

**No. 100**  
**NATIONAL SAND DUNE VEGETATION SURVEY**  
**SITE REPORT NO. 50**  
**HILLEND, LLANGENNITH, BROUGHTON**  
**DELVID AND HILLS BURROWS**  
**1989**

**T C DARGIE**

Contract HF3-03-434

Nominated Officer: G. Radley, CSD

Further copies of this report can be obtained from  
Periodicals Section, Information and Library Services,  
Nature Conservancy Council, Northminster House,  
Peterborough PE1 1UA

Copyright NCC 1990

ISSN 0952-4355

## NCC COASTAL ECOLOGY RESEARCH PROGRAMME

The Coastal Ecology Branch of the Chief Scientist Directorate was established in August 1979. One of the functions of the branch is to co-ordinate a programme of research and survey in the field of terrestrial coastal conservation. To this end a research programme has been developed with four main aims:

1. To describe the size, location and quality of the main coastal habitats in Great Britain (saltmarshes, sand-dunes, vegetated shingle, sea cliffs, strandlines, 'reclaimed' land and maritime islands).
2. To assess the impact of major development projects on sites of national importance for nature conservation.
3. To provide guidance on the management of the main coastal habitats for nature conservation.
4. To investigate the role of physical and biological processes in the maintenance of natural and semi-natural coastal habitats.

The results are disseminated in a variety of Nature Conservancy Council publications.

- a. *CSD Contract reports*: limited numbers with specialist interest are produced. Copies are usually prepared by the contractor and made available as a Chief Scientist Directorate Report in microfiche through the Nature Conservancy Council's Information and Library Services.
- b. *Contract survey reports*
- c. *Research and survey in nature conservation*
- d. *Focus on nature conservation*

If you would like any further information on this report or on the research programme please contact Dr Doody in Peterborough.

Dr Pat Doody  
Coastal Ecologist  
NCC (GBHQ)  
Peterborough

## CONTENTS

|                                                                                | Page  |
|--------------------------------------------------------------------------------|-------|
| 1. BACKGROUND AND OBJECTIVES                                                   | 1     |
| 2. METHODS                                                                     | 2     |
| 3. SITE DESCRIPTION                                                            | 2     |
| 4. VEGETATION OF HILLEND - LLANGENNITH -<br>BROUGHTON - DELVID - HILLS BURROWS | 5     |
| 5. RARE PLANTS                                                                 | 8     |
| 6. SITE ASSESSMENT                                                             | 8     |
| 7. COMMENTS AND SUGGESTIONS                                                    | 8     |
| <br>ANNEX 1 METHODS                                                            | <br>9 |
| ANNEX 2 SITE RECORDING FORM                                                    | 14    |
| ANNEX 3 VEGETATION TYPES                                                       | 15    |
| ANNEX 4 QUADRAT MEMBERSHIP OF<br>VEGETATION TYPES                              | 25    |
| ANNEX 5 FLORISTIC DETAILS OF<br>VEGETATION TYPES                               | 26    |
| ANNEX 6 TARGET NOTES                                                           | 31    |
| ANNEX 7 QUADRAT DATA                                                           | 32    |
| ANNEX 8 AREAS OF VEGETATION TYPES                                              | 34    |

There is no site bibliography - no major previous vegetation survey exists for this site.

## 1. BACKGROUND AND OBJECTIVES

The dunes between Hillend and Hills Tor Burrows were surveyed as part of the Sand Dune Survey of Great Britain. This project is one of a series of strategic surveys of coastal habitats currently being undertaken by the Nature Conservancy Council. The Survey has two aims:

- i. To produce a vegetation map and description for each sand dune system which will be useful to those involved directly in its conservation;
- ii. To produce a national inventory of the range and extent of sand dune habitats in Great Britain. Such an inventory will then allow the interest of any particular site or group of sites to be placed in its national context.

This contract (HF3-03-434) involved a survey of dunes in South Wales. The specification involved the production of a vegetation map(s) and a botanical survey report for **each** of the following sites or site sets:

- i. Pembrey Coast
- ii. Whiteford Burrows
- iii. Hillend-Llangennith-Broughton-Delvid-Hills Tor Burrows
- iv. Port-Eynon to Horton
- v. Oxwich-Nicholaston-Penmaen-Pennard Burrows
- vi. Black Pill to Bryn Mill
- vii. Crymlyn Burrows

This document is one of the above site reports. In addition, the overall information is synthesized in a Regional Report which reviews the following points: dune distribution, type, size, vegetation communities and relationships, management and special characteristics. This report should be read in conjunction with the regional document if the dunes between Hillend and Hills Tor Burrows are to be considered in a broader geographical and ecological context.

## 2. METHODS

The dunes between Hillend and Hills Tor Burrows were surveyed using the standard techniques of the Sand Dune Survey of Great Britain. Collecting data in a consistent manner will thus enable valid comparisons to be made between sites on a national basis.

The field survey technique and subsequent analysis of the data were carried out using methods similar to those of the National Vegetation Classification (NVC).

Further details of the field techniques, data analysis and vegetation mapping are included in Annex 1. The quadrat data set (in coded format) is presented in Annex 7. Quadrat membership of vegetation types is given in Annex 4.

## 3. SITE DESCRIPTION

### Location, conservation status and land ownership

The dunes between Hillend and Hills Tor Burrows are located in the northwest of the Gower Peninsula, immediately east of the tidal island of Burry Holms (Fig. 1). Part of the dune system is an SSSI (Broughton Bay SSSI, 9.2 ha) designated 13 November 1987 for its geomorphological deposits demonstrating environmental conditions in South Wales during the Late Pleistocene.

Ownership of the dunes is in various hands and permission for access was sought from Mr EE Rees, Hillend Farm, Llangennith.

### Geomorphology

Dune sand is derived from Devensian till and outwash materials deposited in the area by piedmont glaciers fed from valleys and high ground further east. Submerged offshore shingle bars were probably created by a rising Flandrian sea level and these migrated landward. A slight fall in sea level and tidal exposure then probably led to coverage by sand which was then vegetated.

When close to shore these barrier beaches created poorly-drained depressions to landward which probably contained alder carr woodland on peat. Outer organic deposits were probably overrun by sand once the beaches reached shore. The deposits of Llangennith Moors and southeast of Delvid Burrows may represent depression sediments. Water from Llangennith Moors is carried by stream to the sea and passes through the dune front in an artificially maintained channel at Diles Lake 1 km from Hillend Farm. Storm conditions between the 14th and 18th century blew considerable quantities of sand inland elsewhere on Gower and in Swansea Bay. Here, it is likely that the sand on Carboniferous Limestone between Burry Holms and Broughton Bay was deposited at this time.

Overall, the dunes between Hillend and Hills Burrows represent bay dune systems with some further sand deposition against and on adjacent hill land.

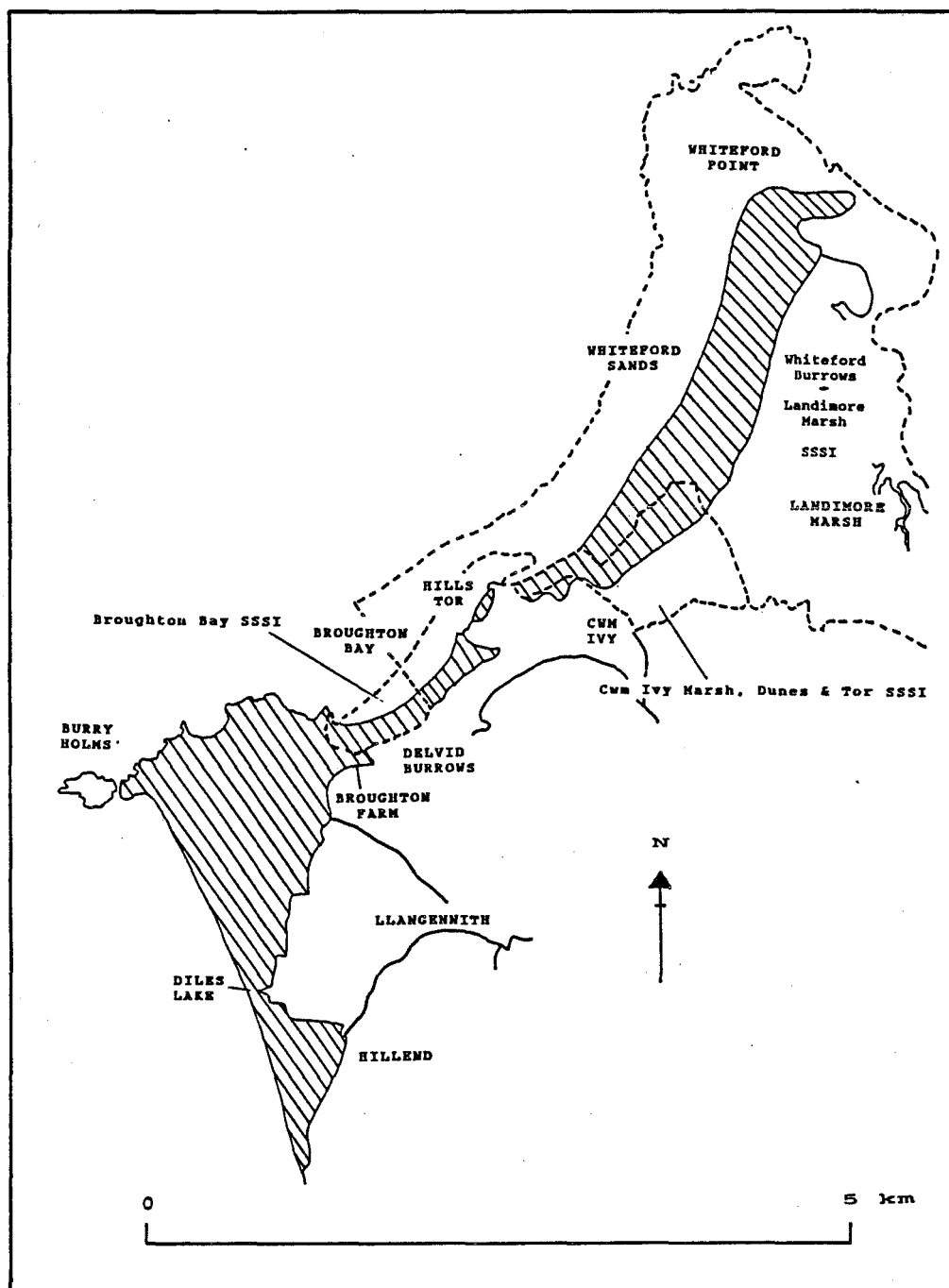


Figure 1 Survey and SSSI boundaries for Northwest Gower study area.

Dashed lines are SSSI boundaries  
Hatching denotes surveyed dune areas

## Soils

All soils sampled are probably strongly calcareous because pH samples range between 7.2 and 8.1. These results suggest that recent dune mobility has been too great for leaching to take effect and produce neutral or acid soils.

## Management

Current management of all surveyed dunes is entirely for recreation, though in the past there may have been stock grazing in addition to rabbit production. Relatively large static caravan parks at Hillend, Broughton Farm and Hills Farm attract large numbers of visitors and there is a large car park at Hillend for day visitors. Camping is possible at Hillend and is very popular for surfers using Rhossili Bay.

Dune erosion at the extreme south end has been well-repaired using marram planting. Public access to the beach here is via boardwalk and concrete slab. Some fencing is in position to protect fragile areas and allow recovery of sites used in the past for car parking. Relatively few people go further north than Diles Lake within the dunes and trampling is not severe until dunes northwest and east of Broughton Farm are reached.

Paths up the cliff northwest from Broughton Farm to Foxhole Point are in poor repair but the loose sand is not easily eroded. Much more serious is the lack of erosion control on Delvid Burrows. This area is very heavily trampled and past attempts to control visitor access by fencing have been very inadequate. Dune erosion is prevalent at the north end where there are small active circular blowouts. The remains of fences and plastic mesh windbreaks are present but visitors appear to have free movement through these areas.

The dunes further northeast at Hills Tor seem relatively unknown to most visitors and show little trampling away from a central path through this small system.

#### 4. VEGETATION OF HILLEND - LLANGENNITH - BROUGHTON - DELVID - HILLS TOR BURROWS

This section contains a general description of the vegetation of the dunes between Hillend and Hills Tor. The characteristic species composition of each community is outlined and the mapping legend number and equivalent NVC code(s) are included in brackets. An explanation of the NVC codes can be found in Annex 3 together with further information on the NVC communities, local variations and non-NVC vegetation types. The vegetation map(s) is provided at the end of the report and area data for vegetation types is given in Annex 8.

##### Strandline

There was no strandline visible at the time of survey. Tidal scour had probably removed it between Hillend and Burry Holms. On the dunes between Delvid and Hills Tor it had probably been buried to form a foredune or low mobile dune.

##### Foredune

There were no foredunes between Hillend and Burry Holms, probably the combined result of trampling by visitors and tidal scour. It is more sheltered east from Delvid Burrows and there are two areas with fragments of embryo foredune. These are dominated (very low cover) by Sand Couch (*Elymus farctus*) and additional infrequent species suggest that the sand has buried a strandline: Prickly Saltwort (*Salsola kali*), Spear-leaved Orache (*Atriplex prostrata*), Sea Rocket (*Cakile maritima*), Sea Sandwort (*Honkenya peploides*) and Sea Beet (*Beta vulgaris maritima*). This is mapped as 2 and the NVC code is SD4.

A little more extensive are foredunes which contain both Sand Couch and Marram grass. The strandline indicators above are often present if the foredunes are close to the drift line but higher up the beach additional species suggest mobile dune elements: Sea Holly (*Eryngium maritimum*), Sea Spurge (*Euphorbia paralias*), Evening Primrose (*Oenothera erythrosepala*) and Common Ragwort (*Senecio jacobaea*). This is mapped as 3 and the NVC code is SD6a.

## Dune grassland

A restricted variety of grassland types is present. Between Hillend and Burry Holms these relate to various stages of dune stabilisation and shelter following a phase of dune erosion. Trampling effects also occur. There are mobile dunes forming the front to the dune system and these often contain a mosaic of two types: Marram Grass (*Ammophila arenaria*) with few other species (4 - NVC SD6d) and a mix of Marram and Red Fescue (*Festuca rubra*) in more sheltered locations behind the outer dune ridge (5 - NVC SD6e).

A little further inland two types of semi-fixed dune are found. Gentler slopes or areas with recent trampling have a turf (6 - NVC SD7c) of Marram, Red Fescue and Common Restharrow (*Ononis repens*). On steeper slopes there is a sparser cover of Marram and Red Fescue. Annual species grow between Marram tufts: Sand Cat's-tail (*Phleum arenarium*), Thyme-leaved Sandwort (*Arenaria serpyllifolia*), Sea Mouse-ear Chickweed (*Cerastium diffusum*) and the grass *Vulpia fasciculata*. There is also a scatter of rosette hemicryptophyte herbs e.g. Cat's-ear (*Hypochoeris radicata*) and patches of the moss *Tortula ruralis* ssp. *ruraliformis*. This is mapped as 7, NVC code SD7d.

Type 7 semi-fixed dune is very common well inland too, marking the steep sides of former active blowouts which have now been stabilised.

Fully-fixed dune types occur in several large blocks as mosaics. A fairly rank turf (8 - NVC SD8) with much Marram, Red Fescue and a mix of Common Restharrow and Lady's Bedstraw (*Galium verum*) is found in the north mixed with Type 7. In the east it is mixed with a very rank grassland of Marram, False-oat Grass (*Arrhenatherum elatius*) and abundant quantities of the prostrate shrub Dewberry (*Rubus caesius*). Close to the caravans at Hillend there is a trampled Type 8 sward.

Between Delvid and Hills Burrows the dunes are dominated by semi-fixed and fixed grassland. A small area with an active blowout supports Type 4 mobile dune and this is the main grassland type in the less-accessible Hills Burrows. Elsewhere the main dune front is a trampled Type 6 grassland which in the south has a belt of moss-stabilized Type 7 marking a zone of entry by visitors which creates instability and partial recolonisation. There is very little Type 8 grassland and the rear of the Delvid system and the hillslope to Prissen's Tor is mainly made up of a very rank Type 9 sward invaded by Blackberry (*Rubus fruticosus*) and Dewberry (*Rubus caesius*).

There is no acidic grassland.

## Dune slack

Slacks are poorly developed in this system and are mainly scattered in the deeper depressions left after the passage of a dune blowout. At the rear of the Hillend - Burry Holm and Delvid - Hills Tor systems there are areas of damp ground on the transition to pasture. These have a slack flora.

Most slacks are dominated by a cover of Creeping Willow (*Salix repens*) and a patchy carpet of the moss *Calliergon cuspidatum*. A few slacks had the fruiting remains of Marsh Helleborine (*Epipactis palustris*) and many contained a scatter of the uncommon Variegated Horsetail (*Equisetum variegatum*). One slack had a small population of Round-leaved Wintergreen (*Pyrola rotundifolia*). All slacks of this type were considered Type 12b, mapped as 12 and coded as NVC SD15.

In one location sand blow into a former Type 12 slack had allowed invasion by Common Restharrow. This was mapped as Type 14 (NVC SD16). In slacks which are probably moist to the surface for most of the year there is a tall-herb community (13 - NVC SD15c) dominated by Fleabane (*Pulicaria dysenterica*) and with sizeable quantities of Yorkshire Fog (*Holcus lanatus*), Water Mint (*Mentha aquatica*), Silverweed (*Potentilla anserina*), Creeping Willow and the moss *Calliergon cuspidatum*. This is generally restricted to the rear of the dune systems.

## Woodland and scrub

There is little scrub between Hillend and Hills Tor. There are a few small patches of mature Sea Buckthorn (*Hippophae rhamnoides*) with an interior containing Stinging Nettle (*Urtica dioica*). Some stands show signs of sand burial from adjacent old blowouts. There is a very small stand of Blackthorn (*Prunus spinosa*) at Delvid Burrows. The most abundant scrub is dominated by Blackberry (*Rubus fruticosus*) and covers the steep cliff slopes between Burry Holms and Foxhole Point, and the hillslope to Prissen's Tor.

Only one type of woodland is found - a solitary stand of mature Common Sallow (*Salix cinerea*) part-buried by sand and probably marking the position of an old buried slack.

## Other habitats

There are no other major vegetation types. There is no dune heath. In the past there might have been better slack and wet meadow vegetation in the depression below Hillend Farm but this has probably been buried by rubble to provide a track and parking in this area. There could have been swamp if the name Diles Lake is a description of this land before drainage and stream diversion.

### Recent changes in vegetation

No older air photos were available to assess vegetation change. The impression gained during survey was that most of the dunes were much more mobile until recently and that the system has now largely stabilised. This probably accounts for the absence of acidic grassland and dune heath.

The rank nature of much of the grassland and shrub invasion by Dewberry (*Rubus caesius*) suggest that current grazing is minimal and that the area is slowly reverting after being under heavier grazing pressure.

### 5. RARE PLANTS

No important rarities were found but the local Round-leaved Wintergreen (*Pyrola rotundifolia*) is possibly a new record for the site.

### 6. SITE ASSESSMENT

The dunes between Hillend and Hills Tor form a large extent and provide a reasonable range of natural dune grassland types with good transitions. There is limited community diversity, with an attenuated grassland sequence (poor embryo dunes, no acidic grassland) and only restricted slack development. Only one local species is known from the area.

There has been a history of visitor impact in the area. Car parks and new tracks might have destroyed wetland to the rear of dunes at Hillend. At present dune and beach access from Hillend is under good control but this is not the case at Delvid Burrows in Broughton Bay.

### 7. COMMENTS AND SUGGESTIONS

Some pressure might be applied to re-start dune restoration and control access in Broughton Bay. In the medium term stock grazing might be encouraged to reduce rank grassland and diversify the sward.

## ANNEX 1

### METHODS

#### AERIAL PHOTOGRAPHY

Air photos were used for field navigation and vegetation mapping in all but one site. The following material was supplied or purchased:

|                            |                                                                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Crymlyn Burrows            | Cambridge University RC8K 27 May 1987<br>Colour (poor quality) c. 1:6000<br>Prints 88-92, 97-105, 121-125                                       |
| Black Pill to<br>Bryn Mill | None available - field positioning and mapping done by pacing in relation to features on 1:10000 OS map.                                        |
| Pennard and<br>Penmaen     | Hunting Surveys HSL UK 86 023 19 March 1986<br>Panchromatic (excellent quality) c. 1:5000<br>Run 17 Prints 2563-2566<br>Run 18 Prints 2478-2482 |
| Oxwich and<br>Nicholaston  | Cambridge University RC8KW 20 June 1983<br>Colour (fair quality) c. 1:5000<br>Prints 201-207, 209-213 (212 missing),<br>218-222.                |
| Port-Eynon to<br>Horton    | Cambridge University RC8DA 26 June 1979<br>Panchromatic (good quality) c. 1:10000<br>Prints 268-270                                             |
| Hillend to<br>Whitford     | MAFF/ADAS Hasselblad 7 May 1989<br>Colour (good quality) c. 1:10000<br>Run 89-18 Prints 43-51, 66-68<br>Run 89-27 Prints 08-09                  |
| Pembrey Coast              | MAFF/ADAS 15 June 1986<br>Panchromatic (excellent quality) c. 1:11000<br>Film 291 Prints 24-36, 86-98, 157-8                                    |

#### FIELD SURVEY

All major types of vegetation at each site were located by a rapid reconnaissance. Each type was then visited and a visually homogeneous stand was picked out. Vegetation was recorded within 2m x 2m (strand, dune grassland, dune slack, dune heath), 5m x 5m (scrub) and 10m x 10m (woodland) quadrats. The quadrat position and number was located precisely on an acetate overlay fixed to air photos.

The recommended procedure for the National Vegetation Classification (NVC) was followed as often as possible. Most dune vegetation types in each site were recorded with a minimum of five quadrats. Transitional habitats to saltmarsh, swamp and scrub/woodland were sampled less intensively.

Each quadrat was recorded on a standard record sheet (see Annex 2) which incorporated species and special variable number codes for use in later rapid computer data entry. All vascular plants, bryophytes and lichens in a quadrat were recorded on the Domin cover/abundance scale, together with community structure data (strata height and cover). Occasional soil samples (0-10 cm) were collected for most vegetation types and were then air dried prior to pH analysis.

Target notes (see Annex 6) were used for several purposes:

- a. To note particular features;
- b. To comment on land use;
- c. To supplement quadrat records.

Target note positions were also marked in the field upon air photo overlays. Less emphasis was placed on these notes than in other National Sand Dune Survey studies because quadrat data was more intensive in this case.

A total of 640 quadrats was achieved for all sites, numbered as follows:

|                                            |                         |
|--------------------------------------------|-------------------------|
| Crymlyn Burrows                            | 1 - 146                 |
| Black Pill to Bryn Mill                    | 147 - 169               |
| Tywyn (Pembrey Coast)                      | 170 - 271               |
| Pembrey Burrows                            | 272 - 347               |
| Pembrey Country Park and<br>Pembrey Forest | 348 - 354,<br>627 - 640 |
| Port-Eynon to Horton                       | 355 - 390               |
| Whiteford Burrows                          | 391 - 468               |
| Nicholaston Burrows                        | 469 - 495               |
| Penmaen Burrows                            | 496 - 522               |
| Oxwich Burrows                             | 523 - 565               |
| Pennard Burrows                            | 566 - 596               |
| Hillend and Llangennith Burrows            | 597 - 626               |

Access problems prevented any quadrat collection from Broughton, Delvid and Hills Tor Burrows. In traversing sites obvious vegetation boundaries were marked on air photo overlays and simple codes were marked for vegetation types, both to aid later photo-interpretation. Survey took place in two phases: June/early July and August/early September.

## ANALYSIS

Quadrat records were entered into an IBM-XT compatible microcomputer using the RECORD program in the VESPAN2 suite devised by Andrew Malloch of Lancaster University.

An initial classification of all quadrats using the TWINSPAN program enabled the clear separation of samples into three sub-sets: strand, dry dune and transitions; wet dune and transitions; scrub, woodland and transitions. Each sub-set of quadrats was then classified by TWINSPAN to produce end groups of samples. Each end group was listed in full using the TABLE program to detail all quadrats and species.

These tables enabled a comparison with the keys, tables and descriptions of vegetation types in the various NVC chapters. In many cases there was a direct correspondence with an NVC community, but often not to sub-community level. Some non-NVC groups were found and required separate description. More importantly, the classifications were not perfect and several NVC vegetation types (notably swamp, scrub and woodland transitions represented by low quadrat totals) were scattered amongst other end groups. Once recognised these community samples were aggregated using the SELECT program in VESPAN2.

Several dune vegetation types with large quadrat totals had distinct non-NVC sub-groups and these were described as variants of the NVC community. This important scale of variability is covered under PROBLEMS (see below).

## MAP PREPARATION

Following analysis and the recognition of vegetation types, a set of mapping units was created (see vegetation legend sheet in map pocket). For Black Pill to Bryn Mill those mapping units present were marked with approximate boundaries upon a 1:10000 OS map, given that air photos were not available. For all other sites fresh acetate overlays were mounted over field overlays and air photos. The mapping units were then marked on the top overlay using an Old Delft Scanning Mirror Stereoscope to position boundaries. In areas of small-scale rapid transition between communities (usually due to microtopography in slacks and around old small blowouts) the communities were mapped as a mosaic.

Features marked on 1:10000 OS maps were also accurately marked. The top overlay was then removed and OS map features were used to reproduce the photo-map at c. 1:7500 using a Zeiss Sketchmaster. All 1:7500 maps were then mosaiced and drawn as a final vegetation map on Permatrace at c. 1:7500 scale. This was then reduced to 1:10000 on an accurate zoom photocopier for reproduction on A3 paper.

A total of 14 final maps was involved. The legend was too lengthy to reproduce on each map and it is presented separately on A4 sheets in the map pocket of site reports.

## AREA MEASUREMENT

One copy of each vegetation map was carefully dissected by cutting around vegetation boundaries with fine scissors. Excised polygons were aggregated into map units and weighed on an accurate balance. The weights were converted to area (hectares) using the known paper weight of a 1 km square (100 ha). Mosaic types had the area allocated equally between component types.

## GENERAL INFORMATION

Additional information on sites was obtained from SSSI site descriptions (if an SSSI), discussions with regional staff of NCC and the National Trust, and by consulting reports held at the Oxwich Information Centre.

## PROBLEMS

1. **Access** No permission was sought for the Broughton area due to local difficulties. This led to no quadrat recording but the area was visited by public footpaths and reasonable mapping was achieved.
2. **Photo availability** Stereoscopic cover of several sites was not available during survey. Additional cover was purchased for the Pembrey Coast and Pennard-Penmaen. Some cover for Oxwich-Nicholaston was out on loan and was returned late despite repeated requests from local NCC staff. This lack of stereoscopy prevented more emphasis on field boundary identification and slowed down accurate field navigation.
3. **Nomenclature** NVC dune community types and nomenclature changed in the course of survey. Details of the revision (new nomenclature and floristic tables, but no information on slacks) were received between the two field survey periods and required some revision of the first phase results, plus a little re-survey. Detailed descriptions (but only nomenclature and floristic tables for slack types) were received as an NVC strand/dune chapter in November 1989. A wholesale revision of slack types had taken place, to the extent that field mapping could not in most cases be accurately assigned to new units. To make matters worse, the computer groupings of slack communities in this survey did not closely agree with new or old types. All mapping of slack communities should therefore be regarded as very approximate.

4. NVC Community variability Several dune communities, notably *Festuca rubra* - *Galium verum* dune grassland and most slack types, were thoroughly sampled with a large number of quadrats. Classification produced distinct sub-types but these were not readily assigned to NVC sub-communities. The problem lies in continuous variation which is dissected in a parsimonious manner by TWINSpan analysis, both for this quadrat data set and for the more comprehensive set (in a geographical sense) on which NVC types are based.

The solution (i.e. extraction of readily-recognised and spatially recurrent vegetation types) can probably only come from a more rigorous analysis using ordination (to handle continuity) and sound interpretative methods to link continuous variation in several dimensions (succession, habitat gradients, geographical trends), e.g. seriation or canonical correspondence analysis. This was beyond the scope of this study but would be a very desirable feature of the complete national survey.

## ANNEX 2

### FIELD RECORDING SHEET

The sheet below is a reduced-size version of that used in the field. Space at the top and bottom was used for the field notes and listing of species not covered in the printed table. The NVC codes for species and special variables are present to aid rapid computer entry after fieldwork.

SITE

DUNE SURVEY SHEET

|                |                |                |                |                |
|----------------|----------------|----------------|----------------|----------------|
| Tree hite 9    | Shrb hite 10   | Herb hite 11   | Moss hite 12   | Bare grnd 22   |
| Tree covr 13   | Shrb covr 14   | Herb covr 15   | Moss covr 16   |                |
| Achi mill 104  | Achi plar 105  | Agro capi 123  | Agro stol 122  | Aira cory 124  |
| Aira prae 125  | Alnu glut 153  | Alth offi 2656 | Amo aren 159   | Anac pyra 160  |
| Anag tene 163  | Anth odor 171  | Anth vuln 174  | Aren serp 194  | Arne aari 195  |
| Arrh elat 197  | Atri hast 217  | Atri luci 218  | Atri patu 220  | Aven prat 655  |
| Aven pube 656  | Bell pere 230  | Beta vulg 2801 | Caki aarit 268 | Call vulg 278  |
| Caly sold 283  | Caup rotu 288  | Card prat 295  | Care aren 304  | Care flac 323  |
| Care nigr 333  | Care pani 339  | Carl vulg 362  | Cent eryt 373  | Cera diff 381  |
| Cera font 384  | Cera seni 385  | Cirs arve 415  | Cirs vulg 419  | Coch dani 425  |
| Coch offi 427  | Cory cane 3075 | Crep capi 447  | Crit aari 452  | Cyti scop 1193 |
| Dact glom 465  | Dact inca 467  | Dact asja 2828 | Dant decu 1249 | Dauc caro 475  |
| Dese cesp 477  | Dese flex 478  | Eleo palu 509  | Elya farc 116  | Elya pycn 117  |
| Elya repe 118  | Epil angu 391  | Epip palu 531  | Equi arve 532  | Equi hyem 534  |
| Equi palu 535  | Equi vari 539  | Erig acer 543  | Erio lati 547  | Erod cicu 549  |
| Erop vern 552  | Eryn aari 555  | Euph offi 568  | Euph para 565  | Euph port 567  |
| Fest ovin 574  | Fest rubr 576  | Fili ulaa 583  | Gali apar 605  | Gali palu 609  |
| Gali veru 613  | Gent ulig 3052 | Glaui flav 635 | Glaui aari 636 | Hera spho 661  |
| Hier pilo 965  | Hippo rham 678 | Hole lana 680  | Honk pepl 682  | Horn petr 686  |
| Hydr vulg 690  | Hypo glab 704  | Hypo radi 706  | Iris pseu 715  | Junc acut 720  |
| Junc arti 722  | Junc bufo 725  | Junc bulb 726  | Junc gera 732  | Junc aari 734  |
| Junc squa 736  | Koel sacu 746  | Leon autu 768  | Leon tara 770  | Lepi lati 3702 |
| Limo bine 778  | Limu cath 786  | Lipa loes 3074 | Lotu corn 800  | Lotu ulig 802  |
| Luzu camp 807  | Lych flos 813  | Lyco euro 823  | Mair aari 1355 | Matt sinu 841  |
| Medi lupu 844  | Ment aqua 855  | Mibo mini 3183 | Mys arve 884   | Oena lach 911  |
| Oeno bien 912  | Onon repe 914  | Ophr apif 918  | Orob aino 928  | Pedi palu 946  |
| Phle aren 958  | Phra aust 961  | Plan coro 972  | Plan lanc 973  | Plan aari 975  |
| Poa prat 988   | Poa triv 990   | Poly oxyz 1010 | Poly vulg 995  | Popu tres 1022 |
| Pote anse 1043 | Prun vulg 1059 | Pter aui 1066  | Puli dyse 1069 | Pyro rotu 1073 |
| Ranu acri 1081 | Ranu flau 1089 | Ranu repe 1095 | Rhin aino 1106 | Rubu frut 1136 |
| Rune acet 1139 | Rune cris 1143 | Rune ella 1140 | Rune aari 1146 | Sagi proc 1158 |
| Sali repe 1179 | Sals kali 1184 | Saub nigr 1187 | Samo vale 1189 | Scir aari 1213 |
| Scir sela 1214 | Sedu acre 1225 | Sene jaco 1239 | Sene vulg 1243 | Sile conl 3235 |
| Sile vulg 1259 | Sola dule 1268 | Soli virg 1270 | Sonc arve 1271 | Sonc aspe 1272 |
| Stel aedi 1298 | Tara offi 2982 | Tees nudi 1320 | Teuc scor 1321 | Thym prae 1333 |
| Trif camp 1342 | Trif dubi 1343 | Trif prat 1349 | Trif repe 1350 | Trig aari 1353 |
| Trig palu 1354 | Ulex euro 1363 | Vero cham 1396 | Vero offi 1401 | Vici sati 2707 |
| Viol cani 1422 | Viol rivi 1429 | Viol tric 1432 | Vulp fasc 1434 |                |
| Brac albi 1510 | Brac ruta 1519 | Bryu algo 1545 | Bryum sp. 2807 | Call cusp 1445 |
| Caup stel 1571 | Cera purp 1586 | Clad arbu 2340 | Clad furc 2362 | Clad rang 2381 |
| Cija dend 1593 | Corn acul 2410 | Dier scop 1638 | Eury prae 1677 | Mosa lule 1562 |
| Hypn cupr 1766 | Hypo phys 2416 | Loph bide 2167 | Pell cani 2486 | Plag undu 1807 |
| Poly pill 1897 | Pseu puru 1914 | Rhyt squa 1940 | Rhyt triq 1941 | Tort rura 2023 |

## ANNEX 3

### VEGETATION TYPES

This section contains a description of each vegetation type (NVC and non-NVC) found in this survey of South Wales dunes. Some types may not be present in this site - see Annex 4 and the vegetation map(s) for details of community presence. The account includes variants of NVC dune communities which do not correspond with NVC sub-community types. Particular features of sites are given in some descriptions.

The account is partly based on the relevant chapters of the NVC written by John Rodwell. The codes mainly relate to the different NVC chapters as follows:

- SD Shingle, strandline and sand-dune communities
- S Swamps and tall-herb fens
- SM Saltmarsh communities
- W Woodland and scrubs
- H Heaths
  
- X Non-NVC or transition types identified in this survey.

One other chapter, mesotrophic grasslands (MG), was not consulted and cases were only mapped in terms of principal dominant (*Arrhenatherum elatius* or *Lolium perenne*).

Most emphasis is placed on SD communities and other vegetation descriptions are abbreviated, reflecting less-intensive quadrat sampling.

1 X1 Dry foredune/saltmarsh/strandline transition community

Strandline vegetation is normally found at the extreme high water mark where washed-up debris becomes buried by blown sand. The normal strandline community within the NVC (SD2 *Honkenya peploides* - *Cakile maritima* strandline) was not found in this survey.

Instead, on exposed shores, the strandline is rapidly buried and a foredune environment persists (see 2 SD4 *Elymus farctus* foredune community). In sheltered environments, to leeward of cusped spits, there is this distinct species-rich strandline transition. The species combination involves a mix of foredune (*Elymus farctus*), saltmarsh (*Festuca rubra*, *Agrostis stolonifera*, *Limonium binervosum*) and strandline (*Honkenya peploides*, *Atriplex prostrata*) indicators. *Cakile maritima* is rare in this environment. Unlike SD2 it is dominated by perennials and it is probably more persistent and less variable than the usual strandline community.

It grades upwards in wet areas to young salt-influenced slacks (see 12(a) SD14c *Salix repens* - *Campyllum stellatum* dune slack, *Bryum pseudotriquetrum* - *Aneura pinguis* sub-community) and to a variety of dune grassland types in dry zonations. Downslope it usually grades into SM24 *Elymus pycnanthus* saltmarsh.

As a community type it perhaps deserves recognition in any revised NVC classification of strandline environments. In this survey it was repeatedly found in suitable locations at Crymlyn Burrows, Tywyn (Pembrey Coast) and Pembrey Burrows.

2 SD4 *Elymus farctus* foredune community

*Elymus farctus* normally dominates this community which is species-poor. Strandline species (notably *Salsola kali*, *Atriplex prostrata*, *Cakile maritima* and *Honkenya peploides*) are also frequent and suggest that in many localities these low dunes are ephemeral summer features forming on the drift line, usually extending by movement a short distance upslope. They are probably destroyed in autumn and winter storms.

In more sheltered locations, particularly at Crymlyn and Pembrey Burrows, the community is persistent and forms the initial phase of sand colonisation which then leads on to a rapid classic psammose via SD6 *Ammophila arenaria* dune. At Pembrey Burrows there has been a recent increase in sand supply (probably from dune erosion in the centre of the Pembrey Coast system) and there has been a very large increase in this community since aerial photography in 1986. The foredunes even extend well downslope into saltmarsh and can include *Puccinellia maritima* and other saline indicators in the species list, though these are rare.

3 SD6a *Ammophila arenaria* mobile dune community  
*Elymus farctus* sub-community

This type of mobile dune community normally occurs closest to the sea. It is very open (70% bare sand) and usually has only *Ammophila arenaria* and *Elymus farctus* as dominants. Two variants (3v1, 3v2) were recognised after analysis. These show gradation within the the sub-community which itself grades downbeach into SD4 and, upwards, into SD6d *Ammophila arenaria* mobile dune, Typical sub-community.

3v1 variant This is usually located above the position of the strandline and often contains *Eryngium maritimum* and *Euphorbia paralias*.

3v2 variant This is usually located on the position of the strandline and often contains strand indicators (*Salsola kali*, *Cakile maritima*, *Rumex crispus* and *Beta vulgaris maritima*). It is more species-rich than 3v1.

4 SD6d *Ammophila arenaria* mobile dune community  
Typical sub-community

This community has a high cover of *Ammophila arenaria* (Marram) and occurs in areas that have a very high rate of sand deposition, in part the effect of the grass itself in modifying windflow to induce sand burial through which it then grows, often in profusion. Areas recently planted with Marram look very similar to this natural community.

In many British systems the community is very species-poor but in this survey there are reasonable numbers of additional species in most samples. Only one monodominant sample (quadrat 270 at Tywyn) was recorded. This enhanced diversity suggests that sand accumulation rates in the South Wales area are lower than normal, allowing invasion by annuals and suitable perennials.

5 SD6e *Ammophila arenaria* mobile dune community  
*Festuca rubra* sub-community

*Festuca rubra* normally forms an open understorey beneath Marram in this sub-community. Sand accumulation is low but still significant, producing vegetation which is still species-poor.

As a mapping unit this community is not very extensive and is best developed on dunes with heavy recreational impact, as at Crymlyn, Black Pill, Port-Eynon and Hillend/Broughton. Trampling, sand burial and litter may make this type more nitrogen-rich than usual, allowing enhanced species diversity compared to the NVC description.

Floristic composition suggests that this vegetation is part of a gradation from SD6a and SD6d to SD7c *Ammophila arenaria* - *Festuca rubra* semi-fixed dune community (*Ononis repens* sub-community). Shrubs can invade (notably *Rubus caesius*) and, at Black Pill, *Populus tremula*.

6 SD7c *Ammophila arenaria* - *Festuca rubra* semi-fixed  
dune community  
*Ononis repens* sub-community

These dunes are usually dominated in Britain by Marram, plus substantial amounts of *Festuca rubra* and *Ononis repens*. Reduced sand deposition compared to other communities to seaward enables high vegetation cover and the start of dune stabilisation.

This vegetation type is very extensive in the dunes of this study and it is possible to recognise four variants (6v1-4).

6v1 variant *Ononis repens* is less common (frequency class III) and is often replaced by an alternative legume (*Anthyllis vulneraria* or *Lotus corniculatus*). Small gaps in the turf are frequent and these are often occupied by winter annuals (*Phleum arenarium*, *Sedum acre*, *Arenaria serpyllifolia*). This is the dominant type at Crymlyn Burrows and is transitional from SD6c to SD7d (*Tortula ruralis* ssp. *ruraliformis* sub-community).

6v2 variant *Ononis repens* is very common and achieves a reasonable cover. Other species suggest this is a community of damper ground (hollows and slack margins, especially at Crymlyn), with *Holcus lanatus* and *Agrostis stolonifera* the main moisture indicators. Mesic conditions in some stands may be created by shading from *Rubus fruticosus* agg..

6v3 variant This is the most typical form found, with high cover and a tall sward being invaded by *Rubus caesius*, *R. fruticosus* agg. or *Arrhenatherum elatius*. These successional transitions to shrub or mesotrophic grassland seem in part due to a lack of grazing in most large dune systems.

6v4 variant This is a small quadrat set which is difficult to interpret and may represent rather heterogeneous conditions. It is species-rich and this vegetation is either trampled dune being invaded by *Rubus caesius* (at Oxwich and Hillend), or is developed on thin sand over limestone on cliffs at Pennard.

The extensive quantities of type 6-SD7c vegetation reflect in part the rapid stabilisation of mobile dunes (and perhaps even foredunes at Crymlyn and Pembrey Burrows) which tend to be low in height and inextensive. In addition their extent shows stabilisation of dune systems with extensive parabolic dune blowouts which were recently mobile (Oxwich, Whiteford).

7 SD7d *Ammophila arenaria* - *Festuca rubra* semi-fixed  
dune community  
*Tortula ruralis* ssp. *ruraliformis*  
sub-community

The usual characteristics of this community in Britain are similar to 6-SD7c: abundant Marram and frequent *Festuca rubra* and *Ononis repens*. It is normally distinguished from SD7c by common *Hieracium pilosella* agg., several species of annual, and often an abundant moss carpet of *Tortula ruralis* ssp. *ruraliformis*. Many of these features are found in South Wales dunes but there are local differences because *Festuca rubra* is comparatively rare and *H. pilosella* has a very weak presence. Winter annuals are a prominent component, especially *Phleum arenarium*, *Arenaria serpyllifolia*, *Cerastium diffusum*, *Vulpia fasciculata*, *Sedum acre* and *Aira praecox*. More rarely *Viola tricolor*, *Cerastium semidecandrum*, *Arabis hirsuta* and *Desmazeria rigida* can be found.

The community is very common in several locations, colonising SD6 mobile dunes either near actively extending foreshores (Crymlyn, Nicholaston, Tywyn) or on the steep slopes and flanks of vegetated blowouts (Oxwich, Llangennith/Broughton). It is rare at Pembrey Burrows, suggesting that dune orientation in that system is sheltered, not creating the sand burial rates which favour this community. It is very rare at Penmaen and Pennard, occurring only as very isolated and small coverage on thin sandy rendzinas overlying limestone. It was not mapped in these two latter places.

8 SD8 *Festuca rubra* - *Galium verum* fixed dune  
community  
No clear NVC sub-community

This community in Britain usually consists of a closed sward made up of grasses, dicotyledons and mosses. Marram may be only occasional and often lacks vigour. There is very little sand accumulation and the first signs of leaching impact are often found here in terms of indicators of soil acidity.

There are three potential sub-communities likely to be found in South Wales but none can be proposed with confidence. Instead, five variants can be recognised and related to local succession and moisture conditions. The absence of clear sub-communities is probably the result of no intensive grazing, a finding in studies elsewhere in Britain.

8v1 variant Marram and *Festuca rubra* are dominant, with appreciable quantities of the moss *Homalothecium lutescens* in the turf. *Ononis repens* and *Galium verum* are fairly common (frequency class III) and the variant is probably an early SD8 type emerging in succession from 7-SD7c.

8v2 variant There is little Marram and most cover is contributed by *Festuca rubra* and the moss *Homalothecium lutescens*. There is virtually no *Ononis repens*, *Galium verum* is infrequent and early leaching indicators are quite common (the moss *Dicranum scoparium* and the lichens *Cladonia rangiformis* and *C. impexa*). Soil samples had some of the lowest pH values of SD8 samples. It is probably the oldest SD8 grassland type, grading into 10-SD12 *Carex arenaria* - *Festuca ovina* - *Agrostis capillaris* grassland over time.

8v3 variant Both Marram and *Festuca rubra* are frequent but *Galium verum* is low (class II) in frequency. There is a high moss cover involving pleurocarps (*Homalothecium lutescens* and *Eurynchium praelongum*) and the acrocarp *Dicranum scoparium* to suggest a trend towards acidity. A large proportion of quadrats also shows shrub invasion by *Rubus caesius*. The high frequency of *Holcus lanatus* (class IV) suggests that moisture is an important determinant of the variant.

8v4 variant This is closest to the SD8a Typical sub-community and many quadrats did show signs of close rabbit grazing. It has abundant *Festuca rubra* and *Galium verum*, with plentiful *Plantago lanceolata*. There are, however, significant quantities of shrubs (notably *Rosa pimpinellifolia* and *Rubus caesius*) and other indicators of shading and invasion (*Pteridium aquilinum*, *Geranium sanguineum*). These suggest a former SD8a community in early transition towards scrub, probably following a relaxation in grazing pressure.

8v5 variant This variant is a more extreme form of 8v4. There is a high degree of invasion by *Pteridium aquilinum* and species typical of early scrub and rank growth: *Geranium sanguineum*, *Rubus caesius* and *Rosa pimpinellifolia*. This community is particularly common between Port-Eynon and Horton where there are a few more nitrophilous species to suggest trampling and dog-walking effects.

9 SD9 *Ammophila arenaria* - *Arrhenatherum elatius*  
dune grassland  
No clear NVC sub-community

In Britain this community is found on less-heavily grazed stretches of fixed calcareous dune systems. There is no clear fit with NVC sub-communities because Marram is rare in variant 9v1 and infrequent in 9v2. The species composition of the two variants suggests that the community is seral in character and that it is undergoing rapid change towards scrub development.

9v1 variant *Arrhenatherum elatius* is relatively infrequent in a rank *Festuca rubra* and *Holcus lanatus* sward which contains large quantities of *Rubus caesius*. There are reasonable quantities of both *Ononis repens* and *Galium verum*, suggesting that the community has developed rapidly from SD7 and SD8 categories. The high quantity of *Holcus lanatus* and occasional presence of *Salix repens* suggest that moist conditions may be a characteristic of sites which have also had a relaxation in grazing.

9v2 variant This variant shows a more advanced stage of scrub development in SD9 communities. There is both a tree and shrub presence in many samples, with quadrats located in a grassland/scrub mosaic at the rear of several systems (notably Crymlyn Burrows, Black Pill, Hillend/Broughton, Pembrey Burrows).

Where both variants occur in a single system, 9v1 tends to be more seaward suggesting the community is currently extending towards younger dune grassland types.

This grassland is typical of grazed acidic sands in Britain and in systems which are initially calcareous it is found on older dunes where leaching has been effective. The rear of most South Wales dune systems, where such swards are likely, has been highly altered in most cases (often to provide golf courses). Reasonable examples of the community type can be found in the fringes of rough around fairways, notably at Crymlyn and Pennard Burrows (the latter system is also grazed by ponies). Further pony grazing by ponies at Penmaen probably also helps maintain the community. Elsewhere the dune systems are either too young or lack of grazing has allowed SD9 rank near-mesotrophic grassland to develop.

There is no very close agreement with NVC sub-communities but two local variants can be recognised.

**10v1 variant** This resembles in part the SD12a *Anthoxanthum odoratum* sub-community but lacks Marram and shows early bracken invasion. There is also floristic evidence of sufficient leaching to allow heath indicators (e.g. *Calluna vulgaris*) into the sward.

**10v2 variant** This is bracken-invaded and much more species-poor as a result of shading and litter accumulation. It is restricted to leached acidic sands on the cliff tops at Penmaen and Pennard. As in 9v1 there is strong floristic evidence of a trend towards heath vegetation.

Some good examples of heath developed on sand were found but in general these were rare. Communities with *Calluna vulgaris* dominant (and, less commonly, *Erica cinerea* and *Vaccinium myrtillus*) are restricted to leached sands banked against the old seacliff at the rear of Crymlyn Burrows, and to the thinner sands deposited on top of cliffs at Penmaen and Pennard. At Crymlyn the community grades into normal H10 *Calluna vulgaris* - *Erica cinerea* heath on the top of the cliff as the sand rapidly thins.

## SLACK COMMUNITIES

Low-lying areas under the influence of the dune water table (slacks) are usually markedly different from dry dune grasslands. A major revision in NVC slack types took place after field mapping (though description of the new types was not provided). Computer analysis of quadrat data found end groups which did not closely fit old or new NVC classifications (see Annex 1 - Problems). The five quadrat groupings (12a, 12b, 13, 14, 15) are therefore presented as a series with what are probably their closest types in the revised NVC system of November 1989. The fit is far from perfect and all slack classification must be considered approximate.

12a SD14c *Salix repens* - *Campyllum stellatum* dune slack  
*Bryum pseudotriquetrum* - *Aneura pinguis*  
sub-community

This community probably represents young slacks formed by the enclosure of depressions by spit extension (as at Tywyn) or in deflation hollows left after the passage of a parabolic dune blowout (north Whiteford). There is a slight saline influence at Tywyn shown by the low frequency of *Glaux maritima*. The community has patches of bare ground and *Salix repens* often shows a pattern of small circular and coalescing colonies, a feature of early succession. The community is very rich in species.

12b SD15a/b *Salix repens* - *Calliergon cuspidatum* dune slack  
*Carex nigra* sub-community (a)  
*Equisetum variegatum* sub-community (b)

There is abundant *Salix repens* over a carpet of *Hydrocotyle vulgaris* and the moss *Calliergon cuspidatum*. *Equisetum hyemale* is very common in this turf and orchids (commonly *Epipactis palustris* and *Dactylorhiza majalis*) are abundant. There is still a saline element in some slacks, shown by *Juncus maritimus*, *J. acutus* and *Oenanthe lachenalii*.

13 SD15c *Salix repens* - *Calliergon cuspidatum* dune slack  
*Carex flacca* - *Pulicaria dysenterica*  
sub-community

This slack community is one of the most distinctive due to the prominence of tall herbs, with much *Juncus maritimus*, *Pulicaria dysenterica*, *Eupatorium cannabinum*, *Filipendula ulmaria*, *Lotus uliginosus* and *Lychnis flos-cuculi*. It often features the start of slack woodland by *Salix cinerea* and *Alnus glutinosa* at Tywyn. At Whiteford it is very extensive on the eastern side, grading into saltmarsh. It seems to prefer steeper slack gradients and may reflect lateral subsurface water flow.

14 SD16a/b *Salix repens* - *Holcus lanatus* dune slack  
*Ononis repens* sub-community (a)  
*Rubus caesius* sub-community (b)

14 SD16c/d *Salix repens* - *Holcus lanatus* dune slack  
*Prunella vulgaris* - *Equisetum variegatum*  
sub-community (c)  
*Agrostis stolonifera* sub-community (d)

A heterogeneous set of slack and slack transition habitats is represented in this group. The topographic differences within the quadrat set are not clearly distinguished by species composition which overall suggest relatively dry slack conditions. Three main types of topography are involved:

- drier slack margins receiving sand input from adjacent dunes (common at Whiteford in western slacks).
- clustered large hummocks ('hedgehogs') up to 2m high and 4-5m in diameter, usually with a strong cover of *Salix repens*. These are believed to be due to dune building controlled by upward growth by *Salix* in areas suffering sand burial in the past. These are present at Pembrey Burrows and Whiteford.
- a transition involving damp grassland at Tywyn which runs for much of the length of the dune system along its eastern side.

15 SD17 *Potentilla anserina* - *Carex nigra* dune slack  
No clear NVC sub-community

This slack type is the least common in samples and in Britain is believed to be older and less calcareous than others. *Carex nigra* is usually a prominent feature but only *Mentha aquatica* is consistently present. Other species offer few clues to more precise habitat or successional relationships.

## SALTMARSH

- 16 SM18b *Juncus maritimus* saltmarsh  
*Oenanthe lachenalii* sub-community

This is common at Crymlyn, Oxwich (unsampled), Whiteford and Tywyn. It represents the highest saltmarsh community in areas which are also flushed by fresh and brackish water draining from dune slacks. It grades upwards into 13-SD15c dune slack, especially at Whiteford.

- 17 SM24 *Elymus pycnanthus* saltmarsh

This was noted (but not accurately mapped in terms of full extent) at Crymlyn, Pennard (very restricted), Oxwich-Nicholaston (not recorded), Whiteford, Pembrey and Tywyn. It represents the highest saltmarsh community in areas which are reasonably dry and uninfluenced by slack water. It also contains strandline indicators.

## SWAMP COMMUNITIES

- 18 S4a *Phragmites australis* swamp and reed-beds  
*Phragmites australis* sub-community

This tall reed-bed community is present in restricted quantity at Crymlyn Burrows and is abundant at Oxwich. Grazing by ponies at Whiteford has probably excluded it as a component of the wet eastern transition from slack to wet saltmarsh.

- 19 S4d *Phragmites australis* swamp and reed-beds  
*Atriplex hastata* sub-community

- 19 S21b *Scirpus maritimus* swamp  
*Atriplex hastata* sub-community

The sheltered strandline at Pembrey Burrows above saltmarsh is the only mapped location for a *Phragmites australis* - *Scirpus maritimus* mosaic (hence the presence of *Atriplex prostratus* and *Elymus pycnanthus*). Discharges from an adjacent sewage outfall pipe probably helps explain the thick growth in this area and the absence of these types from equivalent positions in other parts of the Pembrey Burrows marsh.

- 20 S12b *Typha latifolia* swamp  
*Mentha aquatica* sub-community

This is rather restricted. At Whiteford it is found in a concentrated zone of flushing below a large slack on the transition to saltmarsh. At Tywyn it is found in two man-made slacks adjacent to targets, the sand having been excavated to provide a raised surface for the target zone. A reasonable aquatic flora (including *Chara* sp.) is developing in these excavated hollows.

## SCRUB AND WOODLAND COMMUNITIES

- 21 SD18a *Hippophae rhamnoides* scrub  
*Festuca rubra* sub-community

This sub-community did not appear as an end-group in computer analysis and was obtained by selecting all quadrats containing *Hippophae rhamnoides* and then rejecting those belonging to the 22-SD18b set. This vegetation type represents the early stage of dune scrub invasion, most cases coming from the Pembrey Coast where this process is very frequent. Associated species suggest that 4-SD6d, 5-SD6e and 7-SD7d are the initial invaded communities. This is clear in Pembrey Coast vegetation maps.

- 22 SD18b *Hippophae rhamnoides* scrub  
*Urtica dioica* - *Arrhenatherum elatius*  
sub-community

In this community *Hippophae rhamnoides* is the major dominant. Shading and excreta from birds feeding on berries helps produce a flora characteristic of soils enriched with nitrogen and phosphorus (e.g. *Urtica dioica*, *Galium aparine*). *Sambucus nigra* is occasional and suggests shrub diversification is taking place in larger and older stands. The sub-community is not fully typical of the NVC because *Arrhenatherum elatius* is rare.

- 23 W1 *Salix cinerea* - *Galium palustre* woodland

This community is dominated by *Betula pubescens*, with reasonable quantities of *Salix cinerea* in places. *Galium palustre* and *Iris pseudacorus* are consistently present. All small thickets of *Salix cinerea* were mapped as this category and a reasonable number of quadrats were recorded for this type. However, only seven quadrats formed this clear end-group. A larger number was scattered in various slack end-groups (especially 13), suggesting that such willow scrub is recent and that it has not developed a very distinct flora. Some stands of *Salix cinerea* showed signs of sand burial, notably at Llangennith and Whiteford.

- 24 W10c *Quercus robur* - *Pteridium aquilinum* -  
*Rubus fruticosus* agg. woodland  
*Hedera helix* sub-community

This community is dominated by *Quercus robur* and has a scattered tall-shrub understorey of *Crataegus monogyna* over a floor often dominated by *Rubus fruticosus* agg. Shading is effective and there is little *Pteridium aquilinum*. This category was not an end-group in analysis and was obtained by selection of high-cover *Quercus robur* stands. Only five such stands were found, scattered in end-groups representing well-developed scrub.

- 25 W21a *Crataegus monogyna* - *Hedera helix* scrub  
*Hedera helix* - *Urtica dioica* sub-community

This is the commonest form of non-*Hippophae* scrub quadrat recorded in survey and shows active succession. The tall shrub or tree component rarely forms a continuous canopy and thick *Rubus fruticosus* agg. is the most consistent woody species present. A mix of trees and tall shrubs is present in the group in addition to *Crataegus*: *Quercus robur*, *Prunus spinosa*, *Acer pseudoplatanus*, *Fraxinus excelsior*, *Corylus avellana*, *Pinus nigra*. It seems a clear precursor to a variety of woodland types.

- 26 W22 *Prunus spinosa* - *Rubus fruticosus* agg. scrub  
No clear NVC sub-community

A small number of samples was dominated by *Prunus spinosa* but these quadrats were scattered amongst scrub end-groups (especially 25-W21a) and were found by selection. One stand on the Pembrey Coast contained dead *Hippophae rhamnoides* beneath the closed *Prunus* canopy and this provides some evidence of active succession towards non-dune scrub and woodland types. No clear NVC sub-community can be distinguished within the small quadrat total (9) separated by selection.

- 27 W23 *Ulex europaeus* - *Rubus fruticosus* agg. scrub  
No clear NVC sub-community

*Ulex europaeus* is a fairly common scrub type at the rear of the Crymlyn and Pembrey Burrows dune systems, and upon steep cliff slopes at Nicholaston, Penmaen and Pennard. It usually contains sizeable quantities of *Rubus fruticosus* agg. and sometimes *Pteridium aquilinum* or *Arrhenatherum elatius*. In some locations it seems to have developed from a lower scrub cover of *Rosa pimpinellifolia*. Several stands in cliffed sites showed regeneration after burning, especially at Pennard. This vegetation type did not form an end-group in analysis and had to be selected from other scrub-dominated end-groups.

- 28 W24 *Rubus fruticosus* agg. - *Holcus lanatus*  
underscrub  
No clear NVC sub-community

*Rubus fruticosus* agg. is very widespread in a variety of dune, scrub and woodland communities. In analysis it forms one heterogeneous end-group which has other shrub species patchily present (*Rosa pimpinellifolia*, *Ulex europaeus*, *Crataegus monogyna*). At Black Pill the community contains much *Populus tremula* and is dominant at the rear of the dune system.

- 29 W25 *Pteridium aquilinum* - *Rubus fruticosus* agg.  
underscrub  
No clear NVC sub-community

Bracken-invasion of dune and cliff vegetation is widespread in South Wales and *Pteridium aquilinum* is usually accompanied by a large cover of *Rubus fruticosus* agg.. A shaded community results which has woodland elements (e.g. *Geranium robertianum*, *Glechoma hederacea*, *Silene dioica*). Other shrub species are few (*Ulex europaeus* is rare) and *Acer pseudoplatanus* is the only (infrequent) tree to be recorded. Seral progression beyond this community stage may not therefore be very active.

- 30 X2 *Alnus glutinosa* slack woodland

This community represents the commonest woodland type found in damp habitats. It probably represents the most mature community development in slack conditions. *Alnus glutinosa* is the usual dominant but *Salix cinerea* is also present in large quantity. It probably develops from type 23-W1 woodland. There is no close affinity with other NVC alder woodland types.

*Iris pseudacorus*, *Galium palustre* and *Rubus fruticosus* agg. are frequent beneath the canopy, with a scatter of shade-tolerant herbs (notably *Oenanthe crocata*, *Berula erecta*, *Lycopus europaeus* and *Carex remota*).

In several locations the community is developed adjacent to saltmarsh (at Crymlyn, Oxwich and Whiteford). Young alder thickets are particularly common at Tywyn where rapid scrub succession is taking place. Old inland examples are found as scattered remnants within Pembrey Forest.

- 31 X3 *Pinus nigra/sylvestris* woodland

Pembrey Forest and Pembrey Country Park are dominated by very large expanses of *Pinus nigra* plantation, some dating back to the 1930's. Old and thinned stands support a reasonable woodland groundflora with some shrub development (a scatter of *Crataegus monogyna*, *Prunus spinosa* or *Ligustrum vulgare*, occasionally *Hippophae rhamnoides* in well-thinned places). Several small stands are also present at Whiteford where there is some regeneration from seed. In addition there has been removal and thinning at Whiteford designed to improve shaded dune communities beneath.

This category did not form a clear end-group in analysis and had to be selected. Of seventeen samples, twelve are represented here and the remaining five are shaded slacks which were classified correctly and were thus retained in slack classes. Shading effects were, however, very clear in each case.

- 32 X4 *Acer pseudoplatanus* woodland

Sycamore woodland did not form a classification end-group but five quadrats could be selected. The vegetation type is found at Whiteford on sand blown on to a hillside at the south of the survey area, and it is present in small quantity at the Pembrey Coast. Young stands are developing between Port-Eynon and Horton. The community is rather species-poor and lacks much ecological interest.

## ANNEX 4

### QUADRAT MEMBERSHIP OF VEGETATION TYPES

Quadrat membership of vegetation types at these sites is listed below. Some quadrats appear in more than one vegetation type. These are transitional samples identified in classification and placed in more than one end group of the three main TWINSpan hierarchies.

Only mapping unit numbers (plus variant type) are listed against quadrats. For full NVC nomenclature consult Annex 3 and the vegetation legend in the rear map pocket.

The floristic characteristics of each vegetation type are given in Annex 5. Descriptions of each vegetation type, plus notable characteristics of these sites, are given in Annex 3.

| Q   | VT     | Q   | VT       | Q   | VT     | Q   | VT     |
|-----|--------|-----|----------|-----|--------|-----|--------|
| 597 | 6v4    | 598 | 8v5      | 599 | 4      | 600 | 7      |
| 601 | 8v5    | 602 | 4 8v5    | 603 | 8v4    | 604 | 7      |
| 605 | 7      | 606 | 6v4      | 607 | 4 5    | 608 | 9v2    |
| 609 | 6v4    | 610 | 8v4      | 611 | 9v2 13 | 612 | 14     |
| 613 | 7      | 614 | 4 5      | 615 | 6v1    | 616 | 6v4    |
| 617 | 9v1    | 618 | 13 15    | 619 | 13 15  | 620 | 9v1 13 |
| 621 | 12(b)  | 622 | 15 23    | 623 | 10v1   | 624 | 7      |
| 625 | 9v2 13 | 626 | 12(b) 15 |     |        |     |        |

## ANNEX 5

### FLORISTIC DETAILS OF VEGETATION TYPES

The following pages include the vegetation types present in the site(s). Community structure data on height and cover are provided, plus information on bare ground, pH and mean species diversity. Species are listed in order of decreasing frequency:

|     |   |            |
|-----|---|------------|
| V   | = | >80%       |
| IV  | = | >60% - 80% |
| III | = | >40% - 60% |
| II  | = | >20% - 40% |

Very infrequent species are excluded to restrict table length. Domin values are the most common (i.e. they are modal scores).

MAP VEGETATION  
UNIT UNIT

2 SD4 *Elymus farctus* foredune community

Tree height (m) -  
Shrub/bracken height (m) -  
Herb height (cm) 25  
Tree cover (%) -  
Shrub cover (%) -  
Herb cover (%) 20  
Cryptogam cover (%) -  
  
Bare surface (%) 80  
pH 8.1-8.5  
Mean species per quadrat 5.2

FREQ- DOMIN  
UENCY VALUE

*Elymus farctus* V 5  
*Salsola kali* III 4  
*Atriplex prostrata* III 4  
*Cakile maritima* II 1  
*Honkenya pepioides* II 3  
*Beta vulgaris maritima* II 3

MAP VEGETATION  
UNIT UNIT

3 SD6a *Amnophila arenaria* mobile dune community  
*Elymus farctus* sub-community  
Variant 1

Tree height (m) -  
Shrub/bracken height (m) -  
Herb height (cm) 50  
Tree cover (%) -  
Shrub cover (%) -  
Herb cover (%) 30  
Cryptogam cover (%) -

Bare surface (%) 70  
pH 7.9-8.2  
Mean species per quadrat 4.6

FREQ- DOMIN  
UENCY VALUE

*Elymus farctus* V 5  
*Amnophila arenaria* V 4  
*Eryngium maritimum* III 2  
*Euphorbia paralias* III 4  
*Oenothera erythrosepala* II 1  
*Senecio jacobaea* II 2

MAP VEGETATION  
UNIT UNIT

3 SD6a *Amnophila arenaria* mobile dune community  
*Elymus farctus* sub-community  
Variant 2

Tree height (m) -  
Shrub/bracken height (m) -  
Herb height (cm) 30  
Tree cover (%) -  
Shrub cover (%) -  
Herb cover (%) 30  
Cryptogam cover (%) -

Bare surface (%) 70  
pH 7.9-8.1  
Mean species per quadrat 6.0

FREQ- DOMIN  
UENCY VALUE

*Amnophila arenaria* V 3  
*Elymus farctus* V 4  
*Salsola kali* V 3  
*Cakile maritima* IV 2  
*Eryngium maritimum* II 1  
*Euphorbia paralias* II 1  
*Rumex crispus* II 1  
*Beta vulgaris maritima* II 3

MAP VEGETATION  
UNIT UNIT

4 SD6d *Amnophila arenaria* mobile dune community  
typical sub-community

Tree height (m) -  
Shrub/bracken height (m) -  
Herb height (cm) 70  
Tree cover (%) -  
Shrub cover (%) -  
Herb cover (%) 50  
Cryptogam cover (%) -

Bare surface (%) 50  
pH 7.8-8.2  
Mean species per quadrat 7.1

FREQ- DOMIN  
UENCY VALUE

*Amnophila arenaria* V 7  
*Senecio jacobaea* III 3  
*Hypochaeris radicata* III 3  
*Eryngium maritimum* III 3  
*Senecio asper* III 2  
*Euphorbia paralias* II 3  
*Elymus farctus* II 3  
*Cerastium diffusum diffusum* II 3  
*Oenothera erythrosepala* II 2  
*Arenaria serpyllifolia* II 3  
*Rubus caesius* II 3

MAP VEGETATION  
UNIT UNIT

5 SD6e *Ammophila arenaria* mobile dune community  
*Festuca rubra* sub-community

Tree height (m) -  
Shrub/bracken height (m) -  
Herb height (cm) 50  
Tree cover (%) -  
Shrub cover (%) -  
Herb cover (%) 70  
Cryptogam cover (%) -  
  
Bare surface (%) 30  
pH 7.8  
Mean species per quadrat 9.4

FREQ- DOMIN  
UENCY VALUE

*Ammophila arenaria* V 6  
*Festuca rubra* IV 7  
*Hypochaeris radicata* IV 2  
*Elymus farctus* III 3  
*Carex arenaria* III 3  
*Calystegia soldanella* II 3  
*Ononis repens* II 2  
*Rubus caesius* II 3  
*Senecio jacobaea* II 2  
*Taraxacum* sp. II 2  
*Euphorbia paralias* II 2

MAP VEGETATION  
UNIT UNIT

6 SD7c *Ammophila arenaria* - *Festuca rubra*  
semi-fixed dune community  
*Ononis repens* sub-community  
Variant 1

Tree height (m) -  
Shrub/bracken height (m) -  
Herb height (cm) 50  
Tree cover (%) -  
Shrub cover (%) -  
Herb cover (%) 70  
Cryptogam cover (%) 20  
  
Bare surface (%) 10  
pH 7.6-8.1  
Mean species per quadrat 13.8

FREQ- DOMIN  
UENCY VALUE

*Ammophila arenaria* V 5  
*Festuca rubra* V 6  
*Hypochaeris radicata* IV 3  
*Leontodon hispidus* III 3  
*Ononis repens* III 4  
*Eryngium maritimum* III 2  
*Carex arenaria* III 3  
*Oenothera erythrosepala* III 3  
*Rubus caesius* III 3  
*Anthyllis vulneraria* II 4  
*Cerastium diffusum diffusum* II 2  
*Senecio jacobaea* II 3  
*Eurynchium praelongum* II 4  
*Phleum arenarium* II 2  
*Brachythecium rutabulum* II 3  
*Sedum acre* II 3  
*Barbula vinealis* II 4  
*Arenaria serpyllifolia* II 2  
*Poa pratensis* II 3  
*Brachythecium albicans* II 4  
*Taraxacum* sp. II 3  
*Rhynchosinapis cheiranthos* II 2

MAP VEGETATION  
UNIT UNIT

6 SD7c *Ammophila arenaria* - *Festuca rubra*  
semi-fixed dune community  
*Ononis repens* sub-community  
Variant 4

Tree height (m) -  
Shrub/bracken height (m) 0.4  
Herb height (cm) 30  
Tree cover (%) -  
Shrub cover (%) 40  
Herb cover (%) 80  
Cryptogam cover (%) 10  
  
Bare surface (%) 5  
pH 6.7-7.6  
Mean species per quadrat 11.1

FREQ- DOMIN  
UENCY VALUE

*Festuca rubra* V 6  
*Ononis repens* IV 5  
*Carex arenaria* III 3  
*Rubus caesius* III 7  
*Senecio jacobaea* III 1  
*Ammophila arenaria* III 5  
*Poa pratensis* III 3  
*Galium verum* II 4  
*Lotus corniculatus* II 4  
*Plantago lanceolata* II 3  
*Homalothecium lutescens* II 5  
*Hypochaeris radicata* II 1

MAP VEGETATION  
UNIT UNIT

7 SD7d *Ammophila arenaria* - *Festuca rubra*  
semi-fixed dune community  
*Tortula ruralis* ssp. *ruraliformis*  
sub-community

Tree height (m) -  
Shrub/bracken height (m) 0.3  
Herb height (cm) 20  
Tree cover (%) -  
Shrub cover (%) 5  
Herb cover (%) 40  
Cryptogam cover (%) 30  
  
Bare surface (%) 30  
pH 7.3-8.1  
Mean species per quadrat 16.2

FREQ- DOMIN  
UENCY VALUE

*Phleum arenarium* V 3  
*Ammophila arenaria* IV 5  
*Arenaria serpyllifolia* IV 3  
*Cerastium diffusum diffusum* IV 3  
*Hypochaeris radicata* IV 3  
*Carex arenaria* IV 3  
*Oenothera erythrosepala* IV 3  
*Tortula ruralis* ssp. *ruraliformis* III 5  
*Leontodon hispidus* III 3  
*Vulpia fasciculata* III 4  
*Senecio jacobaea* III 2  
*Sedum acre* III 3  
*Ononis repens* III 4  
*Festuca rubra* II 4  
*Ceratodon purpureus* II 5  
*Holcus lanatus* II 4  
*Rubus caesius* II 4  
*Aira praecox* II 3

MAP VEGETATION  
UNIT UNIT

8 SD8 *Festuca rubra* - *Galium verum* fixed  
dune community  
No clear MVC sub-community  
Variant 4

Tree height (m) -  
Shrub/bracken height (m) 0.4  
Herb height (cm) 30  
Tree cover (%) -  
Shrub cover (%) 20  
Herb cover (%) 90  
Cryptogam cover (%) 20

Bare surface (%) 1  
pH 7.0-7.4  
Mean species per quadrat 15.0

FREQ- DOMIN  
UENCY VALUE

|                                 |     |   |
|---------------------------------|-----|---|
| <i>Festuca rubra</i>            | V   | 7 |
| <i>Galium verum</i>             | IV  | 4 |
| <i>Plantago lanceolata</i>      | IV  | 4 |
| <i>Poa pratensis</i>            | IV  | 3 |
| <i>Carex arenaria</i>           | IV  | 3 |
| <i>Dactylis glomerata</i>       | III | 4 |
| <i>Rosa pimpinellifolia</i>     | III | 5 |
| <i>Anthoxanthum odoratum</i>    | III | 4 |
| <i>Agrostis capillaris</i>      | III | 4 |
| <i>Sanguisorba minor</i>        | III | 4 |
| <i>Holcus lanatus</i>           | II  | 4 |
| <i>Rubus caesius</i>            | II  | 5 |
| <i>Avenula pubescens</i>        | II  | 4 |
| <i>Ononis repens</i>            | II  | 3 |
| <i>Pteridium aquilinum</i>      | II  | 5 |
| <i>Thymus praecox arcticus</i>  | II  | 4 |
| <i>Veronica chamaedrys</i>      | II  | 3 |
| <i>Achillea millefolium</i>     | II  | 4 |
| <i>Lotus corniculatus</i>       | II  | 4 |
| <i>Pseudoscleropodium purum</i> | II  | 5 |
| <i>Geranium sanguineum</i>      | II  | 5 |

MAP VEGETATION  
UNIT UNIT

8 SD8 *Festuca rubra* - *Galium verum* fixed  
dune community  
No clear MVC sub-community  
Variant 5

Tree height (m) -  
Shrub/bracken height (m) 0.6  
Herb height (cm) 60  
Tree cover (%) -  
Shrub cover (%) 40  
Herb cover (%) 90  
Cryptogam cover (%) 10

Bare surface (%) 1  
pH 6.9  
Mean species per quadrat 10.2

FREQ- DOMIN  
UENCY VALUE

|                                |     |   |
|--------------------------------|-----|---|
| <i>Pteridium aquilinum</i>     | IV  | 6 |
| <i>Carex arenaria</i>          | IV  | 3 |
| <i>Geranium sanguineum</i>     | IV  | 6 |
| <i>Rubus caesius</i>           | IV  | 6 |
| <i>Ammophila arenaria</i>      | IV  | 5 |
| <i>Festuca rubra</i>           | IV  | 5 |
| <i>Rosa pimpinellifolia</i>    | III | 6 |
| <i>Convolvulus arvensis</i>    | II  | 3 |
| <i>Galium verum</i>            | II  | 4 |
| <i>Holcus lanatus</i>          | II  | 4 |
| <i>Poa pratensis</i>           | II  | 3 |
| <i>Sanguisorba minor</i>       | II  | 3 |
| <i>Brachythecium rutabulum</i> | II  | 5 |
| <i>Eurynchium praelongum</i>   | II  | 3 |
| <i>Dactylis glomerata</i>      | II  | 4 |

MAP VEGETATION  
UNIT UNIT

9 SD9 *Ammophila arenaria* - *Arrhenatherum elatius*  
dune grassland  
No clear MVC sub-community  
Variant 2

Tree height (m) 0-6  
Shrub/bracken height (m) 0-4  
Herb height (cm) 50  
Tree cover (%) 0-60  
Shrub cover (%) 0-70  
Herb cover (%) 60  
Cryptogam cover (%) 10

Bare surface (%) 1  
pH 6.2-6.4  
Mean species per quadrat 14.1

FREQ- DOMIN  
UENCY VALUE

|                              |     |   |
|------------------------------|-----|---|
| <i>Arrhenatherum elatius</i> | IV  | 5 |
| <i>Eurynchium praelongum</i> | IV  | 4 |
| <i>Festuca rubra</i>         | III | 4 |
| <i>Rubus fruticosus</i> agg. | III | 5 |
| <i>Holcus lanatus</i>        | III | 5 |
| <i>Dactylis glomerata</i>    | III | 4 |
| <i>Carex arenaria</i>        | II  | 3 |
| <i>Heracleum sphondylium</i> | II  | 3 |
| <i>Plantago lanceolata</i>   | II  | 3 |
| <i>Rubus caesius</i>         | II  | 6 |
| <i>Ammophila arenaria</i>    | II  | 4 |
| <i>Rumex acetosa</i>         | II  | 3 |
| <i>Senecio jacobaea</i>      | II  | 3 |
| <i>Populus tremula</i>       | II  | 6 |
| <i>Ulex europaeus</i>        | II  | 7 |
| <i>Centaurea nigra</i>       | II  | 4 |
| <i>Hedera helix</i>          | II  | 4 |
| <i>Rumex crispus</i>         | II  | 2 |
| <i>Salix cinerea</i>         | II  | 6 |
| <i>Lophoclea bidentata</i>   | II  | 4 |
| <i>Vicia sativa</i>          | II  | 3 |

MAP VEGETATION  
UNIT UNIT

10 SD12 *Carex arenaria* - *Festuca ovina* -  
*Agrostis capillaris* grassland  
No clear MVC sub-community  
Variant 1

Tree height (m) -  
Shrub/bracken height (m) 0.4  
Herb height (cm) 30  
Tree cover (%) -  
Shrub cover (%) 20  
Herb cover (%) 70  
Cryptogam cover (%) 50

Bare surface (%) 1  
pH 6.1-7.1  
Mean species per quadrat 17.3

FREQ- DOMIN  
UENCY VALUE

|                                 |     |   |
|---------------------------------|-----|---|
| <i>Hypochaeris radicata</i>     | V   | 3 |
| <i>Carex arenaria</i>           | IV  | 3 |
| <i>Festuca ovina</i>            | IV  | 5 |
| <i>Agrostis capillaris</i>      | IV  | 5 |
| <i>Anthoxanthum odoratum</i>    | IV  | 5 |
| <i>Hypnum cupressiforme</i>     | III | 6 |
| <i>Luzula campestris</i>        | III | 3 |
| <i>Thymus praecox arcticus</i>  | III | 4 |
| <i>Galium verum</i>             | III | 4 |
| <i>Plantago lanceolata</i>      | III | 4 |
| <i>Pteridium aquilinum</i>      | III | 5 |
| <i>Dicranum scoparium</i>       | III | 5 |
| <i>Cladonia impepa</i>          | III | 3 |
| <i>Aira praecox</i>             | III | 3 |
| <i>Hieracium pilosella</i> agg. | III | 3 |
| <i>Poa pratensis</i>            | II  | 3 |
| <i>Cladonia furcata</i>         | II  | 4 |
| <i>Festuca rubra</i>            | II  | 4 |
| <i>Ononis repens</i>            | II  | 4 |
| <i>Holcus lanatus</i>           | II  | 5 |
| <i>Pseudoscleropodium purum</i> | II  | 5 |
| <i>Crepis capillaris</i>        | II  | 3 |
| <i>Leontodon hispidus</i>       | II  | 2 |
| <i>Lotus corniculatus</i>       | II  | 3 |
| <i>Senecio jacobaea</i>         | II  | 2 |
| <i>Calluna vulgaris</i>         | II  | 5 |
| <i>Rubus caesius</i>            | II  | 6 |
| <i>Teucrium scorodonia</i>      | II  | 3 |
| <i>Peltigera canina</i>         | II  | 4 |

MAP VEGETATION  
UNIT UNIT

12 SD15a/b *Salix repens* - *Calliergon cuspidatum*  
dune slack  
*Carex nigra* sub-community (a)  
*Equisetum variegatum* sub-community (b)

Tree height (m) -  
Shrub/bracken height (m) 0.4  
Herb height (cm) 40  
Tree cover (%) -  
Shrub cover (%) 30  
Herb cover (%) 40  
Cryptogam cover (%) 70

Bare surface (%) -  
pH 7.4-7.9  
Mean species per quadrat 16.8

FREQ- DOMIN  
UENCY VALUE

*Hydrocotyle vulgaris* V 6  
*Salix repens* agg. V 6  
*Epipactis palustris* IV 4  
*Equisetum variegatum* IV 4  
*Calliergon cuspidatum* IV 8  
*Agrostis stolonifera* III 4  
*Carex nigra* III 5  
*Holcus lanatus* III 3  
*Juncus maritimus* III 5  
*Mentha aquatica* III 4  
*Potentilla anserina* III 4  
*Galium palustre* III 3  
*Iris pseudacorus* III 3  
*Oenanthe lachenalii* III 3  
*Ranunculus acris* III 3  
*Dactylorhiza majalis* III 2  
*Carex arenaria* II 3  
*Carex flacca* II 3  
*Pulicaria dysenterica* II 4  
*Ranunculus flammula* II 3  
*Salix cinerea* II 4  
*Carex otrubae* II 3  
*Festuca arundinacea* II 3  
*Juncus acutus* II 4  
*Poa pratensis* II 3  
*Rubus fruticosus* agg. II 4  
*Trifolium pratense* II 4

MAP VEGETATION  
UNIT UNIT

13 SD15c *Salix repens* - *Calliergon cuspidatum*  
dune slack  
*Carex flacca* - *Pulicaria dysenterica*  
sub-community

Tree height (m) -  
Shrub/bracken height (m) 0.6  
Herb height (cm) 80  
Tree cover (%) -  
Shrub cover (%) 40  
Herb cover (%) 80  
Cryptogam cover (%) 30

Bare surface (%) -  
pH 7.6-8.3  
Mean species per quadrat 15.6

FREQ- DOMIN  
UENCY VALUE

*Pulicaria dysenterica* IV 6  
*Holcus lanatus* IV 4  
*Mentha aquatica* IV 4  
*Potentilla anserina* III 4  
*Juncus maritimus* III 5  
*Salix repens* agg. III 7  
*Rubus caesius* III 5  
*Equisetum arvense* III 3  
*Eupatorium cannabinus* III 5  
*Festuca rubra* III 5  
*Hydrocotyle vulgaris* III 5  
*Agrostis stolonifera* II 4  
*Carex nigra* II 4  
*Filipendula ulmaria* II 5  
*Calliergon cuspidatum* II 9  
*Lotus uliginosus* II 4  
*Carex flacca* II 3  
*Lychnis flos-cuculi* II 3  
*Angelica sylvestris* II 2  
*Cirsium palustre* II 3  
*Oenanthe lachenalii* II 2  
*Plantago lanceolata* II 4  
*Salix cinerea* II 4  
*Trifolium pratense* II 3

MAP VEGETATION  
UNIT UNIT

14 SD16a/b *Salix repens* - *Holcus lanatus*  
dune slack  
*Ononis repens* sub-community (a)  
*Rubus caesius* sub-community (b)  
*Prunella vulgaris* - *Equisetum variegatum*  
sub-community (c)  
*Agrostis stolonifera* sub-community (d)

Tree height (m) -  
Shrub/bracken height (m) 0.4  
Herb height (cm) 40  
Tree cover (%) -  
Shrub cover (%) 40  
Herb cover (%) 80  
Cryptogam cover (%) 25

Bare surface (%) 1  
pH 7.5-7.9  
Mean species per quadrat 17.0

FREQ- DOMIN  
UENCY VALUE

*Holcus lanatus* IV 4  
*Festuca rubra* IV 6  
*Lotus corniculatus* IV 5  
*Agrostis stolonifera* IV 5  
*Carex arenaria* IV 3  
*Salix repens* agg. IV 7  
*Carex flacca* III 4  
*Equisetum variegatum* III 4  
*Poa pratensis* III 4  
*Trifolium pratense* II 4  
*Plantago lanceolata* II 4  
*Epipactis palustris* II 3  
*Euphrasia officinalis* agg. II 3  
*Hypochoeris radicata* II 3  
*Ononis repens* II 4  
*Taraxacum* sp. II 3  
*Blackstonia perfoliata* II 1  
*Mentha aquatica* II 3  
*Phragmites australis* II 3  
*Prunella vulgaris* II 4  
*Juncus maritimus* II 4  
*Potentilla anserina* II 6  
*Radiola linoides* II 3  
*Rhinanthus minor* II 3  
*Rubus caesius* II 4  
*Calliergon cuspidatum* II 6

MAP VEGETATION  
UNIT UNIT

15 SD17 *Potentilla anserina* - *Carex nigra* dune slack  
No clear NVC sub-community

Tree height (m) -  
Shrub/bracken height (m) 0-3  
Herb height (cm) 80  
Tree cover (%) -  
Shrub cover (%) 30  
Herb cover (%) 90  
Cryptogam cover (%) 30

Bare surface (%) -  
pH 6.8-7.9  
Mean species per quadrat 14.4

FREQ- DOMIN  
UENCY VALUE

*Mentha aquatica* V 5  
*Carex nigra* III 4  
*Hydrocotyle vulgaris* III 6  
*Pulicaria dysenterica* III 5  
*Iris pseudacorus* III 4  
*Equisetum arvense* III 3  
*Filipendula ulmaria* III 5  
*Holcus lanatus* III 4  
*Potentilla anserina* III 4  
*Salix repens* agg. III 6  
*Juncus maritimus* II 5  
*Lythrum salicaria* II 4  
*Calliergon cuspidatum* II 9  
*Agrostis stolonifera* II 4  
*Eupatorium cannabinus* II 5  
*Lotus uliginosus* II 4  
*Salix cinerea* II 4  
*Oenanthe lachenalii* II 2  
*Rubus caesius* II 3  
*Rubus fruticosus* agg. II 5  
*Angelica sylvestris* II 2  
*Arrhenatherum elatius* II 4  
*Eleocharis palustris* II 4  
*Lychnis flos-cuculi* II 3  
*Juncus subnodulosus* II 5

## MAP VEGETATION

UNIT UNIT

22 SD18b Hippophae rhamnoides scrub  
*Urtica dioica* - *Arrhenatherum elatius*  
 sub-community

Tree height (m) -  
 Shrub/bracken height (m) 2-6  
 Herb height (cm) 40  
 Tree cover (%) -  
 Shrub cover (%) 80  
 Herb cover (%) 60  
 Cryptogam cover (%) 20

Bare surface (%) 10  
 pH 6.6-7.5  
 Mean species per quadrat 9.7

FREQ- DOMIN  
 UENCY VALUE

|                                |     |   |
|--------------------------------|-----|---|
| <i>Hippophae rhamnoides</i>    | V   | 8 |
| <i>Galium aparine</i>          | V   | 4 |
| <i>Eurynchium praelongum</i>   | IV  | 5 |
| <i>Rubus fruticosus</i> agg.   | IV  | 5 |
| <i>Urtica dioica</i>           | IV  | 6 |
| <i>Brachythecium rutabulum</i> | III | 5 |
| <i>Sambucus nigra</i>          | III | 5 |
| <i>Solanum dulcamara</i>       | III | 4 |
| <i>Holcus lanatus</i>          | II  | 3 |
| <i>Polypodium vulgare</i>      | II  | 3 |
| <i>Evernia prunastri</i>       | II  | 2 |

## MAP VEGETATION

UNIT UNIT

23 W1 *Salix cinerea* - *Galium palustre* woodland

Tree height (m) 4-8  
 Shrub/bracken height (m) 0-6  
 Herb height (cm) 20-150  
 Tree cover (%) 30-80  
 Shrub cover (%) 0-80  
 Herb cover (%) 30  
 Cryptogam cover (%) 40

Bare surface (%) -  
 pH 6.7  
 Mean species per quadrat 10.3

FREQ- DOMIN  
 UENCY VALUE

|                                 |     |   |
|---------------------------------|-----|---|
| <i>Betula pubescens</i>         | V   | 6 |
| <i>Galium palustre</i>          | V   | 5 |
| <i>Iris pseudacorus</i>         | V   | 4 |
| <i>Agrostis stolonifera</i>     | IV  | 4 |
| <i>Ophioglossum vulgatum</i>    | IV  | 3 |
| <i>Phragmites australis</i>     | IV  | 6 |
| <i>Rubus fruticosus</i> agg.    | IV  | 2 |
| <i>Salix cinerea</i>            | IV  | 5 |
| <i>Calliergon cuspidatum</i>    | IV  | 5 |
| <i>Juncus effusus</i>           | III | 4 |
| <i>Solanum dulcamara</i>        | III | 2 |
| <i>Epilobium palustre</i>       | II  | 3 |
| <i>Equisetum sylvaticum</i>     | II  | 3 |
| <i>Eriophorum angustifolium</i> | II  | 2 |
| <i>Hydrocotyle vulgaris</i>     | II  | 3 |
| <i>Salix repens</i> agg.        | II  | 4 |

## MAP VEGETATION

UNIT UNIT

26 W22 *Prunus spinosa* - *Rubus fruticosus* agg. scrub  
 No clear MVC sub-community

Tree height (m) -  
 Shrub/bracken height (m) 2-5  
 Herb height (cm) 30  
 Tree cover (%) -  
 Shrub cover (%) 60-100  
 Herb cover (%) 5-80  
 Cryptogam cover (%) 10-40

Bare surface (%) -  
 pH 7.4  
 Mean species per quadrat 12.6

FREQ- DOMIN  
 UENCY VALUE

|                                |     |   |
|--------------------------------|-----|---|
| <i>Prunus spinosa</i>          | V   | 8 |
| <i>Eurynchium praelongum</i>   | IV  | 6 |
| <i>Urtica dioica</i>           | IV  | 3 |
| <i>Crataegus monogyna</i>      | III | 5 |
| <i>Dactylis glomerata</i>      | III | 3 |
| <i>Rosa pimpinellifolia</i>    | III | 5 |
| <i>Rubus fruticosus</i> agg.   | III | 4 |
| <i>Festuca rubra</i>           | II  | 4 |
| <i>Geranium robertianum</i>    | II  | 3 |
| <i>Glechoma hederacea</i>      | II  | 4 |
| <i>Hedera helix</i>            | II  | 9 |
| <i>Quercus robur</i>           | II  | 4 |
| <i>Sambucus nigra</i>          | II  | 6 |
| <i>Silene dioica</i>           | II  | 3 |
| <i>Arrhenatherum elatius</i>   | II  | 2 |
| <i>Athyrium filix-femina</i>   | II  | 1 |
| <i>Brachypodium sylvaticum</i> | II  | 3 |
| <i>Carex arenaria</i>          | II  | 3 |
| <i>Dryopteris filix-mas</i>    | II  | 4 |
| <i>Epilobium montanum</i>      | II  | 2 |
| <i>Fraxinus excelsior</i>      | II  | 4 |
| <i>Galium verum</i>            | II  | 4 |
| <i>Phyllitis scolopendrium</i> | II  | 4 |
| <i>Plantago lanceolata</i>     | II  | 3 |
| <i>Pteridium aquilinum</i>     | II  | 4 |
| <i>Rubus caesius</i>           | II  | 4 |
| <i>Senecio jacobaea</i>        | II  | 2 |
| <i>Stachys sylvatica</i>       | II  | 3 |
| <i>Tomus communis</i>          | II  | 1 |

## MAP VEGETATION

UNIT UNIT

28 W24 *Rubus fruticosus* agg. - *Holcus lanatus*  
 underscrub  
 No clear MVC sub-community

Tree height (m) -  
 Shrub/bracken height (m) 1-3  
 Herb height (cm) 30  
 Tree cover (%) -  
 Shrub cover (%) 60  
 Herb cover (%) 60  
 Cryptogam cover (%) 10

Bare surface (%) -  
 pH 6.3-6.9  
 Mean species per quadrat 12.1

FREQ- DOMIN  
 UENCY VALUE

|                              |     |   |
|------------------------------|-----|---|
| <i>Rubus fruticosus</i>      | IV  | 6 |
| <i>Arrhenatherum elatius</i> | IV  | 4 |
| <i>Festuca rubra</i>         | IV  | 4 |
| <i>Holcus lanatus</i>        | III | 4 |
| <i>Eurynchium praelongum</i> | III | 4 |
| <i>Solanum dulcamara</i>     | III | 3 |
| <i>Dactylis glomerata</i>    | III | 3 |
| <i>Galium aparine</i>        | III | 3 |
| <i>Rosa pimpinellifolia</i>  | III | 5 |
| <i>Ulex europaeus</i>        | III | 8 |
| <i>Carex arenaria</i>        | II  | 4 |
| <i>Crataegus monogyna</i>    | II  | 5 |
| <i>Agrostis stolonifera</i>  | II  | 2 |
| <i>Populus tremula</i>       | II  | 6 |
| <i>Urtica dioica</i>         | II  | 4 |
| <i>Hedera helix</i>          | II  | 6 |
| <i>Rumex crispus</i>         | II  | 1 |
| <i>Sonchus asper</i>         | II  | 2 |

## ANNEX 6

### TARGET NOTES

These are marked on the site map sheet(s) as TNn.

#### HILLEND, LLANGENNITH, BROUGHTON, DELVID, HILLS TOR

- 1 SD8 grassland maintained by heavy trampling around caravans. Sward rich in *Plantago lanceolata*.
- 2 Area of former dune restoration with Marram growing in rows as thriving large tussocks with much invasion by *Rubus caesius* and some *Arrhenatherum elatius*.
- 3 Area used for burning rubbish, covered in metal debris.
- 4 Poor dune assemblage with evidence of frontal erosion, exposing shingle. Only slight traces of strand and foredune.
- 5 Stone track has probably buried a former slack. There are a few remaining examples of *Phragmites australis* and *Iris pseudacorus*.
- 6 Stream cuts through dune front via artificial straight channel. At landward end there is a poor aquatic flora (*Nasturtium officinale*, *Sparganium erectum*, *Potamogeton natans*).
- 7 Rubbish dump for waste from Broughton Farm.
- 8 *Pyrola rotundifolia* is present here in one of the few slacks in this area.
- 9 Frontal dunes in this area contain a few individuals of *Crithmum maritimum* and *Matthiola sinuata*.
- 10 Boulders placed at foot of cliff for protection against erosion.
- 11 Most of caravan park area re-seeded with *Lolium perenne*.

## ANNEX 7

### QUADRAT DATA (COMPUTER FORMAT)

Full tabulation of all quadrat data as sample-species tables is too costly in terms of space. A reduced version of the data in NVC format for use in the VESPAN2 package is given here. A copy of this data aggregated for all sites has been supplied to the NCC Nominated Officer on floppy diskette. For readers with access to VESPAN2 it is thus possible to obtain the data and display individual quadrats in full format.

The species characteristics of vegetation types are presented in great detail in Annex 5 (apart from infrequent species), based on data from all sites. Particular characteristics of this site are emphasised under descriptions of vegetation types in Annex 3. Quadrat membership of vegetation types is listed in Annex 4. This organisation of information should satisfy most readers.

597 9 0 10 0 11 5 13 0 14 0 15 40 16 30 22 40 304 4 415 4  
597 465 4 576 5 613 4 625 3 796 6 807 3 972 3 973 31368 41562 6  
597 2982 2  
598 9 0 10 1 11 70 13 0 14 10 15100 16 0 22 0 159 5 304 3  
598 455 4 576 7 613 4 631 5 680 6 988 41066 61123 41127 31349 4  
598 1396 4  
599 9 0 10 0 11 90 13 0 14 0 15 60 16 0 22 40 159 8 576 4  
599 706 21123 11127 31272 1  
600 9 0 10 0 11 10 13 0 14 0 15 30 16 2 22 70 159 5 304 3  
600 576 4 631 6 706 3 769 31127 42023 3  
601 9 0 10 0 11 60 13 0 14 0 15100 16 0 22 0 159 4 304 4  
601 576 7 605 2 631 81066 81123 21127 71396 4  
602 9 0 10 0 11 80 13 0 14 0 15100 16 0 22 0 159 10 576 3  
602 1123 4  
603 9 0 10 0 11 10 13 0 14 0 15 80 16 2 22 20 125 3 304 4  
603 369 3 576 8 613 4 631 8 680 4 706 3 800 4 807 21123 51333 3  
603 1350 42023 2  
604 9 0 10 0 11 5 13 0 14 0 15 30 16 40 22 50 159 3 304 3  
604 369 3 576 4 613 2 631 5 769 3 800 4 914 4 958 31123 51333 3  
604 1434 31562 42023 7  
605 9 0 10 0 11 10 13 0 14 0 15 40 16 90 22 10 125 3 159 5  
605 194 3 304 3 369 3 381 3 567 3 613 3 631 7 680 3 706 2 769 1  
605 914 3 958 31066 31239 11434 41562 51766 52023 8  
606 9 0 10 0 11 70 13 0 14 0 15 80 16 0 22 20 159 7 576 8  
606 1127 4  
607 9 0 10 0 11 50 13 0 14 0 15 60 16 0 22 40 116 3 159 7  
607 565 5 576 3 706 22982 1  
608 9 0 10 1 11100 13 0 14 50 15 90 16 0 22 0 197 4 465 4  
608 576 5 637 7 988 41066 81095 41127 61136 71239 41254 41293 4  
608 1368 41396 5  
609 9 0 10 0 11 40 13 0 14 0 15100 16 0 22 0 159 5 304 3  
609 415 4 576 10 914 4 988 31127 41239 1  
610 9 0 10 0 11 30 13 0 14 0 15100 16 0 22 0 304 5 384 1  
610 475 4 576 9 613 4 631 4 914 4 973 4 988 31053 51239 22982 1  
611 9 0 10 1 11 40 13 0 14 80 15 70 16 0 22 0 104 3 197 4  
611 465 3 532 3 576 5 637 4 680 4 855 3 988 31043 31050 31069 7  
611 1095 31127 91136 41254 21349 31396 3  
612 9 0 10 1 11 30 13 0 14 10 15100 16 5 22 0 304 3 323 3  
612 531 2 576 9 680 4 690 2 706 1 800 4 855 4 973 3 988 31043 6  
612 1095 41106 31179 41519 4  
613 9 0 10 0 11 2 13 0 14 10 15 40 16 50 22 20 194 3 304 3  
613 576 4 769 3 914 3 958 31127 31225 31333 72023 8  
614 9 0 10 0 11 30 13 0 14 0 15 40 16 0 22 60 116 3 159 6  
614 283 5 555 4 565 2 576 4 769 2 914 2  
615 9 0 10 0 11 30 13 0 14 0 15 60 16 0 22 40 159 7 283 5  
615 304 3 555 4 576 8 706 3 769 2 914 5  
616 9 0 10 1 11 40 13 0 14 80 15 50 16 0 22 0 159 6 304 3  
616 576 7 798 4 914 4 988 31127 91239 1  
617 9 0 10 0 11 40 13 0 14 0 15100 16 0 22 0 173 4 197 9  
617 200 6 433 4 465 4 637 4 758 4 988 31254 21368 4  
618 9 0 10 0 11 70 13 0 14 0 15100 16 0 22 0 167 2 197 4  
618 279 4 333 4 415 4 532 4 572 4 690 4 802 4 855 4 862 3 911 2  
618 1043 31069 9  
619 9 0 10 1 11100 13 0 14 0 15100 16 70 22 0 167 2 197 5  
619 532 6 558 3 690 3 715 6 802 4 855 3 988 31069 71446 8  
620 9 0 10 1 11 50 13 0 14 10 15 40 16 0 22 0 113 3 323 3  
620 415 4 532 4 576 5 680 4 734 6 855 31043 31069 51127 81136 4  
620 1179 4

621 9 0 10 1 11 30 13 0 14 70 15 50 16100 22 0 122 4 323 3  
621 333 5 531 4 539 3 576 4 680 4 690 7 720 4 734 5 800 4 973 2  
621 988 31043 41169 41179 81445 10  
622 9 0 10 2 11 40 13 0 14 90 15 70 16 0 22 0 333 3 415 3  
622 532 3 605 3 630 2 680 4 690 5 715 2 831 5 855 61127 51136 3  
622 1169 9  
623 9 0 10 0 11 5 13 0 14 0 15 50 16 90 22 5 125 3 304 3  
623 373 4 576 5 613 4 769 4 800 5 807 41333 61422 31562 9  
624 9 0 10 0 11 5 13 0 14 0 15 60 16 90 22 10 159 3 194 3  
624 304 3 373 3 381 2 385 1 567 2 613 4 631 6 769 3 807 4 914 4  
624 958 2 995 31049 51127 81225 31239 21272 21333 71586 31562 3  
624 2023 92362 42486 4  
625 9 0 10 1 11 50 13 0 14 60 15 60 16 0 22 0 197 5 415 5  
625 576 5 583 6 631 6 734 51049 51069 61127 8  
626 9 0 10 1 11 30 13 0 14 60 15 30 16100 22 0 122 4 333 5  
626 531 3 609 3 690 6 720 4 855 31043 41049 51089 11095 21127 4  
626 1169 41179 81445 101656 4

## ANNEX 8

## AREAS OF VEGETATION TYPES

The table below lists the area (in hectares) of vegetation types at this site(s). Results are based on weighing on a balance accurate to 10mg - small categories may not be fully accurate. H-L-B = Hillend-Llangennith-Broughton, D-HT = Delvid - Hills Tor.

| Map Unit                          | NVC or non-NVC Unit | H-L-B  | D-HT  | TOTAL  |
|-----------------------------------|---------------------|--------|-------|--------|
| 1                                 | X1                  | -      | -     | -      |
| 2                                 | SD4                 | -      | 0.90  | 0.90   |
| 3                                 | SD6a                | -      | 1.03  | 1.03   |
| 4                                 | SD6d                | 16.02  | 1.92  | 17.94  |
| 5                                 | SD6e                | 5.12   | -     | 5.12   |
| 6                                 | SD7c                | 21.79  | 9.62  | 31.41  |
| 7                                 | SD7d                | 27.56  | 6.41  | 33.97  |
| 8                                 | SD8                 | 48.39  | 1.15  | 49.54  |
| 9                                 | SD9                 | 31.73  | 8.33  | 40.06  |
| 10                                | SD12                | -      | -     | -      |
| 11                                | H11                 | -      | -     | -      |
| 12                                | SD14c-SD15a/b       | 2.88   | -     | 2.88   |
| 13                                | SD15c               | 2.56   | 0.64  | 3.20   |
| 14                                | SD16a/b-SD16c/d     | 0.26   | -     | 0.26   |
| 15                                | SD17                | -      | -     | -      |
| 16                                | SM18b               | -      | -     | -      |
| 17                                | SM24                | -      | -     | -      |
| 18                                | S4a                 | -      | -     | -      |
| 19                                | S4d-S21b            | -      | -     | -      |
| 20                                | S12b                | -      | -     | -      |
| 21                                | SD18a               | -      | -     | -      |
| 22                                | SD18b               | 1.28   | -     | 1.28   |
| 23                                | W1                  | 0.83   | -     | 0.83   |
| 24                                | W10c                | -      | -     | -      |
| 25                                | W21a                | -      | -     | -      |
| 26                                | W22                 | 0.13   | 0.13  | 0.26   |
| 27                                | W23                 | -      | -     | -      |
| 28                                | W24                 | 6.41   | 2.69  | 9.10   |
| 29                                | W25                 | -      | -     | -      |
| 30                                | X2                  | -      | -     | -      |
| 31                                | X3                  | -      | -     | -      |
| 32                                | X4                  | -      | -     | -      |
| 1-11 (strand/<br>grassland/heath) |                     | 150.61 | 29.36 | 179.97 |
| 12-15 (dune slacks)               |                     | 5.70   | 0.64  | 6.34   |
| 16-20 (saltmarsh/<br>swamp)       |                     | -      | -     | -      |
| 21-32 (scrub/<br>woodland)        |                     | 8.65   | 2.82  | 11.47  |
| Other:                            |                     | -      | -     | -      |
| Total                             |                     | 164.96 | 32.82 | 197.78 |

# MAPPING AND VEGETATION UNITS FOR 1989 SOUTH WALES DUNE SURVEY

## STRAND, DUNE AND TRANSITIONS

| a  | b    |                                                                                                                                             |
|----|------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | X1   | Dry foredune/saltmarsh/strandline transition community                                                                                      |
| 2  | SD4  | <i>Elymus farctus</i> foredune community                                                                                                    |
| 3  | SD6a | <i>Ammophila arenaria</i> mobile dune community<br><i>Elymus farctus</i> sub-community                                                      |
| 4  | SD6d | <i>Ammophila arenaria</i> mobile dune community<br>Typical sub-community                                                                    |
| 5  | SD6e | <i>Ammophila arenaria</i> mobile dune community<br><i>Festuca rubra</i> sub-community                                                       |
| 6  | SD7c | <i>Ammophila arenaria</i> - <i>Festuca rubra</i> semi-fixed dune community<br><i>Ononis repens</i> sub-community                            |
| 7  | SD7d | <i>Ammophila arenaria</i> - <i>Festuca rubra</i> semi-fixed dune community<br><i>Tortula ruralis</i> ssp. <i>ruraliformis</i> sub-community |
| 8  | SD8  | <i>Festuca rubra</i> - <i>Galium verum</i> fixed dune community<br>No clear NVC sub-community                                               |
| 9  | SD9  | <i>Ammophila arenaria</i> - <i>Arrhenatherum elatius</i> dune grassland<br>No clear NVC sub-community                                       |
| 10 | SD12 | <i>Carex arenaria</i> - <i>Festuca ovina</i> - <i>Agrostis capillaris</i> grassland<br>No clear NVC sub-community                           |
| 11 | H11  | <i>Calluna vulgaris</i> - <i>Carex arenaria</i> heath                                                                                       |

a = mapping unit    b = vegetation unit  
X = Major non-NVC category or transitional type

# MAPPING AND VEGETATION UNITS FOR 1989 SOUTH WALES DUNE SURVEY

## SLACK, SALTMARSH AND SWAMP

| a  | b       |                                                                                                                                                                                     |
|----|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | SD14c   | <i>Salix repens</i> - <i>Campylium stellatum</i> dune slack<br><i>Bryum pseudotriquetrum</i> - <i>Aneura pinguis</i> sub-community                                                  |
| 12 | SD15a/b | <i>Salix repens</i> - <i>Calliergon cuspidatum</i> dune slack<br><i>Carex nigra</i> sub-community (a)<br><i>Equisetum variegatum</i> sub-community (b)                              |
| 13 | SD15c   | <i>Salix repens</i> - <i>Calliergon cuspidatum</i> dune slack<br><i>Carex flacca</i> - <i>Pulicaria dysenterica</i> sub-community                                                   |
| 14 | SD16a/b | <i>Salix repens</i> - <i>Holcus lanatus</i> dune slack<br><i>Ononis repens</i> sub-community (a)<br><i>Rubus caesius</i> sub-community (b)                                          |
| 14 | SD16c/d | <i>Salix repens</i> - <i>Holcus lanatus</i> dune slack<br><i>Prunella vulgaris</i> - <i>Equisetum variegatum</i> sub-community (c)<br><i>Agrostis stolonifera</i> sub-community (d) |
| 15 | SD17    | <i>Potentilla anserina</i> - <i>Carex nigra</i> dune slack<br>No clear NVC sub-community                                                                                            |
| 16 | SM18b   | <i>Juncus maritimus</i> saltmarsh<br><i>Oenanthe lachenalii</i> sub-community                                                                                                       |
| 17 | SM24    | <i>Elymus pycnanthus</i> saltmarsh                                                                                                                                                  |
| 18 | S4a     | <i>Phragmites australis</i> swamp and reed-beds<br><i>Phragmites australis</i> sub-community                                                                                        |
| 19 | S4d     | <i>Phragmites australis</i> swamp and reed-beds<br><i>Atriplex hastata</i> sub-community                                                                                            |
| 19 | S21b    | <i>Scirpus maritimus</i> swamp<br><i>Atriplex hastata</i> sub-community                                                                                                             |
| 20 | S12b    | <i>Typha latifolia</i> swamp<br><i>Mentha aquatica</i> sub-community                                                                                                                |

a = mapping unit    b = vegetation unit  
X = Non-NVC category or transitional type

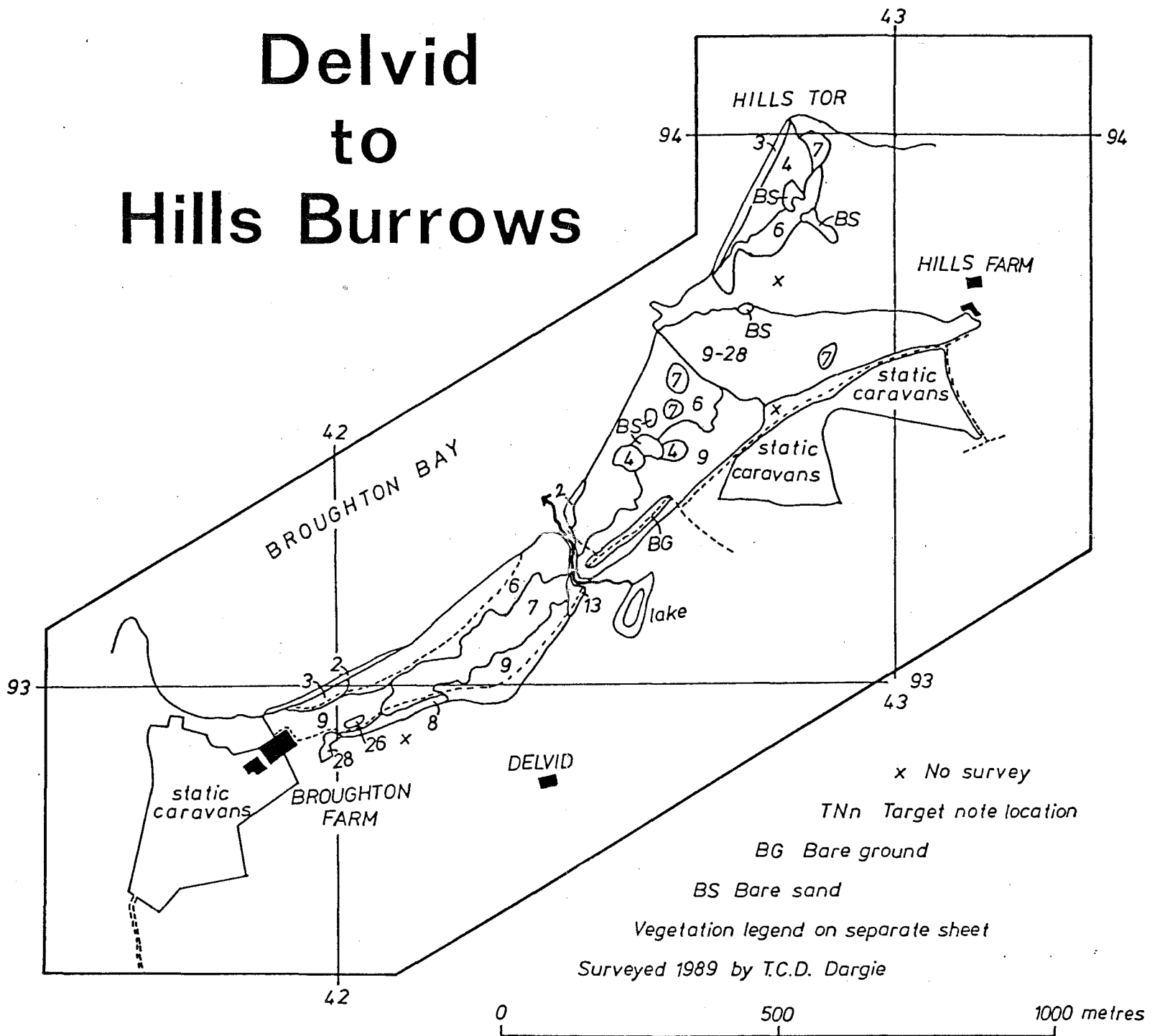
# MAPPING AND VEGETATION UNITS FOR 1989 SOUTH WALES DUNE SURVEY

## WOODLAND AND SCRUB

| a  | b     |                                                                                                                                |
|----|-------|--------------------------------------------------------------------------------------------------------------------------------|
| 21 | SD18a | <i>Hippophae rhamnoides</i> scrub<br><i>Festuca rubra</i> sub-community                                                        |
| 22 | SD18b | <i>Hippophae rhamnoides</i> scrub<br><i>Urtica dioica</i> - <i>Arrhenatherum elatius</i> sub-community                         |
| 23 | W1    | <i>Salix cinerea</i> - <i>Galium palustre</i> woodland                                                                         |
| 24 | W10c  | <i>Quercus robur</i> - <i>Pteridium aquilinum</i> - <i>Rubus fruticosus</i> agg. woodland<br><i>Hedera helix</i> sub-community |
| 25 | W21   | <i>Crataegus monogyna</i> - <i>Hedera helix</i> scrub<br><i>Hedera helix</i> - <i>Urtica dioica</i> sub-community              |
| 26 | W22   | <i>Prunus spinosa</i> - <i>Rubus fruticosus</i> agg. scrub<br>No clear NVC sub-community                                       |
| 27 | W23   | <i>Ulex europaeus</i> - <i>Rubus fruticosus</i> agg. scrub<br>No clear NVC sub-community                                       |
| 28 | W24   | <i>Rubus fruticosus</i> agg. - <i>Holcus lanatus</i> underscrub<br>No clear NVC sub-community                                  |
| 29 | W25   | <i>Pteridium aquilinum</i> - <i>Rubus fruticosus</i> agg. underscrub<br>No clear NVC sub-community                             |
| 30 | X2    | <i>Alnus glutinosa</i> slack woodland                                                                                          |
| 31 | X3    | <i>Pinus nigra/sylvestris</i> woodland                                                                                         |
| 32 | X4    | <i>Acer pseudoplatanus</i> woodland                                                                                            |

a = mapping unit    b = vegetation unit  
X = Non-NVC category or transitional type

# Delvid to Hills Burrows



# Hillend - Llangenith - Broughton

