



APPENDIX 4-7

SURFACE WATER MANAGEMENT PLAN



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Prepared By: **MKO
Tuam Road
Galway
Ireland
H91 VW84**



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APPENDICES

Appendix A - Schedule of Works Operating Record (SOWOR)

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1.

INTRODUCTION

This Surface Water Management Plan (SWMP) is intended, as an accompanying document to the Construction and Environmental Management Plan (CEMP), to compile the proposed surface water drainage control and treatment measures, set out in the Chapter 4 and Chapter 9 of the Environmental Impact Assessment Report (EIAR), and the proposed surface water monitoring programme, in a single document. This SWMP will require updating by the selected contractor in order to identify, assess and satisfy the contract performance criteria as set out by the various stakeholders. The SWMP due to its structure and nature will also require constant updating and revision throughout the construction period as set out below. Therefore, this is a working document and will be developed further prior to and during the construction phase of the Proposed Project.

This SWMP draws and expands on information already provided in Chapter 4 and Chapter 9 of the EIAR and Section 3.2 of the CEMP (Appendix 4-5 of the EIAR). This SWMP has been divided into three sections, as listed below:

- › Surface Water Drainage Design;
- › Surface Water Drainage Management;
- › Surface Water Monitoring Programme.

For the purposes of this EIAR:

- › Where the 'Proposed Wind Farm' is referred to, this refers to turbines and associated foundations and hardstanding areas, including access tracks, underground cabling, permanent meteorological mast, temporary construction compound, peat and spoil management, biodiversity enhancement, tree felling, site drainage, operational stage signage, turbine delivery route and junction accommodation works and all ancillary works and apparatus. The Proposed Wind Farm is described in detail in Chapter 4, Section 4.4.1 of this EIAR.
- › Where the 'Proposed Grid Connection' is referred to, this refers to the proposed 110kV onsite substation, underground 110kV cabling and end masts connecting the proposed 110kV substation to the 110kV Castlebar to Cloon overhead line, access tracks and all ancillary works and apparatus. The Proposed Grid Connection Route is described in detail in Chapter 4, Section 4.4.2 of this EIAR.
- › Where the 'Proposed Project' is referred to, this encompasses the entirety of the project (Proposed Wind Farm and Proposed Grid Connection) for the purposes of this EIA in accordance with the EIA Directive. The Proposed Project is described in detail in Chapter 4 of this EIAR.
- › Where 'the Site' is referred to, this relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary in green as shown on Figure 1-2 of the EIAR and encompasses an area of approximately 165 hectares.

1.1

Statement of Authority

This document was prepared by Joye Atkinson reviewed by Natalia Stolarska and Órla Murphy, all of MKO.

Joye is a Graduate Environmental Scientist with MKO and holds a BSc (Hons) in Social Science from University College Dublin. Prior to joining MKO, she completed a one-year internship with RMLA Planning, where she contributed to a range of projects across both the public and private sectors. At MKO, Joye's work focuses on report writing, EIAR chapter preparation, and GIS-based mapping. She has contributed to multiple onshore wind projects across Ireland, supporting both technical analysis and environmental assessment.

In her role as a project manager, Natalia Stolarska is a Project Environmental Scientist who has been working with MKO since 2023. Natalia holds a BSc in Earth and Ocean Science and an MSc in Environmental Leadership. Natalia's key strengths and areas of expertise are in drafting EIAR report chapters, environmental impact assessment screening reports, wind farm feasibility studies and QGIS mapping. Since joining MKO in September 2023, Natalia has been involved in a range of wind farm projects, assisting with field work, client briefing notes, constraints mapping and drafting EIAR chapters, with more projects in the pipeline.

Órla works with and co-ordinates large multidisciplinary teams including members from MKO's Environmental, Planning, Ecological and Ornithological departments as well as sub-contractors from various fields in the preparation and production of EIARs. Órla Murphy is a Senior Environmental Scientist with McCarthy Keville O'Sullivan Ltd. with over 10 years of experience in private consultancy. Órla holds a BSc (Hons) in Geography from Queens University Belfast & a MSc in Environmental Protection and Management from the University of Edinburgh. Órla's key strengths and areas of expertise are in Environmental Protection and Management, EIA, Project Management, Renewable Energy and Peatland Management, where she has carried out research projects and site work relating to restoration and management of peatland sites in both Scotland and Northern Ireland. On joining MKO Órla has been involved on a range of renewable energy infrastructure projects.

This document has also benefited from input by Michael Gill and Conor McGettigan and Nitesh Dalal, all of Hydro-Environmental Services (HES). Michael, Nitesh and Conor are the authors of Chapter 9: Water of this EIAR. Michael and Conor also designed the proposed drainage plan for the Proposed Project that was submitted as part of the planning application.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous geological, hydrological and hydrogeological impact assessments of wind farms and renewable projects on peatlands in Ireland. He has substantial experience in surface water drainage design and SUDs design, flood modelling, and surface water/groundwater interactions. For example, Michael has worked on the EIS for Carrownagowan WF, Oweninny WF, Cloncreen WF, and Yellow River WF, and over 100 other wind farm-related projects.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with over 3 years' experience in environmental consultancy in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor has prepared the Land, Soils and Geology and Hydrology and Hydrogeology Chapters for numerous wind farm EIAR projects. Conor routinely completes Flood Risk Assessments for a wide variety of projects including wind farms, quarries and proposed residential developments.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India. Nitesh holds a M.Sc. in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016). Nitesh has been involved in the preparation of the land, soils and geology chapters of environmental impact assessment reports for several renewable energy developments. Nitesh has worked on the EIARs for several wind farms projects across the country, including Gannow Renewable Energy Development and Littleton Wind Farm.

2.

SURFACE WATER DRAINAGE DESIGN

The drainage design for the Proposed Project has been prepared by Conor McGettigan and Nitesh Dalal of HES and by the firm's principal, Michael Gill. HES are the authors of the Water chapter of the EIAR (EIAR Chapter 9) and have designed the drainage plan for the Proposed Project based on experience of HES on other wind farm sites, and a number of best practice guidance documents referred to in the References section of EIAR Chapter 9: Water.

The protection of the watercourses within and surrounding the Site, and downstream catchments that they feed is important to establish the most appropriate drainage proposals for the Proposed Project.

2.1

Existing Drainage Features

The central section of the Site drains towards Drumady Lough situated immediately to the southeast. A mixture of peat and agricultural drainage systems direct drainage towards this lake. A stream outfall from this lake and flows to the south into the River Robe. The southern section of the Site drains towards the Meander River. This area is predominantly comprised of a peat drainage network that directs surface run off towards Lough Nambrackkeagh which is the source of the EPA mapped Meander River. The north of the Site is also drained by a network of manmade drainage features which direct water to the north towards Lough Fark.

In places the natural drainage is further facilitated by a network of manmade drains. The nature of these manmade drains depends on the local land use and comprise of agricultural field drains or forestry drains. Drains are also present in the peat areas where turbary cutting has been taking place.

The forestry plantations within the Site are generally drained by a network of mound drains which typically run perpendicular to the topographic contours of the Site and feed into collector drains, which discharge to interceptor drains down-gradient of the plantation. Mound drains and ploughed ribbon drains are generally spaced approximately every 15m and 2m respectively. Interceptor drains are generally located up-gradient (cut-off drains) and down-gradient of forestry plantations. A schematic of a typical standard forestry drainage network and one which is representative of the Site drainage network is shown in Chapter 9, Figure 9-5. The forestry drains are the primary drainage routes towards the natural streams, but the flows in the higher elevated drains are generally very low or absent most of the time.

2.2

Drainage Design Principles

The key principles of drainage design that will be implemented and adhered to as part of the Proposed Project are as follows:

- › Keep clean water clean by intercepting it where possible, upgradient of works areas, and divert it around the works areas for discharge/recharge to ground;
- › Collect potentially silt-laden runoff from works areas via downgradient collector drains and manage via series of avoidance, source, in-line treatment and discharge to ground via infiltration drains and infiltration areas;
- › There is no direct hydraulic connectivity from proposed construction areas to natural watercourses or drains connecting to downstream watercourses;
- › Maintain the existing hydrology/hydrogeology of the site;
- › Re-routing existing local drainage pathways as required; and
- › Daily inspection and recording of surface water management system by on-site Environmental Clerk of Works (EnvCoW) and immediate remedial measures to be carried out as required and works temporarily ceased if a retained stormwater/sediment load is identified to have the potential to migrate from the site.

Runoff control and drainage management are key elements in terms of mitigation against impacts on surface water bodies. Two distinct methods will be employed to manage drainage water within the Site. The first method involves ‘keeping clean water clean’ by avoiding disturbance to existing drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas. The second method involves collecting any drainage waters from works areas within the Site that might carry silt or sediment, and nutrients, to route them towards new proposed silt traps and settlement ponds (or stilling ponds) prior to controlled diffuse release into the existing drainage network. There will be no discharge of untreated or unattenuated water to the existing hydrological features (forestry and agricultural drains or natural watercourses).

The general design approach to wind farm layouts is to utilise and integrate with the existing drainage infrastructure where possible whether it be existing access tracks or the existing forestry / peat / agricultural drainage network. Utilising the existing infrastructure means that there will be less of a requirement for new construction/excavations which have the potential to impact on downstream watercourses in terms of suspended solid input in runoff (unless managed appropriately). The existing forestry and agricultural drains have no major ecological or hydrological value and can be readily integrated into the Proposed Project drainage scheme.

A schematic line drawing of the proposed drainage design is presented Figure 2-1.

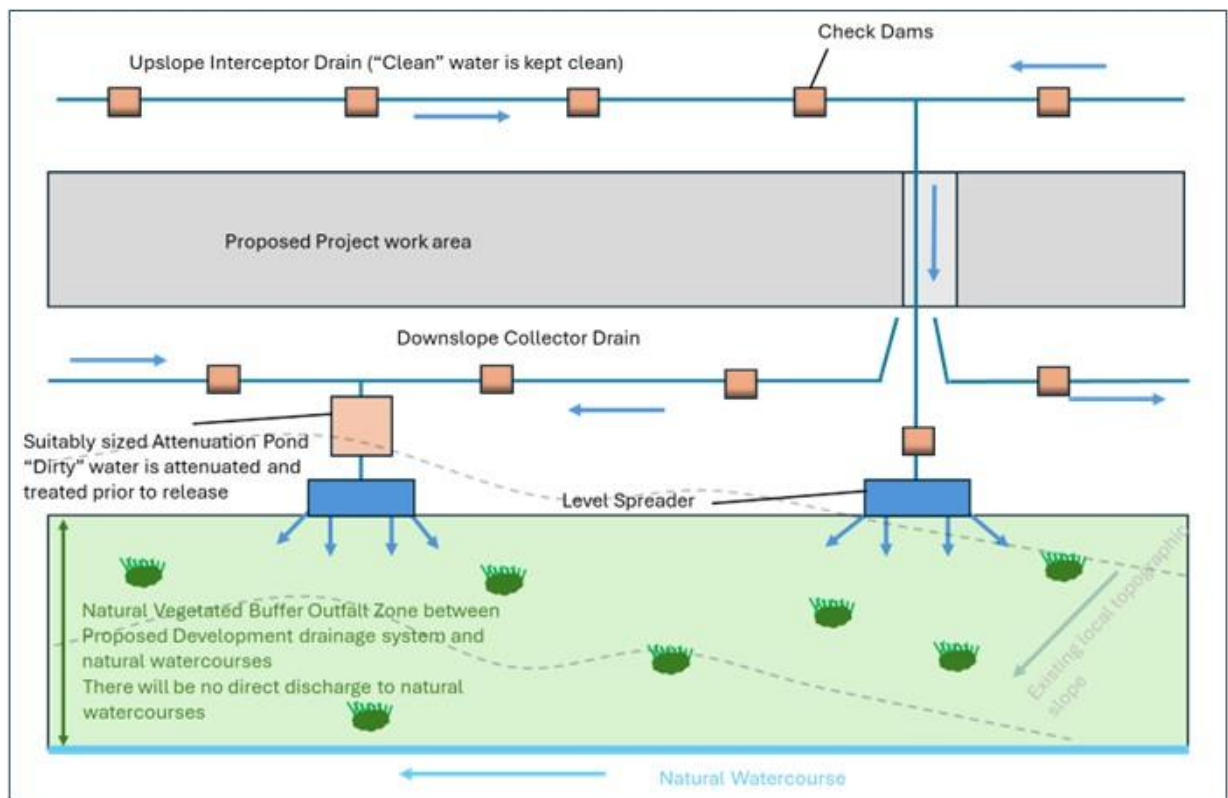


Figure 2-1 Proposed Project Drainage Process Flow

During the construction phase, all runoff from works areas (i.e., dirty water) will be attenuated and treated prior to being released within the Proposed Project site. All drainage outfall from the Proposed Project site is routed through existing settlement ponds that remain in situ from the previous site use.

Comprehensive surface water mitigation and controls are outlined below to ensure protection of all downstream receiving waters. Mitigation measures will ensure that surface runoff from the developed areas of the Site will be of a high quality and will therefore not impact on the quality of downstream surface water bodies.

2.3

Best Practice Guidance

The drainage design presented in the EIAR and planning application documents has been prepared based on experience of the project team of other renewable energy sites in similar environments, and a number of best practice guidance documents.

To achieve best practice in terms of water protection through construction management, the detailed drainage design and all drainage management proposals shall be prepared in accordance with guidance contained in the following:

- › Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- › Environmental Protection Agency (2022): Guidelines on the information to be contained in Environmental Impact Assessment Reports;
- › European Commission (2017): EIA Guidance – EIA Report;
- › Institute of Geologists Ireland (2013) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- › DoE/NIEA (2015): Wind farms and groundwater impacts - A guide to EIA and Planning considerations;
- › OPW (2009) The Planning System and Flood Risk Management;
- › National Roads Authority (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- › Wind Energy Development Guidelines for Planning Authorities, 2006 (the DoEHLG 2006 Guidelines) and the Draft Revised Wind Energy Development Guidelines (Draft DoHLGH 2019 Guidelines);
- › Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- › Good Practice During Wind Farm Construction (Scottish Natural Heritage, 2010);
- › PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- › PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);
- › CIRIA (Construction Industry Research and Information Association) Guidance on ‘Control of Water Pollution from Linear Construction Projects’ (CIRIA Report No. C648, 2006);
- › Wind Farms and Groundwater Impacts: A guide to EIA and Planning considerations (DoE/NIEA, April 2015);
- › Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2001;
- › Land Types for Afforestation (Forest Service, 2016b);
- › Forest Protection Guidelines (Forest Service, 2002);
- › Forest Operations and Water Protection Guidelines (Coillte, 2013);
- › Forestry and Water Quality Guidelines (Forest Service, 2000b); and,
- › Forests and Water, Achieving Objectives under Ireland’s River Basin Management Plan 2018-2021 (DAFM, 2018).

2.4

Drainage System

The early establishment of the drainage system outlined in Section 2.5 below will manage the risk of impacts on watercourses on and adjacent to the Site during construction. In addition, construction operations will adopt best working practices, and the development of the Site will be phased accordingly.

The construction of the drainage will start from the downstream sections and progress upstream, connecting conveyance systems with other drainage features as each development phase progresses.

They have therefore been designed with sufficient capacity to respond to an early phase incoming flow during the construction phase.

The implementation of a Scheduling of Works Operating Record (SOWOR) prior to commencement will provide a series of pre-commencement triggers which set out specific conditions which will be met before the commencement of works in particularly sensitive areas. These pre-commencement triggers will apply to the installation of any drainage infrastructure. An example of a SOWOR that will be developed by the EnvCoW is included in Appendix B.

The detailed drainage measures proposed to address surface water management based upon the design criteria and philosophy will be implemented. The drainage system will be excavated and constructed in conjunction with the access track and hard standing construction. Drains will be excavated, and settlement ponds constructed to eliminate any suspended solids within surface water running off the site.

2.5 Surface Water Drainage Measures

2.5.1.1 Interceptor Drains

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

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains could be removed. At that stage, there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct access tracks, turbine bases or hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to allow water to infiltrate the subsurface of these constructed areas. It is not anticipated that access tracks or other installed Site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. Where the drains are to be removed, they will be backfilled with the material from the diversion dike. Interceptor drains may have to be retained in certain locations, for example where access tracks are to be installed on slopes, to prevent the access tracks acting as conduits for water that might infiltrate the access track sub-base. In these cases, interceptor drains would be maintained in localised areas along the access track with culverts under the access track, which would allow the intercepted water to be discharged to vegetation filters downgradient of the access track. Similarly, in localised hollows where water is likely to be funnelled at greater concentrations than on broader slopes, interceptor drains and culverts may be left in situ following construction. Figure 2-2 below shows an illustrative drawing of an interceptor drain.

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

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

2.5.1.2 Swales

Drainage swales are shallow drains that will be used to intercept and collect run off from construction areas of the Site during the construction phase. Drainage swales will remain in place to collect runoff from access tracks and hardstanding areas of the Proposed Project during the operational phase. A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Swales are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains and collector drains described above. Figure 2-2 below, shows an illustrative example of a drainage swale.

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

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

2.5.1.3 Check Dams

The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale is non-erosive.

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

The proposed check dams will be made up of straw bales or stone, or a combination of both depending on the size of the drainage swale it is being installed in. Where straw bales are to be used, they will be secured to the bottom of the drainage swale with stakes. Clean 4–6-inch stone will be built up on either side and over the straw bale to a maximum height of 600mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the drainage swale with the bucket of an excavator. Figure 2-2, below, shows illustrative examples of check dams.

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

Check dams will be used in artificial drainage channels and interceptor drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

2.5.1.4 Level Spreaders

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

The water carried in interceptor drains will not have come in contact with works areas of the Site and therefore should be free of silt and sediment. The level spreaders will distribute clean drainage water onto vegetated areas where the water will not be reconcentrated into a flow channel immediately below the point of discharge. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion. Figure 2-2, below, shows an illustrative example of a level spreader.

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

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

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

2.5.1.5 Piped Slope Drains

Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.

The piped slope drains will be semi-rigid corrugated pipes with a stabilised entrance and a rock apron at the outlet to trap sediment and dissipate the energy of the water. The base of drains leading into the top of the piped slope drain will be compacted and concavely formed to channel the water into the corrugated pipe. The entrance at the top of the pipe will be stabilised with sandbags if necessary. The pipe will be anchored in place by staking at approximately 3-4 metre intervals or by weighing down with compacted soil. The bottom of the pipe will be placed on a slope with a grade of less than 1% for a length of 1.5 metres, before outflowing onto a rock apron.

The rock apron at the outlet will consist of 6-inch stone to a depth equal to the diameter of the pipe, a length six times the diameter of the pipe. The width of the rock apron will be three times the diameter of the pipe where the pipe opens onto the apron and will fan out to six times the diameter of the pipe over its length. Figure 4-36, below, shows a diagrammatic example of a piped slope drain and rock apron.

Piped slope drains will only remain in place for the duration of the construction phase of the Proposed Project. On completion of the works, the pipes and rock aprons will be removed, and all channels backfilled with the material that was originally excavated from them.

Piped slope drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockages. Stake anchors or fill over the pipe will be checked for settlement, cracking, and stability. Any seepage holes where pipe emerges from the drain at the top of the pipe will be repaired promptly.

2.5.1.6 Vegetation Filters

Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.

Vegetation filters will carry outflow from the level spreaders as overland sheet flow, removing any suspended solids and discharging to the groundwater system by diffuse infiltration.

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

2.5.1.7 Stilling Ponds (Settlement Ponds)

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

Stilling ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond. The points at which water enters and exits the stilling ponds will be stabilised with rock aprons, which will trap sediment, dissipate the energy of the water flowing through the stilling pond system, and prevent erosion. The primary stilling pond will reduce the velocity of flows to less than 0.5 metres per second to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond via another rock apron. The secondary stilling pond will reduce the velocity of flows to less than 0.3 metres per second. Water will flow out of the secondary stilling pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out. Figure 2-2 below, shows an illustrative example of a stilling pond system.

Water will flow by gravity through the stilling pond system. The stilling ponds will be sized according to the size of the area they will be receiving water from but will be sufficiently large to accommodate peak flows storm events. The settlement ponds will be designed for 11hr and 24hr retention times used to settle out medium silt (0.006mm) and fine silt (0.004mm) respectively (EPA, 2006)¹. The stilling ponds will be dimensioned so that the length to width ratio will be greater than 2:1, where the length is the distance between the inlet and the outlet. Where ground conditions allow, stilling ponds will be constructed in a wedge shape, with the inlet located at the narrow end of the wedge. Each stilling pond will be a minimum of 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume.

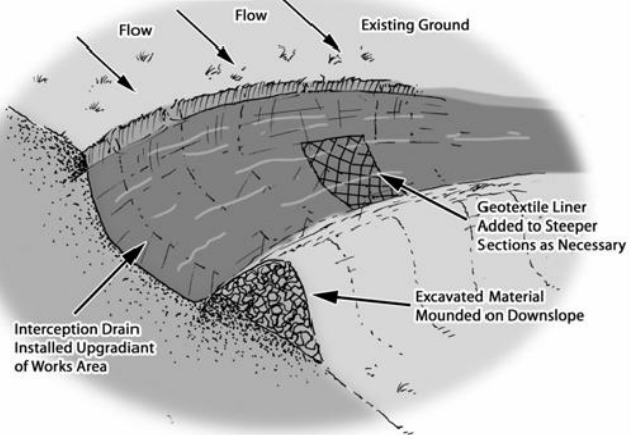
¹ Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006)

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

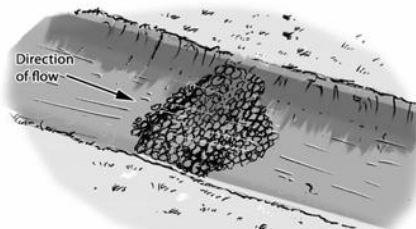
Stilling ponds will be located towards the end of swales, close to where the water will be reconverted to diffuse sheet flow. Upon exiting the stilling pond system, water will be immediately reconverted to diffuse flow via a fan-shaped rock apron if adequate space and ground conditions allow. Otherwise,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

A water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the stilling pond capacity. Sediment will be cleaned out of the stilling pond when it exceeds 10% of pond capacity. Stilling ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows. An illustration of a stilling pond is shown in Figure 2-2.

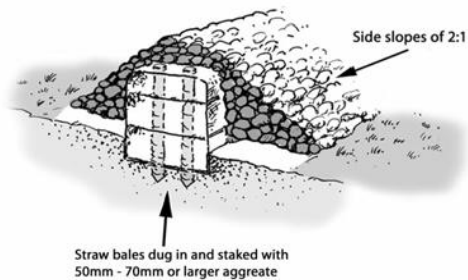
Interceptor Drain



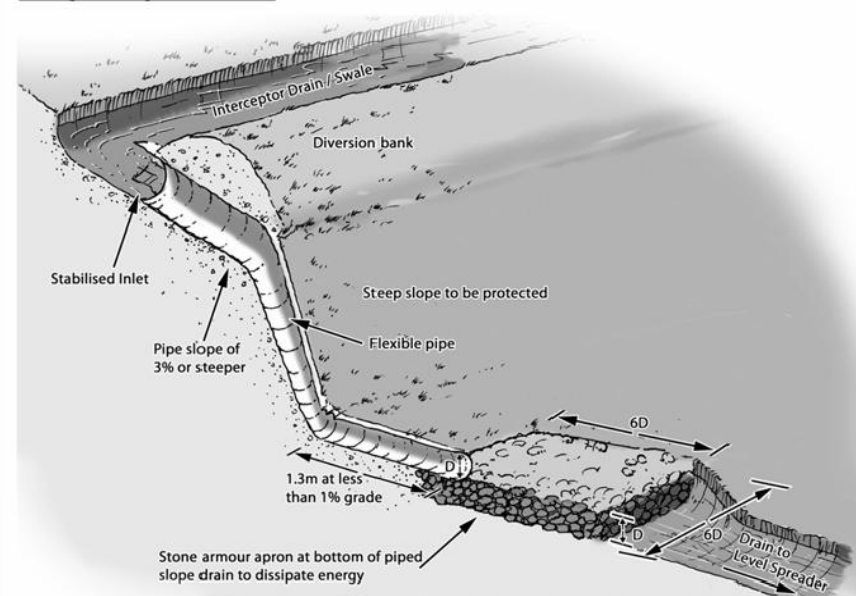
Check Dam (Stone Dam in Drain)



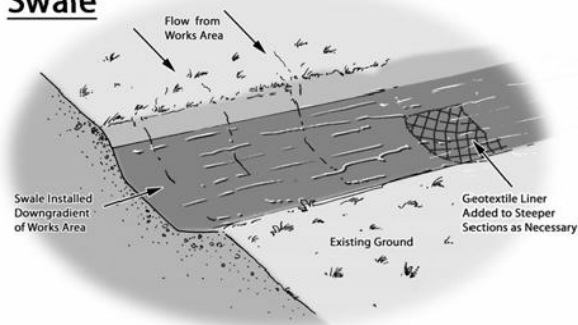
Check Dam (Straw Bale & Stone Dam - Cross Section)



Slope Pipe Drain

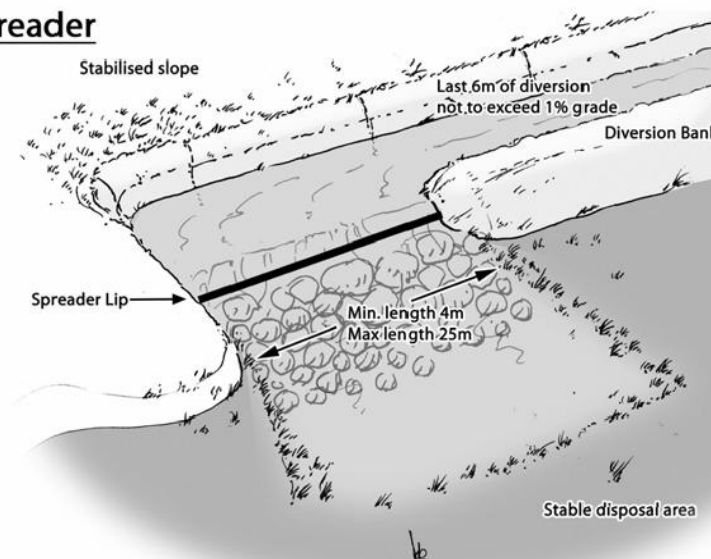


Swale

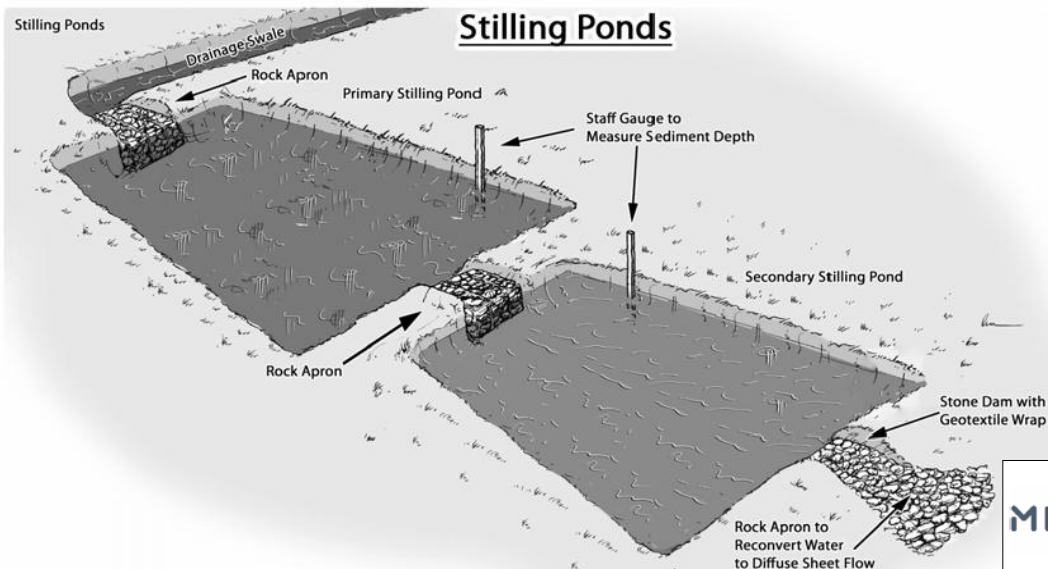


Drainage Design Measures

Level Spreader



Stilling Ponds



MAP TITLE: Drainage Design Measure Illustrations	MAP NO.: Figure 2-2	SCALE: NTS
PROJECT TITLE: Cunlaghfadda Green Energy Project	DATE: 05.05.2026	
DRAWING BY: Natalia Stolarska	CHECKED BY: Órla Murphy	ISSUE NO: 220825
McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C. Moneenageisha Road, Galway, Ireland. Email: info@mccarthynos.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279		

2.5.1.8 Siltbuster

A “siltbuster” or similar equivalent piece of equipment will be available to filter any water pumped out of excavation areas, if necessary, prior to its discharge to stilling ponds or swales.

Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction sites.

The unit stills the incoming water/solids mix and routes it upwards between a set of inclined plates for separation. Fine particles settle onto the plates and slide down to the base for collection, whilst treated water flows to an outlet weir after passing below a scum board to retain any floating material. The inclined plates dramatically increase the effective settling area of the unit giving it a very small footprint on site and making it highly mobile. Figure 2-3 below shows an illustrative diagram of the Siltbuster.

The Siltbuster units are now considered best practice for the management of dirty water pumped from construction sites. The UK Environment Agency and the Scottish Environmental Protection Agency have all recommended/specified the use of Siltbuster units on construction projects.

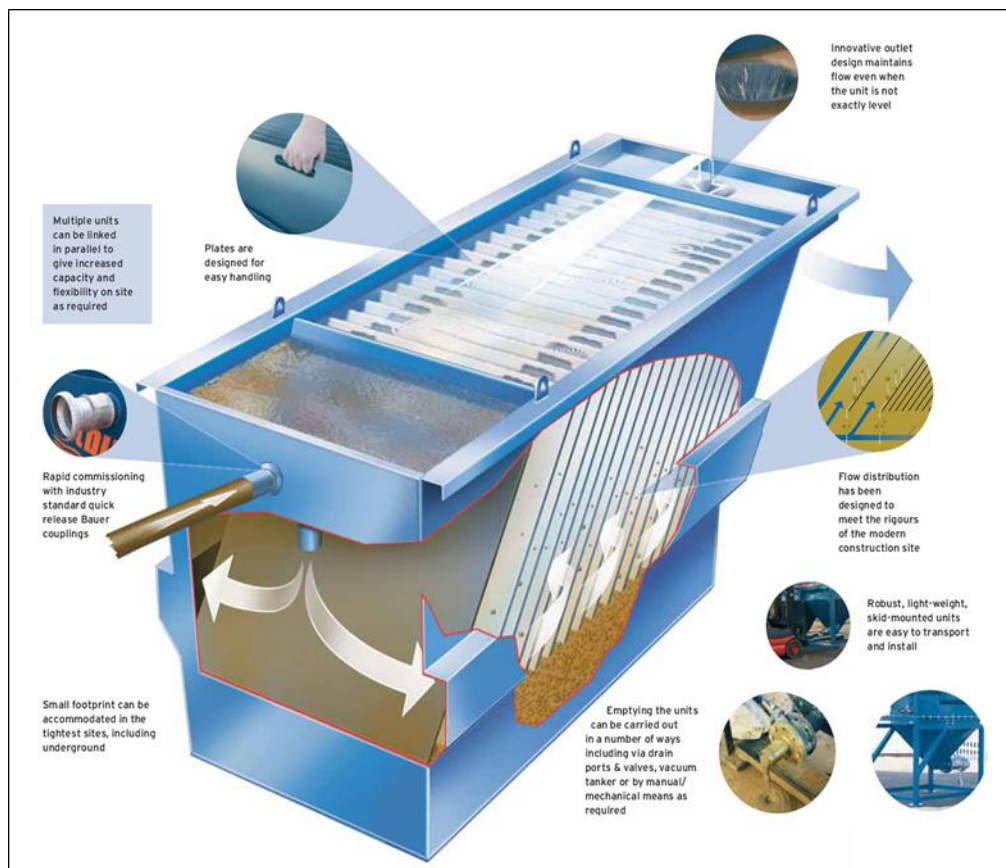


Figure 2-3 Siltbuster (Source: https://www.siltbuster.co.uk/sb_prod/siltbuster-fb50-settlement-unit/)

2.5.1.9 Silt Bags

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

Dewatering silt bags are an additional drainage measure that can be used downgradient of the stilling ponds at the end of the drainage swale channels and will be located, wherever it is deemed

appropriate, throughout the Site. The water will flow, via a pipe, from the stilling ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of silt into the outflow.

The dewatering silt bag that will be used will be approximately 3 metres in width by 4.5 metres (see Plate 2-1 and Plate 2-2 below) in length and will be capable of trapping approximately four tonnes of silt. The dewatering silt bag, when full, will be removed from Site by a waste contractor with the necessary waste collection permit, who will then transport the silt bag to an appropriate, fully licensed waste facility.



Plate 2-1 Silt Bag with water being pumped through



Plate 2-2 Silt bag under inspection

2.5.1.10 Sedimats

Sediment entrapment mats (see Plate 2-3 and Plate 2-4 below), consisting of coir or jute matting, will be placed at the outlet of the silt bag to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.



Plate 2-3 Typical Sedimat Details (Source: <https://www.hy-tex.co.uk/>)



Plate 2-4 Typical Sedimat Details (Source: <https://www.hy-tex.co.uk/>)

2.5.1.11 Culverts

1 no. existing culvert crossings will require upgrading as part of the Proposed Project, this being along the upgrade of the L15053 public road section within the Site. 2 no. new culvert crossings will also be required for the Proposed Project, the first being at the operational site entrance and the second new culvert crossing being along the new access track north of T3. Please see Appendix 4-4 Drainage Design for exact locations of new culvert crossings and location of upgrade to existing culvert.

Furthermore, as part of the accommodation works required for the turbine delivery route, an extension of an existing culvert along a small stream on the junction between the L1505 and L1506 will be required.

All new proposed culverts and proposed culvert upgrades will be suitably sized for the expected peak flows in the watercourse.

Some culverts may be installed to manage drainage waters from works areas of the Proposed Project, particularly where the waters have to be taken from one side of an existing access track to the other for discharge. The size of culverts will be influenced by the depth of the track sub-base. In some cases, two or more smaller diameter culverts may be used where this depth is limited, though this will be avoided as they will have a higher associated risk of blockage than a single, larger pipe. In all cases, culverts will be oversized to allow mammals to pass through the culvert.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the access track at the necessary invert level to ensure ponding or pooling does not occur above or below the culvert and water can continue to flow as necessary.

All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

2.5.1.12 Silt Fences

Silt fences will be installed as an additional water protection measure around existing culverts, natural and / or man-made drainage features where required and the proposed locations are indicated on the drainage design drawings included in Appendix 4-4 of this EIAR.

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

All silt fencing will be formed using Terrastop Premium or equivalent silt fence product.

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

2.5.1.13 Hydrocarbon Interceptors

A hydrocarbon (or petrol) interceptor is a trap used to filter out hydrocarbons from surface water runoff. A suitably sized hydrocarbon interceptor will be installed wherever it is intended to store hydrocarbons and oils (i.e., construction compound and substation compound) or where it is proposed to park vehicles during the construction and operational phases of the Proposed Development (i.e., construction compound and substation compound).

2.5.1.14 Tree Felling Drainage

Tree felling will be required within and around the Proposed Project footprint to allow for the construction of the proposed turbines, access tracks, underground cabling, and the other ancillary infrastructure. The felling will not be undertaken simultaneously with construction groundworks. Keyhole felling to facilitate construction works will take place prior to groundworks commencing.

During tree felling there is a potential to generate silts and sediments in surface water runoff due to tracking of machinery and disturbance of the ground surface etc, however mitigation is provided in Chapter 9 Water with regard to surface water quality protection for this activity which is summarised below. Also, prior to the commencement of tree felling for subsequent access track construction the following key temporary drainage measures will be installed:

- › All existing dry forestry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using forestry check dams/silt traps;
- › Clean water diversion drains will be installed upgradient of the works areas;
- › Check dams/silt fence arrangements (silt traps) will be placed in all existing forestry drains that have surface water flows and also along existing forestry trackside drains; and,
- › A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone.

Before the commencement of any felling works, an Environmental Clerk of Works (ECoW) shall be appointed to oversee the keyhole and extraction works. The ECoW shall be experienced and competent, and shall have the following functions and operate their record using a Schedule of Works Operation Record (SOWOR), as proposed in the planning application:

- › Attend the Site for the setup period when drainage protection works are being installed and be present onsite during the remainder of the forestry keyhole felling works.
- › Prior to the commencement of works, review and agree the positioning by the Operator of the required Aquatic Buffer Zones (ABZs) i.e., 10m drainage and 50m watercourse where required, silt traps, silt fencing (see below), water crossings and onsite storage facilities for fuel, oil and chemicals (see further below).

- Be responsible for preparing and delivering the Environmental Tool Box Talk (TBT) to all relevant parties involved in site operations, prior to the commencement of the works.
- Conduct daily and weekly inspections of all water protection measures and visually assess their integrity and effectiveness in accordance with Section 3.4 (Monitoring and Recording) and Appendix 3 (Site Monitoring Form (Visual Inspections)) of the Forestry & Freshwater Pearl Mussel Requirements.
- Take representative photographs showing the progress of operations onsite, and the integrity and effectiveness of the water protection measures.
- Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements:
 - Surface water samples shall be collected upstream and downstream of the keyhole felling at suitable sampling locations.
 - Sampling shall be taken from the stream / riverbank, with no in-stream access permitted.
 - The following minimum analytical suite shall be used: pH, EC, TSS, BOD, Total P, Ortho-P, Total N, and Ammonia.
- Review of operator's records for plant inspections, evidence of contamination and leaks, and drainage checks made after extreme weather conditions.
- Prepare and maintain a contingency plan.
- Suspend work where potential risk to water from siltation and pollution is identified, or where operational methods and mitigation measures are not specified or agreed.
- Prepare and maintain a Water Protection Measure Register. This document is to be updated weekly by the ECoW.

To protect downstream watercourses, the following measures will be adhered to during all keyhole/tree felling activities.

- All relevant measures, best practice methods and requirements set out in Chapter 9 of the EIAR will be adhered to including Forestry & Water Quality Guidelines, Forest Harvesting & the Environment Guidelines and the Forest Protection Guidelines.
- The extent of all necessary tree felling will be identified and demarcated with markings on the ground in advance of any felling commencing.
- All access tracks and culverts will be inspected prior to any machinery being brought on Site to commence the felling operation. Vehicles will only use existing access track infrastructure.
- Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt traps will be constructed to ensure collection of all silt within felling areas. These temporary silt traps will be cleaned out and backfilled once felling works are complete. This ensures there is no residual collected silt remaining in blocked drains after felling works are completed. No direct discharge of such drains to watercourses will occur from within felling areas.
- New collector drains and sediment traps will be installed during ground preparation to intercept water upgradient of felling areas and divert it away. Collector drains will be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities.
- All silt traps will be sited outside of buffer zones and have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of away from all aquatic zones.
- All new collector drains will taper out before entering the aquatic buffer zone to ensure the discharging water gently fans out over the buffer zone before entering the aquatic zone.

- › Machine combinations, such as mechanical harvesters or chainsaw felling will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance.
- › Mechanised operations will be suspended during and immediately after heavy rainfall.
- › Where brash is required to form brash mats, it is to be laid out at harvesting stage to prevent soil disturbance by machine movement.
- › Brash which has not been pushed into the soil may be moved within the Site to facilitate the creation of mats in more demanding locations.
- › Felling will be planned to minimise the number of machine passes in any one area.
- › Extraction routes, and hence brash mats, will be aligned parallel to the ground contours where possible.
- › Harvested timber will be stacked in dry areas, and outside any watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage sites.
- › Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but removing of natural debris deflectors will be avoided.

2.5.1.15 Cable Trench Drainage

Cable trenches are typically constructed in short, controlled sections, thereby minimising the amount of ground disturbed at any one time and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences. This operation normally occurs over a period of 2-4 hours.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the up-gradient side of the trench and is temporarily sealed/smoothed over, using the back of the excavator bucket. Should any rainfall cause runoff from the excavated material, the material is therefore collected and contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the Proposed Project, would be transported to one of the on-site designated spoil management areas or used for landscaping and reinstatement of other areas elsewhere on-site.

3.

SURFACE WATER DRAINAGE MANAGEMENT

The following sections set out the drainage management arrangements in terms of pre-construction, construction, operational and decommissioning phases of the Proposed Project.

3.1.1

Good Environmental Management During Construction

Timing of works can strongly influence the potential for damaging the freshwater environment. Operations during wetter periods of the year pose a significantly greater risk of causing erosion and siltation, which can be particularly severe following major rainfall or snowmelt events. Traditionally, wind farm construction undertaken during the drier summer months would result in significantly less erosion and siltation. Construction activities in the hydrological buffer zones within the Site shall be avoided during or after prolonged rainfall or an intense rainfall event and work will cease entirely near watercourses when it is evident that water quality is likely to be impacted. The design of the Proposed Project (Proposed Wind Farm and Proposed Grid Connection) has avoided the crossing of EPA mapped watercourses on site. There is one EPA mapped watercourse adjacent to the Site, this being the Meander River which at its nearest point is located c.372m southwest of T5. No works are proposed within the 50m hydrological buffer associated with this watercourse. Therefore, there will be minimal impacts on watercourses.

3.2

Drainage Measure Implementation and Management

3.2.1

Proposed Drainage Management

Runoff control and drainage management are key elements in terms of mitigation against impacts on surface water bodies. Two distinct methods will be employed to manage drainage water within the Site. The first method involves 'keeping clean water clean' by avoiding disturbance to existing drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas. The second method involves collecting any drainage waters from works areas within the Site that might carry silt or sediment, and nutrients, to route them towards new proposed silt traps and settlement ponds (or stilling ponds) prior to controlled diffuse release into the existing drainage network. There will be no discharge of untreated or unattenuated water to the existing hydrological features (forestry and agricultural drains or natural watercourses).

During the construction phase, all runoff from works areas (i.e. dirty water) will be slowed down and treated to a high quality prior to being released.

It should be noted for this Site that an extensive network of forestry and access track drains already exists, and these will be integrated and enhanced as required and used within the wind farm development drainage system. The integration of the existing forestry drainage network and the proposed wind farm network is relatively simple. The key elements being the upgrading and improvements to existing water treatment elements, such as in line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls.

A detailed drainage plan showing the layout of the proposed drainage design elements during construction and operation is shown in Appendix 4-4 of the EIAR.

3.2.2 Pre-Construction Drainage

Prior to the commencement of access track upgrades (or new access track/hardstand or turbine base installs) the following key temporary drainage measures will be installed:

- All existing dry forestry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using forestry check dams/silt traps;
- Clean water interceptor drains will be installed upgradient of the works areas;
- Check dams/silt fence arrangements (silt traps) will be placed in all existing forestry drains that have surface water flows and also along existing forestry trackside drains; and,
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone.

Refer to the drainage plan (Appendix 4-4) for the location of these temporary measures.

Surface water drainage measures, pollution control and other preventative measures have been incorporated into the project design to minimise significant effects on water quality (surface and groundwater), downstream designated sites and water resources. A self-imposed 50m watercourse buffer and a 100m lake buffer were used during the design of the Proposed Project, thereby largely avoiding sensitive hydrological features. Being that there are no watercourses within the footprint of the Proposed Project, there will be minimal impacts on watercourses.

Natural drainage will be further facilitated by a network of manmade drains. The nature of these manmade drains depends on the local land use and comprise of agricultural field drains or forestry drains. As stated above, the central section of the Site drains towards Drumady Lough situated immediately to the southeast. A mixture of peat and agricultural drainage systems direct drainage towards this lake. A stream outfalls from this lake and flows to the south into the River Robe. The southern section of the Site drains towards the Meander River. This area is predominantly comprised of a peat drainage network that directs surface run off towards Lough Nambrackkeagh which is the source of the EPA mapped Meander River. The north of the Site is also drained by a network of manmade drainage features which direct water to the north towards Lough Fark.

There will be no direct discharges to natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made over vegetated filters at an appropriate distance from natural watercourses. Buffer zones around the existing natural drainage features have informed the layout of the Proposed Wind Farm Site and are indicated on the drainage design drawings.

3.2.3 Construction Phase Drainage

The key principles of drainage design that will be implemented and adhered to as part of the Proposed Project are detailed in Section 2.2 above with the proposed drainage infrastructure within the Proposed Wind Farm being detailed in Section 2.5 above. A preliminary drainage design for the Proposed Project, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in the drainage figures included in Appendix 4-4 of this EIAR.

The Appointed Contractor, with input from the Project Hydrologist will complete a detailed drainage design and maintenance plan before construction commences and will attend the Site to set out and assist with micro-siting of proposed drainage controls as outlined in Section 4.9 in Chapter 4 of the EIAR. The drainage system will be excavated and constructed in conjunction with the access track and hard standing construction.

No new crossings of natural watercourse are required within the Site as part of the Proposed Project.

There are manmade agricultural, peat and forestry drains within the Site. However, these are not considered to be a significant constraint and can be rerouted around the Proposed Wind Farm infrastructure and/or integrated into the proposed drainage design. Several of these drains are deeply incised and will be culverted where access tracks are proposed.

The integration of the existing drainage network and the Proposed Project drainage network is relatively simple. The key elements being the upgrading and improvements to existing water treatment elements, such as in line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls. A schematic line drawing of the proposed drainage design is presented in Figure 2-1 above.

As noted previously, the nearest point to a watercourse is located c.372m southwest of T5. No works are proposed within the 50m hydrological buffer associated with the Meander River. The significant setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively. The buffer/setback zone will:

- › Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment;
- › Avoid soil disturbance and compaction within close proximity to surface watercourses;
- › Avoid the entry of suspended sediment from works into watercourses; and,
- › Avoid the entry of suspended sediment from the drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

All of the Proposed Project works will be supervised by the EnvCoW supported by the Project Hydrologist.

The implementation of a SOWOR will continue through the construction phase of the project. The SOWOR provides number of abandonment triggers which will ensure that site management are well informed as to the level of incident that will require the abandonment of works. The various triggers both pre-commencement and abandonment ensure best practice in terms of water quality management is maintained prior to commencement and during the various felling and construction phases.

Best practice and practical experience on other similar projects suggest that in addition to the drainage plans that are included in the EIAR, there are additional site-based decisions and plans that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. The mechanisms for interaction between these roles are outlined within Section 4.1 of the CEMP (Appendix 4-5 to Chapter 4 of the EIAR).

In relation to decisions that are made on site it is important to stress that these will be implemented in line with the associated drainage controls and mitigation measures in the CEMP, and to ensure protection of all watercourses.

3.2.4 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures detailed above, will be brought onsite in phases as they are required during the construction phase in advance of any work commencing. A sufficient number of straw bales, clean drainage stone, terram, stakes, etc., will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures detailed in the above will be installed prior to, or at the same time as the works they are intended to drain.

3.2.4.1 Pre-emptive Site Drainage Management

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

The following forecasting systems are available and will be used on a daily basis at the Site to direct proposed construction activities:

- › General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- › MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- › 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- › Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- › Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

Using the safe threshold rainfall values will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests either of the following is likely to occur:

- › >10 mm/hr (i.e. high intensity local rainfall events);
- › >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- › >half monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures will be completed:

- › All active excavations will be secured and sealed off;
- › Temporary or emergency drainage will be installed to prevent back-up of surface runoff; and,
- › No works will be completed during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded.

3.2.4.2 Reactive Site Drainage Management

The detailed drainage plan prepared for the Proposed Wind Farm Site (see Appendix 4-4 of this EIAR) has provided for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat potentially silt-laden water from the works areas, will be monitored continuously by the ECoW on-site. The ECoW or project hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the

modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time.

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

3.2.4.3 **Operational Phase Drainage Management**

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

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

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

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

Silt traps will be inspected weekly during the construction phase of the Proposed Project and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

Any excess build-up of silt levels at dams, settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. Checks will be carried out on a daily basis.

The drainage system will be monitored in the operational phase until such a time that all areas that have been reinstated become re-vegetated and the natural drainage regime has been restored.

3.2.4.4 **Decommissioning Phase Drainage**

The drainage system will not be altered upon decommissioning. Measures which will be implemented to ensure no impacts upon the drainage system during decommissioning will be outlined within the Decommissioning Plan (Appendix 4-6 of the EIAR) and fully agreed with the local authority prior to any decommissioning works.

3.3 **Activity Specific Drainage Control and Mitigation Measures**

3.3.1

Refuelling, Fuel and Hazardous Materials Storage

On-site refuelling of machinery will be carried out at designated refuelling areas at various locations throughout the Site. Heavy plant and machinery will be refuelled on-site by a fuel truck that will come to the Site as required on a scheduled and organised basis. Other refuelling will be carried out using mobile double skinned fuel bowzers. The fuel bowser will be parked on a level area on-site when not in use.

All refuelling will be carried out outside designated watercourse buffer zones. 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 refuelling operations as required. All plant and machinery will be equipped with fuel absorbent material and pads to deal with any event of accidental spillage.

The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- › Wherever possible, vehicles will be refuelled off-site, particularly for regular road-going vehicles.
- › All plant will be inspected and certified to ensure that they are leak free and in good working order prior to use at the Site.
- › On-site refuelling of machinery will be carried out at designated refuelling areas at various locations throughout the Site.
- › Heavy plant and machinery will be refuelled on-site by a fuel truck, with spill kits kept onboard, that will come to the Site as required on a scheduled and organised basis.
- › Other refuelling will be carried out using mobile double skinned fuel bowser. The fuel bowser will be parked on a level area in the construction compound when not in use
- › Only designated trained operatives will be authorised to refuel plant on-site;
- › Refuelling or maintenance of machinery will not occur within the delineated hydrological buffer zones;
- › Fuels stored on the Site will be minimised;
- › Any diesel or fuel oils stored at the temporary construction compound will be bunded. The bund capacity will be sufficient to contain 110% of the storage tank's maximum capacity; and,
- › An emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction and Environmental Management Plan (Appendix 4-5). Spill kits will be available to deal with accidental spillages.

3.3.2

Cement Based Products Control Measures

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills.

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. Before leaving the Site, washing of the delivery truck will be minimised and restricted to designated wash out areas. Wash out will be restricted to the concrete lorry's chute only. Concrete trucks will be washed out fully at the off-site batching plant, where facilities are already in place.

Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water possible. The small volume of water that will be generated from washing of the concrete truck's chute will be directed into a temporary, lined, impermeable containment area for concrete washout. Where temporary lined impermeable containment areas are used, such containment areas are typically built

using straw bales and lined with an impermeable membrane. Two examples are shown in Plate 3-1 and Plate 3-2 below.



Plate 3-1 Concrete washout area



Plate 3-2 Concrete washout area

The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents will be tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

Alternatively, a Siltbuster-type concrete wash unit or equivalent² may be used. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids can be disposed of off-site at an appropriate waste facility.

The risks of pollution arising from concrete deliveries will be further reduced by the following:

- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout.
- Site access tracks will initially be constructed with a subgrade and compacted with the use of a roller to allow concrete delivery trucks access all areas where the concrete will be needed. The final wearing course for the access tracks will not be provided until all turbine foundations have been poured. No concrete will be transported around the Site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine foundations will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump.

² https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/

- › The arrangements for concrete deliveries to the Site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout and discussing emergency procedures.
- › Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the Site.

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries may be required outside normal working hours to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are normally completed in a single day per turbine.

Given the scale of the turbine base concrete pours which form part of the Proposed Wind Farm Site, the pours will be planned approximately 1 week in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These will include:

- › Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- › Restricting concrete pumps and machine buckets from slewing over watercourses (including drains and ditches) while placing concrete.
- › Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- › Ensuring that covers are available, and used, when necessary, for freshly placed concrete to avoid the surface washing away in heavy rain.
- › The small volume of water that will be generated from washing of the concrete truck's chute will be directed into a temporary, lined, impermeable containment area, or a Silbuster-type concrete wash unit or equivalent.
- › Surplus concrete after completion of a pour will be taken off-site and disposed of at an appropriately authorised facility.

3.3.3 Felling and Scrub Removal Drainage Measures

As discussed in Section 4.4.4.3 of Chapter 4 of the EIAR a total of 0.7ha of coniferous forestry will have to be permanently felled within and around the footprint of the proposed infrastructure. Approximately 1,256 linear metres of hedgerows and treeline will also be permanently removed to facilitate the Proposed Project. In addition, approximately 2.5ha of scrub and mosaics of scrub will be permanently lost to facilitate the Proposed Project

Felling of coniferous plantations required as part of the Proposed Project will be the subject of a Felling Licence application to the Forest Service, in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments.

Tree felling to facilitate the Proposed Project will not be undertaken simultaneously with construction groundworks. Keyhole felling to facilitate construction works will take place prior to groundworks commencing. During tree felling there is a potential to generate silts and sediments in surface water runoff due to tracking of machinery and disturbance of the ground surface etc, however, mitigation is provided in Chapter 9 (Water) with regard surface water quality protection for this activity which is summarised below.

Mitigation measures will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses. These measures are derived from best practice guidance documents.

- › Forestry Standards Manual (Forest Service, 2015);
- › Forest Protection Guidelines (Forest Service, 2002);
- › Forest Operations and Water Protection Guidelines (Coillte, 2013);

- › Forestry and Water Quality Guidelines (Forest Service, 2000b);
- › Forestry and the Landscape Guidelines (Forest Service, 2000c);
- › Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018);
- › Coillte Planting Guideline SOP; and,
- › Code of Best Forest Practice (Forest Service, 2000).

The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively. The buffer/setback zone will:

- › Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment;
- › Avoid soil disturbance and compaction within close proximity to surface watercourses;
- › Avoid the entry of suspended sediment from works into watercourses; and,
- › Avoid the entry of suspended sediment from the drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

Table 3-1 Minimum Buffer Zone Widths (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m
Very steep	(>30%)	20 m	25 m

Also, prior to the commencement of tree felling for subsequent access track construction the following key temporary drainage measures will be installed:

- › All existing dry forestry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using forestry check dams/silt traps;
- › Clean water diversion drains will be installed upgradient of the works areas;
- › Check dams/silt fence arrangements (silt traps) will be placed in all existing forestry drains that have surface water flows and also along existing forestry trackside drains.

Before the commencement of any felling works, an Environmental Clerk of Works (ECoW) shall be appointed to oversee the keyhole and extraction works. The ECoW shall be experienced and competent, and shall have the following functions and operate their record using a Schedule of Works Operation Record (SOWOR), as proposed in the planning application:

- › Attend the Site for the setup period when drainage protection works are being installed and be present onsite during the remainder of the forestry keyhole felling works.
- › Prior to the commencement of works, review and agree the positioning by the Operator of the required Aquatic Buffer Zones (ABZs) i.e., 10m drainage and 50m watercourse where required, silt traps, silt fencing (see below), water crossings and onsite storage facilities for fuel, oil and chemicals (see further below).
- › Be responsible for preparing and delivering the Environmental Tool Box Talk (TBT) to all relevant parties involved in site operations, prior to the commencement of the works.
- › Conduct daily and weekly inspections of all water protection measures and visually assess their integrity and effectiveness in accordance with Section 3.4 (Monitoring and

Recording) and Appendix 3 (Site Monitoring Form (Visual Inspections)) of the Forestry & Freshwater Pearl Mussel Requirements.

- › Take representative photographs showing the progress of operations onsite, and the integrity and effectiveness of the water protection measures.
- › Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements:
 - Surface water samples shall be collected upstream and downstream of the keyhole felling at suitable sampling locations.
 - Sampling shall be taken from the stream / riverbank, with no in-stream access permitted.
 - The following minimum analytical suite shall be used: pH, EC, TSS, BOD, Total P, Ortho-P, Total N, and Ammonia.
- › Review of operator's records for plant inspections, evidence of contamination and leaks, and drainage checks made after extreme weather conditions.
- › Prepare and maintain a contingency plan.
- › Suspend work where potential risk to water from siltation and pollution is identified, or where operational methods and mitigation measures are not specified or agreed.
- › Prepare and maintain a Water Protection Measure Register. This document is to be updated weekly by the ECoW.

The following items will be carried out during pre-felling inspections and after:

- › Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines;
- › Inspection of all areas reported as having unusual ground conditions;
- › Inspection of main drainage ditches and outfalls. During pre-felling inspections the main drainage ditches will be identified. Ideally the pre-felling inspection will be carried out during rainfall;
- › Following tree felling all main drains will be inspected to ensure that they are functioning;
- › Extraction tracks within 10m of drains will be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground;
- › Culverts on drains exiting the site, if impeded by silt or debris, will be unblocked; and,
- › All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:

- › Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance;
- › All machinery will be operated by suitably qualified personnel;
- › Checking and maintenance of access tracks and culverts will be on-going through any felling operation. Where possible, existing drains will not be disturbed during felling works;
- › Machines will traverse the Site along specified access routes (referred to as racks);
- › The location of racks will be chosen to avoid wet and potentially sensitive areas;
- › Brash mats will be placed on the racks to support the vehicles on soft ground, reducing mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all routes off access tracks, to protect the soil from compaction and

rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;

- › Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement for runoff from work areas and will prevent sediment from entering downstream watercourses. Accumulated sediment will be carefully disposed of at pre-selected spoil repository areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- › In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed onsite during construction;
- › Double silt fencing will also be put down slope of felling areas which are located in close proximity to streams and/or relevant watercourses;
- › Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded;
- › Timber will be stacked in dry areas, and outside watercourse buffer zones. Check dams and silt traps will be emplaced on the down gradient side of timber storage/processing sites;
- › Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff;
- › All refuelling will be completed outside of the designated 50m hydrological buffer zones. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and,
- › Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

To protect watercourses, the following measures will be adhered to during all keyhole/tree felling activities.

- › All relevant measures, best practice methods and requirements set out in Chapter 9 of the EIAR will be adhered to including Forestry & Water Quality Guidelines, Forest Harvesting & the Environment Guidelines and the Forest Protection Guidelines.
- › The extent of all necessary tree felling will be identified and demarcated with markings on the ground in advance of any felling commencing.
- › All access tracks and culverts will be inspected prior to any machinery being brought on Site to commence the felling operation. No tracking of vehicles through watercourses will occur. Vehicles will only use existing access track infrastructure and established watercourse crossings.
- › Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt traps will be constructed to ensure collection of all silt within felling areas. These temporary silt traps will be cleaned out and backfilled once felling works are complete. This ensures there is no residual collected silt remaining in blocked drains after felling works are completed. No direct discharge of such drains to watercourses will occur from within felling areas.
- › New collector drains and sediment traps will be installed during ground preparation to intercept water upgradient of felling areas and divert it away. Collector drains will be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities.
- › All silt traps will be sited outside of buffer zones and have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of away from all aquatic zones.

- › All new collector drains will taper out before entering the aquatic buffer zone to ensure the discharging water gently fans out over the buffer zone before entering the aquatic zone.
- › Machine combinations, such as mechanical harvesters or chainsaw felling will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance.
- › Mechanised operations will be suspended during and immediately after heavy rainfall.
- › Where brash is required to form brash mats, it is to be laid out at harvesting stage to prevent soil disturbance by machine movement.
- › Brash which has not been pushed into the soil may be moved within the Site to facilitate the creation of mats in more demanding locations.
- › Felling of trees will be pointed directionally away from watercourses.
- › Felling will be planned to minimise the number of machine passes in any one area.
- › Extraction routes, and hence brash mats, will be aligned parallel to the ground contours where possible.
- › Harvested timber will be stacked in dry areas, and outside any watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage sites.
- › Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but removing of natural debris deflectors will be avoided.

3.3.4 Vegetation Removal Drainage Measures

BMEP works are proposed to offset the loss of habitats within the Site and to further enhance the biodiversity of the Site. The proposed works include planting and enhancement of 2.5km of hedgerows and treeline, planting of 3.5ha of native broadleaved woodland and enhancement of 1.16ha of Molinia meadow habitat for marsh fritillary butterfly.

Some of these proposals will disturb local peat, soil and subsoil deposits and increase the likelihood of erosion of peat and subsoils and have the potential for the entrainment of suspended solids in runoff. However, due to the largely non-invasive nature of the works the potential for effects are limited. The works will have a long-term positive effect by providing stability to the soils and reducing potential erosion.

Given the nature of the restoration measures the following mitigation measures are proposed:

- › Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff;
- › Proposed off-track routes will be walked in advance of any machinery;
- › All machinery operators will be experienced;
- › The Site will be walked before a machine goes off-track;
- › Bog mats will be used where the excavator is required to travel over wet ground; and,
- › A low ground pressure excavator with wide tracks (1.9m or greater) will be used to reduce compaction of the peat and subsoils.

3.3.5 Peat and Spoil Management Areas

It is proposed that excavated spoil and peat will be used for landscaping where required. The excess material will then be placed in 9 no. dedicated peat/spoil management areas as well as placement of peat in the 1 no. proposed borrow pit once the rock is fully extracted.

All proposed peat and spoil storage areas including borrow pits have been thoroughly assessed from a geotechnical and peat stability perspective (refer to Appendix 8-1 for the Geotechnical and Peat Stability Assessment Report).

All proposed 9 no. peat and spoil management areas, as well as the borrow pit are located outside of 50m watercourse buffer zones.

During the initial construction of management areas, silt fences, straw bales and biodegradable geogrids will be used to control surface water runoff from works areas.

Where applicable, the vegetative top-soil layer of the peat and spoil management areas will be rolled back to facilitate placement of excavated spoil, following which the vegetative-top soils layer will be reinstated. Where reinstatement is not possible, spoil and peat management areas will be sealed with a digger bucket and seeded as soon possible to reduce sediment entrainment in runoff.

Drainage from peat and spoil storage areas will ultimately be routed to an oversized swale and a number of stilling ponds pond with appropriate storage and settlement designed for a 1 in 10-year return period before being discharged to the on-site drains.

Peat/subsoil reinstatement areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised peat/subsoil reinstatement areas will no longer be a potential source of silt laden runoff.

Therefore, at each stage of the peat and spoil management area development the above mitigation measures will be deployed to ensure protection of downstream water quality.

3.3.6 Borrow Pit Drainage

It is intended to obtain crushed stone that will be required for the construction of the Proposed Project from 1 no. proposed onsite borrow pit. As the borrow pit excavation progress and become deeper, surface water and groundwater ingress will be removed via pumping to settlement ponds, and re-distribution locally across natural vegetated areas. Where required, additional specialist water treatment measures will be employed to ensure no deterioration in downstream water quality occurs.

Temporary control of groundwater within the borrow pits may be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall locations will be required during construction.

Settlement ponds have been designed at the lower side/outfall location of the borrow pits.

4.

SURFACE WATER QUALITY MONITORING

This section of the SWMP sets out the programme for water quality monitoring during the pre-construction, construction, commissioning and operational phases of the Proposed Project.

The surface water quality monitoring programme combines the use of laboratory analysis, water quality monitoring instrumentation and visual inspection to develop a comprehensive schedule of monitoring of all watercourses that exist both at the Site and the surrounding area. The information collected by this schedule of water monitoring, particularly the continuous turbidity monitoring will inform the pre-commencement triggers in the SOWOR before works commence in an area. The turbidity monitors both upstream and downstream of the site will provide instant data on the quality of water in which they are deployed and will be equipped with an alarm system to alert site management if a peak in turbidity occurs as set out in the SOWOR.

The water monitoring programme was prepared in accordance with the following legislation:

- › Planning and Development Acts 2000 (as amended);
- › Planning and Development Regulations, 2001 (as amended);
- › S.I. No. 477 of 2011: European Communities (Birds and Natural Habitats) Regulations 2011, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);
- › S.I. No. 293 of 1988: Quality of Salmon Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- › S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended) and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC). Since 2000 water management in the EU has been directed by the Water Framework Directive (WFD).
 - The key objectives of the WFD are that all water bodies in member states achieve (or retain) at least 'good' status by 2015. Water bodies comprise both surface and groundwater bodies, and the achievement of 'Good' status for these depends also on the achievement of 'good' status by dependent ecosystems. Phases of characterisation, risk assessment, monitoring and the design of programmes of measures to achieve the objectives of the WFD have either been completed or are ongoing. In 2015 it replaced a number of existing water related directives, which were successively being repealed, while implementation of other Directives (such as the Habitats Directive 92/43/EEC) form part of the achievement of implementation of the objectives of the WFD;
- › S.I. No. 51 of 2025: European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2025, resulting from EU Directive 2006/118/EC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- › S.I. No. 673 of 2025: European Union (Drinking Water) Regulations 2025, which give effect to the requirements off the EU Drinking Water Directive; and

This water monitoring programme will be the subject of independent review by the Project Hydrologist who will provide the necessary guidance on the monitoring requirements. The water monitoring programme is outlined in the following sections.

4.1.1 Pre-Construction Baseline Monitoring

Water quality field testing and laboratory analysis will be undertaken prior to site clearance and commencement of felling at the Site. The monitoring programme will be subject to agreement with Mayo County Council but will be based on the planning stage programme already outlined in the EIAR and CEMP and presented in this document.

Analysis will be for a range of parameters with relevant regulatory limits along with Environmental Quality Standard's (EQSs) and sampling will be undertaken for each stream that drains from the construction site.

Baseline sampling will be completed on at least two occasions, and these will coincide with low flow and high flow stream conditions. The high flow sampling event will be undertaken after a period of sustained rainfall, and the low flow event will be undertaken after a dry spell.

There is an existing drainage network across the Site and runoff drains relatively freely to local watercourses and streams. This existing drainage system will continue to function as it is during the pre-construction phase.

However, prior to commencement of works in sub-catchments across the Site, main drain inspections will be completed to ensure ditches and streams are free from debris and blockages that may impede drainage. These inspections will be done on a catchment-by-catchment basis as the construction works develop across the Site, as works in all areas will not commence simultaneously.

4.2 Construction Phase Monitoring

4.2.1 Daily Visual Inspections

Daily surface water monitoring forms (for visual inspections and field chemistry measurements) will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection, to allow for identification of any obstructions to channels and to allow appropriate maintenance of the drainage regime. Should the suspended solids levels measured during construction, at the daily visual inspection locations, be higher than the baseline levels, the source will be identified, and additional mitigation measures implemented.

During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each primary watercourse, and specifically following heavy rainfall events (as per the CEMP included in Appendix 4-5 of this EIAR.)

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

Daily Visual Inspection locations are shown in Figure 4-1 of this SWMP and will be confirmed by the Project Hydrologist and EnvCoW, prior to the commencement of the construction phase, and a Daily Visual Check Sheet Template is included in Appendix C - Daily Visual Inspections are subject to change upon commencement of construction activity and works in progress within the catchment areas.

The following periodic inspection regime will be implemented:

- › Daily general visual inspections of site operations and inspections of all drainage infrastructure within the Site and in the surrounding area by the EnvCoW or a suitably qualified and competent person as delegated by the EnvCoW;
- › Inspections to include all elements of drainage infrastructure to ensure the system is operating correctly and to identify and maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter will be noted and corrective action will be implemented. High risk locations such as settlement ponds will be inspected daily. Daily inspections checks will be completed on plant and equipment, and whether materials such as straw bales or oil absorbent materials need replacement;
- › Event based inspections by the EnvCoW as follows:
 - >10 mm/hr (i.e. high intensity localised rainfall event);
 - >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day);
 - or,
 - Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week).
- › Monthly site inspections by the Project Hydrologist/ EnvCoW during construction phase;
- › Quarterly site inspections by the Project Hydrologist/ EnvCoW after construction for a period of one year following the construction phase; and,
- › A written record will be maintained or available on-site within the CEMP which will be maintained on-site during the construction phase.

4.2.2 Monthly Laboratory Analysis

Baseline laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken as per water monitoring programme for the Proposed Project. This will not be restricted to just these locations around the Proposed Project site with further sampling points added as deemed necessary by the EnvCoW in consultation with the Project Hydrologist and Site Manager.

4.2.3 Field Monitoring

Field chemistry measurements of unstable parameters (pH, conductivity, temperature) will be taken at the surface water monitoring locations, as per water monitoring programme for the Proposed Project. These analyses will be carried out by either the EnvCoW or the Project Hydrologist. In-situ field monitoring will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period. The Project Hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

4.2.4 Monitoring Parameters

The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations and European Union Environmental Objectives (Freshwater Pearl Mussel) (Amendment) Regulations 2018. The likely suite of determinants will include:

- › pH (field measured);
- › Electrical Conductivity (field measured);
- › Temperature (field measured);
- › Dissolved Oxygen (field measured);
- › Alkalinity (pH measured);
- › Total Phosphorus;
- › Chloride;
- › Nitrate;
- › Nitrite;

- › Total Nitrogen;
- › Ortho-Phosphate;
- › Total Ammonia as N;
- › Biochemical Oxygen Demand;
- › Total Suspended Solids;
- › True colour; and
- › Dissolved Organic Carbon.

4.3 Construction Phase Drainage Inspections and Maintenance

The developer will appoint a Project Contractor who will be responsible for the construction of the Proposed Project in accordance with this SWMP which will be updated by the contractor as required during the construction phase of the Proposed Project. Drainage performance will form part of the civil works contract requirements. During the construction phase, the Project Contractor will be responsible for the effectiveness of drainage measures. This responsibility extends to drainage maintenance, to ensure that the installed drainage measures continue to perform as intended by the detailed drainage design. Silt fences, check dams, level spreaders and other drainage measures likely to form part of the detailed drainage design, require regular maintenance to ensure they continue to function effectively, and the Project Contractor is entirely responsible for this maintenance.

Regular inspections of all existing and installed drainage measures should be undertaken by the Project Contractor, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water within the system. The contractor will devise a system of recording the findings of these inspections. Any excess build-up of silt levels at check dams, the settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. For this reason, the drainage measures installed on-site should be inspected at least weekly by the contractor and maintained as required during the construction phase of the Proposed Project to ensure good performance.

The EnvCoW will monitor the effectiveness of the on-site drainage during changing weather, ground or drainage conditions encountered on site, through their regular visual inspections of on-site watercourses and water monitoring programme. Where it appears that additional drainage measures will be required to ensure the drainage system remains effective, the EnvCoW will notify the contractor, the developer and project design team including the Project Hydrologist. The EnvCoW's role in this regard does not replace the need for the weekly (at least) inspections of the drainage system's measures by the Project Contractor.

4.3.1 Surface Water Monitoring Reporting

Visual inspection and laboratory analysis results of water quality monitoring shall assist in determining requirements for any necessary improvements in drainage controls and pollution prevention measures implemented on site.

It will be the responsibility of the EnvCoW to present the ongoing results of water quality and weather monitoring at or in advance of regular site meetings.

Reports on water quality will consider all field monitoring and visual inspections, and results of laboratory analysis completed for that period. Reports will describe how the results compare with baseline data as well as previous reports on water quality. The reports will also describe whether any deterioration or improvement in water quality has been observed whether any effects are attributable to construction activities and what remedial measures, or corrective actions have been implemented. Any proposed alteration to sampling frequency will be agreed with the Mayo County Council in advance.

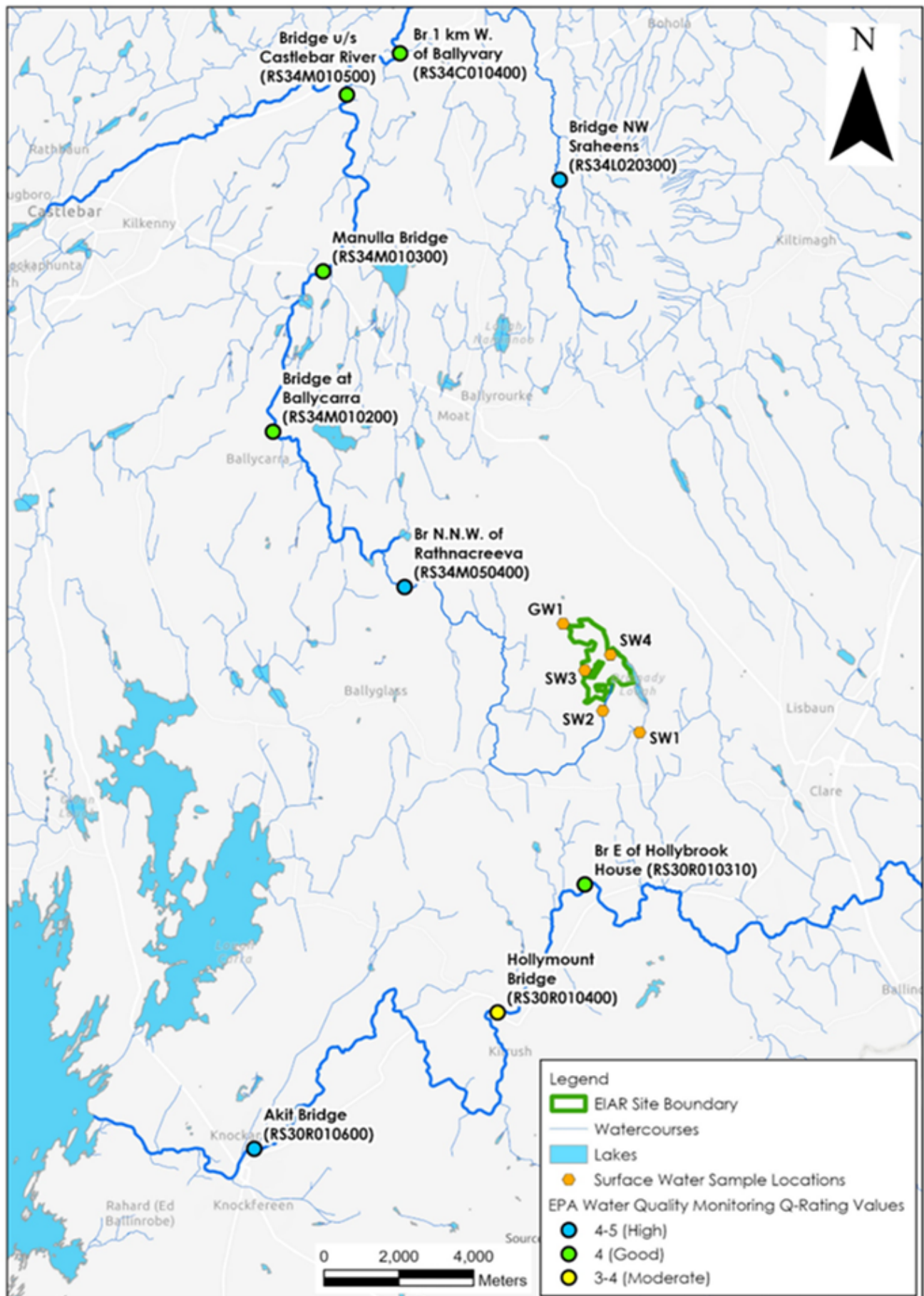
4.3.2 **Post Construction Monitoring**

4.3.2.1 **Monthly Laboratory Analysis Sampling**

Monthly sampling for laboratory analysis for the range of parameters adopted during pre-commencement and construction phases will continue quarterly after construction is complete. The Project Hydrologist will monitor and advise on the readings received from the testing laboratory and monitoring will only cease once the hydrologist is satisfied that the chemical and biological monitoring results show that there is no adverse impact on the quality of surface water within the natural watercourses draining the Site.

Surface water sampling and visual inspection locations are presented in Figure 4-1 below.

Figure 4-1 Surface Water Sampling and Visual Inspection Locations



5. **COMPLIANCE AND REVIEW**

5.1 **Site Inspections and Auditing**

Routine inspections of construction activities will be carried out on a daily and weekly basis by the EnvCoW and the Site Supervisor/Construction Manager to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place. The Project Hydrologist will also assist in compliance of testing and monitoring as required.

The SWMP will be reviewed in line with the CEMP and updated as required prior to commencement of construction to address any relevant planning conditions and mitigation measures, and also every six months thereafter during the construction phase of the Proposed Project.

References

- CIRIA Report No. C648 (2006): CIRIA (Construction Industry Research and Information Association) guidance on 'Control of Water Pollution from Linear Construction Projects'
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- DoE/NIEA (2015): Wind farms and groundwater impacts - A guide to EIA and Planning considerations”
- Draft Revised Wind Energy Development Guidelines (Draft DoHLGH 2019 Guidelines)
- Eastern Regional Fisheries Board: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites
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- Forest Service (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford
- Forestry Commission (2011): Forests and Water UK Forestry Standard Guidelines, Fifth Edition. Publ. Forestry Commission, Edinburgh
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works Adjacent to Waters
- Institute of Geologists Ireland (2013) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements
- MacCulloch (2006): Guidelines for risk management of peat slips on the construction of low volume low-cost roads over peat (Frank MacCulloch Forestry Civil Engineering Forestry Commission, Scotland)
- Murnaine, E., Heap, A., Swain, A., 2006. Control of water pollution from linear construction projects. Site guide (C649). CIRIA.
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes
- PPG1 - Understanding your environmental responsibilities – good environmental practices (UK Guidance Note) (2021)

PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note)

Scottish Natural Heritage, 2010: Good Practice During Wind Farm Construction

Wind Energy Development Guidelines for Planning Authorities, 2006 (the DoEHLG 2006 Guidelines)



APPENDIX A

SCHEDULE OF WORKS OPERATING RECORD (SOWOR)

Work Item No.	Description	Estimated Duration of Works	Risk Schedule 1: very high risk Schedule 2: high risk Schedule 3: intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If <u>any</u> four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing. All in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Daily Visual Inspection procedure in place by ECoW	Trigger 4 Weather forecast: (a) during planned works period (b) observed on site	Trigger 1 Damage to silt fence/other drainage measure or drainage point close to capacity	Trigger 2 River/ Watercourse turbidity	Trigger 3 Deterioration of SW quality as reported by ECoW	Trigger 4: Weather forecast (a) during the planned works period and (b) observed on site
1	Enabling works including felling, site compound establishment welfare facilities, site office and fencing	2 months	Schedule 2	Drainage measures to be installed as per EIAR & drainage management plan	Turbidity at baseline levels	Procedure for inspection must be in place with ECoW reporting satisfactory SW quality before works commence	Schedule 2 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sediments, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 2 rainfall figures (see below)
2	Preliminary enabling works and peat excavation operations	6 months	Schedule 1	Drainage measures to be installed as per EIAR & drainage management plan	Turbidity at baseline levels	Procedure for inspection must be in place with ECoW reporting satisfactory SW quality before works commence	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)

								pumping equipment, sedimats, siltbags and silt fencing			
3	Roads Excavation Excavate new road alignment, upgrade/widen existing carriageway	3-4 months	Schedule 1	Drainage measures to be installed as per EIAR & drainage management plan	Turbidity at baseline levels	Procedure for inspection must be in place with ECoW reporting satisfactory SW quality before works commence	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)
4	Culvert Upgrade or replacement works	4 months	Schedule 1	Drainage measures to be installed as per EIAR & drainage management plan	Turbidity at baseline levels	Procedure for inspection must be in place with ECoW reporting satisfactory SW quality before works commence	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)
5	Carriage way resurfacing	1 month	Schedule 3	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on visual inspection of SW quality	Activity not weather dependent	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on visual inspection of SW quality	Activity not weather dependent

11	Commissioning and snagging	2 months	Schedule 3	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on visual inspection of SW quality	Activity not weather dependent	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on visual inspection of SW quality	Activity not weather dependent
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Schedule 1 – Very high-risk activities	>10 mm/hr (i.e. high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	No overland flow or pathway for water movement
	Conditions on the ground match the forecast
Schedule 2 – High risk activities	>10 mm/hr (i.e. high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	Conditions on the ground match the forecast
Schedule 3 – Intermediate risk	>10 mm/hr (i.e. high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	Conditions on the ground match the forecast



APPENDIX B

DAILY VISUAL CHECK SHEET TEMPLATE

	Daily Visual Inspections	Project	220825 Cunlaghfadda	Draft Date	14/05/2026
		Client	Cunlaghfadda Green Energy Ltd	Version	1
		File Name	220825 - Daily Visual Inspections - 2026.05.14		

Date:	
Weather:	
Rainfall previous 24hr (mm):	
Completed by:	

Surface Water Sampling Locations			
SW Ref	Visual Inspection Result	Action Required	Photographs
SW1			
SW2			
SW3			
SW4			
SW5			
SW6			
SW7			
SW8			
SW9			
SW10			

Visual Inspection Locations			
VC Ref	Visual Inspection Result	Action Required	Photographs
VI1			
VI2			
VI3			
VI4			
VI5			
VI6			
VI7			
VI8			
VI9			
VI10			

Visual Inspection Results:

1. Water clear – no issues.
2. Water turbid with a peaty tinge.
3. Water silty as a result of works NOT associated with the Slieveacurry Renewable Energy Development.
4. Water silty as a result of works associated with the Slieveacurry Renewable Energy Development. ACTION REQUIRED.

	Daily Visual Inspections	Project	220825 Cunlaghfadda	Draft Date	14/05/2026
		Client	Cunlaghfadda Green Energy Ltd	Version	1
		File Name	220825 - Daily Visual Inspections - 2026.05.14		

Action Items / Notes / Comments:

Visual Inspection Results:

1. Water clear – no issues.
2. Water turbid with a peaty tinge.
3. Water silty as a result of works NOT associated with the Slieveacurry Renewable Energy Development.
4. Water silty as a result of works associated with the Slieveacurry Renewable Energy Development.
ACTION REQUIRED.