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Morlais Project

Cliff Habitat Survey Report

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Cliff Habitat Survey Report

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Morlais – Botanical Survey of cliff vegetation

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Contents

1 Introduction

1.1 BSG Ecology was commissioned by Menter Môn in May 2020 to undertake a botanical survey of cliff vegetation at the location of a possible cable route, which may be required as part of the Morlais tidal energy project.

Site Description

1.2 The 'Site' is an area of cliff face and cliff top located in the bay below Henborth, South Stack Road, Holyhead, Anglesey. The Ordnance Survey National Grid Reference of the Site is SH214815. The Site is show on Figure 1.

1.3 The cliff is approximately 38 m high; the front face (facing south-east) is approximately 55 m across. The base of the cliff is directly adjacent to the sea. The lower section of the cliff is formed by exposed rock; above 7-8 m the cliff is generally vegetated, although significant extents of bare soil and rock exposure occur in various areas. The top of the cliff supports patches of dense scrub. Managed grassland is present in fields behind the top of the cliff.

1.4 A section of the cliff faces west. This is on the left-hand side when viewed from the sea. This section is approximately 30 m across supporting vegetation, exposed rock and rock ledges. A line of seepage is present in the centre of the cliff.

1.5 The right-hard side of the main cliff face (the east edge) adjoins an area of exposed loose and eroding rock.

1.6 The rock in this area includes beds of alternating metasandstones and metamudstones, including quartzite (BGS, 2020).

Project Background

1.7 The Morlais project will provide the infrastructure for developers of tidal energy converters to deploy tidal devices on a commercial scale in an area of sea bed off the coast of Anglesey. It has the potential to generate up to 240 MW of electricity.

1.8 Electricity will be brought to a substation on shore via a maximum of nine sub-sea cables. Electricity will be exported from this landfall substation to the existing electricity network via buried cables.

1.9 The cables will need to cross the Glannau Ynys Gybi / Holy Island Coast Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) where the sub-sea cables come on-shore. The preferred option for crossing the cliffs is by Horizontal Directional Drilling (HDD), which avoids all direct impacts on the sensitive coastal habitats.

1.10 Should HDD not be possible at the landfall location, a secondary option is included within the design envelope that would involve pinning cables down a section of cliff and then trenching the cables across clifftop fields to a substation.

1.11 A planning application for the Morlais project has been submitted to Welsh Ministers. This includes an Environmental Statement which details impacts on ecology. Further information has been requested by Natural Resources Wales (NRW) in relation to possible impacts on cliff vegetation which could occur if the secondary option (pinning cables to the cliff) is pursued. Botanical survey work is required to provide information on baseline ecological conditions along the proposed cable route within the SSSI and SAC, to inform the assessment of such impacts.

NRW consultation and identification of survey area

1.12 NRW has been consulted on the Morlais project. A summary of the consultation has been provided to BSG Ecology by consultants Royal HaskoningDHV where it relates to cliff vegetation survey.

1.13 In response to the Environmental Statement, NRW (1/10/2019) requested pre-construction surveys for protected/invasive species to inform the micro-siting of the onshore cable route to avoid any sensitive species.

1.14 Further consultation was carried out on 13/12/2019, this included discussion that potential challenges may present to a survey on the cliff terrain and the timing of further survey (i.e. late spring / early summer 2020).

1.15 Following further design work to minimise the development footprint on the cliffs, the ecological impact assessment was updated; NRW subsequently provided further written feedback (19/03/2020) requesting "a Phase II National Vegetation Classification (NVC) Survey ... that should extend at least 20m from the cliff top inland and should finish at break of slope on the seaward side. Fixed-point photographs should be used as part of the survey procedure."

1.16 In correspondence to Menter Môn in May 2020, NRW clarified that "there is a lack of information about the vegetation in the section of SAC which the cable would cross, should HDD not be possible. Without this information conclusions regarding scale and severity of impacts are uncertain".

1.17 Further consultation in relation to the detail of the survey method was carried out on 21/05/2020, through a meeting between NRW, Menter Môn and BSG Ecology, where the detail of the survey method was discussed; sample drone photographs were provided to NRW in advance of the survey. Further detail on the notified SSSI plant assemblage was provided by NRW on 26/05/2020. The survey method was confirmed with NRW by email on 27 May 2020.

Aims of study

1.18 The aim of the study is to undertake a National Vegetation Classification (NVC) survey to determine which plant species and plant communities occur within the footprint of possible works within the SSSI and SAC. This will establish which plant species and plant communities could be affected if the secondary option of overland cables is pursued.

1.19 This information is required to inform the consenting process (including Habitats Regulations Assessment) and has been requested by NRW (via email to Menter Môn in May 2020).

1.20 In addition to an NVC survey, the presence or absence of certain plants within the footprint of the possible works needed to be established. During initial consultation emphasis was placed on the following rare species, and also other areas of botanically rich vegetation:

- spatulate fleawort *Tephroseris integrifolia* subsp*. maritima*
- spotted rock-rose *Tuberaria guttata*
- golden hair lichen *Teloschistes flavicans*

1.21 An additional target species, ciliate strap lichen *Heterodermia leucomela,* was added to this list following a meeting with NRW on 21 May 2020.

1.22 The list of plant species that form the notified assemblage of the SSSI was also provided by NRW (by email on 22 May 2020):

- seaside centaury *Centaurium littorale*
- Portland spurge *Euphorbia portlandica*
- golden samphire *Inula crithmoides*
- rock sea-lavender *Limonium binervosum*
- spotted rock-rose *Tuberaria guttata*
- pale dog-violet *Viola lactea*
- western clover *Trifolium occidentale*
- spatulate fleawort *Tephroseris integrifolia* subsp. *maritima*

1.23 A further list of plant species of local interest (but not part of the notified SSSI assemblage) was also provided by NRW (although it was noted by NRW that the cliff is probably too dry for most of these species):

- common juniper *Juniperus communis*
- roseroot *Sedum rosea*
- hay-scented buckler-fern *Dryopteris aemula*
- Wilson's filmy-fern *Hymenophyllum wilsonii*
- Tunbridge filmy-fern *Hymenophyllum tunbridgense*
- Dodder *Cuscuta epithymum*

2 Holy Island Coast SSSI/SAC: Botanical interest features

2.1 The section of cliff is part of the Holy Island Coast SSSI/SAC, which covers a large area (> 400ha) of coast and coastal heathland between Porth Dafarch and Holyhead. A plan showing the extent of the SSSI in the vicinity of the cliff is shown in Figure 2.

2.2 The following extracts from the SSSI citation describe its key botanical features:

"This site is of special interest for its geological and biological features, including heathland and maritime grassland communities, coastal cliffs and ledges, its assemblages of vascular plants and birds, invertebrates and its solid geology …

The coastal cliffs and the associated grassland and heaths are of major botanical interest. The South Stack fleawort *Tephroseris integrifolia* subsp. *maritima* isn't found anywhere else in the world and the nationally rare spotted rock-rose *Tuberaria guttata* occurs within the mosaic of heath and grassland communities above the cliffs, together with pale heath violet, *Viola lactea*. Other nationally scarce plant species on the cliffs include golden samphire, *Inula crithmoides* and the endemic rock sea-lavender *Limonium britannicum* subsp*. celticum* and *L. procerum* subsp. *procerum*. Juniper *Juniperus communis*, a locally uncommon plant, occurs on the cliffs and there are Atlantic bryophytes and ferns such as hay scented buckler fern *Dryopteris aemula*, Wilson's filmy fern *Hymenophyllum wilsonii* and Tunbridge filmy fern H*. tunbrigense.*

On rocky ledges and at the top of the cliffs the vegetation comprises the thrift *Armeria maritima* common mouse-ear *Cerastium diffusum* maritime therophyte community. This generally forms rather sparse open turf with much bare ground; associated species include buckshorn plantain *Plantago coronopus* and kidney vetch *Anthyllis vulneraria*. On deeper soils above the cliffs is the cocksfoot *Dactylis glomerata* subcommunity of the red fescue *Festuca rubra* Yorkshire fog *Holcus lanatus* grassland. These areas are characterised by a very thick sward with associated spring squill, wild carrot *Daucus carota* and sorrel *Rumex acetosella*."

2.3 Site information for the Holy Island Coast SAC (JNCC, 2020) includes the following information on habitats:

"Annex I habitats that are a primary reason for selection of this site

1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts

Holy Island, off the north-west coast of Wales, has hard rock acidic cliffs and supports important examples of coastal cliff heathland vegetation. In addition to maritime heath with several rare species such as spotted rock-rose *Tuberaria guttata*, there are extensive maritime cliff-crevice and grassland communities. The maritime influence is not as extreme as in north Scotland, and this site represents an important part of the range of variation on the mid-west coast of the UK.

4030 European dry heaths

Glannau Ynys Gybi/ Holy Island Coast is the most important site in north Wales for maritime forms of European dry heaths. The main NVC types are H7 *Calluna vulgaris – Scilla verna* heath and H8 *Calluna vulgaris – Ulex gallii* heath. The dry heathland is associated with small areas of wet heath and forms part of a complete zonation from maritime grassland through maritime heath to inland heath to inland heath with bracken *Pteridium aquilinum* to bramble *Rubus fruticosus* scrub. The heath is an important locus for spotted rock-rose *Tuberaria guttata*.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site

4010 Northern Atlantic wet heaths with *Erica tetralix*"

2.4 Further information on vegetation communities which form the Annex 1 habitat *1230 Vegetated sea cliffs of the Atlantic and Baltic coasts* is provided in European Commission (2013):

"1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

1) Vegetated cliffs exhibit a complex pattern of variation reflecting the degree of maritime exposure, geology and geomorphology, biogeographical provenance and pattern of human management. Typically, on the most exposed cliffs there is a zonation from crevice and ledge communities of the steepest slopes beside the sea (Crithmo-Armerietalia, Géhu 1964) through to closed maritime grasslands on upper cliff slopes, cliff tops and cliff ledges where there is deeper accumulation of soils (Silenion maritimae, Malloch 1973). Further inland and on more sheltered cliffs, these grade into a complex assemblage of maritime and paramaritime types of heath, calcareous grassland, acid grassland, therophyte, tall herb, scrub and wind-pruned woodland vegetation, each enriched by floristic elements characteristic of coastal habitats. On soft coasts with much active movement, complex assemblages of maritime and non-maritime vegetation occur.

2) Plants: *Crithmum maritimum*, *Armeria maritima*, *Limonium* spp., *Brassica oleracea, Silene maritima, Cochlearia officinalis, Plantago maritima, Festuca rubra* ssp. *pruinosa*, *Daucus* spp., *Matricaria maritima*, *Asplenium marinum*, *Spergularia rupicola*, *Inula crithmoides*, *Sedum anglicum*, *Rhodiola rosea*, *Lavatera arborea*, *Scilla verna*.

3) Corresponding categories United Kingdom Classification:

- MC1 *Crithmum maritimum-Spergularia rupicola* maritime rock crevice
- MC2 *Armeria maritima-Ligusticum scoticum* maritime rock crevice community
- MC3 *Rhodiola rosea-Armeria maritima* maritime cliff ledge community
- MC4 *Brassica oleracea* maritime cliff ledge
- MC5 *Armeria maritima-Cerastium diffusum* maritime therophyte community
- MC6 *Atriplex hastata-Beta vulgaris* ssp. *maritima* seabird cliff community
- MC7 *Stellaria media-Rumex acetosa* seabird cliff community
- C8 *Festuca rubra-Armeria maritima* maritime grassland
- MC9 *Festuca rubra-Holcus lanatus* maritime grassland
- MC10 *Festuca rubra-Plantago* spp. maritime grassland
- M11 *Festuca rubra-Daucus carota* ssp. *gummifer* maritime grassland
- M12 *Festuca rubra-Hyacinthoides nonscripta* maritime grassland
- H6 *Erica vagans-Ulex europaeus* heath
- H7 *Calluna vulgaris-Scilla verna* heath
- H8 *Calluna vulgaris-Ulex gallii* heath."

3 Methods

3.1 The cliff vegetation was surveyed using two methods:

- A drone survey
- A rope-access survey.

3.2 The drone survey was carried out on 27 May 2020. Clwydian Films, as specialist drone operator was employed to assist with the survey. A drone was used to systematically photograph the cliff vegetation within the survey area in detail from a distance of 2 m. A grid indexing system has been used to allow photographs of all parts of the cliff to be referenced. These photographs allow the vegetation communities across the cliff to be viewed and catalogued and allow the majority of vegetation to be identified to NVC community.

3.3 During the drone survey the cliff was viewed from the base using binoculars to search for target species particularly spatulate fleawort, spotted rock rose and golden hair lichen. The survey work was timed to coincide with the flowering period for the two former species.

3.4 The cliff was then subject to a rope access survey on 3 June 2020 with assistance from Access Techniques Ltd. This involved using anchors from a 4x4 car parked in the field above the cliff and descending the cliff using rope-access techniques. Three access points were used at the top of the cliff which allowed all safely accessible areas of the cliff to be accessed.

3.5 Vegetation was sampled using 2 m × 2 m quadrats marked out using cord and pegs. These were set out in typical vegetation on the front face of the cliff (12 quadrat locations), and on the left (west) face of the cliff (five quadrat locations). The rope line was used as a transect; quadrats were sampled at intervals from this.

3.6 For each 2 m × 2 m quadrat, the surveyor identified all vascular plant species present and estimated their percentage cover classes using the Domin scale (Rodwell *et al*., 2000). Quadrat locations are shown in Figure 3.

3.7 The ropes were also used to access other areas of the cliff to identify and record plants in addition to those sampled using quadrats; and to check for the presence of plants on the lists provided by NRW (see Section 1, Introduction).

3.8 Where necessary, photographs were taken of plants and samples of plants were taken to confirm species identification.

3.9 In addition, vegetation was sampled using quadrats in the scrub at the top of the cliff (six quadrat locations) and in the two fields at the top of the cliff (13 quadrats). Ropes were required for access to the scrub, but not for the two fields. The fields are not within the SSSI. The survey area and quadrat locations are shown on Figure 4.

Table 1: Survey locations

Survey Area	OS Grid Reference (Central point)	Number of quadrats sampled	Quadrat size
Cliff: Front face (facing south-east)	SH 2138 8153	12	2 m × 2 m
Cliff: Left (west) face	SH 2134 8152	5	2 m × 2 m
Scrub at top of cliff	SH 2138 8154	6	4 m × 4 m
Grassland above cliff (West Field)	SH 2136 8155	8	2 m × 2 m
Grassland above cliff (East Field)	SH 2139 8157	5	2 m × 2 m

Data Analysis

3.10 Drone photographs were systematically reviewed on a computer to search for target species across the cliff (particularly spatulate fleawort, spotted rock rose and golden hair lichen).

3.11 Quadrat data were tabulated using Microsoft Excel and formatted into a floristic table (as used in Rodwell *et al*., 2000) based on inter-quadrat frequency (i.e. constancy). Data analysis involved three methods:

- The vegetation community identification keys in Rodwell *et al*. (2000) were used to identify plant communities, based on the data in the floristic table.
- The floristic tables were compared (by inspection) with those of Rodwell *et al*. (2000) and Rodwell *et al*. (1992).
- The data were entered into the Modular Analysis of Vegetation Information System (MAVIS) software (CEH, 2016). Quadrat data from each homogenous stand of vegetation was subject to a combined group analysis, based on inter-quadrat frequency values, to determine similarity with published NVC datasets. Goodness of fit ratings were interpreted based on Hill (2015) (i.e. 0–49%: *very poor*; 50–59%: *poor*; 60–69%: *fair*; 70–79%: *good*; and 80–100%: *very good*).

3.12 A written summary of the vegetation communities was also produced.

Personnel

3.13 The survey work was carried out by Principal Ecologist Guy Miller. He is a Chartered Ecologist (CEcol) and a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). Guy has worked as a professional ecologist since 1998. Key areas of work include ecological impact assessment and habitat survey. He has experience at carrying out survey work using rope access and as a professional interest in botany.

3.14 Assistance in survey design, plant identification, NVC assessment and technical review was provided by Dr Tom Flynn (Principal Ecologist, CEcol MCIEEM). Tom has worked as professional ecologist since 2002 and is a lead botanist within BSG Ecology. He has a DPhil in Plant Sciences, and a Level 5 Field Identification Skills Certificate from the Botanical Society of the British Isles. Tom's specialist expertise is in habitat and botanical survey and assessment. He has carried out numerous National Vegetation Classification surveys across the UK, including survey and monitoring of Sites of Special Scientific Interest.

3.15 Botanist Caroline O'Rourke (Senior Ecologist, MCIEEM) as provided assist in plant identification. Caroline holds Level 4 Field Identification Skills Certificate (FISC) from the Botanical Society of Britain and Ireland and has experience in National Vegetation Classification (NVC) survey in Wales.

Limitations

3.16 There are some limits on the resolution of the drone photos. This is partly due to the uneven surface of the cliff which makes it hard to ensure all areas are simultaneously in sharp focus. The drone survey method does not therefore allow all plants (e.g. less distinctive species) to be identified to species level in all of the drone photographs.

3.17 Not all areas of the cliff were accessible using ropes. There are some areas of loose rock on the cliff and due to the risk of dislodging rocks on the surveyor these were not accessed for safety reasons.

3.18 Through applying knowledge of the vegetation communities obtained from the rope-access survey to the photographs, and using the photographs to assess vegetation in the inaccessible areas, the significance of both limitations is reduced. The two techniques in combination are therefore considered to have been an effective way to survey the cliff vegetation and the photos provide a useful resource across the whole face. It is not considered that any other survey methods would provide a greater level of access or survey coverage.

4 Results and Interpretation

Drone Photos

4.1 An archive of photos of the whole cliff has been obtained. Examples of these are provided in Section 7.

Distribution of Target Species

4.2 Spatulate fleawort *Tephroseris integrifolia* subs. *maritima* was not present within the survey area. It was noted from other parts of the bay: a group of plants is present at SH 21496 81492, approximately 100 m to the south-east of the survey area, and a small group of plants is present at SH 21468 81551, approximately 50 m to the east of the survey area.

4.3 Rock sea lavender *Limonium binervosum* occurs frequently on the lower part of the cliff within the survey area. This species was recorded up to 14 m above sea level, with the majority present in the section below 9 m above sea level. Small clumps are present in thin exposed soil and rock exposures.

4.4 Golden samphire *Inula crithmoides* is frequent on the lower half of the cliff forming small clumps; specimens were recorded up to 20 m above sea level on the front face, but it is most frequent in the section between 5 and 10 m above sea level. Small clumps are present in thin exposed soil and rock exposures. It also occurs in several parts of the west side of the cliff.

4.5 Golden hair lichen *Teloschistes flavicans* and ciliate strap lichen *Heterodermia leucomela* were not recorded.

4.6 The other target species from the notified (SSSI) assemblage identified by NRW (as detailed in section 1) were not recorded.

4.7 The local interest species provided by NRW (as detailed in section 1) were not recorded.

NVC Survey: Front Face of Cliff

Description of Vegetation

4.8 The upper part of the face is generally vegetated. There are rock exposures in several areas. Small areas of exposed soil are present.

4.9 Soils here are free draining and the vegetation is short. Red fescue *Festuca rubra* and thrift *Armeria maritima* are constant throughout. Buck's-horn plantain *Plantago coronopus* is abundant across the face. Frequently occurring species include sea campion *Silene uniflora*, bird's-foot trefoil *Lotus corniculatus*, kidney vetch *Anthyllis vulneraria,* spring squill *Scilla verna,* wild carrot *Daucus carota* sheep's-bit *Jasione montana*, cat's-ear *Hypochaeris radicata*, and English stonecrop *Sedum anglicum*. Other grass species present include Yorkshire fog *Holcus lanatus,* creeping bent *Agrostis stolonifera,* cock's-foot *Dactylis glomerata, and* soft brome *Bromus hordeaceus*.

4.10 Low patches of blackthorn *Prunus spinosa* are present in the centre of the face; oxeye daisy *Leucanthemum vulgare and* ivy *Hedera helix* are present within the areas of blackthorn scrub.

4.11 The bottom of part of the cliff face includes a greater proportion of bare rock and exposed soil; this area also supports rock sea spurrey *Spergularia rupicola*, sea beet *Beta maritima,* rock sea lavender *Limonium binervosum*, golden-samphire *Inula crithmoides*, sea mayweed *Tripleurospermum maritimum. Y*ellow crisp-moss *Tortella flavovirens* occurs across the cliff, although is more frequent in this lower part of the face.

4.12 Other species recorded infrequently include common centuary *Centaurium erythraea* and navelwort *Umbilicus rupestris*.

4.13 Lichens are present on the rock exposure. The fruticose species sea ivory lichen *Ramalina siliquosa* and closely related *Ramalina cuspidata* are frequent on the exposed rocks. Crustose lichens (not identified to species level) are present on rocks. A small amount of the lichen *Cladonia rangiformis* was recorded in vegetation on the centre of the face.

4.14 The top part of the cliff supports scrub, primarily western gorse *Ulex gallii* with some blackthorn (as described below under *NVC Survey: Scrub at cliff-top*).

4.15 See Photographs 1-7 in Section 6 below.

Interpretation

4.16 In the open vegetation on rock on various parts of the cliff, but especially towards the base, the constant red fescue, golden samphire and rock sea-spurrey, with the absence of *Ligusticum scoticum* indicates affinity to the MC1 *Crithmum maritimum-Spergularia rupicola* maritime rock-crevice community. More specifically, the constancy of golden samphire indicates affinity to the MC1b *Inula crithmoides* sub-community.

4.17 For the lower part of the face, MAVIS analysis shows a *fair* fit to the MC1b *Crithmum maritimum-Spergularia rupicola* maritime rock-crevice community, *Innula crithmoides* sub-community (goodness of fit value 66.0%). The next highest nine fit values are *poor* (of which the highest four are MC1: 58.4%; MC8e: 58.3%; MC8a: 58.12%; and MC8b: 57.62%). See Figure 5.

4.18 In the more vegetated areas of the mid and upper cliff face, the two constant species (red fescue and thrift) strongly suggest either the MC5 *Armeria maritima-Cerastium diffusum* ssp. *diffusum* maritime therophyte community, or the MC8 *Festuca rubra-Armeria maritima* maritime grassland community.

4.19 Rodwell *et al*. (2000) states that MC5 has "*a very short open turf in which cushions of A. maritima, tussocks of rather poorly-growing F. rubra , P. coronopus, or Sedum spp. may dominate*" (page 275), whereas MC8 has "a generally closed sward, usually dominated by *F. rubra*, which often forms thick mattresses. *A maritima* may be abundant as scattered bulky cushions but is not usually a dominant species" (Rodwell *et al*., 2000; page 286).

4.20 The cliff face vegetation under study has a reasonable range of species present and, in most areas, does not form a closed sward heavily dominated by red fescue or thrift. Buck's horn plantain and English stonecrop are constant, and *Bromus hordaceus* was noted in several of the quadrats. Together these factors indicate affinity to the MC5 community. The presence of frequent English stonecrop, kidney vetch and rock sea-spurrey in the sward indicate closest affinity with the MC5b *Anthyllis vulneraria* sub-community.

4.21 However, some areas with a denser sward of red fescue and/or thrift appear closer to MC8. The abundance of sea campion, kidney vetch and English stonecrop indicates closest affinity of such areas with the MC8f *Anthyllis vulneraria* sub-community.

4.22 MAVIS analysis of quadrats taken form the middle and upper parts of the face shows a *fair* fit to the MC8f *Festuca rubra-Armeria maritima* maritime grassland community, *Anthyllis vulnerea* sub-community (goodness of fit value 61.6%). The next highest four fit values are *poor* (i.e. MC5b: 57.1%; MC8d 56.7%; MC8e: 53.7%; and MC8: 51.9%). All other fits are *very poor*. The three closest fitting sub-communities have rather similar fit values.

4.23 These results for the main face are consistent with the cliff vegetation grading from the MC1 rock crevice community at the bottom of the cliff and on areas of with little soil, to MC5b dominating on the main face, with areas of MC8f maritime grassland on areas with greater soil accumulation. The presence of a mosaic of MC5b and MC8f communities at a fine spatial scale, interspersed with varying amounts of bare rock, means that it was not possible to clearly demarcate these two communities on a map, although MC5b was clearly dominant in the central zone with MC8f becoming more prevalent toward the top of the cliff.

4.24 The distribution of NVC communities is shown in Figure 5.

NVC Survey: Left (West) Face of Cliff

Description of Vegetation

4.25 The west face of the cliff includes a steep rock face and a steep vegetated slope. There is a seepage line running down the cliff.

4.26 Red fescue is constant throughout, particularly where it forms a dense closed sward on the lower part of the slope. Hemp-agrimony *Eupatorium cannabinum* and common scurvy-grass *Cochlearia officinalis* are dominant species across the upper part of the cliff. The lower part of the cliff supports grassland with golden-samphire, rock samphire, sea beet, and sea mayweed. Yorkshire fog and creeping bent are also present. Thrift is present but not frequent.

4.27 Small patches of blackthorn are present in the centre of the cliff. Other species present include Alexanders *Smyrnium olusatrum,* cleavers *Galium aparine,* common yellow sedge *Carex demissa* ssp. *oedocarpa,* false brome *Brachypodium sylvaticum,* great wood-rush *Luzula sylvatica*, common dog violet *Violaceae riviniana*, curled dock *Rumex crispus,* prickly sow thistle *Sonchus asper,* hemlock water dropwort *Oenanthe crocata*, and greater plantain *Plantago major.*

4.28 The exposed rock faces on the right-hand side of the face (viewed from the sea) support the fruticose lichen species sea ivory lichen *Ramalina siliquosa* and *Ramalina cuspidata*. Crustose lichens (not identified to species level) are also present on some areas of rock.

4.29 The top right part of the cliff (viewed from the sea) supports similar vegetation to the front face, as described above, and includes patches of golden samphire.

4.30 See Photographs 8-12 in Section 6 below.

Interpretation

4.31 The general dominance of red fescue, the closed sward and the presence (but not dominance) of thrift suggests affinity to MC8 *Festuca-rubra-Armeria maritima* maritime grassland. However the fit is poor and it is not appropriate to assign a sub-community. The constancy of hemp agrimony is atypical and likely indicates indicate extensive seepages of groundwater.

4.32 MAVIS analysis of quadrats taken form the west face shows a *very poor* fit to published NVC data, with the five highest goodness of fit values was obtained for various sand dune, maritime grassland and saltmarsh communities (SD3: 38.2%; MC8: 36.1%; MC8d: 34.5%; SM28: 33.0% and MC12b: 32.7%).

NVC Survey: Scrub at cliff-top

Description of Vegetation

4.33 The scrub at the top of the cliff is within the SAC/SSSI boundary. Western gorse is the dominant species at the top of the cliff, forming dense stands up to 1 m in height and extending down the top few metres of the face. The gorse is interspersed with frequent blackthorn. Bramble *Rubus fruticosus* agg., bracken *Pteridium aquilinum*, honeysuckle *Lonicera periclymenum*, sorrel *Rumex acetosella,* red campion *Silene dioica* and cock's-foot are also present in amongst the scrub.

4.34 The western part of the cliff top is more open, and in addition to western gorse supports a greater range of species, similar to those that occur on the front face (including thrift, sea plantain *Plantago maritima*, buck's-horn plantain*,* sea campion, bird's-foot trefoil, kidney vetch*,* wild carrot*,* sheep's-bit, cat's-ear, and English stonecrop). Some heather *Calluna vulgaris* and thyme *Thymus polytrichus* is also present.

4.35 See Photographs 13-15 in Section 6 below.

Interpretation

4.36 The constancy of blackthorn clearly indicates affinity to the W22 *Prunus spinosa-Rubus fruticosus* community, and the constancy of cock's-foot suggests closest affinity to the W22b *Dactylis glomerata* sub-community. However, a wide range of accompanying species are present, including many grassland species, suggesting that this scrub has developed over a maritime grassland such as the MC9 community.

4.37 MAVIS analysis shows a *very poor* fit to published NVC data. The highest goodness of fit value was obtained for the W22c *Prunus spinosa-Rubus fruticosus* scrub community, *Dactylis glomerata* sub-community. The next highest four fit values are for communities that include dry heath, maritime grassland and open habitat community (i.e. H7a: 40.8%; MC9b: 40.6%; MC8d: 38.0%; and OV27: 37.4%). These results are consistent with the vegetation being a fine mosaic of grassland and scrub, with broad similarity to W22 scrub and MC9 maritime grassland.

NVC Survey: Grassland above the cliff

Description of Vegetation

4.38 The majority of the grassland in the fields at the top of the cliff (NB this is not within the SSSI) is appears to be managed by mowing. A steeper section immediately above the scrub on the west side of the cliff is not mown and supports longer vegetation.

4.39 The mown areas support a variety of species. Red fescue is constant; cock's-foot, common cat's-ear, and ribwort plantain *Plantago lanceolata* are abundant; meadow buttercup *Ranunculus acris*, Yorkshire fog, common knapweed *Centaurea nigra,* creeping bent, red clover *Trifolium pratense,* sweet vernal grass *Anthoxanthum odoratum,* sorrel *Rumex acetosa* and yarrow *Achillea millefolium* occur very frequently.

4.40 Other species regularly present include creeping thistle *Cirsium arvense*, bird's-foot trefoil *Lotus corniculatus*, hairy tare *Vicia hirsuta*, hogweed *Heracleum sphondylium*, ragwort *Senecio jacobaea*, common mouse-ear *Cerastium fontanum*, crested dog's-tail *Cynosurus cristatus*, perennial rye-grass *Lolium perenne*, wild carrot *Daucus carota* and yellow rattle *Rhinanthus minor*. Daisy *Bellis perennis*, lady's bedstraw *Galium verum*, creeping cinquefoil *Potentilla reptans* and oxeye daisy *Leucanthemum vulgare* are occasionally present

4.41 The taller vegetation adjacent to the scrub supports red fescue, cock's-foot, creeping thistle, common nettle *Urtica dioica*, common couch *Elytrigia repens,* hogweed, bluebell *Hyacinthoides non-scripta* and yarrow.

4.42 See Photographs 15-16 in Section 6 below.

Interpretation

4.43 Despite the absence of false oat-grass *Arrhenatherum elatius*, the constancy of red fescue and cock's-foot suggest affinity to MG1 *Arrhenatherum elatius* grassland, which is a community typically resulting from grassland subject to limited levels of management. Although red fescue is constant, the reasonable diversity of both grass and forb species and the constancy of common knapweed suggests affinity to the species-rich MG1e *Centaurea nigra* sub community, rather than the species-poor MG1a *Festuca rubra* sub-community. The lack of thrift in the sward indicates that this grassland probably cannot be considered a close match to the MC9 *Festuca rubra-Holcus lanatus* community, although there are certainly similarities, particularly (given the abundance of cock's-foot in the sward) to the MC9b *Dactylis glomerata* sub-community.

4.44 MAVIS analysis of this grassland shows a poor fit to published data. The highest goodness of fit value was obtained for the MG1e *Arrhenatherum elatius* grassland, *Centaurea nigra* sub-community (57.1%). The next highest four fit values are for MG1 and MG5 (i.e. MG1: 56.3%; MG5: 55.16%; MG5a: 54.9%; and MG1a 54.25%). The only maritime community in the ten highest fit values is MC9b (9th out of 10; 53.0%); this is the community mentioned in the SSSI citation for this location These results indicate that this grassland is a species-rich grassland, likely having be subject to little agricultural improvement and therefore showing some affinity to MG1e, MG5 *Cynosurus cristatus-Centaurea nigra* grassland and the MC9b *Festuca rubra-Holcus lanatus* maritime grassland, *Dactylis glomerata* sub-community.

NVC Survey: General relationships of vegetation

4.45 The results obtained here indicate that the cliff vegetation has broad affinity to the MC5b community, and in some areas, particularly near towards the top, the MC8f community. These grade into the MC1 community towards the cliff base. There is a band of W22c scrub toward the upper part which has likely developed on MC9 grassland (and still supports many grassland species). This broad arrangement is consistent with the description of cliff vegetation by Rodwell *et al*. (2000): e.g. "[MC5] usually occurs in mosaics with other maritime vegetation types… the [MC5b] sub-community within the MC8 and MC9 grasslands" (Rodwell *et al*., 2000; page 276) and "*the* [MC8] *community generally forms a zone above the* [MC1] *or the* [MC2; in Scotland] *crevice communities into which it may grade through its* [MC8b] *or* [MC8c] *sub-communities. Above it may pass into the* [MC9] *maritime grassland through its* [MC8d] *sub-community. This is the general zonation on the cliffs of much of south-west England, Wales and southern Scotland*" (page 288-289). On the clifftop itself, there is grassland that has affinity to the MG1e community and some affinity to MC9b grassland.

Annex 1 Habitats

4.46 Three NVC communities (MC1 *Crithmum maritimum-Spergularia rupicola* maritime rock crevice, MC5 *Armeria maritima-Cerastium diffusum* maritime therophyte community, MC8 *Festuca rubra-Armeria maritima* maritime grassland) are present over much of the face.

4.47 These three communities are included in the habitat categories which form the Annex 1 habitat *1230 Vegetated sea cliffs of the Atlantic and Baltic coasts*, for which the SAC has been designated (see Section 2.4, above). The scrub habitat at the top of the cliff does not appear to have close affinity to any Annex 1 habitat categories.

Conclusion

4.48 The three rare species that were identified by NRW as target species in the initial survey brief (spatulate fleawort *Tephroseris integrifolia* subsp. *maritima*, spotted rock-rose *Tuberaria guttata*, golden hair lichen *Teloschistes flavicans),* and ciliate strap lichen *Heterodermia leucomela,* which

was subsequently identified by NRW as another target species, were not found during the survey, and are therefore considered unlikely to be present within the footprint of the potential works.

4.49 NVC communities representing the Annex 1 habitat *1230 Vegetated sea cliffs of the Atlantic and Baltic* coasts (i.e. MC1 MC5 MC8) are present over much of the face. Given their distribution, is it unlikely that these can be avoided if cabling is to be attached to the cliff face.

4.50 The vegetation on the face includes two species which are listed in the notified assemblage of the Holy Island Coast SSSI: golden samphire *Inula crithmoides* and rock sea-lavender *Limonium binervosum* primarily occur in the MC1b community in the lower part of the face, as shown on Figure 1.

4.51 There is some variation in vegetation across the face which is based on depth and stability of soil and height above sea level; some areas of bare rock and exposed soil are also present. If HDD is not feasible and cabling does need to be fixed to the cliff then it may be possible to microsite cabling on the face to minimise impacts on vegetation. The photographs obtained during the drone survey could be used to aid the selection of the precise route, in consultation with NRW.

5 References

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6 Photographs

Photograph 1: MC5b/8f mosaic on front face

Photograph 2: West side of front face (foreground), MC1 vegetation and bare rock

Photograph 3: MC5b/8f mosaic on front face

Photograph 4: Front face vegetation: Kidney vetch and buck's-horn plantain.

Photograph 5: Front face: Lichens *Ramalina siliquosa* and *Cladonia rangiformis*

Photograph 6: Front face vegetation: Red fescue, sheep's bit, buck's-horn plantain and sea campion.

Photograph 7: Front face, base, rock-sea lavender and *Ramalina siliquosa* lichen (MC1b)

Photograph 8: West face: Thrift tussocks and rock exposures.

Photograph 9: West face.

Photograph 10: West face – exposed rock and MC8 maritime grassland.

Photograph 11: West face: Red fescue, sea beet, kidney vetch, thrift and hemp agrimony

Photograph 12: Base of West face: rock samphire, sea beet, sea mayweed and golden samphire.

Photograph 13: Scrub and more open vegetation (MC1/MC5b) vegetation at cliff top above West Face

Photograph 14: Western gorse and blackthorn scrub at cliff top above front face.

Photograph 15: Scrub and unmanaged grassland at the top of cliff

Photograph 16: Grassland in fields above cliff.

Example photographs from drone survey

Photograph 16: Scrub at cliff top (38m)

Photograph 17: Front face (23m)

Photograph 18: Front face (17m)

Photograph 19: Front Face 9m

Photograph 20: Front face 7m

Photograph 21: Front Face 2m

7 Figures

Legend

Site location

BSG | ecology

OFFICE: Derbyshire
T: 01433 651869

JOB REF: P20-353

PROJECT TITLE

Morlais Botanical Survey

DRAWING TITLE

Figure 1: Site Location Plan

DATE: 15.06.2020 CHECKED: GM SCALE: 1:2,500 at A3

DRAWN: EB APPROVED: GM STATUS: FINAL

Sources: BSG Ecology survey data

Document path

Legend

- Site boundary
- Holy Island Coast SSSI boundary

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PROJECT TITLE

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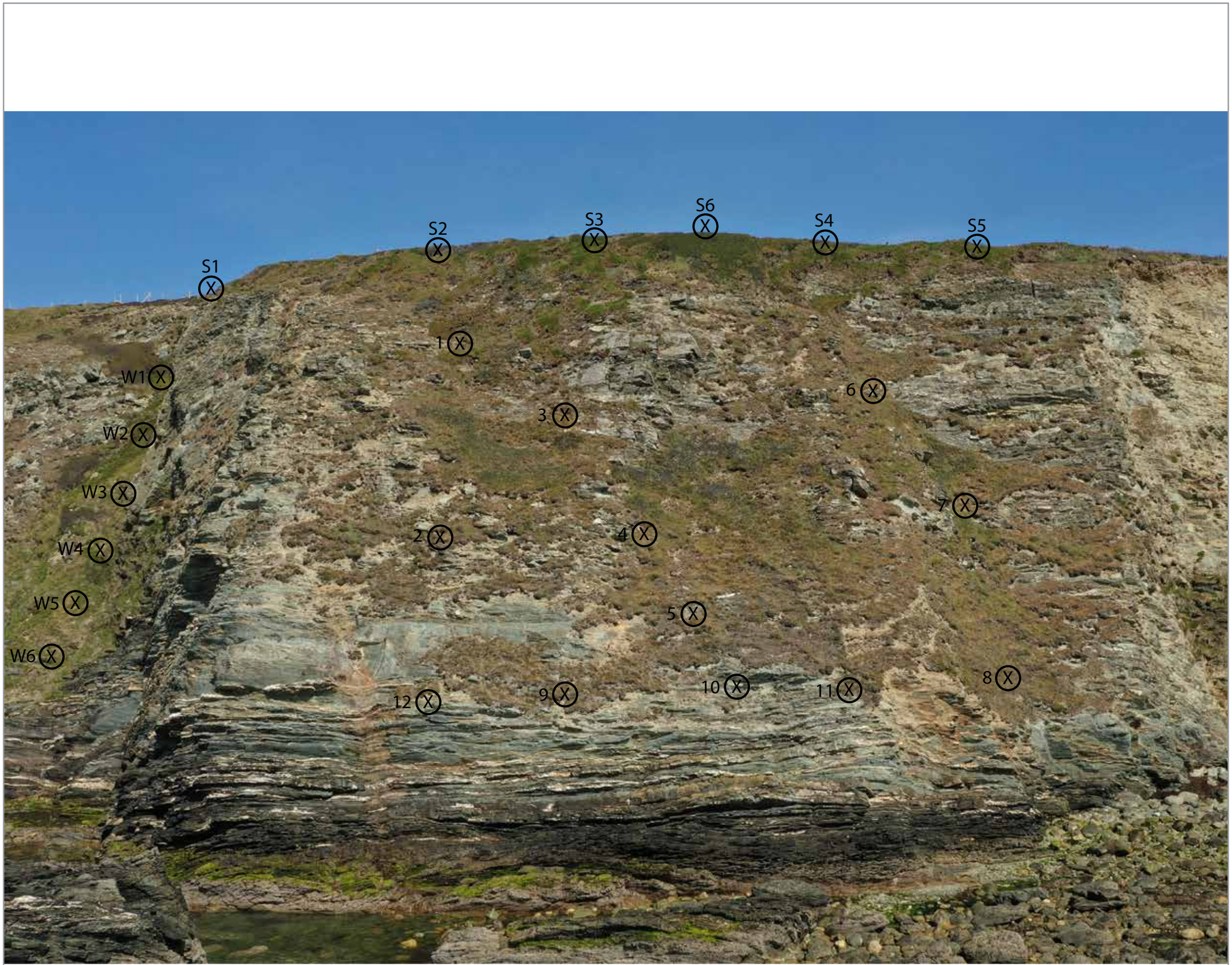
DRAWING TITLE

Figure 2: Extent of SSSI within survey area

DATE: 15.06.2020 CHECKED: GM SCALE: 1:950 at A3

DRAWN: EB APPROVED: GM STATUS: FINAL

Document path



0 2 4 6 8 10 metres

The scale bar is indicative. The cliff height is foreshortened in the image.

LEGEND

X	Quadrat locations
1	Quadrat reference on the main cliff face
S1	Quadrat reference within scrub at the cliff top
W1	Quadrat reference on the west cliff face

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DRAWING TITLE
Figure 3: Quadrat Locations (cliff face)

DATE: 12.06.2020 CHECKED: GM SCALE:INDICATIVE
DRAWN: EB APPROVED: GM VERSION:1.0

Legend

- Quadrat locations in scrub (S)
- Quadrat locations in unmanaged grassland (U)
- Quadrat locations in mown grassland (E/W = east/west field)

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PROJECT TITLE

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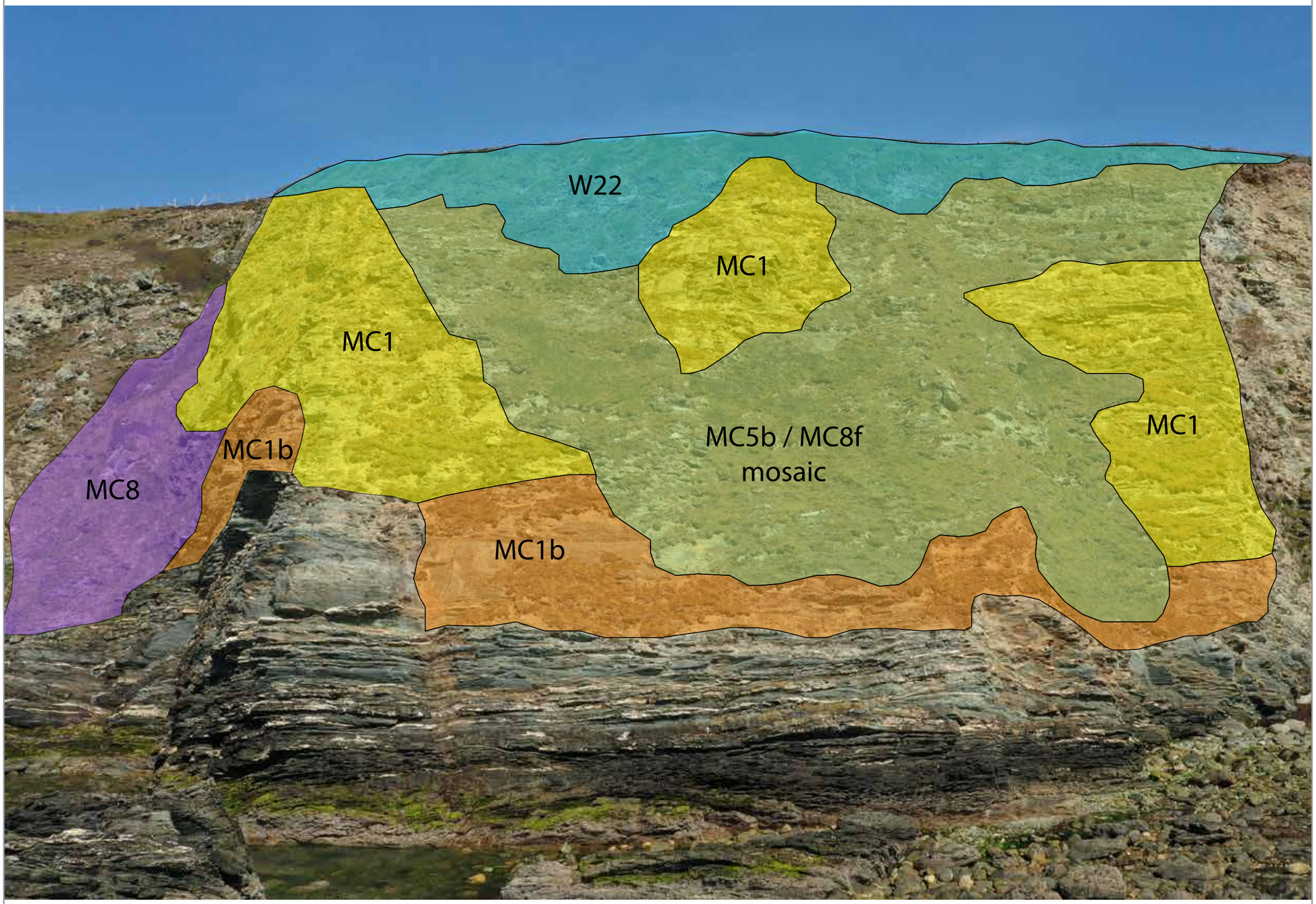
DRAWING TITLE

Figure 4: Quadrat Locations (cliff top)

DATE: 12.06.2020 CHECKED: GM SCALE: 1:800 at A3

DRAWN: EB APPROVED: GM STATUS: FINAL

Document path



0 2 4 6 8 10 metres

The scale bar is indicative. The cliff height is foreshortened in the image.

LEGEND

- MC8 (*Festuca rubra - Armeria maritima* maritime grassland)
- MC1 (*Crithmum maritimum - Spergularia rupicola* maritime rock-crevice community)
- MC1b (*Inula crithmoides* sub-community)
- MC5b (*Armeria maritima - Cerastium diffusum* ssp. *diffusum* maritime therophyte community *Anthyllis vulneraria* sub-community) / MC8f (*Festuca rubra - Armeria maritima* maritime grassland *Anthyllis vulneraria* sub-community) mosaic
- W22 (*Prunus spinosa - Rubus fruticosus* sub-community)

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PROJECT TITLE
Morlais Botanical Survey

DRAWING TITLE
Figure 5: NVC communities

DATE: 15.06.2020 CHECKED: GM SCALE: INDICATIVE
DRAWN: EB APPROVED: GM VERSION:1.0

8 Appendix 1: Botanical Data

Front Face of Cliff - Upper and Middle Sections

Table A1-1: Botanical quadrat data from front face of cliff – upper and middle sections

Common name	Scientific name	Domin scores per quadrat							Constancy and cover range
		Q1	Q2	Q3	Q4	Q6	Q7	Q8	
buck's-horn plantain	*Plantago coronapus*	5	5	5	5	4	4	5	V (4–5)
red fescue	*Festuca rubra*	5	5	5	5	3	7	7	V (3–7)
thrift	*Armeria maritima*	4	5	4	4	2	4	5	V (2–5)
sea campion	*Silene uniflora*	5	5	3	6	7	5		V (3–7)
Yorkshire fog	*Holcus lanatus*		2	5	5	5	7	5	V (2–7)
English stonecrop	*Sedum anglicum*	3	1	1	2	1	1		V (1–3)
spring squill	*Scilla verna*			4	2	3	1	2	IV (1–4)
creeping bent	*Agrostis stolonifera*		2		3		3	3	III (2–3)
kidney vetch	*Anthyllis vulneraria*	2	2		3	3			III (2–3)
bird's-foot trefoil	*Lotus corniculatus*			1		3	3	7	III (1–7)
soft brome	*Bromus hordeaceus*	1	3	2	2				III (1–3)
cock's-foot	*Dactylis glomerata*				1	1	2	2	III (1–2)
wild carrot	*Daucus carota*		2		2		1	1	III (1–2)
sea beet	*Beta vulgaris* ssp. *maritima*		2				1	1	III (1–2)
blackthorn	*Prunus spinosa*	2		6		4			III (2–6)
rock sea spurrey	*Spergularia rupicola*	4			3	2			III (2–4)
cat's-ear	*Hypochaeris radicata*	1		1	2				III (1–2)
sheep's-bit	*Jasione montana*			3	2	3			III (2–3)
oxeye daisy	*Leucanthemum vulgare*			2		2			II (2–2)
golden-samphire	*Inula crithmoides*		2						I (2–2)
yellow crisp-moss	*Tortella flavovirens*							1	I (1–1)
common centaury	*Centaurium erythraea*				1				I (1–1)
ivy	*Hedera helix*			1					I (1–1)

sea ivory lichen	*Ramalina siliquosa*	2							I (2–2)
sea mayweed	*Tripleurospermum maritimum*						1		I (1–1)
Other species recorded (not within quadrats)									
sea ivory lichen	*Ramalina cuspidata*								
a cladonia lichen	*Cladonia rangiformis*								
navelwort	*Umbilicus rupestris*								
crustose lichens	various								

Front Face of Cliff - Lower Section

Table A1-2: Botanical quadrat data from front face of cliff – lower section

Common name	**Scientific name**	**Domin scores per quadrat**					**Constancy and cover range**
		Q5	**Q9**	**Q10**	**Q11**	**Q12**	
buck's-horn plantain	*Plantago coronapus*	3	2	4	1	1	V (1–4)
golden-samphire	*Inula crithmoides*	3	4	3	2	1	V (1–4)
red fescue	*Festuca rubra*	8	4	5	7	7	V (4–8)
rock sea spurrey	*Spergularia rupicola*	1	3	3	3	1	V (1–3)
thrift	*Armeria maritima*	5	4	4	4	2	V (2–5)
rock sea lavender	*Limonium binervosum*	3	3		3	3	IV (3–3)
sea beet	*Beta vulgaris* ssp. *maritima*	2		2	2	1	IV (1–2)
kidney vetch	*Anthyllis vulneraria*	3			2		II (2–3)
sea ivory lichen	*Ramalina siliquosa*		1		1	2	III (1–2)
yellow crisp-moss	*Tortella flavovirens*	1	2				II (1–2)
bird's-foot trefoil	*Lotus corniculatus*	8					II (8–8)
cat's-ear	*Hypochaeris radicata*			1			II (1–1)
creeping bent	*Agrostis stolonifera*	2					II (2–2)
sea campion	*Silene uniflora*	3					II (3–3)
Other species recorded (not within quadrats)							
sea ivory lichen	*Ramalina cuspidata*						
a cladonia lichen	*Cladonia rangiformis*						

navelwort	*Umbilicus rupestris*	
crustose lichens	various	

Left (West) Face of Cliff

Table A1-3: Botanical quadrat data from left (west) face of cliff

Common name	Scientific name	Domin Scores per quadrat						Constancy and cover range
		Q1	Q2	Q3	Q4	Q5	Q6	
scurvy-grass	*Cochlearia officinalis*	7	5	5	5	5		V (5–7)
hemp-agrimony	*Eupatorium cannabinum*	7	5	8	2	2		V (2–8)
red fescue	*Festuca rubra*	4	4	2	6	9	6	V (2–9)
Yorkshire fog	*Holcus lanatus*	2	4	1	4	4		V (1–4)
sea mayweed	*Tripleurospermum maritimum*			4	2	2	5	IV (2–5)
blackthorn	*Prunus spinosa*		3		4	4		III (3–4)
curled dock	*Rumex crispus*			2	2	2		III (2–2)
creeping bent	*Agrostis stolonifera*				2	3		II (2–3)
rock samphire	*Crithmum maritimum*					3	5	II (3–5)
great wood-rush	*Luzula sylvatica*			1	4			II (1–4)
greater plantain	*Plantago major*	2	1					II (1–2)
Alexanders	*Smyrnium olusatrum*		4	2				II (2–4)
sea beet	*Beta vulgaris* ssp. *maritima*				2			I (2–2)
false brome	*Brachypodium sylvaticum*			1				I (1–1)
common yellow sedge	*Carex demissa* ssp. *oedocarpa*		2					I (2–2)
cleavers	*Galium aparine*			2				I (2–2)
golden-samphire	*Inula crithmoides*						2	I (2–2)
hemlock water dropwort	*Oenanthe crocata*					1		I (1–1)
prickly sow thistle	*Sonchus asper*					1		I (1–1)
common dog violet	*Viola riviniana*		2					I (2–2)
Other species recorded (not within quadrats)								
bird's-foot trefoil	Lotus corniculatus							

a sea ivory lichen	*Ramalina cuspidata*	
brookweed	*Samolus valerandi*	
prickly lettuce	*Lactuca serriola*	
primose	*Primula vulgaris*	
sea ivory lichen	*Ramalina siliquosa*	
thrift	*Armeria maritima*	
wild carrot	*Daucus carota*	

Scrub at Cliff-top

Table A1-4: Botanical quadrat data from cliff-top

Common name	Scientific name	Domin Scores per quadrat						Constancy and cover range
		Q1	Q2	Q3	Q4	Q5	Q6	
western gorse	*Ulex gallii*		7	10	8	8		IV (7–10)
blackthorn	*Prunus spinosa*		4		1	3	9	IV (1–9)
Yorkshire fog	*Holcus lanatus*		4		1	2	2	IV (1–4)
cock's-foot	*Dactylis glomerata*		4	2	1	2		IV (1–4)
cat's-ear	*Hypochaeris radicata*	3	2			2		III (2–3)
sheep's-bit	*Jasione montana*	3	2			1		III (1–3)
buck's-horn plantain	*Plantago coronapus*	3	2			2		III (2–3)
bramble	*Rubus fruticosus* agg.			2	1	1		III (1–2)
English stonecrop	*Sedum anglicum*	3	2			2		III (2–3)
sea campion	*Silene uniflora*	4	7			2		III (2–7)
thrift	*Armeria maritima*	2	5					II (2–5)
red fescue	*Festuca rubra*	4	4					II (4–4)
bird's-foot trefoil	*Lotus corniculatus*	4	1					II (1–4)
bracken	*Pteridium aquilinum*			2				I (2–2)
kidney vetch	*Anthyllis vulneraria*	3						I (3–3)
heather	*Calluna vulgaris*	4						I (4–4)
common knapweed	*Centaurea nigra*						*2*	I (2–2)

wild carrot	*Daucus carota*		4					I (4–4)
honeysuckle	*Lonicera periclymenum*					2		I (2–2)
sea plantain	*Plantago maritima*	1						I (1–1)
sorrel	*Rumex acetosa*				1			I (1–1)
curled dock	*Rumex crispus*						1	I (1–1)
red campion	*Silene dioica*				1			I (1–1)
thyme	*Thymus polytrichus*	1						I (1–1)

Grassland above Cliff

Table A1-5: Botanical quadrat data from grassland above cliff

Common name	**Scientific name**	**Domin scores per quadrat**													**Constancy and cover range**
		East field					**West field**					**Field margin by scrub**			
		Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	
red fescue	*Festuca rubra*	5	3	5	6	6	7	8	8	7	8	9	6	8	V (3–9)
cock's-foot	*Dactylis glomerata*	2	4	4	3		3	2	4		3	4	8	5	V (2–8)
common cat's-ear	*Hypochaeris radicata*	3	4	4	2	2	2	4	2	2	6				VI (2–6)
ribwort plantain	*Plantago lanceolata*	4	4	2	3	4	4	4	4	3	3				VI (2–4)
meadow buttercup	*Ranunculus acris*	1	4	3		2	2	2	2	2		1			VI (1–4)
Yorkshire fog	*Holcus Lanatus*	5	4	5	3	5	3	4	4	4					VI (3–5)
common knapweed	*Centaurea nigra*	3		2	2		1	2	3	3	3				VI (1–3)
creeping bent	*Agrostis stolonifera*		2	2	3	2	2	3	3		2				VI (2–3)
red clover	*Trifolium pratense*	3	3	4	2	2	5	4							III (2–5)
sweet vernal grass	*Anthoxanthum odoratum*	5	6	6	5	3	3	5							III (3–6)
yarrow	*Achillea millefolium*	3	3			2	2		2	2				2	III (2–3)
sorrel	*Rumex acetosa*	3	1	2	3		2			2					III (1–3)
creeping thistle	*Cirsium arvense*				3		2					2	3	3	II (2–3)
bird's-foot trefoil	*Lotus corniculatus*						2	1	3		4				II (1–4)

hairy tare	*Vicia hirsuta*				2	2			2						II (2–2)
hogweed	*Heracleum sphondylium*	2	3									3			II (2–3)
ragwort	*Senecio jacobaea*			2				1		4					II (1–4)
bluebell	*Hyacinthoides non-scripta*	1										2			I (1–2)
common mouse-ear	*Cerastium fontanum*	2	2												I (2–2)
common nettle	*Urtica dioica*											4	3		I (3–4)
crested dog's-tail	*Cynosurus cristatus*	4	3												I (3–4)
perennial rye-grass	*Lolium perenne*		1	2											I (1–2)
wild carrot	*Daucus carota*						2				1				I (1–2)
yellow rattle	*Rhinanthus minor*									1	1				I (1–1)
blackthorn	*Prunus spinosa*													2	I (2–2)
common couch	*Elytrigia repens*												4		I (4–4)
creeping cinquefoil	*Potentilla reptans*						2								I (2–2)
daisy	*Bellis perennis*						1								I (1–1)
greater bird's-foot trefoil	*Lotus pedunculatus*									4					I (4–4)
lady's bedstraw	*Galium verum*				1										I (1–1)
Other species recorded (not within quadrats)															
Pink-sorrel	*Oxalis articulata*														
smooth hawk's-beard	*Crepis capillaris*														

Table A1-6: Quadrat locations

Survey area	Quadrat No:	OS Grid Reference
Front face	Q 1	SH 21381 81528
	Q 2	SH 21384 81524
	Q 3	SH 21397 81536
	Q 4	SH 21399 81535
	Q 5	SH 21402 81532
	Q 6	SH 21405 81547
	Q 7	SH 21410 81546
	Q 8	SH 21415 81545
	Q 9	SH 21395 81522
	Q 10	SH 21404 81524
	Q 11	SH 21408 81530
	Q 12	SH 21387 81516
Left (west) face	Q 1	SH 21342 81534
	Q 2	SH 21343 81531
	Q 3	SH 21344 81527
	Q 4	SH 21344 81524
	Q 5	SH 21346 81521
	Q 6	SH 21347 81520
Scrub	Q 1	SH 21346 81539
	Q 2	SH 21369 81540
	Q 3	SH 21386 81552
	Q 4	SH 21399 81563
	Q 5	SH 21408 81572
	Q 6	SH 21392 81555

Survey area	Quadrat No:	OS Grid Reference
West Field	Q 1	SH 21331 81557
	Q 2	SH 21346 81553
	Q 3	SH 21362 81561
	Q 4	SH 21361 81576
	Q 5	SH 21350 81568
East Field	Q 1	SH 21380 81574
	Q 2	SH 21395 81573
	Q 3	SH 21394 81586
	Q 4	SH 21405 81584
	Q 5	SH 21409 81598
Field Margin	Q 1	SH 21371 81557
	Q 2	SH 21370 81550
	Q 3	SH 21363 81554