Maritime cliff vegetation of Flamborough Head

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Background

Flamborough Head

Flamborough Head lies between Filey and Bridlington on the northeast coast of Yorkshire. The site (formerly known as Speeton and Flamborough Coast SSSI) comprises the coastal cliffs between Reighton and Sewerby, composed of chalk and softer sedimentary rocks. The cliff line exposes a variety of geological features and the chalk, which reaches 130 m at Bempton, has been eroded to form impressive stacks and caves between North Cliff and Castlemere Hole. These rock exposures are also of interest in supporting important breeding bird colonies, whilst the cliff slopes support interesting plant communities.

Flamborough Head was identified as a Special Protection Area in 1993 and a candidate Special Area of Conservation in 1996. It was notified as a Site of Special Scientific Interest in 1986 under the 1981 Wildlife and Countryside Act. The site is of international geological importance, with numerous features of interest within a rock sequence spanning the Upper Jurassic period, about 140 million years before the present (MYBP) to the top of the Cretaceous about 70 MYBP, overlain by Pleistocene deposits less than 1 million years old. The site is also important for studies of coastal geomorphology. It is particularly notable, as one of a suite of chalk coastlines, in being within the North Sea wave climate rather than subject to the Atlantic swell or English Channel wave climates, and as the only chalk site extensively overlain by glacial deposits. The north-facing cliffs support internationally important colonies of breeding seabirds with including kittiwakes, guillemots, razorbill, puffins, gannets and fulmars.

The cliff-top vegetation is characterised by both a maritime influence, and by the calcareous influence of the chalk underlying the surface boulder clay. Thus sea cliff species such as thrift *Armeria maritima* and sea plantain *Plantago maritima* grow alongside herbaceous species more typical of chalk grassland such as kidney vetch *Anthyllis vulneraria*.[1]

Objectives

The objectives of the survey were as follows:

- To define and map the area of maritime cliff habitat at Flamborough Head.
- To categorise cliff habitat into maritime soft cliff and maritime hard cliff units and BAP habitat types.
- To classify and map the vegetation within the cliff habitat into NVC vegetation units.
- To support the above with quadrat data, target notes, photographs and other relevant observations.

[1] Information paraphrased from English Nature Citation and Project Specification.

Prior research

The authors are aware of the existence of three previous vegetation surveys in the Flamborough Head area:

- A very detailed vegetation survey of Flamborough Head was undertaken by Sylvia Arnold between July and October 1984. This included both cliff habitats and inland areas. Arnold's report includes in-depth habitat descriptions, species lists and target notes. These refer to a map that was not seen by the current authors.

- Robert Frith and Associates conducted a rapid NVC survey in a limited area on the Flamborough Heritage coast in 1998. The quadrat data presented in this report are not accompanied by grid references. However, these do not appear to overlap with the maritime cliff areas covered by the present study.

- NVC data were collected during a site visit by Geoff Radley and David Rogers of English Nature in August 1995. These include NVC mapping and sampling of the soft cliff areas at Reighton/Speeton, and target note NVC data from the vicinity of the Flamborough Head lighthouse.

Figure 1: The Saddle

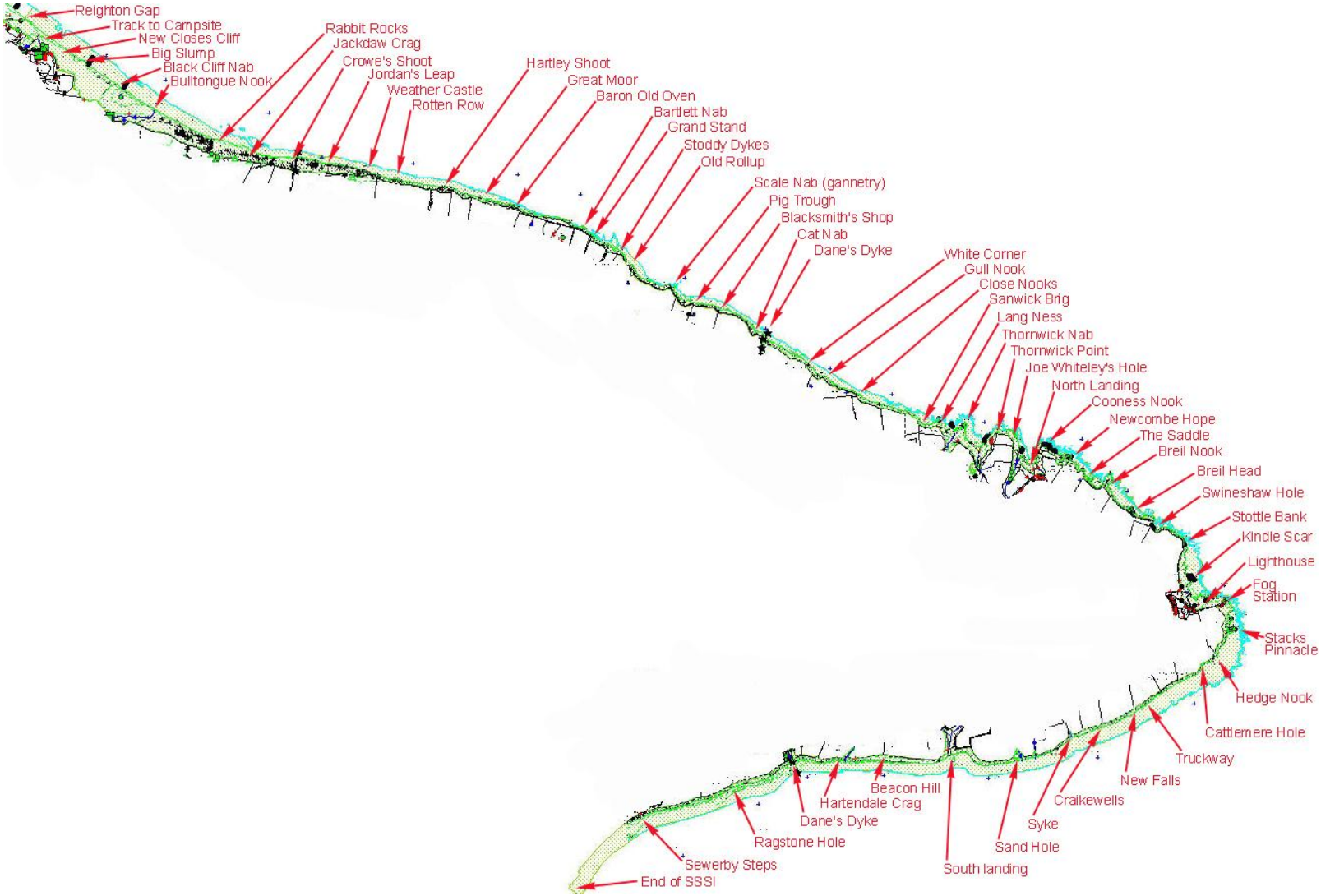

Figure 2: Flamborough Head, showing locations mentioned in this report

Resources on accompanying CD

NVC map on **Mapinfo** database (folder 'Mapping')

- NVC (NVC polygons) – table
- Quadrats – table
- Targets (target notes) – table
- Mosaics (mosaic polygon data) - table
- Photos – table
- Map (NVC map) – workspace

Interactive map including photos and transect data

- Open 'Flamborough Interactive Survey.htm' to activate site
- Land survey photos stored in folder 'Interactive/Imagefiles/Landimages'
- Sea survey photos stored in folder 'Interactive/Imagefiles/Seaimages'

Report and data (folder 'Report and data')

- This report ('Report.doc' – MS Word)
- Quadrat data ('Quadrat data.xls' – MS Excel)

Methods

Standard mapping

Fieldwork was undertaken during the month of August 2002. Initial reconnaissance of the vegetation was undertaken by cliff walking and offshore observation, aided by binoculars and photographic equipment. Maps of vegetation communities and habitat types were hand-drawn onto printouts of OS Landline maps. The exact locations of vegetation boundaries (and the locations of target notes, quadrats and photographs) were ascertained with the use of a Garmin *Etrex* GPS receiver. GPS points were downloaded directly onto a laptop computer and incorporated in the survey database. In open areas (cliff top) this gave reasonable accuracy (the Etrex claims to give points with an accuracy of up to 5m). However, when operating at the base of the cliffs (where available satellites were obscured by the rock) it was sometimes impossible to obtain a fix of better than 20-30m accuracy.

Vegetation communities were sampled using standard NVC sampling techniques as closely as the terrain allowed. Where possible, five quantitative sample quadrats were surveyed for each NVC type identified. Within each 2x2m quadrat (25x25m for woodland/scrub canopy), species were ranked by their dominance according to the following (Domin) scale:

1. <4% cover – few individuals
2. <4% cover – several individuals
3. <4% cover – many individuals
4. 4-10% cover
5. 11-25% cover
6. 26-33% cover
7. 34-50% cover
8. 51-75% cover
9. 76-90% cover
10. 91-100% cover

In the species composition tables that follow in this report (Appendix 2), species have been ranked according to frequency and range of dominance values encountered in the sample quadrats. Frequency is measured as the number of quadrats in which the species was encountered (i.e. between I and V). Thus, ranking a species as III (4-5), for example, indicates that it was found in 3 out of the sample quadrats, that the maximum dominance recorded was 11-25% and the minimum was 4-10%.

Access to otherwise inaccessible cliff ledges was obtained with the help of rope access techniques developed during previous cliff surveys (i.e. double anchors of mild steel angle-irons buried in the cliff top, double static abseil ropes with backup devices, VHF radio communication etc.).

Photographs were taken with a Fujichrome Finepix digital camera.

Mapping cliff habitats

Apart from the obvious access difficulties, the primary limitations in mapping cliff vegetation are as follows:

- Much of the vegetation lies on a near-vertical plane and cannot realistically be depicted in a vertical projection.

- Attempts to do so inevitably result in significant underestimates of the extent of the vegetation.

- Without the availability of aerial photographs it is often impossible to gain an accurate aerial view of the spatial distribution of complex vegetation sequences beneath steep cliffs.

- Variation of vegetation down the cliff is compressed by vertical mapping to the extent that boundaries cannot always be realistically delineated.

As a consequence of these limitations, maps of cliff vegetation using standard techniques are of limited practical value. In order to help to overcome these limitations, the mapping data from this survey have been supplemented by a horizontal survey undertaken from the sea.

Sea survey

The sea survey consists of a series of overlapping digital images covering the entire length of the Flamborough cliffs, taken from a chartered vessel at the beginning of the survey. Images were printed and annotated during the vegetation survey, and at least one known point on each image was recorded with GPS. The photographs have been assembled into an easily navigable html site (viewable with any standard web browser programme) together with hotlinks to photographs and survey (quadrat) data. This assemblage clearly shows the extent of the cliff vegetation and the variation along the Flamborough coast, and should provide a valuable monitoring and management tool.

Extent of maritime cliff habitat and hard and soft cliff areas

The definitions for hard and soft cliff habitats have been outlined in some detail by Hill *et al*. (2002). The first stage of the survey procedure involves the classification of cliff sections into these two categories. The situation at Flamborough Head is complex, however, and for the majority of the cliff area it is not possible to make a simple classification into one or the other. This is due to the geology of the coastline, where deep deposits of glacial drift are found overlying chalk cliffs of varying height and hardness. Where the depth of the drift is significant (and on occasion where it is shallow), the upper sections of the cliff behave in the manner of soft cliffs, with active slumping zones associated with flushes and erosion of the undercliff. These areas support successional vegetation. The chalk cliffs below them, however, which extend from Sewerby to Speeton, are effectively hard cliff zones (although there is some undercutting and occasional collapse). Hard and soft cliff divisions have therefore been based upon the line of break of slope from the cliff top and the bottom line of the 'coastal slope' (soft cliff) as marked on the OS Landline map. The inner edge of the SSSI is taken as the boundary of the cliff top (in general this follows the clifftop path), except where this diverges significantly from the break of slope

Table 1: BAP cliff habitats at Flamborough Head

Hard cliff habitat	**Area (ha)**
Unvegetated crevices and ledges	12.53
Vegetated crevices and ledges, including bird-influenced examples	7.02
Maritime cliff grassland, other improved grassland, tall-herb vegetation, bracken and scrub	5.85
Flushes and springs	0.36
Total	**25.76**
Soft cliff habitat	
Late succession vegetation on drier ground	60.89
Early succession vegetation on drier ground	10.63
Mud and clay	1.06
Early succession vegetation on wetter ground	0.95
Late succession vegetation on wetter ground	0.23
Strandline	0.02
Total	**73.78**
Cliff top habitat	
Maritime cliff grassland, other improved grassland, tall-herb vegetation, bracken and scrub	16.31
Flushes and running water (area not mappable)	
Total	**16.31**
TOTAL CLIFF AREA	**115.85**

BAP habitat classification

All vegetation polygons have been assigned to one of three classes: Soft Cliff, Hard Cliff and Cliff Top. The distribution of these three primary habitat types is shown in Appendix 3. By assigning each of the NVC (or unvegetated) units to one of the broad habitat types specified by Hill et al. (2002), and summing the areas covered by each, it has been possible to provide spatial estimates for each habitat type:

Overview of the vegetation

At Sewerby the chalk cliffs are low. These are overlain by a deep layer of actively eroding drift supporting early successional vegetation (SS**) with tall herbs such as *Epilobium hirsutum*, *Equisetum telmateia* and *Reseda luteola*. There are numerous flushes (AF**) down the face of the hard cliff, dominated by *Agrostis stolonifera*. This combination of flushes on the cliff face accompanied by patches of damp successional vegetation (including *Pulicaria dysenterica* and small *Juncus* mires) on the overlying soft cliff slope continues eastwards to Green stacks. Where seepage through the soft cliff is greatest, distinct patches of *Phragmites australis* occur on the cliff slope. The cliff top from Sewerby to Green stacks is dominated by a combination of MG1 (*Arrhenatherum elatius*) and MG12 (*Festuca arundinacea*) mesotrophic grasslands.

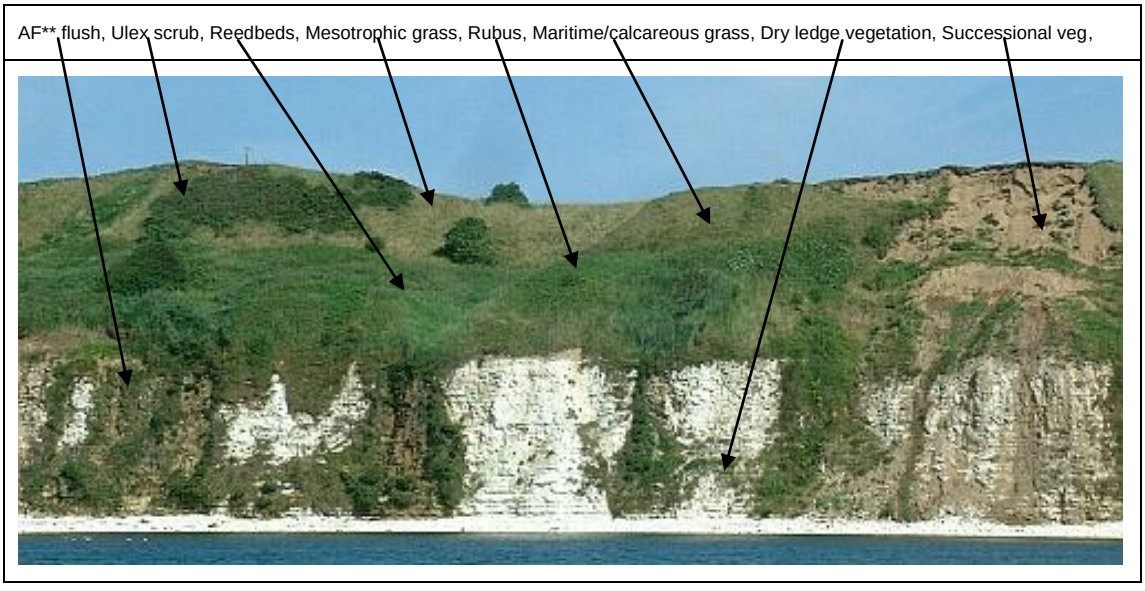

Figure 3: Beacon Hill, showing complex mixture of mesotrophic grassland, *Ulex* scrub, reedbeds, *Rubus* scrub, maritime/calcareous grassland and successional vegetation (soft cliff) with AF flushes and drier (MC8f) ledges on the chalk cliffs below**

Towards Dane's Dyke and beyond, the cliff slope becomes more consolidated and supports increasing quantities of calcareous/maritime grassland. In more sheltered areas these are replaced by the mesotrophic grasslands that descend from the cliff top above. There are also scattered patches of scrub communities (*Crataegus*, *Rubus*, *Prunus* and *Ulex*) on the cliff slopes. From Dane's Dyke eastwards the grassland on the soft cliff slope (MC11) is

increasingly dominated by *Brachypodium sylvaticum* (classified as BS**). Here, the steep well-drained ledges on the chalk cliff face below (in between the damper AF** flushes) support a sparse vegetation similar to MC8f maritime grassland. This sometimes descends almost to sea level.

Where the soft cliff has slumped en *masse* to form a lower plateau, there is typically a mixture of mesotrophic grassland, tall herb vegetation (*Urtica*, *Cirsium*, *Epilobium angustifolium*) and *Rubus* scrub. Small streams cutting through the cliff face support *Rorippa nasturtium-aquaticum* and (in one case) *Phalaris arundinacea*. At South Landing there is a strip of *Atriplex prostrata* strandline vegetation (SD2) backed by a strip of *Elytrygia atherica* grass. In this relatively sheltered location the MG12 mesotrophic grassland descends the soft cliff almost to sea level.

Figure 4: South landing, showing a mixture of mesotrophic (MG12) and calcareous/maritime (BS) grassland on the soft cliff slopes, SD2 strandline vegetation at the base, a large patch of *Rubus* scrub near the shore, and Ulex scrub on the cliff (right)**

Eastwards from South Landing the cliffs continue in a similar fashion, with the soft cliff slope alternating between BS** and SS** interrupted by patches of scrub and *Phragmites*, although at Sand Hole there is a patch of W25 *Pteridium/Rubus* vegetation. Approaching Green Stacks, however, the cliff slope grassland becomes more maritime in nature (MC11), with greater quantities of *Plantago maritima* and *P. coronopus* and generally less *Brachypodium sylvaticum*. *Centaurea scabiosa*, which does not occur further to the west, becomes a conspicuous component of the vegetation.

The vegetation from Green Stacks northwards becomes distinctly more maritime in nature. Although sheltered slopes and plateaux support areas of mesotrophic (MG1) grassland with scattered patches of scrub and tall herb vegetation (with occasional small patches of Juncus/Pulicaria mire in wetter areas), the more exposed cliff slopes (and in some areas the cliff top as well) are covered by dense *Festuca rubra* maritime grasslands. These alternate between MC8 and the more dicotyledon-rich MC9, depending on degree of

exposure and underlying soil conditions. *Ononis repens* is occasionally locally abundant in these grasslands, and although *Armeria maritima* is largely absent it may be abundant at the junction of cliff top and cliff slope. Below the MC8/9, on the steep crumbling lip of the chalk cliffs, there is sometimes a narrow band of sparse MC8f vegetation with *Anthyllis vulneraria*. *Brachypodium*-rich BS** grassland also makes its way around the Flamborough headland, occurring in small patches on the lower cliff slope where the position is relatively sheltered (e.g. within Pigeon Hole).

Figure 5: North landing, showing a complex mixture of *Arrhenatherum* (MG1) and *Festuca rubra* (MC8) grasslands on the left, and successional vegetation on the eroding cliff face on the right

Eroded patches on the soft cliff, usually occurring at the back of small inlets, generally support *Plantago*-rich MC8e vegetation with conspicuous presence of the glaucous-leaved *F. rubra* ssp. *juncea*. Several small patches of perched saltmarsh (SM16) vegetation with *Triglochin* and *Glaux* occur at the base of these eroded basins. MC8e is also abundant on the eroded soft cliff slopes of exposed headlands such as Thornwick Nab and Stacks Pinnacle.

From Green Stacks northwards, seabirds begin to influence the vegetation. On the soft cliff slope this is restricted to small patches that are regularly used by pigeons, and traces of enrichment (again, usually manifested by the presence of *T. maritimum*) above cliffs with nesting kittiwakes etc. Below these nesting cliffs, however, the influence is much greater, and dense patches of *Atriplex prostrata* MC6 vegetation occur. These are generally found on steeply shelving ledges, and become increasingly common as one progresses northwards.

From Sanwick Brig to Reighton the cliffs are higher (to 130+m), the drift overlay is shallower and the rock is harder. The cliff top is dominated by MG1 *Arrhenatherum* grassland interspersed with smaller patches of *Festuca rubra*-dominated MC8 grassland. *Plantago maritima* becomes increasingly scarce among this grassland as the cliffs rise (presumably reflecting decreasing maritime influence). The short soft cliff slope (in places no more than 1-2m) is generally dominated by MC8 *Festuca* grassland, but in more sheltered areas the MG1 grassland extends down from the cliff top almost to the edge (leaving a characteristic '*Festuca* fringe'). From Dane's Dyke westwards, however, tall herb vegetation (OV24 - dominated by *Urtica dioica* and *Galium aparine*) becomes an important component both of the cliff top (towards the edge) and the cliff slope. This continues as far as the screes at Speeton.

Below the edge of the soft cliff slope the vegetation is strongly influenced by seabird activity, consisting of a complex mosaic of MC6 seabird ledge vegetation (with *Atriplex prostrata*), OV24 tall herb vegetation, MC8 Festuca grassland and bare rock (often densely coated with green algae). Some patches of the MC6/OV24 complex support populations of *Brassica oleracea*, possibly warranting its classification as MC4. The MC8 grassland occasionally covers substantial areas where gentler slopes descend the cliff face. This generally shows signs of nitrogen enrichment from the surrounding seabird ledges, often incorporating significant quantities of *Silene dioica* and *Tripleurospermum maritimum*. *Agrostis stolonifera* becomes a dominant element of the vegetation in damp gullies in the cliff face.

Figure 6: Old roll-Up, showing the relatively gentle and sheltered MC9 slopes on the right, and a complex mixture of MC8 (*Festuca rubra*), MC6 (*Atriplex prostrata*) and OV24 (*Urtica dioica*) on the steeper cliffs with seabird nests on the left. Note the golden-coloured MG1 grassland on the short soft cliff slope, with its characteristic green *Festuca* (MC8) fringe, and the green algae at the base of the cliffs on the left.

Where the *Festuca*-dominated slopes are relatively gentle and sheltered (i.e. at Old Roll-up) they become more species-rich, with higher concentrations of dicotyledons (MC9). Towards the western end of the tall cliffs these slopes descend almost to the sea. Here, particularly on steep well-drained slopes, they present a shorter sward displaying both maritime and calcareous

influence (MC8f).

At Speeton the cliffs retreat from the sea. Although the break of slope remains high, the vertical cliff slope gradually diminishes and is replaced by scree slopes. These slopes are covered by a patchy and variable vegetation dominated by *Arrhenatherum elatius* and *Teucrium scorodonia* (classified as AR**). At the western end of these screes, below the small outcrops that mark the western limit of the chalk, small patches of rabbit-grazed CG7 grassland occur close to the sea.

Figure 7: The view towards Speeton cliffs from Black Cliff Nab, showing a mixture of MG5 grasslands, early succession vegetation (on the more mobile ground), *Phragmites* and scrub. Note the scree slopes before the start of the main cliffs.

West of the screes lies the large expanse of boulder clays that make up the Reighton/Speeton soft cliffs. These mobile slopes and slumping gullies support a complex of species-rich MG5 mesotrophic grasslands, scrub communities (*Crataegus*, *Ulex*, *Prunus* and *Rubus*),[2] early succession vegetation (AG**) and (on plateaux) small patches of MG1 *Arrhenatherum* grassland with *Dryopteris* and *Phyllitis* ferns. These areas are associated with small patches of *Epilobium angustifolium* tall herb vegetation. The red clays are generally more calcareous in nature than the black clays, and tend to

[2] The upper valley of Old Beck contains a ribbon of *Acer pseudoplatanus* woodland. This was not mapped or sampled.

support more species-rich grasslands and successional communities.[3] In the slumped areas at the base of the eroded basins the ground is generally wetter, with significant patches of *Pulicaria dysenterica* and (particularly towards the western limits of the cliffs) *Parnassia palustris*. Small patches of *Juncus*, *Typha* and *Filipendula* mire are found in these basins.

NVC communities

Table 2: NVC communities on the Flamborough cliffs and their coverage

Community	Area (ha)
MG1a	18.57
H8.1 (Bare rock)	12.53
MC8a	10.84
W21a	10.06
MG5a	9.77
MG12a	7.51
AG**	7.02
OV24a	5.86
MC8d	5.15
AR**	4.52
MC9	4.13
W24b	3.35
MC6	2.93
SS**	2.48
BS**	2.29
W23b	1.41
MC8e	1.17
H8.2 (Bare ground)	1.06
MC8f	0.99
PB**	0.98
MC11b	0.80
S26b	0.71
AF**	0.60
CG7a	0.28
OV27b	0.22
M22a	0.20
W22c	0.15
W25b	0.07
M27c	0.03
SD2	0.02

Overview of NVC classification and mapping

Much of the vegetation at Flamborough Head does not fit comfortably into the NVC classification as devised by Rodwell (1991-2000). This is due to the fact that little coastal sampling was undertaken in northeast England (apart from the Northumberland coast) during NVC characterisation work. As far as possible, however, the vegetation has been classified according to the NVC

[3] In one area to the west of Old Beck the grassland (classified as PB**) are more calcareous than mesotrophic in nature.

system. In several cases, species that are described as 'constants' in the original definitions of these vegetation types are absent from the vegetation at Flamborough. These differences have been outlined in the following section.

There is substantial micro-local variation in the vegetation at Flamborough Head, at least partly as a result of the dynamic erosion processes in the upper cliff (resulting in regular alternation between early succession, late succession and more established communities). Much of the cliff area is therefore composed of a complex mosaic of vegetation types that could not realistically be mapped as separate areas. This complexity is compounded by the process of two-dimensional mapping of a three-dimensional surface upon which two or three vegetation types often intergrade (i.e. down the cliff) within a relatively small area (see Methods). As a result, a significant proportion of the vegetation at Flamborough was mapped as community mosaics.

CG7: Festuca ovina - Hieracium pilosella - Thymus praecox/pulegioides grassland

CG7 grassland occurs on thin free-draining calcareous soils, often in association with rabbit grazing and anthills. It usually forms a short sward relatively rich in dicotyledenous species and bryophytes (see Fig 8). This type of grassland was only recorded within a relatively restricted area at Flamborough, below Rabbit Rocks at Speeton. Its distribution is patchy, and both anthills and rabbit grazing are evident in the area.[4] *Thymus*, which was found in both of the quadrats allocated to this vegetation type, was not recorded in any other community at Flamborough. Its presence, together with *Leontodon hispidus*, *Festuca ovina*/*rubra* and *Hieracium pilosella* (*Pilosella officinarum*) suggest its inclusion within this vegetation type. However, its species composition is not sufficiently similar to any of Rodwell's sub-communities to warrant further classification, and the high levels of *Brachypodium sylvaticum* in the samples leave some doubt as to whether it really fits CG7 at all.

[4] This was the only evidence of significant grazing anywhere on the Flamborough cliffs.

Figure 8: Rabbit-grazed calcareous grassland near Bulltongue Nook

M22a: Juncus subnodulosus-Cirsium palustre fen meadow - Typical sub-community

M22a is a highly variable community that can be dominated by a number of species, its main characteristic being a rank sward dominated by rushes and sedges (see Fig 9). Small *Juncus*-dominated flushes were recorded at a number of sites on the Flamborough cliffs, generally at the bottom of eroded basins on soft cliffs. In slumped soft cliff areas on the southern side of the headland, this type of vegetation occurs at the head of some of the (AF**) flushes. The dominant species of *Juncus* varies from *J. inflexus* to *J. articulatus*. *Pulicaria dysenterica* (which is widespread in damp areas of soft cliff) is a constant and prominent component of this vegetation type, as are various *Carex* species. Considerable variation was found in the composition of these flushes, some notable species (e.g. *Eriophorum praelongum*,

Hydrocotyle vulgaris, *Mentha aquatica*, *Parnassia palustris*) occurring at only one or two sites.

Figure 9: *Juncus* mire with *Pulicaria* at North Landing

M27c: Filipendula-Angelica mire - Juncus effusus-Holcus lanatus sub-community

A small area of damp ground at the westernmost extremity of the site was found to support vegetation dominated by *Filipendula ulmaria*, *Juncus inflexus* and *Pulicaria dysenterica* (see Fig 10). This fits fairly well into the M27c community, which incorporates a wide range of vegetation communities dominated by *Filipendula* (often with rushes and tall herbs). The *J. effusus-Holcus lanatus* sub-community is less dominated by *F. ulmaria* and generally supports a higher proportion of rushes than the other sub-communities, providing the best match for this stand.

Figure 10: Filipendula/Juncus mire at Reighton Gap

MC4: Brassica oleracea maritime cliff-ledge community

On some of the seabird-influenced ledges on the Bempton-Speeton cliffs (see target notes), *Brassica oleracea* was found growing amongst the *Festuca*/*Atriplex* MC6 vegetation (see Fig 11). This was not observed in quantities large enough to warrant mapping. *Brassica* is not normally a component of MC6 vegetation, possibly warranting the classification of these quadrats as MC4. The MC4 community is characteristic of crumbling cliff ledges on calcareous rocks, and is sometimes associated with seabird activity. However, apart from the occurrence of *Brassica* these samples have little in common with the species composition described by Rodwell (2000), and may be better considered as variations on MC6.

Figure 11: Cliff ledge vegetation with *Brassica oleracea* at Old Roll-up

MC6: Atriplex prostrata - Beta vulgaris sea bird cliff community

Sloping ledges heavily influenced by the presence of seabirds are found on the lower (hard) cliffs from Green Stacks Pinnacle all the way to the end of the cliffs at Speeton. Heaviest nitrogenation occurs below the seabird nesting sites, where the vegetation is dominated by a mixture of *Atriplex prostrata*, *Festuca rubra* and *Tripleurospermum maritimum* (see Fig 12). Other common species include *Sonchus oleraceus*, *Stellaria media* and *Cochlearia officinalis*. *Phleum pratense* was also recorded among this vegetation in quadrats on the Bempton cliffs. Relative proportions vary, and on some ledges the cover is almost 100% *Atriplex*. MC6 vegetation as described by Rodwell (2000) is very variable, but is usually dominated by *Atriplex prostrata*, *Beta vulgaris* or *Lavatera arborea*, often in association with *Tripleurospermum*. This community is specifically associated with seabird communities, and fits well

with the samples from Flamborough.

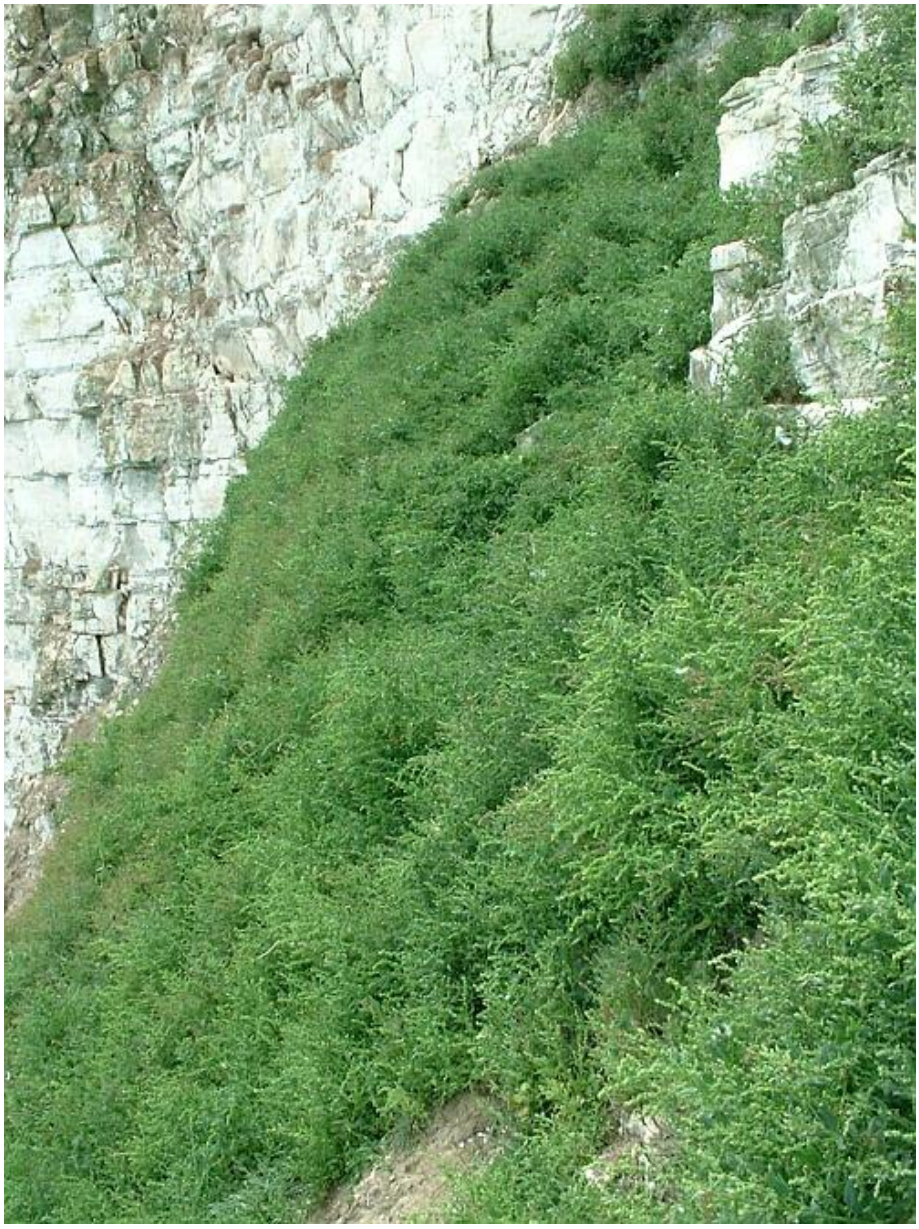

Figure 12: *Atriplex prostrata* seabird ledge vegetation near Breil Nook

MC8 Festuca rubra-Armeria maritima maritime grassland

This community constitutes maritime grassland with a generally closed sward usually dominated by *Festuca rubra*, which often forms a thick mattress. Apart from *F. rubra* the only species normally regarded as 'constant' in the community is *Armeria maritima*, which may be abundant as scattered cushions. The abundance and composition of the dicotyledenous component of this vegetation varies considerably between sub-communities, depending on levels of maritime influence and soil/drainage conditions.

Vegetation broadly fitting this description dominates most of the soft cliff slope (and in some places the cliff top) from Green Stacks round to the western end

of the Speeton cliffs. *Armeria maritima*, however, was notably absent or else very sparse among these communities.[5] In spite of this omission these areas have been classified into sub-communities, but it should be observed that there is considerable intergradation between one type and another even within relatively small areas.

Figure 13: *Festuca rubral Plantago* spp. grassland near the Saddle

[5] *Armeria maritima* was often found to be absent from the grassland on the cliff slopes themselves but abundant in a thin strip along the break of slope (this was also the case for *Galium verum* along much of the cliff edge). This may be due to the greater availability of bare ground at the cliff edge, allowing it to gain a purchase. Elsewhere the dense cushion-like cover of *Festuca rubra* probably hinders its establishment.

MC8a- Typical sub-community

The typical MC8 community is rather species-poor, but *Agrostis stolonifera* can sometimes form a significant component. *Plantago maritima* and *P. lanceolata* are frequently present, as are *Cochlearia officinalis* and *Sonchus arvensis*.

Species-poor *Festuca rubra* grassland dominates the soft cliff slopes for most of the length of the cliffs between Green Stacks and Speeton (see Fig 13), apart from the more sheltered areas (where it becomes more dicotyledon-rich) and the particularly exposed/eroded areas (where it becomes *Plantago*-dominated). These grasslands have been categorised as MC8a. Apart from *Festuca rubra* the only significant species in this community tend to be *Plantago* spp. (*P. maritima* where the maritime influence is greater) and in some cases *Agrostis stolonifera*. *Tussilago farfara* can be locally abundant on damp or disturbed ground. This vegetation generally merges with MG1 *Arrhenatherum* grassland towards the top of the cliff slope.

Figure 14: *Festuca rubra-Holcus lanatus* maritime grassland on high cliffs at Bempton

MC8d: - Holcus lanatus sub-community

The MC8d sub-community is similar to MC8a but generally contains a higher component of species typical of neutral grasslands (including *Achillea millefolium*, *Lotus corniculatus*, *Centaurea nigra* and *Rumex acetosa*. *Holcus lanatus* is constant in this sub-community, which is the least maritime of the MC8 grasslands.

Much of the *Festuca*-dominated grasslands that occur sporadically (particularly on the promontories) along the cliff top between Green Stacks and Sanwick Brig are more species-rich than their cliff-slope counterparts, and have been allocated to this sub-community. This is also the case for the *Festuca* grasslands on the cliff slopes of the Bempton-Speeton cliffs (see Fig 14), where the height of the cliffs above the sea results in reduced maritime influence (but there may be some nitrogen enrichment from surrounding seabird colonies). It should be noted, however, that *Holcus lanatus* is not constant in the samples of this vegetation, in contrast to Rodwell's definition, and *Armeria maritima* is likewise absent. Furthermore there is considerable and constant intergradation with the slightly more maritime MC8a and the slightly less maritime MC9 grasslands.

Figure 15: Short *Plantago* sward (MC8e) on steep ground by Pigeon Hole

MC8e: - Plantago coronopus sub-community

This sub-community, in contrast with the previous two, constitutes a short sward with a heavy content of *Plantago coronopus* and *P. maritima*, together with *Agrostis stolonifera* and *Armeria maritima*. Communities matching this description were recorded on the soft cliff slope from Green Stacks to Sanwick Brig (see Fig 15). This was generally confined to small areas where a relatively high maritime influence is combined with steep or eroding ground (where the *Plantago* species may have an advantage).[6] A glaucous-leaved maritime form of *Festuca rubra* (ssp. *juncea*) commonly occurs in this vegetation community, making it easily recognisable, and *Armeria maritima* is more abundant than it is in any other community at Flamborough Head.

In spite of the similarities in composition and structure to the descriptions of the MC8e sub-community, it should be noted that the vegetation at Flamborough is ungrazed whereas Rodwell (2000) describes MC8e as being the product of grazing.

MC8f: - Anthyllis vulneraria sub-community

The MC8f sub-community generally occurs on steep slopes where drainage is excessive, and is characterised by a reduced dominance of *Festuca rubra* together with a greater preponderance of *Anthyllis vulneraria*. Vegetation roughly corresponding to this description occurs along the relatively sheltered steep lower cliff ledges on the southern coast of Flamborough (i.e. from Green Stacks towards Sewerby), and on steep loose ground (again relatively sheltered) at the cliff edge northwards to Kindle Scar (see Fig 16). However, the composition does not match Rodwell's descriptions particularly comfortably. Many of the theoretically 'constant' species (e.g. *Armeria maritima*, *Silene vulgaris*) are missing and the *Anthyllis* content is generally low. Given the regular presence of *Daucus carota* in the samples, this vegetation may fit equally well into MC11.

[6] For example, at the heads of the many inlets between Flamborough Head and North Landing. The ground at ther head of the gulley is usually eroding, but may also take the brunt of the spray forced up these gulleys during rough weather.

Figure 16: Ledge vegetation with *Anthyllis vulneraria* at Kindle Scar

MC9: Festuca rubra-Holcus lanatus maritime grassland

MC9 grassland generally has a close rather low-growing or tussocky sward dominated by *Festuca rubra*, sometimes with considerable quantities of *Holcus lanatus* or *Dactylis glomerata*. It is usually found in more sheltered locations than the more maritime MC8, and herbaceous dicotyledons usually form an important component (including non-maritime species).

Scattered occurrences of dicotyledon-rich *Festuca* grassland were encountered on the cliff slopes between Green Stacks and Sanwick Brig, generally in more sheltered locations than the MC8 communities (see Fig 17). *Plantago lanceolata* is generally abundant in these grasslands, as is *Centaurea nigra*. There is considerable variation in species composition, with *Dactylis glomerata* and *Agrostis stolonifera*, *Lotus corniculatus*, *Cochlearia officinalis* and others achieving significant cover in some quadrats. *Armeria*

maritima, which is supposedly a constant, is notably absent (as is the case for MC8 grasslands). This somewhat heterogeneous community (which did not show a sufficiently good match to warrant classification to sub-community level) intergrades with neighbouring MC8 and MG1 communities and in some places shows calcareous influence in its composition.

Figure 17: Dicotyledon-rich *Festuca rubra* grassland on cliff slope near Swineshaw Hole

MC11b: Festuca rubra-Daucus carota ssp. gummifer maritime grassland - Ononis repens sub-community

MC11 is the least maritime of the MC communities described by Rodwell (2000). It produces a rather tussocky sward generally dominated by grasses, of which *Festuca rubra* is the most abundant. *Dactylis glomerata* is a constant in this community, as is *Daucus carota*, and the maritime component is relatively small. It is usually found in areas that receive relatively low levels of salt spray, usually on calcareous rocks. MC11b (in which *Ononis repens* is a constant component) is the most calcareous of the sub-communities, characteristic of dry south-facing slopes and cliff edges. It supports a number of species typical of calcareous grasslands such as *Carlina vulgaris* and *Blackstonia perfoliata*.

Vegetation comparable to MC11b was found on the relatively sheltered, dry, south-facing slopes from Green Stacks around towards South Landing (see Fig 18). About halfway between Green Stacks and South Landing, however, the maritime influence diminishes and this grades into BS** grassland (with which it has considerable affinities: see below). *Daucus* and *Dactylis* were

constants, and *Ononis repens* was present/abundant in four out of five quadrats. *Centaurea scabiosa* is also found in this vegetation type. The presence of *Festuca arundinacea* in some of the samples is due to intergradation with the MG12 clifftop grassland.

Although there is a reasonable match with Rodwell's MC11b description, both in terms of habitat and constant species, one or two of the samples appear to show greater maritime influence than one would expect. This suggests an overlap with the MC8f vegetation that tends to occur on the ledges further down the cliff (see above).

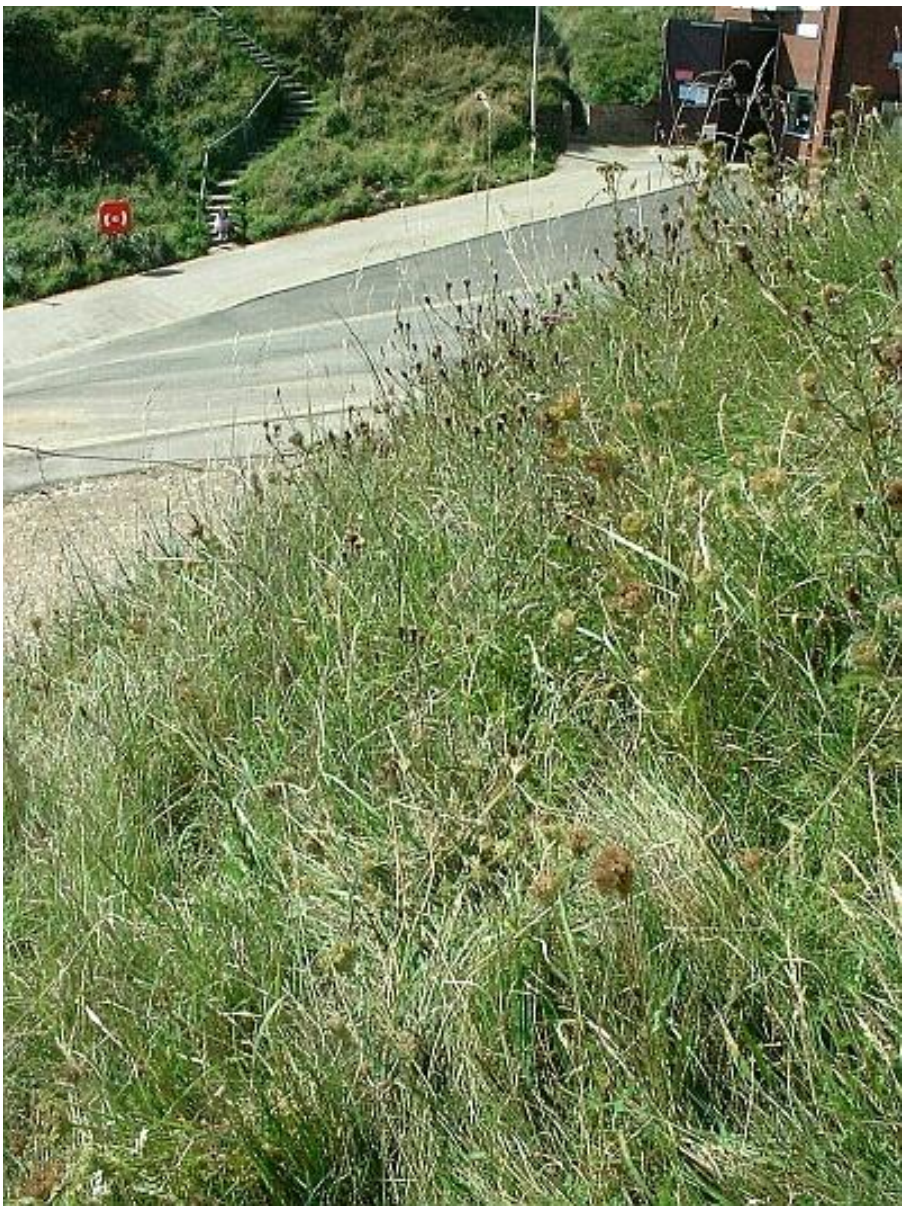

Figure 18: *Daucus*-rich grassland at South Landing

Figure 19: *Arrhenatherum* grassland on cliff top at Sewerby

MG1a: Arrhenatherum elatius grassland - Festuca rubra subcommunity

The MG1a community is composed of coarse-leaved tussock grasses (usually dominated by *Arrhenatherum elatius* together with *Dactylis glomerata* and *Holcus lanatus*). Tall umbellifers are frequent, as are a number of other tall herb species. Beneath these there is generally a layer of smaller grasses (including *Festuca rubra*) and dicotyledenous herbs. This community is very widespread, and is associates with a lack of grazing on circumneutral soils.

This type of mesotrophic grassland community, easily recognised by the heavy dominance of *Arrhenatherum elatius*, dominates the cliff top over the majority of the site (see Fig 19). In more sheltered locations where spray deposition is limited (e.g. at North Landing and Thornwick Bay and on slumped areas of cliff between Dane's Dyke and Green Stacks), it also covers

significant proportions of the soft cliff slope. Its floristic composition and diversity are variable. In general the most impoverished stands are found on the cliff top, but where it intergrades with more calcareous/maritime grasslands on the cliff slope the composition can be more diverse. In addition to *Arrhenatherum* and *Festuca rubra*, other grasses such as *Dactylis glomerata*, *Elytrigia repens* and *Holcus lanatus* can make significant contributions to cover, and tall herb species such as *Cirsium arvense*, *Urtica dioica* and *Heracleum sphondylium* may be prominent.

The MG1 grasslands at Flamborough have been assigned to MG1a (the most species-poor sub-community). However, where the vegetation intergrades with *Urtica dioica* tall herb vegetation (e.g. on the Bempton-Speeton cliffs) or with more calcareous grasslands on the underlying cliff slopes, it could potentially be reclassified on a local scale (e.g. *Centaurea scabiosa* and *Epilobium angustifolium* variants of MG1a, *Urtica dioica* sub-community MG1b, *Centaurea nigra* sub-community MG1e and *Pimpinella saxifraga* variant).

MG5a: Cynosurus cristatus-Centaurea nigra grassland - Lathyrus pratensis sub-community

MG5 is a dicotyledon-rich 'old meadow' grassland of variable composition and appearance. This classification has been assigned to the somewhat variable late-succession grasslands on the soft cliffs at the northern end of the site (Reighton). These cliffs are highly mobile, but in some areas (including the base of eroding/slumping basins) the grassland has become sufficiently established to present reasonably continuous cover (see Fig 20).

These grasslands are dominated by a mixture of grasses including *Festuca rubra*, *Brachypodium sylvaticum*, *Agrostis stolonifera* and *Holcus lanatus*, and *Centaurea nigra*, *Plantago lanceolata* and *Equisetum arvense* are constant components. *Lotus corniculatus* and *Lathyrus pratense* are also commonly encountered in this community. There is a variable calcareous element reflecting local changes in substrate.[7] In wetter areas of ground (e.g. at the base of slumps) *Tussilago farfara*, *Pulicaria dysenterica* and *Parnassia palustris* may also be prominent.

These variable grasslands do not fit particularly comfortably into MG5 as described by Rodwell (1992). Nevertheless, this somewhat embracing community does appear to offer the closest fit.

[7] This led Radley and Rogers (1995) to classify some of these grasslands as calcicolous CG communities – not unreasonably.

Figure 20: Species-rich grassland in damp eroding basin at Reighton

MG12a: Festuca arundinacea grassland - Lolium perenne-Holcus lanatus sub-community

The MG12 community is characteristic of moist but relatively free-draining soils in a coastal environment. It is dominated by tussocks *of Festuca arundinacea* and *Festuca rubra*, with relatively low levels of dicotyledons and other grasses. MG12a is the less maritime of the sub-communities, and sometimes has significant *Agrostis stolonifera* content.

Figure 21: *Festuca arundinacea* grassland on cliff top near South Landing

Most of the mesotrophic grasslands along the cliff tops between Sewerby Hall and Green Stacks match well with the description of this community (See Fig. 21). *Festuca arundinacea* is dominant or co-dominant with *Agrostis stolonifera* and *Festuca rubra* and a small number of dicotyledenous herbs. *Dactylis glomerata* is also constantly present, and high levels of *Phragmites australis* occur near the edges of reed beds.

In places this community alternates with patches of MG1 *Arrhenatherum* grassland on the cliff top, and it also extends well down the cliff slope[8] where it intergrades with wet flushes and with more calcareous grasslands (e.g. BS**).

OV9: Matricaria perforata-Stellaria media community

This ruderal community was only found at one location on the cliffs (Breil Nook – see Fig. 22). It occurred at the tip of a headland on which the *Arrhenatherum* grassland had been mown.[9] The occurrence of this vegetation (typical of agricultural situations) is presumed to be the result of nitrogen enrichment associated with land management (and possibly with the aforementioned mowing). *M. perforata* was not found at the site, but the

[8] At South Landing it extends virtually to the shore.

[9] Mown grassland was not encountered elsewhere within the SSSI.

abundance of *Stellaria media* and *Polygonum aviculare* suggest this community.

Figure 22: Ruderal vegetation on cliff top by Breil Nook

OV24a: Urtica dioica-Galium aparine community - Arrhenatherum elatius-Rubus fruticosus agg. sub-community

Patches of tall nettles occur sporadically along the Flamborough cliffs. In most cases these appear to be natural, although at one or two sites (see below and target notes) their occurrence appears to be related to small-scale management issues. It is only on the Bempton-Speeton sea cliffs westwards from Dane's Dyke, however, that this community achieves significance (See Fig. 23). Here it dominates considerable proportions of the clifftop as well as the soft cliff slope. It also occurs in abundance on ledges below seabird nesting areas in the steep hard cliff zone, presumably on account of nitrogen

enrichment from above. Apart from *Urtica dioica* and *Galium aparine*, the only other species that achieve significant cover are *Silene dioica* (particularly on the seabird cliffs), *Heracleum sphondylium*, *Agrostis stolonifera*, *Arrhenatherum elatius* and *Eurhynchium praelongum*.

This vegetation matches well with Rodwell's OV24. The dense cover of *Urtica* and the relative scarcity of other species suggests the typical sub-community OV24a.

Figure 23: Nettles on ledges below seabird nests on the Bempton cliffs

OV26d: Epilobium hirsutum community - Arrhenatherum elatius-Heraclium sphondylium sub-community

OV26 comprises dense stands of species-poor tall herb vegetation dominated by *Epilobium hirsutum* (often accompanied by *Urtica dioica*). This occurs on moist but well aerated soils. Dense stands of vegetation of this type occur sporadically along the soft cliff slop at Flamborough, generally in patches too small to merit mapping (See Fig. 24). However, they sometimes form part of more complex mixtures of tall herb vegetation and are particularly associated with the tops of flushes (i.e. at the base of the soft cliff slope) between Sewerby and Green Stacks. *Epilobium hirsutum* is a significant part of the SS** successional vegetation described below. The regular occurrence of *Arrhenatherum* in this vegetation justifies its classification into the OV26d sub-community.

Figure 24: Patch of *Epilobium hirsutum* above a flush on Beacon Hill

Figure 25: *Epilobium angustifolium* at Bulltongue nook

OV27b: Epilobium angustifolium community - Urtica dioica-Cirsium arvense sub-community

Patches of OV27b tall herb community dominated by *Epilobium angustifolium*, occur throughout the site, generally in plateau areas where there has been slumping of the soft cliff (See Fig. 25). It is generally found in association with MG1 *Arrhenatherum* grassland, and *A. elatius* can account for significant cover within it. *Urtica dioica* is usually present and there may be a dense cover of *Eurhynchium praelongum* on the ground. The largest patches occur at the northern end of the site, on the plateaux east of Old Beck. Here they are found in association with the ferns *Phyllitis scolopendria* and *Dryopteris filix-mas*, which were not recorded elsewhere. The constant presence of *Urtica* and the occurrence of *Cirsium arvense* and *Rubus fruticosus* in the vegetation justify its classification into the OV27b sub-community.

Figure 26: *Typha* below New Closes Cliff, Reighton

S12: Typha latifolia swamp

Typha latifolia does not occur in mappable quantities at the site. It was noted below New Closes cliff (at the base of a slumped area of soft cliff) at Reighton (See Fig. 26). Other significant species in the quadrat included *Juncus articulatus* and *Eleocharis palustris*. The species composition of the sample does not match closely the S12 descriptions by Rodwell (1995), however, and no sub-community was allocated.

S26b: Phragmites - Urtica tall herb fen

Reedbeds occur in a number of locations along the cliffs from Dane's Dyke eastwards (to beyond South Landing). These usually occur towards the base of the soft cliff slope, at the head of an AF** flush (see below). The largest patch occurs (interspersed with brambles) on the slopes below Beacon Hill (See Fig. 27). Small patches of reeds also occur on the more maritime cliffs around Newcombe Hope. One patch also occurs near Black Cliff Nab on the soft cliffs at Reighton. Apart from *Phragmites*, the only constant species in the quadrats sampled was *Arrhenatherum elatius*. This justifies its classification into the S26b sub-community.

Figure 27: *Phragmites* stand intermixed with Rubus on the cliff slope below Beacon Hill

S28b: Phalaris arundinacea tall-herb fen

A small ribbon of vegetation dominated by *Phalaris arundinacea* was found in the bed of a small stream that cuts through the cliffs to the east of Sand Hole (See Fig. 28). This area was not large enough to be mappable. *Arrhenatherum elatius*, *Rubus fruticosus* and *Urtica dioica* were also present. The presence of *Urtica* suggests its classification into the S28b sub-

community.

Figure 28: Phalaris arundinacea in stream bed east of Sand Hole

SD2: Honkenya peploides-Cakile maritima strandline community

The only significant patch of strandline community occurs at South Landing (See Fig. 29). There are a few other small patches scattered at the base of the cliffs further west, but rarely more than a couple of square metres. The quadrat sample showed 100% *Atriplex prostrata*, but *Sinapsis arvensis* was also observed growing in this community. No other species were recorded.

Although this vegetation contained neither *Honkenya peploides* nor *Cakile maritima*, SD2 (which can be dominated by *A. prostrata*) is the closest match among the strandline communities described by Rodwell (2000).

Figure 29: *Atriplex prostrata* strandline vegetation at South Landing

SM16c: Juncus gerardii salt marsh community - Festuca rubra-Glaux maritima sub-community

Numerous small patches of perched saltmarsh occur in flushes (generally at the base of small eroded basins in the MC8 soft cliff slope) from the Flamborough Fog Station to Sanwick Brig (See Fig. 30). These are variable in composition but generally characterised by the presence of *Triglochin maritimum* and *Glaux maritima*. *Festuca rubra* and *Agrostis stolonifera* are also regularly present (and sometimes dominant). These species usually surround small, damp, eroded, unvegetated depressions. Other species that may be present include *Juncus* spp., *Samolus valerandi* and *Plantago maritima*.

SM16 saltmarsh usually describes large areas rather than small flushes.

However, these match well with the SM16c sub-community, where *Juncus gerardii* is sparser than in the other sub-communities and *Festuca* and *Glaux* tend to dominate.

Figure 30: Perched saltmarsh flush with *Glaux*, *Triglochin* and *Samolus* at Cooness Nook

W21a: Crataegus monogyna-Hedera helix scrub - Hedera helix-Urtica dioica sub-community

Small patches of mixed scrub dominated by *Crataegus monogyna* are scattered along the south-facing cliffs from Sewerby to Green Stacks, as well as at Holmes Gut (North Landing). They generally occur in relatively sheltered locations. Large patches of this vegetation type (generally interspersed with MG5 grassland) also occur over the more stable areas of soft cliff at the northern end of the site (Reighton – see Fig. 31). This type of scrub is variable in composition, and in places it intergrades with W23 *Ulex* and W22 *Prunus* scrub. *Rosa canina*, *Ulex europaeus* and *Rubus fruticosus* are common constituents of the vegetation but *Prunus spinosa*, *Fraxinus excelsior*, *Sambucus nigra* and *Acer pseudoplatanus* can all have local significance. *Lonicera periclymenum* was only recorded in the small patch of scrub at Speeton Gap.

These stands of scrub lack the *Hedera helix* that is normally regarded as a constant in the W21 community, but otherwise the match is good. The relative species poverty and the density of the canopy suggest its classification into the W21a sub-community.

Figure 31: Mixed *Crataegus* scrub west of Old Beck, Reighton

W22c: Prunus spinosa-Rubus fruticosus scrub - Dactylis glomerata sub-community

Small patches of homogeneous wind-blown *Prunus spinosa* scrub occur along the cliffs (both at the southern and northern ends of the site). In some cases these form part of a larger area of W21a scrub, in which cases they were not mapped separately). In cases where they stood alone they were mapped as W22c scrub. No quadrats were made, but this vegetation generally consisted of an impenetrable tangle of pure blackthorn (See Fig. 32). The *D. glomerata* sub-community is the most maritime, and has been recorded on cliffs elsewhere in the UK. However, this sub-community is described as patchy, with maritime grassland vegetation interspersed among it, which was not the case at Flamborough.

Figure 32: Low windblown *Prunus spinosa* scrub east of Old Beck, Reighton

W23b: Ulex europaeus-Rubus fruticosus scrub - Rumex acetosella cub-community

Patches of scrub dominated by *Ulex europaeus* (sometimes pure stands) occur at a number of locations along the cliffs from Speeton to Green Stacks and in a small patch at Holmes Gut (North Landing). Although the gorse bushes may on occasions be loosely scattered on the cliff, it is more common for them to form a closed canopy with very few other species (See Fig. 33). The only other species of significance in this vegetation type is *Rubus fruticosus*.[10] This justifies its classification into the W24b sub-community.

[10] This community can intergrade with W24 *Rubus* underscrub.

Figure 33: *Ulex* scrub near South Landing

W24b: Rubus fruticosus-Holcus lanatus underscrub - Arrhenatherum elatius-Heracleum sphondylium sub-community

W24b underscrub is typically dominated by brambles, rank grasses and tall dicotyledons. Dense bramble patches are common on the Flamborough cliffs (particularly on slumped plateaux) from Sewerby to Green Stacks and also among the considerable expanses of soft cliff around Flamborough, North Landing and Thornwick Bay (See Fig. 34). They are also found on the soft cliffs at Reighton/Speeton. They are generally very dense, with strong dominance of *Rubus fruticosus*, but *Cirsium arvense*, *Galium aparine* and *Urtica dioica* may be in evidence. These stands are often adjacent to patches of tall herb vegetation (OV24, 27).

Although W24 is often associated with woodland (and tends therefore to incorporate other woody species), this is not universally the case. Although

the bramble scrub at Flamborough appears to lack *Holcus lanatus* (which is a 'constant' for W24) it can nonetheless be assigned to this community. We have sub-classified it as W24b on account of the presence of *Arrhenatherum* and *Urtica* content.

Figure 34: *Rubus* patch north of Flamborough lighthouse (with patches of *Calystegia* on left and *Chrysanthemum* with white flowers)

W25b: Pteridium aquilinum - Rubus fruticosus underscrub - Teucrium scorodonia sub-community

The W25b underscrub community brings together vegetation dominated by mixtures of bracken and brambles. This is often (but not exclusively) associated with taller woody vegetation, and relative proportions of the two 'constants' can very considerably. The only occurrence of *Pteridium aquilinum* on the Flamborough cliffs was recorded on the slopes of a gulley in the cliffs at Sand Hole (See Fig. 35). Two quadrats were recorded: one on each side of the gulley. *Arrhenatherum elatius* and *Centaurea nigra* occurred in both, but woody species such as *Rubus fruticosus* and *Ulex europaeus* were only recorded in one. Nevertheless this composition justifies its classification into the W25 community, and the presence of *Ulex* (and its relative species poverty) suggests the W25b sub-community.

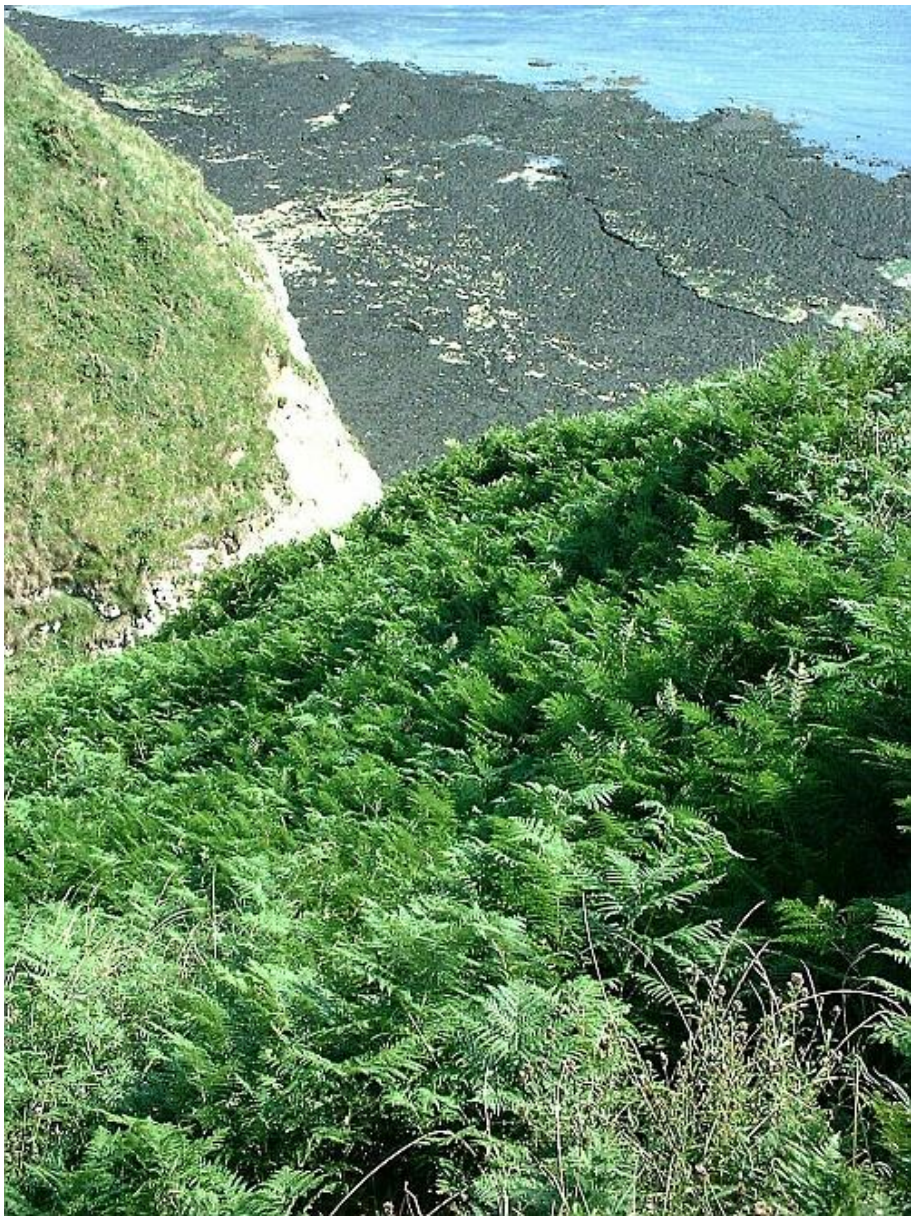

Figure 35: *Pteridium aquilinum* at Sand Hole

Non-NVC communities

*AF**: Agrostis cliff flush

Between Sewerby and Green Stacks there are numerous wet flushes on the cliffs, generally running from the top of the hard (chalk) cliffs right down to their bases (See Fig. 36). The vegetation of these flushes is generally strongly dominated by *Agrostis stolonifera*, although *Juncus articulatus*, *Eupatorium cannabinum* and (occasionally) *Sinapsis arvensis* can be significant. *Tussilago farfara* is typically present in low densities, as are *Epilobium parviflorum* and *Pulicaria dysenterica*. *Pellia endivifolia* and *Didymodon tophaceus* can dominate small patches of the rock face where water flows continuously, and *Melilotus officinalis* typically grows on the margins of the flushes. These flushes tend to originate from slumped areas of

the soft cliff above them, which are presumably more mobile on account of the water flowing through them. These damp slumped areas typically support small *Juncus* mires or dense patches of water-tolerant herbs such as *Pulicaria dysenterica*, *Eupatorium cannabinum and Epilobium hirsutum*. This community has not been classified by the NVC, and is mapped here as a separate unit.

Figure 36: Flush vegetation on cliffs below Beacon Hill

Figure 37: Early succession vegetation beneath New Cliff, Reighton

*AG**: Agrostis successional vegetation*

Slumping and erosion occurs in the soft cliff zone all around the Flamborough cliffs. The early succession vegetation that colonises these areas varies both in composition and density according to differences in substrate and exposure. This vegetation is not covered by the NVC. Early succession vegetation on the cliffs from Reighton to Flamborough head (with the exemption of areas dominated by *Plantago maritima/coronopus* and classified as MC8e) has been mapped as AG** (See Fig. 37). The dominant species in this vegetation are *Agrostis stolonifera* and *Tussilago farfara*. No other species are constant or abundant. Successional vegetation on the black clays at Reighton/Speeton is particularly species-poor, with little more than *A. stolonifera*, whereas on the red clay (which has a slightly more calcareous nature) and on the drift deposits overlying the chalk further east, the composition is marginally more diverse.

*AR**: Arrhenatherum/Teucrium scree slope vegetation*

A distinctive vegetation type was found to cover the scree slopes below the most northerly chalk cliff outcrops at Speeton (See Fig. 38). This is characterised by a sparse cover of *Arrhenatherum elatius*, *Teucrium scorodonia* and *Festuca rubra*, together with *Senecio jacobaea* and a number of mosses (most notably *Dicranum scoparium*, *Pseudoscleropodium purum* and *Homalothecium lutescens*. *Teucrium* was not encountered anywhere else on the site, and the moss coverage here is higher than in any other grassland community. A number of other species can show local abundance

including *Geranium robertianum*, *Rumex acetosa*, *Cladonia pyxidata* and *Holcus lanatus*. *Heracleum sphondylium* is widespread. The closest NVC affinity probably lies with MG1 *Arrhenatherum* grassland, but the abundance of *Teucrium* does not sit well with this and we have decided to maintain it as a separate unit.

Figure 38: *Arrhenatherum/Teucrium*-dominated scree slopes east of Rabbit Rocks

*BS**: Brachypodium-rich cliff grassland*

The relatively sheltered cliff slopes between Dane's Dyke and South Landing and on towards Green Stacks support species-rich grassland with a notably high *Brachypodium sylvaticum* component (See Fig. 39). This community also occurs around Pigeon Hole near the Flamborough lighthouse, and on the lower cliff slopes northwards to Kindle Scar. It intergrades with MC11 *Festuca-Daucus* grassland, with which it has considerable affinities. This grassland shows considerable calcicolous tendencies but is also subject to

maritime influence.

In addition to the dominant *B. sylvaticum* and *Festuca rubra*, other grasses such as *Agrostis stolonifera* and *Dactylis glomerata* are locally prominent. *Daucus carota*, *Medicago lupulina*, *Anthyllis vulneraria* and *Festuca arundinacea* are usually present (the last of which is abundant on the cliff tops in this area), and locally abundant species include *Plantago maritima*, *Sanguisorba minor*, *Carlina vulgaris*, *Rhinanthus minor* and *Lotus corniculatus*.

Figure 39: *Brachypodium*-rich grassland on cliffs east of South Landing

The closest NVC matches for this vegetation appear to be the more species-rich sub-communities of MC11 and MC9, both of which can support significant calcicolous elements. *Brachypodium sylvaticum* is not normally a component of MC11, but *B. pinnatum* can co-dominate with *F. rubra* in the species-rich *Sanguisorba* sub-community, and it may be that *B. sylvaticum* is playing the same role at Flamborough. However, we have decided to maintain it as a separate community.

Figure 40: Calcareous grassland on unstable ground below the pillbox near Old Beck, Reighton

*PB**: Calcicolous grassland on slopes below the pillbox near Old Beck*

An area of grassland was sampled on partially eroded (slumping) slopes below the pillbox above Old Beck, Reighton that differs from the other MG5 grasslands in the vicinity (see Fig. 40). It was differentiated from these species-rich mesotrophic grasslands by its more calcareous nature. Constant species among the three samples included *Festuca rubra* (the dominant grass), *Carex flacca* (relatively abundant), *Sanguisorba minor*, *Tussilago farfara* (indicating the disturbed nature of the ground), *Brachypodium sylvaticum*, *Centaurea nigra* and *Trifolium pratense*. *Lotus corniculatus* is locally abundant, and the occurrence of *Briza media* (which is uncommon elsewhere) is notable. This type of grassland does not appear to find a very comfortable fit in the NVC system. Radley *et al*. sampled it during their 1995 survey of the area and classified it as CG6a *Avenula pubescens* grassland

(but without the 'constants' *A. pubescens*, *A. pratensis* and *Taraxacum* spp.). It does indeed have affinities with this community but we have decided to maintain it separately.

Figure 41: Successional vegetation on eroding cliff at Sewerby

*SS**: Successional vegetation at Sewerby and south-facing slopes

This vegetation occurs along the rapidly eroding soft cliff slopes between Sewerby and Dane's Dyke, and onwards (in eroded patches between the more consolidated grassland slopes) towards green Stacks. At the (notably dry) time of the visit these slopes were dry and crumbling, but it was evident both from the composition of the vegetation and from the level of erosion that they are generally damp. There are numerous AF** flushes on the hard cliffs below, bearing witness to this generally damp nature. As with early successional vegetation elsewhere at Flamborough, *Agrostis stolonifera* is a

consistent and sometimes dominant member of the community (see Fig. 41). *Tussilago farfara* is likewise constant and sometimes abundant, and the damper areas (e.g. at the heads of the flushes) support large quantities of tall herbs such as *Epilobium hirsutum* and *Equisetum telmateia*. *Dactylis glomerata*, *Medicago lupulina* and *Rumex crispus* are common elements and *Anthyllis vulneraria*, *Melilotus officinale* and *Reseda luteola* show local abundance. *Festuca arundinacea*, which dominates the cliff top above, may also be present in significant quantities. Early succession vegetation of this type is not covered by the NVC.

Orchids

Due to the lateness of the year it was not possible to make valid identifications of certain plant groups that require flowers for accurate naming (most notable the orchids and the violets). Arnold (1984), however, provided detailed target notes on the occurrence of orchids on the Flamborough cliffs, and it is recommended that any specific investigation of orchids and other rare species should refer to her notes. The following species were cited:

Dactylorhiza purpurella	Wet flushes on cliffs
D. purpurella x praetermissa	Near lighthouse
D. fuchsii	Frequent on cliffs
Orchis mascula	Dane's Dyke
Ophyris apifera	North side of South Landing
Gymnadenia conopsea	Slopes east of Old Beck, Speeton Gap
Anacamptis pyramidalis	Frequent on cliffs
G. conopsea x A. pyramidalis	Slopes east of Old Beck, Speeton Gap

Alien and naturalised species

A number of alien and naturalised species were recorded at the site. One of the most common is *Montbretia* (*Crocosmia*) sp., which occurs in small patches on the cliff slopes from Sewerby to Thornwick Bay. *Senecio cinerea* was found growing on the lower slopes of the cliffs at Ragstone Hole and *Centranthus ruber* was abundant in a patch of flush vegetation on the cliff slope east of Beacon Hill. Two small patches of *Cerastium tomentosum* were also recorded growing on banks at the cliff edge (see target notes). A number of apparently naturalised species also occur among the scattered W21 scrub between Sewerby and Green Stacks, including *Prunus domestica*, *Rosa* sp. (cultivated escape) and *Ligustrum ovalifolium*. Exotic bushes have also been planted around the top of the Sewerby steps including *Cotoneaster* sp. and *Lonicera involucrata*.

Coastal erosion

Erosion is integral to the Flamborough head coastline and helps to account for the habitat and species diversity of the site. Erosion is most pronounced at the northern end of the site (Reighton/Speeton), where the soft boulder clays are directly exposed to the sea (Figs 45-6). Here the cliffs are highly mobile, and there is massive slumping combined with significant retreat of the cliff edge (15-25m since the OS Landline map was surveyed). Further south, in the hard cliff zone between Speeton and Sanwick Brig, erosion is confined to

the occasional spectacular rock fall (Fig. 44). The drift layer on these cliffs is generally shallow, and, apart from where it has been undermined by such falls, there is little significant erosion.

South of Sanwick Brig, where the soft cliff layer is deeper and the cliffs are lower, large areas of eroded cliffs can be observed (Fig. 43). This may be partly due to occasional undermining of the chalk cliffs beneath (although these are relatively stable) but appears to be more connected with solifluction on wetter ground (e.g. at the heads of inlets), and, on exposed headlands (e.g. Thornwick Nab), with maritime exposure.

The cliffs on the southern side of the headland are relatively sheltered but the levels of erosion of the soft cliff layer are generally higher than further north. This is increasingly the case as one progresses towards Sewerby at the southern end of the site (Fig. 42). This erosion is partly caused by collapse of small sections of chalk cliff, but is also strongly related to the presence of flushes (i.e. weakening of the drift layer due to high moisture content).

Figure 42: Eroding cliffs at Sewerby

Figure 43: Collapsing upper (soft) cliffs to the east of South Landing

Figure 44: Rockfall on the Bempton cliffs - this occurred less than a week before the photograph was taken

Figure 45: Erosion of grey clays near Black Cliff Nab, Reighton

Figure 46: Eroding basin in the soft cliffs at Reighton

Grazing, management and vegetation change

There is no livestock grazing at Flamborough Head. This may at least partly account for the fact that some areas of cliff grassland appear to be under gradual encroachment by bramble scrub (e.g. north of the Flamborough lighthouse) or hawthorn scrub (e.g. on the less mobile soft cliff areas at Reighton/Speeton). The only grazing of any significance recorded at Flamborough was rabbit grazing at the northern end of the site, in particular between the aptly named Rabbit Rocks and the Old Beck near Reighton. Some of the grassland in this area has been grazed to a very short (but generally species-rich) sward. This coincides roughly with the area mapped as CG7 chalk grassland community, which is noted by Rodwell (1992) often to be associated with rabbit grazing.

No major management issues were noted at the site. At a few locations, agricultural runoff from adjacent fields appears to have caused local nitrogen enrichment (resulting in development of tall herb vegetation) and likewise the small-scale dumping of grass clippings from the golf course and the houses at North Landing (see target notes). The much larger areas of OV24a *Urtica*/*Galium* vegetation on the tops and slopes of the Bempton cliffs west of Dane's Dyke, however, are presumed to be influenced by seabird populations rather than agricultural regimes in the adjacent fields.

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Appendix 1: Locations of vegetation quadrats at Flamborough

Quadrat	Easting	Northing	Aspect	Slope
1	514676	475804	NE	30
2	514748	475736	NE	5
3	514729	475648	NE	30
4	515275	475488	NE	10
5	515706	475260		0
6	516017	475100	NE	10
7	515956	475100	NE	30
8	515592	475239	NE	45
9	515320	475396	SE	0
10	515365	475397		20
11	515363	475417	NE	10
12	515409	475441	NE	20
13	515374	475452	NW	20
14	515280	475472	NE	20
15	524653	471947		0
16	524653	471947		0
17	524814	471617		0
18	524953	471532	NE	45
19	524914	471545	NE	40
20	524807	471610		0
21	524777	471630	NE	40
22	524478	471849	NE	50
23	524397	471947	E	40
24	524252	472080	E	30
25	524210	472053	N	20
26	524139	472068	NE	45
27	524061	472176	E	10
28	524060	472183	E	30
29	524001	472228	N	25
30	523964	472206	W	25
31	523820	472052	SE	45
32	523820	472052	SE	45
33	523743	472229	NE	10
34	523743	472229	NE	15
35	523691	472327	E	10
36	523536	472363	NW	45
37	523537	472354	NW	50
38	525330	470926	E	20
39	525352	470953		0
40	525412	470919	E	10
41	525451	470942	SW	10
42	525398	470901		0
43	525550	470732	SE	30
44	525568	470765	NE	45
45	525588	470765	S	40
46	523537	472354	N	5
47	519886	468506	SE	40
48	519878	468491	SE	40
49	519878	468491	SE	40
50	520008	468604		0
51	520162	468674	SW	40
52	520091	468635	S	85
53	521160	469001		0
54	523239	469270	S	5
55	523276	469262		0
56	523296	469251	SW	40
57	523305	469253	SW	50
58	523316	469250	S	40
59	523319	469272	SW	30
60	523332	469257		0
61	523777	469220	SE	40
62	515201	475516	NE	20
63	515044	475660	NE	10
64	514685	475853	N	20
65	520491	468759	S	45
66	520838	468872		0
70	516468	475020	N	70
71	516717	474928	N	80
72	516717	474928	N	30
73	516646	474953	N	50
74	516637	474977	N	45
75	516355	475035	NW	60
76	516101	475117	N	40
77	516062	475117	N	30
78	515937	475182	N	5
79	515770	475223	N	15
80	515753	475229		
81	515738	475222	N	35
82	515675	475251		0
83	515486	475345		0
84	515491	475330	NE	5
85	515450	475343	SE	5
86	515369	475468	N	20
87	515330	475463	N	10
88	515248	475454	N	10
89	515020	475684	NE	20
90	514991	475599	N	10
91	514972	475547	NE	20
92	514992	475550		0
93	514957	475578	E	15
94	514555	475959		0
95	514549	475975		0
96	514167	476320		0
97	514167	476320	N	20
100	516071	475036	NE	20
101	516288	474979	NE	20
102	517123	474854		0
104	518891	474524		0
105	524819	471633	N	80
106	524819	471633	N	70
107	524661	471775	SE	70
108	524663	471767	SE	70
109	524655	471783	SE	60
110	520108	473845	NE	30
111	520108	473845	NE	40
112	520108	473845	NE	45
113	520108	473845	NE	30
114	520108	473845	NE	70
115	520053	473910	E	60
116	520062	473906	E	60
117	520060	473895	E	60
118	525635	470748	NE	5
119	525635	470748	NW	50
120	525807	470678	NE	15
121	525765	470412	E	45
122	525773	470431	SE	20
123	525744	470470	S	50
124	525814	470433	S	60
125	525762	470392	E	50
126	525719	470310	S	50
127	525715	470305	SE	60
128	525679	470239	SE	40
129	525583	470138	S	50
130	525360	469980	S	60
131	525799	470678	SE	5
132	523121	469280	SW	40
133	522936	469191	NE	5
134	522739	469193	S	25
135	522635	469206	SW	30
136	522739	469193	S	20
137	522635	469206	SW	20

138	522651	469217	S	20
139	522509	469231	SW	50
140	521283	469036		0
141	520299	468730		0
142	520056	468633		0
143	521007	468943	SE	40
144	521040	468973		0
145	521035	468957	SE	20
146	521020	468953	SE	30
147	521087	468983	SE	5
148	521112	468989	SE	15
149	521810	499204	S	45
150	522112	469220	W	45
151	522512	469237	W	40
152	521706	469213	S	80
153	521706	469213	S	1297
154	521814	469186	S	80
155	521889	469175	S	70
156	522153	469192	S	85
157	522179	469194	S	
158	520639	468816	SE	65
159	520639	468816	SE	50
160	520639	468816		
161	521025	468940	S	70
162	521020	468943	S	60
163	521481	469126	S	70
164	521467	469120	S	70
165	522270	469196		70
166	522270	469196		
167	522270	469196	SE	50
169	521460	469124	SE	70
170	520310	473754	N	10
171	520592	473580	se	40
172	520600	473586	W	70
173	521156	473373		0
174	521161	473384	NE	70
175	521392	473175	S	20
176	521430	473166	N	30
177	522767	472503	NE	1314
178	522394	472623	NE	40

179	522809	472461	E	50
180	523234	472374	S	40
181	520596	473594	NE	65
182	520596	473594	NW	50
183	520596	473594	NW	70
184	520596	473594	NW	70
185	521438	473178		
186	521438	473178		
187	523447	472258	SW	60
188	523440	472270	SW	45
189	523444	472278	NW	80
190	524009	471973	W	20
191	524095	472156	NW	20
192	524093	472144		0
193	524412	471924	NE	30
194	524415	471911		0
195	524668	471742	NE	50
196	525091	471401	N	5
197	525498	470677	E	5
198	525289	469938	S	50
199	525335	470951	N	10
200	525454	470922	SW	80
201	525468	470928	SE	80
202	523062	472331	NE	40
203	523140	469282	W	45
204	523148	469297		0
205	523423	469177	S	30
206	523628	469182	S	60
207	523727	469207		0
208	523801	469226	SW	40
209	523929	469251	S	15
210	524138	469315	SE	45
211	525160	469872	SE	70
212	524577	469527		0
213	525802	470674	NE	60

Appendix 2: Quadrat data from Flamborough Head

NVC COMMUNITIES	
CG7	Festuca ovina - Hieracium pilosella - Thymus praecox/pulegioides grassland
M22a	Juncus subnodulosus-Cirsium palustre fen meadow - Typical sub-community
M27c	Filipendula-Angelica mire - Juncus effusus-Holcus lanatus sub-community
MC4	Brassica oleracea maritime cliff-ledge community
MC6	Atriplex prostrata - Beta vulgaris sea bird cliff community
MC8a	Festuca rubra-Armeria maritima maritime grassland - Typical sub-community
MC8d	Festuca rubra-Armeria maritima maritime grassland - Holcus lanatus sub-community
MC8e	Festuca rubra-Armeria maritima maritime grassland - Plantago coronopus sub-
MC8f	Festuca rubra-Armeria maritima maritime grassland - Anthyllis vulneraria sub-
MC9	Festuca rubra-Holcus lanatus maritime grassland
MC11b	Festuca rubra-Daucus carota ssp. gummifer maritime grassland - Ononis repens sub-
MG1a	Arrhenatherum elatius grassland - Festuca rubra subcommunity
MG5a	Cynosurus cristatus-Centaurea nigra grassland - Lathyrus pratensis sub-community
MG12a	Festuca arundinacea grassland - Lolium perenne-Holcus lanatus sub-community
OV9	Matricaria perforata-Stellaria media community
OV24a	Urtica dioica-Galium aparine community - Arrhenatherum elatius-Rubus fruticosus
OV26d	Epilobium hirsutum community - Arrhenatherum elatius-Heraclium sphondylium sub-
OV27b	Epilobium angustifolium community - Urtica dioica-Cirsium arvense sub-community
S12	Typha latifolia swamp
S26b	Phragmites - Urtica tall herb fen
S28b	Phalaris arundinacea tall-herb fen
SD2	Honkenya peploides-Cakile maritima strandline community
SM16c	Juncus gerardii salt marsh community - Festuca rubra-Glaux maritima sub-community
W21a	Cratageus monogyna-Hedera helix scrub - Hedera helix-Urtica dioica sub-community
W22c (no quadrats)	Prunus spinosa-Rubus fruticosus scrub - Dactylis glomerata sub-community
W23b	Ulex europaeus-Rubus fruticosus scrub - Rumex acetosella cub-community
W24b	Rubus fruticosus-Holcus lanatus underscrub - Arrhenatherum elatius-Heracleum
W25b	Pteridium aquilinum - Rubus fruticosus underscrub - Teucrium scorodonia sub-
NON-NVC COMMUNITIES	
AF**	Agrostis cliff flush
AG**	Agrostis successional vegetation
AR**	Arrhenatherum/Teucrium scree slope vegetation
BS**	Brachypodium-rich cliff grassland
PB**	CG on slopes below pillbox
SS**	Successional vegetation at Sewerby and south-facing slopes

NVC community data:

NVC Score		**Quadra**t Domin	
CG7			
		5	**82**
II (6-4)	Brachypodium sylvaticum	6	4
II (4-3)	Leontodon hispidus	3	4
II (4-1)	Thymus polytrichus	1	4
II (3-2)	Plantago lanceolata	2	3
II (3-1)	Veronica chamaedrys	1	3
II (2-2)	Centaurea nigra	2	2

II (2-1)	Polygala vulgaris	2	1
II (1-1)	Primula vulgaris	1	1
I (5-5)	Carex flacca	5	
I (5-5)	Festuca ovina	5	
I (5-5)	Festuca rubra		5
I (4-4)	Lotus corniculatus	4	
I (4-4)	Pseudoscleropodium purum		4
I (4-4)	Trifolium pratense	4	
I (3-3)	Eurhynchium striatum		3
I (3-3)	Rhytidiadelphus loreus	3	
I (3-3)	Viola sp.	3	
I (2-2)	Teucrium scorodonia		2
I (1-1)	Angelica sylvestris		1
I (1-1)	Arrhenatherum elatius		1
I (1-1)	Bellis perennis		1
I (1-1)	Carlina vulgaris	1	
I (1-1)	Dicranum scoparium	1	
I (1-1)	Euphrasia officinalis		1
I (1-1)	Pilosella officinarum	1	
I (1-1)	Lathyrus pratensis	1	
I (1-1)	Linum catharticum	1	
I (1-1)	Rosa canina	1	

M22a					
		33	**34**	**92**	**199**
IV (4-1)	Agrostis stolonifera	2	1	3	4
IV (3-2)	Pulicaria dysenterica	3	3	2	2
III (5-3)	Carex flacca	3	3	5	
III (5-2)	Juncus inflexus	2	4	5	
III (4-2)	Holcus lanatus	2	3		4
III (4-1)	Equisetum arvense		1	2	4
III (3-2)	Tussilago farfara	3	2	2	
III (2-1)	Plantago lanceolata	1	2	1	
II (7-4)	Juncus articulatus			4	7
II (5-4)	Hydrocotyle vulgaris	5	4		
II (4-4)	Festuca rubra	4	4		
II (4-3)	Eurhynchium praelongum	4	3		
II (4-1)	Arrhenatherum elatius	1			4
II (4-1)	Deschampsia cespitosa		4		1
II (1-1)	Cirsium arvense		1		1
I (5-5)	Eriophorum angustifolium	5			
I (4-4)	Calliergonella cuspidata	4			
I (4-4)	Mentha aquatica				4
I (3-3)	Carex distans	3			
I (3-3)	Parnassia palustris	3			
I (3-3)	Vicia cracca				3
I (2-2)	Carex hirta				2
I (2-2)	Juncus conglomeratus			2	
I (2-2)	Ranunculus acris	2			
I (1-1)	Centaurea nigra	1			
I (1-1)	Cirsium palustre			1	
I (1-1)	Lathyrus pratensis			1	
I (1-1)	Potentilla reptans				1

I (1-1)	Primula vulgaris		1		
I (1-1)	Prunella vulgaris			1	
I (1-1)	Rubus fruticosus				1
I (1-1)	Triglochin palustre	1			

M27c		
		96
I (8-8)	Filipendula ulmaria	8
I (6-6)	Juncus inflexus	6
I (5-5)	Pulicaria dysenterica	5
I (3-3)	Agrostis stolonifera	3
I (2-2)	Festuca arundinacea	2
I (2-2)	Holcus lanatus	2
I (2-2)	Potentilla anserina	2
I (1-1)	Angelica sylvestris	1
I (1-1)	Lathyrus pratensis	1
I (1-1)	Rubus fruticosus	1

MC4			
		110	**111**
II (7-4)	Festuca rubra	7	4
II (6-4)	Tripleurospermum maritimum	4	6
II (3-3)	Sonchus oleraceus	3	3
II (3-2)	Stellaria media	3	2
II (3-1)	Brassica oleracea	3	1
II (3-1)	Urtica dioica	3	1
II (2-1)	Atriplex prostrata	2	1
II (1-1)	Arrhenatherum elatius	1	1
I (2-2)	Plantago coronopus		2
I (1-1)	Silene dioica	1	

MC6						
		71	**105**	**106**	**107**	**112**
V (9-3)	Atriplex prostrata	3	5	8	9	4
V (5-1)	Tripleurospermum maritimum	1	4	3	1	5
IV (8-4)	Festuca rubra	8	4	4		8
IV (4-1)	Plantago coronopus	1	1		4	1
IV (3-1)	Sonchus oleraceus	1	3	2		1
II (4-3)	Phleum pratense		4	3		
II (3-2)	Stellaria media	2				3
II (1-1)	Cochlearia officinalis		1	1		
II (1-1)	Dactylis glomerata		1	1		
II (1-1)	Plantago maritima	1			1	
I (4-4)	Silene dioica					4
I (1-1)	Lolium perenne					1
I (1-1)	Plantago lanceolata		1			

MC8a						
		23	**37**	**177**	**183**	**185**
V (10-7)	Festuca rubra	10	8	7	9	10
V (4-2)	Plantago lanceolata	3	4	3	2	3
IV (3-1)	Plantago maritima	3	1	3		1
III (3-2)	Agrostis stolonifera	2	3		2	

III (1-1)	Cirsium vulgare		1	1	1	
III (1-1)	Heracleum sphondylium	1			1	1
II (4-1)	Arrhenatherum elatius			4	1	
II (3-2)	Cochlearia officinalis		3		2	
II (3-1)	Sonchus arvensis	3	1			
I (5-5)	Tussilago farfara			5		
I (3-3)	Dactylis glomerata			3		
I (3-3)	Silene dioica				3	
I (2-2)	Cirsium arvense		2			
I (2-2)	Festuca rubra ssp. Juncea	2				
I (2-2)	Rumex acetosa				2	
I (1-1)	Centaurea nigra					1
I (1-1)	Galium aparine				1	
I (1-1)	Leontodon autumnalis		1			
I (1-1)	Leontodon hispidus			1		
I (1-1)	Lotus corniculatus	1				
I (1-1)	Senecio jacobaea				1	
I (1-1)	Sonchus asper			1		
I (1-1)	Sonchus oleraceus					1
I (1-1)	Taraxacum officinale				1	
I (1-1)	Urtica dioica				1	

MC8d						
		17	**18**	**180**	**184**	**186**
V (9-6)	Festuca rubra	9	6	8	9	8
V (4-3)	Plantago lanceolata	3	3	3	4	3
IV (3-1)	Agrostis stolonifera	1		1	3	3
IV (3-1)	Tripleurospermum maritimum		3	1	1	1
III (5-3)	Plantago maritima	3	4	5		
III (4-1)	Cirsium vulgare		4	1	1	
III (4-1)	Cochlearia officinalis		4		3	1
III (1-1)	Centaurea nigra		1	1	1	
II (3-3)	Silene dioica				3	3
II (3-2)	Rumex acetosa	3			2	
II (3-1)	Eurhynchium praelongum		3		1	
II (3-1)	Festuca rubra ssp. Juncea		1	3		
II (3-1)	Holcus lanatus	1				3
II (2-2)	Achillea millefolium	2		2		
II (2-1)	Heracleum sphondylium	2			1	
II (1-1)	Sonchus oleraceus			1		1
II (1-1)	Taraxacum officinale	1				1
I (4-4)	Sonchus arvensis		4			
I (3-3)	Ranunculus acris					3
I (3-3)	Senecio jacobaea		3			
I (2-2)	Armeria maritima		2			
I (2-2)	Bromus hordeaceus			2		
I (2-2)	Lotus corniculatus			2		
I (2-2)	Plantago coronopus			2		
I (1-1)	Arrhenatherum elatius				1	
I (1-1)	Cerastium fontanum				1	

I (1-1)	Cirsium arvense		1			
I (1-1)	Dactylis glomerata			1		
I (1-1)	Leontodon autumnalis	1				
I (1-1)	Myosotis arvensis					1

MC8e						
		28	44	124	194	45
V (7-2)	Plantago coronopus	2	4	7	7	3
V (6-1)	Plantago maritima	5	5	1	6	5
IV (4-1)	Agrostis stolonifera	1	1		4	4
IV (3-1)	Armeria maritima	2	2		3	1
III (7-4)	Festuca rubra		7	4		6
II (2-1)	Daucus carota			1		2
I (6-6)	Festuca rubra ssp. Juncea	6				
I (3-3)	Bryum sp		3			
I (3-3)	Lotus corniculatus					3
I (1-1)	Cochlearia officinalis		1			
I (1-1)	Hypochaeris radicata	1				
I (1-1)	Leontodon autumnalis				1	
I (1-1)	Senecio jacobaea	1				
I (1-1)	Sonchus oleraceus			1		
I (1-1)	Tripleurospermum maritimum		1			

MC8f						
		155	**165**	**198**	**200**	**75**
V (8-3)	Festuca rubra	8	3	5	7	7
V (3-1)	Anthyllis vulneraria	1	2	2	3	3
IV (7-1)	Plantago maritima	1	5	7	7	
IV (4-1)	Daucus carota	3	4	1	4	
IV (4-1)	Plantago lanceolata		1	2	1	4
III (3-1)	Ononis repens	1	3		1	
III (2-1)	Senecio jacobaea		2		1	1
II (8-5)	Bare ground		8	5		
II (4-2)	Dactylis glomerata	4	2			
II (2-1)	Plantago coronopus	2		1		
II (1-1)	Festuca arundinacea	1	1			
I (4-4)	Calliergonella cuspidata					4
I (3-3)	Bellis perennis					3
I (3-3)	Leontodon hispidus					3
I (3-3)	Medicago lupulina	3				
I (2-2)	Agrostis stolonifera					2
I (2-2)	Diplotaxis tenuifolia		2			
I (2-2)	Eurhynchium striatum					2
I (2-2)	Linum catharticum					2
I (1-1)	Angelica sylvestris					1
I (1-1)	Brachypodium sylvaticum				1	
I (1-1)	Carlina vulgaris					1
I (1-1)	Centaurea scabiosa		1			
I (1-1)	Cochlearia officinalis	1				
I (1-1)	Heracleum sphondylium					1
I (1-1)	Orchid					1

I (1-1)	Reseda luteola	1				
I (1-1)	Rumex acetosa	1				
I (1-1)	Sonchus oleraceus			1		

MC9						
		19	**21**	**30**	**31**	**32**
V (7-3)	Festuca rubra	5	6	3	7	7
V (6-2)	Plantago lanceolata	6	4	3	2	4
V (2-1)	Heracleum sphondylium	2	2	1	1	2
IV (5-3)	Centaurea nigra	3	4	5		3
IV (3-1)	Holcus lanatus	1	3		1	2
IV (2-1)	Cirsium arvense	2		1	1	1
III (4-2)	Agrostis stolonifera		4		2	2
II (5-4)	Lotus corniculatus		4		5	
II (5-2)	Dactylis glomerata	2		5		
II (4-1)	Cochlearia officinalis	4		1		
II (4-1)	Ononis repens			1		4
II (3-2)	Equisetum arvense				2	3
II (3-1)	Arrhenatherum elatius		1			3
II (3-1)	Brachypodium sylvaticum				1	3
II (2-2)	Senecio jacobaea	2				2
II (2-2)	Tussilago farfara				2	2
II (2-1)	Bellis perennis	1	2			
II (2-1)	Trifolium pratense		2		1	
II (1-1)	Cirsium vulgare	1				1
II (1-1)	Rumex acetosa			1	1	
II (1-1)	Sonchus oleraceus			1		1
I (5-5)	Sanguisorba minor			5		
I (4-4)	Plantago media				4	
I (3-3)	Achillea millefolium			3		
I (3-3)	Plantago maritima		3			
I (3-3)	Sonchus arvensis	3				
I (2-2)	Anacamptis pyramidalis		2			
I (2-2)	Anthyllis vulneraria		2			
I (2-2)	Primula vulgaris	2				
I (1-1)	Beta vulgaris	1				
I (1-1)	Carex flacca				1	
I (1-1)	Festuca rubra ssp. Juncea	1				
I (1-1)	Leontodon hispidus		1			
I (1-1)	Pulicaria dysenterica				1	

MC11b						
		126	**129**	**132**	**163**	**211**
V (4-1)	Daucus carota	1	3	4	4	2
V (3-2)	Dactylis glomerata	2	3	3	3	3
IV (7-2)	Festuca rubra	4	2	7		3
IV (6-1)	Ononis repens	2	4		6	1
IV (5-1)	Festuca arundinacea	3	1	2	5	
IV (3-1)	Plantago lanceolata		1	1	3	2
III (6-4)	Agrostis stolonifera	6		4	5	
III (4-1)	Centaurea scabiosa	4	1			1
III (2-1)	Centaurea nigra	2	1	2		
II (6-1)	Plantago coronopus		6	1		

II (3-3)	Leontodon hispidus		3			3
II (3-1)	Anthyllis vulneraria			1		3
II (3-1)	Brachypodium sylvaticum	3		1		
II (2-1)	Senecio jacobaea	1			2	
II (1-1)	Senecio erucifolius	1				1
II (1-1)	Sonchus asper	1	1			
I (7-7)	Plantago maritima					7
I (3-3)	Lotus corniculatus			3		
I (3-3)	Sanguisorba minor			3		
I (2-2)	Carex flacca			2		
I (2-2)	Medicago lupulina			2		
I (2-2)	Senecio aquaticus			2		
I (2-2)	Trifolium pratense			2		
I (1-1)	Achillea millefolium	1				
I (1-1)	Cirsium vulgare					1
I (1-1)	Equisetum arvense				1	
I (1-1)	Potentilla reptans		1			
I (1-1)	Rubus fruticosus			1		
I (1-1)	Sinapis arvensis				1	
I (1-1)	Sonchus oleraceus					1

MG1a						
		29	**50**	**85**	**102**	**171**
V (8-6)	Arrhenatherum elatius	7	8	6	7	7
V (6-3)	Festuca rubra	5	3	3	5	6
V (5-1)	Cirsium arvense	5	2	2	3	1
IV (6-1)	Dactylis glomerata	2	3	6		1
IV (3-1)	Rumex acetosa	3		3	1	2
III (4-1)	Urtica dioica			1	4	1
III (3-1)	Silene dioica			1	3	1
III (1-1)	Heracleum sphondylium	1			1	1
II (5-1)	Holcus lanatus		1	5		
II (4-2)	Plantago lanceolata		4			2
II (1-1)	Vicia cracca	1	1			
I (4-4)	Centaurea nigra					4
I (3-3)	Agrostis capillaris					3
I (3-3)	Cerastium fontanum		3			
I (3-3)	Cochlearia officinalis	3				
I (3-3)	Galium verum					3
I (2-2)	Achillea millefolium					2
I (2-2)	Angelica sylvestris			2		
I (2-2)	Elytrigia repens				2	
I (2-2)	Galium aparine				2	
I (2-2)	Potentilla reptans			2		
I (1-1)	Agrostis stolonifera					1
I (1-1)	Anthriscus sylvestris		1			
I (1-1)	Rumex crispus		1			
I (1-1)	Senecio jacobaea		1			

MG5a						
		1	**2**	**3**	**10**	**90**
V (6-5)	Festuca rubra	5	5	5	6	5
V (4-3)	Agrostis stolonifera	4	3	4	4	4

V (4-2)	Brachypodium sylvaticum	2	3	4	2	3
V (4-1)	Equisetum arvense	2	3	3	1	4
V (3-2)	Centaurea nigra	2	2	3	2	2
V (3-1)	Plantago lanceolata	1	2	3	3	2
IV (4-2)	Holcus lanatus	2	4	2		4
IV (4-2)	Lotus corniculatus		3	4	2	3
IV (3-1)	Lathyrus pratensis	2	2		1	3
IV (2-2)	Tussilago farfara	2	2		2	2
III (4-2)	Arrhenatherum elatius	2	2			4
III (4-2)	Festuca arundinacea	4	2		2	
III (4-1)	Pulicaria dysenterica		4		1	3
III (3-2)	Carex flacca		2	2	3	
III (2-2)	Prunella vulgaris		2	2	2	
III (2-1)	Rubus fruticosus		2		2	1
III (1-1)	Cirsium palustre	1	1			1
II (4-3)	Trifolium pratense		3	4		
II (3-2)	Anthoxanthum odoratum		3			2
II (3-2)	Cirsium arvense		2			3
II (3-1)	Achillea millefolium		3		1	
II (3-1)	Angelica sylvestris		3			1
II (3-1)	Linum catharticum		1	3		
II (3-1)	Parnassia palustris		1	3		
II (3-1)	Viola riviniana	1	3			
II (2-2)	Dactylis glomerata	2	2			
II (2-1)	Leontodon hispidus		2		1	
II (2-1)	Rumex acetosa	2				1
II (2-1)	Senecio erucifolius		2		1	
II (1-1)	Crataegus monogyna				1	1
I (5-5)	Agrostis capillaris	5				
I (4-4)	Calliergonella cuspidata	4				
I (4-4)	Eurhynchium praelongum	4				
I (4-4)	Filipendula vulgaris				4	
I (3-3)	Hypnum cupressiforme			3		
I (3-3)	Sanguisorba minor				3	
I (2-2)	Brachythecium sp		2			
I (2-2)	Carlina vulgaris			2		
I (2-2)	Cynosurus cristatus		2			
I (2-2)	Hypericum tetrapterum			2		
I (2-2)	Pseudoscleropodium purum			2		
I (2-2)	Rhytidiadelphus squarrosus			2		
I (1-1)	Centaurium erythraea			1		
I (1-1)	Cerastium fontanum		1			
I (1-1)	Heracleum sphondylium					1
I (1-1)	Knautia arvensis				1	
I (1-1)	Ononis repens				1	
I (1-1)	Orchid					1

MG12a						
		53	**136**	**143**	**149**	**128**
V (8-5)	Festuca arundinacea	8	6	5	6	6
V (6-2)	Festuca rubra	2	6	5	6	4
V (4-1)	Dactylis glomerata	4	2	1	2	3
IV (5-2)	Agrostis stolonifera	3	2	5		5

IV (3-1)	Centaurea nigra	1		3	1	1
IV (2-1)	Cirsium arvense	2	1	1	1	
III (4-1)	Plantago lanceolata	1		4		1
III (2-1)	Lathyrus pratensis		1	2		1
II (3-1)	Brachypodium sylvaticum		1			3
II (3-1)	Holcus lanatus	1		3		
II (2-1)	Convolvulus arvensis				1	2
II (1-1)	Equisetum arvense		1	1		
II (1-1)	Heracleum sphondylium		1			1
II (1-1)	Senecio jacobaea	1		1		
I (5-5)	Phragmites australis				5	
I (4-4)	Arrhenatherum elatius	4				
I (4-4)	Ononis repens					4
I (3-3)	Achillea millefolium			3		
I (3-3)	Agrimonia eupatoria		3			
I (2-2)	Torilis japonica				2	
I (1-1)	Daucus carota	1				
I (1-1)	Equisetum telmateia				1	
I (1-1)	Knautia arvensis					1
I (1-1)	Leontodon autumnalis			1		
I (1-1)	Tussilago farfara					1

OV9			
		15	**16**
II (4-4)	Stellaria media	4	4
II (4-3)	Rumex crispus	4	3
II (3-1)	Agrostis stolonifera	1	3
II (9-4)	Cirsium arvense	4	9
II (9-4)	Polygonum aviculare	9	4
I (2-2)	Lolium perenne	2	
I (1-1)	Arrhenatherum elatius	1	
I (1-1)	Atriplex prostrata	1	
I (1-1)	Matricaria discoidea	1	
I (1-1)	Plantago lanceolata		1
I (1-1)	Tripleurospermum maritimum	1	

OV24a						
		72	**73**	**113**	**170**	**173**
V (9-7)	Urtica dioica	9	8	8	8	7
V (7-1)	Galium aparine	3	1	2	7	6
IV (6-2)	Silene dioica	2	3	5	6	
IV (2-1)	Heracleum sphondylium	1	1		2	2
II (5-3)	Agrostis stolonifera	3	5			
II (5-2)	Arrhenatherum elatius				2	5
II (2-1)	Cirsium vulgare		2	1		
I (5-5)	Eurhynchium praelongum	5				
I (3-3)	Stellaria media			3		
I (2-2)	Elytrigia repens					2
I (2-2)	Holcus lanatus		2			
I (2-2)	Lamiastrum galeobdolon					2
I (2-2)	Tripleurospermum maritimum			2		
I (1-1)	Atriplex prostrata			1		
I (1-1)	Capsella bursa-pastoris			1		

I (1-1)	Cirsium arvense				1	
I (1-1)	Dactylis glomerata		1			
I (1-1)	Festuca rubra			1		
I (1-1)	Poa annua			1		
I (1-1)	Rumex acetosa		1			
I (1-1)	Sonchus oleraceus			1		

OV26d					
		146	**148**	**164**	**197**
IV (9-2)	Epilobium hirsutum	8	8	2	9
IV (5-2)	Arrhenatherum elatius	2	3	3	5
III (5-2)	Urtica dioica	5	2		4
II (7-1)	Heracleum sphondylium	1	7		
II (4-4)	Holcus lanatus		4		4
II (4-3)	Agrostis stolonifera		4	3	
II (2-1)	Cirsium arvense		2		1
I (9-9)	Equisetum telmateia			9	
I (4-4)	Rubus fruticosus	4			
I (3-3)	Festuca arundinacea		3		
I (2-2)	Epilobium parviflorum			2	
I (2-2)	Galium aparine		2		
I (2-2)	Pulicaria dysenterica			2	
I (1-1)	Dactylis glomerata			1	
I (1-1)	Eupatorium cannabinum			1	
I (1-1)	Leontodon autumnalis			1	
I (1-1)	Sinapis arvensis			1	

OV27b					
		79	**80**	**84**	**190**
IV (9-7)	Epilobium angustifolium	9	8	8	7
IV (7-4)	Arrhenatherum elatius	5	4	4	7
IV (2-1)	Urtica dioica	2	2	2	1
III (6-5)	Eurhynchium praelongum	6	5	6	
III (5-3)	Silene dioica	3	5	5	
III (2-1)	Cirsium arvense	1	1	2	
III (2-1)	Dryopteris filix-mas	2	1	2	
III (1-1)	Heracleum sphondylium		1	1	1
II (3-1)	Angelica sylvestris	3		1	
II (3-1)	Phyllitis scolopendrium	3	1		
II (2-1)	Rubus fruticosus	1			2
I (3-3)	Galium aparine		3		
I (1-1)	Cirsium palustre	1			

S12		
		95
I (9-9)	Juncus articulatus	9
I (5-5)	Eleocharis palustris	5
I (4-4)	Agrostis stolonifera	4
I (4-4)	Typha latifolia	4
I (2-2)	Equisetum arvense	2

S26b				
		25	**63**	**135**
III (9-9)	Phragmites australis	9	9	9
III (5-2)	Arrhenatherum elatius	5	3	2
I (4-4)	Agrostis stolonifera		4	
I (4-4)	Brachypodium sylvaticum		4	
I (4-4)	Urtica dioica	4		
I (2-2)	Angelica sylvestris		2	
I (2-2)	Holcus lanatus		2	
I (1-1)	Cirsium arvense	1		
I (1-1)	Equisetum			1
I (1-1)	Pulicaria dysenterica			1

S28b		
		209
I (7-7)	Phalaris arundinacea	7
I (6-6)	Arrhenatherum elatius	6
I (3-3)	Rubus fruticosus	3
I (3-3)	Urtica dioica	3
I (2-2)	Holcus lanatus	2
I (1-1)	Dactylis glomerata	1
I (1-1)	Silene dioica	1

SD2		
		54
I (10-10)	Atriplex prostrata	10

SM16c						
		27	**46**	**118**	**191**	**202**
V (8-4)	Plantago maritima	7	4	8	4	5
V (7-4)	Festuca rubra	6	5	4	7	6
V (4-1)	Agrostis stolonifera	3	1	3	3	4
IV (7-2)	Glaux maritima	3	7	4	2	
III (4-3)	Triglochin maritimum	4			4	3
III (4-2)	Tussilago farfara	2			4	4
III (4-1)	Lotus corniculatus	1			4	1
II (3-1)	Samolus valerandi	3	1			
II (2-1)	Armeria maritima	1	2			
II (2-1)	Plantago coronopus	1		2		
I (5-5)	Bare ground	5				
I (4-4)	Carex flacca					4
I (3-3)	Didymodon tophaceus	3				
I (3-3)	Festuca rubra ssp. Juncea					3
I (3-3)	Leontodon hispidus					3
I (2-2)	Juncus gerardii		2			
I (1-1)	Juncus bufonius	1				
I (1-1)	Pulicaria dysenterica					1
I (1-1)	Sonchus arvensis				1	
I (1-1)	Tripleurospermum maritimum				1	

W21a					
		9	**11**	**62**	**97**
IV (8-5)	Crataegus monogyna	8	6	7	5
IV (6-1)	Rosa canina	1	6		
III (7-2)	Ulex europaeus		7	2	7
III (5-3)	Rubus fruticosus		4	3	5
II (4-2)	Acer pseudoplatanus	2		4	
II (2-2)	Sambucus nigra	2		2	
I (6-6)	Prunus spinosa			6	
I (5-5)	Fraxinus excelsior			5	
I (3-3)	Geum urbanum	3			
I (3-3)	Phyllitis scolopendrium	3			
I (3-3)	Silene dioica	3			
I (2-2)	Brachypodium sylvaticum	2			
I (2-2)	Dryopteris dilatata	2			
I (2-2)	Galium aparine	2			
I (2-2)	Geranium robertianum	2			
I (2-2)	Heracleum sphondylium		2		
I (2-2)	Urtica dioica	2			
I (2-2)	Viola sp.	2			
I (2-2)	Epilobium angustifolium		2		
I (1-1)	Angelica sylvestris				1
I (1-1)	Cirsium arvense				1
I (1-1)	Cirsium vulgare	1			
I (1-1)	Epilobium montanum	1			
I (1-1)	Festuca arundinacea				1
I (1-1)	Pulicaria dysenterica				1
I (1-1)	Torilis japonica	1			

W23b					
		38	**87**	**134**	**205**
IV (10-4)	Ulex europaeus	4	10	10	10
IV (9-1)	Rubus fruticosus	9	4	2	1
II (3-1)	Urtica dioica	3			1
II (2-1)	Rosa canina	1	2		
II (1-1)	Cirsium arvense	1		1	
I (3-3)	Galium aparine	3			
I (1-1)	Agrostis stolonifera		1		
I (1-1)	Arrhenatherum elatius				1
I (1-1)	Dactylis glomerata		1		
I (1-1)	Heracleum sphondylium		1		
I (1-1)	Holcus lanatus		1		
I (1-1)	Prunus spinosa	1			

W24b					
		81	**140**	**204**	**207**
IV (10-9)	Rubus fruticosus	9	10	10	10
III (5-2)	Galium aparine	3	5	2	
III (4-2)	Cirsium arvense		4	2	3
III (3-2)	Urtica dioica	2		2	3
II (1-1)	Arrhenatherum elatius			1	1

II (1-1)	Ulex europaeus	1		1	
I (4-4)	Silene dioica	4			
I (1-1)	Crataegus monogyna	1			
I (1-1)	Dryopteris filix-mas	1			
I (1-1)	Rosa canina	1			

W25b			
		61	**208**
II (8-8)	Pteridium aquilinum	8	8
II (4-3)	Arrhenatherum elatius	4	3
II (2-1)	Centaurea nigra	2	1
I (4-4)	Agrostis stolonifera		4
I (4-4)	Festuca rubra	4	
I (3-3)	Brachypodium sylvaticum		3
I (3-3)	Dactylis glomerata	3	
I (3-3)	Rubus fruticosus		3
I (3-3)	Viola canina		3
I (2-2)	Cirsium arvense		2
I (2-2)	Ulex europaeus		2
I (1-1)	Elytrigia repens		1
I (1-1)	Galium aparine		1
I (1-1)	Lathyrus pratensis	1	
I (1-1)	Senecio jacobaea	1	
I (1-1)	Silene dioica	1	
I (1-1)	Sonchus oleraceus		1
I (1-1)	Urtica dioica		1

AF**						
		52	**131**	**154**	**161**	**166**
V (8-4)	Agrostis stolonifera	4	8	7	4	8
IV (3-2)	Festuca arundinacea		2	3	2	3
IV (2-1)	Plantago lanceolata	2		1	1	1
III (5-3)	Juncus articulatus	5	3		4	
III (4-1)	Epilobium parviflorum	3		4		1
III (3-2)	Tussilago farfara	2	2		3	
III (2-1)	Pulicaria dysenterica			1	2	2
II (5-4)	Eupatorium cannabinum			5		4
II (3-1)	Equisetum palustre			1	3	
II (2-1)	Didymodon tophaceus				2	1
II (1-1)	Ononis repens				1	1
II (1-1)	Sonchus oleraceus	1		1		
I (8-8)	Bare ground	8				
I (5-5)	Pellia endivifolia				5	
I (4-4)	Melilotus officinalis				4	
I (1-1)	Cratoneuron filicinum			1		
I (1-1)	Daucus carota					1
I (1-1)	Epilobium hirsutum			1		
I (1-1)	Galium aparine			1		
I (1-1)	Rumex crispus	1				
I (1-1)	Senecio jacobaea	1				
I (1-1)	Sinapis arvensis			1		
I (1-1)	Sonchus asper					1

AG**						
		13	**64**	**86**	**89**	**93**
V (8-5)	Agrostis stolonifera	7	5	8	5	7
V (3-1)	Tussilago farfara	2	3	1	2	1
IV (8-5)	Bare ground	7		5	8	5
II (2-2)	Plantago maritima	2			2	
II (2-1)	Festuca ovina	2			1	
II (1-1)	Anthyllis vulneraria		1		1	
II (1-1)	Pulicaria dysenterica		1		1	
I (3-3)	Festuca arundinacea		3			
I (3-3)	Festuca rubra		3			
I (2-2)	Holcus lanatus					2
I (2-2)	Rumex acetosa					2
I (1-1)	Centaurea nigra				1	
I (1-1)	Cirsium arvense				1	
I (1-1)	Cirsium palustre		1			
I (1-1)	Cirsium vulgare		1			
I (1-1)	Leontodon hispidus				1	
I (1-1)	Lotus corniculatus				1	
I (1-1)	Plantago lanceolata		1			
I (1-1)	Prunella vulgaris				1	
I (1-1)	Rubus fruticosus					1
I (1-1)	Sonchus oleraceus			1		
I (1-1)	Trifolium pratense				1	

AR**						
		6	**7**	**76**	**77**	**78**
V (7-2)	Festuca rubra	2	6	7	5	3
V (5-3)	Arrhenatherum elatius	5	5	3	4	5
V (4-2)	Teucrium scorodonia	4	3	2	3	4
V (2-1)	Senecio jacobaea	2	2	1	2	1
IV (6-3)	Pseudoscleropodium purum	6	3	3		3
IV (4-1)	Holcus lanatus	2	3	4		1
IV (2-1)	Heracleum spondylium	1	1	2		1
III (4-1)	Rumex acetosa	4			1	3
III (3-1)	Dicranum scoparium	2			3	1
II (5-3)	Homalothecium lutescens				3	5
II (3-3)	Leontodon hispidus			3	3	
II (3-2)	Cladonia pyxidata				2	3
II (1-1)	Campanula rotundifolia			1		1
II (1-1)	Geranium pratense			1		1
II (1-1)	Orchid			1	1	
II (1-1)	Primula vulgaris		1			1
II (1-1)	Viola sp.			1		1
I (4-4)	Lotus corniculatus			4		
I (4-4)	Rhytidiadelphus triquetrus	4				
I (3-3)	Bryum capillare				3	
I (3-3)	Carex flacca			3		
I (3-3)	Cirsium palustre		3			
I (3-3)	Eurhynchium striatum					3
I (3-3)	Festuca ovina		3			
I (3-3)	Lathyrus pratensis		3			
I (3-3)	Plantago lanceolata			3		

I (2-2)	Agrostis stolonifera		2			
I (2-2)	Anthyllis vulneraria			2		
I (2-2)	Ctenidium molluscum					2
I (2-2)	Hypnum lacunosum					2
I (2-2)	Pilosella officinarum					2
I (2-2)	Rhytidiadelphus squarrosus				2	
I (1-1)	Cirsium arvense					1
I (1-1)	Geranium sylvaticum	1				
I (1-1)	Peltigera sp.	1				
I (1-1)	Pulicaria dysenterica		1			
I (1-1)	Sonchus asper		1			
I (1-1)	Sonchus oleraceus					1

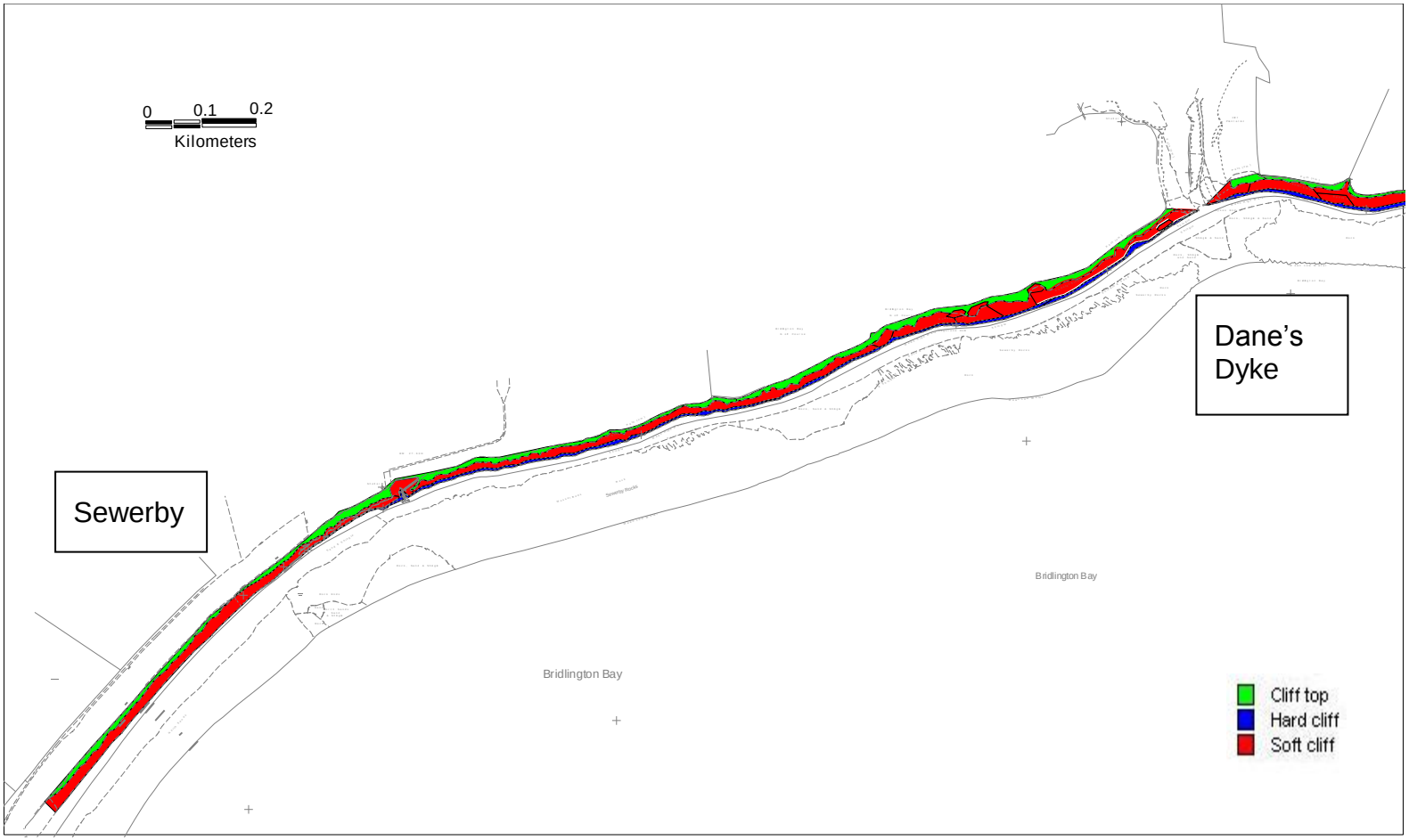
BS**						
		42	**57**	**203**	**206**	**210**
V (7-4)	Brachypodium sylvaticum	4	4	6	6	7
V (6-2)	Festuca rubra	5	2	5	4	6
V (3-1)	Centaurea nigra	2	1	1	2	3
IV (4-3)	Agrostis stolonifera		4	4	4	3
IV (3-2)	Dactylis glomerata	3	2	3	3	
IV (3-1)	Anthyllis vulneraria	1	1		2	3
IV (3-1)	Daucus carota		1	2	3	3
IV (3-1)	Medicago lupulina	1	1	2		3
IV (2-1)	Festuca arundinacea	1	1	2	1	
III (4-2)	Lotus corniculatus			3	4	2
III (4-2)	Plantago maritima		4		4	2
III (3-2)	Plantago lanceolata	3			3	2
III (2-1)	Ononis repens	2	2		1	
III (1-1)	Senecio jacobaea	1		1		1
III (1-1)	Sonchus oleraceus		1	1		1
II (5-2)	Sanguisorba minor	2		5		
II (3-2)	Senecio erucifolius		3		2	
II (3-1)	Carlina vulgaris				3	1
II (2-1)	Lathyrus pratensis	1				2
I (4-4)	Festuca ovina		4			
I (4-4)	Rhinanthus minor	4				
I (3-3)	Carex flacca	3				
I (2-2)	Leontodon hispidus					2
I (2-2)	Trisetum flavescens			2		
I (1-1)	Achillea millefolium				1	
I (1-1)	Blackstonia perfoliolata		1			
I (1-1)	Centaurea scabiosa					1
I (1-1)	Galium aparine					1
I (1-1)	Plantago coronopus			1		
I (1-1)	Rubus fruticosus	1				
I (1-1)	Trifolium arvense	1				

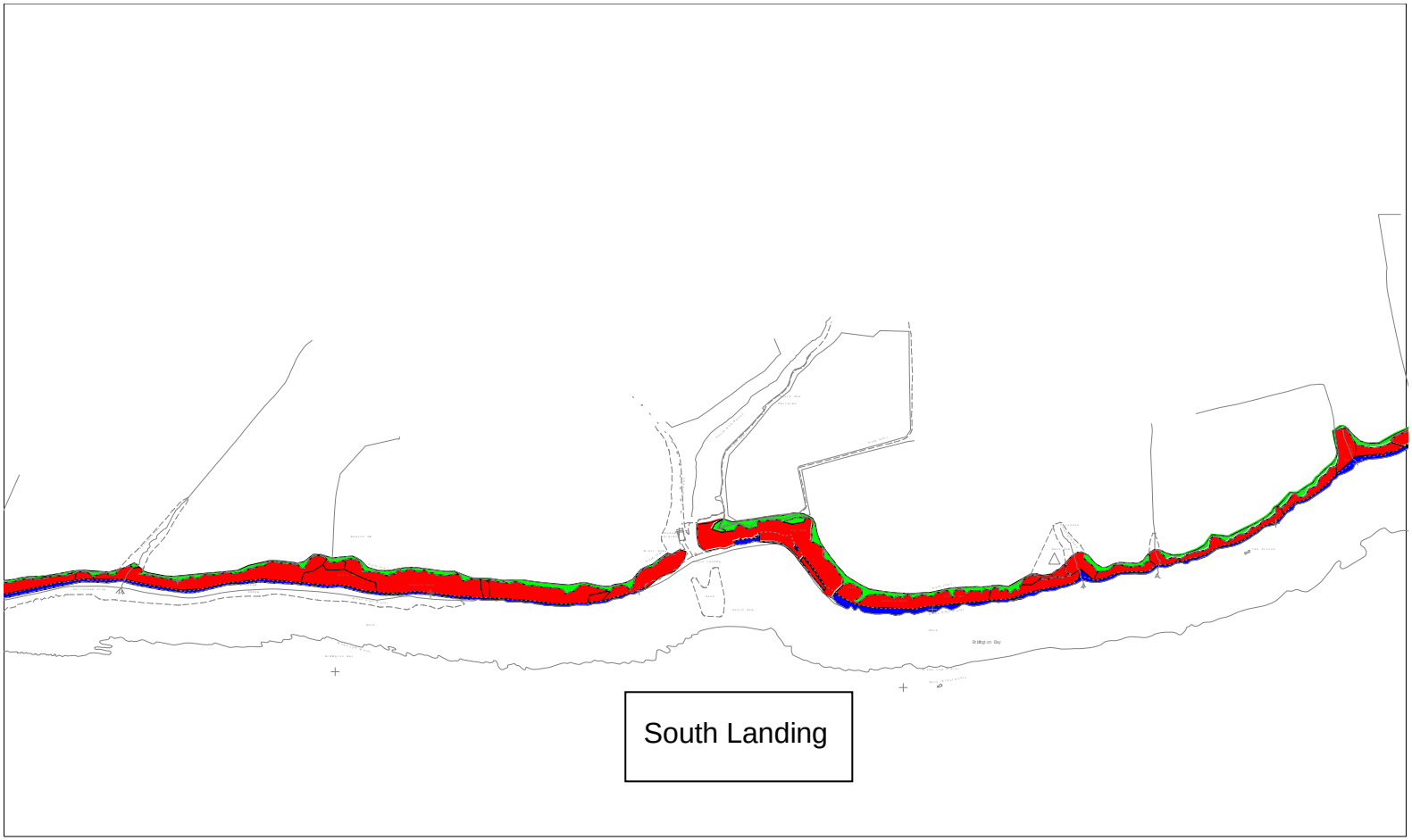
PB**				
		4	**14**	**88**
III (6-3)	Festuca rubra	3	6	5
III (5-4)	Carex flacca	5	4	4
III (4-3)	Sanguisorba minor	4	3	3
III (4-2)	Tussilago farfara	2	2	4

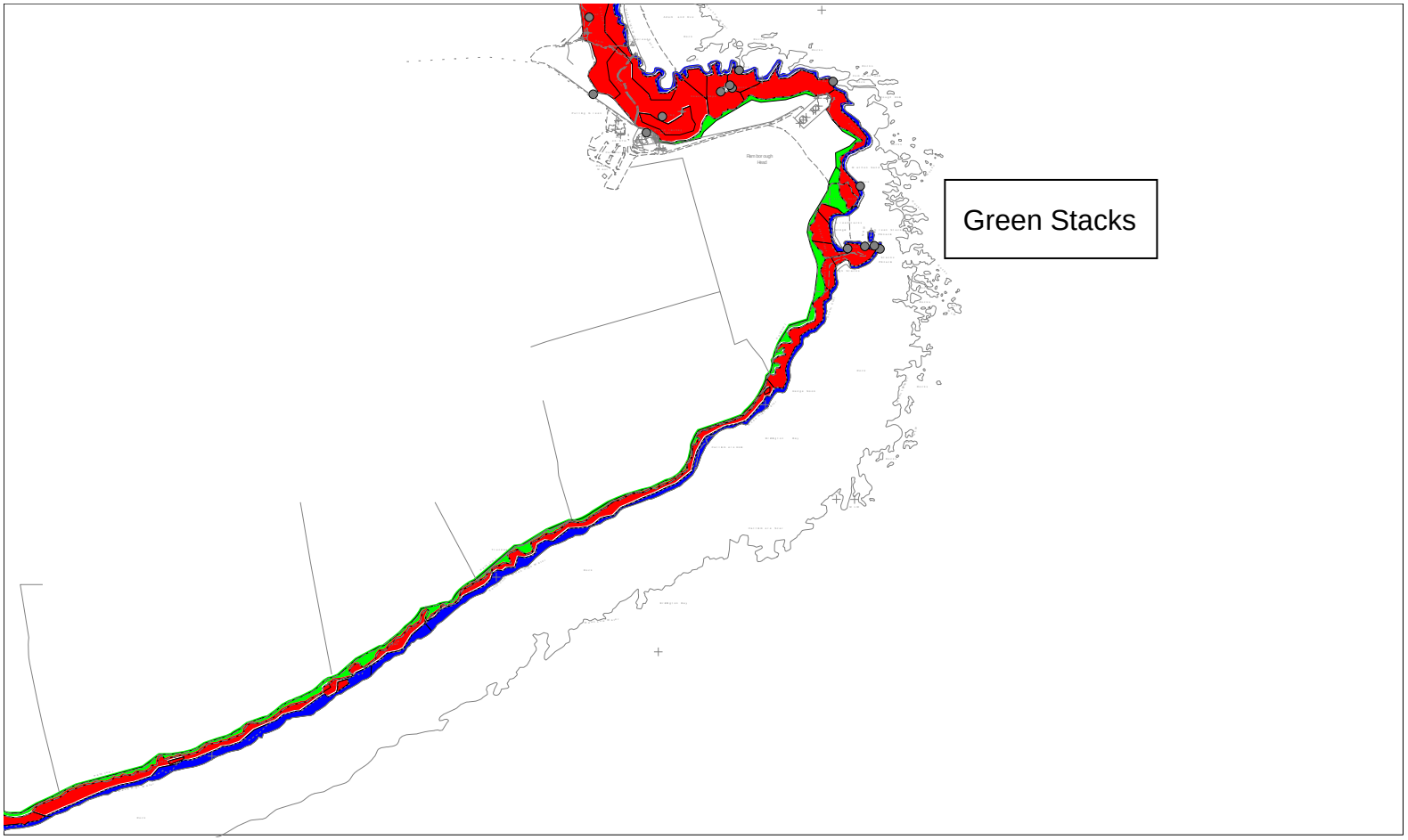
III (3-3)	Agrostis stolonifera	3	3	3		
III (3-2)	Brachypodium sylvaticum	3	2	3		
III (3-2)	Centaurea nigra	2	3	2		
III (3-2)	Trifolium pratense	3	3	2		
II (5-3)	Lotus corniculatus	3		5		
II (3-1)	Briza media	3	1			
II (2-2)	Leontodon hispidus	2		2		
II (2-2)	Plantago lanceolata	2		2		
II (2-1)	Linum catharticum	1	2			
II (2-1)	Medicago lupulina	1	2			
II (1-1)	Festuca arundinacea		1	1		
II (1-1)	Plantago media	1		1		
II (1-1)	Prunella vulgaris	1	1			
II (1-1)	Senecio erucifolius	1		1		
I (3-3)	Festuca ovina	3				
I (3-3)	Holcus lanatus			3		
I (2-2)	Danthonia decumbens	2				
I (2-2)	Lathyrus pratensis			2		
I (1-1)	Achillea millefolium		1			
I (1-1)	Carlina vulgaris		1			
I (1-1)	Dactylis glomerata		1			
I (1-1)	Orchid			1		
I (1-1)	Parnassia palustris	1				
I (1-1)	Pilosella officinarum		1			
I (1-1)	Rumex acetosa		1			

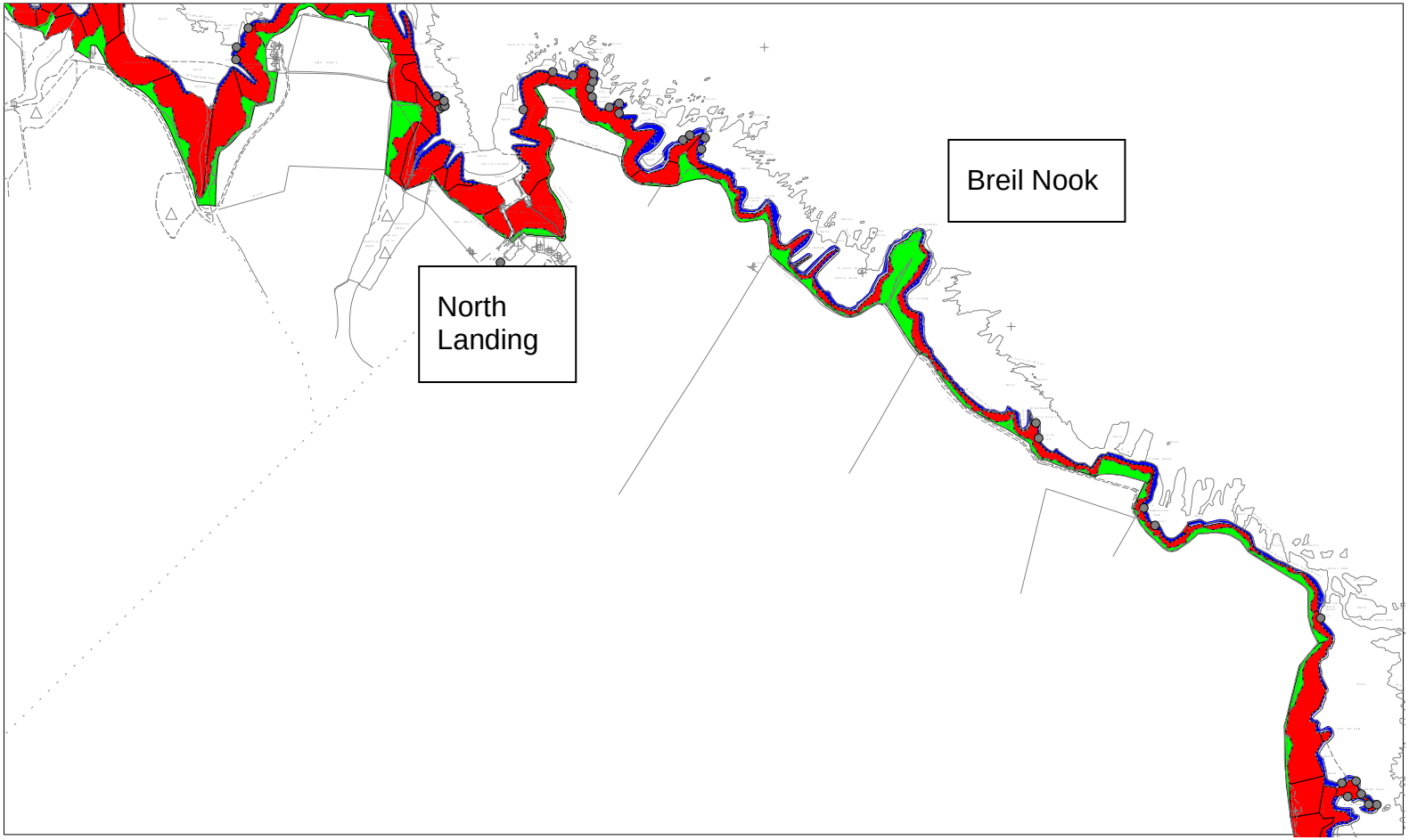
SS**						
		47	**49**	**159**	**160**	**158**
V (7-2)	Agrostis stolonifera	5	2	5	7	3
V (5-1)	Tussilago farfara	3	5	4	2	1
IV (3-1)	Plantago lanceolata	2	1		3	3
IV (2-1)	Dactylis glomerata	2	1	1	1	
III (7-4)	Equisetum telmateia	7	4	6		
III (7-1)	Epilobium hirsutum	1	7	1		
III (4-1)	Festuca arundinacea			1	4	4
III (3-1)	Cirsium arvense		3	2		1
III (3-1)	Medicago lupulina			2	1	3
III (1-1)	Rumex crispus	1	1		1	
II (4-4)	Melilotus officinalis				4	4
II (3-1)	Anthyllis vulneraria				1	3
I (5-5)	Bare ground					5
I (3-3)	Geum rivale	3				
I (2-2)	Senecio erucifolius				2	
I (1-1)	Arrhenatherum elatius			1		
I (1-1)	Elytrigia repens	1				
I (1-1)	Plantago maritima					1
I (1-1)	Sonchus oleraceus		1			
I (1-1)	Trifolium pratense				1	

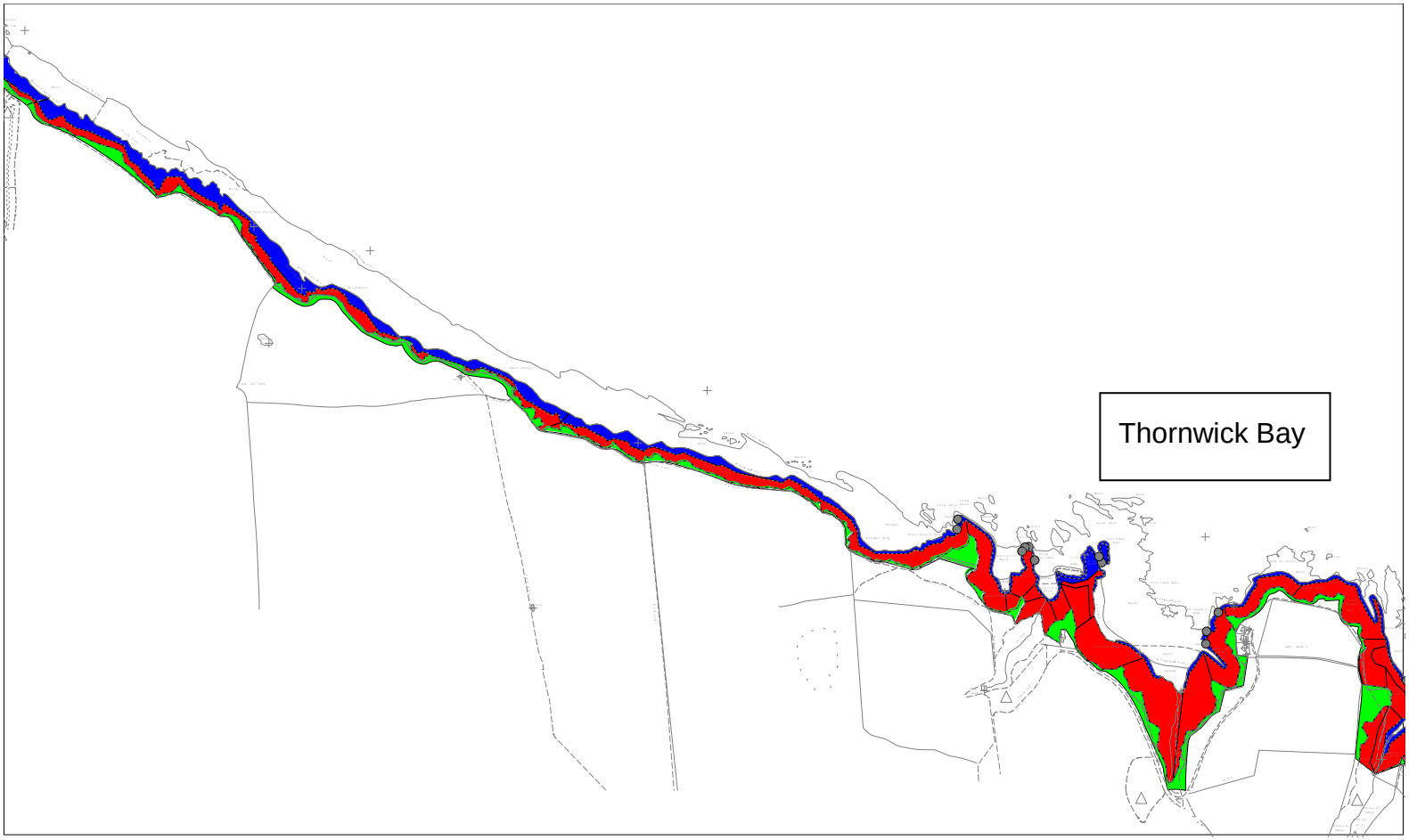
Appendix 3: Distribution of main cliff habitats at Flamborough Head



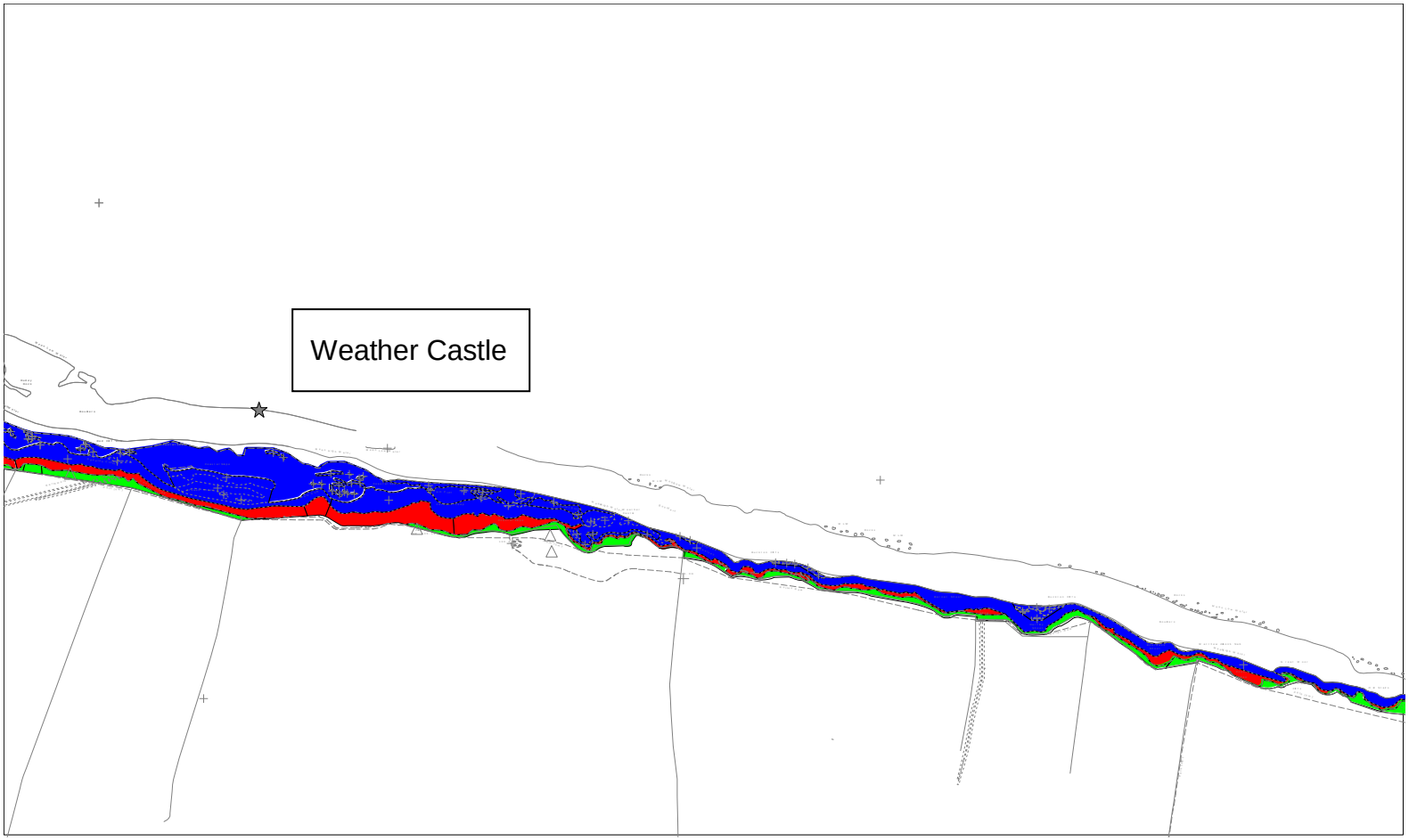

South Landing

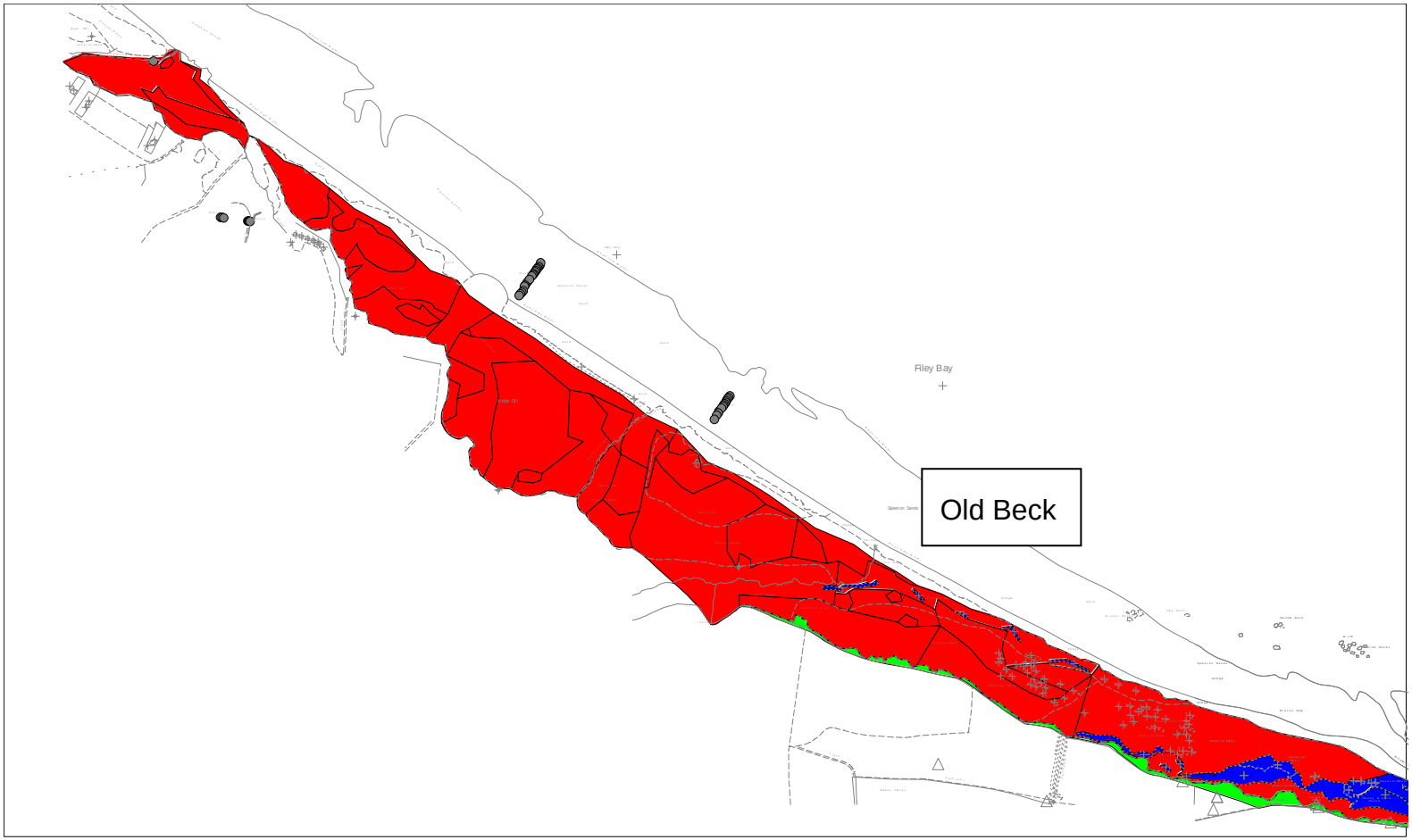

Green Stacks


Breil Nook
North
Landing


Thornwick Bay


Old Roll Up

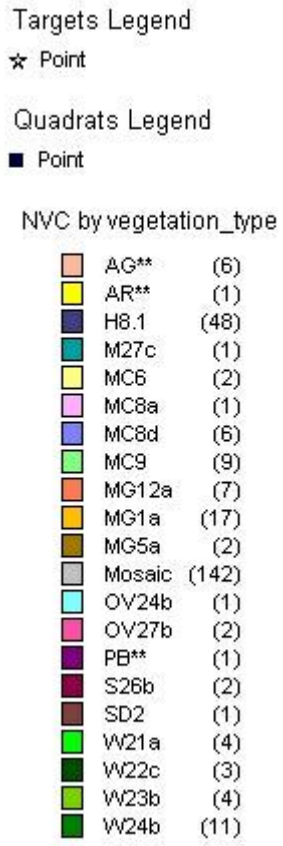

Weather Castle

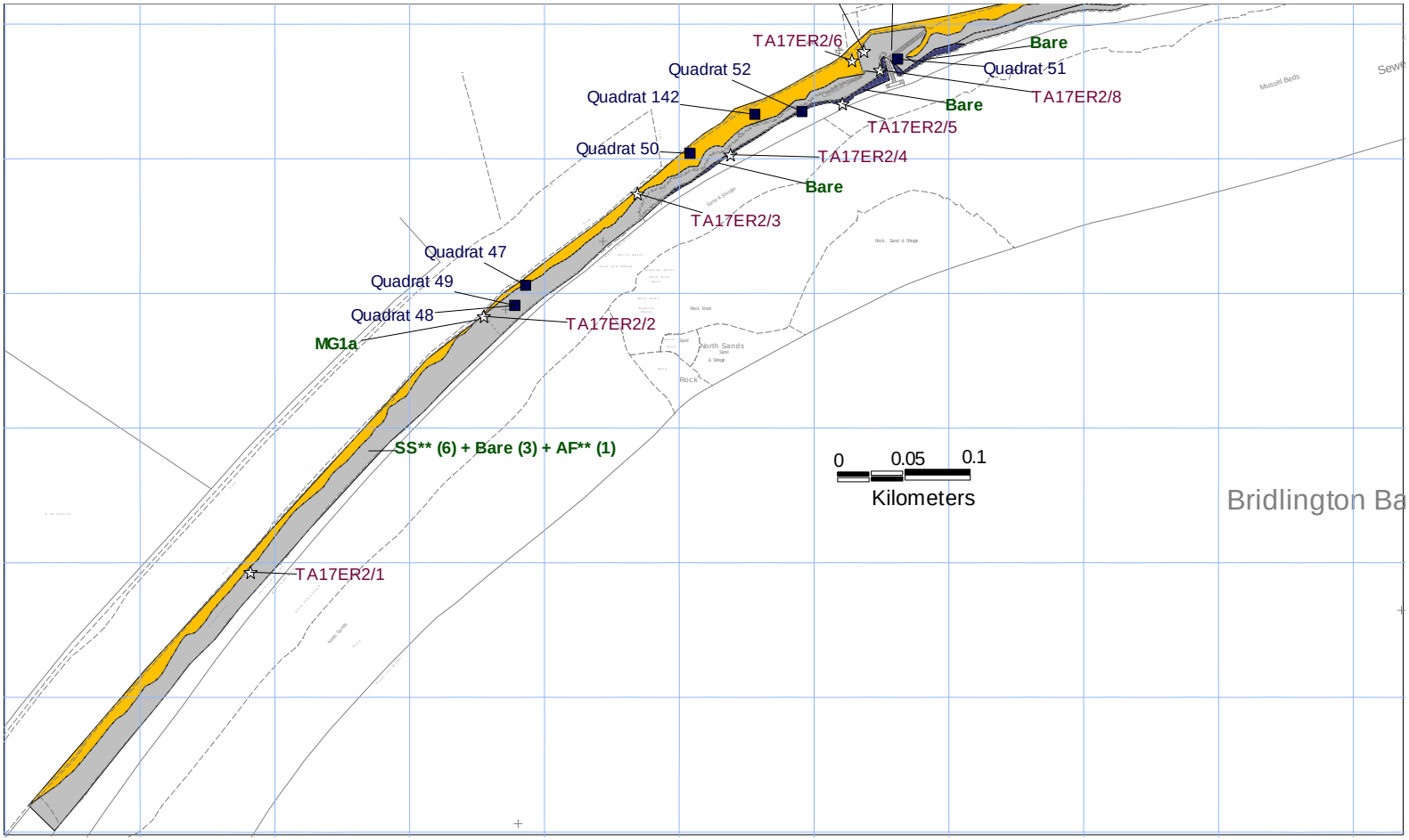

Filey Bay
Old Beck

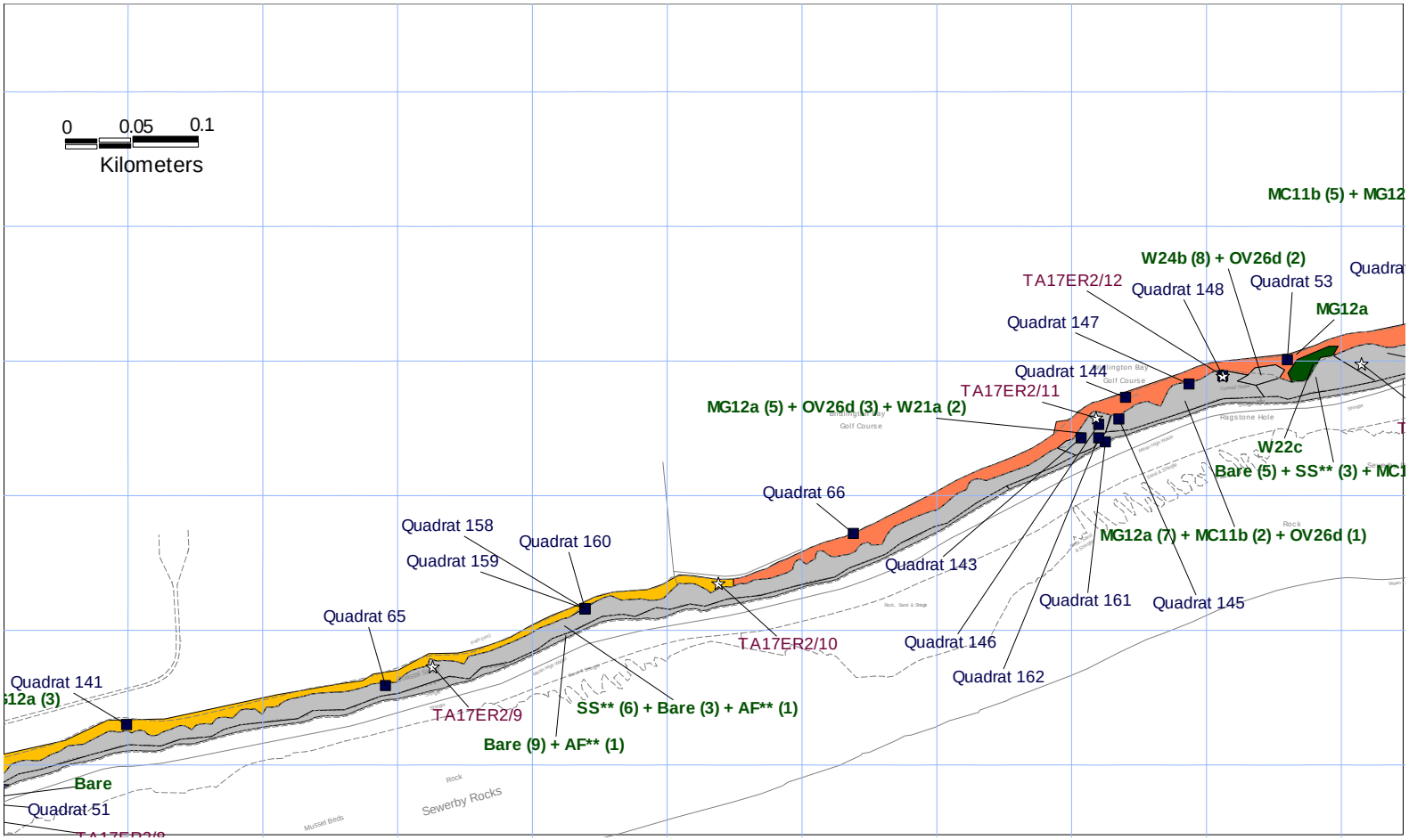
Appendix 4: NVC map of Flamborough Head

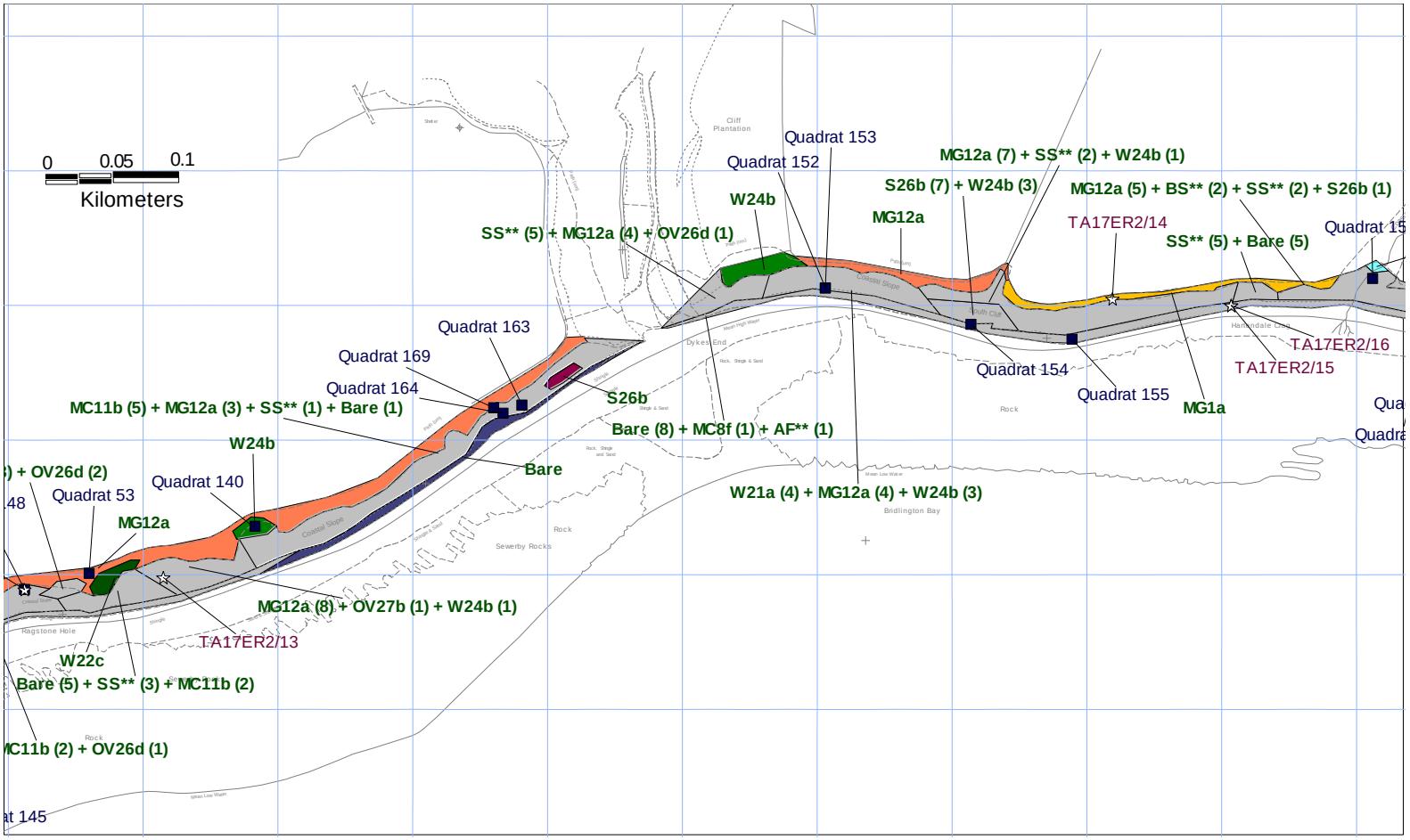
Sewerby to Reighton (progression around Flamborough Head)

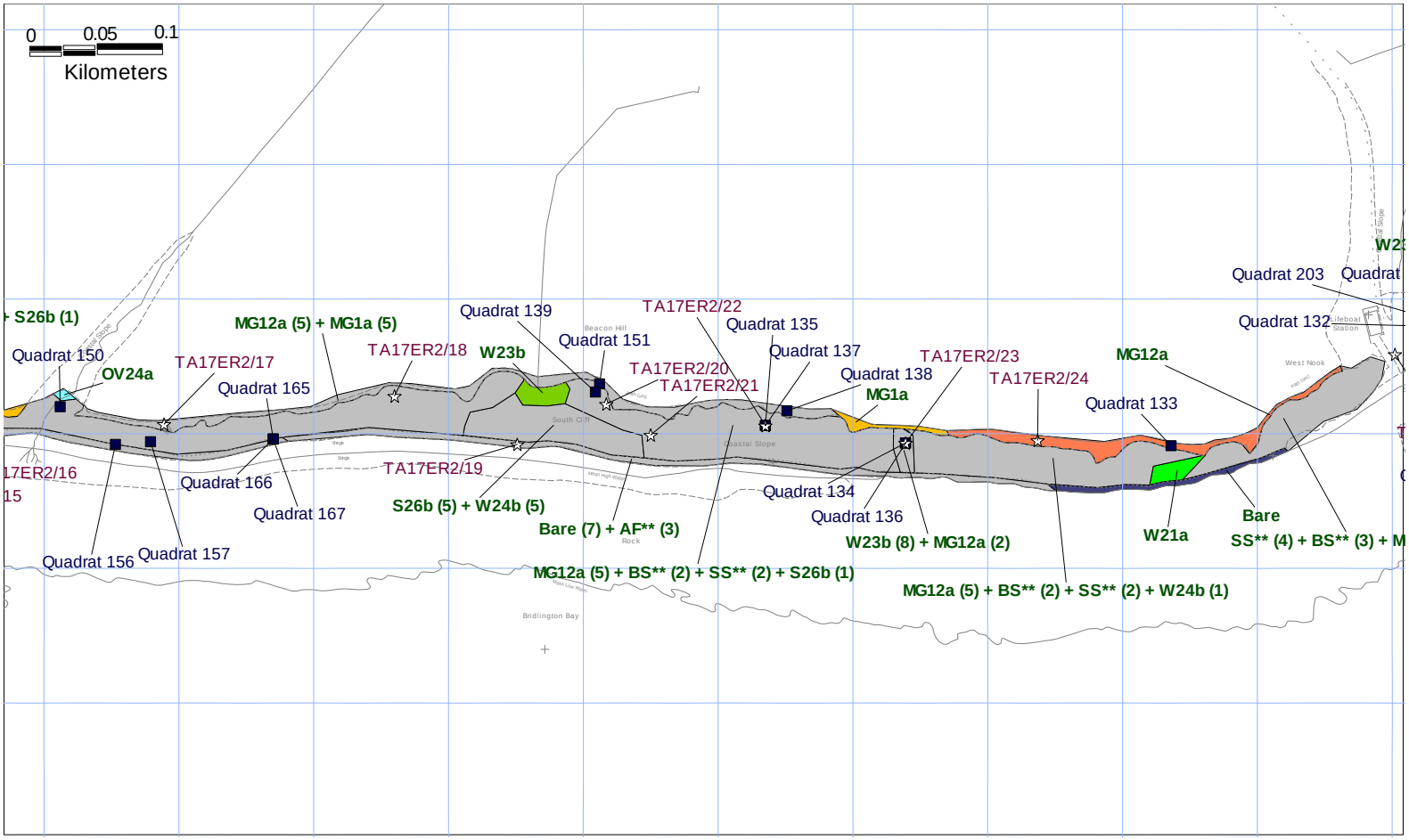
Scale: 1:5,000

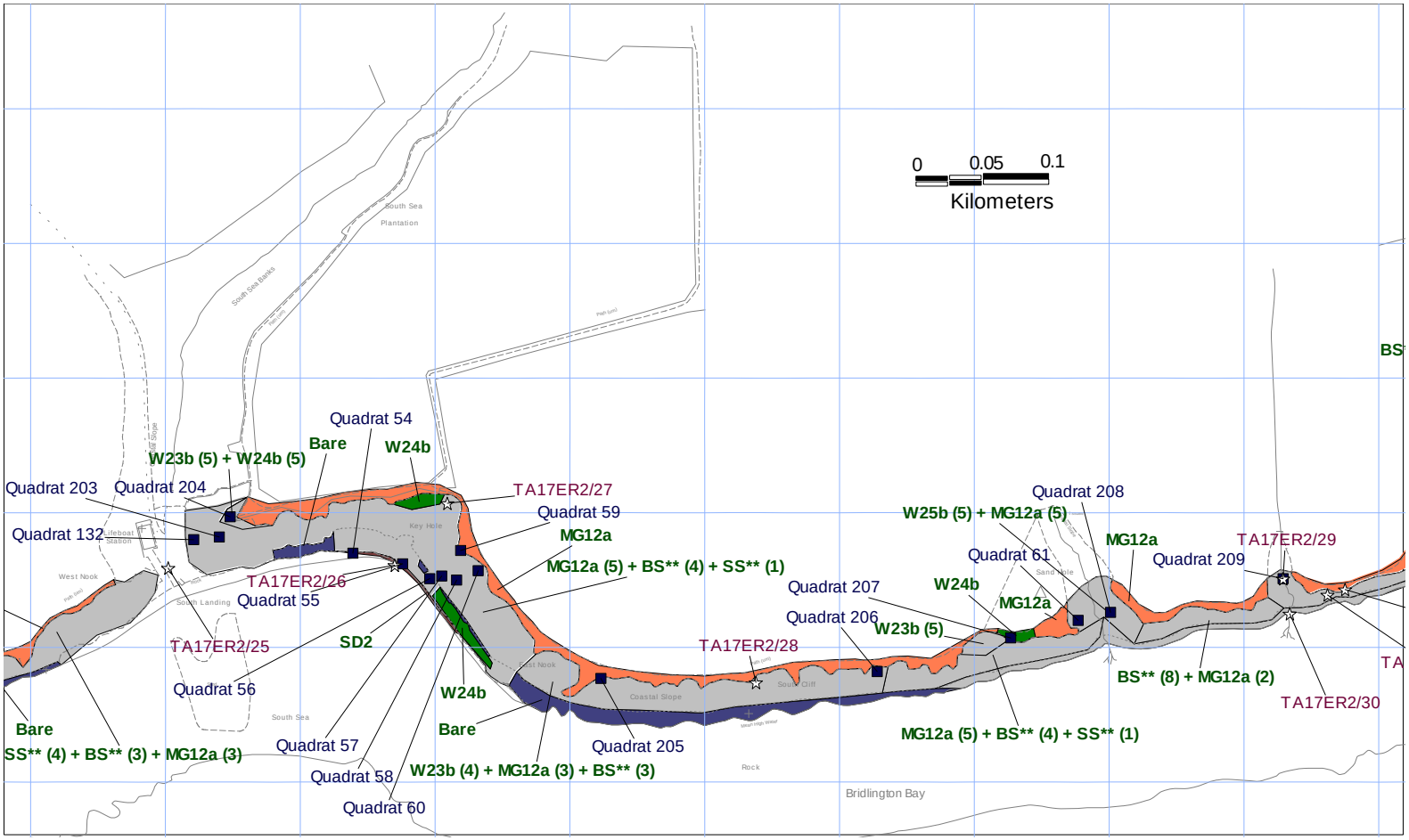


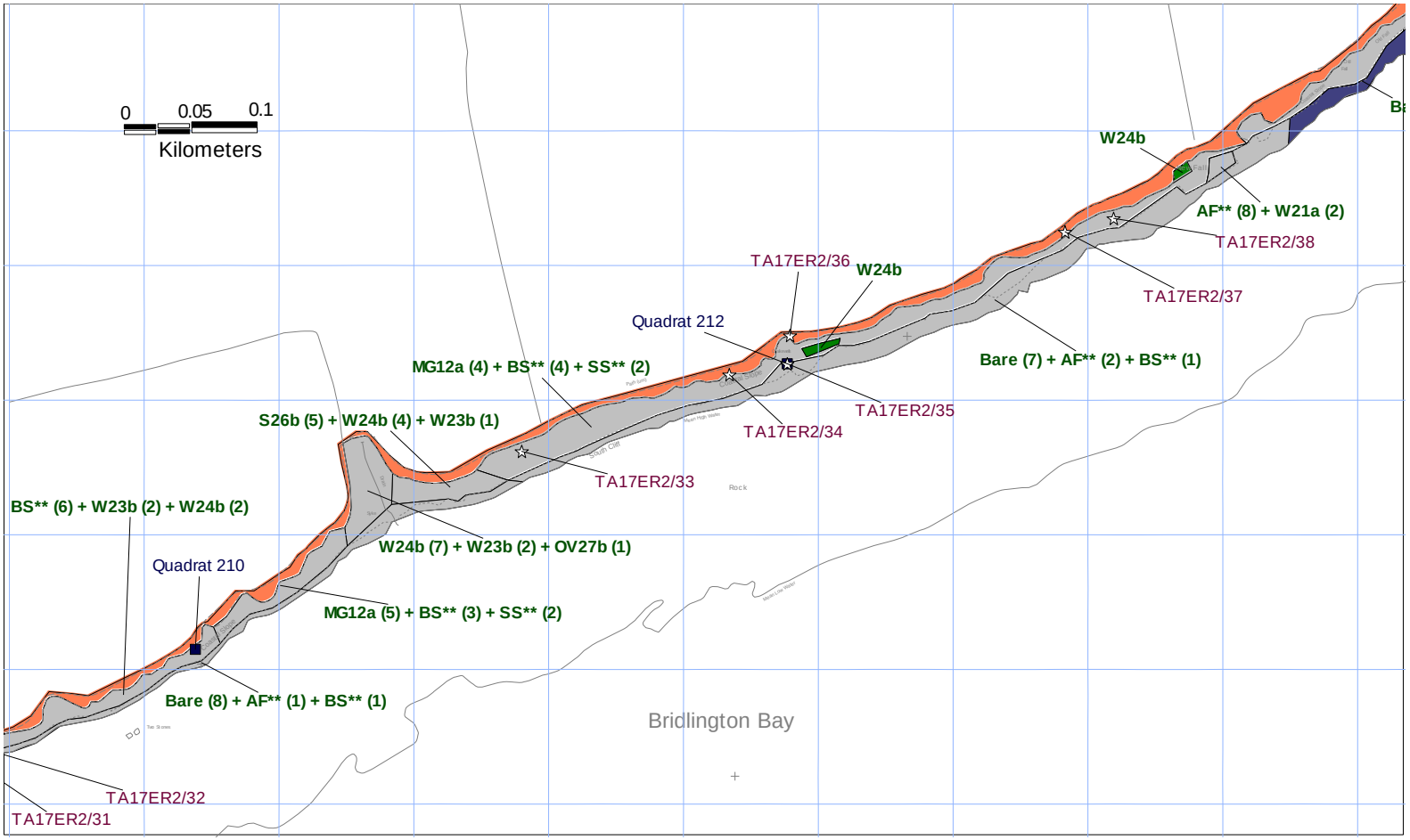


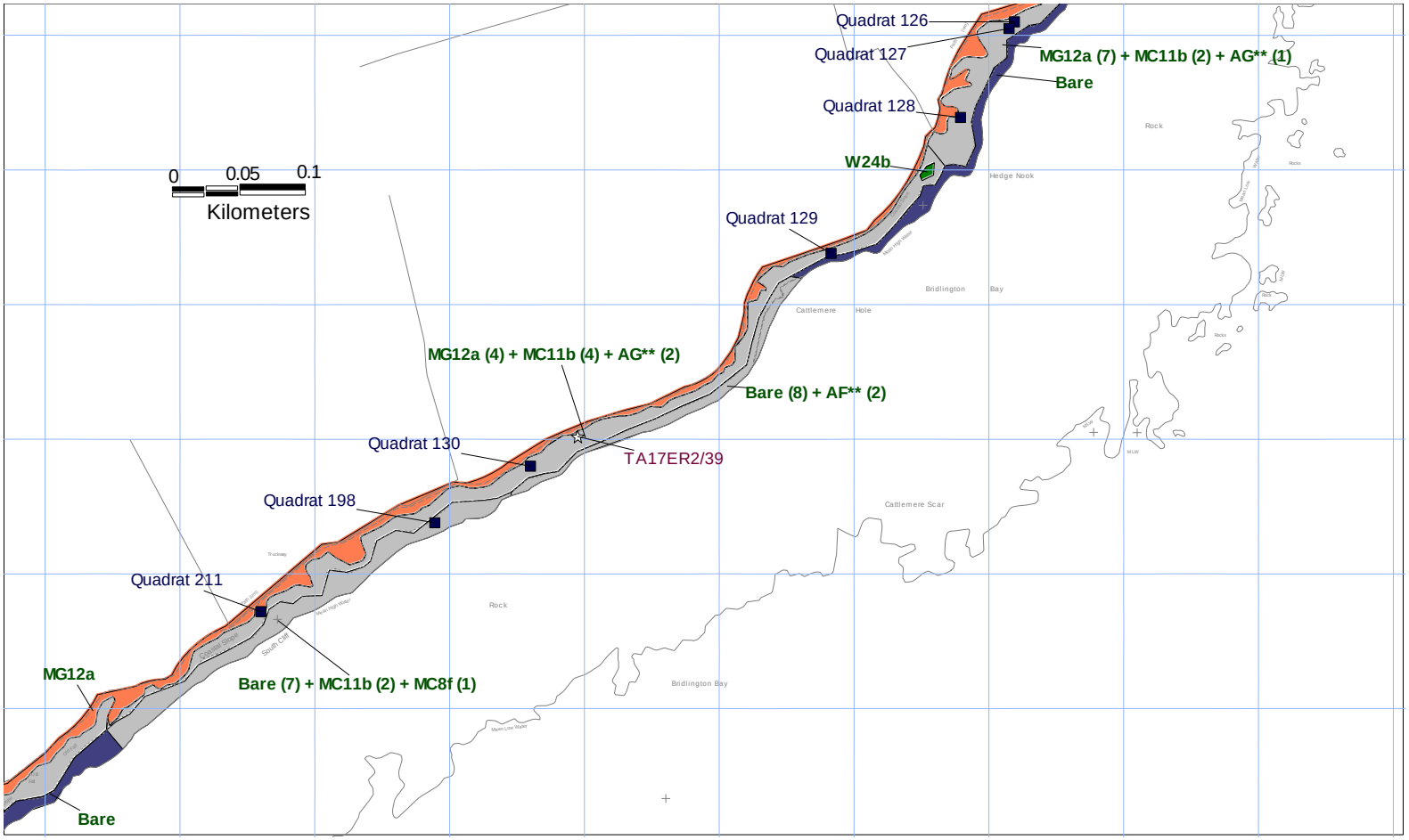


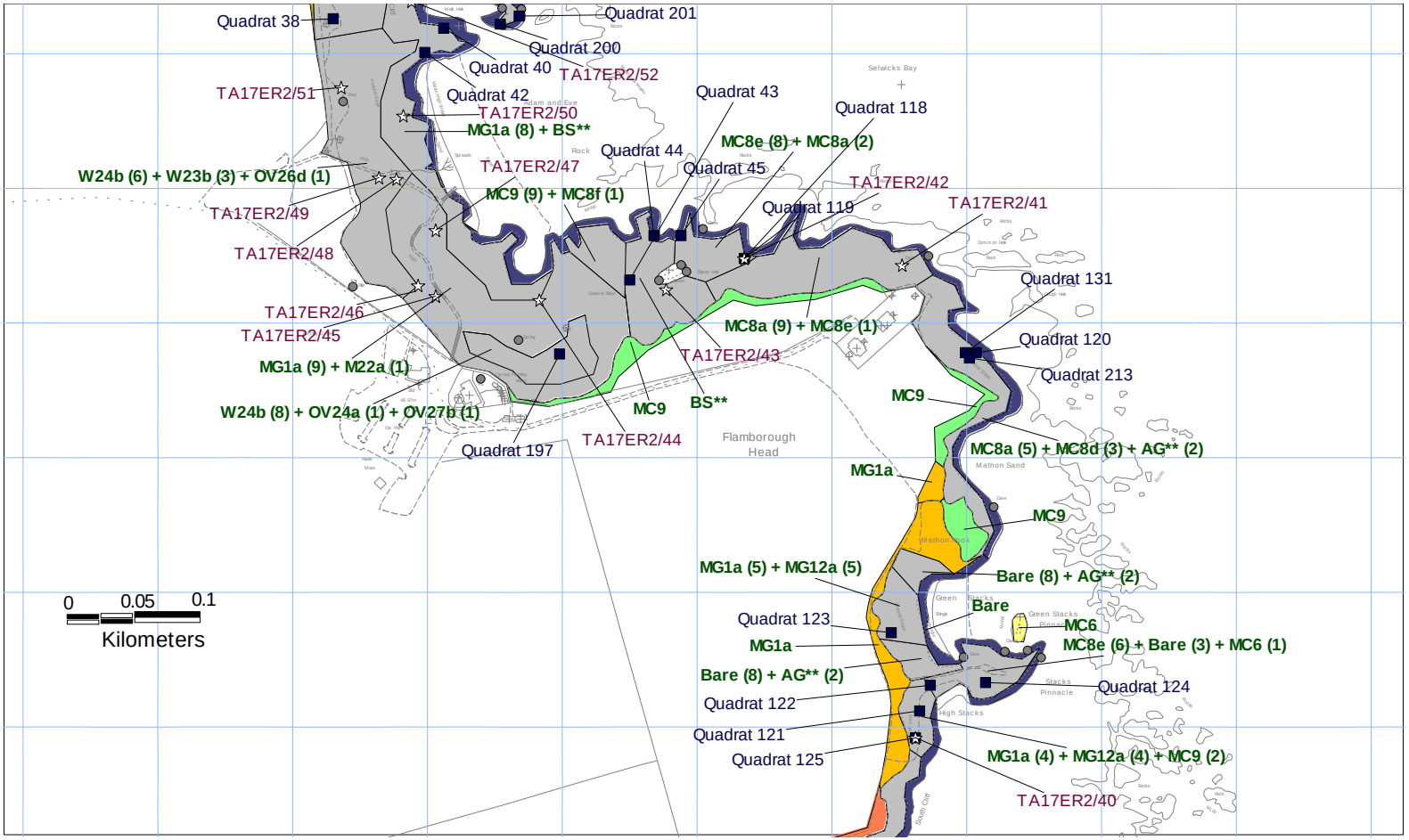


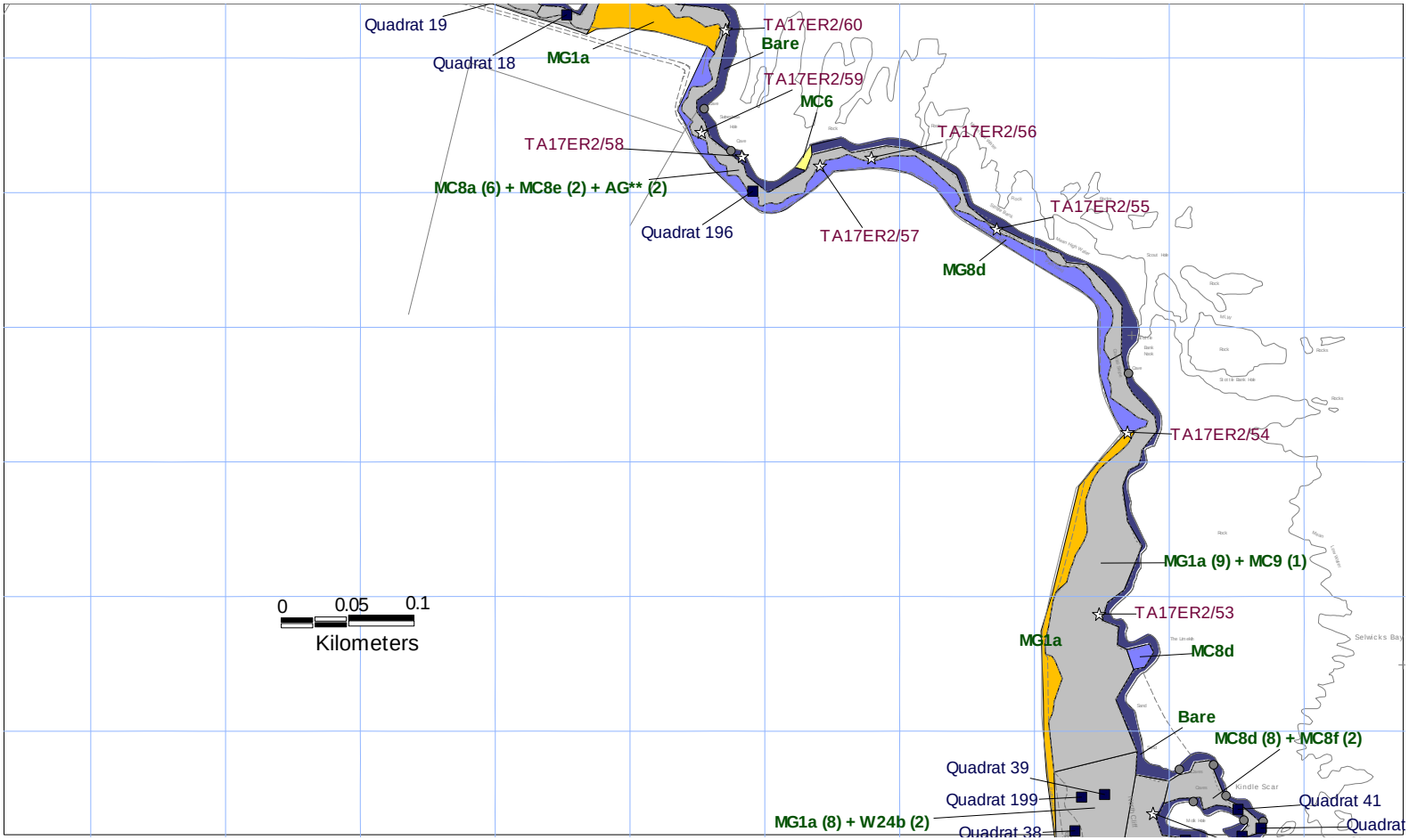


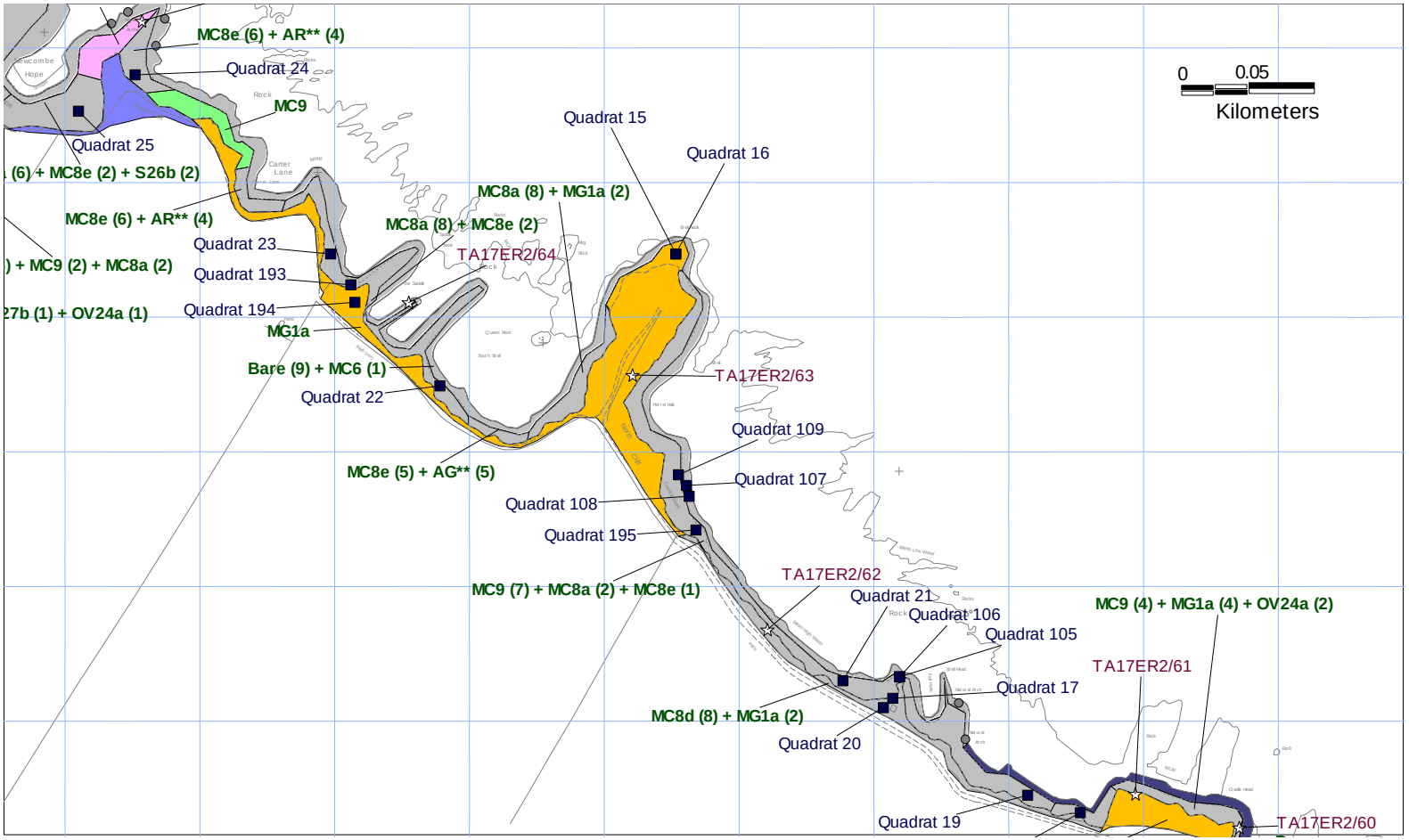


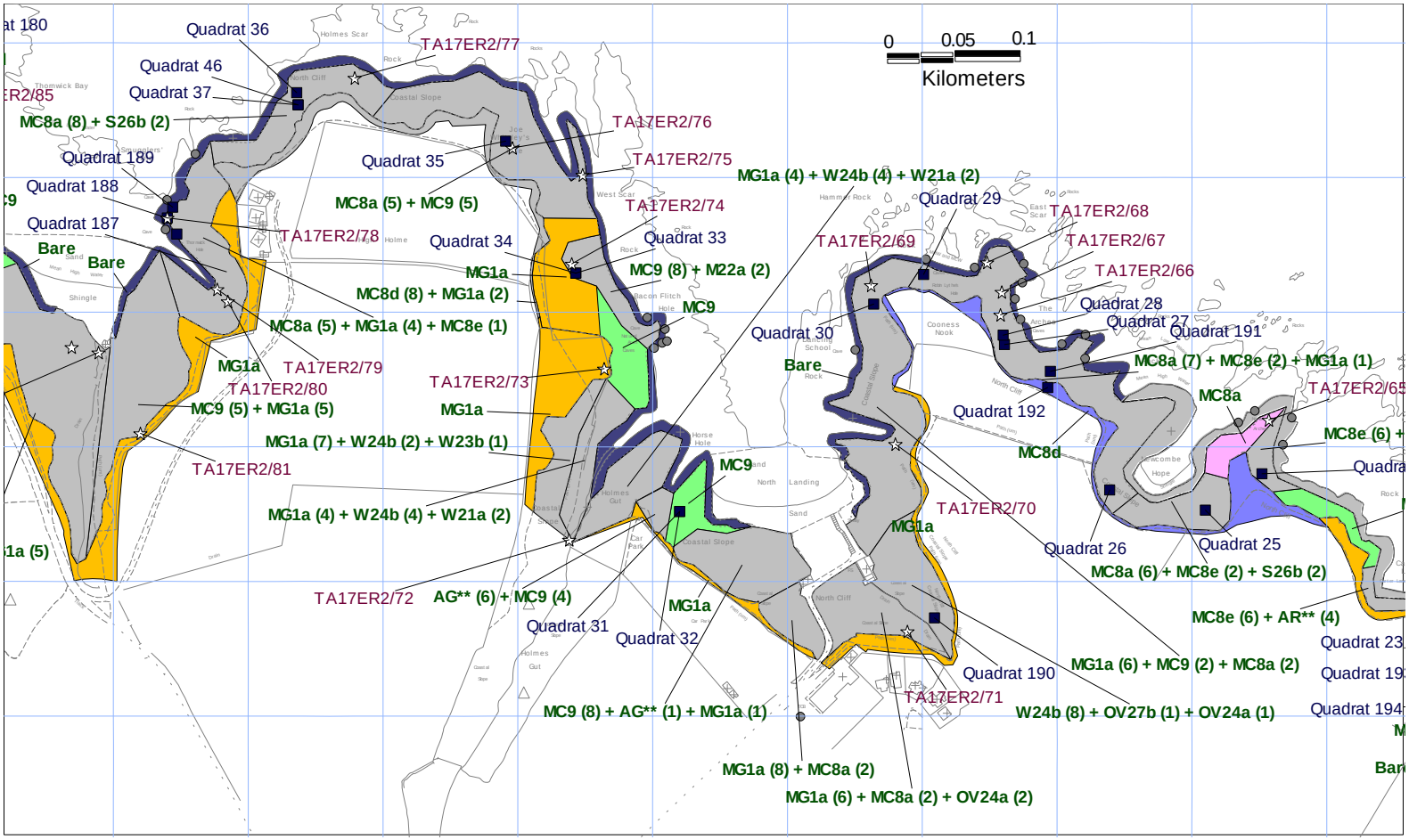


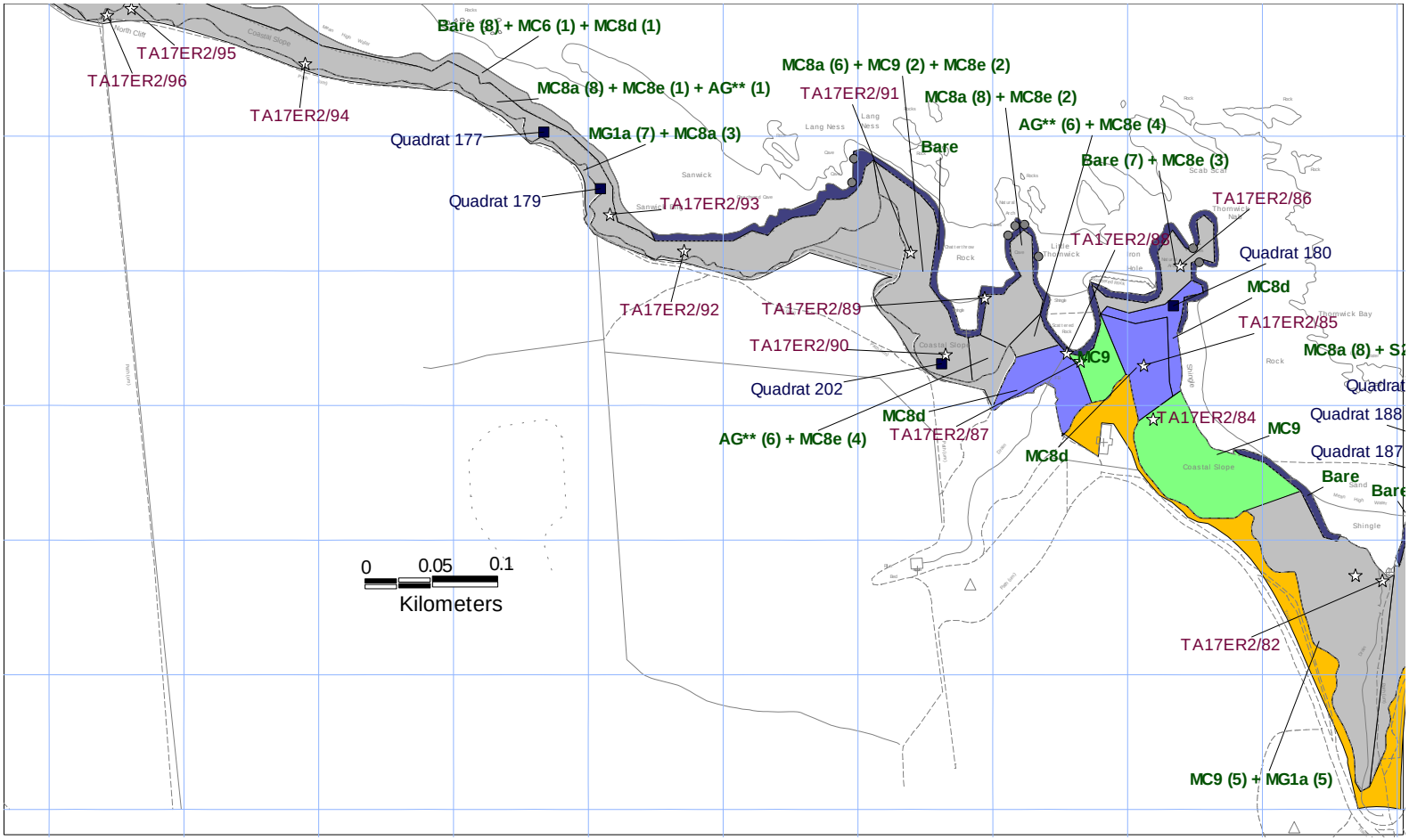


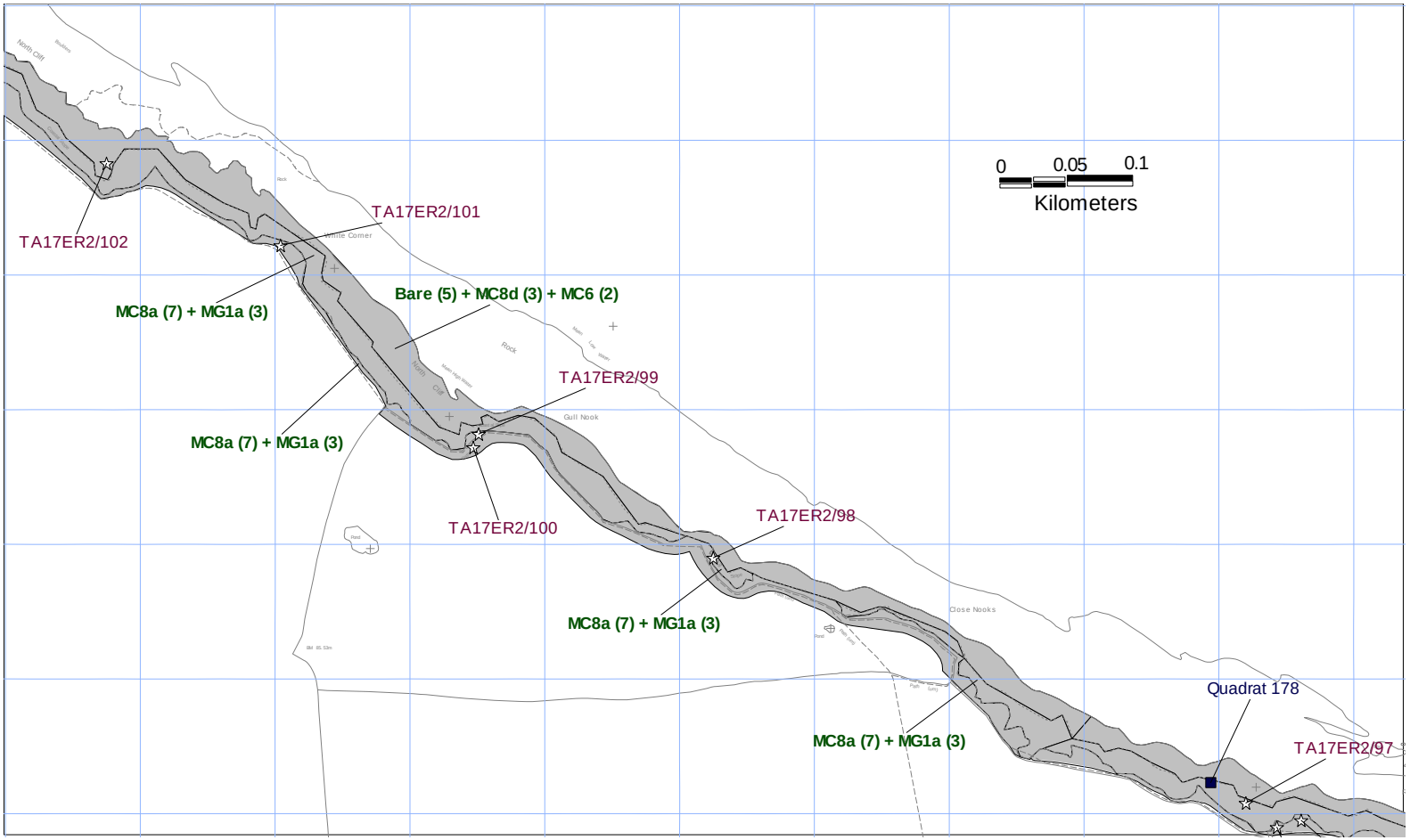


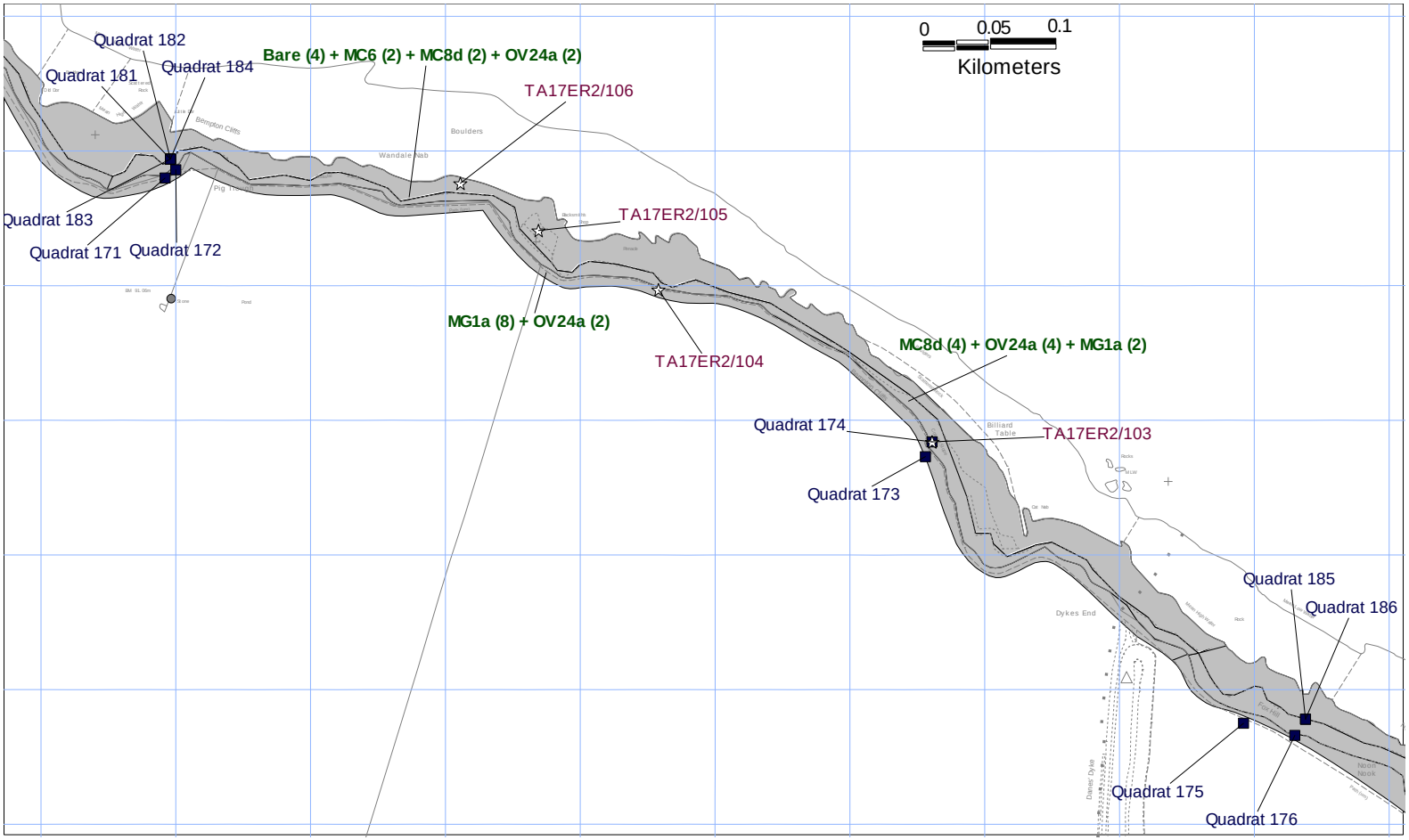


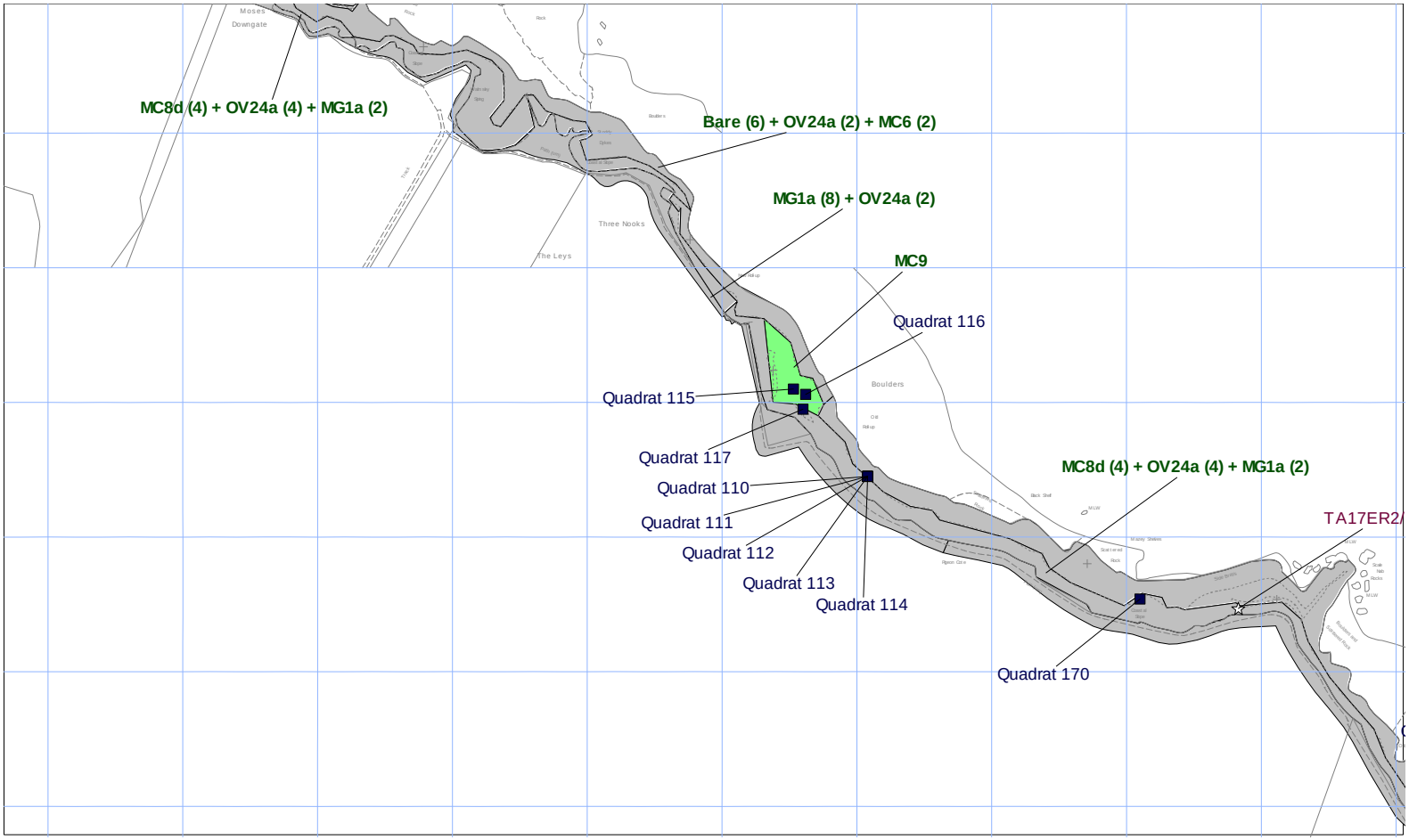


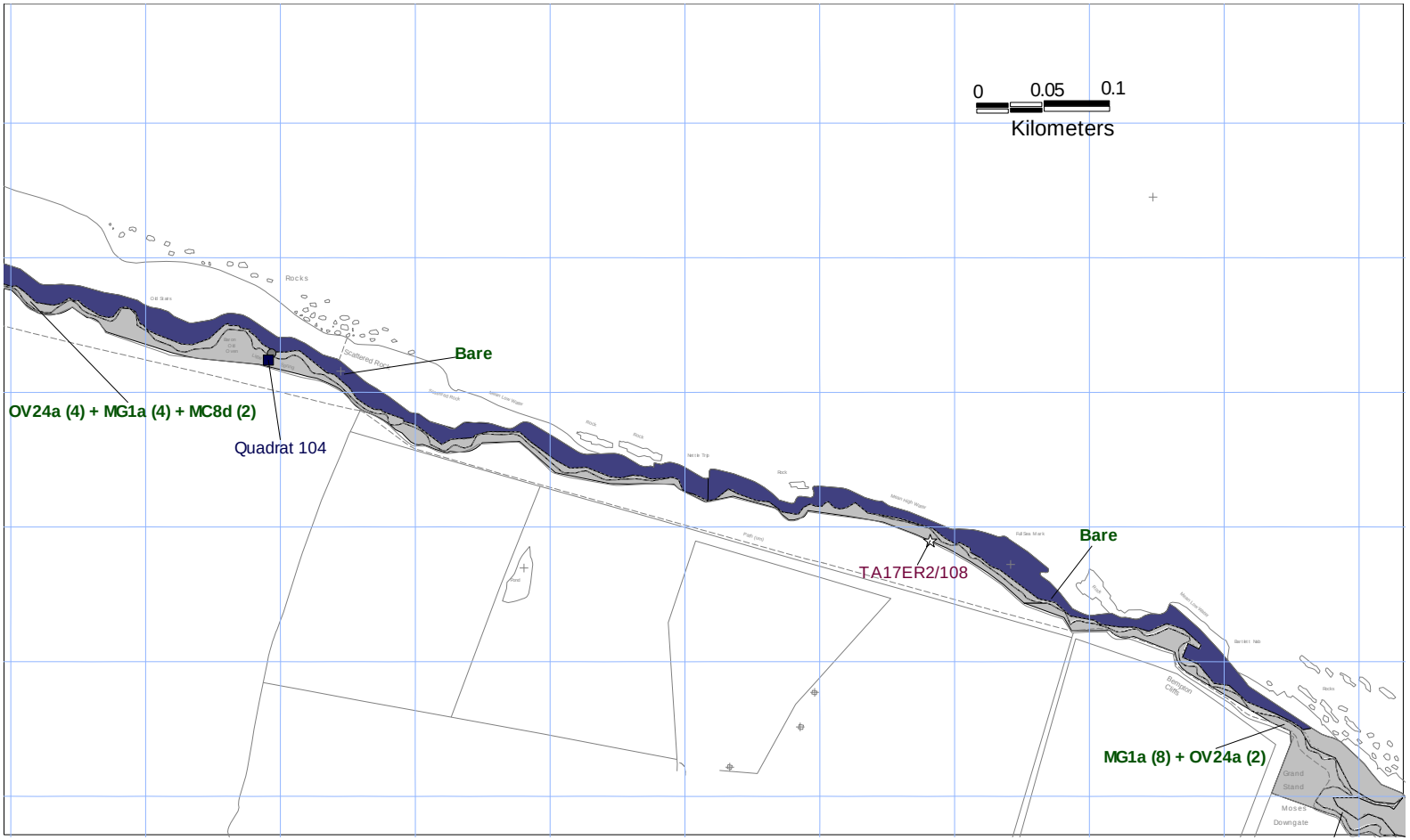


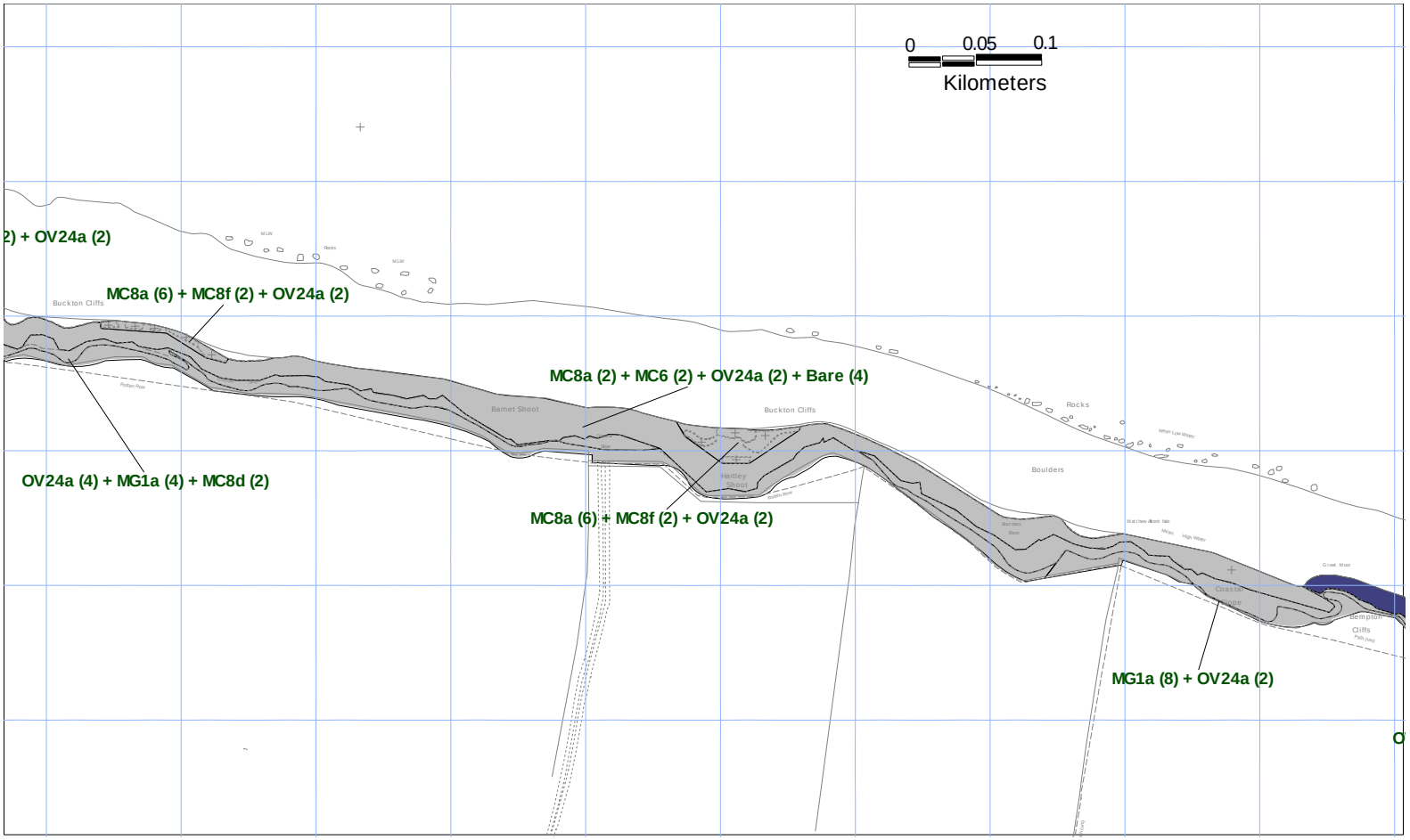


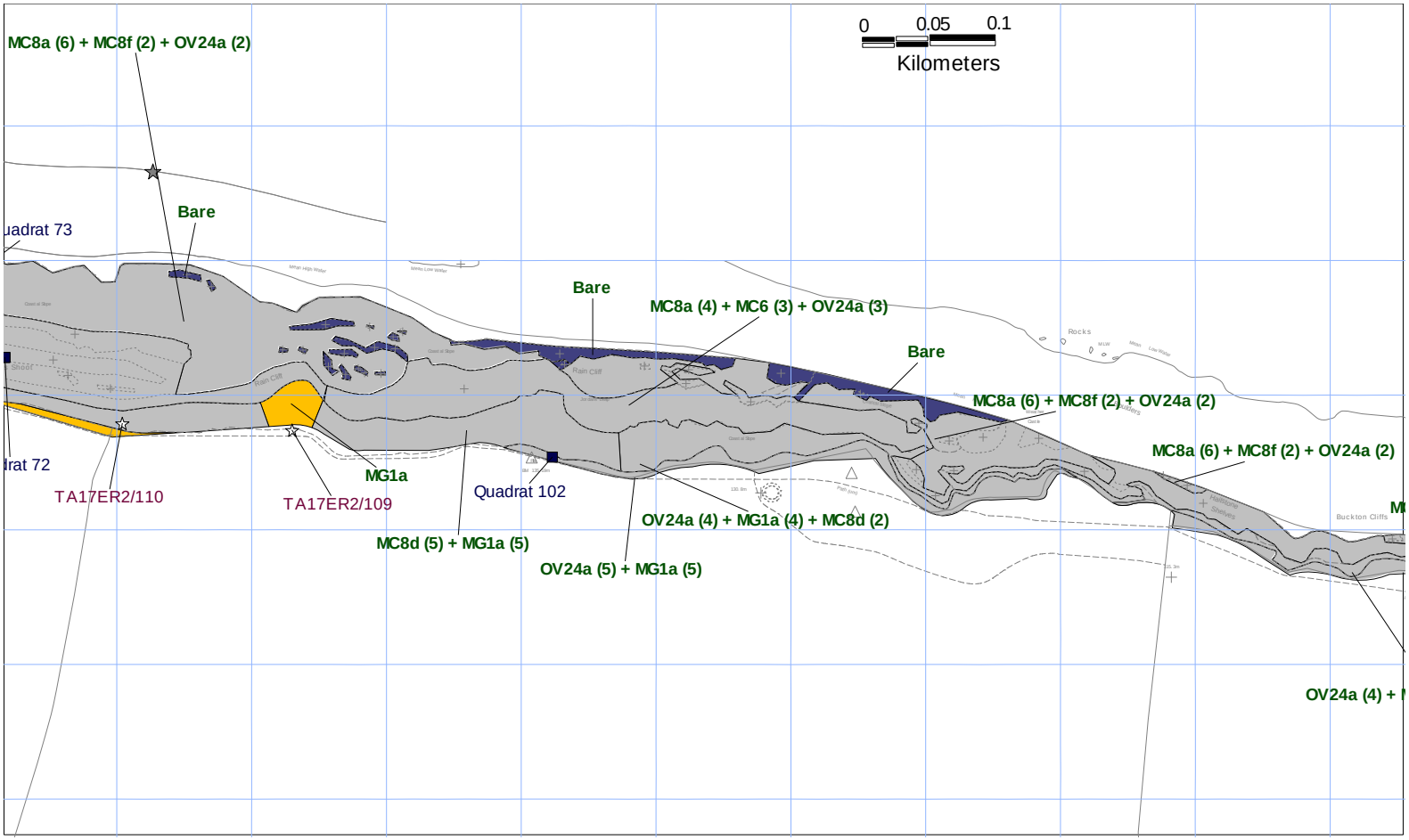


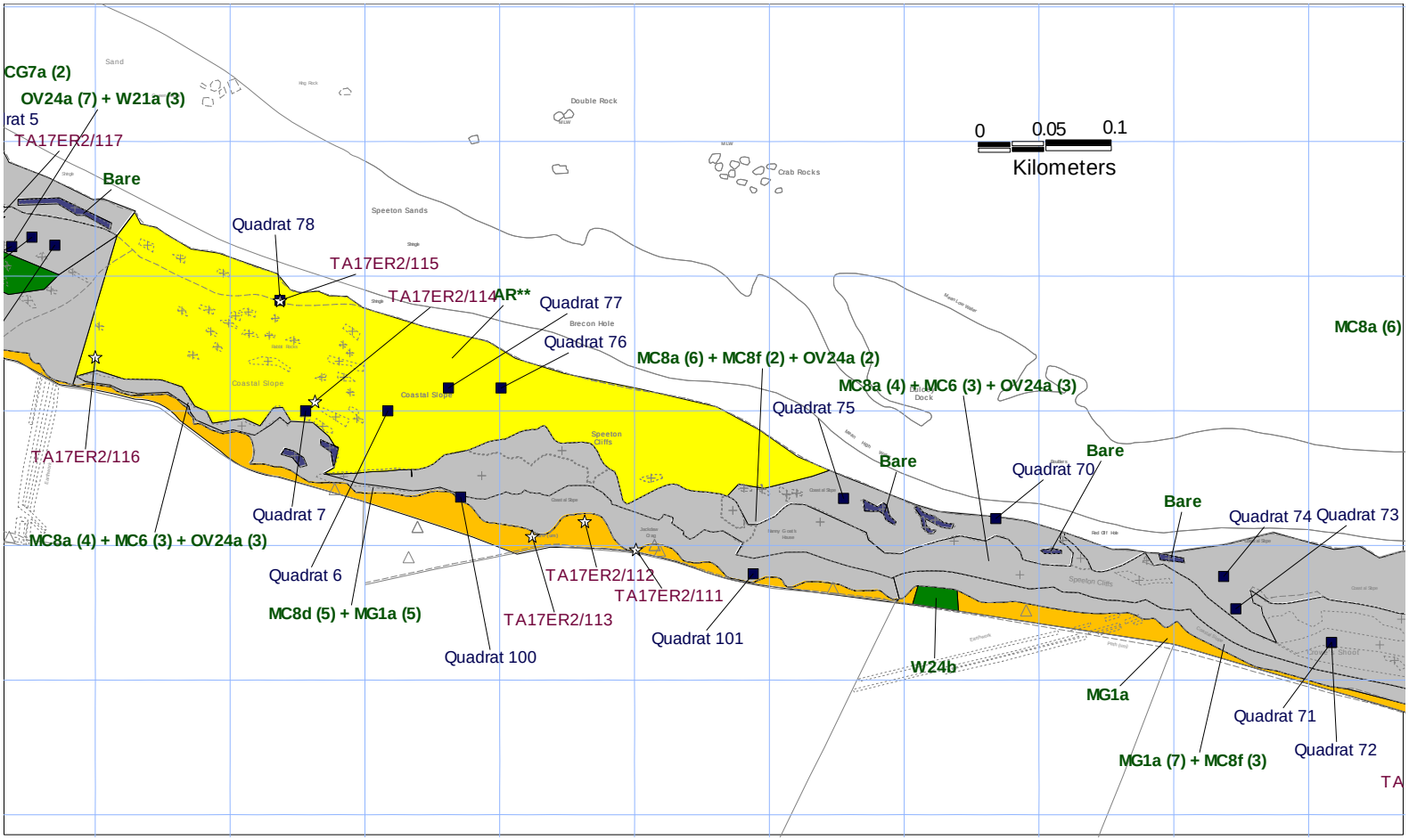


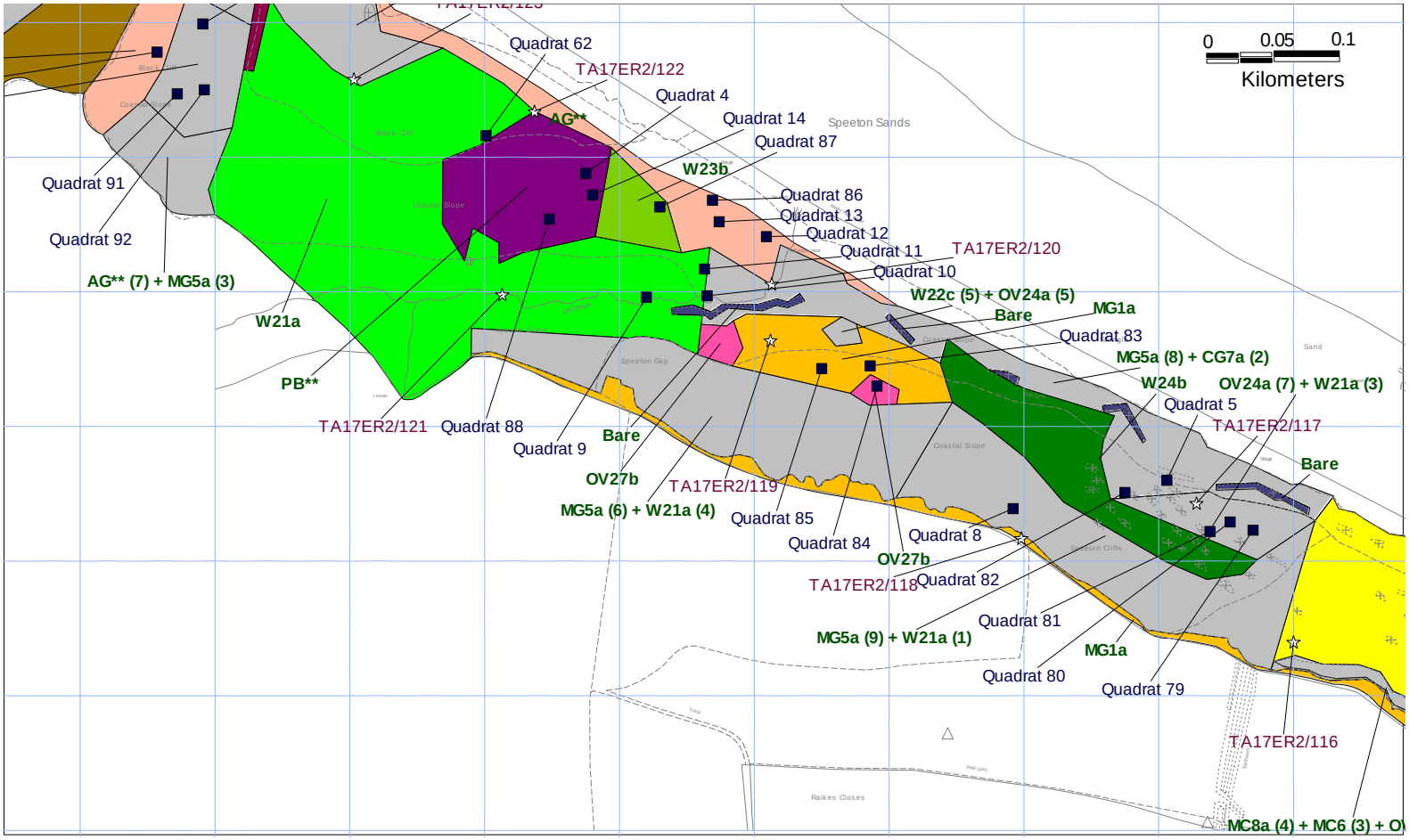


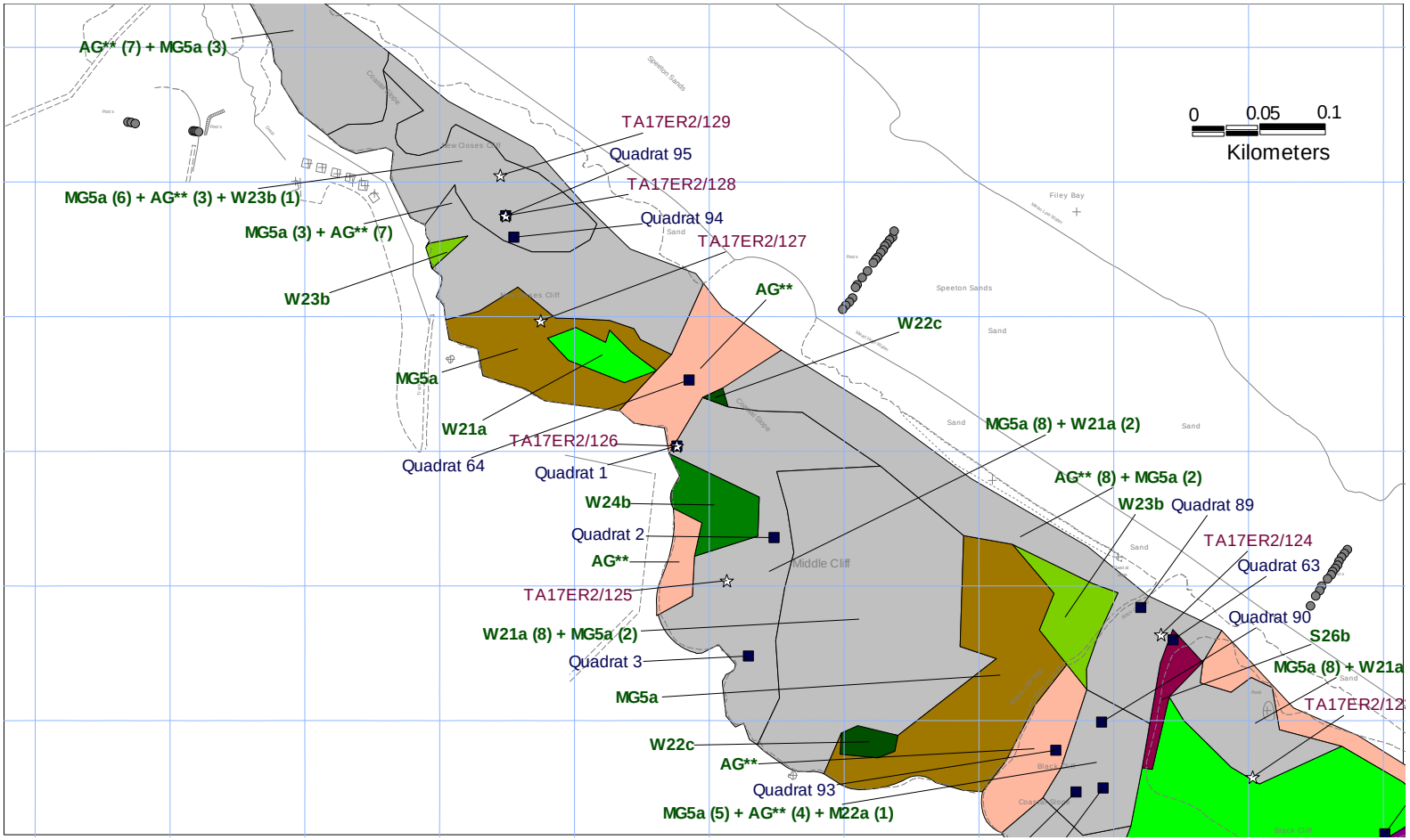


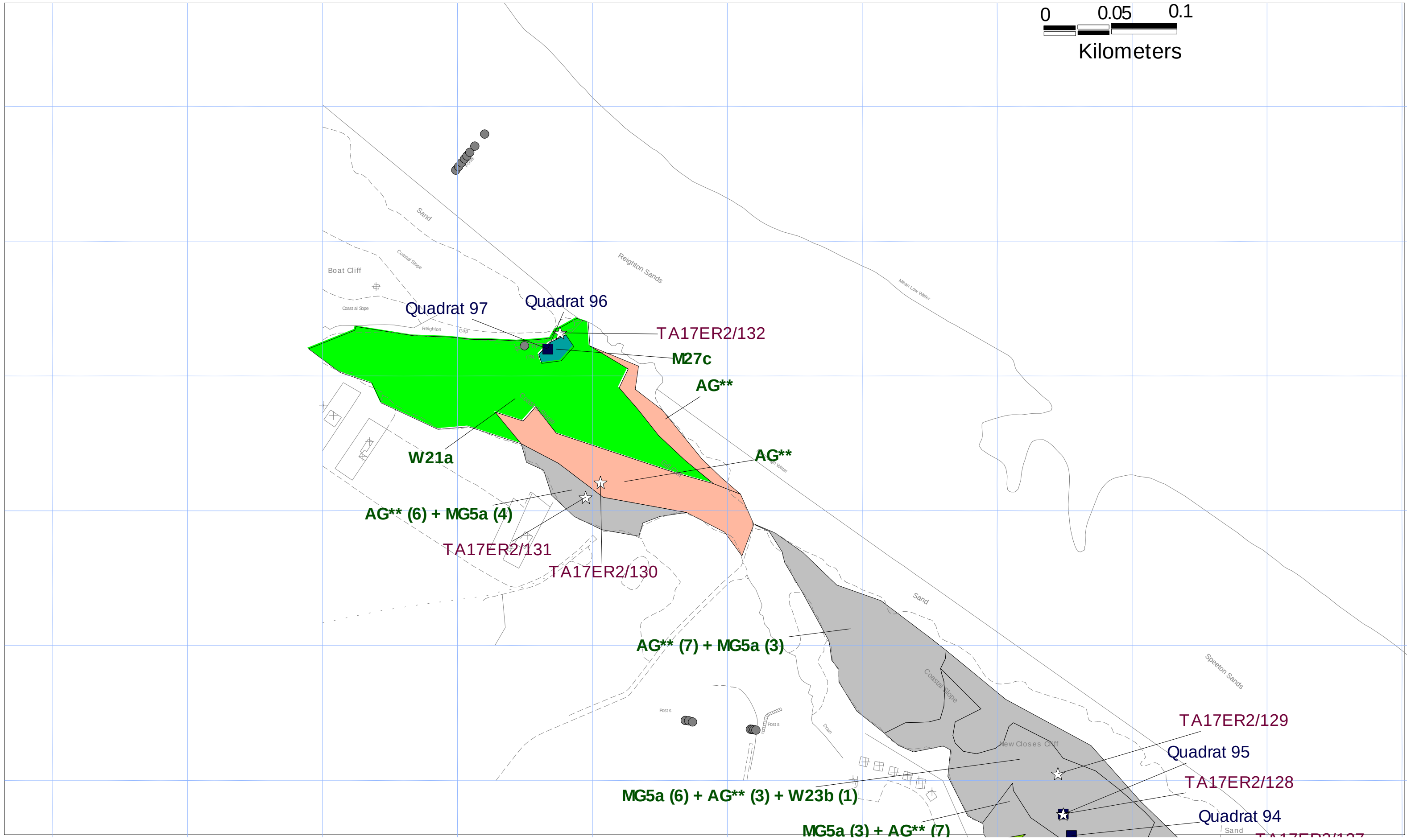












Appendix 5: Target notes

Note	Observations	Easting	Northing
TA17ER2/1	*Tall herb successional vegetation with Equisetum telmateia, Tussilago farfara, Rumex spp., Epilobium hirsutum, Rubus fruticosus, Urtica dioica and Calystegia sylvatica.*	519682	468293
TA17ER2/2	*Two springs in cliff.*	519855	468483
TA17ER2/3	*Teasels.*	519969	468574
TA17ER2/4	*Small patch of Atriplex prostrata strandline vegetation.*	520038	468603
TA17ER2/5	*Stabilisation of cliff slope with concrete*	520121	468641
TA17ER2/6	*Scrub at the top of the Sewerby steps includes Sambucus, Rosa, Rubus, Lonicera involucrata (exotic), Salix cinerea and Acer. There have been efforts to control erosion here including plastic mesh for stabilisation and planting of marram grass.*	520128	468673
TA17ER2/7	*Stabilisation of cliff slope with marram and plastic mesh.*	520137	468680
TA17ER2/8	*Atriplex prostrata strandline vegetation at the base of the steps.*	520149	468666
TA17ER2/9	*Large patch of teasels growing below the old outfall pipe from Sewerby Hall.*	520526	468773
TA17ER2/10	*Clifftop with Festuca arundinacea, F. rubra, Sanguisorba minor. East of this point clifftop vegetation dominated by F. arundinacea. Cliff slope with Anthyllis vulneraria, Plantago spp., Centaurea nigra, Reseda luteola, Cirsium arvense. Many snails.*	520738	468835
TA17ER2/11	*Sycamore and hawthorn.*	521018	468958
TA17ER2/12	*Anagallis arvensis growing on face of eroding cliff.*	521112	468989
TA17ER2/13	*Patch of Montbretia growing close to scrub*	521215	468998
TA17ER2/14	*Patch of Rosa among Phragmites/Rubus.*	521919	469205
TA17ER2/15	*Landslide and flush, with Phragmites at base of cliff.*	522007	469200
TA17ER2/16	*Dense hemp agrimony and Convolvulus arvensis in flush on cliff face.*	522007	469200
TA17ER2/17	*Patches of Epilobium hirsutum and Equisetum.*	522189	469207
TA17ER2/18	*Scattered hawthorn bushes*	522360	469228
TA17ER2/19	*Small patch of Atriplex prostrata strandline vegetation*	522451	469192
TA17ER2/20	*Scattered bushes in this area including elder, sycamore and privet.*	522517	469222
TA17ER2/21	*Sandy landslide on unstable cliff. Agrostis stolonifera at base, Tussilago on slope. Equisetum arvense colonising bare ground. Ononis repens colonising further up. Also present: Plantago coronopus, Hypochaeris radicata, Dactylis glomerata.*	522550	469199
TA17ER2/22	*Head of flush at cliff top with abundant Centranthus ruber (Quadrat 137)*	522635	469206
TA17ER2/23	*Ulex europaeus patch*	522739	469193
TA17ER2/24	*Equisetum telmateia locally abundant on cliff top for 50m either side of this point.*	522837	469195
TA17ER2/25	*Small patch of ruderal grassland.*	523102	469259
TA17ER2/26	*Small patch of Elymus grassland at back of beach at South Landing (behind strandline vegetation). Quadrat 55.*	523276	469262
TA17ER2/27	*Occasional hawthorn in gulley.*	523309	469307
TA17ER2/28	*Scattered gorse and occasional hawthorn.*	523538	469174
TA17ER2/29	*Phalaris arundinacea grassland growing beside stream in gulley.*	523929	469251
TA17ER2/30	*Abundant Rorippa nasturtium-aquaticum among the flush vegetation.*	523934	469225
TA17ER2/31	*Occasional hawthorn and sycamore.*	523962	469239
TA17ER2/32	*Potentilla reptans abundant at top of cliff.*	523975	469243
TA17ER2/33	*Slumped area with MG1 grassland, Urtica, Cirsium arvense, Rubus and occasional hawthorn, gorse and elder.*	524380	469462
TA17ER2/34	*Galium aparine, Plantago maritima and P. coronopus abundant on cliff edge.*	524534	469519
TA17ER2/35	*Hemp agrimony abundant in flush on cliff face below this point.*	524577	469527
TA17ER2/36	*Convolvulus arvensis abundant on cliff top.*	524579	469548
TA17ER2/37	*Head of flush below path with Pulicaria dysenterica, Eupatorium, Mentha aquatica. Abundant butterflies (red admiral, tortoiseshell etc.).*	524783	469625
TA17ER2/38	*Scattered hawthorn.*	524819	469635
TA17ER2/39	*Centaurea scabiosa abundant in the grassland on cliff slope.*	525395	470002
TA17ER2/40	*Elymus repens dominant in grassland at this point.*	525762	470392

TA17ER2/41	*Flush with Juncus bufonius, Glaux maritima (on flat) and Triglochin palustre, G. maritima, Lotus corniculatus, Carex flacca and Plantago maritima (on tussocks).*	525752	470743
TA17ER2/42	*Patches of dense Potentilla anserina in this area.*	525635	470748
TA17ER2/43	*Landslip succession: bare ground colonised by Tussilago and Agrostis stolonifera. Juncus articulatus and bufonius in damper parts. Tussocks of existing (shifting) vegetation maintain their composition. Holcus common in drier parts.*	525577	470725
TA17ER2/44	*Flush with Juncus inflexus, Pulicaria dysenterica, Equisetum, Hypericum tetrapterum, Holcus lanatus, Galium aparine, Epilobium parviflorum*	525483	470717
TA17ER2/45	*Small patch of Sambucus nigra scrub*	525406	470720
TA17ER2/46	*Edge of patch of scrub/tall herb vegetation with Rubus fruticosus, Urtica dioica, Ulex europaeus, Rosa canina, Calystegia sylvatica, Chrysanthemum leucanthemum and Epilobium spp.*	525393	470728
TA17ER2/47	*Flush*	525406	470769
TA17ER2/48	*Damp area with Phragmites, Eupatorium, Pulicaria, Deschampsia cespitosa and Equisetum.*	525377	470807
TA17ER2/49	*Patch of scrub densely swathed in Calystegia sylvatica*	525364	470808
TA17ER2/50	*Flush with Agrimonia eupatoria, Hypericum tetrapterum, Juncus inflexus, Samolus valerandi, Pulicaria dysenterica, Carex flacca and Briza media.*	525382	470854
TA17ER2/51	*Dense patch of Chrysanthemum leucanthemum*	525336	470875
TA17ER2/52	*MG1 gives way to calcareous/maritime grassland only at bottom of slope.*	525388	470939
TA17ER2/53	*Flush with Pulicaria dysenterica, Carex flacca, Festuca arundinacea, Ononis repens, Tussilago farfara, Agrostis stolonifera, Equisetum, Achillea millefolium, Potentilla reptans, Lathyrus pratensis, Centaurea nigra, Festuca rubra and some orchids.*	525348	471087
TA17ER2/54	*Festuca rubra, Agrostis stolonifera, Cirsium arvense, Achillea millefolium, Dactylis glomerata, Holcus lanatus and Potentilla reptans.*	525369	471222
TA17ER2/55	*Perched saltmarsh flush.*	525272	471373
TA17ER2/56	*Clippings from the golf course thrown onto the cliff: Dense patches of Cirsium arvense below them.*	525179	471426
TA17ER2/57	*Clifftop alternating between Arrhenatherum grassland and Festuca/Agrostis*	525141	471420
TA17ER2/58	*Atriplex prostrata seabird ledge (MC6).*	525083	471427
TA17ER2/59	*Perched saltmarsh flush.*	525053	471445
TA17ER2/60	*Recent fall.*	525071	471521
TA17ER2/61	*Patch of Cerastium tomentosum on cliff top.*	524994	471546
TA17ER2/62	*Festuca rubra, Plantago lanceolata, Centaurea nigra, Lotus corniculatus, Daucus carota, Rumex crispus, Anthyllis vulneraria, Plantago media. Plantago maritima at the top of slope..*	524721	471668
TA17ER2/63	*Mown Arrhenatherum grassland on the headland.*	524621	471857
TA17ER2/64	*Several patches of Atriplex seabird ledge vegetation around these promontories.*	524455	471911
TA17ER2/65	*Atriplex seabird ledges below this point.*	524257	472120
TA17ER2/66	*Perched saltmarsh flush.*	524058	472198
TA17ER2/67	*Perched saltmarsh flush.*	524059	472215
TA17ER2/68	*Festuca rubra, Plantago maritima, P. coronopus, P. lanceolata, Armeria maritima, Tripleurospermum maritimum, Agrostis stolonifera, Senecio vulgaris, Tussilago farfara, Dactylis glomerata, Cirsium arvense, Sonchus oleraceus.*	524048	472237
TA17ER2/69	*Patches of tall herb vegetation; mainly Cirsium arvense.*	523962	472220
TA17ER2/70	*Eroded area.*	523980	472102
TA17ER2/71	*Nettles growing below piles of grass clippings thrown onto the cliffs from the cottages. Other species in the tall herb/scrub in this area include Epilobium angustifolium, E. hirsutum, Ulex, Arrhenatherum, Cirsium arvense, Rubus and Senecio jacobaea.*	523989	471963
TA17ER2/72	*Blackthorn, hawthorn and tall herb vegetation in the gulley bottom.*	523738	472031
TA17ER2/73	*Plantago maritima abundant at edge of cliff top.*	523764	472158
TA17ER2/74	*Wet flush with Pulicaria, Parnassia, Tussilago, Carex, Anacamptis, Glaux, Equisetum, Hydrocotyle, Agrostis stolonifera, Epilobium hirsutum, Ranunculus acris, Samolus valerandi, Juncus articulatus, Holcus lanatus, Cochlearia officinalis, Rumex acetosa.*	523740	472236
TA17ER2/75	*Phragmites patch.*	523748	472302

TA17ER2/76	*Perched saltmarsh flush with Triglochin maritima, Festuca rubra, Anacamptis pyramidalis, Trifolium pratense, Juncus articulatus, Samolus valerandi, Juncus bufonius and Armeria maritima.*	523696	472322
TA17ER2/77	*Reedbed*	523579	472374
TA17ER2/78	*Point used by pigeons - Tripleurospermum maritimum abundant.*	523440	472270
TA17ER2/79	*Flush.*	523477	472217
TA17ER2/80	*Festuca-dominated grassland with patches of Ononis repens. Other species include Centaurea nigra, Heracleum sphondylium, Plantago lanceolata, P. maritima, Tussilago farfara, Agrostis stolonifera, Lotus corniculatus, Primula vulgaris, Senecio jacobaea.*	523485	472208
TA17ER2/81	*Patch of Cerastium tomentosum growing on the bank.*	523420	472110
TA17ER2/82	*Rorippa nasturtium-aquaticum in the stream.*	523389	472170
TA17ER2/83	*Flush with abundant Pulicaria*	523369	472174
TA17ER2/84	*Flush*	523219	472290
TA17ER2/85	*Patch of dense Hieracium pilosella.*	523212	472330
TA17ER2/86	*Large amounts of bare ground (active erosion); thin Plantago-rich MC8e vegetation on patches of level or protected ground.*	523239	472404
TA17ER2/87	*Perched saltmarsh flush with Samolus, Pulicaria, Juncus, Carex.*	523165	472333
TA17ER2/88	*Rorippa nasturtium-aquaticum growing in the stream.*	523155	472339
TA17ER2/89	*Tripleurospermum/Atriplex vegetation on point.*	523094	472380
TA17ER2/90	*Two flushes with Triglochin maritima and Pulicaria dysenterica.*	523065	472338
TA17ER2/91	*Patch of grassland unusually rich in Centaurea nigra.*	523039	472414
TA17ER2/92	*Flush*	522871	472415
TA17ER2/93	*Flushes (3) with Triglochin maritima, T. Palustre, Glaux maritima, Agrostis stolonifera.*	522816	472442
TA17ER2/94	*Plantago maritima becoming less abundant in cliff slope vegetation westwards from here.*	522590	472554
TA17ER2/95	*Patches of Potentilla anserina on cliff top.*	522461	472595
TA17ER2/96	*Sonchus arvensis common on cliff slope.*	522443	472590
TA17ER2/97	*Flush*	522420	472608
TA17ER2/98	*Recent cliff fall.*	522025	472790
TA17ER2/99	*Patch of nettles on the cliff top.*	521851	472882
TA17ER2/100	*Occasional patches of Urtica on cliff.*	521847	472872
TA17ER2/101	*Recent fall.*	521704	473022
TA17ER2/102	*Gulley vegetation dominated by Agrostis stolonifera. MC6 vegetation (Atriplex/Festuca) on ledges below.*	521575	473083
TA17ER2/103	*Plantago coronopus abundant in vegetation on steep slope below top of cliff.*	521161	473384
TA17ER2/104	*Urtica dioica/ Galium aparine vegetation abundant on cliff top west of Dane's Dyke.*	520958	473497
TA17ER2/105	*Brassica oleracea growing amongst Silene/Urtica/Galium on ledges.*	520869	473541
TA17ER2/106	*Brassica oleracea and poppies amongst nettles on ledges.*	520811	473576
TA17ER2/107	*Urtica running down cliff slope.*	520383	473747
TA17ER2/108	*Clifftop alternating between dense nettle and Arrhenatherum grassland; Arctium lappa occasional.*	519382	474390
TA17ER2/109	*Patch of Rubus fruticosus.*	516930	474874
TA17ER2/110	*Damp flush with Pulicaria dysenterica.*	516804	474879
TA17ER2/111	*Wheat dump*	516201	474997
TA17ER2/112	*Landslide*	516163	475018
TA17ER2/113	*Patch of Epilobium angustifolium.*	516124	475007
TA17ER2/114	*Rabbit-grazed sward with Festuca ovina, Prunella vulgaris, Teucrium, Lathyrus sp., Veronica chaemydris, Galium verum, Plantago lanceolatus, Myosotis sp., Holcus lanatus, Arrhenatherum elatius, Senecio jacobaea.*	515963	475107
TA17ER2/115	*Below Arrhenatherum/Teucrium scree, small patches of heavily rabbit-grazed grassland with more calcareous/maritime elements including Carlina and Thymus. Hollows with Phyllitis, Dryopteris and Angelica.*	515937	475182

TA17ER2/116	*Vegetation below hard chalk cliff with Arrhenatherum, Teucrium, Rumex acetosa, Senecio jacobaea, Geranium robertianum, Angelica sylvestris, Silene dioica, Dryopteris filix-mas, Primula vulgaris, Festuca rubra and mosses.*	515800	475140
TA17ER2/117	*Scattered hawthorn.*	515728	475243
TA17ER2/118	*Patches of tall herb (Epilobium angustifolium) and Rubus scattered along the cliff top.*	515598	475217
TA17ER2/119	*Patches of Deschampsia cespitosa in the grassland.*	515412	475364
TA17ER2/120	*Abundant Pulicaria on the damp slopes above this site.*	515413	475406
TA17ER2/121	*Sycamore woodland.*	515213	475398
TA17ER2/122	*Small patch of Typha swamp.*	515237	475534
TA17ER2/123	*Depression with tall Equisetum and Pulicaria.*	515103	475558
TA17ER2/124	*Triglochin palustre, Juncus articulatus in mud on cliff edge along flush.*	515035	475664
TA17ER2/125	*Wet flush.*	514713	475704
TA17ER2/126	*Below this point there's a Sparganium flush with Cardamine amara, Juncus inflexus, Sparganium erectum (dominant), Equisetum arvense, Agrostis stolonifera and Juncus compressus.*	514676	475804
TA17ER2/127	*Flush with sedges*	514575	475897
TA17ER2/128	*Damp depression with Typha latifolia.*	514549	475975
TA17ER2/129	*Juncus mire*	514545	476005
TA17ER2/130	*Edge of scrub with Salix alba, Ulex europaeus, Lonicera periclymenum, Crataegus monogyna, Rosa canina. Some tall herb vegetation with Epilobium angustifolium, Chrysanthemum leucanthemum (at edge).*	514206	476221
TA17ER2/131	*Patch of Salix viminalis scrub*	514195	476210
TA17ER2/132	*Flush with Pulicaria dysenterica, Juncus inflexus, Filipendula ulmaria, Rubus fruticosus.*	514176	476332

Appendix 6: Species recorded on Flamborough sea cliffs

Acer pseudoplatanus
Achillea millefolium
Agrimonia eupatoria
Agrostis canina
Agrostis capillaris
Agrostis stolonifera
Alopecurus pratensis
Ammophila arenaria
Anacamptis pyramidalis
Anagallis arvensis
Angelica sylvestris
Anthoxanthum odoratum
Anthriscus sylvestris
Anthyllis vulneraria
Arctium lappa
Armeria maritima
Arrhenatherum elatius
Atriplex prostrata
Bellis perennis
Beta vulgaris
Blackstonia perfoliolata
Brachypodium sylvaticum
Brachythecium sp
Brassica oleracea
Briza media
Bromus hordeaceus ssp. ferronii
Bryum capillare
Calliergonella cuspidata
Calystegia sylvatica
Campanula rotundifolia
Capsella bursa-pastoris
Cardamine amara
Carex distans
Carex flacca
Carex hirta
Carlina vulgaris
Centaurea nigra
Centaurea scabiosa
Centaurium erythraea
Centranthus ruber
Cerastium fontanum
Cerastium tomentosum
Chrysanthemum leucanthemum
Cirsium arvense
Cirsium palustre
Cirsium vulgare
Cladonia pyxidata
Cochlearia officinalis
Convolvulus arvensis
Crataegus monogyna
Cratoneuron filicinum
Crocosmia sp.
Ctenidium molluscum
Cynosurus cristatus
Dactylis glomerata
Dactylorhiza purpurella
Danthonia decumbens
Daucus carota
Deschampsia cespitosa
Dicranum scoparium
Didymodon tophaceus
Diplotaxis tenuifolia
Dipsacus sp.
Dryopteris dilatata
Dryopteris filix-mas
Eleocharis palustris
Elytrigia atherica
Elytrigia repens
Epilobium angustifolium
Epilobium hirsutum
Epilobium montanum
Epilobium parviflorum
Equisetum arvense
Equisetum palustre
Equisetum telmateia
Eriophorum angustifolium
Eupatorium cannabinum
Euphrasia officinalis
Eurhynchium praelongum
Eurhynchium striatum
Festuca arundinacea
Festuca ovina
Festuca rubra (incl. ssp. juncea)
Filipendula ulmaria
Filipendula vulgaris
Fraxinus excelsior
Galium aparine
Galium saxatile
Galium verum
Geranium pratense
Geranium robertianum
Geranium sylvaticum
Geum rivale
Geum urbanum
Glaux maritima
Heracleum sphondylium
Holcus lanatus
Homalothecium lutescens

Hydrocotyle vulgaris
Hypericum tetrapterum
Hypnum cupressiforme
Hypnum lacunosum
Hypochaeris radicata
Juncus articulatus
Juncus bufonius
Juncus compressus
Juncus conglomeratus
Juncus gerardii
Juncus inflexus
Knautia arvensis
Lamiastrum galeobdolon
Lathyrus pratensis
Leontodon autumnalis
Leontodon hispidus
Ligustrum ovalifolium
Linum catharticum
Lolium perenne
Lonicera involucrata
Lonicera periclymenum
Lotus corniculatus
Matricaria discoidea
Medicago lupulina
Melilotus officinalis
Mentha aquatica
Myosotis arvensis
Ononis repens
Parnassia palustris
Pellia endivifolia
Peltigera sp.
Phalaris arundinacea
Phleum pratense
Phragmites australis
Phyllitis scolopendrium
Pilosella officinarum
Pimpinella saxifraga
Plantago coronopus
Plantago lanceolata
Plantago major
Plantago maritima
Plantago media
Poa annua
Polygala vulgaris
Polygonum aviculare
Potentilla anserina
Potentilla reptans
Primula vulgaris
Prunella vulgaris
Prunus avium
Prunus domestica
Prunus spinosa
Pseudoscleropodium purum
Pteridium aquilinum
Pulicaria dysenterica
Ranunculus acris
Reseda luteola
Rhinanthus minor
Rhytidiadelphus loreus
Rhytidiadelphus squarrosus
Rhytidiadelphus triquetrus
Rorippa nasturtium-aquaticum
Rosa canina
Rosa sp. (escape cult.)
Rubus fruticosus
Rumex acetosa
Rumex crispus
Salix cinerea
Salix viminalis
Sambucus nigra
Samolus valerandi
Sanguisorba minor
Senecio cineraria
Senecio erucifolius
Senecio jacobaea
Silene dioica
Sinapis arvensis
Sonchus arvensis
Sonchus asper
Sonchus oleraceus
Sparganium erectum
Stellaria media
Symphoricarpus albus
Taraxacum officinale
Teucrium scorodonia
Torilis japonica
Tortella flavovirens
Tortella inclinata
Tragopogon pratensis
Trifolium arvense
Trifolium dubium
Trifolium pratense
Triglochin maritimum
Triglochin palustre
Tripleurospermum maritimum
Trisetum flavescens
Tussilago farfara
Typha latifolia
Ulex europaeus
Urtica dioica
Veronica chamaedrys
Vicia cracca
Viola canina
Viola ?riviniana