

Oatfield Wind farm

Species and Habitat Management Plan

December 2023



Inis

INIS Environmental Consultants Ltd
Planning and Environmental Consultants

Produced by INIS Environmental Consultants Ltd
E: info@inisenvironment.ie, W: www.inisenvironment.ie

Document details

Publisher: INIS Environmental Consultants Ltd.
Planning and Environmental Consultants,
E: info@inisenv.ie
W: www.inisenv.ie

CONTENTS

1 SPECIES AND HABITATS MANAGEMENT PLAN	1-6
1.1 INTRODUCTION	1-6
1.1.1 Purpose of this Report.....	1-6
1.1.2 Project Background	1-7
1.1.3 Previous experience designing SHMP for Hen Harrier	1-7
1.2 SITE DESCRIPTION.....	1-8
1.2.1 Overview.....	1-8
1.2.2 Ecological Baseline: Key Species	1-8
1.2.3 Ecological Baseline: Other Species	1-10
1.2.4 Ecological Baseline: Habitats	1-10
1.3 MANAGEMENT OBJECTIVES	1-15
1.4 ECOLOGICAL CONTEXT	1-15
1.4.1 Hen Harrier	1-15
1.4.2 Red Grouse	1-18
1.5 COMPENSATORY HABITATS CALCULATIONS.....	1-18
Turbine 1	1-19
Turbine 2.....	1-19
Turbine 3.....	1-20
Turbine 4.....	1-20
Turbine 5.....	1-20
Turbine 6.....	1-20
Turbine 7.....	1-21
Turbine 8.....	1-21
Turbine 9.....	1-21
Turbine 10.....	1-21
Turbine 11.....	1-22
Substation	1-22
Total: All Turbines and substation	1-22
1.6 SITE CONDITIONS AND IDENTIFICATION OF MANAGEMENT AREAS	1-22
1.7 MANAGEMENT PRESCRIPTIONS	1-23
1.7.1 General Management Prescriptions.....	1-23
1.7.2 Management Prescriptions for Hen Harrier.....	1-25
1.7.3 Management Prescriptions for Red Grouse	1-33
1.8 IMPLEMENTATION AND MAINTENANCE	1-34
1.8.1 Timing.....	1-34
1.8.2 Consent	1-34
1.8.3 Procedures	1-34
1.8.4 Responsibilities.....	1-34
1.9 MONITORING AND REVIEWS.....	1-35
1.9.1 Habitats	1-35
1.9.2 Hen Harrier	1-35
1.9.3 Red Grouse	1-35
1.9.4 Collision Fatality Monitoring	1-36

1.9.5 Auditing and Reviews	1-36
1.9.6 Reporting	1-36
1.10 SPECIES AND HABITAT MANAGEMENT PLAN CONCLUSION	1-37
1.11 REFERENCES	1-38
ANNEX A	40
ANNEX B	25

TABLES

Table 1- 1: Baseline habitats within the Study Area	Error! Bookmark not defined.
Table 1- 2: Wider landcover areas within 5 km of the Study Area	1-14
Table 1- 3: Typical annual breeding cycle for Hen Harrier (Hardey et al., 2013)	1-16
Table 1- 4: Recommended classification of habitat types for Hen Harrier assessments.	1-17
Table 1- 5: Habitat compensation allocation	1-19
Table 1- 6: Managed habitats for the Proposed Development	1-23
Table 1- 7: Livestock Unit definitions for grazing management prescriptions	1-27
Table 1- 8: Rush management regimes	1-29

FIGURES

Figure 1- 1: Disturbance Zone Habitats – Regional Context	0
Figure 1- 2: Disturbance Zone Habitats – Local Context	1
Figure 1- 3: Disturbance Zone Habitats – Local Context	2
Figure 1- 4: Turbine 1 Habitats	3
Figure 1- 5: Turbine 2 Habitats	4
Figure 1- 6: Turbine 3 Habitats	5
Figure 1- 7: Turbine 4 Habitats	6
Figure 1- 8: Turbine 5 Habitats	7
Figure 1- 9: Turbine 6 Habitats	8
Figure 1- 10: Turbine 7 Habitats	9
Figure 1- 11: Turbine 8 Habitats	10
Figure 1- 12: Turbine 9 Habitats	11
Figure 1- 13: Turbine 10 Habitats	12
Figure 1- 14: Turbine 11 Habitats	13
Figure 1- 15: Substation Habitats	14
Figure 1- 16: Wider landcover areas within 5 km of the Study Area	15
Figure 1- 17: Breeding season 2022 and 2023 Hen Harrier activity	16
Figure 1- 18: Winter season 2021/22 and 2022/23 Hen Harrier activity	17
Figure 1- 19: 2021-2023 Red Grouse sightings	18
Figure 1- 20: Regional Context - Managed Areas for Hen Harrier, Red Grouse and other key ecological features	19
Figure 1- 21: Local Context - Managed Areas for Hen Harrier, Red Grouse and other key ecological features	20
Figure 1- 22: Local Context - Managed Habitats for Hen Harrier, Red Grouse and other key ecological features	21
Figure 1- 23: Managed Habitats for Hen Harrier, Red Grouse and other key ecological features	22

Figure 1- 24: Managed Habitats for Hen Harrier, Red Grouse and other key ecological features	23
Figure 1- 25: Managed Habitats for Hen Harrier, Red Grouse and other key ecological features	24

1 SPECIES AND HABITATS MANAGEMENT PLAN

1.1 Introduction

1.1.1 Purpose of this Report

This document comprises a Species and Habitats Management Plan (SHMP) to accompany EIAR Chapter 7 Biodiversity and EIAR Chapter 8 Ornithology for the Oatfield Windfarm Project. The purpose of this SHMP is to provide details of required mitigation, enhancement and monitoring to avoid significant adverse effects on species and habitats from the Oatfield Windfarm Project (hereafter referred to as the 'Proposed Development'), and to ensure a positive long-term effect on biodiversity is delivered.

This SHMP focuses on two key biodiversity features identified within EIAR Chapter 8: Hen Harrier (*Circus cyaneus*) and Red Grouse (*Lagopus lagopus*). Context on the ecological baseline of the Proposed Development regarding these species and their habitats is provided in Section 1.2. By providing detailed management prescriptions for these species and their habitats, this SHMP will also ensure appropriate mitigation and enhancements are delivered for other key ecological features identified in EIAR Chapters 7 and 8. The SHMP should therefore be read in conjunction with these chapters.

This report has been prepared in reference to current best practice guidance by the suitably experienced and qualified personnel listed in EIAR Chapter 8.

This report contains information on the locations of sensitive ecological features (e.g., specially protected species) which should be treated as confidential.

The principal aims of the SHMP are as follows:

- To provide areas of optimum foraging habitat for Hen Harriers during the lifetime of the Proposed Development; and
- To provide good quality habitat within the site boundary (enhancing the existing biodiversity of the site for prey items and wildlife in general).

The rationale of the SHMP is based on results from available research on Hen Harriers in Ireland and also on Inis surveyors' observations of Hen Harriers from onsite winter surveys, onsite breeding surveys and extensive Hen Harrier surveys over many years within SPAs and other important breeding Hen Harrier areas e.g. the Slievefelim to Silvermines Mountains SPA (2005 – present), the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (Code: 004160) (2005 – 2022) and Slieve Beagh SPA (Code: 004167) (2007 – 2009).

Compensatory habitats for Hen Harriers have been seen to be readily accepted /used by Hen Harriers at various locations throughout Ireland when optimal habitats are designed and managed. Projects such as Proposed Development, which provide compensatory habitat for the Hen Harrier immediately upon construction, will help to provide additional habitat for the Hen Harrier in the short to medium term and help Hen Harrier populations in the area.

Initially the proposed windfarm incorporated eleven turbines, totalling approximately 16.4 ha in area. The layout was redesigned and turbines sited so that any infrastructure was at least 350 m away from all recent and historical nest sites. All mitigation habitats are positioned in excess of 250 m from any proposed turbine location.

1.1.2 Project Background

The Proposed Development comprises an 11-turbine wind farm on a site located within forested and agricultural lands. It also comprises a Grid Connection Route (GCR) for connection to the national grid, and temporary accommodating works along a Turbine Delivery Route (TDR) to the wind farm, to facilitate the delivery of large components from the port of delivery. The GCR and TDR are both assessed in this EIAR and form part of the planning application.

The key components that are described throughout the EIAR are listed below:

- The wind farm which consists of 11 wind turbines (4 turbines across the Eastern Development Area (Eastern DA) and 7 turbines across the Western Development Area (Western DA));
- The grid connection route and underground cables (also referred to as GCR and UGC); and,
- The turbine delivery route (TDR).

The term 'Proposed Development' collectively describes the above three components. Further information about the Proposed Development is presented in EIAR Chapter 5: Project Description.

1.1.3 Previous experience designing SHMP for Hen Harrier

Inis' previous experience designing SHMP for Hen Harrier (and other species including Red Grouse) includes the following examples (list not exhaustive):

- Designed successful Species and Habitat Management Plans within 4 Hen Harrier SPAs (in Ireland and the UK) encompassing comprehensive Hen Harrier management prescriptions involving the development, management and monitoring of viable foraging habitats;
- Designed managed habitats at wind farms that have proven to be extremely successful for Hen Harrier populations e.g. Ballyhoura Wind Farm with Hen Harrier using managed habitats daily in close proximity to turbines (500 metres), and successfully breeding within 300 metres of a turbine for past 6 years;
- Completed more than 70 separate Hen Harrier surveys and assessments throughout the Republic of Ireland and Northern Ireland in support of renewable energy projects;
- Surveyed Hen Harriers in every SPA in Ireland where Hen Harriers are the special conservation interest of that SPA;
- Have published literature on Hen Harriers, habitat use and management prescriptions. In Practice, CIEEM 2010;
- Designed the extensive Species and Habitat Management Plan for the first wind farm within a Hen Harrier SPA (the Stack's to Mullaghareirk Mountains, West

Limerick Hills and Mount Eagle SPA (Code: 004160)) in Ireland at Knockacummer, County Cork.

- Prepared a Conservation and Habitat Management Plan for Slievecallan Proposed Windfarm Development in Co. Clare with particular reference to Hen Harrier but also for other species including Red Grouse.

1.2 Site Description

1.2.1 Overview

The Proposed Development is located within forested and agricultural lands of an upland area, approximately 5.9 km north of Limerick City and 4.6 km east of the village of Sixmilebridge.

The planning boundary for the Proposed Development primarily comprises two areas covering approximately 292 ha: the Western DA (covering approximately 153 ha), and the Eastern DA (covering approximately 139 ha). These areas predominantly comprise conifer plantation, transitional woodland scrub, mixed forest, pasture, agricultural lands and peatlands. The Proposed Development boundary also includes land allocated for associated elements including the grid connection route and the turbine delivery route.

1.2.2 Ecological Baseline: Key Species

As described in Section 1.1.1, this SHMP focuses on the management of habitat for two key biodiversity features identified within EIAR Chapter 8. These species were selected for targeted habitat management action based on their use of the Proposed Development and adjacent land, their conservation statuses, and the potential effects of the Proposed Development on their local populations. Detailed information on the ecological baseline of the Proposed Development with regard to these species is provided in EIAR Chapter 8 and summarised below.

Hen Harrier

The Hen Harrier is an Annex 1 species on the EU Birds Directive and is currently Amber listed in Ireland in the Birds of Conservation Concern in Ireland, due to historical declines and continued vulnerability as a result of habitat loss and persecution (Lynas et al. 2007). It is a bird of open country that utilizes almost any open terrain that contains enough small mammals or birds for hunting purposes (Watson 1977). In Ireland, the preferred nesting habitat is second rotation pre-thicket forestry, followed by heather/bog and post thicket forestry with patches of heather or scrub (Barton et al. 2006). In Northern Ireland, Hen Harriers have been recorded nesting in trees (Scott & Clarke 2007).

Thompson (1849) describes the Hen Harrier as being 'pretty generally distributed over the island' and although no specific mention is made of North Cork, he does quote other sources which say it is 'occasionally met with' in East Cork and 'common' in Kerry. By 1893, Usher (1893) describes the Hen Harrier as being 'resident and common' fifty years earlier but decreasing to the point where 'it seems now to have almost disappeared'. In 1900, Usher & Warren (1900) state it is 'frequently seen on the mountains south of the Mallow and Killarney line', but 'a straggler to other parts of the county'. By the 1950's the Hen Harrier was 'nowadays a rare straggler' to Ireland (Kennedy, Ruttledge & Scroop 1954) and sufficiently rare to merit publications of individual sightings. Subsequent to this,

it became known that the Hen Harrier had continued to breed in the Slieve Bloom Mountains in Co. Laois and on the Waterford/Tipperary border (Watson 1977, quoted in O'Flynn 1983).

In the early 1950's a recovery is believed to have begun (O'Flynn 1983) and Sharrock (1976) suggested that the population had risen to 200-300 pairs by 1972.

However, by the late 1970's early 1980's the population is again believed to have declined and O'Flynn (1983) says that 'since 1978' in many areas, he has been 'unable to find any evidence of breeding'. From 1980 onwards however, Hen Harriers were once again breeding in East Clare and breeding Hen Harrier has been recorded in the past 5 Hen Harrier National Surveys in the Slieve Bernagh to Keeper Hill Range.

Hen Harriers were frequently recorded within and adjacent to the Proposed Development during the detailed field surveys undertaken between 2021 and 2023, during the breeding and winter seasons.

Breeding season activity included juveniles and breeding adults exhibiting behaviour including food passes between adults, hunting, diving, calling, perching and carrying prey to nest sites. Favoured foraging areas included heath, scrub and more open areas of conifer plantation. Hen Harrier activity recorded during the breeding season is indicated in Annex A.

Three active Hen Harrier nest sites were recorded in 2022:

- 616 m north of T3;
- 356 m north of T7; and
- 1 km west of T11.
- Two active Hen Harrier nest sites were recorded in 2023:
- 970 m west of T11; and
- 487 m south of T8.

Wintering activity included adult males and females flying within and (predominantly) adjacent to the Proposed Development. Despite extensive surveys no winter roosts were identified. Principal areas used by wintering Hen Harriers included land east and west of the grid connection route, on the northern boundary of the Western DA, approximately 860 m southwest of the Western DA, and approximately 640 m west of the Eastern DA. Favoured foraging habitats included heath, scrub and more open areas of conifer plantation. Hen Harrier activity recorded during the winter season is indicated in Annex A.

Red Grouse

Red Grouse is included on the BoCCI Red List, with a moderate short-term breeding population decline and a significant long-term breeding population decline in Ireland. Whilst no wintering activity by Red Grouse was recorded, Red Grouse observations during the breeding season in 2023 were as follows (see Annex A for mapping showing survey results for Red Grouse surveys):

- An adult male flushed from Heather approximately 637 m north of T7;

- A pair (i.e., male and female) flying over suitable breeding habitat approximately 469 m north of T7; and
- One calling from suitable breeding habitat approximately 932 m north of T6.

Based on the type of observations and the habitats they were recorded in (comprising suitable Heather-dominated breeding habitat), 1-2 Red Grouse breeding territories were identified in land north of the Proposed Development.

1.2.3 Ecological Baseline: Other Species

In addition to the two key species for this SHMP described above, the management prescriptions herein will also be beneficial to other key ecological features identified within EIAR Chapters 7 and 8. These EIAR chapters contain additional information on the ecological baselines for these species (including figures indicating their distributions), and mitigation and enhancement measures within and adjacent to the Proposed Development to ensure an overall positive effect on these species is delivered. Species identified as key ecological features which have also been taken into consideration within the recommendations of this SHMP include:

- Kestrel (*Falco tinnunculus*);
- Merlin (*Falco columbarius*);
- Woodcock (*Scolopax rusticola*);
- Otter (*Lutra lutra*); and
- Lesser Horseshoe Bat (*Rhinolophus hipposideros*).

1.2.4 Ecological Baseline: Habitats

Baseline (i.e., pre-construction) habitats within and adjacent to the Proposed Development (together forming the 'Study Area' that is subject to assessment and management prescriptions within this SHMP) are summarised in **Table 1- 1** with main habitats described on the following pages. Baseline habitats within the Study Area are indicated on mapping in Annex A. Full details of habitats within and adjacent to the Proposed Development are provided in EIAR Chapter 7. Illustrative plates showing representative onsite habitats can be viewed in Annex B.

Table 1-1: Baseline habitats within the Proposed Development site

Fossitt Code	Area_(ha)
BL3 Buildings and artificial surfaces	16.697
BL3/ ED2 Buildings and artificial surfaces/ Spoil and bare ground	0.113
BL3/ ED3 Buildings and artificial surfaces/ Recolonising bare ground	0.095
BL3/ GA1 Buildings and artificial surfaces/ Improved agricultural grassland	0.917

BL3/ GA2 Buildings and artificial surfaces/ Amenity Grassland	11.62
BL3/GA2/WD5 Buildings and artificial surfaces/ Amenity Grassland/ Scattered trees and parkland	0.632
BL3/ GS4 Buildings and artificial surfaces/ Wet grassland	0.251
BL3 /WS1 Buildings and artificial surfaces/ Scrub	0.188
BL3 /WS2 Buildings and artificial surfaces/ Immature Woodland	0.891
ED2 Spoil and bare ground	0.38
ED2/GM1 Spoil and bare ground/ Marsh	0.703
ED3 Recolonising bare ground	0.364
GA1 Improved agricultural grassland	51.406
GA1/GS4 Improved agricultural grassland/ Wet Grassland	0.266
GA1/WS1 Improved agricultural grassland/ Scrub	2.637
GM1 Marsh	0.34
GS1/GS3 Dry calcareous and neutral grassland/ Dry-humid acid grassland	0.035
GS2 Dry meadows and grassy verges	0.786
GS3/HH1 Dry-humid acid grassland/Dry siliceous heath	0.590
GS2/HD1 Dry meadows and grassy verges/ Dense bracken	0.066
GS3 Dry-humid acid grassland	5.764
GS3/GS4 Dry-humid acid grassland/ Wet grassland	1.039
GS3/GS4/HH1 Dry-humid acid grassland/ Wet grassland/ Dry siliceous heath	0.033
GS3/HH1 Dry-humid acid grassland/ Dry siliceous heath	0.59
GS3/WS1 Dry-humid acid grassland/ Scrub	5.302
GS4 Wet grassland	30.02
GS4/HH2 Wet grassland/ Dry calcareous heath	0.199
GS4/HH3 Wet grassland/ Wet heath	0.154
GS4/HH3/PB2 Wet grassland/ Wet heath/Upland blanket bog	0.075
GS4/PB2 Wet grassland/ Upland blanket bog	0.299
GS4/WS1 Wet grassland/ Scrub	3.064
HD1 Dense bracken	0.122
HD1/WS1 Dense bracken/ Scrub	0.593
HH3 Wet heath	14.058

HH3/WD4 Wet heath/Conifer plantation	3.044
HH3/WS1 Wet heath/Scrub	1.11
WD1 (Mixed) broadleaved woodland	2.156
WD2 Mixed broadleaved woodland/ conifer plantation	1.984
WN6 Wet willow-alder-ash woodland	1.374
WD3 (Mixed) conifer woodland	1.168
WD4 Conifer plantation	62.186
WD4/WS1 Conifer plantation/Scrub	2.74
WS1 Scrub	13.234
WS1/WD2 Scrub/ Mixed broadleaved woodland/ conifer plantation	0.023
WS1/WS2 Scrub/ Immature woodland	1.436
WS2 Immature woodland	0.584
WS3 Ornamental/non-native shrub	0.431
WS5 Recently-felled woodland	10.46
Fossitt Code	Length (m)
BL1 Stone walls and other stonework	1029.05
BL2 Earth banks	4935.04
BL2/WL1 Earth banks/ Hedgerows	791.96
BL2/WL1/WL2 Earth banks/ Hedgerows/ Treelines	251.86
BL2/WL2 Earth banks/ Treelines	329.27
FW1 Eroding/upland rivers	97.63
FW4 Drainage ditches	3553.18
WL1 Hedgerows	7836.29
WL1/WL2 Hedgerows/ Treelines	7094.51
WL2 Treelines	5461.43

Conifer Plantation (WD4)

Conifer plantation within the Study Area includes areas that support dense stands of planted conifers, with a broadleaved component of less than 25%. The overriding management interest for these areas is commercial timber production. This habitat is characterised by even-aged stands of trees planted in regular rows, often forming angular blocks. Species diversity is low and single species stands are common. Blocks of conifer plantation are present throughout the Study Area including within the Proposed Development, including the footprints of all turbines and the grid connection route.

Hedgerows (WL1)

Linear strips of shrubs and occasionally low scrub, often with occasional trees, typically forming field boundaries. This habitat is present throughout the Study Area, including the IPP grid connection/TDR and grid connection route.

Treelines (WL2)

Narrow rows or single lines of trees greater than 5 m in height and typically occurring along field boundaries. This habitat occurs throughout the Study Area, including areas adjacent to proposed site roads and crossing the footprint of T4. Treelines delineate other elements of the Proposed Development including the grid connection route and proposed IPP connection route/TDR.

Hedgerows/Treelines (WL1/WL2)

A mosaic of these two aforementioned linear habitats is present along the footprint of the grid connection route and the IPP connection route/TDR.

Wet Heath (HH3)

Vegetation with at least 25% cover of dwarf shrubs on peaty soils and shallow wet peats with a typical average depth of 15-50 cm. Characteristic plant species include Heather (*Calluna vulgaris*), Cross-leaved Heath (*Erica tetralix*), Purple Moor-grass (*Molinia caerulea*) and sedges. This habitat occurs within the footprints of T2-T3 and T5-T11, and adjacent to proposed site roads and the IPP connection route and TDR.

Wet Heath/Conifer Plantation (HH3/WD4)

A mosaic of these two aforementioned habitats is present within the footprint of proposed site roads between T5 and T6.

Wet Grassland (GS4)

Occurs on wet or waterlogged mineral or organic soils that are poorly drained or subject to periodic flooding. Wet grassland is present within the footprints of T3-T5, T7 and T10, and within the footprint of the proposed on-site substation and site roads. Significant areas are present adjacent to the IPP connection route/TDR, the northern boundary of the Eastern DA and the southern boundary of the Western DA. Wet grassland is also present along the grid connection route. This habitat covers a combined area of approximately 30.02 ha.

Upland Blanket Bog (PB2)

Upland blanket bog occurs on flat or gently sloping ground above 150 m. The 150 m limit serves to distinguish upland from lowland blanket bog but is loosely applied. Peat depths vary and normally fall in the range of 1-2 m. This habitat occurs along the western boundary of the Eastern DA, 77 m west of T11 and is located within the Gortacullin Bog NHA. This habitat forms a mosaic with wet grassland and wet heath. The total area of these habitats is 0.37 ha.

(Mixed) Broadleaved Woodland (WD1)

Areas of woodland with 75-100% cover of broadleaved trees and 0-25% cover of conifers which cannot be classified as semi-natural, with a minimum canopy height of 4 m. This habitat is located adjacent to the IPP connection route/TDR, the grid connection route and the footprint of T10.

Recently-felled Woodland (WS5)

Areas of plantation or other woodland that have been clear-felled but have not been replanted or converted to another land use. This habitat is located within the footprints of T3-T7.

Mixed Broadleaved/conifer Woodland (WD2)

Includes woodland areas with mixed stands of broadleaved trees and conifers, where both types have a minimum cover of 25% and a maximum cover of 75%, and canopy height is at least 4 m. This habitat was recorded adjacent to the IPP connection route/TDR and within the Proposed Development adjacent to site roads south of T5.

(Mixed) Conifer Woodland (WD3)

Includes woodland areas with 75-100% cover of conifers that are not conifer plantations (WD4), typically dominated by non-native tree species. This habitat is present along the grid connection route, IPP connection route/TDR and Western DA, approximately 269 m south of the proposed on-site substation.

Wet Willow-alder-ash Woodland (WN6)

Includes woodlands of permanently waterlogged sites that are dominated by willows (*Salix* spp.), Alder (*Alnus glutinosa*) and/or Ash (*Fraxinus excelsior*). This habitat is present within the footprint of T8 and approximately 166 m southeast of T4, and is also present along the grid connection route.

Dry-humid Acid Grassland (GS3)

Unimproved or semi-improved grassland occurring on free-draining acid soils that are dry to humid (but not waterlogged). This habitat frequently grades into, or forms mosaics with, dry siliceous heath. This habitat is present within the footprint of T7, on the northern boundary of the Eastern DA and along the grid connection.

Dry-humid Acid Grassland/Wet Grassland (GS3/GS4)

Dry-humid acid grassland recorded within the Study Area forms mosaic habitats with wet grassland. This habitat mosaic is present within the footprint of site roads located at the entrance to the Eastern DA. A small section is also located approximately 530 m east of T9.

Off-site Landcover

To provide context on landcover in the wider area to inform management prescriptions, aerial photographs and mapping were used to study the wider landscape at a radius of 5 km. Forestry was divided into three broad categories: 0-10 years old, 10-20 years old and 20-30+ years old, and areas of bog and heath were also identified. The extents of these broad landcovers are indicated in **Table 1- 2** below and in Annex A.

Table 1- 2: Wider landcover areas within 5 km of the Study Area

Habitat type	Area	% of landcover study area
Forestry 0-10 years old	742 ha	5.40
Forestry 10-20 years old	863 ha	6.28
Forestry 20-30+ years old	1659 ha	12.08
Bog / Heath	754 ha	5.49
Unimproved / natural grassland	1363 ha	9.93
Scrub	677 ha	4.93
Other	7674 ha	55.88

1.3 Management Objectives

As outlined in Section 1.1.1, the purpose of this SHMP is to prescribe detailed mitigation, enhancement and monitoring approaches to avoid significant adverse effects on species and habitats from the Proposed Development and achieve enhancements for these and other ecological features; notably for Hen Harrier and Red Grouse. As such, taking into consideration the ecological baseline and the potential effects on ecological features identified in EIAR Chapters 7 and 8, the primary objectives of this SHMP are:

- **To maintain and improve habitats within the Study Area for Hen Harrier**, such that the local conservation status of Hen Harrier is maintained and improved. Meeting this objective will be heavily reliant on maintaining and increasing the quality and extent of suitable nesting, foraging and roosting habitat for Hen Harrier;
 - Where known or suspected Hen Harrier nest sites occur, the preservation of these nest sites and their surrounding core foraging habitat should take precedence over other management prescriptions; and
- **To maintain and improve habitats within the Study Area for Red Grouse**, such that the local conservation status of Red Grouse is maintained and improved. Meeting this objective will be heavily reliant on maintaining and increasing the quality and extent of suitable habitat for Red Grouse.

In addition to these key management objectives, management measures should seek to deliver enhancements for other ecological features identified in EIAR Chapters 7 and 8 where the opportunity arises, to maximise the biodiversity benefit provided by the Proposed Development.

1.4 Ecological Context

In order to meet the management objectives the ecological requirements of target species and habitats must be understood. Context on these ecological features is therefore provided below.

1.4.1 Hen Harrier

Considering the importance of the Proposed Development and adjacent land for breeding and wintering Hen Harrier management prescriptions for this species must be underpinned by best practice guidance and understanding of the ecological requirements of Hen Harrier and the existing threats and pressures on this species.

Breeding Requirements

Areas supporting successful breeding Hen Harrier populations must provide both suitable nesting locations and suitable foraging habitat. This habitat must remain suitable throughout the breeding season, which typically extends from March to August inclusive, during which the birds typically forage up to 5 km from the nest site. Indicative breeding timings for Hen Harrier provided by Hardey et al. (2013) are detailed in

Table 1- 3 below, providing context to inform mitigation and management recommendations.

Table 1- 3: Typical annual breeding cycle for Hen Harrier (Hardey et al., 2013)

Breeding activity	Peak period	Range	Duration (days)
Site occupation and display	Early April to early May	Late February to late May	-
Nest-building	-	April to late May	-
Egg-laying	Late April to mid-May	Mid-April to late June	5-12
Incubation	Late April to mid-June	Mid-April to late July	29-31
Hatching	Late May to mid-June	Mid-May to late July	-
Young in nest	Late May to mid-July	Mid-May to late August	28-39
Fledging	Late June to mid-July	Mid-June to late August	-
Juvenile dispersal	-	August to September	-

Favoured nesting habitats include pre-thicket conifer plantations (1st and 2nd rotation), failed forestry, mature forestry plantations with wind-throw, gaps or open rides, tall Heather (often on slopes or in gullies), bog (with good Heather growth) and dense scrub (e.g., dense Bramble, Willow and Alder scrub). Use of woodland habitats for nesting is often dependent on the availability of nearby suitable foraging habitat. Nest sites are typically established in dry, well-drained locations, with an apparent tendency to nest in the vicinity of streams and on northwest-facing slopes (Redpath et al., 1998). Rank (but not degenerate) Heather is often selected, with a typical height of approximately 46 cm. Nests may also be established in rushes, Bracken, Willow and long grasses, and occasionally in trees (Hardey et al., 2013).

Preferred foraging areas include open bog and heath, scrub, forestry and woodland edges, young forestry with open ground between trees, rough non-intensively managed upland grassland which is often wet and rushy, and along dense, bushy hedges. Hen Harriers hunt by flying within a few metres of the ground and feed on small birds and mammals. Breeding Hen Harriers must forage in areas with sufficient prey (i.e., small bird and mammal) densities to support both adult birds and their young. On a microhabitat scale, Hen Harriers use features that provide them with cover when they are hunting, such as hedges and scrub patches.

Research into the behaviour of Hen Harriers breeding in Scotland indicated that, while breeding male Hen Harriers travelled up to 9 km from nests on occasion, their home-ranges averaged 8 km² (Arroyo et al., 2014). Home-ranges for females were typically 4.5 km². Males hunted mostly within 2 km of the nest, whilst females hunted mostly within 300 m to 1 km from the nest (Arroyo et al., 2009). Until relatively recently there had been little study of the habitat preference of Hen Harriers in Ireland. Unplanted blanket bog and heath had been traditionally recognised as prime harrier habitat. The value for foraging of young conifer plantations on bog became apparent after the extensive afforestation programmes during the 1960s and 1970s (Biosphere Environmental Services, 2010). As recently as the early 2000s, the value of restock for foraging was unclear though it was recognised as important habitat for nesting (Norriss et al. 2002). Madders' (2000) studying Hen Harrier foraging preferences and success rates in western Scotland found that Hen Harriers foraged preferentially over young coniferous forests, and selected heathland and grassland habitats ahead of closed canopy woodland. He also found that

their success rate in prey capture was also highest over young conifer forests. Madders' study included areas of improved grassland and clear fell and hunting time and success rates were lower in these habitat types than in young conifer forest.

Habitat selection for foraging by harriers has been investigated in various studies funded by NPWS. Although the preference order of positively selected habitats varied in different study areas and years, five habitats (heath/bog H/B, hill farmland RG, new plantation NF, and the later stages of 2nd rotation pre-thicket plantation 2nd F 3 & 4) were consistently preferred by both sexes, whilst three (intensive grassland G, mature plantation F, and recently cleared plantation 2nd F1 & 2) were consistently avoided (habitat abbreviations are given in Table 3). Individual females showed quite variable habitat usage, reflecting the often restricted choices within small foraging ranges close to the nest. For males, the average rank order of habitat selected across sites and years, from most to least preferred, was NF>2ndF3>H/B>2ndF4, followed by F>2ndF1&2>G.

Table 1- 4: Recommended classification of habitat types for Hen Harrier assessments.

Habitat Code		Description
NF	NF 2	New forestry plantation, trees 20-30 cm high
	NF 3	New forestry plantation, trees c.1 m in height
	NF 4	New forestry plantation, trees > 2m in height, patchy thickets
2 nd F	2 nd F 1 & 2	2 nd rotation forestry plantation, trees 20-30 cm high
	2 nd F 3	New forestry plantation, trees c. 1m in height
	2 nd F 4	New forestry plantation, trees > 2m in height, patchy thickets
F		Post thicket plantation
G		Grazing
RG		Rough Grazing & rushy pasture
H/B		Heath / Bog
DE		Deciduous woodland & scrub
GO		Gorse

In one of the most recent National Surveys the most frequent habitat category recorded was heather moorland although afforested habitats were recorded more frequently (49.4%) than open habitats (44.8%). Hunting was recorded most frequently in heather moorland (34%) and foraging was observed less frequently in afforested (42.5%) than in open habitats (53.4%). However, Irwin et al. (2012) have studied behaviour of Hen Harriers (n=3) using GPS trackers. They have found that 64% of hunting tracks occurred in forest habitats as opposed to open habitats. This of course may be related to the relative proportions of habitat within the area but 72% of hunting tracks in forest habitats occurred in areas of second rotation pre-thicket forest.

During surveys for Proposed Development the majority of confirmed nests/territories were located on open moorland (heather) habitats and foraging activity continues to indicate a preference for open moorland habitats on national scale. As there is unlikely to be significant new plantings on bog or heath the population in the Slieve Bernaghs will depend increasingly on the presence of unplanted bog and heath and pre-thicket 2nd rotation.

The proposed SHMP is formulated in the context of the available information on foraging behaviour and preference by Hen Harriers.

Wintering Requirements

In addition to requiring suitable foraging habitat (as described above), Hen Harriers roost in winter. Roosts, which may be used communally (i.e., by multiple birds), are generally built in rank ground vegetation. Habitats used for roosting include bog, heathland, rough wet pasture, reedbeds, fens and scrub. Detailed information including photographs of suitable roosting habitat is provided by O'Donoghue (2019).

1.4.2 Red Grouse

Red Grouse are generally restricted to heaths, blanket bogs and raised bogs, in which their diet is predominantly Heather. Heather is crucial to the species' lifecycle in Ireland, with adults feeding on young Heather shoots and using taller Heather for cover and as nest sites. Indeed, Red Grouse rarely feed more than 20 m from tall Heather due to the protection it provides. This reflects the findings of O'Connell (2008), who found that mountain blanket bog sites with less than 25% Heather cover did not support Red Grouse. Young Red Grouse also require a steady supply of invertebrates during their early development. Red Grouse are resident and sedentary in winter but will move to windswept ridges and lower ground to avoid snow cover. Detailed guidance on Red Grouse habitat suitability and management is provided by Cummins et al. (2010) and Scallan (2015).

1.5 Compensatory Habitats Calculations

Areas of habitat loss through direct loss or disturbance must be compensated for. Habitat loss at substation and turbines are lost due to differing factors

Substation calculations

For the substation we are assuming a total allocation of the entire area due to a direct loss of habitats within the footprint of the substation.

Turbine calculations

The Hen Harrier disturbance zone around each turbine is assumed at 250 metre radius which equates to an area of 19.7 hectares. This loss of habitat through disturbance must be compensated. For the purposes of the following calculations the extent of each habitat type, within this 250 metre radius of each turbine, has been quantified using GIS and then expressed as a % of this 19.7 hectares (using GIS enables us to be very exact when estimating this area).

A detailed habitat map for the 250 metre radius around each turbine can be viewed in Annex A.

We then use other variables such as forestry age, habitat type, harvesting years etc. to calculate the exact area of compensatory habitat that needs to be allocated as a result of that turbine e.g. some habitats get their area fully allocated such as Scrub (WS1) which is useful to Hen Harrier while others such as (WD1) Mixed Broadleaved Woodland get no area allocation as it of limited value to Hen Harrier (see **Table 1- 5** for detail). For all calculations we also assumed that all coniferous forestry is useful to Hen Harrier for the first 10 years of its growth. It is important to note that the compensation for the Proposed Development must be for 35 years (lifetime of the project).

Table 1- 5: Habitat compensation allocation

Habitat type	Habitat allocation
HH3	Full
BL3	Full
WD4	Felling dates specific
ED2	Full
GS4	Full
WS5	Felling dates specific
WS1	Full
WL1	Full
WL2	None
WD1	None
FW4	Full
BL2	Full
ED3	Full
GA1	None
GS3	Full
WN6	Full
WN4	None
BL1	None
WD3	None

All habitats are listed in the text using the Fossitt classification. There is considerable overlap of some 250 metre radii. This overlap, where it occurs has been ignored within the calculations. This results in more compensatory habitats being allocated within the SHMP than are needed for displacement which is an added benefit for Hen Harriers.

Turbine 1

- WS1 0.28 ha
- BL3 0.35ha
- ED2 0.52ha
- WD4 6.3ha $6.3 / 25 \text{ years} \times 10 \text{ years useful to Hen Harrier} = 2.52\text{ha}$
- WD4 5.9ha $5.9 / 25 \text{ years} \times 10 \text{ years useful to Hen Harrier} = 2.36\text{ha}$

Total for Turbine 1 = 6.03 ha/annum
--

Turbine 2

- ED2 0.18ha,
- HH3 4.61 ha
- WD4 8.85ha /25 years x 10 years useful to Hen Harrier = 3.54 ha

Total for Turbine 2 = 8.15ha/annum

Turbine 3

- BI3 0.58ha
- GS4 4.09ha
- HH3 2.08ha
- WS5 4.95 /25 years x 10 years useful to Hen Harrier = 1.98ha
- WD4 2.5 /25 years x 10 years useful to Hen Harrier = 1ha

Total for Turbine 3 = 9.73 ha/annum
--

Turbine 4

- BL3 0.07ha
- GS4 2.99ha
- WS1 5.36ha
- WD4 7.82 /25 years x 10 years useful to Hen Harrier = 3.13ha

Total for Turbine 4 = 11.55ha/annum
--

Turbine 5

- BI3 0.29ha
- GS4 1.86ha
- HH3 7.39ha
- WD5 5.41 / 25 years x 10 years useful to Hen Harrier = 2.164ha

Total for Turbine 5 = 12.44 ha/annum

Turbine 6

- BL3 0.12ha
- HH3 2.45ha
- WS1 3.22ha
- WS5 0.63 /25 years x 10 years useful to Hen Harrier = 0.25ha

- WD4 $0.62/25$ years x 10 years useful to Hen Harrier = 0.25ha + $5.51 /25$ x 9 = 1.98ha + $0.43ha /25$ years x 10 years useful to Hen Harrier = 0.17ha

Total for Turbine 6 = **10.51 ha/annum**

Turbine 7

- ED2 0.39ha
- ED3 0.2ha
- GS3 6ha, GS4 0.2ha
- HH3 0.67ha
- WS1 1.9ha
- WS5 $0.69 / 25$ years x 10 years useful to Hen Harrier = 0.28ha
- WD4 $0.81 /25$ x 9 = 0.29ha + $2.81 /25$ years x 10 years useful to Hen Harrier = 1.12ha

Total for Turbine 7 = **11.58 ha/annum**

Turbine 8

- BL3 0.62ha
- HH3 0.55ha
- WN6 1.09ha
- WS1 0.56ha
- WD4 $14.5 /25$ years x 10 years useful to Hen Harrier = 5.8ha + $4.93 /25$ x 8 = 1.58ha

Total for Turbine 8 = **10.2 ha/annum**

Turbine 9

- HH3 1.98ha
- WS1 0.59ha
- WD4 $17.9 /25$ x 6 = 4.29ha

Total for Turbine 9 = **6.86 ha/annum**

Turbine 10

- GS4 4.16ha
- HH3 1.36ha
- WS1 0.31ha

- WD4 4.10 /25 years x 10 years useful to Hen Harrier = 1.64ha + 9.50 /25 x 6 = 2.28ha

Total for Turbine 10 = 9.75 ha/annum

Turbine 11

- HH3 5.59ha
- PB2 3.92ha
- WD4 10.09 /25 years x 10 years useful to Hen Harrier = 4.04ha

Total for Turbine 6 = 13.55 ha/annum

Substation

- GS4 0.004ha
- HH3 1.510ha
- WS1 0.26ha

Total for Substation 1 = 1.77 ha/annum

Total: All Turbines and substation

The total compensation habitat required for the Proposed Development is calculated as **114.86 hectares**.

1.6 Site Conditions and Identification of Management Areas

The Proposed Development site is part of an upland area to the south-west of Broadford. Apart from some large areas of heath/conifer mosaic the majority of the wind farm site area is planted with coniferous forestry of varying ages. Some of this forestry is mature and a large proportion of it is closed canopy.

When identifying the proposed management areas for this plan Inis looked at areas that were used regularly by Hen Harriers and then we looked at how we could link these with other productive areas nearby. Forming contiguous managed areas with areas already used by Hen Harrier is critical to the success of habitat management for Hen Harrier.

The total hectares of habitat involved with each management area can be found in **Table 1- 6**. See Annex A for a full illustration of agreed management areas and their location.

Table 1- 6: Managed habitats for the Proposed Development

Fossitt Code	Area (ha)	% of study area
BL3 Buildings and artificial surfaces	0.712	0.52
BL3/GA2 Buildings and artificial surfaces/Amenity grassland	0.048	0.03
ED2 Spoil and bare ground	0.195	0.14
ED3 Recolonising bare ground	1.386	1.00
GA1 Improved agricultural grassland	39.129	28.35
GA1/GS3 Improved agricultural grassland/Dry-humid acid grassland	0.778	0.56
GS3/WS1 Dry-humid acid grassland / Scrub	1.011	0.73
GS4 Wet grassland	40.057	29.02
GS4/WS1 Wet grassland / Scrub	17.226	12.48
HH1 Dry heath	5.287	3.83
HH3 Wet heath	0.967	0.70
HH3/WD4 Wet heath / Conifer plantation	3.485	2.52
HH3/WS1 Wet heath / Scrub	0.734	0.53
WD1 Mixed broadleaved woodland	0.353	0.26
WD2 Mixed broadleaved/conifer woodland	0.233	0.17
WD4 Conifer plantation	8.683	6.29
WN4 Wet pendunculate oak-ash woodland	0.795	0.58
WN6 Wet willow-alder-ash woodland	0.854	0.62
WS1 Scrub	16.091	11.66
Fossitt Code	Length (m)	-
FW1 Eroding/upland rivers	1075.95	-
FW4 Drainage ditches	824.55	-
WL1 Hedgerows	3355.40	-
WL1/WL2 Hedgerows/Treelines	468.87	-
WL2 Treelines	3632.85	-

1.7 Management Prescriptions

1.7.1 General Management Prescriptions

Specific habitat management prescriptions relevant to Hen Harrier and Red Grouse are detailed in Sections 1.7.2 & 1.7.3 respectively. These cover habitat types within the managed areas (See **Table 1- 6**) that are important to delivering appropriate mitigation and enhancements for these species.

In addition to habitat-specific management prescriptions, the following general habitat management prescriptions are relevant to all habitats within the Study Area.

Timing of Works

Any activities which could potentially affect nesting birds (e.g., through nest destruction or disturbance) should be undertaken outside of the peak nesting season (i.e., outside of the period mid-February to early September inclusive) wherever possible. Where such

activities must be undertaken during the peak nesting season, the affected area and an appropriate buffer must be checked for the presence of active nests by a suitably experienced ornithologist, with exclusion zones potentially required around active nests, within which potentially disturbing works cannot take place until the young have fledged.

In accordance with current best practice guidance, the exclusion zone around active Hen Harrier nests should be 300-750 m (Goodship & Furness, 2022). Whilst specific exclusion zones for Red Grouse have not been published, based on guidance provided for similar species and professional judgement, an exclusion zone of 100-150 m around active Red Grouse nests is recommended. Activities prohibited within these exclusion zones are likely to include machinery use (e.g., for firebreak cutting) and turbary practice, and forestry planting and felling.

Nest Sites

As described above, effects on nesting Hen Harrier and Red Grouse must be avoided. Long-term monitoring will be undertaken to identify any Hen Harrier nest locations and Red Grouse nesting areas, with particular emphasis on identifying active nest locations prior to undertaking construction or maintenance works so that appropriate mitigation can be adopted. If any Hen Harrier winter roosts are identified during monitoring, similar measures should be adopted to avoid adverse effects.

Landowners should refrain from publicising the locations of any Hen Harrier or Red Grouse nest sites and (as far as is practical) avoid approaching active nests between the period 1st March to 31st July inclusive (see **Table 1- 3**). Grazing will not be permitted within 50 m of an active Hen Harrier nest site between 1st March and 31st July.

Supplementary Feeding

Supplementary feeding of livestock will continue provided excessive poaching is avoided. For this reason, no feeding with round bales or from fixed feeding points is permitted within 30 m of a watercourse, with a larger buffer required where land slopes from the feeding point towards the watercourse to minimise soil erosion.

Burning

No burning of vegetation or other materials will be permitted within the Study Area at any time.

Use of Herbicides

No spraying or broadcast application of herbicides will be permitted within the Study Area at any time. Spot application and wipe-on treatments will be permitted to eradicate docks, thistles, ragwort and similar noxious weeds. Rhododendron and conifers will be removed by cutting and targeted herbicide treatment, whilst bracken will be controlled by rolling, cutting and/or controlled livestock trampling in early summer. In exceptional circumstances, targeted control of bracken using herbicides may be permitted. Herbicide and pesticide use will be minimised wherever possible, with none permitted within 5 m of any existing hedgerows (except for spot treatment of invasive plant species such as Japanese Knotweed (*Reynoutria japonica*)) or watercourses.

Poisons and Stupefying Baits

No use of any poisons or stupefying baits will be permitted within the Study Area due to the major negative effects these can have on Hen Harriers and other wildlife, both directly and through secondary poisoning and other indirect effects.

Shooting

No shooting of Red Grouse or any other wildlife will be permitted within the Study Area.

Fence Marking

Fences in suitable habitat within the Study Area should be fitted with light-coloured plastic fliers to make them more visible to Hen Harrier, Red Grouse and other wildlife and thus reduce the risk of collisions with fences.

1.7.2 Management Prescriptions for Hen Harrier

Conservation habitat management prescriptions for Hen Harrier in this SHMP are based on the prescriptions specified in the National Parks and Wildlife Service (NPWS) Farm Plan Scheme ('the HHFPS')¹. Whilst the guidance provided by the HHFPS aims to ensure the appropriate management of Special Protection Areas (SPAs) designated for Hen Harrier (a designation which does not apply to the Proposed Development and its Hen Harrier populations), this guidance is still relevant in the context of the Hen Harrier populations and relevant habitats within the Study Area.

Management prescriptions within the HHFPS focus primarily on maintaining appropriate grazing regimes; specifically, extensive low-level grazing in bog, heath and grassland to maintain a vegetation structure that is neither too overgrown nor too heavily grazed, whilst retaining and creating scrub and edge habitats (e.g., bushy hedgerows). The intention is to ensure that extensive grazing at an appropriate level continues and, together with other appropriate management, creates a mosaic of bog, heath, grassland and scrub that is highly suitable for breeding and wintering Hen Harrier. This management will also benefit other key ecological features and notable species including various raptors and waders.

Management prescriptions for specific habitat types are detailed below. These habitat types should also be subject to the general management prescriptions specified in Section 1.7.1.

While a myriad of habitats form the managed area throughout the lifetime of the wind farm the main habitats within the Study Area requiring specific management for Hen Harrier comprise:

- Scrub and hedgerows;
- Heath and heath mosaic habitats;
- Forestry;

¹ Further information is available at: <https://www.npws.ie/farmers-and-landowners/schemes/npws-farm-plan-scheme> (accessed 02/11/2023).

- Wet grassland; and
- Improved agricultural grassland.

Scrub and Hedgerows

Scrub currently occupies 16.1ha within the managed area, comprising 9.27% of the proposed Managed Area. A total of 7211.6 linear km of hedgerows are currently present within the Study Area.

Woody scrub (e.g., comprising Gorse, Willow, Alder and Birch) is one of the most favourable habitats for Hen Harrier, supporting prey (e.g., passerines, small mammals) and providing favourable hunting conditions due to its thick, irregular structure. Hen Harrier also show strong preferences for foraging along intact, dense-structured hedgerows approximately 3-4 m in width due to the prey species they support. As such, widespread scrub and hedgerow clearance has been a significant contributing factor to Hen Harrier population declines in Ireland.

Existing areas of suitable scrub and hedgerow will be retained within the Study Area. In areas where the extent of scrub and hedgerow is limited, additional scrub and hedgerow will be created, either through active management or by allowing the expansion of Gorse and native hardwood scrub. Small areas of established Gorse and Willow scrub can be trimmed to prevent unacceptable encroachment onto grassland and access routes, but they must not be removed, burnt or killed. In particular, scrub and hedgerow management should seek to maximise the surface area of this habitat to provide the greatest possible extent of suitable Hen Harrier foraging habitat.

Any large continuous blocks of established briar, scrub or Gorse (i.e., continuous areas exceeding 1 ha) should be opened up within management prescriptions, with rides established to cut smaller blocks out of large blocks of scrub to ensure continuous areas do not exceed 1 ha. If any such blocks of scrub are present during commencement of the Proposed Development, this ride-cutting work must commence in Year 1 and at least 80% of the required works must be completed before the end of Year 3, with 100% completion achieved before the end of Year 4. As such, reassessment of the Study Area for large areas of scrub requiring such management will be necessary if there is a significant delay between the habitat surveys undertaken to inform the application (i.e., those described in EIAR Chapter 7) and project commencement.

As bushy hedgerows provide suitable foraging habitat for Hen Harrier, hedge cutting will be restricted to the minimum necessary. Bushy hedgerows with tall shrubs will be favoured over heavily manicured hedgerows lacking structural diversity.

Habitat management prescriptions for scrub and hedgerows are listed below:

- Retain existing areas of scrub and hedgerows;
- Reinststate scrub and hedgerows where there is evidence of recent removal;
- Create new areas of scrub and hedgerows where the extent of this habitat is limited, and allow the expansion of native hardwood scrub into areas of improved agricultural land;
- Trim established areas of Gorse and Willow scrub and hedgerows as the only means of preventing further encroachment onto grassland and access routes,

repeating annually if necessary, with cutting kept a minimum of 1 m from the hedgerow base;

- Avoid any burning of, or herbicide use on, areas of established scrub;
- Maintain hedgerows to prevent the hedge ‘escaping’ (i.e., hedgerows which have not been topped, allowing the hedgerow to become a line of trees), with hedgerow trees left uncut and the remainder of the hedgerow cut into an ‘A’ shape (i.e., wider at the base than at the top);
- Divide large (i.e., exceeding 1 ha) areas of established scrub by cutting rides in accordance with the schedule described herein; and
- Pile hedge cuttings into heaps and leave to decay naturally.

Heath and Heath Mosaic Habitats

Dry heath, wet heath and associated mosaic habitats currently occupy 10.473ha within the managed areas, comprising 6.03% of the Study Area. Heath is traditionally recognised as optimal Hen Harrier habitat, suitable for nesting and foraging.

The principal method for managing heath habitats for Hen Harrier is through low intensity grazing supplemented with regular inspection to identify and address any establishment of self-seeding conifers. Stocking intensity will follow NPWS guidelines and be selected at a level appropriate to the specific area being managed. Livestock should only be grazed on heath during May to October inclusive; as such, livestock levels can be as much as double the guideline annual stocking levels for the six months of grazing adopted. Relevant Livestock Units for grazing prescriptions are defined in **Table 1- 7** below.

Table 1- 7: Livestock Unit definitions for grazing management prescriptions

Animal	Livestock Unit (LU)
1 Cow	1
1 Bovine over 2 years old	1
1 Bovine over 1 year old but under 2 years old	0.6
1 Bovine under 1 year old	0.4
1 Equine over 6 months old	1
1 Equine under 6 months old	0.6
1 Ewe/Goat	0.15
1 Deer (Red)	0.38
1 Deer (Fallow or Sika)	0.15
1 Ewe + lamb	0.15
1 Hogget	0.15

Whilst practiced elsewhere, Heather burning will be avoided within the Study Area. Instead, cutting (e.g., using a tractor-mounted chain swipe) of short, 30 m wide strips in areas with Heather growing at heights of 30 cm or more will be considered. This practice

would need to be carefully assessed and accompanied by monitoring to determine effectiveness and identify any adverse effects, with the rotation period for cutting determined by the rate of Heather re-growth. Any cutting operations will be carried out from October to March inclusive, with only a relatively small area cut at any one time and cut strips left surrounded by taller Heather.

Habitat management prescriptions for heath are listed below:

- Maintain NPWS guideline stocking levels of up to 0.25 LU/ha;
- Remove self-seeded conifers in open heath as they are noticed, with detailed inspections undertaken at least once every two years;
- Remove all Rhododendron and other invasive plant species during Year 1 of the management plan, with ongoing control undertaken in subsequent years as necessary. Acceptable control methods include cutting/pulling and spot treatment with a suitable herbicide;
- Retain any high Heather-covered banks that have been left after peat cutting as these provide linear habitat features for foraging Hen Harrier; and
- Ensure optimal areas of Hen Harrier nesting habitat are widely available (see Section 1.4.1).

Forestry

Conifer forestry plantation occupies 8.683ha within the Study Area, comprising 5% of the managed areas. These areas are under a 30-year forestry rotation plan and will be replanted after future felling. As described in Section 1.4.1, conifer forestry plantation is an important habitat for Hen Harrier nationally and within the Study Area, and is also of value to other key ecological features to the Proposed Development such as Woodcock.

Forest Service requirements for felling and replanting, imposed as conditions of felling licenses, will ensure that these areas remain available on a limited basis for Hen Harrier habitat due to the cyclical nature of forestry felling and replanting. The Forest Service limits the area of forestry that can be felled in any one year, thereby ensuring a staggered felling schedule for the area of commercial plantation within the Study Area. The cycle of planting, growth and felling will intermittently produce areas of pre-thicket plantation that are favourable for Hen Harrier nesting and foraging.

Habitat management prescriptions for forestry are listed below:

- All felling operations are to be carried out in accordance with any felling licence issued by the Forest Service;
- Any area of forestry felled as part of a regular forest rotation should be replanted with a similar species within one year of felling unless otherwise stipulated by any condition of the felling licence;
- All clear-felling forestry operations will be in accordance with current Forest Service guidelines;
- All forestry thinning and fertilising operations will be in accordance with current Forest Service guidelines; and

- Any measures adopted to control disease in forestry areas will be in accordance with current Forest Service guidelines.

Wet Grassland

Wet grassland currently occupies 74.243ha within the Study Area, comprising 42.75% of the managed areas. Wet grassland is an important foraging habitat for Hen Harrier when managed in favourable condition.

The objective of habitat management prescriptions for wet grassland is to maintain the habitat in rank condition whilst ensuring it is not overgrown with dead grasses or rushes. To achieve this, management prescriptions will focus on three principal aspects: grazing management, rush management, and nutrient management.

Grazing Management

Grazing of areas of wet or rough grassland by cattle or horses/ponies or by mixed grazing is preferred. Whilst guideline target stocking levels for rough grazing are specified below, there is no formal upper limit to stocking density. Stocking density will be selected at a level appropriate to the specific area being managed. In cases where the land is wet, consideration should be given to concentrating grazing pressure in the summer months.

Habitat management prescriptions for managing grazing of wet grassland are listed below:

- Introduce light grazing, rather than cutting or topping, to areas with no livestock currently;
- Maintain appropriate stocking levels to the specific area, in reference to the minimum guideline target stocking level of 0.6 LU/ha; and
- In cases where grassland is wet, concentrate grazing during the summer months.

Rush Management

Rush management in grassland should deliver as dense a covering of rushes as is feasible without resulting in rushes falling over and/or matting the ground. As such, 30-70% rush cover is considered optimal. While appropriate grazing pressure is preferred (see above), in most cases maintaining appropriate rush cover will require active management. This is typically achieved by cutting rushes in every second year, although given the variation between specific areas this cutting regime will need to be tailored to the area in question. **Table 1- 8** below describes the most common situations encountered and the accompanying appropriate rush management regimes.

Table 1- 8: Rush management regimes

Code	Habitat condition	Management prescription
I	Habitats where rush cover of 30-70% is considered unlikely to be achievable irrespective of management, or (in some cases) undesirable (e.g., shallow limestone soils).	No cutting required.

Code	Habitat condition	Management prescription
II	Swards where reversion of improved grassland is planned or where rush cover is less than 10%.	Allow further rush development in the early years. One or two cycles of cutting commencing in Year 3 may be appropriate (as required).
III	Swards where rush cover is 10-30% or where rushes have been topped in the past year.	One or two cycles of cutting commencing in Year 3 may be appropriate (as required).
IV	Swards where rush cover is already 30-70%.	Cutting/topping in Years 1, 3 & 5 to maintain the sward in the desired state.
V	Swards where rush cover is dominant (>70%) and where weed-licking with a suitable herbicide in Year 1 followed by cutting/topping in Years 3 & 5 could be considered.	Generally, in areas with no recent history of rush control. Weed-licking with an appropriate herbicide may enable creation of a suitable sward within 2-3 years. Effects on watercourses must always be considered when using herbicides.

Habitat management prescriptions for managing rushes in wet grassland are listed below:

- Cut rushes on a two-year cycle or at an alternative level appropriate to the specific area;
- Commence active rush management in Year 1 of the plan. This should only be delayed until Year 2 or 3 where improved grassland is in reversion, where rush growth is very weak, or where rushes were cut or treated with herbicide in the year preceding adoption of the plan;
- In areas exceeding 10 ha, active rush management can be delayed in a portion (typically up to 50%) of the area until Year 2;
- Herbicide use (applied using a weed lick) should only be considered where rush growth is very dense and cutting is impractical;
- If access difficulties prevent the active management of rushes, alternatives such as grazing will be employed; and
- Review rush management approaches annually to assess effectiveness and inform any changes in approach.

Nutrient Management

The application of chemical or organic fertiliser in wet grassland will be avoided. Where fertiliser application has been traditionally carried out, it may continue in accordance with the NPWS guidelines on Soil Analysis, Lime and Plant Nutrient Applications (Anon, 2010).

Improved Agricultural Grassland

Improved agricultural grassland currently occupies 39.1 ha within the managed area, comprising 22.53% of the Study Area. A mosaic of improved agricultural grassland and wet grassland occupies a further 0.778 ha within the managed area, comprising 0.45% of the Study Area.

Landowners for relevant areas within the Study Area will be encouraged to allow improved grassland to revert to a more natural state (e.g., to rough grassland suitable for foraging Hen Harrier). In such cases, a reversion program will be required, involving:

- Analysis of soil samples to establish baseline nutrient levels;
- Cessation of chemical and organic fertiliser application;
- Cessation of lime application; and
- Habitat enhancement works.

Enhancement of improved agricultural grassland will also be achieved through additional hedgerow planting, with improved grassland containing less than 400 m of hedgerow per hectare supplemented with additional hedgerow planting to meet this figure (up to a maximum additional hedgerow planting requirement of 50 m per hectare). New hedgerows should be located on or adjacent to areas planned for reversion and managed in accordance with the guidance provided in Section 1.7.

Specific management prescriptions for improved agricultural grassland fields according to their extent and length of hedgerow are provided below:

Grassland Fields >2 ha or with <100 m of Hedgerow per Hectare

These fields will require the establishment of scrub in field corners or the planting of 25 m of hedgerow per hectare. Hedgerows will be planted in Year 1 and established by the end of Year 4.

If scrub is established in field corners, the selected livestock must be excluded from at least two field corners using permanent fencing set back at least 15 m from the corners. At least ten native trees must be planted in the field corner, with trees staked and protected with a tree guard. Where required, fencing and tree planting will be completed before the end of Year 1. In fenced field corners, briars and Blackthorn will be controlled on an annual basis (e.g., using mechanical control or spot treatments with a suitable herbicide). Herbicide use is permitted providing:

- They are not used within 3 m of the existing field boundaries (5 m in the case of watercourses and existing hedgerows); and
- Care is taken to ensure that no drift occurs.

Grassland Fields >4 ha

In grassland fields exceeding 4 ha, the establishment of new hedges and/or exclosures is required. At least one exclosure or 100 m of new hedgerow is required for each hectare or part thereof over 4 ha; for example, a 6 ha grassland plot will require two exclosures or 200 m of new hedgerow. If the plot in question is improved agricultural grassland in reversion, these requirements will be in addition to any new hedgerow planting required as part of the reversion process.

Exclosures will cover 0.1-0.3 ha. Livestock will be excluded from these exclosures by means of a permanent fence before the end of Year 1, and the fence must be maintained in a stockproof condition. Where possible, exclosures should incorporate any existing patches of scrub. Exclosures are to be planted with native tree/shrub species at a density of 1000 plants per hectare, with whips of 40-80 cm in size preferred for planting. The

planting density may be reduced if some scrub already exists. Planting must be completed before the end of Year 1.

General Issues Relating to Grassland Management

Broadcast spraying of rushes is not permitted, but spot treatments or wipe-on treatments are allowed. Herbicides applied using a weed lick can be applied where necessary, particularly in situations where rush growth is very dense or where cutting is impractical due to steep slopes. Applications should not be at a rate which will denude fields completely of rushes. Under normal circumstances, chemical treatment of rushes will only be permitted once in a 5-year plan. Wipe on treatments will only be applied in either Year 1 or Year 2.

The following prescriptions will also apply to general grassland management:

- Maintain traditional grazing patterns;
- Control Bracken if necessary (by weed licking, spot spraying, cutting, rolling or controlled trampling with stock). Mechanical control or trampling is most effective in May/early June. Mechanical control will need to be repeated several times during this period to have a beneficial impact;
- Cut species-rich meadows after 15th July (preferably later);
- Do not plough, cultivate, drain or otherwise reclaim grassland;
- Do not plant conifers;
- Do not plant trees unless such action is provided for in the plan;
- Do not apply lime;
- Do not fertilise above the stipulated levels;
- Do not fertilise on slopes greater than 25°;
- Do not exceed the recommended stocking limits;
- Do not provide supplementary feed stock in grassland except where this has been traditionally practised; and
- Do not dump waste material.

Wet Grassland-heath Mosaic

Areas in which wet grassland and heath form a mosaic can be among the most important habitat for foraging Hen Harrier due to the high densities of Meadow Pipit (*Anthus pratensis*) they often support. Where cover is deep enough (e.g., >40 cm) this habitat can also be attractive for Hen Harrier nesting and winter roosting.

This habitat is often very wet and difficult to access with machinery, which needs to be taken into consideration within management approaches. Management should focus primarily on:

- Maintaining grazing at an appropriate level (see Table 7.1), with stocking levels managed at 0-25-0.6 LU/ha in accordance with NPWS guidance;
- The establishment of small patches of scrub providing greater diversity of foraging opportunities; and

- Cutting of rushes where feasible, with use of herbicides limited to application for invasive species.

1.7.3 Management Prescriptions for Red Grouse

The habitat management measures described above, notably for heath and heath mosaic habitats, are also applicable to habitat management for Red Grouse. In particular, grazing of heath will be required to maintain heath vegetation in favourable condition for nesting, foraging and sheltering for Red Grouse. General management prescriptions will also benefit Red Grouse; notably the prohibition of any shooting within the managed area, and the sensitive timing of activities and/or adoption of exclusion zones to avoid effects on Red Grouse when they are likely to be most sensitive (e.g., when nesting).

1.8 Implementation and Maintenance

1.8.1 Timing

This SHMP will be implemented concurrently with the commencement of the construction phase of the Proposed Development and subsequently throughout the duration of the Proposed Development (including decommissioning). As per the requirements of this SHMP (e.g., within Section 1.7), elements of this SHMP will need to commence in advance of physical construction works.

1.8.2 Consent

The managed area incorporates the pooled land holdings of multiple landowners. These landowners will retain full ownership of their lands during the operation of the Proposed Development. This direct involvement of the landowners and Orsted Onshore Ireland Midco Limited will ensure open access to the land within which the prescriptions specified in this SHMP will be implemented.

1.8.3 Procedures

This SHMP will be implemented on a specific landowner-by-landowner basis as follows:

- A meeting has been held with individual landowners to outline the general aims, objectives and requirements of the SHMP and all are in agreement with the requirements;
- An initial audit of the individual landholdings will be conducted to establish the current land management practices, stocking rates, habitat conditions, enhancement opportunities and any limitations to habitat management; and
- A specific farm plan will be prepared for each individual landowner. These will be modelled on the HHFPS and will outline the specific prescriptions required to ensure the implementation of this SHMP. Each farm plan will include a map of the relevant landholding and a prescriptive list of actions to be undertaken and will detail the time of year when the necessary works and management measures will be undertaken.

Prescriptions for individual farm plans will be selected from the management options described herein, in reference to the baseline characteristics of the landholding and the surrounding land (as established during the audit described above).

1.8.4 Responsibilities

As the wind farm developer, Orsted Onshore Ireland Midco Limited is ultimately responsible for the implementation of this SHMP to ensure that adverse effects on biodiversity features (notably Hen Harrier and Red Grouse) are avoided and enhancements are delivered. In the event of favourable consideration of the Proposed Development application, it is anticipated that the implementation of this SHMP will be secured by means of a condition. It is understood that Orsted Onshore Ireland Midco Limited will subsequently incentivise relevant landowners to adhere to this SHMP.

It is recommended that Orsted Onshore Ireland Midco Limited engages a suitably qualified ecologist to oversee the implementation of this SHMP. Implementation is also

likely to require the input of agricultural advisors regarding the determination of appropriate stocking levels.

1.9 Monitoring and Reviews

1.9.1 Habitats

In addition to the habitat monitoring described, a detailed habitat evaluation programme shall be established based on the parameters for open habitats as set out in Chapter 3 of the Conservation Objectives Supporting Document: Breeding Hen Harrier (National Parks and Wildlife Service, 2022).

The suitability of Hen Harrier and Red Grouse habitat within the Study Area will be assessed and mapped on years 1, 2, 3, 5, 10, 15, 20 and 25 in order to identify the extent, quality and connectivity of nesting, roosting and foraging habitat, and to identify any management issues and/or required changes in management approaches. This annual monitoring will ensure that long-term benefits for Hen Harrier and Red Grouse are delivered and provide a long-term record of how the extent and quality of Hen Harrier and Red Grouse habitat has changed, which will be important for informing this and other similar projects in future.

1.9.2 Hen Harrier

Annual Hen Harrier monitoring will take place throughout the construction and operational phases (Years 1, 2, 3, 5, 10, 15, 20 and 25) of the Proposed Development. This monitoring should be undertaken in accordance with best practice survey methods (Gilbert et al., 1998; Hardey et al., 2013; O'Donoghue, 2019) and focus on recording the following information:

- The number and locations of active nests;
- The timing and success of breeding attempts, notably the number of chicks successfully fledged;
- The number and locations of winter roost sites; and
- The number of Hen Harriers present during the breeding and winter seasons, with emphasis in understanding the level of foraging activity in different areas of the Study Area.

The findings of this annual monitoring should be used to guide ongoing management approaches.

1.9.3 Red Grouse

Annual Red Grouse monitoring will take place throughout the construction and operational phases (Years 1, 2, 3, 5, 10, 15, 20 and 25) of the Proposed Development. This monitoring should be undertaken in reference to best practice survey methods (Gilbert et al., 1998; Cummins et al., 2010) and focus on recording the following information:

- The number and locations of any territories; and
- The number and locations of adults using the Proposed Development site during the breeding and winter seasons.

1.9.4 Collision Fatality Monitoring

As specified in EIAR Chapter 8, detailed collision fatality monitoring will be undertaken to confirm the accuracy of the collision risk modelling predictions made within EIAR Chapter 8, and to guide any additional mitigation requirements. Carcasses of birds and bats likely to be associated with turbine collisions will be searched for by handlers with specially trained cadaver dogs. This monitoring will involve monthly searches of carcasses within monitoring years (Years 1, 2, 3, 5, 10, 15, 20 and 25 January-December) to ensure breeding and wintering species are accounted for. All feather spots and bird carcasses will be photographed and logged in an annual fatality search report, which will be submitted to relevant stakeholders as dictated by the planning authority. Mitigation measures should be reviewed in light of the findings of this collision fatality monitoring and updated as needed to avoid significant effects; especially on key ecological features such as Hen Harrier.

1.9.5 Auditing and Reviews

Periodic audits (annually) will be required to ensure the SHMP is implemented effectively. Audits will be based on a field inspection and assessment of the specific farm plan, with up to 10% of the farm plans selected each year for auditing. Each audit will assess:

- The objectives of the individual farm plan;
- The implementation of the farm plan; and
- Adherence to the requirements of the farm plan.

Individual farm plans will be reviewed every five years to identify any required amendments to ensure they are implemented effectively and deliver the target biodiversity benefits.

1.9.6 Reporting

Reports on the direct management and maintenance of each managed area will be on an annual basis (Breeding season report and winter season report) with reports submitted to relevant stakeholders. These reports will detail the ongoing work and maintenance being carried out to ensure optimal foraging returns from each area. The setting up of management prescriptions is not sufficient; active seasonal management of these prescriptions will be needed if the plan is to be meaningful and effective.

1.10 Species and Habitat Management Plan Conclusion

The development of the Proposed Development needs compensation for displacement from viable foraging habitats within 250 metres radius of each turbine and loss of habitats at substation area. We have calculated this as **114.86ha**. It should be noted that this figure in reality is actually lower, as the overlap between turbine areas has not been taken into consideration.

This Species and Habitat Management Plan allocates a total of **173.66ha** and **14.48km** of linear habitats (hedgerows etc.) as compensatory habitats management for Hen Harriers and Red Grouse managed for the lifetime of the wind farm.

The management prescriptions applied will benefit the Hen Harrier in both the short term and long term and will ensure the supply of a substantial area of suitable foraging habitat for the local Hen Harrier population, over and above that lost as a result of the proposed development. The overall aim of the management plan is for a net gain of foraging habitat for Hen Harriers following development and operation of the windfarm. The management prescriptions we propose will enhance the existing biodiversity of the areas for prey items and wildlife in general which is an extremely important component of successful SHMP application.

The habitat management measures, notably for heath and heath mosaic habitats, will also contribute to enhancement of habitat for Red Grouse. In particular, grazing of heath will maintain heath vegetation in favourable condition for nesting, foraging and sheltering for Red Grouse.

Orsted Onshore Ireland Midco Limited will be solely responsible for implementation of all aspects of the plan and will ensure that the relevant stakeholders are regularly briefed on the progress of the plan in relation to achieving its objectives (including any proposed deviation from the provisions of the Plan which may be required for any reason). Deviations from the Plan will only be accepted if they propose an increase in mitigation for Hen Harrier and Red Grouse.

The SHMP will promote a mosaic of vegetation types which are optimal foraging habitat, will improve foraging success rates and consequently breeding success rates for the local population of Hen Harrier which is the ultimate target of this plan. The implementation of the SHMP will also contribute to enhancement of habitat for Red Grouse. It is concluded that the SHMP which is proposed will provide full and effective additional mitigation habitat for Hen Harrier and Red Grouse, as part of the development of the Proposed Development, above that which will be lost due to disturbance displacement.

1.11 References

- Anon. (2010) *National Parks and Wildlife Service Farm Plan Scheme, Terms and Conditions Document*. Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Arroyo, B., Amar, A., Leckie, F., Buchanan, G. M., Wilson, J. D., & Redpath, S. (2009) *Hunting habitat selection by Hen Harriers on moorland: implications for conservation management*. *Biological conservation*, 142(3), 586-596.
- Arroyo, B., Leckie, F., Amar, A., McCluskie, A. & Redpath, S. (2014) *Ranging behaviour of Hen Harriers breeding in Special Protection Areas in Scotland*. *Bird Study* 61: 48-55.
- Barton, C., C. Pollock, D. W. Norriss, T. Nagle, G. A. Oliver, and S. Newton. 2006. *The Second National Survey of Breeding Hen Harriers Circus cyaneus in Ireland 2005*. In: *Irish Birds* 8:1-20.
- Carey, Michael (2006). Fertiliser application to conifer plantations on oligotrophic peat sites. *Silviculture / Management* 14. Council for Forest Research and Development (COFORD).
- Cummins, S., Bleasdale, A., Douglas, C., Newton, S., O'Halloran, J. & Wilson, H.J. (2010) *The status of Red Grouse in Ireland and the effects of land use, habitat and habitat quality on their distribution*. *Irish Wildlife Manuals*, No. 50. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
- Data from successful Hen Harrier habitat establishment after clearfell at Cruach Mhor wind farm in Scotland. Unpublished report
- Gilbert, G., Gibbons, D.W. & Evans J. (1998) *Bird monitoring methods. A manual of techniques for key UK species*. RSPB, Sandy, Bedfordshire.
- Gilbert, G., Stanbury, A. & Lewis, L. (2021) *Birds of Conservation Concern in Ireland 2020 – 2026*. *Irish Birds*, 43, 1- 22.
- Goodship, N.M. & Furness, R.W. (2022) *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.
- Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B., & Thompson, D. (2013) *Raptors: a field guide for surveys and monitoring*. [Available at: <https://raptormonitoring.org/need-advice-on-monitoring> – accessed 25/10/2023].
- Iremonger, S., O'Halloran, J., Kelly, D.L., Wilson, M., Smith, G.F., Gittings, P.S., Mitchell, F.J.G., Oxbrough, A., Coote, L., French, L., O'Donoghue, S., McKee, A.M., Pithon, J., O'Sullivan, A., Neville, P., O'Donnell, V., Cummins, V., Kelly, T.C. and Dowling, P. (2007) Biodiversity in Irish Plantation Forests. **51**: *Environmental Protection Agency*.
- Kennedy, P.G., Ruttledge R.F., Scroop, C.F. (1954). *Birds of Ireland*. London and Edinburgh.
- Lynas, P., Newton, S.F., Robinson, J. (2007). The status of birds in Ireland: An analysis of Conservation Concern 2008-2013. *Irish Birds*. Vol.8. No.2.
- Madders, M. (2000). Habitat selection and foraging success of Hen Harriers *Circus cyaneus* in west Scotland. *Bird Study* 47, 32-40.
- Madders, M. (2003). Hen Harrier *Circus cyaneus* foraging activity in relation to habitat and prey. *Bird Study* 50, 55-60.
- Macdonald, Elspeth, and Jason Hubert, (2002). A review of the effects of silviculture on timber quality of Sitka spruce. *Forestry* 75.2 107-138.
- Nagle, T. (2006). The status of Birds of Prey in Cork. *Cork Bird Report*.

- Norriss, D.W., Marsh, J., McMahon, D. and Oliver, G.A. (2002). A national survey of breeding Hen Harriers (*Circus cyaneus*) in Ireland 1998-2000 *Irish Birds* 7: 11-12.
- Newton, S., Donaghy, A., Allen, D., and Gibbons, D. (1999). Birds of Conservation Concern in Ireland. *Irish Birds* 6: 333-344.
- Norriss, D.W., Marsh, J., McMahon, D. & Oliver, G.A. (2002). A national survey of breeding Hen Harriers *Circus cyaneus* in Ireland 1998-2000. *Irish Birds* 7: 1-12
- O' Flynn, W.J. (1983). Population changes of the Hen Harrier in Ireland. *Irish Birds*. Vol.2 No.3
- NPWS. (2004) *Site Synopsis: Gortacullin Bog NHA (Site Code 002401)*. National Parks and Wildlife Service. [Available at: [SITE SYNOPSIS \(npws.ie\)](http://npws.ie) – accessed 08/11/2023].
- NPWS (2022). Conservation Objectives Supporting Document: Breeding Hen Harrier. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
- O'Donoghue, B. G. (2010) *The ecology and conservation of Hen Harriers (Circus cyaneus) in Ireland* (Doctoral dissertation, PhD Thesis, University College Cork, Ireland).
- O'Donoghue, B. (2019) *Survey Guide – Hen Harrier Roost Type and Guidelines to Roost Watching*. *Irish Hen Harrier Winter Survey*. [Available at: [IHHWS Guide.pdf](#) – accessed 25/10/2023].
- Redpath, S., Madders, M., Donnelly, E., Anderson, B., Thirgood, S., Martin, A., & McLeod, D. (1998) *Nest site selection by Hen Harriers in Scotland*. *Bird Study*, 45(1), 51-61.
- Ruddock, M. & Dunlop, B.J., O'Tool, L., Mee, A., Nagle T. (2012) Republic of Ireland National Hen Harrier Survey 2012. *Irish Wildlife Manual*, No. 59. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Ruddock, M., Mee, A., Lusby, J., Nagle, A., O'Neill, S. & O'Toole, L. (2016) *The 2015 National Survey of Breeding Hen Harrier in Ireland*. *Irish Wildlife Manuals*, No. 93. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.
- Scott, D. & Clarke, R. (2007). Comparing the Success of Hen Harrier *Circus cyaneus* tree nests and ground nests in the Antrim Hills, 1990-2006. *Irish Birds*, Vol.8 No 2.
- Sharrock, J.T.R. (1976). *The Atlas of Breeding Birds in Britain and Ireland*. T&AD Poyser, London.
- Teagasc (2007). Farm Forestry Series No. 14: Nutrient Deficiencies in Forest Crops. Teagasc, Mellows Centre, Athenry, Co. Galway.
- Thompson, W. (1849). *The Natural History of Ireland*. Volume 1. London.
- UCC and Cork County Council. Following trial at a Hen Harrier breeding site near Bottlehill, Co. Cork. Unpublished report.
- Usher, R.J. (1893). *Birds of County Cork*. Journal of the Cork Historical and Archaeological Society.
- Ussher, R.J. & Warren, R. (1900). *The Birds of Ireland*. London.
- Watson, D. (1977). *The Hen Harrier*. Poyser, London.
- Weatherell, J. (1953). The checking of forest trees by heather. *Forestry*, 26(1), 37-40.
- Scallan, D. (2015) *Development of Best-Practice Guidelines for Red Grouse on Irish SAC Raised Bogs*. National Association of Regional Game Councils.

ANNEX A
SHMP MAPPING

Figure 1- 1: Disturbance Zone Habitats – Regional Context

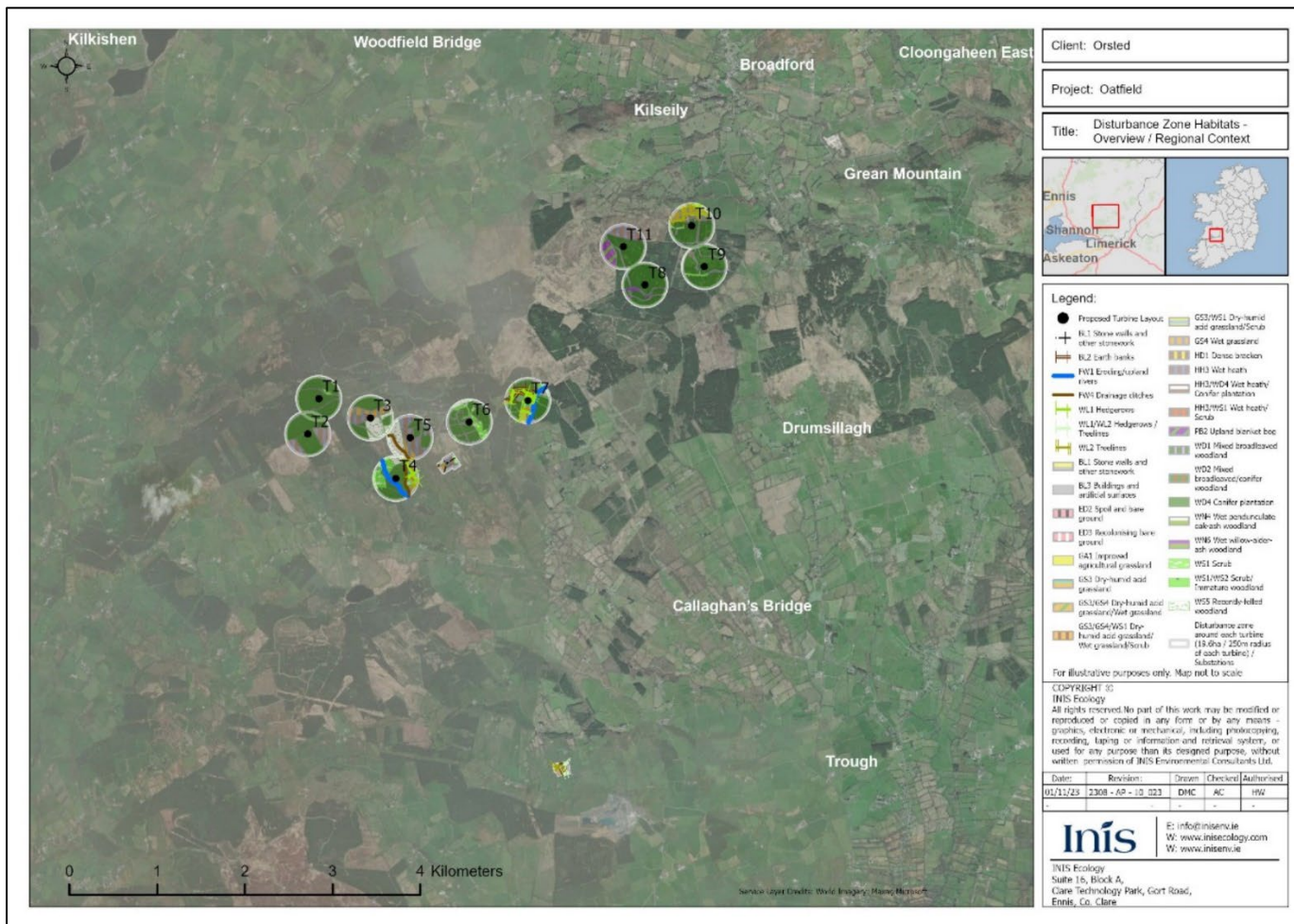


Figure 1- 2: Disturbance Zone Habitats – Local Context

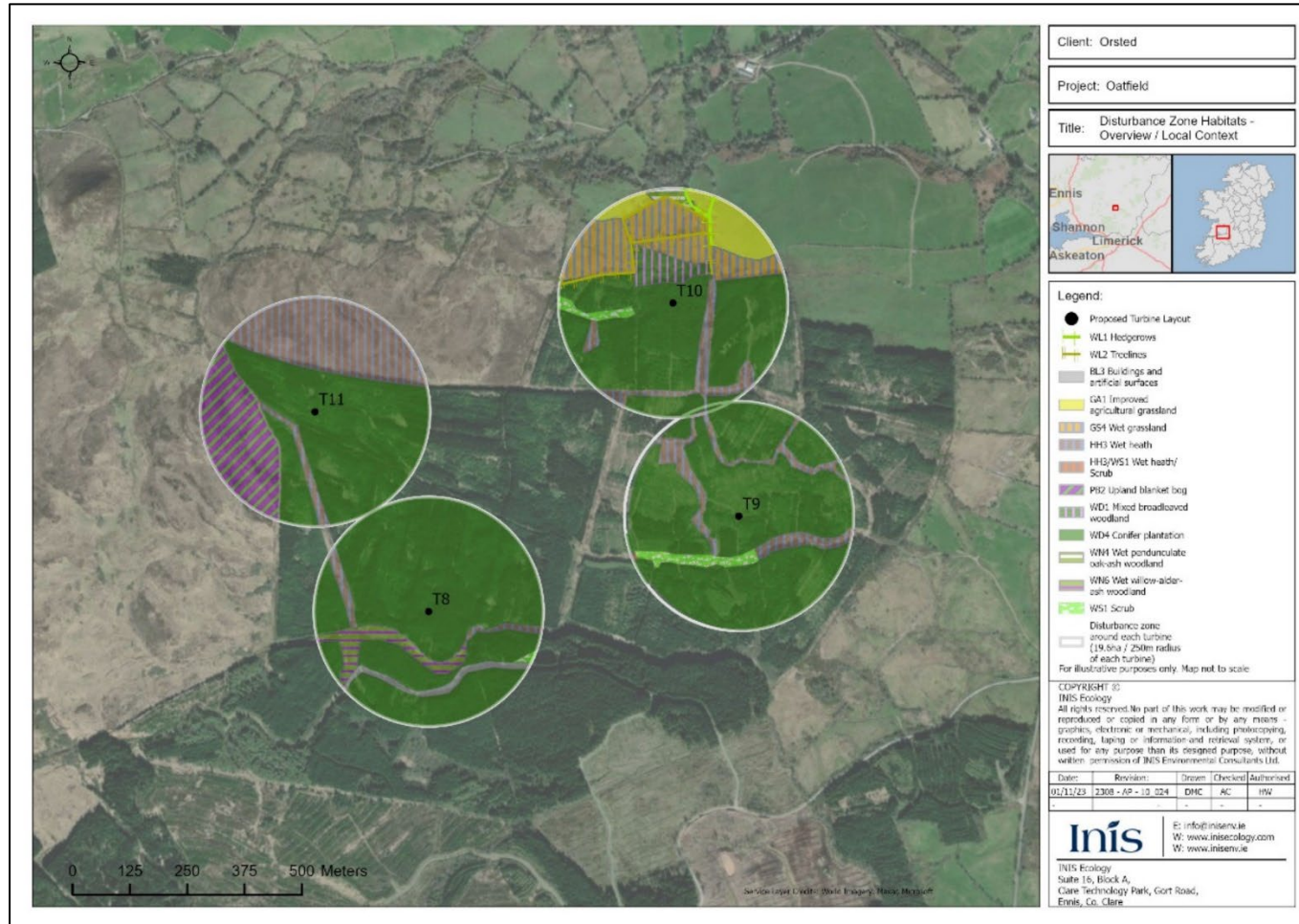


Figure 1- 3: Disturbance Zone Habitats – Local Context

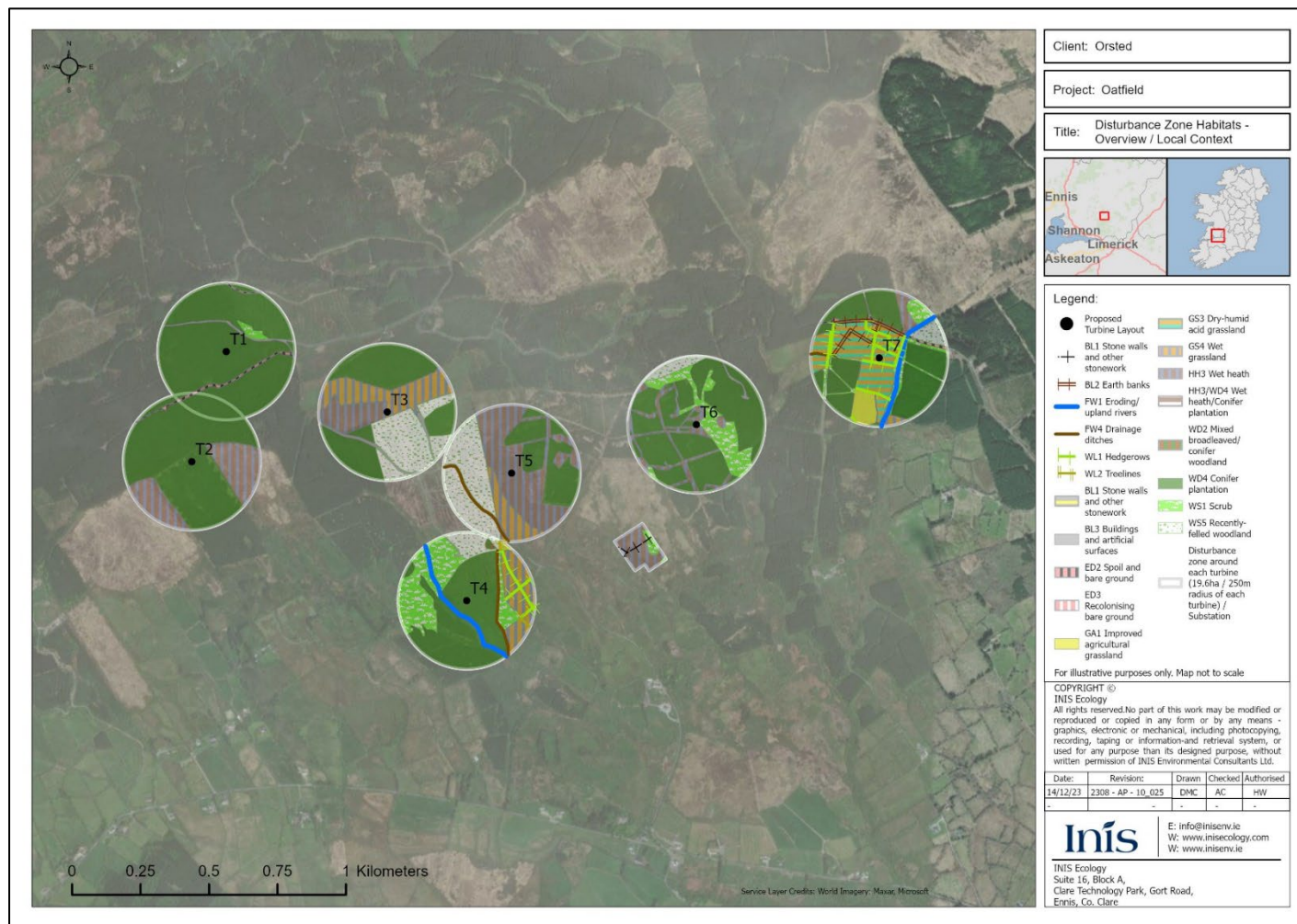


Figure 1- 4: Turbine 1 Habitats

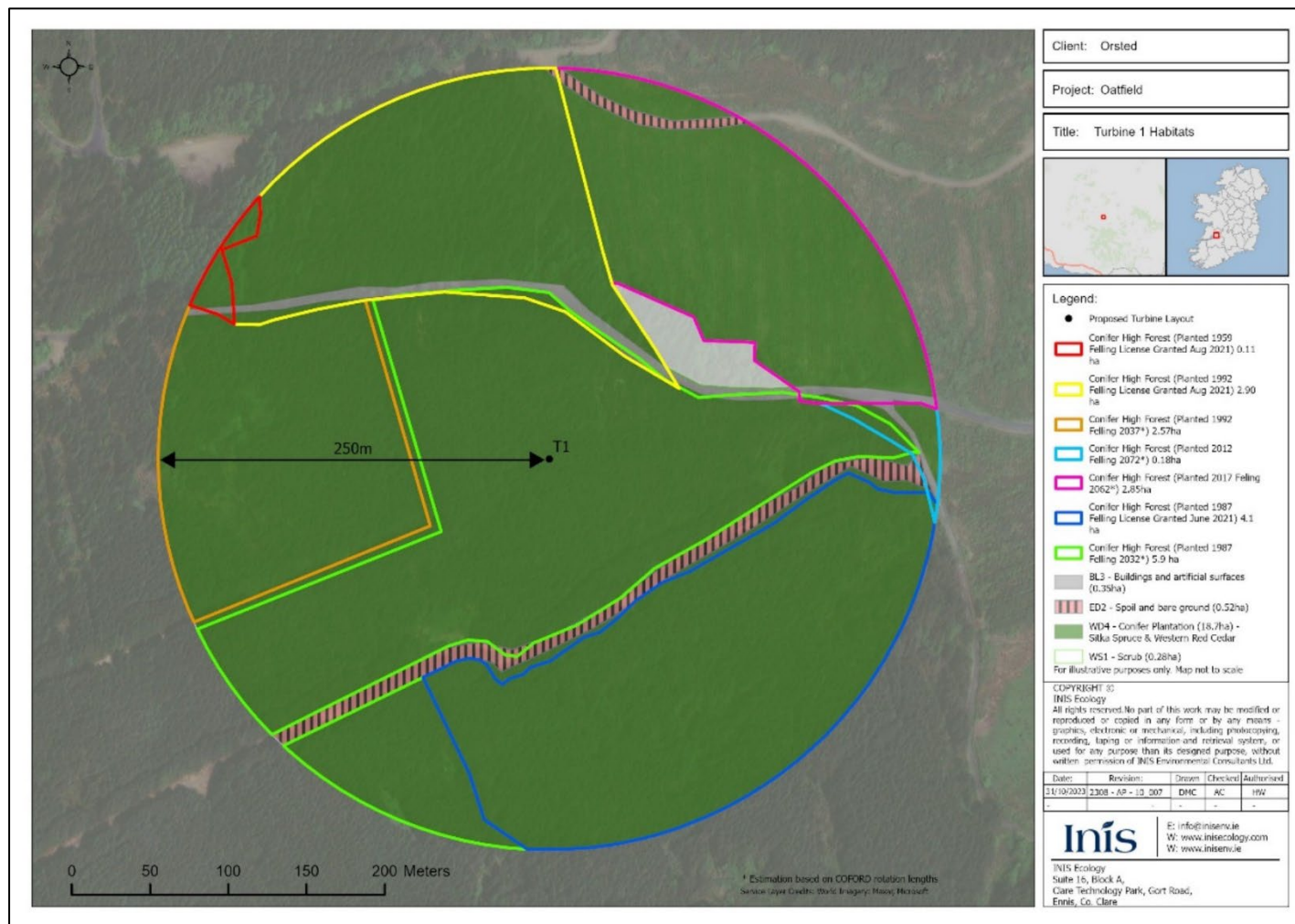


Figure 1- 5: Turbine 2 Habitats

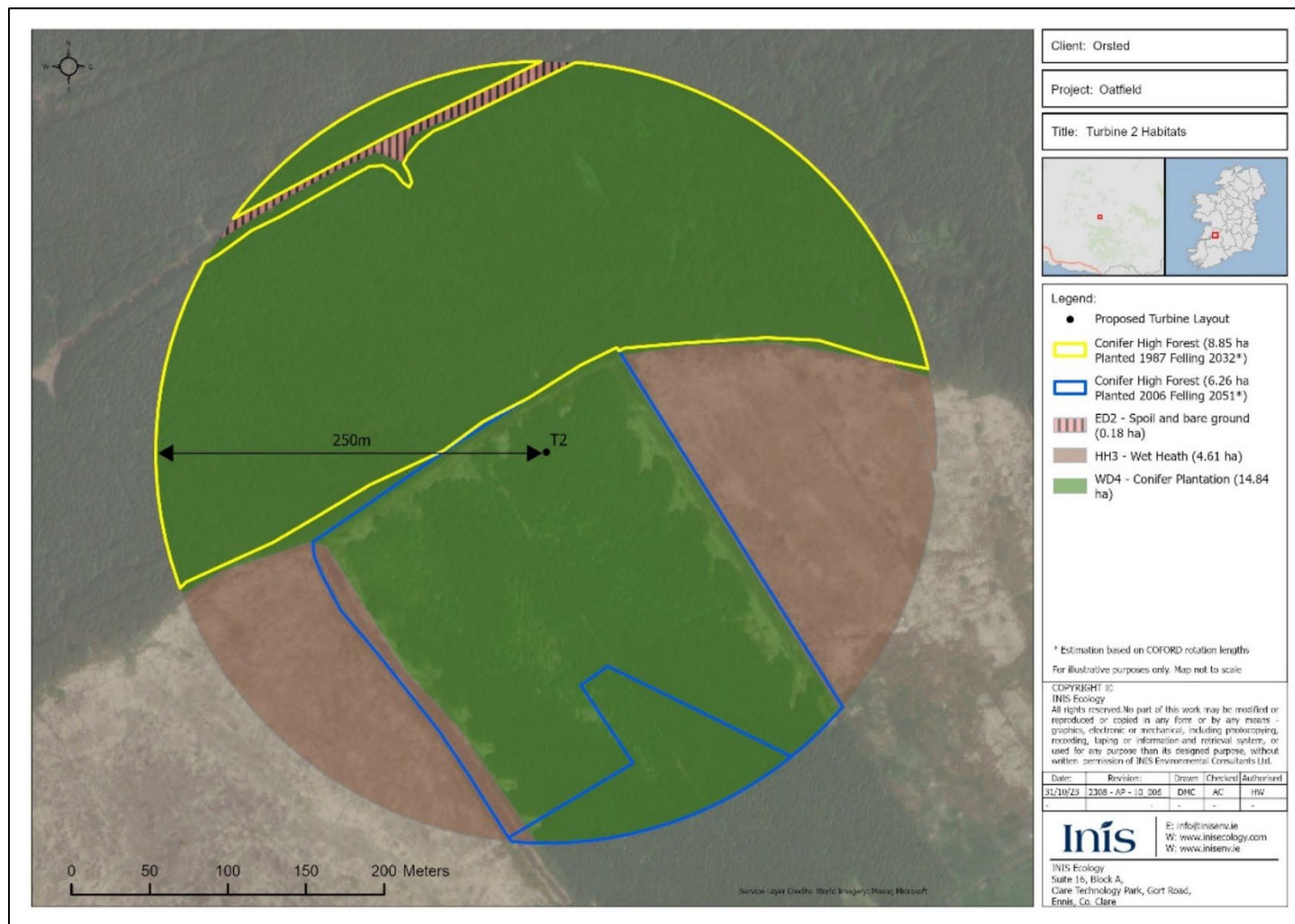


Figure 1- 6: Turbine 3 Habitats

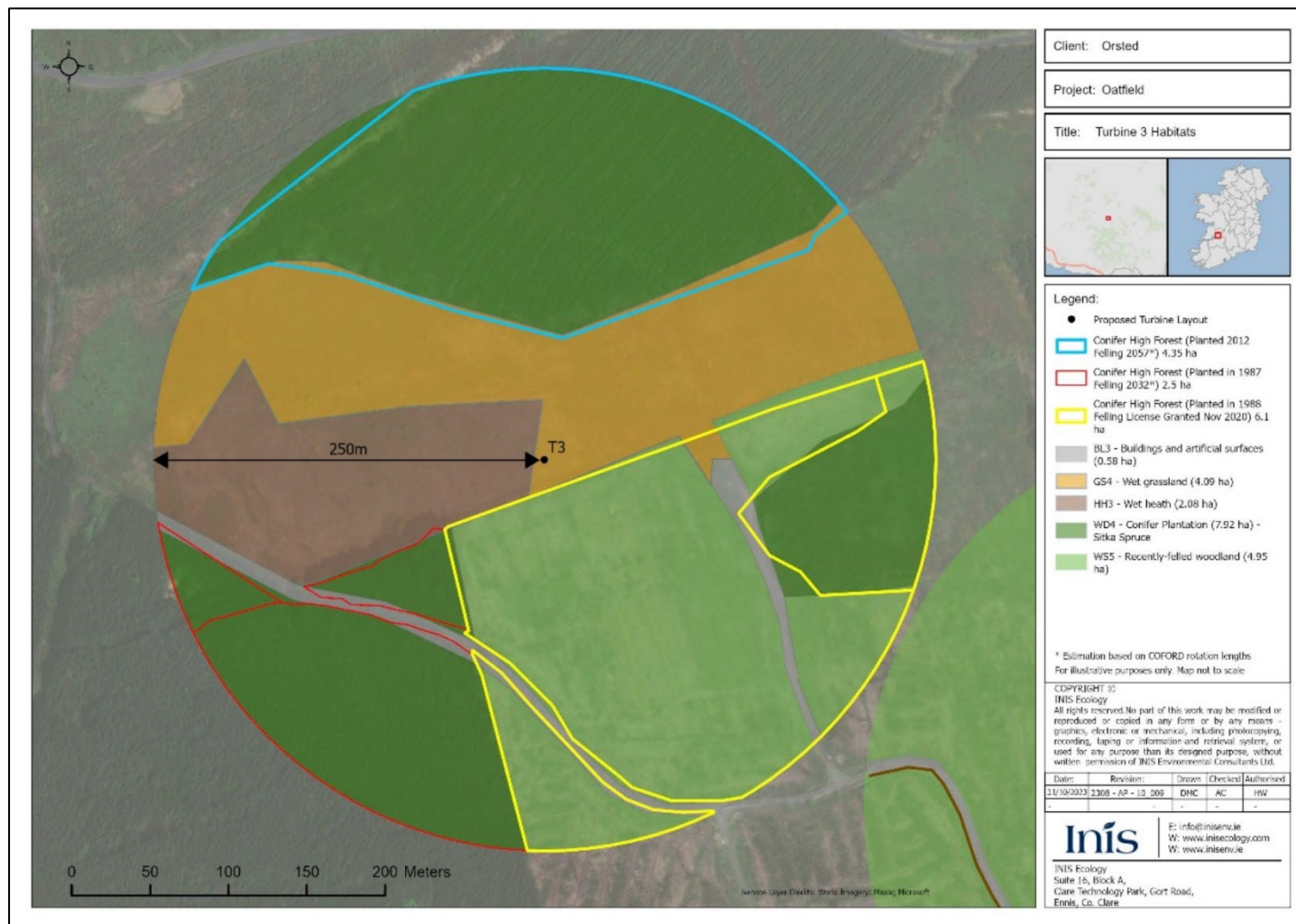


Figure 1- 7: Turbine 4 Habitats

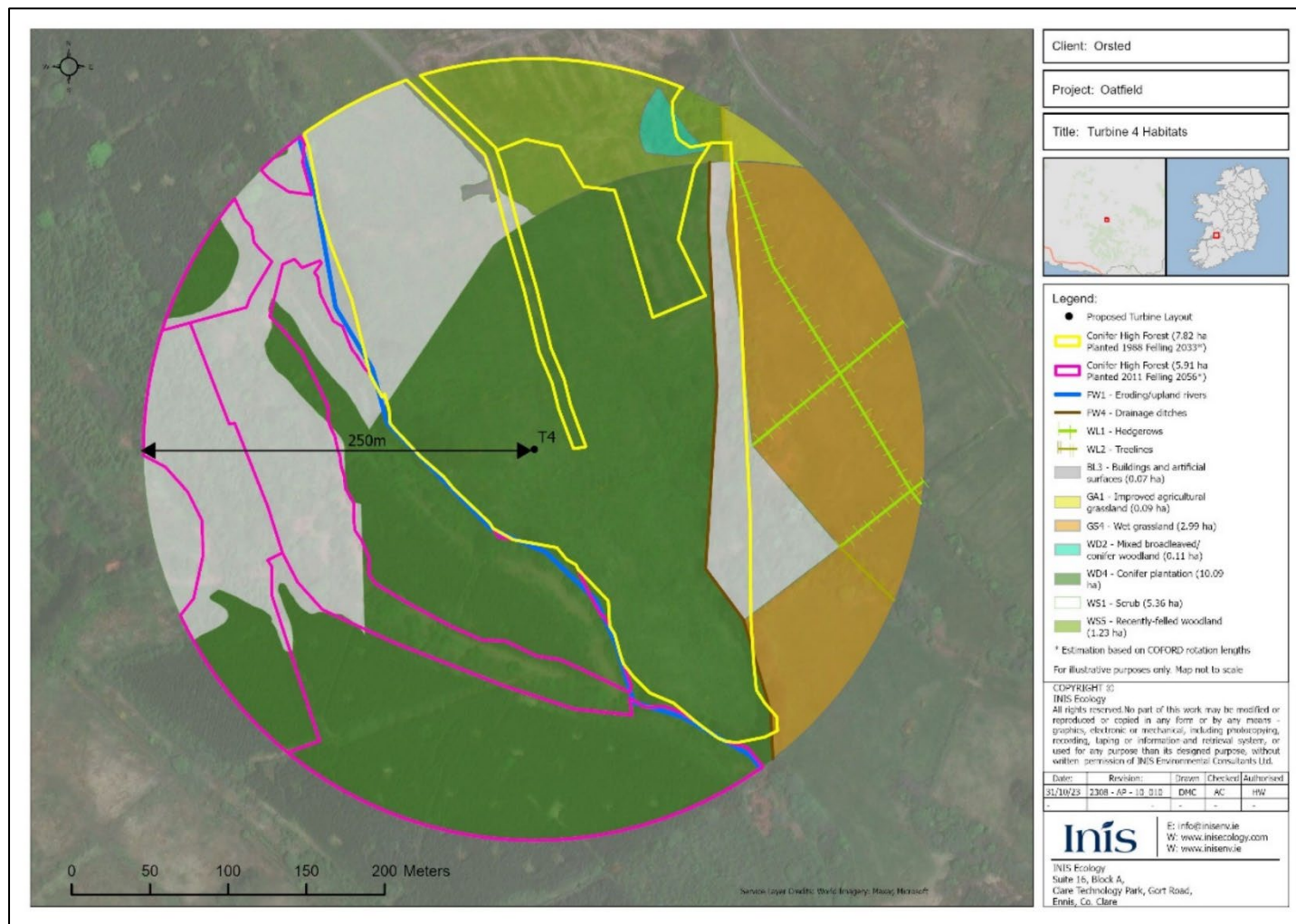


Figure 1- 8: Turbine 5 Habitats

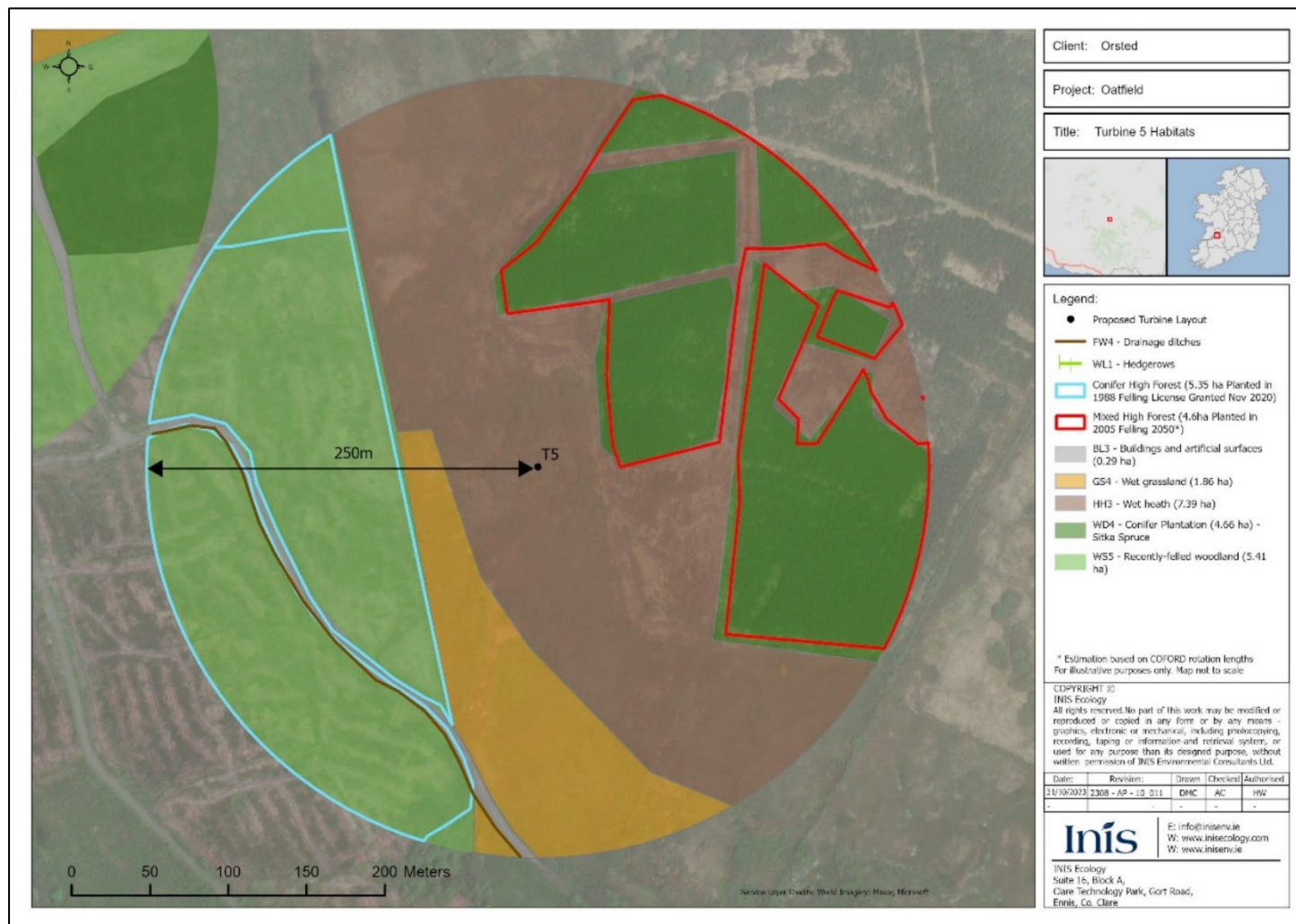


Figure 1- 9: Turbine 6 Habitats

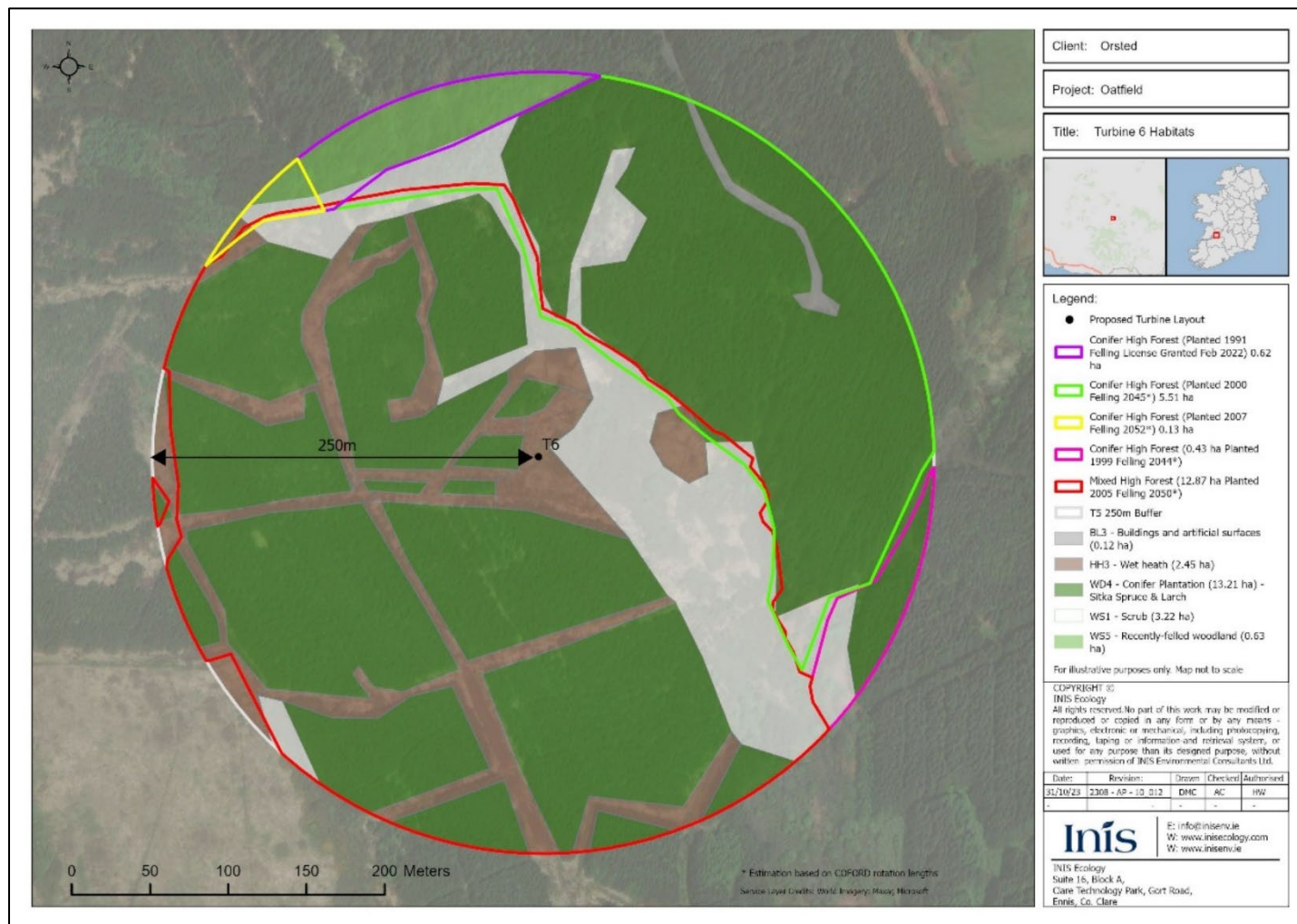


Figure 1- 10: Turbine 7 Habitats

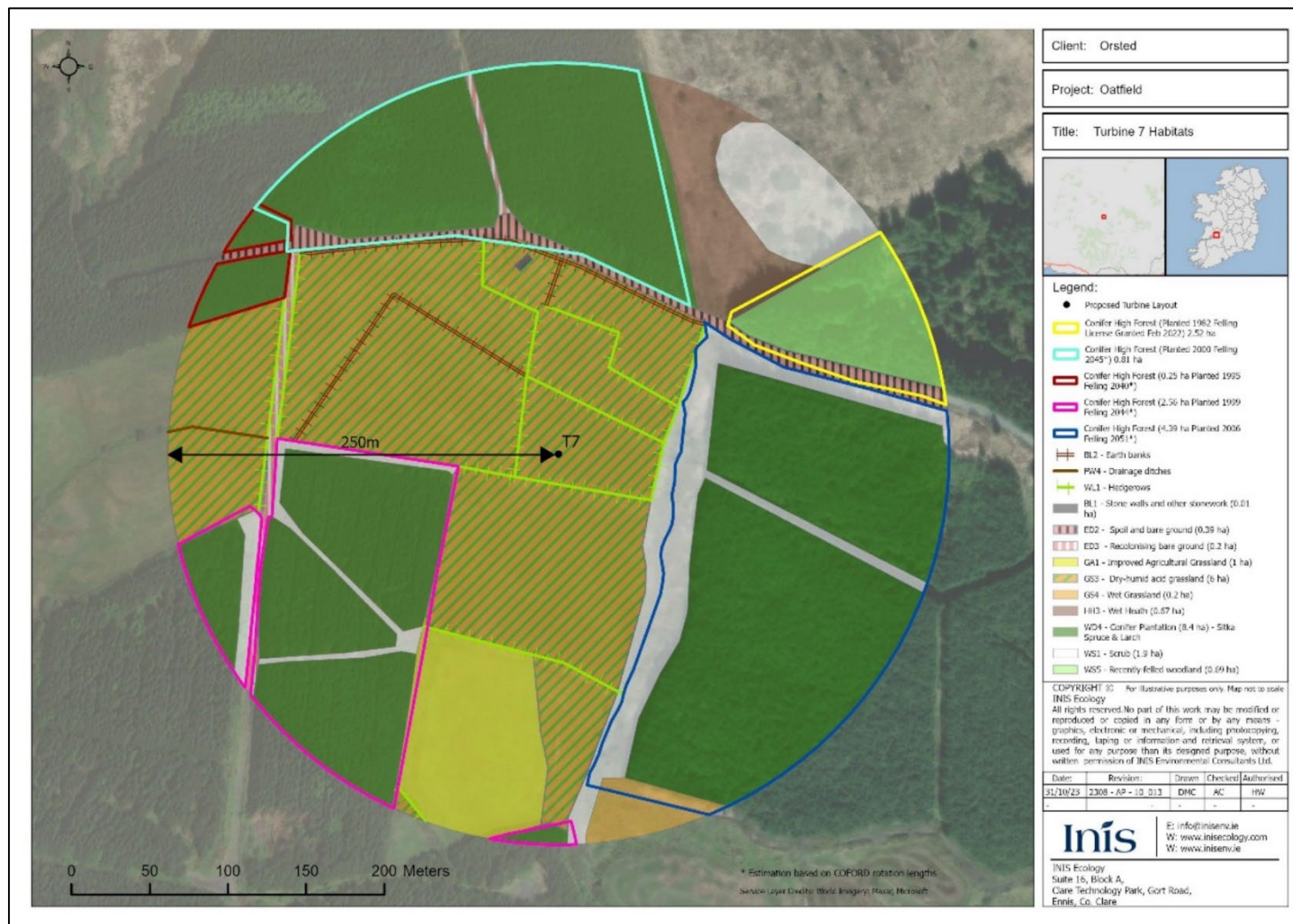


Figure 1- 11: Turbine 8 Habitats

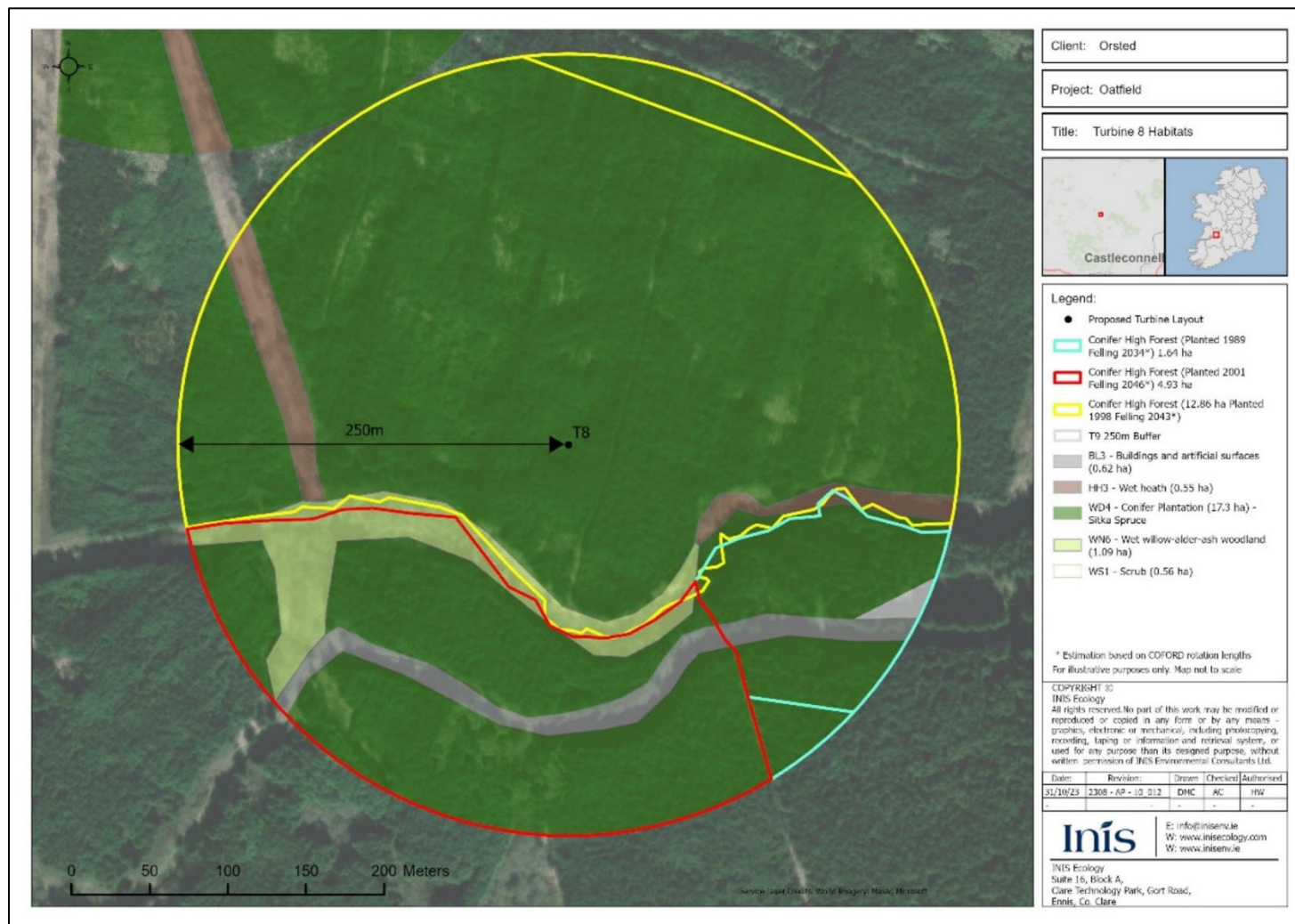


Figure 1- 12: Turbine 9 Habitats

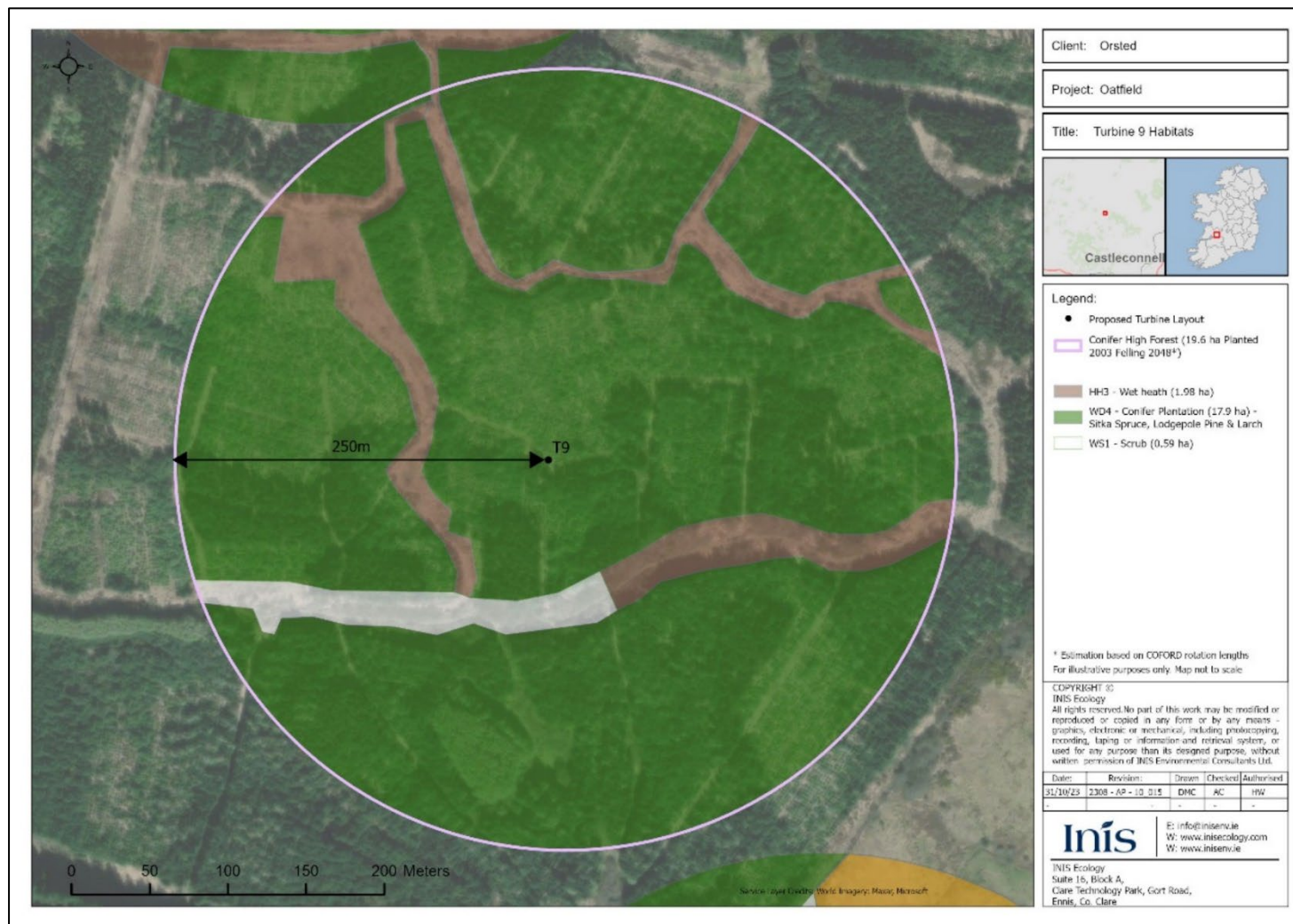


Figure 1- 13: Turbine 10 Habitats

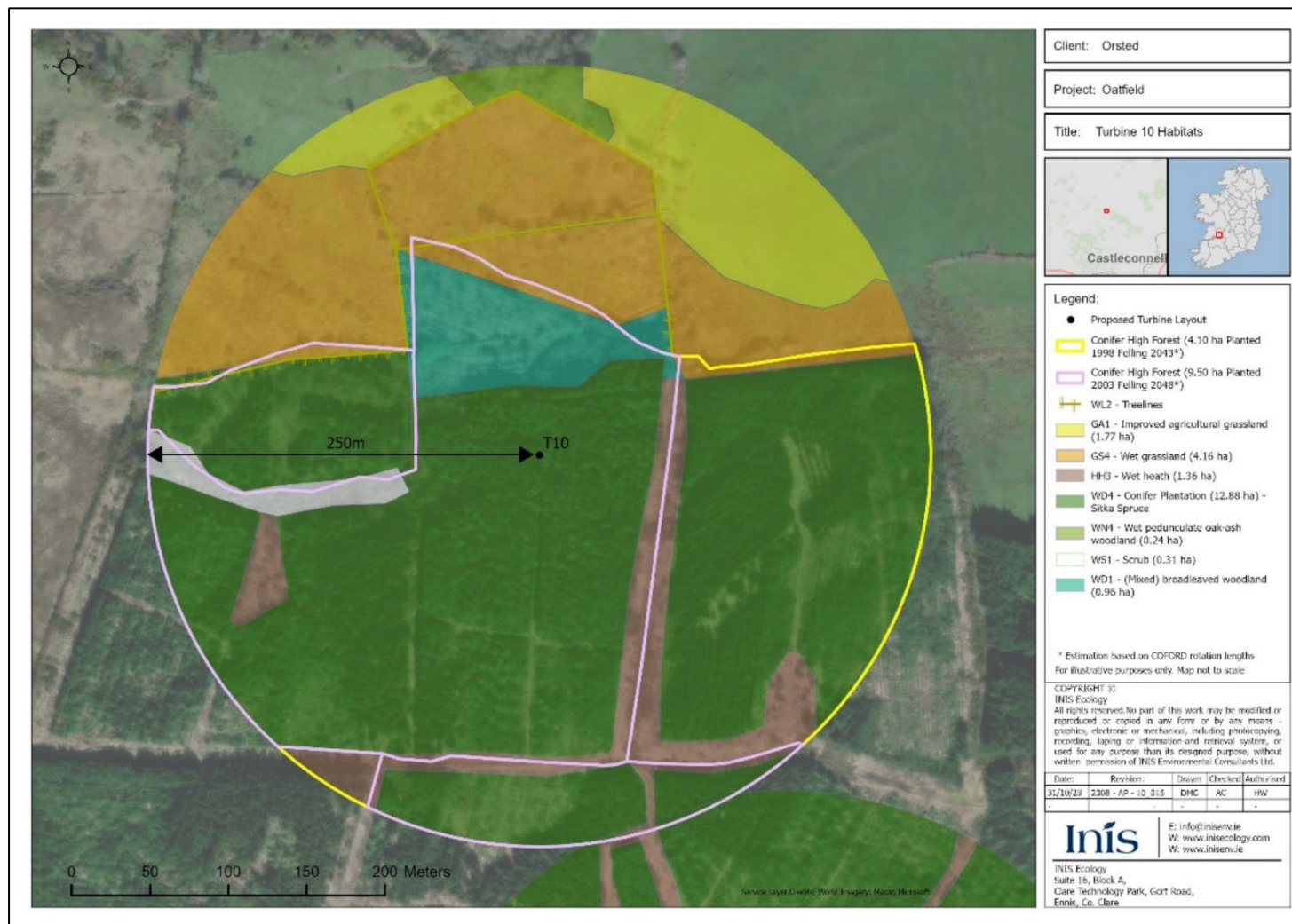


Figure 1- 14: Turbine 11 Habitats

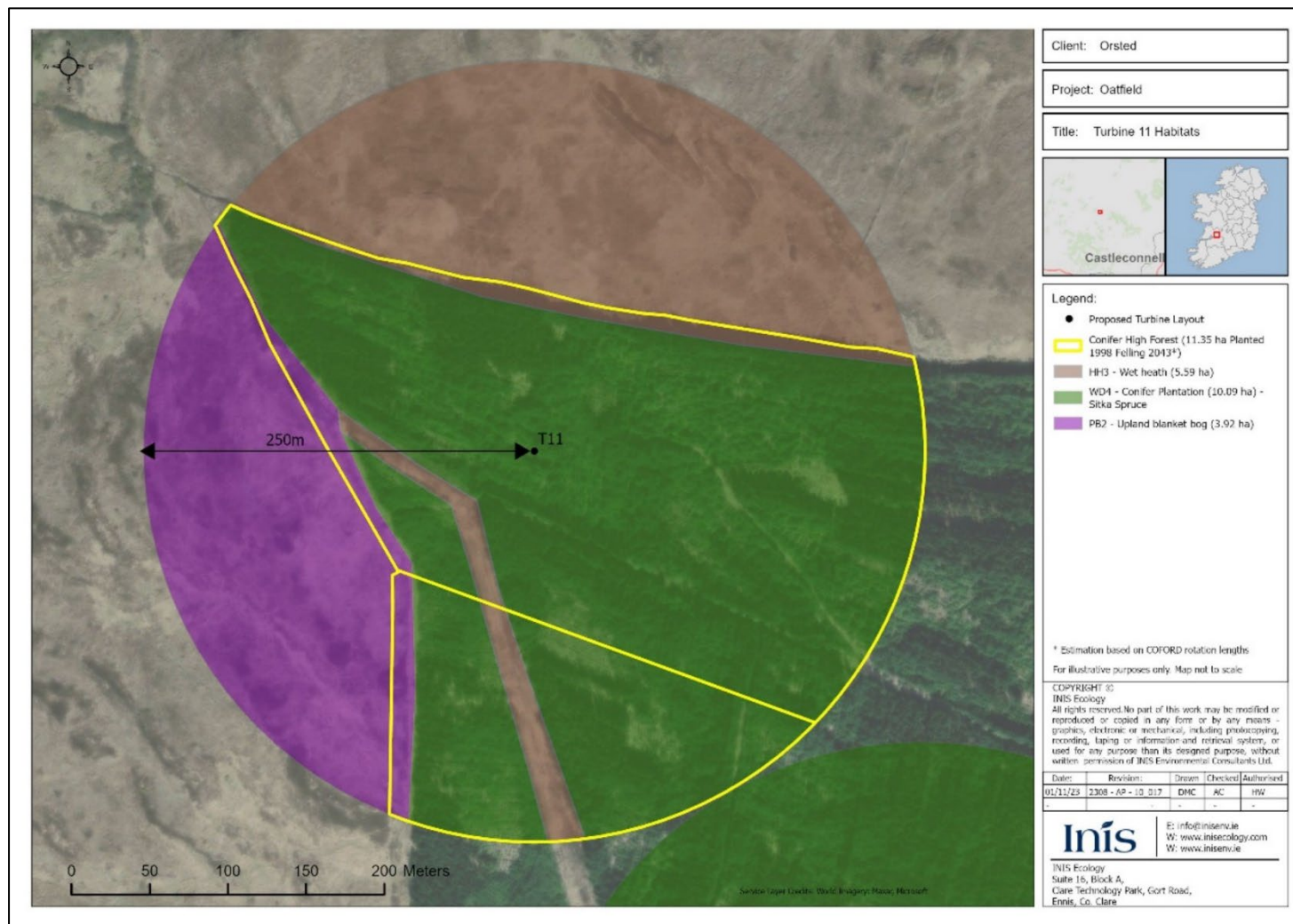


Figure 1- 15: Substation Habitats

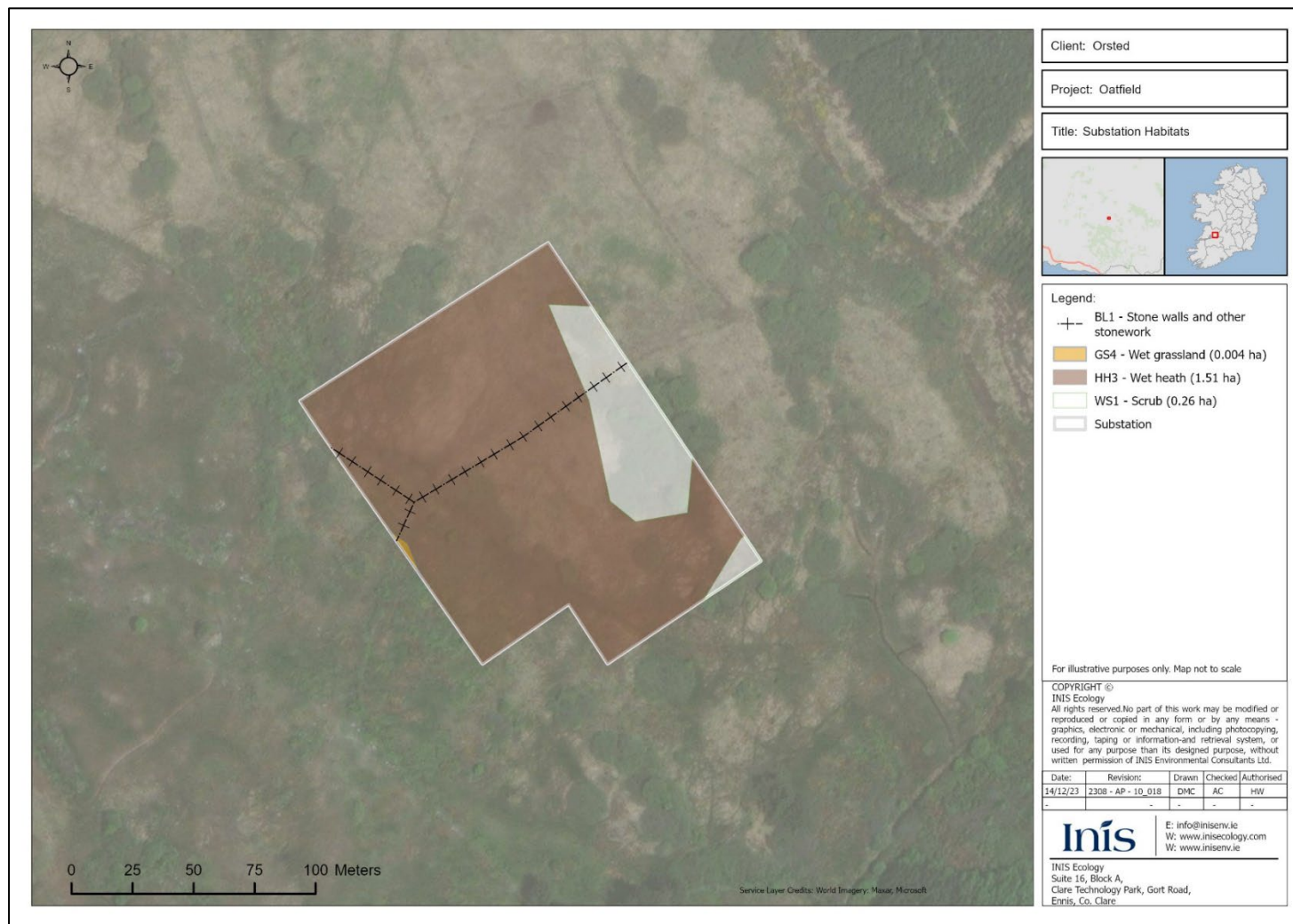


Figure 1- 16: Wider landcover areas within 5 km of the Study Area

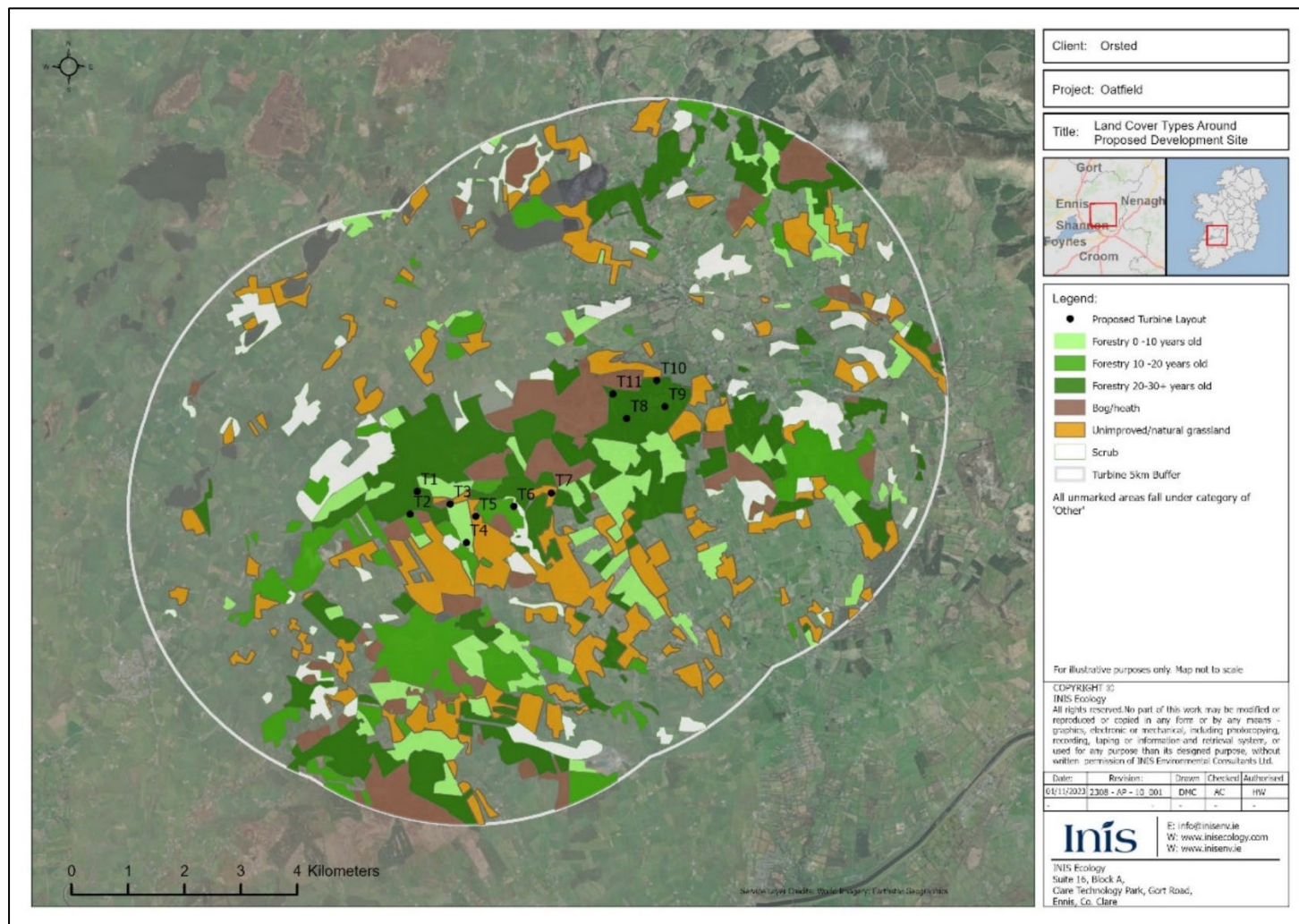


Figure 1- 17: Breeding season 2022 and 2023 Hen Harrier activity

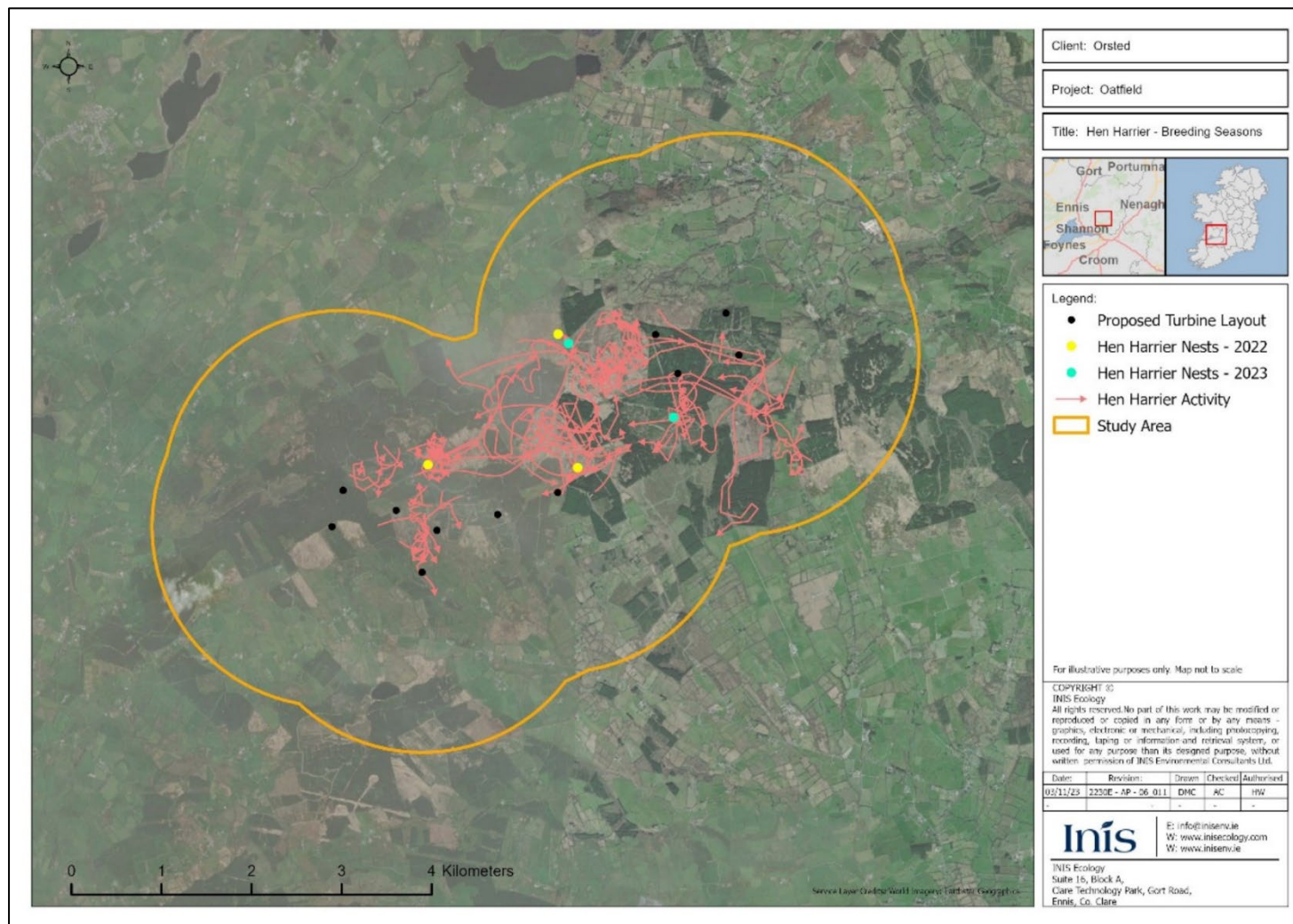


Figure 1- 18: Winter season 2021/22 and 2022/23 Hen Harrier activity

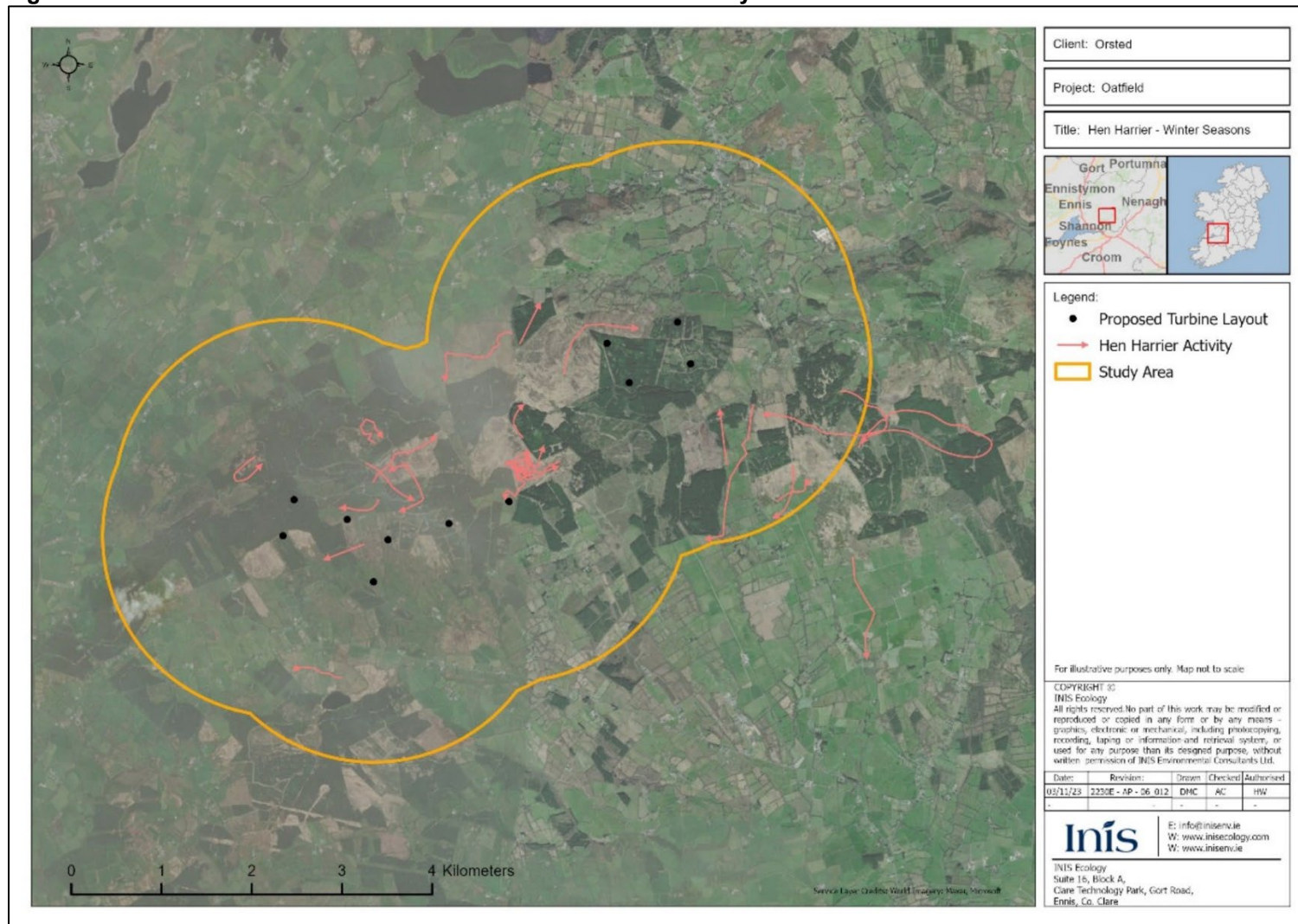


Figure 1- 19: 2021-2023 Red Grouse sightings

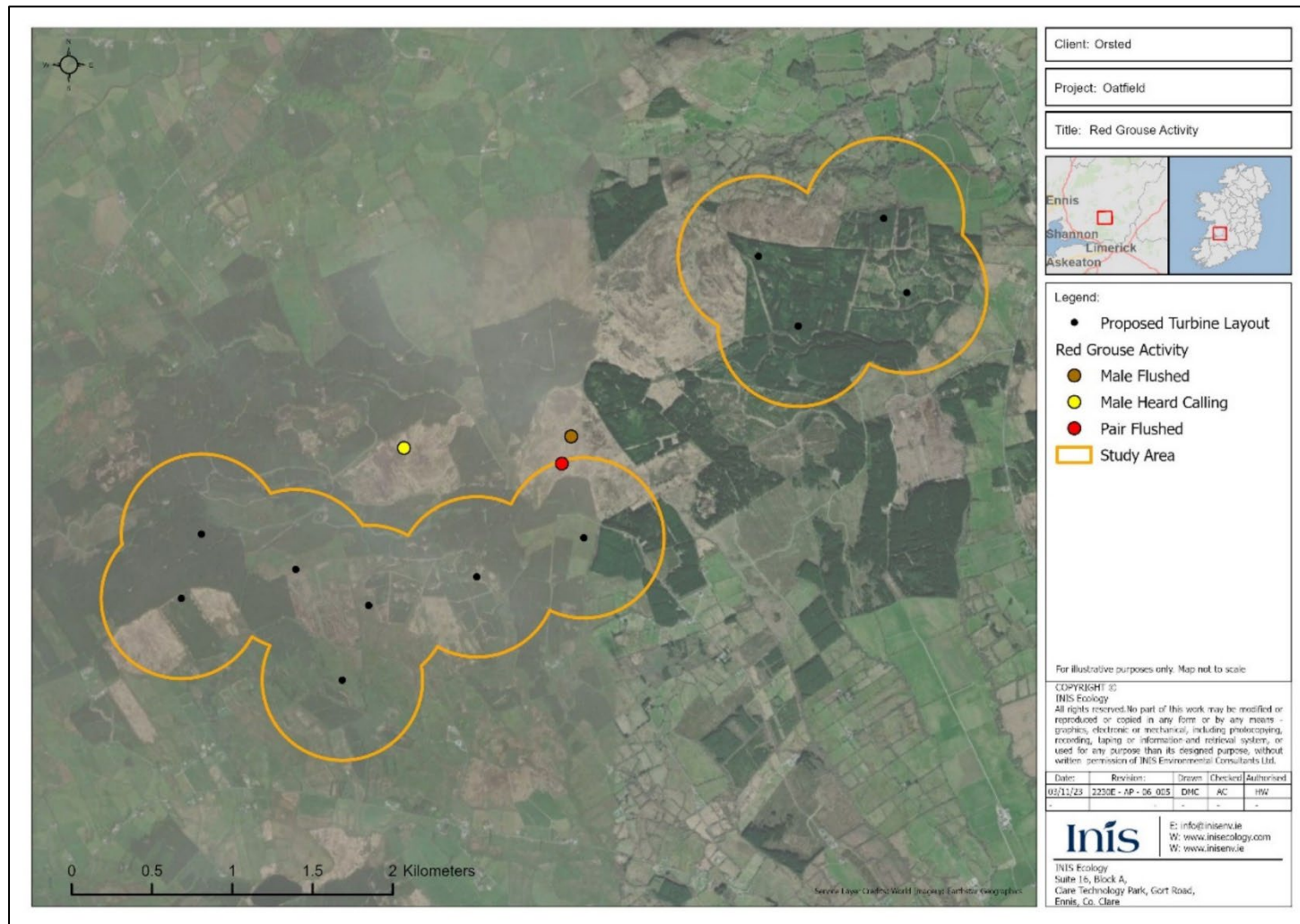


Figure 1- 20: Regional Context - Managed Areas for Hen Harrier, Red Grouse and other key ecological features

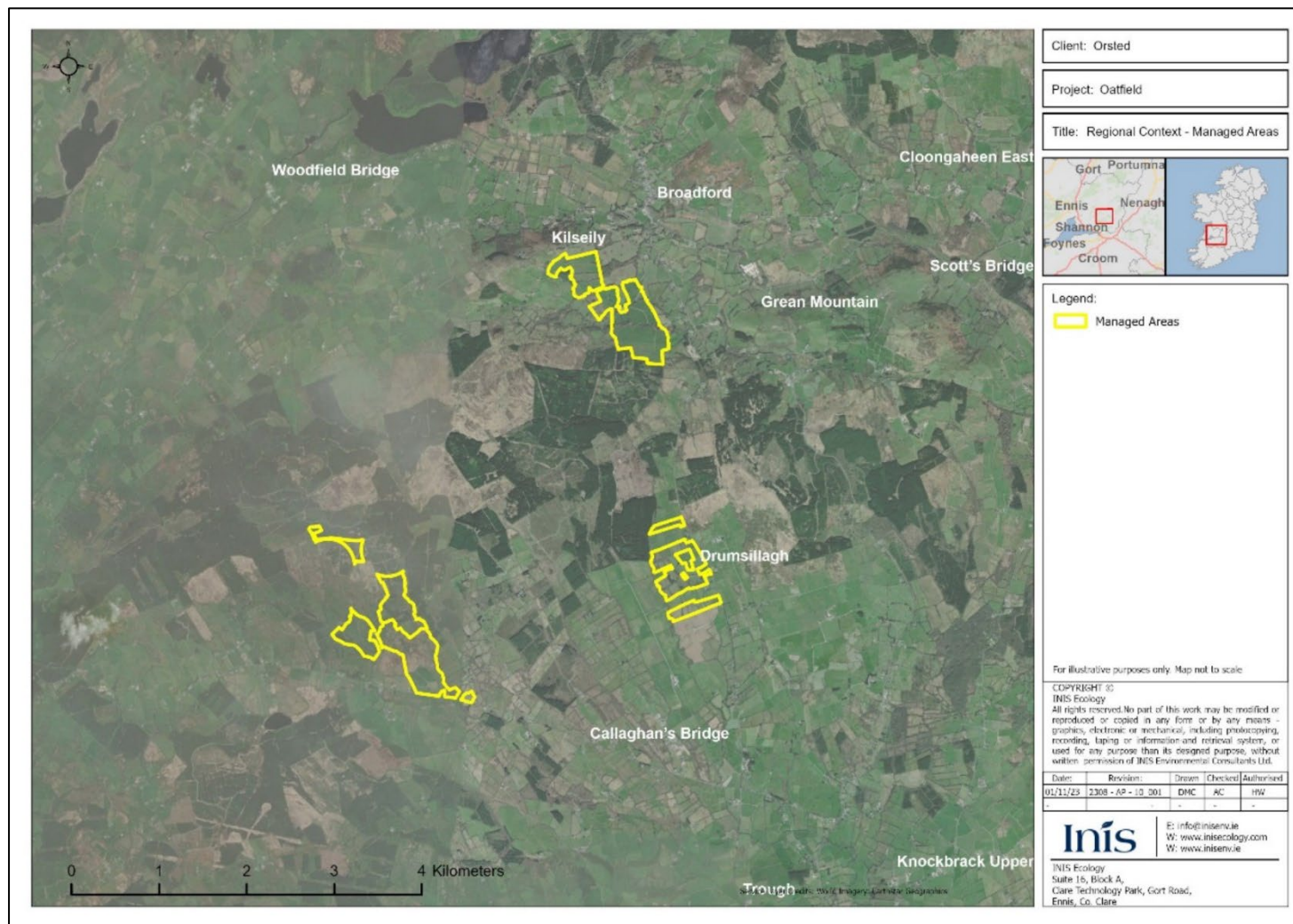


Figure 1- 21: Local Context - Managed Areas for Hen Harrier, Red Grouse and other key ecological features

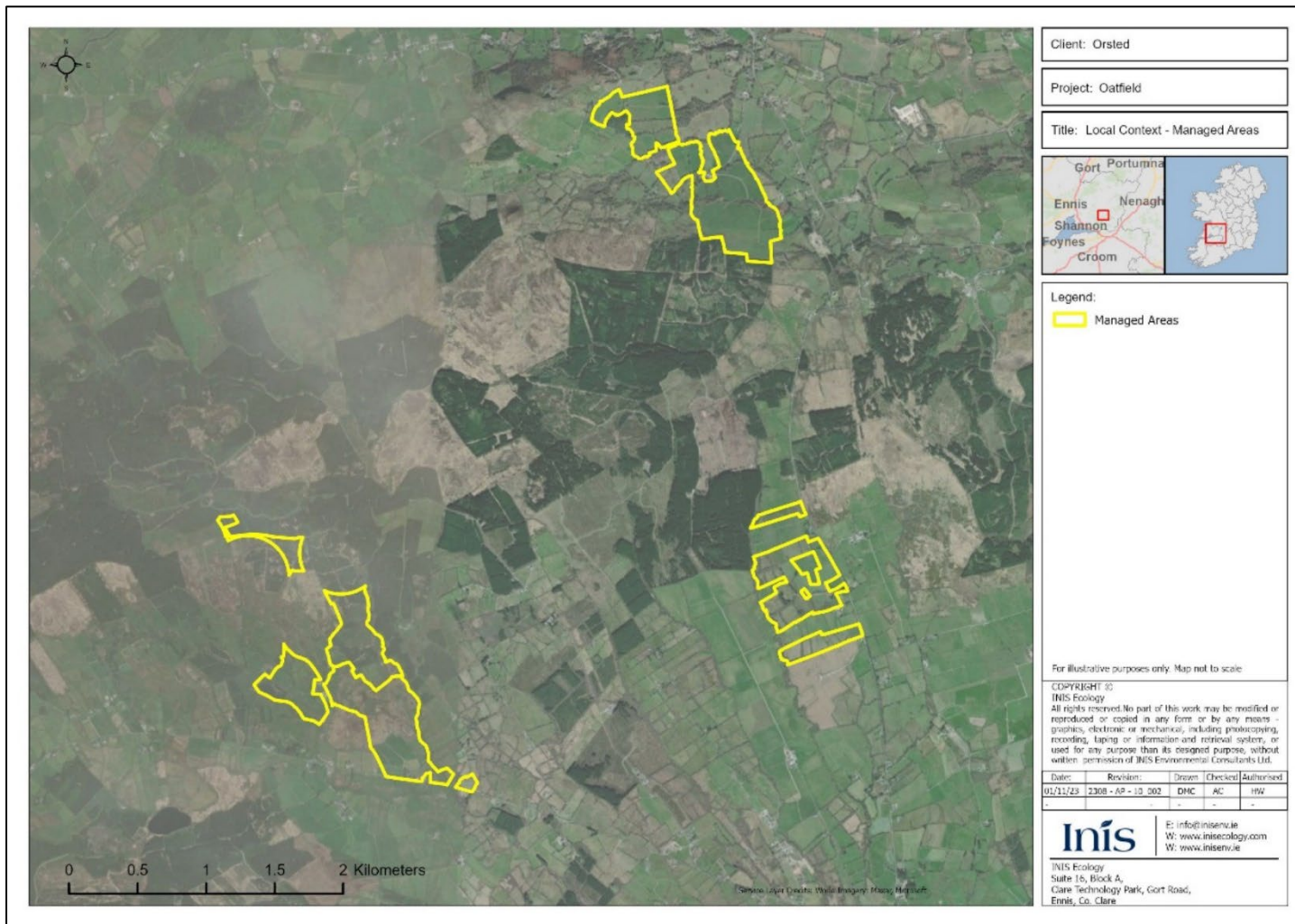


Figure 1- 22: Local Context - Managed Habitats for Hen Harrier, Red Grouse and other key ecological features

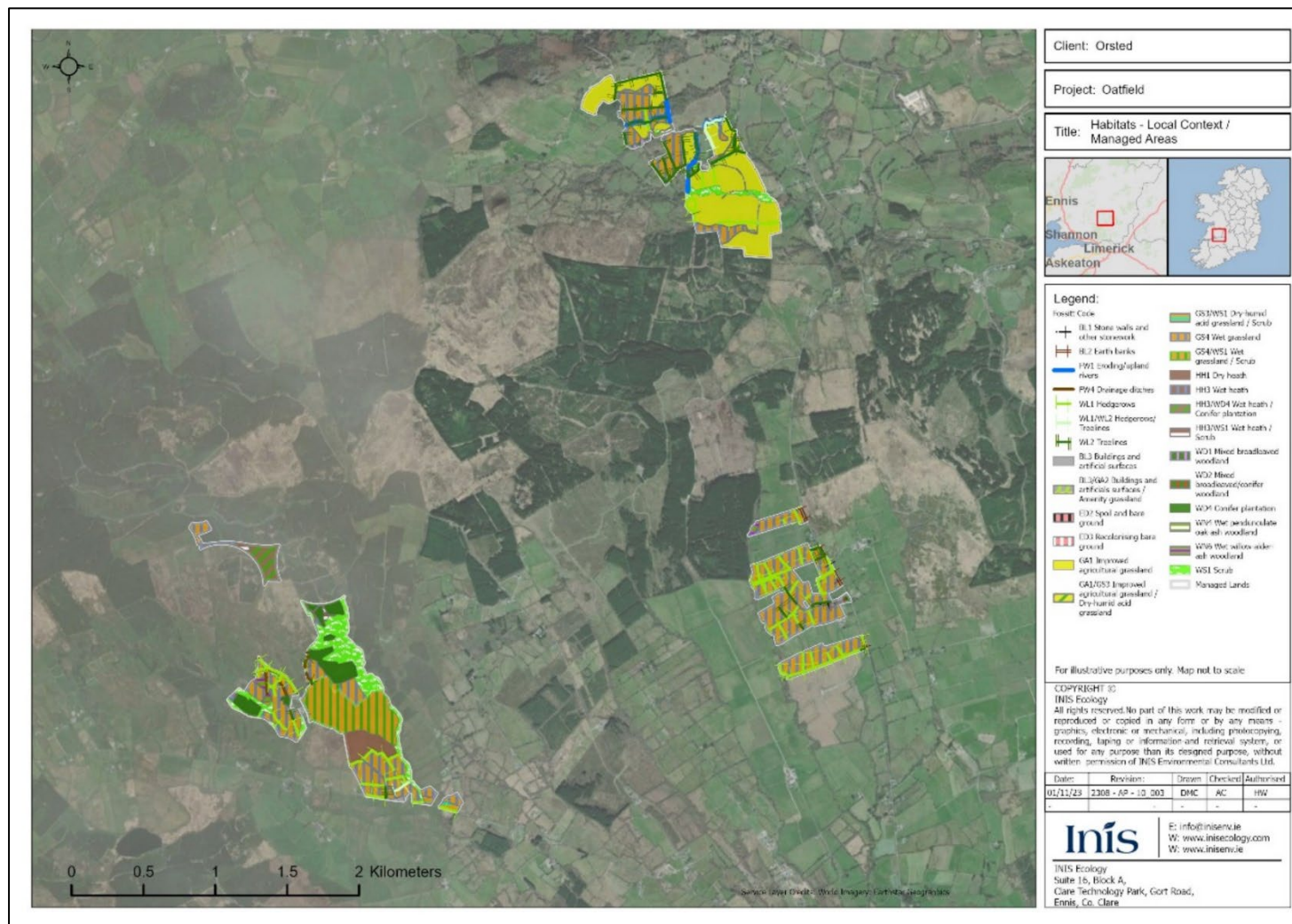


Figure 1- 23: Managed Habitats for Hen Harrier, Red Grouse and other key ecological features

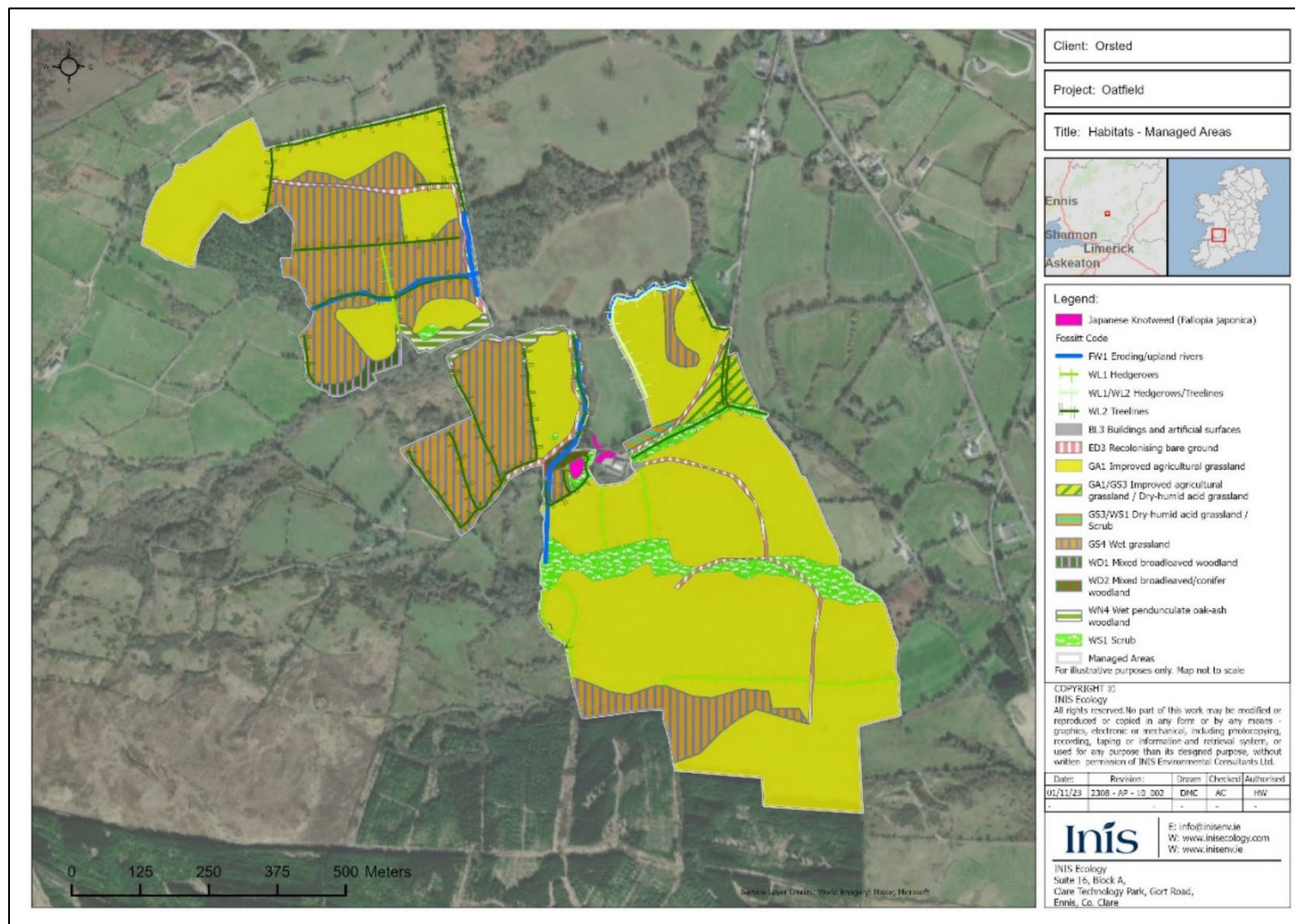


Figure 1- 24: Managed Habitats for Hen Harrier, Red Grouse and other key ecological features

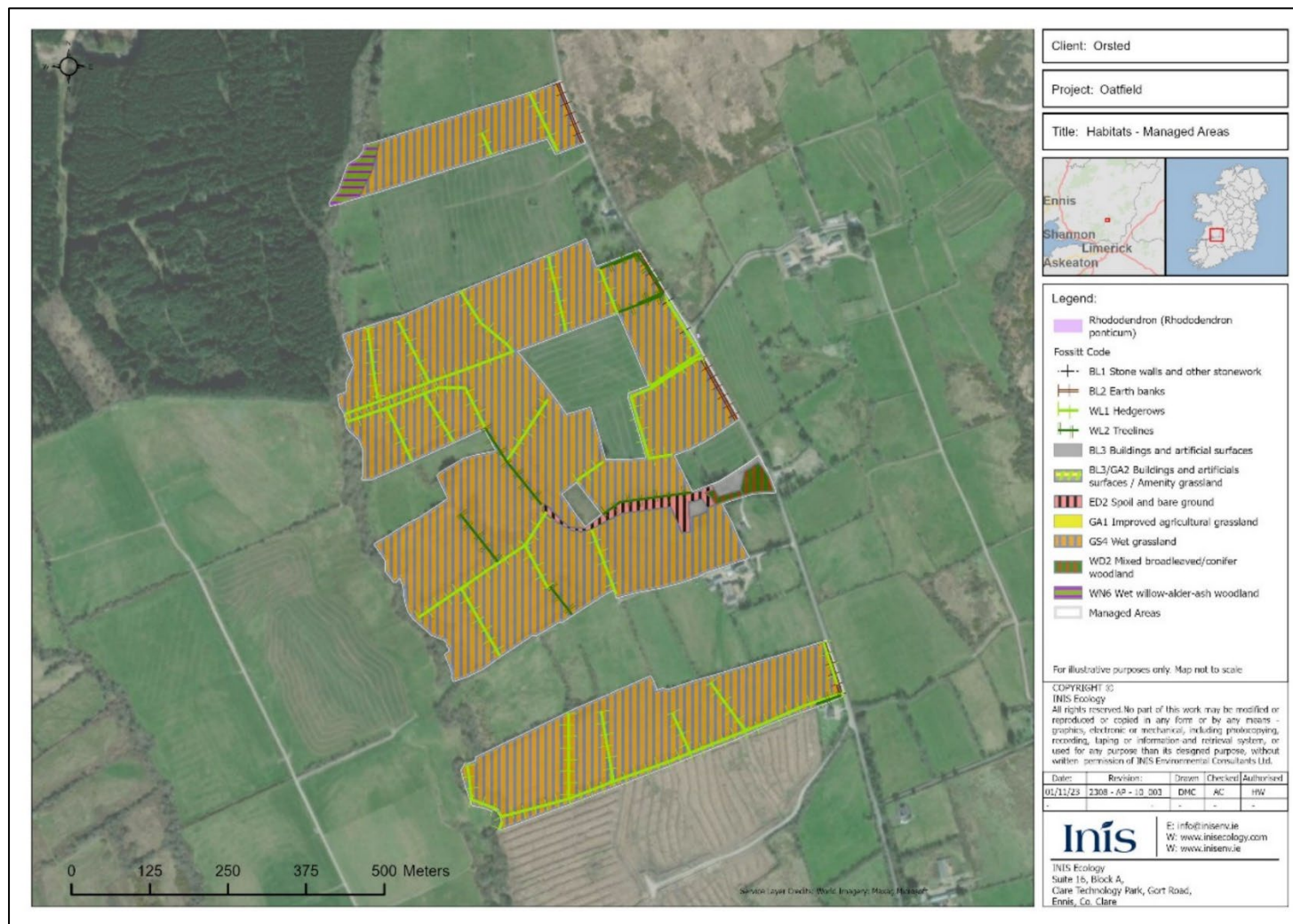
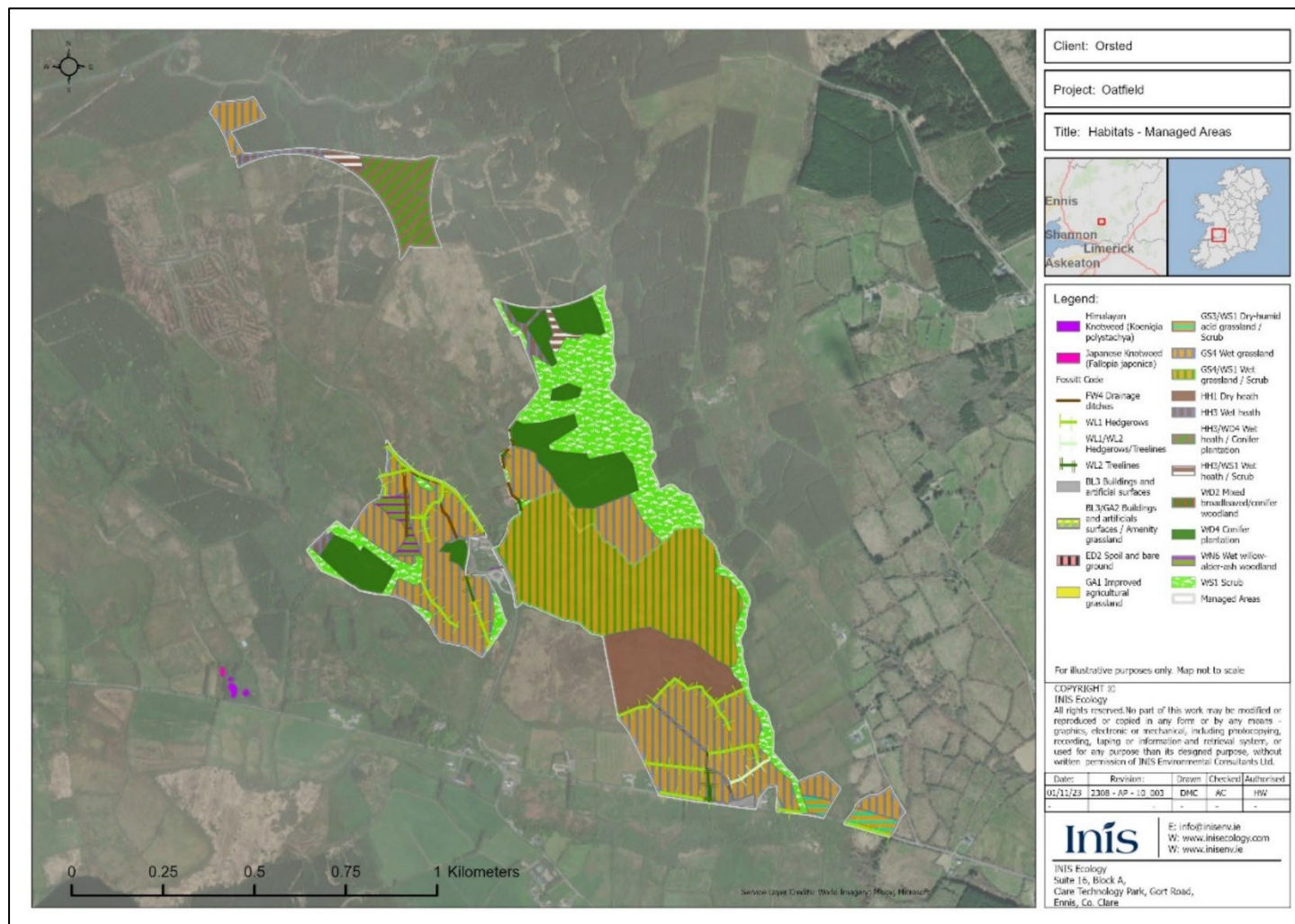


Figure 1- 25: Managed Habitats for Hen Harrier, Red Grouse and other key ecological features



ANNEX B
ILLUSTRATIVE PLATES



Plate 1: BL3 Buildings and artificial surfaces



Plate 2: BL3 Buildings and artificial surfaces with dead Himalayan Knotweed

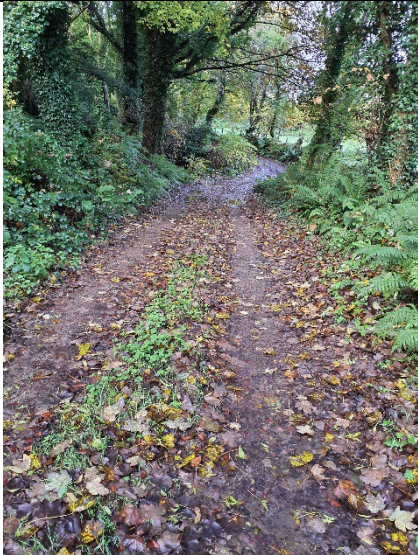


Plate 3: ED3 Recolonising bare ground



Plate 4: GA1 Improved agricultural grassland



<p>Plate 5: GS4 Wet grassland</p>	<p>Plate 6: GS4 Wet grassland 2</p>
	
<p>Plate 7: GS4 WS1 WD4 Wet grassland Scrub Conifer plantation</p>	<p>Plate 8: HH1 Dry heath</p>
	
<p>Plate 9: HH3 PB2 Wet heath Upland blanket bog</p>	<p>Plate 10: HH3 Wet heath</p>



Plate 11: HH3 Wet heath 2



Plate 12: HH3 Wet heath 3



Plate 13: HH3 Wet heath 4



Plate 14: HH3 Wet heath 5



Plate 15: HH3 Wet heath 6



Plate 16: Japanese Knotweed



Plate 17: Japanese Knotweed 2

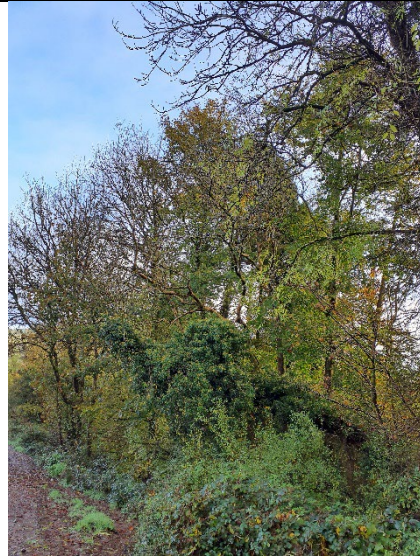


Plate 18: WD1 Broadleaved woodland



Plate 19: WD4 Conifer plantation



Plate 20: WD4 Conifer plantation 2



Plate 21: WD4 Conifer plantation 3



Plate 22: WD4 HH3 Conifer plantation Wet heath



Plate 23: WD4 HH3 Conifer plantation Wet heath 2



Plate 24: WD4 HH3 Conifer plantation Wet heath 3



Plate 25: WD4 WN6 Conifer plantation Wet willow-alder-ash woodland



Plate 26: WL1 Hedgerows



Plate 27: WL2 Treelines



Plate 28: WN6 Wet willow-alder-ash woodland



Plate 29: WS1 Scrub



Plate 30: WS1 Scrub 2



Plate 31: WS5 Recently-felled woodland