Clonakilty Bay SAC
(site code 91)
Conservation objectives supporting document -coastal habitats

NPWS

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Please note that the opinions expressed in the site reports from the Sand Dunes Monitoring Project (SDM) are those of the authors and do not necessarily reflect the opinion or policy of NPWS.

Please note that this document should be read in conjunction with the following report: NPWS (2014). Conservation Objectives: Clonakilty Bay SAC 000091. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

1 Introduction

Achieving Favourable Conservation Status (FCS) is the overall objective to be reached for all Annex I habitat types and Annex II species of European Community interest listed in the Habitats Directive 92/43/EEC (Commission of the European Communities, 2007). It is defined in positive terms, such that a habitat type or species must be prospering and have good prospects of continuing to do so.

Clonakilty Bay in west Cork is an intertidal expanse that stretches from Clonakilty town to the open sea and comprises two small estuaries separated by Inchydoney Island. The bay receives the flows of several small rivers, the biggest being the Fealge. The site also includes adjacent sand dunes and inland marshes and is a coastal complex with a good diversity of habitats including several listed on Annex I of the EU Habitats Directive.

The site contains a fine diversity of dune habitats, notably an area of fixed dunes of moderate size and which are relatively intact. Inchydoney sand dunes are located on the south side of Inchdoney Island in Clonakilty Bay, approximately 3km southeast of Clonakilty town. The dunes rise to a considerable height, particularly at the eastern end where they are underlain by a rocky headland. The underlying rock is mainly Devonian Old Red Sandstone and the sandy soil is calcareous in nature but shows a trend towards acidification. Sand dunes grade from a strandline through to fixed dunes vegetated by grasses, small herbs and several species of orchid. They also support an interesting array of introduced plants such as great mullein (*Verbascum thapsus*), viper's-bugloss (*Echium vulgare*) and teasel (*Dipsacus fullonum*) are the most noticeable. Embryonic shifting dunes and white *Ammophila* dunes are also represented. Fixed dunes are scarce on the south coast of Ireland.

Clonakilty Bay SAC (site code: 91) is designated for a range of coastal habitats including mudflats and sandflats, as well as a range of sand dune habitats. The following five coastal habitats are included in the list of qualifying interests for the site:

- Annual vegetation of driftlines (1210)
- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)
- Atlantic decalcified fixed dunes (Calluno-Ulicetea) (2150)

All of these habitats are associated with sand dune systems and are usually found in close association with each other. It should be noted that the status of the last habitat (dune heath) in Ireland is under review and that the conservation objective may be reviewed at a later stage.

This backing document sets out the conservation objectives for the five coastal habitats listed above in Clonakilty Bay SAC, which is defined by a list of parameters, attributes and targets. The main parameters are (a) Range (b) Area and (c) Structure and Functions, the last of which is broken down into a number of attributes, including physical structure, vegetation structure and vegetation composition.

The targets set for the **sand dune habitats** are based primarily on the results of the Sand Dune Monitoring Project (SDM) (Delaney *et al.*, 2013) and this document should be read in conjunction with that report. It is also recommended that this document be read in conjunction with the final report from the Coastal Monitoring Project (CMP) report (Ryle *et al*., 2009). The CMP was a comprehensive national baseline survey of all known sand dune systems in Ireland. The SDM reviewed and modified the methodology used during the CMP to map and assess the conservation status of dune habitats. A subset of 40 site (including Inchydoney) were selected as a representative sample of the national dune resource for the SDM survey.

The distribution of sand dune habitats within Clonakilty Bay SAC is presented in Appendix I. As part of the SDM, detailed individual reports and habitat maps (a revised baseline habitat map and an updated habitat map) were produced for all sub-sites and those for Inchydoney are included in Appendix II.

The conservation objectives for the sand dune habitats in Clonakilty Bay are based on the findings of the SDM, combined with the results of Gaynor (2008) and Ryle *et al*. (2009). It is thought that the sub-site as surveyed by the SDM represents the total area of sand dunes within Clonakilty Bay SAC.

2 Conservation Objectives

A conservation objective aims to define the favourable conservation condition of a habitat or species at a particular site. Implementation of the objective will help to ensure that the habitat or species achieves favourable conservation status at a national level.

3 Sand dune habitats

Sand dunes are hills of wind-blown sand that have become progressively more stabilised by a cover of vegetation. In general, most sites display a progression through strandline, foredunes, mobile dunes and fixed dunes. Where the sandy substrate is decalcified, fixed dunes may give way to dune heath. Wet hollows, or dune slacks, occur where the dunes have been eroded down to the level of the water-table. Transitional communities can occur

between dune habitats and they may also form mosaics with each other. Dune systems are in a constant state of change and maintaining this natural dynamism is essential to ensure that all of the habitats present at a site achieve favourable conservation condition.

In Ireland, there are nine sand dune habitats (including annual vegetation of drift lines) listed under Annex I of the EU Habitats Directive (92/43/EEC) (* denotes a priority habitat):

- **Annual vegetation of drift lines (1210)**
- **Embryonic shifting dunes (2110)**
- **Shifting dunes along the shoreline with *Ammophila arenaria* (2120)**
- **Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) ***
- Decalcified dunes with *Empetrum nigrum* (2140) *
- **Atlantic decalcified fixed dunes (Calluno-Ulicetea) (2150) ***
- Dunes with *Salix repens* (2170)
- Humid dune slacks (2190)
- Machair (21AO) *

The five habitats indicated in bold above are listed as Qualifying Interests for Clonakilty Bay SAC. These habitats include mobile areas at the front as well as more stabilised parts of dune systems. There is some doubt concerning the presence of the habitat 'Atlantic decalcified fixed dunes'. The status of this habitat in Ireland is under review. Humid dune slacks have also been recorded at the Inchydoney sub-site (Ryle *et al.*, 2009; Delaney *et al*., 2013).

Annual vegetation of drift lines is found on beaches along the high tide mark, where tidal litter accumulates. It is dominated by a small number of annual species (i.e. plants that complete their life-cycle within a single season). Tidal litter contains the remains of marine algal and faunal material, as well as a quantity of seeds. Decaying detritus in the tidal litter releases nutrients into what would otherwise be a nutrient-poor environment. The habitat is often represented as patchy, fragmented stands of vegetation that are short-lived and subject to frequent re-working of the sediment. The vegetation is limited to a small number of highly specialised species that are capable of coping with salinity, wind exposure, an unstable substrate and lack of soil moisture. Typical species include spear-leaved orache (*Atriplex prostrata*), frosted orache (*A. laciniata*), sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*) and prickly saltwort (*Salsola kali*).

Embryonic dunes are low accumulations of sand that form above the strandline. They are sometimes referred to as foredunes, pioneer dunes or embryo dunes, as they can represent the primary stage of dune formation. They are characterised by the presence of the salt-tolerant dune grasses sand couch (*Elytrigia juncea*) and lyme grass (*Leymus arenarius*),

which act as an impediment to airborne sand. Strandline species can remain a persistent element of the vegetation.

Where sand accumulation is more rapid, marram grass (*Ammophila arenaria*) invades, initiating the transition to mobile dunes (Shifting dunes along the shoreline with *Ammophila arenaria*). Marram growth is actively stimulated by sand accumulation. These unstable and mobile areas are sometimes referred to as 'yellow dunes' (or white dunes in some European countries), owing to the areas of bare sand visible between the tussocks of marram.

Fixed dunes refers to the more stabilised area of dune systems, generally located in the shelter of the mobile dune ridges, where the wind speed is reduced and the vegetation is removed from the influence of tidal inundation and salt spray. This leads to the development of a more or less closed or 'fixed' carpet of vegetation dominated by a range of sand-binding species (Gaynor, 2008).

At the older landward edge of the fixed dunes, leaching of basic minerals and nutrients can lower the pH over time and create conditions suitable for colonisation by heath species. As these decalcified or acidic conditions can only form on the older, landward extremes of dune systems, they are often vulnerable to housing or other developments. Well-developed dune heath communities containing the classic dwarf ericoid shrubs, such as *Calluna vulgaris* (Heather), and *Erica* spp., that are generally regarded as characterising the habit, are not well represented in Ireland.

Decalcified dune heath habitat is also generally found on the landward edge of dune systems where the surface layers of sand have been leached of their calcium content, or where sand has blown up over rock that is siliceous (silica-rich) in nature. It is characterised by the presence of heathers (*Calluna vulgaris, Erica tetrilx, Erica cinerea*) and gorse species (*Ulex europaeus* and *Ulex gallii*) which differentiates it from the other dune heath habitat, decalcified *Empetrum* dunes. This heath-like habitat does not appear to be well developed in Ireland.

Humid dune slacks are wet or moist depressions between dune ridges. They are characterised by the occurrence of a water-table that is maintained by a combination of groundwater (which may or may not be slightly saline), precipitation and an impermeable layer in the soil. In the winter, the water-table normally rises above the soil surface and inundation occurs. In spring and summer, the water-table drops, but the top layer of the soil remains wet. Proximity of the water-table to the surface is evidenced in the vegetation, in which rushes, sedges and moisture-loving herbs such as marsh pennywort (*Hydrocotyle vulgaris*), bog pimpernel (*Anagallis tenella*), grass of Parnassus (*Parnassia palustris*), common marsh-bedstraw (*Galium palustre*) and marsh helleborine (*Epipactis palustris*) are obvious features. The frequency and duration of flooding, as well as the level of salinity,

determines the vegetation composition. In addition, nutrient-enrichment can occur as a result of leaching from the surrounding dune ridges (Gaynor, 2008).

All the dune habitats indicated above occur as a complex mosaic of constantly changing and evolving vegetation communities. They are inextricably linked in terms of their ecological functioning and should be regarded as single geomorphological units. As such, no dune habitat should be considered in isolation from the other dune habitats present at a site, or the adjoining semi-natural habitats with which they often form important transitional communities.

The SDM surveyed one sub-site within Clonakilty Bay SAC:

1. Inchydoney

Note that the SDM site surveyed includes a dune system to the west of Virgin Mary's Point that is largely outside the SAC.

Detailed descriptions from the Sand Dunes Monitoring Project (Delaney *et al.,* 2013) of each each sand dune habitat found at Inchydoney are presented in Appendix II. A total of 18.92ha of sand dune habitat was mapped within Clonakilty Bay SAC, of which 0.28ha represents humid dune slacks, which is not listed as a qualifying interest for this particular site.

3.1 Overall objectives

The overall objective for 'Annual vegetation of driftlines' in Clonakilty Bay SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Embryonic shifting dunes' in Clonakilty Bay SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Shifting dunes along the shoreline with *Ammophila arenaria* (white dune)' in Clonakilty Bay SAC is to 'maintian the favourable conservation condition'.

The overall objective for 'Fixed coastal dunes with herbaceous vegetation' in Clonakilty Bay SAC is to 'restore the favourable conservation condition'.

While acknowledging that the habitat may be poorly developed at this site, the overall objective for 'Atlantic decalcified fixed dunes (Calluno-Ulicetea)' in Clonakilty Bay SAC is to 'maintain the favourable conservation condition'.

These objectives are based on an assessment of the current condition of each habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Area (b) Range and (c) Structure and Functions.

3.2 Area

3.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. A baseline habitat map was produced for the sand dune habitats at the Inchydoney sub-site in Clonakilty Bay SAC during the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009). During the Sand Dunes Monitoring Project (SDM) (Delaney *et al*., 2013), these baseline maps were checked and revised to account for changes in habitat interpretation and ommissions. Updated maps were then produced to reflect the current situation on the ground. The revised baseline habitat maps and updated habitat maps from the SDM are included with the individual site report in Appendix II.

The total areas of each sand dune habitat within the SAC as mapped by Delaney *et al*. (2013) are presented in the following table.

Habitat	**Total area (ha) of habitat within SAC boundary following SDM**
Annual vegetation of driftlines	0.00[1]
Embryonic shifting dunes	1.62
Shifting dunes along the shoreline with *Ammophila arenaria*	0.72
Fixed coastal dunes with herbaceous vegetation	16.30
Atlantic decalcified fixed dunes (Calluno-Ulicetea)	Unknown
Total	**18.64**

[1]None of this habitat was mapped during the SMP; however, 0.25ha was mapped during the CMP (Ryle *et al*., 2009)

Although the SDM recorded losses of the habitat 'annual vegetation of driftlines' since the CMP, it is not considered a permanent loss, in view of the highly ephemeral nature of this habitat. Therefore, general target for this attribute in the case of each habitat is that the area should be stable, or increasing. Bearing in mind that coastal systems are naturally dynamic and subject to change, this target is always assessed subject to natural processes, including erosion and succession.

3.3 Range

3.3.1 Habitat distribution

The distribution of sand dune habitats as mapped by Delaney *et al.* (2013) is presented in Appendix I.

Of particular interest at the site is the possible existence of a small area of decalcified dune heath, a priority Annex I habitat, at the site. This habitat is normally characterised by the presence of ericoid or heath species in association with dune species. Although erocoid species are absent, the presence of gorse (*Ulex europaeus)* is seen as an indicator of the acidic nature of the substrate. The status of this habitat in Ireland is currently under review.

The target is that there should be no decline or change in the distribution of these sand dune habitats, unless it is the result of natural processes, including erosion, accretion and succession.

3.4 Structure and Functions

The location, character and dynamic behaviour of sand dunes are governed by a combination of geographic, climatic, edaphic and anthropogenic factors. Sand dunes are highly complex, dynamic systems, where the habitats occur in a complex and constantly evolving and changing mosaic. They function as systems in terms of geomorphology and hydrology and maintaining the favourable conservation condition of the habitats present depends on allowing these processes to continue unhindered. Maintaining the favourable conservation condition of all of the sand dune habitats in Clonakilty Bay SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

3.4.1 Physical structure: functionality and sediment supply

Coastlines naturally undergo a constant cycle of erosion and accretion. There are two main causes of erosion: (a) those resulting from natural causes and (b) those resulting from human interference. Natural causes include the continual tendency towards a state of equilibrium between coasts and environmental forces, climatic change (particularly an increase in the frequency of storms or a shift in storm tracks), relative sea level rise and natural changes in the sediment supply. Human interference is usually associated with changes in the sediment budget, either directly, through the removal of beach or inshore sediment, or indirectly, by impeding or altering sediment movement. It is important to recognise that the process of

coastal erosion is part of a natural tendency towards equilibrium. Natural shorelines attempt to absorb the energy entering the coastal zone by redistributing sediment.

Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Sediment supply is especially important in the embryonic dunes and mobile dunes, as well as the strandline communities where accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. The construction of physical barriers such as sea defences can interrupt longshore drift, leading to beach starvation and increased rates of erosion. Sediment circulation and erosion also has a role to play in the more stabilised dune habitats. Cycles of erosion and stabilisation are part of a naturally functioning dune system, where the creation of new bare areas allows pioneer species and vegetation communities to develop, increasing biodiversity. The construction of physical barriers can interfere with the sediment circulation by cutting the dunes off from the beach resulting in fossilisation or over-stabilisation of dunes.

The target for this attribute is to maintain and where possible restore the natural circulation of sediment and organic matter throughout the entire dune system, without any physical obstructions.

3.4.2 Vegetation structure: zonation

The range of vegetation zones on a dune system should be maintained. Gaynor (2008) highlights the highly transitional nature of much of the vegetation; therefore, it is important that the transitional communities are also conserved, including those to the saltmarsh communities.

The sand dunes at Inchydoney are part of a coastal complex that includes estuarine and intertidal habitats as well inland mashes. The sand dunes grade from strandline to embryonic and *Ammophila* dunes to fixed dunes with some small areas of decalcified dune heath with some gorse (*Ulex europaeus*). Inland of the western estuary, an extensive wetland area occurs, which contains habitats from saline lagoons, to brackish grasslands, open freshwater marsh and Alder scrub.

The target is to maintain the range of coastal habitats, including transitional zones, subject to natural processes, including erosion and succession.

3.4.3 Vegetation structure: bare ground

This target applies to fixed dunes and dune heath. It does not apply to the other habitats present where high levels of bare sand are a natural component of the habitat. In the fixed and slack areas some degree of instability is vital. Constant cycles of erosion and stabilisation provide the necessary conditions for the establishment of pioneer species, species that favour open conditions and a range of invertebrates, helping to increase biodiversity.

There were several large tracks and blowouts in the fixed dunes at Inchydoney. While the blowouts may be attributable partly to the natural cycles of erosion, the tracks are attributable to the recreational use of the site.

The target is to achieve up to 10% bare sand, with the exception of pioneer slacks which can have up to 20% bare sand. This target is assessed subject to natural processes.

3.4.4 Vegetation composition: plant health of dune grasses

The health of the dune grasses (particularly *Ammophila arenaria* and *Elytrigia juncea*) are assessed by the plant parts above the ground (they should be green) and the presence of flowering heads. This gives a clear indication of the status of the supply of blown sand, which is required for these species to thrive.

The target for this attribute is that more than 95% of the dune grasses should be healthy.

3.4.5 Vegetation structure: vegetation height

This attribute applies to the more fixed habitats (fixed dunes and dune heath). A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. The ecological benefits of moderate levels of grazing on dunes have been well documented (Gaynor, 2008). Moderate grazing regimes lead to the development of a species-rich vegetation cover. The animals increase biodiversity by creating micro-habitats through their grazing, dunging and trampling activities. Grazing slows down successional processes and in some cases reverses them, helping to achieve a diverse and dynamic landscape. The effects of trampling assist the internal movement of sand through the development of small-scale blowouts, while dunging can eutrophicate those dune habitats whose nutrient-poor status is crucial for the survival of certain vegetation types. Many species, from plants to invertebrates, benefit immensely from the open and diverse system created by a sustainable grazing regime. Many dune species are small in size and have relatively low competitive ability. Consequently, the maintenance of high species diversity on

a dune system is dependent on the existence of some control to limit the growth of rank coarse vegetation (Gaynor, 2008).

Although rabbits are abundant at Inchydoney the fixed dunes are somewhat undergrazed and there is no evidence of a stock-grazing regime at the site. The shortest areas of turf are associated with the rocky headland.

The target for this attribute is to maintain structural variation within the sward.

3.4.6 Vegetation composition: typical species & sub-communities

Species diversity and plant distribution in dunes is strongly controlled by a range of factors, including mobility of the substrate, grazing intensities, moisture gradients, nutrient gradients and human disturbance. In the younger, more mobile dunes, marram (*Ammophila arenaria*) is common, while groundsel (*Senecio vulgaris*), sea rocket (*Cakile maritima*) and dandelion (*Taraxacum* sp.) are also present. The fixed, more stable dune vegetation includes lady's bedstraw (*Galium verum*), common birdsfoot trefoil (*Lotus corniculatus*), wild thyme (*Thymus praecox*), kidney vetch (*Anthyllis vulneraria*), wild pansy (*Viola tricolor*) and biting stonecrop (*Sedum acre*).

All dune habitats at Inchydoney support a typical flora (Ryle *et al*., 2009). The CMP noted the rare frog orchid (*Coeloglossum viride*) in the fixed dunes (Ryle *et al*. 2009). The site also supports a rich and varied bryophyte and lichen flora (Gaynor, 2008).

The target for this attribute is to maintain a typical flora for the particular sand dune habitat.

3.4.7 Vegetation composition: negative indicator species

Negative indicators include non-native species (e.g. *Hippophae rhamnoides*), species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled.

The main invasive species identified in Gaynor (2008) were bracken (*Pteridium aquilinum)* and sea buckthorn (*Hippophae rhamnoides)*. The invasion of non-native species compromises the typical plant community structure. Bracken (*Pteridium aquilinum)* is becoming increasingly dominant, particularly where sites have been abandoned or where grazing levels have been significantly reduced. The vegetation retains many elements of the original vegetation cover, but there is a reduction in biodiversity. As the canopy becomes taller and ranker, many of the low-growing species disappear. In this case, the vegetation is treated as a sub-community of the original community that was invaded. This is always the

case unless the original vegetation cover has been completely destroyed, as can happen with *H. rhamnoides*, which can form dense impenetrable thickets.

Large areas of the fixed dunes at Inchydoney are heavily colonised by bracken (*Pteridium aquilinum*) (Gaynor, 2008; Ryle *et al.,* 2009; Delaney *et al*., 2013).

The target is that negative indicators (including non-native species) such as *Hippophae* should make up less than 5% of the vegetation cover.

3.4.8 Vegetation composition: scrub/trees

This attribute only applies to the fixed dunes and dune slacks. Scrub encroachment leads to reduction in dune biodiversity and needs to be controlled. The presence of scrub and trees which have deep roots can also lower the groundwater table which can have significant impacts on the slack communities.

Burnet rose (*Rosa pimpinellifolia*) is a feature of the fixed dune habitat at Inchydoney. The CMP also noted a number of shrub-sized specimens of several trees, including sycamore (*Acer pseudoplatanus*) ash *(Fraxinus excelsior*) and hawthorn (*Crataegus monogyna*) throughout the fixed dunes, though their cover is less than 1% of the total area (Ryle *et al*., 2009).

The target for this attribute therefore is that the cover of scrub and tree species should be under control, or make up less than 5% of the vegetation cover.

4 References

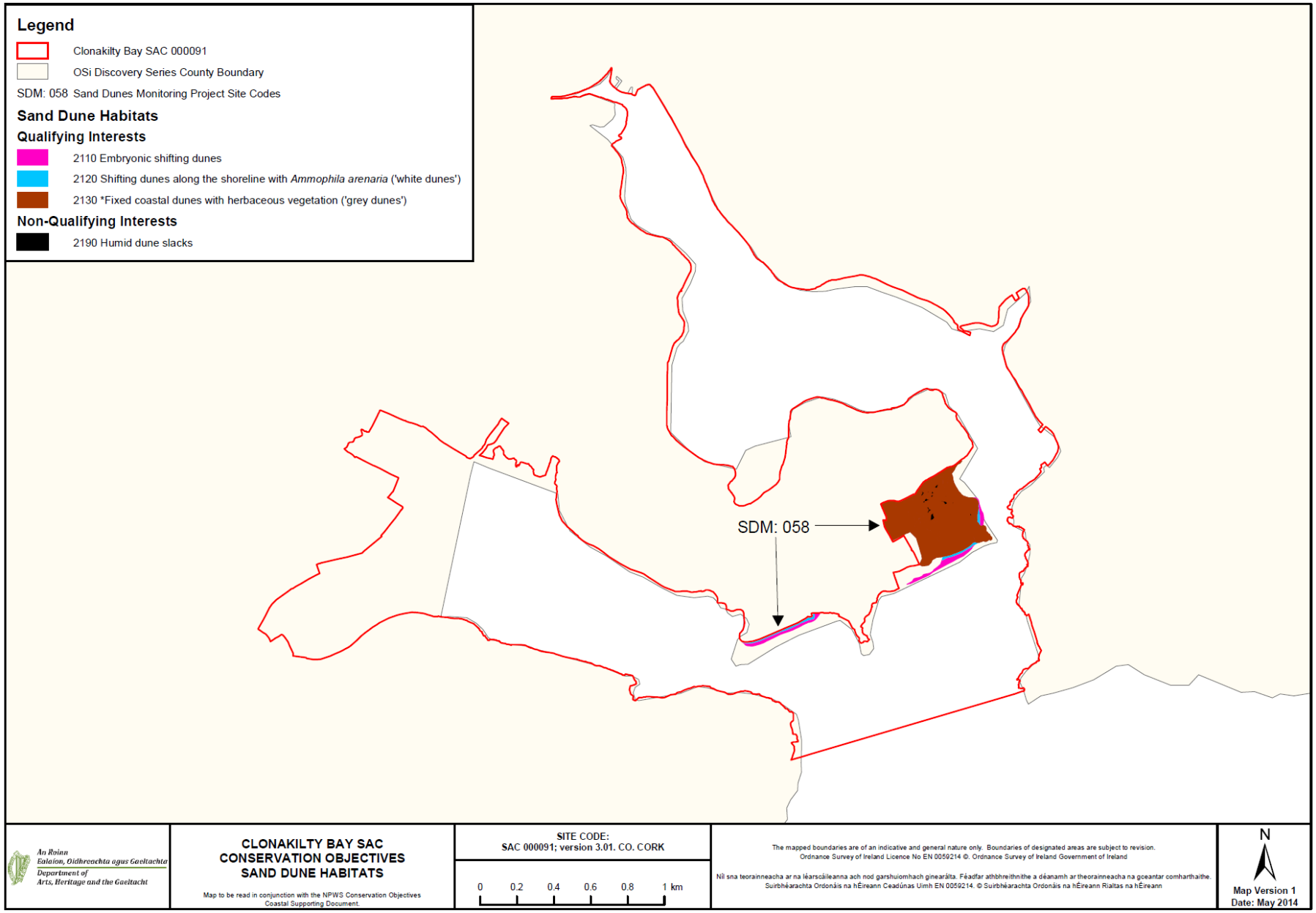
Commission of the European Communities (2007). *Interpretation Manual of European Union Habitats – EUR 27*. DG Environment-Nature and Biodiversity, Brussels.

Delaney, A., Devaney, F., Martin, J.R. and Barron, D.J. (2013). Monitoring survey of Annex I sand dune habitats in Ireland. *Irish Wildlife Maunuals*, No. 75. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Gaynor, K. (2008). *The phytosociology and conservation value of Irish sand dunes*. Ph.D. Thesis, National University of Ireland, Dublin.

Ryle, T., Murray, A., Connolly, K. and Swann, M. (2009). *Coastal Monitoring Project 2004-2006*. Unpublished report to the National Parks and Wildlife Service, Dublin.

A**ppendix I –** Distribution map of sand dune habitats within Clonakilty Bay SAC



Appendix II – Inchydoney site report and habitat map from the Sand Dunes Monitoring Project SDM (Delaney *et al*., 2013)

SITE 058 INCHYDONEY

The following individual site report should be read in conjunction with the main report (Delaney *et al*., 2013). Please note that CMP refers to the Coastal Monitoring Project (Ryle *et al*., 2009) and SDM refers to the Sand Dunes Monitoring Project (Delaney *et al*., 2013). Unless otherwise stated, the baseline maps refer to the habitat maps produced during the CMP. These baseline maps were revised, to account for discrepancies in the original survey, before comparisons were made with the habitat maps produced during the SDM (see section 2.3 in SDM main report). These revised maps are referred to as the revised baseline maps in the following text.

1 SITE DESCRIPTION

Inchydoney is a small site located 3 km south-east of Clonakilty, on the south coast of Co. Cork. The site is part of the Clonakilty Bay SAC (SAC 000091) and Clonakilty Bay SPA (SPA 004081). **1140 Mudflats and sand flats not covered by seawater at low tides** and ***2150 Decalcified dune heath** are listed as other coastal habitats of Qualifying Interest within the SAC which were not recorded as part of the CMP or the SDM. Five Annex I sand dune habitats (* indicates a priority habitat) were recorded during the CMP: **1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes, 2120 Marram dunes (white dunes), *2130 Fixed dunes (grey dunes)** and **2190 Humid dune slacks** (Ryle *et al*., 2009). A rare fungus, *Tulostoma brumale* was found in the ***2130 Fixed dunes (grey dunes)** during the SDM, and Ryle *et al.* (2009) noted the site's importance for invertebrates, such as grasshoppers and Fritillary butterflies. Inchydoney is popular with tourists and is currently a Blue Flag beach (An Taisce, 2012). Public parking and toilets are provided adjacent to the beach. Agriculture is the main adjacent land-use.

2 CONSERVATION ASSESSMENTS

2.1 Overview

Inchydoney was surveyed on the fourth of October, 2011. Of the five Annex I sand dune habitats that were recorded during the CMP, four were assessed in 2011. The habitats found at Inchydoney in 2011 and the results of the conservation assessments are presented in Table 1. **1210 Annual vegetation of drift lines** was no longer present, and could therefore not be assessed. **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** were assessed as Unfavourable-Inadequate. ***2130 Fixed dunes (grey dunes)** were assessed as Unfavourable-Bad, while **2190 Humid dune slacks** were assessed as Favourable.

Table 1. Conservation assessment results for all Annex I dune habitats surveyed at Inchydoney, Co. Cork

Habitat	Area	Structure & Functions	Future Prospects	Overall result
2110 Embryonic shifting dunes	Favourable (Improving)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Improving)
2120 Marram dunes (white dunes)	Favourable (Improving)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Improving)
*2130 Fixed dunes (grey dunes)	Favourable (Stable)	Unfavourable-Bad (Deteriorating)	Unfavourable-Bad (Deteriorating)	Unfavourable-Bad (Deteriorating)
2190 Humid dune slacks	Favourable (Stable)	Favourable (Stable)	Favourable (Stable)	Favourable (Stable)

2.1.1 Area

The areas of Annex I sand dune habitats at Inchydoney are presented in Table 2. No revisions were made to the baseline areas apart from that of ***2130 Fixed dunes (grey dunes)**, which was revised to include areas formerly mapped as scrub. The total area of Annex I sand dune habitats at Inchydoney has increased due to accretion of **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes). 1210 Annual vegetation of drift lines** were no longer present during the SDM.

Table 2. Areas of Annex I dune habitats originally mapped at Inchydoney during the baseline survey (Coastal Monitoring Project), the revised baseline areas and areas mapped during the Sand Dune Monitoring Project in 2011.

Habitat	• Bas	• Revi	• Sand Dunes
1210 Annual vegetation of drift lines	0.25	0.25	0.00
2110 Embryonic shifting dunes	0.05	0.05	1.62
2120 Marram dunes (white dunes)	0.42	0.42	0.78
*2130 Fixed dunes (grey dunes)	17.81	19.11	19.06
2190 Humid dune slacks	0.28	0.28	0.28
Total	18.81	20.11	21.74

2.1.2 Structure and Functions

Structure and Functions were assessed for four habitats at Inchydoney. Table 3 shows the results of the Structure and Functions assessment. **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** were assessed as Unfavourable-Inadequate, with only one criterion failing for each. ***2130 Fixed dunes (grey dunes)** were assessed as Unfavourable-Bad, having 5 of the 11 criteria failing, while **2190 Humid dune slacks** were assessed as Favourable.

Table 3. Annex I sand dune habitats at Inchydoney for which Structure and Functions were assessed, with the number of monitoring stops, assessment criteria and the number of criteria that failed.

Habitat	No. monitoring stops	Total no. assessment criteria	No. failed criteria
2110 Embryonic shifting dunes	4	7	1
2120 Marram dunes (white dunes)	4	7	1
*2130 Fixed dunes (grey dunes)	8	11	5
2190 Humid dune slacks	4	11	0

2.1.3 Future Prospects

Impacts and activities recorded at Inchydoney are presented in Table 4. Impact codes are assigned according to Ssymanck (2010). Recreational impacts, such as walking, trampling, campfires and other uses, were recorded in all four Annex I habitats present during the SDM, often with negative effects associated with them. **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** were particularly affected by trampling, while undergrazing and bracken encroachment were significant negative impacts for ***2130 Fixed dunes (grey dunes)**. No negative impacts were recorded for **2190 Humid dune slacks**. Grazing horses had a positive impact on both ***2130 Fixed dunes (grey dunes)** and **2190 Humid dune slacks**.

Table 4. Impacts recorded in Annex I sand dune habitats at Inchydoney in 2011. Source refers to whether the impact being scored originates inside or outside the Annex I habitat being assessed.

Habitat code	Impact code	Impact description	Intensity	Effect	Percent of habitat	Source
2110	G01.02	Walking	Low	Neutral	25	Inside
2110	G05.01	Trampling	High	Negative	20	Inside
2120	G01.02	Walking	Low	Negative	10	Inside
2120	G05.01	Trampling	High	Negative	50	Inside
*2130	A04.02.03	Non intensive horse grazing	Medium	Positive	75	Inside
*2130	A04.03	Undergrazing	Medium	Negative	70	Inside
*2130	D01.02	Roads	Low	Neutral	10	Outside
*2130	D01.03	Car parks	Low	Neutral	10	Outside
*2130	G01.02	Walking	Low	Negative	5	Inside
*2130	G01.08	Recreational use	Medium	Negative	10	Inside
*2130	G05	Campfires	High	Negative	1	Inside
*2130	G05.01	Trampling	High	Negative	10	Inside
*2130	I01	Invasive non-native species	Medium	Negative	1	Inside
*2130	I02	Problematic natives species	High	Negative	40	Inside
*2130	K01.01	Erosion	High	Neutral	1	Inside
*2130	K02.01	Scrub encroachment	High	Negative	10	Inside
*2130	K04.05	Rabbit grazing	Medium	Positive	30	Inside
2190	A04.02.03	Non intensive horse grazing	Medium	Positive	100	Inside
2190	G01.02	Walking	Low	Neutral	5	Inside
2190	K01.03	Drying out	Medium	Neutral	100	Inside

2.2 Annex I habitat assessments

The conservation status of the Annex I habitats at Inchydoney is discussed below. The present conservation status in 2011 is compared with the baseline status and if a habitat is not in Favourable status, the main reasons for the Unfavourable assessment are given. Areas recorded in 2011 are compared with the revised baseline areas. It should be borne in mind that natural processes such as erosion, deposition and succession are primary drivers of change on coastal habitats.

2.2.1 1210 Annual vegetation of drift lines

1210 Annual vegetation of drift lines were recorded during the CMP but were not present in 2011. This was the result of natural succession and did not appear to be associated with human activity. The conservation status of **1210 Annual vegetation of drift lines** was not assessed.

2.2.2 2110 Embryonic shifting dunes

2110 Embryonic shifting dunes were mapped to the south and east of the site in three distinct areas and were the most seaward habitat recorded during the SDM. The two largest areas of **2110 Embryonic shifting dunes** were separated by a small headland known as Virgin Mary's Point.

Area

The area of **2110 Embryonic shifting dunes** has increased from 0.05 ha during the CMP to 1.62 ha during the SDM as a result of accretion. During the CMP, Area was assessed as Unfavourable-Bad because the habitat was of limited extent. Area was assessed as Favourable (improving) during the SDM.

Structure and Functions

The criterion assessing damage due to disturbance failed during the Structure and Functions assessment. Disturbance is focussed in the western part of the site, but there are signs of trampling at access points in the eastern portion of the habitat. Although no monitoring stops were carried out in the habitat during the CMP, it was assessed as Unfavourable-Inadequate because of unhealthy vegetation. Structure and Functions were assessed as Unfavourable-Inadequate (stable) during the SDM.

Future Prospects

Walking and trampling were recorded as negative impacts during the SDM. No negative impacts were recorded for the habitat during the CMP, but the Future Prospects were assessed as Unfavourable-Inadequate because of threats associated with amenity use. During the SDM, Future Prospects were assessed as Unfavourable-Inadequate (stable).

Conservation assessment

Two of the parameters were assessed as Unfavourable-Inadequate, while one was assessed as Favourable during the SDM. The conservation status was assessed as Unfavourable-Bad during the

CMP because of the limited extent of the habitat. During the SDM, the conservation status of **2110 Embryonic shifting dunes** was assessed as Unfavourable-Inadequate (improving).

2.2.3 2120 Marram dunes (white dunes)

2120 Marram dunes (white dunes) were mapped to the west, south and east of the site, in four distinct areas. Similar to **2110 Embryonic shifting dunes**, the two largest areas are separated by the headland, Virgin Mary's Point. The area of **2120 Marram dunes (white dunes)** in the west of the site is the most seaward habitat, while the other three areas are fronted by **2110 Embryonic shifting dunes.**

Area

The area of **2120 Marram dunes (white dunes)** increased from 0.42 ha during the CMP to 0.78 ha during the SDM. During the CMP, area was assessed as Unfavourable-Bad due to its limited extent. Although the habitat is less extensive than described in the Natura 2000 report, and the OSI Discovery maps suggest that the site occupied a greater area in the past, there is no clear link with human activity, and Area was assessed as Favourable (improving) during the SDM.

Structure and Functions

The criterion assessing damage due to disturbance failed during the Structure and Functions assessment. Most of the **2120 Marram dunes (white dunes)** habitat is located in the more disturbed, western part of the site. No monitoring stops were carried out in the habitat during the baseline survey, but Structure and Functions were assessed as Unfavourable-Inadequate because of habitat degradation. During the SDM, Structure and Functions were assessed as Unfavourable-Inadequate (stable).

Future Prospects

Walking and trampling were both recorded as negative impacts during the SDM. No negative impacts were recorded in this habitat during the baseline survey, but it was assessed as Unfavourable-Inadequate because of amenity use. Future Prospects were assessed as Unfavourable-Inadequate (stable) during the CMP.

Conservation assessment

One of the parameters was assessed as Favourable while the other two were assessed as Unfavourable-Inadequate during the SDM. Conservation status was assessed as Unfavourable-Bad during the CMP. The conservation status of **2120 Marram dunes (white dunes)** was assessed as Unfavourable-Inadequate (improving) during the SDM.

*2.2.4 *2130 Fixed dunes (grey dunes)*

***2130 Fixed dunes (grey dunes)** represent the most extensive habitat at Inchydoney, with the largest area found in the east of the site. The rare fungus *Tulostoma brumales* was found in this habitat, and its presence should be treated as a feature of interest.

Area

The area of ***2130 Fixed dunes (grey dunes)** has decreased slightly from 19.11 ha during the CMP to 19.06 ha during the SDM. Area was assessed as Favourable during the CMP and as Favourable (stable) during the SDM, since no anthropogenic erosion was found.

Structure and Functions

Five of the criteria failed during the Structure and Functions assessment. Two monitoring stops had fewer than four positive indicator species. Negative indicator species were frequent and *Pteridium aquilinum* occupied over 10% of the habitat. The vegetation was tall at six monitoring stops and flowering and fruiting were infrequent. Parts of the habitat were damaged by amenity use. During the CMP, Structure and Functions were assessed as Unfavourable-Inadequate because of rank vegetation, lack of indicator species and negative indicator species affecting two monitoring stops. There are indications that the area affected by *Pteridium aquilinum* and scrub species has increased since the baseline survey. Structure and Functions were assessed as Unfavourable-Bad (decreasing) during the SDM.

Future Prospects

Although horses and rabbits graze the larger, eastern portion of the site, the level of grazing at present is not sufficient to maintain structural diversity with an appropriate proportion of short turf at Inchydoney. Undergrazing and associated impacts such as problematic native species, non-native invasive species and succession to scrub were recorded as negative impacts. The proximity of the site to a road and a car park make it very attractive to visitors. These were recorded as neutral impacts here, but they were indirectly linked to several negative impacts including recreation, trampling, walking and campfires. Negative impacts recorded during the CMP included agricultural improvement, undergrazing, walking/horse riding and invasion by a species. Future Prospects were assessed as Unfavourable-Inadequate during the CMP due to the spread of *Pteridium aquilinum* and recreational uses. During the SDM, the severity, number and extent of the impacts and threats affecting the habitat resulted in a Future Prospects assessment of Unfavourable-Bad (decreasing).

Conservation assessment

Although area was assessed as Favourable, Structure and Functions and Future Prospects were assessed as Unfavourable-Bad. Conservation status was assessed as Unfavourable-Inadequate during the CMP. The conservation status of ***2130 Fixed dunes (grey dunes)** was assessed as Unfavourable-Bad (deteriorating) during the SDM.

2.2.5 2190 Humid dune slacks

Eleven **2190 Humid dune slacks**, of varying size, were mapped during the SDM. They were only found in the eastern section of the site, where dense bracken on the adjacent ***2130 Fixed dunes (grey dunes)** was concentrated.

Area

There was no change in the area of **2190 Humid dune slacks** between the baseline survey and the SDM. They were assessed as Favourable during the CMP, and as Favourable (stable) during the SDM.

Structure and Functions

All of the criteria passed in the Structure and Functions assessment. Structure and Functions were assessed as Favourable during the CMP. During the SDM, Structure and Functions were assessed as Favourable (stable).

Future Prospects

No negative impacts were recorded in 2011. Horse grazing has a positive effect on the habitat. Bracken has not invaded the slacks, and this is probably due to the high water table and because they are selectively grazed by the horses. There are signs that the slacks are drying out, but this is considered to be a natural process as there is no indication that water abstraction is being carried out. During the CMP, the slacks were assessed as Unfavourable-Inadequate because of the lack of young slacks at the site, but no negative impacts were listed. Under the current methodology, dune slacks would probably have been assessed as Favourable. Future prospects were assessed as Favourable (stable) during the SDM.

Conservation assessment

All of the parameters were assessed as Favourable during the SDM. Although the habitat was assessed as Unfavourable-Inadequate during the CMP, it would probably been assessed as Favourable under the current methodology. The conservation status of **2190 Humid dune slacks** was assessed as Favourable (stable) during the SDM.

3 Discussion

3.1 Recreation

The beach at Inchydoney is well served by roads and parking, and there is a hotel located directly adjacent to the site. Recreation is mainly focussed in the western part of the site, which is easily accessible by road. Trampling has resulted in fragmentation of the sand dune habitats in the seaward part of the dunes which is clearly visible on aerial photographs. Although the pressures of recreation are less severe in the eastern part of the site, there are beaten tracks which have exposed the sandy substrate in the ***2130 Fixed dunes (grey dunes)** and the sensitive foredune habitats are trampled.

3.2 Scrub and bracken encroachment

Scrub is a feature of the western portion of the site while *Pteridium aquilinum* is more prevalent in the eastern part. Both are indicators of undergrazing and reduce the diversity of the habitat by shading out species of open habitats. Although both scrub and *Pteridium aquilinum* can add structural diversity to the habitat, at current levels, they are resulting in reduced species richness. Part of the site is currently grazed, but the horses target areas without bracken for grazing and do not eat mature

Pteridium aquilinum. It is unlikely that they current management will cause a reduction on the cover of *Pteridium aquilinum* in the eastern part of the site. Although scrub does not cover a large proportion of the habitat, it is becoming problematic in the smaller, western part of the site where there is no management to control its spread.

3.3 Agriculture

Horses graze the eastern part of the site, while there is no agricultural management on the western part of the site. Here, the ***2130 Fixed dunes (grey dunes)** habitat is becoming rank and is affected by scrub. While horse grazing in the eastern area will help to maintain open vegetation were it already occurs, it is unlikely to reduce the cover of *Pteridium aquilinum* to a level consistent with good conservation status.

3.4 Rare plants

Tulostoma brumale, the winter stalkball, was found in the ***2130 Fixed dunes (grey dunes)** in the eastern part of the site. It was located in an area free of *Pteridium aquilinum*, among short herbaceous vegetation and moss. The species has a restricted distribution in Ireland (GBIF, 2013).

3.5 *2150 Decalcified dune heath

According to the Natural 2000 data form, ***2150 Decalcified dune heath** comprises a small area of the Clonakilty Bay SAC (SAC 000091) (estimated as approximately 1% in the Natura 2000 data form). Heath was not recorded when the site was surveyed in 2011, although *Ulex europaeus* scrub was present. The conservation status was not assessed during the CMP or the SDM.

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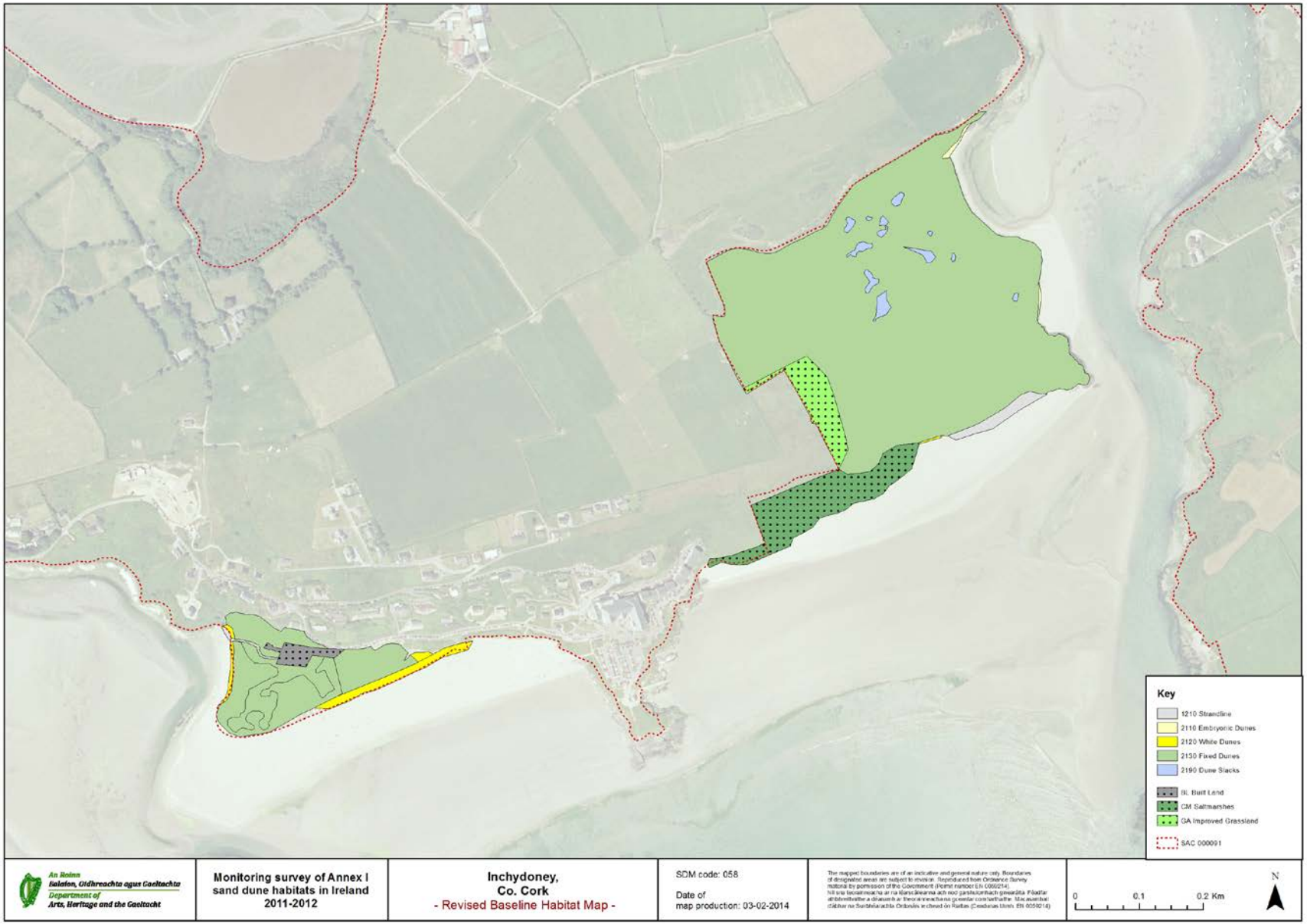
Key
1210 Strandline
2110 Embryonic Dunes
2120 White Dunes
2130 Fixed Dunes
2190 Dune Slacks
BL Built Land
CM Saltmarshes
GA Improved Grassland
SAC 000091
An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht
Monitoring survey of Annex I
sand dune habitats in Ireland
2011-2012
Inchydoney,
Co. Cork
- Revised Baseline Habitat Map -
SDM code: 058
Date of
map production: 03-02-2014
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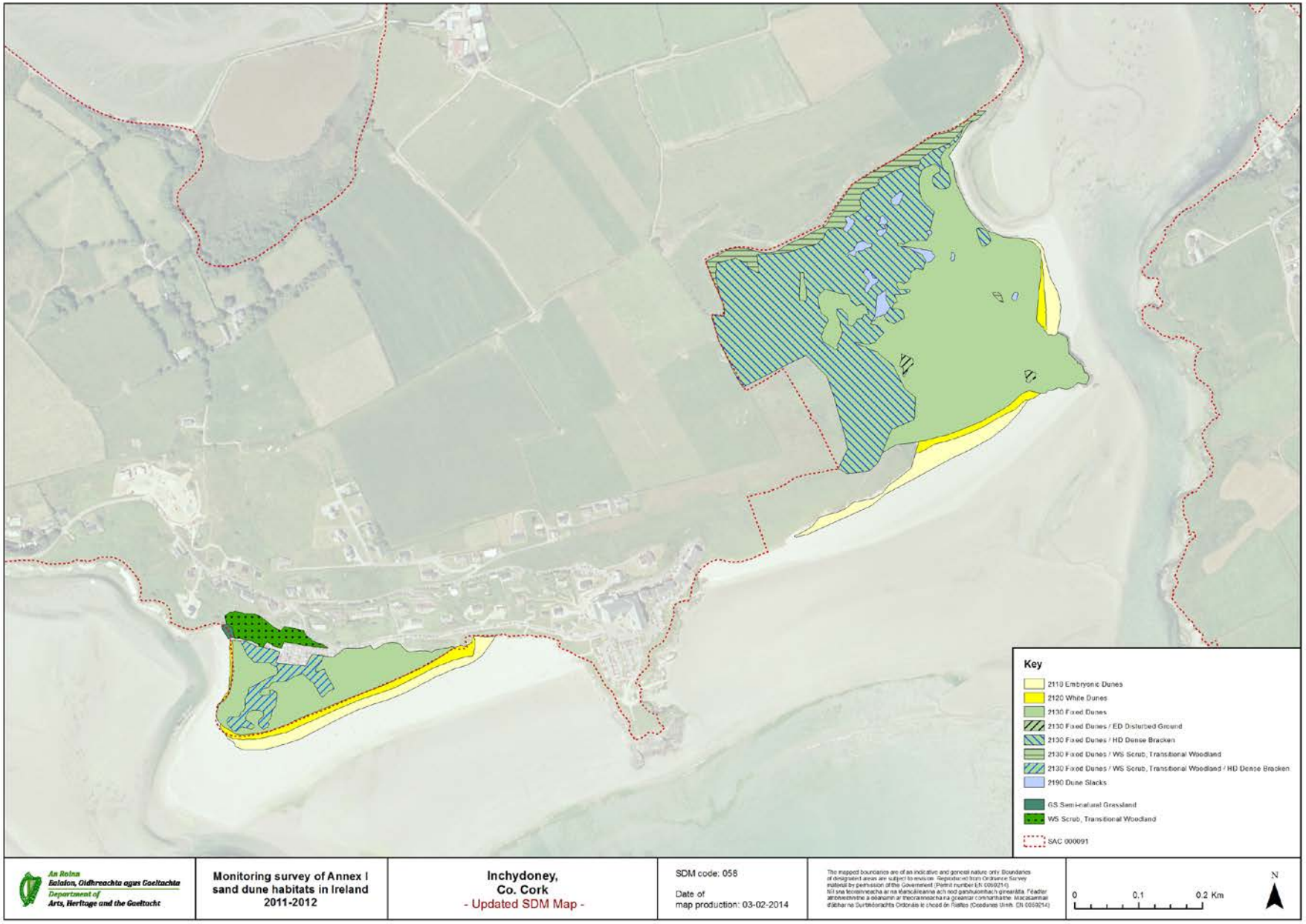
Key
2110 Embryonic Dunes
2120 White Dunes
2130 Fixed Dunes
2130 Fixed Dunes / ED Disturbed Ground
2130 Fixed Dunes / HD Dense Bracken
2130 Fixed Dunes / WS Scrub, Transitional Woodland
2130 Fixed Dunes / WS Scrub, Transitional Woodland / HD Dense Bracken
2190 Dune Slacks
GS Semi-natural Grassland
WS Scrub, Transitional Woodland
SAC 000091
An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht
Monitoring survey of Annex I sand dune habitats in Ireland 2011-2012
Inchydoney,
Co. Cork
- Updated SDM Map -
SDM code: 058
Date of
map production: 03-02-2014
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