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APPENDIX 9.1

Biodiversity Enhancement and Management Plan (BEMP)

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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COUMNAGAPPUL WIND FARM, CO. WATERFORD

BIODIVERSITY ENHANCEMENT AND MANAGEMENT PLAN (BEMP)

Prepared for:

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EMPower

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1. INTRODUCTION

This Biodiversity Enhancement and Management Plan (BEMP) will provide guidance for the creation and implementation of habitat and species enhancement features at the proposed wind farm site. The plan includes both mitigation and enhancement measures, which are clearly differentiated. Additionally, maintenance measures are detailed.

The geographic scope of the BEMP is confined to the red line development boundary for the proposed wind farm.

1.1 Existing Environment

1.1.1 Terrestrial Habitats

The wind farm Site encompasses a mixture of habitat types, with Wet heath HH3 habitats, composed of predominantly grasses and sedges, forming a large portion. Dense Bracken HD1 and Dry siliceous heath HH1 are also present on the slopes. Agricultural land, comprising Improved agricultural grassland GA1, Scrub WS1 and Wet grassland GS4, dominates the lowlands. Conifer plantation WD4 dominates the western side of the Site, where the access tracks enter.

An Eroding/ Upland River FW1 flows through the study area. There are few examples of hedgerows WL1, Treelines WL2 and Drainage ditches FW4 onsite, with the slopes being open and field boundaries largely restricted to the lowland fields.

Other habitats present, either in pure form or various mosaic combinations include scrub, and conifer plantation

Habitat mapping is provided in Figure 9.5, Volume IV of the EIAR and the habitat areas within the Site are detailed in Table 1-1, as classified by Fossitt (2000). Refer to Chapter 9 – Biodiversity of the EIAR for a more detailed description of these habitats.

Table 1-1: Habitat within the main wind farm Site

Habitat	Area within the Proposed Development Boundary (ha)
Improved Agricultural Grassland (GA1)	10.09
Wet grassland (GS4)	20.57
Dense bracken (HD1)	14.17
Dense bracken/ scrub mosaic (HD1/WS1)	0.93
Dry siliceous heath (HH1)	51.83
Wet heath (HH3)	57.99
Conifer woodland (WD4)	5.89
Exposed siliceous rocks (ER1)	2.83
Total	**190.30**

1.1.2 Aquatic Habitats

River habitat assessment of the upper reaches of the Colligan river (see Appendix 9.3 of the EIAR) noted the watercourse to be salmonid, noting that the existing forded crossing of the Skeheens Stream comprises a concrete apron, which does not support fisheries.

The other watercourse are noted as sub-optimal, including for eel and lamprey.

1.1.3 Species

Field survey indicated a range of species using the Site. These are detailed within EIAR Chapter 9: Biodiversity and include:

- Bats – three bat species were commonly recorded within the Site: common pipistrelle, soprano pipistrelle, Leisler's bat.
- Mammals - feeding signs (stripped spruce cones) indicating the presence Wood Mouse were observed within conifer plantation at the western side of the study area on 07th September 2022.
- Birds – Raptors, Small Passerines and ground nesting birds, such as the red-listed Meadow Pipit utilise the Site

All of these species will benefit from tree planting and grassland enhancement and management proposed as part of this BEMP. These area of enhancement are located away from proposed turbine locations so as not to increase collision risk to species.

2. ECOLOGICAL ENHANCEMENT

2.1 Translocation of Wet Grassland Turves

Turves from within the footprint of the Borrow Pit area will be translocated to the agricultural field south of T10 (Area A on Figure 9.6, Volume IV) in order to preserve the flora and seedbank present within the footprint. The receptor site will be prepared in advance by excavating shallow linear trenches where the existing grassland is retained between trenches. This will reduce the likelihood of translocated turves drying out.

The turves will be directly translocated to the receptor sites and not stockpiled, under the supervision of an ecologist. If required, watering of newly translocated turves will be carried out to prevent drying and aid in establishment.

The translocation must be implemented by a suitable qualified and experienced ecologist to ensure the best outcome of *the sward / plants.*

In order to prepare the receptor site any leaf litter and scrub will be fully removed (including roots).

All machinery is prohibited from tracking over the receptor and donor habitat as it will compact and damage the soil.

The ecologist will check the donor site for invasive/alien/weed species and will isolate or remove these as appropriate to ensure they are not translocated to the receptor site.

Habitats are best translocated in the autumn when the soils are warm and moist and new root growth is possible before winter[1]. Translocation in spring has a greater risk of failure as the roots may not develop before the stresses of summer; while translocation in summer is likely less successful because the vegetation will have the greatest demand for water at a time when the supply of rainwater is lowest and the root system has been disrupted[1].

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Appropriate Translocation Period (Green)												

Suitable habitat for translocation as turves within the borrow pit area will be identified by the EcOW. These will be watered in advance as necessary and will only be removed on a cloudy day or on a later afternoon such that the plants will not be stressed by the sun. The turves will be excavated and brought directly to the receptor site (Area A in Figure 9.6). The ecologist will determine the appropriate turve sizes for translocation. Turves will not be covered, rolled or stacked. Turves will not be stockpiled. As such the movement and excavation of the turves and placement of turves will be done is a sequential manner.

[1] Box, J. and Stanhope, K., 2010, August. Translocating wildlife habitats: a guide for civil engineers. In *Proceedings of the Institution of Civil Engineers-Civil Engineering* (Vol. 163, No. 3, pp. 123-130). Thomas Telford Ltd.

Image 2-1: Sample process for removing the full sod including the root layer

The depth of topsoil to be translocated will be determined by the EcOW (likely to be 10-20cm bgl). Soil stripping will follow the "bed system[2]", whereby each layer of soil within sequential strips is excavated prior to excavation of the next strip. The excavated material will be stockpiled single tier mounds i.e. into their separate layers and the basal layer will be firstly moved to the receptor site to form a new mound. This will then be covered by the subsoil layer followed by the topsoil (which holds the seed bank). Removed topsoil will be stored for no longer than 48 hours.

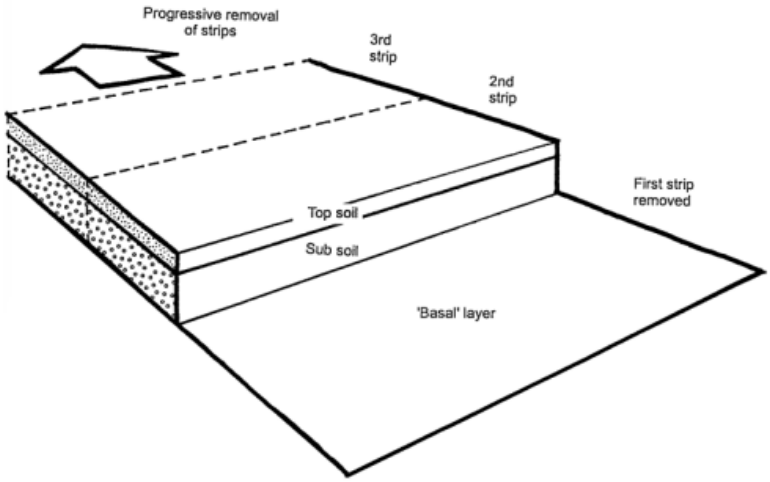

Image 2-2: The Bed System

The stockpile of topsoil will not be tracked over by any machinery. The maximum volume of soil will be picked up and moved within each excavation movement to limit disturbance to the soil.

Each load of topsoil will be spread upon the raised habitat feature prior to tipping of the next load. Spreading will be carried out by hand using rakes and treading upon freshly spread soil prohibited.

2 MAFF & Crown Copyright (Ministry of Agriculture Fisheries and Food, 2000)

Transfer of soil will not commence unless there is reasonable confidence that no periods of heavy rainfall are forecast for the day of operations.

Once soil transfer is completed, turves will be lifted and directly transferred and laid at the receptor site.

2.2 Heath Grazing management

Wet heath (HH3) habitat is frequently found throughout the wind farm site. The wet heath habitat is identified as being in poor condition and dominated by grass, notably purple moor grass *Molinia caerulea*, suggesting overgrazing within the wind farm site. Overgrazing of wet heath habitat can lead to a loss of dwarf shrubs and wildflowers which allows grasses to dominate.

The EC (2008) guidance notes that grasslands swards are maintained with different grazing animal types throughout Europe, including cattle, horses, sheep and goats, and that all stock types when used at low densities produce the kind of patchy structure and mixed height grasslands that form the conservation objective for many grazing regimes. All animals graze selectively. Favoured elements of the vegetation are eaten first while less desirable plants are left until last, or not grazed at all. There is considerable variation between different types of animals regarding which plant species they favour. Cattle differ greatly from sheep in that they prefer to eat longer grass and they cannot graze as selectively. Based on their non-selective grazing, lower likelihood of overgrazing swards, and lower probability of damage to the grassland turve, non-sheep grazers (cattle, donkey, horses) are identified as the preferred stock type for Coumnagappul.

As noted in the EC (2008) guidance, younger cattle are preferred due to reduced weight. Irish heritage breeds such as Dexter, Droimeann and Kerry cattle are recommended due to being better adapted to live on forage with lower nutrient levels than breeds used in intensive industrial farming. These Irish breeds (particularly Dexter) also have the advantage of being smaller than industrial breeds making soil damage less likely and transport to and from site easier.

The recommended stocking densities are detailed in the EC (2008) guidance of a maximum year-round stocking rate of around 0.25 Livestock Unit / ha, with stock removed from 01st November to 28/29th February. Stocking density can also be adjusted seasonally, e.g. reduced towards autumn as productivity declines and avoided during the winter months when poaching of the ground is more prevalent. It is preferable to maintain lower stocking densities for longer periods, rather than high densities for short periods. However, these are recommended to be reduced initially for the shorter grazing periods on a precautionary basis until monitoring indicates the optimal stocking density for a given time period.

Surveys to determine the conservation condition and establishment of new wet heath are required during the first 3 years post remediation. This will determine the effectiveness of the grazing regime adopted and indicate if any adjustments are required. If intensive (high density/short period) grazing is used, botanical surveys before and after grazing are required. If extensive (low density/long period) grazing is used, one botanical survey is required and can be carried out concurrently with grazing.

Fencing is required to keep stock within the targeted areas. Cattle ingress into existing ponds, drainage ditches and wetlands within the site must be avoided to avoid significant impacts to these habitats. Adequate drinking water supplies are required. These areas should be fenced off to prevent sheep grazing, with grazing to be limited to spring and summer in these areas

Marsh Fritillary have been recorded historically within the vicinity of the site. Non-sheep grazers (specialist breeds of cattle, ponies or donkey) should be used in these areas to maintain varied sward structure (vegetation heights of 12-25cm) for Devils Bit Scabious *Succisa pratensis*.

c. 11.5 ha are proposed within the grazing management Area A, which equals to three livestock units.

c. 14 ha are proposed within the grazing management Area B, which equals to three livestock units.

2.3 Treeline Enhancement

Native Broadleaf treelines will be planted as indicated in Figure 9.6, Volume IV.

It is proposed to create closely-spaced double lines of treelines, with willow on one side, and pollinator-friendly hedgerow species, hawthorn, elder, rowan, holly. Planting of these species will be staggered to prevent excessive shading and aid establishment of the hedgerows. Young trees will require protection until established.

The Design and Construction of all broadleaf tree planting shall incorporate the following percentages of tree sizes as part of the planting mix:

- Minimum 25 percent of feathered whips trees (1200 - 1500 millimetres high);
- Minimum 10 percent of half-standard trees (60 - 80 millimetres girth);
- Minimum 10 percent of Standard trees (80 - 100 millimetres girth);
- Minimum 10 percent of *Ilex aquifolium* and/or *Pinus sylvestris* (at minimum 500 millimetres high); and
- Minimum 5 percent of *Pinus sylvestris* (minimum 600 millimetres high).

Double row treelines shall be set 300 - 400 millimetres apart with plants at between 400 - 500 millimetres centres in staggered rows.

The species composition of newly planted treelines in the Design and Construction shall provide native trees including, but not limited to, the following:

- Pedunculate Oak (Quercus robur);
- Sessile Oak (Quercus petraea);
- Scots Pine (Pinus sylvestris);
- Alder (Alnus glutinosa);
- Hazel (*Corylus avellana*);
- Holly (*Ilex aquifolium*);
- Willow species (*Salix spp.*);

An understory layer of Blackthorn (Prunus spinosa) and Hawthorn (Crataegus monogyna) should also be included.

2.4 New Meadow Grassland

Meadow grassland will be created as indicated in Figure 9.6, Volume IV to provide habitat for hunting barn owl and kestrel and for ground-nesting birds. These areas will also benefit other fauna through the provision of food (seeds, pollen, nectar, invertebrate prey) and shelter.

Establishing new wild flower meadows:

Fields which are currently dominated by vigorous grasses (such as perennial rye grass and Yorkshire fog) will need to be either nutrient stripped over the course of a few years by one or a combination of the following:

- Repeated cutting (and collection cuttings) without the addition of fertilisers followed by harrowing.
- Turve stripped in order to allow finer wild flower species a competitive chance when introduced. If Wildflower seed mixes are to be used they must be of native provenance; mainstream commercially available mixes are not acceptable. Ecoseeds https://www.ecoseeds.co.uk/ (Northern Ireland) or another reputable and experienced supplier capable of supplying seed mixes that meet the required criteria shall be used. Treat thistles and docks prior to seeding if the land is not being ploughed first.

The lands should not be prepared by using herbicide.

Taking a soil test can be a useful way of determining nutrient levels. Low levels of phosphorus and potassium are generally needed for a successful meadow creation project:

- Available phosphorus: Optimum 5 to 10 mg kg-1. Upper limit of 25 mg l-1
- Extractable potassium needs to be <175 mg/

Continued management will be required and it may take five years or more to achieve a good wildflower meadow.

It's important to mow your new perennial or mixed meadow regularly in the first year after sowing, to encourage the perennial flowers and grasses to make strong root growth. Cut to a height of 5cm (2in), about six to eight weeks after the seedlings appear and repeat every two months throughout the first summer. These cuts can be lower, at 4cm (1½in).

After the first year, the cutting (cut and collect) regime should be as follows:

- Spring cut - Cut to a height of 7.5cm (3in) and complete no later than the end of April.
- Autumn cut – August/ September cutting favours summer flowers, such as knapweed, devil's bit scabious and lady's bedstraw. Leave the cut material in place for a few days to allow the seeds to drop to the ground. Then rake up and remove, to help reduce soil fertility.

A typical wildflower meadow plant assemblage includes the following species: Birdsfoot Trefoil, Black Medick, Cowslip, Devil's Bit Scabious, Meadow Buttercup, Field Scabious, Foxglove, Hemp Agrimony, Kidney Vetch, Lady's Bedstraw, Lesser Knapweed, Meadowsweet, Mullein, Ox-eye Daisy, Purple Loosestrife, Ragged Robin, Red Campion, Red Clover, Ribwort Plantain, Rough Hawksbit, Sorrel, St Johnswort, Wild Angelica, Wild Carrot, Yarrow, Yellow Agrimony, Yellow Rattle, Teasel, Corn Marigold, Corn Poppy, Cornflower and Scented Mayweed. In particular, Devils Bit Scabious will provide food plant for Marsh Fritillary, which was noted in the desk study.

2.5 Watercourse Crossing Enhancement

The proposed site entrance crosses the Skeheens Stream at an existing ford crossing. The ford crossing comprises a concrete apron and is unsuitable fishery habitat (refer to Image 2-3). A bottomless culvert is proposed for the wind farm access track at this location. The concrete apron will be removed and back filled with a substrate mix as follows:

Cobble (64-190mm) - 10%

Very coarse gravel (32-64mm) - 35%

Coarse gravel (16-32mm) - 25%

Medium gravel (8-16mm) - 20%

Fine gravel (4m-8mm) - 10%

Pools will be created ca. 10m upstream and c. 10m downstream of the crossing to provide holding / nursery habitat (final locations within the red line boundary to be determined on-site by the ecologist). Intermittent large boulders (3-5 nr) will also be placed within the pools and set out in a triangular formation.

The natural channel width should be maintained.

Image 2-3: Existing forestry ford crossing to be enhanced

While fishery habitat survey carried out as part of the EIAR indicates sub-optimal habitat for eels in the upper Colligan catchment, Inland Fishery Ireland WFD monitoring in 2017 (at station 17C010030A) recorded eel. It is proposed therefore to install eel brushes/bristles within the piped culvert on the new watercourse crossing (Crossing # 5) on the Knockavanniamountain Stream. The eel brushes will be installed on both sides of the culvert and 20mm and 30mm spacings will be used respectively. These will be installed as per the instruction of the ecologist.

Image 2-4: Eel Bristle / brush[3]

2.6 Shelter Habitats

2.6.1 Bat Boxes

Bat boxes will be installed at the locations specified in Figure 9.6 which are representative of treeline ridges and the riparian corridor of the Skeheens stream which are known to be used by bats within the Site.

Bat boxes will be installed as per the Bat Conservation Trust guidance 'Bat Box Information Pack' (May 2018)[4].

2.6.2 Nest boxes

One kestrel nest box will be installed on suitable trees within the ecological enhancement area at the north of the Site, which is located over 1km from the closest turbines. This can be installed on poles if suitable trees are not available (noting that it is also proposed to plant a broadleaf treeline at this location). The box should be located 3-5m up a tree with a clear flight path without overhanging branches. The opening of the box should be positioned away from the prevailing wind.

General bird boxes (no=8) will be installed for other species, including linnet, skylark and yellowhammer, within the grassland enhancement areas of the Site (see Figure 9.6). The entrance hole for these general bird boxes will need to be at least 3cm in diameter to allow access to these species, and 2-4m off the ground.

These kestrel and general nest boxes will be maintained and replaced as required during the lifespan of the wind farm. Any maintenance work may only be carried out from October to February inclusive under the supervision of a qualified ecologist to ensure nesting season is avoided.

Nest boxes for these species are commercially available or can alternatively be constructed onsite. Plans for kestrel boxes are included below.

[3] Source https://cottambrush.com/wp-content/uploads/2022/07/Rigid_Eel_Pass_Brush-1.jpg

[4] https://cdn.bats.org.uk/uploads/pdf/Bat-Box-Information-Pack-Sept-2020-JF.pdf

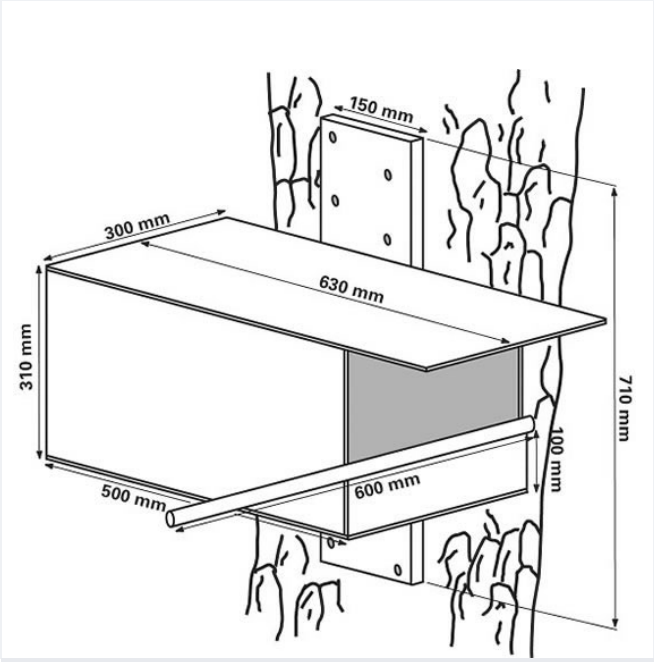

Image 2-5: Kestrel Nest Box Dimensions

2.6.3 Bee Banks

Banks made up of well-drained soil will be created along access tracks at passing bay locations. These can be created by scraping vegetation away from an existing bank if available, or by constructing a bank from excess spoil generated onsite.

It is important to avoid heavily compacting it with machinery. The road-facing sections of banks will be required to be kept clear of vegetation using mechanical means only. This can be carried out in winter as required (frequency depends on rate of re-vegetation) by scraping away vegetation.

2.6.4 Log Piles/ Refugia/ Hibernacula

A proportion of the timber being removed (substantial pieces of timber-tree trunk/branches) will be salvaged by cutting into logs to create log stacks/piles in the areas specified in Figure 9.6. These piles will be used by insects as the timber decays. Logs of different sizes can be stacked on top of each-other or positioned vertically in a pile. It is important to ensure that the logs remain damp and do not dry out by part-burying (some) logs and placing in a partly shaded location within the site.

Refugia piles and hibernacula will also be created at suitable locations within the Site as determined by the EcOW. These provide sheltering locations for a wide range of wildlife, including reptiles, amphibians, small mammals and invertebrates. Refugia piles are produced by piling natural materials such as logs, sticks and leaves; that can be supported by additional materials such as rubble and bricks to form a structure with many cracks and crevices for sheltering. Hibernacula are produced in a similar way, but often require setting into the ground in a shallow pit and topping with soil to enclose the structure and creating a more stable microclimate suitable for hibernating species. These structures will be installed near hedgerows and in areas of woodland within the site, where they are less likely to be disturbed.

Image 2-6: Example of a Hibernacula[5]

[5] (Source: Green Mumbles accessed Mar 2023)

3. MAINTENANCE

3.1 Hedgerow and Treeline Maintenance

Tightly cut hedgerows with flat tops provide little benefit to wildlife, taller and bulky hedgerows are recommended as this provides more shelter for wildlife. When the hedgerows are maintained, stems will be cut a little above the last cut (see Image 3-1) as cutting back to the exact same point depletes the energy of the hedgerow, forms a build-up of scar tissue which discourages new growth.

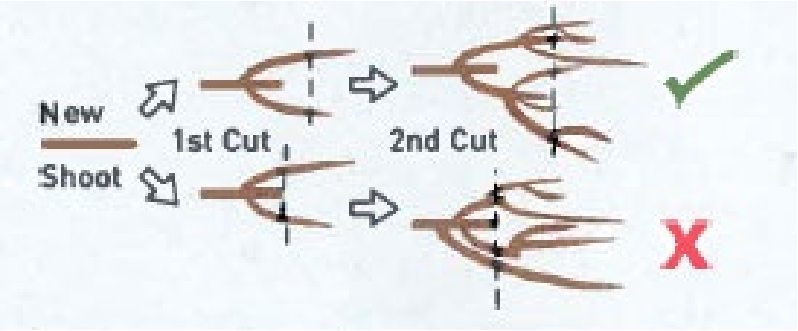

Image 3-1: Hedgerows Level of Cut[6]

Light annual cutting of hedgerows is not good for wildlife as it limits the production of flowers and fruit. The sites hedgerows will be cut every three to four years in rotation as this will leave areas of undisturbed hedgerows. Cutting equipment used will be sharp so as not to shatter or fray the hedge. Shattering and fraying allows for disease to enter plants and can lead to decay and weaken the vigour of the hedgerow. A finger-bar cutter is recommended as the most appropriate tool to minimise fraying and smashing of branches (Heritage Council, 2017). A flail-type hedge cutter is unsuitable for hedge trimming in situations where hedgerow health is a priority.

Hedgerow and tree maintenance will not be carried out between the 1st of March and 31st of August as this is the nesting period for birds and any maintenance at this time may disturb breeding; this is in keeping with the Wildlife Act 1976 (as amended).

Larger trees can be slower to establish following transplantation and need help until established. These trees may require watering and provisions should be made for this. While establishing, the trees will not require pruning, except where dead branches form or branches are damaged by winds. These branches should be carefully removed to prevent the introduction of disease.

3.2 Meadow Grassland

Meadow grassland areas will be created and managed in accordance with National Biodiversity Data Centre Series No. 30 'How-to-guide Creating and restoring meadows in local communities and gardens How to transform grassy areas into semi-natural grassland'[7].

[6] Source: Teagasc
[7] https://pollinators.ie/wp-content/uploads/2023/04/Meadow-Guideline-2023-WEB.pdf

Light annual grazing using sheep or cattle may be used to maintain the meadow grassland areas. In spring or summer grazing of the site will be avoided to favour early or late flowering species respectively and allow the development of nectar and seeds for ground nesting birds and mammals. Mechanical mowing can also be used, either in combination with grazing, or alone. If mowing only is used, one cut and lift per year between October – February is required. This can be split into rotational mowing where half is cut late in the year and half is cut early the following year, however all areas will only be cut once per year.

3.3 Maintenance and Monitoring of Translocated Wet Grassland

The area will be monitored weekly for the first 8 weeks – with additional watering to take place if required. The soil moisture levels will be the key point of concern.

4. MONITORING

Commencing in year 1 of operation the status of the habitats created, enhanced hedgerows and the species enhancement measures will be checked as per Table 5-1 below. Monitoring will be undertaken by a qualified ecologist appointed by the developer/operator of the wind farm. The timing of monitoring is provided in Table 3-4 below. This will follow implementation of the plan to confirm whether habitats have successfully established and to identify any issues that need to be addressed. Following these monitoring visits, a short status report will be prepared. This will identify any necessary actions to ensure the success of the BEMP, which will be implemented on foot of the report findings.

A final assessment of the condition and success of the various biodiversity management and enhancement prescriptions will also be undertaken in Year 34 (i.e., in the year before the final year of operation).

Table 5-1: Summary of Biodiversity Enhancement & Management Measures

Measure	Target Species/ Habitat	Implementation Timeline	Monitoring	Ongoing Management
Mitigation				
Bat Buffer Maintenance	All bat species occurring onsite	Buffers to be cleared prior to turbine installation. Clearance will take place outside the bird breeding season (March-August inclusive)	Annual monitoring throughout lifespan of wind farm (mid-late summer)	Ensure vegetation is kept low – no trees establishing
Hedgerow/ Treeline Reinstatement Planting	Hedgerows/ Treelines Associated bird & insect species	To be planted as early as possible during Construction and Heavy standard trees are to be used to aid establishment.	Years 1, 2, 3, 5, 15	Ensure establishment
Enhancement				
Grassland biodiversity areas - grazing management	Heath, wet grassland and meadows	From project initiation	Years 1, 2, 3, 5, 10, 15, 20, 30, 34 Any positive findings for FPO or rare/threatened species to be reported to the National Biodiversity Date Centre.	Ensure grazing rate is appropriate, no signs of over/ under grazing, poaching.
Nest boxes	Kestrel Passerines	Following wind farm completion	Years 1, 2, 3, 5, 10, 15, 20, 30, 34 during breeding season Any positive findings reported to the National Biodiversity Date Centre.	Ensure boxes are well maintained and/or replaced as required

Measure	Target Species/ Habitat	Implementation Timeline	Monitoring	Ongoing Management
Mining Bee Banks	Mining bees	Following access track construction	Years 1, 2, 3, 5, 10, 15, 20, 30, 34 Any positive findings reported to the National Biodiversity Date Centre.	Ensure continued presence; vegetation to be scraped off annually
Log Piles	Small mammals Insects	Following access track construction	Years 1, 3, 5, 10, 20, 30, 34 Any positive findings reported to the National Biodiversity Date Centre.	Ensure continued presence; add material as required
Refugia/Hibernacula	Small mammals Insects	Following access track construction	Years 1, 3, 5, 10, 20, 30, 34 Any positive findings reported to the National Biodiversity Date Centre.	Ensure continued presence; add material as required
Watercourse Crossing Enhancement	Salmonids Other aquatic species	Following access track construction	Years 1, 3, 5, 10, 20, 30, 34	Ensure gravels remain in place, monitor sedimentation levels, blockages from debris

5. REFERENCES & BIBLIOGRAPHY

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