Inishmore Island SAC (site code 213)
Conservation objectives supporting document -coastal habitats

NPWS

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Please note that the opinions expressed in the site reports from the Coastal Monitoring Project (CMP) 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 (2015). Conservation Objectives: Inishmore Island. 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.

Inishmore Island is the largest of the three Aran Islands, situated approximately 8km off the south coast of County Galway. Geologically an extension of the Burren in County Clare, the island is formed of Upper Carboniferous limestone strata, interleaved with layers of shale and clay. In places along the coast, cliffs rise to 90m. A thin cover of rendzina occurs in pockets between blocks of bare limestone. This is combined with a mixture of sand and seaweed to form a unique man-made soil cover built up over centuries.

Inishmore Island Special Area of Conservation (SAC) supports a range of Annex I habitats of the EU Habitats Directive such as, lowland hay meadows, marine caves, alpine heath and dry heath along with the many coastal habitats. The SAC site includes a large area of marine waters surrounding the island. The site is also selected for *Vertigo angustior*, an snail listed on Annex II of the EU Habitats Directive that has been recorded within dune habitats and maritime grasslands within this SAC.

Inishmore Island SAC (site code: 213) is designated for a range of coastal habitats including vegetated shingle, sand dunes, machair and sea cliffs. The following eight coastal habitats are included in the list of qualifying interests for the site (*indicates priority habitat):

- Perennial vegetation of stony banks (1220)
- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Fixed coastal dunes with herbaceous vegetation (grey dunes)* (2130)
- Dunes with *Salix repens ssp. argentea* (*Salix arenariae*) (2170)
- Humid dune slacks (2190)
- Machairs (*in Ireland) (21a0)
- Vegetated sea cliffs of Atlantic and Boreal coasts (1230)

The first habitat represents vegetated shingle, the next six are associated with sand dune systems, and the last represents sea cliffs. The first seven of these habitats are usually found in close association with each other. The distribution of vegetated shingle sites and sand dune habitats is presented in Appendix I and sea cliffs in Appendix II.

The Coastal Monitoring Project (CMP) also recorded 'Annual vegetation of drift lines' at Eararna and Portmurvy sub-sites (Ryle *et al.,* 2009), but this habitat is not listed as a qualifying interest for this SAC.

This backing document sets out the conservation objectives for the eight coastal habitats listed above in Inishmore 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 **shingle** are based in part on the findings of the National Shingle Beach Survey (NSBS), which was carried out in 1999 on behalf of the National Parks and Wildlife Service (NPWS) (Moore & Wilson, 1999). Some vegetated shingle was also recorded at Eararna and Portmurvy sub-sites by the Coastal Monitoring Project (Ryle *et al.*, 2009). The distribution of known shingle sites in Inishmore Island SAC is presented in Appendix I.

The NSBS visited the following eight sub-sites within Inishmore Island SAC:

1. An Gleannanchan
2. Clochan
3. Port Mhuirbhigh
4. An Scailp Fhada
5. Port Chorruch
6. Port Eochla
7. Portnamonastragh
8. Trá na bhFrancach

During the NSBS, profiles and transects were recorded from each shingle beach and each site was assigned a crude High/Medium/Low interest ranking. A 'high interest' ranking denotes a site that is of high conservation value. The site may be of interest botanically or geomorphologically. A 'medium interest' ranking implies the site may be extensive but not of particular interest either botanically or geomorphologically. A 'low interest' ranking is reserved for small sites, highly damaged sites or sites that are of a very common classification. The vegetated shingle at An Gleannanchan sub-site was rated of high interest owing to the presence of a superb population of sea kale (*Crambe maritime*), while the Clochan sub-site is rated of 'medium interest' owing to the good quality of the vegetation present (Moore & Wilson, 1999).

The habitat was not mapped at any of the sub-sites, but the vegetation was recorded, as were the human impacts and alterations at the site, which are useful tools for assessing the Structure and Functions of the site.

The targets set for the **sand dune habitats** are based primarily on the results of the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009) and this document should be read in conjunction with that report.

The CMP surveyed, mapped and assessed a total of two sub-sites within Inishmore Island SAC (Ryle *et al.*, 2009):

1. Eararna
2. Portmurvy

The distribution of sand dune habitats within Inishmore Island SAC is presented in Appendix I. As part of the Coastal Monitoring Project (CMP) detailed individual reports and habitat maps were produced for each of the two sub-sites and these are included in a set of Appendices to this document (Appendix III to IV).

The Eararna sub-site is located in the east of Inishmore at Gregory's Sound. Port Murvey is a small beach located on the northern shore of the island (Ryle *et al*., 2009).

The conservation objectives for the sand dune habitats in Inishmore Island are based on the findings of the individual reports for each of these sites, combined with the results of Gaynor (2008). It is thought that the two sub-sites as surveyed by the CMP represent the total area of sand dunes within Inishmore SAC.

The targets set for **vegetated sea cliffs** are based on the findings of the Irish Sea Cliff Survey (ISCS) (Barron *et al.,* 2011) and this document should be read in conjunction with that report.
The Irish Sea Cliff Survey (ISCS) surveyed one sub-site within Inishmore Island SAC:

1. Onaght

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 Perennial vegetation of stony banks

Perennial vegetation of stony banks is vegetation that is found at or above the mean high water spring tide mark on shingle beaches (i.e., beaches composed of cobbles and pebbles). It is dominated by perennial species (i.e. plants that continue to grow from year to year). The first species to colonise are annuals or short-lived perennials that are tolerant of periodic displacement or overtopping by high tides and storms. Level, or gently-sloping, high-level mobile beaches, with limited human disturbance, support the best examples of this vegetation. More permanent ridges are formed by storm waves. Several of these storm beaches may be piled against each other to form extensive structures.

3.1 Overall Objective

The overall objective for 'perennial vegetation of stony banks' in Inishmore Island SAC is to 'maintain the favourable conservation condition'. This objective is based on an assessment of the recorded condition of the habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Range, (b) Area 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. The target for favourable condition is *'no decrease in extent from the established baseline'*. Bearing in mind that coastal systems are naturally dynamic and subject to change even within a season, this target is assessed subject to natural processes, including erosion and succession.

The exact current extent of this habitat in Inishmore Island SAC is unknown. The National Shingle Beach Survey recorded vegetated shingle ridge from eight sub-sites: An Gleannachan, Clochan, Port Mhuirbhigh, An Scailp Fhada, Port Chorruch, Port Eochla, Portnamonastragh and Trá na bhFrancach, but did not map the extent (Moore & Wilson, 1999). A total area of 0.44ha of vegetated shingle was also recorded and mapped at Eararna (0.30ha) and Portmurvey (0.14ha) by the Coastal Monitoring Project (CMP) (Ryle *et al.,* 2009).

The target is that the area should be stable or increasing, subject to natural processes, including erosion and succession.

3.3 Range

3.3.1 Habitat distribution

Shingle deposits occur throughout Inishmore Island particularly along the north and north-eastern coastline of the island (Moore & Wilson, 1999).

An Gleannachan is an extensive well-developed shingle ridge backed by a track and sea wall that has become breached by the sea. The shingle is also breached by an outlet of Lough Dearg, and a substantial cobble barrier has formed to the east of the lake (Moore & Wilson, 1999).

An Clochan is a well-developed shingle ridge with occasional sandy substrate (Moore & Wilson, 1999).

Port Mhuirbhigh is a small shingle deposit in the corner of the bay (Moore & Wilson, 1999).

An Scailp Fhada is a cobble ridge that occurs alongside the road (Moore & Wilson, 1999).

Port Chorruch is a cobble barrier that is backed by Lough Phort Chorruch (Moore & Wilson, 1999), which is a coastal lagoon.

Port Eochla is a small shingle deposit of pebbles, cobbles and boulders that is backed by pasture and a small tidal Lough (Moore & Wilson, 1999).

Portnamonastragh is a storm deposit that is backed by a concrete protective barrier and road (Moore & Wilson, 1999).

Trá na bhFrancach is a small fringing deposit of shingle that is backed by a seawall and road, and tapers to sandy dunes (Moore & Wilson, 1999).

At Eararna, the perennial shingle vegetation occurs on the cobble along the rocky edge either side of Ceann an Mhada (Dog's Head) just north of Barr na Coise. At Portmurvy the shingle is widest along the western edge of the strand and grades into embryo dunes (Ryle *et al*., 2009).

The target is that there should be no decline or change in the distribution of this habitat, unless it is the result of natural processes, including erosion and succession.

3.4 Structure and Functions

A fundamental aim of shingle conservation is to facilitate natural mobility. Shingle beaches are naturally dynamic systems, making them of geomorphological interest as well as ecological interest. They are constantly changing and shingle features are rarely stable in the long term.

3.4.1 Functionality and sediment supply

The health and on-going development of this habitat relies on a continuing supply of shingle sediment. This may occur sporadically as a response to storm events rather than continuously. Interference with the natural coastal processes, through offshore extraction or coastal defence structures in particular, can interrupt the supply of sediment and lead to beach starvation.

Moore & Wilson (1999) recorded the presence of sea walls at An Gleannachan, Port Mhuirbhigh, Portnamonastragh and Trá na bhFrancach. Extraction was also recorded at An Gleannachan. The level of impact that these structures and activities are having on the site functionality and sediment supply is unclear.

The target is to maintain and restore where possible the natural circulation of sediment and organic matter, without any physical obstructions.

3.4.2 Vegetation structure: zonation

Ecological variation in this habitat type depends on stability; the amount of fine material accumulating between the pebbles; climatic conditions; width of the foreshore and past management of the site. The ridges and lows also influence the vegetation patterns, resulting in characteristic zonations of vegetated and bare shingle. In the frontal less stable areas of shingle, the vegetation tends to be dominated by annuals and short-lived salt-tolerant perennials. Where the shingle is more stable the vegetation becomes more perennial in nature and may include grassland, heathland and scrub, depending on the exact nature of the site. The presence of lichens indicates long term stability of the shingle structure. Transitions to intertidal, sand dune and karst habitats occur at this site. The following table outlines the habitats associated with the vegetated shingle at each of the sub-sites surveyed by Moore and Wilson (1999).

Sub-site	**Associated habitats**
An Gleannachan	lowland karst and rocky shore
Clochan	Intertidal shingle
Portnamonastragh	Intertidal shingle
Port Mhuirbhigh	lowland karst
An Scailp Fhada	lowland karst and intertidal shingle
Port Chorruch	lowland karst, lagoon and intertidal shingle
Port Eochla	lagoon and intertidal shingle
Trá na bhFrancach	sand dunes

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 composition: typical species & sub-communities

The degree of exposure, as well as the coarseness and stability of the substrate determines species diversity. The shingle habitat in Inishmore Island SAC is known to support a typical flora for this habitat type.

The dominant vegetation of the shingle beaches within the site is that of a mosaic of *Annual vegetation of driftlines* (1210) and *Perennial vegetation of stony banks* (1220). The more stable areas of shingle support characteristic species of both EU Habitat types such as sea beet (*Beta vulgaris* ssp. *maritima*), sea mayweed (*Tripleurospermum maritimum*), sea campion (*Silene uniflora*), curled dock (*Rumex crispus)*, orache species (*Atriplex* species), sea sandwort (*Honckenya peploides*) and silverweed (*Potentilla anserina*) (Moore & Wilson, 1999).

At An Gleannachan, a large sea kale (*Crambe maritime*) population (36 plants) was recorded by the NSBS, along with bittersweet (*Solanum dulcamara*), cow parsley (*Anthriscus sylvestris*), burnet rose (*Rosa pimpinellifolia*), two-spined acaena (*Acaena ovalifolia*), vetch species (*Vicia* species) and spear-leaved orache (*Atriplex prostrata*) (Moore & Wilson, 1999).

At Clochan, bittersweet (*Solanum dulcamara*), cow parsley (*Anthriscus sylvestris*), thistle (*Cirsium* species), spear-leaved orache (*Atriplex prostrata*), beet (*Beta vulgaris*), scurvy grass (*Cochlearia officinalis*) were recorded (Moore & Wilson, 1999).

At Port Mhuirbhigh, scurvy grass (*Cochlearia officinalis*), sea-milkwort (*Glaux maritima*), bramble (*Rubus fruticosus*), curled leaved dock (*Rumex crispus*), sea mayweed (*Tripleurospermum maritimum*), and red fescue (*Festuca rubra*) were recorded (Moore & Wilson, 1999).

At An Scailp Fhada, long-leaved plantain (*Plantago lanceolata*), bramble (*Rubus fruticosus*), nettle (*Urtica dioica*), red fescue (*Festuca rubra*) were recorded in the vegetated shingle habitat (Moore & Wilson, 1999).

At Port Chorruch, bittersweet (*Solanum dulcamara*), common chickweed (*Stellaria media*), cow parsley (*Anthriscus sylvestris*), spear-leaved orache (*Atriplex prostrata*), sea beet (*Beta vulgaris* ssp *maritima*), scurvy grass (*Cochlearia officinalis*), were recorded by the NSBS (Moore & Wilson, 1999).

At Port Eochla, red fescue (*Festuca rubra*) was recorded in the vegetated shingle (Moore & Wilson, 1999).

At Trá na bhFrancach, bittersweet (*Solanum dulcamara*), spear-leaved orache (*Atriplex prostrata*), sea milkwort (*Glaux maritima*), radish (*Raphanus raphanistrum*), curled leaved dock (*Rumex crispus*), sea mayweed (*Tripleurospermum maritimum*) were recorded (Moore & Wilson, 1999).

The target for this attribute is to ensure that the typical flora of vegetated shingle is maintained, as are the range of sub-communities within the different zones.

3.4.4 Vegetation composition: negative indicator species

Where the shingle becomes more stabilised negative indicator species can become an issue. Negative indicator species can include non-native species (e.g. *Centranthus ruber, Lupinus arboreus*); species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered to be typical of the habitat (e.g. *Pteridium aquilinum*).

The target for this attribute is that negative indicator species (including non-native species) should make up less than 5% of the vegetation cover.

4 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) *
- Decalcified dune heath (2150) *
- **Dunes with *Salix repens* (2170)**
- **Humid dune slacks (2190)**
- **Machair (21AO) ***

Seven dune habitats were recorded by Ryle *et al*. (2009) but only the six habitats indicated in bold above are listed as Qualifying Interests for Inishmore SAC. These habitats include mobile areas at the front as well as more stabilised parts of dune systems. Annual vegetation of driftlines was also recorded at Eararna sub-site by the CMP. Neither 'Dunes with *Salix repens'* nor 'Humid dune slacks' were recorded at either sub-site by the CMP.

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).

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).

Dunes with creeping willow (*Salix repens*) occur where this shrub forms a dense ground cover and are found in close association with dune slacks. The distinguishing feature is the proximity of the water table to the surface, which in the case of dunes with *S. repens* is below a level where it exerts an influence on the vegetation. As a result, the moisture-loving plants generally associated with dune slacks are noticeably reduced or absent. Dunes with *S. repens* are often found on sandy hummocks within slacks, or on the sides of dune ridges adjacent to slacks.

Machair (21A0) is a highly specialised and complex dune habitat that is confined globally to the north-west coasts of Ireland and Scotland. It comprises a flat or gently undulating sandy plain that develops in an oceanic location with a cool moist climate. Machair systems are highly calcareous, the sediments usually containing a high percentage of shell fragments and having pH values in excess of 7. The vegetation is herbaceous, with low frequency of sand-binding species (Gaynor, 2006). Irish machair is a priority habitat under the EU Habitats Directive.

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 CMP surveyed two sub-sites within Inishmore Island SAC:

1. Eararna
2. Portmurvy

Detailed descriptions from the Coastal Monitoring Project (Ryle *et al.,* 2009) of each sub-site and each sand dune habitat found at Eararna and Portmurvy are presented in Appendices III to IV. A total of 99.64ha of sand dune habitat was mapped within the Inishmore Island SAC, of which 0.27ha represents annual vegetation of driftlines, which is not listed as a qualifying interest for this particular site.

4.1 Overall objectives

The overall objective for 'Embryonic shifting dunes' in Inishmore Island SAC is to 'maintain the favourable conservation condition' (not assessed by CMP at Eararna).

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

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

In the absence of information on the status of this habitat, the overall objective for 'Dunes with *Salix repens ssp argentea*' in Inishmore Island SAC is to 'maintain the favourable conservation condition'. This objective is subject to review in light of new information.

In the absence of information on the status of this habitat, the overall objective for 'Humid dune slacks' in Inishmore Island SAC is to 'maintain the favourable conservation condition'. This objective is subject to review in light of new information.

The overall objective for 'Machair' in Inishmore Island SAC is to 'restore the favourable conservation condition'.

These objectives are based on an assessment of the recorded 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.

4.2 Area

4.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. Baseline habitat maps were produced for the sand dune habitats in Inishmore Island SAC during the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009). These maps are included with the individual site reports in the set of Appendices at the end of this document. The total areas of each sand dune habitat within the SAC as estimated by Ryle *et al*. (2009) are presented in the second column of the following table. These figures were subsequently checked and adjusted to take into account some overlapping polygons and mapping errors. The adjusted figures are presented in the final column.

Habitat	**Total area (ha) of habitat from CMP**	**Total area (ha) of habitat within SAC boundary**
Embryo shifting dunes	0.222	0.22
Shifting dunes along the shoreline with *Ammophila arenaria*	1.646	1.63
Fixed coastal dunes with herbaceous vegetation	60.563	60.06
Humid dune slacks	-	-
Dunes with *Salix repens* ssp. *argentea*	-	-
Machair	38.214	37.01
Total	**100.645**	**98.92**

It should be noted that the CMP did not record humid dune slacks or dunes with *S. repens*. The status of these two habitats at this site is under review and the objectives may change in light of such a review.

The 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.

4.3 Range

4.3.1 Habitat distribution

The distribution of sand dune habitats as mapped by Ryle *et al.* (2009) is presented in Appendix II.

Four of the six qualifying interest habitats were recorded at Eararna sub-site by the CMP. At Portmurvy, three of the six qualifying interests were recorded by the CMP. 'Dunes with *Salix repens* ssp *argentea (Salix arenariae*)' and 'Humid dune slacks' were not recorded at either Eararna or Port Murvy sub-sites. The habitat 'Shifting dunes with *Ammophila arenaria'* was not recorded at Portmurvy (Ryle *et al*., 2009).

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.

4.4 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 Inishmore SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

4.4.1 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.

There is a seawall at the Portmurvy sub-site. The CMP noted that this sea wall has contributed to a build-up of sediment and the development of a relatively wide area of embryo dunes (Ryle *et al.,* 2009).

The mobile dunes at Eararna were impacted by trampling and bike scrambling at time of survey which according to the CMP compounded the natural erosion affecting the seaward edge of the dunes (Ryle *et al*, .2009).

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.

4.4.2 Physical structure: hydrological and flooding regime

The conservation of dune slacks and dunes with *S. repens* is inextricably linked with the local hydrological regime. Dune slacks are characterised by the proximity of a groundwater table that is maintained by the combination of an impermeable layer in the soil, or deeper salt water and precipitation. Dunes with *S. repens* are closely associated with dune slacks but are distinguished from them by a water table that is at a depth that no longer exerts an influence on the vegetation. Most dune slacks are fed by a range of water sources, including precipitation, surface water or groundwater. The latter two sources are usually somewhat calcareous while the former is acid.

The most important influence on the nature and vegetation of a dune slack is the groundwater table, which can fluctuate considerably throughout the year. The frequency and duration of periods of flooding or inundation determines the vegetation composition. The water table depth has been identified as the primary determining factor in vegetation variation, followed by weak trends in calcium and sodium availability. Other contributing factors include stage of development, precipitation, distance from the sea, the grazing regime, recreational pressure, nature of the sediment, soil pH and the porosity of the sediment.

Dune slack habitats should never be considered in isolation, but as part of the larger dune system that functions as an eco-hydrological unit. Dune slacks are highly sensitive to human influences on their hydrology, either through water abstraction or drainage works. Generally, the maintenance of a naturally functioning dune slack depends on both the amount of (a) precipitation and (b) groundwater discharge. Water abstraction interferes with the local hydrology, potentially having serious implications

for the plant and animal communities of slacks. Abstraction can lower the level of the groundwater table, causing the slacks to dry out. It can also lead to saline infiltration in slacks formed close to the front of a dune system and particularly where the underlying substrate is highly permeable (e.g. shingle).

Typically, the true machair plain represents the area where wind erosion has eroded a dune system to a level just above the water table, where the wet consistency of the sand prevents further erosion. In general, the degree of flatness depends on the age of the system, as well as the underlying topography, geology, outcropping of local rocks and historical management. Machair plains can be terminated on the landward side by a lake or associated marsh/fen (Gaynor, 2006). Consequently, the condition and conservation of the machair habitat can be inextricably linked to the local hydrology.

Wet machair can essentially be compared to humid dune slacks due to the periodic fluctuations and the proximity of the groundwater table to the surface throughout the year. The frequency and duration of periods of flooding or inundation determines the vegetation composition. The water-table depth has been identified as the primary determining factor in vegetation variation, followed by weak trends in calcium and sodium availability. Other contributing factors include stage of development, precipitation, distance from the sea, the grazing regime, recreational pressure, nature of the sediment, soil pH and the porosity of the sediment.

Like dune slacks, machair is highly sensitive to human influences on hydrology, either through water abstraction, drainage works or increased nutrient inputs. Water abstraction interferes with the local hydrology, potentially having serious implications for the plant and animal communities of wet machair communities.

The target is to ensure that the hydrological regime continues to function naturally and that there are no increased nutrient inputs in the groundwater.

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

4.4.4 Vegetation structure: bare ground

This target applies to machair, fixed dunes, dunes with *S. repens* and dune slacks. 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 and species that favour open conditions such as petalwort (*Petalophyllum ralfsii*) and a range of invertebrates, helping to increase biodiversity.

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.

4.4.5 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.

4.4.6 Vegetation structure: vegetation height

This attribute applies to the more fixed habitats (machair, fixed dunes, dunes with *S. repens* and dune slacks). 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).

At Eararna, the CMP recorded light levels of grazing especially in the fixed dunes at Barr na Coise. The machair at this sub-site was subject to overgrazing at the time of the CMP survey (Ryle *et al*., 2009).

At Portmurvy, low intensity grazing was noted by the CMP at time of survey (Ryle *et al*., 2009).

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

4.4.7 Vegetation structure: vegetation cover

The only habitat where this is a specific attribute is humid dune slacks where that target is to maintain less than 40% cover of *S. repens.* This species forms a natural component of many dune slack communities in Ireland. However, high covers of this shrub can lower the level of water-table causing the slacks to dry out. It can also form a dense canopy that shades out slack species leading to a reduction in biodiversity.

The target is therefore to keep the cover of *S. repens* below 40%.

4.4.8 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*).

The Eararna and Portmurvy sub-sites support a characteristic dune flora, details of which can be found in the site reports from the CMP (Ryle *et al.,* 2009) which are included in Appendices III to IV.

Notable plant species that have been recorded on or adjacent to sandy habitats on Inishmore Island include the following, the Red Data Book species bee orchid (*Orchis apifera*), sea kale (Crambe maritima) and the rare and protected plants hairy violet (*Viola hirta*) and purple milk vetch (*Astragalus danicus*) have been recorded in the fixed dune and machair (Ryle *et al*., 2009).

The vegetation of machair is often composed of both wet and dry communities and although there is generally an obvious distinction between the dry and wet types, transitional communities are common (Gaynor*,* 2006). No suite of species is unique to machair and the vegetation can best be described as a mosaic of calcareous fixed dune, mesotrophic grassland and dune slack communities (Gaynor, 2006).

The following table lists the dominant species listed in dry and wet Irish machair from Gaynor (2006). Differences in the dominant species between the two types of machair plain are indicated by *.

Dry machair	Wet machair
Festuca rubra	*Trifolium repens*
Plantago lanceolata	*Agrostis stolonifera*
Trifolium repens	*Calliergonella cuspidata*
Lotus corniculatus	*Festuca rubra*
Bellis perennis	*Bellis perennis*
*Galium verum**	*Plantago lanceolata*
Carex arenaria	*Carex arenaria*
*Rhytidiadelphus squarrosus**	*Potentilla anserina*
*Leontodon taraxacoides**	*Hydrocotyle vulgaris*
*Poa pratensis (subcaerulea)**	*Lotus corniculatus*
*Homalothecium lutescens**	*Prunella vulgaris*

Other species typically recorded on Irish machair include common yarrow (*Achillea millefolium*), early hair grass (*Aira praecox*), common mouse-ear (*Cerastium fontanum*), smooth hawksbeard (*Crepis capillaris*), common storksbill (*Erodium cicutarium*), eyebright (*Euphrasia officinalis*), common flax (*Linum catharticum*), red bartsia (*Odontites verna*), yellow rattle (*Rhinanthus minor*), biting stonecrop (*Sedum acre*), wild thyme (*Thymus poytrichus*) and violets (*Viola* spp.) (Ryle *et al*., 2009). The calcareous nature of the substrate can be reflected by the presence of thyme-leaved sandwort (*Arenaria serpyllifolia*), crested hair grass (*Koeleria macrantha*), ox-eye daisy (*Leucanthemum vulgare*) and squinancywort (*Asperula cynanchica*).

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

4.4.9 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.

According to the CMP, negative indicator species were uncommon in the coastal habitats surveyed at Eararna and Portmurvy sub-sites (Ryle *et al*., 2009).

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

4.4.10 Vegetation composition: scrub/trees

This attribute only applies to the fixed dunes, dunes with *S. repens* 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.

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.

4.4.11 Vegetation composition: bryophytes

This attribute applies to machair. Bryophytes are an important element of the machair flora. Moss cover is well developed within the machair habitat at this SAC and typically attains 90% cover. Frequently occurring species include *Campylium stellatum, Drepanocladus revolvens, Ctenidium molluscum* and *Philontis fontana*, most of which are indicative of wet, base-rich conditions.

The CMP noted that the machair at Eararna supported a high cover of bryophytes (Ryle *et al*., 2009).

The target for this attribute therefore is that the cover of bryophytes should and should always be at least an occasional component of the vegetation (Ryle *et al*., 2009).

5 Vegetated sea cliffs

Sea cliffs can be broadly divided into two categories: hard (or rocky) cliffs and soft (or sedimentary) cliffs, both of which are covered by the Annex I habitat 'vegetated sea cliffs of the Atlantic and Baltic coasts'. Hard cliffs are composed of rocks such as limestone, sandstone, granite or quartzite which are hard and relatively resistant to erosion. Soft cliffs are composed of softer rock such as shale or unconsolidated material such as glacial till. Vegetation of hard sea cliffs in exposed situations exhibits a strong maritime influence and is relatively stable. Soft cliff habitats are more prone to slope failure which results in the presence of fast-colonising pioneer species.

Defining the limits of what constitutes a sea cliff is problematic and a number of different interpretations have been used in the past (Fossitt, 2000; JNCC, 2004; Browne, 2005; Commission of the European Communities, 2007). In order to address any inconsistencies, the following definition for sea cliffs was developed and used during the Irish Sea Cliff Survey (Barron *et al*., 2011):

“A sea cliff is a steep or vertical slope located on the coast, the base of which is in either the intertidal (littoral) or subtidal (sublittoral) zone. The cliff may be composed of hard rock such as basalt, or of softer substrate such as shale or boulder clay. Hard cliffs are at least 5m high, while soft cliffs are at least 3m high. The cliff top is generally defined by a change to an obvious less steep gradient. In some cases the cliff may grade into the slopes of a hillside located close to the coast. In these cases the cliff is defined as that part of the slope which was formed by processes of coastal erosion, while the cliff top is where there is the distinct break in slope. Both the cliff and the cliff top may be subject to maritime influence in the form of salt spray and exposure to coastal winds. A cliff can ascend in steps with ledges, and the top of the cliff is taken to occur where erosion from wave action is no longer considered to have been a factor in the development of the landform. The cliff base may be marked by a change in gradient at the bottom of the cliff. Where the base is exposed it can be characterised by scree, boulders, a wave-cut platform or sand, among other substrates. During this survey where cliffs occur within the subtidal zone the base was considered to be the high water mark. A cliff is considered to have reached its end point where it is no longer over 5m high (hard cliffs) of 3m high (soft cliffs), or no longer has a steep slope. To be considered in this study, a cliff had to be a minimum of 100m in length. Sea cliffs may support a range of plant communities such as grassland, heath, scrub and bare rock communities, among others.”

Cliffs up to 80m or more dominate the south-west coastline of Inishmore Island. Hard cliffs are the predominant cliff type in this SAC (Browne, 2005; Barron *et al.,* 2011).

These cliffs are also an important breeding site for *C*hough (*Pyrrhocorax pyrrhocorax).*

5.1 Overall Objective

The overall objective for ‘vegetated sea cliffs of the Atlantic and Baltic coasts’ in Inishmore Island SAC is to ‘Maintain favourable conservation condition’. The objective is based on an assessment of the current condition of the 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.

5.2 Area

5.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target is ‘no decrease in extent from the established baseline’. Bearing in mind that coastal systems are naturally dynamic and subject to change even within a season, this target is assessed subject to natural processes, including erosion and succession.

The distribution of vegetated sea cliffs as identified during the Irish Sea Cliff Survey (ISCS) (Barron *et al*., 2011) is shown on a map in Appendix III. The ISCS surveyed one cliff sub-site on Inishmore Island at Onaght.

The Sea cliffs in Inismore Island SAC are of high quality and are an important western example of the habitat.

As cliffs are linear features on maps, their extent is measured in kilometres rather than hectares, as you would with other habitats. During the ISCS (Barron *et al*., 2011), each cliff was divided in to sections based on physical characteristics and vegetation cover. Breaks (i.e. non-cliff areas) of between 80m and 500m along a length of cliff were discounted from the calculations. The total length of cliff sections for the ISCS sub-site Onaght was 17.38km

5.3 Range

5.3.1 Habitat Distribution

The distribution of sea cliffs throughout Inishmore Island SAC as identified by the Irish Sea Cliff Survey is presented in Appendix III. The ISCS surveyed one sub-site at Onaght.

Sea cliffs up to 80m or more dominate the south-west coastline of Inishmore (Browne, 2005; Barron *et al*., 2011). Hard cliff types dominate within the site, which are unlikely to be redistributed through natural processes, unlike more dynamic coastal systems such as sand dunes and saltmarshes.

5.4 Structure and Functions

A fundamental aim of sea cliff conservation is to facilitate some degree of natural mobility through slumping. Sea cliffs can be of geomorphological interest as well as ecological interest and also erosion can expose geological features of interest.

5.4.1 Functionality and hydrological regime

Coastal protection works can disrupt the natural integrity of a sea cliff. The health and ongoing development of vegetated sea cliffs relies on natural processes such as erosion continuing without any impingement. This is generally a bigger issue for soft cliffs which require a degree of slumping and erosion to expose bare soil for pioneer species to colonise; otherwise the vegetation is replaced by hardy grasses and scrub of little conservation value can develop. In addition, cliff erosion provides an important sediment source to sites further along the coast (e.g. sand dunes). Preventing erosion at a cliff site can lead to beach starvation at another site.

Flushes can be associated with cliffs in areas where the groundwater seeps out onto the cliff face. This is more usually associated with soft cliffs where these flushes contribute to the natural instability of the ground and provide patches of wetland habitat.

Hydrological features such as freshwater seep were identified by the ISCS as occurring at Onaght (Barron *et al*., 2011).

The target is to maintain, or where necessary restore, the natural geomorphological processes without any physical obstructions, and the local hydrological regime including groundwater quality.

5.4.2 Vegetation structure: zonation

Ecological variation in this habitat type depends on a number of physical and biological factors, in particular climate, degree of exposure to sea-spray, geology and soil type, as well as the level of grazing and seabird activity. The rocky cliff flora often grades naturally into coastal heath vegetation and maritime grassland.

Adjacent habitats to the sea cliffs at Onaght include exposed rock, semi-natural grassland and littoral rock (Barron *et al.,* 2009)

Internal habitats on the cliffs at Onaght include exposed rock and semi-natural grassland and two zones were identified during field survey by the ISCS, crevice ledge and splash zone.

The target is to maintain the sea cliff habitat, as well as transitional zones, including those to terrestrial communities.

5.4.3 Vegetation structure: vegetation height

A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. Grazing increases the species diversity and is particularly important for maritime grasslands and coastal heath, which are often associated with sea cliffs. The target is to maintain the structural variation in the sward height.

5.4.4 Vegetation composition: typical species & sub-communities

Different sea cliff communities develop in a number of habitat zones related to the degree of maritime influence (exposure to wind and sea spray), geology and soil type. In general, Irish sea cliffs display a range of zones running in a series of horizontal bands up the cliff face, each of which has its own distinct sub-communities including:

- Splash zone
- Pioneer zone
- Rock crevice/cliff ledge zone

- Maritime grassland zone
- Maritime heath zone
- Maritime slope flush zone

There is considerable variation but the general pattern would be that the maritime influence is strongest near the base of the cliff and becomes gradually less dominant towards the cliff top. At the cliff base, vegetation is naturally very open and the species present have a high tolerance to salinity. The splash zone generally has a well-developed lichen flora dominated by species such as *Verrucaria maura*, *Ramalina* spp. and *Xanthoria* spp. These plant communities are dependent on rock crevices for rooting. Moving up the cliff, between the splash zone and the cliff top, vegetation on the cliff ledges is less open and can support some species which are not exclusively associated with coastal conditions. Closer to the cliff top maritime grasslands can occur. The plant communities and physical characteristics of maritime grasslands vary depending on the degree of exposure and whether or not grazing is a factor. Plant communities typical of sea birds and maritime therophyte communities are exceptions to this horizontal zonation and can occur as a mosaic with the other plant communities. The following tables presents lists of species that are considered typical of the different zones associated with soft cliffs and hard cliffs by Barron *et al*. (2011), such as those found in Onaght at Inishmore Island.

Typical pioneer slope species on soft cliffs		
Agrostis stolonifera *Daucus carota*	*Equisetum spp.* *Lotus corniculatus*	*Tussilago farfara*
Flush on soft cliffs		
Equisetum spp.	*Orchid species*	*Schoenus nigricans*
Coastal heath		
Calluna vulgaris *Daboecia cantabrica* *Empetrum nigrum*	*Erica cinerea* *Erica tetralix* *Scilla verna*	*Ulex gallii* *Vaccinium myrtillus*
Coastal grassland on soft cliffs		
Agrostis stolonifera *Anthyllis vulneraria* *Arrhenatherum elatius*	*Dactylis glomerata* *Daucus carota* *Elytrigia repens*	*Festuca rubra* *Lotus corniculatus* *Tussilago farfara*

Typical splash zone species on hard cliffs		
Ramalina spp	*Verrucaria maura*	*Xanthoria spp*

Typical crevice and ledge species on hard cliffs		
Anthyllis vulneraria	*Asplenium marinum*	*Armeria maritima*
Aster tripolium	*Atriplex prostrata*	*Beta vulgaris ssp. maritima*
Catapodium marinum	*Cerastium diffusum*	*Crithmum maritimum*
Festuca rubra	*Inula crithmoides*	*Lavatera arborea*
Ligusticum scoticum	*Limonium sp*	*Plantago coronopus*
Plantago maritima	*Sedum anglicum*	*Sedum rosea*
Silene uniflora	*Spergularia rupicola*	

Typical coastal heath species		
Calluna vulgaris	*Daboecia cantabrica*	*Empetrum nigrum*
Erica cinerea	*Erica tetralix*	*Scilla verna*
Ulex gallii	*Vaccinium myrtillus*	

Typical maritime grassland species on hard cliffs		
Anthyllis vulneraria	*Armeria maritima*	*Crithmum maritimum*
Daucus carota	*Festuca rubra*	*Hyacinthoides non-scripta*
Plantago coronopus	*Plantago maritima*	*Scilla verna*
Sedum anglicum	*Silene uniflora*	*Spergularia rupicola*

On Onaght, two zones were identified during field survey by the ISCS, crevice ledge and splash zone. Within the crevice ledge, the following species were recorded frequently, *Festuca rubra/ovina, Hypochaeris radicata, Armeria maritima, Aster tripololium, Cochlearia officinalis, Spergulalria rupicola*. Within the splash zone, the lichen *Verrucaria* species was dominant.

The target for this attribute is to ensure that the typical flora of vegetated sea cliffs is maintained, as are the range of sub-communities within the different zones.

5.4.5 Vegetation composition: negative indicator species

Negative indicator species can include non-native species (e.g. *Hebe* sp.,*Carpobrotus edulis, Gunnera tinctoria*), species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered to be typical of the habitat (e.g. *Pteridium aquilinum*).

The target for this attribute is that negative indicator species (including non-native species) should make up less than 5% of the vegetation cover.

5.4.6 Vegetation composition: bracken and woody species

Encroachment of bracken (*Pteridium aquilinum*) and woody/scrub species on cliffs, particularly the maritime grasslands and coastal heath leads to a reduction in species diversity.

The target for this attribute is that in the case of maritime grassland and/or heath, bracken should make up less than 10% of the vegetation cover, while woody species should make up no more than 20% of the vegetation cover.

6 References

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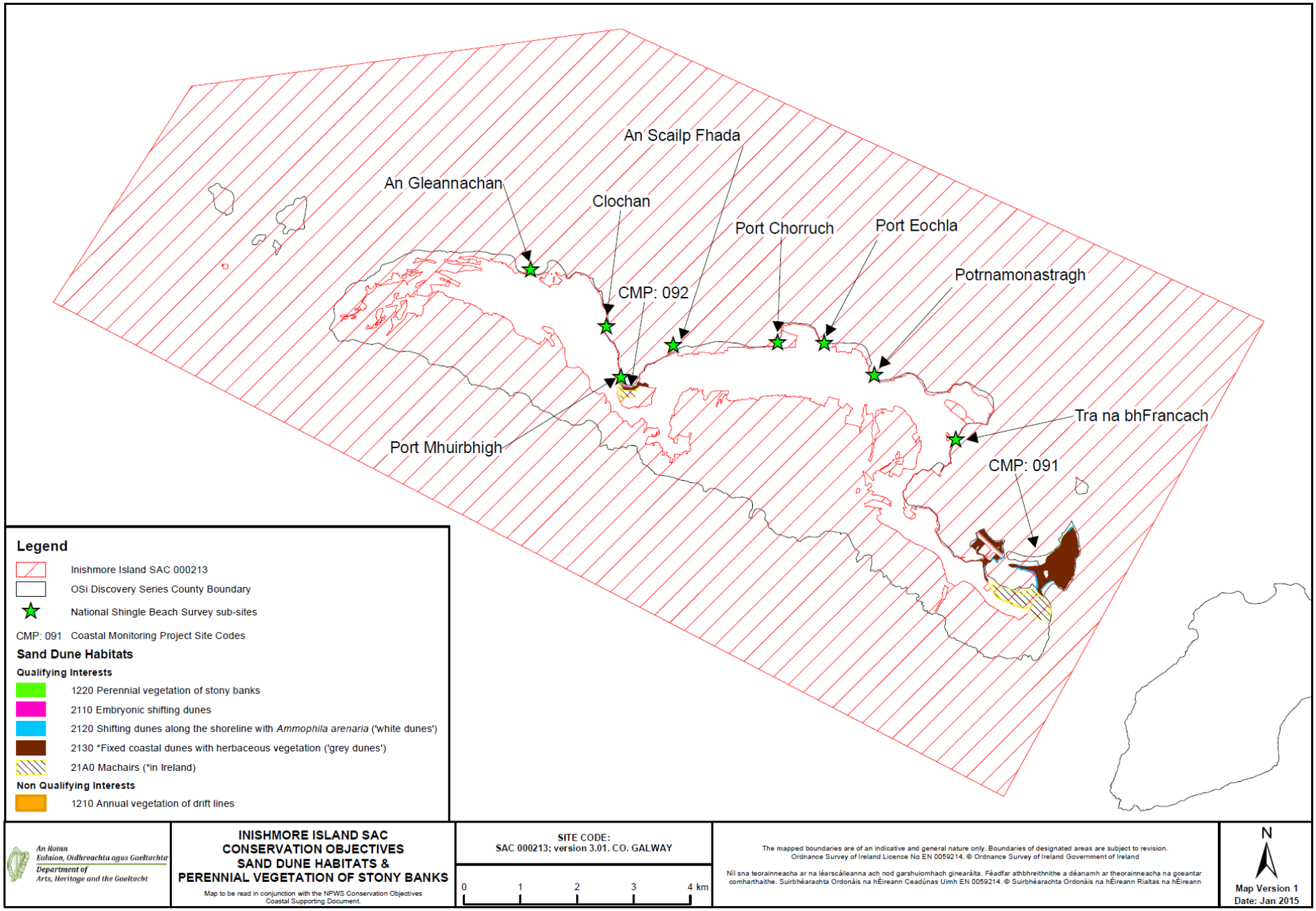
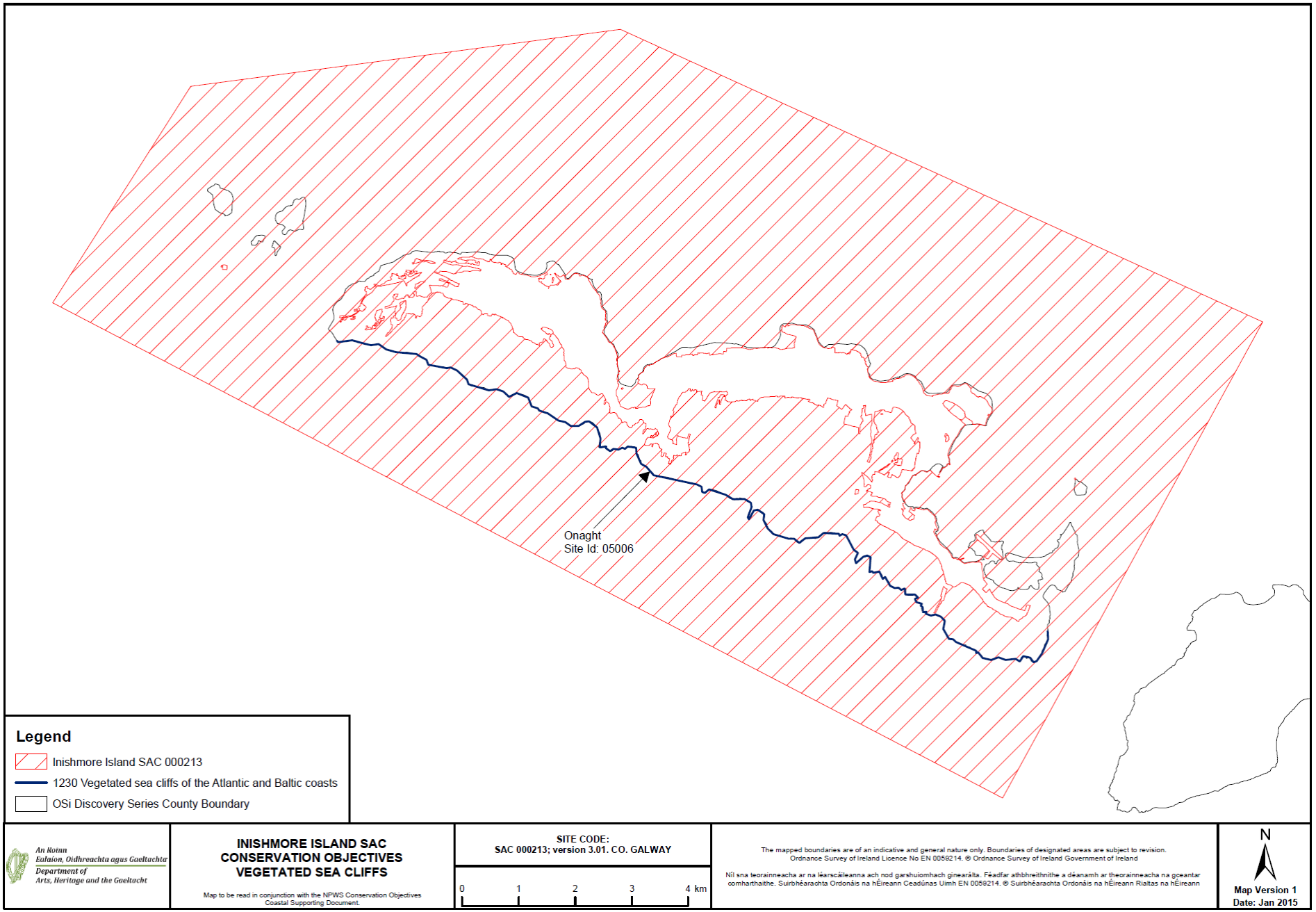
Appendix I: Distribution map of shingle sites and sand dune habitats within Inishmore Island SAC**.**



Appendix II – Distribution map of sea cliff habitats within Inishmore Island SAC



Appendix III– Eararna site report and habitat map from the CMP (Ryle *et al*., 2009)

SITE DETAILS

CMP06 site name: **Eararna** CMP06 site code: **091** CMP Map No.: **89**

County: **Galway** Discovery map: **51** Grid Reference: **L 072 900**

6 inch Map No.: **Ga 111 & 119**

Aerial photographs (2000 series): **O 03734A,B,C,D**

NPWS Site Name: **Inishmore Island**

NPWS designation: pNHA: **213** cSAC: **213**

Ranger Area**: Galway**

MPSU Plan**: Draft II-Consultation**

Report Author**: Anne Murray**

SITE DESCRIPTION

Eararna is located in the east of Inishmore cSAC at Gregory's Sound. Inishmore is the largest of the three Aran Islands, which are situated off the western coast at the mouth of Galway Bay. It is designated for the priority EU Annex I habitats - Fixed dunes and Machair along with other sand dune Annex I habitats including, Dunes with *Salix repens*, Dune slack, Mobile dunes, Embryonic dunes and Perennial vegetation of stony banks. Other EU Annex I priority habitats for which the site is designated include: Limestone pavement, Orchid rich calcareous grassland and Lagoon.

The Red Data Book species – *Orchis apifera* (Bee Orchid) and the rare and protected plants *Viola hirta* (Hairy violet) and *Astragalus danicus* (Purple milk vetch) have been recorded in the fixed dune and machair at Eararna. The latter species is confined to Inishmore and Inishmaan, in Ireland. These rare species are considered *Indicators of local distinctiveness* at this site.

Table 91A Areas of EU Annex I habitats mapped at Eararna

EU Code	EU Habitat	Area (ha)
H1210	Annual vegetation of driftlines	0.267
H1220	Perennial vegetation of stony banks	0.416
H2110	Embryonic shifting dunes	0.101
H2120	Shifting dunes along the shoreline with *Ammophila arenaria*	1.646
H2130	Fixed coastal dunes with herbaceous vegetation	58.106
H21A0	Machair	33.012
	Total Sand dune	**93.548**

The EU Annex I sand dune habitats recorded at Eararna during this project include; Machair, Fixed dunes, Mobile dunes, Annual vegetation of driftlines and Perennial vegetation of stony banks. The fixed dune habitat occurs in a mosaic with limestone pavement.

The presence of an airstrip on Inishmore has reduced the extent of the sand dune/machair habitat and a shift in focus from agricultural activities to tourism has resulted in a reduction of grazing, mainly in the fixed dune area. The machair area is generally very tightly grazed.

The total area of sand dune and machair habitat at Eararna is 93.5ha (Table 91A).

Machair (H21A0)

Machair habitat was noted for this part of the cSAC on the gross habitat map (MPSU) and the Biomar Survey of Irish Machair Sites (Crawford *et al*., 1996).

Machair was identified at Eararna in an area known as Na Muirbhigh, south of An Trá Mhór, during the survey. This area is highly representative of machair in terms of vegetation, flora and topography. This is based on visual assessment of a) the presence of sandy substrate, b) species composition and c) flat/level topography. However, machair is indicated on the MPSU map as extending from Na Muirbhigh as far as the headland northwest of An Trá Mhór. This part of the site has been altered by the presence of the airport. Fixed dune habitat was recorded on the headland during this survey.

Na Muirbhigh machair occurs in close association with fixed dunes and it is flanked by mobile dunes along its seaward edge to the north. The landward edge of the machair is delineated by the main road of Eararna. The machair contains a low diversity of typical species rich in mosses and lichens. There is very little agricultural improvement of the machair within the cSAC. It is grazed by cattle and rabbits and is overgrazed in places. Both overgrazing and burrowing by rabbits are contributing to erosion of the machair. The total machair area comprises 33ha.

Typical machair species diversity is low and it is likely that this is due to overgrazing. Those recorded at Eararna include: *Bellis perennis* (Daisy), *Carex arenaria* (Sand sedge), *Euphrasia officinalis* agg. (Eyebright), *Galium verum* (Lady's bedstraw), *Linum catharticum* (Fairy flax), *Lotus corniculatus* (Bird's foot trefoil), *Pilosella officinarum* (Mouse-ear hawkweed),

Plantago lanceolata (Ribwort plantain), *Prunella vulgaris* (Selfheal), *Trifolium repens* (White clover) and *Viola tricolor* subsp.*curtisii* (Wild pansy).

The orchid, *Spiranthes spiralis* (Autumn lady's-tresses) and the parasitic plant - *Cuscuta epithymum* (Dodder) also occur on the machair along with *Agrostis stolonifera* (Creeping bent), *Anagallis arvensis* (Scarlet pimpernel), *Asperula cynanchica* (Squinancywort), *Festuca rubra* (Red fescue), *Hypochaeris radicata* (Cat's ear), *Taraxacum* agg. (Dandelion) *Luzula campestris* (Field wood-rush), *Polygala vulgaris* (Common milkwort) and *Medicago lupilina* (Black medick).

Moss cover is very high with the following species occurring throughout the machair- *Climacium dendroides, Homalothecium lutescens, Hylocomium splendens, Hypnum cupressiforme, Rhytidiadelphus squarrosus, Scleropodium purum* and *Tortula ruraliformis.* The lichens *Peltigera* spp. and *Cladonia* spp. are also abundant.

The rare and protected species *Astragalus danicus* (Purple milk vetch) was recorded throughout the machair. This is noted as an *Indicator of local distinctiveness* for this site.

The negative indicator species *Senecio jacobaea* (Common ragwort) occurs on the machair but is rare.

Fixed Dunes (H2130)

The priority habitat fixed dune covers just over 58ha of the total sand dune habitat at Eararna (Table 91A). The fixed dune occurs over limestone at Barr na Coise on the rocky headland east of An Trá Mhór, it also occurs along the spit at An Trá Mhór and over a low rock headland to the northwest of An Trá Mhór.

Barr na Coise

The fixed dune at Barr na Coise (east of An Trá Mhór) contains a high diversity of typical species and it occurs in a mosaic with limestone pavement. The cover of limestone pavement is approximately 20% of the total area here. The area has been grazed in the past but is currently lightly grazed. A very large blowout has developed in the southern part of the fixed dunes. The blowout was mapped during this survey and its area, when compared to the 2000 aerial photograph, appears to have decreased. This may be, in some small part, due to the

reduced disturbance as a result of lower grazing levels at this part of the site. However, this area is also naturally highly dynamic and dramatic shifts in the sand dune structure and composition have been recorded in the past, over periods of time as brief as one year (NHA files).

A narrow band of sand stretches across the mouth of An Trá Mhór and fixed dune (semi-fixed) has developed on the more stable central section. Mobile dune edges the inner part of the spit and Annual strandline vegetation edges the seaward side.

The species diversity is high on the fixed dunes at Barr na Coise with plenty of typical species including: *Anthyllis vulneraria* (Kidney vetch), *Carex arenaria* (Sand sedge), *Campanula rotundifolia* (Harebell), *Cerastium fontanum* (Common mouse-ear), *Daucus carota (*Wild carrot*), Euphrasia officinalis* agg. (Eyebright), *Festuca rubra* (Red fescue), *Galium verum* (Lady's bedstraw), *Hypochaeris radicata* (Cat's ear), *Lotus corniculatus* (Bird's foot trefoil), *Linum catharticum* (Fairy flax), *Plantago lanceolata* (Ribwort plantain), *Rhinanthus minor* (Yellow rattle), *Taraxacum* agg. (Dandelion), *Trifolium repens* (White clover), *Thymus polytrichus* (Wild thyme) and *Viola tricolor* subsp. *curtisii* (Wild pansy). The lichens, *Peltigera* spp., *Cladonia* spp. and mosses *Tortula ruraliformis* and *Calliergonella cuspidata* are also present. The orchids *Anacamptis pyramidalis* (Pyramidal orchid) and *Spiranthes spiralis* (Autumn lady's tresses) are also noted in the fixed dune as well as the rare and protected species *Astragalus danicus* (Purple milk vetch).

Other species present in the fixed dune are: *Anagallis arvensis* (Bog pimpernel), *Ammophila arenaria* (Marram grass), *Asperula cynanchica* (Squinancywort), *Bellis perennis* (Daisy), *Carlina vulgaris* (Carline thistle), *Cuscuta epithymum* (Dodder), *Heracleum sphondylium* (Hogweed), *Leontodon autumnalis* (Autumn hawkbit), *Leontadon saxatilis* (Lesser hawkbit), *Plantago coronopus* (Buck's-horn plantain), *Plantago maritima* (Sea plantain), and the moss - *Homalothecium lutescens.*

The negative indicator species *Senecio jacobaea* (Common ragwort) and *Cirsium arvense* (Creeping thistle) occur throughout the fixed dunes but are rare.

Inishmore airport

The fixed dune to the northwest of An Trá Mhór has been altered and its area reduced by the presence of Inishmore airport, which covers approximately 5ha and is outside of the cSAC,

and a sports pitch that is within the cSAC. The remaining fixed dune habitat has similar, but lower species diversity than at Barr na Coise. Some rabbit grazing is evident but most of the area consists of rank grasses dominated by *Ammophila arenaria* (Marram grass). This area was described as machair in the Conservation Plan (MPSU, undated).

The negative indicator species *Senecio jacobaea* (Common ragwort) is occasional in this part of the site.

Dunes with *Salix repens* **(2170)**

The site is noted for Dunes with *Salix repens* in the NATURA 2000 survey, however this habitat was not noted during this survey. Given the highly dynamic nature of the fixed dune area, this habitat may have been removed in the recent past.

Dune Slacks (H2190)

The site is noted for dune slack in the NATURA 2000 survey, however dune slack was not noted during this survey. Natural processes may have removed the dune slack also.

Mobile Dunes (H2120)

The total mobile dune area is 1.6ha (Table 91A). The mobile dunes extend the length of the sheltered inner edge of the spit at An Trá Mhór. It also fronts the dunes along the beach at Portdeha at Gregory's Sound.

The typical species *Ammophila arenaria* (Marram grass) dominates with other species present – *Euphorbia paralias* (Sea spurge) and *Calystegia soldanella* (Sea bindweed).

The negative indicator species *Cirsium arvense* (Creeping thistle) occurs in the mobile dunes but is not common. There is also evidence of some trampling by cattle and vehicles, it appears to be minor and confined mainly to the neck of the spit.

Embryonic Dunes (H1220)

The site is noted for embryonic dunes in the NATURA 2000 survey, however there is very little embryonic habitat located at Eararna, the total area is 0.1ha (Table 91A). A narrow band occurs in close association with the mobile dunes at An Trá Mhór. The area is dominated by both *Elytrigia juncea* (Sand couch) and *Ammophila arenaria* (Marram grass). Negative indicator species were not recorded in this habitat.

Perennial vegetation of stony banks (H1220)

The perennial shingle vegetation occurs on the cobble along the rocky edge either side of Ceann an Mhada (Dog's Head) just north of Barr na Coise and comprises over 0.4ha in area (Table 91A).

The typical shingle species at this part of the site is *Tripleurospermum maritimum* (Scentless mayweed). Other species present include: *Armeria maritima* (Thrift), *Plantago coronopus* (Buck's-horn plantain), *Plantago maritima* (Sea plantain) and *Sedum acre* (Biting stonecrop).

No negative indicator species were recorded and there are currently no apparent threats to this habitat at Ceann an Mhada.

There are other areas of this habitat on the island. These are not associated with sand dune or machair and are not assessed in this survey. Sea Kale (*Crambe maritima*), a Red Data Book species has been previously recorded in this habitat at other locations within the cSAC.

Annual Strandline (H1210)

The strandline occurs along the seaward edge of the spit that partially encloses An Trá Mhór and also at the tip of Ceann an Mhada. This habitat comprises just under 0.3ha in area (Table 91A). The typical species include: *Atriplex laciniata* (Frosted orache), *Atriplex* spp. (Orache spp.), *Cakile maritima* (Sea rocket) and *Salsola kali* (Prickly saltwort). There were no negative indicator species recorded but grazing of the strandline species is evident.

IMPACTS

The main activities impacting the machair and sand dunes at Eararna are given in Table 91B. The fixed dune at Barr na Coise appears to be largely unaffected by any activities with the exception of grazing (code 140). Grazing is light and is impacting positively on the fixed dunes, resulting in a high diversity of species. However, the grazing regime needs to be maintained as the sward height is high in places. The fixed dune to the northwest of An Trá Mhór is affected by the presence of the airport (code 505) which covers approximately 5ha and is excluded from the site. This has caused fragmentation of the habitat and has reduced the quality of this part of the site. A sports pitch (code 607) is located within the cSAC next to the airport. The area has been flattened and reseeded.

Table 91B Intensity and impact of various activities on sand dune habitats at Eararna

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
H2130	140	B	+1	40	Inside
H21A0	140	B	+1	25	Inside
H21A0	143	A	-1	8	Inside
H21A0	146	A	-1	8	Inside
H2130	505	A	-2	Unknown	Outside
H2130	607	A	-2	2	Inside
H2120	720	B	-1	1	Inside
H21A0	720	C	-1	1	Inisde
H21A0	900	C	0	2	Inside
H2120	900	C	0	Unknown	Inside

[1]EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.
[2] Description of activity codes are found in Appendix 3
[3] Intensity of the influence of an activity is rated as: A= high, B = medium, C = low influence and D = unknown.
[4] Impact is rated as: -2 = irreparable negative influence, -1 = repairable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence
[5] Location of activity: Inside = activities recorded within and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

The entire machair habitat is affected by grazing (code 140) by rabbits and cattle and overgrazing (code 143) is evident in places. Overgrazing causes damage to surface vegetation, destabilisation of the soil surface followed by erosion. The impact of overgrazing is apparent in the low number of typical machair species and the high cover of mosses. The associated activities of overgrazing such as poaching (code 720) and natural erosion (code 900) are also evident at Na Muirbhigh. The numerous rabbit burrows in the machair area are damaging the structure of the habitat and also contributing to erosion of this habitat.

The mobile dunes are impacted by trampling and bike scrambling (code 720). This has compounded the natural erosion affecting the seaward edge of the dunes (code 900).

CONSERVATION STATUS

The conservation assessment of each habitat at Eararna is given in Table 91C. The conservation status of a site is assessed on the current condition of the site and on baseline information.

The main source of baseline information for this site was from the ASI survey, NATURA 2000 report, the most recent Conservation Plan for the site (MPSU, undated) and the Biomar Survey of Irish Machair Sites (Crawford *et al*., 1996). The EU Annex I habitat - Perennial vegetation of stony banks is listed and assessed in the NATURA 2000 form, this habitat was surveyed where it occurred in association with sand dune and machair habitat during this survey.

Machair (H21A0)

The MPSU maps for this site indicate machair habitat at Inish Mór Airport and Na Muirbhigh. Machair has been identified at Na Muirbhigh during this survey, as discussed in the preceding paragraphs. Therefore, the assessment of the extent of machair is based on the extent of Na Muirbhigh machair and is rated as *unfavourable-inadequate* (Table 91C). The machair is impacted from wind erosion and trampling from livestock and burrowing by rabbits in some parts compounds this.

Table 91C Conservation status of Annex I sand dune habitats of the subsites at Eararna

Habitat[1]	EU Conservation Status Assessment				
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**	**Proposed Irish conservation status system[2]**
Machair (H21A0)		Extent, Structure & Functions, Future prospects		**Unfavourable-inadequate**	**Unfavourable-declining**
Fixed Dunes (H2130) **Bar na Coise**	Extent, Structure & Functions, Future prospects			**Favourable**	**Favourable-maintained**
Fixed Dunes (H2130) **Inishmore Airport**		Extent, Future prospects	Structure & Functions	**Unfavourable-bad**	**Partially destroyed**
Mobile Dunes (H2120)	Structure & Functions,	Extent, Future prospects		**Unfavourable-inadequate**	**Unfavourable-declining**
Perennial vegetation of stony banks (H1220)	Extent, Structure & Functions, Future prospects			**Favourable**	**Favourable-maintained**
Annual vegetation of driftlines (H1210)	Extent	Structure & Functions, Future prospects		**Unfavourable-inadequate**	**Unfavourable-declining**

[1] EU Codes as per Interpretation Manual

[2] Ratings are Favourable (Enhanced, Maintained, Recovered, Declining), Unfavourable (Recovering, Unchanged, Declining) and Destroyed (Partially destroyed, Completely destroyed and Unknown)

The conservation status for structure and functions is rated as *excellent* in the NATURA 2000 form as the machair is described as relatively undisturbed with a rich and diverse sward. Four relevés were placed in the machair during the Biomar Survey of Irish Machair Sites (Crawford *et al.*, 1996). The assessment criteria used for monitoring stops of the current survey were applied to the data contained in each relevé. Two of the relevés failed on typical species, but all passed the overall monitoring stop assessment. Eight monitoring stops were placed in the machair area during this survey and all of these passed (Table 91D). Four of the monitoring stops were located in the vicinity of the four relevés of the Biomar Survey. The results are similar to those of the Biomar Survey. The monitoring stops passed overall, however, three of the monitoring stops failed to pass the attribute of typical species. Generally

the machair is dominated by mosses and lichens. It is very tightly grazed and overgrazing has been noted in the Conservation Plan (MPSU), in the recent past. The structure of the machair is impacted by rabbit burrowing. Currently, the conservation status is considered *unfavourable-inadequate*.

Table 91D Pass/Fail results of monitoring stops for Annex I sand dune habitats at Eararna

	Monitoring stops		
Habitat	**Pass**	**Fail**	**Conservation status**
Machair (H21A0)	8	0	**Unfavourable-inadequate***
Fixed Dunes (H2130)	6	3	**Unfavourable-bad**
Mobile Dunes (H2120)	5	0	**Unfavourable-inadequate**

*The assessment is based on best scientific judgement as the monitoring stops did not reflect the overall condition of the habitat.

The future prospects for this site are considered *unfavourable-inadequate*. The strategies outlined in the Conservation Plan include, the management of livestock grazing and the control of the rabbit population. However, these strategies have not been implemented to date. The rare and protected species *Astragalus danicus* (Purple milk vetch) is common throughout the machair. This is considered an *Indicator of local distinctiveness* for this habitat. Some degree of protection should be provided under the Flora Protection Order 1987 due to the presence of this species (NATURA 2000). The increase in tourism on the island may adversely affect the machair if it is not monitored and controlled. Nevertheless, pressure from tourism is not, at this time, apparent within the machair habitat.

The conservation status of the machair in the NATURA 2000 survey is rated as *excellent*. Currently the overall EU conservation status of the machair is considered *unfavourable-inadequate* (Table 91C). This rating is mainly due to the impact of grazing and rabbit burrowing within the machair. Control of the rabbit population would greatly improve the overall rating.

The Irish conservation status is rated as *unfavourable-unchanged*.

Fixed Dune (H2130)

Barr na Coise

The extent of the fixed dune under the EU conservation status is *favourable*. This is based on a comparison of the extent of the fixed dunes from this survey with that indicated on the

MPSU maps. This part of the site is naturally highly dynamic and there is evidence from previous reports of yearly shifts in the structure and composition of this habitat (NHA files). Therefore, the main impact on the extent of the fixed dunes is natural and is not considered unfavourable.

The structure and function is rated as *favourable*. Four monitoring stops were placed in the fixed dune area (Table 91D) and all of these passed. The sward height is above the threshold in places. This may be partly attributed to the presence of *Ammophila arenaria* (Marram grass) which is a common component throughout the dunes due to the naturally shifting nature of this part of the site. Overall the habitat is functioning well with a rich and diverse flora and human disturbance is very low.

The future prospects of this habitat are *favourable*. The Conservation Plan for the site aims to establish sustainable levels of grazing for the fixed dunes. This, if implemented, would ensure that the fixed dunes are maintained in a favourable condition. The rare and protected species *Astralagus danicus* (Purple milk vetch) is common throughout the fixed dune and its presence should give the habitat some degree of protection under the Flora Protection Order 1987. Currently, no other threats are apparent in this habitat. The constant shifting of the dunes in the south of Barr na Coise is natural and should remain unrestricted.

The overall conservation status of the fixed dune is described as *excellent* in the NATURA 2000 survey. The current overall EU conservation status of the habitat is *favourable* (Table 91C).

Under the Irish scheme, the conservation status for fixed dune at this site is *favourable – maintained*.

Inishmore Airport

The extent of the fixed dunes to the northwest of An Trá Mhór at Inishmore airport is considered *unfavourable-inadequate*. An area (1.7ha) of fixed dune habitat within the cSAC has been levelled and reseeded in order to develop a sports pitch. There are some kitchen gardens occupying a small part of this area also but these appear to be established a long time.

The structure and functions is rated as *unfavourable-bad*. Four stops were placed in the fixed dunes and three of these failed. The attributes that failed to reach their targets in various stops

are typical species, flowering and fruiting, sward height, and negative indicator species. The fixed dune shows signs of human disturbance and is fragmented due to the presence of the airport.

The future prospects of this part of the site are considered *unfavourable-inadequate*. This part of the site is located at the main access point onto the island and is under the on-going threat of development for recreational facilities.

The overall conservation status is not described in the NATURA 2000 survey, as fixed dune was not identified at this part of the site. The overall conservation status is currently considered *unfavourable-bad.* This is mainly attributed to the poor quality of the habitat due to human disturbance. The Irish conservation status is rated as *unfavourable-declining*.

Mobile Dunes (H2120)

The extent of the mobile dunes is considered *unfavourable-inadequate.* The MPSU map does not differentiate the mobile habitat from the other sand dune habitats at Eararna. However, the mobile habitat is indicated on the Machair maps (Crawford *et al*., 1996) and comparisons with the current survey indicate that the extent of the mobile habitat appears to have changed at the tip and seaward edge of the spit. Amenity and leisure activities, especially scrambling and trampling, have been listed as the main reason for loss of this habitat (NATURA 2000). This has compounded natural erosion occurring on the seaward edge. At present, the mobile habitat is confined to the inner edge of the spit that partially encloses the sand flats at An Trá Mhór.

Five monitoring stops were placed in the mobile dunes (Table 91D). All of the monitoring stops passed, however there is evidence of trampling through the mobile dunes at the main access route to An Trá Mhór. The structure and functions parameter is given a *unfavourable-inadequte* conservation status based on best scientific judgement.

Increases in tourism on the island are predicted in the Conservation Plan for Inishmore (MPSU). However, no strategies to protect and conserve the condition of this habitat have been included in the plan. The loss of extent as a result of increased tourism and amenity use of the site is identified in the NATURA 2000 form and in this current survey. Until these issues are addressed the future prospects of the mobile dunes are considered *unfavourable-inadequate.*

The conservation status is rated as *good* in the NATURA 2000 form. The mobile dunes are currently regarded as *unfavourable-inadequate* under the overall EU conservation status and *unfavourable-declining* under the Irish conservation status system (Table 91C). This unfavourable rating is due to some loss of extent caused by negative impacts from human pressures.

Embryonic Dunes (H1220)

The site is noted for embryonic dunes in the NATURA 2000 survey, however the area of embryonic habitat located at Eararna is very limited, the total area is 0.1ha (Table 91A). Therefore, there is no conservation assessment of this habitat.

Perennial vegetation of stony banks (H1220)

An estimated total area of 24ha of Perennial vegetation of stony banks is given in the NATURA notes. This is considered an overestimation and includes areas of this habitat throughout the cSAC not directly associated with sand dune and machair. Currently, the habitat appears to be undisturbed and no damaging activities have been noted in the NATURA 2000 form or in this survey. The extent of this habitat is rated as *favourable*.

No monitoring stops were placed in this habitat given its limited extent. Based on an overall visual assessment of this habitat and presence/absence of typical species, the conservation status of the structure and functions is rated as *favourable*.

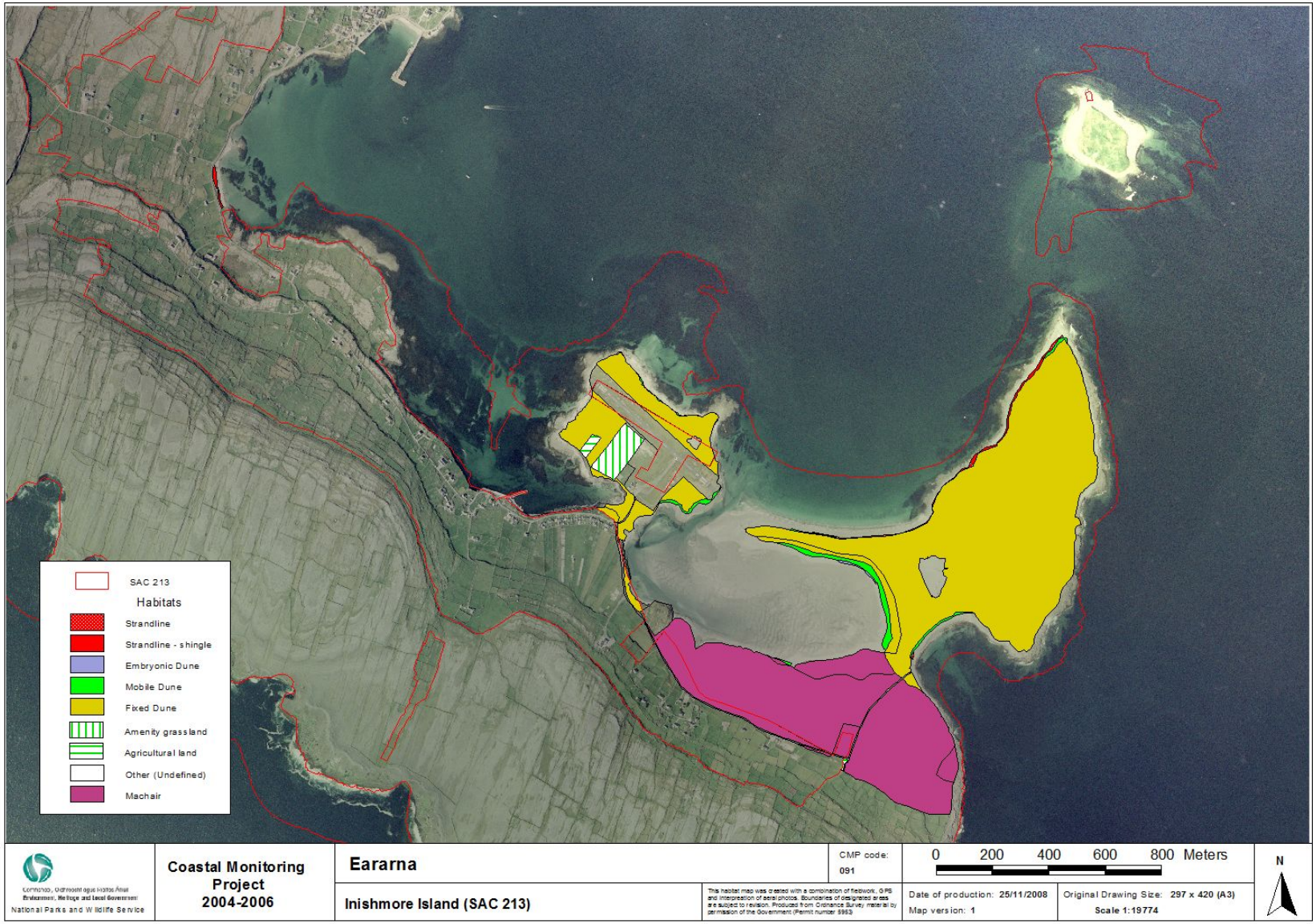
Future prospects are also considered *favourable* as there appears to be no threats to this habitat. Therefore, this area currently requires no intervention in terms of conservation management.

The conservation status for Perennial vegetation of stony banks in the NATURA 2000 form is considered *excellent*. The overall EU conservation status is currently regarded as *favourable* and the Irish conservation status is *favourable-maintained* (Table 91C).

Annual Strandline (H1210)

Annual vegetation of strandlines edges the seaward edge of the band of sand that partially encloses An Trá Mhór. Given the limited area of this habitat, the conservation status assessment is based on scientific judgement. The extent is considered *favourable*. The parameters of structure and function and future prospects are rated as *unfavourable-*

inadequate as the strandline vegetation is grazed which limits the opportunity for these annual plants to seed. Therefore, the overall EU conservation status of this habitat is rated as *unfavourable-inadequate*. The Irish conservation status is rated as *unfavourable-declining*.


SAC 213
Habitats
Strandline
Strandline - shingle
Embryonic Dune
Mobile Dune
Fixed Dune
Amenity grassland
Agricultural land
Other (Undefined)
Machair
Coastal Monitoring Project 2004-2006
Eararna
Inishmore Island (SAC 213)
CMP code: 091
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Date of production: 25/11/2008
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:19774
National Parks and Wildlife Service

Appendix IV– Portmurvy site report and habitat map from the CMP (Ryle *et al*., 2009)

SITE DETAILS

CMP06 site name: **Portmurvy** CMP06 site code: **092** CMP Map No.: **90**

County: **Galway** Discovery map: **51** Grid Reference: **L 083 105**

6 inch Map No.: **Ga 110**

Aerial photographs (2000 series): **O 3675-B**

NPWS Site Name: **Inishmore Island**

NPWS designation: pNHA: **213** cSAC: **213** (outside current boundary)

Other designation: **Blue Flag Beach** (**Cill Mhuirbthigh)**

Ranger Area: **Galway**

MPSU Plan: **Draft 2 – Consultation (Old Format)**

Report Author: **Tim Ryle**

SITE DESCRIPTION

Portmurvy is one of two sand dune sites found on Inishmor, Eararna (CMP site 91) being the other. It is a small beach, located on the northern shore of the Island, approximately 2.5 kilometres south-east of the promontory fort of Dun Aongusa. The beach material is largely coarse, derived from the slate and limestone geology, which is part of the Burren complex. Strandline and foredune vegetation are noted at the front of a man-made sea wall that stretches along most of the beach. Flat, outcropping limestone pavement is present towards the northern end of the beach.

The blue flag beach is popular with locals and visitors alike, as it is one of only two sandy beaches on the Inishmor. It is also sheltered and facilities include the provision of toilets and a life-guard station that is operational during the summer months only. While the strand is heavily used, the use of the surrounding land is low by mainland standards, as it comprises mainly small private fields.

Much of Inishmor is designated as a candidate Special Area of Conservation (cSAC 213), due to the range of Annex I habitats including a large number of priority habitats including Limestone pavement (H8240), Orchid-rich grassland (H6210), Machair (H21A0) and Fixed dunes with herbaceous vegetation (H2130), Lagoon (H1150) and Turloughs (H3180). The small sand dune system at Portmurvy currently lies outside the designation boundary.

Notable plant species that are known to occur or have previously been recorded on or adjacent sandy habitats on Inishmore include *Ophrys apifera* (Bee orchid), *Crambe maritima* (Sea kale), *Viola hirta* (Hairy violet) and *Astralagus danicus* (Purple milk vetch). The last two species are protected under the 1999 Flora Protection Order.

The areas of the sand dune habitats recorded from Portmurvy are listed in Table 92A. Other habitats adjacent to the system include 0.068ha of amenity grassland – the small patch of land around the toilet and 12.443ha of other undefined habitats, which although small patches of sand are present, is considered as calcareous grassland over limestone pavement.

Table 92A Areas of EU Annex I habitats mapped at Portmurvy

EU Code	EU Habitat	Area (ha)
H1220	Perennial vegetation of stony banks	0.143
H2110	Embryonic shifting dunes	0.121
H2130	Fixed coastal dunes with herbaceous vegetation	2.457
H21A0	Machair	5.202
	Total Sand dune	**7.923**
	Developed land	**0.068**
	Potential Sand Dune	**7.991**

Machair (H21A0)

Machair grassland and fen occurs in a depression behind the fixed dunes. The relict machair receives no direct input of fresh sediment and it is now cut off from the strand by man-made structures, and a series of small roads. Much of the surrounding landscape is characterised by low stone walls that are so characteristically abundant on the Aran Islands.

The area of machair is estimated at 5.202ha (Table 92A), however this figure may be revised upon further survey. One of the difficulties is characterising the vegetation and delineating a boundary is the occurrence of similar assemblage of plant species on the sandy grassland and also the calcareous grassland that are found on thin soils on outcropping limestone. Thus a large portion of the undefined habitat (12.443ha) that surrounds the machair grassland is considered calcareous grassland. Pockets of bare sand are a component of the habitat, but the agricultural management and species composition including the orchids may be better classified as calcareous grassland. See also the report of Grasslands Monitoring Project (Dwyer *et al.*, 2007) which visited this site.

Unlike the current beach, which is largely composed of coarse dark sediment derived from limestone, fine sand was an obvious component of the machair soils. It did not appear to be deep although this varied and was also restricted by out-cropping limestone strata.

Much of the machair is grazed as evidenced by several tracks and minor poaching. However, other than the abundance of *Cynosurus cristatus* (Crested dog's tail), the intensity of the grazing would not appear to have had a detrimental impact on the diversity of the grassland and negative indicator species were not common. Characterised by grasses such as *Festuca rubra* (Red fescue) and *Cynosurus cristatus* (Crested dog's tail) other typical machair species present included *Bellis perennis* (Daisy), *Lotus corniculatus* (Common bird's-foot-trefoil), *Trifolium repens* (White clover), *Plantago lanceolata* (Ribwort plantain), *Galium verum* (Lady's bedstraw) and *Carex arenaria* (Sand sedge).

The majority of the machair is relatively dry as it is found on freely draining, sloped ground. However, a low-lying wet machair area or machair fen is mapped in the south-western corner of the site. Owing to the level of the standing water at the time of survey, the machair fen merged gradually with a small water body that is characterised by rushes and aquatic plants. Species that were more abundant in the damp machair grassland here included *Prunella vulgaris* (Selfheal), *Carex nigra* (Common sedge) and *Hydrocotyle vulgaris* (Marsh pennywort).

Fixed Dunes (H2130)

Occupying an area approximately 2.5ha (Table 92A), the fixed dunes are constrained in their extent owing to the presence of man-made structures. The small isolated patch of dune grassland is showing signs, due to sediment starvation, of maturing and is variable in appearance and management. At one end of the system, a toilet block has been built on the fixed dunes with a small, area of managed grassland surrounding it. At the north-eastern end of the site, large volumes of sand have been extracted for construction purposes. Grazing pressure is negligible with a single horse observed on the day of survey.

Largely characterised by a rank *Ammophila arenaria* (Marram)-dominated sward, small patches of short sward grassland or moss-dominated depressions were also noted. Although a sizeable number of species were recorded from the habitat, the majority are not abundant. Typical species included *Festuca rubra* (Red fescue), *Lotus corniculatus* (Common bird's-foot-trefoil), *Carex arenaria* (Sand sedge), *Cerastium fontanum* (Common mouse-ear),

*Daucus carota (*Wild carrot*), Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Trifolium repens* (White clover), *Euphrasia officinalis* (Eyebright) and *Hypochaeris radicata* (Cat's ear), along with *Linum catharticum* (Fairy flax) and minor patches of *Eryngium maritimum* (Sea holly) scattered along the front of the habitat

Embryonic Dunes (H1220)

The embryonic dunes occupied much of the frontline of the beach at Portmurvy. A steady supply of wind & sea borne gritty sediment is thrown up onto the beach against the seawall. The accumulating sand can rise 1 metre above the meagre strandline vegetation that patchily occurs along its front. Two monitoring stops were carried out in this habitat and both passed on structure and function.

Typically, *Elytrigia juncea* (Sand couch) which varied in extent from 50% to 90% cover dominated the foredunes. Other species that were sporadically recorded throughout, included *Taraxacum officinale* agg. (Dandelion) and *Plantago coronopus* (Buck's-horn plantain). The occurrence of strandline species amongst the foredunes including *Beta vulgaris* ssp. *maritima* (Sea beet) and *Tripleurospermum maritimum* (Sea mayweed) indicate the degree to which fresh sand has built up during the summer months over the strandline vegetation. Negative indicator species were not generally abundant and *Senecio jacobaea* (Common ragwort) and *Senecio vulgaris* (Groundsel) typically accounted for less than 1% of the cover.

Shingle Vegetation (H1220)

This habitat occurs is found occurring on a largely coarse substrate, with only minor amounts of fine sand recorded at the eastern end of the small strand. There is no earlier vegetation descriptions with which to compare with. The vegetation is varied in its distribution and is estimated to occupy 0.143ha (Table 92A). It is widest along the western edge of the strand but it rapidly diminishes eastwards and is subsumed by the embryonic dunes.

The typical species that were recorded include *Tripleurospermum maritimum* (Sea mayweed), *Honckenya peploides* (Sea sandwort), *Beta vulgaris* ssp. *maritima* (Sea beet) with *Elytrigia juncea* (Sand couch) progressively increasing in abundance eastwards along the strand.

IMPACTS

The activities and impacts that were recorded for Portmurvy are listed in Table 92B. Although the site is situated outside the cSAC boundary, the impacts occur within the habitats, as shown in the table.

Given the relative paucity of safe, accessible and sandy beaches on Inishmor, it is not surprising that this blue flag beach is popular with locals, temporary summer residents of the language schools and the many tourists that pass by daily. Despite the large numbers of people using the beach, the recreational impacts are not considered significant and littering (code 790) is not a problem.

Table 92B Intensity and impact of various activities on sand dune habitats at Portmurvy

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
H2130	302	A	-1	1.0	Inside
21BB	500	A	-1	Unknown	Inside
21BB	790	C	0	Unknown	Inside
H1220	871	A	+2	0.143	Inside
H2110	871	A	+2	0.121	Inside
H2130	871	A	-1	Unknown	Inside
21BB	900	B	0	Unknown	Inside

[1]EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.
[2] Description of activity codes are found in Appendix 3
[3] Intensity of the influence of an activity is rated as: A= high, B = medium, C = low influence and D = unknown.
[4] Impact is rated as: -2 = irreparable negative influence, -1 = repairable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence
[5] Location of activity: Inside = activities recorded within and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

Access to the beach is very easy (code 500) and the sand dune system has for a long time been dissected by a series of roads/tracks which are parallel to the beach. Most recreational activity is centred on the beach itself. The construction of the seawall (code 871) is associated with maintaining access to the beach and preventing winter flooding of the machair grassland further inland. Indeed its presence allows considerable volumes of sediment to build up and the successful establishment of a very healthy and relatively wide area of embryonic dunes.

Low intensity agricultural management occurs beyond the roads, mostly in the machair grassland, although horses graze the easterly section of the fixed dune 'island'.

The removal of beach material (code 302) was noted in one field at the eastern end of the site. It is clear that large volumes of sand have been removed, in the past, from this area (either for use by the county council or by locals in the construction of new houses etc.), which is only now starting to become revegetated. The revegetated areas are highly disturbed with a number

of species not normally associated with sand dunes present. Sand extraction is still carried out amongst some island communities, as the costs of importing sand would be prohibitive. It is not a notifiable action (*sensu* NPWS) as the area is outside the cSAC boundary.

Erosion (code 900) is probably negligible in much of the sand dune system, although it is likely that the fixed dunes have suffered from sediment depletion owing to the presence of man-made structures. Natural erosion is a feature among the strandline and frontline embryonic dunes as sediment is redistributed during winter storms.

CONSERVATION STATUS

In general, the conservation status of a sand dune habitat is determined on the extent, structure and function and future prospects of each habitat and where possible baseline information. Although the NPWS has information on the sand dune habitats at Eararna, which is within the cSAC, there is no substantive vegetation description for Portmurvy with which to compare any changes in extent or condition. Thus the condition of the habitats is based on the survey work alone and the results are given in Table 92C.

Table 92C Conservation status of Annex I sand dune habitats at Portmurvy

Habitat[1]	EU Conservation Status Assessment			Overall EU conservation status assessment	Proposed Irish conservation status system[2]
	Favourable	Unfavourable - Inadequate	Unfavourable - Bad		
Machair (H21A0)	Extent / Structure and Functions / Future Prospects			**Favourable**	**Favourable - Maintained**
Fixed Dunes (H2130)	Structure and Functions	Extent / Future Prospects		**Unfavourable - Inadequate**	**Unfavourable - Declining**
Embryonic Dunes (H2110)	Extent / Structure and Functions / Future Prospects			**Favourable**	**Favourable - Maintained**

[1]EU Codes as per Interpretation Manual
[2] Ratings are Favourable (Enhanced, Maintained, Recovered, Declining), Unfavourable (Recovering, Unchanged, Declining) and Destroyed (Partially destroyed, Completely destroyed and Unknown)

Machair (H21A0)

The occurrence of priority machair habitat at Portmurvy, although not extensive, is rated as *favourable* owing to the fact that it is a relatively intact and its inclusion increases the overall extent of the habitat on the Inishmor.

Both monitoring stops passed on the structure and functions criteria (Table 92D) resulting in a *favourable* assessment (Table 92C). Agricultural management of the land has not greatly influenced species diversity.

The future prospects for the machair are also rated as *favourable* (Table 92C). It is not likely that there will be any great change in agricultural practices, let alone management given the relative small size of the majority of the sandy fields.

Overall, the machair at Portmurvy is given a *favourable* conservation status (Table 92C). The comparable Irish rating for this habitat is *favourable-maintained*, as it is unlikely that there has been any significant change in its condition or extent owing to the constraints on agricultural intensification owing to the size of the fields.

The conservation value of the habitat is further increased by the fact that there is a gradual transition to another priority habitat orchid-rich calcareous grassland (H6210). See also the report of the grassland survey of a number of sites around Ireland (Dwyer *et al*. 2007).

Table 92D Pass/Fail results of monitoring stops for Annex I sand dune habitats at Portmurvy

	Monitoring stops		
Habitat	**Pass**	**Fail**	**Conservation status**
Machair (H21A0)	2	0	**Favourable**
Fixed Dunes (H2130)	2	0	**Favourable**
Embryonic Dunes (H2110)	2	0	**Favourable**

Fixed Dunes (H2130)

The fixed dunes are limited in extent at Portmurvy and highly constrained by man-made structures. The small narrow area of fixed dune is elevated between 1 and 2 metres above the level of the beach. This is further compounded as it is fronted by a man-made stonewall and a narrow access road which further separates the habitat from a steady sediment supply. For this reason their extent is rated as *unfavourable-inadequate* (Table 92C).

Both monitoring stops passed on structure and functions (Table 92D) which would suggest a *favourable* rating. However, both stops differed somewhat in species composition, which reflects the management regime. However, given the limited extent of the habitat, the rating remains as favourable (Table 92C).

Given the relative paucity of the habitat and the unlikely change in the management regime, coupled with the maturing nature of the vegetation the future prospects of the habitat warrants a rating of *unfavourable-inadequate* (Table 92C).

Overall, the conservation status of the fixed dunes is *unfavourable-inadequate*, for reasons that the habitat is not extensive, is disturbed at one end through the provision of toilets while it is rank and maturing at the other (Table 92C). The comparable Irish rating for this habitat is *declining*.

Embryonic Dunes (H2110)

Given the relative size of the beach and the degree to which coarse sediment has accumulated at the front of the sea wall, the extent of this habitat is *favourable* (Table 92C).

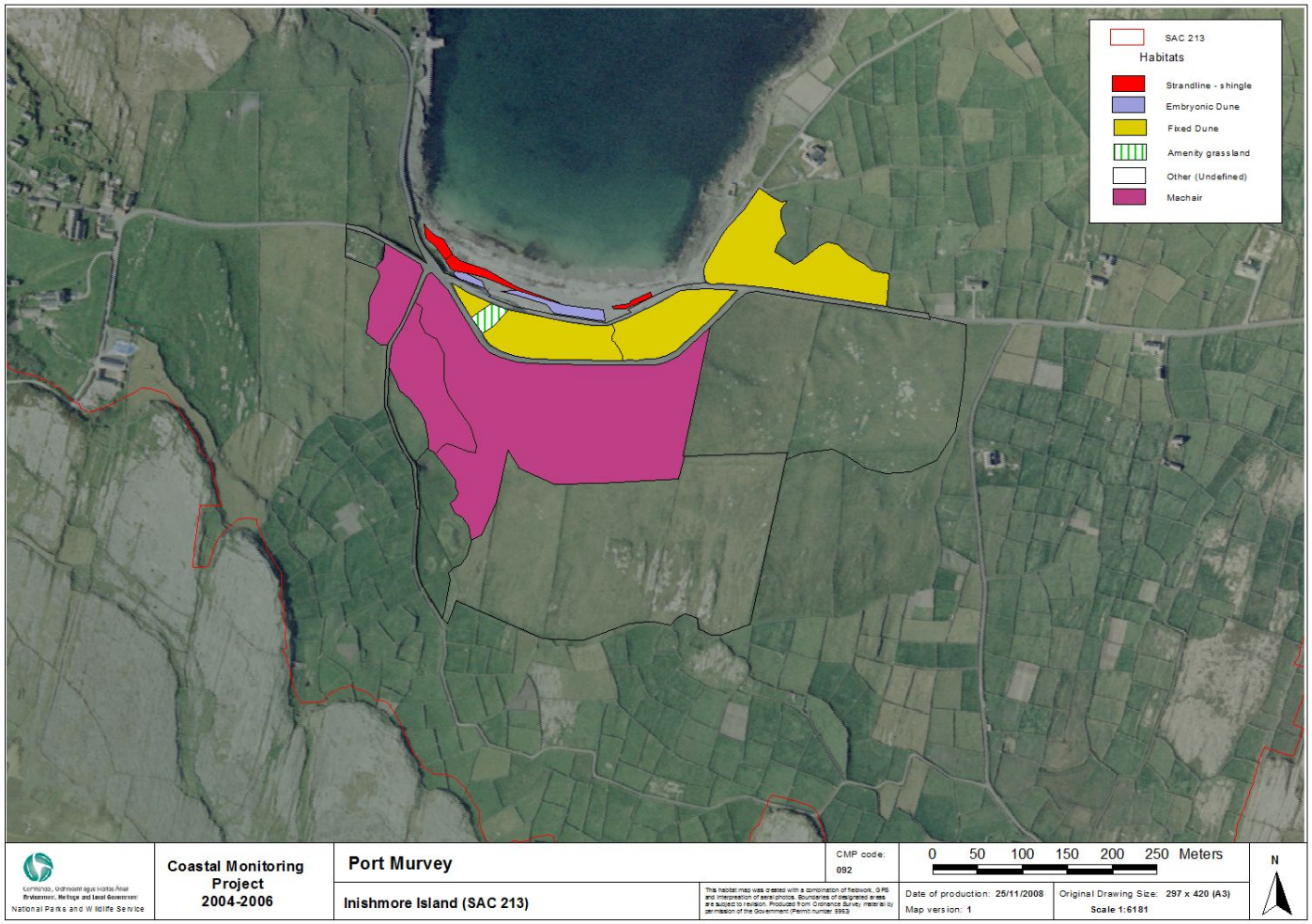
The structure and functions of the embryonic dunes are rated as *favourable* (Table 92C). Two monitoring stops were carried out in the habitat, with both satisfying the target criteria (Table 92D).

The future prospects of the foredunes are rated as *favourable* (Table 92C). Other than winter storms and the natural redistribution of sediment, it is not foreseen that any major change will occur in the extent of the foredunes.

The condition and extent of the embryonic dunes warrants an overall *favourable* conservation status, which under the proposed Irish conservation assessment scheme tentatively corresponds to *favourable-maintained* (Table 92C), although there is no previous information to compare changes.

Strandline

No assessment is given for either annual or perennial strandline vegetation on the basis that it has been subsumed by accumulating sand and replaced by embryonic habitat at the time of survey.


SAC 213
Habitats
Strandline - shingle
Embryonic Dune
Fixed Dune
Amenity grassland
Other (Undefined)
Machair
Coastal Monitoring Project 2004-2006
Port Murvey
Inishmore Island (SAC 213)
CMP code: 092
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 6953)
0 50 100 150 200 250 Meters
Date of production: 25/11/2008
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:6181
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National Parks and Wildlife Service