# APPENDIX A4.1

# CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP) FOR ACKRON WIND FARM

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**ACKRON WIND FARM LTD**

Prepared By:

**Arcus Consultancy Services**

7th Floor
144 West George Street
Glasgow
G2 2HG

**T** +44 (0)141 221 9997 | **E** info@arcusconsulting.co.uk
**w** www.arcusconsulting.co.uk

Registered in England & Wales No. 5644976

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# 1 INTRODUCTION

Ackron Wind Farm Ltd (the Applicant) is seeking planning permission under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 from the Highland Council (the Council), to install and operate a wind farm comprising up to 12 turbines, with a generation capacity of less than 50 megawatts (MW), and associated infrastructure (the Development) on land located in north-eastern Sutherland (the Site).

This Construction Environmental Management Plan (CEMP) forms an appendix to the Environmental Impact Assessment Report (EIA Report) for the Development. The CEMP will be maintained and updated throughout the construction process as a live document. It will be augmented by design specifications and construction documentation and will provide comprehensive information on environmental management appropriate to the stage of development. This document is accurate at this point of the EIA process; however, as construction methods, further site investigations, etc. become available, these elements of work would be included in the CEMP. Prior to construction, the CEMP would be subject to approval by the Highland Council with further consultation undertaken with Scottish Environment Protection Agency (SEPA) and NatureScot.

The CEMP is structured as follows:

- Aims and Objectives of the CEMP;
- Description of the Proposed Development;
- Construction Management;
- Preliminary Surveys and Ground Investigations;
- Construction Methodologies;
- Environmental Management;
- Water Construction Environmental Management Technical Appendix A;
- Peat Management Plan Technical Appendix B; and
- Framework Construction Traffic Management Plan Appendix C.

# 2 AIMS AND OBJECTIVES

Potential environmental sensitivities on a wind farm construction site need to be identified and given consideration prior to the start of the construction. Potential effects identified within the EIA Report, including embedded mitigation in the form of best practice, must be adhered to during construction.

## 2.1 Project Environmental Policy

The Development should be delivered in accordance with good construction practice, both in its approach to the management of effects on the environment and its support of local communities.

In doing so, the following approach has been developed and is delivered through the implementation of the CEMP and associated plans and reports:

- The Developer, the Contractor, the Designers and other parties to the construction process will act collaboratively and cooperatively to achieve the best environmental outcomes;
- The works will progress in accordance with the requirements of the EIA Report and methods agreed with the Planning Authority and Consultees;
- The Developer undertakes to appoint a Contractor that is competent and is experienced in constructing projects similar in nature to the Development;
- The Developer undertakes to appoint a Contractor that is experienced in delivering works in environments similar to those of the Development site and in implementing mitigation works of a similar nature to those defined in the EIA Report;

- The Contractor plans the work integrating from the outset the objectives of the Development and the environmental requirements defined in the EIA Report;
- The Contractor programmes the work in a manner that is safe and that the work and mitigation measures have the greatest opportunity to be effective;
- The Contractor develops contingency plans for reasonably foreseeable events. The Developer, the Designer and other parties take reasonable steps to support the development of the Contractor's plans taking into account responsibilities;
- The Contractor shall take reasonable steps to notify local communities of operations during the Development that may impact on domestic or business activity and will use appropriate methods to manage the impact; and
- In all operations, management of the environment and control of effects will be an integral part of the design, management and construction process.

### 2.2 CEMP Objectives

The objective of the CEMP is to contribute to the successful delivery of the Development, achieved through a structured approach to good construction management taking into account information and research documented in the EIA Report, whilst incorporating flexibility to accommodate unforeseen conditions and innovation.

A copy of this CEMP and related files and reports will be kept in the site offices of the Contractor for the duration of the site works and will be made available for review at any time.

Upon completion of the construction works, the Contractor will submit a complete copy of the final set of information to the Developer for their records. This information will include electronic scans of all hard copy reports, data, field records and correspondence which are gathered over the course of the construction works, and all updates to this CEMP.

It is intended that the CEMP be a live document that is regularly reviewed and updated to reflect conditions experienced onsite.

### 2.3 CEMP Review Process

Where the Contractor has standard documents within their own Company or Corporate Environmental Management Plan which might cover a particular requirement of this CEMP, this will be provided to the Developer and the relevant corresponding documents will be made available.

A checklist will be issued providing the Contractor with a summary of the minimum information to be provided to the Developer pre, during and post-construction.

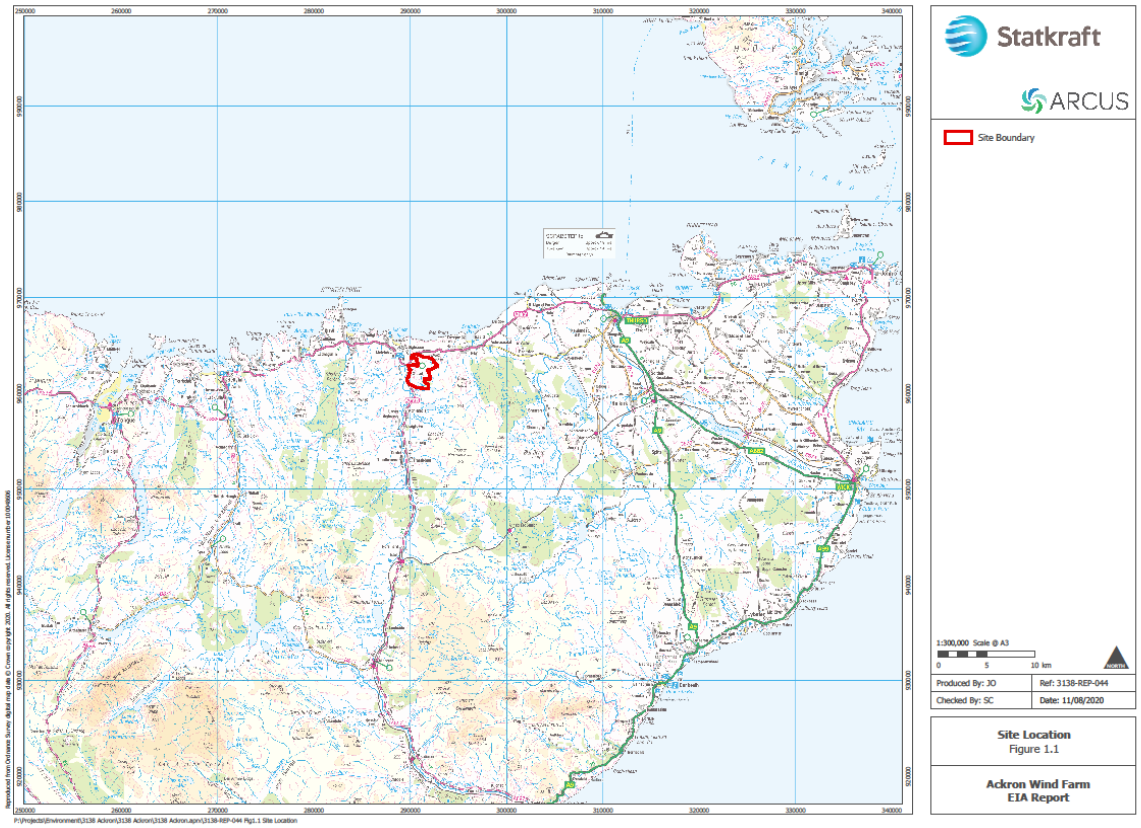
The Developer will undertake review and acceptance of the Contractor's provided information prior to commencement of construction works.

## 3 DESCRIPTION OF THE DEVELOPMENT

### 3.1 Site Description

The Site lies approximately 18 kilometres (km) west of Thurso and approximately 2 km south-east of Melvich in Sutherland, and is centred on National Grid Reference (NGR) 291200, 962500. Figure 1 shows the location and wider context of the site.

The application Site area totals 662 hectares (ha), and largely consists of open moorland. The elevation of the Site ranges from approximately 163 m above ordnance datum (AOD, approximately equivalent to sea level) near Caol-Loch (in the northeast of the Site) to 38 m AOD along the A897. There are two named knolls: Golval Hill (127 m AOD) and Cnoc an Achadh (123 m AOD). The Site is shown in detail in Figure 2.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Site Boundary
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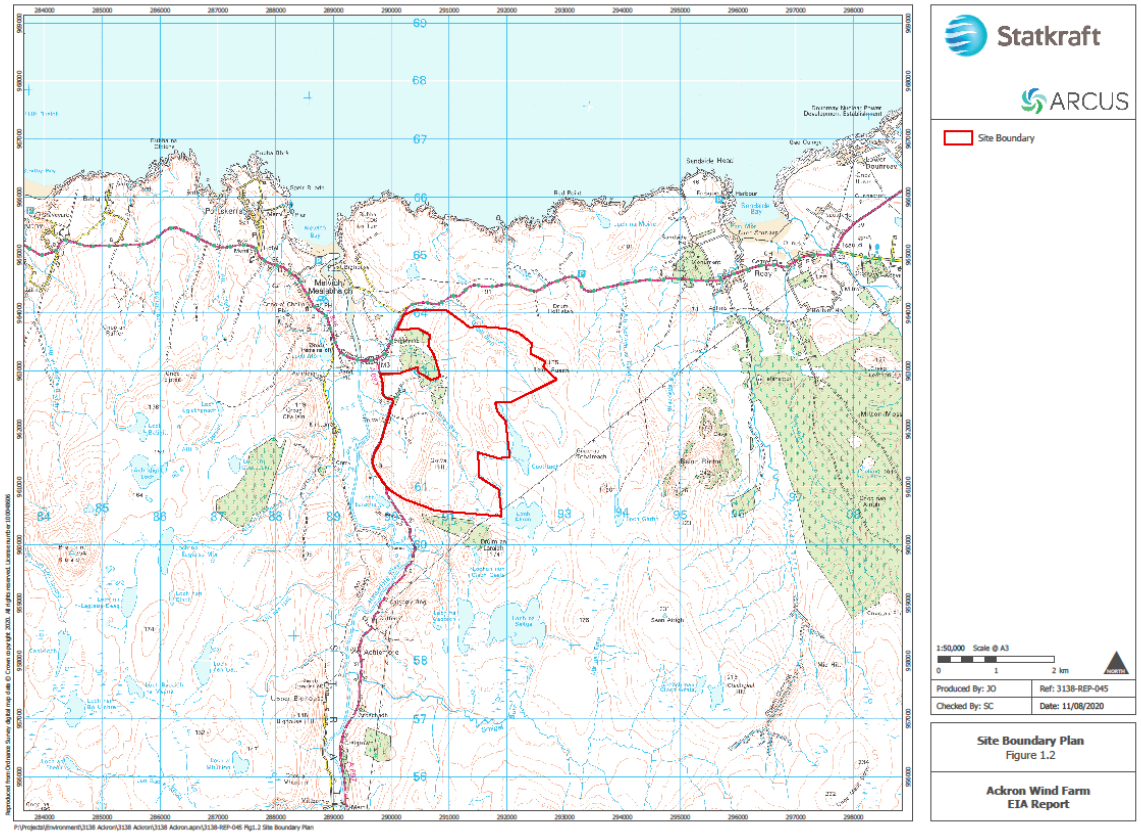
Produced By: JO
Ref: 3138-REP-044
Checked By: SC
Date: 11/08/2020
Site Location
Figure 1.1
Ackron Wind Farm
EIA Report


Statkraft
ARCUS
Site Boundary
1:50,000 Scale @ A3
0 1 2 km
Produced By: JO
Ref: 3138-REP-045
Checked By: SC
Date: 11/08/2020
Site Boundary Plan
Figure 1.2
Ackron Wind Farm
EIA Report

## 3.2 Development Description

The application is for a wind energy development comprising of the erection, 30-year operation and subsequent decommissioning of up to 12 turbines with a capacity of up to, but not exceeding 50 MW.

In summary, the main components of the Development to which the CEMP relates are:

- Up to 12 three-bladed turbines with a maximum tip height of 149.9 m including external transformers (if required);
- Associated foundations, blade laydown areas and crane hardstandings at each wind turbine location;
- Access tracks linking the turbine locations;
- Substation compound incorporating electrical switchgear and wind farm control elements;
- Temporary construction compound;
- Network of underground cabling running adjacent to the access tracks where possible;
- A permanent anemometry mast (up to 92 m);
- Up to two borrow pits; and
- New site access off the A897.

## 3.3 Key Sensitivities

The EIA Report notes that the Development would have potential effects upon a small number of key onsite environmental sensitivities including:

- Water environment; and
- Areas of peat.

Specific mitigation for the above receptors is primarily contained in the Water CEMP included as Appendix A and Peat Management Plan (PMP) included as Appendix B.

## 3.4 Development Programme

The construction works are expected to be completed over a period of approximately 15 months.

Construction activity would be as follows:

- Off-site remedial works;
- Site compound set up;
- Establish borrow pits;
- Construction of site tracks;
- Felling of woodland;
- Construction of turbine crane hardstandings;
- Construction of turbine foundations;
- Construction of control building/substation;
- Site cabling installation;
- Installation of switchgear/metering;
- Installation of transformer and externals;
- Turbine erection;
- Grid connection commissioning;
- Turbine and SCADA commissioning;
- Performance testing; and
- Site reinstatement.

# 4 CONSTRUCTION MANAGEMENT

This section details the responsibilities of the various roles involved in the construction of the Development. All those involved would be responsible for compliance with the CEMP.

## 4.1 Developer

The Developer will appoint an appropriately competent person or persons to undertake relevant environmental tasks as detailed in this document prior to, during and upon completion of the construction works. This person will be the Developer's Site Environmental Representative.

The competence of the Developer's Site Environmental Representative will be demonstrated to the Developer via submission of relevant information (e.g. CV, training records, membership records or similar) for review and acceptance prior to commencement of construction works.

The Developer will be responsible for obtaining all necessary consents, licences and permissions for their activities as required by current legislation governing the protection of the environment.

## 4.2 Contractor

The Contractor, also known as the Balance of Plant (BoP) Civil & Electrical Contractor, will undertake the earthworks, install the on-site cabling, construct the access tracks and hardstandings, construct the substation compound and control buildings, and construct turbine foundations.

The Contractor will be deemed to be the Principal Contractor for the purposes of the Construction (Design and Management) Regulations 2015 (CDM Regulations).

The Contractor will have a proven track record in successfully implementing similar projects.

The Contractor will consider all of the mitigation measures and best practice construction methods detailed within this CEMP in their design and in any detailed environmental plans as required by the Contract. Where any mitigation measures or construction methods described in other documents deviate in any way from those contained within this document, the Contractor will abide by whichever is the most onerous and stringent in terms of environmental protection and identify this to the Developer.

The Contractor will submit to the Planning Authority final layouts of temporary working areas (works compounds, borrow pits, and other temporary construction areas) to demonstrate compliance with the EIA Report and this CEMP.

Where approaches, methods or designs deviate from the EIA Report or this CEMP, these should be notified to the Developer and the Planning Authority to confirm that they achieve the objectives of the Development.

## 4.3 Environmental / /Ecological Clerk of Works

A suitably qualified and experienced Environmental / Ecological Clerk of Works (ECoW) will be appointed to provide ecological and environmental advice during construction. The ECoW would monitor construction to ensure compliance with the CEMP and help to reduce risks and delays. Any breeches of the CEMP will be reported to the Project Manager who would have the authority to stop construction works.

The ECoW will be a professionally qualified individual possessing the following skills:

- Knowledge and experience of typical construction practices;
- Assertiveness and strong communication skills, in particular an ability to relay environmental information at both a technical and layman level;

- Robust understanding of relevant scientific principles; and
- A sound understanding of the environmental/ecological legislation (and licensing) and how it applies to construction sites.

ECoW responsibilities will include (but not be limited to):

- Thoroughly understanding the ecological issues and best practice relevant to the Development;
- Planning (as far in advance as possible) for known ecological issues, and responding to new ones, appropriately;
- Fulfilling the requirements of the CEMP and associated documents, including surveys and watching briefs where appropriate;
- Educating relevant personnel (principally site staff and contractors) about ecologically and environmentally sensitive features, legal obligations, best practice, and relevant procedures;
- Advising on the location of sensitive ecological / environmental features and the type of protection or mitigation required;
- Supervising and monitoring the implementation of mitigation measures to ensure legal compliance and safeguard sensitive ecological receptors;
- Regular surveying to monitor environmental/ecological sensitivities at the site. These may be sensitive receptors such as a protected watercourse, fixed sensitivities such as badger setts, or more transient features such as nesting birds;
- Monitoring construction activities in close proximity to sensitive environmental receptors to ensure impacts are minimised (e.g. monitoring pollution prevention measures);
- Liaising with, and reporting to, the construction project management team, site personnel and contractors, and relevant stakeholders about ecological issues; and
- Directing the sensitive micro siting and placement of turbines, borrow pits, bridges, compounds and tracks where appropriate.

### 4.4 Geotechnical Advisor

The Geotechnical Advisor is an engineering design consultant appointed by the Contractor to assess the suitability of the Developer's site information, assess rock quality and to assess the bearing capacities of formations.

The Geotechnical Advisor will scope any additional surveys or investigations required to complete the design and construction, and will oversee, review and certify the design and construction as complying with the project requirements, best practice and all appropriate design standards of relevance to the location and EU member state.

The Geotechnical Advisor will have a proven track record in the assessment, design and construction supervision/inspection of similar projects.

### 4.5 Owner's Engineer

The Owner's Engineer is the engineering design consultant appointed by the Developer to review the Contractors designs and conduct on-site testing works.

### 4.6 Principal Designer

The Principal Designer will be appointed by the Developer to oversee the works in accordance with its duties under CDM 2015 Regulations.

## 5 PRELIMINARY SURVEYS AND GROUND INVESTIGATIONS

This section details the surveys and ground investigations that would be conducted after consent and prior to the start of construction. These surveys would inform the design of

the Development and any additional required environmental mitigation to be implemented during the construction phase.

### 5.1 Protected Species Surveys

Pre-construction surveys for protected species will be undertaken within the working areas (and appropriate buffers). These surveys will inform the implementation of species protection plans, licencing requirements and appropriate mitigation to be incorporated into the CEMP.

### 5.2 Bird Surveys

Pre-construction surveys for wild birds will be undertaken within the working areas (and appropriate buffers). These surveys will inform the implementation of species protection plans and breeding bird protection plan, licencing requirements and appropriate mitigation to be incorporated into the CEMP.

### 5.3 Water Quality Monitoring

A surface water and groundwater monitoring programme will be established prior to the construction phase of the Development.

### 5.4 Ground Investigations

Ground investigations and topographic surveys would be conducted post-consent. The findings of these surveys would provide more detailed, location specific ground conditions to help optimise micrositing of turbine locations and associated infrastructure by identifying environmental or technical constraints.

## 6 CONSTRUCTION METHODOLOGIES

Upon appointment of a Construction Manager, a detailed construction methodology will be proposed. These outline methods will inform the Contractor's detailed method statements produced as the development progresses. This section will be updated as appropriate.

### 6.1 Construction Working Hours

Construction work would be limited to the hours of 0700 to 1900 Monday to Friday and 0700 to 1800 hours on Saturdays, with no working on Sundays or public/bank holidays. Quiet on-site working activities such as electrical commissioning are assumed to extend outside the core working times, noted above, where required.

Work outside of these hours is not usual, though if it was required to meet specific short term demands (e.g. during foundation pours or to undertake work which is highly weather dependent, such as low wind speed needed for turbine erections), the planning authority would be informed, as required.

### 6.2 Health and Safety

The purpose of this section is to provide background information about safety policies and to describe how safety issues are to be managed during the construction, operation and decommissioning of the Development. Upon appointment the Construction Manager will be responsible for the Health and Safety Policy, in line with current legislation and guidance.

### 6.3 Public Safety

The Development site is currently not crossed by any formal footpaths, but sits within private moorland with any tracks into the Site enclosed with locked gates. Mitigation

measures for public safety during construction on site are not necessary. Upon appointment the Construction Manager will be responsible for the Health and Safety Policy in regards to public safety.

## 6.4 Construction Compounds and Laydown Areas

Upon appointment of a Construction Manager, a detailed Construction Plan and Construction Method Statements would be drafted which would include any construction compounds and laydown areas.

## 6.5 Borrow Pits

This Preliminary Borrow Pit Assessment (BPA) has been prepared initially to provide details of potential borrow pit locations or aggregate extraction areas required for the construction of the wind farm.

Based on the desk-based assessment, it is anticipated that there are two adequate locations on site to position proposed borrow pits which would achieve the required aggregate quantities for the development at approximately 94,855$m^3$.

Considerations for the assessment of borrow pits following consent of the Development will include:

- Ground investigations and relevant geo-environmental analysis undertaken prior to finalising borrow pit proposals;
- Three-dimensional design should be undertaken following detailed design and ground investigations to confirm the capacity of the proposed borrow pits; and
- Detailed profiles of borrow pit excavations including existing ground levels, proposed excavation levels and a conceptual restoration profile for each borrow pit should be produced once final borrow pit extents have been agreed.

Prior to the construction of the windfarm, design and best practices and any required mitigation measures would be incorporated into this Construction Environmental Management Plan and agreed with the statutory bodies.

## 6.6 Internal Access Tracks

A total of approximately 7.26 km of on-site access tracks would be required for the Development. Two teams are expected to operate during access track construction. A detailed plan of internal access tracks based upon site specific conditions will be put in place by the Construction Manager.

Internal track maintenance is anticipated to be a relatively infrequent activity. Any track maintenance that is required would be undertaken where possible in the summer months.

## 6.7 Drainage Design

Drainage within the temporary site compound, where construction vehicles would park and where any diesel fuel would be stored, would be directed to an oil interceptor to prevent pollution if any spillage occurred.

## 6.8 Watercourse Crossings & Road Construction near Watercourses

One watercourse crossing proposals; is included in the project design. A culvert crossing is proposed for the Development: box culvert or pipe culvert. However, the use of each of these types of structure would be determined individually to minimise potential effects based on a site-specific assessment, which would account for topographic, hydrological and ecological attributes at each proposed crossing point. Upon appointment of a Construction Manager, a detailed Construction Plan and Construction Method Statement would be drafted which would include decisions on these water crossings.

## 6.9 Substation Compound

The electricity substation compound would comprise a fenced hardstanding with maximum dimensions of approximately 100 m x 50 m. The area for the substation compound would be prepared by removing the topsoil and subsoil down to competent bearing strata, and concrete foundations would be required to take the weight of the components. An electrical earth network would be buried around the building. Details of this will be confirmed by the Construction Manager, upon appointment.

## 6.10 Cabling

Electrical cabling for wind farm power distribution will require to be delivered and will constitute 34 HGV movements over the period of delivery. Underground electrical cabling linking all of the turbine unit transformers will be installed.

The method of installation would be selected to have minimum disturbance to the peat at the time of installation and afterwards. The following methods would be used where appropriate:

- Burial in ducts across the tracks;
- Fitted in ducts along bridges;
- Burial in trenches; and
- Ploughing.

## 6.11 Wind Turbine Foundations

Construction of turbine foundations would involve the excavation of the ground to expose the underlying load bearing strata or bedrock, then backfilling with concrete. The intention is for the wind turbine foundations to be formed mainly from concrete batched onsite, if possible. In the eventuality that ready mix concrete is used, each foundation will be poured in one continuous session over a single day, with 12 non-consecutive days required in total over the 20-week duration of this element of works. After appointment the construction contractors would determine detailed procedures for this construction stage.

## 6.12 Hardstanding Areas

Crane hardstanding areas will be constructed for each wind turbine, these will then be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the wind farm. These could also be utilised during decommissioning at the end of the wind farm's life. After appointment the construction contractors would determine detailed procedure for this construction stage.

## 6.13 Assembly of Wind Turbines

During the construction phase, heavy lifting cranes will be used to install the wind turbines. The crane type would be confirmed when the specific turbine type has been selected. After appointment the construction contractors would determine the actual cranes used, together with the exact programme and number of teams on site.

## 6.14 Decommissioning

The Development has been designed with an operational life of 30 years. At the end of the operational period, it would be decommissioned and the turbines dismantled and removed. Any alternative to this action would require consent from the Highland Council.

# 7 ENVIRONMENTAL MANAGEMENT

An EIA has been undertaken for the Development in support of the application. The following sections describe mitigation controls that have been incorporated to protect the environment. Detailed proposals for such measures will be documented prior to construction. This should be used for reference only, with specific information sourced in the EIA report itself.

## 7.1 Woodland

There will be some felling required of mature conifer woodland around T2 to ensure adequate distance from woodland edge for bats (circa 1.1 hectare). This would be replanted on the same landowner's property or compensated via habitat restoration. Further details will be provided in a Habitat Management Plan prepared post-consent and prior to construction.

## 7.2 Ecology

An ECoW will be appointed to provide ecological and environmental advice during pre-construction and construction. This will include the monitoring of compliance with the recommendations of the EIA Report and planning conditions. The ECoW would be required, along with the project hydrologist, to undertake a review of design and drainage plans, to minimise the potential for effects to habitats of conservation concern, and to assist in the identification of appropriate locations for commencement of habitat restoration works.

Pre-construction surveys for protected species will be undertaken within the working areas (and appropriate buffers). These surveys will inform the implementation of species protection plans, licencing requirements and appropriate mitigation.

A Construction Biosecurity Plan (CBP) will be written and implemented ahead of the commencement of the construction phase. The CBP will be subject to approval by the local planning authority and will aim to ensure works do not facilitate the spread of signal crayfish.

Measures to maintain hydrological connectivity during construction will be put in place, and good practice measures for the management and storage of peat (including appropriate use of vegetated turves) will be undertaken to ensure effective re-use as part of reinstatement works.

An offset distance of 50 m between bat habitats, such as riparian features and forest edges and turbines blade tips will be implemented and maintained throughout the life of the Development.

No additional bat mitigation is required. Should the updated guidance confirm a requirement for post-construction monitoring, a programme should be developed to identify and minimise the risk of collision to bats and detailed within a bat monitoring and mitigation plan.

## 7.3 Ornithology

Pre-construction surveys for wild birds will be undertaken within the working areas (and appropriate buffers). These surveys will inform the implementation of species protection plans, licencing requirements and appropriate mitigation. Should an active nest site of a Schedule 1 bird be located, all construction works within 500 m of the nest site should be halted immediately and a disturbance risk assessment prepared. Should the nest of any other wild bird not listed on Schedule 1 be located, construction activities within 50 m of the nest site should be halted and the ECoW informed immediately.

Potential operation effects, the loss of life for birds whose flight path intercepts the turbines, is considered negligible for all noted bird species.

If decommissioning is to occur during times of the year when breeding birds might be affected, best practice measures, like those used during construction, will be put into place.

## 7.4 Geology and Peat

There are no turbines situated within zones of peat greater that 1.0 m. Mitigation states that turbines will be micro-sited outwith the deeper peat areas in order to reduce the overall impact on peat and loss of soils.

Slope stability monitoring will occur during pre-construction and construction phases of work, including for both peat stability and non-peat related stability.

Best practice measures for managing excavated peat and peaty soils are detailed in the Peat Management Plan in Appendix B.

## 7.5 Hydrology

An account of the hydrology environmental management measures can be found in the Water Construction Environmental Construction Plan (Appendix A). A brief summary can be found in the following paragraphs.

The Development is situated within a Scottish Water Drinking Water Protected Area (DWPA). All site personnel will be made aware they are working in a DWPA and Scottish Water will be notified of the construction start date and notified without delay in the event of a pollution incident.

Sediment and surface water run-off generated during the construction phase of the Development will be managed through good practice construction techniques. Drainage from the site will include elements of Sustainable Drainage Systems (SuDS) design, where appropriate. SuDS replicate natural drainage patterns and have a number of benefits:

- SuDS will attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream;
- SuDS will treat run-off, which can reduce sediment and pollutant volumes in run-off before discharging back into natural drainage network; and
- SuDS measures, such as lagoons or retention ponds, correctly implemented will produce suitable environments for wildlife.

Best practice management will be put in place for chemical storage and use including fuel, oils and concrete. This will include bunding of the construction compound, use of spill kits and absorbent pads and use of impermeable geotextile membranes in chemical storage areas.

Best practice measures will be put in place to protect private water supplies including absorbent spill pads / kits and other measures highlighted within the outline CEMP. Best practice construction methods including speed limits and regular vehicle and machine maintenance will be employed.

Best practice felling measures will be put in place and any felling in sensitive areas will be approved by the ECoW.

Best practice drainage and sediment management measures will be put in place including the use of check dams, silt fencing / mats.

A programme of water quality monitoring will be carried out during the pre-construction, construction and post-construction periods.

Best practice measures will be employed to manage drainage from access tracks and stored soils, and to manage dust from haul roads and access tracks.

Best practice measures will be followed during design and installation of watercourse crossings. All crossings will be agreed with SEPA at detailed design phase.

## 7.6 Noise

To ensure construction noise is minimised, operations shall be limited to times agreed with the Highland Council. This includes the delivery of turbines both within agreed times and by agreed routes. The site contractors will also be required to undertake all works in accordance with British Standard (BS) 5228.

Where practicable the following will be implemented to further minimise construction noise:

- The work programme will be phased, which would help to reduce the combined effects arising from several noisy operations;
- Noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens;
- Where practicable, Night-time working will not be carried out. Local residents shall be notified in advance of any night-time construction activities likely to generate significant noise levels, e.g. turbine erection; and
- Where practicable, onsite batching is recommended for turbine foundations.

## 7.7 Traffic and Transport

The Development would be accessed via the A897. Due to the abnormal size and loading of wind turbine delivery vehicles, it is necessary to review the public highways that would provide access to the site to ensure they are suitable, and to identify any modifications required to facilitate access.

A Traffic Management Plan would be prepared prior to construction detailing recommended mitigation measures, for adoption in the TMP, are as follows:

- Construction Traffic, including Heavy Goods Vehicles (HGVs) and Light Goods Vehicles (LGVs to include vans and cars) will be restricted from travelling between the Site and Helmsdale via the A897[1];
- As far as reasonably possible, deliveries should be scheduled outside of school opening and closing times;
- Drivers of all delivery vehicles to be made aware during induction of the presence of schools and emergency services within Thurso and also the village of Reay as this will see an increase in HGV traffic during concrete delivery days above the allowable threshold;
- If possible, onsite batching should be considered to reduce max monthly anticipated vehicle movement of concrete deliveries during turbine foundation construction. Onsite batching is the preferred option by the Applicant and the ability to accommodate batching onsite would be confirmed following post-consent site investigations; and
- Communication with local communities should be undertaken for planned activities, such as turbine deliveries and concrete delivery days (if onsite batching is not possible).

A Framework Construction Traffic Management Plan is provided in Appendix C.

[1] Exceptions shall be granted to sub-contractors living or staying along the A897 and the B871 roads, to ensure that local accommodation businesses on these roads are not affected by the above restriction. This will also ensure that sub-contractors are not restricted from staying in accommodation along the A897 and the B871.

# APPENDIX A – WATER CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

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# 1 INTRODUCTION

This outline Water and Construction Environmental Management Plan (WCEMP) forms an appendix to the Construction Environmental Management Plan for Ackron Wind Farm (the Development).

## 1.1 Guidance and Legislation

The following legislation and guidance documents have been used to inform the overall WCEMP:

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR)[2];
- The Water Quality (Scotland) Regulations 2010[3];
- Good practice during wind farm construction[4];
- Groundwater Protection Policy for Scotland Version 3 (2009)[5];
- SEPA Planning guidance on on-shore windfarm developments (LUPS-GU4)[6];
- The Construction Industry Research and Information Association (CIRIA) (2015), Environmental Good Practice on Site (C741)[7]; and
- Guidance for Pollution Prevention (GPP/ PPG) 1: Understanding your environmental responsibilities[8]; and
- Planning Advice Note (PAN) 61 – Planning and Sustainable Urban Drainage Systems[9].

Relevant guidance and best practice document are subsequently provided in the relevant sections of this report.

# 2 DEVELOPMENT REQUIREMENTS

The WCEMP takes into account specific activities during the construction and operational phases of the Development, including:

- Access roads;
- Borrow workings;
- Turbine foundations; and
- Hardstanding areas and buildings (including crane hardstanding, construction compounds and associated infrastructure).

[2] UK Government (2011) The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) [Online] Available at: http://www.legislation.gov.uk/ssi/2011/209/contents/made

[3] The Scottish Government (2010) *The Water Quality (Scotland) Regulations 2010* [Online] Available at: http://www.legislation.gov.uk/ssi/2010/95/contents/made (Accessed: 14/11/2019)

[4] Scottish Renewables, Scottish Natural Heritage, SEPA, Forestry Commission Scotland, Historic Environment Scotland, Marine Science Scotland (2019) *Good Practice during Wind Farm Construction 4th Edition* [Online] Available at: https://www.nature.scot/guidance-good-practice-during-wind-farm-construction (Accessed: 08/06/2020)

[5] SEPA (2009) *Groundwater protection policy for Scotland Version 3* [Online] Available at: https://www.sepa.org.uk/media/60033/policy-19_groundwaternov09.pdf (Accessed: 15/06/2020)

[6] SEPA (2017) *Land Use Planning System SEPA Guidance Note 4: Planning guidance on on-shore windfarm developments* [Online] Available at: https://www.sepa.org.uk/media/136117/planning-guidance-on-on-shore-windfarms-developments.pdf (Accessed: 11/06/2020)

[7] CIRIA (2015) *Environmental good practice on site guide* (fourth edition) (C741)

[8] NetRegs (2013) PPG1: Understanding your environmental responsibilities – good environmental practices [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 08/06/2020)

[9] Scottish Government (2001) Planning Advice Note 61: Planning and Sustainable Urban Drainage Systems [Online] Available at: https://www2.gov.scot/Publications/2001/07/pan61 (Accessed: 15/06/2020)

## 2.1 Potential Sources of Pollution

The identified potential sources of pollution as a result of the construction, operational and decommissioning phases of the Development, based on the findings of the EIA Report Chapter, are as follows:

- Direct disturbance of banks and bed of river and lochs;
- De-watering of excavations;
- Run-off from exposed ground and material stockpiles;
- Run-off from roads and haul routes and river crossings;
- Plant washings/ washing areas;
- Fuel and chemical storage / refuelling areas; and
- Leaking/ vandalised equipment.

## 2.2 Schedule of Mitigation

Mitigation measures are incorporated into the EIA Report assessment of significance of effects for hydrology and hydrogeology. A summary of the mitigation measures proposed within the EIA Report Chapter 12: Hydrology and Hydrogeology are outlined in Table 2.1.

***Table 2.1: Schedule of Mitigation***

| Section of EIA Report | Receptor | Potential Effect | Mitigation specified within EIA Report |
|---|---|---|---|
| **Construction Phase** | | | |
| Section 12.6.1.1 | Surface hydrology (watercourses)<br>Hydrogeology (groundwater and near-surface water) | Chemical pollution as a result of chemical handling and storage and onsite vehicle fuelling and maintenance.<br>Pollution from concrete use and washout. | Refer to Section 3.3.<br>Chemical pollution prevention and appropriate measures for chemical storage outlined in Section 3.3.1<br>Details of mitigation of spillage incidents and best practice in the event of a spill outlined in Section 3.3.2<br>Mitigation relating to concrete use on site is provided in Section 3.3.3, and washing of vehicles on site, including concrete washout areas, detailed in Section 3.3.4.<br>Concrete use in watercourse crossing design and construction is outlined in Section 3.4.2<br>It is suggested a surface water quality monitoring programme is conducted as good practice, in accordance with Section 3.7 |
| Section 12.6.1.2 | Surface hydrology (watercourses)<br>Hydrogeology (groundwater and near-surface water) | Erosion and Sedimentation as a result of excavation works and track construction and upgrades. | Refer to Section 3.2.<br>Any works to be conducted within or near watercourse refer to Section 3.4 including appropriate measures for construction of watercourse crossings and culverts to prevent erosion of stream beds. |

| Section of EIA Report | Receptor | Potential Effect | Mitigation specified within EIA Report |
|---|---|---|---|
| Section 12.6.1.3 | Surface hydrology (watercourses) | Impediments to surface water flows as a result of installation of watercourse crossings. | Watercourse crossing construction and culverting best practice guidance outlined in Section 3.4.2 and 3.4.3.<br>Any works to be conducted within or near watercourse refer to Section 3.4.<br>It is suggested a surface water quality monitoring programme is conducted as good practice, in accordance with Section 3.7. |
| | Hydrogeology (groundwater and near-surface water) | Diversion of near-surface flow as a result of track construction and the installation of turbine foundations / hardstanding. | Details of appropriate site drainage to maintain continuity of surface and near-surface flows is detailed in Section 3.1.<br>Any dewatering works required for installation of turbine foundations will be conducted in line with guidance in Section 3.4.4.<br>Details relating to protection of GWDTE in Section 3.5. |
| Section 12.6.1.4 | Private water supplies (PWS) | Pollution as a result of track upgrades and uncontained spills from vehicles, and chemical handing/ storage.<br>Drying out or changes to quantity as a result of upgrades to access track. | Specific measures relating to the protection of water supplies and groundwater abstractions are provided in Section 3.6.<br>Monitoring of PWS water quality, if required, would be incorporated into a water quality monitoring programme as outlined in Section 3.7.<br>Measures relating to chemical pollution, sedimentation and site drainage should all be considered as part of PWS protection. |
| Section 12.6.1.5 | Groundwater Dependent Terrestrial Ecosystems (GWDTE) | Pollution as a result of track construction and uncontained spills from chemical handling / storage. Drying out or changes to groundwater interflow patterns as a result of construction. | Specific measures relating to the protection of GWDTE are provided in Section 3.5.<br>Measures relating to chemical pollution, sedimentation and site drainage should all be considered as part of GWDTE protection. |
| Section 12.6.1.7 | Surface hydrology (watercourses) | Increase in volume of run-off and potential flood risk as a result of increased hardstanding. | Site drainage measures and Sustainable Drainage Systems (SuDS) to prevent an increase in flood risk and to maintain natural site drainage as much as possible, are detailed in Section 3.1. |

**2.3**

## 2.4 Regulation and Authorisation

All construction and engineering activities within or hydrologically connected to the water environment require authorisation under Controlled Activities Regulations (CAR). There are three levels of authorisation and the level required is site-specific and based on the level of risk of the activity to the water environment. The levels of authorisation are:

1. General Binding Rules (GBR): low risk activities. All development activities must comply with these rules. No application to SEPA is required.
2. Registration: medium risk activities. Application to SEPA is required to register an activity.
3. Licence: high risk activity. Simple or complex licences exist depending on the activity. Application to SEPA is required to obtain a licence for the activity.

Further guidance on the requirement for authorisation are outlined in the following documents:

- CAR – A Practical Guide (Controlled Activities Regulations)[10];
- Introduction to Controlled Activities Regulation[11]; and
- SEPA LUPS-GU-15: Planning guidance in relation to SEPA regulated sites and processes[12].

The requirements for authorisation of specific activities are outlined in the relevant sections of this document.

## 2.5 Environmental Clerk of Works (ECoW)

An Environmental (or Ecological) Clerk of Works (ECoW) will be appointed for the construction period (commencement of development to final commissioning or end of construction period). The ECoW will hold an advisory role. In relation to the water environment, the scope of the ECoW role will include:

- Monitoring compliance with the mitigation outlined in the EIA Report, CEMP and other relevant documentation relating to the planning condition and site licence, such as the Pollution Prevention Plan (PPP);
- Routine monitoring of water pollution prevention measures, such as silt management measures, and inspection following storm events; and
- Routine visual inspection and observation of watercourses for the presence of silt, discolouration and hydrocarbons.

[10] SEPA (2019) *The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide* [Online] Available at: https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf (Accessed: 10/06/2020)
[11] SEPA (n.d.) *Introduction to the Controlled Activates Regulations* [Online] Available at: https://www.sepa.org.uk/media/34800/introduction-to-the-controlled-activities-regulations.pdf (Accessed: 10/06/2020)
[12] SEPA (2013) *Land Use Planning System SEPA Guidance Note 15: Planning Guidance in Relation to SEPA Regulated Sites and Processes (LUPS-GU15)* [Online] Available at: https://www.sepa.org.uk/media/136091/planning-guidance-in-relation-to-sepa-regulated-sites-and-processes.pdf (Accessed: 12/06/2020)

# 3 OUTLINE MITIGATION FOR THE WATER ENVIRONMENT

## 3.1 Site Drainage

Drainage from the site will include elements of Sustainable Drainage Systems (SuDS) design, where appropriate. SuDS is a method of controlling surface water run-off in a manner that replicates natural drainage patterns and has a number of benefits, including:

- SuDS will attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream;
- SuDS will treat run-off to a certain degree, which can reduce sediment and pollutant volumes in run-off before discharging back into natural drainage network; and
- SuDS measures, such as lagoons or retention ponds, correctly implemented will produce suitable environments for wildlife.

The following best practice guidance should be used:

- CIRIA C648 – Control of water pollution from linear construction projects[13];
- CIRIA C352 – Control of water pollution from construction sites [14];
- CIRIA SuDS Manual (C753)[15];
- CIRIA Guidance on the construction of SuDS (C768)[16]; and
- SEPA WAT-RM-08 Regulatory Method: SuDS[17];
- SEPA WAT-SG-75 Sector-specific Guidance – Construction Sites[18]; and
- Water Assessment and Drainage Guide (WADAG)[19];
- GPP5: Works and maintenance in or near water[20]; and
- GPP4: Treatment and disposal of wastewater where there is no connection to the public fowl sewer.

### *3.1.1 Authorisation*

SuDS are a legal requirement for all developments draining to the water environment (other than a single dwelling or discharges to coastal water). All developments must comply with all conditions of the CAR Regulations General Binding Rules (GBR) including the requirement for SUDS.

Developments require authorisation for surface water run-off discharges under CAR regulations by a SEPA licence (Construction SUDS licence) for construction sites which:

- Exceed 4 ha area;
- Contain a road or track length in excess of 5 km; and / or
- Include any area with a slope gradient of more than 250 m over 1 ha or 500 m length.

[13] CIRIA (2006) *C648: Control of water pollution from linear construction projects: Technical Guidance* [Online] Available at: https://www.ciria.org/Search?SearchTerms=c648 (Accessed: 09/06/2020)
[14] CIRIA (2001) *C532: Control of water pollution from construction sites: Guidance for consultants and contractors* [Online] Available at: https://www.ciria.org/ProductExcerpts/C532.aspx (Accessed: 09/06/2020)
[15] CIRIA (2015) *C753: The SuDS Manual*
[16] CIRIA (2017) *C768: Guidance on the construction of SuDS*
[17] SEPA (2019) *WAT-RM-08: Regulatory Method Sustainable Drainage Systems (SUDS or SUD Systems) v6.4* [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed: 10/06/2020)
[18] SEPA (2018) *WAT-SG-75 Supporting Guidance Sector Specific Guidance: Construction Sites* [Online] Available at: https://www.sepa.org.uk/media/340359/wat-sg-75.pdf (Accessed: 10/06/2020)
[19] SUDSWP (n.d.) *Water Assessment and Drainage Assessment Guide* [Online] Available at: https://www.sepa.org.uk/media/163472/water_assessment_and_drainage_assessment_guide.pdf (Accessed: 10/06/2020)
[20] NetRegs (2017) *GPP5: Works and maintenance in or near water* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 10/06/2020)

If the development is below the threshold criteria, a licence is not required and the development can be authorised under GBR10 and no direct consultation with SEPA is required.

SEPA WAT-RM-08 Regulatory Method: SuDS provides further details on the licence requirements.

### *3.1.2 Pre-Earthworks Drainage*

Pre-earthworks drainage relates to the required drainage measures to be installed prior to earthwork activities such as access track construction and borrow pit workings.

Best practice pre-earthworks drainage measures include:

- Cut-off / diversion ditches;
- Temporary interception bunds;
- Swales; and
- Retention ponds.

#### *3.1.2.1 Purpose / Aim*

The aim of pre-earthworks drainage is to:

- Divert 'clean' surface water run-off and stormwater away from exposed soils of earthworks preventing further erosion; and
- Prevent 'clean' water from mixing with potentially silt-laden water generated from construction works.

#### *3.1.2.2 Installation*

Pre-earthwork drainage should be installed immediately prior to earthworks and construction works commencing.

Temporary interception bunds and cut-off drainage ditches ('clean water drains') will be constructed on the 'high-side' boundary of the earthwork operations to prevent surface water run-off entering excavations. Run-off collected in the drainage ditches will be diverted along a channel which follows the natural gradient of the ground, avoiding steep gradients.

The profile of the ditch can vary from a 'v' shape to a 'u' shape but should have a constant uniform depth. The profile of the ditch will depend on the soil type and stability.

The use of 'u'-shaped vegetated ditches is preferential, these are also known as swales. The dimensions and gradient of swales will be kept to a minimum to prevent rapid flow of water. Swales to collect runoff will be placed on the downslope of earthworks and stockpiles and will be designed to treat potentially silty runoff before discharging back into the drainage system. This may include constructing check dams within the channel and employing silt management measures. The use of retention ponds allows for additional storage capacity during heavier rainfall events.

#### 3.1.2.3 Reinstatement

All pre-earthworks drainage channels should be re-instated unless required for long-term drainage on the site. No exposed soils should remain, and turves should be emplaced to prevent erosion.

Where exposed soil is to be left for a long period before reinstatement or re-seeding, other measure to prevent erosion may be required:

- Geotextiles (biodegradable and non-biodegradable);
- Mulching/ binders/ hydro-seeding;
- Turf cut from other areas on site; and

- Surface roughening.

### *3.1.3 Earthworks Drainage*

Drainage for permanent or semi-permanent earthworks such as access tracks is required to control surface water run-off and discharge to appropriate outlets.

Best practice pre-earthworks drainage measures include:

- Drainage ditches;
- Sumps; and
- Culverts.

#### *3.1.3.1 Purpose/ Aim*

To manage surface water run-off from earthworks e.g. access tracks, and manage and allow for continuity of the natural drainage of surface water and groundwater from higher elevations to lower.

#### *3.1.3.2 Pre-installation*

Prior to access track and earthwork construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow so that site drainage design will maintain hydrological connectivity. Site drainage design will be produced in advance of construction.

Floating roads are used within the design. Further details of good practice with regards to drainage for floating roads is provided in Floating Roads on Peat[21] good practice guidance document.

#### *3.1.3.3 Installation*

All earthworks will have a gravity drainage system and all water will drain to an adequately sized sump. If dewatering of borrow pits or excavations is necessary, waste water will be treated by designed settlement lagoons and retention ponds, further details are provided in Section 3.2.5.

Trackside drainage ditches are to be constructed parallel to the access tracks and follow the same gradient as the access tracks. To allow for continuity of surface and ground water flow from the high-side of the track to low-side, culverts are required to be built crossing the track at appropriate intervals, as shown in

Plate 3.1. All culverts should be constructed to allow for peak river flow plus a climate change allowance of 37% in accordance with SEPA climate change allowances for flood risk guidance[22]. Further details of culvert design are provided in Section 3.4.4.

Permanent check dams can also be installed to slow the flow of water in ditches with steeper gradients and straightened channels to prevent erosion of channels and at outlets. Water within channels should be allowed to flow and should not be stagnant, and tracks should be free from standing water through inclusion of camber or cross-fall. Track surface cross-drains can be installed on tracks with long gradients and limited camber, and should be kept free of sediment.

Sustainable drainage systems such as swales with vegetated channels are preferential and will be designed to intercept, filtrate and convey run-off. Permanent swales and

[21] SNH and Forestry Civil Engineering (2010) *Floating Roads on Peat: A Report into Good Practice Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland* [Online] Available at: http://www.roadex.org/wp-content/uploads/2014/01/FCE-SNH-Floating-Roads-on-Peat-report.pdf (Accessed: 10/06/2020)

[22] SEPA (2019) *Land Use Planning System SEPA Guidance: Climate change allowances for flood risk assessment in land use planning* (LUPS-CC1) [Online] Available at: https://www.sepa.org.uk/media/426913/lups_cc1.pdf (Accessed: 22/06/2020)

drainage ditches adjacent to access tracks will have outlets at specified intervals to reduce the volume of water collected in a single channel and, therefore, reduce the potential for erosion.

***Plate 3.1: Trackside drainage ditch and cross-drainage culvert***

Settlement lagoons should be installed at drainage ditch outlets, prior to discharge to watercourse. They should be constructed to allow for adequate attenuation of water and settlement of sediments. Silt mats may be used at the outfalls of settlement lagoons and retention ponds to further aid the settlement of sediment from earthworks drainage. Further details on sediment management are provided in Section 3.2.

The use of retention ponds should be used to allow for additional storage capacity during heavier rainfall and storm events.

### *3.1.4 Management of Drainage from Surplus and Loose Materials*

Careful consideration will be given to the location of topsoil and subsoil storage areas for all areas of the Development during construction. Storage areas will be either in a flat dry area away from watercourses, or be protected by the addition of cut off drains above the storage areas to minimise the ingress of water.

The use of peat and soil stockpiles will be minimised by earthworks planning. However, where stockpiles are used, silt fences and silt mats will be employed to minimise sediment levels in run-off.

All stockpiled material will be stored at least 50 m from watercourses in order to reduce the potential from sediment to be transferred into the wider surface water system and will be regularly inspected to ensure that erosion of the material is not taking place.

An example of a stockpile/ overburden and the installation of drainage ditch to divert run-off from the stockpile material is shown in Plate 3.2.

***Plate 3.2: Stockpile and drainage ditch (under construction)***

In accordance with BS 3882 'Specification for Topsoil and Requirements for Use', any long-term stockpiling of topsoil should not exceed 2.0 m in height with a maximum side slope of 1 in 2. In its dry non plastic state, topsoil can be stockpiled in a 'loose tipped' manner and tracked in a compactive method reducing water ingress. Wetter soils can be stored in windrows for drying and later stockpiled for re-use. The re-wetting of peat will be carried out, if there is a potential risk of the peat drying out. Mineral and peat soil stockpiles will not be allowed to dry out.

Loose materials such as crushed rock and stone will be prevented from entering watercourses through the employment of sediment pollution prevention measures in areas of loose material storage or generation, as outlined in Section 3.2.

### *3.1.5 Discharge of Water*

Discharge of water from the site will depend on the water environment on site and the quality of the final discharge. This section considers the discharge of surface water drainage to the water environment and does not consider foul drainage from substation and temporary construction compound welfare facilities.

#### *3.1.5.1 Discharge to Sewer*

Discharge to foul sewer require permission from Scottish Water. Scottish Waters starting position is that no new surface water connections to combined/ foul sewer will be accepted.

Scottish Water prefer that surface water is re-used on site where practicable, drained into a SUDS system, drained to ground through soakaway or to an existing watercourse and notes that pumping of water to one of these outlets may be required.

Where it is not practicable to discharge to SUDS, ground or watercourse, surface water may be drained to a combined/ surface water sewer and requires enquiry and an application to Scottish Water.

Further details are provided in Scottish Water Surface Water Policy advice note and guidance[23] and GPP4.

#### *3.1.5.2 Soakaway*

Water contaminated with fine silt only can be discharged to vegetated surfaces and required permission from SEPA and landowner.

Irrigation techniques, which may include the use of perforated discharge hoses or similar, will be employed to rapidly distribute discharge across a vegetated slope. This will be carried out in consultation with the ECoW.

Details on typical infiltration rates of soil types are provided in GPP5.

#### *3.1.5.3 Drain to watercourse or SUDS system*

Treated water can be discharged to watercourse, loch or SuDS systems. The discharge water must be in line with the baseline water quality and flood risk capacity of the receiving water.

Methods of on-site sediment and chemical pollution prevention and water treatment are outlined in Section 3.2 and 3.3

Authorisation from SEPA is required for discharge of water from the Development to the water environment.

#### *3.1.5.4 Tanker off site*

Water which cannot be treated on site and is not of a quality which can be released to water environment, will need to be tankered off site for appropriate treatment and disposal.

### *3.1.6 Provision for Storm Events*

The site itself is not at risk from flooding. In extreme storm events, there would be elevated levels of run-off from the hardstanding elements of the Development relative to greenfield flow rates, which has the potential to contribute to down-stream, off-site, flood risk. The areas of new hardstanding, in terms of the percentage of the relevant catchments, is approximately 1% of the Akran Brun catchment and <1% of the Halladale River catchment.

In the baseline scenario, the water table is not at the ground surface, and hence some infiltration would be expected. Measures are proposed in this document that would limit run-off rates in Section 3.2.

Temporary storage volume for storm run-off from the turbine foundations and crane hardstanding areas would be provided via settlement lagoons, further details of which are provided in 3.2.5.

Along the access tracks, drainage channels on the down-slope would shed track run-off to adjacent rough ground approximately every 30 m, to attenuate flow and allow natural filtration to remove sediments. In areas within 50 m of a watercourse marked on an Ordnance Survey 1:50,000 scale map or where cross-slopes exceed 1 in 20, drainage channels will be bunded and outflow will be monitored daily in areas with on-going construction activity.

[23] Scottish Water (2018) Surface Water Policy: Standard advice note and process guidance [Online] Available at: https://www.scottishwater.co.uk/help-and-resources/document-hub/business-and-developers/connecting-to-our-network (Accessed: 10/06/2020)

## 3.2 Sediment Pollution Prevention

Sediment pollution and release of excess sediments can result in detrimental effects to fish spawning habitats by covering the stream bed. Mitigation measures should minimise mobilisation and release of sediments to the water environment. Water polluted by sediments are not allowed to leave the site untreated and the final discharge from the site must have acceptable levels of sediment (in line with baseline levels).

Major construction works will be minimised during heavy precipitation events.

Sediment pollution prevention is to be employed in line with the following best practice guidance:

- SEPA WAT-SG-26: Good Practice Guide – Sediment Management[24];
- SEPA WAT-SG-78 Sediment Management Authorisation[25]; and
- CIRIA C648 – Control of water pollution from linear construction projects[26];
- CIRIA C352 – Control of water pollution from construction sites [27]; and
- GPP5: Works and maintenance in or near water[28];

Best practice methods of sediment management and pollution prevention, and required authorisation are outlined in the following sections.

### *3.2.1 Authorisation*

Under CAR Regulations authorisation is required for all sediment management works within inland surface water and surface water dependent wetlands.

The levels of authorisation are GBR, Registration or Licence and the required level is based on the environmental risk at the Site. More details are provided in SEPA guidance documents WAT-SG-78 Sediment Management Authorisation and WAT-RM-02 Regulation of Licence level Engineering Activities[29].

### *3.2.2 Silt Traps and Silt Matting*

#### *3.2.2.1 Purpose*

Silt traps may be utilised to trap, temporarily store and filter sediment-laden run-off from excavation works at the Development, including turbine bases and access roads. This is to prevent discharge of silt-laden waters to watercourses or ground.

#### *3.2.2.2 Installation*

Silt traps and matting have a limited effective flow capacity and must be installed with the peak river flow plus a climate change allowance of 37% capacity in consideration.

Silt traps and matting are to be installed at the following locations:

- Within drainage ditches but will be sited to avoid slopes with a gradient greater than 1 in 20;

[24] SEPA (2010) *WAT-SG-26: Engineering in the water environment: good practice guide – Sediment management* [Online] Available at: https://www.sepa.org.uk/media/151049/wat-sg-26.pdf (Accessed: 09/06/2020)
[25] SEPA (2012) *Supporting Guidance (WAT-SG-78) Sediment Management Authorisation v1* [Online] Available at: https://www.sepa.org.uk/media/151062/wat-sg-78.pdf (Accessed: 09/06/2020)
[26] CIRIA (2006) *C648: Control of water pollution from linear construction projects: Technical Guidance* [Online] Available at: https://www.ciria.org/Search?SearchTerms=c648 (Accessed: 09/06/2020)
[27] CIRIA (2001) *C532: Control of water pollution from construction sites: Guidance for consultants and contractors* [Online] Available at: https://www.ciria.org/ProductExcerpts/C532.aspx (Accessed: 09/06/2020)
[28] NetRegs (2017) *GPP5: Works and maintenance in or near water* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 10/06/2020)
[29] SEPA (2019) *WAT-RM-02 Regulation of Licence Level Engineering Activities* [Online] Available at: https://www.sepa.org.uk/media/150958/wat_rm_02.pdf (Accessed: 10/06/2020)

- At the inlet (sump) or outlet side of culverts; and
- At the outfall of settlement lagoons to filter sediment during times of heavy rainfall as shown in Plate 3.3.

***Plate 3.3: Silt matting (combined with silt fencing)***

*3.2.2.3 Maintenance*

The silt traps and silt matting will be monitored by the Ecological Clerk of Works (ECoW) and should be cleared regularly and replaced when necessary.

### *3.2.3 Silt Fencing*

*3.2.3.1 Purpose*

Silt fencing is a widely used form of silt trapping and provides a linear barrier for installation upstream of watercourses and lochs. Silt fences are cost-effective and practical methods of attenuating storm water run-off and intercepting sediment and silt.

*3.2.3.2 Installation*

Silt fences are a semi-permeable geotextile fabric arranged in the form of a fence (attached to timber posts) as shown in Plate 3.4

Silt fences are to be used as perimeter controls on the site at the downslope end of earthworks or disturbed soils, and at watercourse crossings as shown in Plate 3.5. They should be used in conjunction with other sediment and water treatment solutions where required.

To comply with best practice, they should be installed as follows:

- Installed perpendicular to the gradient of the slope;
- Construct a trench on the up-gradient side;
- Install stakes on the down-gradient side; and
- Position with a curve to the end of the fence in the up-gradient direction to help capture surface run-off as shown in Plate 3.3.
- Silt fences should not be installed in the following:
- Within drainage ditches or channels; and/ or
- Running parallel to the direction of slope.

***Plate 3.4: Typical silt fencing***

***Plate 3.5: Silt fencing at watercourse crossing***

*3.2.3.3 Maintenance*

Silt fencing will be monitored by the Ecological Clerk of Works (ECoW) and should be cleared regularly of sediment and silt build-up, and after heavy rainfall and storm events. Silt fencing will should be replaced when necessary.

### *3.2.4 Check Dams*

*3.2.4.1 Purpose*

Check dams will facilitate the settlement of suspended solids by slowing the flow of water within the drainage ditches. An example of a typical check dam is shown in Plate 3.6.

*3.2.4.2 Installation*

Check dams will be installed within drainage ditches at regular intervals, where appropriate. Appropriately sized stone pitching will be used within the dam in order to provide a rough surface for water within the drainage ditch to pass over.

***Plate 3.6: Check dam example***

### *3.2.5 Settlement Lagoons*

#### *3.2.5.1 Purpose*

Retention of contaminated water to allow for the settlement of silt and sediments to an acceptable level (in line with baseline level) prior to discharge to the water environment.

#### *3.2.5.2 Installation*

Settlement lagoons will be implemented where appropriate across the Site and at all turbine excavations. They take the form of large trenches dug into the ground and are often bunded.

Settlement lagoons should be installed so as to retain water long enough for silt to settle out. The length of time required will depend on the type of silt with finer silts and clays taking longer to settle.

Further measures may include the use of flocculent to further facilitate the settlement of suspended solids. The appropriateness of flocculent use must be discussed with SEPA prior to its introduction into settlement lagoons. Flocculants can be pollutants if the incorrect dosage is used. Further guidance on the required dimension of settlement lagoon are provided in GPP5.

To comply with best practice, they should be installed as follows:

- Install energy dissipation methods (e.g. rip-rap) at the inlet to minimise flow;
- Install inlet pipe work vertically to dissipate energy of flow in;
- Install a lined inlet chamber and outlet weir with materials such as geotextiles;
- Install a long outlet weir;

Install two or three lagoons in a series to increase silt retention and storage as shown in Plate 3.7.

***Plate 3.7: Settlement lagoon series***

*3.2.5.3 Maintenance and Operation*

Settlement lagoons should be inspected regularly by the ECoW to ascertain the functionality of the system. To comply with best practice, the following maintenance measures are to be conducted:

- All settlement lagoons will be actively managed to control water levels and ensure that any run-off is contained, especially during times of rainfall;
- A constant pumped inlet rate should be maintained;
- Inlet chamber should be emptied of silt regularly;
- Discharge quality to be monitored frequently.

Settlement lagoon outflow discharge may be pumped, when required, for maintenance purposes. A 'Siltbuster' is a method of pumping excess silt-laden water and treated prior to discharge, as shown in Plate 3.8.

Any pumping activities will be supervised and authorised by the Infrastructure Contractor's Project Manager.

Methods for discharge of outflow water from a settlement lagoon are detailed in the following section.

***Plate 3.8: Settlement lagoon and Siltbuster pumping out water for treatment***

## 3.3 Chemical Pollution Prevention

Pollution from fuels and other chemicals can cause a variety of detrimental effects to freshwater ecology and can lead to loss of aquatic flora and fauna. Cement pollution and concrete wash-out can lead to increases in alkalinity and rase the pH of watercourses, which can be toxic to aquatic flora and fauna.

Chemical pollution prevention is to be employed on site in line with best practice guidance, including the following:

- SEPA Groundwater protection policy for Scotland (Section F);
- SEPA WAT-SG-31: Special Requirements for Civil Engineering Contracts for the Prevention of Pollution[30];
- SEPA WAT-SG-32: SEPA Guidance on the Special Requirements for Civil Engineering Contracts[31];
- CIRIA Control of Water Pollution form Construction Sites (C532)[32];
- GPP5: Works and maintenance in or near water[33];
- GPP8: Safe storage and disposal of used oils[34];

[30] SEPA (2006) *WAT-SG-31: Prevention of pollution from Civil Engineering Contracts: Special Requirements Version 2* [Online] Available at: https://www.sepa.org.uk/media/152220/wat_sg_31.pdf (Accessed: 09/06/2020).

[31] SEPA (2006) *WAT-SG-32: Prevention of pollution from Civil Engineering Contracts: Guidelines for the Special Requirements Version 2* [Online] Available at: https://www.sepa.org.uk/media/152233/wat_sg_32.pdf (Accessed: 09/06/2020)

[32] CIRIA (2001) *C532: Control of water pollution from construction sites – Guidance for consultants and contractors*

[33] NetRegs (2017) *GPP5: Works and maintenance in or near water* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 10/06/2020)

[34] NetRegs (2017) *GPP8: Safe storage and disposal of used oils* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 10/06/2020)

- GPP13: Vehicle washing and cleaning[35];
- PPG18: Managing fire water and major spillages[36];
- GPP21: Pollution incident response planning[37];
- GPP22: Dealing with spills[38]; and
- GPP26: Safe storage – drums and intermediate bulk containers[39].

To reduce the potential for a chemical pollution incident, areas of high-risk activities are to be located away from watercourses and drainage paths. Areas of high risk include:

- Fuel and chemical storage;
- Refuelling areas;
- Material stockpiles;
- Vehicle and equipment washing areas; and
- Site compounds / parking areas.

### *3.3.1 Storage of Chemicals and Oil*

Potentially contaminating chemicals stored on site will be kept within a secure bunded area to prevent any accidental spills from affecting hydrological resources. The bunded area will be within the construction compound and will be underlain by an impermeable ground membrane layer to reduce the potential pathways for contaminants to enter watercourses and groundwater.

Oil storage areas will be covered in order to prevent rainwater collecting within the bunded area.

The chemicals storage area would be kept secure to prevent theft of vandalism. A safe system for accessing the storage area would be implemented by the Construction Contractor.

The following measures should be employed under best practice guidance for storage of chemicals and oils:

- Storage tanks (above or below ground) should eb sufficient strength and structural integrity to hold without leak or burst and bunded in accordance with SEPA guidance, and double-skinned tanks should be used for list l substances[40];
- Storage containers should have a minimum design life of 20 years; and
- All storage containers are closed and locked when not in use.

Chemical storage areas are to be removed from Site as part of decommissioning, any remnant in-situ storage facilities must be appropriately maintained and monitored for degradation and release of oils or chemicals.

[35] NetRegs (2017) *GPP13: Vehicle washing and cleaning* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 12/06/2020)

[36] NetRegs (2000) *PPG18: Managing water and major spillages* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 12/06/2020)

[37] NetRegs (2017) *GPP21: Pollution Incident Response Planning* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 12/06/2020)

[38] NetRegs (2017) *GPP22: Dealing with spills* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 12/06/2020)

[39] NetRegs (2017) *GPP26: Safe Storage – drums and immediate bulk containers* [Online] Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ (Accessed: 12/06/2020)

[40] https://www.sepa.org.uk/media/59968/policy_61-control-of-priority-and-dangerous-substances-and-specific-pollutants-in-the-water-environment.pdf

### *3.3.2 Spillage of Chemicals and Oil*

The construction compound will have a bunded area and this area will be underlain by an impermeable ground membrane layer. The bund will have a capacity of 110 % of the stored liquid containers (including fresh concrete). This will reduce the potential for accidental spillages to contaminate surface water or groundwater.

Best practice guidance on the prevention of spillages of chemical outlines the following measures:

- Areas where transfer and handling of chemicals is to occur should have impermeable surface;
- Drainage systems onsite should be designed to enable the containment of spillages and appropriate disposal and treatment; and
- Emergency procedures are implemented for a spillage incident and leak detection measures (if appropriate);
- Regular maintenance and inspection of chemical storage facilities to be conducted (may be carried out by onsite ECoW); and
- Provision and training in the use of spill kits, as outlined below.

An appropriately sized spill kit(s) will be provided, maintained and located at strategic points across the site, as shown in Plate 3.9. This will contain materials, such as absorbent granules and pads, absorbent booms and collection bags. These are designed to halt the spread of spillages and will deployed, as necessary, should a spillage occur elsewhere within the construction compound.

***Plate 3.9: Spill kit provision on site***

Speed limits for vehicles transporting concrete will be set at a maximum of 15 miles per hour (mph) and will be monitored. Maximum vehicle load capacities will not be exceeded. Although tracks will be maintained in good condition, vehicle loads will be reduced when a rougher surface is identified prior to track maintenance.

All maintenance and operation of machinery, and use of chemicals and oils on site, will be conducted on suitable absorbent spill pads to minimise the potential for groundwater

and surface water pollution. All machinery will be equipped with drip pans to contain minor fuel spillage or equipment leakages.

Appointed refuelling personnel will be trained in the correct methods of refuelling on site to ensure that pollution incidents are prevented and a quick response plan is implemented, should a spill occur, to minimise the impact of spills.

Regular vehicle and machinery maintenance will be conducted to ensure that there is minimal potential for fuel or oil leaks / spillages to occur.

Plate 3.10 and Plate 3.11: Drip trays and bunds show examples of drip trays and bunds.

***Plate 3.10 and Plate 3.11: Drip trays and bunds to prevent chemical spillages***


### *3.3.3 Concrete, Cement and Grout*

Concrete, cement and grouts which are batched and transported on site will be subject to the same requirements as outlined in Section 3.3.1.

To comply with best practice, concrete, cement and grout mixing and washing areas should:

- Be sited in an impermeable hardstanding or geotextile within a designated area;
- Be sited at least 10 m from any watercourse or surface water drain, rock outcrop or sinkhole;
- Install settlement and re-circulation systems for water re-use in the batching process to minimise water use, treatment requirements and risk of pollution;
- Designated and contained washing areas for batching plant and vehicles (further details of vehicle washing provided in Section 3.3.4);
- Collect contaminated wash waters which cannot be reused and discharge to foul sewer or tanker off-site (further details of discharge of water is provided in Section 3.1.5). Contaminated water should never be released to the water environment.

To prevent pollution, it is important that all concrete pours are planned and that specific procedures are adopted where there may be a risk of surface water or groundwater contamination, in accordance with CIRIA C532. These procedures will include:

- Ensuring that all excavations are sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system;
- Ensuring that covers are available for freshly placed concrete to avoid the surface of the concrete washing away during heavy precipitation; and
- Installation of a geotextile or sand barrier within the excavation in aquifer units to restrict the flow of concrete into groundwater units (including dewatered units).

Typical foundation shuttering is shown in Plate 3.12.

***Plate 3.12: Shuttering for concrete foundation (wind turbine base)***

### *3.3.4 Vehicle Washing*

There will be a wash-out facility within the construction area consisting of a sump overlain with an impermeable geosynthetic membrane. The geosynthetic membrane will filter out the concrete fines leaving clean water to pass through to the sump. The sump water will be pumped to a licenced carrier and taken off-site for approved disposal.

No washing of concrete-associated vehicles will be undertaken outside the wash out facilities, and the area will be signposted, with all site contractors informed of the locations.

The frequency of concrete plant washout may also be reduced through the use of retarders.

Plate 3.13 displays a typical concrete wash-out facility.

In the event that plant and wheel washing is required, dry wheel wash facilities and road sweepers will be provided to prevent (as far as is practicable) mud and debris being carried from within the site onto the public road.

Signage will be put in place to direct all plant vehicles to use wheel wash facilities. The track section between the wash facility and the public road will be surfaced with tarmac or clean hardcore and the area surrounding the facilities will be kept clean and in good condition.

The wheel wash facility, which will work on a closed cycle, shall be operated throughout the construction period. Wheel wash facilities will be located within a designated area of hardstanding at least 50 m from the nearest watercourse or 20 m from the nearest surface drain. It is expected that these facilities shall be sited adjacent to the site entrance. An example of a dry-ramp wheel wash facility is shown in Plate 3.14.

Should debris be spread onto the site access or public road adjacent to the wind farm, then road sweepers will be quickly utilised to clean affected areas. Loose debris will also be periodically removed from on-site tracks. All HGVs taking construction materials to and from the site will be sheeted to prevent the spillage or deposit of material on the highway.

***Plate 3.13: Concrete wash-out facility***

***Plate 3.14: Vehicle wheel wash facility***

## 3.4 Activities in the Water Environment

Temporary activities related to construction phase works within the water environment include construction of temporary and permanent watercourse crossings.

### *3.4.1 Authorisation*

Engineering activities within the water environment, including construction of watercourse crossings, culverting, diversions and dewatering requires authorisation under the Controlled Activities Regulations (CAR).

The level of authorisation required is anticipated to be a Registration.

### *3.4.2 Watercourse Diversions*

Temporary watercourse diversions may be required to allow for construction works to be conducted on the banks of a watercourse, within wetlands or a watercourse channel. The requirement for this should be avoided and designed out where possible.

Where required, watercourse diversions are to be installed in line with the following best practice guidance:

- SEPA WAT-SG-29: Temporary Construction Methods[41];
- Isolation of a watercourse to allow works may be in the following good practice methods:
- Partial isolation (cofferdam);
- Partial isolation (cassion);
- Full isolation (temporary diversion);
- Full isolation (gravity/ flume pipe); or
- Full isolation (over-pumping/ siphon).

#### *3.4.2.1 Full isolation: over-pumping / siphon*

Allows for a whole section of the channel to be isolated, and water is diverted downstream using a pump or siphon in order to retain hydrological continuity. This temporary diversion may be utilised prior to establishing a long-term watercourse diversion for permanent infrastructure within watercourses.

The section of the watercourse requiring diversion will be isolated using barriers that span the full width of the existing watercourse. This keeps a stretch of the watercourse dry and the water is transferred downstream of the works area by mechanical assistance (pumping), until a long-term diversion is operational.

The pump and associated pipework need not be located in the isolated area, as shown in Plate 3.15.

It may be necessary to pump water from upstream of the barrier to downstream of the works area, i.e., maintain 'normal' flow in the watercourse either side of the isolated reach. Depending on the gradient of the watercourse, it may also be necessary to install a full width barrier downstream of the work area to prevent ingress of water, as shown in Plate 3.16.

[41] SEPA (2009) WAT-SG-29: *Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods First Edition* [Online] Available at: https://www.sepa.org.uk/media/150997/wat_sg_29.pdf (Accessed: 12/06/2020)

***Plate 3.15: Typical over pumping arrangement[42]***

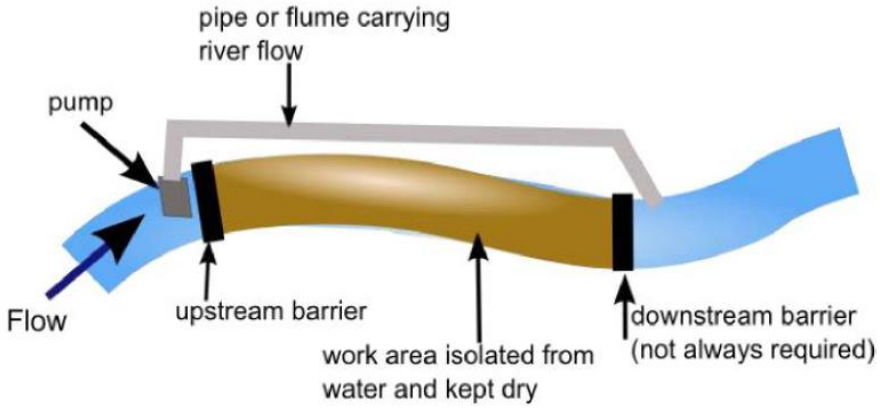


***Plate 3.16: Watercourse Diversion (Full isolation – over pumping)***

Pumps will be kept at least 10 m from the edge of the channel and on drip trays or within bunds that have a capacity 110 % of that of the fuel tank.

[42] SEPA (2009) WAT-SG-29: Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods First Edition [Online] Available at: https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/ (Accessed: 22/07/2020)

### *3.4.3 Watercourse Crossings*

The crossing of watercourses is to be avoided in the design where possible. Existing culverts and watercourse crossings, if any, may be upgraded and anticipated to be replaced with suitable pre-cast culvert designs.

Where required to be installed, watercourse crossings should be designed in order to minimise effects of developments on the natural integrity and continuity of watercourses. The following best practice guidance should be used:

- Forest and Water Guidelines43;
- SEPA WAT-SG-25 River Crossing – Good Practice Guide44;
- SEPA WAT-PS-06-02: Culverting watercourses45; and
- CIRIA C689: Culvert design and operation guide46.

#### *3.4.3.1 Pre-installation*

Identification of ecological requirements and limiting factors (e.g. breeding birds and fish spawning) should be conducted prior to installation of a watercourse crossing. The ECoW should be consulted before watercourse crossing construction can commence.

The hydraulic capacity of the crossing is to be assessed and constructed peak river flow plus a climate change allowance of 37 %. Further information on the hydraulic capacity of a watercourse crossing or culvert is outlined in SEPA River Crossing – Good Practice Guide.

Watercourse crossings should not be installed in 'active' areas of a watercourse e.g. meandering bends and depositional areas.

Consideration should be given to the type of watercourse crossing acknowledging that hard engineering structures, such as concrete culverts, can make it more difficult to restore a site or decommission temporary structures e.g. access tracks. Single span bridges or bridges with an in-stream support should be used for large watercourse crossings and culverts for smaller scale crossings. Further details on the type of culvert to use is provided in Section 3.4.4.

#### *3.4.3.2 Installation*

The use of in-situ fresh concrete in the construction of watercourse crossings will be avoided where possible by the use of pre-cast elements. Watercourse crossings will be installed perpendicular to the direction of flow.

In total one new watercourse crossings are required for the Development. It is anticipated the following type of watercourse crossings are to be installed on site:

- Ready-made concrete 'box style' or bottomless arched concrete or plastic culverts.

However, in accordance with best practice guidance, each watercourse crossing shall be designed on a case by case basis to be appropriate for the width of watercourse being crossed, and the prevailing ecological and hydrological situation (i.e. the sensitivity of the

[43] Forestry Commission (2011) *Forest and Water Guidelines, 5th Edition,* Forestry Commission [Online] Available at: https://www.confor.org.uk/media/246145/forest-and-water-guidelines.pdf (Accessed: 09/06/2020).
[44] SEPA (2010) *WAT-SG-25 Engineering in the water environment: good practice guide. River Crossings.* [Online] Available at: https://www.sepa.org.uk/media/151036/wat-sg-25.pdf (Accessed: 09/06/2020).
[45] SEPA (2015) *WAT-PS-06-02: Culverting of Water courses - Position Statement and Supporting Guidance* [online] Available at: https://www.sepa.org.uk/media/150919/wat_ps_06_02.pdf (Accessed: 09/06/2020).
[46] CIRIA (2010) *C689: Culvert design and operation guide* [Online] Available at: https://www.ciria.org/Resources/Free_publications/C689.aspx?WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91 (Accessed: 10/06/2020)

watercourse). A number of factors, both environmental and engineering will influence the selection of structure type and the design of the crossing.

All watercourse crossings should be installed in line with SEPA WAT-SG-25 River Crossing good practice guide. General good practice in watercourse crossing design and construction will ensure that site conditions are taken into account and the objectives of the CAR are achieved. These include:

- The use of appropriate structures to carry access tracks across watercourses taking into account the scale of the watercourse, ecological value, sensitivity to construction activities, topography and construction methodology;
- There is a preference to avoid construction in watercourses altogether through the use of arch culverts appropriately designed not to impede the flow of water and allow safe passage for wildlife, such as fish, water voles, otters etc. However, short- and long-term impact of designs should be considered, and there can be a case for using pipe or box culverts;
- When installing culverts, care will be taken to ensure that the construction does not pose a permanent obstruction to migrating species of fish, or riparian mammals (i.e. the crossings will make provision for fish and wildlife migration);
- Culverts should be sized so that they do not interfere with the bed of the stream post construction, (i.e. the crossings will leave the watercourse in as natural condition as possible or permit re-establishment of substrate post construction);
- Single culverts will be used in preference to a series of smaller culverts that may be more likely to become blocked with flotsam and create erosion (i.e. the crossings will not constrict the channel);
- Although no fish have been recorded within the tributaries running through the Site, if any fish are found during the construction of any culverts, they will be removed from the immediate construction site to a place of safety if deemed necessary after consultation with the relevant fisheries interest;
- To minimise impacts on the breeding of any fish found, any in-stream works in these areas will be conducted during months which have less impact on their breeding and development, where possible;
- Ease and speed of construction are important to minimise disruption to the watercourse and surrounding habitat;
- Culverts and headwalls should be designed to last the operational life of the Development; and
- Designs should be low maintenance and where possible self-cleansing; and
- Structures should be visually in keeping with the surroundings.

#### *3.4.3.3 Maintenance*

Erosion to the bed and banks at a watercourse crossing as a result of scouring during high rainfall and storm events. Erosion can expose span structure foundations and/ or cause a drop forming at the outlet of the watercourse crossing.

If this occurs, the inclusion of erosion protection measures may be required, such as baffles. The crossing should be reinstated and reinforced to allow for scour during higher flows. The crossing should be reinstated to allow for fish passage and continuity of the watercourse bed. If this is not possible, inclusion of a fish pass may be required.

If maintenance works are required within the watercourse bed then isolation of the watercourse is required, as detailed in Section 3.4.2, and authorisation from SEPA may be required.

Culverts are prone to blockage by debris and may require routine clearing.

### 3.4.4 Culverts

Culverts are used to create artificial channels and allow for the continuity of water drainage and balance upstream and downstream of infrastructure associated with the Development e.g. access tracks.

Closed culverts for river crossings would only be justified for single track roads over small watercourses (<2 m wide). Closed culverts are sufficient for cross-drainage under an onsite access track, as outlined in Section 3.1.3.

Bottomless arch culverts and box culverts should be used for all culverts over watercourses of 2 m or greater in width.

Culverts will be installed and designed in line with best practice guidance, including CIRIA C689, and incorporate the following criteria:

- Culverts will be well bedded to avoid settlement and protected by an adequate cover of road material;
- The substrate and side/ head walls will be reinforced in order to prevent erosion;
- The culverts will be designed such that it does not cause a barrier to movement of fish or other aquatic fauna;
- Culvert floors will have the same gradient (not exceeding a slope of 3 %) and level, and carry similar bed material and flow, as the original stream;
- There shall be no hydraulic drop at the culvert inlet or outlet;
- The width of the culvert will be greater than the active channel width of the watercourse;
- The culvert must not exacerbate or create flooding;
- Culverts will be used to conduct water under the wind farm tracks; and
- Any fences or screens fitted on the inlet or outlet of the culvert will be designed to allow at least 230 mm of space between the bars of the screen of fence, up to the high-water level.
- A natural stone headwall will be provided upstream and downstream of culverts to protect the road embankment. Further protection will be provided to the banks using soft engineering techniques as much as possible.
- Where there is risk of bed erosion upstream or downstream of culverts, natural stone rip-rap will be provided.

### 3.4.5 Dewatering

Dewatering may be required for excavations, construction of foundations or borrow pits. Dewatering is regulated under CAR GBR15 if less than 10m$^3$ per day.

Dewatering should be employed in line with the following best practice guidance:

- SEPA WAT-SG-29: Temporary Construction Methods;
- SEPA Good Practice Guide WAT-SG-28: Intakes and Outfalls[47]; and
- SEPA Regulatory Method WAT-RM-11: Licensing Groundwater Abstractions including Dewatering[48].

If the dewatering volume is greater than 10m$^3$/ day, a CAR licence is required and SEPA WAT-RM-11 is to be referred to. Discharge of water as a result of dewatering must not cause further erosion and energy dissipation measures should be put in place as outlined in SEPA WAT-SG-28 guidance.

[47] SEPA (2019) *WAT-SG-28: Engineering in the Water Environment Good Practice Guide: Intakes and outfalls Second Edition* [Online] Available at: https://www.sepa.org.uk/media/150984/wat_sg_28.pdf (Accessed: 12/06/2020)

[48] SEPA (2017) *WAT-RM-11: Regulatory Method: Licensing Groundwater Abstractions including Dewatering* [Online] Available at: https://www.sepa.org.uk/media/151997/wat-rm-11.pdf (Accessed: 12/06/2020)

Dewatering must consider the impact on other groundwater abstractions and groundwater dependent terrestrial ecosystems (GWDTE). Further information on the protection of GWDTE and groundwater abstractions are provided in Section 3.5 and 3.6.

## 3.5 Measures to Protect Groundwater Dependent Terrestrial Ecosystems (GWDTE)

Foundations, borrow pits and linear infrastructure such as roads, tracks and trenches can disrupt groundwater flow. If carried out in close proximity to GWDTE, construction activities can have adverse effects on these receptors.

Measures to protect GWDTE are based on mitigation and good practice, similar to those outlined already in this document, as well as avoidance of GWDTE habitats during design. The following guidance document(s) are used to inform protection of GWDTE habitats:

- SEPA LUPS-GU-31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems[49].

The following measures will ensure that water quality and the flow supply of groundwater and near-surface water are maintained during the construction and operational phase of the Development.

Key measures include:

- Silt traps may be deployed to trap and filter sediment-laden run-off throughout the construction phase of the Development;
- Settlement lagoons may be constructed and actively managed to control water levels and ensure that any runoff is contained, especially during times of rainfall. The location and management of the settlement lagoons is essential and will not be sited within vulnerable wetland areas where they may cause drying out and direct loss of habitat;
- Flush areas, depressions or zones which may concentrate water flow, will be identified in advance of construction and a suitable drainage design shall be developed to address each location, to ensure hydraulic connectivity;
- Site drainage design will avoid any severance of saturated areas to ensure hydrological connectivity is maintained. Site drainage design will be produced in advance of construction;
- The length of time excavations are kept open and the duration of any dewatering will be minimised;
- All excavations will be sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system; and
- Water from dewatering activities are generally treated by settlement lagoons and will be discharged onto vegetated surfaces, ensuring no net loss of water from the hydrological system. If ponding of water is observed during the discharge onto vegetated surfaces, additional measures may be employed.

## 3.6 Measures to Protect Groundwater Abstractions and Private Water Supplies

Foundations, borrow pits and linear infrastructure such as roads, tracks and trenches can disrupt groundwater and near-surface water flow.

Measures to protect water supply abstractions are based on mitigation and good practice, similar to those outlined already in this document, as well as avoidance of private water

[49] SEPA (2017) Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (LUPS-GU-31) [Online] Available at: https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf (Accessed: 12/06/2020)

supply source water catchments and infrastructure in the design, where possible. Pollution prevention measures outlined in Section 3.2 and 3.3 will minimise the risk of pollution of the source water, and measures outlined in Section 3.1 and 3.4 will minimise the potential risk of effects on water supply quantity and continuity.

The following guidance document(s) are used to inform protection of groundwater abstractions:

- SEPA LUPS-GU-31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems[50].

Further to these mitigation measures, the following specific measures are to be employed on site to protect all private water supply sources and distribution infrastructure (e.g. pipes):

- Silt traps to be installed on the down-slope side of tracks to ensure sediment is not transferred towards the settling tank or into the wider hydrological system;
- Infiltration trenches to be placed down-slope of overburden and rock stockpiles and will be designed to treat run-off before discharging back into the drainage network;
- Settlement lagoons to be installed to facilitate the settlement of sediment-laden run-off from turbine foundation excavations by allowing suspended solids to settle out of the water before it is discharged to ground or a watercourse;
- Check dams and silt traps to be installed on the down-slope side of tracks up-gradient of the PWS to ensure sediment is not transferred towards the source;
- Overburden and rock stockpiles and will not be located up-gradient of the PWS;
- Permanent swales and drainage ditches adjacent to access tracks will have outlets at specified intervals to reduce the volume of water collected in a single channel;
- Outfall pipes will drain into a bunded section of the drainage ditch to allow suspended solids to settle. Further measures could include the use of flocculent to further facilitate the settlement of suspended solids, if required. This would only be carried out under following consultation with the local Environmental Health Officer; and
- Private Water Supply Monitoring Programme, as outlined in Section 3.8.

### *3.6.1 Additional mitigation*

A 'watching brief' should be used to clearly mark any distribution infrastructure (e.g. pipes which serve PWS).

### *3.6.2 Alternative Potable Source*

An alternative temporary potable source (in the form of a water bowser) can be provided during the construction of the access track up-gradient of the PWS, if required. As the occupants of the supply are financially involved with the Development, agreement to this measure will be sought prior to the determination of the Development.

An alternative long-term potable water supply may be provided by the Developer if deemed necessary. This may include installation of another private water supply not compromised by the Development (for example, a groundwater borehole) or connection the Scottish Water Mains.

[50] SEPA (2017) Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (LUPS-GU-31) [Online] Available at: https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf (Accessed: 12/06/2020)

## 3.7 Measures to Protect Water Environment from Tree Felling and Removal

The following measures will be implemented during tree felling as part of the Development to ensure that harvesting methods are in accordance with good practice:

- Timber will be stacked on drier slopes at least 50 m from watercourses and not blocking roadside drains;
- Brash will not be stockpiled within 50 m of a watercourse;
- The area within 50 m of watercourses shall be regarded as a "sensitive area";
- During felling operations within "sensitive areas", silt traps or temporary dams will be used in local ditches to prevent sediment entering watercourses, and silt fences will be constructed locally between working areas and watercourses;
- Any work in "sensitive areas" to be approved by the Infrastructure Contractor's Project Manager and the ECoW;
- If felling is to occur in the riparian zone (the interface between land and a flowing surface water body) of a watercourse, trees will be felled away from the watercourse;
- Brash mats will be used for vehicle trafficking to protect bare soils;
- Silt traps will be installed in existing and new drainage ditches downstream of felling areas and construction activities but will be sited to avoid slopes with a gradient greater than 1 in 20;
- Silt fences and traps will be cleaned out on a regular basis and following heavy precipitation; and
- Silt matting if used to be checked on a daily basis and replaced as required.

## 3.8 Water Quality Monitoring Programme

A surface water and groundwater monitoring programme will be established prior to the construction phase of the Development. An indicative monitoring programme is set out below.

Surface water monitoring would be undertaken at locations on the principal watercourses downstream of the Development infrastructure and upstream of other non-natural influences, where possible.

Regular visual inspections of surface watercourses are proposed, especially during major excavation works, as these allow rapid identification of changes in levels of suspended solids that could indicate construction related effects are occurring upstream. Potential effects can then be investigated and remedial action taken to prevent further effects, if necessary.

To supplement the visual inspections, it is anticipated that there would be a number of surface water monitoring points for extractive sampling and analysis. Details will be agreed with SEPA in advance of construction.

The following sampling frequency is proposed in order to establish baseline hydro-chemical conditions of surface water constituents:

- Once every month for 6 -12 months prior to the construction phase.

The following sampling frequencies are proposed in order to monitor surface water conditions against baseline conditions:

- Bi-monthly during ground breaking works and concrete works, e.g., access track construction, turbine foundations;
- Once a month during minor construction works; and
- Twice a month for three months then once a month for a further 3 months during the post construction phase.

Establishing baseline conditions for surface waters will enable any trends in levels of critical parameters to be assessed and deviations from the norm identified and rectified through water management measures. It will also allow for monitoring of cumulative effects of other developments within the same catchment, if monitoring points are located appropriately.

### *3.8.1 Private Water Supply Monitoring Programme*

A programme of water supply monitoring will ensure that water management measures are functioning appropriately.

The following sampling frequency is proposed in order to represent baseline hydrochemical conditions and set threshold values for water parameters**:**

- Once per month for 12 months prior to the construction phase;
- Bi-monthly during ground breaking works and concrete works, e.g., access track construction, turbine foundations;
- Once per month during construction phase; and
- Once per month for a period of two months following construction.

It is proposed that during the upgrade of the access track which passes up-gradient of the supply, the water quality will be monitored by weekly visual inspections and in-situ monitoring.

Prior to the construction phase of the Development, the occupants of Ackron Farm will be provided with an emergency contact sheet with the following details:

- A contact name and number of an appropriate person related to the Development; and
- A contact name and number at the environmental health department of the Highland Council.

#### *3.8.1.1 Private Water Supply Analysis Suite*

The following water constituents will be monitored:

- pH;
- Total Petroleum Hydrocarbons (TPH);
- Suspended solids;
- Electrical conductivity;
- Heavy metals; and
- Microbiological parameters (e. coli, total coliforms and enterococci).

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## APPENDIX B – PEAT MANAGEMENT PLAN

Included as Appendix A13.2 within the EIA Report Volume 3 Technical Appendices.

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## APPENDIX C – TRAFFIC MANAGEMENT PLAN

Included as Appendix A11.3 within the EIA Report Volume 3 Technical Appendices.

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