

# Good Practice during Wind Farm Construction



A joint publication by

Scottish Renewables  
Scottish Natural Heritage  
Scottish Environment Protection Agency  
Forestry Commission Scotland  
Historic Environment Scotland  
Marine Scotland Science  
AEECoW

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# Part 1

## Introduction

### 1.1 BACKGROUND

The Scottish Government and its agencies support the development of renewable energy, including wind farms, as a key means of tackling climate change.

Considerable experience has been gained from the construction and operation of wind farms across Scotland with an installed capacity totalling over 7500 Megawatts. The purpose of this guidance is to share that experience amongst the industry, planning authorities, key agencies and those more broadly involved in the planning and development of wind farms. It is focused on pollution prevention, protection of the environment and natural resources, hydrology and archaeology related issues and the adoption of biosecurity protocols, including the control of invasive and non-native species

It does not offer guidance on the detailed design or erection of turbines, their components or related infrastructure. **It does not address matters of Health and Safety on site specifically. Please refer to the Health and Safety Executive for guidance on these matters.** It is aimed at the post consent, pre-construction planning and construction phase of development.

This guidance seeks to identify Good Practice, not necessarily Best Practice, which is evolving constantly. This guidance aims to 'raise the bar' and ensure that all wind farm sites are constructed in a sustainable way which respects the surrounding environment and minimises environmental risks. This means going beyond ensuring compliance with environmental legislation whilst balancing this with the practicalities of construction and commercial constraints on developers and contractors.

The guidance will be updated as more experience is gained. In particular, our understanding of issues relating to carbon emissions from wind farm sites is evolving quickly and as a result this guidance will be updated regularly. Box 1 below outlines the current approach to Good Practice when addressing issues of peat management on site and minimising carbon loss.

This guidance is aimed at:

- Wind farm developers
- Construction companies and contractors working on wind farm sites
- Consultants and advisers supporting the wind farm industry
- Planning officers working on wind farm applications
- Statutory consultees and Key Agencies,
- Clerks of Works

### 1.2 HOW TO USE THIS GUIDANCE

This is **not** a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. It is impossible to offer generic guidance which is relevant to all wind farms. Every site is different and will require a tailored approach.

Within each of the topics included in the guidance key considerations are identified; examples of good practice are provided and the key issues are highlighted.

### 1.3 HOW THIS GUIDANCE WAS PRODUCED

A working group comprising representatives from SNH, SEPA, FCS, Scottish Renewables and several member companies with extensive wind farm development experience have developed this guidance. Members include:

Forestry Commission Scotland  
Historic Environment Scotland  
Scottish Renewables  
Macarthur Green  
Natural Power  
SNH  
SEPA  
Scottish Power Renewables  
SSE Renewables  
Marine Scotland Science  
R. J. McLeod  
Perth and Kinross Council  
Association of Environmental and Ecological Clerks of Works



*Staff on a site visit to a completed wind farm development.*

**Some of the examples provided are deliberately ‘disguised’ and not attributed to a particular company or wind farm. The purpose of this guidance is to show what is achievable (and what can go wrong) – not to endorse or criticise a particular wind farm, developer or contractor.**

### 1.4 CIRCULAR ECONOMY AND SUSTAINABILITY

The concept of the circular economy is a move away from the linear model of “take, waste and make” to “one that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles”. On wind farms, this means minimising infrastructure material use, minimising transportation and re-using and recovering as much redundant material as possible, including; turbine base material, cables, and track stone.

Circular economy on site also extends to; protecting the water environment for other users (Water Framework Directive objectives), ensuring functioning ecosystems and maintaining viable populations of native species, avoiding introducing non-native species, minimising excavations and subsequent management of resources, minimising all forms of pollution (chemical, silt and dust), and achieving a positive legacy for the development overall.

## 1.5 CARBON EMISSIONS

### Box 1. Good Practice approach to development on peat and carbon savings – a summary of recommendations

- [Conduct a detailed peat survey](#)
- Position site infrastructure in areas of shallower peat or design an appropriate engineering solution to avoid and/or minimise excavation of peat (for example floating roads and piling solutions).
- Minimise the detriment to peat if excavation cannot be fully avoided.
- Avoid or reduce peat displacement from the development of excavations.
- Excavations should be prevented from drying out or desiccating as far as possible. Consideration should also be given to spraying with water (although this may not be feasible in the long term).
- If stockpiling peat assess the potential loading effects for peat slide risk.
- The peat should be restored as soon as possible after disturbance.
- Consider cable trenching operations and timings.
- Floating roads should be used in areas of deeper peat.
- Minimise plant movements and haul distances in relation to any earthworks activities including peat management.
- Developers should take all opportunities to identify habitat enhancement opportunities, where appropriate.

One of the key aims of wind farm development is to reduce carbon emissions. Wind farm developments, through the materials used, the construction processes employed and the potential emissions from disturbed soils and habitats, do result in carbon emissions. [Guidance from the Scottish Government](#) provides a methodology to explore potential carbon emission savings and losses associated with a wind farm development in forestry or on peatland.

The report recognises that in some circumstances the payback of wind farm development could be significantly affected by the construction methods used and the degree of restoration of the site. This guidance seeks to ensure that good practice is adopted to reduce the carbon emissions associated with wind farm development.

## 1.6 OPPORTUNITIES FOR ENVIRONMENTAL ENHANCEMENT

Wind farms present an excellent opportunity for biodiversity enhancement. These sites tend to encounter little disturbance from humans and machinery once construction is complete.

We recommended that a site-specific biodiversity action plan be devised for each proposal, as separate from any Habitat Management Plan. Any plan should also cover the decommissioning of the site and should include:

- The specific objectives for the site and the habitat enhancements that are planned to achieve these;
- The contribution of the site's enhancement in the wider landscape and local ecological network by improving connectivity between existing habitats;
- Identifying species for planting and suitable sources for seed and plants;
- A management regime for habitats for the entire life of the site;
- The provision of a plan for monitoring the site; and adapting management as appropriate to the findings of this monitoring.

## 1.7 SOURCES OF FURTHER INFORMATION

Key sources of further information include:

[www.nature.scot](http://www.nature.scot)

[www.sepa.org.uk](http://www.sepa.org.uk)

[www.scottishrenewables.com](http://www.scottishrenewables.com)

[www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/onshoreren](http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/onshoreren)

[www.scotland.forestry.gov.uk](http://www.scotland.forestry.gov.uk)

[www.historicenvironment.scot](http://www.historicenvironment.scot)

## 1.8 CONTACTS

For further information please contact:

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# Part 2

## Pre-Construction Considerations

### 2.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

One of the ways in which Planning Authorities and statutory consultees can help to speed up the planning process is to make effective use of pre-application engagement. Relevant staff should participate in meaningful dialogue, with a view to providing helpful advice at an early stage of development proposals. Where relevant, the agencies will work together to provide coordinated advice on issues of joint interest.

Pre application engagement should continue through to post consent, pre-construction stage where there are issues to be resolved. Communication between all parties involved in the development is the key. Getting pre-construction right should prevent pollution of the environment, harm to human health, and unnecessary damage to nature conservation and archaeological interests. It will reduce risk, cost and programme delay, and increase stakeholder confidence in the project.

We recommend the involvement at this stage of both the assigned contractor to help guide design and an appointed Environmental Clerks of Works to offer advice that could minimise environmental impacts from implementation of the design.

Please consult with the Planning Authority on any application to modify or discharge (remove) a planning obligation that was applied to the planning permission. They will also expect to be consulted on any other material changes to a development that will significantly affect the level of environmental impact, e.g. an increase in turbine height for a wind farm or a change to the route of an access track to a development.

### 2.2 KEY CONSIDERATIONS

Pre-construction planning involves the incorporation of construction due diligence both during the Environmental Impact Assessment (EIA) stage of the project and prior to site mobilisation planning. It is about planning ahead and being proactive in your construction strategy. The key issues to be considered include:

- Contacting appropriate Planning Authorities and public bodies (key agencies)
- Relevant legislation (e.g. Construction (Design and Management) Regulations (2015), and current policies
- Effective communication amongst all parties.
- Water related legislation, including drinking, surface and ground waters, and GWDTEs
- Watercourse crossings

- Production of peat management plans, if appropriate
- Environmental Protection, including habitats and wildlife legislation
- Knowledge of the relevant waste legislation, incorporating waste management
- Presence of, or the risk of introducing invasive non-native species and/or damaging pests and diseases
- Wildlife and habitat surveys
- Archaeological surveys
- Ground risk (geotechnical risk management and the geotechnical risk register)
- Minimisation of peat arisings
- Justifying the need for, use and location of borrow pits ([Scottish Planning Policy paragraph 243 offers more detail on this](#))
- The quality of the rock available in borrow pits
- interaction with existing services, such as public roads, grid connections and other potential constraints
- Existing and proposed wind farms in the area
- Compliance with the UK Forestry regulations
- Flood risk assessment

## 2.3 SITE INFRASTRUCTURE LAYOUT

### Key considerations

- Have constraints maps been produced to highlight site infrastructure and sensitivities? Is this diagram / map accessible to all parties on site?
- Have sufficient surveys on habitat, water-bodies and protected species been conducted in order to influence track micro-siting?
- Are temporary works (e.g. site compound, laydown areas) and permanent works situated in areas of suitable gradient, with sufficient design separation from sensitive receptors?
- Has the use of existing infrastructure been considered in the design?
- Are access track gradients and size suitable for the largest loads anticipated to be delivered to the site?
- Are site tracks following design track lines as identified in the EIA? If not, have proposed alternative track lines and other infrastructure amendments been suitably assessed by the appropriate consenting authorities, and



## Environmental Clerks of Works?

- Are critical path items (e.g. lay-down areas) easy to access at an early stage of the works?
- Are borrow pits proposed (see Scottish Planning Policy paragraph 243)? If so;
  - Is the rock suitable for purpose?
  - Can engineering standards be applied to assess suitability?
  - Are they proposed in suitable locations (i.e. as close to the proposed construction routes / end use as possible, to minimise haul distances as far as possible)?
- In line with [SEPA's Regulatory Position Statements](#), surplus material, including forest residues and peat may under some circumstances be classified as waste and waste activities (recovery and disposal) may require authorisation from SEPA.
- Consider the recycling of waste material originating from the site such as demolition waste. This may fall under waste management legislation and it is recommended that a Site Waste Management Plan (SWMP) is developed.
- Maximise the use of recycled material, promote the use of secondary aggregates (sand, gravel and stones etc.), and ensure sufficient production of primary materials (where excavated material is suitable for use).
- You must not commence any construction work (including land preparation) at a site for which a [Construction site licence](#) is required without:
  - having first obtained a licence from SEPA; and
  - adhering to a pollution prevention plan for the site that SEPA has reviewed.
- Have appropriate arrangements been made for the storage of fuel and oil? Does this comply with Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)? Re-fuelling points (RFP's) should be designated and retrieval of stranded plant should be by the minimum transfer required to return the plant to the designated RFP.
- Maintenance of vehicles and plant should be carried out in impermeable areas where any oil spillage can be contained.



*Peat probing very deep peat. Thorough site investigation, such as detailed peat depth surveys, is essential at the early stages.*

- Are oil / chemical spill kits appropriately sited across the site?
- Is felling proposed? Is the area prone to acidification and diffuse pollution risks which could be exacerbated by felling, leading to potential implications for water quality? Is there scope to restore the felled woodland to open habitat types or re-stock?
- If felling operations are to take place, consider whether the site is in a catchment near a Potentially Vulnerable Area and engage with SEPA and FCS to make sure that operations do not exacerbate flood risk down-stream.
- Will the risk of water run-off from the site due to construction activities contribute to flooding downstream?

## 2.4 SITE INVESTIGATION

Good, proportionate Site Investigation (SI) is essential. SI includes desk study, site walk-over surveys (see Box 2 below) and more “intrusive” methods which are termed “ground investigation” (GI). SI should begin during the early phases of the EIA design, when other surveys (ornithological, ecological, hydrological, archaeological, hydrogeological) and assessments (e.g. waste management) are undertaken, so that potential ground risk can be identified and designed for appropriately.

Ground investigation will also be required during the EIA phase (i.e. soil/peat depth surveys, including depth and general characteristics, identifying ground water dependant terrestrial ecosystems), to inform infrastructure siting (see [peat land survey guidance](#)). Flow chart 1 below offers more detail on peat investigations.

The Environmental Impact Assessment report (ER) should demonstrate that the wind farm design has taken into account all environmental constraints, such as soils, site hydrology, species and habitats. Turbines and other infrastructure should be located on the basis of waste minimisation, ecological protection (species and habitats), hydrological / hydrogeological and archaeological survey work, and balanced against the other assessments and constraints identified during the EIA.

If the proposed wind farm is to be sited within a forest, we recommend a stand-alone chapter on ‘woodland management and tree felling’ be included in the ER to describe the environmental values of the existing forest and clearly indicate proposed areas of woodland for felling to accommodate new turbines, access roads and other infrastructure. The chapter should describe the changes to the forest structure, the woodland composition and describe the work programme, including replanting and on-site and off-site compensatory planting activities.

SI should include and report on all the main infrastructure – access track alignments, watercourse crossings, crane hard-standings and turbine bases, sub-station and construction compounds, laydown areas and borrow pits. A suitably qualified professional engineering geologist/geotechnical engineer can advise on appropriate methods of GI, which may include (but not be limited to), further peat probing, trial pitting, boreholes, geophysics and appropriate sampling and laboratory testing and reporting. If as a result of GI amendments are made to the design it is important that this is carefully assessed to ensure that any new impacts are reconsidered.

Consider mobilisation and site access for GI plant – in the absence of any wind farm access tracks existing infrastructure may not permit easy access (i.e. narrow gates, bridge parapets, weak ground). Always check for environmental sensitivities and risks prior to accessing the site. Always reinstate the ground after the GI is completed.

## **Box 2. NVC survey method and mapping requirements**

### **Survey data should be available for constructors and Clerks of Works at the beginning of the construction phase.**

NVC surveys should only be conducted during peak months for vegetation; May to September. Phase 1 surveys may be possible to conduct outside of this period by experienced surveyors provided there is good visibility and no snow cover. As an initial survey for wetland habitats, a Phase 1 walkover survey should be used in conjunction with the [Sniffer Functional Wetland Typology](#) categories.

**All** mapped NVC survey information should be submitted with the following information:

Appropriate scale to show all features. Springs and flushes must be mapped and the map scale should be suitable to show these features clearly. Where this is not feasible, **all** springs and flushes should be noted with a target note and it clearly indicated how this feature will interact with any activity (development, abstraction etc.)

Site boundary clearly marked

Adjacent designations shown plus NVC information where this is relevant to the activity (i.e. designation within risk screening zones)

All watercourses mapped (not just those shown on OS 1:25,000 scale)

Contour lines. These are essential for being able to infer the direction a pressure may come from e.g. the direction of groundwater flow and how infrastructure may interact with this.

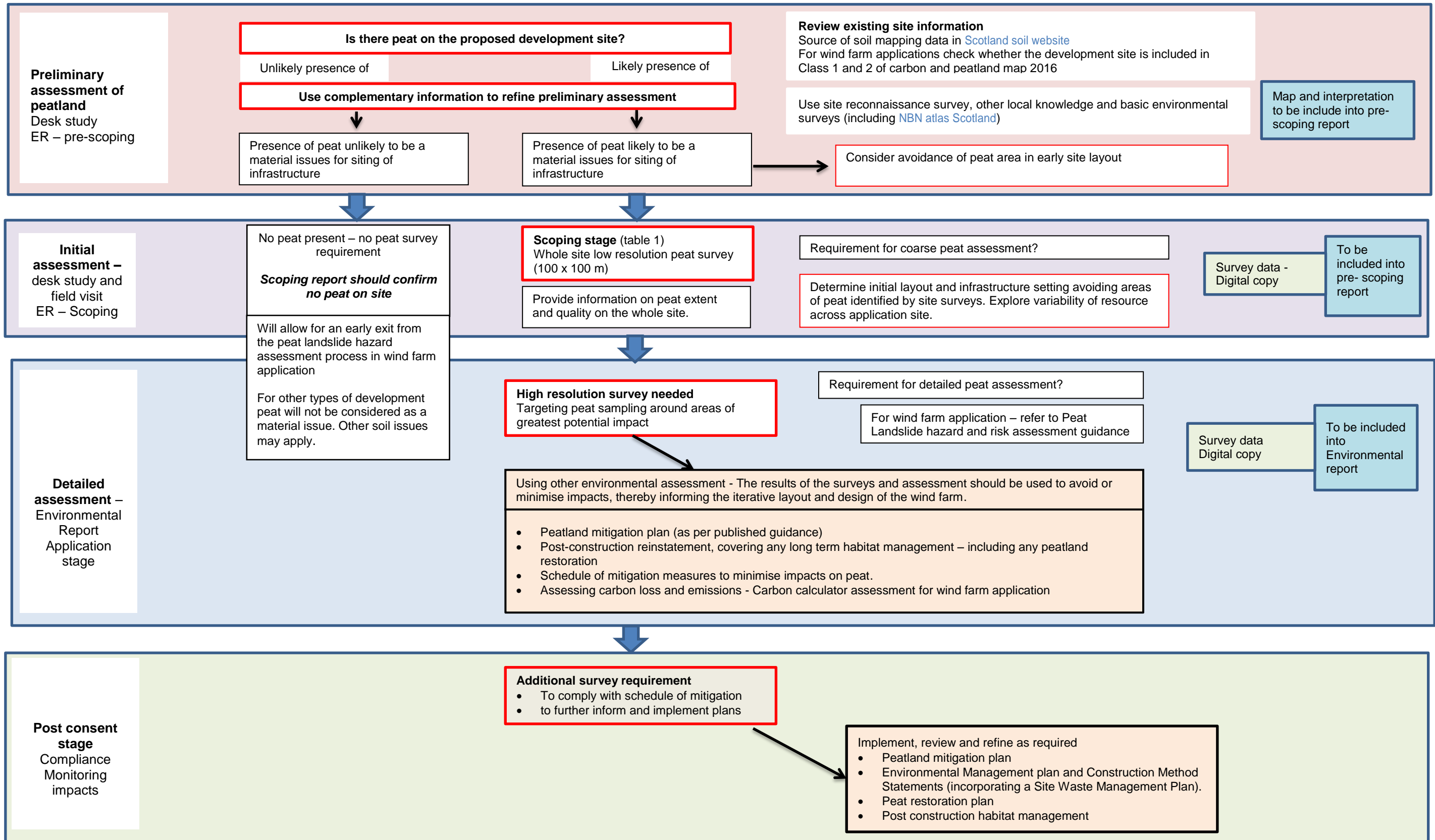
Colours: distinct colours/ shading patterns for each NVC category.

A habitat map should be overlain with the site infrastructure so that an assessment can be made of construction of the development and the environmental risk.

**Surveys submitted for consideration without the above listed features and information will be returned automatically with a 'lack of information' response from consultees. The earlier that this is undertaken**

Flowchart 1. PEAT SURVEY FLOWCHART – WHEN /WHY / HOW

WHEN WHY/WHAT HOW /WHAT Reporting - Examples



## **2.5 PLANNING CONDITIONS**

It is the responsibility of the developer of the wind farm to ensure that planning conditions are adhered to. It is also the responsibility of the Planning Authority to monitor and ensure compliance. SEPA and SNH will often advise the determining authority (either the Planning Authority or the Scottish Government Energy Consents Unit) if conditions are required to meet pollution prevention or nature conservation objectives. Conditions should be developed in early consultation with the developer. The model conditions developed by [Energy Consents](#) provide a good starting point for this, though conditions should always be tailored to the specific circumstances of each proposal.

SNH will advise on any non-standard conditions relevant to issue within their remit, particularly where the conditions are required to avoid impacts that [could raise issues of national interest](#). There may also be a requirement to obtain other permissions such as a species licence, or permit or authorisation from SEPA, which will be monitored and enforced by SEPA.

Woodland areas proposed to be removed and compensated (as identified and quantified in the ER), must mirror what is stated in the planning conditions. Where the planning permission authorises the felling of trees on a development site, both on-site restocking and compensatory planting must be secured by a condition as part of the planning consent. Planning conditions must also specify monitoring arrangements. FCS provides advice and facilitates compliance with the policy on [Control of Woodland Removal](#), as well as offering help to developers with regards to the delivery of compensatory planting requirements. Monitoring of replanted areas and off-site areas of compensatory planting must take place with reporting to the planning authority as stated in the conditions.

Historic Environment Scotland will advise where conditions are required for the protection of scheduled monuments. Local Authority Archaeologists will provide advice on conditions for issues including unscheduled archaeology and the nature and extent of any archaeological surveys required.

## **2.6 THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015**

As part of fulfilling a Client's (the Developer's) responsibilities under the CDM Regulations 2015, a pre-construction information pack (PCIP) should be prepared for contractors involved in the project. In addition, sufficient time should be allowed for the appointed contractor to complete any detailed design and mobilisation to the site with sufficient welfare facilities in place for site staff.

## **2.7 TIMING OF PRE-CONSTRUCTION SURVEYS**

It is important that surveys are commenced prior (6-12 months typically, depending on monitoring parameter) to the on-set of the Site Works to establish suitable baseline conditions for such factors as: Water Quality; Protected Species and Habitat Surveys (flora and fauna); archaeological potential, noise and dust levels. Planning legislation provides three years to commence development and species surveys may need to be updated depending on the timing of construction.

## **2.8 MICRO-SITING**

Micro-siting of wind turbine locations and ancillary infrastructure is commonly

undertaken at this stage, typically of around 50m. A variety of considerations need to be taken into account, such as:

- Results of detailed habitat, species and vegetation surveys
- Results of soil/peat surveys (depth and characteristics)
- Landscape considerations / character
- Geotechnical assessment
- Hydrology
- Archaeology
- Wind turbine requirements

Care is required to ensure that the overall effects of micro-siting are taken into account. For example, extensive micro-siting may affect the landscape and visual impact of the entire development, and have knock-on cumulative impacts. A level of re-assessment may be required at this stage to ensure that any negative impacts are minimised. Further consultation may be required. It is recommended to make use of clerks of works services to gain their feedback on proposed micro-siting of infrastructure and help guide good siting and design of infrastructure.

## **2.9 DECOMMISSIONING**

Decommissioning and post-operational restoration should be considered during the initial design phase of the development, ensuring that decommissioning of infrastructure and the restoration of habitats is achievable and practical once the development has ceased operating.

It is good practice to include an outline [Decommissioning and Restoration Plan \(DRP\)](#) in the Environmental Report. However, as there would commonly be 25 years between construction and decommissioning of a wind farm, the outline DRP should be sufficiently flexible. The draft DRP should at least consider the main infrastructure on the site and the likely aims of the restoration process.

The developer should review the DRP at least every 3-5 years throughout the lifetime of the development, and more frequently should the need arise. This is to ensure that site conditions, maintenance requirements and unexpected events do not compromise the objectives of the DRP. For example, unexpected impacts may arise during/following construction that affects the initial objectives of the DRP. Consultation with the statutory bodies should be considered at these review stages, as appropriate.

The advice here will be refined and updated as we and the industry gain experience and will develop good practice to ensure the best outcome is delivered at the end of a wind farm's operational life. For further information please see [SNH Commissioned Report on Restoration and Decommissioning of onshore wind farms \(2013\)](#).

# Part 3

## Seasonal Considerations

### 3.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

The current turbine supply market and the availability of specialist contractors may limit the opportunities for a developer to fundamentally alter a construction schedule to take account of these issues. Nonetheless, it is important to consider the time of year and scheduling of wind farm construction to minimise impacts on the surrounding environment.



*Winter conditions pose a significant challenge in all stages of construction*

Careful scheduling is required, particularly when planning for drainage and the impact of flood events.

### 3.2 KEY CONSIDERATIONS

Weather - the winter months make the scheduling of turbine lifts difficult and create additional challenges in terms of managing run off and storm events. Flood, snow, and ice cover will restrict access and increase risks on site and therefore;

- Site drainage (during construction, and then for the operational stage) should be designed to take account of the likely Storm Event Intensity for an area and infrastructure appropriately designed for a 1:200 year event (see section 9). Failure to adequately plan for flood events can result in considerable damage on site, construction delays and pollution of watercourses, lochs, sensitive wetlands, and groundwater;<sup>1</sup>
- [The design and maintenance of sustainable drainage measures to prevent heavy silt runoff;](#)
- Any reductions in base flows or an increased risk of flooding as a result of construction activities can be important to water quality;
- There is an increased risk of peat slides in very wet weather and from the additional weight of a snow pack;

<sup>1</sup> Further information is highlighted within Planning Advice Note PAN 69: Planning and Building Standards Advice on Flooding. The assessment should take account of the expected impact of climate change. The Flood Estimation Handbook (FEH) published by the Centre for Ecology and Hydrology (CEH) should be used to calculate flood values. CIRIA and SEPA guidance should also be referred to.

- In wet weather some excavated materials (particularly peat) can quickly turn to sludge making it more difficult to excavate, transport and store;
- Low visibility in blizzard conditions or heavy fog can increase the risk of accidents on site;
- During the winter months snow cover and frost will inhibit activities such as re-vegetation, restoration work and identification of sensitive flora/ habitats on site;
- Snow clearance may be required to obtain access to site.
- Forestry – seasonal timing of tree felling should be considered according to the UK Forestry Standard and associated guidelines; to avoid disturbance to protected species; and to meet market demand for timber.
- Forestry and tree felling: weather conditions must be considered to avoid pollution entering watercourses (excessive and prolonged periods of rain); good practice guidance can be found on the [Forestry and Water Scotland](#) website
- Planting of trees (restocking) activities: consideration must be given to soil conditions when planning restocking activities. Don't undertake ground preparation on waterlogged ground.

- Dust – dry weather can make it difficult to manage dust from vehicles and tracks. Vehicle movements may be constrained and suitable mitigation put in place e.g. spraying;
- Traffic – patterns of road use change throughout the year and may influence the scheduling of deliveries;
- Seasonal use of watercourses – many species are particularly sensitive / vulnerable to watercourse pollution during certain seasons (Oct-May). As a general rule in-stream or near stream works/activities should be avoided as much as practicable. Further guidance is provided in the [Forests and Water Guidelines](#) and in the [SNH Guidance for Competent Authorities](#);



*Early nightfall in winter bringing dark, difficult working conditions*

- Water crossings – Water crossings authorised under CAR (2017) are issued with the condition that activities affecting the bed and banks shall not be undertaken during periods in which fish are likely to be spawning nor in the period between spawning and emergence of juvenile fish, this can vary from watercourse to watercourse across the country;
- [Breeding bird season](#) – many species of birds will only be present / most at



risk during the main part of the breeding bird season (March-August); while other species may be present throughout the year. A **Bird Protection Plan** should consider the specific risks to each species on each site. On most sites, a walkover of track routes and the locations of site infrastructure by a qualified ornithologist is recommended prior to construction and at any key stages during the construction process;

- Other protected species, such as badger, red squirrel, otter and bats are also more active at different times of year and may require consideration if present on site. If [species licenses](#) are required then timing and phasing of construction needs careful planning;
- Deer – managing deer may not be possible at certain times of year (for example in closed seasons), and the impact of deer grazing on restoration work should be considered. Further information is available in the [Deer management: general guidance | Scottish Natural Heritage](#);
- Habitat management – the effectiveness of restoration work and habitat management is often highly dependent on the time of year, especially if livestock are present. Temporary fencing may be required;
- Working hours will be restricted at certain times of year and careful consideration of site health and safety will be required. The impacts of lighting should be considered.

### **3.3 KEY THINGS TO ADDRESS IN CONSTRUCTION & ENVIRONMENTAL METHOD STATEMENT**

- Produce a construction timetable as part of a construction and environmental management plan and illustrate seasonal considerations.
- [Comply with SEPA construction site licence, as required.](#)
- What measures will be put in place to deal with weather related events (flash floods, peat slide, snow melt, dust)?
- Appropriate use of track and road material, and other hard-standing material to minimise pollution.
- How will sediment management be adapted in emergency situations to cope with high rainfall and runoff?
- How will construction be scheduled around key site constraints (such as the breeding or migration seasons for bird and fish)? Where scheduling is not practical, what other mitigation can be put in place?
- How will construction be scheduled to benefit site restoration?

## Part 4

# Construction Method Statements and Environment Management Plans

### 4.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

The use of Construction Environment Management Plans (CEMP), and more specific task based Construction Method Statements (CMS), to guide a development is common practice across the construction industry. With the ability to cover a wide range of subjects, including environmental, archaeological, hydrological and ecological considerations, Health and Safety<sup>2</sup> on site and build procedures, the CEMP ensures consistency across the site for the duration of a build. To deliver a competent method statement or management plan, your document must be site specific and include drawings which describe the proposed methodology. Drawings are more user friendly than extensive text.

CEMP and CMS should be drafted and implemented taking account of the requirements of any [SEPA construction site licence](#), as required.

### 4.2 WASTE MANAGEMENT

Advice on how to prepare a Site Waste Management Plan (SWMP) is available on [SEPA's website](#). Further advice on the reuse of demolition and excavation materials is available from the [Waste and Resources Action programme \(WRAP\)](#). Advice from SEPA should be sought at an early stage

### 4.3 KEY CONSIDERATIONS FOR A CEMP

- Maps and plans can be far more descriptive than text on a page.
- Is it a 'living' document that can be refined and modified, as situations change on site?
- What is required within the Planning Permission?
- What are the environmental objectives for the site? Are the relevant plans addressing these?
- CEMP should not be over-burdened by Health and Safety considerations, but work in union with site documents.
- What licenses and permits may be required and issued by statutory bodies and consenting authorities? How might these interact with planning

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<sup>2</sup> Health and safety considerations are not addressed in detail within this guidance, please refer to the HSE website for further guidance - [www.hse.gov.uk](http://www.hse.gov.uk)

permission?

- Does the CEMP identify and address compliance with all relevant legislation?
- If you are responsible for the operation of a construction site, you must ensure that discharges of water run-off from that site to the water environment do not cause pollution, as per CAR GBRs. [If your construction site exceeds the Construction site licence thresholds, you must apply to SEPA for an authorisation to discharge water run-off from a construction site.](#)

The thresholds are:

- the site exceeds 4 hectares in area;
  - the site contains a road or track length in excess of 5km; or
  - the site includes any area of more than 1 hectares or any length of more than 500 metres on ground with a slope in excess of 25 degrees.
- Has the temporary storage of excavated materials on site been planned for, where relevant/appropriate?
  - Site Waste Management Plans and Accident Management Plans (spillages, etc.), should also form part of the CEMP.
  - CEMPs should be available on site, and used on a daily basis.
  - Avoid setting unachievable aims, procedures and details within the CEMP. CEMPs should be robust, flexible documents reacting to changing circumstances on site. Consultation may be required on any changes.
  - Do method statement timings match 'work on the ground' timings? Will the content/subject of the CEMP be affected by seasonality?
  - Generally [SNH](#) and [SEPA](#) will only comment on those aspects of a CEMP on which they have specifically requested to be consulted or which have significant consequences for their statutory responsibilities.

# Part 5

## Environmental Clerks of Works

### 5.1 INTRODUCTION

During wind farm construction the developer and contractor have to comply with a number of obligations under both the conditions of the planning consent and environmental legislation. To ensure effective auditing, implementation and monitoring of these obligations, Environmental Clerks of Works (ECoW) (of varying disciplines relevant to the site) are commonly requested as a condition of planning consent.

The [Environmental Clerks of Works role](#) is different from a Planning Monitoring Officer whose role is to facilitate a robust and comprehensive review of planning conditions, preparation and submission of documentation to vary and/or discharge conditions and ensure compliance to the planning conditions at the construction, operation and decommissioning phases.

#### 5.1.1 Types of ECoW

Generally, there are 2 types of ECoW: Auditors and Advisers, the applicability of which are project dependent. The consenting body is responsible for determining which role it considers most suitable for a consented project, taking into consideration various factors, including significance of environmental risk and resource availability.

##### Clerks of Works disciplines:

- ECoW: Ecological Clerk of Works
- EnvCoW: Environmental Clerk of Works
- ACoW: Archaeological Clerk of Works
- LCoW: Landscape Clerk of Works
- GCoW: Geological Clerk of Works

##### Auditor ECoW

This role is a passive means of monitoring compliance with planning conditions, or equivalent. It does not include for proactive support when incidents occur or when the developer may require advice or support in delivering compliance.

##### Advisory ECoW

The advisory role is often used on complex sites where risks to environmental sensitivities are higher and/or less well understood. In this situation, the ECoW works with the developer or contractor and provides ongoing advice and support in addition to their compliance monitoring and reporting obligations.

It is appropriate for an onsite ECoW to have the authority to temporarily stop works over a small part of the site for example to avoid a crime being committed.

### 5.2 KEY CONSIDERATIONS

1. The scope of works and level of resource commitment required of the ECoW needs to be commensurate with the scale of the development, construction programme, and the complexity of the issues at a site. For this reason it is often the case the ECoW position represents a broad multidisciplinary resource. The scope of the ECoW position is likely to include the following aspects:

- Production and monitoring of site-specific Environmental Management Plans
- Preparing and delivering tool-box talks and issue-specific training to contractors
- Developing and monitoring pollution prevention measures
- Developing and monitoring species protection plans (including protected species licences)
- Developing and monitoring mitigation measures in relation to built heritage, noise, air quality etc.
- Recording all mitigation measures and environmental incidents
- Liaising with relevant regulators and stakeholders
- Reporting non-compliance events



*An ECoW can provide on-site advice on protected habitats and species, such as this water vole colony.*

2. The role of an ECoW will focus on providing advice relating to their specialism, and monitoring compliance – not implementing the measures. Depending on the complexity and environmental sensitivity of a given site, it is often appropriate to deploy a team of ECoWs, each responding to a site's particular challenges. When appointing ECoWs, it is important to ensure their skill set matches the specific environmental constraints posed by the site.



*The ECoW is likely to be involved in advising on habitat management measures such as drain blocking*

Generally, for the ECoW's advice to be effective, appropriate capacity needs to be allocated to environmental protection by the infrastructure contractor. This may involve a dedicated 'environmental team' on site whose core responsibility is to maintain and monitor environmental protection measures, with regular liaison with the ECoW.

3. The ECoW needs to maintain communication with all the Contractors on site and Developer on a daily basis to ensure all parties are working together to achieve the project goals. This could be achieved by a communication plan, outlining all relevant parties and communication channels.

### **5.3 BENEFITS**

In general, ensuring that the project has appropriate ECoW resource allows construction to progress more smoothly. Common issues, including those of protected species, habitats and pollution prevention, can be addressed effectively at an early stage avoiding unnecessary delays to project completion. The key is well written Conditions to set good foundations for the development process, using a well-qualified and experienced ECoW, and maintaining good lines of communication between all parties. Alongside a clear site Construction / Environmental Management Plan, the findings of baseline surveys, mitigation plans and monitoring programmes should be incorporated into site management, overseen by the ECoW to ensure efficient and prompt site management actions and minimal impacts of development.

## Part 6

# Historic Environment/Archaeology

### 6.1 INTRODUCTION

Scotland's historic environment is the physical evidence for human activity and contributes to Scotland's economy, cultural identity and quality of life. The historic environment is a key cultural and economic asset which should be cared for and protected; it is a finite and non-renewable resource and should be preserved in situ where possible as required by [Scottish Planning Policy \(SPP\)](#). The historic environment is made up of both tangible and non-tangible assets, including a variety of objects, structures, landscapes and features, stories and traditions.

Wind farm developments have the potential to have direct impacts on tangible assets such as archaeological sites. Wind farms are often located in areas which have not previously been developed and therefore have the potential for archaeological sites to survive within the wind farm boundaries. [Archaeological sites](#) can sometimes have upstanding remains which are visible above ground, however, often the sites will comprise solely of below ground remains which are not visible on the ground surface and which can be difficult to identify without the assistance of heritage professionals.

Some of the impacts from wind farm construction will be due to potential direct physical impacts on historic environment assets such as archaeological sites; however, the design of a wind farm has the potential for impacts on the setting of historic environment assets. Setting impacts can best be mitigated by alterations to the siting or design of the development. It is therefore important that the historic environment is given early and consistent consideration throughout the design and construction of any wind farm development.

Some historic environment assets are recognised for their national importance and are protected by designation as scheduled monuments, listed buildings or being placed on the Inventories of gardens and designed landscapes or battlefields. Direct impacts to scheduled monuments and listed buildings may require additional consents beyond planning permission, such as scheduled monument consent (SMC) or listed building consent (LBC).

### 6.2 KEY CONSIDERATIONS

Some elements of wind farm construction such as the excavation of turbine foundations and construction of access tracks will clearly have the potential for direct impacts on archaeology. However, other less obvious elements of construction, such as forestry management and habitat management also have the potential for both direct and indirect impacts and these must also be taken into account during design and construction of the development.

### 6.3 PRE-CONSTRUCTION ACTIVITIES

Prior to the construction phase of the wind farm it is important to identify the historic environment assets within and around the wind farm which might be affected by the development. It is likely that these assets will already have been identified during the application for planning permission, particularly if an Environmental Impact

Assessment (EIA) was required as part of the application process.

Historic environment surveys including a desk-based assessment (DBA) and walkover surveys should be undertaken as early as possible by experienced heritage professionals to identify assets both within the wind farm boundary and outside it which may receive either direct impacts or impacts to their setting. These surveys should inform the design consented in the planning permission and incorporate any mitigation agreed.

Setting impacts can be difficult to mitigate at later stages of the project and so it is vital that consideration is given to avoiding or reducing the potential setting impacts by carefully locating the turbines so that they have the least impact during the design of the wind farm. For further information on setting impacts, assessment of such impacts and mitigation please see Historic Environment Scotland's Managing Change in the Historic Environment guidance note on [Setting](#).

If any micro-siting of wind turbines and ancillary infrastructure is required impacts on historic environment assets should be taken into account both to avoid direct impacts and any potential effects on setting. If necessary the potential impacts should be reassessed and further consultation undertaken.

#### Evaluation/trial trenching, excavation and survey

If archaeological sites are identified within the wind farm which cannot be avoided during construction, or if there is a high potential for unknown archaeology to be present within the wind farm boundary, as part of the conditions of planning permission the planning authority may include conditions which require archaeological works such as excavation of known sites, archaeological evaluation/trial trenching of areas of archaeological potential or other non-intrusive survey such as geophysical survey or LiDAR. If the wind farm site is large, it is possible that these works may be undertaken in phases during construction. In some instances, however, it will be easier to complete the archaeological fieldwork prior to other construction works taking place on site.

## 6.4 CONSTRUCTION ACTIVITIES

### Toolbox talks and constraint maps

During the construction phase of the wind farm it is important that all site staff are made aware of the presence or potential for historic environment assets within the wind farm site. This is usually best achieved by raising awareness of assets during site inductions and at regular toolbox talks, especially if these are carried out when moving into new areas of the wind farm to remind staff of the presence of assets in the area which must be protected. Constraint maps which clearly identify the presence of historic environment assets/archaeological sites which must be protected and avoided should be made available to site staff and displayed within site compounds.



*Well sign posted archaeological asset. Good practice would provide a more visible fence.*



### Marking out sites

Any historic environment assets within the site boundary should be clearly marked out on the ground to avoid any accidental damage. The best method of marking sites out is to fence the asset off using highly visible fencing, preferably including a slight buffer zone around the asset to avoid causing damage with the fencing. It is easy for accidental damage to occur to archaeological assets in particular as they can be difficult to recognise on the ground, it is therefore best to have an experienced heritage professional mark out the sites. It is best to leave the sites marked out for the full construction period to avoid any accidents caused by returning to complete any construction works after the main works have been carried out.

It should be noted that if the asset is designated as a scheduled monument then fencing *must* be outside the scheduled area as it is an offence to carry out works (including fencing) within a scheduled area without prior permission known as scheduled monument consent (SMC) from Historic Environment Scotland. For more information see the [Historic Environment Scotland website](#).

### Watching brief

In areas where there is the potential for previously unknown archaeology, the planning authority may include a condition that requires a watching brief to be carried out on any ground-breaking/excavation works. A watching brief involves the monitoring of ground-breaking works by an experienced and qualified archaeologist to allow the identification and recording of any archaeological remains. This could involve the monitoring of excavation of turbine foundations, access tracks, cable networks, site compounds and drainage systems or any element of the wind farm which involves ground-breaking works and is within an area of archaeological potential. A watching brief may be carried out in addition to other archaeological requirements such as archaeological excavation or evaluation/trial trenching.

### Monitoring/Archaeological Clerk of Works (ACOW)

On some wind farm sites an Environmental Clerk of Works (ECoW) may be employed to ensure compliance with any planning obligations or legislation requirements. In some cases the ECoW may have sufficient archaeological expertise to liaise with any archaeological contractors on site to monitor works efficiently and ensure compliance. In other cases it may be necessary to employ a specific Archaeological Clerk of Works (ACOW) to ensure successful monitoring, liaison and compliance.

### Discovery of archaeological remains during construction

There may be occasions when the presence of archaeological remains becomes apparent only once development has commenced. In these circumstances, the local authority archaeologist should be informed immediately, and will be able to offer practical advice on the mitigation measures which should be applied by the developer to ensure appropriate excavation, reporting and analysis if preservation *in situ* cannot be achieved.

## **6.5 POST-CONSTRUCTION ACTIVITIES**

### Interpretation

As part of the mitigation agreed in the planning consent, interpretation works, such as the erection of interpretation panels in public areas of the wind farm site may be required. The exact form and location of any interpretation on the site should be agreed with the planning authority. Should ground-breaking works be required to install interpretation panels on site archaeological monitoring may be necessary.

### Publication

It is important that the results of any archaeological works carried out during wind farm construction should be published to make the knowledge gained available to as wide an audience as possible. This is likely to form part of a condition on the consent for the planning application. Publication of the results of surveys, evaluations, excavations and watching briefs should be published in formats which are suitable for and accessible to both the archaeological community and the wider public.

### Monitoring for potential indirect impacts

Potential indirect impacts, such as changes in the water table which may affect archaeologically sensitive areas such as peat bogs or other water-logged areas, can be caused by works associated with the construction of wind farms. It may therefore be necessary to carry out monitoring of such areas to ensure that any changes are identified promptly in order that appropriate measures can be put in place to either mitigate or remedy the impacts. [Planning authorities](#) must give consideration to the requirement of monitoring measures under the 2017 EIA regulations. Any requirement for archaeological monitoring should be arranged on a case by case basis as part of the pre-consent discussions.

# Part 7

## Traffic Management

### 7.1 INTRODUCTION

The wording in this Part is not meant to be a ‘how to’ guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

Good traffic management is vital to a successful wind farm construction project, particularly in light of the intensity of public highway usage at key periods during the construction phase, and the presence of abnormal loads on the roads. This document identifies good construction practice relating to traffic management, and includes key items that should be considered in the preparation of a Traffic Management Plan (TMP).

Good traffic management improves road safety for all users, minimises congestion and “severance”, reduces environmental risk and promotes positive dialogue with local communities.

### 7.2 KEY CONSIDERATIONS

- Relevant legislation/permits
- Key stakeholders
- Transport Route(s)
- Site Access
- Health and Safety
- Signage
- Traffic Management Plan
- Section 96 of the Roads (Scotland) Act



*Careful planning of turbine component delivery is essential*

### 7.3 EXAMPLES OF GOOD PRACTICE

#### Speed limits

Speed limits on public highways may not always be suitable for wind farm construction traffic. Alternative, lower speed limits should sometimes be set for site traffic on public highways to increase road safety and minimise nuisance to the general public. The Police should be consulted if necessary.

Consideration should be given to how on-site speed limits are policed, perhaps introducing a “zero tolerance” policy for all site drivers who exceed the lower limit introduced. Speed limits on the wind farm site require careful consideration and should be set at a level relevant to the risks on the site.

#### Road cleaning

Although wheel wash facilities are often introduced on-site to clean vehicles as they exit onto the public highway, it is inevitable that some dirt will make it onto the public roads. Arranging for the regular use of a “street sweeper” vehicle to clean the public highway is a positive demonstration of commitment to a clean project.

Closed wheel wash systems are unlikely to need SEPA authorisation though arrangements should be made to dispose of waste water through a properly licenced waste operator. It is unlikely that any proposal for the use of jet washing facilities on unmade ground without foul drainage would be approved by SEPA. Further guidance can be found in GPP13 “[Vehicle Washing and cleaning](#)”.



The design of the track can also be used to help to remove debris from vehicles before they enter the public network i.e. clean stone stretch followed by surfacing.

Site Access

Consideration should be given to sufficient ‘sight-lines’, and appropriate modification of existing fabric/roadside vegetation to give clear vision for all road users. Bell-mouths at the entrance to sites, or

onto approaching minor roads toward site, should be sufficiently wide to permit the largest abnormal loads to turn off (and onto) the public highway safely. Entrance control points/gates should be sufficiently set back from the road to prevent accessing vehicles having to “wait” on the public road.



Proposed design of the junctions will require consultation with the Roads Department of the local Council or the Road Network Authority and final sign off will require to be obtained. A Road Safety Audit may also be required. Tie into the existing Highway drainage should also be considered.

Vegetation should be checked by the ECoW prior to removal.

*An example of the scale of improvements which can be required on the public road network*

Traffic Management

Managing traffic flows on approach to the site is a key consideration. The type of road (trunk road, B-Class, or minor), the typical traffic flows (peak times, local domestic, agricultural or industrial use), and, often most significant, proximity to local schools, should all be considered. The use of traffic lights, stop go signals, road closures and diversions are all possible options, though minimising



*Use of road signs to inform other road users as well as drivers*

disruption and inconvenience to the general public, particularly local residents or tourists, is of importance. Consider time of year (holiday periods), time of day (rush-hour, school drop-off/pick-up times), and typical weather (snow and ice) in your traffic management preparations. Plan ahead. Check local dates, such as agricultural/ village fairs and avoid these periods.

#### Information

Keep local communities informed of your proposed works, key delivery dates and times. Consider door-to-door visits, letter drops, notices in village post office, dissemination via community councils, and newspaper notices. Provide contact details for your Site Manager/Community Liaison Officer so that concerned individuals can speak to an informed individual.

#### Trial-runs

Always undertake a “dry-run” before abnormal load deliveries commence. Plan this as far in advance as is practical. Keep communities informed.

#### Driving Skills

Never expect public road users to stop for you. Always be courteous and respectful of other road users and the Highway Code.

#### Public Roads Survey and Reinstatement

The development of a wind farm requires large components, equipment and materials to be brought to site. The local roads network, particularly in rural locations, is not designed to cope with high volumes of traffic or abnormal loads which large scale wind farm construction or decommissioning requires.

If for any reason, on-site borrow pits will not yield the anticipated volumes required by the development the Local Authority (LA) should be notified immediately. This could not only affect any agreement entered under S96 but could also materially affect planning permission or deemed planning permission.

Section 96 of the Roads (Scotland) Act 1984 delivers a mechanism for LAs to pursue ‘extraordinary damage’ to the public road network. This can lead to costly litigation as the burden of proof is on the LA to evidence what is alleged ‘extraordinary damage’. This can be avoided by entering into a legal agreement under Section 96 of the Roads (Scotland) Act 1984, often referred to as a ‘S96 Agreement’. The S96 Agreement secures a survey on the affected road or roads carried out prior to commencement, with a dilapidation survey on the same roads carried out upon completion.

The developer would be expected to reinstate, at their cost, the road to the pre-construction condition. During the construction period the developer would carry out all routine maintenance to the road, they should also carry out routine inspection on the road and provide details of these inspections and the work carried out as a result of those inspections to the LA. Prior to agreeing the S96, the LA should assess the costs incurred in routine maintenance of the road over an historic period. These costs should be averaged and the LA should set this aside to provide a contribution to the works which are required on completion following the dilapidation survey.

A separate entry in the section 96 agreement will pertain to road related structures (bridges, culverts, retaining walls etc.) along the route. This will require that all structures are assessed by a structural Engineer prior to the construction commencing, the purpose of this assessment will be to determine the pre-

construction condition of the structure and to determine if the structure is capable of withstanding the loads from any abnormal vehicles which may be servicing the development. If required the developer will require to upgrade relevant structures before the development commences. Periodic assessments (usually 3 monthly) during the course of the works will be carried out and results and details of any necessary works that are identified during these assessments will be submitted to the LA for consideration and approval. The developer will bear the cost of all works necessary on these structures.

#### **7.4 KEY THINGS TO ADDRESS IN TRAFFIC MANAGEMENT PLAN**

- Continued dialogue with local communities, including advance notice of abnormal load deliveries.
- Avoiding school opening and closing times, peak times, holiday periods.
- Road sweepers to clear any residue off public highway.
- A pre-condition survey may be necessary.
- Include key contacts (Police, Trunk Roads, Local Roads Department and other key stakeholders, including local schools/institutions along the proposed transport route(s)).
- Identify any specific environmental risks.
- Assessment of all structures on haul route by consultant engineers.
- Impact on roads network of associated forestry clearance which will accommodate the wind farm.
- Liaising with any other major construction or extraordinary events on the affected haul routes to deliver coordinated effort to minimise impact on local community.

# Part 8

## Recreation and Access

### 8.1 INTRODUCTION

Sites chosen for wind farm development are often used for outdoor recreation, both by local residents and, in some cases, visitors from further afield. The number of users will often be small, but some sites may be visited more frequently, depending on existing access arrangements, the attractiveness of the site and its proximity to where people live. The development is an opportunity to create a legacy of improved provision for outdoor recreation. Most developers and landowners will therefore gain significant benefits, including better relations with local communities, from positive management and provision for public access both during construction and operation.

Public access to the outdoors in Scotland is largely based on the [Land Reform \(Scotland\) Act 2003](#) (LRSA), which establishes statutory rights of responsible access (referred to as Scottish access rights) that apply to most land. These are accompanied by rights of way which apply to particular routes and are established under common law. Scottish access rights include crossing over land and non-motorised recreational activities like walking, cycling, angling and horse riding, and will normally apply across the whole area of a planned wind farm development.

Access rights are based on shared responsibilities. The public have to act responsibly, following the [Scottish Outdoor Access Code](#) (SOAC), while land owners/managers have a reciprocal responsibility to respect the interests of those who exercise their rights. The LRSA and SOAC provide the context for access management both during construction and once the wind farm is operational, and this framework is fully integrated with the requirements of other legislation, including health & safety. The HSE were consulted and have helped steer the content of this section.



*Maintaining access for a wide range of users will increase the benefits of the wind farm to the local community.*

### 8.2 PLANNING FOR PUBLIC ACCESS

Arrangements for access provision and management should be set out in an Access Management Plan, which should:

- Identify and map existing patterns of access, including any core paths (designated under the LRSA), rights of way or other well-used paths or routes across the site. The plan should also consider the range of users involved - which might include walkers, cyclists, horse-riders and water-based users.
- Address any specific conditions relating to access in the planning consent.
- Identify any opportunities for improved access provision once the development is in place, such as cycle routes, car parking, new circular

routes, routes to particular features of interest within or adjacent to the site (such as viewpoints, hill summits or lochs) or connections to external paths.

- Consider related design issues, for example path surfaces and any new access infrastructure. New gates should be designed to allow access for all, including cyclists, horse-riders and people with disabilities.

Local authority access officers can advise on access provision and management both during and after construction. This process should also be informed by consultation with relevant local groups and user-representative bodies, which can be identified in conjunction with the access officer.

### 8.3 MANAGING ACCESS DURING THE CONSTRUCTION PHASE

In addition to the obligations arising from LRSA and SOAC, developers also have obligations relating to the safety of the public under the Health and Safety at Work etc. Act 1974 and the [Construction \(Design and Management\) Regulation 2015 \(CDM\)](#). These public access and safety requirements work together and should be addressed in an integrated way.

Access rights may be suspended on land on which construction work is being carried out, except for routes that are core paths or rights of way. This suspension applies to areas where building operations are active, rather than the whole area under the developer's control, and the Scottish Outdoor Access Code underlines that restrictions should be kept to the minimum area and the minimum duration that is reasonable and practicable.



*Advisory sign at farm entrance*

Management arrangements should therefore be flexible enough to take reasonable account of public access requirements and to adapt as the site develops, so that access controls are focused on where the actual risks are present. This ensures that limitations on access are seen to be proportionate and credible by recreational users. This approach is likely to encourage greater compliance by the public and will be more effective in meeting safety needs. Discussion with the Health & Safety Executive (HSE) has underlined both the importance of this approach and its consistency with the CDM Regulations.

A range of mechanisms can be used to manage access during construction, including informal, proportionate and short-term limitations on access (for the minimum necessary time and area), providing signposted alternative routes and active management of access where work is underway. Both the areas where construction work is taking place and routes which lead into and across the site from public roads should be considered.



Although access management must always be considered, the effort required will depend on the assessment of existing levels and patterns of access, and on the range of users involved (see 7.2). Particular care and attention will be needed when:

- There are significant levels of public use, particularly for sport or recreation;
- The site is close to a community or populated area, or extends over a large area;
- There are paths (such as core paths and rights of way) or well-used informal routes across the site which play a key part in local access provision, with corresponding expectations within the local community;
- Nationally promoted routes (e.g. Scotland's Great Trails or routes to visitor attractions) cross the site; or

Access tracks that are used by construction traffic can be important for recreational users, particularly where these follow the lines of older tracks which have long been used for public access to the area. Signs can remind the public to look out for site traffic and to step aside to allow it to pass safely, and drivers should be trained accordingly. During periods of particularly heavy traffic, users can be asked to keep off the track and to use a reasonable alternative route (if there is one), in line with the usual principle of minimum time and minimum area.

Effective communication with the public will be very important and can be achieved through on-site signs, information boards and way-marking, and other mechanisms such as leaflets, relevant websites, community newsletters and liaison with relevant representative groups. It may be helpful to identify and advertise a key point of contact for members of the public regarding access issues.

#### **8.4 MANAGING ACCESS IN THE OPERATIONAL PHASE**

Any new gates, paths, signs and other access infrastructure which have been installed on the site will require periodic maintenance, but an installed wind farm should not in itself raise other access management implications. Public access will often share vehicular tracks with maintenance traffic, but this position is common to a wide range of tracks used for forestry and upland estate management and is unlikely to require any special provision.



*Site maps can be produced to aid access and reduce risks to the public*

Wind turbines have a risk of ice throw and warning signs at access points should highlight this issue. These should advise the public not to stand close below towers, and to take care when nearby and in-line with turbine blades, under icy conditions.

# Part 9

## Forestry Management

### 9.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

Scotland's woodlands and forests contribute significantly to Scotland's economy. They deliver a wide range of benefits including inward investment and jobs, climate change adaptation and the enhancement of the health and well-being of Scotland's communities. The Scottish forestry sector is worth almost [£1 billion per year and employs over 25,000 people](#).

Forestry also plays an important role in [climate change mitigation](#) by helping the government meet its ambitious greenhouse gas reduction targets. As they are valuable resources, it is important that forestry is managed in a sustainable manner. The renewable energy sector is a key stakeholder and can contribute greatly to this aim. The following guidance explains the importance of complying with the principles and standards of sustainable forest management during the planning and construction of wind farms within forested areas.



*Tree planting and sapling protection* sector

### 9.2 KEY CONSIDERATIONS

Where a developer intends to construct a wind farm within a forest, it is crucial that pre-application discussions with FCS and other interested parties are conducted as early as is possible in the process.

#### Compliance with the UK Forestry Standard

The [UK Forestry Standard](#) (UKFS) (2017) is a benchmark, adopted by the governments in the UK, for sustainable forest management. In Scotland the main body responsible for promoting and regulating the standard and associated guidelines is Forestry Commission Scotland (FCS). The UKFS and its guidelines are intended to be applied by all bodies with responsibilities for controlling the management of forests, including planning authorities when authorising tree planting, removal, or specifying future management standards as part of the consent of a development. The Scottish Government expects all forestry plans and operations in Scotland to comply with the standards and it is therefore incumbent

on all developments- when this does not lead to a change in land use- to demonstrate compliance with it.

Developers are advised to prepare a long term forest plan that describes the major forest operations over a 20 year period. Such a plan should be prepared alongside the ER and it should clearly indicate proposed forest areas for felling to accommodate new turbines, access roads and other infrastructure. The plan should describe the changes to the forest structure, the forest composition and describe the work programme. Operations need to comply with the UKFS and associated environmental guidelines.

### The requirement for tree removal

Statutory guidance on woodland removal is included in the Scottish Planning Policy (SPP) [para 218]. The Scottish Government's [Policy on Control of Woodland Removal](#) aims to minimise woodland loss, protect Scotland's woodland resource and for compensatory planting to be carried out where a change of land use under the planning system allows the removal of woodland to deliver significant public benefit.

The first consideration regarding all woodland removal should be whether the underlying purpose of the proposal can reasonably be met without resorting to woodland removal – for example by changes to wind farm design.

Consideration should be given to the forest's potential future development- for example, forests characterised by a lack of diversity, due to extensive areas of even-aged trees, should be progressively restructured to achieve a diverse structure of habitat- including an appropriate amount of open ground- and species and ages of trees, appropriate to the scale and context.

Alternative futures for the woodland should also be considered (e.g. conversion to low management intensity native woodland) as these may enable proposals to proceed satisfactorily without the need for woodland removal.

Whilst compensatory planting can potentially take place both off and on site, developers are expected to explore on-site replanting opportunities (or in close proximity of the site) first, taking account of existing ground conditions. Any future repowering options should take account of existing compensatory planting requirements.



*On site harvesting operations prior to wind farm construction.*

### Permission to fell trees and felling operations

- a. In relation to the forested site, discussions between the applicant and FCS should take place in advance of the scoping process. Applicants should contact the relevant [regional Conservancy offices](#).
  - i. Any tree felling carried out without a felling licence or other valid permission is an offence unless it is covered by an exemption. Felling coupes should be of a scale which is in keeping with the context of the surrounding forest

- ii. Competent specialist advice should always be sought when arranging felling contracts so that safety, environmental and other requirements are fully addressed.
- b. Monitor tree felling before, during and after the operations to ensure the contractors' compliance with the safety and environmental specifications agreed within the contract.
- c. Developers are encouraged to seek competent advice on whether the timber felled will be eligible to be sold as 'Certified timber' under the forest certification schemes operating in the UK. Failure to secure certification can have a significant bearing on the value and saleability of timber, and may have implications for the final 'use' of the timber.
- d. SEPA, SNH and FCS have produced and published [guidance on use of trees cleared to facilitate development on afforested land](#) (see box 4 below).

- e. The harvesting of stumps and root plates can pose a significant risk to the soil and water environment. Accordingly, [industry wide guidance on stump harvesting](#) has been developed to encourage good practice and reduce risk. Removal of brash can have similar associated risks however this material can often be processed to fulfil other off-site or on-site uses. The role of brash within the development site needs to be clearly outlined and justified in the ER.



*Harvesting adjacent to existing good habitat. Measures should be taken to protect areas of good habitat during felling/chipping.*

- f. On anything other than the steepest sites commercial harvesting is recommended using ground-based machines called 'harvesters' to fell and process the timber and forwarders to remove the logs from the site. Some brash material can be used to form brash mats for the machinery to move along safely and minimise soil damage, erosion and avoid pollution into the water environment. This method is usually used on mature commercially viable crops. Careful consideration should be given to leaving brash mats in situ following activities, or their removal and any associated impacts. Where the ground is too steep for the safe operation of ground-based machines, aerial extraction systems, known as cable-cranes, are used.
- g. On immature crops that are not commercially viable as timber, [other off-site uses should be considered and a number of techniques can be used on sites which chip stems and branches](#). These approaches however can have unwanted environmental and regulatory (waste) consequences which require careful consideration (refer to Box 4 below).

- h. Risks associated with fish populations following tree removal should also be considered. Impacts on fish populations may include;
  - i. habitat loss through the removal of overhanging vegetation;
  - ii. the loss of a food supply from terrestrial invertebrates inhabiting vegetation;
  - iii. the deterioration in water quality (e.g. nutrient leaching, acidification and mineral mobilisation, notably labile aluminium);
  - iv. the disturbance and removal of spawning habitats, smothering of eggs and yolk sac fry and irritation to fish gills as a result of increased sediment transport and deposition;
  - v. changes in water temperature;
  - vi. a loss of organic detritus in the form of decaying leaves;
  - vii. altered hydrology, the latter would include flooding and seasonal droughts.
  
- i. [A water quality monitoring programme](#) can be carried out before, during and after tree felling. This can be set against the local water quality baseline and help in designing appropriate mitigation.

#### **Box 4. Use of trees cleared to facilitate development on afforested land**

Some developers seek management approaches that allow felled trees to remain on site. Depending on their proposed use, materials produced as a result of development may be defined as waste and waste management licensing requirements may apply. In such situations SEPA's "[Management of forestry waste](#)" should be referred to.

The preference is for forest materials to be used for economic and environmental benefits and not to be disposed of as waste. We advise developers to:

- Seek professional forester input to quantify volumes, markets and economic uses of trees across the site
- quantify the likely volumes of material for which no economic off-site use can be found and identify valid uses on site for this material, using professional ecological /drainage consultant input where required.

As a general rule, any timber of diameter greater than 7 cm, bark included, should be considered as merchantable timber, and hence will be harvested and extracted from the site.

Where there are difficulties in transportation or concerns regarding market saturation, consideration should be given to phased felling, storage of felled trees on site or initial keyholing to facilitate development. The impacts of options for timber extraction and reuse on other interests should also be considered to ensure that addressing one issue does not create another. Site conditions may make it less straightforward to remove trees without causing excessive damage to the soil and compromising the ability of the habitat to recover.

Some tree materials may also be used to support peatland habitat restoration, for example the inclusion of small amounts of brash in re-wetted ditches to provide a scaffold for *Sphagnum* growth. However, the amount of tree material that can be used in such a manner on a site must be fit for purpose and must not result in harm to the environment through, for example, nutrient enrichment.

For chipped material, as a rule of thumb, it is considered that:

- Where existing ground cover vegetation is present in the form of the target vegetation (i.e. the vegetation type that restoration is aiming to achieve), the spreading of chipped material is not acceptable.
- Where existing ground cover vegetation is in a form other than the target vegetation type, provide justification on how the application of forest material would facilitate or improve the restoration.
- Where there is no or sparse existing vegetation, it may be appropriate to apply mulch, along with other measures, to help create the physical requirements to encourage the regeneration of wetland habitats. Mulch should be:
  - i) spread in a thin layer to allow the surface of the mulch layer to retain moisture in the surface of the soil where appropriate for the restoration being aimed for, but avoiding smothering of the *in situ* seed bank.
  - ii) of random particle size between 5 and 30 cm length.
  - iii) spread so as to allow a minimum of 25% light penetration to the ground surface

It is sometimes preferable for brash mats to be removed from the site as a brash layer could allow undesirable seedling regeneration. Where brash mats are to remain on site, the management plan will need to identify active management measures to remove seedlings and prevent the restored area from reverting to a non-target habitat. It is not expected that embedded material will be removed, as this would cause excessive ground disruption.

In general, it is recommended that trees are harvested as close to the ground as possible and that stumps are left in situ.

In some situations it may be appropriate to use forest material in addition to traditional drain blocking methods (such as peat dams or pile dams) to increase the speed with which active peat forming species are able to colonise these linear features. Where this use may be justified, the use of larger material (not brash or fine chipped material) to provide long term physical support to peat forming plants and to minimise the risk of nutrient leaching into the water environment may be appropriate.

## Drainage management

Assess the drainage system, identify all drains and watercourses on site before operations start and put in mitigation measures beforehand. Do not wait until problems arise. Pollutants can get into drains, ditches or groundwater, ending up in watercourses many miles downstream of the site.

Disconnect any drains that connect directly into a watercourse before forest operations start on site. Sumps, silt traps and brush mats can all be used to settle out sediment run-off. Also, plan excavator routes carefully, as well as timber lifting areas to avoid additional sediment being generated.

Streams, drains, ditches and buffer areas should be kept clear of brush as far as practicable – to avoid nutrients entering the water environment - and clear litter from streams, drains and ditches.

Avoid felling trees into watercourses and remove felled material or any other accidental blockages that may occur. Whenever chipping or mulching is proposed it should be discussed at an early stage of the planning process with SEPA and SNH.

## The aims of habitat restoration following tree removal

- a. The policy on the control of woodland removal describes situations where woodland removal is likely to be appropriate without the need for compensatory planting, for example where it would contribute significantly to enhancing priority habitats or their connectivity. Woodland removal for habitat restoration has to be carefully evaluated, planned and described.
- b. The restoration to open ground habitat of cultivated and disturbed land may present issues and take significant time. Also, the site hydrology has a big impact on the expected outcomes, and needs to be carefully evaluated. Failed reinstatement may cause harvesting residues left on site, tree regeneration, colonisation by invasive species (and unintended pollution), siltation and run off. The key point is that any restoration work must be well planned and executed to be successful.
- c. Long term monitoring is required to inform site management and aftercare. This should ideally be initiated pre-clearance to establish baseline conditions and then continued at an appropriate and pre-agreed frequency and duration post-clearance.
- d. Consider the benefits to the aquatic environment as a result of planting native riparian vegetation on appropriate soils e.g. modifying of water temperatures, stabilisation of river banks, provision of in-stream habitat and a direct and indirect food source.



*Stored timber awaiting transport*

## Biosecurity – tree pests and diseases (refer to Part 15)

**Biosecurity measures** are practical steps designed to minimise the risk of introducing or spreading pests and diseases. In a forestry context 'pests and diseases' refer to invertebrate pests (for example, insects) that are harmful to trees, and to diseases of trees caused by pathogens such as certain bacteria and fungi.

The threat to forests has never been greater from pests and diseases. Increased global trade and the movement of goods between countries means an increased risk of spreading pests and diseases, which may travel hidden in plant products, packaging and shipping crates. Trees and plants in Britain are now vulnerable to a range of new pests and diseases, and outbreaks can seriously threaten sustainable forest management. In addition to economic losses for forestry and related industries, outbreaks can disrupt other sectors such as tourism.

Forestry Commission has **developed guidance** - recommended as good working practice for use by all those working in forestry.



# Part 10

## Drainage

### 10.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

This section considers the need for a drainage strategy for the wind farm site. It provides detailed methods for the collection and treatment of all surface water runoff from hard standing areas and roads using sustainable drainage principles. Getting drainage right from the start of the construction process will significantly reduce environmental risks and delays.

Water run-off means water from rainfall or meltwater from ice or snow flowing over, or horizontally through, the surface of the ground; and any matter picked up by that water as it does so.

If you are responsible for the operation of a construction site, you must ensure that discharges to the water environment do not cause pollution. If your construction site exceeds the [SEPA Construction site licence thresholds](#), you must apply to SEPA for an authorisation to discharge water run-off from a construction site.

The thresholds are:

- the site exceeds 4 hectares in area;
- the site contains a road or track length in excess of 5km; or
- the site includes any area of more than 1 hectares or any length of more than 500 metres on ground with a slope in excess of 25 degrees.

The following recommendations and general principles should be adhered to on site throughout all stages of construction from initial site investigation through to the operation stage:

- Ensure knowledge of existing drainage across the site.
- Follow the hierarchal principle: minimise, settle, treat.
- Engineering activities such as culverts, bridges, watercourse diversions, bank modifications and



*Sediment lagoons should always be situated away from watercourses, unless, as in this case, there are no alternatives. Straw bales should be carefully monitored for effectiveness. Better pre-construction planning should address this.*

dams are avoided wherever possible in order to maintain the natural state of the water environment. Necessary watercourse crossings should use bridging solutions, or appropriate culverting, with abutments sufficiently set back so as not to affect the bed and banks, ecology, and water levels of the watercourse.

- Speak to SEPA about the requirements for a Construction site licence and the production of pollution prevention plans.
- Identify any environmental enhancement opportunities associated with the water environment on site.
- Employ sustainable drainage techniques as close to source as possible.
- Appropriate buffer zones between water bodies and construction areas are established.
- Dewatering excavation activities should not cause pollution
- No large capacity build ups of surface water can occur that could lead to additional loadings being placed on the surrounding ground that may lead to soil failure, especially in areas with peat stability concerns.



*Silt fencing is an effective way of capturing larger sediment particles. Care should be taken so that fencing is not overwhelmed and the receiving habitat can act as filter strip without becoming saturated.*

- Any effects on natural flora and fauna are avoided where possible through good design or minimised if avoidance is not possible to ensure there are no direct or indirect impacts on any surrounding designated sites and GWDTEs.
- Impacts on sites of archaeological interest are avoided, including indirect impacts.
- Pollution Prevention and Environmental Protection Legislation are adhered to.
- Works are allowed to progress efficiently without flash wash-out events affecting partially completed sections.
- The completed wind farm can operate with minimum maintenance to the installed drainage systems.

- Both temporary and long term foul drainage provisions and maintenance are considered and authorisation sought if applicable.

## 10.2 RELEVANT LEGISLATION

The Water Environment and Water Services (Scotland) Act 2003 (WEWS Act) gave Scottish Ministers powers to introduce regulatory controls over water activities, in order to protect, improve and promote sustainable use of Scotland's water environment. This includes wetlands, rivers, lochs, transitional waters (estuaries), coastal waters and groundwater.

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 ([as amended](#)) are more commonly known as the Controlled Activity Regulations (CAR). If you intend to carry out any activity which may affect Scotland's water environment, (this includes wetlands, rivers, lochs, transitional waters [estuaries], coastal waters and groundwater) you must be authorised to do so. Discharges, disposal to land, abstractions, impoundments and engineering works are all regulated by SEPA. Early engagement with SEPA is recommended.

## 10.3 KEY CONSIDERATIONS

- **Do** produce a water management plan and pollution prevention plan as per requirements of a SEPA licence.
  - **Do get to know your site**, to understand drainage paths, downstream users, and areas where flows would normally collect and discharge particularly where downstream users are Private Water Supplies or are protected areas.
  - **Do** identify potential "pinch points" which are likely to cause issues during construction such as long straight slopes or spots where the access track is particularly close to water courses or large deposits of deep peat.
  - **Do** encourage diffuse movement of water across the site which preserves local hydrology and prevents issues with habitat mobilisation. Avoid single point discharges that may lead to erosion and scour.
  - **Do** consider options for habitat enhancement or restoration through appropriate drain blocking and other measures.
  - **Do** keep existing natural hydrology and hydrogeology in balance as far as reasonably practical. This includes preventing the under-draining of wetlands which are protected under WEWS 2003.
  - **Do** keep clean water flows clean, by not allowing mixing with "construction" drainage. This means that there are less volumes of contaminated/ discoloured water to treat.
- Do** include many small/mid diameter offlets, rather than collecting larger volumes of drainage flows.
- **Do not** allow direct, contaminated ditch discharge into watercourses, lochs and sensitive wetlands, GWDTEs, or grasslands.
  - **Do not** divert natural flows, unless under prior agreement with SEPA.

SEPA's experience is that the discharging of surface water to vegetation is not an effective way of taking out fine material such as silt, particularly on upland sites where ground is often sloping, waterlogged or frozen. Whilst the discharging of surface water to vegetation is an acceptable method of disposing of excess clean water it should not be considered as a "treatment" stage in and of itself for silt laden run-off.

## 10.4 ACCESS TRACK DRAINAGE

For further information, refer to the [CIRIA C648 guidance on Control of Water Pollution from Linear Construction Projects](#).

### Pre-earthworks drainage

This is the term generally given to cut-off/diversion ditches that are installed ahead of the main earthworks activities to minimise the effects of collected water on the stripped/exposed soils once earthworks commence.

These drainage ditches should be installed on the "high-side" boundary of the areas that will be affected by the access track earthworks operations, and should be installed immediately ahead of the main track construction operations commencing. They should generally follow the natural flow of the ground with a generally constant depth to ditch invert. They should have shallow longitudinal gradients. Consider the opportunities to introduce swale designs (shallow U-shaped vegetated ditches) in ditch construction. Their purpose is to intercept any storm water surface run-off, and collect it to the existing low points in the ground, allowing the clean water flows to be transferred independently through the works without mixing with the "construction" drainage.

This can be achieved through dedicated piped culverts and results in a significant reduction of the volumes of discoloured run-off that would require treatment prior to passing across the riparian zone, and ultimately filtering into the existing main watercourses.

Depending on the types of soils that are local to the area the profile of the ditch can vary from a sharp 'V' to a flatter sided 'U' shape. A flatter "U" ditch has the benefit of allowing easier access, and egress to wildlife. Ideally, all ditches should be reinstated unless they are required for longer term drainage management of site infrastructure. If at all possible, any stripped turves should be placed back in the invert and sides of the ditches to assist regeneration, and to reduce potential erosion in softer soils.

## CASE STUDY: HARESTANES WIND FARM

Harestanes Wind Farm is located within the Forest of Ae, a commercial forestry plantation in the South of Scotland. Construction works, over a 2 year period, involved the construction/upgrading of 60km of site access roads, 250km of underground cable, 600ha of tree clearance, 68 turbines, on-site concrete batching and the operation of 8 on-site borrow pits. The site lies within two river catchments, the Water of Ae and the Kinnel Water, both which are tributaries of the River Annan and are important for salmon and trout populations.

Prior to construction works commencing, a range of surface water management measures were planned, detailed and installed throughout the site. These measures were then reviewed, improved and maintained with support from the site team (developer, principal contractor, sub-contractors, dedicated contractors' Environmental Team, full-time independent Ecological Clerk of Works & other specialists) and further developed through stakeholder engagement.

Despite these measures, and due to various site complexities (such as poor stone quality, large-scale earth works over winter period, complex existing forest drainage network, site topography, intense periods of wet weather including snow melt), silty water run-off issues were experienced on the site in early 2013. Additional solutions to manage and mitigate surface water run off throughout the site were required, in order to protect the surrounding environment.

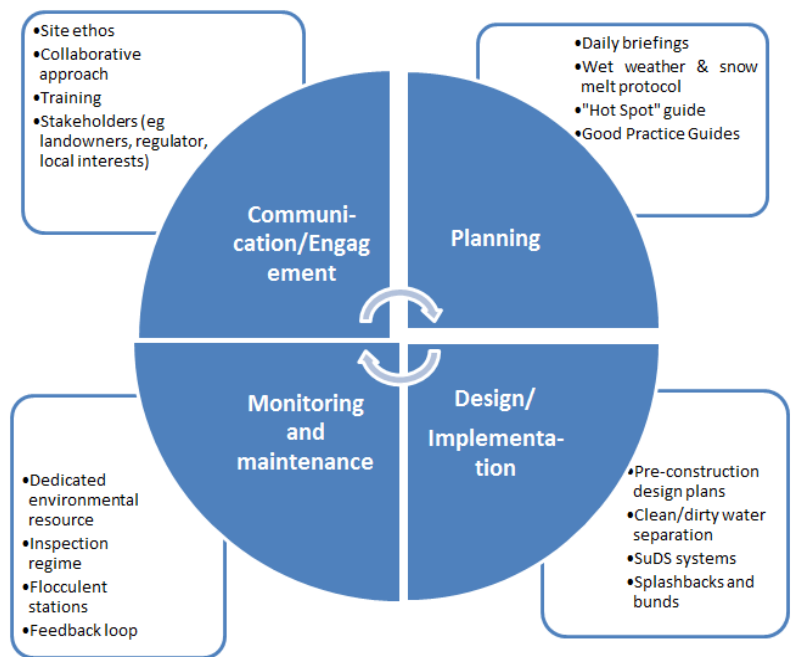


Figure 1 – Surface Water Management measures and controls



A collaborative approach was adopted by the site team in the development and implementation of further solutions to surface water management on the site (as shown in the diagram), and included the involvement of key stakeholders and regulators. Approximately **120 surface water management systems** were installed throughout the site, with more than **500 settlement ponds** being constructed.

These systems were further supplemented by "Good Practice Guides" prepared by the contractor, which detailed solutions to issues arising on the site. These solutions included the innovative clean water separation systems using flexible pipes, temporary bridge deck drainage methods, installation of flocculent dosing stations, splash-backs and bunds at road crossings and extensive series of settlement ponds. **The approach adopted on the project managed to successfully overcome the complex site characteristics and challenges.**

### Permanent track drainage

Track edge drainage is required to control run-off from the running surface to lower water levels in the subgrade, to control surface water and groundwater from adjacent higher ground, and to carry this flow to outlet points. They can also create habitats if designed sustainably. These ditches are nominally a uniform depth, and their invert gradient follows the track gradient.

To reduce the potential for a larger volume flow collecting, it is important to install intermediate (closer-centred) offlet culverts under the built track with ditch blockers being installed immediately downstream of the culvert inlet. By introducing more offlets, this reduces the volumes of flows in the ditches and provides a more even redistribution onto the existing riparian zone. Permanent stone check dams can also be installed to slow down the flow of track drainage. This flow reduction also lessens the potential for track edge erosion during periods of high rainfall. Where possible, consider sustainable drainage options, such as swales, to allow for sphagnum build up for habitat creation (in peatland locations), improved flow rates and attenuation, and natural sediment capture.

In sections of long cutting, and space allowing, a settlement lagoon may be required in a suitable location to deal with any flow in-rush capacity, and to allow settling out of the finer materials. It is important that the track surface remains free from standing water (through a camber or cross fall), and that any collected water is released through a settlement area, before reaching any watercourses, lochs, groundwater or sensitive wetlands, including GWDTEs.

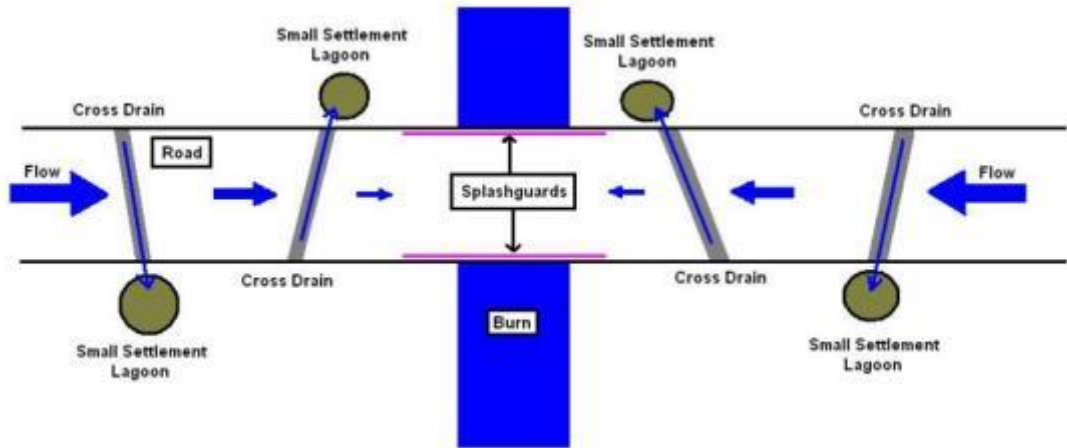


*Culvert under road – shorten the pipe and apply mitigation to avoid scour of the bed.*

### Culverts

The main method of transferring the collected surface waters ‘through’ the track, allowing water flow balance to be maintained, is through the use of culverts, or piped crossings. These culverts transfer flows from track side ditches, or are installed to ensure that existing paths in periods of high rainfall are maintained.

The culverts should be of suitable diameter to allow sufficient surface water transfer in periods of excessive rainfall, and should have further capacity allowed as a factor of safety assuming that in some cases a build-up of deposits in the invert level could reduce overall capacity.



The culverts should be installed in such a way that the invert levels are slightly lower than the corresponding levels on the inlet and outlet sides, to allow a natural bed to form.

Culverts should not be installed with a “hanging” outlet (i.e. significantly higher than the corresponding ground level), as this will cause erosion of the ground through the forced action of the water flows, and would not provide a suitable path for small mammals to use in periods of drier conditions. Headwalls should be provided around the inlet and outlet ends of the culverts to retain the track building materials, as well as to minimise any subsequent wash-in of finer materials from the track causing potential blockage to the culvert ends.

Culverts should be designed to allow for easy escape for species i.e. otter, water vole, reptiles and the migratory requirements of fish.

Where drainage ditches have been installed in materials that may give rise to erosion, silt traps should be installed which take the form of a formed pit, which could either be situated at the inlet, or outlet ends or both. It may be necessary to construct a retaining structure (e.g. pre-cast manhole ring units) to ensure that a robust structure is in place to allow future maintenance to take place without damage or erosion to the substrate material. A route should be provided out of these ditches for small mammals that may become trapped.



*Cross-drain on access track. Good practice would cover the drain with a screen to prevent debris entering.*

#### Track Running Surface Cross-drains

On sections of tracks that have particularly long gradients, surface erosion can occur following periods of persistent rainfall. Due to the design (normal WTG component delivery vehicle) specifications that usually limit the amount of track camber or crossfall, the surface water tends to run down the roadline, accumulating as it nears the lower sections. This can lead to significant volumes of flow on the access track that scours out the running surface, causing runnels to form that accentuate the problem.

To alleviate this issue, it is recommended to install a series of surface cross-drains to intercept these flows, and divert them into the side ditches, preventing the build-up of flow. These cross-drains can be constructed with channels of various materials but should be strong enough to withstand the expected traffic loadings and cope with maintenance requirements and snow clearance.

### Silt Traps

A sediment trap is a containment area where surface water run-off is temporarily stored to allow sediment to settle out before the run-off is discharged.

Silt traps can be a simple and effective method of controlling sediment laden run-off, but are limited by capacity of what the expected flows are likely to be. These can be installed either on the inlet (sump) or outlet side of culverts but must be robust enough to allow for frequent clearing out of collected sediments.

Any installed silt traps should be regularly inspected and procedures should be put in place to have them cleared out regularly. It is recommended that this be done in a period of dry weather, when flows would not affect the disturbed silt materials. **Ensure ongoing maintenance.**

### Silt Fencing



*A peat cutting spade is an effective way for non-invasive silt fence erection avoiding unnecessary digging.*

This system involves the installation of some semi-permeable geotextile fabric, vertically held on simple timber posts, and is used primarily as an additional means of filtering out sediments from run-off water. The fences can be installed (**to manufacturers' recommendations**) alongside any sensitive areas, e.g. watercourses, large areas of stripped materials, or downstream from outlet ends of culverts, and can usually be arranged in a horse-shoe style configuration to contain, and allow settlement of suspended sediments. Silt fencing works through ponding. It allows runoff water to gather, and for sediment to sink while the water itself slowly soaks into the

ground or evaporates. **Ensure ongoing maintenance.**

### Check Dams

These consist of clean gravel used to create a filtration device. They need to be solid enough to not be washed away and to slow movement of water through the drainage system and increase the retention time for silty water in the system. Frequency should be dictated by gradient and run-off volumes. Follow good practice design (keying in) methods.





*Regular, robust check dams on road sloping ditches*

### Settlement lagoons

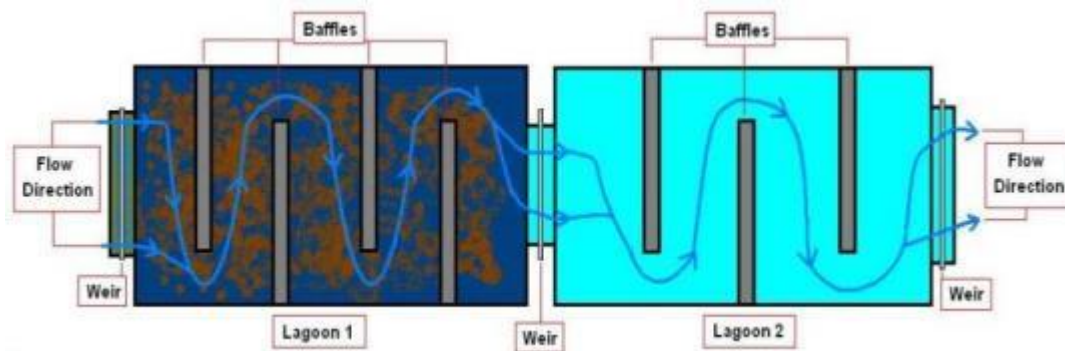
Large capacity settlement lagoons require careful planning and location consideration. Calculate and forecast the expected volumes of flows that they will be required to cope with rainfall as necessary. Lagoons are particularly effective where a large run-off volume is expected and small scale dispersal to suitable vegetation would not be successful.



*In some locations substantial 'Step' designed settlement lagoons may be required to manage large volumes of contaminated run-off.*

Settlement lagoons normally take the form of a large contained pool area, either partially dug in to the ground or bunded to act as a barrier to stop the surface run-off escaping. This pool should be further compartmentalised to allow different levels of filtration and settlement to occur, progressively, from the inlet end through to the eventual discharge end. Care is required to ensure that the sidewalls are strong enough to withstand any potential loadings as an uncontrolled discharge (burst) could have serious environmental consequences.

For further information, [refer to the CIRIA C648 guidance on Control of Water Pollution from Linear Construction Projects.](#)



*Settlement lagoon good practice*

### Flocculent dosing

Where all other possibilities of sediment control have been considered, tried, or discounted, another method to increase the rate of settlement would be by the introduction of liquid, or solid dosed flocculants. These work by pulling together finer suspended solids, into larger and therefore heavier particles that settle out quicker. The use of flocculants agents should be considered where there are limits on available space. Liquid flocculants can be dosed into settlement lagoons, and solid flocculent blocks can be set in flowing water to slowly dissolve, thereby giving a 'dose' to the suspended sediments in the run-off. Specialist assistance should be sought if this option is being considered, and approvals from the statutory agencies sought, prior to use. SEPA should be consulted when considering using flocculants.

### Pumping

Where there is a significant build-up of water it may be necessary to pump this to avoid further build up, or to allow works to progress in that area. Any discharge from pumping should enter a suitably designed treatment system, which could include settlement lagoons, an appropriate distance away from watercourses, lochs, sensitive wetlands and groundwater in order to filter out any suspended sediments. Proprietary equipment such as "Siltbuster" type tanks can also be used to assist with the reduction of suspended solids.

### Watercourse Crossings

The location of watercourses should be given careful consideration in determining the routing of roads and pipelines and the location of temporary and permanent infrastructure. The crossing of watercourses is to be avoided where possible. *Where these are necessary developers should use bridging structures or bottomless/arched culverts which will not impact on the flow, bottom, banks and ecology of the watercourse.*



*Temporary construction phase bridge and bank habitat. Steep sides of loose material could be washed off in a storm event. Use of splash boards on bridges can prevent contamination of watercourses.*

All watercourse crossings must be carried out in accordance with the Controlled Activity Regulations. Controls range from General Binding Rules, through to complex

licences. Further information should be sought from SEPA. For each level of authorisation, different timescales apply, and these timescales should be allowed for in the overall Construction Planning.

### Maintenance

- Any protection measures should be regularly inspected, and procedures should be put in place to have any collected sediment cleared out to ensure maximum capacity can be maintained. Clearing out should be done in a period of dry weather, when flows would not affect the disturbed sediment materials. Headwall conditions should be checked as well as the inlet, and outlet ends of culverts to ensure no blockages are evident.
- If there are any permanent settlement lagoons these should be checked for leakage. Following periods of heavy rainfall, if there has been sufficient settling of sediments, water levels should be lowered to allow increased containment capacity to be available within the lagoon for the next rainfall period.
- Ditches should be checked for blockages, and kept clear and in good order. Any growing vegetation in ditches should be left as this will aid in the filtering of some of the sediments.

- Surface water quality (including turbidity/suspended solids) should be monitored before, during and after construction, in addition to regular visual inspections (as noted above). This is to ensure the effectiveness of the mitigation measures and a minimal effect on aquatic flora and fauna.



*A well designed and located cement wash out bay can prevent bad practice elsewhere on site. A ticketing system to ensure it is used by all drivers has been shown to be useful.*

- Draw up a Pollution Prevention Plan, as per CAR construction site licence.
- A regular reporting mechanism should be implemented such that data collected as part of the monitoring programme are compared with results from previous surveys, threshold levels determined from baseline data and environmental standards. Reports should be issued to the local planning authorities.
- Prior to the dewatering of the turbine bases a plan should be proposed by the Contractor to show where the water will exit the excavation and how it shall be treated. It shall consider the Ground Investigation information and the protected species information. Mitigation measures in line with Section 9. 5 should also be identified. A permit system should be considered for all dewatering activities to ensure it is agreed by all parties prior to the work

commencing. Cut-off ditches above the excavations will help to reduce volumes.

- The drainage of the borrow pits should be progressed from the CEMP/ Borrow Pit Management Plans, which should identify the site specific mitigation measures. The plans should be reviewed regularly.

# Part 11

## Construction of Access Tracks

### 11.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

The Access Tracks constructed on a wind farm are required for four main phases of the works:

1. Initial installation to allow the main construction plant, personnel, and materials to gain access to the remaining areas of the site to allow the construction of the civil and electrical infrastructure.
2. Safe haulage of the main Wind Turbine Generator component parts and access for cranes.
3. Long term access for the Operational & Maintenance needs of the wind farm, as well as providing amenity access for landowners and the public.
4. Access for the eventual decommissioning of the wind farm.



*Effective track reinstatement*

Getting the track construction correct means that, with properly considered design and construction methods, you can expect to:

- Avoid track failure
- Reduce volumes of sediment laden run-off during, and post-construction
- Reduce quantities of road stone used
- Minimise waste production
- Avoid delays in allowing access for wind turbine component deliveries
- Reduce timescales for the re-generation of reinstated verges
- Limit the long-term requirement for maintenance
- Minimise the impact on the existing landscape and habitat by careful micro-siting, construction and restoration of tracks.
- Avoid impacts on sites of archaeological interest
- Improve success of decommissioning activities on site

## 11.2 KEY CONSIDERATIONS

- Where a wind farm is proposed in an upland area then this section should be read in conjunction with the SNH publications '[Constructed tracks in the Scottish Uplands](#)' and '[Floating Roads on Peat](#)' (2010).
- Drainage (please refer to Drainage section 9)
- Pre-Construction tasks:
  - Existing ground conditions analysis
  - Existing ground surveys/Topography
  - Catchment/Run-off studies
  - Construction Planning (including waste management)
  - Limits of Construction
  - Existing services and other constraints
- Track Design:
  - Alignment Horizontal & Vertical, and consideration of upgrading existing tracks
  - Peat Stability issues
  - Specification requirements
- Track Construction:
  - Floating Construction (geogrid types, structural stability, hydrology, inclusion of existing roots and vegetation)
  - Traditional 'Cut & Fill' Construction (consider an estimate of the excavated material that this technique will generate)
  - Rock Source; Quantity & Quality
  - Ditches/Culverts/Catchpits (Temporary and Permanent)
- Verge Reprofilling/reinstatement (please refer to Part 11)
- Operational Maintenance

## 11.3 PRE-CONSTRUCTION TASKS

It is essential that there is a full understanding of the area where the tracks are proposed. This should cover the following points:

**Topography** of the ground ought to be considered ranging from detailed reviews of current mapping, right through to detailed ground surveys. This information is also important to assess the potential catchment area for expected ground water and surface water run-off, as this will be required when sizing culverts, spacing off-lets, settlement lagoons etc. Access tracks should avoid water bodies wherever possible. It is also important that tracks and access to and from borrow pits are considered.

The Ecological Clerk of Works (ECoW) should be on site to advise on the final track route to minimise habitat impact. The ECoW will also advise on the placement of mitigation in the track structure to maintain natural groundwater or surface water flows – this may be a requirement to meet planning conditions.

Results from a comprehensive **ground investigation** should also be reviewed to understand what the expected ground conditions will be. Important information

from the ground investigations for tracks includes **peat/topsoil probing**, and **trial pitting**, in-situ shear vane tests, particle size distributions. This information allows a full understanding of the ground make-up.

Initially, peat probing should be carried out over a wide corridor, within the **limits of construction** (set through the Planning Permission) and roughly following the intended track line. The results of detailed probing of sufficient intensity (including characterisation of peat and habitats present) could then allow a more detailed fix of the tracks' intended centre-line, avoiding areas of deeper peat, or sloping ground.

A series of “on-line” trial pits should be commissioned to allow physical cross-checks to correlate the probing of the softer materials, and to provide an inspection of the underlying soil types. Good ground investigation is extremely important when considering the types of track construction to be employed, when assessing the need for additional reinforcement materials and when considering any potential slope stability issues, borrow pits and waste management.



*Construction of a cut road*

## 11.4 TRACK DESIGN

During the more detailed **track design** stages, the specification limits for the intended track construction must be fully considered. Usually there are limits set by either the turbine supplier, or delivery contractor, for horizontal, and vertical alignment gradients, as well as minimum track widths, and load bearing capacities. At this stage, a Geotechnical Engineer may need to be consulted to ascertain any potential issues with regard to the intended track construction style, track gradients, temporary construction stages and how this may affect the stability of the existing ground form, and in particular any potential **peat stability** issues. Throughout the construction phase it is also recommended that regular Geotechnical inspections are made to promote good practice, and that forums are created to review and discuss any potential concerns.

Prior to the **commencement of construction**, it is advised that the centre-line of the track is “set-out”, and a walk over is performed by the site manager or general foreman, along with the Geotechnical Engineer, and appropriate Clerk of Works (please refer to Section 5). This should be carried out to check that the ground conditions/drainage paths are as expected, sites of archaeological interest are

adequately fenced off, and if “fine-tuning” of the alignment is required. This can usually be accommodated without too great an effect on construction progress. A map can illustrate track and drainage routes, and made available for all relevant staff on site for installation and maintenance requirements.

Any requirement to install pre-earthworks drainage can also be carried out at this stage, once the final line has been agreed. In sensitive sites, the installation of drains and settlement lagoons in advance of the track construction is considered good practice.

## 11.5 TRACK CONSTRUCTION

The track construction method generally follows one of two options:

- A “**Floating track**” where the vegetation and supporting subsoils remain intact, with a track built off the existing ground surface supported with the introduction of geotextiles and geo-grids to reinforce the track building roadstone. This technique may produce less waste due to a reduction in the amount of excavation required.



*Poor floating road construction - attention to detail is required at track edges to prevent construction material spilling onto surrounding vegetation. Tipping large aggregate onto the geogrid, as shown, is unlikely to create the necessary interlock with the geo-grid.*

- A more traditional “**Cut & Fill track**”, is generally constructed where there is a relatively thin layer of vegetation, and soft (soils/subsoils) materials that can be easily removed to provide a suitable bearing layer, or if the topography is steeper, and floating construction is not considered acceptable. Note that this technique may generate more excavated material.

### Floating tracks

These tracks are commonly constructed across areas of deep soft materials usually gently rolling peat, or occasionally soft poor-strength clays. It is important that the topography of the surrounding area is fully understood and that a suitable peat probe survey has been carried out to



*Surveying floating road structural integrity. Note that excessive material should not be placed on the side of tracks as shown on the left of this image.*



inform the type of construction. Floating tracks are not recommended on areas where the “cross fall”, or slope of the virgin ground is of a magnitude that could lead to a slip or a circular failure. Where the strength of the virgin materials could not support the loadings of the track construction plant and materials, and more significantly the weight of the WTG components & vehicles during the delivery stages, cut and fill might be more appropriate. For example crane hard-standings and transitions into these areas. Some crane types may have to be de-rigged to travel on floating roads due to the loading.

For best results the vegetation layer should be left in place, and in the case of clear-felled forested areas, the tree roots systems should not be grubbed up, but the stump remains should be cut/ground to the vegetation level. Where feasible and appropriate, brash from woodland removal can be re-used to add support to a floating road.

A full installation procedure is given in the [SNH/FCE publication ‘Floating Roads on Peat’ \(2010\)](#).

Cable trenching remaining “open”, and drainage ditches in close proximity to floating track areas, can offer void space for underlying soft materials to migrate into from track edges. This can cause weak points in the track. Any gathered surface water should be allowed to run off the track edges, at very close intervals across the verges, and onto the neighbouring vegetation, to avoid any surface ponding.

Culverts may still be required in floating track. In particular in areas of ground water dependent terrestrial ecosystems (GWDTE's).

### Cut & Fill tracks

These tracks are constructed in a more traditional form, where the vegetation layer (nominally the top 300mm) and remaining underlying “soft” materials are removed, allowing access to construct off the sub-soil or bed-rock, which would usually consist of better bearing capacity material.

After the centre-line of the track has been set-out, and any required pre-earthworks drainage provisions have been made, the corridor of the intended track is marked out to allow the excavators to commence. The vegetation and materials holding the seedbank, (300mm of the top of the softer materials) should be stripped, and carefully set aside for re-use in the reprofiling and reinstatement works.

Where practical, whole turves should be set aside, watered (if required) and stored vegetation side up, for use in restoration. The sub-soil materials can then be assessed, and in some cases some localised soft-spots may require to be excavated and replaced with better quality, imported materials. If the bearing materials are assessed as being “marginal”, it may also be necessary to install some geotextile reinforcement to spread the track load over the bearing surface.

Care is required to ensure that the surface of the tracks do not hold standing water, as this can lead to more extensive maintenance being required to fill potholes and can lead to premature track failures.

For best results when constructing the final running surfaces of the tracks it is important that a **good quality stone which is suitable for the specific task** is

utilised. “Making-do” with a substandard material, that will break down more readily, will lead to more silt-laden run-off, more maintenance and earlier track deterioration. Expert geotechnical advice should be sought where the suitability of a given material is uncertain. The source rock should be of good quality either from an external quarry, or from an on-site “Borrow-Pit”. If the quality of rock is poor then an alternative source should be considered, or suitable mitigation implemented.

When sourcing rock, sands or gravels, it should be borne in mind that these are non-renewable resources and their extraction may have a permanent impact on the earth science interests of the area. Further guidance is available in SNH’s ‘[Constructed tracks in the Scottish Uplands](#)’ (2015).

### Verge Reinstatements

Once the track running surface has been installed, the verges can be reinstated. The main objective is to create a good landscape tie-in with the original ground form and habitat. To secure the best results, the previously stripped soils should be brought back over the verges as quickly as possible, as this gives the seedbank and vegetation the best chance of an early regeneration. Replacing whole turves is the ideal method of restoration.

The soils should not be spread back on the verges too thinly as the material may then have a tendency to dry out and crack (particularly during the summer months) before the root system has had a chance to form, stabilising the surrounding soils. There will be differences in the growing performance depending on season, and altitude, but an early reinstatement generally provides for the most beneficial results.

There is no ecological benefit from using excess and unsuitable material to create shoulders on floating roads or cut and fill tracks. The soil smothers the existing vegetation, preventing natural re-growth of bog vegetation adjacent to tracks. Ensure verge material allows drainage of the road surface. Also, the material will likely be unstable and at increased risk of drying out, which may lead to carbon loss or runoff problems.



*An example of poor practice. Excavated peat placed 4m from edge of access track. Note that no peat turves have been re-used. This peat is likely to dry out and provides no ecological benefit.*



*An example of good practice. Track edges have been reinstated with whole turves and tied into the surrounding landscape.*

Guidance on the appropriate use of peat for floating road edges is provided in 'Floating Roads on Peat' (2010).

Issues that need to be considered:

- Each site is different and wider verges may be more acceptable where topography suits.
- Cable tracks are generally adjacent to tracks which also require to be reinstated after the ducts or cables are laid. This might be up to 3-5m wide in some locations.
- Edges of floating road and cut track sometimes need to be sealed to stop fines migrating through the stone. Peat is often used for this purpose.
- Excessive soil and peat needs a re-use location. There are often areas on sites where there is little ecological value associated with a habitat. The ECoW may suggest the use of this area for taking material to fill in dips and hollows as long as turves are used to cover over.
- Double handling is often avoided when peat is used along the edges of the road as opposed to a storage area at hard-standings, where habitat gets damaged, and then material has to be reinstated or removed. Developers should aim to over strip turves so there are plenty of turves to cover the peat. Ensure good plant operators are on-site to undertake the task.

### Operational Maintenance

Wind farm tracks require careful monitoring to ensure that there is no significant standing water forming, which would lead to potholes in the running surface. It is recommended that environmental audits capture this information as part of the general maintenance that takes place during the operational phase. If there are areas of track identified that are causing concern, repairs should be carried out in favourable, preferably dry, conditions, to ensure that there is no saturation of the surface of the track. It is also important to check that it is always possible for the surface run-off to clear the road edges. It will be necessary to clear channels to allow the run-off to exit clearly. Transverse camber or cross fall surface profile should be maintained.



*Note the bridge spans the banks of the water course to allow mammal passage under the road.*

Because of the unbound nature of the access tracks they will be susceptible to the freeze/thaw effects of frost (frost heave). Saturated water within the track matrix can freeze and expand. Subsequent thawing will leave the track surface soft, due to the previously expanded frozen material now appearing more "open" than before.

It is not recommended that commercial road salts be used, as although they will locally thaw the build-up of ice, they can also have a damaging effect on the track surface, the verge vegetation, and a negative effect on the water environment.

## 11.6 KEY ITEMS TO ADDRESS IN CONSTRUCTION METHOD STATEMENT

- Prevent uncontrolled surface run-off by including pre-earthworks drainage, silt traps, settlement lagoons, silt fencing, etc.

- Consider details in a CEMP and look at the pre-construction, construction, and post construction phase performance of the track build.



Reinstated turves at road verge provide optimal restoration. Careful supervision of works may be required to achieve this.

- Plan for suitable areas for the storage and maintenance of “soft” materials that are to be temporarily stored, effectively managed and suitably utilised in a later construction phase, e.g. peat turves.
- Has the need for snow poles, and the frequency of passing places along the route been properly considered?
- Gather all available information to gain a full understanding of the terrain, and soil types, in the area you are to work on, with particular respect to potential peat stability issues and surface / ground water movements.
- Understand the likely source, and quality of the roadstone that will be available to construct the tracks.

# Part 12

## Site Compound

### 12.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

All wind farms require a site compound during the construction stage of the project. Typically the compound would include office and welfare facilities, parking, laydown and storage areas.

Under the Construction (Design and Management) Regulations 2015 (CDM) it is the Client's responsibility to ensure suitable welfare facilities are provided from the start for workers under their control, and maintain them throughout the work.

This section provides details on best practice for design considerations and construction methods, including possible environmental mitigation methods. Specifically this includes:

- i. Location of the site compound.
- ii. Design of the site compound and construction methods.
- iii. Environmental mitigation methods.
- iv. Reinstatement of site compound.



*Considerable lay-down areas are required on site and should be planned for early in the process.*

### 12.2 KEY CONSIDERATIONS

#### a) Location of the site compound

The location of the compound is normally part of the planning consent and any impacts, including visual intrusion and ground conditions, should have been considered as part of the Environmental Impact Assessment.

The site compound is normally situated towards the entrance of the site to enable control of material onto the site, ease of access for workers and visitors, and ease of construction at the beginning of the works.

When considering the location of the compound at the construction phase the following should be reviewed from earlier planning stages:

- I. Distance from watercourses, lochs and wetlands
- II. Topography of the area and the avoidance of deep peat
- III. Proximity to services i.e. electricity and water.
- IV. Ground conditions, including peat depth
- V. Hydrology
- VI. Designated Sites and protected species

- VII. Visual impact
- VIII. Sites of archaeological interest

The results of baseline surveys (and any subsequent survey work) should provide much of the information required.

b) Design of the compound and construction methods

During the design phase it is desirable to minimise the overall footprint of the site compound. Where the compound has been proposed on an inclined area, the use of split level areas should be considered to reduce the excavation into the slope and balance the cut and fill required on the area thus minimising haulage of excavated material.

When designing the compound the use of a perimeter drain should be considered. Where the surface drainage across the compound could affect its integrity a perimeter drain should be designed taking into account mitigation for sediment transport. Where surface drainage is unlikely to affect the compound, perimeter drains should be avoided thus preventing impact on the hydrology of the area and potential of sediment transport.

When constructing the site compound the peat/topsoil should be stripped and stored in a suitable location even when using geotextile material. Suitable stone should be placed and compacted to create the compound. It is important that the stone does not include a high percentage of fines which could increase the risk of sediment contamination of the adjacent area and watercourses.

The site facilities will include mess and toilet facilities for the site workers. The design of the effluent system, either septic tank and soakaway or contained tank, will depend on the sensitivity of the adjacent area. Where soakaways are proposed they should be kept as far away from watercourses as feasibly possible. SEPA licences may be required.

If compound lighting is required it should be designed to minimise light pollution to the surrounding area. All lights should face inwards to reduce overall environmental impact.

Normally bulk fuel and oil storage will be within the site compound area. Suitable bunded areas should be designed and constructed to meet the requirements of SEPA's pollution prevention guidelines and oil storage regulations ([Guidance for Pollution Prevention](#)). Additional facilities should be provided for other hazardous materials e.g. non-bulk fuel and waste oils. The contractors on-site should have an emergency procedure for dealing with oil and fuel spills. Emergency spill kits should be available within the compound and a contract with a 24 hour response environmental clean-up company should be in place for the construction period.

c) Compound Reinstatement

The compound is required during the whole of the construction period, and without appropriate management it is likely that any turves which were stripped would have decomposed depending on the length of time for which these are stored. The reinstatement of the compound area would normally include a degree of landscaping followed by replacement of the peat/topsoil over the

area. The compound area will take a number of years to fully reinstate, depending on the type of adjacent vegetation. The use of reseeded or temporary fencing of the area to protect against grazing animals should be considered to help accelerate vegetation.

If the compound is not required during the operational phase of the wind farm the area should be re-graded to match in with the surrounding levels. Suitable material for reinstatement should be appropriately stored and managed, near to the site compound but away from/with suitable buffers from watercourses and other sensitive receptors.

# Part 13

## Cable Installation

### 13.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

It is important to balance land, ecology, archaeological, economic, drainage requirements and [safety factors when designing the wind farm electrical system](#). This section provides advice on good practice construction methods to minimise the impact during construction.

This includes:

- a) Designing the location of cable trenches.
- b) Design and installation method i.e. cable trenches and construction methods.
- c) Timing of construction and reinstatement works.



*Cable trench adjacent to constructed road*

### 13.2 KEY CONSIDERATIONS

Designing the location of cable trenches:

- a) Cable route design

When designing the cable route for the wind farm it is important to take the following into consideration:

- i. The design of the consented turbine and site track layout. This can influence trench size.
- ii. The environmental/ecological sensitivity of the area.
- iii. Existing land use.
- iv. Archaeological sites.
- v. The hydrology of the area.
- i. Drainage of the proposed cable route
- vi. Ground conditions.
- vii. Topography of the area.
- viii. Economics of the cable route.
- ix. Ability and speed to repair the cables during the operational phase.

When designing the cable routes it is important to take into account the physical layout of the turbines and site tracks. Generally it is more convenient to install the cables adjacent to the site tracks to allow easy access for the cable laying and trenching plant.

It is preferable from a pollution control perspective to install cable trenches on



the down slope side of the site tracks, as this prevents the cable trench acting as a clean water diversion ditch and conduit for ground water flows. If they are on the upslope side there should be a clean water diversion ditch upslope of the cable trench. Appropriate design and mitigation should be applied to any cable routes crossing watercourses / ditches.

Ground conditions and topography need to be considered for various practical reasons. Separate cable routes on steep gradients, especially with soft ground, have high risks of causing machines to topple. It may also be more difficult to reinstate and subject to erosion by surface water flow. Cables should not be installed in deep soft peat as they will slowly sink adding tension into the cable, which may require premature replacement.

Cable routes should avoid areas of potential archaeological interest. Where this is not possible mitigation should be proposed, including a written scheme of investigation. Consultation with Historic Environment Scotland or the Local Planning Authority may be required.

#### b) Cable trench design, installation and reinstatement

Cable trenching can be performed by traditional excavation methodology or by using cable ploughing. Ploughing is generally used in deep peat conditions and the cables are ploughed into the ground. However, the plant needs to be able to be moved to these locations. There is evidence that the increasingly repeated passage of vehicles over peat can damage the vegetation and the surface layer. As would be expected, the greater the number of vehicular movements, the greater the compression of vegetation tussocks and the greater the area of peat that is exposed. Damage to peat associated with unmade tracks depends on the peat type, the weight of vehicle, the number of vehicle movements and the type of tyre or 'caterpillar' track used by the vehicle.

Cable trenching is likely to involve:

- i. Stripping and storing separately the topsoil/peat layer.
- ii. Excavating the trench through the subsoil.
- iii. Laying earth tape/cable in contact with the base of the trench.
- iv. Placing sand bedding.
- v. Laying power and communication cables and sand surround.
- vi. Cable markers must be clearly visible.
- vii. Installing marker tapes/tiles and back filling the trench.
- viii. Reinstating the topsoil/peat layer.

Where cables are installed adjacent to floating track sections, trenching in the reinstated track edges should be considered as part of the track design. This can minimise any additional land take area for cable trenching as well as giving support to the cables preventing them sinking through the peat or soft sub-soils. This has the additional benefit of not requiring separate cable trenches in virgin ground thus minimising hydrological and ecological impacts.

Cable trenches might have to accommodate numerous cable circuits and layouts and these have to be segregated as per the design.

Wind farms have recently been targeted, due to high metal prices, by thieves wanting to steal cables and earth tapes/cables. As well as the cost of theft this activity can destroy the reinstated area and reduce the quality of any further reinstatement attempts. Decommissioned wind farms should remove all cables from site.

The quality of reinstatement of cable installation areas is generally dependent on the following:

- The amount of time between the excavation of the trench and the reinstatement of the topsoil/peat. Trenches left open for long periods of time tend to act as conduits for water causing erosion and potential sediment pollution of adjacent watercourses and land. Consider the programme of the works to minimise this.
- Poor separation of excavated material will lead to mixed soils. Consideration should be given to over stripping for the cable trench areas to prevent mineral soil/sediment contamination of the adjacent vegetated areas. The over stripping method will be dependent on the materials excavated from the trench. Where cable trench arisings are mineral soil or weathered bedrock over stripping should be considered. Contamination of previous stripped areas should be avoided where multiple contractors involved and co-ordination will be required between all parties.
- Consider the hydrology at the design stage to ensure the type of vegetation on the reinstated area does not differ from the adjacent area.
- Include mitigation in the trench such as clay plugs/ peat bunds to prevent trenches from becoming a preferential flow path and to maintain local hydrological conditions. It is strongly recommended that the ECoW oversees the placement of this mitigation. Consider the low points of the cable runs and consider the use of drains to let water dissipate from the flow path:
  - Plans of cable trench excavation should be established/ prepared before the works commences and consider the interface between the temporary and permanent drainage design of the tracks. Mitigation measures in line with Section 9.0 of this guide.
  - Reinstatement should consider the interface with the Civil Contractor and should be to a high standard.

The number of in trench cut-offs or bunds to be installed should be proportionate to the gradient of the trench section and take into account the elevation differential to avoid excessive head on the clay plugs.

Where wetlands with more discrete groundwater flows are intercepted (e.g. spring and flush habitats) we suggest that a clay plug is placed immediately either side of the spring or flush feature to maintain the original hydrological conditions/flows within the wetland on either side of the cable trench.

It is often the case that cabling must cross watercourses. Consideration should be given to directional drilling where this is necessary. While potentially a more costly installation technique, it offers reduced risk to the water environment and minimal reinstatement, which the initial cost of installation should be balanced against. Directional drilling could also be considered where there may be public roads to cross. This is more prevalent on wind farms where connection to the grid is remote from the wind farm location.

# Part 14

## Turbine Foundation and Crane Pad Construction

### 14.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

Before detailed foundation and crane pad design can be carried out, adequate ground investigations are required. Typically this involves: trial pits, boreholes, in-situ testing and laboratory testing of samples to inform the design of the foundation. Foundation design should also consider the decommissioning potential of the base following the operational stage. Some bases may be completely removed in future, others may be re-engineered to accept a second generation turbine and initial considerations of this will help manage this process.



*Turbine foundation under construction with adjoining crane pad.*

A key consideration should be waste minimisation and the reduction of carbon emissions. In areas of poor ground conditions it may be more appropriate to consider alternative methods such as piling.

The most appropriate type of the foundation (gravity, piled or rock anchored), can only be determined following ground investigation works. The results of a peat survey completed during the EIA stage should inform whether piling is a feasible option. This would depend on safety, cost, access and construction logistics and consideration of other potential environmental impacts such as noise, vibration and disturbance of wildlife.

The construction of foundations and crane pads involve heavy civil and earthworks, which have a high risk of sediment pollution and chemical contamination of the water environment. When considering the foundation and crane pad design it is important to consider the following ecological, hydrological, archaeological and operational factors:

- Minimising excavation of material.
- The possible effect on the water table.

- The possible effect of drainage on the type of vegetation.
- How to deal with silty water within the excavated areas.
- How the topsoil/peat stripping should be carried out.
- How excavated material should be stored temporarily or re-used.

## 14.2 KEY CONSIDERATIONS

### a) Turbine and crane pad location

The location of the turbine and crane pad will determine how much earthworks will be required to enable the civil works. A turbine located on a steep gradient will require extensive earthworks to level a large enough area to accommodate both the foundation and crane pad area. It could also cause operational risks due to snow accumulation. Areas of deep peat should be avoided to minimise the volume of peat excavated. The location of bases should also take into account GWDTE's, protected species and watercourses.



*Preparation of turbine foundations*

Work with the turbine suppliers to minimise the crane hardstandings and gradient requirements to suit the site. Avoid constructing blade fingers and non-essential pads where it will involve large earthworks and habitat damage.

### b) Soil and overburden stripping

When designing the turbine foundation it is essential to understand the existing ground conditions.

Where stripped/excavated peat is not suitable for reinstatement it is likely to be considered to be a waste material and the relevant waste management legislation will apply (this should be discussed with SEPA). In light of these discussions the CEMP should identify appropriate handling and storage methodologies.

Subject to any waste management control a plan showing areas which are safe for stockpiling should be created prior to works beginning. Where excavated material is not suitable for back filling over the foundation or for reinstatement purposes it should be transported to its final agreed location. Double handling of silty material increases the risk of pollution and contamination of the adjacent land.

If designed properly the use of a temporary low bund of sub-soil around the perimeter of the excavated area can be a useful mitigation method, to prevent silt from stockpiles being washed into the adjacent area or watercourses.

Deep excavations should be fenced with appropriate warning signs until suitably restored.

c) Drainage

Cut off drains are commonly used on the top side of excavations to prevent surface water runoff entering the excavation. If possible the excavation should be designed to allow drainage out through a limited number of controlled outlets, where sediment can be controlled through a series of settlement ponds or filtering systems. Flocculants should be considered to assist sediment precipitation. A flocculent specialist as well as SEPA should be consulted prior to use.

Where water collects in the bottom of an excavation it will be necessary to pump the water out to allow continued works. If pumping is required it is important to agree locations away from water courses where further treatment can occur (see Section 9). Have you considered permit-to-pump procedures?

d) Crane pad (hardstanding) size and layout



The size of the crane pad is normally directly related to the size of the cranes required for installation. The turbine manufacturers may also require the crane pads for temporary storage of turbine components; e.g. blades and nacelles.

It is possible to reduce the size of the crane hardstanding area by designing separate pads for the crane outriggers, but only if the precise installation crane is known. Specifically designed crane pads also limit the type of crane that can be used for maintenance during the operational phase. A storage area for turbine components would also be required either on-site or near to site.

e) During construction

It is good practice to utilise proprietary shuttering for the foundation pours which incorporate built-in ladders/steps and access platforms with handrails. Backfilling after the first pour improves access/egress for the second pour and minimises H&S issues. Sacrificial shuttering can also be used to allow for quick reinstatement and backfilling of the base

Turbine foundations and crane hard standings involve heavy earthworks and civil works. It is important that any mitigation measures designed are monitored (by the contractor and the appropriate Clerk of Works) and maintenance carried out.

f) Reinstatement

The use and frequency of use of crane pads during the operational period should be considered prior to reinstatement. From experience the use of crane pads during the operational period can be an ongoing requirement. Where crane pads have been reinstated with a layer of peat following construction,

the peat is often stripped off within the first 2 to 3 years of operation to allow maintenance.

When the layer of peat is stripped off using an excavator the peat becomes mixed with the stone from the hardstanding and is usually not suitable for reuse. Typically reinstatement over crane pad areas take 2 to 3 years to establish but due to the reuse of the hardstanding the reinstatement of these areas rarely reaches a high percentage of vegetation cover unless reseeded is used.

In the light of operational experience it is recommended that crane pads are not covered with peat, in particular catotelmic peat, or topsoil for the operational period of the wind farm. It is critical that the area around the crane pads and any exposed batters are reinstated to reduce visual impact. Long-term storage of peat material is not a recommended option due to weathering, drying, erosion and run-off. If possible micro-siting of the crane pad should be considered at the design stage to reduce excessive excavation and visual impact. It is also desirable to remove any temporary raised hardstandings used for storing turbine components on site.

# Part 15

## Biosecurity and the management of invasive non-native species

### 15.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

Non-Native Species (NNS) are any animal or plant introduced (deliberately or accidentally) by human activity to an area in which they do not naturally occur. Some animals and plants may have been transported here a long time ago and be considered “naturalised”, but these are still considered non-native species. Others are native to some parts of the UK but not to other parts (for example native to the mainland but not all islands).

Invasive Non-Native Species (INNS), sometimes referred to as ‘invasive alien species’, are those non-native species that have the ability to spread rapidly and become dominant in an area or ecosystem, causing adverse ecological, environmental and economic impacts. INNS can also affect our health.

Examples of the negative effects caused by invasive non-native species include; economic cost, structural damage, environmental degradation, aesthetic degradation, biodiversity loss, loss of land function, access restrictions and increased risk to human and animal health and safety. Costs incurred because of invasive non-native species can include repairs to damaged structures and environment, delays to works, loss in value of a landholding or other asset, potential for prosecution because of damage caused by invasive species or infringement of legislation. There is also a risk of loss of reputation through mismanagement of invasive species, especially where the interest of sensitive local groups (such as a fisheries trust) could be affected.

### 15.2 KEY CONSIDERATIONS

Managing land inhabited by a non-native species, in a timely and appropriate way, can help avoid:

- Excessive development costs
- Physical damage to buildings and hard surface
- Harm to the environment.
- Reputational damage
- Compensation claims
- Prosecution

Identifying a non-native species on a site early lets developers assess and cost options for managing, disposal, or destruction.

Making sure staff can identify non-native species which are present on site can reduce waste costs and improve how you manage the site. A clerk of works can



oversee the management of non-native species and is a good way of ensuring that contractors treat them in an appropriate manner.

### 15.3 YOUR LEGAL RESPONSIBILITIES WHEN DEALING WITH NON NATIVE SPECIES

Under the Wildlife and Countryside Act 1981 it is an offence to plant or otherwise cause to grow in the wild any non-native plant, or release any non-native animal.

If you have invasive non-native species on your premises you have a responsibility to prevent them from spreading into the wild.

If you are undertaking control of any non-native plants on land that you own or occupy, you must comply with specific legal responsibilities relating to:

- Spraying herbicides
- Burning invasive plants
- Burial of soil containing invasive plant material
- Disposing of invasive plants and contaminated soil off site.

Full details are available via [Netregs](#).

When dealing with any non-native species, demonstrating that you have exercised due diligence, adopting best practice and taking reasonable steps to comply with the legislation is prudent. This involves:

- **Adopting a precautionary approach.** Don't release or plant until you have a clear understanding of the situation.
- **Carrying out risk assessments.** Due diligence is likely to include assessing the risk of an offence happening, establishing what to do to avoid it happening and acting according to best practice to prevent it happening. Further advice and information, including identification guides, can be found at the GB Non-Native Species Secretariat website: [www.nonnativespecies.org](http://www.nonnativespecies.org).
- **Seeking advice and following good practice.** You should seek advice from an expert if you are unsure about any issues relating to the release, or planting of non-native plants and animals.
- **Reporting the presence of non-native species.** The cost of removing or controlling a well-established invasive non-native plant or animal can be very high. You can report your finding to [iRecord](http://www.brc.ac.uk/irecord) [http://www.brc.ac.uk/irecord] or SEARS (Scottish Environment and Rural Services) 24/7 customer service number 08452 30 20 50 or email [info@sears.scotland.gov.uk](mailto:info@sears.scotland.gov.uk)

### 15.4 AVOIDING THE INTRODUCTION, MOVEMENT AND SPREAD OF NON-NATIVE SPECIES ON AND OFF YOUR CONSTRUCTION SITE

#### a) Pre-construction considerations:

- Ensure detailed checks and risk assessments are carried out for non-native species within initial site feasibility assessments and surveys.

- Where any non-native species is present, ensure you understand the risks and implications of managing it, as well as your legal requirements. Seek advice early.
- Where a non-native species is identified as a risk of being introduced, spread within, or moved off site, ensure mitigation measures are considered at the early planning stage, and ensure enough time is given to implement them.
- Consider phasing the development to allow time to deal with the presence and/or risk of spread of non-native species.
- Ensure non-native species and locations (mapped) are incorporated within all relevant site method statements, including the site Ecological Protection Plan and Species Protection Plans, where appropriate.
- Where a species requires long-term management (e.g. [Japanese knotweed](#)), ensure a site management plan is put together that addresses all issues associated with it
- Nominate a designated Clerk of Works to manage the issue of non-native species on your site from an early stage.

b) Biosecurity considerations on-site:

If your site does not currently have any non-native species, it is also important to consider potential pathways of introductions onto your site from elsewhere and for mitigation procedures to be put in place to prevent this.



*An example of a foot bath & biosecurity station (© Galloway Fisheries Trust)*

You should brief all contractors fully, and ensure all staff are aware of what the species looks like and the issues associated with it. This could be done through 'tool-box' talks or within site introductions. Everybody working on site must understand the role and authority of the Clerk of works managing the issue of the non-native species.

You should record any areas that are contaminated/infested with non-native species within your management plan, isolate them with fencing and put up restricted access signs.

c) Equipment / machinery

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

- A fence that can be clearly seen should mark out the area of issue. Signs should be erected to warn people working there that the area is infested / contaminated.
- Where contaminated soil, materials or water are located, signage should be erected to indicate them.
- Personnel working on or between sites should ensure their clothing and footwear are cleaned where appropriate to prevent spread
- Tracked vehicles should not be used within the area of infestation.
- All vehicles leaving the infested area and / or transporting infested soil/materials must be thoroughly pressure-washed in a designated wash-down area before being used for other work.
- Where cross-contamination is possible (i.e. from one site to another), consider designating vehicles or machinery to specific sites where possible to prevent spread.
- Material / water left after vehicles have been pressure-washed must be contained, collected and disposed of appropriately.
- All chemicals used for the control of non-native species should be stored and used in a responsible manner.
- All wash facilities including waste water from washing vehicles, equipment or personnel should be managed in a responsible way so as not to not cause harm to the environment.

d) Use and movement of soil and water

The introduction of a non-native species both onto and off a site is most likely to happen in the following ways:

*Contaminated topsoil*

If soil has been treated for and is free from Japanese knotweed it can be re-used on site without the need for a waste management license or an exemption. If taken off site, this material must be disposed of in a licensed landfill. Developers reuse treated soils at their own risk and they should be re-used in a restricted area, rather than spread across the site, but this should be recorded in an ongoing management plan and inspected/treated accordingly.

You should always consider the source of topsoil brought onto any site, which can easily introduce a non-native species along with it, particularly Japanese knotweed.

Section N.6.4.5 of BS 3882:1994, the British Standard for topsoil clearly states that it is critical that material should be free from Japanese knotweed propagules, rhizome and vegetative fragments.

## **CASE-STUDY: CLYDE WINDFARM, EAST AYRSHIRE**

### **Introduction**

The Clyde Windfarm was constructed spanning two river catchments; the River Clyde in South Lanarkshire and the River Annan whose headwaters are in Dumfriesshire.

As part of early investigative work it was noted that the Clyde river catchment was inhabited by a very invasive non-native species; the North American signal crayfish, which can cause significant adverse impacts within our freshwaters, and can spread between waters either by the movement of individual animals and/or the movement of their eggs.

The status of signal crayfish within the river Annan catchment, however, was unknown, but it was flagged early on that the construction of the wind farm must not inadvertently spread them from the River Clyde to the River Annan, if they were not already present. The two river catchments were, however, hydraulically linked which could offer easy access for crayfish.

### **Pre-site surveys**

The windfarm construction company commissioned the Annan District Salmon Fishery Board (ADSFB) to undertake a report to confirm/establish the status of signal crayfish on the Annan headwaters which were closest to the Clyde and close to the construction site (i.e. if present or not), and electrofishing, kick-sampling and trapping were carried out on four of the most vulnerable burns most likely to be accessed by signal crayfish. Results showed that although difficult to confirm with 100% certainty, it was highly unlikely that there were any crayfish in this part of the Annan.

Recommendations were made by ADSFB to undertake further surveys to prevent natural spread of signal crayfish, but also to prevent cross-contamination by civil engineering work for the windfarm (by people and machinery) across the river catchments.

### **Mitigation policies and procedures**

The windfarm company adopted the following policies and procedures in order to mitigate risk of the spread of signal crayfish:

- Catchment boundaries were clearly marked.
- Separate plant was used for forestry felling operations in one catchment or another, or plant washed down if moved between catchments;
- A drive through wheel wash was set up at key sites to prevent potential spread between sites.

*Use of water and/or crossing of water*

If using water on your site for construction purposes or to wash vehicles or equipment, you should ensure that the source of that water will not inadvertently act as a vector for the transportation of non-native species to/from your site or elsewhere.

If you abstract or store any surface or ground water on your site for any reason you must gain appropriate authorisation from SEPA. Disposal of contaminated wash water must also be dealt with in a responsible manner to avoid pollution and to prevent the spread of any non-native species that may be present. For further information see [www.netregs.org.uk](http://www.netregs.org.uk) (Pollution Prevention Guidance 5 - Works and maintenance in or near water).

*Contamination of vehicles or machinery*

Where non-native species are known to be within or close to your site, you should take care not to facilitate the transportation of plant seeds or fragments, animals or eggs on machinery, vehicles or by foot, from one site/river catchment to another. This may require the need for an exclusion zone and/or the use of designated machinery/ equipment on key sites to prevent movement from one site or river catchment to another.



*An example of a drive-through bath*

You should inspect vehicles before moving them from site to site or off site, and provide wash facilities suitable for the machinery you have, if needed, e.g. a drive through bath or footbaths. You should pay particular attention to caterpillar tracks and where trucks and dumpers are stowed.

## 15.5 FURTHER CONTACT INFORMATION & GUIDANCE IN SCOTLAND

Relevant bodies in Scotland under the Framework of Responsibilities for non-native species:-

Relevant Body	Habitat
<a href="#">Scottish Natural Heritage</a>	dry land, river banks and wetlands
<a href="#">Forestry Commission Scotland</a>	woodland, trees & woody shrubs
<a href="#">Scottish Environment Protection Agency</a>	standing and running freshwater environments
<a href="#">Marine Scotland</a>	marine environments

# Part 16

## Habitat Reinstatement

### 16.1 INTRODUCTION

The wording in this Part is not meant to be a 'how to' guide – the case studies and examples used are illustrative only and they do not prescribe a specific method, technique or approach. The content, however, is the latest good practice, but can always be improved with innovative approaches.

This section provides an overview of habitat reinstatement, habitat creation and land-management measures that may be required for wind farm developments.

The successful delivery of habitat reinstatement (returning damaged / impacted soils, drainage and vegetation to a pre-damaged state i.e. functioning ecosystem) and management (ensuring habitats remain in their intended state and are not modified by human activities i.e. removing non-native forestry regeneration) requires co-ordination by all parties involved in the construction and operational phases of the wind farm. The Environmental Clerk of Works (see Part 5) is of particular importance. Compliance will be monitored by the ECoW, in addition to providing expert advice on habitat management options.

### 16.2 SITE PROPOSALS AND WRITTEN STATEMENTS

Management and reinstatement of habitats that may be affected by a wind farm development is often a requirement of planning permission. The detail may be outlined in the construction phase, site-specific content of the Habitat Management Plans (HMPs), any Peat Management Plans (PMPs) and Construction and Environmental Management Plans (CEMPs), or Biodiversity Plans. Where reinstatement or compensatory habitat creation is required, the plans may cover delivery methods of habitat improvements and their long-term management. Ultimately, the Environmental Report should drive appropriate Management Plans and habitat options. A Peat Management Plan is essential to safeguard the peat resource on site so it is managed in a way that remains true to the completed carbon calculator for the site.

Works on site can fall into two broad categories, each capable of being undertaken individually, but are best considered together to give a clear picture of site works, impacts and improvements in their entirety:

- Construction reinstatement
  - Guided by the Environmental Report, Construction Method Statements (CMSs) / Construction and Environmental Management Plans (CEMPs) and other appropriate management plans (see Part 4)
- Post-construction maintenance and on-going site management

#### 16.2.1 Management plans related to habitat reinstatement

Site specific management plans related to habitat reinstatement, including 'on-site' aspects of an HMP, Biodiversity plans or Peat Management Plans, should outline mitigation measures proposed by the applicant, as part of their submitted

development proposal, or be required by a condition of planning consent. In either case, the plans should set out how management on site will:

- mitigate or compensate for the impacts caused by the development, or
- enhance the natural heritage interest of the area.

The work may, for example, be done directly by reinstating or enhancing habitat to off-set habitat lost during construction.

Monitoring will form a key part of post-construction activities. It is important to quantify the successes, or failures, of the measures employed on a site to allow for adaptive management and contingency works, as well as to better understand the effectiveness of current best practice and trial innovative methods.

Always consider the long-term vision for all restorative work, extending beyond the end of the initial operational phase. How will the site be managed during repowering or decommissioning of the proposed wind farm, and beyond?

Further information on HMPs can be found on [SNH's website](#)

### 16.3 REINSTATEMENT OF CONSTRUCTION IMPACTS

The impact of infrastructure can be reduced through micro-siting and environmentally responsible construction. However, it is inevitable that a certain amount of environmental damage will occur through construction although these impacts can be further reduced through sensitive reinstatement. Reinstatement aims to reverse disturbance and, as far as possible, recover the original condition and functioning of the displaced habitat.

#### General principles for reinstatement of soils

Maintain the original soil layering and do not mix topsoil and subsoil layers. For peat soils, the acrotelm and catotelm should be handled and stored separately and reinstated with the acrotelmic layer on top (see Glossary). For peat and mineral soils, it is especially important to keep the layer of surface soil and stripped turves of vegetation on the top of the reinstatement, the right way up.

Turves should not be stacked but placed beside each other. Turves must be cut to an appropriate depth to maintain plant root systems and provisions for keeping soil moist must be considered in the event of dry spells of weather where vegetation may succumb to drought or the soil may be susceptible to wind erosion. Sometimes there is no water on site to re-use and it would involve tankering water in. Maintaining the seed bank and existing vegetation on the surface provides the best possible start for effective restoration.

The creation of bare ground through inappropriate construction activities may lead to soil erosion that demands costly mitigation measures including soil stabilisation, re-seeding and pollution-control measures. Options include:

- The easiest method and most cost effective way to quickly stabilise bare soils is to **reuse the turves already cut from the site**. Alternatively turves from adjacent ground can be used in consultation with the ECoW.
- Protect the bare soil surface with a physical barrier. This could be a thin layer of mulch (e.g. heather mulch/brush protects the soil surface and provides a suitable seed source for the restoration of heath communities or geotextile/erosion control matting such as coir or GeoJute.

- Encourage rapid re-vegetation through re-seeding. This option is not suitable all year round and so the timing of works and exposure of soil needs to be considered. Some hydro seeding mixes contain chemicals that can be harmful to aquatic environments.

Do not mix soils with other material. Mixing of soils alters the hydrological and chemical properties, reducing its suitability for re-use in ecologically beneficial restoration.

Avoid compaction of soils, for example through excessive vehicle tracking. Where vehicle tracking over vegetation is unavoidable, minimise the number of trips and for softer ground such as peat, consider the use of low ground pressure or tracked vehicles.

Fencing or other appropriate barriers to prevent entry to the area may be justified in the short to medium term, to prevent grazing or allow vegetation re-growth in order to stabilise the surface. It is important to consider the Access code associated with this activity.

### Peat soils

Acceptable uses for excavated peat on a wind farm site are limited. Peat depths on site, potential excavation and re-use volumes are all serious considerations at the scoping stage. Some key principles regarding excavated peat are outlined below:

- Key to effective reuse of peat within a site is good planning and minimal transportation.
- Identify and manage natural drainage effectively.
- The carbon content of carbon-rich soils (peat and peaty soils) should be protected throughout reinstatement. Peat soils should only be placed where supporting hydrological conditions exist, or can be created; this may involve measures to restore the water table and micro-topography in reinstated areas.
- Fibrous acrotelmic peat, particularly vegetated peat turves, may be used for reinstating vegetation around the edges of infrastructure such as tracks and crane pads. The scales of these works should be carefully considered so as not to undertake a waste disposal operation.
- Mixing of carbon-rich soils with other materials will also likely result in oxidation and release of carbon stored within the peat.
- Excess peat should not be used to create bunds around infrastructure. Even where landscaping and screening is a specific requirement of planning permission, it is unlikely that peat soils will be suitable to meet this requirement and other options should be discussed at the planning stage.
- Excess peat should not be used to create shoulders on floating roads or for cut tracks, or spread on land adjacent to tracks because this will smother existing vegetation.



- Excavation of deep peat (>0.5m) should be avoided through layout design at the planning stages. Excavation of deep peat areas will likely result in the excavation of amorphous peat which is difficult to handle and store effectively or safely. Amorphous peat is unsuitable for use in reinstatement and restoration works on site and cannot be accepted in off-site waste-management facilities.
- Consider the re-use in the Peatland / Habitat Management Plan / Biodiversity Plan. Can it be used to improve habitat or in ditch blocking?

### Borrow pits

Firstly, identify whether there is a requirement to reinstate the borrow pits on site (it may be that the borrow pit is to be kept open). Once the construction phase is complete, there is often a desire to reinstate the soils excavated from the borrow pit or reinstate the area using other methods such as re-profiling. Consider the potential for delivering environmental benefits/enhancement in the design and proposed methods.

For borrow pits located out with peatland habitats, reinstatement techniques using material other than peat may require careful consideration in order to meet overall habitat, landscape and environmental objectives. The reinstatement considerations outlined below apply equally to mineral soil use.

Provided the overall habitat and environmental reinstatement objectives (including landscape) and requirements at the site are maintained, and no residual risks from pollution of the environment or harm to human health exist, peat may be reused within borrow pits for the purpose of their reinstatement. Although waste legislation constraints may apply, peat used in this manner should not require any pre-treatment, with minimum quantities utilised to meet objectives. One of the criteria for the re-use of peat is a waste exemption on the grounds of ecological benefit. To satisfy this requirement, details should be provided to SEPA to fully justify the use of peat material. These include:

- The depth and profile of peat proposed, following [SEPA guidelines](#). What depths of catotelmic and acrotelmic peat are being used?
- How the hydrology of the borrow pit will support the placement of soils and protect the carbon stored within that soil?
- Demonstrate that the profile of peat reinstatement within the borrow pit is safe and does not pose a risk to surrounding areas e.g. from surface runoff or peat slide.
- Define the target habitat restored on-top of the re-used peat. Different vegetation types are typically supported on different depths of peat soil and the profile of the peat should be matched to the desired vegetation community. The target vegetation within the reinstated borrow pit should tie in with the surrounding habitats and landscapes.

Fencing or other appropriate barriers to prevent entry to the area **may be justified in the short to medium term**, to prevent grazing or allow vegetation re-growth in order to stabilise the surface.

It is likely that there may be some medium-long term management requirement of the area such as control of undesirable vegetation (e.g. non-native species or [regeneration from forestry](#)).

#### **16.4 FURTHER CONSIDERATIONS OF HABITAT MANAGEMENT**

- Can the environmental and social benefits of reinstatement / restoration work be shared and promoted as good practice? Are there opportunities to link with wider Local Biodiversity Action Plan aims, for instance?
- What are the wider public perceptions, reputational and legacy aspects of effective restoration of landscapes and habitats for the sector and developments of this nature? These are important considerations.
- What are the implications of repowering or decommissioning on habitat restoration? Will progress be undermined by a new construction phase and disturbance?

## **GLOSSARY**

### **Acrotelm**

The upper layer of peat in which the water table fluctuates and upon which the surface layer of vegetation grows. The acrotelm is typically fibrous in nature and can vary in its thickness across site depending upon hydrological regime (i.e. typical depth of 0-30cm)

### **Amorphous**

Lacking form or having no specific shape. This term is typically used to describe highly decomposed peat that is liquid in nature.

### **Brash**

Material resulting from the removal of branches and tops of trees after felling and removal of timber products.

### **Catotelm**

The layer of peat below the acrotelm (see above). It is permanently below the water table and is therefore saturated. The catotelmic layer of peat is typically more decomposed than the acrotelm and can be up to several metres in depth. The structure of the catotelmic layer degrades with depth and deep layers of catotelmic peat can be amorphous.

### **CDM Regs**

The Construction (Design & Management) Regulations (2015) are the main set of regulations for managing the health, safety and welfare of construction projects

### **EIA**

Environmental Impact Assessment is a means of drawing together, in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development.

### **NVC**

National Vegetation Classification survey. Classifies British vegetation into a series of plant communities according to phytosociological groups using standard field methods and data analysis/classification techniques. The methodology is based on taking quadrats using a strict sampling system from stands of homogeneous vegetation.

### **Reinstatement and Restoration**

Restoration targets may specifically refer to the reinstatement of particular ecosystem services i.e. re-naturalising disturbed drainage pathways (reinstating) to ensure wetland function (restoration).

### **Seed bank**

Term typically used to refer to the plant propagules (seeds, rhizomes etc.) which remain viable and able to grow from the surface layers of the soil. Some plant species can survive for long periods of time as dormant seeds in the soil and this seed-bank can be an important resource to support restoration of suitable vegetation.

### ***Sphagnum***

A group of moss species. Also known as 'bog mosses'. Sphagnum species are often responsible for the main accumulation of peat soils in waterlogged habitats such as peat bogs. There are a number of different species in the Scotland which favour different conditions.