AI Appendix 9I
Habitat Management Plan

Lewis Wind Power
Cumhachd Gaoithe

wood.

Lewis Wind Power

Stornoway Wind Farm
Habitat Management Plan

Wood Environment & Infrastructure Solutions UK Limited – January 2020

wood.

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Doc Ref. 40001GGos0581R

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Document revisions

No.	Details	Date
0	OHMP 1st draft	December 2019
1	Final	January 2020

Contents

1. Introduction

1.1 Background

1.1.1 This Outline Habitat Management Plan ("OHMP") has been prepared for the Stornoway Wind Farm (the "Proposed Development") by Wood Technical Consulting Solutions UK Ltd ("Wood") on behalf of Stornoway Wind Farm Limited (the "Applicant).

1.1.2 This OHMP should be read in conjunction with the [ ] April 2019 Environmental Impact Assessment Report ("EIA Report") (**Chapters 8 Ornithology and 9 Ecology**); and Additional Information ("AI"), which collectively consider a complete suite of ecological features, including habitats and species. In addition, see also **EIA Appendix 9H Peat Management Plan** ("PMP") which includes measures relevant to the OHMP, notably methods on how peat will be excavated and reinstated within the application red line boundary (the Proposed Development "Site"). The **EIA** Report 2019 and the **AI** submission addresses comments received during the EIA consultation process and specifies a range of mitigation measures to avoid or, where this is not practicable, reduce adverse effects on important ecological features. Where mitigation is not possible in situ, appropriate compensation measures are proposed instead. Enhancement measures are also specified to achieve benefits for biodiversity, in accordance with planning policy requirements and good practice.

1.2 Scope of Habitat Management Plan

1.2.1 The purpose of this OHMP is to set out the strategy that the Applicant proposes to employ to ensure that habitat management measures would be put in place to compensate for predicted residual significant adverse impacts upon ecological features due to the Proposed Development (ie those residual effects on the Blanket bog, wet modified bog and wet heath). No significant adverse impacts were predicted for ornithological features within the EIA Report and the **AI** submission. However, as a result of the increasing hen harrier population within and around the Development Site, a key element of the strategy will be to ensure that habitats supporting the local hen harrier population are maintained and where possible enhanced.

1.2.2 The OHMP will also meet the requirements of the Nature Conservation (Scotland) Act, 2004[1].

1.2.3 An OHMP was included within the EIA Report (**EIA Appendix 9I**). This set out criteria for identifying and delivering compensatory blanket bog habitat management offsite, small scale native tree planting within the Development Site and identifying/ managing rush pasture and woodland habitats offsite for the benefit of hen harrier.

1.2.4 This revised OHMP (**AI Appendix 9I**) expands upon the information presented in the EIA Report. In particular, it sets out the aims and objectives by which Habitat Management Plan ("HMP") areas will be managed for delivering a variety of ecological benefits, together with supporting rationale and an outline of the methods by which they can be achieved. However, it is not the intention for this OHMP to provide all the details of the biodiversity management proposals, as certain details can only be established upon grant of consent for the Proposed Development, for example the location of blanket bog feasibility studies, blanket bog enhancement area, and the location of woodland to be managed for hen harrier enhancement. A full HMP will be developed post consent and before construction works commence.

[1] The Nature Conservation (Scotland) Act 2004 states *'It is the duty of every public body and office-holder, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions'.*

1.2.5 The spatial scope of the OHMP includes locations within the Development Site boundary as well as off-site locations on Lewis.

1.2.6 Issues relating specifically to construction of the Proposed Development (e.g. preventing pollution of watercourses or disturbance of protected species) are not considered in this document. Further information about the mitigation measures to be employed during the construction, operation and decommissioning periods are included in **AI Chapters 8 and 9**. Prior to construction commencing the Applicant will submit a Construction Environmental Management Plan ("CEMP") to Comhairle nan Eilean Siar ("CnES") for their approval (in consultation with appropriate consultees). The CEMP will detail the methods and techniques to be employed across the whole of the Proposed Development to ensure compliance with legislation, construction best practice and the mitigation measures. Proposed peat management measures are described in the PMP, which will be updated as necessary in response to new information from detailed site investigations.

1.3 HMP Delivery and the Planning Framework

1.3.1 A number of stakeholders will be involved in the formulation and agreement of the HMP including (but not necessarily limited to) the Applicant, The Stornoway Trust (the land owner), Scottish Natural Heritage ("SNH"), Royal Society for Protection of Birds ("RSPB"), the Peatland Action Project Officer, Forestry & Land Scotland ("FLS") and the Lewis & Harris Deer Management Group ("LHDMG").

1.3.2 It is anticipated that this OHMP will be a live document that will be further modified during pre and post construction, taking account of any design changes and priorities within the Development Site, and in response to monitoring outcomes both within the Site and the off-site habitat management areas. New opportunities for habitat management and enhancement may become apparent during this pre and post construction period and indeed during the life-time of the Proposed Development, and previously proposed actions may become redundant.

1.3.3 The OHMP could be secured as part of the consent for the Proposed Development via a condition.

1.3.4 The OHMP also includes measures that would allow key consultees the opportunity to monitor the success of the HMP and require the Applicant to take action where necessary. The OHMP would operate for the 25-year life span of the Development. The success of the HMP (both on and off-site) would be monitored over this period, with input from core delivery partners including the Peatland Action Officer and the LHDMG.

1.3.5 The HMP will be funded and delivered by the Applicant and overseen by an HMP steering group. The purpose of the steering group will be to review progress and effectiveness of the HMP on at least an annual basis, and to modify or add to the content of the HMP if necessary. The formal membership and format of the steering group is yet to be agreed – the following organisations will be invited to participate in this process in some form: CnES, The Stornoway Trust, LHDMG, SNH, RSPB, and FLS, and the steering group will be chaired by the Applicant or its representative.

1.4 Structure of the HMP

1.4.1 This HMP is intended to be a practical, succinct document, as full details pertaining to current Development Area characteristics and the Proposed Development proposals can be found in the Stornoway Wind Farm EIA Report.

1.4.2 The OHMP provides:

- A brief baseline summary of the current Proposed Development site characteristics as a general background (Section 2);

- The rationale behind proposed aims and objectives (Section 3);
- Details of the aims and objectives (Section 4):
- The prescriptions that will be applied in order to achieve those objectives - **Table 4.1**, **Table 4.2** and **Table 4.3**;
- Details of implementation including partnership working, funding and duration (Section 5.1 – 5.4):
- Details of monitoring prescriptions needed to evaluate success or otherwise of the implementation of management (Section 5.5).

2. Baseline

2.1 Current Land Use

2.1.1 The Proposed Development is located south-west of Stornoway and east of the Lewis Peatlands Special Area of Conservation ("SAC") and Special Protection Area ("SPA"), on land owned by The Stornoway Trust (see **Figure 2.1 – Site location**).

2.1.2 The Proposed Development site is primarily used for grazing of livestock, including sheep and Highland cattle, small-scale (crofter) peat cutting, forestry and angling. Forestry plantations are found on the slopes of Beinn Hulabaidh, and intermittently across the Site to the south of Pentland Road. However, much of the forestry is of poor quality with stunted growth as discussed in **AI Chapter 8.**

2.1.3 Areas of existing and former peat cutting are located mainly on the floodplain of the Abhainn a Ghlinn Mhoir (Glen River), and to the south of the A858 from approximately the Airigh an da Mhile (NGR NB 383 325) northwards and eastwards. In some places these appear to have had a noticeable influence on the local hydrology, creating localised preferential flow paths along the line of the cuttings.

2.1.4 Within the Development Site, to the north of the Abhainn a' Ghlinn Mhoir, is the active Bennadrove Landfill, whilst Beinn Greidaig Wind Farm straddles the Abhainn a' Ghlinn Mhoir and Abhainn Ghrioda catchments.

2.1.5 Areas of quarrying are close to the Development Site but outside the boundary. These include the Bennadrove Quarry immediately outside the Development Site boundary (NGR NB 346 343), Loch Airigh na Lic Quarry further to the east (NGR NB 400 343) and the Marybank Quarry opposite to the proposed northern site entrance (NGR 409 332).

2.2 Existing Management

Livestock Grazing

2.2.1 According to *Artz et al.* (2014), there has been an overall reduction in grazing across Lewis (since 1982) of about 9% in terms of livestock units, whilst sheep numbers have much reduced, cattle numbers have more than doubled since 2000.

2.2.2 The Development Site is currently managed by low density stock grazing. The majority of stock are sheep with a small number of highland cattle in summer.

Deer Management

2.2.3 A Lewis & Harris Deer Management Plan ("LHDMP") has been formally adopted[2] and provides an agreed framework for a coordinated and co-operative approach to deer management in the area.

2.2.4 The LHDMP identifies specific actions and targets to be delivered by 2023. These are reviewed on an annual basis. The Steering Group uses information gathered from habitat monitoring, population census and cull reporting to agree and set culls on an annual basis. Each management unit is committed to implementing the necessary culls to achieve this.

[2] http://www.deer-management.co.uk/dmgs/deer-management-groups/deer-management-group-map/harris-and-lewis-dmg/

2.2.5 The Lewis and Harris Deer Management Group Area covers 197,824 hectares, and is illustrated in Diagram 1 below. The Proposed Development is located to the north of the Harris and Lewis Deer Management Group Area. The LHDMG covers the Isles of Lewis and Harris (including the island of Taransay) in the Outer Hebrides. Its purpose is to manage deer on a collective basis, in accordance with Scottish Government strategy (Scotland's Wild Deer: A National Approach, 2008), the Code of Practice on Deer Management (2012), Wild Deer Best Practice Guidance and in a manner that integrates different land-use objectives, recognising that compromises over objectives may be required where conflict occurs.

Diagram 1

2.2.6 A current estimate of numbers across the whole Deer Management Group ("DMG") using a combination of counts and local knowledge has estimated there to be around 3,375 deer in total (1,020 stags, 1,751 hinds plus calves) which represents a density of 1.72 deer/km^2 across the Plan area. There are 20 main deer management units within the DMG area. The relevant management unit for this HMP is Stornoway Trust.

2.2.7 Based on data from counts in 2018, the deer density on the Stornoway Trust management unit is currently estimated at 0.4 deer/km^2. Culls and leases are agreed once deer numbers have been established and deer management is undertaken by a syndicate of 5 local controllers.

2.2.8 The LHDMG undertakes Habitat Monitoring Training and Blanket bog is one of the habitats that the DMG has included in the monitoring programme.

2.3 Terrestrial Ecology

2.3.1 Full details of the ecological assessment for the Proposed Development are presented in **AI Chapter 9**. The following presents a brief summary.

2.3.2 Ecological work to support the EIA has been conducted over two main periods - between 2010 and 2011 (in preparation for the Stornoway Wind Farm 2012 application[3]), and during 2018/19 (as part of the 2019 application):

[3] Entec UK Limited (2011). Stornoway Wind Farm Environmental Impact Assessment, Chapter 12 – Ecology.

- A Phase 1 habitat survey, National Vegetation Classification (NVC) survey, and protected species surveys for otter, freshwater pearl mussel, freshwater invertebrates, and ornithological surveys were conducted in 2010/ 11; and
- Additional ecological work carried out to update the 2019 application included a desk study of biological records, consultation, repeat otter and electrofishing surveys, and a structured programme of bird survey work[4].

Habitats

2.3.3 Protected and priority habitats identified within the Development Site that are listed in Annex 1 of the Habitats Directive[5], and/or on the Scottish Biodiversity List[6] are relevant for this OHMP as detailed below:

2.3.4 The dominant habitat within the Site is blanket bog, covering approximately 1,668ha. This area is considered to be important in ecological terms. Key items of note are:

- New peat continues to form and slowly deepen from the component mire species. Peat formation 'activity' is considered to be relatively high within the Development Site, with virtually no grazing over most of it, and the bog supports a very spongy and lush surface of mosses and lichens with vascular plants growing through it;
- Parts of the blanket bog have undergone erosion in the past, resulting in dendritic gullying of the blanket bog. Although there is still some erosion in parts of the blanket bog many of these areas now support actively re-generating vegetation and there is very little bare peat here compared to other areas of blanket bog on the Isle of Lewis and Scotland in general; and
- Around the edges of the blanket bog, where access is easier, there are many areas of peat cuttings. As a result of this activity the peat here is generally less deep. However, as mire forming species continue to flourish, many of these areas are still considered to be active (i.e. peat forming).

2.3.5 Wet heath covers approximately 32ha of the Development Site and is present where the blanket peat thins around knolls and hummocks. These plant communities look like, and often grade into, blanket bog. They can also occur throughout the blanket bog but are not usually extensive. Where they occur these plant communities are considered to be in good condition.

2.3.6 Dry heath covers approximately 1.3ha of the Development Site and is present where the peat is free-draining. These plant communities are restricted to the shallowest peats and can be found occasionally throughout the survey area where there are undulations in the underlying substrata sufficient to protrude through the blanket peat. Areas are therefore never very extensive as well as being quite localised and variable. Where they occur, these plant communities are in good condition supporting a typical range of species and with no, or very light, grazing.

[4] Scottish Natural Heritage (SNH), in their scoping opinion response (SNH, 22nd August 2018) noted that in view of the proximity of the Lewis Peatlands SPA and potential usage of the site by the qualifying species of the SPA, two years' worth of field data should be gathered to inform impacts upon the site, in accordance with their guidance: SNH (2017). Recommended bird survey methods to inform impact assessment of offshore wind farms.

[5] The Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and wild fauna and flora) is a European Union directive that was adopted in 1992. In Scotland, the Habitats Directive is translated into specific legal obligations by the Conservation (Natural Habitats and c.) Regulations 1994 (as amended in Scotland).

[6] The SBL is a list of flora, fauna and habitats considered by the Scottish Ministers to be of principal importance for biodiversity conservation and its publication was a requirement of Section 2(4) of The Nature Conservation (Scotland) Act 2004.

2.3.7 Acid flush plant communities cover approximately 15ha of the Development Site and are associated with areas of surface water seepage. Within the Development Site these communities occur in linear soakways within the blanket bog and alongside more prominent channels and burns. They are never of great extent and of low botanical diversity.

2.3.8 Marshy grassland covers approximately 18ha of the Development Site and is often associated with areas of bog that have been drained for tree planting. It is also found in small patches alongside channels and soakways along with acid flushes, as well as larger stands close to the edge of the blanket bog where the ground is more agriculturally improved. Marshy grassland generally comprises areas of mire dominated by purple moor-grass, dense with dead litter and with only a few sparse associates.

2.3.9 Small areas of mesotrophic grassland communities are found in a few locations around the edges of the Development Site and alongside some roads.

2.3.10 Plantation coniferous woodland is estimated to cover approximately 211ha of the Proposed Development Site. Many of the planted trees are in poor condition and are dying or have died due to unsuitable growing conditions. Also, bog vegetation is re-establishing in many drains that were installed for the forestry and these no longer appear to function as drains. This indicates that these areas are reverting to their previous state. Within coniferous plantation woodland, there are also unplanted rides that have not been subject to drainage, which support unmodified, good condition blanket bog vegetation.

2.3.11 The Development Site is intersected by three river catchments. From north to south these are:

- River Laxdale (Abhainn Lacasdail);
- Glen River (Abhainn a' Ghlinn Mhoir); and
- River Creed (Abhainn Ghrioda).

2.3.12 These are relatively small watercourse reaches, crossing moorland/heath, with the River Creed being comparatively larger than the other watercourses. The watercourses are characterised by variable flow types, including riffle/run/glide sequences. The water is generally less than 1m deep and substrates are also variable, comprising mainly cobble, pebble and boulder. These watercourses connect a number of freshwater lochans within the Development Site.

Protected Species

2.3.13 The protected species surveys identified a high level of otter activity across the Development Site, in the form of spraints and active resting sites. Freshwater habitat and electrofishing surveys indicate that catchments facilitate moderate to high habitat potential for fish species, with watercourses supporting generally 'good' to 'excellent' density populations of Atlantic salmon and brown trout.

2.3.14 The ecological findings have been considered during the site design process, which includes a range of mitigation measures to reduce or avoid potential impacts on valued ecological features. It is nevertheless predicted within the **AI** that there would be significant adverse effects upon blanket bog and wet heath as a result of the Proposed Development. There are no significant residual adverse effects predicted upon other ecological features as a result of the Proposed Development.

2.4 Ornithology

2.4.1 Full details of the ornithological assessment for the Proposed Development are presented in **AI Chapter 8**. The following presents a brief summary.

2.4.2 The Site supports an important upland/ moorland/ open water bird community for the region. The five most frequently recorded species during vantage point surveys, were common tern, golden eagle, great skua, hen harrier, and red-throated diver.

2.4.3 Breeding survey results indicate that twenty-five species of conservation concern were recorded breeding or possibly breeding within the relevant survey areas. Nine of these species are Wildlife and Countryside Act 1981 (as amended in Scotland) Schedule 1 species (black-throated diver; golden eagle; greenshank; hen harrier; merlin; red-throated diver, whimbrel, white-tailed eagle and whooper swan).

2.4.4 Six of the seven qualifying species for the adjacent Lewis Peatlands SPA were recorded breeding within 2km of the site. Other recorded breeding bird species include common sandpiper, common tern, dunlin, golden plover, great black-backed gull, great skua, lesser black-backed gull, mallard, snipe, and potentially short-eared owl.

2.4.5 Of particular ornithological interest is the presence of hen harrier within and adjacent to the Development Site. From evidence collated over the last five years (2015-2019) it is apparent that hen harrier has become established as a breeding species. The breeding population has increased from a single breeding attempt recorded in 2015 to ten (10) breeding attempts recorded in 2019, with nests identified in habitats made up of a mosaic of coniferous plantation and wet modified bog. In addition to this, there appears to be a non-breeding population of hen harriers that have become established, that utilise roost areas characterised by *Juncus sp*. vegetation within the Proposed Development site.

2.4.6 The ornithological findings have been considered during the iterative design process, which includes a range of mitigation measures to reduce or avoid potential impacts on valued ecological features. As a result, **AI Chapter 8** concluded no significant residual adverse effects are predicted upon ornithological features.

3. HMP Context and Rationale

3.1 Management Principles, Constraints and Opportunities

3.1.1 This OHMP has sought to maximise the biodiversity opportunities as well as providing the management required to ameliorate the effects of potential constraints to development wherever possible, whilst recognising the constraints posed by species and habitats with competing requirements. The primary principles for habitat management proposals will be to:

- Maximise opportunities for the enhancement of blanket mire habitats on-site;
- Restore and/or manage off-site Annex I blanket mire and/ or wet heath habitats to offset impacts on-site;
- Fell commercial forestry to benefit underlying blanket mire habitats where appropriate;
- Maximise opportunities for scattered riparian woodland planting where creation of these habitats will not affect the integrity of Annex I habitat types; and
- Ensure that habitat management does not adversely impact upon hen harriers:
  - Target permanent forestry removal in areas where hen harriers are not active;
  - Ensure that managed areas remain suitable for breeding and foraging hen harrier; and
  - Target off-site compensatory habitat management to benefit hen harrier where feasible.

3.1.2 Other features of importance which are identified in the **AI Chapter 8 and 9** include otter and birds such as hen harrier, black-throated diver, red-throated diver, golden eagle, whimbrel and greenshank. However, it has been established through the EIA process that none of these are likely to be significantly affected by the Proposed Development, subject to the implementation of mitigation measures during the construction phase. Whilst these features are not priorities for management action in the OHMP, several of these species are likely to benefit from the proposed habitat management measures.

3.1.3 In designing this OHMP and incorporating the above opportunities into the Proposed Development design, full consideration has been made of the need to operate within the framework of known constraints throughout the lifetime of the Proposed Development. These constraints include the need for:

- Minimisation of disturbance to peat-based habitats.
- Forestry removal to facilitate wind farm construction; and
- The outcomes of habitat management and forestry removal not to increase turbine collision risk to hen harrier, as well as minimising direct and indirect habitat loss to hen harrier;

3.1.4 These principles have underpinned the evolution of the OHMP and are discussed in more detail below.

3.2 Factors Influencing the Selection of Habitat Management Areas

Annex I Habitats

3.2.1 Blanket bog and, to a lesser extent, wet heath vegetation cover a most of the Development Site. Much of the blanket bog has been classified as 'active'[7].

3.2.2 Based on the Proposed Development, there would be a predicted permanent loss of blanket bog and wet heath totalling approximately 31.8ha and compensatory measures are therefore proposed. It is considered that an area of at least double this (i.e. approximately 62ha) is required to offset these losses.

3.2.3 Given the extent of poor condition degraded or modified bog/peatland on-site is limited, opportunities to restore or enhance these habitats are subsequently limited also. The restoration of afforested parts of the Development Site would offer a possible solution to addressing the loss of good condition habitats; however, the utilisation of this poor condition forestry by hen harrier significantly increases their ecological importance and largely precludes their use for targeted restoration (see paragraphs 3.2.12 - 3.2.16).

3.2.4 Apart from a permanent loss of c.31.8ha of blanket bog and wet heath, blanket bog will be safeguarded during the operational life of the Proposed Development, with maintenance of the hydrology of the peatland being key to maintaining the structure and quality of the vegetation and for maintaining suitable conditions for species such as hen harrier. In addition to the design iteration process and application of industry standard impact mitigation, a range of habitat-specific measures (set out within **AI Chapter 9** have been presented to minimise the overall impact of the Proposed Development on ecological features. A number of measures and prescriptions are set out in a PMP which, amongst other things, include careful stripping and storage of turves to safeguard blanket mire and other communities and permit restoration of temporary work areas and track batters; phasing of works to minimise extent of exposed ground at any one time; biosecurity and operative education.

3.2.5 To this end, the OHMP (in conjunction with the PMP) aims to promote the maintenance of existing retained active blanket bog over the Development Site and will focus on the recovery of Annex I habitats on degraded peatland off-site (see **Section 3.4**).

Riparian Compensatory Woodland Planting

3.2.6 In accordance with the UK Forestry Standard (UKFS) and The Scottish Government's Policy on Control of Woodland Removal, compensatory tree planting will be provided to fully offset loss of coniferous plantation woodland in this case 40.61ha. Where peat depth is <50cm within riparian corridors (notably Allt a Choire and Abhainn Ghrioda), consideration will be given to native tree planting to offset tree felling elsewhere within the Development Site. It is anticipated that this could comprise approximately 5ha of woodland planting. An indication of where tree planting could take is included in **AI Figure 9I.4.1**.

3.2.7 Should consent be granted a condition could be imposed to require a compensatory planting scheme setting out the quantity (area) of planting required, their location, species, and planting density. Consideration will be given to further areas of planting on site, if it complies with this OHMP and doesn't impact on the sensitive bog habitats. Where this is not possible the addition planting

[7] Blanket bog that supports significant areas of peat-forming plants is referred to as active blanket bog, a priority habitat under the EU Habitats Directive http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=Blanket_bogs_Brochure.pdf

sufficient to meet the compensatory planting requirement would be provided on adjacent land controlled by the Stornoway Trust. Trees planted would be of native species, and planting proposals would be subject to consultation with SNH and SF prior to commencing development.

Hen Harrier

3.2.8 Survey evidence collated over the last five years (2015-2019) demonstrates that hen harriers have become established as a breeding population on the Development Site, which has increased from a single breeding attempt recorded in 2015 to ten breeding attempts recorded in 2019.

Productivity

3.2.9 The population modelling **(AI Appendix 8F Vegetation sensitivity)** predicted the main limiting factor to the expansion of the population is the low fledging rate affecting productivity as illustrated by the slow trajectory of population growth. Generally, there are a number of influences acting upon fledging survival rates, ranging from poor weather affecting food resources and successful foraging, predation pressures, low levels of food supply affecting the time spent foraging and subsequent feeding rates of chicks.

3.2.10 Currently, it's not known what factors are contributing to the low fledging survival rate on the Isle of Lewis, but a number of factors may be acting on the population including sub-optimal nesting habitats, low abundance of suitable prey items and sub-optimal foraging habitats. Furthermore predation may be a significant factor (two nest failures in 2019 were attributed to avian predation), given the proximity of the Bennadrove Landfill Site which attracts numbers of corvids including raven that are known to predate harrier chicks, as well as great skua and gull colonies within the survey area that may also predate harrier chicks and eggs.

3.2.11 It is proposed that a number of additional studies are undertaken that will help to inform the most appropriate measures to take with regard to further HMP prescriptions for hen harrier.

Habitat Selection

3.2.12 Of the 12 monitored breeding attempts recorded in 2018 and 2019, six were located within habitats consisting of a mosaic of failing forestry plantation and modified bog. Additionally, there appears to be a non-breeding population of hen harrier that use marshy grassland/ rush pasture within the Proposed Development site as nocturnal roosting areas.

3.2.13 A study into the distribution of breeding hen harrier flight activity over dominant vegetation types within the Development Site identified that although blanket bog is the predominant habitat type recorded on site (almost 80% coverage), it only accounts for 5% of flight activity/ha on the site. Over 50% of hen harrier activity was recorded over wet modified bog[8], a mosaic of wet modified bog and plantation woodland or plantation woodland, and these three habitat types accounted for less than 10% of the available habitats, indicating that the mosaic of bog and coniferous forestry plantation present within the Development Site serves as preferential nesting and foraging habitat for hen harrier.

3.2.14 The mosaic of forestry plantation and modified bog together with rush pasture is important for hen harrier. It is considered that retaining these habitats is therefore key to the continued support for hen harriers in the local area, and mitigation is included within the Stornoway Wind Farm EIA at **AI Chapter 8** to try to ensure that loss of these habitats will be minimised.

[8] Much of this vegetation is classified as M17mod (a modified *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire – however there is a range of variation in this drained mire type, which transitions between more natural M17a, M17b, to the *Molinia* dominated M25a (*Molinia caerulea-Potentilla erecta* mire – *Erica tetralix* sub-community).

3.2.15 However, there would be a predicted loss of 40.61ha of coniferous plantation woodland and 0.03ha of marshy grassland. Compensatory tree planting equivalent to that felled on site would be provided. This would be approximately 5ha of native riparian planting taking place across the Development Site in discrete areas where this would be ecologically beneficial and, importantly, where the trees should be able to establish and grow successfully. An indication of where on site tree planting could take is included in **AI Figure 9I.4.1.** Addition planting sufficient to meet the compensatory planting requirement would be provided on adjacent land controlled by the Stornoway Trust. Trees planted would be of native species, and planting proposals would be subject to consultation with SNH and SF prior to commencing development.

3.2.16 Within the Development Site insufficient opportunities were identified for compensatory habitat management for the benefit of hen harrier except for those areas where closed canopy plantation forestry exist. It was necessary therefore to seek opportunities offsite; and Section 3.4 sets out the process for the delivery of appropriate offsite habitat management.

3.3 Selection of Off-Site Habitat Management Areas for Annex I Habitats

3.3.1 Off-site compensatory blanket bog management would be undertaken in stages during the lifetime of the wind farm based on criteria developed within this OHMP. The following section describes the initial feasibility process which would be followed to identify a suitable candidate management area.

3.3.2 Discussions have taken place with the Peatland Action Officer, and locations where management could take place are currently being identified in the region. In collaboration with the Peatland Action Officer, target management areas would be identified within a broad study area based on the following attributes where possible:

- An area at least 62ha to compensate (at a ratio of 2:1) for the permanent loss or modification of blanket bog and wet heath totalling approximately 31ha;
- A high-priority area for active management intervention;
  - Peatland which is actively eroding (e.g. have extensive areas of bare peat and/or actively eroding gully systems) as opposed to those which have begun to re-vegetate, and thus apparently to recover;
  - Peatland where there are signs of direct human disturbance such as ditches, grazing lines, peat-cuttings, tracks etc., especially where impacts could be reversed by active intervention.
- Potential to support a self-sustaining section of blanket peatland, and its management should take into account any functional connections with adjacent peatland habitats;
- Potential for restoration of a self-sustaining section of blanket peatland incorporating a representative range of landforms;
- Land that supports additional important peatland habitats and species;
- Land where specific and imminent threats to the additional important habitats and species have been identified;
- Land outside the Lewis Peatlands SAC/SPA/Ramsar site;
- Land within the Lewis Wind Power Lease Area and Stornoway Trust land boundary where possible;
- Land providing opportunities to trial the management proposals;

- Avoids risk to the highest quality habitat elements (e.g. young/stunted forestry supporting hen harrier, or lochans where divers breed with consistent success) until techniques are proven;
- Accessible from public roads; and
- Location enabling management work to commence and proceed largely independently of wind farm construction work.

3.3.4 The study area will be defined by the Peatland Action Officer, but for the purposes of this HMP, an indicative study area is illustrated in **AI Figure 3.1** (**Study area for off-site peatland restoration**).

3.3.5 The method of identification of target areas will be undertaken by the Peatland Action Officer and would involve existing knowledge of opportunity areas and additional ground-truthing field surveys. Additionally, remote sensing technology[9] could be used to complement on the ground site surveys to help identify restoration opportunities, inform feasibility studies and providing a baseline for long term monitoring of peatland resource. The merits of this approach will be considered by the Peatland Officer.

3.4 Selection of Off-Site Habitat Management Areas for Hen Harrier

3.4.1 Based on survey data its apparent that at least two areas outside of the main survey area supported additional breeding territories in 2019, featuring habitats characterised by a mosaic of habitats comprising forestry plantations, blanket bog and marshy grassland. It is proposed that these areas (See **AI Figure 3.2 – Offsite hen harrier target management areas**) are included within the HMP, and that further work is undertaken to identify other similar areas.

[9] Brown *et al.* (2007) sought to map and classify peatland on the Isle of Lewis using satellite imagery from the Landsat ETM+ sensor. Their aim was to use this technique to classify types of blanket peatland and reduce or eliminate some of the ground-based problems of peatland monitoring. This work was an attempt to update previous research that had been carried out for that area using satellite data, aerial photography and ground survey. It was concluded that peatland mapping and monitoring could be informed by high spatial resolution remote sensing imagery (<10m) to distinguish successfully between different peat types.

4. Aims, Objectives and Prescriptions

4.1 Introduction

4.1.1 **AI Chapter 9** concluded that the Proposed Development has the potential to have significant adverse effects which cannot be mitigated upon habitats (permanent loss of 28.68ha of blanket bog and 2.4ha of wet heath); therefore compensatory habitat management is proposed. Due to the importance of the population of hen harriers that has become established, it is also proposed to undertake habitat management for the benefit of this species.

4.1.2 The following Stornoway Wind Farm HMP has three main aims. These are:

- Aim 1: To manage and enhance Annex 1 habitats (Blanket bog and wet heath) on-site;
- Aim 2: To expand and enhance Annex 1 habitats (Blanket bog and wet heath) off-site;
- Aim 3: To support actions that will go towards maintaining, expanding and enhancing the recently established hen harrier population on the Isle of Lewis.

4.2 Aim 1: To manage retained Annex 1 habitats on-site

4.2.1 Aim 1 is associated with five objectives; their associated prescriptions are summarised in **Table 4.1** and illustrated in **Appendix 9I AI Figure 9I 4.1 (Onsite habitat management proposals)**.

Table 4.1 Aim 1 – Objectives and Actions/Prescriptions

	Objective	Actions/Prescriptions
1.1	**Monitor vegetation recovery in areas of peat reinstatement and around infrastructure**	1 – Post-construction vegetation monitoring will be undertaken at all areas of peat reinstatement and around infrastructure across the Site.
1.2	**Vegetation surveys to inform (livestock) grazing reduction measures and monitoring**	1 – Baseline vegetation surveys will be undertaken within illustrated on **AI Figure 9I 4.1** to establish the current condition of vegetation and determine the potential for enhancement through implementation of grazing reduction measures. 2 – The Applicant will work in conjunction with the factor and tenant farmers to implement grazing control where appropriate. Compensatory payments would be necessary should recommendations comprise a stock grazing reduction or installation of fenced areas. 3 - Following implementation of grazing reduction measures, a monitoring programme would be followed to assess ongoing grazing impacts or improvement in vegetation condition.

	Objective	Actions/Prescriptions
1.3	**Deer habitat impact monitoring and management**	1 – A programme of monitoring to assess impacts of deer and manage those impacts within acceptable ranges will be implemented within HMP (on-site and off-site) management areas. Monitoring these locations will enable the effectiveness of deer management across the management areas to be examined and to assess if this is influencing the condition of on-site habitats, as well as the successful restoration of the proposed off-site blanket bog restoration areas. It is proposed that the LHDMG might be best placed to implement this monitoring. 2 – Based on monitoring results, should impacts be considered unacceptable, the Applicant would work in conjunction with the LHDMP to ensure that guidelines on stocking rates for upland habitats, indicative annual stocking rates (LU/ha) for blanket bog (M17, M18 and M19) of between 0.00 – 0.05 (equating to a target deer density of <5 deer per km^2) are maintained.
1.4	**Map and monitor condition of on-site forestry (plantation height and structure) and hen harrier distribution**	1 - A survey of all core on-site forestry blocks (See **AI Figure 9I 4.1**) is proposed in order to establish baseline plantation height and structure, necessary to inform a future programme of blanket bog restoration through selective removal of closed canopy forestry unsuitable for nesting hen harrier. 2 – Ongoing monitoring would then be undertaken every five years to provide an update baseline to inform further proposed tree felling.
1.5	**Undertake a phased programme of blanket bog restoration through removal of closed canopy forestry**	1 – Once sufficient forestry condition data and hen harrier distribution and productivity data has been collated (see **Table 4.3 – Objective 1.1**), it is proposed that a plan for the phased felling of closed canopy tree would be developed in consultation with FLS and other relevant consultees and implemented, identifying suitable areas for blanket bog restoration and areas suitable to improve hen harrier nesting potential (see **Table 4.1 – Objective 1.2**). Dependent on the extent of proposed removal, the requirement for replacement planting would be considered in consultation with FLS.

4.3 Aim 2: To expand and enhance Annex 1 habitats off-site

4.3.1 Aim 2 is associated with three objectives; their associated prescriptions are summarised in **Table 4.2**.

Table 4.2 Aim 2 – Objectives and Prescriptions

	Objective	Actions/Prescriptions
2.1	**Undertake a feasibility assessment of potential restoration opportunity areas across Lewis**	1 – The Peatland Action officer will undertake a qualitative assessment of peatland condition within an identified study area (See **AI Figure 9I 3.1**). 2 - Once potential candidate management units have been identified, a feasibility assessment would be undertaken to evaluate peatland condition (erosion, human impact, forestry, drainage), safeguarding requirements, opportunities for habitat enhancement and management constraints. On this basis, a target management area would be identified suitable to be delivered as a discrete project by Peatland Action. 3 – This process would align with the remit of the Peatland Action Project Officer and support the objectives of identifying restoration opportunities and providing a high-resolution baseline upon which to baseline long term monitoring.
2.2	**Restore and manage 62ha of blanket bog and wet heath habitat**	1 – A detailed specification for the restoration works, tailored to the specific conditions within an identified target management area (based on the attributes set out in **Section 3.3)**. will be agreed with the Peatland Action Officer and the HMP Stakeholder Group following grant of the application for the Proposed Development, but would be likely to include the following: • Reducing the extent of bare peat; • Reinstating continuous 'active' blanket bog vegetation;

	Objective	Actions/Prescriptions
		• Replacing erosion patterns with the typical surface patterning for healthy blanket bog in Lewis; and • Establish grazing at a level that is compatible with maintenance of these peatland features.
2.3	**Long term monitoring of off-site peatland restoration and Annex 1 vegetation recovery**	1 – Following completion of restoration works within the identified target management area, a long-term monitoring programme would be implemented every five years (Year 5, 10, 15, 20 and 25) over the operational lifetime of the wind farm.

4.4 Aim 3: To support actions that will go towards maintaining, expanding and enhancing the recently established hen harrier population on the Isle of Lewis.

4.3.1 Aim 3 is associated with five proposed objectives. Their associated prescriptions are summarised in **Table 4.3** and illustrated in **AI Figure 9I 4.1**; and **AI Figure 9I 3.2**.

Table 4.3 Aim 3 – Objectives and Actions/Prescriptions

	Objective	Actions/Prescriptions
3.1	**Identify factors driving low productivity**	1 - Techniques to identify factors driving low productivity (applied across the existing survey area and additional areas identified for further study) could include: • The provision of nest cameras to monitor frequency of provisioning of chicks, identify prey species and record predation events. • The use of novel techniques to determine prey species such as the use of buccal swabs.[10] • The provision of satellite tags using GPS that uploads data via GSM/GPRS or 3G telecommunication network to be attached to chicks in order to develop further understanding on post fledging movements, preferred foraging areas etc. 2 - Undertake prey availability surveys across the existing survey area and additional areas identified for further study for two years pre-construction. 4 - Where possible, the Steering Group will use the results from these studies to further develop the objective of managing the drivers of low productivity.

[10] Nota *et al.* used a metabarcoding-based dietary analysis of hen harrier using buccal swabs from chicks to detect prey species.

	Objective	Actions/Prescriptions
3.2	**Create additional nesting and foraging habitats**	1 - A phased approach to felling closed canopy forestry is proposed, leaving felled material in situ to provide nesting and foraging opportunities across the existing survey area (>500m from the nearest turbine) and additional off-site areas identified for further study. 2 - A reduction in grazing pressure from deer will be instigated to improve nesting and foraging habitat (applied across the existing survey area and additional off-site areas) – see **Table 4.1** for further details. 3 – Restocking of linear native riparian woodland adjacent to some streams where conditions are otherwise unsuitable for the development of blanket bog or heathland - including Allt a Choire and Abhainn Ghrioda. ● Prepare ground and plant 5ha of broad-leaved woodland and scrub along the Allt a Choire and Abhainn Ghrioda and Cnoc a' Choilich using Scot's pine, downy birch, willows and rowan, grading into willow scrub. ● Planting will aim to create a mosaic of native species in a random pattern of distribution. ● Planting densities would be around 500 trees per hectare, planting at between 3.0m and 1.8m centres. ● Planting locations would be >500m from the nearest proposed turbine locations in order to avoid enhancing habitat quality for hen harrier in close proximity to turbines and therefore reduce the likelihood of collision. ● Hand preparation will be used for all planting areas due to the proximity of watercourses. ● Plants would be of local provenance. ● Provide adequate protection for establishing vegetation, including bird deflectors where fencing is used.
3.3	**Pre-construction Monitoring**	1 – Two years of additional monitoring of the Isle of Lewis hen harrier population will be continued annually up to the construction period and then during the construction period, across the existing survey area and additional areas identified for further study so that the actions and prescriptions in Objective 3.1 can be met.
3.4	**Post-construction Monitoring**	1 - Monitoring is proposed to be continued as part of an Ornithological Monitoring Plan, across the existing survey area and additional off-site areas in years 1-5, 10, 15 and 25 once the wind farm has become operational. 2 - Collision monitoring is proposed to be undertaken in years 1-5, 10, 15 and 25, and will include carcass searches and calibration of searcher efficiency and carcass removal rates by scavengers.
3.5	**Reporting and Management**	1 - Annual progress reports will be produced documenting the findings of monitoring and survey work, identifying key trends and issues and providing a basis upon which to formulate further actions through the Steering Group.

5. Implementation

5.1 Management

5.1.1 Implementation of the final HMP will be the responsibility of the Applicant, aided and advised by the proposed Stornoway Wind Farm HMP Steering Group, which could comprise a number of different organisations and individuals. These are outlined in **Table 5.1**. It is envisaged that the HMP will be an evolving document and all alterations will be agreed with the Steering Group.

5.1.2 An initial work programme that outlines the necessary steps to be taken and that further develops the management prescriptions above will be progressed if and when consent is granted. The terms of reference will be agreed post consent, but the Applicant is expected to co-ordinate, deliver and drive the implementation of the HMP.

5.2 Partnership Working

5.2.1 The Applicant will implement the HMP with the help of a number of potential partners which are expected to include (but not be limited to) those listed in **Table 5.1**. It is envisaged that these partners will be involved from the earliest stages in order to ensure the effective delivery of the plan.

Table 5.1 Potential HMP Delivery Partners

Partner	Roles
Stornoway Trust **Lewis & Harris Deer Management Group** **Caorann**	• Assessment of grazing levels. • Negotiations with crofters/lease holders. • Calculation of appropriate compensation. • Production of grazing management plans. • Research & monitoring of the HMP outcomes. • Independent peer review.
Peatland Action Officer	• Locating suitable offsite areas for peatland restoration. • Advice, information & technical input on blanket bog restoration.
Western Isles Council	• Advice, information & technical input. • Integration of management plan outputs with LBAP.
SNH	• Advice, information, monitoring & technical input. • Licensing.
RSPB	• Advice, information & technical input on habitat • restoration & species requirements.
SEPA	• Advice, information & technical input.
Lewis & Harris Raptor Study Group (LHRSG)	• Advice, information & technical input.
Ecological/ornithological contractors (Local/Islands based)	• Ongoing monitoring work – vegetation and hen harrier.

Partner	Roles
Forestry and Land Scotland	• Advice, information & technical input. • Integration of management plan outputs for compensatory planting

5.2.2 Core delivery partners to whom agreements regarding the scope and responsibilities of the HMP will need to be confirmed. Funding would be directed in order to implement on and off-site HMP objectives. This may include LHDMG and Peatland Action, as both parties may be well placed to deliver the identified actions. It is envisaged that they would provide a costed breakdown for delivering the necessary actions outlined in this document.

5.3 Funding

5.3.1 The implementation of the management plan will be funded by the Applicant. The funding commitment by the Applicant will span the life of the project; a period of at least 25 years and may include:

- A costed package for the implementation and delivery of a peatland restoration project on Lewis, which could include:
  - The salary and other expenses associated with the Peatland Action Project Officer longer term;
  - Costs to devise and manage feasibility assessment and remote sensing baseline and monitoring study;
  - Costs and time for the collection and propagation of plant species for blanket bog and woodland regeneration;
  - The hire or purchase and maintenance of necessary equipment.
  - Contributions towards machinery and materials, (fencing, matting, dam materials, etc);
  - Costs associated with the monitoring off-site HMP locations over a 25-year period;
- A costed package [by LHDMG] for delivery of vegetation and deer habitat impact assessment surveys and associated deer management;
  - Costs associated with LHDMG staff to monitor HMP locations (on and off-site) over a 25-year period;
- Costs for hen harrier Target Areas, field trials and pre/post construction monitoring.
- Costs for re-stocking riparian woodland on-site.

5.4 Duration

5.4.1 The HMP will only be implemented following consent for the Proposed Development and it will incorporate two phases. Phase 1 will extend over the first five years and would include the establishment of the necessary baseline survey and monitoring programmes; re-stocking of riparian woodland and conservation of the other habitats within the development Site; and instigation of feasibility studies and blanket bog restoration trials. Phase 2 will extend from the point at which target management areas have been identified, subject to discussions with the Peatland Action Officer and

will incorporate the wider application of the blanket bog restoration techniques and management of the off-site compensatory management areas.

5.5 Monitoring and Review

5.5.1 HMP prescriptions will be subject to monitoring in order to assess their effectiveness at achieving the overarching aims and objectives. The outcomes of the monitoring prescriptions will be used by the HMP Steering Group to adjust current objectives and their prescriptions, or to devise new aims and objectives.

5.5.2 During the first five years of operation of the Proposed Development, vegetation monitoring on-site will be undertaken, based on SSSI Site Condition Monitoring protocols, which will be combined with deer habitat impact assessments, which will be undertaken on a regular basis. These will include recording the percentage cover of indicator species, such as *Sphagnum* mosses, from within fixed quadrats and will provide information on the nature of change, including vegetation establishment and development, as well as any ongoing problems of erosion or deer grazing pressure. This is turn will inform the management, such that prescriptions can be altered quickly, if necessary.

5.5.3 The same vegetation monitoring will be undertaken for the off-site target management area once identified and once restoration works have been implemented.

5.5.4 Long term monitoring of the vegetation communities present and the condition and impacts of deer to the Annex 1 habitats will then be assessed in years 5, 10, 15 and 25 of the Operational Phase of the wind farm.

5.5.5 A programme of annual surveys will be undertaken pre-construction (at least 2 years) and in years 1-5, 10, 15 and 25 of the operational phase to determine hen harrier productivity.

5.5.6 Monitoring results will be reported to the HMP Stakeholder Group annually. Reporting of monitoring results and the review of management prescriptions will be undertaken by suitably qualified and experienced ecologists. The HMP Stakeholder Group will be responsible for reviewing the results of the monitoring and agreeing amended management prescriptions if necessary.

5.5.7 The monitoring prescriptions associated with the activities described in **Section 4** are summarised in **Table 5.2** below; and a proposed monitoring timetable is provided in **Table 5.3**.

Table 5.2 Scope of Monitoring and Target Outcomes

Objective		Scope of monitoring prescriptions	Target outcome
1.1	**Monitoring of vegetation recovery in areas of peat reinstatement and around infrastructure**	• Monitoring would include key parameters for restoration such as ecological surveys to determine habitat, vegetation type and cover, and hydrological surveys to confirm water regime and groundwater levels. • Monitoring would be carried out during pre-construction and construction. Monitoring during the Operational Phase of the wind farm would take place in years 5, 10, 15, 20 and 25.	Percentage cover of indicator species, such as *Sphagnum* mosses, from within fixed quadrats will provide information on the nature of change, including vegetation establishment and development, as well as any ongoing problems of erosion. Annual progress reports will be provided to the Steering Group, which will approve any management changes that may need to be implemented.
1.2	**Vegetation surveys to inform (livestock) grazing reduction measures and monitoring**	• The extent and condition of habitat features will be recorded at fixed monitoring plots in each identified management area following JNCC (2009) Common Standards Monitoring Guidance for Upland Habitats. • Baseline data will be collected pre-construction and during construction and the condition and impacts of livestock particularly on blanket bog habitats will be assessed annually for the first 5 years of the operation phase.	Targets will be to improve the condition of habitat features and will follow the targets for upland habitat features relating to feature extent, vegetation composition, vegetation structure and physical structure. Annual progress reports will be provided to the Steering Group, which will approve any management changes that may need to be implemented.
1.3	**Post-construction habitat impact monitoring**	• Fixed monitoring plots (2 x 2m quadrats) would be identified and baseline condition and habitat impact assessment (HIA) of the grazing and trampling impacts on blanket bog would be undertaken. Baseline data will be collected prior to construction (on-site) or restoration activities (off-site). • Monitoring locations will be spaced 100m apart across the restoration area – the number of monitoring plot locations will be determined at a later stage. • At each quadrat a complete species list will be collected along with the percentage coverage the species occupy. • In addition to the species and coverage, assessment evidence of herbivore or land management impacts to the blanket bog habitat will be assessed using standardised guidance (MacDonald et al., 1998). The assessment will consider parameters of both the condition and the current trends associated with impacts to the blanket bog habitats from red deer.	On-site and off-site management areas would align with habitat impact targets for designated sites set by SNH (SNH, 2016c) for 90% of survey samples (overall impacts: grazing/browsing and trampling) to be in the range of Low to Moderate/Low. For proposed woodland planting areas without fencing, a minimum of 60% of herbivore impacts to be in the Low-Moderate category. Monitoring of these will enable the effectiveness of deer management across the wider area to be examined and to assess if this is influencing the successful restoration of the proposed blanket bog restoration area. Annual progress reports will be provided to the Steering Group which will approve any management changes that may need to be implemented.

Objective		Scope of monitoring prescriptions	Target outcome
		• Additional monitoring of the vegetation communities present and the condition and impacts of deer to the blanket bog habitats will be assessed in years 5, 10, 15, 20 and 25 of the Operational Phase of the wind farm. • Findings from this HMP and the surveys/monitoring associated with this, will be fed into the LHDMP.	
1.4	**Post-construction monitoring condition of on-site forestry (plantation height and structure) and hen harrier distribution**	• Five target plantation areas have been identified within the site boundary: Druim Speireag; 2.) Beinn Greidaig; 3.) Airigh na Beiste; 4.) Airigh an da Mhile; and 5.) Cnoc a' Cholich. Plantation areas will be surveyed in Year 1 to establish a baseline in terms of canopy height, condition, structure and density and would be monitored over the Operational Phase of the wind farm, in years 5, 10, 15, 20 and 25. • Management proposals would be reviewed alongside hen harrier utilisation and distribution data from post construction monitoring, and where appropriate, recommendations would be made for selective removal of enclosed canopy plantation.	Collation of habitat condition data based on size/structure/density; and hen harrier distribution/ habitat utilisation data. Based on the initial baseline condition survey, target areas of plantation nearing canopy closure would be identified as priority areas and monitored accordingly until deemed ready for removal. Where data support this, selective forestry removal will be recommended. Progress reports will be provided to the Steering Group in year 1 and thereafter on a 5-yearly basis. The Steering Group will approve any management changes that may need to be implemented.
2.1	**Undertake a feasibility assessment of potential restoration opportunity areas across Lewis**	• In consultation with all relevant stakeholders, a feasibility assessment will be undertaken of candidate site(s) identified by the Peatland Action officer.	Based on the attributes outlined within the HMP, Target Management Area(s) will be identified suitable to deliver the restoration and management of 62.16ha of Annex I habitats.
2.2	**Restore and manage 62ha of Annex I habitats**	• A combination of remote sensed aerial imagery and ground-truthing will be undertaken. High-resolution vertical air photographs will sample all target management areas, providing a clear indication of surface patterns; • Analysis techniques are available and archive images can be obtained in order to make retrospective condition assessments for comparison with trends emerging in the future. • Repeat monitoring of peatland condition could be based primarily on satellite imagery (supported by vegetation survey for ground-truthing purposes). • In order to determine sustainable long-term stocking levels, accurate measures of grazing management will also be made.	Percentage cover of indicator species, such as Sphagnum mosses, from within fixed quadrats will provide information on the nature of change, including vegetation establishment and development, as well as any ongoing problems of erosion. Measures of success could also include a measurable reduction in erosion features and maintenance of appropriate stocking levels. Progress reports will be provided to the Steering Group in year 1 and thereafter on a 5-yearly basis. The Steering Group will approve any management changes that may need to be implemented.

Objective		Scope of monitoring prescriptions	Target outcome
		• Adaptive management measures based on best available technologies to support vegetation recovery will be implemented should recovery not be sufficient.	
2.3	**Long term monitoring of peatland restoration and Annex 1 vegetation recovery within off-site target management area**	• Monitoring would include key parameters for restoration such as ecological surveys to determine habitat, vegetation type and cover, and hydrological surveys to confirm water regime and groundwater levels. • Monitoring would be carried out during pre-construction and construction. Monitoring during the Operational Phase of the wind farm would take place in years 5, 10, 15, 20 and 25.	
3.1	**Identify factors driving low productivity**	• Techniques to identify factors driving low productivity (applied across the existing survey area and additional off-site areas identified for further study) could include: • the provision of nest cameras to monitor frequency of provisioning of chicks, identify prey species and record predation events (assume up to 10 cameras); • the use of novel techniques to determine prey species such as the use of buccal swabs; and • the provision of up to 10 tags (in the pre-operational phase) using GPS that uploads data via GSM/GPRS or 3G telecommunication network to be attached to chicks in order to develop further understanding on post fledging movements, preferred foraging areas etc. • Undertake prey availability surveys across the existing survey area and additional areas identified for further study for two years pre-construction. • Where possible, the Steering Group will use the results from these studies to further develop the objective of managing the drivers of low productivity.	Provide nest locations to LHRSG so that nest cameras, fitting of satellite tags and undertaking buccal swabs can be undertaken. Annual progress reports will be produced documenting the findings of monitoring and survey work, identifying key trends and issues and providing a basis upon which to formulate further actions through the Steering Group.
3.2	**Create additional nesting and foraging habitats**	• A phased approach to felling closed canopy forestry is proposed, leaving felled material in situ to provide nesting and foraging opportunities across the existing survey area (>500m from the nearest turbine) and additional off-site areas identified for further study.	Annual progress reports will be produced documenting the extent of habitat establishment and any requirement for replacement planting, and inclusion of hen harrier activity/distribution data indicating the extent to which new habitats are supporting hen harrier, providing a basis upon which to formulate further actions through the Steering Group.

Objective		Scope of monitoring prescriptions	Target outcome
		• A reduction in grazing pressure from deer will be instigated to improve nesting and foraging habitat (applied across the existing survey area and additional off-site areas) – see **Table 4.1** for further details. • Restocking of linear native riparian woodland will be undertaken adjacent to some watercourses where conditions are otherwise unsuitable for the development of blanket bog or heathland - including Allt a Choire and Abhainn Ghrioda. • Prepare ground and plant 5ha of broad-leaved woodland and scrub along the Allt a Choire and Abhainn Ghrioda using Scot's pine, downy birch, willows and rowan, grading into willow scrub.	
3.3	**Hen harrier pre-construction monitoring**	• In addition to those measures outlined in objective 3.1, the following monitoring would be undertaken for two years pre-construction: ▶ Breeding and nest monitoring; ▶ Focal watch surveys; ▶ Roost search and monitoring; and • Standard VPs would be undertaken in the last year of pre-construction for all species (including harrier).	Provide nest locations to LHRSG so that nest cameras, fitting of satellite tags and undertaking buccal swabs can be undertaken.
3.4	**Hen harrier post-construction monitoring**	• Collision monitoring to include carcass searches, calibration of searcher efficiency and determination of carcass removal rates. • All surveys / monitoring undertaken in support of objective 3.1 and 3.2 will be undertaken in years 1-5, 10, 15 and 25.	Annual progress reports will be produced documenting the findings of monitoring and survey work, comparison with previous findings, identifying key trends and issues and providing a basis upon which to formulate further actions through the Steering Group.

Table 5.3 Summary of HMP Activities during the Lifetime of the Proposed Development

Timeline of HMP Activities Through Pre-construction/Construction and Operational Phases of the Proposed Development															
Wind Farm Phase	**Pre-construction Year**		**Construction Year**			**Operation Year**									
Task	**1**	**2**	**1**	**2**	**0.5**	**1**	**2**	**3**	**4**	**5**	**10**	**15**	**20**	**25**
Implementation of hen harrier field trials to identify factors driving low productivity															
Creation of additional nesting and foraging habitats – riparian planting															
Pre-construction hen harrier monitoring															
Post-construction hen harrier monitoring															
Reporting on hen harrier monitoring and recommendations for habitat management															
Monitoring vegetation recovery in areas of peat reinstatement and around infrastructure															
Vegetation surveys to inform (livestock) grazing reduction measures and monitoring															
Deer habitat impact monitoring and management															
Mapping and monitoring condition of on-site forestry (plantation height/structure)															
Phased programme of blanket bog restoration through removal of closed canopy forestry															
Feasibility assessment of potential peatland restoration opportunity areas across Lewis															
Implementation of restoration project at identified target management area															
Long term monitoring of off-site peatland restoration and Annex 1 vegetation recovery, including deer habitat impact assessments															

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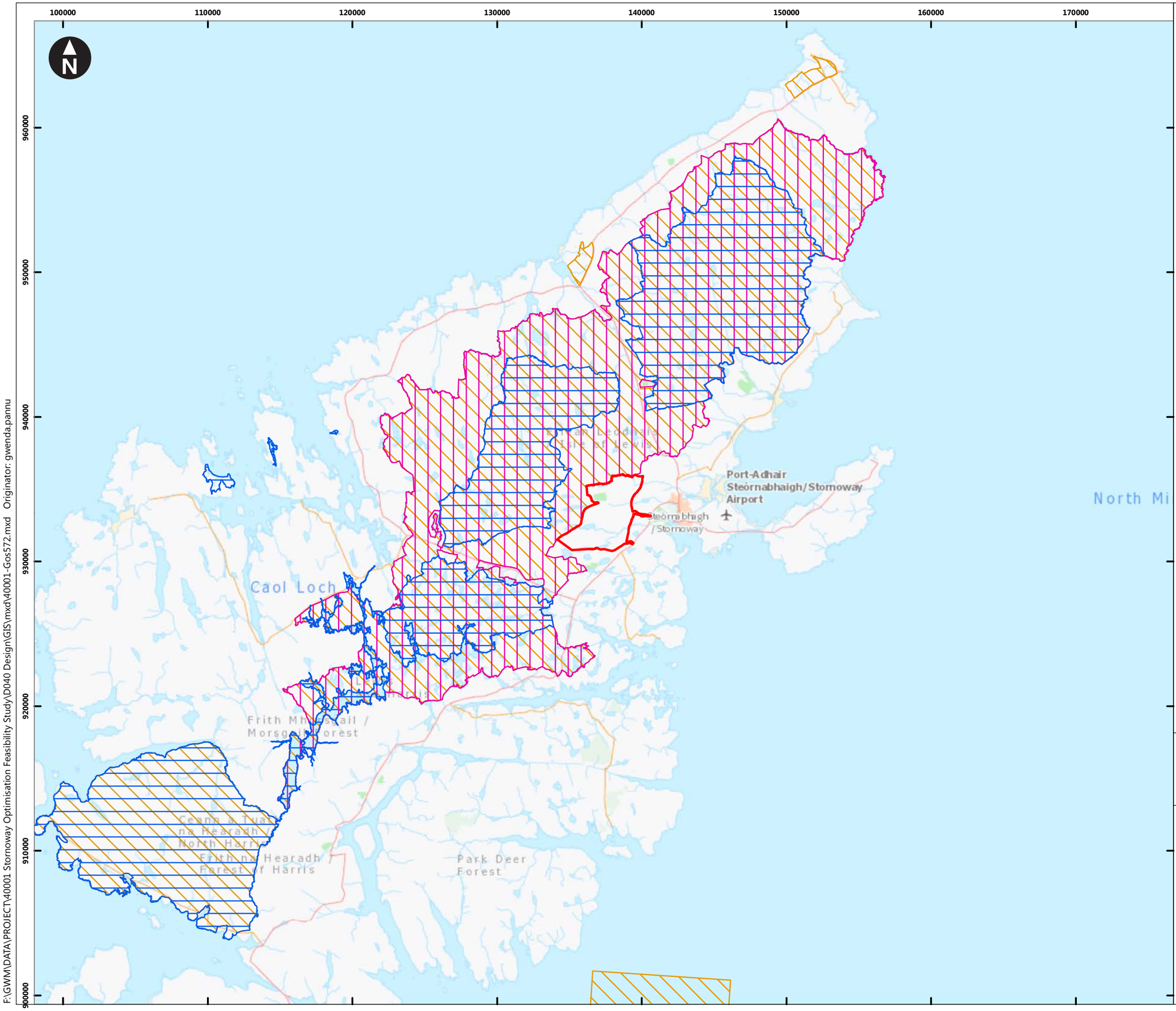
Appendix A
Figures



Key

- Development site boundary
- Ramsar
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

0 2.5 5 7.5 10 12.5 km

Scale at A3: 1:250,000

Client

Lewis Wind Power
Cumhachd Gaoithe

Stornoway Wind Farm
Additional Information

AI Figure 9I.2.1
Site location

January 2020

wood.

40001-Gos572

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120000
130000
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950000
940000
930000
920000

Key

- Development site boundary
- Ramsar
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Indicative peatland restoration study area

0 2.5 5 7.5 km

Scale at A3: 1:150,000

Client

Lewis Wind Power
Cumhachd Gaoithe

Stornoway Wind Farm
Additional Information

AI Figure 9I.3.1
Study area for off-site peatland restoration

January 2020

wood.

40001-Gos573

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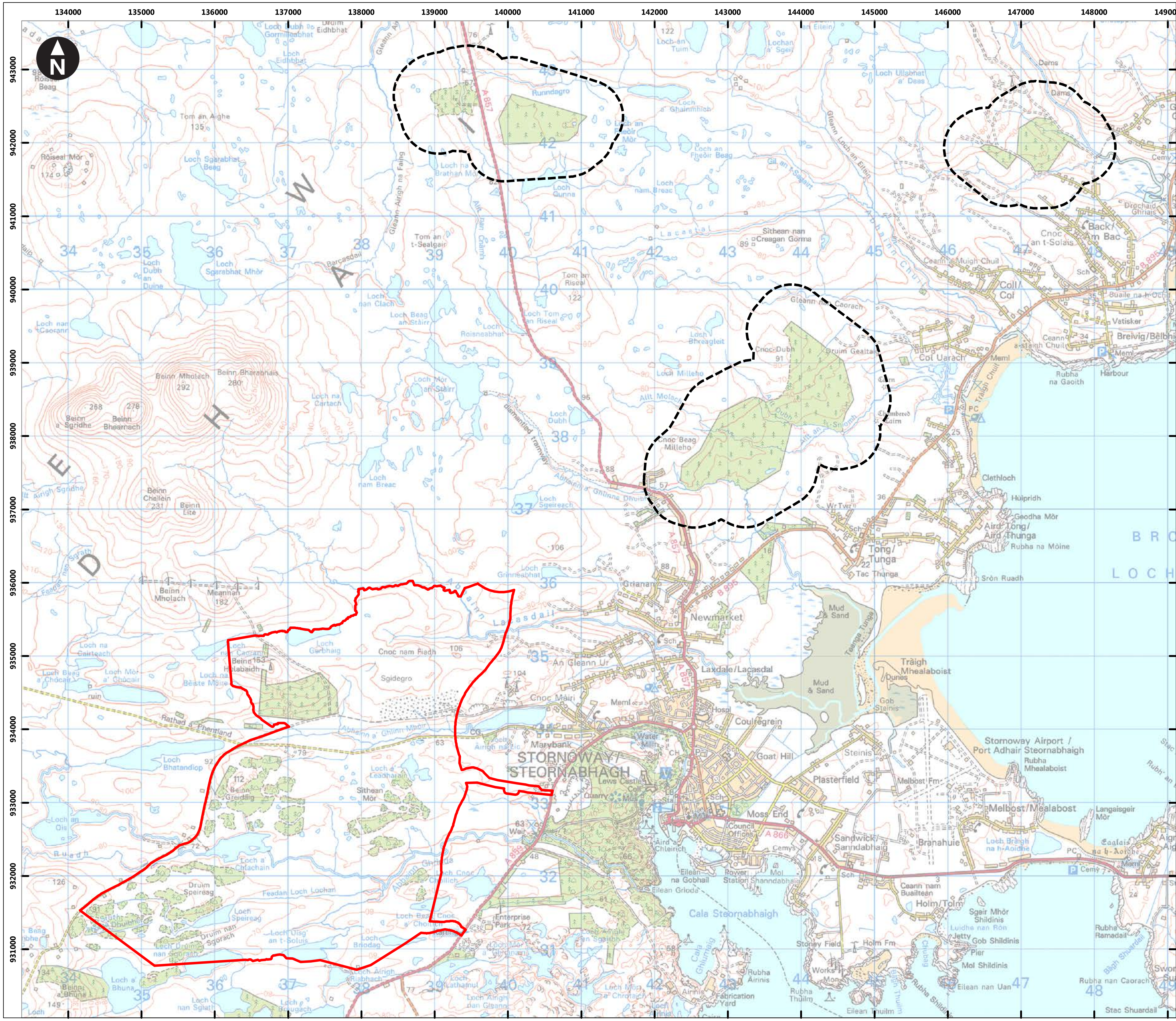


Key

Development site boundary

Hen harrier target management areas

0 1 2 3 km

Scale at A3: 1:50,000

Client

Lewis Wind Power
Cumhachd Gaoithe

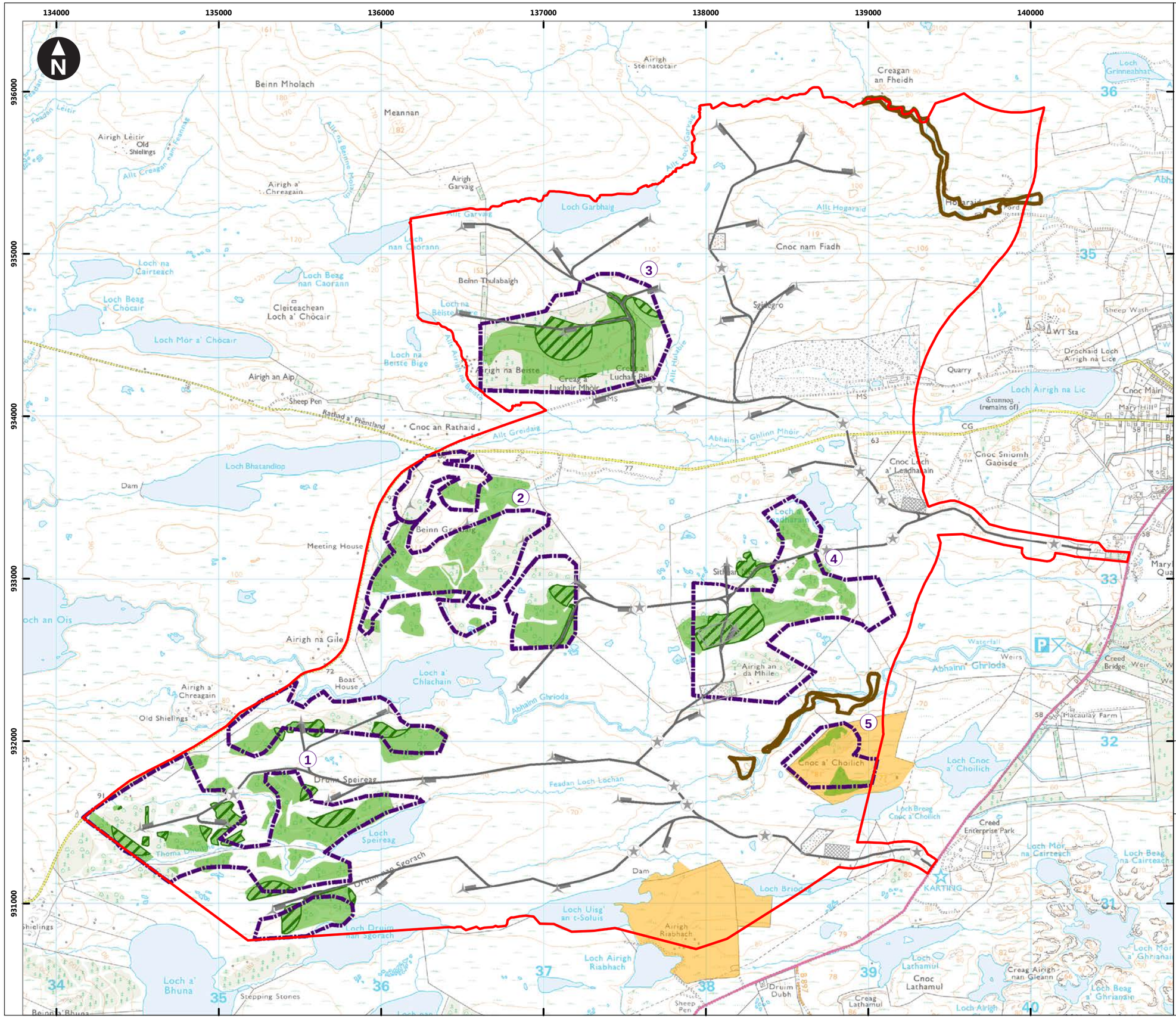
Stornoway Wind Farm
Additional Information

AI Figure 9I.3.2
Off-site hen harrier target management areas

January 2020

wood.

40001-Gos574



Key

- Felling area
- Development site boundary
- Turbine location
- Site roads
- Cranepad hardstanding
- Substation / compound / laydown areas

Habitat Managaement Areas

- Planted Coniferous Woodland
- Forestry monitoring areas
  1. Druim Speireag
  2. Beinn Greidaig
  3. Airigh na Beiste
  4. Airigh an da Mhile
  5. Cnoc a' Choilich
- Riparian woodland planting

Deer management / monitoring areas within site boundary. Monitoring locations tbc.

- Felling area
- Potential enhancement areas for grazing reduction

0 250 500 750 1,000 m

Scale at A3: 1:22,500

Client

Lewis Wind Power
Cumhachd Gaoithe

Stornoway Wind Farm
Additional Information

AI Figure 9I 4.1
On-site habitat management proposals

February 2020

wood.

40001-Gos571b

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Appendix B
Species Names

Common and Scientific Species Names

Common Name	Scientific Name
Fish	
Atlantic salmon	*Salmo salar*
Brown trout	*Salmo trutta*
Ornithology	
Black throated diver	*Gavia arctica*
Common sandpiper	*Actitis hypoleucos*
Common tern	*Sterna hirundo*
Dunlin	*Calidris alpina*
Golden eagle	*Aquila chrysaetos*
Golden plover	*Pluvialis apricaria*
Great black-backed gull	*Larus marinus*
Great skua	*Stercorarius skua*
Greenshank	*Tringa nebularia*
Hen harrier	*Circus cyaneus*
Lesser black-backed gull	*Larus Fuscus*
Mallard	*Anas platyrhynchos*
Merlin	*Falco columbarius*
Snipe	*Gallinago gallinago*
Short-eared owl	*Asio flammeus*
Red-throated diver	*Gavia stellata*
Whooper swan	*Cygnus cygnus*
Plants	
Sitka spruce	*Picea stitchensis*
Lodgepole pine	*Pinus contorta*

Common Name	Scientific Name
Ling heather	*Calluna vulgaris*
Cross-leaved heath	*Erica tetralix*
Purple moor grass	*Molinia caerulea*