NATURA IMPACT STATEMENT

Black Lough Wind Farm, Tawnamore and Cloonkeelaun, Co. Sligo.

Report prepared by Woodrow Sustainable Solutions Ltd.

On behalf of Rouse Developments Ltd.

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DOCUMENT CONTROL

Document	Natura Impact Statement for proposed Black Lough Wind Farm, Tawnamore and Cloonkeelaun, Dromore West, Co. Sligo.
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STATEMENT OF AUTHORITY

The report has been written by Will Woodrow. Will is a Director at Woodrow Sustainable Solutions. Will Woodrow is an experienced ecologist with over 30 years of experience in ecological surveys and assessment. Will is a Chartered Ecologist and a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

As a member of CIEEM Will is required to abide by a strict code of professional conduct in all aspects of his work.

The report has been checked internally by Sharon Eastwood.

A scientist by training, Sharon has highly developed interpersonal and facilitation skills with the ability to enthuse and engage communities and businesses in the process of appropriate change to better their environment, in line with required legislation and best practice. In her work with national charities and community groups, Sharon has formed long-term, strategic plans consulting with 100+ staff, the public and community groups. Her meticulous Project Management skills, ensure that projects get off the ground and that targets are achieved within (often tight) budgets. She is a 'Green mentor' for businesses and communities and Sharon is proud of her work as a National Adjudicator for TidyTowns – Europe's longest running and biggest community programme - encouraging bottom-up environmental change. She has co-directed the company, Woodrow, since its formation in 2001. While, in 2016, Woodrow was shortlisted as an Outstanding Small Business in Ireland by the Small Firms Association.

Sharon is also a Fellow of the Royal Society for Encouragement of Arts, Manufacture & Commerce (RSA).

The impacts, mitigation and conclusion sections of this report have been checked by Róisín NigFhloinn.

Róisín is a Senior Ecologist with Woodrow. She has completed an honours B.Sc. specialising in Botany and M.Sc. in Ecology and Management of the Natural Environment. She is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). She regularly carries out reporting on Ecological Impact Assessment and to inform Natura Impact Assessments / Appropriate Assessments carried out by statutory authorities. Furthermore, she has several years' experience in habitat surveys, mammal surveys, bird and bat surveys for a number of large infrastructure schemes, commercial and residential projects. Róisín is an experienced Ecological Clerk of Works (ECoW).

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HND Conservation Management. Farnborough College of Technology, 1989.

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1 Introduction

1.1 Background

Woodrow Sustainable Solutions Ltd ("Woodrow") was commissioned by the applicant (John Hallinan) to collate information to inform a Natura Impact Statement to be conducted by the competent authority (Sligo County Council). The Proposed Development is installation of cabling within two consented wind farm developments (Black Lough and Cloonkeelaun – 6 No turbines in total). The development is located partly within the Ox Mountains Bogs Special Area of Conservation (SAC). The proposal, located at Tawnamore and Cloonkeelaun townlands, Co Sligo, an electrical connection, hereafter referred to as the "Proposed Development".

This report assesses the potential for impacts upon European Sites (or Natura 2000 sites) as a result of the Proposed Development. European Sites include Special Areas of Conservation (SACs) designated for Annex habitats and species of the Habitats Directive and Special Protection Areas (SPAs) designated for Annex bird species of the Birds Directive.

1.2 Legislative Context

1.2.1 Requirement for a Screening for Appropriate Assessment.

The Habitats Directive was transposed into Irish law by the European Communities (Natural Habitats) Regulations 1997 and European Communities (Birds and Natural Habitats) Regulations 2011 (the Habitats Regulations). Regulation 42(1) of the 2011 Regulations requires that:

"A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site".

Guidance document on Article 6(4) of the 'Habitats Directive' states that:

"any uncertainty over the precise nature and/or magnitude of the adverse effects should be thoroughly tested. Where appropriate, a precautionary approach should be adopted and the assessment of adverse effect based on a worse-case scenario.[1]"

If at this stage if the potential for likely significant effects to be identified - there is a requirement for a Natura Impact Assessment to be carried out.

1.2.2 Requirement for a Natura Impact Statement

The Appropriate Assessment test assesses whether, in view of best scientific knowledge and applying the precautionary principle, and in light of the conservation objectives of the relevant

[1] (European Commission, 2007)
http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/guidance_art6_4_en.pdf (Accessed February 2018)

Natura 2000 Sites, the Proposed Development, either alone or in combination with other plans or projects, may adversely affect the integrity of any Natura 2000 Sites.

If, following the screening process, a potential significant effect is predicted or cannot be ruled out, under Regulation 42(6) of the 2011 Habitats Regulations an Appropriate Assessment is required in order to determine the potential for impact on integrity of a European site.

With the Screening for Appropriate Assessment having determined that potential significant effects on Natura 2000 sites could not be ruled out (see Appendix 1), a Natura Impact Statement as required under Regulation 42(6) of the European Communities (Birds and Natural Habitats) Regulations 2011. This Natura Impact Statement provides an assessment of the proposal considering potential impacts on Qualifying Interests within Natura 2000 sites and provides mitigation proposals to avoid impacts on the integrity of Natura 2000 sites. This allows for an audit trail through Article 6 of the EU Habitats Directive to facilitate an Appropriate Assessment by a competent authority.

1.3 Structure/ Layout of the report

This Natura Impact Statement provides the information necessary for the competent authority, in this case Sligo County Council, to undertake an Appropriate Assessment of the proposal. The report sections, paragraphs and tables relate in sequence to the process of assessing the potential impact of the project in the context of sequential requirements of Article 6 of the EU Habitats Directive.

1.4 Main sources of consultation and information

The following information sources were consulted:

- Department of Environment, Heritage and Local Government (DoEHLG, 2009a). *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*;
- European Community Habitats Directive (92/43/EEC) – The Habitats Directive;
- European Communities (Natural Habitats) Regulations 1997;
- European Commission Environment DG (2001). *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*;
- *Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitats Directive 92/43/EEC*;
- National Parks and Wildlife Services online MapViewer[2];
- National Parks and Wildlife Service's data (downloaded GIS datafiles[3]);
- Sligo County Council Planning Portal[4]; and,
- Field visits to the site between February and September 2018

A general site visit was conducted on 13th February 2018 to gain a better understanding of the site and of the proposal. Further visits were completed on:

[2] NPWS Map Viewer http://webgis.npws.ie/npwsviewer/ (Accessed May 2018)
[3] NPWS Maps and Data https://www.npws.ie/maps-and-data (Accessed May 2018)
[4]Sligo County Council Planning Portal http://www.sligococo.ie/planning/SearchPlanningApplications/ (Accessed June 2018)

- 17 and 19 April 2018. Detailed ecological field surveys including full habitat assessment for Annex I Habitat Qualifying Interests and habitat suitability assessment for Annex II species Qualifying Interests.
- 27 September 2018. Survey of known and potential marsh saxifrage areas in order to map extent and ascertain any potential.
- 23 October 2018. Survey for potential Geyer's whorl snail and survey for Geyer's whorl snail within any suitable habitat areas.

1.5 Description and features of the Proposal

1.5.1 Location

The proposal lies approximately 10 km south-west of Dromore West in County Sligo. The proposed electrical connection follows a general NE to SW line, starting at its north- boundary at IG 39151 25668, heading south-west to IG 37651 23693. The location of the proposal is shown in Figure 1 alongside other local Natura 2000 sites.

1.5.1 General layout and details of proposal

The proposed works comprise underground cabling and overhead line between turbine T2 and the control building at Cloonkeelaun.

The proposed layout is shown on **Figure 2.**

Figure 1 - Proposal within the context of the Ox Mountain Bogs SAC and other Natura 2000 sites.

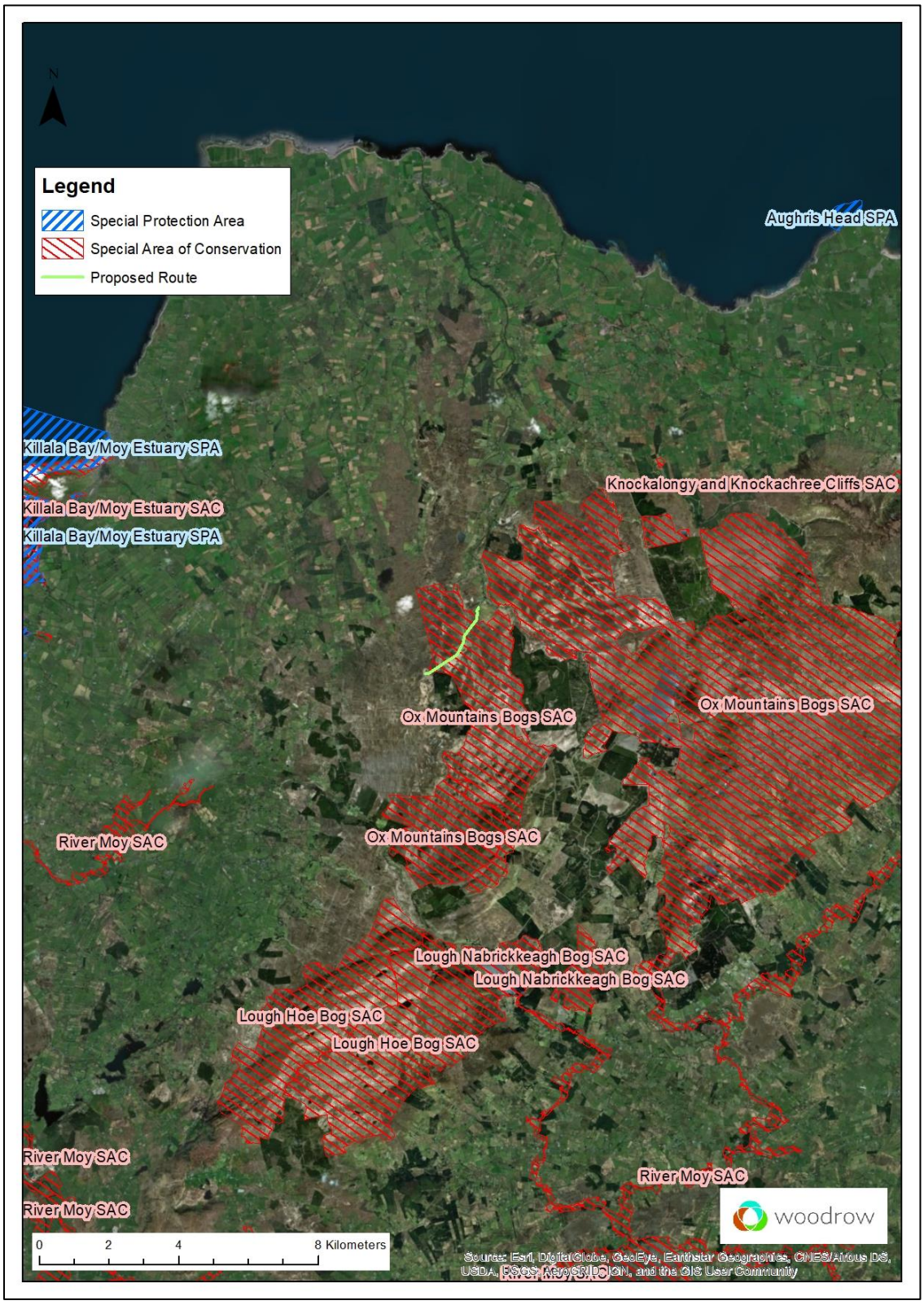
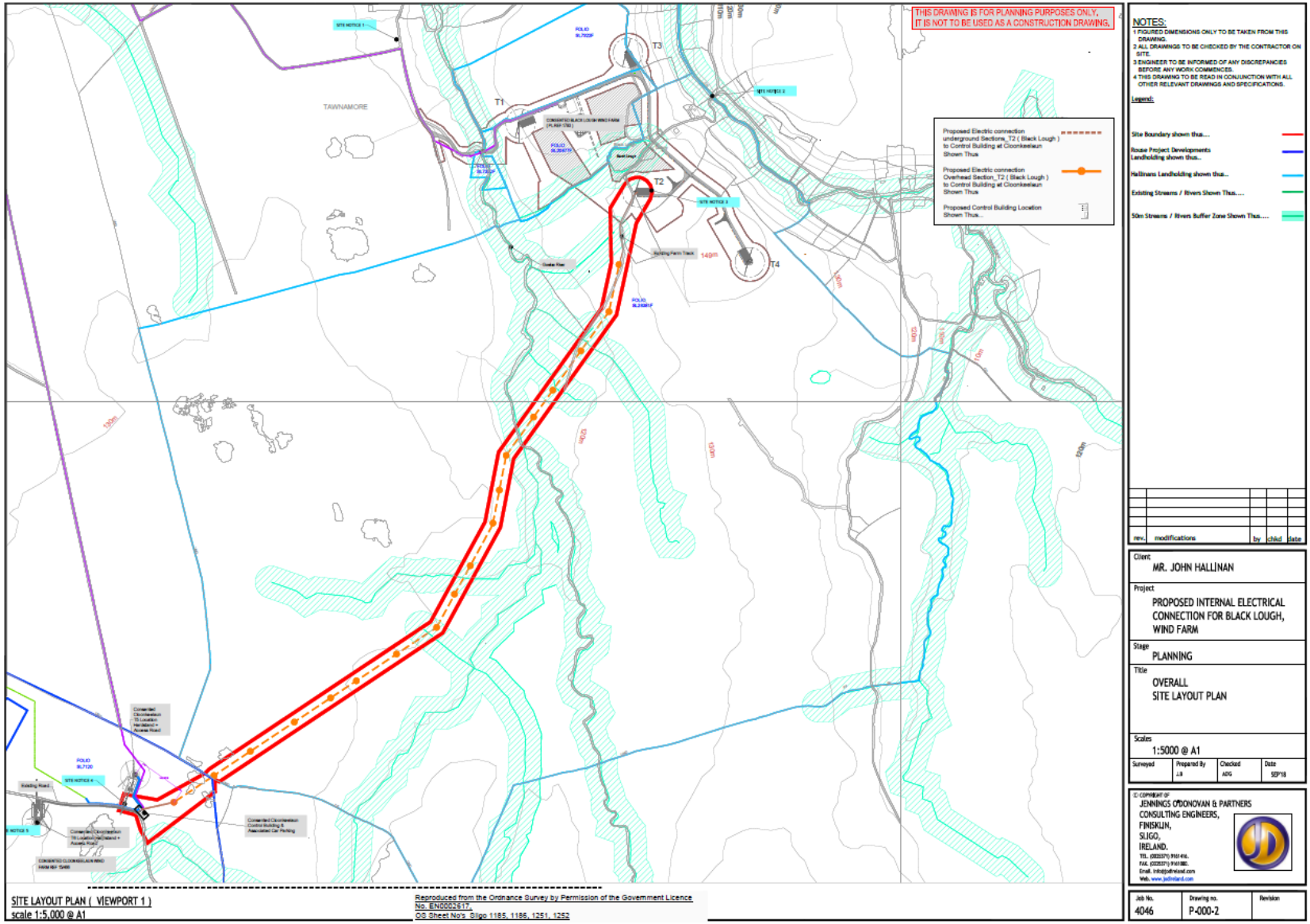


Figure 2 – Proposal Layout



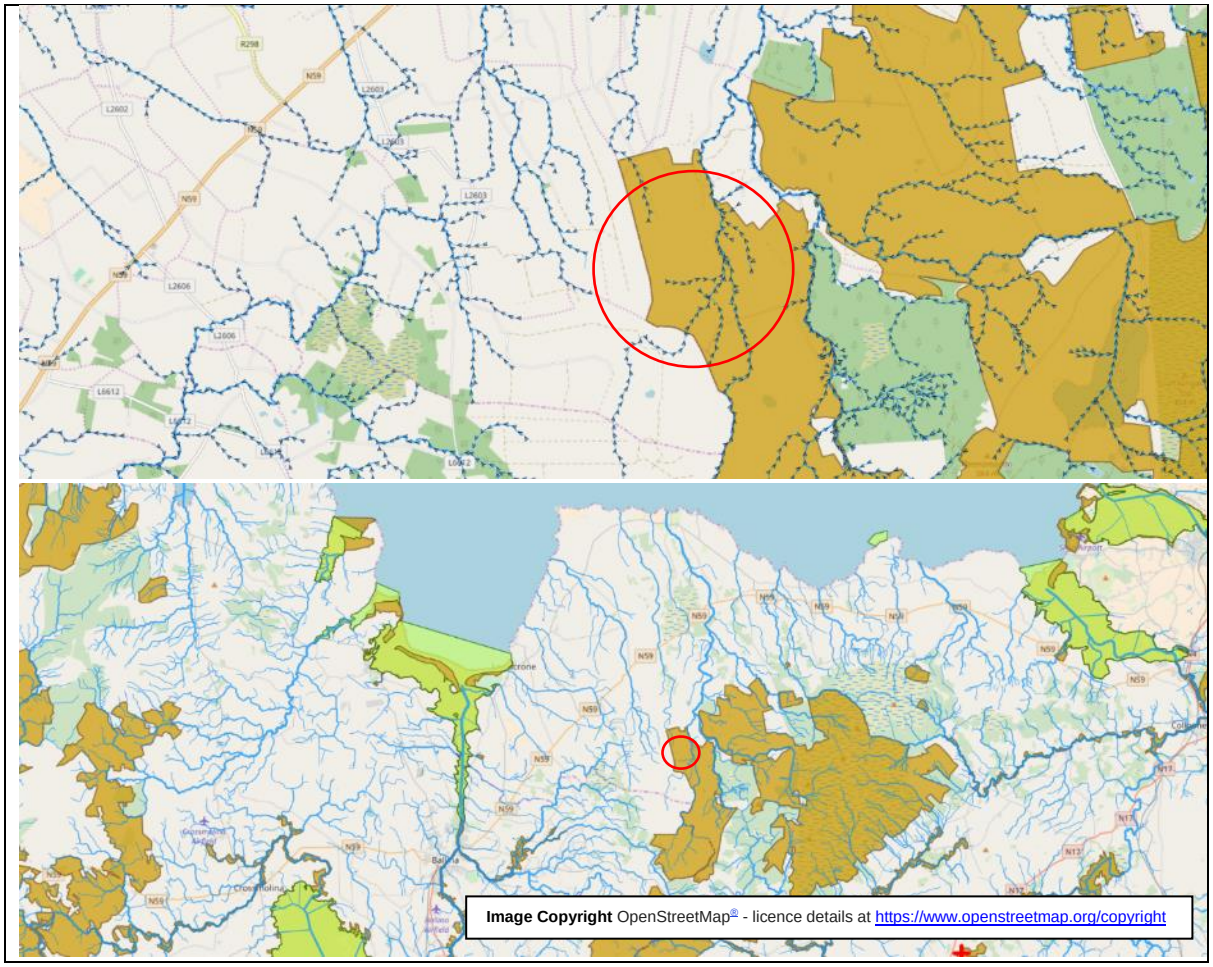
2 Description of Natura 2000 Site and Qualifying Interests potentially affected

As demonstrated in Figure 1, the proposal falls partly within the Ox Mountains Bogs SAC and is therefore likely to result in potential significant effects on Qualifying Interests (QIs) of the Natura 2000 site. Hence a Natura Impact Statement is required.

There are not considered to be any other Natura 2000 sites that the proposal has the potential to significantly affect, with no other Natura 2000 sites hydrologically connected to the proposal or with any other potential connectivity as demonstrated by Figure 3.

Other Natura 2000 sites considered with respect to potential for significant effect included Lough Hoe Bog SAC and the River Moy SAC. Notably the proposal falls within the Gowlan River catchment and connects downstream to the Easky River catchment and does not connect to the Moy River catchment, which falls to the west of the proposal. The assessment of the potential impact on the integrity of the Ox Mountains Bogs SAC, with respect to structure and function of Qualifying Interests is given in this section.

Figure 3 – Location of proposal (in red circle) in the context of Natura 2000 sites with rivers and flow direction (top) and wider context (bottom) (Source – EPA AA GeoTool https://gis.epa.ie/EPAMaps/AAGeoTool)



2.1 Natura 2000 Sites identified within the Screening Assessment

Table 1 details the Natura 2000 Sites for which the Screening for Appropriate Assessment concluded Significant Effects were likely or could not be ruled out. It includes the Qualifying Interests potentially affected as well as impact type and potential resulting effect.

Table 1 Potential significant effects matrix for Natura 2000 Sites and Qualifying Interests with the potential to be significantly affected by the Proposed Development.

Natura 2000 Site	Qualifying Interest	Potential impact type
Ox Mountains Bogs SAC (000252)	**Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (3110)**	• Direct loss • Drainage • Pollution (sediment and chemical / fuel)
	Natural dystrophic lakes and ponds (3160)	• Direct loss • Drainage • Pollution (sediment and chemical / fuel)
	Northern Atlantic Wet Heaths with Erica tetralix (4010)	• Direct loss • Vegetation damage • Drainage
	European Dry Heaths [4030]	• Direct loss • Vegetation damage • Drainage • Pollution (sediment and chemical / fuel)
	Blanket Bog (Active only) (7130)	• Direct loss • Vegetation damage • Drainage • Pollution (sediment and chemical / fuel)
	Transition mires and quaking bogs [7140]	• Direct loss • Vegetation damage • Drainage • Pollution (sediment and chemical / fuel)
	Depressions on peat substrates of the Rhynchosporion (7150)	• Direct loss • Vegetation damage • Drainage • Pollution (sediment and chemical / fuel)
	Vertigo geyeri - Geyer's Whorl Snail (1013)	• Direct loss • Habitat damage • Drainage of / hydrological damage to suitable habitat • Pollution (sediment and chemical / fuel)
	Saxifraga hirculus Marsh Saxifrage [1528]	• Direct loss • Habitat damage • Drainage of / hydrological damage to suitable habitat • Pollution (sediment and chemical / fuel)

2.2 Description of Natura 2000 sites within the Zone of Influence

As illustrated in Figure 1, a significant part of the Proposed Development is located within the Ox Mountains Bogs SAC. The following sections describe the site's conservation objectives, the Qualifying Interests (QIs), the character and extent of the QI's and current threats and pressures on the site.

2.2.1 Description of Ox Mountains Bogs SAC

This site comprises several upland Blanket Bogs situated in the Slieve Gamph, or Ox Mountain range, on the border between counties Sligo and Mayo. The town of Tobercurry lies approximately 12 km to the south-east. Most of the underlying rock is composed of metamorphic schists and gneisses, but igneous intrusions are also found, as at the silica-rich granitic ridge to the east of Easky Lough.

Extensive areas of active Blanket Bog occur throughout this site. The dominant and most frequently occurring vascular plant species are Heather (*Calluna vulgaris*), Cross-leaved Heath (*Erica tetralix*), Deergrass (*Scirpus cespitosus*), Purple Moor-grass (*Molinia caerulea*), Common Cottongrass (*Eriophorum angustifolium*) and Hare's-tail Cottongrass (*E. vaginatum*). Bog mosses such as *Sphagnum papillosum* and *S. capillifolium* occur commonly through the site and contribute significantly to the vegetation.

The conservation objectives document for this site is generic and states that the objective for this site is to *"maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected"*

Qualifying Interests for the site are:

- Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae);
- Natural dystrophic lakes and ponds;
- Northern Atlantic Wet Heaths with Erica tetralix;
- European Dry Heaths;
- Blanket Bogs (* if active bog);
- Transition mires and quaking bogs;
- Depressions on peat substrates of the Rhynchosporion;
- Vertigo geyeri (Geyer's Whorl Snail);
- Saxifraga hirculus (Marsh Saxifrage)

2.2.1.1 Character of the Qualifying Interests of the Ox Mountains Bogs SAC.

Table 2 outlines the QIs of the Ox Mountains Bogs SAC and describes the extent and character of these interests in the context of their national status.

Table 2 Qualifying Interests of the Ox Mountains Bogs SAC. (Source: NPWS, 2017)

Qualifying Species of the Ox Mountains Bogs SAC	Extent (Nationally and within SAC) and Character (Nationally)
Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110]	This habitat is recorded in 172 10km squares in Ireland. The habitat covers around 2% of the SAC. **Threats** The principal threats to oligotrophic lakes include nutrient enrichment from agricultural practices, including overgrazing and excessive fertilisation, afforestation and waste water from housing developments in rural areas. Lakes may also be negatively affected by the introduction of invasive alien species, and their utilization for an increasing number of sport and leisure activities. While the range and area of this habitat are stable, significant areas are suffering from, or are at risk from nutrient enrichment. **Conservation Status** The status of this habitat is assessed as bad (NPWS 2013).
Natural dystrophic lakes and ponds [3160]	This habitat is recorded in 130 10km squares in Ireland. The habitat covers around 3% of the SAC. **Threats** The principal threats to natural dystrophic lakes and ponds are peat cutting, overgrazing and afforestation of peatland habitats. **Conservation Status** The status of this habitat is assessed as bad (NPWS 2013).
Northern Atlantic Wet Heaths with Erica tetralix [4010]	This habitat is recorded in 422 10km squares in Ireland. The habitat covers around 10.2% of the SAC. **Threats** Reclamation, afforestation and burning have resulted in extensive loss of Wet Heath. Overstocking has also degraded large areas of the habitat, especially in uplands of the wettest western regions, through overgrazing and trampling. This has depleted heather and other plant cover and allowed invasion by non-heath species, or exposure of peat to severe erosion. **Conservation Status** The status of this habitat is assessed as bad (NPWS 2013).
European Dry Heath [4030]	This habitat is recorded in 632 10km squares in Ireland. The habitat covers around 3.1% of the SAC. **Threats** The principal threats to European Dry Heaths are afforestation, agricultural improvement, overgrazing and invasive non-native species. **Conservation Status** The status of this habitat is assessed as bad (NPWS 2013).

Blanket Bog (if active only) [7130];*	This habitat is recorded in 361 10km squares in Ireland. The habitat covers around 68.5% of the SAC. **Threats** The main threats to Blanket Bog include overgrazing and trampling, drainage, afforestation, mechanical peat-extraction, burning and windfarm and other infrastructural development. **Conservation Status** The overall conservation status of this habitat is considered to be bad (NPWS, 2013).
Transition mires and quaking bogs [7140]	This habitat is recorded in 151 10km squares in Ireland. The habitat covers around 0.3% of the SAC. **Threats** The main threats to Blanket Bog include overgrazing and trampling, drainage, afforestation, mechanical peat-extraction, burning and windfarm and other infrastructural development. **Conservation Status** The overall conservation status of this habitat is considered to be bad (NPWS, 2013).
Depressions on peat substrates of the Rhynchosporion [7150]	This habitat is recorded in 364 10km squares in Ireland. The habitat covers around 0.5% of the SAC. **Threats** The main threats to Depressions on peat substrates of the Rhynchosporion include peat cutting and drainage. **Conservation Status** The overall conservation status of this habitat is considered to be favourable (NPWS, 2013).
Vertigo geyeri - Geyer's Whorl Snail [1013]	This species is recorded in 24 10km squares in Ireland. The species occurs in one site within 1km square within this SAC. **Threats** The sites where species exist are very small and fragile and so can be easily damaged. **Conservation Status** The overall conservation status of this species is considered to be inadequate (NPWS, 2013).
Marsh Saxifrage Saxifraga hirculus [1528]	This species is recorded in 6 10km squares in Ireland. Three populations of this species were recorded in this SAC. **Threats** There is no evidence of any major pressures impacting this species and therefore the Overall Status is assessed as Favourable. **Conservation Status** The overall conservation status of this species is considered to be favourable (NPWS, 2013).

2.2.2 Threats and Pressures on the Ox Mountains Bogs SAC

Table 3 lists the threats, pressures and activities impacting the Ox Mountains Bogs SAC as identified within the Natura 2000 Standard Data Form[5].

Table 3 Threats, pressures and activities impacting the Ox Mountains Bogs SAC. (Source: NPWS, 2017)

Code	Threats & Pressures	Rank	Inside/Outside
Negative			
A04	Grazing	M	i
L09	Fire (natural)	H	i
D01.02	Roads. Motorways	L	b
B01	Forest planning on open ground	H	i
C01.03.02	Mechanical removal of peat	H	i
D05	Improved access to site	M	i
C01.03.01	Hand cutting of peat	M	i
C03.03	Wind energy production	H	i
Positive			
X	No threats or pressures	L	i

Rank: H = high, M = medium, L = low; i= inside, o = outside, b = both

2.3 Description of the Ox Mountains Bogs SAC along the proposed route including Qualifying Interests

The proposed route follows a line of approximately 2.6km, including 2km within the Ox Mountains Bogs SAC. In order to inform the NIS, the proposed route, as well as a minimum distance of 30m either side, was surveyed in order to ascertain the Annex I habitats found in the vicinity as well as the potential for QI Annex II species. The results are set out below.

2.3.1 Relevant desk study / consultation data

2.3.1.1 National Survey of Upland Habitats

The Ox Mountains Bogs were included within Phase 3 of the National Survey of Upland Habitats, commissioned by the National Parks and Wildlife Service in 2012-2013 (Perrin *et al*., 2013). The primary aim of this survey was to record habitats corresponding to Annex I habitat categories (European Commission, 2007).

The standard habitat classification system provided by Fossitt (Fossitt, 2000) does not provide a framework for classification of local variations within individual upland habitats. In order that the National Survey of Upland Habitats could provide the level of survey information required to inform more effective conservation management strategies, a provisional classification of upland vegetation types was devised in order to record more detailed plant community information (Perrin et al, 2014). This system was produced with

[5] Natura 2000 Standard Data Form for Ox Mountains SAC – Available at: https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF002006.pdf

reference to a number of sources including the British National Vegetation Classification (Rodwell 1991a, 1992), and is tailored to specifically describe Irish upland plant communities.

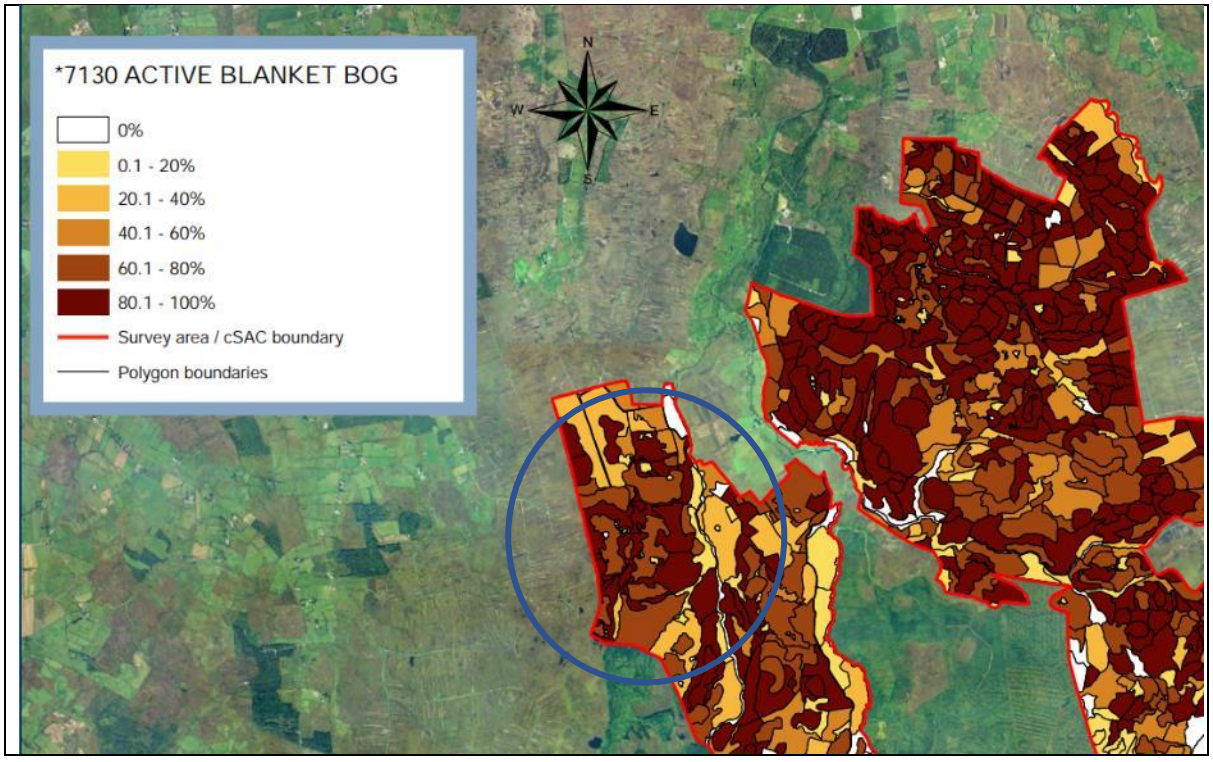
A survey of the propose electrical connection route and environs (the aspect of the proposal that falls partly within the Ox Mountains Bogs SAC) was undertaken. The following upland plant communities were recorded by the National Survey of Upland Habitats in the vicinity of the survey area:

- **BB3 - *Eriophorum vaginatum – Sphagnum papillosum* bog**
- **BB5a - *Calluna vulgaris - Eriophorum* spp. bog - typical sub-community**
- **HW1 - *Sphagnum denticulatum/cuspidatum* hollow**
- **WH3 - *Calluna vulgaris - Molinia caerulea - Sphagnum capillifolium* wet / damp heath**

Much of the current survey area was identified by the National Survey of Upland Habitats undertaken in 2012 as being Active Blanket Bog, an EU Annex I Priority Habitat. This is illustrated in Figure 4.

The site synopsis for Ox Mountains Bogs SAC states that extensive areas of active Blanket Bog occur throughout the site and the large number of dystrophic bog pool systems is considered to be an important feature of the site (NPWS, 2016). Wet Heath is described as being extensively-developed at the site, particularly on the lower slopes of the north-facing side of the Ox Mountains (which encompass the current survey area) and along the numerous stream valleys that descend from the plateau.

Figure 4 - Proportions of active Blanket Bog in the survey area (blue circle), recorded during the National Survey of Upland Habitats (reproduced from Perrin et al., 2013).



2.3.1.2 Surveys for Geyer's whorl snail (Vertigo geyeri)

The Ox Mountains Bogs SAC area was included in surveys in 2008-2010 for Vertigo snails, including Geyer's whorl snail. Results were written up by Moorkens and Killen (2011) and state with respect to general habitat suitability for the species:

> "In general, the micro-habitat of *Vertigo geyeri* at its sites is very uniform, reflecting the very narrow niche of habitat that can sustain it. The wider sites within which the snail habitat is found are much more varied, and can be divided into spring seepages a) at the edge of lowland fens; b) at spring lines in upland mountain ranges; c) in stable seepages associated with lakes; and, d) in stable coastal fen systems".

In addition, the report states that "*The exception to the use of standard transect methodology was at sites where the gross distribution of the species was virtually unknown (e.g. V. moulinsiana at Portumna), or sites where the habitat was very small in area (e.g. V. geyeri at Easky Valley or Ox Mountains)".*

2.4 Surveys undertaken to advise the NIS

2.4.1 Methodology

2.4.1.1 Habitat surveys

A detailed habitat survey of the area surrounding the proposed development, within and adjacent to the SAC, was undertaken on 17th and 19th April 2018. Initially, the entire proposed development route was walked, including a buffer of at least 30m either side of the route, in order to assess the quality of the vegetation along its length as well as its suitability to support Qualifying Interest species, including marsh saxifrage *Saxifraga hirculus*. Where the route was found to pass through wet, obviously active Blanket Bog, a wider area was investigated in order to provide information to enable alternative routes to be proposed, passing through less ecologically-sensitive areas. Mapping was undertaken with the assistance of orthophotographs and a hand-held GPS device, enabling areas of differing vegetation to be identified and delineated on field maps.

The habitats surrounding the proposed route were initially classified according to basic Fossitt habitat categories (Fossitt, 2000). In order to provide more information on vegetation communities within these basic habitats, twelve 2m x 2m quadrats were analysed, placed within areas of differing vegetation type in the vicinity of the proposed route. The vegetation in each quadrat was analysed according to standard methodology, first listing all plant species present within the quadrat, including bryophytes, and then assessing the percentage cover of each species, bearing in mind the possibility of species overlapping. This data was then used to assign a vegetation type to the quadrat according the National Classification System of classifying plant communities (Rodwell (ed.), 1991). This was later cross-referenced to the Provisional Classification of Upland Vegetation Types devised by Perrin et al (2014), as described above.

2.4.1.2 Marsh saxifrage surveys

A survey of the area surrounding the proposed development within the SAC was undertaken on 27 September 2018. This involved a survey of known areas as well as potentially suitable areas for the Qualifying Interest species, noting any occurrence of the species as well as positive indicator species for potentially suitable habitat.

2.4.1.3 Geyer's whorl snail surveys

A Geyer's whorl snail survey of the area surrounding the proposed development within the SAC was undertaken on 23 October (with subsequent laboratory work). The aim of the survey was to investigate if suitable habitat for *Vertigo geyeri* exists along the proposed electrical connection route (surveys in the vicinity of the Black lough and Cloonkeelaun Wind Farms have been undertaken in previous years), and if so, to establish the presence of *Vertigo geyeri* within these areas.

2.4.2 Habitats recorded within the survey area (electrical connection route)

The habitats recorded within the vicinity of the proposed route during surveys undertaken on 17th and 19th April 2018 are described in the following sections and illustrated on the maps in Figures 6 - 10.

2.4.2.1 North eastern section – east of the river

At its north eastern end, the proposed route falls partly outside the SAC and initially passes through improved grassland and extremely degraded former Blanket Bog vegetation that is heavily grazed by sheep. The route at this point passes along an existing farm track. Southwards, this vegetation grades into Blanket Bog that is relatively dry underfoot and appears to have been somewhat modified by a combination of turf cutting, grazing and drainage. Nevertheless, it appears reasonably intact, the vegetation dominated by hare's-tail cottongrass (*Eriophorum vaginatum*), purple moor-grass (*Molinia caerulea*) and heather (*Calluna vulgaris*) with some cross-leaved heath (*Erica tetralix*) and variable quantities of *Sphagnum* spp. mosses.

Southwards, the modified Blanket Bog vegetation appears to further improve in quality, supporting locally abundant *Cladonia* lichen and occasional woolly fringe-moss (*Racomitrium lanuginosum*), perhaps due to reduced grazing intensity further from the improved areas to the north.

The Blanket Bog in this area corresponds to the Fossitt habitat category **PB2 Upland Blanket Bog**. Quadrats 5 and 6 were located within this area and analysis of their vegetation indicated that the vegetation is derived from the NVC community **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire,** that has undergone varying degrees of modification.

2.4.2.2 South western section – west of the river

The vegetation in this general area was found to correspond to two main habitat types, according to the standard Fossitt habitat classification system described in *A Guide to Habitats in Ireland* (Fossitt, 2000): **PB2 Upland Blanket Bog** and **HH3 Wet Heath.** Additionally, a number of bog pool formations were identified within Blanket Bog habitat to the west and south of the proposed route, corresponding to the Fossitt habitat category **FL1 Dystrophic lakes**.

At this location, the river occupies a shallow, broad valley. The lower slopes of the river valley tend to be dominated by a relatively dry, dense vegetation type resembling **Wet Heath (HH3)**, which is dominated by purple moor-grass (*Molinia caerulea*) and heather (*Calluna vulgaris*), underlain by some red bog-moss (*Sphagnum capillifolium*). Hare's-tail cottongrass (*Eriophorum vaginatum*) is also present in these areas, but tends not to dominate the vegetation. Bog myrtle (*Myrica gale*) is also abundant in some areas. The ground in these areas tend to be fairly firm and peat depths are likely to be relatively shallow.

These areas have been classified as habitat transitional between Wet Heath HH3 and Blanket Bog PB2. These two habitat types may appear similar in terms of species composition, but Wet Heath occurs on peat which is less than 0.5 in depth and for this reason the ground in Wet Heath areas tends to firmer, drier and less spongy than in Blanket Bog. The local abundance of purple moor-grass (*Molinia caerulea*) and bog myrtle (*Molinia caerulea*) tend to suggest Wet Heath; whereas those areas that have a greater abundance of hare's-tail cottongrass (*Eriophorum vaginatum*) and *Sphagnum* spp. are more reminiscent of Blanket Bog. Local variations in species composition are likely to reflect variations in peat depth, slope and hydrology. One area of Wet Heath vegetation situated on a low ridge at the southern end of the survey area is particularly dry in character and exhibits some characteristics of Dry Heath (Fossitt category HH1). This is the only location in which bell heather (*Erica cinerea*) was recorded during survey of this site (see Quadrat 10).

Quadrats 2, 4, 8, 10 and 12 were located within areas mapped as transitional Wet Heath/Blanket Bog habitat. The vegetation was compared to the mire and heath communities described in the National Vegetation Classification text *British Plant Communities. Volume 2. Mires and heath* (Rodwell *et al,* 1991), and was found to correspond variously to the following NVC communities:

- M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire
- M15 *Scirpus cespitosus-Erica tetralix* Wet Heath

Above the valley slopes, the ground becomes more level and the transitional Wet Heath/ Blanket Bog vegetation characteristic of the valley side becomes a more pronounced Blanket Bog; the bog surface becomes wetter and more spongy, and the vegetation supports increased quantities of cottongrasses (*Eriophorum* spp.) and a greater quantity and diversity of bog-mosses (*Sphagnum* spp.). Quadrats 1, 3, 7, 9 and 11 were placed within areas mapped as PB2 Blanket Bog vegetation and were found to correspond to the NVC community M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire. The more extensive areas of Blanket Bog located above about 120-130 m support well-defined, complex bog pool systems containing abundant feathery bog-moss (*Sphagnum cuspidatum*), which correspond to the Fossitt category FL1 dystrophic lakes (Fossitt, 2000) and the NVC community M2 *Sphagnum cuspidatum/recurvum* bog pool.

These Blanket Bog areas appear structurally and hydrologically intact and exhibit a good diversity of characteristic peat-forming species, and are considered to constitute active Blanket Bog. This means that this area is likely to gradually accumulate organic matter as peat, over time, given the species composition and physical conditions that are present.

2.4.3 Correspondence of habitats in this area to EU Annex I habitats

The correspondence of these communities at this site with Fossitt, Provisional Classification of Upland Vegetation Types and EU Annex I habitats are indicated in Table 4.

Table 4 – Correspondence within the survey area between Fossitt habitats and NVC communities encountered, the Irish Provisional Classification of Upland Habitats (Perrin *et al*, 2014), and EU Annex I habitat types.

Fossitt habitat type	NVC vegetation community	Irish Provisional Classification	EU Annex I habitat
PB2 Upland Blanket Bog	M17 *Scirpus cespitosus* – *Eriophorum vaginatum* blanket mire	BB3 – *Eriophorum vaginatum – Sphagnum papillosum* bog BB5a - *Calluna vulgaris - Eriophorum* spp. bog - typical sub-community.	7130 Blanket Bogs (EU Priority Habitat when active bog)
HH3 Wet Heath	M15 Scirpus cespitosus-Erica tetralix Wet Heath	WH3 - *Calluna vulgaris - Molinia caerulea - Sphagnum capillifolium* wet / damp heath.	4010 Northern Atlantic Wet Heaths with *Erica tetralix*
FL1 Dystrophic lakes	M2 *Sphagnum cuspidatum/recurvum* bog pool	HW1 *Sphagnum denticulatum/cuspidatum* hollow.	3160 Natural dystrophic lakes and ponds

With the exception of some relatively small areas of improved grassland and acid grassland, the vast majority of the site is considered to correspond to the EU Annex I habitats 4010 Northern Atlantic Wet Heaths with *Erica tetralix* and 7130 Blanket Bogs. Moreover, much of the Blanket Bog is considered to comprise active Blanket Bog, indicated by its intact hydrology and structure, and its abundance of peat-forming species such as cottongrasses (*Eriophorum* sp.) and bog-mosses (*Sphagnum* spp.). Active Blanket Bog is classified as an EU Annex I Priority Habitat. In addition, the bog pool systems at the site correspond to the EU Annex I habitat 3160 Natural dystrophic lakes and ponds.

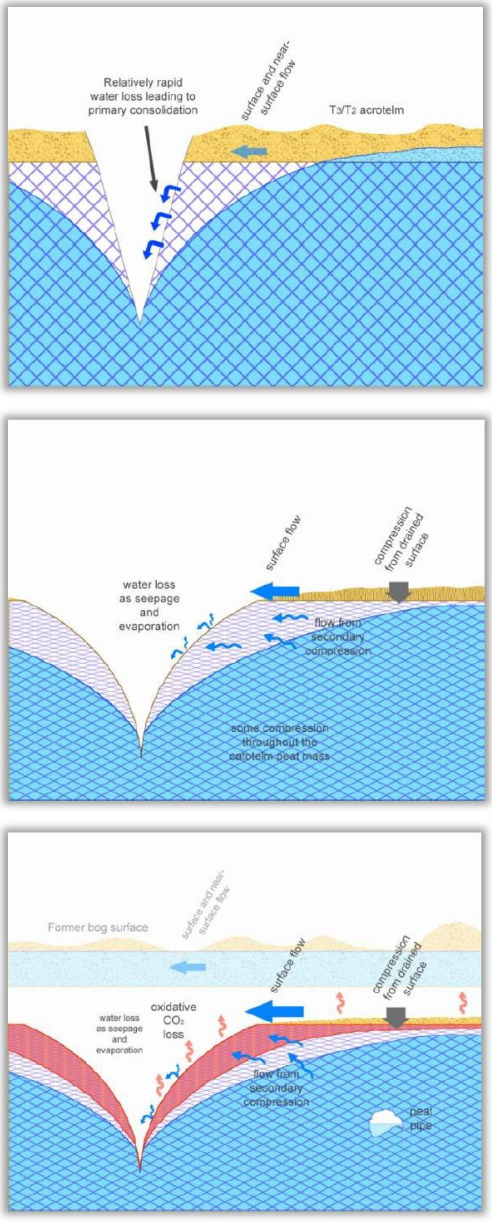
2.4.4 Current site management

The site within the Ox Mountains Bogs SAC is currently grazed by sheep. The area was enclosed by a fence-line in 2014 and a Natura Impact Statement (NIS) was required at the time. The NIS required for a specific grazing regime to be complied with, following enclosure of the area by a fence, appropriate to the continued positive management of the SAC.

The central part of the site within the SAC holds two significant drains. These drains are likely to have been cut prior to the designation of the site, with spoil in some areas that was clearly derived from the drain excavation now being well vegetated. These drains are likely to be having a long-term deleterious effect on the surrounding Blanket Bog. The diagram shown in Figure 5 and accompanying text demonstrates that such drainage, while not always having an immediate effect, will result in degradation of the habitat in the longer term

as a result of primary consolidation (secondary compression and oxidative wastage are also relevant but not shown in the diagram) (IUCN 2014[6]).

Figure 5 – The impact of drainage on long term Blanket Bog degradation – from drainage to primary consolidation (source IUCN 2014[7])



Drying of the acrotelm results in progressive loss of peat-forming conditions and peat-forming species, which means that the acrotelm is no longer capable of providing fresh peat material to the catotelm. Indeed many plant species which typically colonise a dry acrotelm surface **have root systems which further dry out both the acrotelm and the upper layers of the catotelm**, thus enhancing the impact of the drains.

The lower catotelm layer responds to drainage in a completely different way - apparently resisting all attempts to achieve significant water-table draw-down. **Water movement in the catotelm is extremely slow**, up to 1 million times slower than the speed of a snail. It has been estimated that it would probably take **around 90 years for a single raindrop to filter downwards through the 10 m thickness of a raised bog system**. A drain therefore has relatively little *immediate* effect on the water held in the main body of catotelm peat, but *in the immediate vicinity of the drain*, water held in the larger spaces between peat fragments seeps fairly readily into the drain through gravity drainage (visible on the drain walls of the photograph at the start of this Briefing). This water loss results in a draw-down of the water table adjacent to the drain. **This draw-down is often the only *measured* effect of drainage.**

Prior to drainage, water typically occupied as much as 50% of the catotelm peat volume and loss of this water therefore **results in collapse and shrinkage of the peat adjacent to the drain. This process is called *primary consolidation***. Its effects are felt immediately but may continue for some years. The key impact of this primary consolidation is that the drain, in effect, becomes wider because the ground immediately adjacent to the drain subsides.

[6] IUCN UK Committee Peatland Programme *Briefing Note No3* - Impacts of Artificial Drainage on Peatlands 2014. Available at http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/3%20Drainage%20final%20-%205th%20November%202014.pdf

[7] IUCN UK Committee Peatland Programme *Briefing Note No3* - Impacts of Artificial Drainage on Peatlands 2014. Available at http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/3%20Drainage%20final%20-%205th%20November%202014.pdf

Plate 1 – Old drain (note vegetated spoil) within Blanket Bog / Wet Heath transition habitat running south from proposed route

Plate 2 – Old drain within Blanket Bog / Wet Heath transition habitat running north from proposed route

Figure 6 – Habitat types recorded in the vicinity of the proposed route

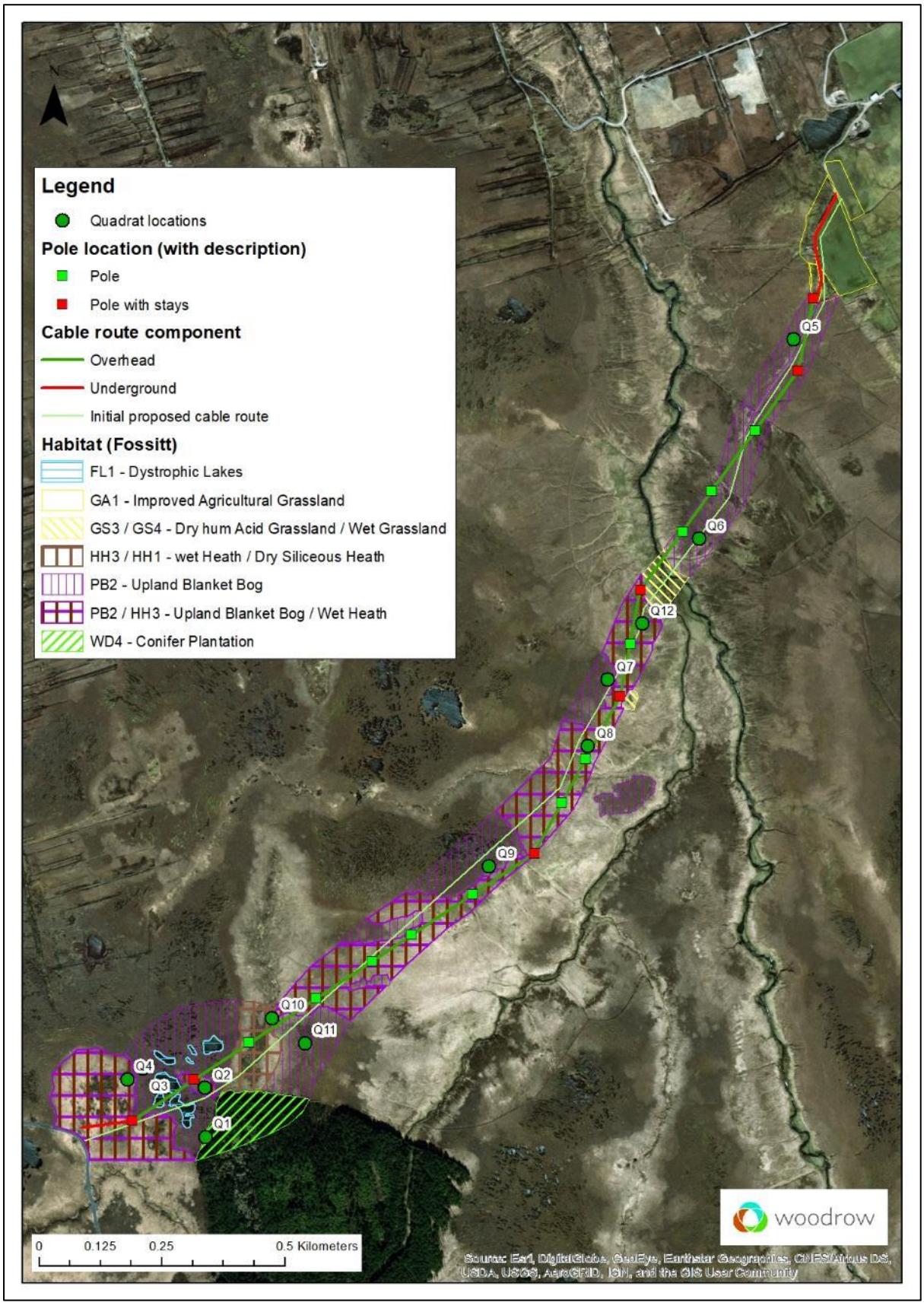


Figure 7 – Habitat types recorded in the northeast section of the proposed route

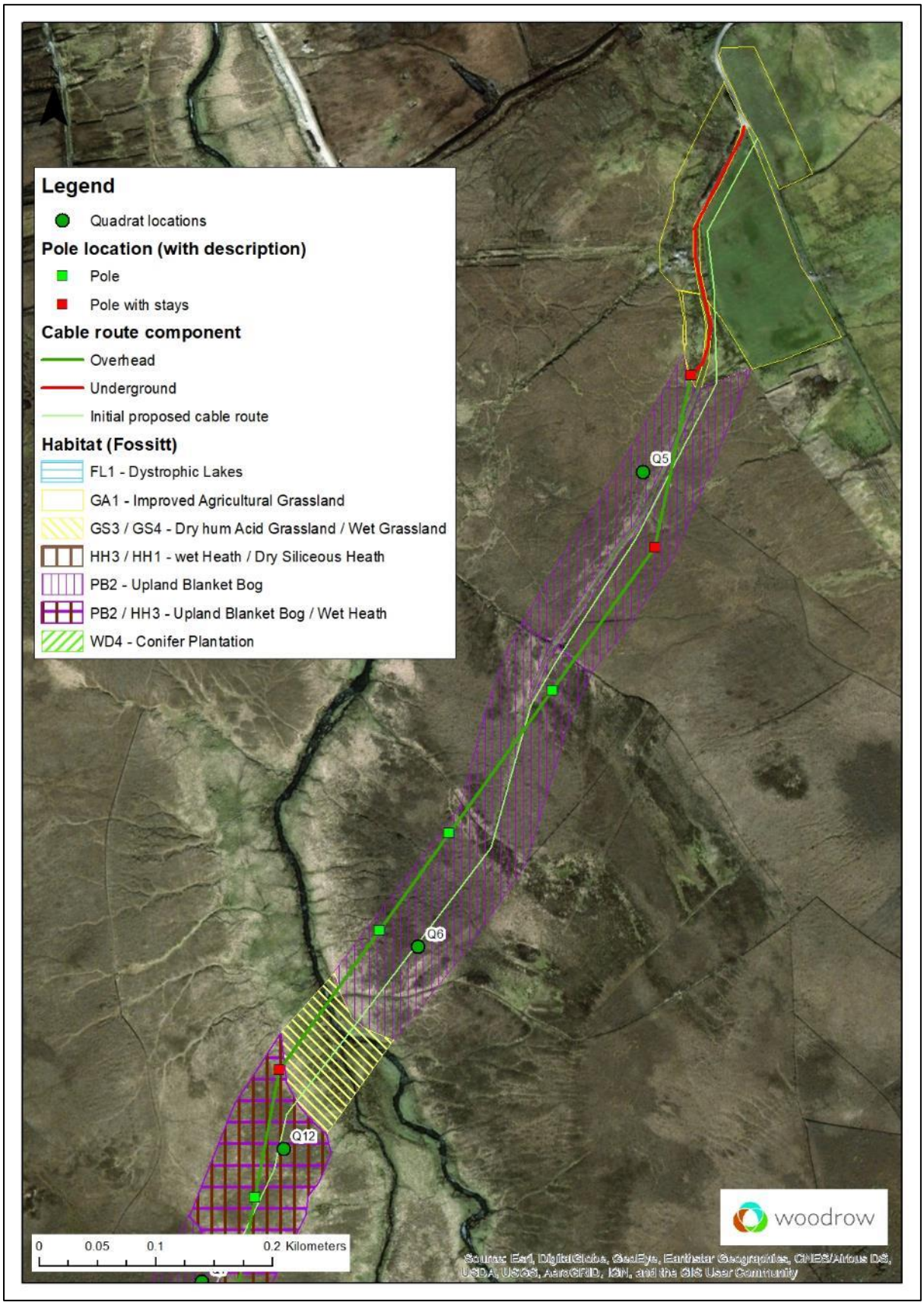


Figure 8 – Habitat types recorded in the central section of the proposed route

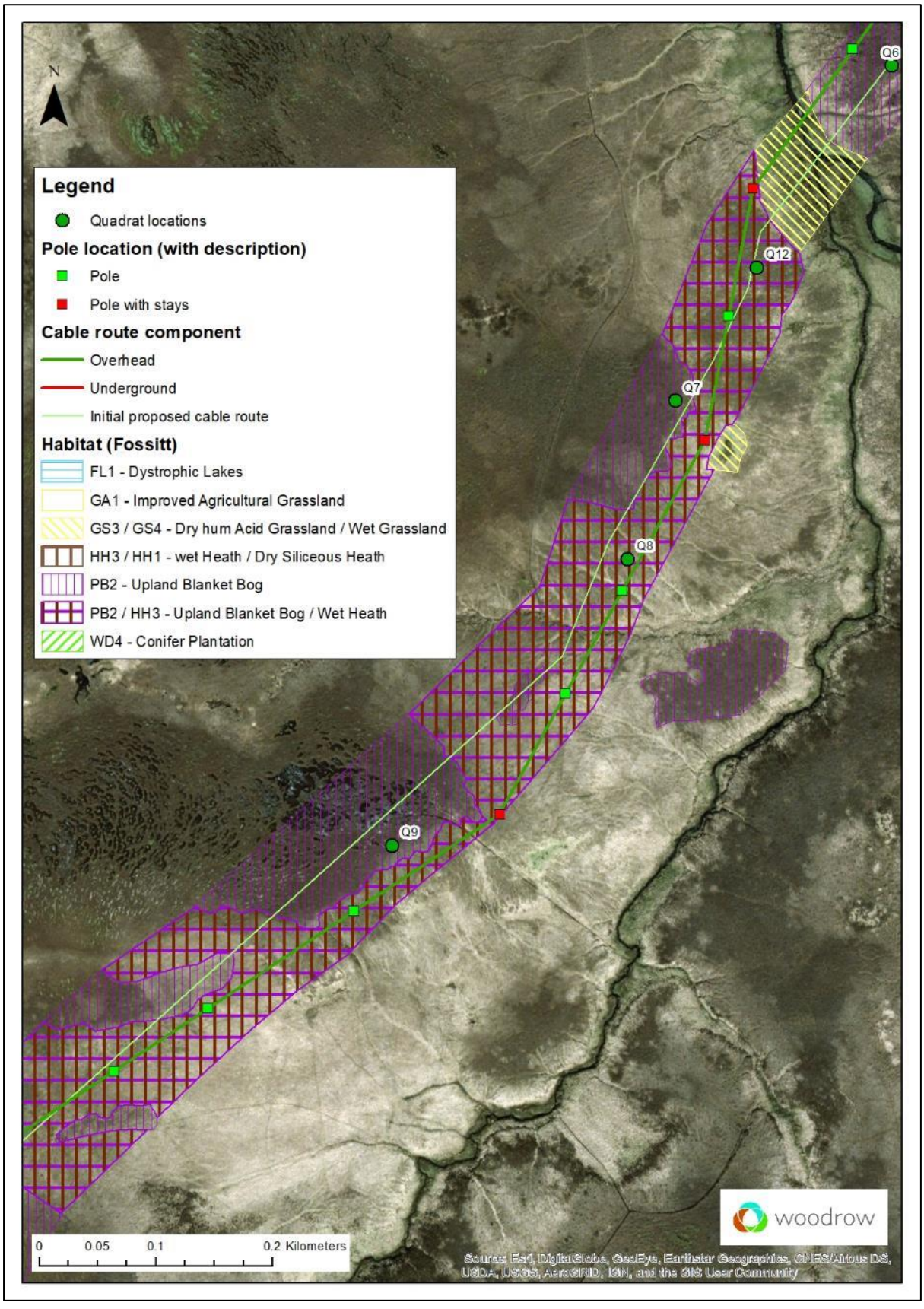
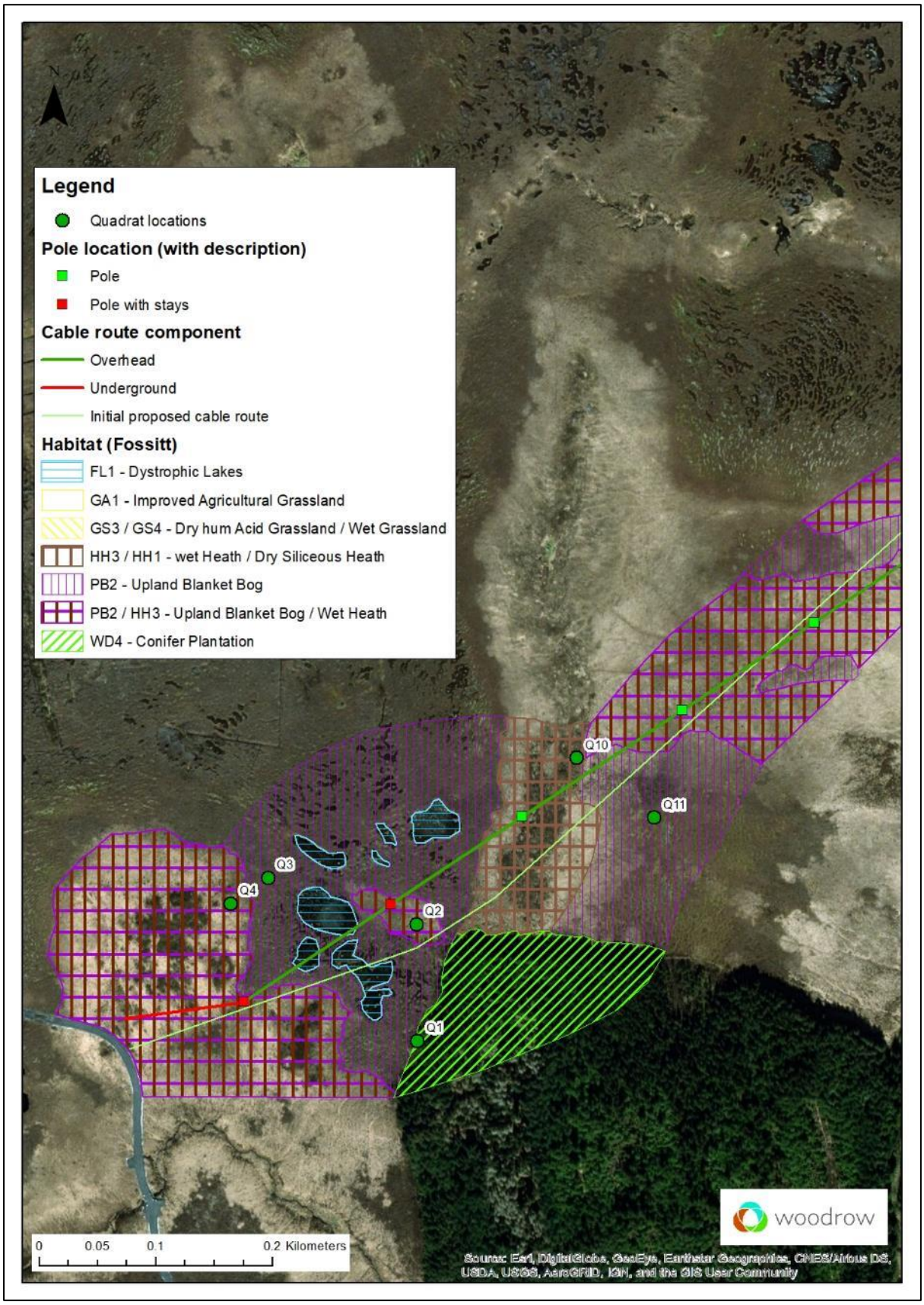


Figure 9 – Habitat types recorded in the southwest section of the proposed route



2.5 Qualifying Interests falling within the survey area or potential influence of the proposal

Section 2.4.2 has detailed the habitats falling within the survey area. It is clear that the following Annex I habitats fall within the Zone of Influence of the proposal:

- 7130 Blanket Bogs (EU Priority Habitat when active bog)
- 4010 Northern Atlantic Wet Heaths with Erica tetralix
- 3160 Natural dystrophic lakes and ponds

It is also considered that *Depressions on peat substrates of the Rhynchosporion [7150],* which occurs as pockets within 7130 Blanket Bogs Habitat (although not noted during the surveys), is likely to occur to a degree within the Zone of Influence.

In addition to the Qualifying Interests listed above identified through field survey and likely association with other habitats, data from the NPWS survey (Perrin *et al*. 2013) can also provide important information in identifying potential Qualifying Interests within the potential Zone of Influence. The mapped data associated with these surveys is provided in Figure 11. This information shows that Annex I Habitat *7230 Alkaline Fens*, occurs some 75m east of the proposed route towards the northern end. Although not a Qualifying Interest in its own right, it is considered that this is the closest potentially suitable habitat for the Annex II species *Vertigo geyeri - Geyer's Whorl Snail 1013* which is a Qualifying Interest for the site. Although somewhat distant from the proposal, these areas have the potential to be affected by overland flow of pollutants or by uncontrolled access.

It is considered that these areas of Alkaline Fen also have the potential to support Annex II species *Saxifraga hirculus - Marsh Saxifrage 1528* which is also a Qualifying Interest for the site (though noting that the site synopsis states that the species is found within the SAC in the townland of Letterunshin, which is to the east of the Easky River).

It is therefore concluded that the following Qualifying Interests are considered to be within the potential Zone of Influence of the proposal:

- 7130 Blanket Bogs (EU Priority Habitat when active bog)
- 4010 Northern Atlantic Wet Heaths with Erica tetralix
- 3160 Natural dystrophic lakes and ponds
- 1013 *Vertigo geyeri* - Geyer's Whorl Snail
- 1528 *Saxifraga hirculus* - Marsh Saxifrage

These Qualifying Interests are further assessed within this Natura Impact Statement.

Figure 10 – Annex 1 Habitats within the survey area.

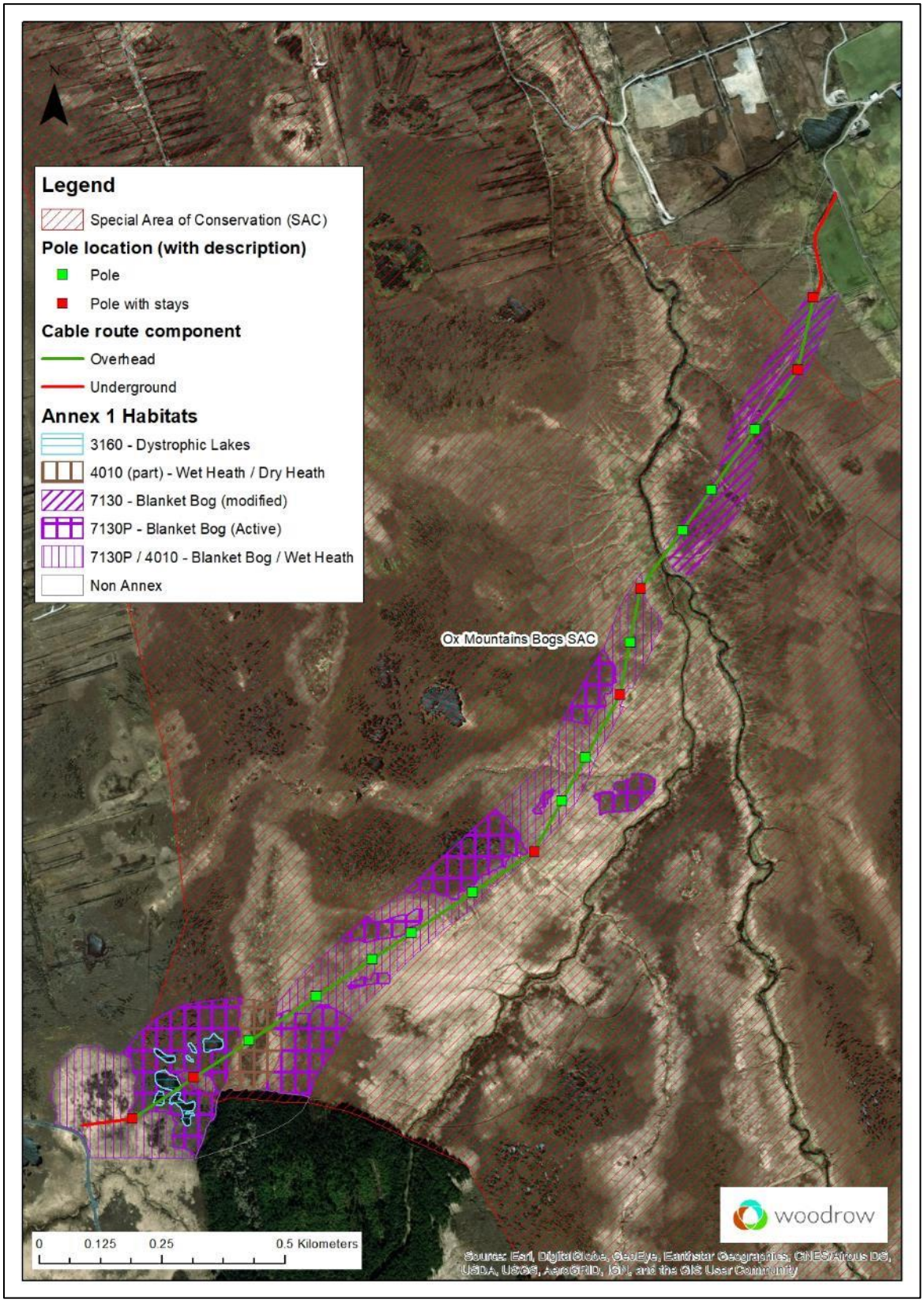
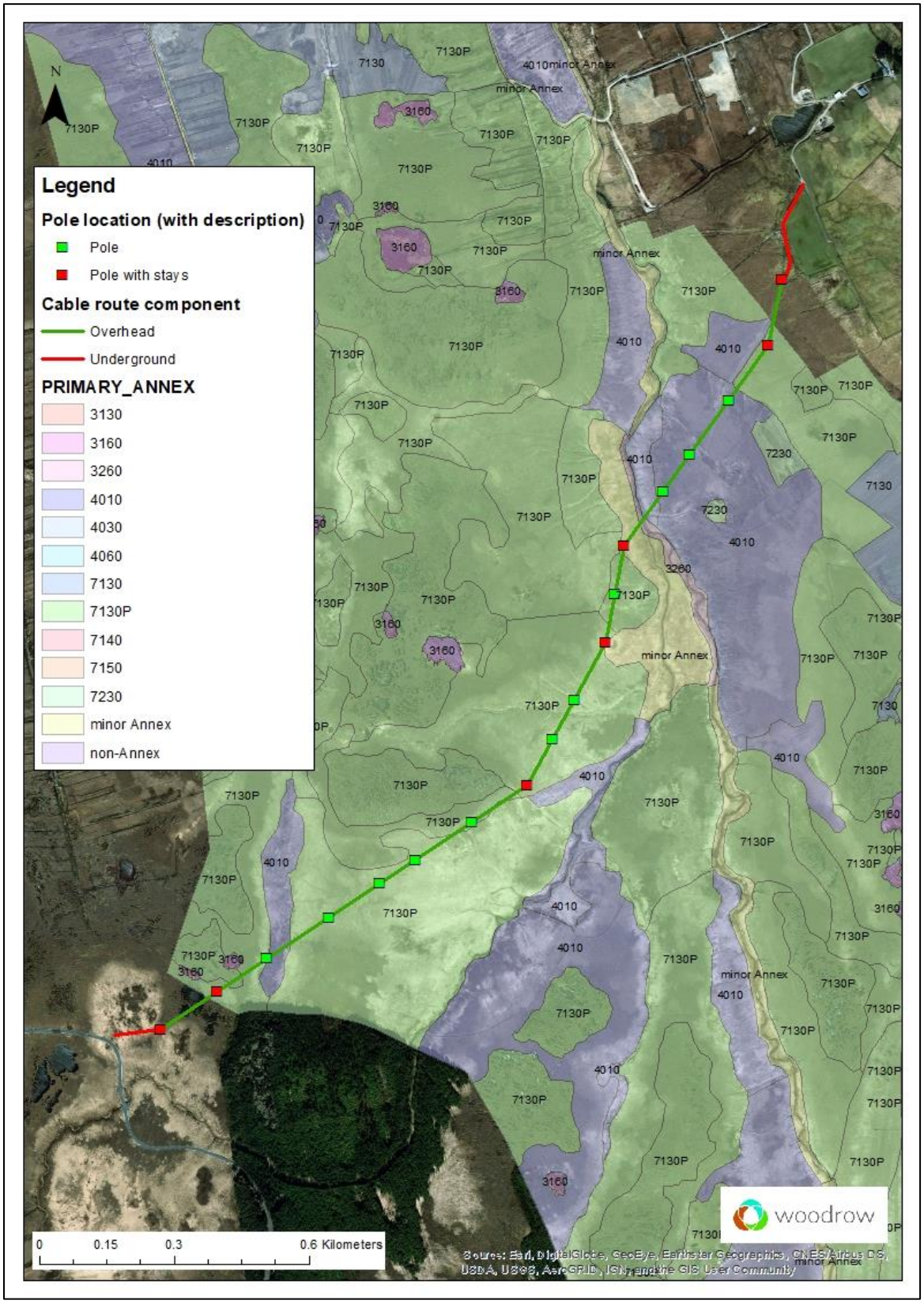


Figure 11 – Wider Area Annex 1 Habitats (source – NPWS 2016).



3 Impact Assessment

The proposal falls substantially within the Ox Mountains Bogs SAC and has therefore been concluded to have likely significant effects on Qualifying Interests (QIs) of the Natura 2000 site and a Natura Impact Statement is therefore required. There are not considered to be any other Natura 2000 sites that the proposal has the potential to significantly affect.

Article 6(3) of the EU Habitats Directive requires that any plan or project that is likely to have a significant effect on a European Site must undergo an Appropriate Assessment of *"its implications for the site in view of the site's conservation objectives"*. Such a project can only be consented if the Appropriate Assessment can demonstrate that the proposal *"will not adversely affect the integrity of the site concerned"*. EU guidance on Article 6[8] states, with respect to 'integrity' *"The 'integrity of the site' has been usefully defined as 'the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified'"*.

The assessment of the potential impact on the integrity of the Ox Mountains Bogs SAC, with respect to structure and function of Qualifying Interests is given in this section.

3.1 Potential impacts on the Ox Mountains Bogs SAC features

Due to the nature of the proposal, some level of impact associated with the development cannot be avoided. This section details the main potential impacts in the context of potential for adverse impact on the integrity of the site. This assessment takes account of EU Guidance such as 'Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE'. This includes the following text:

> *The 'integrity of the site' has been usefully defined as 'the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified'.*
>
> *A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required.*
>
> *When looking at the 'integrity of the site', it is therefore important to take into account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long-term.*
>
> *The integrity of the site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives.*

The potential impacts of the proposal on the SAC are likely to arise from:

- Damage to vegetation during construction by access to the site, delivery of materials and construction / excavation / stringing of cables;

[8] EC (2000) MANAGING NATURA 2000 SITES The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Available at http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

- Ongoing drainage of the site through the unintentional creation of preferential underground drains (underground cable approach only).

The habitat maps shown in Figures 6 to 10 demonstrate that variability of habitats at the site, even though they generally fall into the few Annex I habitats described in Table 2. These habitats vary in their sensitivity to impact sources such as access. For example, the areas shown as M17 Blanket Bog with Pool System are highly sensitive and could not be reasonably accessed without significant impact. Some of the areas mapped as M15 Wet Heath / M17 Blanket Bog transition however are largely dominated by purple moor-grass and are significantly drier and more resilient to impact on the surface vegetation.

The two options initially considered for the electrical connection that runs through the Ox Mountains Bogs SAC were underground cables and overhead powerline on poles. The potential ecological issues for each are listed below.

3.1.1 Underground cables

Approach

The entire length of the cable would be underground along the route with the exception of the watercourse crossing. This would involve the use of a purpose made excavator bucket. Turves and peat would be excavated, kept whole and replaced following placement of the cables. The approach would require access and excavation along the full route of the cable as well as access for re-fuelling.

Potential issues

- Excavation required along full length of cable route
    - Potential for vegetation disturbance
    - Difficult to avoid all wet Blanket Bog areas
- Potential for underground (within excavation) drainage to be caused without mitigation.

3.1.2 Overhead powerline

Approach

Single wooden poles would be required every 150m or so along the route. Where there is a required change in direction or where ground conditions demand, stabilising guide wires (stays) will be installed either side of the pole. Poles and construction materials can be delivered to each pole location by helicopter. Cables will be strung between the poles. The approach would not require excavation along the full route but would require access for stringing of cables.

Potential issues

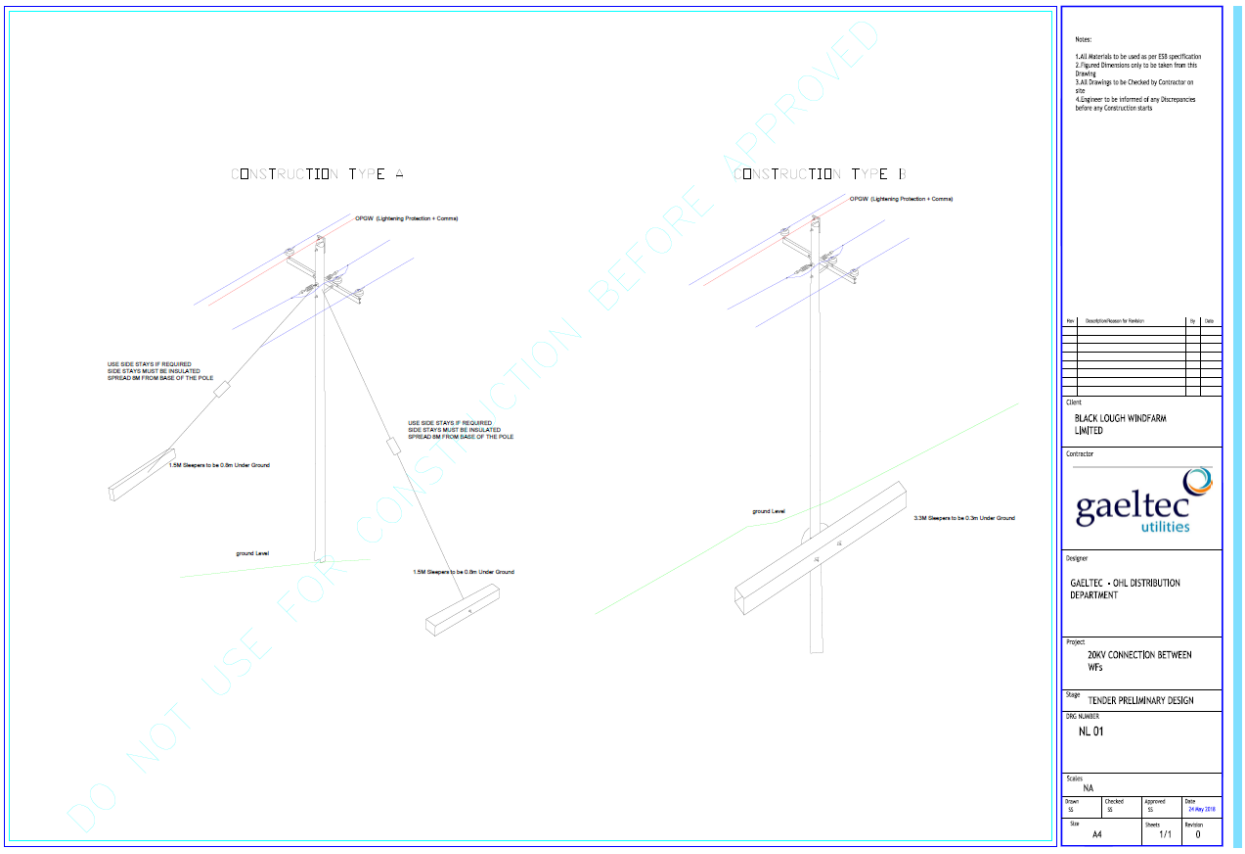
- Materials at each pole location (16 locations within the SAC) are heavy and would need to be delivered by helicopter or similar.
- Poles would need to be set into the peat, either within a base or by another support approach. If driven into the peat, the equipment to do so would need to get access to all locations.

Following detailed consideration of the above two options, it was determined that the overhead powerline approach was the favoured option, for the majority of the route, as a result of concerns that the buried cable approach:

- involved a significant amount of unavoidable excavation of peat;
- required excavation along the full corridor of the proposed route within the SAC; and,
- had the potential, without significant mitigation, to create preferential drains under the peat that may result in long term drainage issues.

For these reasons, the overhead cable option is assessed within this chapter as the proposal as the approach within the SAC, with underground cabling being undertaken outside the SAC where the route comes near turbines and is required to be underground for safety reasons. The proposed 'pole and cable' arrangement is shown in Figure 12.

Figure 12 – Proposed pole and cable arrangement, including anchors (Source: Gaeltec Utilities 2018).



Detailed description of works and approach.

The proposal being assessed within this NIS with respect to the electrical connection (the primary potential impact on the Ox Mountains Bogs SAC), therefore, is as follows:

1. Approximately 2.3km of overhead line and 340m of underground cabling. Around 240m of the underground cabling will extend from turbine T2 at Black Lough to the first wooden pole at the north-eastern end of the route. The remaining 100m of underground section will extend from the last pole at Cloonkeelaun to the control building. These underground sections are needed to provide sufficient setback of the overhead line from the turbines in accordance with ESB specifications.
2. The underground section in Black Lough will follow the alignment of an existing farm track that passes turbine T2 and extends in a south-westerly direction. The underground section at Cloonkeelaun will go across Blanket Bog.
3. The underground sections will use either direct burial of cables or using ducting (150mm diameter PVC ducts); the ducts are installed first, and the cables are pulled through at a later stage, which is the likely method to be used. The typical trench will be approximately 1.2m deep and 0.4m wide, with earthing conductors and 150mm diameter and 50mm diameter ducting for electrical cables, communications and low voltage cables.
4. Approximately 18 No. single wooden poles with stays at the 2 No. end poles and 5 No. angle poles.
5. Of the total grid route length, approximately 2km of the overhead line will pass through the Ox Mountains Bogs SAC. This compares to approximately 1.4km of cabling that would follow roads through the SAC in the permitted route.
6. The cabling will connect to the consented control building at Cloonkeelaun.

Potential impacts on the Ox Mountains Bogs SAC habitats, Blanket Bog (Active) (7130), Depressions on peat substrates of the *Rhynchosporion* (7150), Northern atlantic Wet Heaths with *Erica tetralix* (4010), Natural dystrophic lakes and ponds (3160), 1013 *Vertigo geyeri* - Geyer's whorl snail, and 1528 *Saxifraga hirculus* – marsh saxifrage, for which the site has been designated, have the potential to occur as a result of access to the route, installation of the wooden poles, stringing of cable and demobilising of equipment and machinery. Although largely during the construction stage, potential impacts also have the potential to occur during the operational decommissioning phases of the proposal. Potential impacts are considered under each qualifying interest (QI) in sections below.

3.2 Potential Impacts on Blanket Bog (* if Active) (7130)

Blanket Bog occurs on flat or sloping land with poor surface drainage, in cool, wet, oceanic climates. It occurs on lowlands and uplands on Ireland's Atlantic coast but elsewhere in the country, it is restricted to uplands. Active (i.e. growing) Blanket Bog occurs throughout the entire Blanket Bog range. Active Blanket Bog constitutes 59% of the Ox Mountains Bogs SAC and is therefore an important ecological feature at this site. The habitat occurs within the area of proposed works as well as throughout adjacent areas.

Blanket Bog (* if active bog) (7130) habitat occurs within the route as (Active) Blanket Bog Priority Habitat[9], as well as Blanket Bog (where modified) and occurs in mosaic with Wet Heath habitat. The extent of the proposed route falling into each habitat category and Annex habitat, as well as the number of proposed pole structures within each, are shown in Figure 10. For Blanket Bog habitat within the SAC this comprises at least 5 poles with stays and up to 11 poles with no stays.

Blanket Bogs depend to a large degree on maintenance of surface water flow patterns at a landscape scale and hence are dependent on sensitive land management practices (NPWS 2007). The main threats to this habitat type as a result of the proposed works are direct loss of habitat, compaction / damage by machinery during access and changes in drainage resulting from excavation.

3.2.1 Potential construction phase impacts

Direct loss

As mentioned, there are 16 poles to be placed within Blanket Bog including Active Blanket Bog within the Ox Mountains Bogs SAC, and of these, at least 5 will require 2 side stays. The habitat loss associated with the pole stays is considered negligible, with only metal attachment points at the surface vegetation.

Poles are no larger than approximately 300mm diameter, and each pole therefore would result in a loss of 0.09m^2. Total habitat loss associated with this habitat is therefore considered to be no more than 1.44m^2.

For each pole, an excavation of 2-2.5m x 2-2.5m will be required in order to allow for the use of 1.5m long sleepers and bog boards to create a raft, with excavations being undertaken down to a depth of 3m. In addition, 1.5-2m x 1.5-2m excavations will be required at each stay location.

In the case of Blanket Bog (including in mosaic with Wet Heath), this would result in excavation of an area of up to 140m^2. This area would then undergo restoration, with the exception of the 1.44m^2 that will be taken up by the poles themselves.

The placement of 16 poles within Blanket Bog and Blanket Bog/Wet Heath habitat will therefore result in direct impact on 140m^2 in terms of habitat area through excavation. Following successful restoration, the placement of poles within this habitat will result in the loss of 1.44m^2 of habitat.

Restoration success will depend on a strict approach to excavation, temporary storage and replacement of turves, acrotelmic and catotelmic peat and, potentially, mineral soils. A strict approach will be required for this, including a method statement and supervision of works. Mitigation in this regard is set out in Section 4.

[9] Priority Annex I habitats are indicated in the literature with an asterisk (*)

Compaction / damage

Research information on the impact of vehicular access on Blanket Bog is somewhat limited, although sources generally agree (eg IUCN, NE etc) that access using low ground-pressure machinery can still result in impacts upon Blanket Bog if it is excessive within a specific area. For example, the UK IUCN guidance document on 'Tracks across peatlands'[10] states the following:

While it is true that, for smaller-scale operations, modern ATV quad-bikes and other types of ATVs are now capable of transporting people and supplies across all but the wettest, softest ground, it has also become clear that repeated use of such vehicles along regular routes results in much the same damage to an active bog surface as does repeated heavy trampling (see Grazing and Trampling Briefing Note 7). The living acrotelm layer is quickly destroyed leaving the unprotected catotelm peat (see Biodiversity Briefing Note 2) to be churned up by the action of the tyre treads. As parts of the route become increasingly churned up, a zone of expanding devastation develops as drivers wish to avoid becoming bogged down in the most damaged areas. In the worst cases this process can render whole sections of the route impassable, in effect reducing the bog to a bare erosion surface with associated loss of carbon, water quality and other ecosystem services (see Erosion Briefing Note 9). Even where obvious erosion does not occur, a chronic level of ground-pressure disturbance can reduce the extent and vigour of peat-forming species or prevent recolonisation of damaged areas.

An experiment in the Pennines in the UK on the use of mesh tracks and low ground-pressure machinery[11] resulted in the following conclusions:

We present a spatially and temporally rich water-table dataset from the study site showing how the impacts of the track on water table are spatially highly variable. Water-table depths across the site were shallow, typically within the upper 10 cm of the peat profile for > 75% of the time. We show that mesh track and low-ground-pressure vehicle impacts on water-table depth were small except for directly under and close to the track. Where the track runs parallel to the contours, water-tables were found to be deeper downslope of the track and shallower upslope. However, in the no track/driving treatment; water table was significantly shallower downslope than upslope. Strong anisotropy was found in both 'before-track' and 'after-track' Ks, with horizontal Ks significantly greater than vertical Ks. No significant difference was found in vertical Ks before and after driving (medians 8.6 x 10-5 and 6.6 x 10-5 cm s-1 respectively). Horizontal Ks was significantly greater after driving (median 2.2 x 10-3 cm s-1) than before (median 3.7 x 10-4 cm s-1). Post-hoc testing highlights variability in response to treatment and topographic position. We suggest that this surprising result is related to rapid regrowth of new vegetation (particularly Sphagnum) through the mesh of the track, which was more dominant on horizontal Ks than the compression from low-ground-pressure vehicle use. Our results indicate that mesh tracks have a significant impact upon hydrology; however, response is variable dependent upon

[10] *IUCN UK Committee Peatland Programme Briefing Note No12 Tracks across peatlands*. Available at: http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/12%20Tracks%20on%20peatland_v2_FINAL.pdf

[11] McKendrick-Smith, K, Holden, J and L Parry (2016) *Impact of mesh tracks and low-ground-pressure vehicle use on blanket peat hydrology*. Geophysical Research Abstracts Vol. 18, EGU 2016. Available at: http://meetingorganizer.copernicus.org/EGU2016/EGU2016-9898.pdf

topographic and seasonal factors. These findings can be used to inform land-management decision-making for the use of mesh tracks in peatlands.

The conclusions from research are considered to be somewhat inconclusive on thresholds of access use by low ground-pressure machinery that have the potential to result in hydrological or other impacts. However, the available references state that impacts are likely to be caused by 'repeated' use of trackways and that a 'chronic' level of disturbance could result in impact on the vegetation surface.

Experience by the author of this NIS, garnered from work as an Ecological Clerk of Works during construction on wind farms requiring access over (and in some cases cabling within) Blanket Bog / Wet Heath habitat, the potential for impact largely relates to the following factors:

- Ground conditions (with areas of flush or softer habitat more easily impacted);
- Weather conditions (with prolonged wet spells increasing the risk of surface vegetation damage highly significantly);
- Machinery used (minimising use of vehicles such as tracked dumpers which, although low ground-pressure, can result in cutting into vegetation due to loading);
- Driver experience and expertise; and,
- Stringent supervision of works by a suitably experienced person.

It is therefore concluded that the proposal, without mitigation, has significant potential to result in damage to 'Active Blanket Bog' priority habitat as a result of compaction and surface damage. Potential impacts are likely to occur as a result of access to the site, along the construction route and in the vicinity of pole locations.

Although the potential impacts of the proposal would be limited to the area of the proposed route, and although potential impacts are likely to be reversible, it is concluded that, without mitigation, there is potential for damage to both structure and function of Active Blanket Bog priority habitat as a result of damage to the surface vegetation from access and construction activities.

It is considered that this is the greatest impact risk associated with the proposal and the proposal would require a full suite of appropriate mitigation in order to avoid damage to this habitat and any impact on the integrity of the SAC. Mitigation in this regard includes a detailed access proposal and which is provided in Section 4.

Drainage / hydrology

Works within the SAC relating to the proposal will not require either any drainage works or linear excavation, which has the potential to affect drainage / hydrology over the wider area. There is, however, cable trenching intended to be carried out outside the SAC, for connection to the Black Lough Wind Farm to the northeast and control building to the southwest (with cabling required to be underground within proximity of turbines). Excavated trenches for buried cables, if not undertaken correctly, have the potential to act as preferential subsurface drains. Such a situation could result in localised drainage of Blanket Bog or modified bog habitat within the same hydrological unit as the Blanket Bog within the SAC if appropriate care is not taken during the works. This is particularly relevant at the southwestern section of the cable route where, although outside the SAC, works will be within Blanket Bog / Wet Heath transition habitat that falls within the same hydrological unit as some Blanket Bog habitats within the SAC.

Mitigation measures in terms of an appropriate approach to excavation and restoration of the cabling trench will be required in order to ensure the continued hydrological integrity of the Blanket Bog / Wet Heath transition habitat in this location. This is set out in Section 4.

Pollution

In addition to direct loss, vegetation damage and hydrological impact, potential impacts exist in terms of localised impacts on Blanket Bog vegetation as a result of factors such as fuel spillages or localised sediment release from dewatering of excavations. Fuel spillages, in particular, can travel significant distances within overland flow on habitats such as Blanket Bog in wet conditions, with far reaching impacts on the vegetation and the organisms found within it. Sediment release over Blanket Bog vegetation can result in vegetation changes, for example favouring negative indicator species such as soft rush *Juncus effusus*.

Although generally likely to be localised and reversible, such impacts have the potential to be significant and can be avoided. Mitigation is set out in Section 4 in this regard.

3.2.2 Potential operational phase impacts

Operational phase impacts on this habitat are likely to be limited to ongoing drainage and lack of recovery of excavated areas. In the case of drainage, this is relevant only to the areas where the cable is intended to be buried, in particular the southwest of the proposal site, where the area of buried cable lies within the same hydrological unit as part of the SAC. In the case of recovery of vegetation, again the main risk is within areas where the cable is being buried (outside the SAC), although it is also relevant to excavated areas at the pole and stay anchor locations.

In the case of drainage, there is considered to be a risk to the ongoing function of the Active Blanket Bog priority habitat in the absence of appropriate mitigation measures. In the case of vegetation recovery, there is considered to be a limited risk to the structure of Active Blanket Bog priority habitat vegetation in the vicinity of the poles and stays.

In both cases the potential impacts are both avoidable and reversible. Appropriate working practices in excavation, storage of materials, restoration and also measures to ensure that

excavated cable routes do not become preferential subsurface drains once filled in would avoid such impacts. Mitigation in respect of this is set out in Section 4 below.

3.3 Potential Impacts on Depressions on peat substrates of the *Rhynchosporion* (7150)

Rhynchosporion depressions are highly constant communities of humid exposed peat or sometimes sand, with the vegetation forming on stripped areas of Blanket Bogs or raised bogs. The communities are similar and closely related to those of shallow bog hollows and of transition mires. The habitat is associated with raised bog in the lowlands of central and mid-west Ireland, and with lowland Blanket Bog and Wet Heath in western Ireland (NPWS 2007). As seen in Figure 10 above, areas aligning with Active Blanket Bog Priority Habitat within the survey area have been specifically avoided by the route in terms of locations of any poles or stays. No *Rhynchosporion* depressions were recorded in the Blanket Bog / Wet Heath transition habitats within the survey area or any other habitats. This is likely to be due to the fact that a proposed route was specifically chosen within drier habitat at the top of a slope for much of the route, the latter is a habitat context within which *Rhynchosporion* depressions are unlikely to occur.

The main risk to this habitat as a result of the proposed works is direct impact as a result of access by machinery.

3.3.1 Potential construction phase impacts

Direct loss

The layout of the proposal, which avoids construction operations within any areas holding this habitat, means that there is not likely to be any risk of direct loss of this habitat. However, the habitat can exist in very small pockets which do have the potential to be impacted by vehicles accessing the area if an appropriate working corridor is not put in place and complied with. Because of the nature of the habitat, occurring in small depressions within a wider area of Blanket Bog, Wet Heath or modified bog, access into small areas of this habitat have the potential to damage them to the point of effective loss of individual depressions or groups of this habitat.

To avoid this, mitigation in the form of a strict working corridor, including undertaking of a pre-construction walkover to ensure that all areas potentially corresponding to *Rhynchosporion* depressions are excluded from the working, corridor is required. Mitigation in respect of this is set out in Section 4.

Compaction / damage

There is potential for some level of damage to areas of lowland Blanket Bog / Blanket Bog with pools (with the potential to hold *Rhynchosporion* depressions) during the laying out and stringing of cables. In some areas, the cable route crosses lowland Blanket Bog / Blanket Bog with pools, where the cables will be strung above the habitat. An inappropriate approach to laying out and drawing the cables has the potential to result in damage to the habitat of varying degrees, for example as a result of access into the area or scouring from the drawing of cables across the habitat surface, depending on the approach taken.

Although any potential impacts are likely to be limited and reversible, mitigation, in the form of an agreed approach to the drawing and stringing of cables will be required in order to avoid any impact on this habitat as a result of damage during construction. This is provided in Section 4.

Drainage / hydrology

The risks to this habitat as a result of changes to drainage hydrology, although less likely due to it not being recorded along the route, are similar to those described above for Blanket Bog (Section 3.2).

Mitigation measures in terms of an appropriate approach to excavation and restoration of the cabling trench will be required in order to ensure the continued hydrological integrity of any *Rhynchosporion* depressions in the wider area. This is set out in Section 4.

Pollution

Potential pollution impacts on this habitat, although at a lower risk of occurring since it does not occur within the specific footprint of the proposal, is still a potential impact. Although generally likely to be localised and reversible, such impacts have the potential to be significant and can be avoided. Mitigation is set out in Section 4 in this regard.

3.4 Potential Impacts on Northern Atlantic Wet Heaths with *Erica tetralix* (4010)

Wet Heath is widespread in the uplands and in western Ireland. It occurs on areas of relatively shallow peat, generally where the peat is between 30cm and 80cm in depth, and where there is a fluctuating water table rather than permanently waterlogged peats.

It occurs within the survey area along much of the proposed route in transition with Blanket Bog (as shown in Figures 6 – 10). In addition, it is worth noting that the north-easterly section of the proposed route within the SAC was mapped during the National Survey of Upland Habitats (Perrin *et al.* 2013, NPWS 2016) as Wet Heath (falling within Annex I habitat *Northern Atlantic Wet Heaths with Erica tetralix*) whereas it was mapped within surveys in 2018 as modified bog (falling within Annex I habitat *Blanket Bog*). The distinction between the two largely relates to peat depths but with impacts of drainage and peat cutting, for example, often resulting in habitat moving to resemble Wet Heath rather than Blanket Bog.

Because Wet Heath occurs in transition with Blanket Bog at the site during 2018 mapping, the potential impacts on it have been already generally assessed under Blanket Bog (Section 3.2). For Wet Heath habitat (including where it occurs in transition with Blanket Bog) this comprises 4 poles with stays and 7 poles with no stays.

Threats

As with Blanket Bog, the main threats to this habitat type as a result of the proposed works are direct loss of habitat, compaction / damage by machinery during access and changes in drainage resulting from excavation. Wet Heath, however, as a slightly drier habitat community with shallower peat or on better draining slopes, is slightly more robust as a habitat in terms of resisting damage from vehicular access (since it contains fewer very wet habitat sub-types). Although some aspects of the habitat, such as the bryophyte community, would still be sensitive to repeated tracking or rutting caused by vehicular access.

3.4.1 Potential construction phase impacts

Direct loss

The potential for direct loss has been set out in Section 3.2 with respect to Blanket Bog, which includes Wet Heath within transition habitat (see Figure 10). In addition to the 11 poles that are proposed to be placed within Blanket Bog / Wet Heath transition habitat and already assessed previously, a further pole (with stays) is proposed to be placed within Wet Heath / Dry Heath transition habitat.

This results in a total of 8 poles plus 4 poles with stays that will be placed within Wet Heath (including in association with other habitats). The habitat loss associated with the pole stays is considered absolutely negligible, with only metal attachment points at the surface vegetation.

For poles of no larger than approximately 300mm diameter, total habitat loss associated with this habitat is therefore considered to be no more than 1.08m^2. This is not considered significant with respect to any potential impact on structure and function of this habitat within the Ox Mountains Bogs SAC or therefore the ecological integrity of the Ox Mountains Bogs SAC as a whole.

Impacts associated with habitat damage are considered in the following section.

Compaction / damage

Wet Heath occurs on areas where peat is shallower than Blanket Bog (typically less than 50cm) or where an increased slope results in less waterlogged conditions than with Blanket Bog.

The shallower peat depths combined with the less waterlogged conditions mean that the habitat is both more resistant to compaction and also less fragile. This means that it is feasible to undertake some access, with appropriate care, without significant damage to, or compaction of, the habitat. It also means that, without appropriate care, there is potential for significant damage / compaction to occur. This habitat can occur with varying levels of heather as a constituent part of it (from around 25% heather cover upwards) and, in general terms, impacts on surface vegetation are likely to be less in areas with a lower heather, and therefore a higher grass, composition.

The potential for compaction or surface vegetation damage to this habitat is therefore dependent on the specific choice of any route through it, the approach to access (for example in terms of machinery used and any access plan) and monitoring of works.

In terms of the specific choice of route, this was chosen following a site walkover and habitat mapping, to follow a line keeping to the more resilient, grass dominated areas. This, forming part of the proposal being assessed, is considered to be embedded mitigation. However, as with Blanket Bog, there is still potential for damage to this habitat as a result of the proposed works, with extent or risk of potential likely to be related to the following factors:

- Ground conditions (with areas of flush or softer habitat more easily impacted);
- Weather conditions (with prolonged wet spells increasing the risk of surface vegetation damage highly significantly);

- Machinery used (minimising use of vehicles such as tracked dumpers which, although low ground-pressure, can result in cutting into vegetation due to loading);
- Driver experience and expertise; and,
- Adequate supervision of works by a suitably experienced person.

It is concluded therefore that although the habitat is considerably more robust than Active Blanket Bog, the proposal, without mitigation, has potential to result in damage to Wet Heath habitat as a result of compaction and surface damage. Potential impacts are likely to occur as a result of access to the site, along the construction route and in the vicinity of pole locations.

The potential for impacts on habitat as a result of excavation for the poles and stays will depend on the approach required for pole erection and also the approach taken to habitat restoration.

Where peat depths are greater, poles can sometimes be inserted directly into the peat, not requiring excavation. However, as can be seen in Figure 13, peat depths at the proposed pole locations are only in excess of 2.2m in 6 cases and in excess of 3.1m in 2 cases (one of which is outside the SAC). Potential impacts as a result of damage are therefore based on the assumption that all pole and stay locations will have to be excavated to allow for burying of the pole and stabilising infrastructure.

In the case of each pole, it is likely that an excavation of 2-2.5m x 2-2.5m will be required in order to allow for the use of 1.5m long sleepers and bog boards to create a raft, with excavations being undertaken down to a depth of 3m. It is also expected that 1.5-2m x 1.5-2m excavations will be required at each stay location.

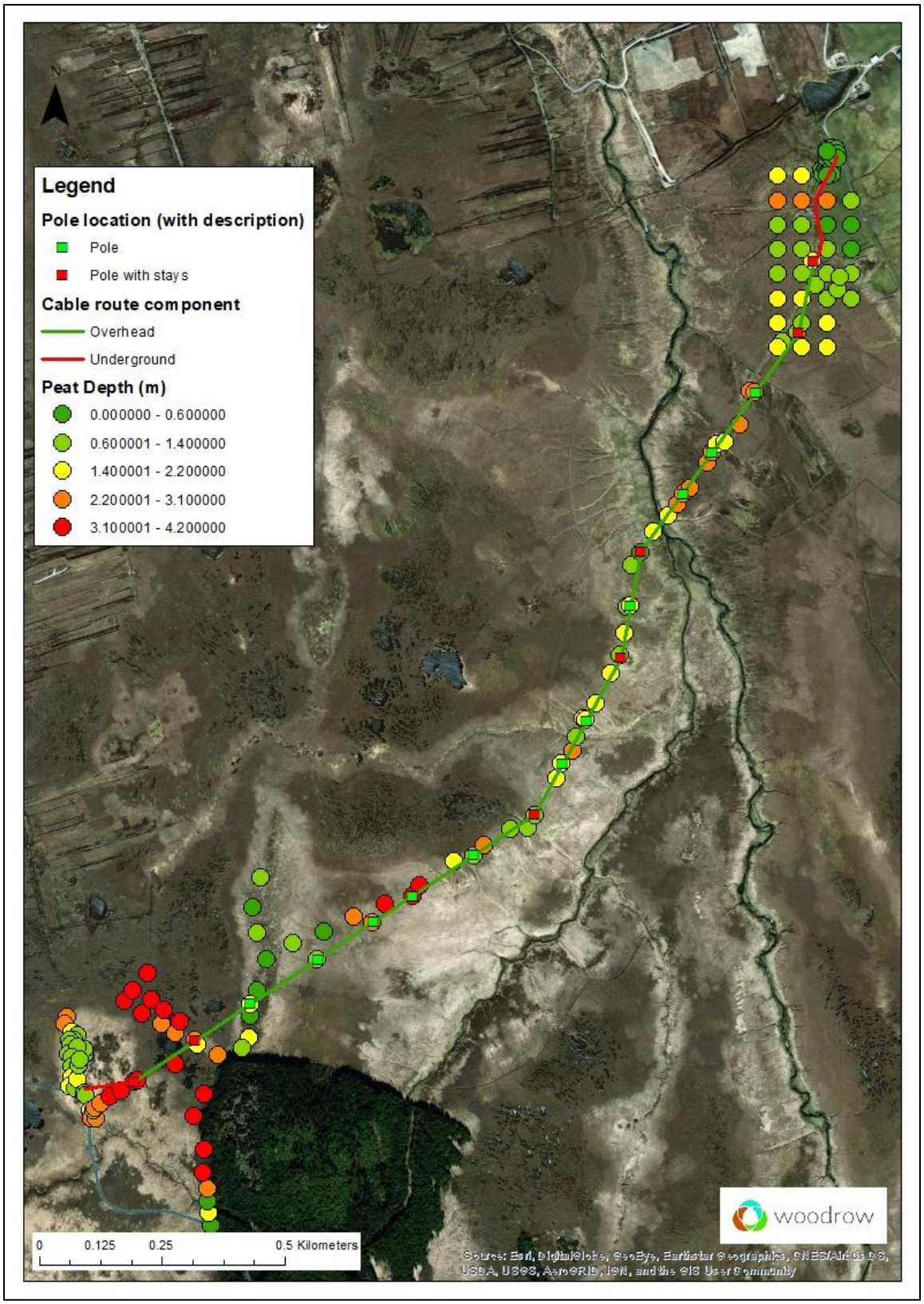
In the case of Wet Heath (including in transition to Blanket Bog), this would result in excavation of an area of up to 107m^2. This area would then be restored, with the exception of the 1.08m^2 that will be taken up by the poles themselves.

Restoration approaches to such excavated areas are well proven with good success when undertaken correctly. However, there is potential for failure of habitat restoration if not undertaken following proven specific approaches. For example, the approach to separation, storage and replacement of till, acrotelmic peat, acrotelmic peat and surface turves is fundamental to success.

Although the potential impacts of the proposal would be limited to the area of the proposed route, and although potential impacts are likely to be reversible, it is concluded that, without mitigation, there is potential for damage to both structure and function of Wet Heath Habitat as a result of damage to the surface vegetation from access and construction activities.

As with Active Blanket Bog Habitat, avoidance of impact on Wet Heath will require a full suite of appropriate mitigation in order to avoid any impact on the integrity of the SAC. Mitigation in this regard includes a full access proposal and is given in Section 4.

Figure 13 – Peat depths within and adjacent to the Ox Mountains Bogs SAC.



Drainage / hydrology

Although Wet Heath develops in areas that are less waterlogged, than Active Blanket Bog, it is found within a very specific hydrological niche and is equally dependent on specific hydrological conditions, drainage or hydrological change therefore has the potential to affect Wet Heath habitat is very similar ways to Active Blanket Bog.

Works within the SAC relating to the proposal will not require either any drainage works or linear excavation, which has the potential to affect drainage / hydrology over the wider area. There is, however, cable trenching intended to be carried out outside the SAC, for connection to the Black Lough Wind Farm to the northeast and the control building to the southwest (with cabling required to be underground within proximity of turbines). Excavated trenches for buried cables, if not undertaken correctly, have the potential to act as preferential subsurface drains. Such a situation could result in localised drainage of Wet Heath habitat within the same hydrological unit as the Blanket Bog within the SAC if appropriate care is not taken during the works. This is particularly relevant at the southwestern section of the route where, although outside the SAC, works will be within Blanket Bog / Wet Heath transition habitat that falls within the same hydrological unit as some Blanket Bog habitats within the SAC.

Mitigation measures in terms of an appropriate approach to excavation and restoration of the cabling trench will be required in order to ensure the continued hydrological integrity of the Blanket Bog / Wet Heath mosaic habitat in this location. This is set out in Section 4.

Pollution

Potential pollution impacts on Wet Heath are considered to be identical to those listed under Blanket Bog in Section 3.2.1. Although generally likely to be localised and reversible, such impacts have the potential to be significant and can be avoided. Mitigation in this regard is set out in Section 4.

3.4.2 Potential operational phase impacts

Direct loss

Potential impacts associated with direct loss of this habitat have been set out in Section 3.4.1 above. This states that the proposal will result in the direct loss of up to 1.08m^2 of Wet Heath. This in itself is not considered to be significant and will not result in an impact on the ecological structure and function of the site.

Compaction / damage

Despite the conclusion above relating to direct loss of Wet Heath habitat, the proposal will also result in excavation of a further 106m^2 of Wet Heath habitat (in transition / mosaic with Blanket Bog) which has the potential to undergo change and be damaged by the works if not appropriately restored.

Mitigation measures in terms of an appropriate approach to excavation and restoration of the all pole and stay locations will be required in order to ensure the restoration of these areas, and therefore no impact upon Wet Heath habitat. This is set out in Section 4

3.5 Potential Impacts on Natural dystrophic lakes and ponds (3160)

This habitat occurs within mosaics with Blanket Bog. At the site, it is found in the wettest areas of Blanket Bog, mapped individually in Figures 6 – 10 and also found to occur in areas mapped as 7130P - Blanket Bog (Active) - a priority habitat as illustrated in Figure 10.

The main risk to this habitat as a result of the proposed works is direct impact as a result of access by machinery. As well as impact on the waterbodies themselves, the high water-table in the areas where they occur means that the areas surrounding them can be highly susceptible to damage from access by machinery.

3.5.1 Potential construction phase impacts

Direct loss

There will be no direct loss of this habitat as a result of the proposed works. This is due to the fact that no access will be made into areas of this habitat due to the high water-table here.

Damage

This habitat is too soft for any level of access by machinery, or realistically on foot. Any access into this habitat would be likely to result in the loss of machinery.

However, it can be seen from Figures 6 – 9 that part of the route includes areas with Natural Dystrophic Lakes and Ponds. Although there will be no requirement to enter the habitat, cable stringing will be undertaken above the habitat and there is some potential for limited damage if heavy cables were pulled through the habitat. Such an event can be avoided by an appropriate cable stringing approach, incorporated into a method statement in order to avoid impacts on this habitat. Mitigation in this regard has been set out in Section 4 below.

Drainage / hydrological change

As detailed elsewhere, there are no proposed works within the SAC that have the potential to result in drainage. The only excavation will occur outside of the SAC to lay the cable adjacent to turbine locations.

Pollution

Potential impacts with respect to pollution are considered to be similar to those outlined for Blanket Bog but with a greater potential to spread within the habitat due to the presence of open water. Such impacts have the potential to be significant and can be avoided. Mitigation in this regard has been set out in Section 4.

3.6 Potential Impacts on 1013 *Vertigo geyeri* - Geyer's Whorl Snail

Moorken and Killeen (2011) state that Geyer's whorl snail is found exclusively in saturated groundwater-fed calcareous flushes. Following a survey for the species in 2011 (Moorkens & Associates, 2011), the species is known to occur within flush habitat adjacent to the Gowlan River at two locations 195m and 270m west of the proposed electrical connection route, as well as at locations to the north-east of the proposal (outside the Ox Mountains Bogs SAC) (shown in Figure 14). Two further locations lie to the north-east of the proposal within a separate sub-catchment.

A survey of the vicinity of the proposed electrical connection route for Geyer's whorl snail was contracted in 2018 by Maria Long. The survey resulted in the finding of 2 new locations for Geyer's whorl snail to the east of the proposed electrical connection route (see Figure 14).

Threats to the species from the proposal are likely to be limited to uncontrolled access by vehicles / machinery as well hydrological / pollution impacts as a result of impacts on the drains / runnels that feed suitable habitat.

3.6.1 Potential construction phase impacts

Direct impact / compaction and damage to host habitat

Compaction or damage to the host habitat for this species, which (within the Ox Mountains Bogs SAC) occurs around 70m from the Application Site at the nearest point, could only occur if vehicular access for works was allowed to extend a significant distance from the proposed route corridor. This is unlikely, but possible. A strict working corridor will be required and must be specified to avoid this host habitat. Mitigation in this regard has been set out in Section 4.

Hydrological change

The drains and runnels that are crossed by the proposed electrical connection route have the potential to connect to, and feed at least one of the locations where Geyer's whorl snail has been recorded (which lies some 170m north-west of the Application Site). This drain is already culverted by the existing track and the nearby proposed pole location can be accessed to within 10m by the use of the existing track. There are two pole locations beyond this location that would need to be reached without impact on drains and runnels that feed habitats with potential to support the species. Again, an appropriately chosen access route and strict working corridor will be required and must be specified to avoid any potential for impact. Mitigation in this regard has been set out in Section 4.

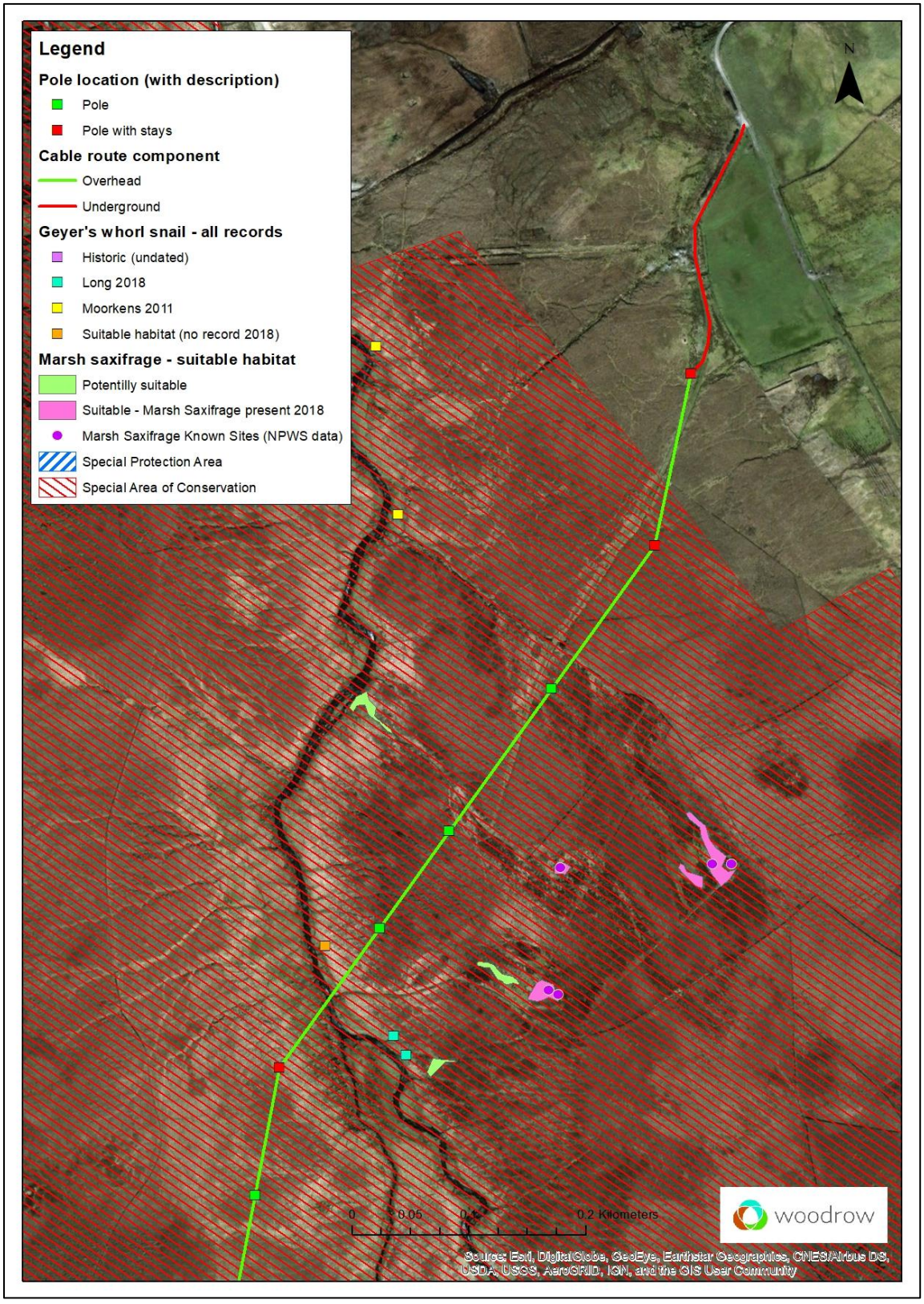
Pollution of host habitat

Potential pollution impacts on the host habitat of Geyer's whorl snail are considered to be the same as those listed under Blanket Bog in Section 3.2. The separation of this habitat from the proposed route also means that the likelihood of pollution is low, although the potential for some level of connectivity by overland flow between the access route required to the pole locations and suitable habitat areas is acknowledged above. Despite the low likelihood, such impacts have the potential to be significant, can and must be avoided. Mitigation in this regard has been set out in Section 4.

3.6.2 Potential operational phase impacts

There are considered to be no potential operational phase impacts on this species as a result of the proposal, given that the proposed cable route will not directly impact upon the host habitat.

Figure 14 – Locations of known Geyer's whorl snail and marsh saxifrage populations and suitable host habitat close to proposed electrical connection route.



3.7 Potential Impacts on 1528 *Saxifraga hirculus* - Marsh Saxifrage

This species generally occurs within mineral-rich flush habitat. A survey of the species and potentially suitable habitat was undertaken in September 2018. No suitable habitat or species records were found within the Application Site. The species was recorded in existing known locations to the east of the Application Site (as shown in Figure 14b).

3.7.1 Potential construction phase impacts

Direct impacts and compaction / damage

Compaction or damage to the host habitat for this species (and the species itself), which occurs around 75m from the proposed route could only occur if vehicular access for works was allowed to extend a significant distance from the proposed grid route corridor. This is unlikely but possible. A working corridor will be required and must be specified to avoid this host habitat. Mitigation in this regard has been set out in Section 4 below.

Pollution

Potential pollution impacts on the potential host habitat of marsh saxifrage are considered to be the same as those listed under Blanket Bog in Section 3.2. The separation distance of this habitat from the proposed route (*c.*75m) also means that the likelihood of pollution is very low. Despite this, such impacts have the potential to be significant and can be avoided. Mitigation in this regard has been set out in Section 4 below.

3.7.2 Potential operational phase impacts

There are considered to be no potential operational phase impacts on this species as a result of the proposal.

3.8 Summary of potential impacts

The preceding sections have set out potential impacts by Qualifying Interest. In many cases, the potential impacts are shared across the Qualifying Interests and there is substantial repetition between the different sections. For this reason, to provide more clarity, the potential impacts have been set out by task in Table 5 below.

Mitigation is set out in Section 4 to address all potential impacts associated with the proposal with the exception of permanent loss of 7130 Blanket Bogs / 4010 Northern Atlantic Wet Heaths with *Erica tetralix* Qualifying Interest habitats at the actual pole locations. This is considered to amount to a total of 1.44m^2, will not affect the structure and / or function of the habitats concerned. This impact is considered reversible with appropriate restoration, and is not considered significant.

Table 5 – Summary Table of the potential impacts associated with different tasks

Task	Access required	Relevant requirements • Issues	Conclusions on potential for impact
Delivery of pole components	Movement of poles and sets of stays, to separate locations along the proposed route.	Poles are heavy and of an awkward size to take across sensitive habitat without likely potential impact on surface vegetation: • Movement by excavator would need up to 14 separate trips across sensitive habitat and risks imbalance to excavator – increasing the risk of rutting and tracks cutting into surface vegetation. • Movement by low pressure dumper or similar machine would be likely to result in rutting of Blanket Bog and localised hydrological impact through compaction.	Delivery of poles over land is considered to result in a significant risk of damage to surface vegetation. The use of a dumper vehicle or similar will increase the risk of damage. The use of an excavator will increase the number of required access trips and thereby the likely extent of damage. It is considered that the only feasible way of avoiding impact is by delivery by air (see mitigation proposed in Section 4).
Delivery and stringing of cables	The extent of access required depends on the approach to cabling taken.	Cable reels, although compact, and not an awkward load like poles, are very heavy. The location that cables need to be delivered to depends on the construction approach; they are either fixed to a vehicle which then drives the route allowing the cable(s) to be rolled out as the vehicle moves, or they are pulled from the reel which is at a fixed location. • Driving the route with a cable reel would require 5 trips and specialised machinery. This may result in rutting of Blanket Bog and localised hydrological impact through compaction. • Delivery of the cables to specific sites by vehicle has the potential to result in rutting (and potential cutting up of surface vegetation) of Blanket Bog and localised hydrological impact through compaction. Once in place, cable can be pulled from the reels by hand.	Delivery and stringing of cables over land is considered to result in a significant risk of damage to surface vegetation. The use of a vehicle to reel out the cable will increase the number of required access trips and thereby the likely extent of damage. It is considered that the only feasible ways of avoiding impacts are: • delivery of cables (and reel cradles) by air to appropriate locations and the pulling of cables by hand before stringing; or, • pulling cables over the full length of the route from a reel outside of the designated site (This is the favoured option - see mitigation proposed in Section 4 below)
Erection of poles and stays	The erection of poles and stays will require both excavation of the anchor points and holding of the poles while they are fixed in place.	These works will require the use of a low ground-pressure excavator. This can undertake both excavation and pole stabilising roles. Issues are: • Limited access onto firmer areas of Blanket Bog by low ground-pressure is not likely to result in significant impact if an experienced driver is used and works are appropriately supervised. • Access onto wetter Blanket Bog (e.g. Blanket Bog with pools) will not be feasible without significant potential for surface vegetation damage. • A large number of trips with excavators, even on firmer Blanket Bog, can result in damage to surface vegetation, especially in wetter conditions. • Excavation and restoration of excavated areas has the potential to result in localised impact and limitation in the potential for areas to recover.	To avoid damage, all access by excavators would need to: • Be limited to low ground-pressure (e.g. 'bogmaster') vehicles; • Be limited in the number of tracking trips made; • Avoid all areas of Blanket Bog with pools' habitat (and similarly sensitive wet areas); and, • Be fully supervised by an appropriately experienced site ecologist, with any minor surface impacts being restored as work progresses. Any excavation must be undertaken in such a way as to ensure full recovery of the habitat (see mitigation approach proposed in Section 4).

Task	Access required	Relevant requirements • Issues	Conclusions on potential for impact
Refuelling of machinery	Excavators will need regular re-fuelling.	Excavators may require re-fuelling on site. Issues are: • Fuel is a heavy material and would need to be brought to the excavators regularly in order to avoid tracking back to a refuelling location.	Movement of excavators back to a base location for re-fuelling will result in an unnecessary number of trips and could result in compaction or damage to surface vegetation. Bulk delivery overland could potentially result in rutting / compaction or damage to surface vegetation. To avoid damage, all movement of fuel will: • Need to be delivered by air; or • Need to be in small quantities to allow for daily delivery by ultra-low ground-pressure vehicles (this is the favoured approach – see proposed mitigation in Section 4
Delivery of personnel and general access	Daily access required for personnel to access current working location	• Personnel will require tools and materials with them on a daily basis.	Because daily visits will be required during the construction period (likely to comprise 2-3 weeks within the SAC), vehicular access has the potential to result in significant rutting / compaction without appropriate mitigation. Use of ultra-low ground-pressure vehicles is likely to be required for this in order to avoid impact (Argo-cat or similar), and an agreed standardised access corridor will be required to minimise the footprint while avoiding damage through an overly concentrated footfall or vehicular use. A mitigation approach is proposed in Section 4.
Excavation of trenches	All proposed cable trenching is outside the SAC.	• Although trenching is outside the SAC, such linear excavations have the potential to result in the creation of preferential drains within peat, affecting the hydrology of the wider area.	Actions can be taken to prevent such linear excavations from becoming preferential drains. This includes no use of sand for blinding as well as creation of underground ‘bunds’ or ‘seals’ at intervals around the cables to stop the flow of water. Such seals can be made with a section of compacted catotelmic peat, ensuring that it does not come as far as the surface and affect surface vegetation. A mitigation approach is proposed in Section 4.

3.9 Assessment of potential in-combination effects on Natura 2000 sites

Having identified, within the Screening Stage, possible significant effects on Natura 2000 sites as a result of potential impacts during the construction and operational phases of the proposal, the potential for these to adversely affect the integrity of the Natura 2000 site in question in combination with other proposals is considered below.

3.9.1 Additive/Incremental Impacts

Additive incremental impacts consider multiple activities/projects (each with potentially insignificant effects) but which added together can give rise to a significant effect due to their proximity in time and space (CIEEM, 2016).

The area within which the proposal lies falls within open bog / grassland habitat with surrounding land uses including farming, forestry, and an operational wind farm. These are the type of proposals that have the potential to result in additive / incremental impacts.

A significant part of the area, within which the project is proposed, was fenced in for better stock control in 2014. This required planning consent (PL13/354) and a Natura Impact Statement was completed for the project. One of the potential issues identified in the current proposal is the potential disturbance of surface vegetation. Stock grazing following disturbance of surface vegetation may have the effect of increasing damage if the area is preferred by stock and movements / activity are centred on that area. In this instance, however, the existence of the fence and the co-operation of the landowner means that stock can be controlled within or excluded from the area. This means that the existence of the fence can be used to help mitigate any impacts. While the existence of the stock on site is considered an additive impact, therefore, the fence forms part of the proposed mitigation, as set out in 4.3.1.

The southern part of the site is adjoined by forestry. As with all forestry areas within bog habitat, there will be associated drainage. This could have the potential to exacerbate any drainage activities associated with the proposal. However, the undertaking of all works within the SAC by overhead lines means that there will be no drainage impacts within the SAC. Any drainage impacts outside the SAC will be mitigated through an appropriate trenching and restoration approach (see section 4.2.3.1). It is therefore considered that there are no potential additive impacts in this regard.

3.9.2 Associated/Connected Developments

Associated/Connected Developments are those developments which may result as a consequence of the current planning application process (CIEEM, 2016).

In the case of the current Planning Application, the proposal is associated with the Black Lough Wind Farm, which has planning consent (PL 17/93) and has undergone a Natura Impact Statement. The NIS considered downslope hydrological issues, avoidance of potential *Vertigo geyeri* habitat, and indirect impacts on aquatic species. The NIS proposed mitigation measures to offset any impacts. It is not considered that this proposal will result in an increase in the likelihood or potential extent of the potential impacts identified, and mitigated, within the NIS for Black Lough Wind Farm (Earthy Matters, 2017).

In addition, the proposal is associated with the consented proposal for 2 turbines at Cloonkeelaun (PL 15/466), to which it connects. A Screening Report (Screening Statement of Appropriate Assessment) was produced by Earthy Matters in December 2015 and submitted as part of the application. The report concluded that surface run-off from the site was likely to be negligible, and concluded "that the significance of impact on water quality in the nearby SAC during construction and operation phase can be deemed negligible".

There is an existing consent for a grid connection (PL16/422). This falls partly within the Ox Mountains Bogs SAC and a Natura Impact Statement was produced for it. The NIS concluded that there would be no impact on the integrity of the Ox Mountains Bogs SAC. If the current proposal is consented, then it would replace the part of the electrical connection route between Black Lough Wind Farm and the proposed control building at Cloonkeelaun, and there would be no need for that part of the route between Black Lough and Cloonkeelaun consented under PL16/422 and therefore no potential for in-combination impacts.

Taking account of the above factors, it is considered that all in-combination impacts have been taken account of and any potential for in-combination impacts have been mitigated either as part of the associated or additive proposal or within the mitigation for this project.

4 Mitigation of effects

This section sets out mitigation required to address potential effects (identified in Section 3) caused by the Proposed Development on the Natura 2000 site (the Ox Mountains Bogs SAC) significantly affected by the proposal. The mitigation set out below details all that required to ensure the proposal will not impact on important ecological receptors.

4.1 Embedded mitigation

It is considered that any approach to the electrical connection, in order to avoid an impact on the integrity of the Ox Mountains Bogs SAC would have to:

- Avoid all areas of Blanket Bog with Pool System and wetter Blanket Bog;
- reduce construction impacts on all bog / heath habitats to a minimal level;
- Avoid any level of exacerbation in long term drainage; and,
- Mitigate any impacts on surface vegetation.

The project incorporates embedded mitigation in the form of choosing an overhead line approach for works within the SAC and also in the choice of route and micro-siting of poles. This has resulted in the proposal avoiding the more sensitive habitats and facilitating an approach whereby the more significant issues were avoided in project design, allowing for mitigation to be put in place to reduce other potential impacts to a negligible level.

4.2 Construction Phase Mitigation

4.2.1 Mitigation by Avoidance

4.2.1.1 Protection of important terrestrial habitats

- There will be no vehicular or pedestrian access into or storage of materials within areas mapped as '7130P – Blanket Bog (Active)' in Figure 10 within the SAC, with the exception of a 40m stretch in the extreme south-west corner of the SAC. Access through this area will be minimised, micro-sited following a survey by the Project Ecologist / ECoW, and fully monitored by the Project Ecologist / ECoW.
- Any ropes between poles where '7130P – Blanket Bog (Active) occurs will be walked around the habitat to the poles and then pulled through, avoiding any need for access into the habitat. This work will be fully supervised by the Project Ecologist / ECoW.
- A working corridor will be set out in advance of the works. The setting out of the corridor will be preceded by a site walkover by an appropriately qualified ecologist to ensure that habitat potentially aligning to 'Depressions on peat substrates of the *Rhynchosporion* (7150)*'* are excluded from the working corridor area.

4.2.1.2 Protection of watercourses, aquatic habitats and species

- There will be no access of any kind to within 20m of areas highlighted as holding or potentially suitable for marsh saxifrage or Geyer's whorl snail, as mapped 15.

- Routes and approaches crossing features marked as 'linear runnel / drain – avoid impact' in Figure 15 will be agreed with the ECoW during works. Crossings will be limited to a total of 2 passes with a single low-pressure excavator only. There will be no crossing of these features except fully supervised by the ECoW.
- There will be no dewatering of any excavations (including cabling trenches) to watercourses, including land drains. No dewatering is considered required as part of these works.
- Disturbed ground within the site will be actively revegetated with lifted and stored turves.
- There will be no vehicular access across the Gowlan River or tributaries.
- A 50m buffer zone (as shown in Figure 15) will be in place either side of the Gowlan River. There will be no refuelling within or vehicular access into this area. Pedestrian access will be limited to pulling of pilot ropes for cabling and any water pollution control measures (such as silt fences).
- There will be no refuelling within 20m of any drain / stream on the site.

4.2.2 Mitigation by Reduction

4.2.2.1 Protection of Annex I habitats and habitats with potential to support Annex II species

- A working corridor will be employed as follows:
    - Maximum 6m width for travel between pole locations;
    - Maximum 10m around pole locations; and,
    - 50m exclusion buffer around the Gowlan River (work by hand only within buffer zones).
- There will be no excavation of any sort excepting at the pole and guy wire locations and underground cabling sections (the latter is located outside the SAC only). At these locations, excavation will be limited to 2.5m square. Any excavated material (acrotelmic peat and turves, catotelmic peat and mineral soil) will be carefully excavated, temporarily stored separately on bog mats before being used to re-fill the excavation (see Section 4.2.3.1).
- The potential for damage to other Annex I / QI habitats will be minimised by a detailed access, delivery and working plan (Construction Method Statement). This is provided in Appendix 2 and will include the following at a minimum:
    - All heavy materials, including pole structures will be delivered by air (helicopter) to strategic locations within the working corridor to minimise movements with laden machinery.
    - All machinery access will be undertaken with specialised low ground-pressure machinery. A strict hierarchy of machinery will be employed, with no unnecessary trips being undertaken with oversized machinery for the task:
        - Access to areas north-east of the Gowlan River will be undertaken using the existing track as far as feasible with movements away from the track only for constriction access for specific pole locations. There will be no movements between poles where use of the existing track is feasible.

- A single low-pressure excavator used for anchoring, stabilisation and works associated with pole erection only within the SAC (with machinery associated with cable pulling being set-up outside the SAC).
- Ultra-low-pressure vehicles used for daily carriage of personnel / light materials and fuel if required (e.g. Argocat or similar).

o Access into and within the site will be limited to the routes shown in Figure 14. It will be limited to 2 entry points, one to the south west and one to the north east, with no vehicular river crossing allowed. The number of tracking trips will be limited to reduce potential for impact on vegetation surface as follows:

- Low pressure excavator – single track trip to end of working area and back (2 tracked trips in total).
- Ultra-low-pressure wheeled / rubber tracked machinery (Argocat or similar) – daily as required (monitored by Project Ecologist / ECoW).

Re-fuelling will need to be undertaken by hand on site to avoid the need for vehicles tracking out of the site or heavy bowsers being taken into site.

- Although cabling in the vicinity of Cloonkeelaun is outside the SAC and not considered to have any potential impact on the SAC, a working corridor will be employed extending no further than 5m from the extents of the building and hardstand / turbine base where it adjoins Bog and Heath habitat.

4.2.3 Mitigation by Restoration

4.2.3.1 Restoration of Annex I habitats

- Excavations around poles and stays (within and outside the SAC) will be undertaken in the following manner to ensure restoration success:
  - All excavations will be supervised by the Project Ecologist / ECoW.
  - At each location a bog mat will be placed adjacent to the excavation to allow for temporary storage of excavated material.
  - Turves will be taken to a depth of 350-500mm to ensure viability for replacement.
  - Where feasible, the turves will be simply 'folded' over onto adjacent vegetation to allow for optimal restoration.
  - Any lifted turves will be stored separately and the correct way up on the bog mat.
  - Any remaining acrotelmic peat (peat down to a depth of up to 5-800mm from the vegetation surface) will then be excavated and stored separately on the bog mat.
  - Catotelmic peat (peat below a depth of up to 5-800mm from the vegetation surface) will then be excavated and stored separately on the bog mat.
  - Any till will then be excavated and stored separately on the bog mat.
  - Following installation of the pole infrastructure, the excavation will be filled, firstly with any till, then catotelmic peat, acrotelmic peat and then turves. Following the

placement of till (which can be heavily tamped down), peat and turves will be gently tamped into place under supervision of the project ecologist / ECoW.

- Trench excavations (within the South-western underground section of the proposal) will be undertaken in the following manner to ensure restoration success and no potential for the creation of preferential sub-surface drainage (North-eastern underground works shall occur within the roadside):
    - Turves / acrotelm peat will be excavated to a minimum of 350mm using a trenching bucket and set to one side of the trench.
    - The turves will be placed immediately outside the side of the excavator tracks in order to avoid impact but to minimise the size of the working corridor.
    - Any remaining acrotelmic peat will be excavated to achieve a total trench depth of no more than 800mm and will be set to the opposite side of the trench from the turves / acrotelm peat. There will be no mixed storage of sub-peat and mineral soil or clay. Any mineral arisings will be stored separately, closer to the trench than the sub-peat to facilitate a clean approach to infilling.
    - The trench will be infilled using mineral arisings first (where they occur), followed by catotelmic peat and then acrotelmic peat and turves at the surface.
    - The turves will be placed the correct way up to cap the restored trench and gently tamped into placed with the excavator bucket. A small amount of peat will be kept back to fill any gaps between the turves. The final restoration of all sections of the trench will be checked by the Project Ecologists / ECoW and any remediation will be carried out as directed either by hand or by excavator, depending on the sensitivity of the area.
    - In the absence of mitigation, there may be some potential for the cable route to create a preferential water pathway. This potential will be avoided by the use of dams installed in the trench at 30m intervals (within the south-western trench). Depending on the substrate, these will be created using plastic piling, impermeable subsoil material or dewatered catotelmic peat. These will be created as sub-surface 'bunds' and will project only to within 350mm of the surface. The approach will ensure that the implementation of these measures will not compromise the surface vegetation restoration.
    - There will be no substrate used in the trench (including sand) for any purpose within the SAC or bog habitats, including blinding, excepting that arising from the excavation itself.

4.3 Operational phase mitigation

4.3.1 Mitigation by Restoration

- Following the completion of works, the route will be walked by the Project Ecologist to assess any areas where measures may be required to speed up recovery of surface vegetation. If deemed appropriate, stock grazing will be reduced (in terms of total numbers of sheep) or stopped in the year following the works. A report detailing the results of the survey and mitigation applied will be provided to the local Planning Authority and NPWS.

4.3.2 Assurance of delivery of mitigation

- In order to be certain that all mitigation is appropriately applied, a suitably qualified Project Ecologist / ECoW will be employed for full time site attendance during the entire construction period with roles including:
    - Ensuring exclusion zones are put in place and maintained.
    - Advice on and supervision of pit and trench excavation, including turve stripping, storage and restoration.
    - Monitoring of surface vegetation along the proposed corridor and identification of restoration / remediation actions to be taken.
    - Input into method statements as required.
    - Ensuring measures to protect adjacent watercourses are put in place and maintained.
    - The Project Ecologist / ECoW will delay or stop works where there is a considered threat of significant impact on the Qualifying Interests of the SAC as a result of works at any time. Works will remain stopped either at a specific location or at the site as a whole until avoiding any potential impacts can be satisfactorily achieved. In any such situation, NPWS will be notified of the decision to stop the works and included in the decision on measures to be taken to avoid impact.

4.4 Opportunities for benefit to the SAC

- It is considered that the mitigation measures above will result in the avoidance of any adverse impact on the integrity of the Ox Mountains Bogs SAC. Despite this, it was noted during the surveys that there were two significant historic drains within this part of the Ox Mountains Bogs SAC. These have been detailed in section 2.4.4 of the NIS, as well as their likely long-term impacts on the Blanket Bog and Wet Heath habitats. The location and extent of these drains is shown in Figure 16. Drain blocking along these drains will result in significant long-term benefits to the Blanket Bog and Wet Heath habitats within the site. It is recommended that drain-blocking within these drains is undertaken in order to result in an overall benefit for this area of the SAC. Works would be required to include the following:
    - Drain blocking will be undertaken by use of peat where it still occurs adjacent to the drain, or plastic piling where it does not.
    - Works will be undertaken using a single wide-tracked (‘Bogmaster’ or similar) excavator which will track next to the drain and undertaken the works during a single pass, with a return pass only required to exit the site.
    - Plastic piling will be delivered to site by ‘Argocat’ or similar.
    - Locations of dams will be chosen on the basis of a levels survey, with the intention of maintaining a water level as close to the surface as possible.

Figure 15 – Proposed access avoiding sensitive habitats.

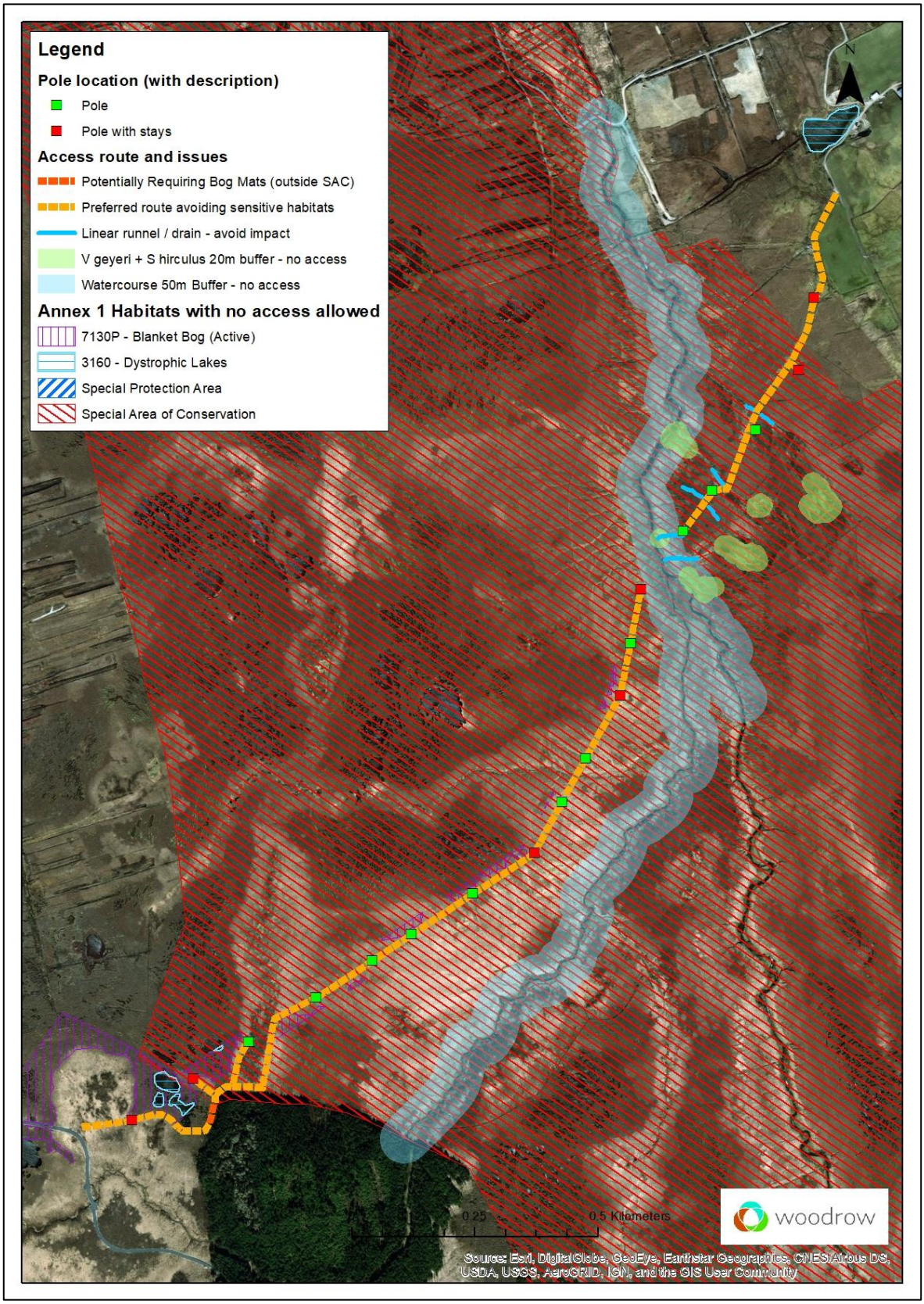
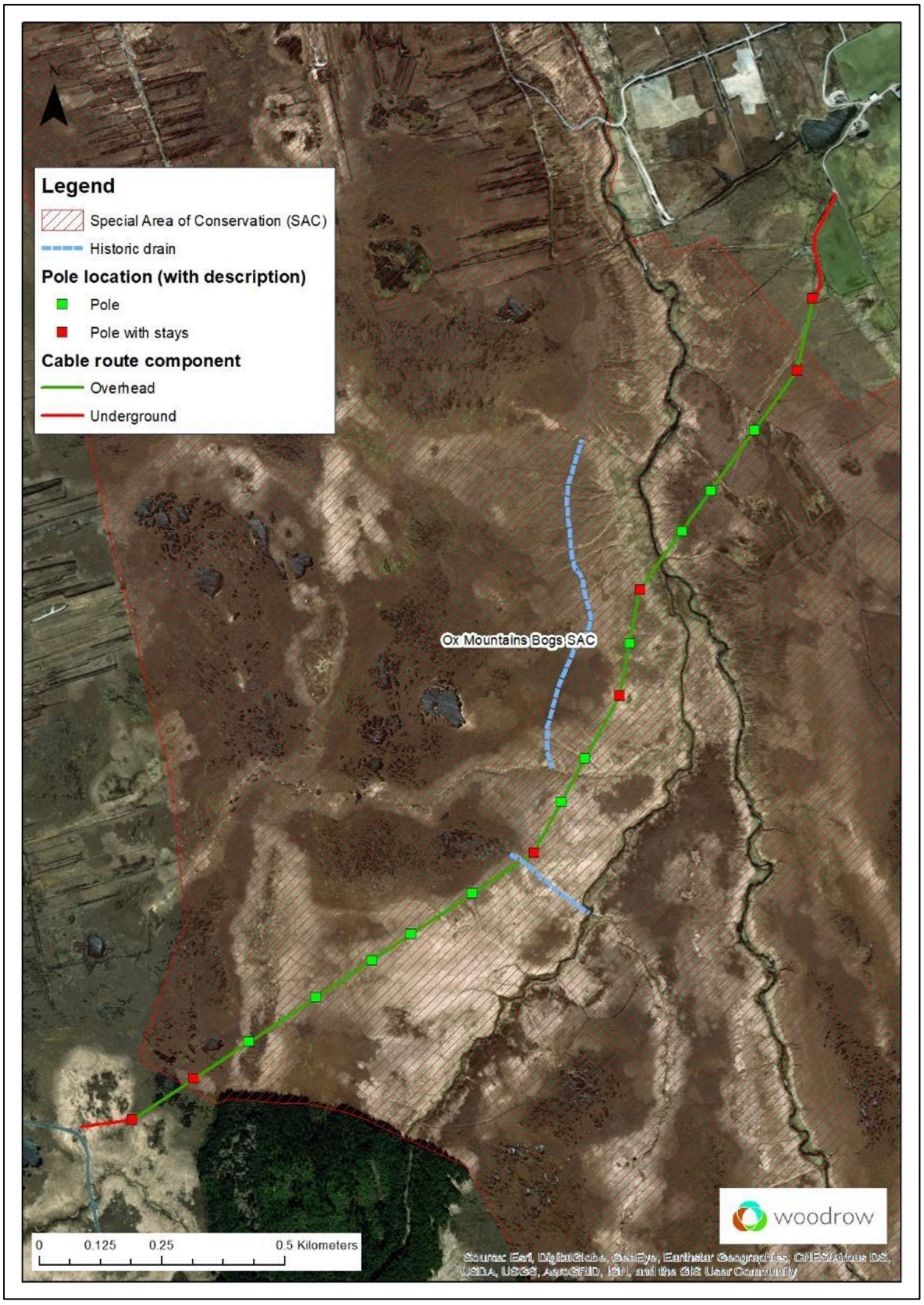


Figure 16 – Locations and extent of historic drains.



5 Conclusions

In order to facilitate the Appropriate Assessment for this project, which will be undertaken by Sligo County Council as the Competent Authority in this instance, information was gathered in respect to the potential impacts of the proposal, by way of research, data gathering, field survey and consultation. Notably, this included a full and detailed botanical survey of the part of the Ox Mountains Bogs Special Area of Conservation (SAC) within which the proposal falls. This was supplemented by the collation of available survey data within the site and the wider area. It is considered that the scientific knowledge provided within this report, which can inform the Appropriate Assessment, is robust and provides sufficient information on which to assess the potential for impacts upon relevant Natura 2000 Sites (European Sites).

The area of SAC, within which the electrical connection is proposed, comprises Annex I habitats 7130 Blanket Bogs, including Active Blanket Bog which is a priority habitat, 4010 Northern Atlantic Wet Heaths with *Erica tetralix*, and 3160 Natural dystrophic lakes and ponds, together with other non-Annex I habitats. Other Qualifying Interest, including the Annex I habitat 7150 Depressions on peat substrates of the *Rhynchosporion*, 1013 *Vertigo geyeri* - Geyer's Whorl Snail, and 1528 *Saxifraga hirculus* - Marsh Saxifrage – which are either known to, or are considered likely to, occur in the wider area.

The potential impacts on these habitats as a result of the proposal include direct loss, damage (by compaction and vehicular access), pollution and hydrological changes, which have been assessed.

The use of embedded mitigation, notably in the form of choosing an overhead line approach, has reduced the potential loss of habitat to 1.44m^2. This is considered to be negligible. In addition, the approach will avoid any trenching work within the SAC, and so avoided any potential for drainage.

Excavation required for the placement of poles and stays within the SAC is estimated to be no more than 140m^2. A restoration (including supervision) approach has been proposed in the mitigation section of the Natura Impact Statement (NIS). The approach suggested is well proven in Ireland.

Measures have been proposed to minimise the risk of habitat damage resulting from vehicular access and construction operations. These mitigation measures include a demarcated limited-working corridor, having all heavy materials delivered to pole locations by helicopter, winching of cables from outside the SAC and an access approach that minimises damage through reduced number of access events and the use of appropriately specified low ground-pressure vehicles.

Measures have been proposed to minimise the risk of pollution to neighbouring and downstream habitats through appropriate procedures.

Measures have also been proposed to ensure the recovery of any temporarily damaged vegetation by reducing or removing grazing pressure at the site in the year following works.

This Natura Impact Statement details the precautionary mitigation measures needed to prevent any potential direct or indirect impacts on Qualifying Interests of the 'Ox Mountains Bogs SAC' (Site Code: 002006) as summarised above. This report concludes that if the mitigation measures specified for this specific development are implemented, as detailed in Section 4, the proposal will not, in the light of best scientific knowledge, adversely affect the integrity of the Ox Mountains Bogs SAC or any Natura 2000 site either alone or in combination with any other plans or projects.

Additional issues

As stated in Section 4.4, it is proposed that measures are undertaken to block the two significant drains which already exist within the area of SAC, adjacent to the works, at the same time as the proposed electrical connection works. The landowner has already agreed to these works being carried out (Pers. comm. August 2018). This will be of significant benefit to the management of the area and will complement the specific Conservation Objectives for Blanket Bog and Wet Heath for the site (NPWS 2016a) which both include '*Area increasing, subject to natural processes'* as the conservation target for *'Habitat Area'*. The Blanket Bog notes on this target state *"It should be noted that further restoration of Blanket Bog would be required in order to fulfil the targets for peat formation and hydrology presented below"*.

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APPENDIX 1 –QUADRATS ANALYSED ON 17/19 APRIL 2018

Quadrats were sampled at twelve locations in the vicinity of the proposed cable route. This section details the findings of the surveys. Quadrats were sited within areas of differing and vegetation composition, in the locations indicated in Figure A7. Each quadrat is photographed and described in detail in the tables that follow.

Figure A7 - Locations of quadrats analysed during field surveys undertaken on 17/19 April 2018.

Quadrat 1 **G37882 23723**	**Location: Tawnamore**

This quadrat is located within an area of very wet Blanket Bog vegetation adjacent to a conifer plantation (approximately 3m from the forest margin). There is no evidence of grazing in this area, which is located just outside the boundary of the Ox Mountains Bogs SAC.

The Blanket Bog is dominated by heather (*Calluna vulgaris*) and hare's-tail cottongrass (*Eriophorum vaginatum*) with some common cottongrass (*Eriophorum angustifolium*). Its surface is quite uneven, with many dystrophic pools containing feathery bog-moss (*Sphagnum cuspidatum*). *Cladonia* lichen is quite abundant in this area. Pine seedlings were noted in the general area.

The vegetation is this quadrat most closely aligns to the NVC community type **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire.** Bog pools in this area support vegetation characteristic of the NVC community type **M2 *Sphagnum cuspidatum/recurvum* bog pool**

View from north edge

View from south edge

General view of area

Date	17 April 2018	
XY coordinates reading	-8.951576988 54.15878767	
Size m²	2x2	
Aspect and slope	level / very slight east-facing slope	
Altitude m	130	
Height of vegetation	up to 40cm	
Vegetation cover %	100	
Bare rock cover %	-	
Bare peat cover %	-	
Shrub cover %	33	
Graminoid cover %	33	
Bryophyte cover %	50	
Standing water	20	
No. plant species in quadrat	16	
Substrate	Deep peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	25	5
Eriophorum angustifolium	3-4	3
Calluna vulgaris	30	6
Erica tetralix	<1	2-3
Molinia caerulea	2-3	2-3
Carex sp.	<1	2
Narthecium ossifragum	2-3	3
Cladonia sp.	10	4
Sphagnum papillosum	<1	1-2
Sphagnum capillifolium	2	2-3
Sphagnum cuspidatum	15	5
Sphagnum tenellum	1-2	3

Hypnum jutlandicum	5-10	4
Racomitrium lanuginosum	2-3	3
Pleurozia purpurea	1	3

Quadrat 2 **G 37886 23823**	**Location: Tawnamore**

This quadrat is located within an area of Blanket Bog that is drier and less species rich than adjacent areas, dominated by purple moor-grass (*Molinia caerulea*) with some heather (*Calluna vulgaris*). There is much thatch present and although there is a layer of *Sphagnum* spp. beneath this, the bog is quite dry at this location.

There was no evidence of grazing by sheep in this area, although sheep do have access. Red deer prints were seen close by. This area lies within the Ox Mountains Bogs SAC.

Survey of this area was undertaken early in the season and therefore percentage cover for each species should be regarded as approximate. Likewise, some species may have been missed.

This vegetation in this area appears transitional between **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire,** which is the predominant vegetation community in the surrounding Blanket Bog areas, and **M15 *Scirpus cespitosus-Erica tetralix* Wet Heath**, into which the M17 type characteristically merges, in areas where there are reduced peat depths or changes in topography or hydrology**.**

View from north edge

View from south edge

General view of area

Date	17 April 2018
XY coordinates reading	-8.951610554 54.1596828
Size m²	2x2
Aspect and slope	fairly level
Altitude m	132
Height of vegetation cm	20-30
Vegetation cover %	100
Bare rock cover %	-
Bare peat cover %	-

Shrub cover %	<20	
Graminoid cover %	80	
Bryophyte cover %	10	
No. plant species in quadrat	11	
Substrate	Deep peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	10	4
Calluna vulgaris	15	5
Erica tetralix	1-2	2-3
Molinia caerulea	75	8
Carex panicea	<1	1-2
Narthecium ossifragum	10	4
Sphagnum papillosum	<1	1
Sphagnum capillifolium	<5	3
Cladonia sp.	2-3	2
Hypnum jutlandicum	5	4
Potentilla erecta	<1	1

Quadrat 3 **G 37755 23868**	**Location: Tawnamore**

This quadrat is located within an area of intact Blanket Bog which has some hummock-and-hollow structure and pools of standing water. The surface is spongy and wet underfoot.

The vegetation is dominated by heather (*Calluna vulgaris*) and hare's-tail cottongrass (*Eriophorum vaginatum*), and bog-mosses (*Sphagnum* spp.) are frequent. The heather forms drier hummocks, with hypnoid mosses beneath, which are surrounded by wetter *Sphagnum* spp. hollows.

There is no evidence of grazing in this area, which is located just outside the Ox Mountains Bogs SAC.

The area most closely equates to the NVC vegetation community **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire.**

View from north edge

View from south edge

General view of area

Date	17 April 2018
XY coordinates reading	-8.953559115 54.16002322
Size m²	2x2
Aspect and slope	level
Altitude m	136
Height of vegetation cm	20-30
Vegetation cover %	97
Bare rock cover %	-
Bare peat cover %	2-3

Shrub cover %	35	
Graminoid cover %	60	
Bryophyte cover %	25	
No. plant species in quadrat	13	
Substrate	Deep peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	40	7
Eriophorum angustifolium	1-2	2
Calluna vulgaris	25	5
Erica tetralix	10	4
Molinia caerulea	10	4
Juncus squarrosus	<1	1
Narthecium ossifragum	10	4
Sphagnum cuspidatum	<5	3
Sphagnum papillosum	<1	2
Sphagnum capillifolium	15	5
Sphagnum tenellum	2-3	3
Hypnum jutlandicum	5	4
Cladonia sp.	3	3

Quadrat 4 **G 37726 23846**	**Location: Tawnamore**

This quadrat is located within an area of vegetation that is much drier than the adjacent Blanket Bog and pool system, on the slopes of a small hill. This area is dry and firm underfoot, the vegetation dominated by purple moor-grass (*Molinia caerulea*) and heather (*Calluna vulgaris*). There are occasional hummocks of red bog-moss (*Sphagnum capillifolium*), and this species is also quite abundant beneath the dense *Molinia* thatch that is present.

The heather in this area is quite tall and leggy, and there is no evidence of grazing here. This area is located just outside the Ox Mountains Bogs SAC.

It is likely that the vegetation in this area represents a transition from the **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire** that is found in adjacent wetter, more level areas, towards the Wet Heath community **M15 *Scirpus cespitosus-Erica tetralix* Wet Heath.** This would reflect its location on the slopes of a small hill. This classification is backed up by the local abundance of bog myrtle (*Myrica gale*) in adjacent areas, a species which is a constant of the M15 community type.

View from north edge

View from south edge

General view of area

Date	17 April 2018
XY coordinates reading	-8.954040437 54.15982057
Size m²	2x2
Aspect and slope	north-facing slope, <5˚
Altitude m	132
Height of vegetation	20-50
Vegetation cover %	100
Bare rock cover %	-
Bare peat cover %	-

Shrub cover %	15	
Graminoid cover %	80	
Bryophyte cover %	25	
No. plant species in quadrat	8	
Substrate	Deep peat	
Species	**% cover**	**DOMIN**
Molinia caerulea	75	8
Eriophorum vaginatum	5	4
Calluna vulgaris	15	5
Erica tetralix	1-2	2-3
Sphagnum capillifolium	25	5
Cladonia sp.	<1	1
Aulacomnium palustre	<1	1
Potentilla erecta	<1	1

Quadrat 5 **G 39086 25353**	**Location: Tawnamore**

This quadrat is located within an area of modified Blanket Bog located on level (but locally undulating) ground, on either side of the northern section of the proposed cable route. The quadrat is located approximately 10m from the cable route.

The Blanket Bog is quite wet overall but the surface is relatively firm. Raised hummocks of heather are interspersed by cushions of bog-moss (*Sphagnum* spp.) and some standing water is visible in places. The vegetation is dominated by heather (*Calluna vulgaris*), hare's-tail cottongrass (*Eriophorum vaginatum*) and purple moor-grass (*Molinia caerulea*) with some cross-leaved heath (*Erica tetralix*). *Sphagnum* mosses are quite abundant but appear somewhat degraded in places. Hypnoid mosses are patchily frequent. In some areas, bog myrtle (*Myrica gale*) is abundant and adjacent to the track and soft rush (*Juncus effusus*) is quite frequent; However, neither of these species occurs within the quadrat area.

The general area is grazed by sheep and connects improved grassland to the north with grazing land adjacent to the river. Some nibbling of grasses was noted within the quadrat. Some areas within the Blanket Bog appear to be periodically utilised for spreading hopper turf, in particular to the east of the cable route.

The vegetation in this area most closely equates to **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire,** but does appear a little degraded, perhaps as a result of grazing and turf cutting activities.

Numerous skylark and meadow pipit were observed singing and displaying in this general area.

This area is located within the Ox Mountains Bogs SAC.

View from north edge

View from south edge

General view of area

Date	17 April 2018
XY coordinates reading	-8.933586771 54.17351057
Size m²	2x2
Aspect and slope	level
Altitude m	116
Height of vegetation	25-30cm
Vegetation cover %	100
Bare rock cover %	-
Bare peat cover %	-

Shrub cover %	25	
Graminoid cover %	70	
Bryophyte cover %	25	
No. plant species in quadrat	16	
Substrate	peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	50	7
Eriophorum angustifolium	1-2	3
Molinia caerulea	20	5
Calluna vulgaris	25	6
Erica tetralix	5	4
Succisa pratensis		1
Potentilla erecta	<1	2
Sphagnum palustre / papillosum	0.25	1-2
Sphagnum tenellum	<0.25	1
Sphagnum capillifolium	10	4
Sphagnum subnitens	10	4
Hypnum jutlandicum	<5	3
Hylocomium splendens		1
Rhytidiadelphus squarrosus		1
Dicranum scoparium		1
Cladonia sp.		1

Quadrat 6 **G 38893 24944**	**Location: Tawnamore**
This quadrat is located within an area that is similar to that described for Q5, but wetter and appearing in better condition – it may be less frequently grazed? The vegetation in this area is dominated by heather (*Calluna vulgaris*), hare's-tail cottongrass (*Eriophorum vaginatum*) and purple moor-grass (*Molinia caerulea*) with abundant bog-mosses, mainly red bog-moss (*Sphagnum capillifolium*). *Cladonia* lichen is abundant upon the heather hummocks and two species were noted (*C. potentosa* and *C. uncilaris* ssp. *biuncilaris* ?) The vegetation contains lots of dry thatch and the surface is relatively firm. Woolly fringe-moss (*Racomitrium lanuginosum*) was observed elsewhere in this area, but was infrequent. The vegetation in this area most closely equates to **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire.** Percentages given below should be regarded as approximate due to the early season – new growth of grasses and herbs had not appeared at the time of the survey This area is located within the Ox Mountains Bogs SAC.	

View from north edge

View from south edge

General view of area

Date	17 April 2018	
XY coordinates reading	-8.936450789 54.16984224	
Size m²	2x2	
Aspect and slope	level	
Altitude m	109	
Height of vegetation	25	
Vegetation cover %	100	
Bare rock cover %	-	
Bare peat cover %	-	
Shrub cover %	35	
Graminoid cover %	60	
Bryophyte cover %	30	
No. plant species in quadrat	11	
Substrate	peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	40	7
Eriophorum angustifolium *	10	4
Molinia caerulea *	10	4
Calluna vulgaris	30	6
Erica tetralix	5	4
Sphagnum capillifolium	20	5
Sphagnum subnitens	5	4
Sphagnum tenellum		1
Hypnum jutlandicum	1-2	2-3
Cladonia sp.	8-10	4
Potentilla erecta		1

Quadrat 7 **G 38707 24660**	**Location: Tawnamore**

This quadrat is located within quite low-growing Blanket Bog vegetation that is quite wet underfoot but nonetheless has a relatively firm surface. It is situated upon a level area on top of a ridge. The ridge slopes support a drier, less diverse Blanket Bog vegetation.

The vegetation is dominated by heather (*Calluna vulgaris*) and hare's-tail cottongrass (*Eriophorum vaginatum*) with some common cottongrass (*Eriophorum angustifolium*) and purple moor-grass (*Molinia caerulea*). Bog-mosses (*Sphagnum* spp.) and hypnoid mosses are frequent to locally abundant in this area. The vegetation in this area appears to most closely correspond to **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire,** while the ridge slopes appear transitional to the **M15 *Scirpus cespitosus-Erica tetralix* Wet Heath** community.

No evidence of grazing was observed although sheep do have access to this area.

This area is located within the Ox Mountains Bogs SAC.

View from north edge

View from south edge

Close-up of vegetation

General view of area

Date	17 April 2018	
XY coordinates reading	-8.939223621 54.16724808	
Size m²	2x2	
Aspect and slope	level / very slight south-facing slope	
Altitude m	126	
Height of vegetation	20-25	
Vegetation cover %	100	
Bare rock cover %	-	
Bare peat cover %	-	
Shrub cover %	35	
Graminoid cover %	60	
Bryophyte cover %	50	
No. plant species in quadrat	15	
Substrate	Peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	40	7
Eriophorum angustifolium	1-2	3
Calluna vulgaris	30	6
Erica tetralix	5	4
Molinia caerulea	10-15	4-5
Carex panicea	1-2	3
Narthecium ossifragum	5?	4?
Sphagnum capillifolium	35	7
Sphagnum palustre / papillosum	1	2
Sphagnum subnitens	1-2	3
Sphagnum tenellum	≤5	3-4
Hypnum jutlandicum	10	4

Dicranum scoparium		1
Cladonia sp.		1
Potentilla erecta		1

Quadrat 8 **G 38664 24527**	**Location: Tawnamore**

This quadrat is located on a slight slope, within vegetation that appears transitional between Blanket Bog and Wet Heath, which is dry and firm underfoot.

The vegetation is dominated by heather (*Calluna vulgaris*) and purple moor-grass (*Molinia caerulea*) with some hare's-tail cottongrass (*Eriophorum vaginatum*). There is lots of dry thatch present. The vegetation in this area appears transitional between the NVC mire communities **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire** and **M15 *Scirpus cespitosus-Erica tetralix* Wet Heath.**

There is no evidence of grazing in this area, although sheep do have access; however no sheep were seen in the vicinity during this field visit.

A little woolly fringe-moss (*Racomitrium lanuginosum*) was observed in the wider area.
This area is located within the Ox Mountains Bogs SAC.

View from north edge

View from south edge

General view of area

Date	17 April 2018
XY coordinates reading	-8.939819701 54.16602588
Size m²	2x2
Aspect and slope	slight southeast-facing slope
Altitude m	120
Height of vegetation	20-25
Vegetation cover %	100
Bare rock cover %	-
Bare peat cover %	-

Shrub cover %	25	
Graminoid cover %	80	
Bryophyte cover %	5-10	
No. plant species in quadrat	15	
Substrate	Peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	10	4
Eriophorum angustifolium	1-2	2-3
Calluna vulgaris	20	5
Erica tetralix	5	4
Molinia caerulea	70	8
Carex panicea		1
Potentilla erecta		1
Pedicularis sylvatica		1
Narthecium ossifragum	up to 5%	2-3
Sphagnum papillosum / palustre	1	3
Sphagnum capillifolium	2	3
Sphagnum tenellum	3	3
Hypnum jutlandicum	1	3
Dicranum scoparium		1
leafy liverworts	1-2	2-3

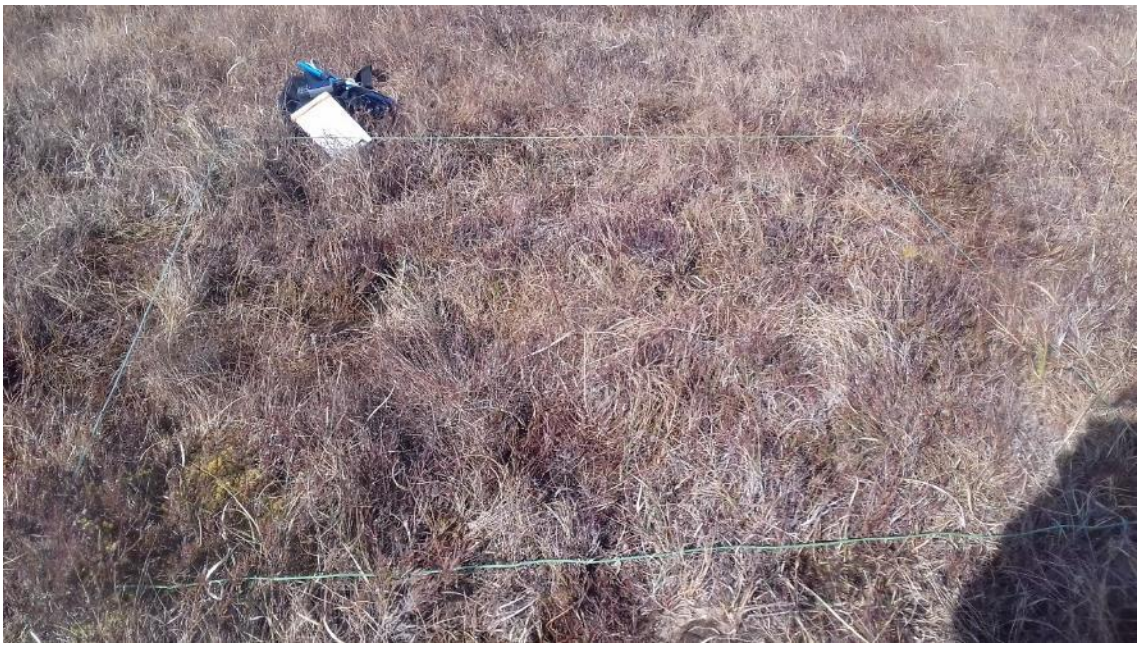
Quadrat 9 **G 38460 24279**	**Location: Tawnamore**

This quadrat is located within an area of wet Blanket Bog with standing water and pools nearby. The surface has some hummock and hollow structure and is quite spongy underfoot. The vegetation is dominated by heather (*Calluna vulgaris*), hare's-tail cottongrass (*Eriophorum vaginatum*), deergrass (*Trichophorum cespitosum*) and bog-mosses (*Sphagnum* spp.) and is notable for the presence of the liverwort species purple spoonwort (*Pleurozia purpurea*), which is indicative of intact blanket and raised bog.

The vegetation in this area appears most characteristic of the NVC vegetation community **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire.**

View from north edge

View from south edge



General view of area

Date	17 April 2018
XY coordinates reading	-8.939819701 54.16602588
Size m²	2x2
Aspect and slope	slight southeast-facing
Altitude m	127
Height of vegetation	20-25
Vegetation cover %	97
Bare rock cover %	-
Bare peat cover / standing water %	1-2

Shrub cover %	25	
Graminoid cover %	60	
Bryophyte cover %	25	
No. plant species in quadrat	17	
Substrate	Deep peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	30	6
Eriophorum angustifolium	5	4
Calluna vulgaris	20	5
Erica tetralix	10	4
Trichophorum cespitosum	25	6
Carex panicea	<1	2
Narthecium ossifragum	5?	4?
Sphagnum papillosum / palustre	3	3
Sphagnum capillifolium	5	4
Sphagnum cuspidatum	5	4
Sphagnum subnitens	2-3	3
Sphagnum tenellum	5	4
Sphagnum denticulatum	0.5	2-3
Hypnum jutlandicum	2-3	3
Dicranum scoparium	0.25	2
Pleurozia purpurea	1-2	3
Cladonia sp.		1

Quadrat 10 **G 38020 23970 WP 81**	**Location: Tawnamore**

This quadrat is located within an area of tall tussocky Blanket Bog / Wet Heath vegetation which is dominated by purple moor-grass (*Molinia caerulea*) and heather (*Calluna vulgaris*), situated on a ridge of land above the Easky River. The area is generally quite dry underfoot although *Sphagnum* spp. mosses are present in one corner. There is no evidence of grazing by livestock although sheep do have access.

The vegetation in this quadrat most closely aligns to the **M15 *Scirpus cespitosus-Erica tetralix* Wet Heath** NVC community. This is the only quadrat at this site in which bell heather (*Erica cinerea*) was recorded)

This area is located within the Ox Mountains Bogs SAC.

View from north edge

View from south edge

General view of area

Date	17 April 2018
XY coordinates reading	-
Size m²	2x2
Aspect and slope	slight southeast-facing?
Altitude m	133
Height of vegetation	40-70
Vegetation cover %	100
Bare rock cover %	-
Bare peat cover %	-

Shrub cover %	33	
Graminoid cover %	70	
Bryophyte cover %	10	
No. plant species in quadrat	5	
Substrate	Deep peat	
Species	**% cover**	**DOMIN**
Calluna vulgaris	25	6
Erica tetralix	2-3	2
Erica cinerea	≤5	3-4
Molinia caerulea	70	8
Cladonia sp.	<1	2
Sphagnum capillifolium	10	4

Quadrat 11 **G 38084 23919**	**Location: Tawnamore**

This quadrat is located within an area of very wet Blanket Bog vegetation which contains numerous *Sphagnum* spp. filled pools; however, there is no bare ground or standing water within the quadrat.

The ground surface is spongy with a hummock and hollow structure. The vegetation is dominated by hare's-tail cottongrass (*Eriophorum vaginatum*) and heather (*Calluna vulgaris*) with abundant bog-mosses (*Sphagnum* spp.) and *Cladonia* sp. lichen. There is no evidence of grazing here although sheep do have access. This area is level with many pools and has some characteristics of raised bog. Its vegetation most closely equates to the NVC vegetation community **M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire**. This area is located within the Ox Mountains Bogs SAC.

View from north edge

View from south edge

General views of area

Date	17 April 2018	
XY coordinates reading	-8.948512771 54.16052565	
Size m^2	2x2	
Aspect and slope	level	
Altitude m	130	
Height of vegetation	20-25 (max 30cm)	
Vegetation cover %	100	
Bare rock cover %	-	
Bare peat cover %	-	
Shrub cover %	35	
Graminoid cover %	60	
Bryophyte cover %	35	
No. plant species in quadrat	12	
Substrate	peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	55	8
Eriophorum angustifolium	2-3	2
Calluna vulgaris	25-30	6
Erica tetralix	5-10	4
Molinia caerulea	<1	2
Narthecium ossifragum	5?	4?
Pedicularis sylvatica		1
Sphagnum papillosum / palustre	15	5
Sphagnum capillifolium	5	4
Sphagnum tenellum	2-3	3
Sphagnum cuspidatum	2	3
Cladonia sp.	10	4

Quadrat 12 **G 38772 24771**	**Location: Tawnamore**

This quadrat is located on an east-facing gentle slope above the Easky River. The vegetation is dominated by heather (*Calluna vulgaris*) and hare's-tail cottongrass (*Eriophorum vaginatum*) with purple moor-grass (*Molinia caerulea*) and some red bog-moss (*Sphagnum capillifolium*) and is somewhat reminiscent of Wet Heath. Immediately to the south is an area that supports abundant bog myrtle (*Myrica gale*). This species is absent from the area to the north.

The vegetation is tall and tussocky, with a deep layer of thatch beneath, and the ground is relatively dry and firm underfoot. Other grasses (e.g. wavy hair grass *Deschampsia flexuosa*) may be present but new growth has not yet emerged.

There is a sparse cover of bryophytes beneath the thatch layer - the exact extent of bryophyte cover is difficult to assess.

The vegetation in this general area most closely equates to the NVC vegetation community **M15 *Scirpus cespitosus-Erica tetralix* Wet Heath.**

Sheep have access to this area but there are no obvious signs of grazing.

This area is located within the Ox Mountains Bogs SAC.

View from north edge

View from south edge

General view of area

Date	17 April 2018
XY coordinates reading	-8.938178301 54.16827713
Size m²	2x2
Aspect and slope	5˚ east-facing slope
Altitude m	121
Height of vegetation	20-40
Vegetation cover %	100
Bare rock cover %	-
Bare peat cover %	-

Shrub cover %	40	
Graminoid cover %	65	
Bryophyte cover %	10-15	
No. plant species in quadrat	11	
Substrate	Deep peat	
Species	**% cover**	**DOMIN**
Eriophorum vaginatum	50	7
Calluna vulgaris	35	7
Erica tetralix	1-2	2
Myrica gale	3	2
Molinia caerulea	15	5
Sphagnum palustre		
Sphagnum spp. *(*mainly *S. capillifolium,* possibly some *S. fallax*)	5	4
Hypnoid mosses *(Kindbergia praelonga, Hypnum jutlandicum, Hylocomium splendens)*	5-10	4-5

APPENDIX 2 – CONSTRUCTION METHOD STATEMENT

Black Lough Wind Farm
Tawnamore
County Sligo

Method Statement
Electrical Connection Between Black Lough and Cloonkeelaun

Prepared for:
Black Lough Windfarm Ltd
Tawnamore
County Sligo

Prepared by:
Keohane Geological & Environmental Consultancy
Ivy House
Clash
Carrigrohane
County Cork

August 2018

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1 INTRODUCTION

1.1 Overview of Scope of Work

Sligo County Council granted planning permission to John Hallinan for a wind farm consisting of four turbines at Tawnamore in June 2017 – planning number PL17/93 refers. The permission included a control building at Black Lough to facilitate connection to the National Grid at Glenree County Mayo. Two separate planning permissions were granted for this grid connection; planning number PL16/422 in County Sligo and planning number P16/822 in County Mayo.

The permitted cable route between Black Lough and Cloonkeelaun is 6.92km long, entirely underground and largely follows existing public and bog roads; a short section (~330m) goes 'cross-country' at the approach to the Cloonkeelaun control building. Approximately 1.5km of the permitted route passes through the Ox Mountains Bogs SAC. The original route was selected to follow roads as far as possible as it might become an ESB asset (depending on the outcome of the Cloonkeelaun turbines application), connecting the control building at Black Lough to Glenree. The grid connection (i.e. the ESB asset) will now be between Cloonkeelaun and Glenree. The connection between Black Lough and Cloonkeelaun is now, technically, an internal electrical connection.

Due to difficulties with landowner leases along the permitted route between Black Lough and Cloonkeelaun, an alternative electric connection is required. The proposed route is a shorter (2.6km), more direct, route then the permitted one (granted under PL16/422). The proposed route has the required landowner lease in place.

The proposed route will consist of:

1. Approximately 2.3km of overhead line and 340m of underground cabling.
2. The underground sections will use either direct burial of cables or using ducting (150mm diameter PVC ducts); the ducts are installed first, and the cables are pulled through at a later stage, which is the likely method to be used. The trench will be approximately 1.2m deep and 0.4m wide, with earthing conductors and 150mm diameter and 50mm diameter ducting for electrical cables, communications and low voltage cables. The underground sections consist of:
    a. 240m of underground cabling will extend from turbine T2 at Black Lough to the first wooden pole. This underground section is needed to provide sufficient setback of the overhead line from the turbine in accordance with ESB safety specifications. The underground section at Black Lough will follow the alignment of an existing farm track that passes turbine T2 and extends in a southerly direction.
    b. 100m of underground cabling from the southern-most pole to the control building at Cloonkeelaun. The underground section at Cloonkeelaun will cross blanket bog.
3. Approximately 18 No single wooden poles with stays at the 2 No. end poles, 4 No angle poles and at locations where ground conditions require stays.
4. Of the total grid route length, approximately 2km of the overhead line will pass through the Ox Mountains Bogs SAC.

This document is produced to outline works involved in the construction of the electrical connection and the environmental mitigation measures required as a result of these works. This Method Statement should be read in conjunction with the Natura Impact Statement (NIS) prepared for the proposed project.

1.2 Environmental Setting

The area surveyed by the project ecologist for this proposal lies largely within the north western part of the Ox Mountains Bogs Special Area of Conservation (site code 002006). The location of the proposed route in relation to the Ox Mountains Bogs SAC is illustrated in Figure 1-1, with typical habitats shown in Plate 1-1.

The survey area is located in the vicinity of the Easky river system, and the electrical connection crosses the Gowlan River (as a pole-mounted overhead line) approximately 1.6km upstream of its confluence with the Easky River – refer to Plate 1-2. The Easky river system is known to be important for salmonids and also supports a population of freshwater pearl mussel *Margaritifera margaritifera.* Both Atlantic salmon and freshwater pearl mussel are listed on Annex II and Annex V of the EU Habitats Directive.

The north-eastern section of the proposed route lies to the east of the Gowlan River, where it passes through improved grassland and modified blanket bog, following an existing farm track for part of its length. The proposed route then crosses the river and extends in a south westerly direction across peatland habitats on the western side of the river. Here, the proposed route passes through both wet heath (Fossitt habitat HH3) and intact upland blanket bog (Fossitt category PB2), some of which contains extensive pool systems. The general area of the proposed route is underlain by peat over thick glacial till deposits over limestone bedrock.

Plate 1-1: Typical Blanket Bog Habitat Along Route within SAC

Plate 1-2: Overhead Line Crossing Location of Gowlan River

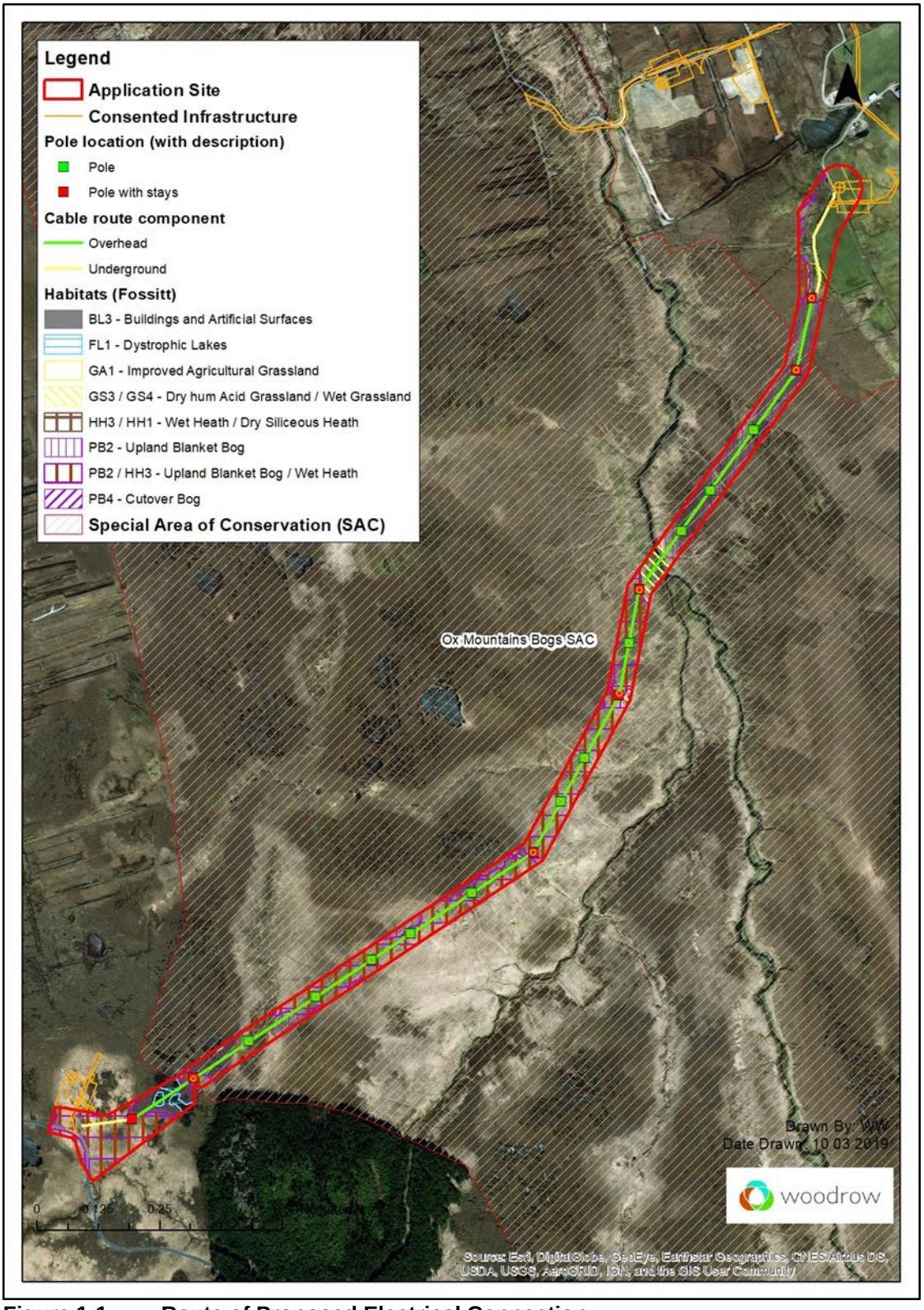

Figure 1-1: Route of Proposed Electrical Connection

2 CONSTRUCTION WORKS

The construction of the electrical connection will involve the following components:

1. Installation of approximately 240m of underground cable from turbine T2 at Black Lough to the first pole. This will follow an existing farm track.
2. Installation of approximately 100m of underground cable from the control building at Cloonkeelaun to the last (southerly-most) pole. This will cross blanket bog.
3. Delivery and installation of approximately 18 wooden poles.
4. Stringing of conductors (cables) on the wooden poles and pulling through the ducting at each end.

2.1 Site Access

The Gowlan River splits the project corridor in two. Access to the site to the east of the Gowlan River will be through the Black Lough Wind Farm using existing farm tracks and roads upgraded for the wind farm. Access to the site to the west of the Gowlan River will be from the forestry / wind farm road at Cloonkeelaun.

There will be no in-stream works or machinery crossing of the Gowlan River during the construction of the electrical connection.

2.2 Plant & Equipment

An indicative list of the main plant and equipment to be used for the construction of the electrical connection is set out in Table 2-1.

Table 2-1: Indicative List of Main Plant & Equipment to be Used

Plant & Equipment
2 No. 13-tonne low ground pressure, wide-track excavators (bogmaster)–see Plate 2-1
1 No. Argocat, low ground pressure vehicle with rubber tracks (if required))–see Plate 2-2
Cable drum carrier–see Plate 2-3
Cable Winch / Rope Puller–see Plate 2-4
Cable rollers (mounted on pole cross-arms)-see Plate 2-5
Various tools for connecting cables and removing the rollers

Plate 2-1: Wide-Track Excavator (Bog Master)

Plate 2-2: Argocat, Low Ground Pressure Vehicle with Rubber Tracks

Plate 2-3: Cable Drum Carrier

Plate 2-4: Typical Cable Winch / Rope Puller

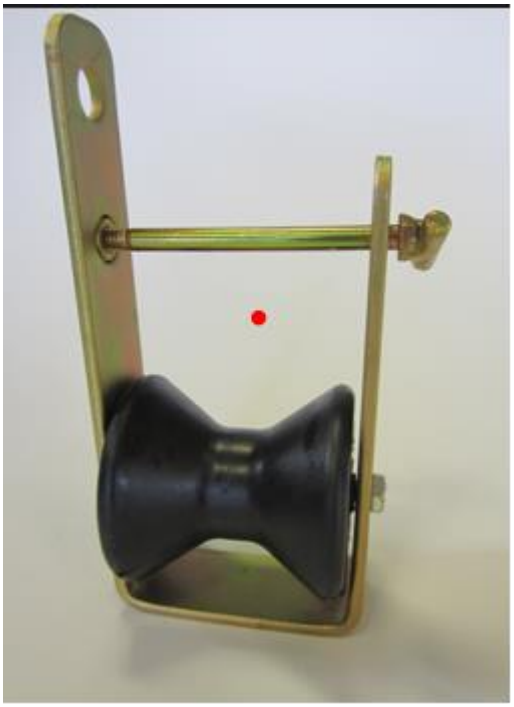

Plate 2-5: Cable Rollers

2.3 Construction of Overhead Line

The construction of the overhead line is summarized as follows:

1. The cranage hardstand at turbine T2 will be used as the main staging area for plant and equipment at Black Lough. A second staging area at the T17 hardstand at Cloonkeelaun will also be used.
2. Surveyors will walk the line route and peg each pole position.
3. Peat depth at each pole location will be probed and ground conditions noted.
4. The working corridor will be marked on the ground by the ECoW using timber post & rope and appropriate signage.
5. Once delivered to the hardstand at T2, the poles will be assembled with cross-arms, rollers, insulators and sleepers. Sleepers will be assembled to suit the ground conditions at each location – poles will be specific to each location to maximise the pre-assembly on the hardstand and minimise works along the route.
6. A helicopter will then deliver the assembled poles, stays and sleepers to each specific location. This will be completed in one day.
7. A low ground-pressure excavator (with split bucket) will enter from the Cloonkeelaun side carrying two bog mats. Bog mats will be used where required for accessing pole locations.
8. Working from the southwestern end of the overhead line, the excavator will dig each hole for poles and temporary store excavated material on bog mats.
9. The excavator will then place pole into the hole and held by two general operatives (GOs) while the excavator backfills the hole. Material will be returned into the hole in reverse order – tills first, followed by catotelm peat then acrotelm peat. The excavator will then move to next pole along the delineated corridor, until it has erected all the poles on the western side of the Gowlan River.
10. At the two stay positions, (for pole locations requiring stays), the excavator will dig and store material on bog mats and then place timber stay in the hole and backfill.
11. The GOs will pull a rope through each of the three rollers mounted on cross arms as they progress. This excavator will remain at the pole nearest the western bank of the Gowlan River until needed for carrying out rollers.

12. A second low ground-pressure excavator will enter the site from the Black Lough side and continue erecting poles and progressively pulling ropes until all the poles are erected. At this stage, three ropes will be strung through the rollers of each pole along the entire overhead route.
13. The ropes will be attached to the end of the cables, which will then be pulled from one end of the line to the other – see Plate 2-4 for cable winch/rope puller. The cable will be mounted on a cable drum carrier, which will be staged on hardstanding outside the SAC.
14. When the three cables are pulled, a GO will the walk the line climbing poles, removing rollers and attaching each conductor to the insulators.
15. The rollers will be collected and carried by excavator as it exists the site towards Cloonkeelaun.

It is anticipated that the poles can be erected in 1 or 2 days, with a further 2 or 3 days needed to pull the cable and transfer the cable from the rollers to insulators.

2.4 Construction of Underground Sections

The underground section at the northeastern end of the connection is approximately 240m long. It follows the alignment of an existing farm track (refer to Plate 2-6) and is outside the SAC.

Plate 2-6: Farm Track in Black Lough – Underground Section of Connection

There are no roadside drains along this farm track where the underground cable is being constructed. There is one culvert under the track along the underground route. The underground section will be constructed as follows:

1. An excavator will be used to dig a trench approximately 1.2m deep and 04.m wide along one side of the farm track. The trenching will commence near the foundation of T2 where the cables will enter the turbine structure.
2. Peat / topsoil and subsoil will be kept separate for reuse in backfill and ground restoration.
3. The trenching, installation of ducting, backfilling and restoration will be carried out on an on-going basis.
4. Once the trench has advanced approximately 20m, ducting, earthing and warning tape/tiles will be installed. Excavated material will be reused to backfill the trench.
5. The trench will continue to the first pole at the Black Lough end of the overhead line.
6. The trenching and installation of ducting will take one to two days to complete.

The underground section at the southwestern end of the connection is approximately 100m long. It crosses blanket bog and is outside the SAC.

1. A wide-track excavator will be used to dig a trench approximately 1.2m deep and 04.m wide. The peat depth is greater than 1.2m along the entire section.

2. Vegetated turves (acrotelm) will be removed to a depth of approximately 500mm and placed to the side of the works area. These turves will be kept whole and in good condition for reuse in restoration of the trench.
3. The catotelm peat will be stored separately for reuse in backfill.
4. The trenching will commence near the location of the control building.
5. The trenching, installation of ducting, backfilling and restoration will be carried out on an on-going basis.
6. Once the trench has advanced approximately 20m, ducting, earthing and warning tape/tiles will be installed. Excavated material will be reused to backfill the trench.
7. The trench will continue to the first pole at the Cloonkeelaun end of the overhead line.
8. The trenching and installation of ducting will take one day to complete.

Once the cables are strung on the poles, each end will be pulled through the ducting of the underground sections; one end terminated in T2 and the other terminated in the control building.

3 MITIGATION MEASURES

Measures to be put in place for the overhead line construction include:

1. All contractors will be given a comprehensive toolbox talk by the ECoW on the sensitive ecological receptors in the area and the use of Best Practice work methods during construction.
2. All materials needed for pole installation and stringing will be delivered to each pole site by helicopter, including assembled poles with cross arms, stays and rollers fitted.
3. All works, and access will be limited to a delineated working corridor within the site. This will be a maximum of 6m wide between pole locations; of maximum dimensions 10m x 10m at pole locations; and of maximum dimensions 5m x 5m at stay locations. This working corridor will be clearly marked out with stakes and rope with signage indicating no access beyond the corridor. This corridor has been mapped as part of the NIS and any amendments will be agreed with the Planning Authority and NPWS in advance of works. The route mapped will be adhered to by workers and maps will be within all machinery entering the site.
4. Any concerns over potential impacts on habitats and or water quality will result in the works being suspended and additional control measures put in place. Such measures may include silt fences / traps and curtains to protect downstream environments or a temporary delay in works during adverse weather conditions. Any potential impacts on habitats will have additional controls such as offsetting of machinery corridors (within the overall working corridor) or temporary delay in works during adverse weather conditions if rutting of peat habitats is occurring. Work will not continue until the ECoW is satisfied that there is no pollution risk or damage to sensitive habitats.
5. Plant machinery must be in good working order and must be checked for any fuel or oil leaks or drips every day prior to the commencement of works.
6. Any pollution incident will be immediately reported to the site manager and the on-site ECoW and the Emergency Spill Response protocol for the site will be followed.
7. The excavator used on the western side of the Gowlan River will track in and out only once. This will avoid rutting. An argocat, low ground pressure vehicle with rubber tracks will be used if necessary to transport equipment into/from the site.
8. Refuelling of machinery will be carried out without the need for machinery to be tracking out of the bog, but while avoiding any potential impact on sensitive habitats and watercourses. This will minimise rutting of the surface of the bog habitat if movements are reduced. If required, machinery can be refuelled at pole locations using small containers – jerry cans. These containers can dispense fuel in a controlled and safe manner. However, refuelling will still not be permitted within 50m of the watercourse. Fuel containers will be transported to site using a low pressure argocat rubber tracked vehicle which will reduce the impact on bog habitats. Spill-kits and hydrocarbon nappies will always be onsite in the event of a fuel spill. It is however expected that the excavator can complete the pole installation without the need for refuelling.
9. The excavator will be left secured onsite at the end of each day thus reducing travelling on bog habitats. The machine will always be left outside of the watercourse buffer zone in the event of a fuel spill. A hydrocarbon nappy will be deployed at the end of each day on the underneath of the excavator to prevent any hydrocarbon leaks or hydraulic fluids from escaping to the environment whilst left unattended.
10. The Gowlan River will not be crossed by any type of machinery or vehicles. The pilot ropes will be taken across the river by hand or thrown. The Gowlan River is approximately 4-5m wide at the crossing point and so the pilot rope can be manually handled across the river. A buffer zone of 50m for this river will ensure no machinery can come into this exclusion zone.

Additional measures to be put in place for the underground sections include:

1. Peat will be used as backfill in the trenches, so the trenches don't act as preferential pathways for water movement. Bedding sand will not be used.
2. Areas stripped of vegetation will be kept to a minimum, thereby reducing the areas of soil exposed to erosion.
3. Trenching works will be suspended in periods of heavy rainfall. In this regard, weather forecasts will be monitored and during Met Eireann orange alerts[1], excavations will be suspended.
4. Materials excavated from the trenches will be reused as backfill.

[1] Orange Weather Alert for Rainfall = 50 – 70mm in 24 hours, 40 – 50mm in 12 hours; or 30 – 40mm in 6 hours.

APPENDIX 11-2

FIGURES

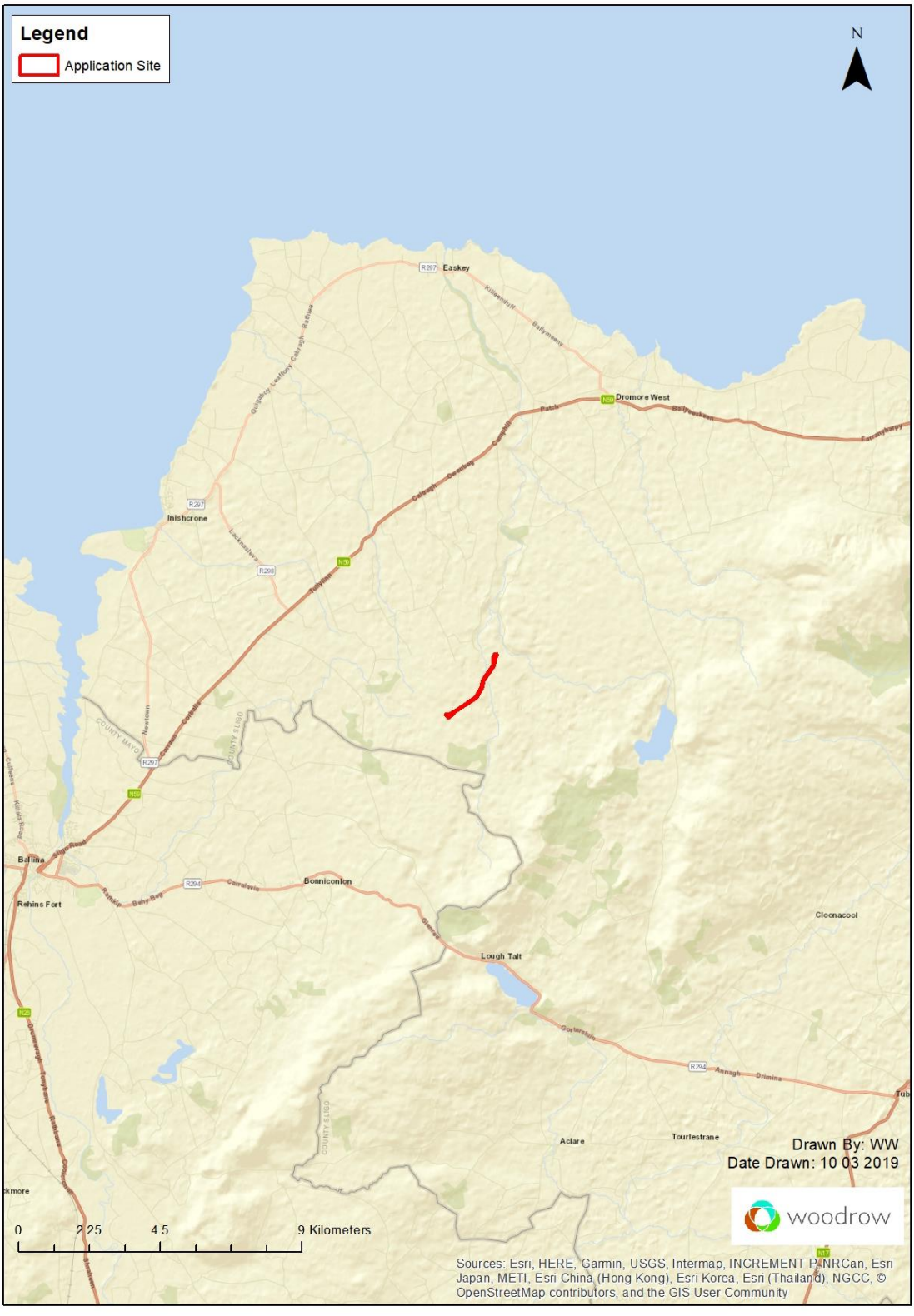

Figure 11-1: EIA Development Location

Figure 11-2a: Designated Areas - International

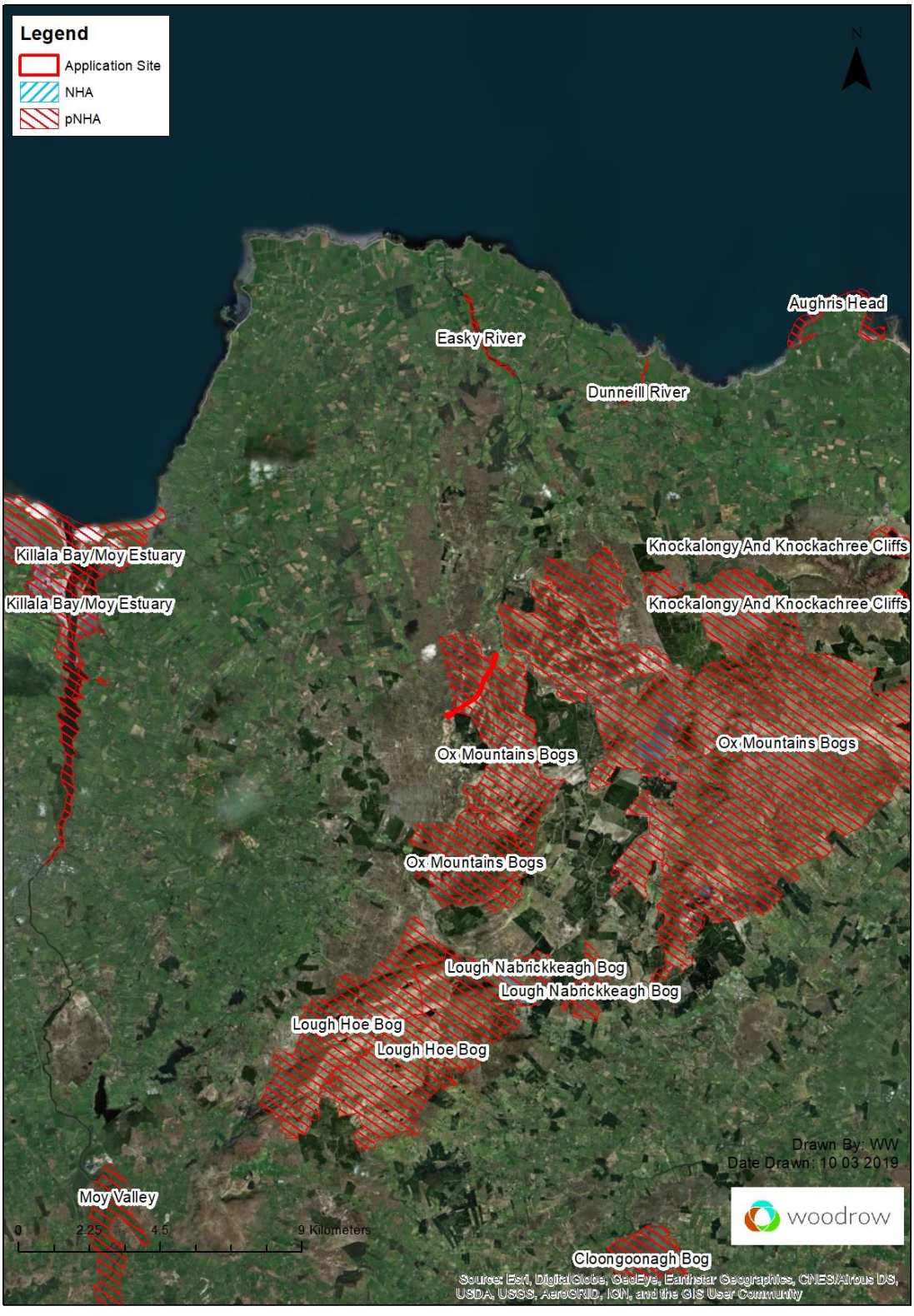

Figure 11.2b: Designated Areas – National

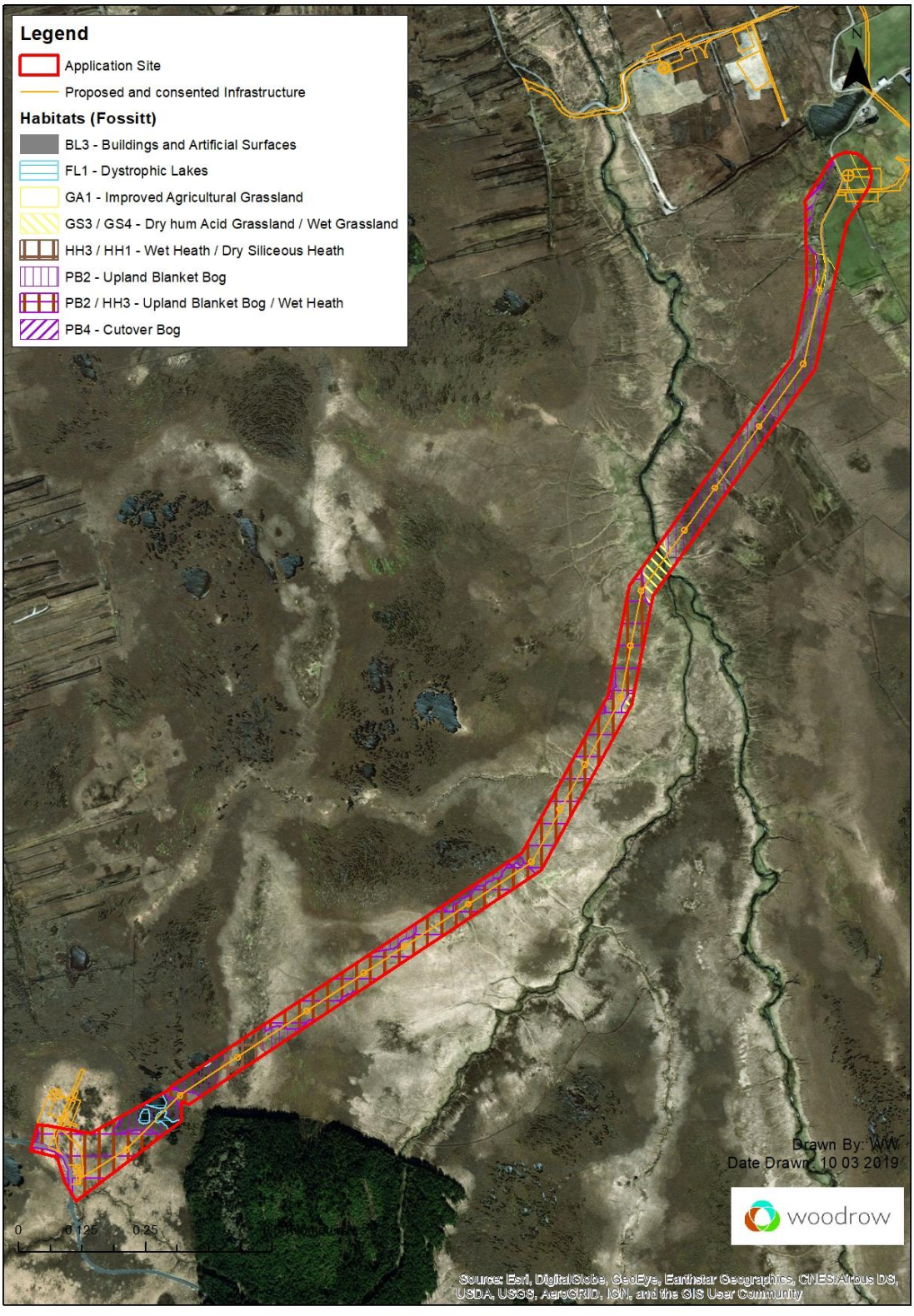

Figure 11.3: Habitats (Fossitt)

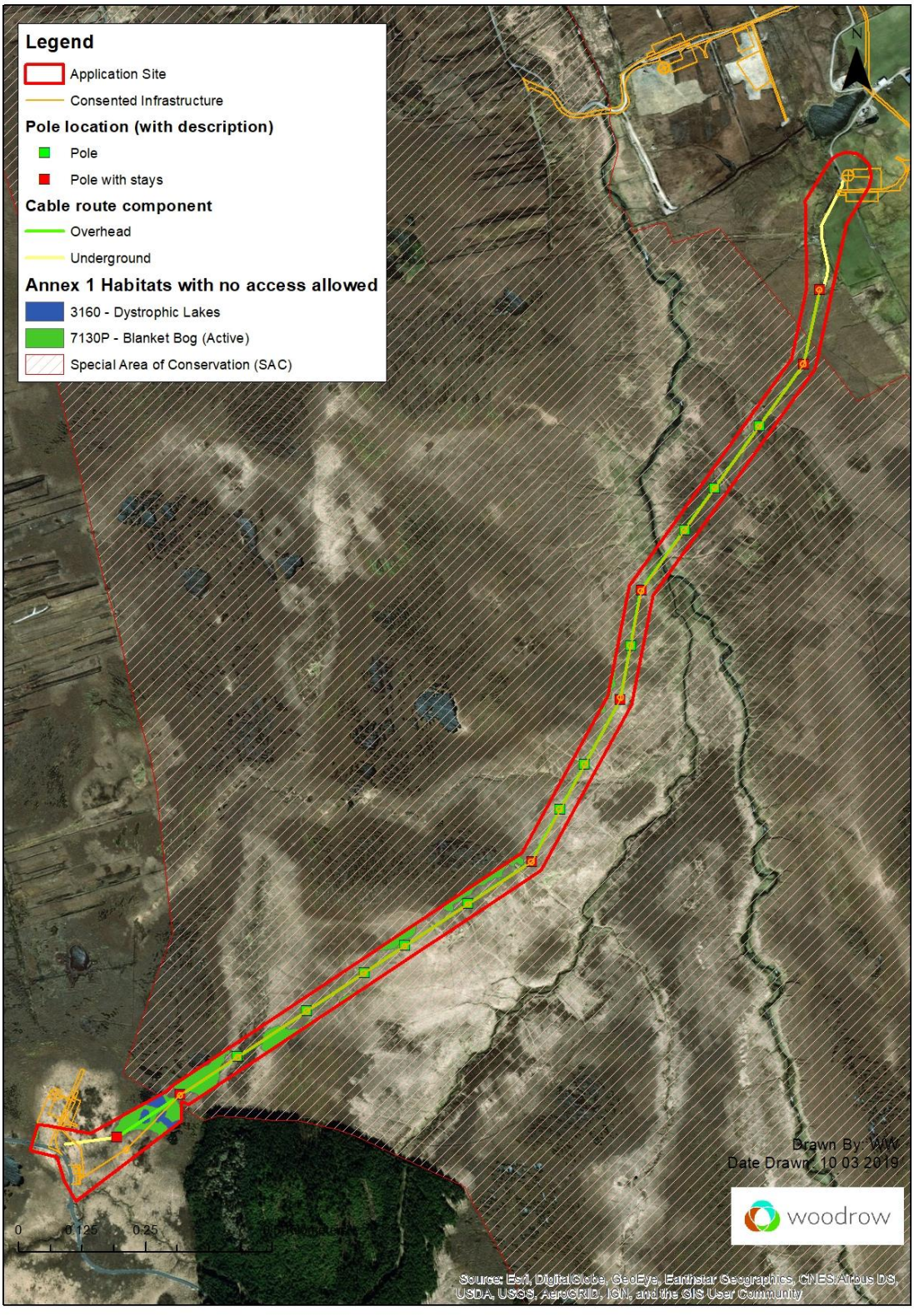

Figure 11.5: Sensitive Habitats to be avoided

APPENDIX 12-1

AVIAN ECOLOGY – TABLES

Table 12.1 Details of winter walkover surveys 2009

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
07-Feb-09	10:00	14:00	3	20	no	5-10
28-Feb-09	13:00	15:30	4	60	no	0-5
21-Mar-09	13:00	15:00	2	80	no	0-5

Table 12.2 Details of winter walkover surveys 2012/13

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
16-Sept-12	08:00	10:20	2	60	no	8-14
01-Oct-12	12:00	14:00	2	100	yes (light)	10
10-Dec-12	11:30	13:00	1	10	no	4
20-Dec-12	15:00	16:40	1	100	no	5
05-Jan-13	12:00	13:20	4	100	yes	10

Table 12.3 Details of winter vantage point surveys

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
07-Feb-09	08:00	10:00	3	20	no	5-10
	16:30	17:15	3	20	no	5-10
28-Feb-09	08:00	11:00	4	60	no	0-5
	15:30	17::00	4	60	no	0-5
21-Mar-09	07:00	10:00	2	80	no	0-5

Table12.4 Details of winter vantage point surveys 2012/13

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
16-Sep-12	11:00	14:00	2	60	no	14
	14:30	17:30	2	80	yes	12
01-Oct-12	09:00	12:00	3	80	no	9-12
	14:00	17:00	2	100	yes	10-14
10-Dec-12	08:30	11:30	1	10	no	2
	13:35	16:35	1	10	no	4
20-Dec-2012	09:00	12:00	1	100	no	5
	12:00	15:00	1	100	no	5
05-Jan-13	09:00	12:00	4	100	yes	9
	13:30	16:30	4	100	yes	10
06-Jan-13	09:00	12:00	3	100	yes	10
	12:40	15:40	3	100	yes	10
Total	36 hours					

Table 12.5 Details of Red Grouse tape lure surveys

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
28-Feb-09	15:30	16:30	4	60	no	0-5
21-Mar-09	10:00	12:00	2	80	no	0-5

Table12.6 Details of breeding season walkover surveys

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
17-Apr-09	11:00	17:30	3	40	No	13
24-Apr-09	10:30	16:30	2	20	No	15
03-May-09	09:30	16:00	1	10	No	20
25-May-09	11:30	14:30	1	10	No	18
22-Jun-09	09:30	14:00	2	30	No	22
29-Jun-09	10:00	16:30	2	40	No	25
16-Jul-09	10:30	14:00	1	20	No	18
17-Jul-09	12:30	15:30	3	80	Yes	18
27-Aug-09	12:30	17:00	5	100	Yes	15

Table 12.7 Breeding season vantage point surveys

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
17-Apr-09	09:00	11:00	3	40	No	13
24-Apr-09	08:30	10:30	2	20	No	15
03-May-09	07:00	09:30	1	10	No	20
25-May-09	07:30	11:00	1	10	No	18
22-Jun-09	07:00	09:30	2	30	No	22
29-Jun-09	07:00	10:00	2	40	No	25
16-Jul-09	07:30	10:30	1	20	No	18
17-Jul-09	09:00	12:30	3	80	Yes	18
27-Aug-09	09:30	12:30	5	100	Yes	15

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
17-Apr-09	09:00	11:00	3	40	No	13
24-Apr-09	08:30	10:30	2	20	No	15
03-May-09	07:00	09:30	1	10	No	20
25-May-09	07:30	11:00	1	10	No	18
22-Jun-09	07:00	09:30	2	30	No	22
29-Jun-09	07:00	10:00	2	40	No	25
16-Jul-09	07:30	10:30	1	20	No	18
17-Jul-09	09:00	12:30	3	80	Yes	18
27-Aug-09	09:30	12:30	5	100	Yes	15

Date	Time Start	Time Finish	Wind	Cloud %	Rain	Max Temp °C
17-Apr-09	09:00	11:00	3	40	No	13
24-Apr-09	08:30	10:30	2	20	No	15
03-May-09	07:00	09:30	1	10	No	20
25-May-09	07:30	11:00	1	10	No	18
22-Jun-09	07:00	09:30	2	30	No	22
29-Jun-09	07:00	10:00	2	40	No	25
16-Jul-09	07:30	10:30	1	20	No	18
17-Jul-09	09:00	12:30	3	80	Yes	18
27-Aug-09	09:30	12:30	5	100	Yes	15

Table 12.8 Summary of Carrowleagh key species results wildfowl (breeding)

Breeding	2005/06	2010	2011	2012	2013	2014
Little Grebe	5	-	-	-	-	-
Cormorant	1 (nb)	-	-	-	-	-
Mallard	7	3	-	-	4	5
Teal	5	-	8	2	-	-

Table 12.9 Summary of Carrowleagh key species results wildfowl (non-breeding)

Winter	2006	2009/10	2010/11	2011/12	2012/13	2013/14
Mallard	10	2	-	2	8	-
Teal	6	-	-	1	-	-
Whooper Swan	11	-	-	-	-	26

Table 12.10 Summary of Carrowleagh key species results raptors (breeding)

Breeding	2005/06	2010	2011	2012	2013	2014
Golden Eagle	a	-	-	-	-	1
Buzzard	a	-	-	-	-	1
Sparrowhawk	p	2	2	2	-	-
Kestrel	p	2	2	2	2	1
Merlin	p	-	1	-	1	-
Peregrine	p	-	1	-	-	-

Table 12.11 Summary of Carrowleagh key species results raptors (non-breeding)

Winter	2006	2009/10	2010/11	2011/12	2012/13	2013/14
Hen Harrier	-	-	1	-	-	-
Sparrowhawk	1		3	3	1	-
Kestrel	1	-	2	3	2	-
Merlin	1	-	-	-	1	-
Peregrine	1	-	-	1	-	-

Table 12.12 Summary of Carrowleagh key species results, red grouse

Breeding/winter	2006	2009/10	2011	2012	2013	2014
Red Grouse	3	3	3	5	3	-

Table 12.13 Summary of Carrowleagh key species results, breeding waders

Breeding	2005/06	2010	2011	2012	2013	2014
Grey Heron	1 (nb)	-	-	-	1 (nb)	-
Common sandpiper	2	-	-	-	-	-
Curlew	1	-	-	-	-	-
Common Snipe	6	4	2	7	5	2
Golden Plover (nb)	1	-	1	1	-	-

Table 12.14 Summary of Carrowleagh key species results waders (non-breeding)

Winter	2006	2009/10	2011	2012	2013	2013/14
Grey Heron	1	-	1	2	1	-
Golden Plover	780*	205	92	82	12	54
Woodcock	-	1	-	4	1	-
Common Snipe	7	4	1	7	16	-
Jack Snipe	2	-	-	-	1	-

Table 12.15 Summary of Carrowleagh key species results gull spp (non-breeding)

Winter	2006	2009/10	2011	2012	2013	2013/14
Common Gull	-	-	-	2	3	-
Lesser Black-backed Gull	-	-	1	-	-	-

Table 12.16 Summary of Carrowleagh key species results gull spp (breeding) nb (not breeding)

Breeding season	2005/06	2010	2011	2012	2013	2014
Common Gull	13 (nb)	1(nb)	3(nb)	2(nb)	3(nb)	2(nb)
Black-headed Gull	5 (nb)	-	-	-	-	-
Lesser Black-backed Gull	15 (nb)	2 (nb)	-	2 (nb)	-	2 (nb)
Herring Gull	-	-	-	-	4 (nb)	-
Great Black-backed Gull	-	-	-	-	4 (nb)	-

Table 12.17 Summary of Carrowleagh key species results general spp (breeding and non breeding)

Breeding season	2006	2010	2011	2012	2013	2014
No. Of surveys	**3**	**5**	**5**	**4**	**5**	**2**
Collared Dove	2	-	-	-	-	-
Wood Pigeon	14	3	2	5	8	-
Cuckoo	2	1	1	1	4	-
Skylark	17	23	29	51	138	39
Swift	5 (nb)					
Sand Martin	13	2	7	9	13	
House Martin	3	3	0	0	0	0
Swallow	30	21	5	13	414	
Meadow Pipit	39	130	73	115	3	51
Pied Wagtail	6					
Grey wagtail	2	3	1	1	2	1
Dipper	2					
Wren	6	6	6	30	25	20+
Dunnock	1	2	1	1	1	

Breeding season	2006	2010	2011	2012	2013	2014
No. Of surveys	**3**	**5**	**5**	**4**	**5**	**2**
Robin	7	4	5	12	26	
Blackbird	7	3	3	2	10	6
Song Thrush	3	1	1	1	2	1
Mistle Thrush	4		2		1	1
Wheatear	2	1	5	3	27	1
Whinchat	1	-	-	-	-	-
Stonechat	8	3	4	1	7	
Sedge Warbler	1	1	1	1	10	3
Whitethroat	2		5	2	1	
Grasshopper warbler	1	-	-	-	-	1
Blackcap	1	2	1	2	1	1
Chiffchaff	-	3	1	1	1	1
Willow Warbler	15	36	16	16	12	22
Goldcrest	7	3	1	1	3	
Long-tailed Tit	8	0	53			
Great Tit	7	10	17	19		16
Coal Tit	9	7	22			1
Blue Tit	5	13	3	1	8	8
Magpie	13	4	2	2	2	1
Rook	23	2	4	3	4	
Hooded Crow	13	26	8	7	63	
Raven	P	14	22	4	17	2
Jackdaw	27	-				
Starling	50	-				
House Sparrow	6	-				
Greenfinch	2	-				

Chaffinch	34	24	6	45	17	11
Linnet	7	15	4	2	4	
Goldfinch	5	6	8	3	4	
Siskin	4	12	27	4	6	6
Lesser Redpoll	9	21		17	7	20
Common Crossbill	12	2	1	2	1	
Bulfinch	-	2				
Reed Bunting	4			9	7	3

Winter	**2006**	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
No. Of surveys	**1**	**2**	**2**	**4**	**2**	**3**
Wood Pigeon	3			1	9	
Skylark	2		5		8	
Meadow Pipit	30	14	4		57	18
Grey wagtail	1			4	1	
Wren	4	16	2	12	12	
Dunnock	-			3		1
Robin	5	10	1		28	7
Blackbird	7			7		2
Song Thrush	1				3	
Mistle Thrush	4		2	2	2	1
Redwing	25		3	2	65	82
Fieldfare	160				35	
Stonechat	8	13				

Winter	**2006**	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
No. Of surveys	**1**	**2**	**2**	**4**	**2**	**3**
Goldcrest	3	3		8		
Long-tailed Tit	-			15	25	
Great Tit	3		4	17	2	1
Coal Tit	7				24	
Blue Tit	1		3	23	8	
Magpie	12			2	1	
Rook	7				6	
Hooded Crow	18		4	8	7	12
Raven	5	3	2	7	1	2
Chaffinch	26		6	12	30	7
Siskin	4		2	7	3	25
Lesser Redpoll	6		1	1	15	150+
Common Crossbill	7		5	5	1	
Reed Bunting	2	3		187	7	

APPENDIX 12-2

AVIAN ECOLOGY – FIGURES

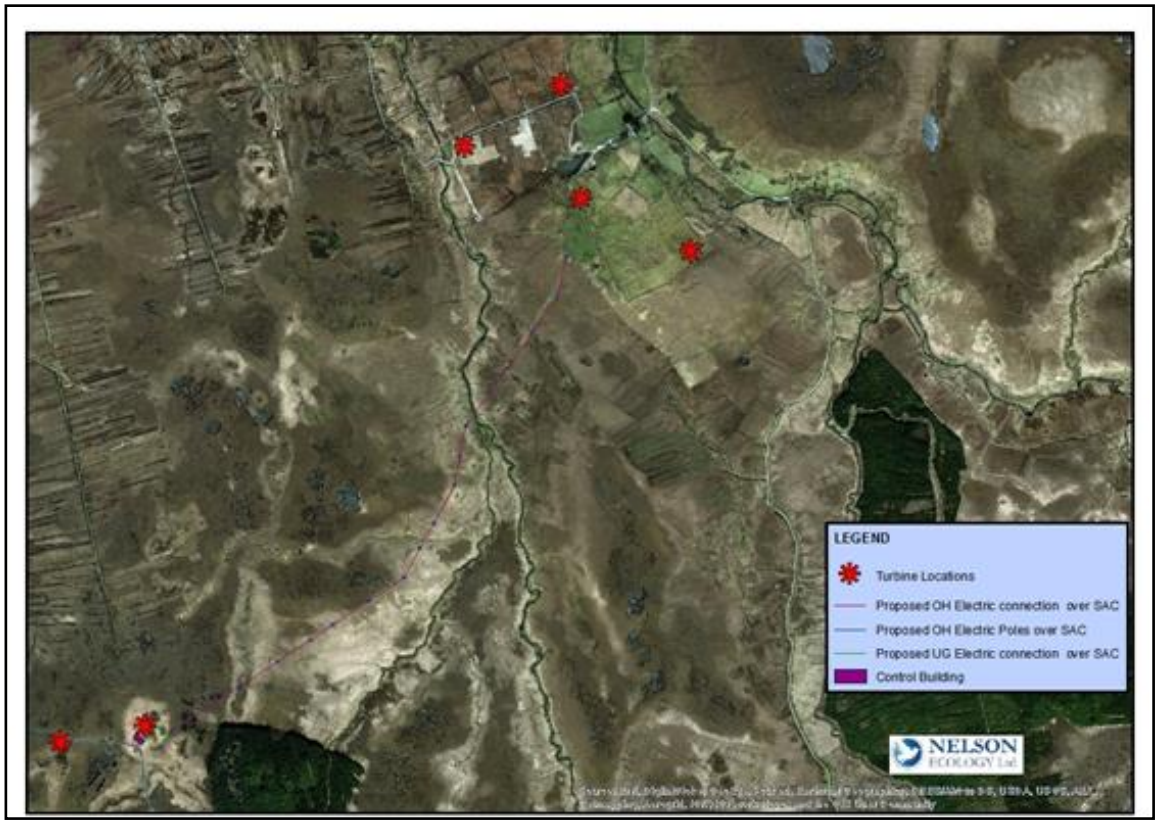

Figure 12. 1 Site Plan and Boundaries

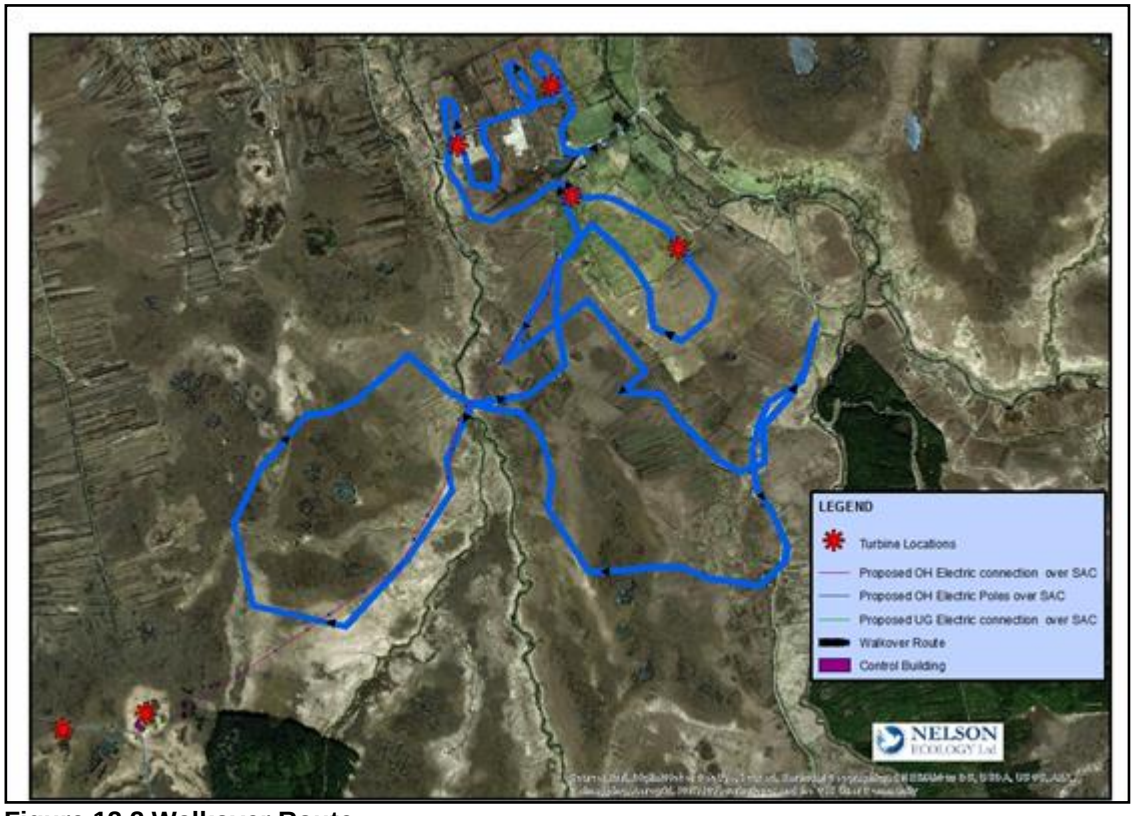

Figure 12.2 Walkover Route

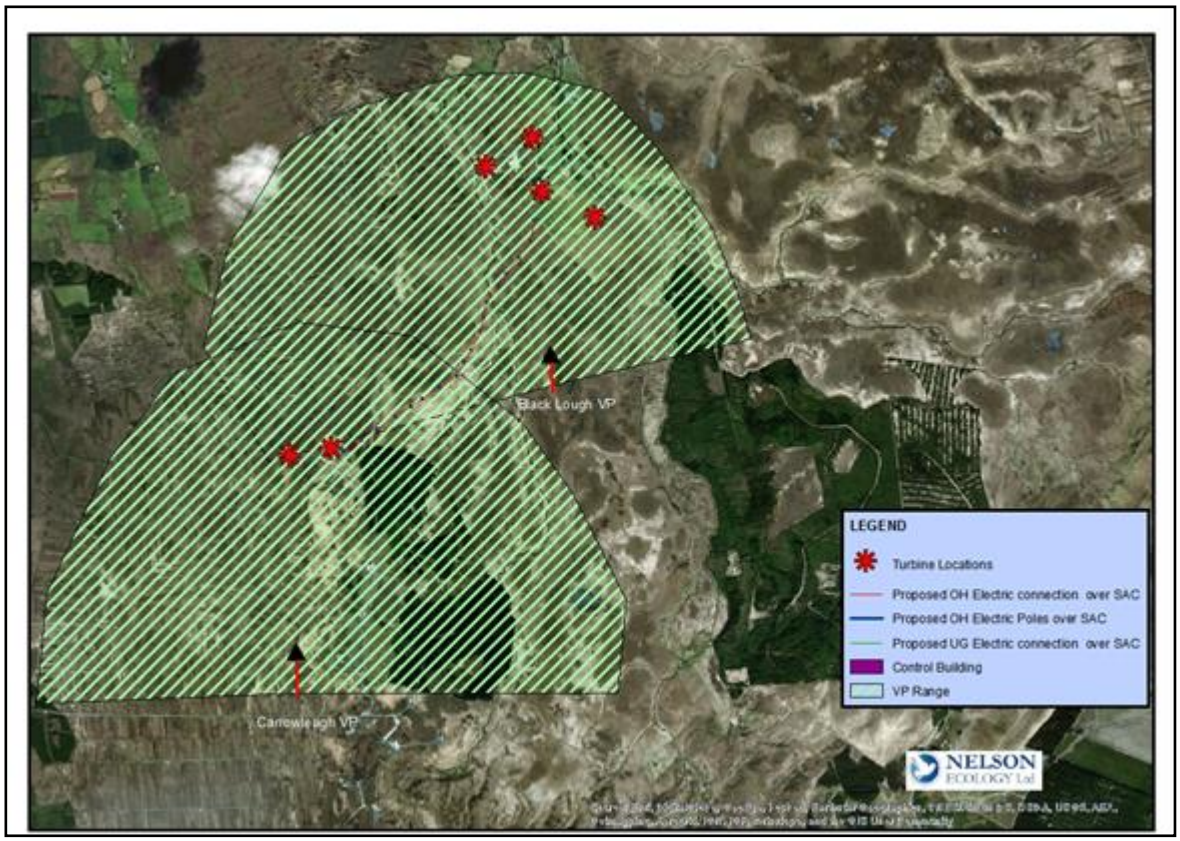

Figure 12.3 Vantage Point

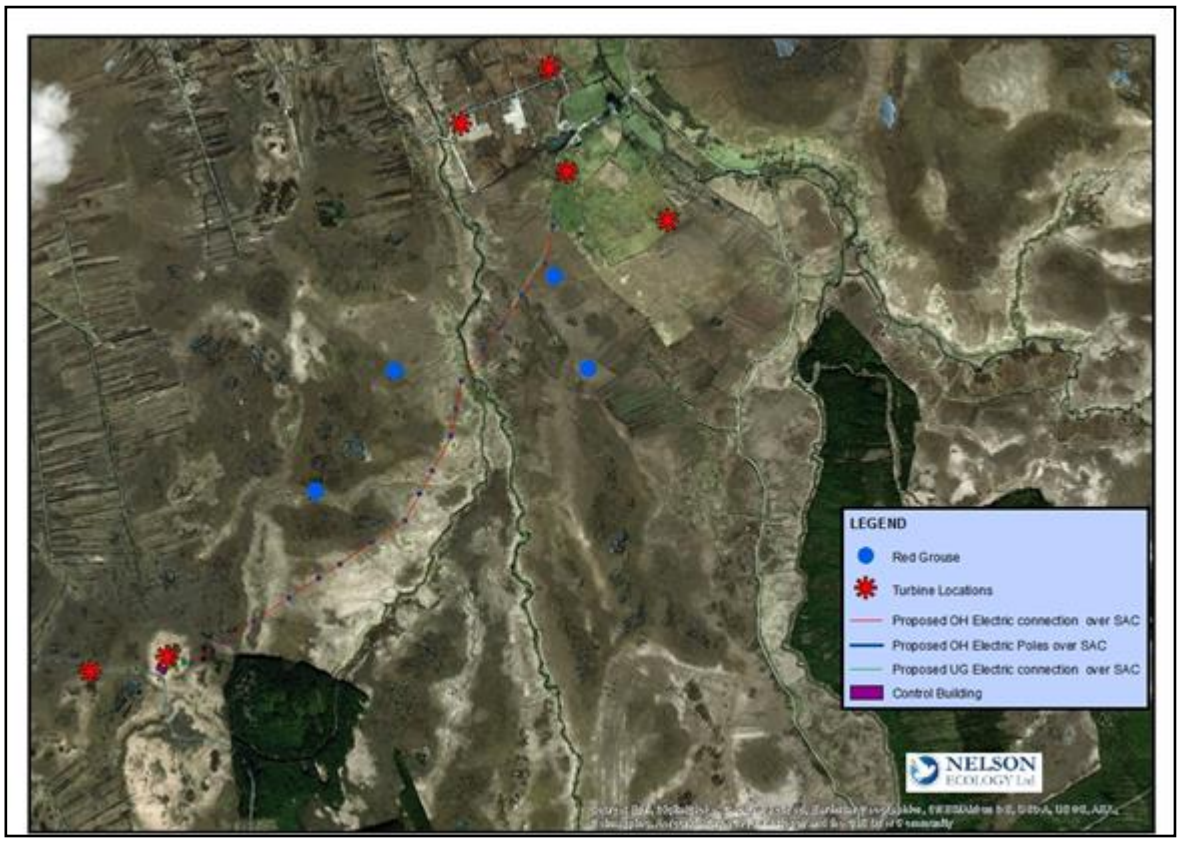

Figure 12.4 Red Grouse Locations

APPENDIX 12-3

AVIAN ECOLOGY – METHODS

Methods

Brown and Shepherd Upland Wader Walkover Surveys 1993 (Modified)

Surveys for breeding waders and all species should take place out to a distance of 500m from the proposed wind farm site. For most species the Brown & Shepherd (1993) survey method is used. This method involves three visits to the survey area, one early in breeding season and the two at a later date. The first visit generally aims to detect earlier breeding species (e.g. curlew) and territorial display in later breeding species (e.g. golden plover), and the second visit aims to detect birds alarm calling when they have chicks. The Brown & Shepherd (1993) method, like many survey methods, is sensitive to the timing of survey visits: visits which are too late or too early can miss vital stages of the breeding season which generate records of evidence of breeding. Timing of breeding varies geographically and annually. It can be sensible, therefore, to plan for and undertake three survey visits (which should be undertaken April to July) in order to ensure that key phases of the breeding cycle are not missed, especially in areas where existing information on the timing of breeding is absent.

Unfortunately this method, designed and tested for survey of some upland wader species over large areas, has been inappropriately used by some assessment studies. The following cautionary statements need to be emphasised, therefore:-

- The method should not be used for raptors or waterfowl or for birds in non-upland habitats.
- It is NOT appropriate for all upland breeding wader species: refer to Gilbert et al. (1998) for those species for which it is appropriate and for methods for other species (e.g. whimbrel, dotterel, and typically lowland species).
- All survey visits should be undertaken in the same season; splitting survey visits between years (e.g. visit 1 in year 1, visit 2 in year 2 etc) is not valid.
- Observation time during a Brown & Shepherd (1993) survey does not count towards observation time conducted under Vantage Point watches: the two methods are not consistent in design or objectives.
- Locations of records of breeding birds from a Brown & Shepherd (1993) survey represent points where a bird has been seen displaying some evidence of breeding. They do not indicate precisely where nest sites are. Wader brood movements can be extensive and some species can display over several hundred square metres of ground. A Brown & Shepherd survey merely picks up a snapshot of such movements.

The method is adapted for passerines and all species of open uplands or scrubby habitats as it is similar to several species-specific methods (Gilbert et al 1998). Typically, the method as developed for waders is to record after about 09:00 in the morning (Brown & Shepherd 1993). By extending the method to include the hours between dawn and 09:00, passerines can be included within a survey.

Vantage Point Watches SNH 2014

Breeding waders of conservation interest should be included as target species during VP watches: these can be combined with VP watches for other target species i.e. VP watches can simultaneously collect data on breeding waders and breeding raptors. These should be timed to occur March – August, and should involve at least 36 hours of observation from each VP and be stratified to record periods of flight display when flight activity may be greatest. Display tends to be more common earlier in the season. Other flight activity can be more common immediately before and after dawn and in the evening around twilight e.g. golden plover during changes in golden plover may also fly between breeding sites and off-site grassland according to weather conditions before breeding commences. Such temporal patterns of activity should be reflected in the temporal pattern of VP observations in order to efficiently record more potentially risky flight line observations (though observations should also be conducted at other times to gain a representative picture). The decision on which wader species to include as secondary species should depend on how many other target species are selected and the capacity of observer effort to cope with a limited number of species and/or activity.

Vantage point (VP) watches are a means of quantifying flight activity of bird species of conservation importance that take place within the wind farm envelope, with the principal aim of determining the likely collision risk. Activity patterns and time spent flying within the turbine envelope may also allow an assessment of the consequences of displacement assuming that the turbines are built.

Purpose

The purposes of vantage point watches are to:

1. Collect data on target species (see Section 3.2 of main text) that will enable estimates to be made of:
    a. The time spent flying over the defined survey area;
    b. The relative use of different parts of the defined survey area; and
    c. The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and rotor hub height.
2. Calculate an index of flight activity for other species - secondary species using the defined survey area.

Methods

Information is collected during timed watches from strategic vantage points (VPs) covering the defined survey area, which encompasses the turbine envelope and extends anything from 200m to 500m beyond the outermost proposed turbines. In the majority of cases, a 200m extension is sufficient to deal with inaccuracies of position for flight line observations.

1. The survey area should not be too restrictive otherwise there is a danger that chance effects will have a large influence on the recorded flight activity. The envelope, including the 200-500m extension (see above) reduces the risk of failing to record birds that use the wind farm area only occasionally.
2. When selecting VPs, the aim should be to cover all of the survey area such that no point is greater than 2km from a VP. It is very important that VPs are chosen parsimoniously in order to achieve maximum visibility with the minimum number of points. However, separation may be reduced where it is necessary to ensure reliable observations e.g. for smaller species. Ideally, it will be possible to scan an arc of up to 180^{o} from each VP. Larger arcs are difficult to scan efficiently. In exceptional circumstances it may be possible to observe the entire survey area from a single VP. In most cases, however, two or more VPs will be required. For example an upland site in Scotland measuring around $10km^2$ typically requires three or four VPs. It is important to minimise the observer's effect on bird behaviour. For this reason VPs are best located outside the survey area where possible. As acuity of observations will decrease with distance, VPs should be located as close to the survey boundary as possible. VPs should not be located near to the nest site of target species and observers should try to position themselves inconspicuously so as to minimise their effects on bird movements. This often precludes the use of hill summits for VP observations. Obviously, VPs should never be located within the proposed wind farm site, but if there is no alternative but to locate VPs within the wind farm site, then this should only be undertaken when the proposed site is sufficiently large that a part of the wind farm site at least 500m from the VP can be watched (observations at closer distances are potentially biased). Analytically, such potential bias can only be checked for if the area surrounding a VP within a wind farm site is also observed from another VP away from the wind farm site when there is no observer present at the within site VP (i.e. compare the observed bird use during potentially biased conditions against the observed bird use during unbiased conditions). If the observed bird use in the area surrounding the VP within the wind farm is not different with or without an observer present, then this would suggest that the observer has not biased the observation conducted within site. However, considerable effort may be required to generate sufficient records to make such a comparison. When several observers are involved it is advisable to mark the exact location of each VP on the ground, as in some situations, even 8-figure GR may be insufficient to ensure consistency in observer position. Because it is critical that the

spatial coordinates of VPs are measured to the highest level possible, using a Global position System (GPS) is strongly recommended.

3. Watches are undertaken between dawn and by a single observer under conditions of good ground visibility (>3km). Use of more than one observer simultaneously may be required when the number of individual birds is large: responsibilities for taking records of different species and/or individuals should be clear to ensure no errors. When flightlines need to be tracked across large distances (e.g. simultaneously recording records of diver flights from a VP overlooking a nest and from a VP at a distant proposed wind farm site) means of rapid communication between observers will be necessary. The cloud base should be higher than the most elevated ground being observed. In some instances and for some species, observations may be necessary in conditions of low cloud base: clearly in conditions of such visibility will be impaired but auditory records may be possible to indicate if the target species continue to be active under such conditions. Ideally such observations should be made in a range of wind conditions. This is particularly important in the case of soaring birds when wind direction and strength is likely to have a large effect on ranging behaviour. Regular measurement of wind using hand held anemometer is advised in order to investigate the magnitude of this effect.
4. Each watch should last a maximum of three hours but can be suspended and then resumed to take account of changes in visibility (e.g. fluctuations in the cloud base). Experience from field trials suggest that the acuity of most observers declines after three hours, and some may prefer to conduct shorter watches. A gap of at least one hour between watches is advisable. A shorter gap might be used if the watch is shorter than three hours.
5. Guidance for different species groups can be adopted when large numbers of one species occur within the proposed site boundary.
6. During each watch, two hierarchical recording methods are used to record data: focal animal sampling for target species; and activity summaries for secondary species. These are as follows:
    a. Focal animal sampling. The area in view is scanned until a target species is detected at which point it is followed until it ceases flying or is lost from view. The time the target bird was detected and the flight duration are recorded. The route followed is plotted in the field onto 1:25 000 scale maps. The bird's flight height is estimated at the point of detection and then at 15 second intervals thereafter, using, for example, a count-down timer with an audible alarm. Note that this does not apply to display flights of hen harrier and short-eared owl. A 15 second interval is recommended as a practical compromise that aims to minimise dependency within data while maximising the sample of observations. If necessary, the data can be re-sampled after post hoc analysis (e.g. using a one-sample runs test). Flight heights can be classified as <10m, 10-100m, or >100m; depending on rotor blade dimensions and rotor hub height, <20m, 20-100m, or >100m, or other height bands reflecting rotor swept area as appropriate. If conditions allow a finer resolution of height bands (e.g. presence of features of known height) then more detailed observations of flight height should be made. Training and checking of observer accuracy in relation to height estimation should be made and accounted for where this is possible. Use of a clinometer and range finder provides one means of determining flight heights accurately. Observations of target species take priority over completion of activity summaries (b).
    b. Activity summaries. Each watch should be sub-divided into 5 minute periods, at the end of which the number and activity of all secondary species observed should be recorded. If a target species is being tracked at the end of a 5 minute period, then the activity summary for that period should be abandoned and a new one started once observations of the target species have ended. Observation of target species take priority over recording of secondary species. Note that the number of birds recorded should be the minimum number of individuals that could account for the activity observed. Static and flying birds should be recorded separately. Observers should record perched birds and

birds on water bodies once only on arrival at the VP, and the area or site used marked on a map. Thereafter only flying birds and newly noticed perching/swimming birds should be included in the activity summaries. This allows greater time for focal animal sampling, rather than repeated observations of the same static birds. It is simpler to record unusual movements (e.g. flights of gulls) as a separate event rather than incorporate them into 5-minute activity summaries. Wind speed and direction should be recorded as frequently as possible, preferably as part of the 5-minute activity summaries.

At the end of each watch, the locations and activity indicative of breeding by divers, raptors and all other target species should be recorded on the map.

7. For some analyses it is necessary to calculate the amount of time birds spend per unit area of ground surveyed. The use of several VPs can therefore complicate the analyses of collision risk as described by Band et al. (1998) because overlap in visibility means that some parts of the survey area will be observed for longer than others. However, a more statistically robust method is to calculate activity per unit area on the basis of watches from each VP (i.e. the activity is calculated per VP and the un-weighted mean of these measures is used as the metric for input into collision risk models), then this source of error should not arise. However, if the areas for each VP are widely variant, then there may be a need to use an area-weighted mean, assuming the survey time for each VP is broadly consistent (see paragraph 131 of main text). Visibility from each VP can be mapped in the field, from photos taken from each VP, or using terrain data within a Geographic Information System (GIS). Software used to predict the Zone of Visible Influence (ZVI) of wind farm developments, such as Windfarm 2000™, can be useful in this respect.
8. Mapping in the field or from photographs tends to overestimate visibility because observers are unaware that some areas are hidden from view. This is particularly true when convex slopes or undulating terrain are being viewed. In general, therefore, use of GIS is to be preferred. However, in habitats with much woodland or other tall vegetation it will be complex terrain or vegetation relief, visibility can alter with small changes in observer position. It is therefore critical that the spatial coordinates of VP positions be are measured to the highest level of accuracy possible, using a GPS. Also as noted earlier, observers should take care to re-use the exact VP location in successive watches.
9. Birds are often visible when the ground they are flying over is not. Thus birds can sometimes be seen flying or soaring over hidden valleys and watersheds. Since a key purpose (see above) is to estimate the risk of collision with turbines, it is the visibility of the airspace with the turbine rotors (the collision risk volume) that is of prime importance. Therefore it is recommended that visibility be calculated using the least visible part of this airspace i.e. an imaginary layer suspended at the lowermost height passed through by the rotor blade tips (typically about 20m above ground level). Predicting this visibility at this level is a simple task using GIS.

Notes

- Although all points within the survey area are required to be within the 2km of a VP, observations from each VP are not constrained to a 2km radius (i.e. birds are recorded regardless of their distance from the VP).
- At further distances there will be a bias in favour of records of larger target species (geese, swans and large raptors), compared to smaller species such as waders, and raptors such as merlin, which are less easily visible.
- The location of displaying hen harriers and short-eared owls should be recorded as accurately as possible on the maps (including start and finish point, plus extent of display area). Record the duration of display, number of oscillations – counted as number of dives – and the estimated minimum and maximum flying height.

Recording
Data should be recorded on two forms (referred to as 'Form 1' and 'Form 2') and 1:25 000 map(s). Form 1 [activity summaries] must be completed for each VP watch, regardless of whether target species were recorded or not. Use different forms for different watches (i.e. do not combine data from different watches onto one form or map). Forms used should encapsulate the observations listed below and, of course, record start and finish times, observer name, weather records and VP location (cross referenced to the map).

Form 1 Activity Summaries

Use BTO species and activity codes.

Record target species on both forms, but those not in flight will appear on Form 1 only.

Form 2 Focal Sampling

- For each watch number each flying bout consecutively. Cross reference this number to the flight path recorded on the relevant map.
- Record the time the bird is first detected to the nearest minute e.g. 15:45.
- Record duration of flying bout to the nearest second.
- For each flying bout: starting at 0 (zero – point of first detection), number each 15 second interval consecutively, and tick appropriate flying height for each 15 second interval.
- Rule off under each flying bout to highlight end of recording.

Map(s):

- Mark the location of the VP used and if a GPS is used then cross refer GPS location to position on map.
- Mark flight paths of target species and indicate direction of flight. Use different colours and symbols for each species. Provide key on back of form.
- Number each flying bout and cross reference with Form 2.
- Use additional map(s) if data records are cluttering initial map.
- Include information on displaying owls and hen harriers on a separate sheet, but ensure that it is included with all other data sheets and enough information is recorded enabling cross reference with other forms and maps.

APPENDIX 12-4

AVIAN ECOLOGY – REFERENCES

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