Eve O'Sullivan

From: Damien Holmes <damien.holmes@landfills.ie>
Sent: 21 January 2019 14:53
To: Eve O'Sullivan
Cc: Dee Stevenson
Subject: Proposed Boundary Change W0165-02 - CR05782
Attachments: Appropriate Assessment Screening Ballynagran Licence Alteration .pdf

Eve

See attached AA Screening document which we got prepared based on my conversation with your office in December. It was mentioned that there was some confusion between the EPA Screening document and AA Screening document so we went ahead and got the attached report prepared.

We are anxious to get this matter resolved as it very important for our business going forward.

Could someone please let me know an expected timeline on this licence alteration.

Thanks

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APPROPRIATE ASSESSMENT

STAGE 1 SCREENING

PROPOSED ALTERATION TO LICENCE BOUNDARY

BALLYNAGRAN LANDFILL

COUNTY WICKLOW.

Prepared For: -

Ballynagran Landfill Ltd,
Ballynagran,
County Wicklow.

Prepared By: -

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January 2019

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1. INTRODUCTION

Ballynagran Landfill Ltd (BLL) operates the non-hazardous residual waste landfill under an Industrial Emissions Licence (IEL) Reg. No. W0165-02 granted by the Environmental Protection Agency (Agency).

BLL has requested the Agency to alter the licence to exclude an area of the site from within the licence boundary and to revise the site location map referenced in Condition 1.2 of the licence. As part of the alteration process the Agency requires a screening exercise to be completed to determine if the proposed change will have significant effects on Special Areas of Conservation (SAC) and Special Protection Areas (SPA) that designated under the European Union (EU) Habitats Directive (92/43/EC) and the EU Birds Directive (2009/147/EC) respectively and are collectively known as Natura 2000 Sites.

The Habitats Directive, which is implemented under the European Communities Birds and Natural Habitats) Regulations 2011 (S.I. No 477 of 2011), requires an "appropriate assessment" of the potential impacts any proposed development that may have an impact on the conservation objectives of any Natura 2000 site.

Article 6(3) of the Directive stipulates that *any plan or project not directly connected with or necessary to the management of a Natura 2000 site, but likely to have a significant effect thereon…shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.*

Guidance documents issued by Department of Environment, Heritage and Local Government and the National Parks and Wildlife Services recommend that the assessment be completed in a series of Stages, which comprise:

Stage 1: Screening

The purpose of this Stage is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project, alone and in combination with other plans or projects, could have significant effects on a Natura 2000 site in respect of the site's conservation objectives.

Stage 2: Appropriate Assessment

This Stage is required if the Stage 1 Screening exercise identifies that the project is likely to have a significant impacts on a Natura 2000 site.

Stage 3: Assessment of Alternative Solutions

If Stage 2 determines that the project will have an adverse impact upon the integrity of a Natura 2000 site, despite the implementation of mitigation measures, it must be objectively concluded that no alternative solutions exist before the plan can proceed.

Stage 4: Compensatory Measures

Where no alternative solutions are feasible and where adverse impacts remain but imperative reasons of overriding public interest require the implementation of a project an assessment of compensatory measures that will effectively offset the damage to the Natura site 2000 is required.

1.1 **Methodology**

BLL commissioned O'Callaghan Moran & Associates (OCM) to complete a Stage 1 Screening to determine the effects of the proposed changes to the boundary. The Screening took into consideration the "Assessment of Plans and Projects significantly affecting Natura 2000 sites, Methodological Guidance on the provisions of Articles 6(3) and 6(4) of the Habitats Directive 92/43/EEC"; The Department of Environment, Heritage and Local Government Appropriate Assessment of Plans and Projects in Ireland and the National Parks and Wildlife Services Circular NPW 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.

2. PROJECT DESCRIPTION

2.1 Site Layout

The site encompasses approximately 128 hectares (ha) and is located on the eastern side of the Wicklow Mountains at an elevation between 52 and 147m Ordnance Datum (OD). The operational area occupies approximately 21 ha of the entire site and the associated infrastructure includes weighbridges (2 No.), wheel- wash, waste quarantine and inspection area, engineered landfill cells, leachate storage lagoon, landfill gas utilisation compound, surface water pond; office and welfare facilities, oil storage tank and security fencing.

2.2 Proposed Change

The area to be removed from the licensed boundary is in the southeast of the site, as shown on Drawing No. 1006-IG 18-18. It comprises a portion of the L1113 local road, which was subject to a compulsory purchase order as part of the N11/M11 upgrade works, woodland/scrubland and grassland that is currently being grazed by livestock (sheep). A stream flows from north to south through the area.

The licence specifies emission limit values for the rain water run-off, dust and noise and requires regular surface water, dust and noise monitoring to confirm compliance with the emission limit values. Four of the monitoring points listed in the licence are within the proposed area.

- Dust monitoring location AD12A,
- Surface water monitoring location SW2 ,and
- Groundwater monitoring locations MW6s & MW6d.

Dust monitoring location AD12A will be relocated to the nearest suitable location within the new boundary and a right of way will be obtained to access the surface water and ground water monitoring locations.

A new 2.4m high chain link fence will be erected along the revised boundary as shown on Drawing No. 1006-IG 18-18. The existing hedgerows will be retained. Control of the land removed from the licence will revert to the landowner and it is understood that the current land use for animal grazing will continue.

2.3 Hydrology

A ridge to the north and west of the site forms a catchment divide. The land to the north of the divide drains to the Vartry River. South of the divide there are three small streams, two to west of the BLL site (Kilcandra and Ballynagran Streams) and one to the east (Longford Stream) that flows through the eastern section of the site. The three streams merge south-east of the BLL site to form the Three Mile Water River, which flows to the south-east and enters the sea at Maherabeg. There are a number of other shallow seasonal drains across the site and in extended dry periods the Ballynagran Stream dries up.

All rainfall on the active landfill cells is collected in the leachate collection system. Surface water from the wheel-wash, weighbridge and inspection and quarantine area is directed to the leachate storage lagoon. The surface drainage from all roads, hardstanding areas and all other areas where the surface water has the potential to become contaminated passes through a Class I oil interceptor before entering the surface water pond. The pond outfalls to a constructed wetland that discharges to the Longford Stream.

Water quality monitoring of the surface water system prior to construction of the landfill, including biological and chemical assessments established that although water quality had been impacted by surrounding domestic and agricultural land use, there has been a gradual improvement. The routine monitoring carried out since waste acceptance began has confirmed the operations have not impacted on the water quality in the Kilcandra, Ballynagran and Longford Streams and the Three Mile Water River.

2.4 Geology & Hydrology

The subsoils comprise glacial till with some lenses of fluvio-glacial sands and gravels ranging in thickness from 2m at the northern boundary to 25m in the centre of the site. The site is underlain by different bedrock types comprising slate with thin siltstone and slate with minor sandstones

The bedrock aquifers are classified as a 'Poor Aquifer' (Pl), which is generally unproductive except for local zones, and as 'Local Aquifer' (Ll) which is moderately productive, but only in local zones. The aquifer vulnerability to contamination from the ground surface ranges from high to low across the site based on the subsoil thickness. The direction of groundwater flow is to the south and south-east.

Baseline groundwater quality monitoring conducted before the landfill was developed identified the localised presence of elevated pH and ammonia. The routine monitoring carried out since waste acceptance began has confirmed that site operations have had no impact on groundwater quality.

2.5 Agency Inspection

The Agency carried out an inspection of the proposed area on the 30th October 2018. At the time there was no licensable activity occurring in area to be removed from the licensed

boundary and the physical condition was satisfactory, mostly green field other than the area occupied by the re-routed L1113 road.

3. NATURA 2000 SITES

SACs are selected for the conservation and protection of habitats listed on Annex I and species (other than birds) listed on Annex II of the Habitats Directive, and their habitats. The habitats on Annex I require special conservation measures. SPAs are selected for the conservation and protection of bird species listed on Annex I of the Birds Directive and regularly occurring migratory species, and their habitats, particularly wetlands.

Favourable Conservation Status of a habitat, as defined in 2011 Birds and Natural Habitats Regulations, is when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

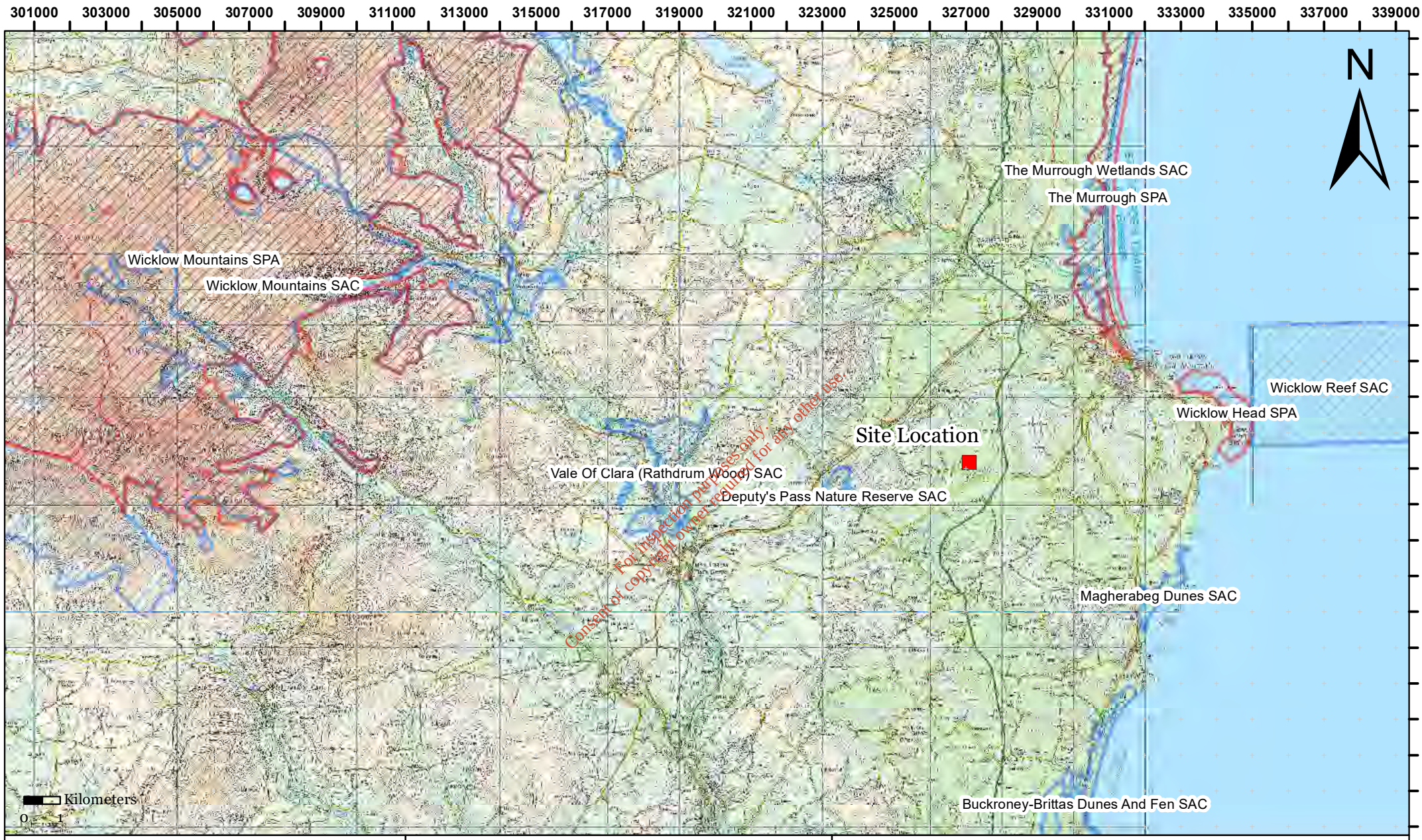
Conservation Status of a species is when:

- the favourable population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats,
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

3.1 Natura 2000 Sites within 10km of the Development Site.

The Natura 2000 Sites within 15 km of the site are shown on Figure 3.1. The closest designated site is the Deputy's Pass Nature Reserve SAC (000717), which is approximately 4km west of the site. The Murrough SPA (004186) and The Murrough Wetlands SAC are 5.3km to north-east; Maherabeg Dunes (001766) SPA is 6.5km south-east; Wicklow Head SPA (004127) is 7km to the east; Vale of Clara (Rathdrum Woods) SAC(000733) is 7.3km to the west; Buckroney-Brittas Dunes and Fen SAC (000729) is 7.6km south-east; Wicklow Reef SAC (002274) is 7.9km to the east; the Wicklow Mountains SAC (002122 is 12.3km to the west and the Wicklow Mountains SPA (004040) is 14.3km to the west.

The full site synopsis and conservation objectives for the sites are in Appendix 1 and summarised below:



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CLIENT

Ballynagran Landfill Limited

TITLE

Natura 2000 Sites

Details:

- Site Location
- SPA
- SAC

Figure 3.1

3.1.1 Deputy's Pass Nature Reserve SAC (000717)

Deputy's Pass Nature Reserve SAC was selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (numbers in brackets are Natura 2000 codes):

91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles

3.1.2 The Murrough SPA (004186)

The generic conservation objective for The Murrough SPA is to maintain or restore the favourable conservation condition of the following species of interest:

Bird Code	Common Name	Scientific Name
A002	Red-throated Diver	*Gavia stellata*
A043	Greylag Goose	*Anser anser*
A046	Light-bellied Brent Goose	*Branta bernicla hrota*
A050	Wigeon	*Anas penelope*
A052	Teal	*Anas crecca*
A179	Black-headed Gull	*Chroicocephalus ridibundus*
A184	Herring Gull	*Larus argentatus*
A195	Little Tern	*Sterna albifrons*

To acknowledge the importance of Ireland's wetlands to wintering waterbirds, "Wetland and Waterbirds" may be included as a Special Conservation Interest for some SPAs that have been designated for wintering waterbirds and that contain a wetland site of significant importance to one or more of the species of Special Conservation Interest.

Therefore it is an objective to maintain or restore the favourable conservation condition of the wetland habitat at The Murrough SPA as a resource for the regularly-occurring migratory waterbirds that use it.

3.1.3 The Murrough Wetlands SAC (002249)

The Murrough Wetlands SAC was selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (numbers are Natura 2000 codes):

1210 Annual vegetation of drift lines
1220 Perennial vegetation of stony banks
1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
1410 Mediterranean salt meadows (Juncetalia maritimi)
7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae
7230 Alkaline fens

3.1.4 Maherabeg Dunes SAC (001766)

Maherabeg Dunes SAC was selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (numbers are Natura 2000 codes):

1210 Annual vegetation of drift lines
2110 Embryonic shifting dunes
2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)
2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)
7220 Petrifying springs with tufa formation (Cratoneurion)

3.1.5 Wicklow Head SPA (004127)

The conservation objective for this SPA is to maintain or restore the favourable conservation condition of the following bird species:

Bird Code	Common Name	Scientific Name
A188	Kittiwake	*Rissa trydactyla*

3.1.6 Vale of Clara (Rathdrum Wood) SAC (000733)

Vale of Clara (Rathdrum Wood) SAC was selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (numbers are Natura 2000 codes):

91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles

3.1.7 Buckroney-Brittas Dunes and Fen SAC (000729)

Buckroney-Brittas Dunes and Fen SAC was selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (numbers are Natura 2000 codes):

1210 Annual vegetation of drift lines
1220 Perennial vegetation of stony banks
1410 Mediterranean salt meadows (Juncetalia maritimi)
2110 Embryonic shifting dunes
2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)
2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)
2170 Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae)
2190 Humid dune slacks
7230 Alkaline fens

3.1.8 Wicklow Reef SAC (002274)

Wicklow Reef SAC was selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (numbers are Natura 2000 codes):

1170 Reefs

3.1.9 The Wicklow Mountain SPA (004040)

The generic conservation objective for The Wicklow Mountain SPA is to maintain or restore the favourable conservation condition of the following species of interest:

Bird Code	Common Name	Scientific Name
A098	Merlin	*Falco columbarius*
A103	Peregrine	*Falco peregrinus*

The Wicklow Mountains SPA is of high ornithological importance as it supports nationally important populations of Merlin and Peregrine, both species that are listed on Annex I of the E.U. Birds Directive. Part of Wicklow Mountains SPA is a Statutory Nature Reserve.

3.1.10 Wicklow Mountains SAC (002122)

Wicklow Mountains SAC was selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (numbers are Natura 2000 codes):

3110 Oligotrophic Waters containing very few minerals
3160 Dystrophic Lakes
4010 Wet Heath
4030 Dry Heath
4060 Alpine and Subalpine Heaths
6130 Calaminarian Grassland
6230 Species-rich Nardus Grassland*
7130 Blanket Bogs (Active)*
8110 Siliceous Scree
8210 Calcareous Rocky Slopes
8220 Siliceous Rocky Slopes
91A0 Old Oak Woodlands
1355 Otter (Lutra lutra)

4. LIKELY EFFECTS

4.1 Plan or Project

The proposed development solely involves changing the boundary of the licence area and does not require any construction works, other than the erection of a chain link fence along the revised boundary and will not give rise to any new or altered emission to surface water, groundwater or atmosphere.

4.2 Direct Effects

The subject site is not located within any designated Natura 2000 Site and therefore the current and proposed land use does not and will not result in any direct habitat loss or fragmentation of a Natura 2000 Site.

The closest Natura 2000 Sites are 4 km to the west (Deputy's Pass Nature Reserve SAC); 5.3km to the south (The Murrough SPA); 3.5km to the south-east (The Maherabeg Dunes SAC) and 7km east (The Wicklow Head SPA).

The Longford Stream that flows through the subject area is a tributary of the Three Mile Water River, which enters the sea at Maherabeg Dunes. Therefore there is a pathway between the proposed development area and the Maherabeg Dunes SAC. Given the separation distance between the proposed development area and the designated sites, the Three Mile Water River is the only viable environmental pathway to a Natura 2000 Site.

4.3 Indirect Effects

Based on the nature of the development, which will not involve any new emission to the Longford Stream and will result in the continued use of the area for animal grazing; the distance to the Maherabeg Dunes SAC, and the habitats for which the Site was selected (sand dunes and petrifying springs with tufa formation) the proposed boundary revision will have no effect on this designated area.

4.4 Cumulative Effects

The development will not contribute to cumulative effects on the SAC and the SPAs.

5. SCREENING CONCLUSION & STATEMENT

The proposed revision of the licence boundary will not result in any new or additional emission/disturbance that could present a significant risk to the Conservation Objectives of any of the Natura 2000 Sites within 15km of the site. Therefore a Natura Impact Statement is not required.

APPENDIX 1
SITE SYNOPSIS

SITE SYNOPSIS

Site Name: Buckroney-Brittas Dunes and Fen SAC

Site Code: 000729

Buckroney-Brittas Dunes and Fen is a complex of coastal habitats located about 10 km south of Wicklow town. It comprises two main sand dune systems, Brittas Bay and Buckroney Dunes, connected on the coast by the rocky headland of Mizen Head. The dunes have cut off the outflow of a small river at Mizen Head and a fen, Buckroney Fen, has developed. A further small sand dune system occurs south of Pennycomequick Bridge.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1210] Annual Vegetation of Drift Lines
[1220] Perennial Vegetation of Stony Banks
[1410] Mediterranean Salt Meadows
[2110] Embryonic Shifting Dunes
[2120] Marram Dunes (White Dunes)
[2130] Fixed Dunes (Grey Dunes)*
[2150] Decalcified Dune Heath*
[2170] Dunes with Creeping Willow
[2190] Humid Dune Slacks
[7230] Alkaline Fens

Along much of the higher parts of the beach at this site, typical annual strandline vegetation occurs. Species such as Sea Rocket (*Cakile maritima*), Prickly Saltwort (*Salsola kali*) and Spear-leaved Orache (*Atriplex prostrata*) are frequent in this zone, with the scarcer Yellow Horned-poppy (*Glaucium flavum*) present in places.

A shingle ridge occurs along the Buckroney dune system. The amount of exposed shingle is low, but it is likely that shingle underlies much of the sandy areas also. The vegetation on the shingle is similar in composition to that which occurs as part of the drift line and embryonic dune habitats. Sea Sandwort (*Honkenya peploides*) is characteristic, and other species include Sand Couch (*Elymus farctus*), Sand Sedge (*Carex arenaria*), Sea Rocket and Yellow Horned-Poppy.

An area of saline vegetation which conforms to 'Mediterranean salt meadows' occurs in the Buckroney dune system south of the inlet stream to the fen, and possibly in small areas elsewhere within the site. It is typically dominated by rushes (*Juncus* spp.), and of note is the presence of Sharp Rush (*J. acutus*). Sea Club-rush (*Scirpus*

maritimus) also occurs. The area is inundated by the tide only occasionally via the narrow inlet leading to Buckroney Fen.

Embryonic dune development occurs at the southern part of Brittas and more widely at Buckroney and Pennycomequick. Typical species are couch grasses (*Elymus* sp.), Sand Sedge and Sea Sandwort. The main dune ridges are dominated by Marram (*Ammophila arenaria*), with herbaceous species such Sea Spurge (*Euphorbia paralias*), Sea-holly (*Eryngium maritimum*) and Common Restharrow (*Ononis repens*) occurring throughout. The main dune ridges are well developed, reaching heights of 10 m at Brittas. The northern end of the Brittas system has fine examples of parabolic dunes.

Stable fixed dunes are well developed at Brittas and Buckroney. Marram is less frequent in these areas and is replaced by Red Fescue (*Festuca rubra*) as the most common grass species. A rich flora occurs, especially in the more open areas. Common species include Pyramidal Orchid (*Anacamptis pyramidalis*), Common Milkwort (*Polygala vulgaris*), Wild Pansy (*Viola tricolor* subsp. *curtisii*), Carline Thistle (*Carlina vulgaris*), Biting Stonecrop (*Sedum acre*), Wild Thyme (*Thymus praecox*) and Common Bird's-foot-trefoil (*Lotus corniculatus*). The mature areas of fixed dune also contain Burnet Rose (*Rosa pimpinellifolia*), Bracken (*Pteridium aquilinum*), Wood Sage (*Teucrium scordonia*) and Common Sorrel (*Rumex acetosa*). Mosses such as *Tortula ruralis* subsp. *ruraliformis, Rhytidiadelphus triquetris,* and *Homalothecium lutescens* are frequent, along with lichens (*Cladonia* spp., *Peltigera canina*).

This is one of the few Irish east coast sites to possess good examples of wet dune slacks and dunes with Creeping Willow (*Salix repens*). These areas of the dunes have a rich and varied flora, including species such as Creeping Willow, Water Mint (*Mentha aquatica*), Silverweed (*Potentilla anserina*), Meadowsweet (*Filipendula ulmaria*) and Meadow Thistle (*Cirsium dissectum*). The slacks are notably rich in rushes and sedges. Of particular interest is the presence of Sharp Rush (*Juncus acutus*), a scarce species in eastern Ireland and one that is indicative of a saline influence.

The site is also notable for the presence, at the back of the dunes, of areas of decalcified dune heath, a rare habitat type, and one which is listed with priority status in the E.U. Habitats Directive. Heath species present include Heather (*Calluna vulgaris*), Bell Heather (*Erica cinerea*) and Gorse (*Ulex europaeus*).

Buckroney Fen lies west of Mizen Head. It is backed to the west by a dense swamp of Common Reed (*Phragmites australis*). The fen is dominated by Tussock Sedge (*Carex paniculata*), with Water Mint, Purple Loosestrife (*Lythrum salicaria*), Marsh Pennywort (*Hydrocotyle vulgaris*), Greater Bird's-foot-trefoil (*Lotus uliginosus*), Water Horsetail (*Equisetum fluviatile*), small sedges (*Carex* spp.) and other flowering plants. An extensive stand of Blunt-flowered Rush (*Juncus subnodulosus*) is of note. Throughout this area the rare Marsh Fern (*Thelypteris palustris*) is frequent. There are also extensive areas of Rusty Willow (*Salix cinerea* subsp. *oleifolia*) scrub.

This site contains two rare plant species protected under the Flora (Protection) Order, 1999: Wild Asparagus (*Asparagus officinalis* subsp. *prostratus*), in its most northerly

Irish station, and Meadow Saxifrage (*Saxifraga granulata*). Other rare species which occur within the site include Green-flowered Helleborine (*Epipactis phyllanthes*), Bird's-foot (*Ornithopus perpusillus*) and Spring Vetch (*Vicia lathyroides*). All of these are Red Data Book species. The rare sedge hybrid *Carex riparia* x *C. vesicaria* (*Carex* x *csomadensis*) is only known from Mizen Head.

The invertebrate fauna of Buckroney fen has been investigated and some notable species have been recorded, including the beetle *Eurynebria complanata* and the following flies: *Machimus cowini, Anasimyia lunulata, Parhelophilus consimilis* and *Lejogaster splendia*.

Little Tern, a species listed on Annex I of the E.U. Birds Directive, has bred or attempted to breed at Buckroney strand in recent years. In 1992 between 7 and 10 pairs were present and in 1993 up to 8 pairs. Teal are regular in winter (119), as are Curlew (46), Lapwing (515) and Snipe (87). All figures are average peaks for 1994/95 - 1995/96.

The dune systems and beaches are subject to high amenity usage from day-trippers and several areas around the site have been developed as caravan parks, car parks and golf courses. The marginal areas of the fen have been reclaimed, especially at the south end, though these areas still flood in winter and attract waterfowl.

This site is important as an extensive sand dune/fen system with well developed plant communities. Several coastal habitats listed on the E.U. Habitats Directive, including two priority habitats - fixed dune and decalcified dune heath - are present. The area contains two legally protected plants, as well as a number of other rare or scarce plant species. The site provides habitat for some rare species of invertebrate and for the vulnerable Little Tern. A rich flora and fauna has persisted on this site despite extensive amenity use and adjacent farming. However, future land use practices will need to be managed to ensure the continued survival of this unique mosaic of coastal habitats.

SITE SYNOPSIS

Site Name: Deputy's Pass Nature Reserve SAC

Site Code: 000717

Deputy's Pass woodland is located on the northern spur of the Deputy's Pass near Glenealy in Co. Wicklow. It was designated a Nature Reserve in 1982.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[91A0] Old Oak Woodlands

The predominant vegetation community in Deputy's Pass Nature Reserve is Sessile Oak (*Quercus petraea*) woodland, referable to the Blechno-Quercetum petraeae association. The oak is of coppice origin, 70-80 years old, and forms a nearly closed canopy. Other tree species present are Rowan (*Sorbus aucuparia*), Holly (*Ilex aquifolium*), and Downy Birch (*Betula pubescens*), occurring mainly at the edges. In some areas Beech (*Fagus sylvatica*) also occurs. The understorey is formed of oak saplings, Holly and Hazel (*Corylus avellana*), while the ground flora of the wood is dominated by Great Wood-rush (*Luzula sylvatica*), Bilberry (*Vaccinium myrtillus*), Hard Fern (*Blechnum spicant*), and Bramble (*Rubus fruticosus* agg.). Heather (*Calluna vulgaris*) and Bracken (*Pteridium aquilinum*) are abundant in some areas. In some parts, Bluebells (*Hyacinthoides non-scripta*), Male Fern (*Dryopteris filix-mas*), Hay-scented Buckler-fern (*D. aemula*), Sanicle (*Sanicula europea*) and Wood-sorrel (*Oxalis acetosella*) occur commonly.

The regeneration of native trees and the good ground cover indicate an absence of grazing; there are no sheep in the site and deer very seldom occur.

Less than 10% of the site is occupied by conifers. Where they are present they consist of 20-30 years old plantations of Douglas Fir (*Pseudotsuga menziesii*), Sitka Spruce (*Picea sitchensis*), Norway Spruce (*P. abies*), European Larch (*Larix decidua*) and Scots Pine (*Pinus sylvestris*). Once mature these small stands will be removed, to allow native species to naturally replace them.

The site supports breeding populations of the Smooth Newt (*Triturus vulgaris*) and the Common Frog (*Rana temporaria*), amphibians protected by the Wildlife Act, 1976.

Deputy's Pass is managed as a Nature Reserve and is part of an internationally important series of oak woods in Co. Wicklow which are almost certainly natural in origin and which retain much of their original character and species composition (other examples include Glendalough, Clara Vale and Ballinacor).

SITE SYNOPSIS

Site Name: Magherabeg Dunes SAC

Site Code: 001766

Magherabeg Dunes SAC is a sand dune system situated at Ardmore Point, about 5 km south of Wicklow Head in Co. Wicklow. The Three Mile Water River enters the sea through the dunes. The site is fairly intact, though some areas are being naturally eroded by wind and sea, in particular at the southern end, where bedrock has been exposed.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1210] Annual Vegetation of Drift Lines
[2110] Embryonic Shifting Dunes
[2120] Marram Dunes (White Dunes)
[2130] Fixed Dunes (Grey Dunes)*
[2150] Decalcified Dune Heath*
[7220] Petrifying Springs*

Despite its small size, the dune system at Magherabeg shows most of the developmental stages, with embryonic dunes, white dunes, grey fixed dunes and decalcified fixed dunes all represented. The embryo dunes occur mainly in the northern sector, in association with a good example of drift line vegetation. Species present include Sea Couch (*Elymus farctus*), Marram (*Ammophila arenaria*) and Sea Sandwort (*Honkenya peploides*). A narrow band of shifting marram dunes then occur, these having been largely washed away by erosion in the southern sector. Stable fixed dunes are well represented, with such species as Red Fescue (*Festuca rubra*), Common Restharrow (*Ononis repens*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Wild Pansy (*Viola tricolor*), Wild Thyme (*Thymus praecox*) and White Clover (*Trifolium repens*). Burnet Rose (*Rosa pimpinellifolia*) is present on the older fixed dunes. The fixed dunes merge with dune heath, with species such as Gorse (*Ulex europaeus*) and Bracken (*Pteridium aquilinum*) present. The dune system is backed by drift banks, which are well covered by deciduous woodland and scrub. Other species occurring on these drift banks include Hemp-agrimony (*Eupatorium cannabinum*), Yellow-wort (*Blackstonia perfoliata*) and the scarce species Wood Vetch (*Vicia sylvatica*).

Along the low cliffs at Ardmore Point a line of petrifying springs with tufa formations occurs, and a range of specialised moss species are found.

The Three Mile Water River, which flows through the dunes provides habitat for wetland species such as sedges, including Bladder Sedge (*Carex vesicaria*), Fox Sedge (*C. otrubae*) and Grey Sedge (*C. divulsa*). The very rare hybrid sedge, *Carex* x *grossii* (*C. hirta* x *C. vesicaria*) has also been recorded here. Common Reed (*Phragmites australis*) is also found along the river.

The site is of conservation importance because it is a fine example of a dune system which is fairly intact and which has a well-developed flora. The lack of easy public access to this site has undoubtedly helped in preventing damage and erosion from amenity activities. The presence of wetland vegetation on the site is of additional interest.

SITE SYNOPSIS

SITE NAME: THE MURROUGH SPA

SITE CODE: 004186

The Murrough SPA comprises a coastal wetland complex that stretches for 13 km from Kilcoole Station, east of Kilcoole village in the north to Wicklow town in the south, and extends inland for up to 1 km in places. The site includes an area of marine water to a distance of 200m from the low water mark. A shingle ridge runs along the length of the site and carries the Dublin-Wexford railway line.

Beside the shingle shore is a stony ridge supporting perennial vegetation. Driftline vegetation on the seaward side includes species such as Sea Rocket (*Cakile maritima*), Sea Sandwort (*Honkenya peploides*), Sea Holly (*Eryngium maritimum*) and Yellow-horned Poppy (*Glaucium flavum*). Low sand hills occur at Kilcoole, with Marram (*Ammophila arenaria*) and Lyme-grass (*Leymus arenarius*). In other areas and further inland a rich grassy sward, which is most extensive in the south end of the site, has developed. A community dominated by Silverweed (*Potentilla anserina*) and Strawberry Clover (*Trifolium fragiferum*) occurs in some of the wetter, grassy areas. In some places, particularly at the south of the site, a Gorse (*Ulex*) heath has developed on the stony ridge.

At the southern end of the site, Broad Lough, a brackish, partly tidal lake, has a well-developed saltmarsh community. Common Reed (*Phragmites australis*) is abundant along the western shore, along with some Sea Club-rush (*Scirpus maritimus*). Saltmarsh is also present in the northern end of the site in the vicinity of the Breaches. An area of fen occurs at Five Mile Point. Here, Black Bog-rush (*Schoenus nigricans*) is dominant. Fen Sedge (*Cladium mariscus*) is present where the ground is wetter. This merges into areas dominated by Common Reed. A wide range of freshwater and brackish marsh habitats occur within the site. These vary from reed-marsh dominated by reeds and rushes (*Juncus* spp.), to those of sedges (*Carex* spp.) with other areas supporting a mixture of sedges and Yellow Iris (*Iris pseudacorus*) also occurring. The marshes merge into wet grassland in many areas and where grazing pressure is low, a herb-rich sward occurs. Sedges are abundant in the wetter areas. Where drains have been cut, there are many other species such as Greater Spearwort (*Ranunculus lingua*), Bogbean (*Menyanthes trifoliata*) and Reed Sweet-grass (*Glyceria maxima*).

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Red-throated Diver, Greylag Goose, Light-bellied Brent Goose, Wigeon, Teal, Black-headed Gull, Herring Gull and Little Tern. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The shingle ridge at Kilcoole is a traditional nesting area for Little Tern, and the site now supports one of the largest colonies in the country. Numbers vary between years,

with 36 pairs recorded in 1995 and 106 pairs in 2006. A tern protection scheme and research programme, co-ordinated by BirdWatch Ireland and the National Parks and Wildlife Service, has been in operation since 1985. Breeding success varies from year to year, largely due to predation by foxes, crows and other species.

During the winter this site is important for a number of waterbirds - all population sizes are the mean of peak counts for the 5 years, 1995/96 – 1999/2000. Light-bellied Brent Goose occurs here in internationally important numbers (859). Other species that visit here in nationally important numbers are Red-throated Diver (32), Greylag Goose (300), Wigeon (1,209), Teal (644), Black-headed Gull (997) and Herring Gull (506). Other species that are known to occur here are Little Grebe, Grey Heron, Cormorant, Mute Swan, Whooper Swan, Greenland White-fronted Goose, Shelduck, Gadwall, Shoveler, Mallard, Golden Plover, Ringed Plover, Lapwing, Dunlin, Curlew, Greenshank and Redshank.

Short-eared Owl is recorded here during the winter. Little Egret has bred locally in recent years and this site is a main feeding area, with several birds present regularly. While formerly a rare bird in Ireland, Little Egret is now well-established with most birds occurring in the south-east and south (Counties Wexford, Waterford and Cork). The Murrough is presently at the edge of the species' range. This site is one of the few sites in Ireland where Reed Warbler breeds regularly. It is considered that 1-4 pairs bred each year during the 1980s and early 1990s, with a minimum of 6 birds in song in 1993. An absence of records since 1996 may be due to under-recording. Kingfisher regularly uses the site. Sandwich Tern are recorded from the site during the autumn.

The Murrough SPA is an important site for wintering waterbirds, being internationally important for Light-bellied Brent Goose and nationally important for Red-throated Diver, Greylag Goose, Wigeon, Teal, Black-headed Gull and Herring Gull. It is probably the most important site in the country for nesting Little Tern. The regular occurrence of Red-throated Diver, Little Egret, Whooper Swan, Greenland White-fronted Goose, Golden Plover, Little Tern, Sandwich Tern, Short-eared Owl and Kingfisher is of note as these species are listed on Annex I of the E.U. Birds Directive. Part of the Murrough SPA is a Wildfowl Sanctuary.

15.5.2015

SITE SYNOPSIS

Site Name: The Murrough Wetlands SAC

Site Code: 002249

The Murrough is a coastal wetland complex which stretches for 15 km from Ballygannon to north of Wicklow town, and in parts, extends inland for up to 1 km. A shingle ridge stretches the length of the site and carries the mainline Dublin-Wexford railway.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1210] Annual Vegetation of Drift Lines
[1220] Perennial Vegetation of Stony Banks
[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[7210] *Cladium* Fens*
[7230] Alkaline Fens

On the seaward side of the shingle bank which runs along The Murrough Wetlands SAC site drift line vegetation includes species such as Sea Rocket (*Cakile maritima*), Sea Sandwort (*Honkenya peploides*), Sea-holly (*Eryngium maritimum*) and Yellow Horned-poppy (*Glaucium flavum*). The rare and legally protected Oysterplant (*Mertensia maritima*) (Flora (Protection) Order, 1999) has been recorded on the gravelly shore in the past but is now considered to be extinct from this locality.

Low sand hills occur at Kilcoole, with Marram (*Ammophila arenaria*) and Lyme-grass (*Leymus arenarius*). In other areas and further inland a rich grassy sward, which is most extensive at the south of the site, has developed. Typical species include Sweet Vernal-grass (*Anthoxanthum odoratum*), Crested Dog's-tail (*Cynosurus cristatus*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Burnet Rose (*Rosa pimpinellifolia*) and Pyramidal Orchid (*Anacamptis pyramidalis*). A community dominated by Silverweed (*Potentilla anserina*) and Strawberry Clover (*Trifolium fragiferum*) occurs in some of the wetter, grassy areas. In some places, particularly at the south of the site, a gorse (*Ulex* sp.) heath has developed on the stony ridge.

Saltmarsh is present within the site in two distinct areas. At the southern end of the site is found Broad Lough. This is a brackish, partly tidal lake, and has a well developed saltmarsh community which includes Saltmarsh Rush (*Juncus gerardi*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Sea Purslane (*Halimione portulacoides*) and Common Scurvygrass (*Cochlearia officinalis*).

Common Reed (*Phragmites australis*) is abundant along the western shore, along with some Sea Club-rush (*Scirpus maritimus*). Saltmarsh is also present in the northern end of the site in the vicinity of The Breaches. Though this has been greatly affected by drainage in the late 1980s and early 1990s, localised Sea Couch (*Elymus pycnanthus*) still occurs. The grassland which was created and improved as a result of the drainage is now influenced by seepage and flooding of saline waters.

Fen vegetation is well developed in the Murrough wetlands, with both alkaline and calcareous fen with Great Fen-sedge (*Cladium mariscus*) represented. The fens occur mostly between Five Mile Point and Six Mile Point, especially in the townland of Blackditch and also in the Leamore and Grange areas. The alkaline fen is dominated by Black Bog-rush (*Schoenus nigricans*), with Marsh Pennywort (*Hydrocotyle vulgaris*), Purple Moor-grass (*Molinia caerulea*), Devil's-bit Scabious (*Succisa pratensis*), Heather (*Calluna vulgaris*), Cross-leaved heath (*Erica tetralix*), and a wide variety of orchids also present. The rare, Narrow-leaved Marsh-orchid (*Dactylorhiza traunsteineri*) has also been recorded here. Great Fen-sedge occurs in mosaic with several vegetational elements but chiefly with alkaline fen. Its many forms can range from pure stands of Great Fen-sedge, through to occurring as a dominant with Greater Tussock-sedge (*Carex paniculata*) and Blunt-flowered Rush (*Juncus subnodulosus*). *Cladium* fen also occurs at Blackditch within stretches of swamp woodland or fen carr dominated by Rusty Willow (*Salix cinerea* subsp. *oleifolia*) and Downy Birch (*Betula pubescens*).

A fine wet woodland occurs at Blackditch. Downy Birch is the dominant species, with some Alder (*Alnus glutinosa*), willows (*Salix* spp.) and Ash (*Fraxinus excelsior*) also present. The ground flora of this wooded area is often quite dense. This wood also contains a rich invertebrate community with at least eight rare or notable species of fly (Order Diptera) occurring, including *Syntormon setosus,* a species unknown elsewhere in Britain or Ireland.

A wide range of freshwater and brackish marsh habitats occur within the site. These vary from reed-marsh dominated by reeds and rushes (*Juncus* spp.), to those of sedges (*Carex* spp.), with other areas supporting a mixture of sedges and Yellow Iris (*Iris pseudacorus*). A wide variety of grasses and herbs are also found. These include Meadowsweet (*Filipendula ulmaria*), Silverweed and Common Spike-rush (*Eleocharis palustris*). The scarce Red Data Book species Marsh Pea (*Lathyrus palustris*) occurs in one area. The marshes merge into wet grassland in many areas. Where grazing pressure is low, a herb-rich sward occurs with species such as Ragged-Robin (*Lychnis flos-cuculi*), Cuckooflower (*Cardamine pratensis*), Meadowsweet and Heath Spotted-orchid (*Dactylorhiza maculata*) occurring. Sedges are abundant in the wetter areas. Where drains have been cut, there are many other species such as Greater Spearwort (*Ranunculus lingua*), Bogbean (*Menyanthes trifoliata*) and the scarce Reed Sweet-grass (*Glyceria maxima*).

The Murrough is an important site for wintering waterfowl and breeding birds. Species listed on Annex I of the E.U. Birds Directive include Little Egret, Whooper Swan, Greenland White-fronted Goose, Golden Plover, Kingfisher and Little Tern. Average peak winter counts from 1994/95 - 1997/98 showed the site to have an

internationally important population of Brent Goose (1,318, higher than in the early 1990s), nationally important populations of Wigeon (1,518), Teal (772) and Lapwing (3,140), and regionally or locally important populations of Whooper Swan (80), Little Grebe (22), Shelduck (95), Gadwall (9), Mallard (391), Shoveler (22), Golden Plover (615), Curlew (605) and Redshank (181). Greylag Goose numbers were nationally important in the early 1990s but these numbers have dropped off. The average peak is now 213.

Little Tern breed on the shingle beach near The Breaches and this is the largest colony on the east coast (approx. 50 pairs in 1993, an average of 37 pairs over the ten year period 1988-1998). Redshank, Oystercatcher, Ringed Plover and Water Rail also breed. The reedbeds at Broad Lough provide habitat for Reed Warbler and the rare Bearded Tit has bred here.

Otter has been reported regularly from the Murrough. This is a Red Data Book Species, and is also listed on Annex II of the Habitats Directive.

Recent farming and drainage practices and afforestation have greatly reduced the area and quality of the wetlands habitats - the area between Kilcoole and Newcastle is particularly affected. In 1997 there was some levelling of the sand hills below Killoughter station. Pollution, reclamation and further drainage would adversely affect this site. A section of the wetlands at Blackditch, which includes alkaline and *Cladium* fen, has been acquired by BirdWatch Ireland and is being managed for nature conservation.

This site is of importance as it is the largest coastal wetland complex on the east coast of Ireland. Although much affected by drainage, it still contains a wide range of coastal and freshwater habitats including six listed on Annex I of the E.U. Habitats Directive, some of which contain threatened plants. Areas on the site contain a rich invertebrate fauna, including several rarities. It is an important site for both wintering and breeding birds and supports a variety of species listed on Annex I of the E.U. Birds Directive.

SITE SYNOPSIS

SITE NAME: WICKLOW HEAD SPA

SITE CODE: 004127

Wicklow Head is a rocky headland with extensive exposures of mica-schist. It is situated approximately 3 kilometres south of Wicklow town. A lighthouse is located near the base of the cliffs. The cliffs are highest immediately south of the lighthouse where they rise to about 60 m and it is here that most of the seabirds breed. The site comprises the cliffs and cliff-top vegetation, as well as some heath vegetation. The marine area to a distance of 500 m from the base of the cliffs is included in the site.

At the time this site was identified for Special Protection Area (SPA) designation it was utilised by a nationally important population of Kittiwake and this species is regarded as a special conservation interest for this SPA.

A survey in 2002 recorded a nationally important population of breeding Kittiwake (956 pairs) and other breeding seabirds including Fulmar (62 pairs), Shag (11 pairs), Herring Gull (20 pairs), Guillemot (281 pairs) and Razorbill (125 pairs). A survey of Black Guillemot in April 1998 recorded 70 individual birds within the SPA.

The site also supports a pair of breeding Peregrine. Ravens nest annually on the cliffs, and the heath supports such species as Stonechat, Whitethroat and Linnet.

The occurrence of Peregrine, a species that is listed on Annex I of the EU Birds Directive, is of note.

24.4.2012

SITE SYNOPSIS

Site Name: Wicklow Mountains SAC

Site Code: 002122

Wicklow Mountains SAC is a complex of upland areas in Counties Wicklow and Dublin, flanked by the Blessington reservoir to the west and Vartry reservoir in the east, Cruagh Mountain in the north and Lybagh Mountain in the south. Most of the site is over 300 m, with much ground over 600 m. The highest peak is 925 m at Lugnaquilla. The Wicklow uplands comprise a core of granites flanked by Ordovician schists, mudstones and volcanics. The form of the Wicklow Glens is due to glacial erosion. The topography is typical of a mountain chain, showing the effects of more than one cycle of erosion. The massive granite has weathered characteristically into broad domes. Most of the western part of the site consists of an elevated moorland, covered by peat. The surrounding schists have assumed more diverse outlines, forming prominent peaks and rocky foothills with deep glens. The dominant topographical features are the products of glaciation. High corrie lakes, deep valleys and moraines are common features of this area. The substrate over much of the area is peat, usually less than 2 m deep. Poor mineral soil covers the slopes, and rock outcrops are frequent. The Wicklow Mountains are drained by several major rivers including the Dargle, Liffey, Dodder, Slaney and Avonmore. The river water in the mountain areas is often peaty, especially during floods.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[3110] Oligotrophic Waters containing very few minerals
[3160] Dystrophic Lakes
[4010] Wet Heath
[4030] Dry Heath
[4060] Alpine and Subalpine Heaths
[6130] Calaminarian Grassland
[6230] Species-rich *Nardus* Grassland*
[7130] Blanket Bogs (Active)*
[8110] Siliceous Scree
[8210] Calcareous Rocky Slopes
[8220] Siliceous Rocky Slopes
[91A0] Old Oak Woodlands

[1355] Otter (*Lutra lutra*)

The vegetation over most of Wicklow Mountains SAC is a mosaic of heath, blanket bog and upland grassland (mostly on peaty soil, though some on mineral soil), stands of dense Bracken (*Pteridium aquilinum*), and small woodlands mainly along the rivers. Mountain loughs and corrie lakes are scattered throughout the site.

The two dominant vegetation communities in the area are heath and blanket bog. Heath vegetation, with both wet and dry heath well represented, occurs in association with blanket bog, upland acid grassland and rocky habitats. The wet heath is characterised by species such as Heather (*Calluna vulgaris*), Cross-leaved Heath (*Erica tetralix*), cottongrasses (*Eriophorum* spp.), Tormentil (*Potentilla erecta*), Mat-grass (*Nardus stricta*), bent grasses (*Agrostis* spp.) and bog mosses (*Sphagnum* spp.). In places the wet heath occurs in conjunction with flush communities and streamside vegetation, and here species such as Heath Rush (*Juncus squarrosus*) and sedges (*Carex* spp.) are found. Dry heath at this site is confined to shallow peaty soils on steep slopes where drainage is better and particularly in sheltered conditions. It is characterised by species such as Heather, gorse (*Ulex* spp.), Bell Heather (*Erica cinerea*), Bilberry (*Vaccinium myrtillus*), Purple Moor-grass (*Molinia caerulea*) and lichens (*Cladonia* spp.). In places the heath grades into upland grassland on mineral soil.

Blanket bog is usually dominated by cottongrasses, Heather and bog mosses. On steeper slopes there is some flushing and here Purple Moor-grass, Heath Rush and certain *Sphagnum* species become more common. The Liffey Head blanket bog is among the best of its kind in eastern Ireland, with deep peat formations and an extensive system of dystrophic pools developed among the hummocks and hollows on the bog surface. The vegetation is largely dominated by Heather and Cross-leaved Heath, with cottongrasses (*Eriophorum vaginatum* and *E. angustifolium*), Deergrass (*Scirpus cespitosus*) and Bog Asphodel (*Narthecium ossifragum*). In drier areas, Bilberry and Cowberry (*Vaccinium vitis-idaea*) are common, while the scarce Bog-rosemary (*Andromeda polifolia*) is also found. Blanket bog occurs over extensive areas of deeper peat on the plateau and also on gentle slopes at high altitudes.

Due to the underlying rock strata, the water of the rivers and streams is acid rather than alkaline. The water is generally oligotrophic and free from enrichment. The lakes within the area range from the high altitude lakes of Lough Firrib and Three Lakes, to the lower pater-noster lakes of Glendalough, Lough Tay and Lough Dan. Spectacular corrie lakes, such as Loughs Bray (Upper and Lower), Ouler, Cleevaun, Arts, Kellys and Nahanagan, exhibit fine sequences of moraine stages. The deep lakes are characteristically species-poor, but hold some interesting plants including an unusual form of Quillwort (*Isoetes lacustris* var. *morei*), a stonewort (*Nitella* sp.) and Floating Bur-reed (*Sparganium angustifolium*).

Alpine vegetation occurs on some of the mountain tops, notably in the Lugnaquilla area, and also on exposed cliffs and scree slopes elsewhere in the site. Here alpine heath vegetation is represented with heath species such as Crowberry (*Empetrum nigrum*) and Cowberry, and others such as Dwarf Willow (*Salix herbacea*), the grey-green moss *Racomitrium lanuginosum*, and scarce species such as Mountain Clubmoss

(*Diphasiastrum alpinum*), Firmoss (*Huperzia selago*), and Starry Saxifrage (*Saxifraga stellaris*). Some rare arctic-alpine species have been recorded, including Alpine Lady's-mantle (*Alchemilla alpina*) and Alpine Saw-wort (*Saussurea alpina*).

Old lead mine workings at Glendasan support an estimated 3.6 hectares of Calaminarian Grassland, with a suite of rare metallophyte (metal-loving) bryophytes, including the moss *Ditrichum plumbicola* and the liverworts *Cephaloziella massalongi* and *C. nicholsonii*.

Small areas of old oakwood (Blechno-Quercetum petraeae type) occur on the slopes of Glendalough and Glenmalure, near Lough Tay and Lough Dan, with native Sessile Oak (*Quercus petraea*) trees, many of which are 100-120 years old. On wetter areas, wet broadleaved semi-natural woodlands occur which are dominated by Downy Birch (*Betula pubescens*). Mixed woodland with non-native tree species also occurs.

The site supports a range of rare plant species. Parsley Fern (*Cryptogramma crispa*), Marsh Clubmoss (*Lycopodiella inundata*), Lanceolate Spleenwort (*Asplenium billotii*), Small-white Orchid (*Pseudorchis albida*) and Bog Orchid (*Hammarbya paludosa*) are all legally protected under the Flora (Protection) Order, 2015. Greater Broomrape (*Orobanche rapum-genistae*), Alpine Saw-wort and Alpine Lady's-mantle are listed in the Irish Red Data Book. The rare Myxomycete fungus *Echinostelium colliculosum* has been recorded from the Military Road.

The Red Data Book fish species Arctic Char has been recorded from Lough Dan, but this population may now have died out.

Mammals and birds which occur are typical of the uplands. Deer are abundant, mainly hybrids between Red and Sika Deer. Other mammals include Hare, Badger and Otter, the latter being a species listed on Annex II of the E.U. Habitats Directive. Pine Marten has recently been confirmed as occurring within the site. Among the birds, Meadow Pipit, Skylark, Raven and Red Grouse are resident throughout the site. Wheatear, Whinchat and the scarce Ring Ouzel are summer visitors. Wood Warbler and Redstarts are rare breeding species of the woodlands. Dipper and Grey Wagtail are typical riparian species. Merlin and Peregrine, both Annex I species of the E.U. Birds Directive, breed within the site. Recently, Goosander has become established as a breeding species.

Large areas of the site are owned by the National Parks and Wildlife Service (NPWS) and are managed for nature conservation based on traditional land uses of upland areas. The most common land use is traditional sheep grazing, but others include turf cutting, mostly hand-cutting but some machine-cutting also occurs. These activities are largely confined to the Military Road, where there is easy access. Large areas which had been previously hand-cut and are now abandoned are regenerating. In the last 40 years, forestry has become an important land use in the uplands, and has affected both the wildlife and the hydrology of the area. Amenity use is very

high, with Dublin city close to the site. Peat erosion is frequent on the peaks. This may be a natural process, but is likely to be accelerated by activities such as grazing.

Wicklow Mountains is important as a complex, extensive upland site. It shows great diversity from a geomorphological and a topographical point of view. The vegetation provides examples of the typical upland habitats with heath, blanket bog and upland grassland covering large, relatively undisturbed areas. In all, twelve habitats listed on Annex I of the E.U. Habitats Directive are found within the site. Several rare or protected plant and animal species occur, adding further to its value.

SITE SYNOPSIS

SITE NAME: WICKLOW MOUNTAINS SPA

SITE CODE: 004040

This is an extensive upland site, comprising a substantial part of the Wicklow Mountains. Most of the site is in Co. Wicklow, but a small area lies in Co. Dublin. The underlying geology of the site is mainly of Leinster granites, flanked by Ordovician schists, mudstones and volcanics. The area was subject to glaciation and features fine examples of glacial lakes, deep valleys and moraines. Most of site is over 300 m, with much ground being over 600 m; the highest peak is Lugnaquillia (925 m). The substrate over much of site is peat, with poor mineral soil occurring on the slopes and lower ground. Exposed rock and scree are features of the site. The predominant habitats present are blanket bog, heaths and upland grassland.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Merlin and Peregrine.

A series of surveys of the Wicklow Mountains SPA indicates that up to 9 pairs of Merlin breed within the site in any one year. Traditionally a ground-nesting species, Merlin in the Wicklow Mountains are usually found nesting in old crows nests in conifer plantations. The open peatlands provide excellent foraging habitat for Merlin with small birds such as Meadow Pipit being their main prey. The cliffs and crags within the site also provide ideal breeding locations for Peregrine (20 pairs in 2002). Other birds of the open peatlands and scree slopes that have been recorded within the site include Ring Ouzel and Red Grouse.

The Wicklow Mountains SPA is of high ornithological importance as it supports nationally important populations of Merlin and Peregrine, both species that are listed on Annex I of the E.U. Birds Directive. Part of Wicklow Mountains SPA is a Statutory Nature Reserve.

7.7.2014

SITE SYNOPSIS

Site Name: Wicklow Reef SAC

Site Code: 002274

Wicklow Reef is situated just to the north of Wicklow Head on the east coast of Ireland in Co. Wicklow. The substrate is a mixture of cobbles, bedrock and sand and is subject to strong tidal streams.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1170] Reefs

Wicklow Reef is an example of a subtidal reef constructed by the honeycomb worm *Sabellaria alveolata*. In Irish waters this worm normally constructs reefs on intertidal rocks, in areas subject to some sand scour. Such reefs are widespread but uncommon. *Sabellaria alveolata* subtidal reefs are known to occur in the Mediterranean but this example is an extremely unusual feature and may be the first record for Britain and Ireland.

The reef occurs at a depth of 12-30 m and reaches a thickness of at least 0.3-0.5 m. It is composed of consolidated sand grains formed into a honeycomb structure by the activities of the worm. There is a good diversity of species associated with the reef, including hydroids (e.g. *Hydrallmania falcata*), a variety of polychaete worms, the snail *Calliostoma zizyphinum*, the bivalves *Musculus discor* and *Mytilus edulis*, other molluscs, bryozoans, barnacles, amphipods, crabs, starfish, brittlestars and sea squirts. Three of the species associated with this biogenic reef are rare in Irish waters. The bryozoan *Phaeostachys spinifera* is only known from five locations, with the majority on the west coast and no records in the Irish sea south of Co. Antrim. The polychaete *Eulalia ornata* and the amphipod *Unciola crenatipalma* are only known from one and two sites respectively in Ireland.

Wicklow Reef is of high conservation value as it is the only documented example in Ireland of a biogenic reef. Further, it supports a number of uncommon species.

APPENDIX 2
CONSERVATION OBJECTIVES

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Buckroney-Brittas Dunes and Fen SAC 000729

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000729	Buckroney-Brittas Dunes and Fen SAC
1210	Annual vegetation of drift lines
1220	Perennial vegetation of stony banks
1410	Mediterranean salt meadows (Juncetalia maritimi)
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)*
2170	Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae)
2190	Humid dune slacks
7230	Alkaline fens

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1981
Title :	Ecological/hydrological report on Buckroney Marsh, Co. Wicklow
Author :	Cross, J. (ed.)
Series :	Unpublished report to NPWS
Year :	1999
Title :	National Shingle Beach Survey of Ireland 1999
Author :	Moore, D.; Wilson, F.
Series :	Unpublished Report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Saltmarsh monitoring project 2007-2008
Author :	McCorry, M.; Ryle, T.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	Monitoring survey of Annex I sand dune habitats in Ireland
Author :	Delaney, A.; Devaney, F.M.; Martin, J.M.; Barron, S.J.
Series :	Irish Wildlife Manual No. 75
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Buckroney-Brittas Dunes and Fen SAC (site code: 729) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2008
Title :	The phytosociology and conservation value of Irish sand dunes
Author :	Gaynor, K.
Series :	Unpublished Ph.D. Thesis, National University of Ireland, Dublin

Spatial data sources

Year :	2013
Title :	Sand Dune Monitoring Project 2011. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1210, 1220, 2110, 2120, 2130, 2150, 2170, 2190 (map 2)
Year :	2009
Title :	Coastal Monitoring Project 2004-2006. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1210, 1220, 2110, 2120, 2130, 2150, 2170, 2190 (map 2)

1210 Annual vegetation of drift lines

To maintain the favourable conservation condition of Annual vegetation of drift lines in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the sub-site mapped: Pennycomequick - 0.48ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). Annual vegetation of drift lines was mapped at the sub-site Pennycomequick (CMP site ID: 019) to give a total estimated area of 0.48ha within Buckroney-Brittas Dunes and Fen SAC. The habitat is very difficult to measure in view of its dynamic nature which means that it can appear and disappear within a site from year to year. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for mapped locations	Based on data from Ryle et al. (2009). See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali*) and oraches (*Atriplex* spp.)	Based on data from Ryle et al. (2009). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008) and Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See the coastal habitats supporting document for further details

1220 Perennial vegetation of stony banks

To restore the favourable conservation condition of Perennial vegetation of stony banks in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession	The total current area of perennial vegetation of stony banks within Buckroney-Brittas Dunes and Fen SAC is currently unknown. During the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013) an area of 0.08ha of vegetated shingle was recorded in the sub-site Mizen Head (SDM site ID: 018) in Buckroney-Brittas Dunes and Fen SAC. NB further unsurveyed areas may be present within the SAC. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for mapped locations	The full distribution of perennial vegetation of stony banks in the SAC is unknown at present, although the habitat has been recorded in the Mizen Head sub-site by Delaney et al. (2013). NB further unsurveyed areas may be present within the SAC. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Attribute and target based on data from Moore and Wilson (1999). See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Attribute and target based on data from Moore and Wilson (1999). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the typical vegetated shingle flora including the range of sub-communities within the different zones	Attribute and target based on data from Moore and Wilson (1999). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Attribute and target based on data from Moore and Wilson (1999). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See the coastal habitats supporting document for further details

1410 Mediterranean salt meadows (Juncetalia maritimi)

To maintain the favourable conservation condition of Mediterranean salt meadows (Juncetalia maritimi) in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). The current area of Mediterranean salt meadows (MSM) in Buckroney-Brittas Dunes and Fen SAC is unknown. The SMP recorded 0.08ha of MSM habitat within the sub-site Buckroney (SMP site ID: SMP0037), but this area was subsequently re-classified as a fixed dune/humid dune slack mosaic by the Sand Dunes Monitoring Project (Delaney et al., 2013). It is important to note that there may be additional areas of unsurveyed saltmarsh present within the SAC. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes	See notes on area above. NB further unsurveyed areas may be present within the SAC. See the coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Based on data from McCorry and Ryle (2009). Mediterranean salt meadow is found high up in the saltmarsh but requires occasional tidal inundation. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of the area outside of creeks vegetated	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in McCorry and Ryle (2009)	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species - *Spartina anglica*	Hectares	There is no record of common cordgrass (*Spartina anglica*) in the SAC and its establishment should be prevented	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To restore the favourable conservation condition of Embryonic shifting dunes in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For the sub-sites mapped: Brittas Bay - 2.02ha; Mizen Head - 0.22ha; Pennycomequick - 0.35ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Embryonic shifting dunes habitat was mapped at three sub-sites, Brittas Bay (SDM site ID: 017), Mizen Head (SDM site ID: 018) and Pennycomequick (CMP site ID: 019), giving a total estimated area of 2.59ha within Buckroney-Brittas Dunes and Fen SAC. The habitat is very difficult to measure in view of its dynamic nature. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Embryonic shifting dunes occur in the north-east of Brittas Bay and the north of the Mizen Head sub-site, where they have developed as a narrow strip in front of the eroding face of the fixed dunes. At Pennycomequick, the embryonic dunes occur as a narrow band along the front of the northern half of the dune system. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of sand couch grass (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sand couch grass (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See the coastal habitats supporting document for further details

2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes)

To restore the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For the sub-sites mapped: Brittas Bay - 3.64ha; Pennycomequick - 0.7ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Shifting dunes along the shoreline with *Ammophila arenaria* was mapped at two sub-sites, Brittas Bay (SDM site ID: 017) and Pennycomequick (CMP site ID: 019), giving a total estimated area of 4.36ha within Buckroney-Brittas Dunes and Fen SAC. The habitat is very difficult to measure in view of its dynamic nature. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Marram (*Ammophila arenaria*) dunes were mainly found in the north-east of the Brittas Bay sub-site. The mobile dunes at Pennycomequick occupy a narrow band at the front of the glacial cliffs and beyond the headland at the eroding face of the fixed dunes. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram grass (*Ammophila arenaria*) reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth encouraging further accretion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	More than 95% of marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities dominated by marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See the coastal habitats supporting document for further details

2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)

To maintain the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes)* in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For the sub-sites mapped: Brittas Bay - 52.03ha; Mizen Head - 46.4ha; Pennycomequick - 11.15ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Fixed coastal dunes with herbaceous vegetation was mapped at three sub-sites, Brittas Bay (SDM site ID: 017), Mizen Head (SDM site ID: 018) and Pennycomequick (CMP site ID: 019), giving a total estimated area of 109.58ha within the SAC. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species (including *Hippophae rhamnoides*)	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. Bracken (*Pteridium aquilinum*) was recorded as widespread in the fixed dunes at Brittas Bay. Several non-native species were also present including sea buckthorn and cotoneaster (*Cotoneaster* sp.). The negative indicator species bracken, burnet rose (*Rosa spinosissima*) and common ragwort (*Senecio jacobaea*) were present in the Mizen Head sub-site. Negative indicator species in the Pennycomequick fixed dunes include common ragwort, common horsetail (*Equisetum arvense*) and bramble (*Rubus fruticosus* agg.), although none were as abundant as bracken. See the coastal habitats supporting document for further details

Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Pine (*Pinus* spp.), sea buckthorn (*Hippophae rhamnoides*) and cordyline (*Cordyline* spp.) were all recorded in the Brittas Bay sub-site. Sea buckthorn represents the greatest threat to the fixed dunes due to its ability to colonise large areas in a short time. Burnet rose (*Rosa spinosissima*) is tall and quite dense in places in the fixed dunes in the Mizen Head sub-site. See the coastal habitats supporting document for further details

2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)

To restore the favourable conservation condition of Atlantic decalcified fixed dunes (Calluno-Ulicetea)* in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For the sub-site mapped: Brittas Bay - 0.26ha. See map 2	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Atlantic decalcified fixed dune habitat was mapped at the sub-site Brittas Bay (SDM site ID: 017) to give a total estimated area of 0.26ha within Buckroney-Brittas Dunes and Fen SAC. The habitat can be difficult to map as it occurs in a mosaic with fixed dunes. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for mapped distribution	Based on data from Delaney et al. (2013). See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of the dune habitat, subject to natural processes	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Brittas Bay is an important site for the very rare dune heath habitat and for its well-developed flora. See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See the coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details

2170 Dunes with Salix repens ssp. argentea (Salicion arenariae)

To maintain the favourable conservation condition of Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae) in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For the sub-sites mapped: Brittas Bay - 0.13ha; Mizen Head - 0.07ha. See map 2	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Dunes with *Salix repens* ssp. *argentea* (Salix arenariae) was mapped at two sub-sites, Brittas Bay (SDM site ID: 017) and Mizen Head (SDM site ID: 018), giving a total estimated area of 0.20ha within Buckroney-Brittas Dunes and Fen SAC. The habitat can be difficult to distinguish from 2190 Humid dune slacks. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on data from Delaney et al. (2013). Dunes with creeping willow (*Salix repens*) are well-developed in the Brittas Bay sub-site and occur as fragmented patches close to dune slacks in the Mizen Head sub-site. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% cover, subject to natural processes	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	See the coastal habitats supporting document for further details
Vegetation composition: cover and height of *Salix repens*	Percentage cover; centimetres	Maintain more than 10% cover of creeping willow (*Salix repens*); vegetation height should be in the average range of 5-20cm	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Cover of creeping willow (*Salix repens*) needs to be maintained (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species (including *Hippophae rhamnoides*)	Percentage cover at a representative number of monitoring stops	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See the coastal habitats supporting document for further details

Vegetation composition: scrub/trees	Percentage cover	For trees and scrub other than creeping willow (*Salix repens*), there should be no more than 5% cover or their presence should be under control	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). In the dunes with creeping willow (*Salix repens*) in the Mizen Head sub-site, scrub encroachment was recorded as a negative impact affecting 20% of the habitat. See the coastal habitats supporting document for further details

2190 Humid dune slacks

To restore the favourable conservation condition of Humid dune slacks in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For the sub-sites mapped: Brittas Bay - 0.34ha; Mizen Head - 4.76ha; Pennycomequick - 0.10ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Humid dune slacks habitat was mapped at three sub-sites, Brittas Bay (SDM site ID: 017), Mizen Head (SDM site ID: 018) and Pennycomequick (CMP site ID: 019), giving a total estimated area of 5.2ha within Buckroney-Brittas Dunes and Fen SAC. See the Buckroney-Brittas Dunes and Fen SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Two slacks occur in the Brittas Bay sub-site. In the Mizen Head sub-site, the occurrence of a range of slacks adds to the ecological significance of the dune system there. A single dune slack is located in a small depression in the centre of the Pennycomequick sub-site. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations (metres)	Maintain natural hydrological regime	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Buckroney Fen is closely associated with the dune system in the Mizen Head sub-site and the dune slacks in particular. See the coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 5% of dune slack habitat, with the exception of pioneer slacks which can have up to 20% bare ground	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details
Vegetation composition: cover of *Salix repens*	Percentage cover	Maintain less than 40% cover of creeping willow (*Salix repens*)	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Cover of creeping willow (*Salix repens*) may need to be controlled (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See the coastal habitats supporting document for further details

Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See the coastal habitats supporting document for further details

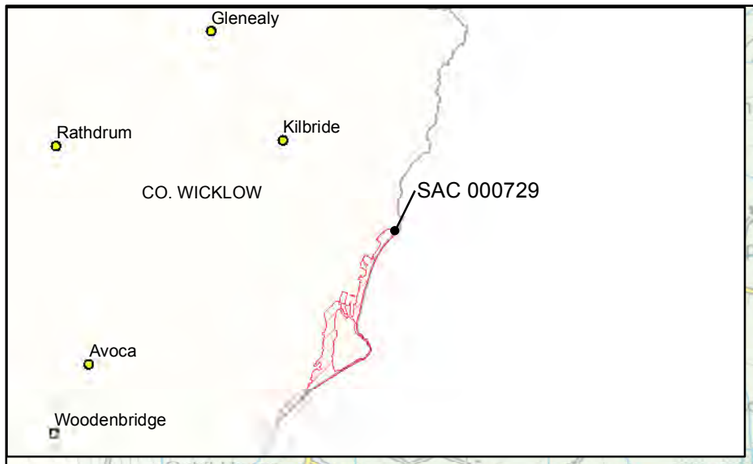
7230 Alkaline fens

To maintain the favourable conservation condition of Alkaline fens in Buckroney-Brittas Dunes and Fen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Alkaline fens has not been mapped in detail for Buckroney-Brittas Dunes and Fen SAC and thus the total area of the qualifying habitat is unknown. The habitat occurs mainly within the centre of a fen complex in a shallow basin whose exit to the sea is partially blocked by a gravel and sand ridge south of Mizen Head and which is backed by a dense swamp of common reed (*Phragmites australis*). The fen is fed by a series of springs and seepage zones at the northern end, and from a stream at the southern end. The alkaline fen merges with wet grassland, reed beds and wet willow (*Salix*) scrub (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See note on area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat in NPWS (2013)
Ecosystem function: peat formation	Flood duration	Maintain active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time (Jim Ryan, pers. comm.)
Ecosystem function: hydrology	Metres	Maintain appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Maintenance of groundwater, surface water flows and water table levels within natural ranges is essential for this wetland habitat. The hydrological conditions of the southern part of the site are major factors in maintaining the continued existence of Buckroney Fen and the adjacent salt meadow/humid dune slacks in the dunes (Cross, 1981; NPWS internal files)
Ecosystem function: water quality	Water chemistry measures	Maintain appropriate water quality, particularly nutrient levels, to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus, with the latter tending to be the limiting nutrient
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Further information on the vegetation communities associated with alkaline fens (in upland areas) is presented in Perrin et al. (2014)
Vegetation composition: number of positive indicator species (brown mosses)	Number of species at a representative number of 2m x 2m monitoring stops	At least one brown moss species present at each monitoring stop	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. Mosses found in the habitat in the SAC include *Callliergon giganteum*, *Calliergonella cuspidata*, *Cratoneuron filicinum* and *Fissidens adianthoides* (NPWS internal files)

Vegetation composition: number of positive indicator species (vascular plants)	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive vascular plant indicator species present at each monitoring stop is at least two for small-sedge flushes and at least three for black bog-rush (*Schoenus nigricans*) flush and bottle sedge (*Carex rostrata*) fen	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. Greater tussock-sedge (*Carex paniculata*) and water mint (*Mentha aquatica*) dominate the fen in the SAC. Other vascular plants listed include blunt-flowered rush (*Juncus subnodulosus*), sharp-flowered rush (*J. acutiflorus*), small sedge species (*Carex* spp.), marsh pennywort (*Hydrocotyle vulgaris*), water horsetail (*Equisetum fluviatile*), purple loosestrife (*Lythrum salicaria*), greater bird's-foot trefoil (*Lotus pedunculatus*), bogbean (*Menyanthes trifoliata*), bog pimpernel (*Anagallis tenella*), yellow iris (*Iris pseudacorus*), tubular water-dropwort (*Oenanthe fistulosa*), meadowsweet (*Filipendula ulmaria*), fen bedstraw (*Galium uliginosum*) and orchid species (*Dactylorhiza* spp.) (Cross, 1981; NPWS internal files)
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of brown moss species and positive vascular plant indicator species at least 20% for small-sedge flushes and at least 75% cover for black bog-rush (*Schoenus nigricans*) flush and bottle sedge (*Carex rostrata*) fen	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Total cover of non-native species less than 1%	Attribute and target Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based Perrin et al. (2014). Scrub and trees will tend to invade if fen conditions become drier. In Buckroney-Brittas Dunes and Fen SAC, there are areas of scrub within the fen that are dominated by common sally (*Salix atrocinerea*) (NPWS internal files)
Vegetation composition: soft rush and common reed cover	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of soft rush (*Juncus effusus*) and common reed (*Phragmites australis*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: height	Percentage of leaves/shoots at a representative number of 2m x 2m monitoring stops	Proportion of live leaves and/or flowering shoots of vascular plants that are more than 5cm above the ground surface should be at least 50%	Attribute and target based on Perrin et al. (2014). Vegetation heights lower than these levels would indicate undesirable levels of grazing
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014). While grazing may be appropriate in this habitat, excessive areas of disturbed bare ground may develop due to unsuitable grazing regimes
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage as a result of drainage ditches or heavy trampling less than 10%	Attribute and target based Perrin et al. (2014). Drainage can result in loss of characteristic species and transition to drier habitats. Buckroney Fen has been subject to some drainage efforts in the past. Although no drains have been opened in more recent years, old drains within the site are still open and are continuing to drain the fen (NPWS internal files)
Physical structure: tufa formations	Percentage cover in local vicinity of a representative number of 2m x 2m monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%	Attribute and target based on Perrin et al. (2014)

Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species on the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The Near Threatened species (Wyse Jackson et al., 2016) marsh fern (*Thelypteris palustris*) is common throughout the fen in the SAC (NPWS internal files)



Legend

Buckroney-Brittas Dunes and Fen SAC 000729

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
BUCKRONEY - BRITTAS DUNES AND FEN SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000729; version 3. CO. WICKLOW

0 0.55 1.1 1.65 2.2 km

N

Map Version 1
Date: Nov 2016

Legend

- Buckroney-Brittas Dunes and Fen SAC 000729
- Sand Dune Monitoring Project Survey Area
- Coastal Monitoring Project Area

Qualifying Interests

- 1210 Annual vegetation of drift lines
- 1220 Perennial vegetation of stony banks
- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
- 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)
- 2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
- 2170 Dunes with *Salix repens ssp. argentea (Salicion arenariae)*
- 2190 Humid dune slacks
- OSi Discovery Series County Boundary

SDM Site Code: 017

SDM Site Code: 018

CMP Site Code: 019

Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
BUCKRONEY - BRITTAS DUNES AND FEN SAC
CONSERVATION OBJECTIVES
SANDDUNE HABITATS AND
PERENNIAL VEGETATION OF STONY BANKS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000729; version 3. CO. WICKLOW

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: Nov 2016

Conservation objectives for Deputy's Pass Nature Reserve SAC [000717]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	**Description**
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Deputy's Pass Nature Reserve SAC [000717]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Magherabeg Dunes SAC 001766

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001766	Magherabeg Dunes SAC
1210	Annual vegetation of drift lines
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)*
7220	Petrifying springs with tufa formation (Cratoneurion)*

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2013
Title :	Conservation status assessment for petrifying springs
Author :	Lyons, M.D.; Kelly, D.L.
Series :	Unpublished report to NPWS
Year :	2013
Title :	Monitoring survey of Annex I sand dune habitats in Ireland
Author :	Delaney, A.; Devaney, F.M.; Martin, J.M.; Barron, S.J.
Series :	Irish Wildlife Manual No. 75
Year :	2016
Title :	Monitoring guidelines for the assessment of petrifying springs in Ireland
Author :	Lyons, M.D.; Kelly, D.L.
Series :	Irish Wildlife Manual No. 94
Year :	2017
Title :	Magherabeg Dunes SAC (site code: 1766) Conservation objectives supporting document-coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2008
Title :	The phytosociology and conservation value of Irish sand dunes
Author :	Gaynor, K.
Series :	Unpublished Ph.D. Thesis, National University of Ireland, Dublin
Year :	2010
Title :	Water quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	EPA, Wexford
Year :	2015
Title :	The flora and conservation status of petrifying springs in Ireland
Author :	Lyons, M.D.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin

Spatial data sources

Year :	2009
Title :	Coastal Monitoring Project 2004-2006. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1210, 2110, 2120, 2130, 2150 (map 2)
Year :	2016
Title :	Point file associated with Lyons (2015)
GIS Operations :	Dataset created from spatial references; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	7220 (map 3)

Conservation Objectives for : Magherabeg Dunes SAC [001766]

1210 Annual vegetation of drift lines

To maintain the favourable conservation condition of Annual vegetation of drift lines in Magherabeg Dunes SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the two sub-sites mapped: Magherabeg - 0.03ha; Magheramore - 0.04ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). Annual vegetation of drift lines was mapped at two sub-sites, Magherabeg (CMP site ID: 016) and Magheramore (CMP site ID: 015), giving a total estimated area of 0.07ha within Magherabeg Dunes SAC. The habitat is very difficult to measure in view of its dynamic nature which means that it can appear and disappear within a site from year to year. See the Magherabeg Dunes SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on data from Ryle et al. (2009). A single clump of annual strandline vegetation at the southern extreme of Magherabeg accounts for the mapped area of 0.03ha and a further 0.04ha was recorded at Magheramore. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). The embryonic dunes at Magherabeg occur in association with drift line vegetation. See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali*) and oraches (*Atriplex* spp.)	Based on data from Ryle et al. (2009). Sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*) and prickly saltwort (*Salsola kali*) were noted in the habitat in Magherabeg Dunes SAC. See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See the coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Magherabeg Dunes SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the sub-site mapped: Magherabeg - 1.71ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). Embryonic shifting dunes habitat was mapped at the sub-site Magherabeg (CMP site ID: 016) to give a total estimated area of 1.71ha within the SAC. The habitat is very difficult to measure in view of its dynamic nature. See the Magherabeg Dunes SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on data from Ryle et al. (2009). See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). Magherabeg Dunes SAC supports most sand dune stages with embryonic dunes, white dunes and fixed dunes all represented. See the coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of sand couch grass (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sand couch grass (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009). Species present in the embryonic dunes in the SAC include sand couch (*Elytrigia juncea*), sea spurge (*Euphorbia paralias*), marram (*Ammophila arenaria*), sea sandwort (*Honkenya peploides*) and sea rocket (*Cakile maritima*). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008) and Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See the coastal habitats supporting document for further details

2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes)

To maintain the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) in Magherabeg Dunes SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the two sub-sites mapped: Magheramore - 0.01ha; Magherabeg - 1.80ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). Shifting dunes along the shoreline with *Ammophila arenaria* was mapped at two sub-sites, Magherabeg (CMP site ID: 016) and Magheramore (CMP site ID: 015), giving a total estimated area of 1.81ha within Magherabeg Dunes SAC. The habitat is very difficult to measure in view of its dynamic nature. See the Magherabeg Dunes SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on Ryle et al. (2009). The mobile dunes at the Magherabeg sub-site form a continuous strip in excess of 10m wide, apart from the 250m stretch where the Three Mile Water River channel cuts through the strand. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram grass (*Ammophila arenaria*) reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth encouraging further accretion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.	Based on data from Ryle et al. (2009). Magherabeg Dunes SAC supports most sand dune stages with embryonic dunes, white dunes and fixed dunes all represented. See the coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	More than 95% of marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities dominated by marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008) and Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See the coastal habitats supporting document for further details

2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes)* in Magherabeg Dunes SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the sub-site mapped: Magherabeg - 7.93ha. See map 2	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). Fixed coastal dunes with herbaceous vegetation was mapped at the sub-site Magherabeg (CMP site ID: 016) to give a total estimated area of 7.93ha within the SAC. See the Magherabeg Dunes SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 2 for known distribution	Based on data from Ryle et al. (2009). The fixed coastal dunes occur in a band along the length of the southern portion of Magherabeg Dunes SAC. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). Magherabeg Dunes SAC supports most sand dune stages with embryonic dunes, white dunes and fixed dunes all represented. See the coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes	Based on data from Gaynor (2008) and Ryle et al. (2009). At Magherabeg, natural erosion has led to the expansion of blowouts and erosion of the seaward side of dune ridges. See the coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Ryle et al. (2009). Areas of the fixed dunes at Magherabeg Dunes SAC are undergoing succession to rank grassland and low scrub, with subsequent loss of flora diversity. See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Ryle et al. (2009). Magherabeg has a good proportion of short turf grassland with a reasonably diverse fixed dune flora including typical species such as lady's bedstraw (*Galium verum*), common bird's-foot trefoil (*Lotus corniculatus*), common restharrow (*Ononis repens*), wild carrot (*Daucus carota*), wild thyme (*Thymus polytrichus*) and kidney vetch (*Anthyllis vulneraria*). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008) and Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. Negative indicator species found throughout the fixed dunes at Magherabeg Dunes SAC include common ragwort (*Senecio jacobaea*), creeping thistle (*Cirsium arvense*), common nettle (*Urtica dioica*) and perennial rye-grass (*Lolium perenne*). Bracken (*Pteridium aquilinum*) and burnet rose (*Rosa spinosissima*) appear to be invasive throughout the fixed dunes at Magherabeg Dunes SAC. See the coastal habitats supporting document for further details

Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). Scrub vegetation may be spreading at the landward edge of the fixed dunes where stock grazing has been discontinued. See the coastal habitats supporting document for further details

2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)

To maintain the favourable conservation condition of Atlantic decalcified fixed dunes (Calluno-Ulicetea)* in Magherabeg Dunes SAC, which is defined by the following list of attributes and targets:

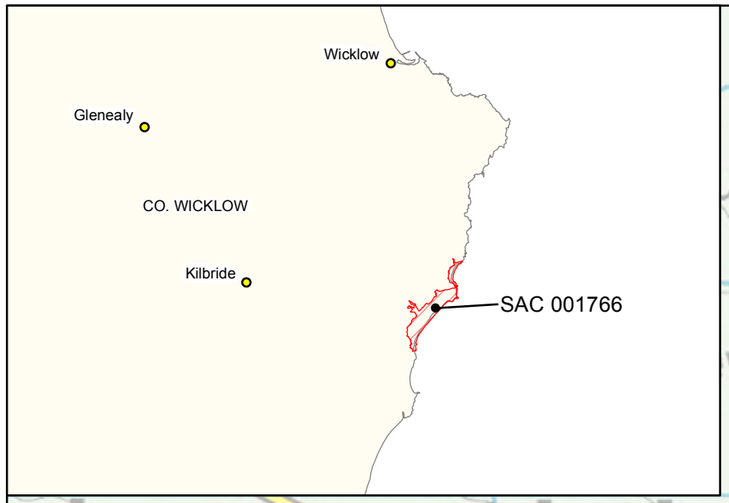
Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). No area was mapped for Atlantic decalcified dune habitat at Magherabeg Dunes SAC by the CMP, but it is potentially present as evidenced by the occurrence of European gorse (*Ulex europaeus*), in mosaic with fixed coastal dunes with herbaceous vegetation. Thus, the total area of the qualifying habitat within the SAC is unknown. See the Magherabeg Dunes SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes	Based on data from Ryle et al. (2009). This habitat is characterised by the presence of European gorse (*Ulex europaeus*), which occurs on the inland side of the fixed dunes in Magherabeg Dunes SAC. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). Magherabeg Dunes SAC supports most sand dune stages with embryonic dunes, white dunes and fixed dunes all represented. See the coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of the dune habitat, subject to natural processes	Based on data from Gaynor (2008) and Ryle et al. (2009). See the coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Ryle et al. (2009). Areas of the fixed dunes at Magherabeg Dunes SAC are undergoing succession to rank grassland and low scrub, with subsequent loss of flora diversity. See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Gaynor (2008) and Ryle et al. (2009). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008) and Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See the coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). Scrub vegetation may be spreading at the landward edge of the fixed dunes where stock grazing has been discontinued. See the coastal habitats supporting document for further details

7220 Petrifying springs with tufa formation (Cratoneurion)

To restore the favourable conservation condition of Petrifying springs with tufa formation (Cratoneurion) in Magherabeg Dunes SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Square metres	Area stable or increasing, subject to natural processes	A total of 275m² of this habitat was recorded at three locations within Magherabeg Dunes SAC at Ardmore Point by Lyons (2015) (see map 3). The first (site ID: PS091a) was recorded as tufa-forming seepage and dry, inactive tufa on rocky shore with an area of c.25m², the second (site ID: PS091b) as tufa-forming seepages from coastal cliffs with an area of c.200m² and the third (site ID: PS091c) has been described as a spring line with tufa cascades and stream crust tufa over coastal rocks with an area of c.50m²
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3 for point locations	This habitat has been recorded at three locations at Ardmore Point within Magherabeg Dunes SAC by Lyons (2015). Lyons and Kelly (2016) describe eight plant communities of Irish petrifying springs based on relevé data. Two of the springs in this SAC (PS091a and PS091c) fall into the *Eucladium verticillatum-Pellia endiviifolia* tufa cascades group and the other (PS091b) into the *Schoenus nigricans* springs group (Lyons, 2015). Further information on these and all the vegetation communities associated with this habitat is presented in Lyons and Kelly (2016)
Hydrological regime: height of water table; water flow	Metres; metres per second	Maintain appropriate hydrological regimes	Petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources (Lyons and Kelly, 2013). Water flow should not be altered anthropogenically. See Lyons and Kelly (2016) for further details
Water quality - nitrate level	mg/l	No increase from baseline nitrate level and less than 10mg/l	Target based on data from McGarrigle et al. (2010). See Lyons and Kelly (2016) for further details
Water quality - phosphate level	µg/l	No increase from baseline phosphate level and less than 15µg/l	Based on data from Lyons (2015). See Lyons and Kelly (2016) for further details
Vegetation composition: positive indicator species	Number per spring	At least three positive/high quality indicator species as listed in Lyons and Kelly (2016) and no loss from baseline number	Based on Lyons and Kelly (2016), where the lists of positive and high quality indicator species are presented. The positive indicator species *Didymodon tophaceus*, *Eucladium verticillatum* and red fescue (*Festuca rubra*) were found at all three sites, black bog-rush (*Schoenus nigricans*) was recorded at PS091b and PS091c, bog pimpernel (*Anagallis tenella*), *Campylium stellatum*, *Chara vulgaris*, *Rivularia biasolettiana* and brookweed (*Samolus valerandi*) were recorded at PS091b and the moss *Palustriella commutata* at PS091c (Lyons, 2015)

Vegetation composition: negative indicator species	Cover (DAFOR scale)	Potentially negative indicator species should not be Dominant or Abundant; invasive species should be absent	Based on Lyons and Kelly (2016), where the lists of potentially negative herbaceous, bryophyte (and alga) and woody species are presented. See Lyons and Kelly (2016) also for details on potentially invasive species, including sycamore (*Acer pseudoplatanus*) which is invasive in non-wooded springs and a negative indicator species in wooded springs. If two or more potentially negative bryophyte species are present, and if at least two are Frequent, or at least one is Abundant, then the habitat fails for this attribute. See Lyons and Kelly (2016) for further details. The moss *Cratoneuron filicinum* was recorded as a potentially negative bryophyte species and common reed (*Phragmites australis*) was recorded as a potentially negative herbaceous species at PS091c, but neither species was Dominant or Abundant (Lyons, 2015)
Vegetation structure: sward height	Centimetres	Field layer height between 10cm and 50cm (except for bryophyte-dominated ground <10cm)	See Lyons and Kelly (2016) for further details
Physical structure: trampling/dung	Cover (DAFOR scale)	Cover should not be Dominant or Abundant	See Lyons and Kelly (2016) for further details



Legend

Magherabeg Dunes SAC 001766

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
MAGHERABEG DUNES SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

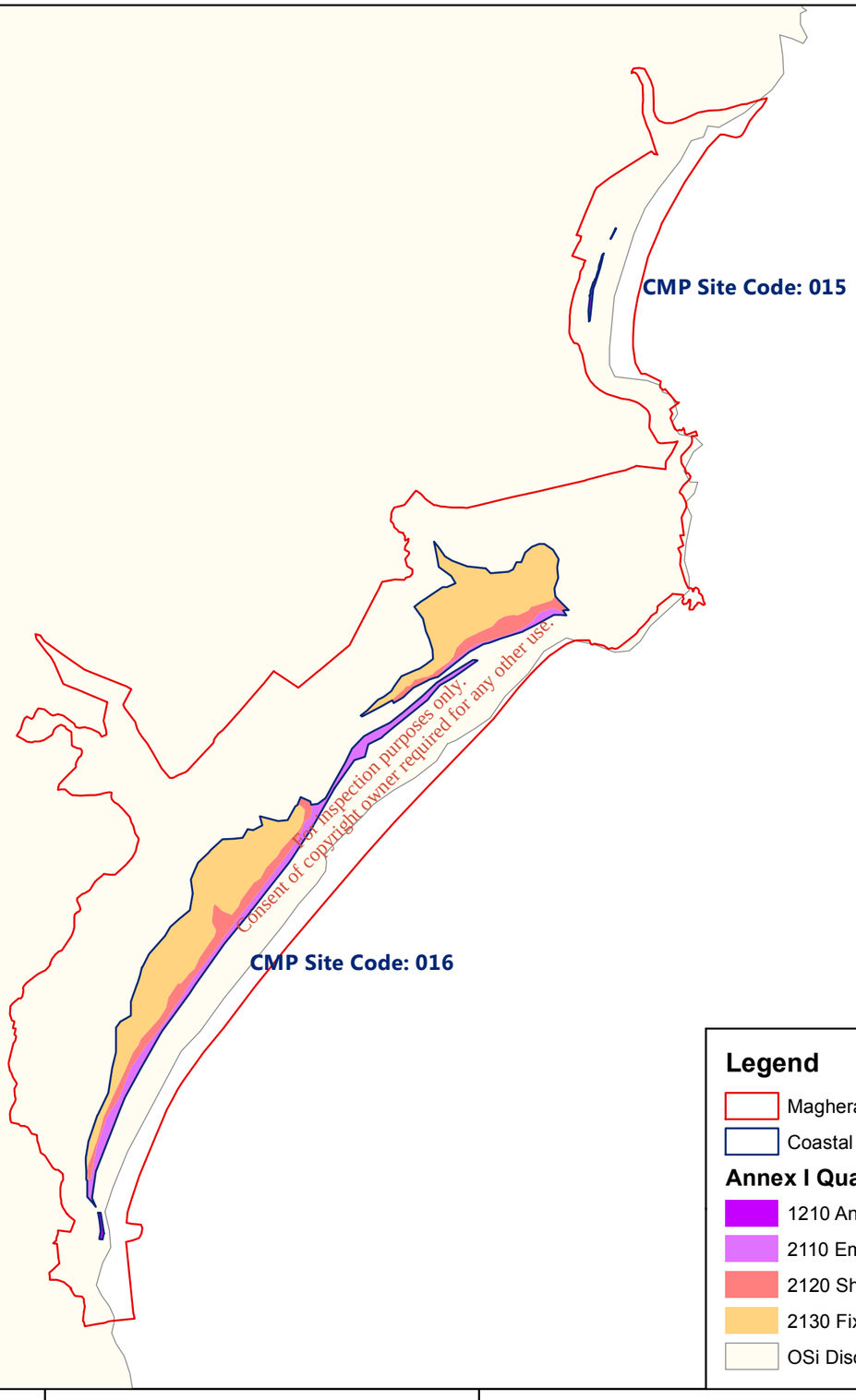
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001766; version 3.
CO. WICKLOW

0 0.1 0.2 0.3 0.4 0.5 km

N

Map Version 1
Date: Nov 2016



Legend

- Magherabeg Dunes SAC 001766
- Coastal Monitoring Project Survey Area

Annex I Qualifying Interests

- 1210 Annual vegetation of drift lines
- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
- 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)
- OSi Discovery Series County Boundary

An Roinn Falaíocht, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
MAGHERABEG DUNES SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001766; version 3.
CO. WICKLOW

0 0.1 0.2 0.3 0.4 0.5 km

N

Map Version 1
Date: Nov 2016

Legend

- 7220 Petrifying springs with tufa formation (*Cratoneurion*)
- Magherabeg Dunes SAC 001766
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
MAGHERABEG DUNES SAC
CONSERVATION OBJECTIVES
PETRIFYING SPRINGS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001766; version 3.
CO. WICKLOW

0 0.1 0.2 0.3 0.4 0.5 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas

N

Map Version 1
Date: Nov 2016

Conservation objectives for The Murrough SPA [004186]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A001	Red-throated Diver	*Gavia stellata*
A043	Greylag Goose	*Anser anser*
A046	Light-bellied Brent Goose	*Branta bernicla hrota*
A050	Wigeon	*Anas penelope*
A052	Teal	*Anas crecca*
A179	Black-headed Gull	*Chroicocephalus ridibundus*
A184	Herring Gull	*Larus argentatus*
A195	Little Tern	*Sterna albifrons*

To acknowledge the importance of Ireland's wetlands to wintering waterbirds, “Wetland and Waterbirds” may be included as a Special Conservation Interest for some SPAs that have been designated for wintering waterbirds and that contain a wetland site of significant importance to one or more of the species of Special Conservation Interest. Thus, a second objective is included as follows:

Objective: To maintain or restore the favourable conservation condition of the wetland habitat at The Murrough SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

Citation: *NPWS (2018) Conservation objectives for The Murrough SPA [004186]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for The Murrough Wetlands SAC [002249]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
1210	Annual vegetation of drift lines
1220	Perennial vegetation of stony banks
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
1410	Mediterranean salt meadows (Juncetalia maritimi)
7210	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae*
7230	Alkaline fens

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for The Murrough Wetlands SAC [002249]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Vale of Clara (Rathdrum Wood) SAC [000733]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	**Description**
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Vale of Clara (Rathdrum Wood) SAC [000733]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

SITE SYNOPSIS

Site Name: Vale of Clara (Rathdrum Wood) SAC

Site Code: 000733

The Vale of Clara woodland is situated mostly on the east side of the Avonmore River, immediately north of Rathdrum in Co. Wicklow. It lies between 107 and 244 m above sea level, and forms an integral part of one of the most scenic valleys in Wicklow. The woodland is a remnant of the once extensive forests of east Wicklow, which may have occupied this site since the end of the last Ice Age. Unfortunately, the hardwoods have been replaced, or underplanted with conifers, since the 1940s. However, most of the site is now within the Vale of Clara Nature Reserve, ensuring that the future of the existing hardwoods.

The woods in the Vale of Clara are a mosaic of relatively pure oak woodland (Sessile Oak, *Quercus petraea*), mixed woodland and commercial plantations, growing on an acidic orange-brown, sandy loam over a schist bedrock. A distinct mor humus, often several centimetres thick, overlies the mineral soil.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[91A0] Old Oak Woodlands

The oak woods are good examples of the species-poor Blechno-Quercetum vegetation community, and are best developed in the Cronybyrne area. The understorey is mostly of Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Rowan (*Sorbus aucuparia*). The ground flora includes Great Wood-rush (*Luzula sylvatica*), Bilberry (*Vaccinum myrtillus*), Ivy (*Hedera helix*), Honeysuckle (*Lonicera periclymenum*), Wood-sorrel (*Oxalis acetosella*) and violets (*Viola* spp.).

The areas of mixed woodland contain a variety of underplanted conifers, as well as Beech (*Fagus sylvatica*) and other introduced deciduous species. The planted conifer compartments contain a wide range of conifer species. An area of wet woodland is well developed near Ballyhad Bridge. The Avonmore River, which flows through the site, creates further habitat diversity.

Narrow-leaved Helleborine (*Cephalanthera longifolia*), a rare plant species which is listed in the Irish Red Data Book, has been recorded from the locality, as has the scarce, Ivy-leaved Bellflower (*Wahlenbergia hederacea*). Narrow-leaved Helleborine is protected under the Flora (Protection) Order, 1999. Several rare species of Myxomycete fungus have also been recorded from the site, namely *Cribraria rufa*,

Diderma floriforme, *Stemonitis smithii* (only known Irish site) and *Trichia verrucosa* (in its only known Republic of Ireland site).

The woodland bird community includes the Jay, Long-eared Owl, Treecreeper, Woodcock and Blackcap. The Wood Warbler and Crossbill have also been recorded, while the Dipper and Grey Wagtail occur on the Avonmore River.

The Holly Blue (*Celastrina argiolus*) butterfly has been seen within the woods.

This site is a good example of what remains of the once extensive oak forests of east Wicklow, and is representative of the relatively dry, acid oak woods of eastern Ireland. The woodlands are of considerable conservation significance as they conform to a type listed on Annex I of the E.U. Habitats Directive. The historical record of land use within the woods adds to the interest of the site, as does the occurrence of a number of rare and scarce species.

Conservation objectives for Wicklow Head SPA [004127]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A188	Kittiwake	*Rissa tridactyla*

Citation: *NPWS (2018) Conservation objectives for Wicklow Head SPA [004127]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

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National Parks and Wildlife Service

Conservation Objectives Series

Wicklow Mountains SAC 002122

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002122	Wicklow Mountains SAC
1355	Otter *Lutra lutra*
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea
3160	Natural dystrophic lakes and ponds
4010	Northern Atlantic wet heaths with *Erica tetralix*
4030	European dry heaths
4060	Alpine and Boreal heaths
6130	Calaminarian grasslands of the Violetalia calaminariae
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)*
7130	Blanket bogs (* if active bog)
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)
8210	Calcareous rocky slopes with chasmophytic vegetation
8220	Siliceous rocky slopes with chasmophytic vegetation
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Please note that this SAC overlaps with Wicklow Mountains SPA (004040). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1984
Title :	The vegetation of Irish lakes
Author :	Heuff, H.
Series :	Unpublished report to NPWS
Year :	1991
Title :	Survey to locate mountain blanket bogs of scientific interest in Ireland
Author :	Mooney, E.; Goodwillie, R.; Douglas, C.
Series :	Unpublished report to NPWS
Year :	2005
Title :	Management Plan for Wicklow Mountains National Park 2005-2009
Author :	NPWS
Series :	Department of Environment, Heritage and Local Government, Dublin
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Bryophytes and metallophyte vegetation on metalliferous mine-waste in Ireland
Author :	Holyoak, D.T.
Series :	Unpublished report to NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manual No. 46
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manual No. 76

Year :	2013
Title :	Results of a monitoring survey of old sessile oak woods and alluvial forests
Author :	O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manual No. 71
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Wicklow Mountains SAC (site code: 2122) Conservation objectives supporting document-blanket bogs and associated habitats- V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1950
Title :	The Flora of the County Wicklow. Flowering Plants, Cryptogams and Characeae
Author :	Brunker, J.P.
Series :	Dundalgan Press, Dundalk
Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57

Year :	1991
Title :	Acid sensitive surface waters in Ireland: the impact of a major new sulphur emission on sensitive surface waters in an unacidified region
Author :	Bowman, J.
Series :	Environmental Research Unit, Dublin
Year :	1992
Title :	Red Data Books of Britain and Ireland, Charophytes
Author :	Stewart, N.F.; Church, J.M.
Series :	Joint Nature Conservation Committee and Office of Public Works
Year :	1998
Title :	The application of multivariate land classification to vegetation survey in the Wicklow Mountains, Ireland
Author :	Cooper, A.; Loftus, M.
Series :	Plant Ecology, 135(2): 229-241
Year :	1998
Title :	Ireland's Freshwaters
Author :	Reynolds, J.D.
Series :	Marine Institute, Dublin
Year :	1998
Title :	Studies in Irish Limnology
Author :	Giller, P.S. (ed.)
Series :	Marine Institute, Dublin
Year :	2000
Title :	Appendix 2. Notes on the status and ecology of *Ditrichum cornubicum*
Author :	Holyoak, D.T.; Clements, R.; Colemen, M.R.J.; MacPherson, K.S.
Series :	English Nature Research Reports, No. 328: 40-50
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623
Year :	2001
Title :	Heavy metal concentrations in the soil substrates associated with rare bryophytes at former metalliferous mining sites in East Cornwell
Author :	Walsh, L.
Series :	Unpublished B.Sc. Thesis, University of Hertfordshire
Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2002
Title :	Deterioration of Atlantic soft water macrophyte communities by acidification, eutrophication and alkalinisation
Author :	Arts, G.H.P.
Series :	Aquatic Botany, 73: 373-393

Year :	2002
Title :	The Freshwater Algal Flora of the British Isles. An Identification Guide to Freshwater and Terrestrial Algae.
Author :	John, D.M.; Whitton, B.A.; Brook, A.J. (eds)
Series :	Cambridge University Press
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	EPA, Wexford
Year :	2008
Title :	Water Quality in Ireland 2004-2006
Author :	Clabby, K.J.; Bradley, C.; Craig, M.; Daly, D.; Lucey, J.; McGarrigle, M.; O'Boyle, S.; Tierney, D.; Bowman, J.
Series :	EPA, Wexford
Year :	2009
Title :	The identification, characterization and conservation value of isoetid lakes in Ireland
Author :	Free, G.; Bowman, J.; McGarrigle, M.; Little, R.; Coroni, R.; Donnelly, K.; Tierney, D.; Trodd, W.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 19(3): 264–273
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2010
Title :	Water quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	EPA, Wexford
Year :	2012
Title :	Rare and threatened bryophytes of Ireland
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	National Museums Northern Ireland
Year :	2012
Title :	The impact of conifer plantation forestry on the ecology of peatland lakes
Author :	Drinan, T.J.
Series :	Unpublished Ph.D. thesis, University College Cork
Year :	2013
Title :	Conservation of selected legally protected and Red Listed bryophytes in Ireland
Author :	Campbell, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin

Year :	2013
Title :	Interpretation manual of European Union habitats- Eur 28
Author :	European Commission- DG Environment
Series :	European Commission
Year :	2015
Title :	Water quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	EPA, Wexford

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to SAC boundary. Expert opinion used to identify Annex I habitats and to resolve any issues arising
Used For :	3110, 3160 (map 3)
Year :	2012
Title :	Bryophytes and Metallophyte Vegetation on Metalliferous Mine-waste in Ireland
GIS Operations :	Sites identified; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6130 (map 4)
Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0 (map 5)
Year :	2010
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	Creation of 80m buffer on aquatic side of lake data; creation of 10m buffer on terrestrial side of lake data. These datasets combined with the derived OSi Discovery Series river and canal datasets. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on aquatic side of lake boundary to highlight potential commuting points
Used For :	1355 (map 6)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of 10m buffer on terrestrial side of river banks data; creation of 20m buffer applied to canal centreline data. Creation of 20m buffer applied to river and stream centreline data; These datasets combined with the derived OSi 1:5000 vector lake buffer data. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)

3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

To maintain the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Lake habitat 3110 is likely to occur in Loughs Dan, Tay, Upper and Lower Lakes (Glendalough), and Upper and Lower Bray in Wicklow Mountains SAC (see map 3). The SAC was formerly selected for lake habitat 3130 based on an older interpretation of that habitat where it was associated with uplands (see O Connor, 2015). In line with Article 17 reporting (NPWS, 2013), all lakes larger than 1ha were mapped as potential 3110. In lakes at higher altitude (above 200m), lake habitat 3160 may occur. Reynolds (1998) noted the dystrophic nature of corrie lakes in the Wicklow Mountains including U. and L. Bray, U. Glendalough, Tay, Ouler, Kelly's and Arts. Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, all lakes larger than 1ha have been mapped as potential 3110 (see map 3)
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see the Article 17 habitat assessment for habitat 3110 (NPWS, 2013) and O Connor (2015). Brunker (1950) includes records for Loughs Bray (Upper and Lower), Dan, Upper and Lower (Glendalough), Ouler, Tay, Kelly's and Arts, with typical 3110 species such as *Isoetes lacustris, Littorella uniflora, Lobelia dortmanna* and *Juncus bulbosus* occurring in most. *Isoetes lacustris* var. *morei*, a deep-water, long frond variant, is known only from Upper Lough Bray (Brunker, 1950). The only Irish sites for *Nitella gracilis*, a Vulnerable charophyte, are Loughs Tay (recorded at north end in 1991 by N.F. Stewart, R. FitzGerald and T. Curtis) and Dan (1890s) (Stewart and Church, 1992). Heuff (1984) surveyed Tay and Glendalough (Lower). Dan, Tay, Bray Lower and Upper Lake Glendalough are Water Framework Directive (WFD) monitoring lakes and regular macrophyte surveys are conducted by the Environmental Protection Agency (EPA)
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3110 (see O Connor, 2015)
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3110. Maximum depth should be large in the SAC, as many of the lakes are deep corrie lakes and the water should be very clear. Information on vegetation depth may be available for WFD monitoring lakes

Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3110 is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Rock, coarse sand and peat are likely to dominate many lakes in the SAC, particularly at higher altitude. *Nitella gracilis* is found on peat or peaty-silt (Bryant and Stewart, 2002 in John et al., 2002). Open-cast lead and zinc mining has affected the sediment and water chemistries of both Glendalough lakes (Murray, 1998 in Giller, 1998)
Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3110 (O Connor, 2015). Habitat 3110 is associated with very clear water. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥3m annual minimum Secchi disk depth. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m. High altitude deep lakes, such as those found in Wicklow Mountains SAC, are expected to have high transparency. Heuff (1984) recorded transparency of 3m in Upper Lake (Glendalough) and 2.1m in Tay
Water quality: nutrients	µg/l P; mg/l N	Maintain/restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and WFD 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For lake habitat 3110, annual average total phosphorus (TP) concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. Bray had good nutrient status 2007-09 and 2010-12, exceeding the TP target; Dan and Tay had good nutrient status in 2007-09 and high in 2010-12; Upper Glendalough had high status in both reporting periods (McGarrigle et al., 2010; Bradley et al., 2015)

Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain/restore appropriate water quality to support the habitat, including high chlorophyll *a* status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3110. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. The annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak chlorophyll *a* concentration should be ≤8.0µg/l. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. Glendalough Upper and Lower Bray were oligotrophic using chlorophyll *a* in 2004-06; Dan was mesotrophic in 2004 and oligotrophic in 2006 based on limited data (Clabby et al., 2008). Lower Bray, Upper Glendalough and Tay had high chlorophyll *a* status in 2007-09 and 2010-12 (McGarrigle et al., 2010; Bradley et al., 2015)
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, lake habitat 3110 requires WFD high status. Phytoplankton composition was high at Loughs Dan and Tay in 2010-12 (Bradley et al., 2015)
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain/restore trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3110 should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, lake habitat 3110 requires high phytobenthos status. Phytobenthos status was good at Loughs Dan and Tay in 2010-12 (Bradley et al., 2015)
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain/restore high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3110 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. All four monitored lakes failed to reach high macrophyte status in 2007-09 and 2010-12, with moderate macrophyte status recorded at Dan and Tay in 2007-09 and in Upper Bray and Tay in 2010-12 (McGarrigle et al., 2010; Bradley et al., 2015). All other macrophyte assessments were good status
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. In Europe, acidification of isoetid lakes can lead to loss of isoetids and dominance by submerged *Sphagnum* mosses and *Juncus bulbosus* (Arts, 2002). The specific requirements of lake habitat 3110, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. For lake habitat 3110, and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5 pH units. Maximum pH should be <9.0 pH units, in line with the surface water standards established for soft waters (where water hardness is ≤100mg/l calcium carbonate). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. All four monitored lakes passed in 2007-09 and 2010-12 (McGarrigle et al., 2010; Bradley et al., 2015). Glendalough Lake Upper is an acid sensitive water monitoring site (Bowman, 1991)

Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be very low (<20mg/l PtCo or even <10mg/l PtCo) in lake habitat 3110, where the peatland in the lake's catchment is intact. Free et al. (2006) reported colour of 103mg/l PtCo in Lough Dan and 134mg/l PtCo in Lough Tay
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc. Peatland erosion is frequent in the catchments of lakes in this SAC (Mooney et al., 1991; Cooper and Loftus, 1998)
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3110	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet woodland that intergrade with and support the structure and functions of the lake habitat. In Wicklow Mountains SAC, lake shorelines are likely to have upland grassland, siliceous rock and scree, heath and eroding bog communities. Poor fen and flush and active bog may also occur. Fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves

3160 Natural dystrophic lakes and ponds

To maintain the favourable conservation condition of Natural dystrophic lakes and ponds in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Liffey Head (Sally Gap) bog has some of the best blanket bog pools in the east of Ireland. A small complex of large bog pools occurs at Cloghoge Bog in the SAC. Owing to their altitude, all pools and lakes, with the exception of the Lower Lake (Glendalough) and Lough Dan, have been mapped as potential 3160 (see map 3). Note: all 3160 pools may not be mapped in the 1:5,000 OSi data, and some may have formed as a result of peat erosion. Wicklow Mountains SAC has some of the highest altitude lakes in Ireland, e.g. Cleevaun (c.680m) and Firrib (c.655m). Reynolds (1998) noted the dystrophic nature of corrie lakes in the Wicklow Mountains. Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, the habitat is widespread in Wicklow Mountains SAC (see map 3). All lake/pond polygons, with the exceptions of Lower Lake (Glendalough) and Lough Dan, have been mapped as potential 3160
Typical species	Occurrence	Typical species present in good condition, and demonstrating typical abundances and distribution	For lists of typical plant and invertebrate species, see the Article 17 habitat assessment for lake habitat 3160 (NPWS, 2013) and O Connor (2015). See Mooney et al. (1991) for information on bog pools and the site-specific conservation objective for lake habitat 3110 (in this volume) for sources of information on larger lakes in Wicklow Mountains SAC
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3160 (see O Connor, 2015). Spatial patterns are likely to be relatively simple in 3160 lakes and ponds, with limited zonation
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3160. 3160 lakes and pools naturally have very clear water and, therefore, maximum depth can be large, particularly in corrie lakes
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes and pools must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced. Owing to their size and the sensitivity of peatland, 3160 lakes and pools can easily be damaged or destroyed by drainage. The hydrological regime of 3160 lakes and pools is integrally linked to that of the surrounding blanket bog, transition mire/quaking bog and other peatland habitats

Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3160 is associated with nutrient-poor substrates, including peat and rock
Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3160 (O Connor, 2015). Habitat 3160 is associated with very clear water. The OECD fixed boundary system set transparency targets for ultra-oligotrophic lakes of ≥12m annual mean Secchi disk depth, and ≥6m annual minimum Secchi disk depth
Water quality: nutrients	µg/l P; mg/l N	Maintain/restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and Water Framework Directive (WFD) 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For 3160 lakes and pools, annual average total phosphorus (TP) concentration should be ≤5µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. Lough Bray had good nutrient status 2007-09 and 2010-12, exceeding the TP target; Lough Tay had good nutrient status in 2007-09 and high in 2010-12; Upper Glendalough had high status in both reporting periods (McGarrigle et al., 2010; Bradley et al., 2015)
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain/restore appropriate water quality to support the habitat, including high chlorophyll *a* status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3160. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l (The European Communities Environmental Objectives (Surface Waters) Regulations 2009). Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The OECD targets may be more appropriate for lake habitat 3160: annual average chlorophyll *a* concentration <1µg/l and annual peak chlorophyll *a* concentration ≤2.5µg/l. Glendalough Upper and Lower Bray were oligotrophic using chlorophyll *a* in 2004-06 (Clabby et al., 2008). Lower Bray, Upper Glendalough and Tay had high chlorophyll *a* status in 2007-09 and 2010-12 (McGarrigle et al., 2010; Bradley et al., 2015)
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The Environmental Protection Agency (EPA) has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, lake habitat 3160 requires WFD high status. Phytoplankton composition was high at Lough Tay in 2010-12 (Bradley et al., 2015)
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain/restore trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in 3160 lakes and ponds should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, lake habitat 3160 requires high phytobenthos status. Phytobenthos status was good at Lough Tay in 2010-12 (Bradley et al., 2015)

Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain/restore high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for 3160 lakes and pools is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. All monitored 3160 lakes (Upper Bray, Upper Glendalough and Tay) failed to reach high macrophyte status in 2007-09 and 2010-12, with moderate macrophyte status recorded at Lough Tay in 2007-09, and in Upper Bray and Tay in 2010-12 (McGarrigle et al., 2010; Bradley et al., 2015). All other macrophyte assessments were good status
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. Although European Commission (2013) describes lake habitat 3160 as having pH 3-6, Drinan (2012) found mean pHs of 5.16 and 5.62 in upland and lowland 3160 lakes, respectively. The target for lake habitat 3160 is pH >4.5 and <9.0, in line with the surface water standards for soft waters (where water hardness is ≤100mg/l calcium carbonate). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. The specific requirements of lake habitat 3160, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. The three monitored 3160 lakes passed in 2007-09 and 2010-12 (McGarrigle et al., 2010; Bradley et al., 2015). Glendalough Lake Upper is an acid sensitive water monitoring site (Bowman, 1991)
Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mgl PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be very low (<20mg/l PtCo or even <10mg/l PtCo) in 3160 lakes and pools where the peatland in the lake's catchment is intact. Free et al. (2006) reported colour of 134mg/l PtCo in Lough Tay
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc. Peatland erosion is frequent in Wicklow Mountains SAC (Mooney et al., 1991; Cooper and Loftus, 1998)

Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3160	3160 bog pools intergrade with blanket bog, or other peatland communities, in Wicklow Mountains SAC. 3160 lakes may be surrounded by these same habitats, as well as upland grassland, siliceous rock and scree, heath and eroding bog communities. These fringing habitats support the structure and functions of the lake habitat. The fringing habitats are also dependent on the lake/pool, particularly its water levels, and can support wetland communities and species of conservation concern

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for Wicklow Mountains SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 8,248ha, covering 25% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Wicklow Mountains SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur throughout the SAC, often occurring in association with other habitats including blanket bog, upland acid grassland and rocky habitats. It is particularly well-developed around the Kippure and Lugnaquilla mountain areas (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of wet heath vegetation communities have been recorded in this SAC (NPWS internal files), four of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)

Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The FPO listed and Vulnerable marsh clubmoss (*Lycopodiella inundata*) (Wyse Jackson et al., 2016) has been recorded within the SAC (NPWS, 2005; NPWS internal files), but this species cannot be assigned specifically to this habitat

4030 European dry heaths

To restore the favourable conservation condition of European dry heaths in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	European dry heaths have not been mapped in detail for Wicklow Mountains SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 4,210ha, covering 13% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Wicklow Mountains SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs throughout the SAC, often occurring in association with blanket bog, upland acid grassland and rocky habitats. It is typically present on shallow peaty soils on steep slopes and in sheltered conditions. Examples of this habitat are present on Kippure, Seefin, Powerscourt Mountain, Djouce Mountain, Lugnaquilla, Camarahill and Ballineddan Mountain (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of dry heath vegetation communities have been recorded in this SAC (NPWS internal files), three of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three, excluding *Campylopus* and *Polytrichum* mosses	Attribute and target based on Perrin et al. (2014)
Vegetation composition: number of positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least two	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50% for siliceous dry heath and 50-75% for calcareous dry heath	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: dwarf shrub composition	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of dwarf shrub cover composed collectively of bog-myrtle (*Myrica gale*), creeping willow (*Salix repens*) and western gorse (*Ulex gallii*) is less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) was recorded from dry heath within the SAC (NPWS internal files)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: senescent ling	Percentage cover at a representative number of 2m x 2m monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry (*Empetrum nigrum*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Vegetation structure: growth phases of ling	Percentage cover in local vicinity of a representative number of monitoring stops	Outside sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in the mature phase	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There are historic records for the FPO listed and Vulnerable small-white orchid (*Pseudorchis albida*) (Wyse Jackson et al., 2016) from the SAC (NPWS, 2005; NPWS internal files), but this species cannot be assigned specifically to this habitat

4060 Alpine and Boreal heaths

To restore the favourable conservation condition of Alpine and Boreal heaths in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Habitat area	Area stable or increasing, subject to natural processes	Alpine and Boreal heaths has not been mapped in detail for Wicklow Mountains SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 326ha, covering 1% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Wicklow Mountains SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Alpine and Boreal heaths occur at high altitudes within the SAC. Examples are present in the Kippure, Lugnaquilla and Mullaghcleevaun mountain areas (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Alpine and Boreal heath vegetation communities have been recorded in this SAC (NPWS internal files), one of which corresponds to a community recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 66%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrub species at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 10%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of grazing	Percentage of leaves grazed at a representative number of 2m x 2m monitoring stops	Less than 10% collectively of the live leaves of specific graminoids showing signs of grazing	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of specific graminoids
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry (*Empetrum nigrum*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)

Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning within the habitat	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The Near Threatened stag's-horn clubmoss (*Lycopodium clavatum*) and Alpine clubmoss (*Diphasiastrum alpinum*) (Wyse Jackson et al., 2016) have been recorded in this habitat in the SAC (NPWS, 2005; NPWS internal files)

6130 Calaminarian grasslands of the Violetalia calaminariae

To maintain the favourable conservation condition of Calaminarian grasslands of the Violetalia calaminariae in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	No decline, subject to natural processes	Calaminarian grasslands of the Violetalia calaminariae was surveyed in detail by Holyoak (2009) at three locations within Wicklow Mountains SAC: at Glendasan, where the area of this habitat is estimated to be 3.6ha, at Foxrock Mine, where the area of the habitat is estimated to be 0.6ha and at East of Lough Nahanagan where it is estimated that the habitat covers 0.1ha. Several other small areas of 6130 habitat are known to occur on mine-spoil in upper Glendassan, each mainly less than 1ha in area (Holyoak, 2009). The habitat is also thought to occur at the old lead mine workings at Glendalough in the SAC
Distribution	Location	No decline, subject to natural processes. See map 4 for surveyed locations at Glendassan, Foxrock Mine and East of Lough Nahanagan	In Wicklow Mountains SAC, calaminarian grassland is documented to occur at old lead mine workings at Glendasan (Old Hero Mine) on the north-facing slope of the Glendasan River valley side, at Foxrock Mine on the south-facing slope of the valley side and at East of Lough Nahanagan at the foot of the north-east-facing hillslope of Camaderry and on the base of a slope at the edge of the valley (Holyoak, 2009). It is important to note that further unsurveyed areas are present within the SAC (see notes for Habitat area)
Physical structure: bare ground	Percentage cover	Maintain adequate open ground	At Glendasan, Calaminarian grassland is well-developed over most of the open lead mine spoil area and the whole area is very open with no trees and very little scrub. The extent of bare soil and rock within five (50cm x 50cm) quadrats (in 2008) ranged between 0% and 36% (Holyoak, 2009). At Foxrock Mine, the habitat occurs on low mine spoil, although some of the spoil slopes are too steep for vegetation to establish (Holyoak, 2009). The extent of bare soil and rock within four quadrats (in 2008) ranged between 0% and 50% (Holyoak, 2009). At East of Lough Nahanagan, the habitat is mainly present in narrow strips the base of spoil heaps (Holyoak, 2009). The extent of bare soil and rock within one quadrat (in 2008) was 25-50% (Holyoak, 2009)
Soil toxicity: copper content	µg Cu/g dry weight soil	Maintain high copper (Cu) levels in soil	Total copper content in a sample of mine spoil taken from Glendasan in 2009 was 477.5µg/g dry weight (total lead content was 30,522µg/g dry weight) (Campbell, 2013). Mine spoil with similar vegetation from Cornwall had available copper of 151–3220µg/g dry weight (Holyoak et al., 2000; Walsh, 2001)
Vegetation structure: height and cover	Centimetres; percentage cover	Maintain low and open vegetation	At Glendasan, herbaceous vegetation height was recorded as relatively short (0-13cm) and cover was 0-75%. Bryophyte cover was high (34-75%) (Holyoak, 2009). At Foxrock Mine, herbaceous vegetation height was 7-38cm and cover was 11-50%. Bryophyte cover was high (26-100%) (Holyoak, 2009). At East of Lough Nahanagan, herbaceous vegetation height was short (7cm) and cover was low (34-50%). Bryophyte cover was 26-33% (Holyoak, 2009)

Vegetation composition: metallophyte bryophytes	Number	Maintain diversity and populations of metallophyte bryophytes	*Cephaloziella massalongi* and *C. nicholsonii*, liverworts listed on the Flora (Protection) Order, 2015 (FPO) and classified as Vulnerable (Lockhart et al., 2012), occur at Glendasan (Holyoak, 2009). The Near Threatened *C. stellulifera* (Lockhart et al., 2012) occurs at Glendasan, Foxrock Mine and East of Lough Nahanagan (Holyoak, 2009) and at Glendalough (NPWS internal files). The Endangered and FPO listed moss *Ditrichum plumbicola* (Lockhart et al., 2012) is found at Glendalough (NPWS internal files)

6230 Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

To restore the favourable conservation condition of Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and sub-mountain areas, in Continental Europe)* has not been mapped in detail for Wicklow Mountains SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 2ha, covering less than 1% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Wicklow Mountains SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur on the north-eastern slopes of Carrigshouk Mountain and on the north-western slopes of Ballineddan Mountain (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities subject to natural processes	The diversity of species-rich *Nardus* grassland* communities within this SAC is unknown. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: high quality indicator species	Number of species at a representative number of 2m x 2m monitoring stops	At least two high quality indicator species for base-rich examples of the habitat and at least one for base-poor examples of the habitat	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: species richness	Number of species at a representative number of 2m x 2m monitoring stops	Species richness at each monitoring stop at least 25	Attribute and target based on Perrin et al. (2014)
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than or equal to 1%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of negative indicator species individually less than or equal to 10% and collectively less than or equal to 20%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: *Sphagnum* cover	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of *Sphagnum* species less than or equal to 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: *Polytrichum* cover	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of *Polytrichum* species less than or equal to 25%	Attribute and target based on Perrin et al. (2014)

Vegetation composition: shrubs, bracken and heath cover	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of shrubs, bracken (*Pteridium aquilinum*) and heath collectively less than or equal to 5%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: forb to graminoid ratio	Percentage cover at a representative number of 2m x 2m monitoring stops	Forb component of forb:graminoid ratio is 20-90%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: sward height	Sward height at a representative number of 2m x 2m monitoring stops	Proportion of the sward between 5cm and 50cm tall is at least 25%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: litter cover	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of litter less than or equal to 20%	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than or equal to 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: grazing or disturbance	Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m²	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There are historic records for the FPO listed and Vulnerable small-white orchid (*Pseudorchis albida*) (Wyse Jackson et al., 2016) from the SAC (NPWS, 2005; NPWS internal files), but this species cannot be assigned specifically to this habitat

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (* if active bog) in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Blanket bog has not been mapped in detail for Wicklow Mountains SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 12,376ha, covering 38% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Wicklow Mountains SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Blanket bog is documented to occur throughout the SAC, often occurring in association with other habitats including heath and upland acid grasslands. Well-developed examples are present at Liffey Head Bog, Castlekelly Bog, Shankill Bog, Cloghoge Bog, Ballynultagh Bog and Brockagh Bog. A large stretch of this habitat is also present in the area from Lugnaquilla northwards towards Table Mountain, and stretching east towards Laragh (Mooney et al., 1991; NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (NPWS internal files), three of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) and the non-native moss *Campylopus introflexus* were recorded from blanket bog within the SAC (NPWS internal files)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The FPO listed and Vulnerable marsh clubmoss (*Lycopodiella inundata*) and the FPO and Near Threatened bog orchid (*Hammarbya paludosa*) (Wyse Jackson et al., 2016) have been recorded within the SAC (NPWS, 2005; NPWS internal files), but these species cannot be assigned specifically to this habitat

8110 Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)

To restore the favourable conservation condition of Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) has not been mapped in detail for Wicklow Mountains SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 54ha, covering less than 1% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Wicklow Mountains SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur at Glen of Imaal, Ballineddan Mountain, Lough Nahanagan and Lugnaquilla including the North and South Prison (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes and non-crustose lichen species at least 5%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of vegetation composed of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of vegetation composed of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species in local vicinity of a representative number of monitoring stops	At least one positive indicator species present in vicinity of each monitoring stop in block scree	Attribute and target based on Perrin et al. (2014). The list of positive indicator species for this habitat is also presented in Perrin et al. (2014) and is the same as for 8220 Siliceous rocky slopes
Vegetation composition: grass species and dwarf shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of grass species and dwarf shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken, native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of bracken (*Pteridium aquilinum*), native trees and shrubs less than 25%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: grazing and browsing	Percentage of leaves/ shoots grazed/browsed at a representative number of 2m x 2m monitoring stops	Live leaves of forbs and shoots of dwarf shrubs showing signs of grazing or browsing collectively less than 50%	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbance	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Ground disturbed by human and animal paths, scree running, vehicles less than 10%	Attribute and target based on Perrin et al. (2014)

Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The FPO listed and Vulnerable parsley fern (*Cryptogramma crispa*) (Wyse Jackson et al., 2016) has previously been recorded within this habitat in the SAC (NPWS, 2005; NPWS internal files)

8210 Calcareous rocky slopes with chasmophytic vegetation

To restore the favourable conservation condition of Calcareous rocky slopes with chasmophytic vegetation in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Calcareous rocky slopes with chasmophytic vegetation has not been mapped in detail for Wicklow Mountains SAC and thus total area of the qualifying habitat in the SAC is unknown. Further details on this and the following attributes can be found in the Wicklow Mountains SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur within the corrie associated with Lough Ouler and close to the summit of Lugnaquilla (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Vegetation composition: positive indicator fern and *Saxifraga* species	Number of species in local vicinity of a representative number of monitoring stops	Number of ferns and *Saxifraga* indicators at each monitoring stop is at least one	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: positive indicator species	Number of species in local vicinity of a representative number of monitoring stops	Number of positive indicator species at each monitoring stop is at least three	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover in local vicinity of a representative number of monitoring stops	Proportion of vegetation composed of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken, native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of bracken (*Pteridium aquilinum*), native trees and shrubs less than 25%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: grazing and browsing	Percentage of leaves/ shoots grazed/browsed in local vicinity of a representative number of monitoring stops	Live leaves of forbs and shoots of dwarf shrubs showing signs of grazing or browsing collectively less than 50%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The Vulnerable Alpine saw-wort (*Saussurea alpina*) and Alpine lady's-mantle (*Alchemilla alpina*) (Wyse Jackson et al., 2016) were recorded within this habitat in the SAC (NPWS, 2005; NPWS internal files). The Near Threatened beech fern (*Phegopteris connectilis*) (Wyse Jackson et al., 2016) has been recorded within the SAC (NPWS, 2005), but this species cannot be assigned specifically to this habitat

8220 Siliceous rocky slopes with chasmophytic vegetation

To restore the favourable conservation condition of Siliceous rocky slopes with chasmophytic vegetation in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Siliceous rocky slopes with chasmophytic vegetation has not been mapped in detail for Wicklow Mountains SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 36ha, covering less than 1% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Wicklow Mountains SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur in locations with significant rock exposures such as Lugnaquilla, Glendalough Valley, Lough Ouler, cliffs to the north-east of Table Mountain, Lough Tay and the two Lough Brays (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Vegetation composition: positive indicator species	Number of species in local vicinity of a representative number of monitoring stops	At least one positive indicator species present in vicinity of each monitoring stop	Attribute and target based on Perrin et al. (2014). The list of positive indicator species for this habitat is also presented in Perrin et al. (2014) and is the same as for 8110 Siliceous screes
Vegetation composition: non-native species	Percentage cover in local vicinity of a representative number of monitoring stops	Proportion of vegetation composed of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken, native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of bracken (*Pteridium aquilinum*), native trees and shrubs less than 25%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: grazing and browsing	Percentage of leaves/ shoots grazed/browsed in local vicinity of a representative number of monitoring stops	Live leaves of forbs and shoots of dwarf shrubs showing signs of grazing or browsing collectively less than 50%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The Near Threatened beech fern (*Phegopteris connectilis*) (Wyse Jackson et al., 2016) has been recorded within the SAC (NPWS, 2005), but this species cannot be assigned specifically to this habitat

91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles

To restore the favourable conservation condition of Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

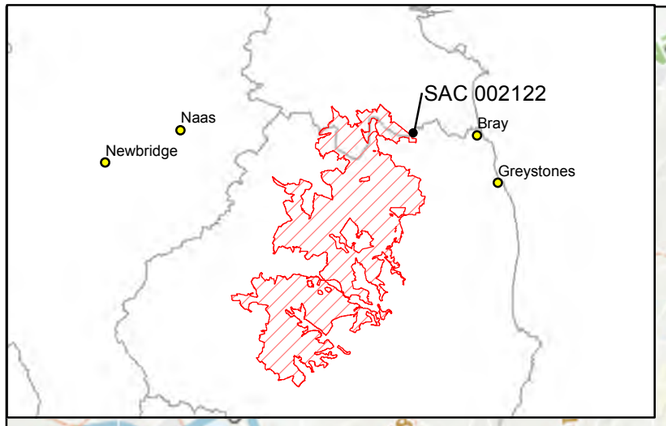
Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 215.4ha for sites surveyed. See map 5	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles were surveyed in Wicklow Mountains SAC by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW) within the sites Ballard Hill (NSNW site code 336), Baltynanima (746), Derrybawn (775), Luggala Lodge (780), The Giant's Cut and Lugduff (786), Brockagh (801), Brockagh South (819) and Ballyboy (821). Three sites, Baltynanima (NSNW site code 746), Luggala Lodge (780) and The Giant's Cut and Lugduff (786), were also included in a national monitoring survey (O'Neill and Barron, 2013). The minimum area of old oak woodland within the SAC is estimated to be 215.4ha. It is important to note that further unsurveyed areas may be present within the SAC. Map 5 shows the old oak woodlands surveyed by Perrin et al. (2008)
Habitat distribution	Occurrence	No decline, subject to natural processes. Surveyed locations shown on map 5	Distribution based on Perrin et al. (2008). NB further unsurveyed areas may be present within this SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008)
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak (*Quercus petraea*) generally regenerates poorly. In suitable sites, ash (*Fraxinus excelsior*) can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red data and other rare or localised species. Perrin and Daly (2010) identify two sites within the SAC, Baltynanima (NSNW site code 746) and Derrybawn (NSNW site code 775), as possible ancient woodland

Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including oak (*Quercus petraea*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common non-native invasive species in this woodland type: beech (*Fagus sylvatica*), sycamore *(Acer pseudoplatanus*) and rhododendron (*Rhododendron ponticum*). Beech has been reported from Ballard Hill (NSNW site code 336), The Giant's Cut and Lugduff (786) and parts of Derrybawn (775) by Perrin et al. (2008). Spruce (*Picea* spp.), Douglas fir (*Pseudotsuga menziesii*), cherry laurel (*Prunus laurocerasus*) and rhododendron have also been reported from the woodland at Derrybawn (NPWS, 2005)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in Wicklow Mountains SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 716.6ha along river banks/lake shoreline/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along river banks and around water bodies identified as critical for otters (NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 359.1km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 141.8ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase. For guidance, see map 6	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



Legend

Wicklow Mountains SAC 002122

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MAP 1:
WICKLOW MOUNTAINS SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002122; version 3.
CO. WICKLOW / CO. DUBLIN

0 1.5 3 4.5 6 7.5 km

N

Map Version 1
Date: May 2017

SPA 004040

SAC 002122

Legend

- Wicklow Mountains SPA 004040
- Wicklow Mountains SAC 002122

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MAP 2:
WICKLOW MOUNTAINS SAC
CONSERVATION OBJECTIVES
OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002122; version 3. SPA 004040; version 3
CO. WICKLOW / DUBLIN

0 1 2 3 4 km

N

Map Version 1
Date: May 2017

Lough Bray Lower

Lough Bray Upper

Cleevaun Lough

Lough Tay

Lough Dan

Lough Ouler

Lough Firrib

Lower Lake

Upper Lake

Arts Lough

Kelly's Lough

Legend

- Wicklow Mountains SAC 002122
- OSi Discovery Series County Boundaries

Indicative Lake Habitats

- 3110 Oligotrophic waters containing very few minerals of sandy plains: Littorelletalia uniflorae
- 3110 and Potential 3160 Oligotrophic waters containing very few minerals of sandy plains: Littorelletalia uniflorae / Potential natural dystrophic lakes and ponds
- Potential 3110 and Potential 3160 Potential oligotrophic waters containing very few minerals of sandy plains: Littorelletalia uniflorae / Potential natural dystrophic lakes and ponds
- Potential 3160 Potential natural dystrophic lakes and ponds

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MAP 3:
WICKLOW MOUNTAINS SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002122; version 3.
CO. WICKLOW / DUBLIN

0 1 2 3 4 km

N

Map Version 1
Date: May 2017

Legend

- 6130 Calaminarian grasslands of the *Violetalia calaminariae*
- Wicklow Mountains SAC 002122
- OSi Discovery Series County Boundaries

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MAP 4:
WICKLOW MOUNTAINS SAC
CONSERVATION OBJECTIVES
CALAMINARIAN GRASSLAND

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002122; version 3.
CO. WICKLOW / DUBLIN

0 1 2 3 4 km

N

Map Version 1
Date: June 2017

NSNW Site Code: 780

NSNW Site Code: 746

NSNW Site Code: 801

NSNW Site Code: 786

NSNW Site Code: 819

NSNW Site Code: 786

NSNW Site Code: 775

NSNW Site Code: 336

NSNW Site Code: 775

NSNW Site Code: 821

Legend

Annex 1 Woodland Habiats

- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Wicklow Mountains SAC 002122
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
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MAP 5:
WICKLOW MOUNTAINS SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002122; version 3.
CO. WICKLOW / DUBLIN

0 0.85 1.7 2.55 3.4 4.25 km

N

Map Version 1
Date: June 2017

Legend

- 1355 Otter *Lutra lutra* Commuting
- Wicklow Mountains SAC 002122
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 6:
WICKLOW MOUNTAINS SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002122; version 3.
CO. WICKLOW / DUBLIN

0 0.85 1.7 2.55 3.4 4.25 km

N

Map Version 1
Date: May 2017

Conservation objectives for Wicklow Mountains SPA [004040]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A098	Merlin	*Falco columbarius*
A103	Peregrine	*Falco peregrinus*

Citation: *NPWS (2018) Conservation objectives for Wicklow Mountains SPA [004040]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Wicklow Reef SAC 002274

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Citation:

NPWS (2013) Conservation Objectives: Wicklow Reef SAC 002274. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002274	Wicklow Reef SAC

1170	Reefs

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2013
Title :	Wicklow Reef SAC (2274) Conservation objectives supporting document- marine habitat V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2013
Title :	Survey of Wicklow Reef SAC (Site code 002274)
Author :	MERC
Series :	Unpublished report to Marine Institute and NPWS

Spatial data sources

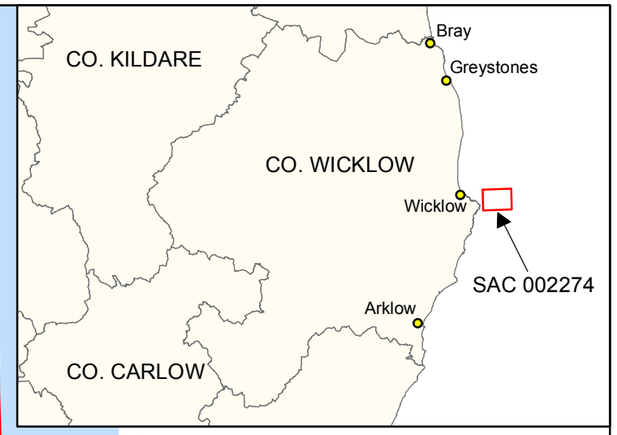
Year :	Interpolated 2013
Title :	2013 subtidal survey
GIS Operations :	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used For :	1170, Marine community types (maps 2 and 3)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined
Used For :	Marine community types base data (map 3)

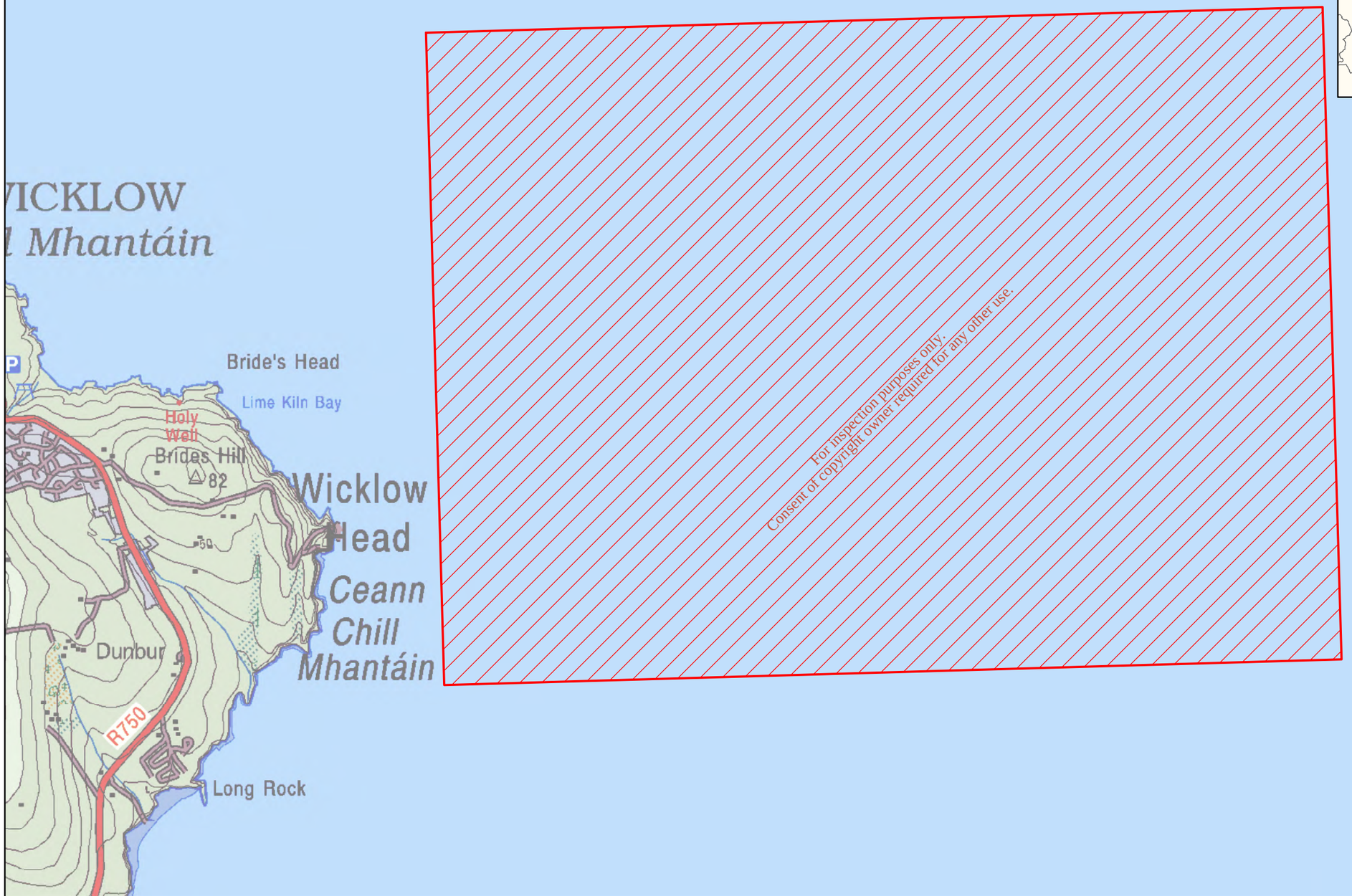
Conservation Objectives for : Wicklow Reef SAC [002274]

1170 Reefs

To maintain the favourable conservation condition of Reefs in Wicklow Reef SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 2	Habitat area estimated as 1533ha from a 2013 subtidal reef survey (MERC, 2013)
Distribution	Occurrence	The distribution of reefs is stable or increasing, subject to natural processes. See map 2	Based on information from 2013 subtidal reef survey (MERC, 2013). See marine supporting document for further details
Community structure	Biological composition	Conserve the following community type in a natural condition: Current-swept subtidal reef community complex. See map 3	Reef mapping based on information from 2013 subtidal reef survey (MERC, 2013). See marine supporting document for further details





Legend

SAC 002274

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1: WICKLOW REEF SAC CONSERVATION OBJECTIVES SAC DESIGNATION

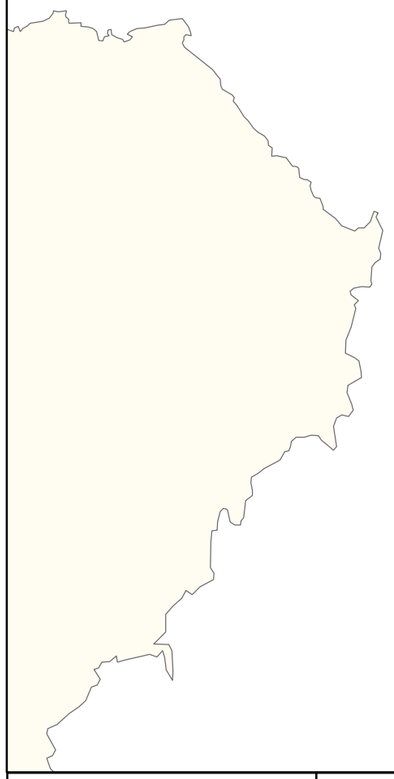
Map to be read in conjunction with the NPWS Conservation Objectives Document.

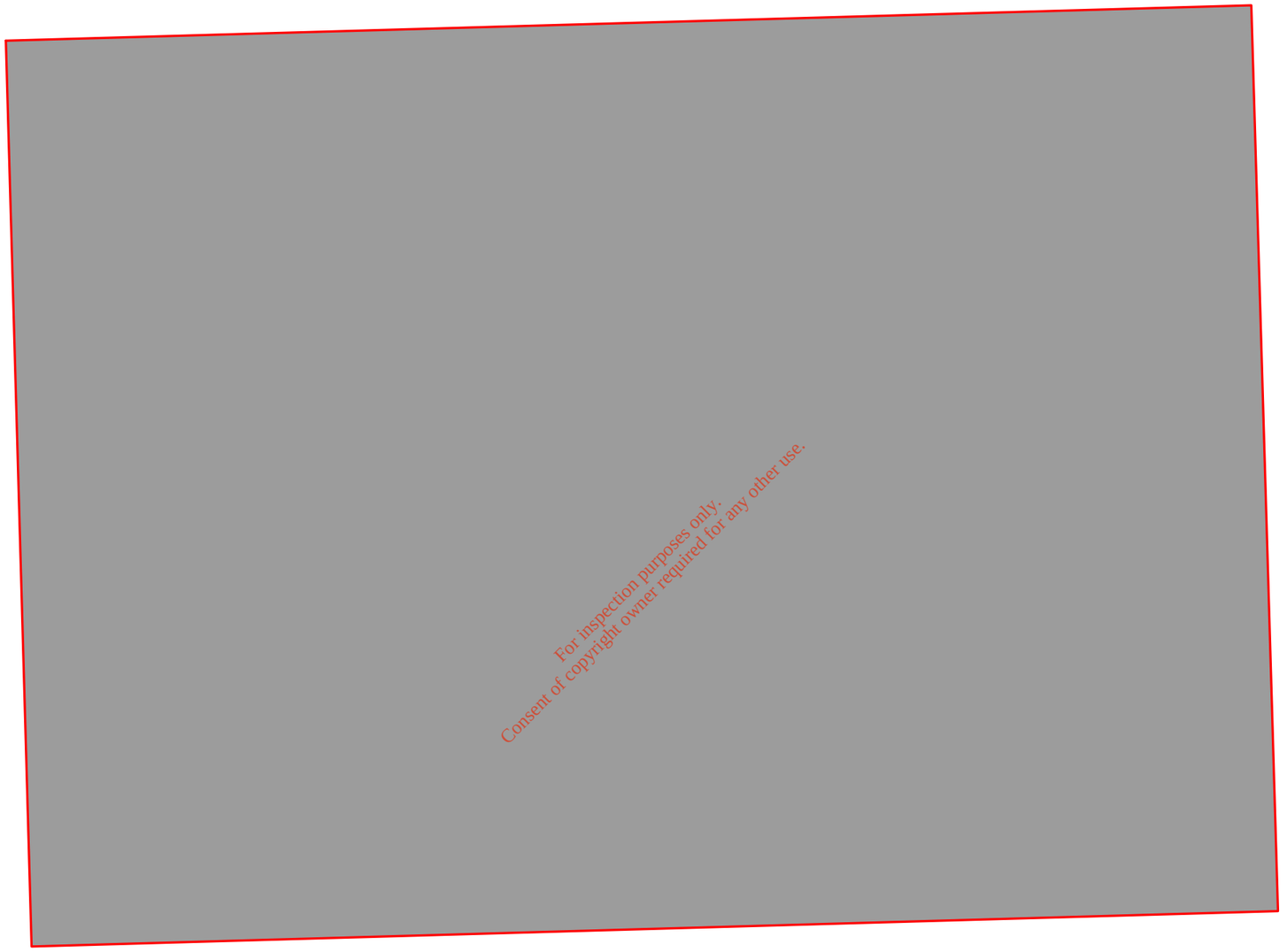
SITE CODE: SAC 002274; version 3
CO WICKLOW

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: June 2013





Legend

- SAC 002274
- 1170 Reefs
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
WICKLOW REEF SAC
CONSERVATION OBJECTIVES
REEFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002274; version 3
CO WICKLOW

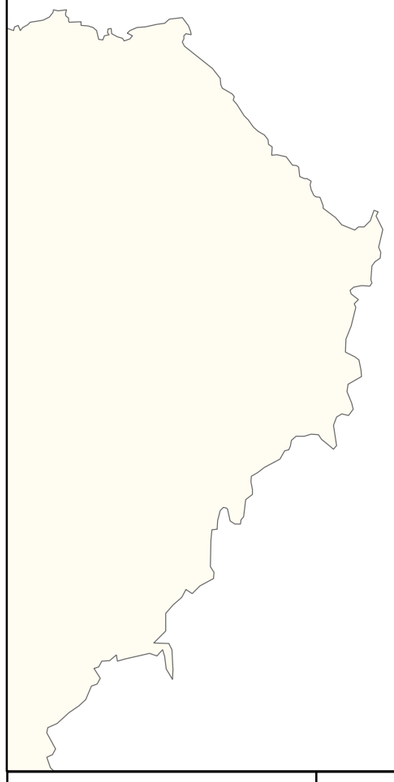
0 0.25 0.5 0.75 1 km

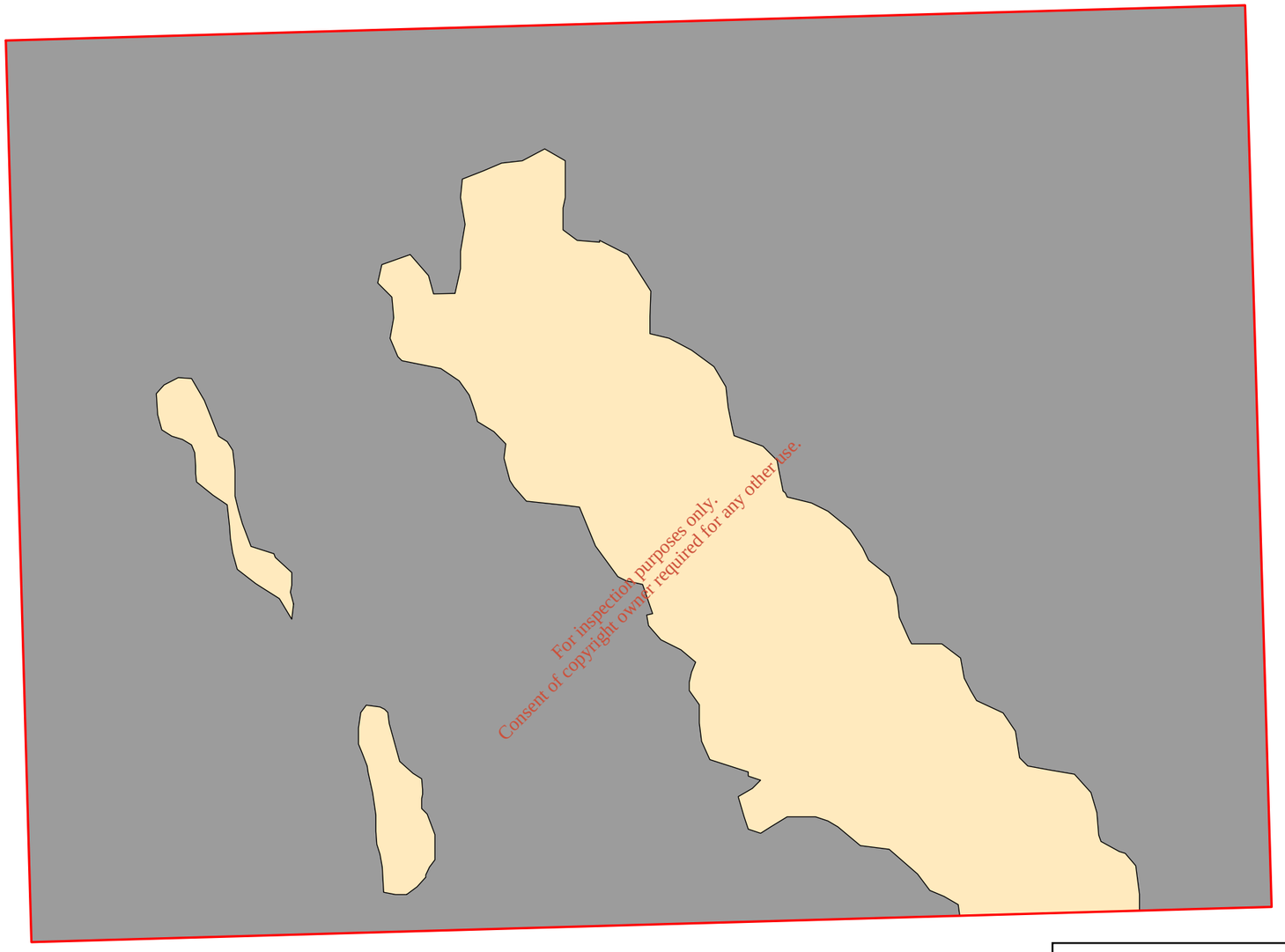
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).

Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: June 2013





Legend

- SAC 002274
- OSi Discovery Series County Boundaries

Marine Community Types

- Current-swept subtidal reef community complex (bedrock)
- Current-swept subtidal reef community complex (cobbles and boulders)

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 3:
WICKLOW REEF SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002274; version 3
CO WICKLOW

0 0.25 0.5 0.75 1 km

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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

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Map Version 1
Date: June 2013