to the plan are required the Contractors must consult with the Ecological Clerk of Works. See **Appendix B**.
3	Decommissioning Plan	The Contractors will further develop the Decommissioning Plan. Where changes to the plan are required, the Contractors must consult with the Ecological Clerk of Works. See **Appendix C**.
4	Traffic Management Plan	The Contractors will further develop the Traffic Management Plan (contained in Appendix 14.2 of Volume IV of the EIAR). Where changes to the plan are required, it can be amended by the Contractors.

Appendix A - Emergency Response Plan

TULLAGHMORE WIND FARM LIMITED

TULLAGHMORE WIND FARM, MAAM CROSS, CO. GALWAY

CONSTUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

EMERGENCY RESPONSE PLAN (ERP)

JANUARY 2023

Tullaghmore Wind Farm Limited,
C/O EMPower,
2 Dublin Landings,
North Wall Quay,
North Dock,
Dublin 1,
D01V4A3,
Ireland.

Jennings O'Donovan & Partners Limited,
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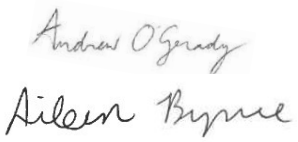
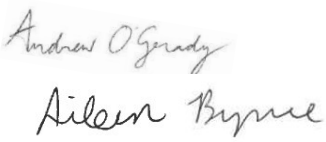
DOCUMENT APPROVAL

PROJECT	Tullaghmore Wind Farm	
CLIENT / JOB NO	Tullaghmore Wind Farm Limited	6276
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Emergency Response Plan	

	Prepared by	**Reviewed/Approved by**
Document Rev0	Name Andrew O'Grady / Aileen Byrne	Name David Kiely
Date October 2022	Signature 	Signature 

	Prepared by	**Reviewed/Approved by**
Document Final	Name Andrew O'Grady / Aileen Byrne	Name David Kiely
Date January 2023	Signature 	Signature 

CONTENTS

1. INTRODUCTION

1.1 Why have an Emergency Response Plan?

Many construction and industrial sites intrinsically have the potential to cause significant environmental harm which could threaten water supplies, public health and wildlife in the event of an environmental incident. The aim of this plan is to see that in the event of an emergency, quick action will limit any impacts on humans and the local environment.

This response plan forms part of the conditions of work for staff, and for every contractor or sub-contractor at the site.

1.2 Outline of this Environmental (Incident & Emergency) Response Plan

The information contained in this plan forms the Emergency Response Plan (ERP), part of the Construction Environmental Management Plan (CEMP) for Tullaghmore Wind Farm.

It contains details of:

- Who should be contacted in an emergency?
- Procedures to be followed in an emergency
- Staff responsibilities in an emergency

1.3 What is an Environmental Incident?

This plan should be instigated once there has been an emergency or environmental incident on site or elsewhere, linked to the construction of Tullaghmore Wind Farm. Such an incident is a discharge to air, land or water that could cause environmental damage. Potential causes of environmental incidents on this site include:

- Leaking plant or equipment
- Containment Failure
- Fire
- Land Slide
- Vandalism
- Overfilling of containment vessels
- Flooding on site
- Leaking Portaloo
- Discharge of raw or partially treated effluent

- Wind-blown waste, litter or dust
- Fuel drips or spills during refuelling
- Leak from fuel or chemical containers
- Contaminated water or sediment/silt entering a water course or drain
- Failure of pumps and pipelines
- Blade throw (results from wind turbine failure and may include the splintering of rotor blades and detachment of debris)

Any of these incidents could affect drainage systems, surface waters, aquatic ecosystems, groundwater and soil. These incidents could also affect air quality by producing toxic fumes and airborne pollutants which may damage human health, wild and domestic animals and ecosystems. The emergency procedures to be followed for each of the incidents listed above ae detailed in **Section 6.1**.

1.4 Reference Documents

Current legislation including the Safety, Health and Welfare at Work Act 2005 and the Safety Health and Welfare at Work (Construction) Regulations 2013, has been taken into account into the production of this Plan and will be complied with in the further development of the Contractor's Construction Management Plan.

2. GENERAL REQUIREMENTS OF AN ERP

As mentioned, environmental incidents may include flooding, spillages (oil and chemicals), contaminated run-off, riverbed disturbance, damage to underground services, damage to habitats, poor waste disposal and storage.

This Emergency Response Plan:

- Identifies key staff and 24-hour contact details to be contacted in the event of an emergency (**Section 6.5**)
- Identifies key external bodies and emergency response numbers who should be contacted in the event of an emergency (**Section 6.4)**
- Details an Inventory of Chemical Products and Waste Inventory on Site (**Section 6.6**)*
- Details an Inventory of Pollution Prevention Equipment (**Section 6.7**)
- Provides details of staff trained in the use of spill kits and booms etc. (**Section 6.8**)

- Provides details of reporting requirements (**Sections 6.3 to 6.9**)
- Provides detailed procedures to be followed in the event of an emergency (**Sections 6.1**)
- Provides a Communication Plan for operatives outlining key actions in the event of an emergency (**Section 6.2**). This will be available to all operatives on site.

*****_Because of the nature of wind farm construction operations and the nature of works on site, the potential pollutants will vary._

3. INCIDENT & HAZARD REPORTING

A blank Environmental Incident Report Form for reporting environmental incidents or hazards for the site is attached in **Section 6.9**. A blank Site Environmental Audit Form is attached in **Section 6.10** to record audit results. The details recorded in these forms will be regularly reviewed and will form part of the response plan procedural review.

4. WASTE DISPOSAL AFTER ENVIRONMENTAL INCIDENCES

If spill kits etc. are used in the event of a pollution incident, operatives will carefully dispose of used equipment by carefully placing them in a sealed bag or container. They will then be removed from site by a licensed waste contractor. Contaminated soil also needs to be disposed of as hazardous waste by a permit holder.

5. SITE INDUCTION AND TOOLBOX TALKS

It is imperative that all contractors, sub-contractors and staff on site are fully familiar with this emergency response plan and it will be detailed regularly in Toolbox Talks. During these talks, they will also receive regular reminders of the importance of the local environment and of the necessary environmental controls that are in place on site.

6. PROCEDURE AND COMMUNICATION PLAN IN EVENT OF AN INCIDENT

6.1 Procedures to be followed in the event of an incident:

The following procedures are intended as a guide in dealing with incidents. Health & Safety guidance should be followed at all times applying common sense and ensuring the health & safety of yourself and others:

6.1.1 Spillages/Leaks/Containment Failure

1. Identify the source of the spillage and cut off source, if possible, e.g. by closing valve, righting container etc.
2. Work on site will cease and all operatives will assist in placing spill mats on the affected area. Site Manager/Main Contact must be notified.
3. Identify where spillage may go. If spillage is near a watercourse (drainage/ditch/ river) divert spillage away from the watercourse through the use of absorbent materials from the spill kit.
4. Notify all parties in the order listed in **Sections 6.4 and 6.5**. Notification should be made by one member of staff whilst remainder of staff present deal with the spill/incident.
5. Dig up all contaminated ground as soon as possible/immediately. All contaminated materials should be placed in sealed polythene bags/containers and disposed of appropriately by an appropriate licensed waste contractor.
6. Complete required record of incident and response into reporting system.

6.1.2 Contamination of Watercourse

Suspended Solids

7. If watercourse is at risk of contamination from suspended solids from a slope failure, the Site Manager/Main Contact must be notified and the following actions must be implemented:
    a) Place straw bales wrapped in geotextile or sand/gravel bags with geotextile curtains **immediately** in the watercourse(s) at regular intervals downstream from the incident. These sand/straw bags and bales will be removed and replaced with stone filters once water quality is stabilised.
    b) Stone check dams faced with a layer of geotextile will be constructed at critical points along the watercourse.

c) Small sumps will be formed intermittently between the check dams to reduce the amount of suspended solids contained in the water.

Oil Spill in Watercourse

8. If spill has reached the watercourse the Site Manager/Main Contact must be notified and the following actions must be implemented:
   a) Place flexible absorbent booms across watercourse, ahead of the contamination within a quiet stretch of water.
   b) Place absorbent cushions in the water immediately upstream of these booms as well as downstream of the booms.
   c) Remove and replace saturated absorbent material as required. Ensure removed cushions are placed in sealed polythene bags/containers and disposed of by the principal waste contractor.

6.1.3 Land Slide

9. Please see EIAR Figure 4 Landslide Susceptibility Mapping (of the PSRA) for further detail of flow routes and storage locations for excavated materials to be re-used for reinstatement works. Where the onset or actual detachment of peat (e.g., cracking, surface rippling) occurs:
   a) All activities in the area will cease and all available resources will be diverted to assist in the required mitigation procedures.
   b) The Site Manager/ Main Contact must be notified
   c) All relevant authorities will be notified if a peat slide event occurs on site and this Emergency Response Plan (ERP) followed.
   d) Where peat slides do not represent a risk to a watercourse and have stopped moving, they will be stabilised using rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and a stabilisation procedure implemented. The area will be monitored, as appropriate, until movements have stopped.
   e) Where possible, check barrages (comprises the placement of rock fill across a watercourse which allows the passage of water but will prevent peat debris from passing through) will be constructed on land using rock fill to prevent a peat slide reaching any watercourse.
   f) If peat reaches a watercourse a check barrage will need to be constructed across the watercourse preventing the peat from moving downstream. The check barrage will allow water to flow through it, but the peat will be trapped.

g) The size of the check barrage will depend on the scale of the peat slide to be contained and the geometry of the watercourse at the location of the barrage.

h) All measures to contain the peat slide must be approved by Galway County Council or Inland Fisheries Ireland (IFI).

6.1.4 Fire

10. In the unlikely event of a fire at a turbine or at the substation, all personnel on site will meet at a designated fire point and emergency services will be contacted.

6.1.5 Blade Throw

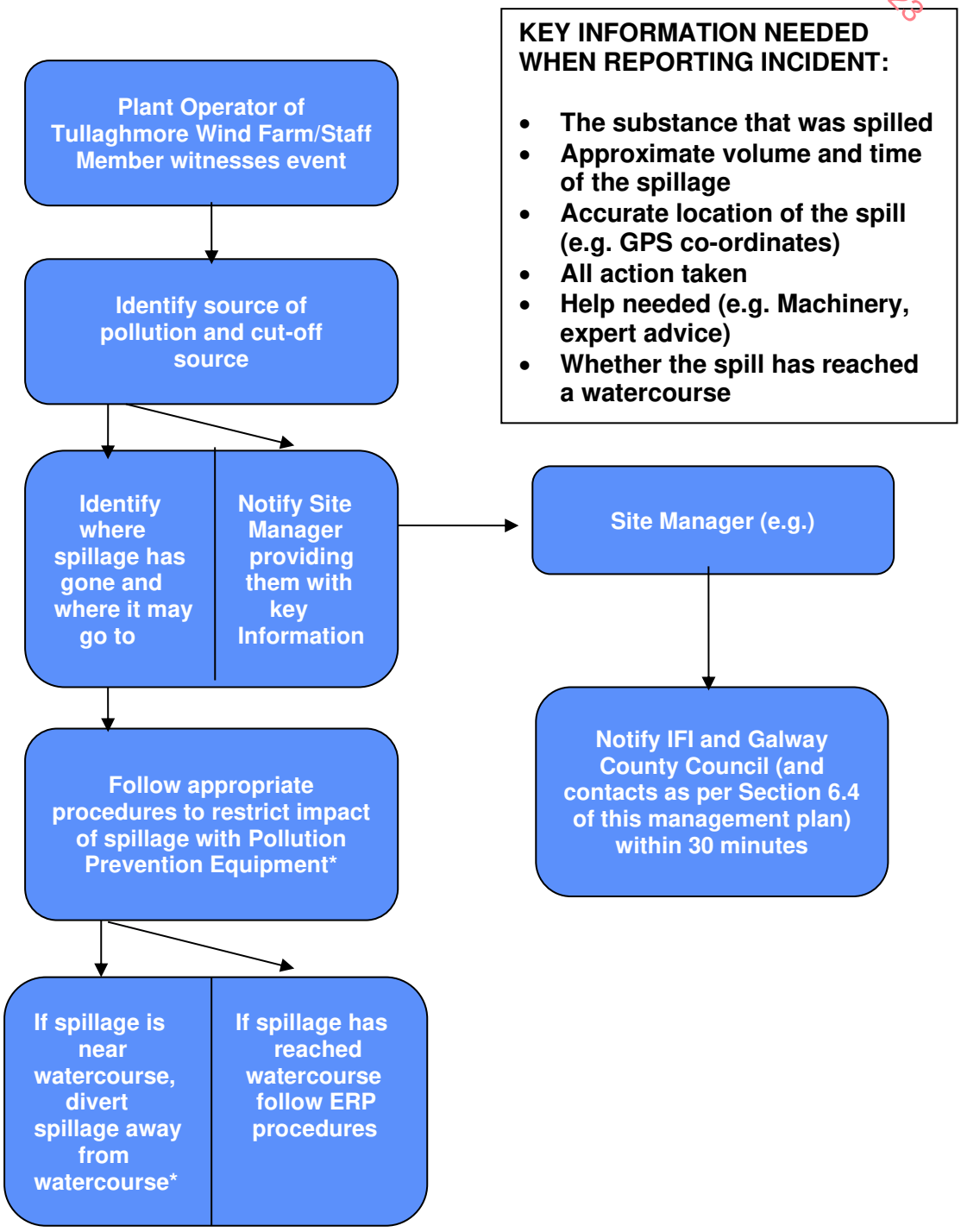
11. In the unlikely event of ice throw from blades, all activities in the area will cease and site personnel will stand clear of turbines where possible until they have been shut down completely.

6.1.6 Vandalism

12. In the event of a vandalism at the site, all personnel on site will be notified and An Garda Síochána will be contacted.

6.2 Communication Plan

A Communication Plan (to be followed in the event of an incident) will be provided by the Contactor, in liaison with relevant stakeholders and will be included in the updated ERP prior to commencement of site development works. A Communication Plan is proposed below:



6.3 Environmental Response Plan for Tullaghmore Wind Farm

INCIDENT RESPONSE PLAN FOR TULLAGHMORE WIND FARM

Based on template provided in GPP 21 – Pollution Prevention Guidelines.

Site Address: Tullaghmore Wind Farm, Tullaghmore, Maam Cross, Co. Galway **Official Company Address:** Tullaghmore Windfarm Limited, C/O EMPower, 2 Dublin Landings, North Wall Quay, North Dock, Dublin 1, D01 V4A3. **KEY HOLDERS FOR SITE – NAME & CONTACT NUMBERS:** Mr. Michael O'Connor, Tullaghmore Windfarm Limited, 2 Dublin Landings, North Wall Quay, North Dock, Dublin 1, D01 V4A3. Tel: 087 993 6673 Email: moc@emp.group	**Middle of Site** **ITM:** 502827 E, 747106N **Site Entrance** **ITM**: 502301 E, 745075 N **Map references:** OSI Discovery Sheet 45 **Link to Map:** https://www.google.com/maps/@53.4687444,-9.4719018,9182m/data=!3m1!1e3
Overview of the activities on site: **Include number of employees at different time of the day:** Daylight Hours: Dusk to Dawn: Weekend Dusk to Dawn: Bank Holidays:	
Date & Version of the plan:	**Name & position of person responsible for compiling/approving the plan:**
Review Date	**Date of next exercise:**
Objectives of the plan: To limit any potential harmful impact to the local environment through swift and appropriate actions in the event of an emergency.	
List of external organisations consulted in the preparation of this plan with contact details	

Distribution list of who has received this plan and which version. *Please note that it is recommended that you review and revise this plan regularly:*

6.4 External Contacts

Contact	Office Hours	Out of Office
Emergency Services (Fire/Police/Ambulance)	999 or 112	999 or 112
Local Garda Station Oughterard	091 557 320	
Local Hospital. University Hospital Galway	091 524 222	
Environment Directorate, Prospect Hill, Co. Galway	091 509 510	
EPA	053 916 0600	1850 365 123
Inland Fisheries Ireland	01 884 2600	**1818 347 424 (24 hours a day)**
Roads Service (Blocked/Flooded Roads)	091 509 000 (Galway County Council customer. service) 353 46 942 2000 (OPW floodinfo) (091) 509 000 (flooding.ie Galway CC)	
ESB- Electricity Company	021 238 6555 (ESB Galway) 1800 372 999 (ESB Emergency) 1800 372 757 (ESB Fault Report)	1800 372 999 **(24 hours a day)**
Telecommunications – Eircom	1800 245 245	

6.5 Internal Contacts

Names and position of staff authorised and trainers to activate and co-ordinate the plan.
Staff to be contacted if need to move or evacuate the site

Other Staff:		
Managing Director		
Site Manager		
Environmental Manager		
Health & Safety Manager		

6.6 Chemical Product & Waste Inventory

Trade name/ substance	Solid/liquid/ gas or powder	UN number	Max amount	Location marked on site plan	Type of Containment	Relevant health & environmental properties

6.7 Pollution Prevention Equipment Inventory (On/Off-Site Resources)			
Type	**Location**	**Amount**	**Staff contact**

For example:

- *Personal protective Equipment (PPE) available that should be worn*
- *absorbents*
- *drain mats/covers*
- *pipe blockers*
- *booms*
- *pumps*
- *sandbags*
- *silt fencing*
- *over drums*

IF ANY OF THIS EQUIPMENT REQUIRES SPECIALIST TRAINING – STATE WHO HAS BEEN TRAINED IN ITS USE AND DATE OF TRAINING (attach evidence where possible).

6.8 List of Staff Trained in the Use of Spill kits and Booms

Name	Date of Training

6.9 Site Environmental Incident Report Form

Site		Date	
Time		Weather:	
Report By:		Position:	
Tullaghmore Wind Farm personnel present:		Position:	
Contractor Personnel Present:		Position:	

Description of Incident

Item Spilled	
Estimate of Volume of Spillage	

List of actions followed once incident was noted	Time	Corrective Action By	
		Action	By
Who first observed incident?			
First action			
Next Action			
Time Pollution Hotline was contacted			
Other			

Details of Clean-Up contractor or how contamination was removed from site:

Details of how this could be avoided in future:	
Details of review of internal procedures as result of this incident:	

DATE REPORT COMPLETED_____

6.10 Site Environmental Audit Form

Site:		Date:	
Time:		Weather conditions:	
Report by:		Position:	
Tullaghmore Wind Farm personnel present:		Position:	
Contractor personnel present:		Position:	

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
1. Miscellaneous					
1.01	Does the contractor carry out regular internal environment audits on the site? Are recommendations recorded and is corrective action monitored?				
1.02	Have any environment incidents occurred and have these been reported as per on site procedure?				
1.03	Does the site induction contain a section on environmental requirements, including spill procedures, and is this communicated effectively?				
2. Land					
2.01	Are areas of hard standing (excluding bunded and refuelling areas) appropriately drained?				
2.02	Have local roads been inspected and cleaned where necessary?				
2.03	Has all test pitting and soil stripping been monitored by an archaeologist?				
2.04	Have all site clearance works been checked by an ecologist prior to works?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
3. Material and equipment					
3.01	Is there knowledge of the IFI |Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016) and OPW Environmental Guidance: Drainage Maintenance & Construction (2019)				
3.02	Are transformers/ generators located in secondary containment bunds?				
3.03	Are all bunds capable of containing 110% of the volume of the largest container?				
3.04	Is refuelling carried out in a designated refuelling bay?				
3.05	Does all site drainage on hard standing drain to an oil interceptor?				
3.06	Is the designated area for oil, fuel and chemical storage appropriately sited (i.e. on hard standing at least 10m from a watercourse)?				
3.07	Are there procedures in place to monitor bund integrity and mange bund rainwater levels? Are these followed and recorded?				
3.08	Is there awareness that oil or residue from contaminated water removed from bunds should be disposed of as special waste and not discharged to land or the water environment? (oil absorbent materials (pads etc.) should be used first)				
3.09	Are all drums and mobile plant (e.g. generators) placed on drip trays more than 10m from any watercourse?				
3.10	Is all plant maintained in a good state of leaks? Are there records of this?				
3.11	Are there adequate spill kits available and stored in close proximity to potential risks?				
3.12	Are all refuelling browsers double skinned, locked when not in use, and in a good state of repair?				
3.13	Is there evidence of unmanaged/ unrecorded fuel / oil spillages on site?				
3.14	Are dry or wet wheel washing facilities fully operational and effective?				
3.15	If wet wheel washing facilities are required, are these closed systems				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
	with no discharge to the water environment?				
3.16	Are there laboratory certificates (accredited by the Irish National Accreditation Board) to confirm that imported material stone aggregate brought onto site is free from any contamination?				
4. Noise, Dust and Light					
4.01	Are there facilities to dampen stockpiles and site working areas/roads to suppress dust?				
4.02	Are vehicles carrying loose material sheeted at all times?				
4.03	Are construction works, or deliveries of materials to and from the development, audible at noise sensitive premises?				
4.04	Has all external construction lighting received the approval of the planning authority?				
5. Waste					
5.01	Is the site tidy and free from litter?				
5.02	Is there evidence of waste beyond the site boundary?				
5.03	Is waste segregated and kept securely in containers in clearly designated areas?				
5.04	Does all waste leaving the site have the appropriate duty of care paperwork?				
5.05	Is all waste leaving the site being taken to an appropriately licenced site?				
5.06	Does all special/ hazardous waste (e.g. oil contaminated soils, waste oil) have the appropriate Special Waste Consignment Note?				
5.07	Is material re-used/recycled on site where possible?				
5.08	Are waste management practices in line with the site waste management plan?				
5.09	Are relevant Waste Management Exemptions in place for use of waste on site (e.g. use of waste concrete to create foundation sub-base)?				
5.10	Is there any evidence of burning on site?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
5.11	Is there any evidence of unlicensed burial of waste?				
6. Water					
6.01	Do all discharges to land or watercourses have appropriate authorisation from Local Authorities /IFI?				
6.02	Does all watercourse engineering (bank protection, crossing etc.) have the appropriate authorization from Local Authorities / IFI?				
6.03	Do any abstractions from a watercourse or groundwater body have the appropriate authorization from Local Authority / IFI?				
6.04	Has confirmation for the SUDS design for access roads been gained from Local Authority / IFI?				
6.05	Are cut-off ditches installed on the uphill side of the working area to avoid contaminated surface water run-off?				
6.06	Have field drain been diverted where necessary?				
6.07	Is adequate treatment (e.g. settlement tank/lagoons/discharge to land) provided to prevent silt contaminated water entering watercourses and groundwater?				
6.08	Has vegetation removal/ clearance of the site been minimised to avoid unnecessary areas of bare ground?				
6.09	Have buffer-strips been left between working area and watercourses?				
6.10	Is plant operating in the watercourse?				
6.11	Have all culverts been installed at the base of stockpiles situated within close proximity to watercourses?				
6.12	Have silt fences been installed at the base of stockpiles situated within close proximity to watercourses?				
6.13	Are there adequate controls on site construction roads to minimize sediment runoff into watercourses (in particular, are there adequate flow attenuation measures within surface drain)?				
6.14	Are there any sign of decaying straw bales in water courses? (this could lead to organic pollution of the water course)				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
6.15	Are silt traps regularly maintained?				
6.16	Has ease of maintenance been considered in the design of permanent drainage features?				
6.17	Is there evidence of contamination of any watercourse (e.g. with oil, sediment, concrete, waste) in the vicinity of the works?				
6.18	Is monitoring of potential impacts on watercourses carried out on a regular basis and fully recorded?				
6.19	Are dewatering operations being carried out in such a way to minimise sediment contamination?				
6.20	Is drainage and run off in concrete batching areas adequate?				
6.21	Are adequate pollution prevention measures considered and put in place during concrete pours?				
7. Landscape					
7.01	Have earthworks been designed to promote successful re- instatement of vegetation?				
7.02	Are reinstatement and restoration works being implemented in a timely manner as per the requirements of the Contract?				
8. Ecology					
8.01	Have storage sites (soil, plant etc.) been sited on areas of lower quality habitat where possible?				
8.02	Is the ECoW a member of the institute of Ecology and /or Environmental management as required by planning conditions?				
8.03	Have buffer zones been constructed and maintained around designated protected species exclusion areas (e.g. red squirrel dreys, water vole habitats, otter holts, badger holts etc.)?				
8.04	Have toolbox talks on the subject of ecology and environmental responsibilities on site been delivered? Have attendance record been maintained for these?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
9. Documentation Check					
9.01	Start-up meeting record				
9.02	Full contacts list in Section 3, Table 3.0 of CEMP				
9.03	Induction records				
9.04	Pollution Prevention Measures Register				
9.05	Geotechnical Risk Register				
9.06	Weekly meeting minutes				
9.07	Records of environmental checks and routine monitoring of mitigation measures				
9.10	Water Quality Monitoring Results				
9.11	Safety and Environmental Awareness Reports (SEARs). Filed and entered on database?				
9.12	Safety and Environmental Audit Reports for the site. (If yes, insert date of last audit_____)				
9.13	Contractor's Environmental Plans (or Construction Method Statements):				

Appendix B – Surface Water Management Plan

TULLAGHMORE WIND FARM LIMITED

Conceptual Design, EIA & Planning Services

for

Tullaghmore Wind Farm,

Co. Galway.

Surface Water Management Plan

November 2022

Tullaghmore Wind Farm Limited,
C/O Empower Renewables,
2 Dublin Landings,
North Wall Quay,
North Dock,
Dublin,
D01 V4A3.

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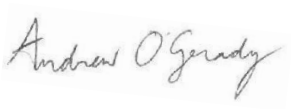
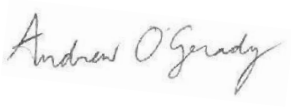
DOCUMENT APPROVAL

PROJECT	Tullaghmore Wind Farm	
CLIENT / JOB NO	Tullaghmore Wind Farm Limited	6276
DOCUMENT TITLE	Surface Water Management Plan	

	Prepared by	**Reviewed / Approved by**
Document Rev. 0	Name Andrew O'Grady	Name David Kiely
Date 18th July 2022	Signature 	Signature 

Document Rev. 4	Name Andrew O'Grady	Name David Kiely
Date 17th November 2022	Signature 	Signature 

TULLAGHMORE WIND FARM
SURFACE WATER MANAGEMENT PLAN

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Overview

This Surface Water Management Plan (SWMP) for the Development describes the site drainage that has been designed for the site using the following principles:

- Ecologically Sensitive Processes
- Sustainable Drainage Systems (SuDS)

This is a live document and where there is a requirement for variation on the ground to provide more ecologically sensitive drainage then the SWMP will be updated to reflect this. The SWMP will be updated by the appointed Contractor and changes to the document will be agreed with the Project Hydrologist and Ecological Clerk of Works (EcoW) before drainage works commence.

The SWMP aims to:

- Describe environmental sensitives of the site and the buffer zones
- Describe how the system will operate to minimise modification and disruption to the existing site hydrology
- Outline the proposed maintenance regime
- Outline the proposed drainage management post-construction

2 BASELINE ENVIRONMENT

2.1 Site Description

The Site is located within an upland bogland landscape between Maam Cross and Oughterard, Co. Galway. The Site is located approximately 30km northwest of Galway City, and 9km west of Oughterard, Co. Galway.

Figure 1: Site Location

2.2 Topography

The topography of the Site is variable, and it is broadly surrounded by or is partially overlapping three elevated areas. These include Knockbrack to the east of the Site (299m OD (metres above Ordnance Datum)) near Lough Beg in the Derroura Forest and Cappanalaurabaun (273m OD) at the northern extent of the Site. Further north beyond the Site boundary is Curraun Hill at 252m OD. The southern and western extents of the Site are low lying areas ranging from 50 – 60m OD. The topography beyond the southern and western extent of the Site is characterised by low lying surface water features such as the Owenwee River, Owenree River, Lough Bofin, Loughanaduff, Loughaunierin and Tawnaghbeg Lough. The N59 road which traverses the southern Site boundary is also generally low lying.

The Site is generally topographically elevated in the north / north-west and generally topographically low lying in the south and east. The steepest incline across the Site occurs at the north-western extent of the Site near the proposed T4 position. A peat stability risk

assessment (PSRA) (included in **Appendix 8.1**) and a chapter on Lands, Soils and Geology (Chapter 8 of the EIAR) have been prepared to address the potential risks associated with the positioning of project infrastructure and potential peat failures. Elevations typically range from between 100m and 200m OD across the majority of the Site with areas of relatively flat ground existing within the central areas of the Site between elevations of 110m – 150m OD. The peat storage area and ecological enhancement area is relatively flat with elevations ranging from 41 to 46mOD.

2.3 Hydrology and Geology

The proposed wind farm Site and current grid connection route are located within the Corrib and Galway Bay North catchment areas in Hydrometric Area 30 and 31 respectively. The proposed wind farm Development and grid connection to Screebe are located within three WFD sub-catchments. These include the Corrib and Joyce's subcatchments with a small section of the EIAR boundary overlapping into the Ballycuirke Lough Stream sub catchment. The Ballycuirke Lough Stream sub-catchment is listed as a Margaritifera Sensitive Area in accordance with Annex II and Annex V of the EU Habitats Directive. All of the proposed wind farm Development and grid connection options are located within the National River Basin District (RBD) as defined by the 2nd Cycle of the WFD (2015 - 2021). Maps illustrating the catchment and subcatchments areas relative to the proposed Site and grid connection are illustrated in Volume III of the EIAR.

The proposed Site and its surrounds are located upstream of Lough Corrib Upper which is located approximately 7m from the Site boundary at the closest extent near the proposed T3 turbine position. The proposed Site has indirect hydraulic connectivity to Lough Corrib Upper via the headwaters of the Owenwee and Owenree Rivers which drain the site. Lough Corrib is the second largest lake in Ireland in terms of area (176km^2) and is designated as the Lough Corrib SAC. The western portion of the Site is primarily hydraulically characterised by a number of unnamed rivers and streams that are headwaters of the Owenree River which ultimately discharges into Lough Corrib Upper.

3 ENVIRONMENTAL CONSTRAINTS AND MITIGATION MEASURES

There are a number of construction phase mitigation measures that must be adhered to during the installation of the drainage system. The relevant EIA Chapters where mitigation measures can be found are shown in **Table 3.1**.

Table 3.1 Location of relevant mitigation measures

Element	Location of Mitigation Measures
Biodiversity	EIA Chapter 6
Ornithology	EIA Chapter 7
Soils and Geology	EIA Chapter 8
Hydrology and Geology	EIA Chapter 9

4 DRAINAGE SYSTEM OVERVIEW

4.1 SuDS Drainage Design

The design criteria for the SuDS design are as follows:

- To select and install ecologically sensitive drainage.
- To minimise alterations to the ambient site hydrology and hydrogeology.
- To provide settlement and treatment controls as close to the site footprint as possible and to replicate where possible the existing hydrological environment of the site.
- To minimise sediment loads resulting from the development run-off during the construction phase.
- To preserve Greenfield runoff rates and volumes.
- To provide settlement ponds to encourage sedimentation and storm water runoff settlement.
- To reduce stormwater runoff velocities throughout the site to prevent scouring and encourage settlement of sediment locally.
- To manage the problems of erosion and allow for the effective revegetation of bare surfaces.
- To control water within the site and allow for the discharge of runoff from the site within the limits prescribed in the Salmonid Regulations.

4.2 SuDS Design Principles

The approach to treatment and attenuation of storm water is as follows:

- Additional drainage measures will only be added as necessary. The dimensions of these features will avoid intercepting large volumes of water. Any changes to the SWMP must be agreed with the Project Hydrologist and the ECoW.
- Surface water runoff from the proposed Site Access Tracks will be managed with crossfall downslope to mimic the natural drainage patterns of the site.
- Drainage vegetation used will be appropriate to the local area and will be approved by the ECoW.
- Temporary erosion protection together with silt fences may be required until the

vegetation becomes established (coir matting or similar).

- Roads will be constructed from aggregate and will not be surfaced with bitumen materials, thus allowing for permeation and helping to reduce runoff volumes. Therefore, a reduced runoff coefficient of 65% is applicable.
- An additional 20% will be included to take account for climate change.
- Stormwater runoff within the trackside drainage will be treated through the provision of check dams, within a range depending on local slope of the drain.
- The stone used for the construction of the check dams will be washed graded stone with a size range between approximately 5mm and 40mm.
- Discharging directly back into the surrounding area will assist in maintaining the hydrological characteristics of the site.
- Vegetation will be reinstated on slopes as early as possible.
- Under track drainage will be provided with drainage pipes at existing surface water features. The under-track drainage will provide a means for flows to pass and maintain the natural flow throughout the site.
- A sump may be required for trench dewaterings. Water will subsequently be pumped into settlement ponds and allowed to settle. The general location of the small sump will ensure that they pose minimal health and safety risk to site personnel.
- The settlement ponds will be designed to cater for infilling and rehabilitation post construction phase of the project.
- The level of silt runoff during construction will be monitored and if found to be excessive in any area, will subsequently be managed by the provision of additional silt attenuation features such as silt fences or silt traps. If the suspended solids levels remain high, water can be pumped from settlement ponds into tankers and transferred off site to a suitable water treatment facility subject to agreement with the Local Authority. Note that works will be temporarily suspended in the area of the site contributing to elevated suspended solids levels.
- Field drains will be piped directly under the track through appropriately sized drainage pipes.
- Appropriate site management measures will be taken to ensure that runoff from the construction site is not contaminated by fuel or lubricant spillages.
- There will be no discharge of trade effluent, sewage effluent or contaminated drainage into any surface water feature.

4.3 Purpose of a SuDS Drainage Design

There is increased potential for water pollution, in particular sedimentation to local surface

water features due to the excavation and generation of spoil and emplacement of stone materials during the construction stage of the project.

The purpose of incorporating a SuDS design is:

- To provide sufficient detail to see that water pollution will not occur as a result of construction activities at the site and to minimise the risk of any such occurrence.
- To regulate the rate of surface water run-off downslope to prevent scouring and to encourage settlement of sediment locally.
- To minimise the quantity of sediment laden stormwater and resulting settlement pond sizes by separating "clean" water from the "dirty" development runoff.

4.4 Design Philosophy

The SuDS design must be managed and monitored at all times and particularly after storm or heavy rainfall and during construction phase environmental auditing. The design rationale is that of an integrated approach where each element is assessed for its potential contribution to sediment suspension and the appropriate mitigation measures integrated into the layout design. The design principles are as follows:

Minimise → Intercept → Treat → Disperse → Dilute

4.4.1 Minimise

The main principle of this SuDS design is to minimise the volume of 'dirty' water requiring treatment through means of informed, integrated and sustainable drainage design. It achieves this by keeping 'clean' water clean by interception and separation, and by collecting the 'dirty' water and treating it by removing the suspended sediments. The resultant outflow is dispersed across vegetation and will become diluted through contact with the clean water runoff in the buffer areas before entering site/ roadside drains.

4.4.2 Intercept

The key sediment control measure is the separation of construction runoff from the clean water runoff that arises in the undisturbed areas of the site and surrounding lands. This significantly reduces the volume and velocity of dirty water that the sediment and erosion control measures need to deal with. To achieve separation, clean water infiltration collector drains or silt fences are positioned on the upslope and dirty water v-drains positioned along the verge, with site surfaces sloped towards dirty water v-drains. The remainder of this clean water will be regularly piped under the site roads and dirty water v-drains to avoid contamination. Piping the clean water regularly under the site roads allows the clean water

to follow the course it would have taken before construction thus mimicking the existing surface water sheet flow pattern of the site.

4.4.3 Treat, Disperse and Dilute

The clean water infiltration interceptor drains are positioned upslope of the development footprint, to prevent any mixing of the clean and 'dirty' water. The infiltration interceptor drains redirect the clean water away from the site infrastructure, as best suits the natural topography of each sector. The clean water outflow is then discharged into either, an existing drainage network or dispersed through an area of vegetation where it can percolate into the ground naturally.

In the drawings, 'dirty water' drains, indicated in orange, collect all incident rainwater that falls on the development infrastructure. These then drain to buffered outfalls or into settlement ponds. The treated effluent from the settlement ponds is then dispersed across vegetation (through buffered outfalls) to further filter the discharge. Dispersal in this manner has the effect of allowing the smaller particle sizes to be taken up by the vegetation.

5 DETAILED DESIGN CONSIDERATIONS

5.1 Overview

This SuDS adopts a design for the drainage of the site. The following elements in series are proposed:

- Open Constructed drains for development run-off collection and treatment;
- Collection Drains for upslope "clean" water collection and dispersion;
- Filtration Check Dams to reduce velocities along sections of road which run perpendicular to contours;
- Settlement Ponds and Buffered Outfalls to control and store development runoff to encourage settlement prior to discharge at Greenfield runoff rates.

These measures provide a surface water management train that will mitigate any adverse impact on the hydrology of the site and surrounds during the construction phase of the project.

5.2 Cut-off Ditches / Collector Drains (Clean Water)

Drainage management will ensure that natural runoff is not permitted to mix with construction runoff from sources such as excavation dewatering or track runoff. Design will ensure that infiltration interceptor drains be installed upslope of development, to intercept and divert clean surface water runoff, prior to it coming in contact with areas of excavation. Design will ensure that natural runoff infiltration interceptor drains are installed ahead of main earthworks

wherever practical.

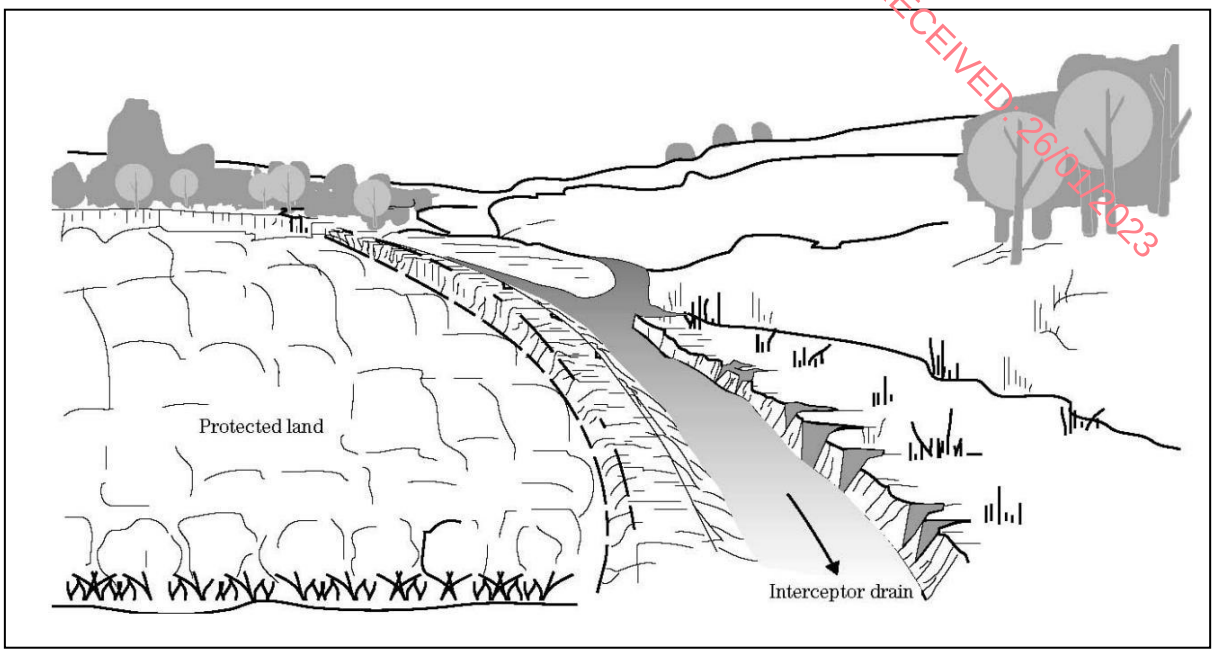


Figure 5.1: Diagram showing interceptor drain (Source: NJWMG, 2007) [1]

This is intended to reduce the flow of natural runoff onto any exposed areas of peat/soil, thereby reducing the amount of potential silt laden runoff requiring treatment. Installed drainage will allow provision for natural runoff water, upslope of the development, to collect in infiltration interceptor drain and directed away from the development. In certain areas it will be required to pass through under track clean water culverts, separate to drainage provided for track runoff, and be discharged downstream of site development.

Temporary silt / pollution prevention and scour protection measures will be provided in artificial natural runoff drainage installed in order to mitigate potential for scouring and transport of sediment from newly excavated channels which will be formed as part of the construction runoff drainage provisions.

Frequency of outflow points are designed to avoid collection and interception of large catchments creating significant point flows, with associated risks due to scour and hydraulic capacity.

The drains will be max 350mm – 500mm in depth.

[1] New Jersey Water Management Guide, 2007. Online: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs141p2_017651.pdf [Accessed 15/02/2022]

5.3 Buffered Outfalls

Dirty water will be discharged to land via buffered outfalls. These drainage outfalls will contain hardcore material of similar or identical geology to the bedrock at the Site to entrap suspended sediment. In addition, these outfalls promote sediment percolation through vegetation in the buffer zone, reducing sediment loading to any adjacent watercourses and avoiding direct discharge to the watercourse. It is recommended that a relatively high number of discharge points are established, thus decreasing the loading on any particular outfall. Discharging at regular intervals mimics the natural hydrology by encouraging percolation and by decreasing individual hydraulic loadings from discharge points.

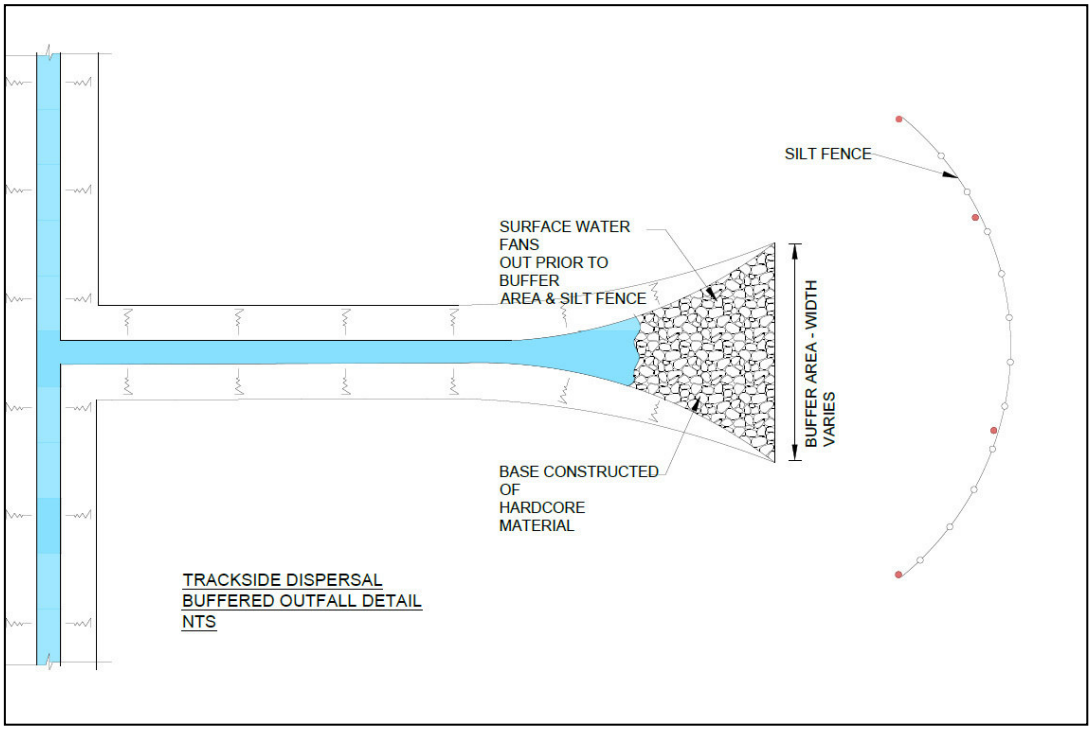


Figure 3: Diagram of Buffered Outfall

5.4 Trackside Drains (Dirty Water)

These are open gently sloping drainage channels to convey dirty water, trap sediment, enhance filtration and slow down the rate and magnitude of runoff that could enter the local watercourses. The drains will be max 350mm – 500mm in depth and the turve will be taken as a single piece and placed on the downslope side of the drain. Therefore, once construction works are complete the turve can be put back in place with minimal ecological damage. These drains will be reinstated following the works.

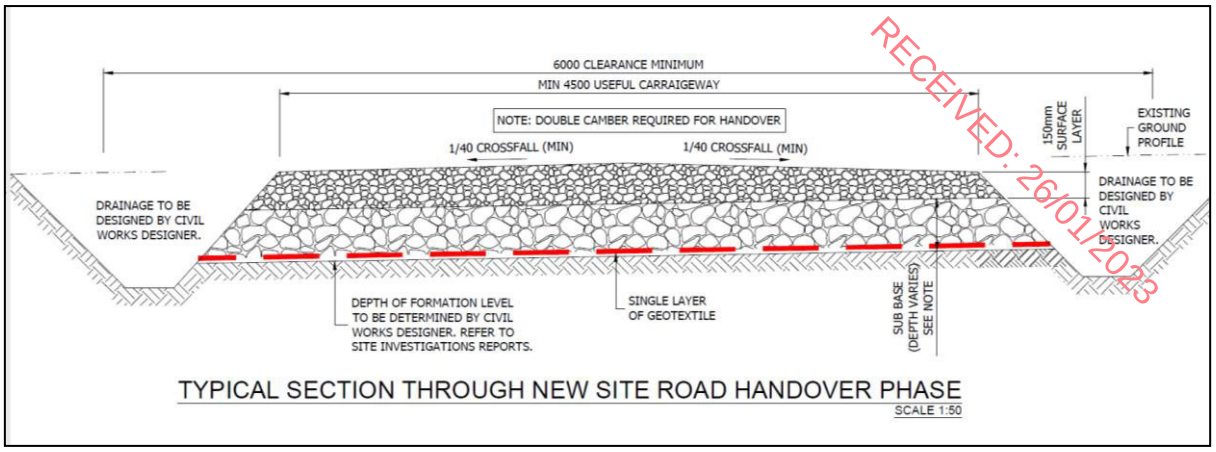


Figure 4: Site Access Track Section

5.5 Silt Fences

Silt Fences are designed in order to effectively filter the water, holding back the silt and allowing the water through, they require to be installed correctly with the lower part of the fence dug into the ground. Silt fences will also be required to be cleaned out on a regular basis, particularly after periods of heavy rainfall. Silt fences are required to be inspected and maintained on a regular basis in order to ensure that silty water is not running under or around the silt fences. Silt fences can also be used to divert clean water away from the development area, minimising the volume of dirty water.

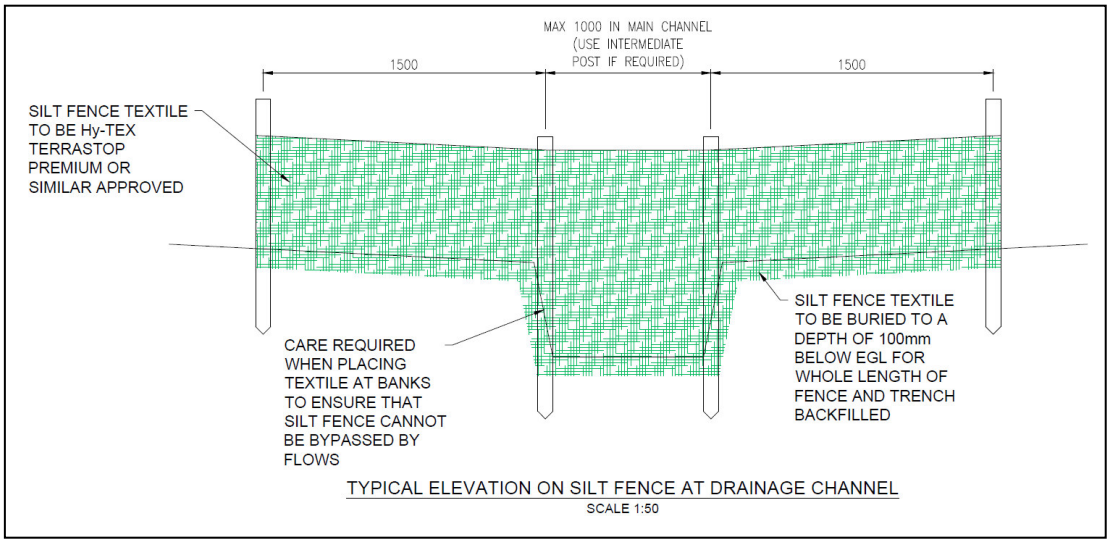


Figure 5: Illustration of Silt Fencing

Plate 1: Photograph of Silt Fencing

5.6 Filtration Check Dams

Check dams (flow barriers or dams constructed across the drainage channel) will be installed at regular intervals within the dirty trackside drains in order to reduce erosion and allow for greater flow control. These check dams are required in order to reduce the velocity of water and therefore allow settlement of coarser sediment particles as well as silt at low flow conditions. Reduction in flow velocity will also prevent scouring of the drainage channel itself. Rock filter bunds may be used for check dams however, stone can also be used if properly anchored. It is recommended that multiple check dams are installed, particularly in areas immediately downgradient of construction areas.

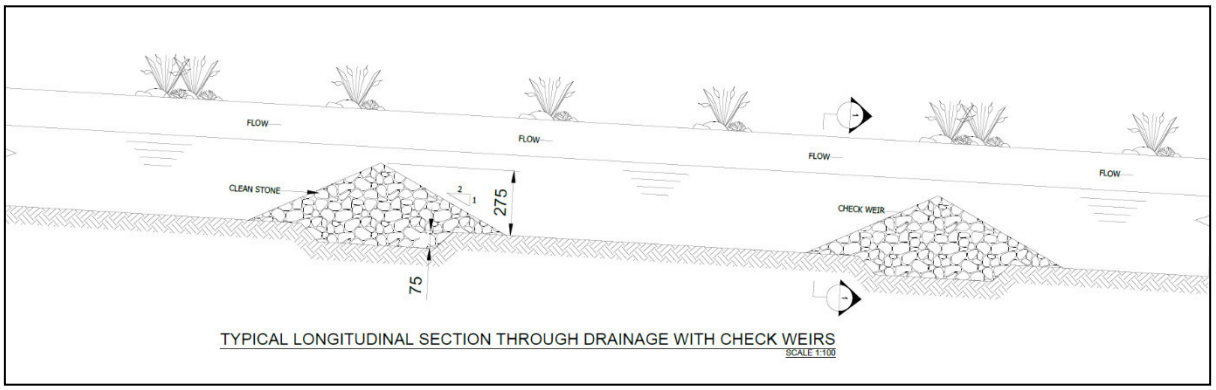


Figure 6: Diagram Showing the Function of Check Dams

Settlement build up will be monitored and cleaned during the construction stage when necessary. The number and location of check dams will be dependent on the slope, flow and volume of water, although the following general rules will be applied:

- The maximum spacing between check dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam;
- The centre of the check dam should be at least 0.2m lower than the outside edges;
- Side slopes should be 1:2 or less;
- A Terram membrane barrier or similar non-woven geotextile membrane placed around check dam
- Check dams should be keyed at least 0.1m into the drainage channel bottom in order to prevent the dam washing out; and
- Check dams will be maintained and monitored on a regular basis. Sediment will be removed before it reaches one half the original dam height.

Worked examples:

The depth of a check dam is 0.3m high: 0.3m x (1 in 100 gradient) = 30m spacing;
For a 0.3m high Check Dam: 0.3m x (1 in 50 gradient) = 15m spacing.
For a 0.5m high Check Dam: 0.5m x (1 in 50 gradient) = 25m spacing.

See **Table 5.1** for recommended spacing, relative to the gradient of drain, for a 0.3m high check dam.

Table 5.1 Check Dam Spacing

Max Spacing (m)	Gradient
3m	10% (1 in 10)
4m	8% (1 in 12)
5m	6% (1 in 17)
6m	5% (1 in 20)
8m	4% (1 in 25)
10m	3% (1 In 33)
15m	2% (1 In 50)
20m	1.5% (1 in 67)
30m	(1 in 100)

5.7 Settlement Ponds

Runoff from the windfarm track surface will be attenuated to mimic natural runoff patterns. To capture runoff generated within the development footprint, it is proposed to use constructed trackside drains. Accumulations of runoff will then be transferred to settlement ponds. See **Figure 7** below and detail drawings (Planning Drawing No. 6276-TWF-JOD-XX-DR-C-0301 to 0304) which displays a diagrammatic cross section through a settlement pond within the

drainage regime. All ponds will be kept as shallow as possible so that they pose no health and safety risk to plant or personnel. Settlement ponds are to be securely fenced to prevent easy access.

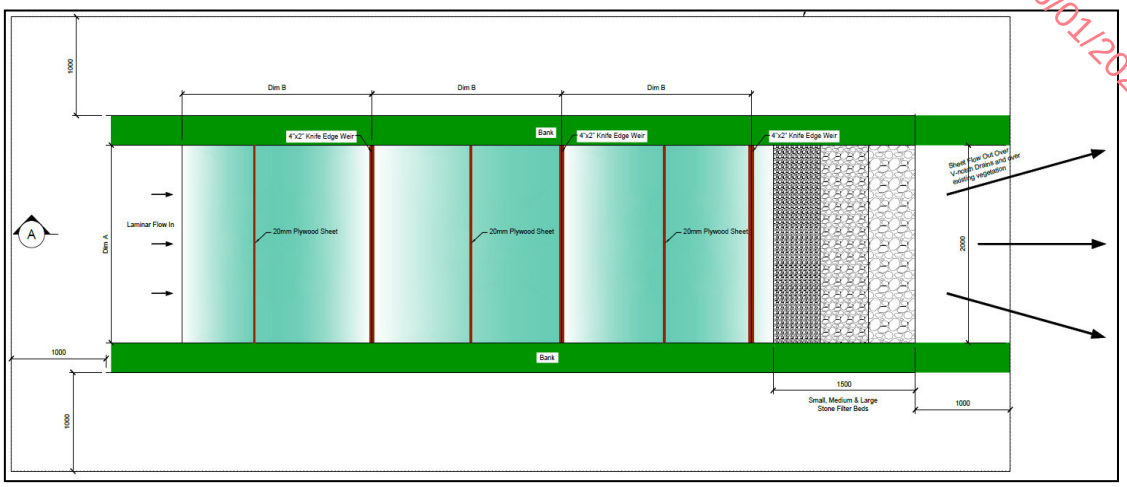


Figure 7: Plan View of Settlement Ponds (with Discharge to Drains where Applicable)

Plate 2: Completed Settlement Pond System

The ponds are utilised to attenuate and to aid the removal of suspended solids from site runoff water. All the pond locations are displayed within the site drainage drawings. Settlement ponds will be emplaced at twenty four (24) locations along the drainage footprint.

Calculation parameters for the determination of storage requirements have been undertaken and are as follows:

- A 1 in 200 year rainfall return over 30 minutes design has been used for the settlement

ponds[2] (Source: Met Éireann - Please refer to **Appendix 1**).

- An initial outlet overflow rate is applied of 39.5 l/s/ha (litres per second) which approximates to Greenfield run-off rates for the site. (Source: HR Wallingford – Please refer to **Appendix 2**).
- The rational method is subsequently applied to calculate the flow volumes into each settlement pond over these respective periods.
- A is the area of the hardstanding / catchment, I is the rainfall depth and t is the duration of rainfall occurrence.
- A runoff coefficient of 0.8 (20% for Climate Change, 60% for runoff) is conservatively applied to all footprint areas. The runoff coeeficient of 60% was derived from table of Values of Runoff Coefficient or Impermeability Factor for Different Surfaces (After Kuichling). Surface No. 4 is considered the most appropriate 'Pavements of stones, bricks and wooden blocks with open joints' which has a runoff coefficient of 0.5 to 0.7 and a mid value of 0.6 is considered appropriate for this project. Therefore, the overall runoff coefficient used is 0.72 when a 20% increase in rainfall is added for climate change.

Table 5.2 identifies settlement ponds designed to treat and attenuate each development catchment area. The details in **Table 5.2** are based on calculations found in **Appendix 3**.

Tables 5.2: Settlement Pond Sizing

Pond Ref.	Development Area (m^2)	Residual Volume (m^3)	Pond Dimensions			Overall Volume of Settlement Pond (m^3)
			Dim. Length (m)	Dim. Width (m)	Dim. Height (m)	
SP1	2,105	21.9	7.3	3	1	21.9
SP2	2,387	24.8	8.3	3	1	24.9
SP3	3,000	31.2	9.9	3.2	1	31.68
SP4	3,672	38.2	12.4	3.2	1	39.68
SP5	2,968	30.9	9.9	3.2	1	31.68
SP6	3,430	35.7	10.5	3.5	1	36.75
SP7	2,120	22.0	7.4	3	1	22.2
SP8	9,961	103.6	17.5	6	1	105
SP9	2,030	21.1	7.3	3	1	21.9
SP10	13,450	139.8	20	7	1	140
SP11	3,135	32.6	10.5	3.2	1	33.6
SP12	1,950	20.3	7.8	2.6	1	20.28
SP13	6,010	62.5	14	4.6	1	64.4
SP14	3,367	35.0	10	3.5	1	35
SP15	1,140	11.9	6	2	1	12

[2] The drainage system will be designed for a 1 in 100 year 6 hour return period with the settlement ponds being designed for a 1 in 200 year 30 minute rainfall event.

Pond Ref.	Development Area (m^2)	Residual Volume (m^3)	Pond Dimensions			Overall Volume of Settlement Pond (m^3)
			Dim. Length (m)	Dim. Width (m)	Dim. Height (m)	
SP16	12,550	130.5	20.5	6.5	1	133.25
SP17	2,410	25.1	8.4	3	1	25.2
SP18	17,100	177.8	22.4	8	1	179.2
SP19	2,750	28.6	9.3	3.1	1	28.83
SP20	5,080	52.8	12.4	4.3	1	53.32
SP21	10,915	113.5	18.4	6.2	1	114.08
SP22	3,870	40.2	11.6	3.6	1	41.76
SP23	11,835	123.1	18.9	6.6	1	124.74
SP24	16,050	166.9	22	7.6	1	167.2

6 MAINTENANCE AND MONITORING

Surface water runoff control infrastructure will be checked and maintained on a regular basis and settlement ponds and check dams will be maintained (desludged/settle solids removed) on a regular basis, particularly during the construction phase of the Development. It is important to minimise the agitation of solids during these works, otherwise it will likely lead to an acute significant loading of suspended solids in the drainage network.

Site water runoff quality will be monitored on a continuous basis at a reasonable frequency during both the decommissioning and construction, and operational phases of the Development. A relatively high frequency of monitoring (e.g. daily) is required during the decommissioning and construction phase, similarly the early stages of the operational phase will require a relatively high frequency of monitoring, however the frequency of monitoring can gradually reduce thereafter – presuming there are no issues with the quality of discharging water at that point in time.

7 POST CONSTRUCTION DRAINAGE MANAGEMENT

Following the completion of construction, a full review of construction stage drainage will be undertaken by the appointed Contractor (in conjunction with the EM and the ECoW) with a view to removing drainage infrastructure that is no longer required during the development's operation phase.

APPENDIX 1

TULLAGHMORE RAINFALL DATA

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 102863, Northing: 246952,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	3.3,	4.3,	4.8,	5.6,	6.1,	6.4,	7.7,	9.0,	9.8,	11.0,	11.9,	12.7,	13.9,	14.7,	15.4,	N/A ,
10 mins	4.6,	6.0,	6.7,	7.8,	8.5,	9.0,	10.7,	12.5,	13.7,	15.3,	16.7,	17.7,	19.3,	20.5,	21.5,	N/A ,
15 mins	5.4,	7.0,	7.9,	9.1,	9.9,	10.6,	12.5,	14.7,	16.1,	18.0,	19.6,	20.8,	22.7,	24.1,	25.3,	N/A ,
30 mins	7.4,	9.6,	10.7,	12.3,	13.4,	14.2,	16.7,	19.4,	21.1,	23.5,	25.5,	27.1,	29.4,	31.2,	32.6,	N/A ,
1 hours	10.2,	13.1,	14.6,	16.6,	18.0,	19.0,	22.2,	25.7,	27.8,	30.8,	33.3,	35.2,	38.1,	40.3,	42.1,	N/A ,
2 hours	14.1,	17.9,	19.8,	22.5,	24.2,	25.5,	29.6,	33.9,	36.6,	40.3,	43.5,	45.9,	49.4,	52.1,	54.3,	N/A ,
3 hours	17.1,	21.5,	23.7,	26.8,	28.8,	30.3,	35.0,	39.9,	43.0,	47.2,	50.8,	53.5,	57.5,	60.6,	63.0,	N/A ,
4 hours	19.6,	24.5,	26.9,	30.3,	32.5,	34.2,	39.4,	44.8,	48.2,	52.8,	56.7,	59.7,	64.1,	67.4,	70.0,	N/A ,
6 hours	23.7,	29.4,	32.2,	36.2,	38.7,	40.6,	46.5,	52.8,	56.7,	61.9,	66.3,	69.6,	74.6,	78.3,	81.3,	N/A ,
9 hours	28.6,	35.3,	38.5,	43.1,	46.0,	48.2,	55.0,	62.1,	66.6,	72.5,	77.5,	81.2,	86.8,	91.0,	94.4,	N/A ,
12 hours	32.7,	40.1,	43.8,	48.8,	52.1,	54.5,	62.0,	69.8,	74.6,	81.1,	86.6,	90.7,	96.7,	101.3,	104.9,	N/A ,
18 hours	39.6,	48.2,	52.4,	58.2,	62.0,	64.8,	73.3,	82.2,	87.7,	95.0,	101.2,	105.8,	112.6,	117.7,	121.8,	N/A ,
24 hours	45.3,	54.9,	59.5,	66.0,	70.1,	73.2,	82.6,	92.3,	98.3,	106.3,	113.0,	118.1,	125.5,	131.0,	135.4,	150.2,
2 days	59.4,	70.6,	76.0,	83.4,	88.1,	91.6,	102.1,	112.9,	119.5,	128.2,	135.5,	141.0,	148.9,	154.8,	159.6,	175.2,
3 days	71.8,	84.4,	90.4,	98.7,	103.8,	107.7,	119.2,	131.0,	138.2,	147.6,	155.4,	161.3,	169.8,	176.1,	181.1,	197.7,
4 days	83.2,	97.1,	103.7,	112.7,	118.3,	122.4,	134.9,	147.6,	155.2,	165.3,	173.7,	179.9,	188.9,	195.6,	200.9,	218.3,
6 days	104.6,	120.7,	128.2,	138.5,	144.9,	149.7,	163.8,	178.0,	186.6,	197.8,	207.1,	213.9,	223.9,	231.2,	237.0,	256.1,
8 days	124.7,	142.8,	151.2,	162.6,	169.7,	175.0,	190.5,	206.1,	215.5,	227.8,	237.9,	245.3,	256.1,	264.0,	270.3,	290.8,
10 days	144.0,	163.9,	173.1,	185.6,	193.4,	199.1,	216.0,	232.8,	242.9,	256.1,	266.9,	274.9,	286.4,	294.9,	301.6,	323.4,
12 days	162.8,	184.4,	194.4,	207.9,	216.2,	222.3,	240.5,	258.5,	269.3,	283.3,	294.8,	303.2,	315.5,	324.4,	331.5,	354.6,
16 days	199.5,	224.2,	235.6,	250.9,	260.3,	267.2,	287.6,	307.7,	319.7,	335.3,	348.1,	357.4,	370.9,	380.8,	388.6,	413.9,
20 days	235.5,	263.0,	275.6,	292.6,	302.9,	310.5,	333.0,	355.1,	368.2,	385.2,	399.1,	409.2,	423.9,	434.5,	443.0,	470.3,
25 days	279.8,	310.6,	324.7,	343.5,	355.0,	363.4,	388.2,	412.5,	426.9,	445.5,	460.7,	471.8,	487.7,	499.3,	508.5,	538.1,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

APPENDIX 2

GREENFIELD RUN-OFF RATE

Print | Close Report

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Andrew O'Grady
Site name:	Tullaghmore
Site location:	Maam Cross

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.46317° N
Longitude:	9.46026° W
Reference:	1871189426
Date:	Aug 25 2022 14:33

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 5.96

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	5	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.53	0.53

Hydrological characteristics	Default	Edited
SAAR (mm):	1756	1756
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	109.54	109.54
1 in 1 year (l/s):	93.11	93.11
1 in 30 years (l/s):	180.73	180.73
1 in 100 year (l/s):	213.59	213.59
1 in 200 years (l/s):	235.5	235.5

APPENDIX 3

SETTLEMENT POND CALCULATIONS

Tullaghmore SUDS Drainage Design

(C)Volumetric run-off coefficient 0.8

Catchment Area				
Ref	A (m^2)		A (km^2)	Residual Volume (m3)
SP1	2105		0.0021	21.9
SP2	2387		0.0024	24.8
SP3	3000		0.0030	31.2
SP4	3672		0.0037	38.2
SP5	2968		0.0030	30.9
SP6	3430		0.0034	35.7
SP7	2120		0.0021	22.0
SP8	9961		0.0100	103.6
SP9	2030		0.0020	21.1
SP10	13,450		0.0135	139.8
SP11	3135		0.0031	32.6
SP12	1950		0.0020	20.3
SP13	6010		0.0060	62.5
SP14	3367		0.0034	35.0
SP15	1140		0.0011	11.9
SP16	12,550		0.0126	130.5
SP17	2410		0.0024	25.1
SP18	17,100		0.0171	177.8
SP19	2750		0.0028	28.6
SP20	5080		0.0051	52.8
SP21	10,915		0.0109	113.5
SP22	3870		0.0039	40.2
SP23	11,835		0.0118	123.1
SP24	16,050		0.0161	166.9

Catchment	SP1								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.00211	0.054	16.2	11.9	2.5	13.7
M200 10min	10	14.9	0.278	0.72	89.4	0.00211	0.038	22.6	23.7	5.0	17.6
M200 15min	15	17.5	0.278	0.72	70	0.00211	0.029	26.5	35.6	7.5	19.1
M200 30min	30	24.3	0.278	0.72	48.6	0.00211	0.020	36.9	71.1	15.0	21.9
M200 60min	60	33.7	0.278	0.72	33.7	0.00211	0.014	51.1	142.2	29.9	21.2
M200 2hr	120	46.8	0.278	0.72	23.4	0.00211	0.010	71.0	284.5	59.9	11.1
M200 4hr	240	65	0.278	0.72	16.25	0.00211	0.007	98.6	569.0	119.8	-21.2
M200 6hr	300	78.7	0.278	0.72	15.74	0.00211	0.007	143.2	853.5	179.7	-36.4
M200 12hr	600	109.3	0.278	0.72	10.93	0.00211	0.005	198.9	1707.0	359.3	-160.4
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00211	0.003	276.1	3414.0	718.6	-442.5
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00211	0.002	316.3	6827.9	1437.3	-1120.9

Catchment	SP9								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.00203	0.052	15.7	11.9	2.4	13.2
M200 10min	10	14.9	0.278	0.72	89.4	0.00203	0.036	21.8	23.7	4.8	17.0
M200 15min	15	17.5	0.278	0.72	70	0.00203	0.028	25.6	35.6	7.2	18.4
M200 30min	30	24.3	0.278	0.72	48.6	0.00203	0.020	35.5	71.1	14.4	21.1
M200 60min	60	33.7	0.278	0.72	33.7	0.00203	0.014	49.3	142.2	28.9	20.4
M200 2hr	120	46.8	0.278	0.72	23.4	0.00203	0.010	68.5	284.5	57.8	10.7
M200 4hr	240	65	0.278	0.72	16.25	0.00203	0.007	95.1	569.0	115.5	-20.4
M200 6hr	300	78.7	0.278	0.72	15.74	0.00203	0.006	138.1	853.5	173.3	-35.1
M200 12hr	600	109.3	0.278	0.72	10.93	0.00203	0.004	191.9	1707.0	346.5	-154.7
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00203	0.003	266.3	3414.0	693.0	-426.8
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00203	0.002	305.1	6827.9	1386.1	-1081.0

Catchment	SP17								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.00241	0.062	18.6	11.9	2.9	15.7
M200 10min	10	14.9	0.278	0.72	89.4	0.00241	0.043	25.9	23.7	5.7	20.2
M200 15min	15	17.5	0.278	0.72	70	0.00241	0.034	30.4	35.6	8.6	21.8
M200 30min	30	24.3	0.278	0.72	48.6	0.00241	0.023	42.2	71.1	17.1	25.1
M200 60min	60	33.7	0.278	0.72	33.7	0.00241	0.016	58.5	142.2	34.3	24.2
M200 2hr	120	46.8	0.278	0.72	23.4	0.00241	0.011	81.3	284.5	68.6	12.7
M200 4hr	240	65	0.278	0.72	16.25	0.00241	0.008	112.9	569.0	137.1	-24.2
M200 6hr	300	78.7	0.278	0.72	15.74	0.00241	0.008	164.0	853.5	205.7	-41.7
M200 12hr	600	109.3	0.278	0.72	10.93	0.00241	0.005	227.8	1707.0	411.4	-183.6
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00241	0.004	316.1	3414.0	822.8	-506.6
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00241	0.002	362.2	6827.9	1645.5	-1283.3

Catchment	SP2								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.00239	0.061	18.4	11.9	2.8	15.6
M200 10min	10	14.9	0.278	0.72	89.4	0.002387	0.043	25.6	23.7	5.7	20.0
M200 15min	15	17.5	0.278	0.72	70	0.00239	0.033	30.1	35.6	8.5	21.6
M200 30min	30	24.3	0.278	0.72	48.6	0.00239	0.023	41.8	71.1	17.0	24.8
M200 60min	60	33.7	0.278	0.72	33.7	0.00239	0.016	58.0	142.2	34.0	24.0
M200 2hr	120	46.8	0.278	0.72	23.4	0.00239	0.011	80.5	284.5	67.9	12.6
M200 4hr	240	65	0.278	0.72	16.25	0.00239	0.008	111.8	569.0	135.8	-24.0
M200 6hr	300	78.7	0.278	0.72	15.74	0.00239	0.008	162.4	853.5	203.7	-41.3
M200 12hr	600	109.3	0.278	0.72	10.93	0.00239	0.005	225.6	1707.0	407.5	-181.9
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00239	0.004	313.1	3414.0	814.9	-501.8
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00239	0.002	358.7	6827.9	1629.8	-1271.1

Catchment	SP10								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.01345	0.346	103.7	11.9	15.9	87.8
M200 10min	10	14.9	0.278	0.72	89.4	0.01345	0.241	144.4	23.7	31.9	112.5
M200 15min	15	17.5	0.278	0.72	70	0.01345	0.188	169.6	35.6	47.8	121.8
M200 30min	30	24.3	0.278	0.72	48.6	0.01345	0.131	235.5	71.1	95.7	139.8
M200 60min	60	33.7	0.278	0.72	33.7	0.01345	0.091	326.6	142.2	191.3	135.3
M200 2hr	120	46.8	0.278	0.72	23.4	0.01345	0.063	453.6	284.5	382.6	70.9
M200 4hr	240	65	0.278	0.72	16.25	0.01345	0.044	630.0	569.0	765.3	-135.3
M200 6hr	300	78.7	0.278	0.72	15.74	0.01345	0.042	915.3	853.5	1147.9	-232.7
M200 12hr	600	109.3	0.278	0.72	10.93	0.01345	0.029	1271.2	1707.0	2295.9	-1024.7
M200 24hr	1200	151.7	0.278	0.72	7.585	0.01345	0.020	1764.3	3414.0	4591.8	-2827.5
M200 48hr	2400	173.8	0.278	0.72	4.345	0.01345	0.012	2021.3	6827.9	9183.6	-7162.2

Catchment	SP18								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.01710	0.439	131.8	11.9	20.3	111.6
M200 10min	10	14.9	0.278	0.72	89.4	0.01710	0.306	183.6	23.7	40.5	143.1
M200 15min	15	17.5	0.278	0.72	70	0.01710	0.240	215.6	35.6	60.8	154.8
M200 30min	30	24.3	0.278	0.72	48.6	0.01710	0.166	299.4	71.1	121.6	177.8
M200 60min	60	33.7	0.278	0.72	33.7	0.01710	0.115	415.2	142.2	243.2	172.0
M200 2hr	120	46.8	0.278	0.72	23.4	0.01710	0.080	576.7	284.5	486.5	90.2
M200 4hr	240	65	0.278	0.72	16.25	0.01710	0.056	800.9	569.0	973.0	-172.1
M200 6hr	300	78.7	0.278	0.72	15.74	0.01710	0.054	1163.7	853.5	1459.5	-295.8
M200 12hr	600	109.3	0.278	0.72	10.93	0.01710	0.037	1616.1	1707.0	2918.9	-1302.8
M200 24hr	1200	151.7	0.278	0.72	7.585	0.01710	0.026	2243.1	3414.0	5837.9	-3594.8
M200 48hr	2400	173.8	0.278	0.72	4.345	0.01710	0.015	2569.8	6827.9	11675.7	-9105.9

Catchment	SP3								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.00300	0.077	23.1	11.9	3.6	19.6
M200 10min	10	14.9	0.278	0.72	89.4	0.00300	0.054	32.2	23.7	7.1	25.1
M200 15min	15	17.5	0.278	0.72	70	0.00300	0.042	37.8	35.6	10.7	27.2
M200 30min	30	24.3	0.278	0.72	48.6	0.00300	0.029	52.5	71.1	21.3	31.2
M200 60min	60	33.7	0.278	0.72	33.7	0.00300	0.020	72.9	142.2	42.7	30.2
M200 2hr	120	46.8	0.278	0.72	23.4	0.00300	0.014	101.2	284.5	85.3	15.8
M200 4hr	240	65	0.278	0.72	16.25	0.00300	0.010	140.5	569.0	170.7	-30.2
M200 6hr	300	78.7	0.278	0.72	15.74	0.00300	0.009	204.2	853.5	256.0	-51.9
M200 12hr	600	109.3	0.278	0.72	10.93	0.00300	0.007	283.5	1707.0	512.1	-228.6
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00300	0.005	393.5	3414.0	1024.2	-630.7
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00300	0.003	450.8	6827.9	2048.4	-1597.5

Catchment	SP11								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.00314	0.081	24.2	11.9	3.7	20.5
M200 10min	10	14.9	0.278	0.72	89.4	0.00314	0.056	33.7	23.7	7.4	26.2
M200 15min	15	17.5	0.278	0.72	70	0.00314	0.044	39.5	35.6	11.1	28.4
M200 30min	30	24.3	0.278	0.72	48.6	0.00314	0.030	54.9	71.1	22.3	32.6
M200 60min	60	33.7	0.278	0.72	33.7	0.00314	0.021	76.1	142.2	44.6	31.5
M200 2hr	120	46.8	0.278	0.72	23.4	0.00314	0.015	105.7	284.5	89.2	16.5
M200 4hr	240	65	0.278	0.72	16.25	0.00314	0.010	146.8	569.0	178.4	-31.5
M200 6hr	300	78.7	0.278	0.72	15.74	0.00314	0.010	213.3	853.5	267.6	-54.2
M200 12hr	600	109.3	0.278	0.72	10.93	0.00314	0.007	296.3	1707.0	535.1	-238.8
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00314	0.005	411.2	3414.0	1070.3	-659.0
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00314	0.003	471.1	6827.9	2140.6	-1669.4

Catchment	SP19								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	10.7	0.278	0.72	128.4	0.00275	0.071	21.2	11.9	3.3	17.9
M200 10min	10	14.9	0.278	0.72	89.4	0.00275	0.049	29.5	23.7	6.5	23.0
M200 15min	15	17.5	0.278	0.72	70	0.00275	0.039	34.7	35.6	9.8	24.9
M200 30min	30	24.3	0.278	0.72	48.6	0.00275	0.027	48.2	71.1	19.6	28.6
M200 60min	60	33.7	0.278	0.72	33.7	0.00275	0.019	66.8	142.2	39.1	27.7
M200 2hr	120	46.8	0.278	0.72	23.4	0.00275	0.013	92.7	284.5	78.2	14.5
M200 4hr	240	65	0.278	0.72	16.25	0.00275	0.009	128.8	569.0	156.5	-27.7
M200 6hr	300	78.7	0.278	0.72	15.74	0.00275	0.009	187.1	853.5	234.7	-47.6
M200 12hr	600	109.3	0.278	0.72	10.93	0.00275	0.006	259.9	1707.0	469.4	-209.5
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00275	0.004	360.7	3414.0	938.8	-578.1
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00275	0.002	413.3	6827.9	1877.7	-1464.4

Catchment	SP4								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00367	0.094	28.3	11.9	4.4	24.0
M200 10min	10	14.9	0.278	0.72	89.4	0.00367	0.066	39.4	23.7	8.7	30.7
M200 15min	15	17.5	0.278	0.72	70	0.00367	0.051	46.3	35.6	13.1	33.2
M200 30min	30	24.3	0.278	0.72	48.6	0.00367	0.036	64.3	71.1	26.1	38.2
M200 60min	60	33.7	0.278	0.72	33.7	0.00367	0.025	89.2	142.2	52.2	36.9
M200 2hr	120	46.8	0.278	0.72	23.4	0.00367	0.017	123.8	284.5	104.5	19.4
M200 4hr	240	65	0.278	0.72	16.25	0.00367	0.012	172.0	569.0	208.9	-36.9
M200 6hr	300	78.7	0.278	0.72	15.74	0.00367	0.012	249.9	853.5	313.4	-63.5
M200 12hr	600	109.3	0.278	0.72	10.93	0.00367	0.008	347.0	1707.0	626.8	-279.8
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00367	0.006	481.7	3414.0	1253.6	-771.9
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00367	0.003	551.8	6827.9	2507.2	-1955.4

Catchment	SP5								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00297	0.076	22.9	11.9	3.5	19.4
M200 10min	10	14.9	0.278	0.72	89.4	0.00297	0.053	31.9	23.7	7.0	24.8
M200 15min	15	17.5	0.278	0.72	70	0.00297	0.042	37.4	35.6	10.6	26.9
M200 30min	30	24.3	0.278	0.72	48.6	0.00297	0.029	52.0	71.1	21.1	30.9
M200 60min	60	33.7	0.278	0.72	33.7	0.00297	0.020	72.1	142.2	42.2	29.9
M200 2hr	120	46.8	0.278	0.72	23.4	0.00297	0.014	100.1	284.5	84.4	15.7
M200 4hr	240	65	0.278	0.72	16.25	0.00297	0.010	139.0	569.0	168.9	-29.9
M200 6hr	300	78.7	0.278	0.72	15.74	0.00297	0.009	202.0	853.5	253.3	-51.3
M200 12hr	600	109.3	0.278	0.72	10.93	0.00297	0.006	280.5	1707.0	506.6	-226.1
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00297	0.005	389.3	3414.0	1013.3	-623.9
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00297	0.003	446.0	6827.9	2026.5	-1580.5

Catchment	SP6								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00343	0.088	26.4	11.9	4.1	22.4
M200 10min	10	14.9	0.278	0.72	89.4	0.00343	0.061	36.8	23.7	8.1	28.7
M200 15min	15	17.5	0.278	0.72	70	0.00343	0.048	43.3	35.6	12.2	31.1
M200 30min	30	24.3	0.278	0.72	48.6	0.00343	0.033	60.1	71.1	24.4	35.7
M200 60min	60	33.7	0.278	0.72	33.7	0.00343	0.023	83.3	142.2	48.8	34.5
M200 2hr	120	46.8	0.278	0.72	23.4	0.00343	0.016	115.7	284.5	97.6	18.1
M200 4hr	240	65	0.278	0.72	16.25	0.00343	0.011	160.7	569.0	195.2	-34.5
M200 6hr	300	78.7	0.278	0.72	15.74	0.00343	0.011	233.4	853.5	292.7	-59.3
M200 12hr	600	109.3	0.278	0.72	10.93	0.00343	0.008	324.2	1707.0	585.5	-261.3
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00343	0.005	449.9	3414.0	1171.0	-721.1
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00343	0.003	515.5	6827.9	2342.0	-1826.5

Catchment	SP7								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00212	0.054	16.3	11.9	2.5	13.8
M200 10min	10	14.9	0.278	0.72	89.4	0.00212	0.038	22.8	23.7	5.0	17.7
M200 15min	15	17.5	0.278	0.72	70	0.00212	0.030	26.7	35.6	7.5	19.2
M200 30min	30	24.3	0.278	0.72	48.6	0.00212	0.021	37.1	71.1	15.1	22.0
M200 60min	60	33.7	0.278	0.72	33.7	0.00212	0.014	51.5	142.2	30.2	21.3
M200 2hr	120	46.8	0.278	0.72	23.4	0.00212	0.010	71.5	284.5	60.3	11.2
M200 4hr	240	65	0.278	0.72	16.25	0.00212	0.007	99.3	569.0	120.6	-21.3
M200 6hr	300	78.7	0.278	0.72	15.74	0.00212	0.007	144.3	853.5	180.9	-36.7
M200 12hr	600	109.3	0.278	0.72	10.93	0.00212	0.005	200.4	1707.0	361.9	-161.5
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00212	0.003	278.1	3414.0	723.8	-445.7
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00212	0.002	318.6	6827.9	1447.5	-1128.9

Catchment	SP8								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00996	0.256	76.8	11.9	11.8	65.0
M200 10min	10	14.9	0.278	0.72	89.4	0.00996	0.178	106.9	23.7	23.6	83.3
M200 15min	15	17.5	0.278	0.72	70	0.00996	0.140	125.6	35.6	35.4	90.2
M200 30min	30	24.3	0.278	0.72	48.6	0.00996	0.097	174.4	71.1	70.8	103.6
M200 60min	60	33.7	0.278	0.72	33.7	0.00996	0.067	241.9	142.2	141.7	100.2
M200 2hr	120	46.8	0.278	0.72	23.4	0.00996	0.047	335.9	284.5	283.4	52.5
M200 4hr	240	65	0.278	0.72	16.25	0.00996	0.032	466.5	569.0	566.8	-100.2
M200 6hr	300	78.7	0.278	0.72	15.74	0.00996	0.031	677.9	853.5	850.2	-172.3
M200 12hr	600	109.3	0.278	0.72	10.93	0.00996	0.022	941.4	1707.0	1700.3	-758.9
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00996	0.015	1306.6	3414.0	3400.6	-2094.0
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00996	0.009	1497.0	6827.9	6801.3	-5304.3

Catchment	SP12								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00195	0.050	15.0	11.9	2.3	12.7
M200 10min	10	14.9	0.278	0.72	89.4	0.00195	0.035	20.9	23.7	4.6	16.3
M200 15min	15	17.5	0.278	0.72	70	0.00195	0.027	24.6	35.6	6.9	17.7
M200 30min	30	24.3	0.278	0.72	48.6	0.00195	0.019	34.1	71.1	13.9	20.3
M200 60min	60	33.7	0.278	0.72	33.7	0.00195	0.013	47.4	142.2	27.7	19.6
M200 2hr	120	46.8	0.278	0.72	23.4	0.00195	0.009	65.8	284.5	55.5	10.3
M200 4hr	240	65	0.278	0.72	16.25	0.00195	0.006	91.3	569.0	111.0	-19.6
M200 6hr	300	78.7	0.278	0.72	15.74	0.00195	0.006	132.7	853.5	166.4	-33.7
M200 12hr	600	109.3	0.278	0.72	10.93	0.00195	0.004	184.3	1707.0	332.9	-148.6
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00195	0.003	255.8	3414.0	665.7	-409.9
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00195	0.002	293.1	6827.9	1331.4	-1038.4

Catchment	SP13								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00601	0.154	46.3	11.9	7.1	39.2
M200 10min	10	14.9	0.278	0.72	89.4	0.00601	0.108	64.5	23.7	14.2	50.3
M200 15min	15	17.5	0.278	0.72	70	0.00601	0.084	75.8	35.6	21.4	54.4
M200 30min	30	24.3	0.278	0.72	48.6	0.00601	0.058	105.2	71.1	42.7	62.5
M200 60min	60	33.7	0.278	0.72	33.7	0.00601	0.041	145.9	142.2	85.5	60.5
M200 2hr	120	46.8	0.278	0.72	23.4	0.00601	0.028	202.7	284.5	171.0	31.7
M200 4hr	240	65	0.278	0.72	16.25	0.00601	0.020	281.5	569.0	342.0	-60.5
M200 6hr	300	78.7	0.278	0.72	15.74	0.00601	0.019	409.0	853.5	512.9	-104.0
M200 12hr	600	109.3	0.278	0.72	10.93	0.00601	0.013	568.0	1707.0	1025.9	-457.9
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00601	0.009	788.4	3414.0	2051.8	-1263.4
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00601	0.005	903.2	6827.9	4103.6	-3200.4

Catchment	SP14								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00337	0.087	26.0	11.9	4.0	22.0
M200 10min	10	14.9	0.278	0.72	89.4	0.00337	0.060	36.2	23.7	8.0	28.2
M200 15min	15	17.5	0.278	0.72	70	0.00337	0.047	42.5	35.6	12.0	30.5
M200 30min	30	24.3	0.278	0.72	48.6	0.00337	0.033	59.0	71.1	23.9	35.0
M200 60min	60	33.7	0.278	0.72	33.7	0.00337	0.023	81.8	142.2	47.9	33.9
M200 2hr	120	46.8	0.278	0.72	23.4	0.00337	0.016	113.5	284.5	95.8	17.8
M200 4hr	240	65	0.278	0.72	16.25	0.00337	0.011	157.7	569.0	191.6	-33.9
M200 6hr	300	78.7	0.278	0.72	15.74	0.00337	0.011	229.1	853.5	287.4	-58.2
M200 12hr	600	109.3	0.278	0.72	10.93	0.00337	0.007	318.2	1707.0	574.7	-256.5
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00337	0.005	441.7	3414.0	1149.5	-707.8
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00337	0.003	506.0	6827.9	2299.0	-1793.0

Catchment	SP15								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00114	0.029	8.8	11.9	1.4	7.4
M200 10min	10	14.9	0.278	0.72	89.4	0.00114	0.020	12.2	23.7	2.7	9.5
M200 15min	15	17.5	0.278	0.72	70	0.00114	0.016	14.4	35.6	4.1	10.3
M200 30min	30	24.3	0.278	0.72	48.6	0.00114	0.011	20.0	71.1	8.1	11.9
M200 60min	60	33.7	0.278	0.72	33.7	0.00114	0.008	27.7	142.2	16.2	11.5
M200 2hr	120	46.8	0.278	0.72	23.4	0.00114	0.005	38.4	284.5	32.4	6.0
M200 4hr	240	65	0.278	0.72	16.25	0.00114	0.004	53.4	569.0	64.9	-11.5
M200 6hr	300	78.7	0.278	0.72	15.74	0.00114	0.004	77.6	853.5	97.3	-19.7
M200 12hr	600	109.3	0.278	0.72	10.93	0.00114	0.002	107.7	1707.0	194.6	-86.9
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00114	0.002	149.5	3414.0	389.2	-239.7
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00114	0.001	171.3	6827.9	778.4	-607.1

Catchment	SP16								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.01255	0.323	96.8	11.9	14.9	81.9
M200 10min	10	14.9	0.278	0.72	89.4	0.01255	0.225	134.7	23.7	29.8	105.0
M200 15min	15	17.5	0.278	0.72	70	0.01255	0.176	158.3	35.6	44.6	113.6
M200 30min	30	24.3	0.278	0.72	48.6	0.01255	0.122	219.8	71.1	89.3	130.5
M200 60min	60	33.7	0.278	0.72	33.7	0.01255	0.085	304.8	142.2	178.5	126.2
M200 2hr	120	46.8	0.278	0.72	23.4	0.01255	0.059	423.2	284.5	357.0	66.2
M200 4hr	240	65	0.278	0.72	16.25	0.01255	0.041	587.8	569.0	714.1	-126.3
M200 6hr	300	78.7	0.278	0.72	15.74	0.01255	0.040	854.0	853.5	1071.1	-217.1
M200 12hr	600	109.3	0.278	0.72	10.93	0.01255	0.027	1186.1	1707.0	2142.3	-956.1
M200 24hr	1200	151.7	0.278	0.72	7.585	0.01255	0.019	1646.2	3414.0	4284.5	-2638.3
M200 48hr	2400	173.8	0.278	0.72	4.345	0.01255	0.011	1886.1	6827.9	8569.0	-6683.0

Catchment	SP20								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00508	0.131	39.2	11.9	6.0	33.1
M200 10min	10	14.9	0.278	0.72	89.4	0.00508	0.091	54.5	23.7	12.0	42.5
M200 15min	15	17.5	0.278	0.72	70	0.00508	0.071	64.1	35.6	18.1	46.0
M200 30min	30	24.3	0.278	0.72	48.6	0.00508	0.049	89.0	71.1	36.1	52.8
M200 60min	60	33.7	0.278	0.72	33.7	0.00508	0.034	123.4	142.2	72.3	51.1
M200 2hr	120	46.8	0.278	0.72	23.4	0.00508	0.024	171.3	284.5	144.5	26.8
M200 4hr	240	65	0.278	0.72	16.25	0.00508	0.017	237.9	569.0	289.0	-51.1
M200 6hr	300	78.7	0.278	0.72	15.74	0.00508	0.016	345.7	853.5	433.6	-87.9
M200 12hr	600	109.3	0.278	0.72	10.93	0.00508	0.011	480.1	1707.0	867.1	-387.0
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00508	0.008	666.4	3414.0	1734.3	-1067.9
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00508	0.004	763.4	0.0	0.0	763.4

Catchment	SP21								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.01092	0.281	84.2	11.9	12.9	71.2
M200 10min	10	14.9	0.278	0.72	89.4	0.01092	0.195	117.2	23.7	25.9	91.3
M200 15min	15	17.5	0.278	0.72	70	0.01092	0.153	137.6	35.6	38.8	98.8
M200 30min	30	24.3	0.278	0.72	48.6	0.01092	0.106	191.1	71.1	77.6	113.5
M200 60min	60	33.7	0.278	0.72	33.7	0.01092	0.074	265.1	142.2	155.3	109.8
M200 2hr	120	46.8	0.278	0.72	23.4	0.01092	0.051	368.1	284.5	310.5	57.6
M200 4hr	240	65	0.278	0.72	16.25	0.01092	0.036	511.2	569.0	621.1	-109.8
M200 6hr	300	78.7	0.278	0.72	15.74	0.01092	0.034	742.8	853.5	931.6	-188.8
M200 12hr	600	109.3	0.278	0.72	10.93	0.01092	0.024	1031.6	1707.0	1863.2	-831.6
M200 24hr	1200	151.7	0.278	0.72	7.585	0.01092	0.017	1431.8	3414.0	3726.3	-2294.6
M200 48hr	2400	173.8	0.278	0.72	4.345	0.01092	0.009	1640.3	6827.9	7452.7	-5812.3

Catchment	SP22								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.00387	0.099	29.8	11.9	4.6	25.3
M200 10min	10	14.9	0.278	0.72	89.4	0.00387	0.069	41.6	23.7	9.2	32.4
M200 15min	15	17.5	0.278	0.72	70	0.00387	0.054	48.8	35.6	13.8	35.0
M200 30min	30	24.3	0.278	0.72	48.6	0.00387	0.038	67.8	71.1	27.5	40.2
M200 60min	60	33.7	0.278	0.72	33.7	0.00387	0.026	94.0	142.2	55.1	38.9
M200 2hr	120	46.8	0.278	0.72	23.4	0.00387	0.018	130.5	284.5	110.1	20.4
M200 4hr	240	65	0.278	0.72	16.25	0.00387	0.013	181.3	569.0	220.2	-38.9
M200 6hr	300	78.7	0.278	0.72	15.74	0.00387	0.012	263.4	853.5	330.3	-66.9
M200 12hr	600	109.3	0.278	0.72	10.93	0.00387	0.008	365.8	1707.0	660.6	-294.8
M200 24hr	1200	151.7	0.278	0.72	7.585	0.00387	0.006	507.6	3414.0	1321.2	-813.6
M200 48hr	2400	173.8	0.278	0.72	4.345	0.00387	0.003	581.6	6827.9	2642.4	-2060.8

Catchment	SP23								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.01184	0.304	91.2	11.9	14.0	77.2
M200 10min	10	14.9	0.278	0.72	89.4	0.01184	0.212	127.1	23.7	28.1	99.0
M200 15min	15	17.5	0.278	0.72	70	0.01184	0.166	149.2	35.6	42.1	107.2
M200 30min	30	24.3	0.278	0.72	48.6	0.01184	0.115	207.2	71.1	84.2	123.1
M200 60min	60	33.7	0.278	0.72	33.7	0.01184	0.080	287.4	142.2	168.4	119.0
M200 2hr	120	46.8	0.278	0.72	23.4	0.01184	0.055	399.1	284.5	336.7	62.4
M200 4hr	240	65	0.278	0.72	16.25	0.01184	0.038	554.3	569.0	673.4	-119.1
M200 6hr	300	78.7	0.278	0.72	15.74	0.01184	0.037	805.4	853.5	1010.1	-204.7
M200 12hr	600	109.3	0.278	0.72	10.93	0.01184	0.026	1118.5	1707.0	2020.2	-901.7
M200 24hr	1200	151.7	0.278	0.72	7.585	0.01184	0.018	1552.4	3414.0	4040.4	-2488.0
M200 48hr	2400	173.8	0.278	0.72	4.345	0.01184	0.010	1778.6	6827.9	8080.8	-6302.2

Catchment	SP24								water discharge rate (l/s)		
Clean water natural flow									39.5	l/s/ha	
1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M200 5min	5	10.7	0.278	0.72	128.4	0.01605	0.412	123.7	11.9	19.0	104.7
M200 10min	10	14.9	0.278	0.72	89.4	0.01605	0.287	172.3	23.7	38.1	134.3
M200 15min	15	17.5	0.278	0.72	70	0.01605	0.225	202.4	35.6	57.1	145.3
M200 30min	30	24.3	0.278	0.72	48.6	0.01605	0.156	281.0	71.1	114.2	166.9
M200 60min	60	33.7	0.278	0.72	33.7	0.01605	0.108	389.7	142.2	228.3	161.4
M200 2hr	120	46.8	0.278	0.72	23.4	0.01605	0.075	541.3	284.5	456.6	84.6
M200 4hr	240	65	0.278	0.72	16.25	0.01605	0.052	751.7	569.0	913.2	-161.5
M200 6hr	300	78.7	0.278	0.72	15.74	0.01605	0.051	1092.2	853.5	1369.9	-277.6
M200 12hr	600	109.3	0.278	0.72	10.93	0.01605	0.035	1516.9	1707.0	2739.7	-1222.8
M200 24hr	1200	151.7	0.278	0.72	7.585	0.01605	0.024	2105.3	3414.0	5479.4	-3374.1
M200 48hr	2400	173.8	0.278	0.72	4.345	0.01605	0.014	2412.0	6827.9	10958.8	-8546.8

Appendix C – Decommissioning Plan

TULLAGHMORE WIND FARM LIMITED.

TULLAGHMORE WIND FARM, MAAM CROSS, CO. GALWAY.

CONSTUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

DECOMMISSIONING & RESTORATION PLAN

July 2022

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DOCUMENT APPROVAL

PROJECT	Tullaghmore Wind Farm, Co. Galway	
CLIENT / JOB NO	Tullaghmore Wind Farm Limited	6276
DOCUMENT TITLE	Decommissioning & Restoration Plan	

Prepared by **Reviewed/Approved by**

Document	Name	Name
DRAFT	Shauna Conlan	David Kiely
Date July 2022	Signature Shauna Conlan	Signature David Kiely

Prepared by **Reviewed/Approved by**

Document	Name	Name
FINAL	Shauna Conlan	David Kiely
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TULLAGHMORE WIND FARM LIMITED

TULLAGHMORE WIND FARM, MAAM CROSS, CO. GALWAY.

DECOMMISSIONING & RESTORATION PLAN

PLANNING

TABLE OF CONTENTS

1.0 INTRODUCTION

This proposed Tullaghmore Wind Farm will consist of 6 wind turbines installed on cast in-situ below ground concrete foundations with adjacent crane hard standing areas at all turbines. A stand-alone 38kV Electric Control Building and compound will be constructed on site and all structures shall be connected via a network of existing and proposed access tracks. Underground electrical and communications cables will also link the turbines to the site control building and the power generated will be exported to the National Grid by underground cables.

This Decommissioning and Restoration Plan outlines the project components to be removed from site, and how disturbed areas are to be restored within the project area on decommissioning of the wind farm.

It is noted that any works to be completed under this Decommissioning and Restoration Plan shall be fully compliant with the methodology and practices outlined in the Environmental Impact Assessment Report (2022) and any subsequent Further Environmental Information submissions of the planning application and planning appeal respectively shall also be adhered to.

In preparing this Decommissioning and Restoration Plan, cognisance has also been given to the Scottish Natural Heritage (SNH) commissioned report no 591 titled *'Research and guidance on restoration and decommissioning of onshore wind farms'* (SNH, 2013), and the guidance document titled *'Decommissioning and Repowering plans for onshore wind farm'*[3]. The SNH Guidance also notes that reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm. Due to the efficiency of modern turbines, it is estimated that their lifespan will be 35 years. The technological advances and preferred approaches to reinstatement are likely to change in the intervening decades.

In this regard, this Decommissioning Plan will be reviewed and updated for the written agreement of the Planning Authority prior to commencement of a decommissioning works. It will take account of the relevant conditions of the planning permission and current health and safety standards in accordance with the approach set out and the principles established in this document.

2.0 WIND FARM INFRASTRUCTURE

The following items will make up the wind farm infrastructure once construction is completed:

- 6 no. wind turbine generators
- 6 no. wind turbine foundations
- 6 no. crane hard-standing areas
- Upgrade of approximately 1,450m of existing Site Access Tracks
- Construction of approximately 5,530m of new Site Access Tracks
- 1 no site 38kV Substation control building and compound
- Underground electrical & communications cables
- Site drainage network
- Biodiversity enhancement measures
- Spoil storage and restoration areas

All access roads and hardstanding areas forming part of a site roadway network which are required for wind farm operation and maintenance staff for ongoing forestry operations will be left in situ for future use. The substation and grid connection are permanent features. It is intended that all above ground components and underground cabling (ducting left in-situ) will be removed from the Site as part of the decommissioning of the Development. The approach proposed for decommissioning is one of minimal intervention.

The following elements are included in the decommissioning phase:

- Decommissioning works will be limited to action necessary to remove the wind farm structures, i.e., removal of turbines, cabling and the monitoring mast.
- Roads and associated drainage systems will remain in place to serve ongoing forestry and agriculture activity.[1]
- Hardstanding areas will be allowed to revegetate naturally.
- Turbine plinths will be removed, and the hardcore covering turbine foundations will be allowed to revegetate naturally.[2]
- Soil disturbance will be avoided.
- Importing soil is not a preferred option. If this is to be considered, it will be as a last resort only. If it is nonetheless considered necessary to import soil, it will be peat soil.[3]

[1] For a wind farm where the roads are not to be retained, natural revegetation is preferred to reprofiling, or the importation of soil.
[2] The covering of turbine foundations with soil material was discussed, and discounted. Instead, the possibility was discussed of roughening the surface of the concrete foundation, to assist in the initiation and subsequent growth and coalescence of flora. However, the foundations will in fact be covered with hardcore, so this step is unnecessary.
[3] This is because mineral soil will have different properties and different seed banks to peat soil and will not be suitable for transplantation to a bog environment. Natural colonisation of hardcore by local flora is expected to occur quite easily. This is seen from experience at existing wind farms, where regular maintenance is required to keep hardstandings and road verges free from growth.

Mineral soil will not be brought into the Site. Any decision to import peat soil will need to carefully balance any benefits of doing so against the ecological and hydrological impacts of excavating it elsewhere.

3.0 TARGETS AND OBJECTIVES

The key targets are as follows:

- Ensure decommissioning works and activities are completed in accordance with mitigation and best practice approach presented in the accompanying Environmental Impact Assessment Report (EIAR) and associated planning documentation.
- Ensure decommissioning works and activities have minimal impact/disturbance to local landowners and the local community. This will relate to transport, particularly of material off site with noise and dust also impacting on receptors at time of decommissioning to a lesser extent.
- Ensure decommissioning works and activities have minimal impact on the natural environment. Disturbance to habitats will be avoided and the use of existing infrastructure and drainage will ensure silt does not enter waterways.
- Adopt a sustainable approach to decommissioning. This means comparing alternative methods for turbine disassembly and taking the approach with the least impact on the natural environment; and,
- Provide toolbox talks, environmental training and awareness of sensitive receptors and waste management within the Site for all project personnel.

The key site objectives are as follows:

- Ensure sustainable sources where possible. This means using sources which have derived from resources that can maintain current operations without jeopardising the energy needs or climate of future generations and implementing the waste hierarchy.
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and have emergency measures in place, in accordance with the Water Quality Management Plan. Similar mitigation measures to the construction phase will be implemented. Please Section 3 for more details.
- Avoidance of vandalism.
- Keeping all watercourses free from obstruction and debris.
- Sustainable drainage system/drainage design principles will be maintained and monitored to ensure efficiency.
- Keep impact of decommissioning works to a minimum on the local environment, namely watercourses, and wildlife through the use of defences such as buffers and

silt fences.

- Correct fuel storage and refuelling procedures to be followed.
- Good waste management and housekeeping to be implemented.
- Air and noise pollution prevention to be implemented.
- Monitoring of the works and any adverse effects that it may have on the environment.

4.0 WIND FARM DECOMMISSIONING PLAN

Prior to the commencement of any decommissioning works on site, a comprehensive Health and Safety Risk Assessment, complete with method statements, shall be developed by the appointed Contractor. These risk assessments and method statements will take on board all updated health and safety legislation and policies which are appropriate to the time in question. A similar review of the EIAR and any Further Information (FI) Responses shall be completed to ensure that all environmental legislation, best practice guidance, etc., which may have been introduced in the intervening years are adopted into the specific construction method statements.

The main components of the wind farm infrastructure are itemised hereunder and addressed individually.

4.1 Wind Turbine Generators

The key wind turbine generator components to be considered in decommissioning include:

Key Element	Components	Constituents
Turbines	i. Blades	Resin / fibre glass (18 No.)
	ii. Blade hub & nose cone	Cast iron, resin, fibre glass (6 No.)
	iii. Nacelle, incl generator & gearbox if appropriate	Iron, steel, copper, resin, silica (6 No.)
	iv. Tower	Steel (18 No. Sections)
	v. Transformer	Electrical components (6 No.)

Prior to any works being undertaken on wind turbines, they will be disconnected from the grid by the site operator in conjunction with ESB Networks and EirGrid. Once a Health and Safety Risk Assessment has been completed and the turbines have been isolated electrically, they will be systematically disassembled and disconnected from their concrete bases, and subsequently removed from site on similar transport vehicles to those which were used to deliver the turbines to Site. The main components of the wind turbines (the

tower, the nacelle, blades, etc.) are modular items that allow for ease of construction and disassembly. It is noted that wind turbine components have a significant recycle value in the form of steel, aluminum, copper, etc., (in some instances wind turbines can be refurbished and sold as secondhand turbines), therefore an incentive will always exist to carefully and diligently remove these structures from a non-operating wind farm site.

Suitable cranes, similar to those used for the installation works, shall be required for this operation. All components removed from Site will be sent to a licensed waste management firm and or recycling facility and disposed of in accordance with European Union (Waste Electrical and Electronic Equipment) Regulations 2014 and EU (Environmental Impact Assessment) Waste Regulations 2013 or other applicable legislation which may be in force at the time of decommissioning. As outlined above, it is anticipated that the waste steel turbine towers will be re-cycled and potentially used again for manufacturing and that the generator components will be broken down into their respective components and re-cycled as appropriate.

The transport of disassembled turbines from the site will be undertaken in accordance with a Transport Management Plan which will be issued to and agreed with the competent authority at that time as part of a permit application for the delivery of abnormal loads using the local roads under the Road Traffic (Special Permits for Particular Vehicles) Regulations 2007. The Transport Management Plan will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

4.2 Wind Turbine Foundations

The key wind turbine foundation components to be considered in decommissioning include:

Key Element	Components	Constituents
Turbine Foundation	i. Backfill above & around base	Suitable engineering fill / crushed rock
	ii. Concrete Foundations	Concrete / steel reinforcement
	iii. Concrete piles	Concrete / steel reinforcement

Each wind turbine will have a reinforced concrete foundation comprising of a concrete base slab (c. 25.5m in diameter, and 3.0m deep) lying on either bedrock, competent substrata, or concrete piles, with a concrete central upstand column (measuring c.6m in diameter and c.650mm tall) which sits c.100mm above finished ground level, and connects to the bottom

turbine tower fixing section.

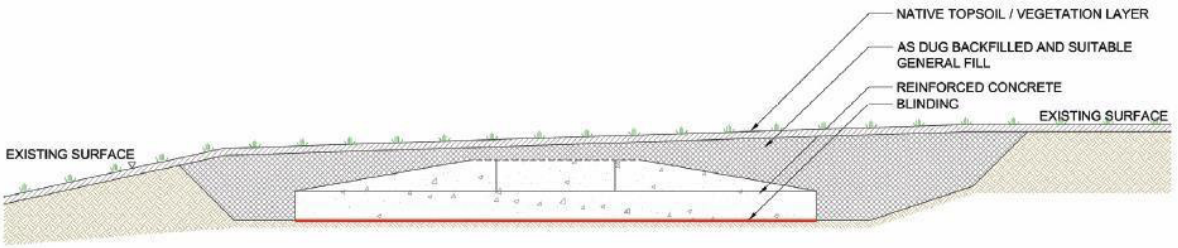
In order to keep the ground disturbances to a minimum, it is proposed that turbine foundations will not be removed in their entirety from the ground, with the concrete demolition works being confined to the central upstand column of the turbine foundation. This shall typically be broken out by mechanical rock hammers and reinforcing steel cut level with the broken concrete which will terminate approximately 400mm below finished ground level. It is envisaged that this work would be completed with a 30 tonne 360^{o} Tracked Excavator with a suitable sized hydraulic hammer. The broken-down rock is loaded into a mobile crusher using a wheeled loading shovel machine and crushed down into the correct grade for use in the civil construction of Site Access Tracks and Turbine Hardstands.

The remaining concrete base slab will be c.3m below finished ground level, and shall be covered over with peat material as appropriate from the project site. The reinstatement of topsoil and the restoration of vegetation will be kept consistent and compatible with surrounding vegetation.

The methodology of all restoration works shall first be agreed with the site Environmental Engineer, and the Engineer shall monitor and supervise the entire restoration works programme.

It is noted that the SNH Commissioned Report no 591 concludes that *"there is a relatively low environmental risk associated with reinforced concrete that is left in situ (The Concrete Society pers comm. 2013), and the noise, ground disturbance and cost (excavation/breaking/processing/transporting), along with associated carbon emissions, may create a larger environmental impact than leaving such concrete in situ on the site".'*

The following figure which is extracted from the SNH commissioned report, shows a typical cross section of a restored turbine foundation.



PARTIAL REMOVAL AND RESTORATION

4.3 Crane Hardstand Areas

The key crane hardstand components to be considered in decommissioning include:

Key Element	Components	Constituents
Crane hard- standing areas	i. Hard-standing Area Approx 3,395m^2/ Turbine	Crushed rock / geogrid reinforcement. Weathered & possibly vegetated
	ii. Soils	In-situ soils

In order to reduce the potential impact of excavating and removing the entirety of the crane hardstand areas, it is proposed that the majority of the stone structure of the individual crane hardstands will be left in place, with topsoil and or peat being spread on top of the hardstand to form a vegetated surface layer. The top layer of the crane hardstand areas will have the rock/stone dug out and be left to revegetate naturally. Any reinstatement of topsoil and the restoration of vegetation will be kept consistent and compatible with surrounding vegetation, and shall be agreed with the Environmental Engineer in advance of commencement. The Environmental Engineer shall also supervise the restoration works on site.

By minimising the excavation of stone, and geo-grid etc., which over the lifetime of the windfarm may have become vegetated, the risk of creating sedimentation of watercourses etc. is kept to a minimum.

4.4 Site Tracks

The key site track components to be considered in decommissioning include:

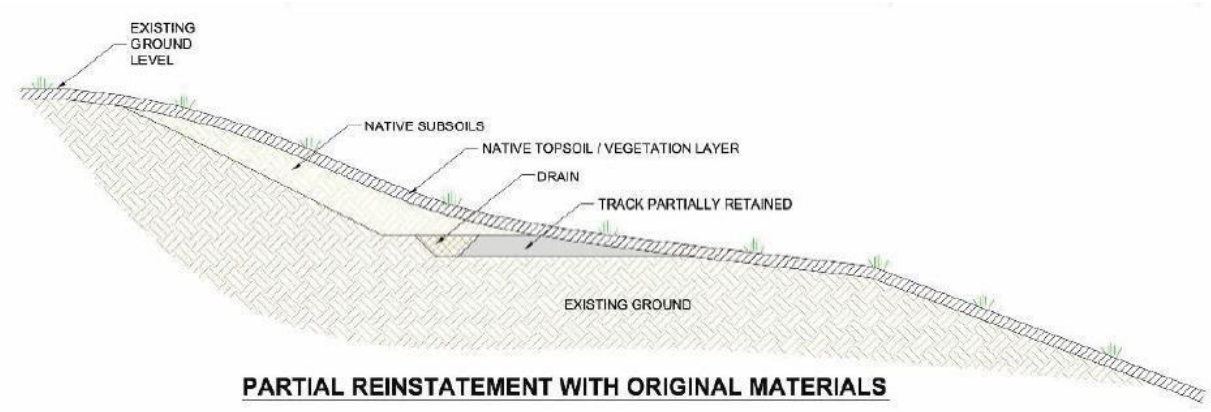
Key Element	Components	Constituents
Site tracks	i. Wind farm spec roads (granular fill) (also floating roads)	Crushed rock / geotextile separators / geogrid reinforcement. Weathered & possibly vegetated.

Approximately 7.0km of Site Access Tracks will be constructed as part of the project.

It is proposed that the Site Access Tracks will be left in situ for use by the landowners. Any localised sections of track which will be required to be reinstated will have a covering layer of topsoil or peat (depending on adjacent vegetation) being placed on top of the track surface, with vegetated sods used where available. These works will also be in accordance with the requirements of the EIAR, and as per all other works on site will be first agreed with, and supervised by the appointed Environmental Engineer.

The SNH commissioned report no 591 notes that the *"risks associated with leaving tracks in situ are relatively low. If the tracks are not required to be re-used, then localised grading of the road to suit the ground profile followed by reinstatement of topsoil/vegetation layer would be a low risk activity. Consideration and sensitive management of the movement of groundwater and surface water would be important. Similarly, the underlying track, once covered, may drain water from the overlying topsoil and vegetation, and therefore reinstatement may not achieve the desired outcome. This can be managed and engineered to mitigate these risks."*

The following figure is extracted from this SNH report and provides a cross section example of the proposed restoration works.



4.5 Control Building and Compound

The Control Building and Compound will be owned and operated by the ESB once operational and so will not be decommissioned as part of the works, unless required by ESB.

4.6 Internal Underground Electrical & Communication Cables

The key underground cable components to be considered in decommissioning include:

Key Element	Components	Constituents
Internal Underground cables	i. Underground cables, including electrical, earthing, and fibre optic	Copper, aluminium, fibre optic, plastic and rubber sheaths, HDPE ducting

All internal underground cables installed as part of the wind farm development shall be extracted from the ground and disposed of to a licensed recycling facility.

The associated ground disturbance with the removal of the underground cables should be minimal, however these works, like all others, shall be approved and supervised by the appointed Environmental Engineer. The ducts will remain in-situ.

5.0 ENVIRONMENTAL CONTROLS

5.1 Site Drainage

Prior to any decommissioning or restoration works commencing on site, the site drainage network shall be inspected by a SuDS hydrologist, and any necessary repairs to settlement ponds, check dams, etc., shall all be completed to ensure the drainage system is working adequately prior to ground works commencing.

As turbine foundations, crane hardstand areas, access tracks, etc. are being restored, the respective drainage features shall all be filled in and or blocked to prevent any unnecessary dewatering of the restored area. These works shall all be completed under guidance from the site hydrologist and the appointed Environmental Engineer.

5.2 Refuelling; Fuel and Hazardous Materials Storage

The plant and equipment used during decommissioning will require refuelling during the works. Appropriate management of fuels will be required to ensure that incidents relating to refuelling are avoided. The following mitigation measures, which are the same as those proposed for the construction phase, are proposed to avoid release of hydrocarbons at the Site:

- Road-going vehicles will be refuelled off site wherever possible.
- On-site refuelling will be carried out at a designated refuelling area on the Site. Machinery such as cranes will be refuelled directly by a mobile fuel truck that will come to site as required. Drip trays will be used in such circumstances.
- 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.
- Fuel volumes stored on site will be minimised. The fuel storage areas will be bunded to 110% of the storage volume.
- The plant used will be regularly inspected for leaks and fitness for purpose.
- An emergency plan for the decommissioning phase to deal with accidental spillages will be developed. Spill kits will be available to deal with an accidental spillage in and outside the refuelling area.
- A programme for the regular inspection of plant and equipment for leaks and fitness

for purpose will be developed at the outset of the decommissioning phase.

5.3 Dust Control

Dust is unlikely to be generated in significant amounts from on-site activities during decommissioning. The extent of dust generation will depend on the type of activity undertaken, the proximity of activities to receptors and the nature of the dust, i.e., soil, and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Site traffic movements also have the potential to generate dust as they travel along the haul route.

Proposed measures, which are the same as those proposed for the construction phase, to control dust include:

- Any site roads with the potential to give rise to dust will be regularly dampened down, 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 inspected daily by the Site Manager for cleanliness and cleaned if deposits are found.
- Material handling systems and material storage areas influenced by convenience and ease of handling, and peat slippage safety.
- Water misting or sprays will be used in dry and windy if particularly dusty activities are necessary during dry or windy periods.
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles.
- Daily inspection of the site to examine dust measures and their effectiveness.
- When in dry and/or windy weather and dirt is visible on the roads, sections of the haul route will be swept using a truck mounted vacuum sweeper.

5.4 Noise Control

The operation of plant and machinery, including site vehicles, is a source of potential impact that will require mitigation at all locations within the site. Proposed measures, which are the same as those proposed for the construction phase, to control noise include:

- Diesel generators will be enclosed in sound proofed containers to minimise the potential for noise impacts.
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All plant and equipment to be used on-site will be modern equipment and will comply with the S.I. No. 359/1996 - European Communities

(Construction Plant and Equipment) (Permissible Noise Levels) (Amendment) Regulations.

- Regular maintenance of plant will be carried out in order to minimise noise emissions. 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 of the "sound reduced" 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 during those periods when they are not in use.
- Training will be provided by the Site Manager to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation.
- Local areas of the haul route will be condition monitored and maintained, if necessary.

5.5 Invasive Species Management

Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of the wind farm site to identify invasive species where any minor excavation will be required. Any invasive species encountered will be removed based on the advice of the ecologist.

5.6 Traffic Management

A Traffic Management Plan (TMP) will be prepared in advance of any decommissioning works. The traffic management arrangements for the removal of turbines although similar to those that will be implemented for construction materials delivery as outlined in the EIAR and the TMP in **Appendix 14.2**, will be agreed in advance of decommissioning with the competent authority.

The TMP for the decommissioning phase will also include provision for the removal of underground cables from the underground ducts within the Site. Cables in public roads will be left in-situ as they will be the responsibility of the ESB.

5.7 Waste Management Plan

This waste management plan outlines the best practice procedures during the decommissioning of the Development. The Waste Management Plan will outline the methods

of waste prevention and minimisation by recycling, recovery and reuse at each stage of decommissioning. Disposal of waste will be a last resort.

5.7.1 Legislation

The Waste Management Act 1996 as amended 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 Tullaghmore Wind Farm development to provide that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to see 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. Waste removal-related traffic volumes during the decommissioning phase, will be similar or less than those anticipated and assessed for the construction phase.

The Department of the Environment provides a document titled, 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006). No demolition will take place at this site.

5.7.2 Waste Management Hierarchy

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

1. **Prevention and Minimisation:**
   The primary aim of the Waste Management Plan will be to prevent and thereby reduce the amount of waste generated.
2. **Reuse of Waste:**
   No material is likely to be reused on site during the Decommissioning phase. Materials such as cabling will be reused off-site.
3. **Recycling of Waste:**
   There are several established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.
4. **Disposal of Waste to Landfill**
   At all times during the implementation of the Waste Management Plan, disposal of waste to landfill will be considered only as a last resort.

5.7.3 Waste Arising from Decommissioning

The relevant components will be removed from site for re-use, recycling or waste disposal. Any structural elements that are not suitable for recycling will be disposed of in an appropriate

manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the Development are outlined in below.

Waste Types Arising during the Decommissioning Phase

Material Type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminum, lead and iron	17 04 07
Fibreglass	Turbine blade component	10 11 03
Hydrocarbons	Oils and lubricants drained from the turbines	13 01 01,13 02 04

5.7.4 Reuse

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

- Electrical wiring can be reused on similar wind energy projects
- Elements of the turbine components can be reused but this will be determined by the condition that they are in.

5.7.5 Recycling

If a certain type of material cannot be reused, then recycling is the most suitable option. The opportunity for recycling during decommissioning will be limited and restricted to components of the wind turbines.

All wastes will be sorted and segregated on-site during the time of decommissioning. The anticipated volume of all waste material to be generated at the Tullaghnmore Wind Farm development is low which provides the justification for adopting small containers as a method of waste storage.

5.7.6 Environmental Monitoring

In advance of any decommissioning or restoration works commencing on site, an Environmental Engineer shall be appointed to assist with the preparation of all Method Statements associated with the works to occur at the site. The Environmental Engineer shall be retained throughout the site works, providing guidance and instruction throughout, and

independently supervising the works to ensure they are being completed in an environmentally sensitive manner.

Following the completion of the decommissioning and restoration works the Environmental Engineer will survey the entire site and produce a snag list of outstanding items, all of which will be completed by the appointed contractor under the supervision of the Environmental Engineer.

6.0 PROGRAMME FOR DECOMMISSIONING AND RESTORATION

The following is a proposed Decommissioning and Restoration Programme:

- 6 no. wind turbine generators — 4 Weeks
- 6 no. wind turbine foundations — 4 Weeks
- 6 no. hardstand areas & access tracks — 2 Weeks
- Control building and compound, underground cable, and site drainage — 3 Weeks

Decommissioning and restoration works shall commence following the expiration of a period of 35 years from the commencement of electricity generation, or upon the expiration of a period of 12 months following the cessation of electricity generation at the site.

7.0 DECOMMISSIONING & RESTORATION PLAN REVIEW PERIOD

The Decommissioning & Restoration Plan shall be reviewed prior to the commencement of any decommissioning and restoration works to ensure that all applicable best practice guidance, which may have been introduced in the intervening period, has been considered.