



White Cross Offshore Wind Farm ES Addendum

**Appendix L: Petalwort Desk-Based
Assessment and Survey Report**



Document Code:		FLO-WHI-REP--0017	
Contractor Number:	Document	PC2978-RHD-ZZ-XX-RP-Z-0785	
Version Number:		00	
Date:	<i>Issue</i>	<i>Date</i>	
	24/04/2024		
Prepared by:	JH		<i>Electronic Signature</i>
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Version Number	Reason for Issue / Major Changes	Date of Change
00	For issue	24/04/2024

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Glossary of Acronyms

Acronym	Definition
BRAG	Black-Red-Amber-Green
CEMP	Construction Environmental Management Plan
DBA	Desk based assessment
DM	Dalcour Maclaren
GIS	Geographic Information System
GLONASS	Global Orbiting Navigation System
GPS	Global Positioning System
Km	Kilometre
m	Metre
NBN	National Biodiversity Network
NE	Natural England
NVC	National Vegetation Classification
OCEMP	Outline Construction Environmental Management Plan
RAG	Red-Amber-Green
P&R	Park and Ride
SAC	Special Area of Conservation
WCOWF	White Cross Offshore Wind Farm
WCOWL	White Cross Offshore Windfarm Limited

Glossary of Terminology

Defined Term	Description
Applicant	White Cross Offshore Windfarm Limited
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation or the inter-array cable junction box (if no offshore substation), to the NG Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
the Onshore Project	The Onshore Project for the onshore TCPA application includes all elements onshore of MLWS. This includes the infrastructure associated with the offshore export cable (from MLWS), landfall, onshore export cable and associated infrastructure and new onshore substation (if required).
the Project	the Project is a proposed floating offshore windfarm called White Cross located in the Celtic Sea with a capacity of up to 100MW. It encompasses the project as a whole, i.e. all onshore and offshore infrastructure and activities associated with the Project.
White Cross Offshore Windfarm	100MW capacity offshore windfarm including associated onshore and offshore infrastructure

1. Introduction

1. White Cross Offshore Windfarm Limited (WCOWL) commissioned Sharon Pilkington, an independent professional bryologist with over 20 years' contract experience and expertise in Petalwort assessments, to undertake a comprehensive assessment into the presence of the highly protected bryophyte species Petalwort (*Petalophyllum ralfsii*) across the Braunton Burrows Special Area of Conservation (SAC) and surrounding areas.
2. This assessment has been undertaken in response to concern that the proposed works related to the Onshore Export Cable Corridor, within the Braunton Burrows SAC area, may cause adverse effects upon the habitats that support Petalwort (including Annex I habitat: Humid dune slacks).
3. Natural England (NE) have advised that areas of Petalwort, other rare species and diverse areas of vegetation should be avoided to reduce adverse impacts upon their population during the construction, operation and maintenance of the Onshore Export Cable.
4. NE also advised that pre consent surveys are undertaken to understand the level of risk the proposed activities related to the Onshore Export Cable has upon Petalwort species.

1.1 Purpose of the Document

5. The purpose of this document is to present the results of the Desk Based Assessment (DBA) (provided in **Annex 1**) and Petalwort Survey Report (provided in **Annex 2**) to identify the presence, distribution and population of the nationally rare Petalwort bryophyte species within the Onshore Export Cable Corridor.
6. This document includes the following sections:
 - **Section 1:** Introduction to Project, Petalwort ecology, site description and project outline.
 - **Section 2:** DBA and field survey approach and methodology
 - **Section 3:** DBA results
 - **Section 4:** Field survey results
 - **Section 5:** Summary and recommendations
 - **References**
 - **Annexes**

1.2 Petalwort Background and Ecology

7. Petalwort is a perennial thallose liverwort belonging to the family *Petalophyllaceae*. Its plants (known as thalli) grow in solitary rosettes or in mats, each thallus generally measuring up to 10 mm in diameter and up to 15mm long. A subterranean lipid-packed rhizome-like stem allows it to withstand long periods of desiccation, with the visible parts of the plant dying back during dry conditions in summer.
8. Petalwort is dioicous and often fertile; spore-producing capsules are carried by female plants from December to June. The spores are relatively large and may persist in the soil for long periods until environmental conditions become suitable for new plant growth. No asexual propagules are known, but it can reproduce clonally by means of bifurcation whereby the thallus splits into two and underground branches can also give rise to new thalli.
9. In Britain and Ireland, Petalwort is mainly a coastal species of calcareous sand dunes and machair where it behaves as a pioneer along the edges of dune slacks subject to inundation in the winter. However, it avoids ground that is dry, deeply flooded in winter or heavily shaded. In some sites, (including Braunton Burrows) it is heavily dependent on light disturbance and compaction provided by the movements of vehicles, humans and/or livestock. It rarely grows on pure damp sand, instead preferring more water-retentive sand-peat soils.
10. In England, there are strong populations at a number of dune complexes in Devon and Cornwall. Whilst some colonies have increased in recent years, others have declined due to a trend of sand dune stabilisation which over time causes dune slacks to dry out as a result of the processes of natural succession.
11. Petalwort is a species of high conservation importance and it is listed on Schedule 8 of the Wildlife & Countryside Act 1981 (as amended), receiving full legal protection. It is also listed under the Habitats Directive (92/43/EEC) as an Annex II species. In Britain, the species is also recognised as Nationally Scarce (Pescott, 2016) and is regarded as Vulnerable in the current Red List (Callaghan, 2022).

2. Assessment Approach

2.1 Desk Based Assessment Approach

12. The DBA considered the extent of the Onshore Development Area plus a 20m buffer. Layers of records georeferenced (i.e. to 100m resolution or greater from all data sources) were added to a Quantum GIS project to display the known distribution of

Petalwort. Consideration of these records and the cable installation technique informed the survey area for the Petalwort survey (**Section 2.2** below).

2.1.1 Information Sources

13. Petalwort has been known from Braunton Burrows for many decades, and the dune complex was well known as a stronghold of this species during the 1960s. By 1997, however it was feared extinct there and in north Devon. However, it was rediscovered by David Holyoak (Holyoak, 1998), who then carried out further monitoring in 2001, 2005 and 2008. Some of the records made between 1998 and 2008 during these earlier surveys are available for public viewing on the National Biodiversity Network Atlas website (NBN network, 2024).
14. Other sources of information about the distribution of Petalwort at Braunton Burrows that have been consulted in the preparation of this Advice Note include:
 - Data digitised from a monitoring survey in 2018 by Matthew Stribley on behalf of the Freshwater Habitats Trust (Stribley, 2018).
 - All 89 validated records of Petalwort at Braunton Burrows held in the British Bryological Society's comprehensive records database¹. These cover dates between 1950 and 2015 and include those generated by Holyoak's surveys of 1998 – 2008.
15. No further monitoring of the Petalwort population was undertaken until the field surveys in 2023 which included a survey and condition assessment funded by Natural England's Dynamic Dunescapes project.

2.2 Petalwort Survey Methodology

16. In response to the advice from Natural England pre consent surveys were undertaken on the areas identified following the DBA (**Section 2.1** above). The survey was undertaken on 27th February 2024 by Sharon Pilkington.
17. The weather was dry and mild and the ground was moist after rain, so field conditions were ideal. February is an optimal time of year for surveying Petalwort, a perennial species that typically begins above-ground growth in autumn, producing spores in late winter and spring and then retreating underground in the warmest and driest months.
18. A slow walkover specifically sought out low-lying open ground that might offer suitable Petalwort habitat. **Figures 1.1-1.3 of Annex 2** show the GPS-generated walkover route taken from west to east.

19. Potential habitats were searched for rosettes of Petalwort, which, if found would be georeferenced using a GPS/GLONASS navigational receiver¹ with a normal positioning accuracy of 3m in open terrain.
20. Other mosses and liverworts were also recorded for completeness and context. Names of bryophytes in this report follow the current checklist of Blockeel et al. (2021). Names of vascular plants follow the taxonomy of Stace (2019).
21. Quantum GIS software (QGIS Development Team, 2024) was used to prepare the figures in this report.

2.2.1 Petalwort Survey Limitations

No limitations or problems were encountered during the fieldwork that might compromise the findings.

3. Desk Based Assessment Results

3.1 Distribution of Petalwort at Braunton Burrows SAC

22. **Figure 1 of Annex 1** shows that the population is highly localised in the central and southern parts of the SAC, with populations remaining faithful to these areas over many years whilst the habitat stays suitable.
 23. There are four main sub populations:
 - The northernmost sub-population (now very small) is in the long complex known as Beach Head Slack, with a small outlier found in the adjacent Bush Grass Slack in 2018.
 - More than 1km further south, small populations have been found in Raven Slack and Long Slack.
 - A much larger sub-population is scattered through a series of interconnected slacks disturbed by military activity east of Airy Point. It is present over a distance of approximately 1.3km from Doughnut Slack to Twayblade Slack via Pebble Slack.
 - The largest sub-population is known from the southern end of Braunton Burrows, in the disused Broadsands car park and scattered along 1.4km of the verge of the American Track (shown in **Figure 1 of Annex 1** as the Tarka Trail and the South-west Coast Path).
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24. The 2023 work showed that the population of Petalwort at Braunton Burrows is currently in sharp decline after two decades of expansion. Its strongholds remain the now-closed Broadsands car park, near Crow Point.
25. No Petalwort has ever been reported from the SAC north of Beachy Head Slack. It is known that Petalwort has gone from slacks in the Hog Wood Plain area south-east of Sandy Lane carpark, where it was present in large numbers between 1947 and 1971 (Holyoak, 2005).

3.2 Likely Impacts of the Project on Petalwort

26. The Export Cable for the White Cross Offshore Windfarm comes ashore at Saunton Sands then will be installed below the Braunton Burrows SAC. At no point will opencut trenching take place within the boundaries of the SAC. The cables will be installed below ground level (to a maximum depth of approximately 13m) using trenchless technology. From the trenchless technique exit point, it will run south across arable and pastoral farmland to Crow Beach House before crossing below the Taw Estuary.
27. Possible risks to the SAC considered relate to frac out, where the inert drilling lubricant, which is bentonite clay-based, is inadvertently forced up to the surface due to ground conditions and could affect adjacent vegetation. However, this risk of this impact is very low (as detailed in **Appendix T: Onshore Ground Investigation Interpretative Report**). If it were it to occur, it is likely to be very localised at the entry and exit points of the trenchless sections and limited to very few meters. The entry and exits points are outside the boundaries of the SAC. Measures to be implemented in the unlikely event of frac out are outlined in **OCEMP Annex 3: Outline Bentonite Management Plan**.
28. Classification of vegetation communities in the vicinity of the Onshore Development Area in the SAC was undertaken in 2023. The work confirmed the presence of a number of sand-dune communities but none of the five National Vegetation Classification (NVC) dune slack communities which could theoretically support Petalwort:
 - SD13 *Sagina nodosa* – *Bryum pseudotriquetrum* dune-slack community
 - SD14 *Salix repens* – *Campylium stellatum* dune-slack community
 - SD15 *Salix repens* – *Calliergonella cuspidate* dune-slack community
 - SD16 *Salix repens* – *Holcus lanatus* dune-slack community
 - SD17 *Potentilla anserina* – *Carex nigra* dune-slack community.

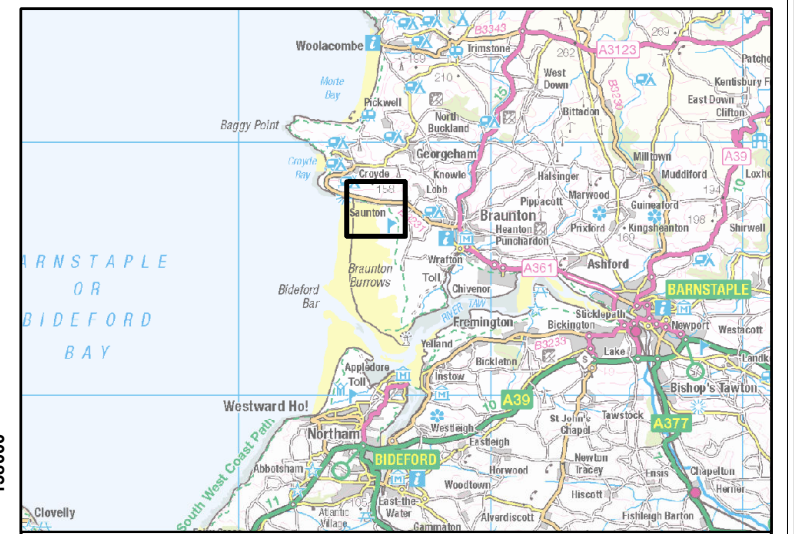
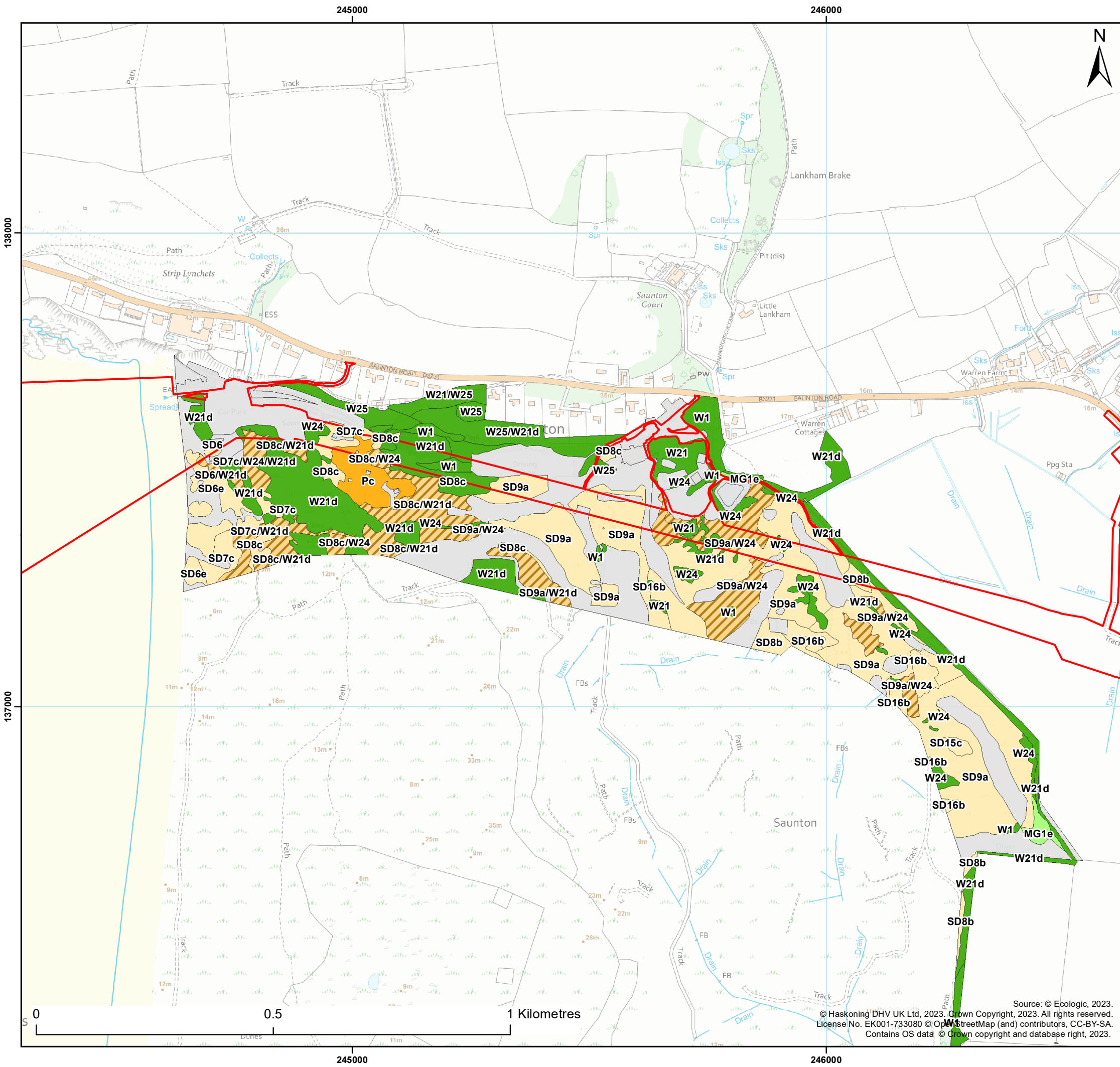
3.3 Likely Impacts of the Project on Petalwort at Braunton Burrows SAC

29. It was considered that there appears to be a very low risk of Petalwort being impacted by the Project. This conclusion was based on:
 - a) lack of evidence of any Petalwort ever being found within 1km of Onshore Development Area where it crosses Braunton Burrows SAC
 - b) a lack of dune slack vegetation (that might support it) in the same area.
30. However, both assumptions were considered to carry some uncertainty. First of all, it is not known if dune slacks in the northern part of Braunton Burrows SAC have ever been targeted by Petalwort Surveys.
31. It is clear that recent monitoring and condition assessment work has focused on habitats in the central and southern parts of the burrows but it is an enormous site, and there is potential for past surveys to have concentrated on historical localities for Petalwort and not on surveying new areas.
32. A second issue of uncertainty is habitat mapped as having 'No NVC classification' in the NVC survey (**Figure 1**). These areas relate to car park access roads, a modern holiday lodge development and golf course greens/fairways.
33. In some southern parts of the SAC, Petalwort occupies habitat that would not be classified as any of the five NVC dune slack communities SD13-SD16, for example in damp depressions in the former Broadsands car park and on the verges of the American Road.
34. Furthermore, Petalwort may grow in small and highly localised areas of damp, disturbed ground (dog-walker's paths, for example) whilst being absent from other suitable-looking areas. As such the presence of Petalwort in these areas is unlikely but cannot be ruled out.

3.4 Recommendations

35. To address the uncertainties identified in the DBA, it was recommended that a Petalwort survey should be undertaken in dune habitats in the northern part of the SAC within a 20m radius of the Onshore Development Area. The survey was recommended to be undertaken between January and April, which is when Petalwort is most conspicuous.
36. The aim of the survey was to confirm the assessment, and to either rule out the presence of this species or should any be located provide information on the location

of this species in the working area, this would enable these areas to be identified and factored into the final CEMP for the project.



Legend:

- Onshore Development Area
- National Vegetation Classification (NVC) Category**
- Populus Canescens Scrub (Pc)
- Sand Dunes (SD)
- Sand Dune/Woodland Matrix (SD/W)
- Unimproved/improved grasslands (MG)
- Woodland (W)
- No NVC Classification

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm
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Title:
National Vegetation Classification (NVC) at Saunton Sands

Figure: 1 Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0768

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	06/12/2023	AB	CB	A3	1:8,000

Co-ordinate system: British National Grid

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4. Petalwort Survey Results

37. No Petalwort was found within the survey area and its habitats were considered to be unequivocally unsuitable for it.
38. Stabilised sand dunes in the western part of the survey area were found to be predominantly dry and elevated and covered in coarse vegetation defined by mixtures of Marram *Ammophila arenaria*, Atlantic Ivy *Hedera hibernica*, Bracken *Pteridium aquilinum* and Bramble *Rubus fruticosus* *agg.* among extensive and dense stands of mixed scrub.
39. Small patches of open dune grassland kept short and free of scrub by rabbit browsing supported more diverse vascular communities but were also well-drained. Characteristic bryophytes of the dunes included *Syntrichia ruraliformis*, *Pseudoscleropodium purum*, *Homalothecium lutescens*, *Brachythecium rutabulum*, *Rhynchostegium megapolitanum*, *Barbula unguiculata* and *Streblotrichum convolutum* *var. convolutum*.
40. No dune slacks were present, although one large willow-dominated depression held damp ground. This was a man-made feature of unknown purpose comprising a series of parallel low ridges and ditches. Now disused, it has been colonised by a dense and tangled stand of Grey Willow *Salix cinerea* and White Willow *S. alba* over Greater Pond-sedge *Carex riparia* and Bramble. It was considered far too overgrown and shaded to support Petalwort.
41. In Saunton Golf Course, the focus of the survey was short turf in low-lying fairways, greens and the driving range. Roughs, bunkers and elevated ground generally were all considered completely unsuitable for Petalwort.
42. The course lies over partially reclaimed dunes and the fairways, greens and driving range appear to be carefully managed to optimise drainage and maintain a very short uniform sward of fine-leaved grasses. As such, they offered no habitat to Petalwort either. Small, heavily trampled patches of bare or sparsely vegetated ground were occasionally associated with the fairways or ground between them. These areas supported communities of small pioneering species e.g. Annual Meadow-grass *Poa annua*, Common Whitlowgrass *Erophila verna*, Parsley-piert *Aphanes arvensis*, Buck's-horn Plantain *Plantago coronopus* and small annual mouse-ears *Cerastium spp.* Such areas also supported a few common pioneering bryophytes, including *Bryum rubens*, *B. dichotomum*, and *B. argenteum*. None offered potential habitat to Petalwort. **Annex 3** lists all 44 common and widespread bryophyte taxa seen in the course of the survey.

5. Summary

43. The DBA found that Petalwort distribution is highly localised in the central parts of the SAC with four main sub-populations: northmost sub-population, sub-population 1km south, larger sub-population east of Airy Point and the largest sub-population in the southern end of Braunton Burrows. The DBA also showed that the population trend of Petalwort at Braunton Burrows is of high concern with sharp declines discovered.
44. The DBA also found that the proposed cabling below the Crow Point car park is at least 300m east of the nearest Petalwort in Broadsands and therefore outside of the survey area covering the Onshore Development Area plus 20m buffer. The actively used public Crow Point car park east of Broadsands (as accessed via the toll road) has entirely unsuitable habitat for Petalwort.
45. The Petalwort survey found that the nearest confirmed extant population of Petalwort to the proposed cabling below Braunton Burrows is in Beach Head Slack, approximately 1.3km to the south (Pilkington, 2023b). All other known past and present populations in the SAC lie even further away. It is reasonable to conclude, therefore, that the proposed onshore cabling for White Cross Offshore Windfarm will have no impact on the population of Petalwort in Braunton Burrows.

6. References

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Callaghan, D. A. (2022). A new IUCN Red List of the Bryophytes of Britain, 2023. *Journal of Bryology*, 44:4, 271-389.

Holyoak, D. T. (1998). Rare plant surveys at Braunton Burrows: Water Gemander (*Teucrium scordium*) and Petalwort (*Petalophyllum ralfsii*). *Unpublished report to English Nature on contract*. F14-01-627

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Annex 1: Petalwort Technical Advice Note

P22-827 WHITE CROSS OFFSHORE WINDFARM

Technical Advice Note: Petalwort at Braunton Burrows SAC

Revised April 19th 2024

Introduction

The purpose of this Advice Note is to provide advice to BSG Ecology Ltd about any likely impacts of the proposed development of White Cross Offshore Windfarm on the population of Petalwort *Petalophyllum ralfsii* (Wils.) Nees & Gottsche at Braunton Burrows Special Area of Conservation (SAC).

Author Credentials

Sharon Pilkington is a nationally recognised professional botanist specialising in bryophytes. She has undertaken numerous bryophyte assessments in Britain and Ireland since 2000 and is the British Bryological Society's national Recorder for Mosses. She recently undertook a condition assessment of Petalwort at Braunton Burrows (Pilkington, 2023).

Information Sources

Petalwort has been known from Braunton Burrows for many decades, and the dune complex was well known as a stronghold of this species during the 1960s. By 1997, however it was feared extinct there and in north Devon. However, it was rediscovered by David Holyoak (Holyoak, 1998), who then carried out further monitoring in 2001, 2005 and 2008. Some of the records made between 1998 and 2008 during these earlier surveys are available for public viewing on the National Biodiversity Network Atlas website www.nbnatlas.org.

Other sources of information about the distribution of Petalwort at Braunton Burrows that have been consulted in the preparation of this Advice Note include:

- Data digitised from a monitoring survey in 2018 by Matthew Stribley on behalf of the Freshwater Habitats Trust (Stribley, 2018).
- All 89 validated records of Petalwort at Braunton Burrows held in the British Bryological Society's comprehensive records database¹. These cover dates between 1950 and 2015 and include those generated by Holyoak's surveys of 1998 - 2008.

No further monitoring of the Petalwort population was undertaken until 2023 when the author was commissioned to undertake a survey and condition assessment funded by Natural England's Dynamic Dunescapes project. The scope of the work was to update the known extent of Petalwort across the SAC and assess its condition. As part of this, historical populations were revisited and new areas of potential habitat were surveyed. Detailed records were generated and have also been used to inform this Advice Note.

¹ Complete North Devon (Watsonian vice-county 4) validated dataset of records of mosses, liverworts and hornworts. Made available online to BBS Regional Recorders in October 2022.

The Habitat and Ecology of Petalwort

Petalwort is a perennial thallose liverwort belonging to the family Petalophyllaceae. Its plants (known as thalli) grow in solitary rosettes or in mats, each thallus generally measuring up to 10 mm in diameter and up to 15mm long. A subterranean lipid-packed rhizome-like stem allows it to withstand long periods of desiccation, with the visible parts of the plant dying back during dry conditions in summer.

Petalwort is dioicous and often fertile; spore-producing capsules are carried by female plants from December to June. The spores are relatively large and may persist in the soil for long periods until environmental conditions become suitable for new plant growth. No asexual propagules are known, but it can reproduce clonally by means of bifurcation whereby the thallus splits into two and underground branches can also give rise to new thalli.

In Britain and Ireland, Petalwort is mainly a coastal species of calcareous sand dunes and machair where it behaves as a pioneer along the edges of dune slacks subject to inundation in the winter. However, it avoids ground that is dry, deeply flooded in winter or heavily shaded. In some sites, (including Braunton Burrows) it is heavily dependent on light disturbance and compaction provided by the movements of vehicles, humans and/or livestock. It rarely grows on pure damp sand, instead preferring more water-retentive sand-peat soils.

In England, there are strong populations at a number of dune complexes in Devon and Cornwall. Whilst some colonies have increased in recent years, others have declined due to a trend of sand-dune stabilisation which over time causes dune slacks to dry out as a result of the processes of natural succession.

Petalwort is a species of high conservation importance and it is listed on Schedule 8 of the Wildlife & Countryside Act 1981 (as amended), receiving full legal protection. It is also listed under the Habitats Directive (92/43/EEC) as an Annex II species. In Britain, the species is also recognised as Nationally Scarce (Pescott, 2016) and is regarded as Vulnerable in the current Red List (Callaghan, 2022).



Petalwort

Distribution of Petalwort at Braunton Burrows

Layers of records georeferenced i.e. to 100m resolution or greater from all data sources were added to a Quantum GIS project to display the known distribution of Petalwort (Figure 1).

Figure 1 shows that the population is highly localised in the central and southern parts of the SAC, with populations remaining faithful to these areas over many years whilst the habitat stays suitable. There are four main sub-populations:

- The northernmost sub-population (now very small) is in the long complex known as Beach Head Slack, with a small outlier found in the adjacent Bush Grass Slack in 2018.
- More than 1km further south, small populations have been found in Raven Slack and Long Slack.
- A much larger sub-population is scattered through a series of interconnected slacks disturbed by military activity east of Airy Point. It is present over a distance of approximately 1.3km from Doughnut Slack to Twayblade Slack via Pebble Slack.
- The largest sub-population is known from the southern end of Braunton Burrows, in the disused Broadsands car park and scattered along 1.4km of the verge of the American Track (shown in Figure 1 as the Tarka Trail and the South-west Coast Path).

The 2023 work showed that the population of Petalwort at Braunton Burrows is currently in sharp decline after two decades of expansion. Its stronghold remains the now-closed Broadsands car park, near Crow Point. No Petalwort has ever been reported from the SAC north of Beach Head Slack. It is known that Petalwort has gone from slacks in the Hog Wood Plain area south-east of Sandy Lane car park, where it was present in large numbers between 1957 and 1971 (Holyoak 2005).

Likely impacts of the proposed development of White Cross Offshore Windfarm Project on Petalwort

Cabling for the White Cross Offshore Windfarm would come ashore at Saunton Sands then travel east initially, crossing Saunton Golf Club, before turning and running south across farmland to Crow Beach House before crossing the Taw estuary. The initial onshore part of the project would involve installing cabling below Braunton Burrows SAC. The cables will be installed below ground level, using trenchless technology. Possible risks to the SAC that are being considered relate to frac out, where the inert drilling lubricant, which is bentonite clay-based, is inadvertently forced up to the surface due to ground conditions and could affect adjacent vegetation. However it is understood that this risk of this impact is very low (frac out is not anticipated), and that, were it to occur, it is likely to be very localised (likely to be limited to very few meters, at most).

Classification of vegetation communities in the vicinity of the onshore development area in the SAC was undertaken in 2023. The work confirmed the presence of a number of sand-dune communities but none of the five National Vegetation Classification (NVC) dune slack communities which could theoretically support Petalwort:

SD13 *Sagina nodosa* – *Bryum pseudotriquetrum* dune-slack community

SD14 *Salix repens* – *Campyllum stellatum* dune-slack community

SD15 *Salix repens* – *Calliergonella cuspidata* dune-slack community

SD16 *Salix repens* – *Holcus lanatus* dune-slack community

SD17 *Potentilla anserina* – *Carex nigra* dune-slack community

Likelihood of Impacts on Petalwort at Braunton Burrows SAC

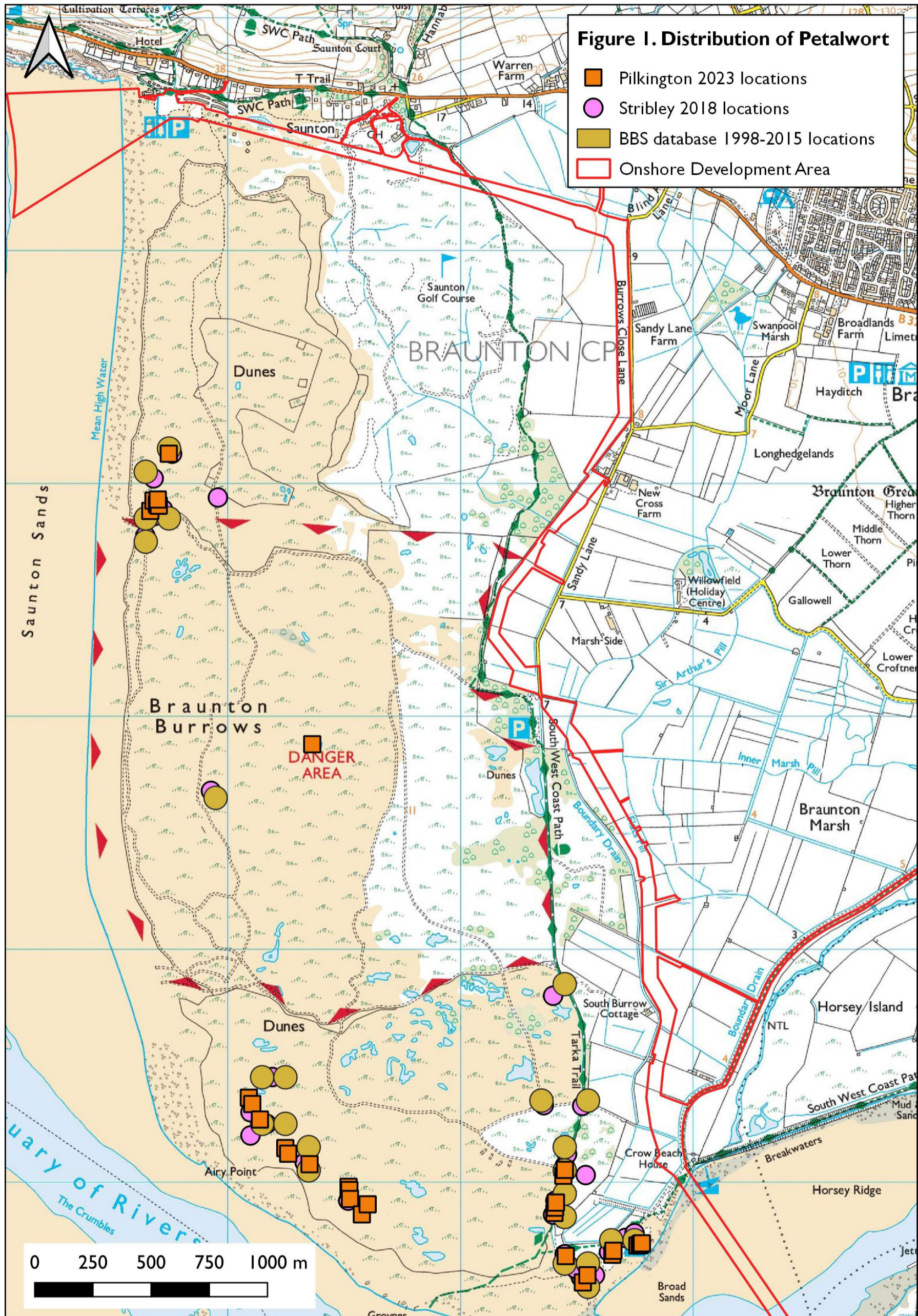
There appears to be a very low risk of Petalwort being impacted by the proposed onshore work associated with the windfarm development. This conclusion is based on (a) lack of evidence of any

Petalwort ever being found within 1 km of this area and (b) a lack of dune slack vegetation (that might support it) in the same area.

However, both assumptions carry some uncertainty. First of all, it is not known if dune slacks in the northern part of Braunton Burrows SAC have ever had targeted Petalwort surveys. It is clear that recent monitoring and condition assessment work has focussed on habitats in the central and southern parts of the burrows but it is an enormous site, and there is potential for past surveys to have concentrated on historical localities for Petalwort and not put much effort into surveying new areas. A second issue of uncertainty is habitat mapped as having 'No NVC classification' in the NVC survey. These areas relate to car park access roads, a modern holiday lodge development and golf course greens/fairways. In some southern parts of the SAC, Petalwort occupies habitat that would not be classified as any of the five NVC dune slack communities SD13-SD16, for example in damp depressions in the former Broadsands car park and on the verges of the American Road. Furthermore, Petalwort may grow in small and highly localised areas of damp, disturbed ground (dog-walker's paths, for example) whilst being absent from other suitable-looking areas. As such the presence of Petalwort in these areas is unlikely but cannot be ruled out.

Recommendations

To address the uncertainties identified above, it is recommended that a Petalwort survey is undertaken in dune habitats in the northern part of the SAC within a 20m radius of the red line boundary of the onshore cable route. The survey should be undertaken between January and April, which is when Petalwort is most conspicuous. The aim of the survey would be to confirm the assessment, and to either rule out the presence of this species, or should any be located provide information on the location of this species in the working area, this would enable these areas to be identified and factored into the CEMP for the project.



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Annex 2: Petalwort Survey Report



VEGETATION SURVEY & ASSESSMENT

WHITE CROSS OFFSHORE WINDFARM PETALWORT *PETALOPHYLLUM RALFSII* SURVEY

A report for BSG Ecology Ltd

Revision I

April 2024



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I. INTRODUCTION

BSG Ecology Ltd is currently providing ecological advice to the developers of the proposed White Cross Offshore Windfarm. The initial onshore part of the project would involve installing cabling using trenchless technology below Braunton Burrows Special Area of Conservation (SAC). Cabling for the windfarm would come ashore at Saunton Sands, travelling east initially across the dunes at the northern end of Braunton Burrows before crossing Saunton Golf Club and leaving the SAC to run south through farmland.

Braunton Burrows supports a large but scattered population of the nationally rare Petalwort *Petalophyllum ralfsii*, a liverwort that is legally protected and listed on Schedule 8 of the Wildlife & Countryside Act (1981, as amended). Petalwort is also listed as Vulnerable in Europe and is included on Annex II of the Habitats Directive.

Petalwort has never been recorded from the corridor of land to be crossed by the cabling at the far northern end of the SAC and a feasibility study (Pilkington, 2023a) concluded that it was unlikely that it would be present. However, to rule out any doubt, a survey of the potential impact area was commissioned.



Petalwort

2. ASSESSMENT APPROACH

2.1 Methodology

The survey was undertaken on 27th February 2024 by Sharon Pilkington, an independent professional bryologist with over 20 years' contract experience and expertise in Petalwort assessments. The weather was dry and mild and the ground was moist after rain, so field conditions were ideal. February is an optimal time of year for surveying Petalwort, a perennial species that typically begins above-ground growth in autumn, producing spores in late winter and spring and then retreating underground in the warmest and driest months.

The survey area included an irregular corridor 1.5 km long from the beach at Saunton Sands to the eastern edge of Saunton Golf Course (the proposed cabling route or Onshore Development Area). It was extended to include a 20m buffer on both sides of the ODA. A slow walkover specifically sought out low-lying open ground that might offer suitable Petalwort habitat. Figures 1.1-1.3 show the GPS-generated walkover route taken from west to east.

Petalwort has very closely defined habitat needs. In dune systems such as Braunton Burrows SAC, it is almost always confined to dune slacks or associated damp grassland where regular trampling by people, livestock and/or light vehicles create small pockets of bare ground and restrict competition from other plants. It avoids bare sand, preferring humus-rich sandy soil which contains a significant amount of organic matter and where the water table is high enough to encourage moisture retention without prolonged periods of flooding in winter. For more information about the ecology of Petalwort, see Pilkington (2023a).

Potential habitat was searched for rosettes of Petalwort, which, if found would be georeferenced using a GPS/GLONASS navigational receiver¹ with a normal positioning accuracy of 3 metres in open terrain.

Other mosses and liverworts were also recorded for completeness and context. Names of bryophytes in this report follow the current checklist of Blockeel et al. (2021). Names of vascular plants follow the taxonomy of Stace (2019).

Quantum GIS software (QGIS Development Team, 2024) was used to prepare the figures in this report.

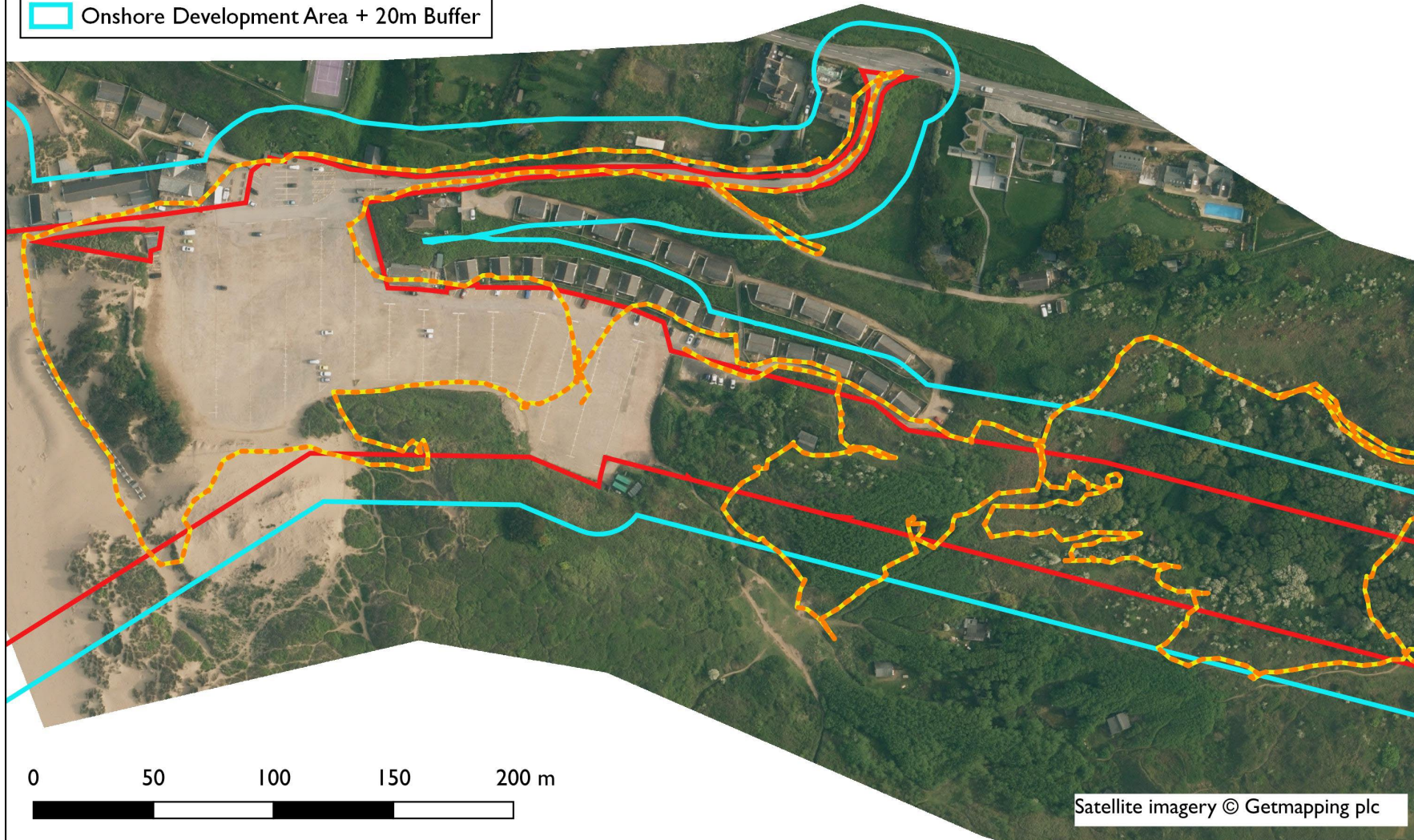
2.2 Limitations

No limitations or problems were encountered during the fieldwork that might compromise the findings.

¹ Garmin model GPSMAP 64S.

Figure 1.1 Survey area west

- Survey route
- Onshore Development Area
- Onshore Development Area + 20m Buffer



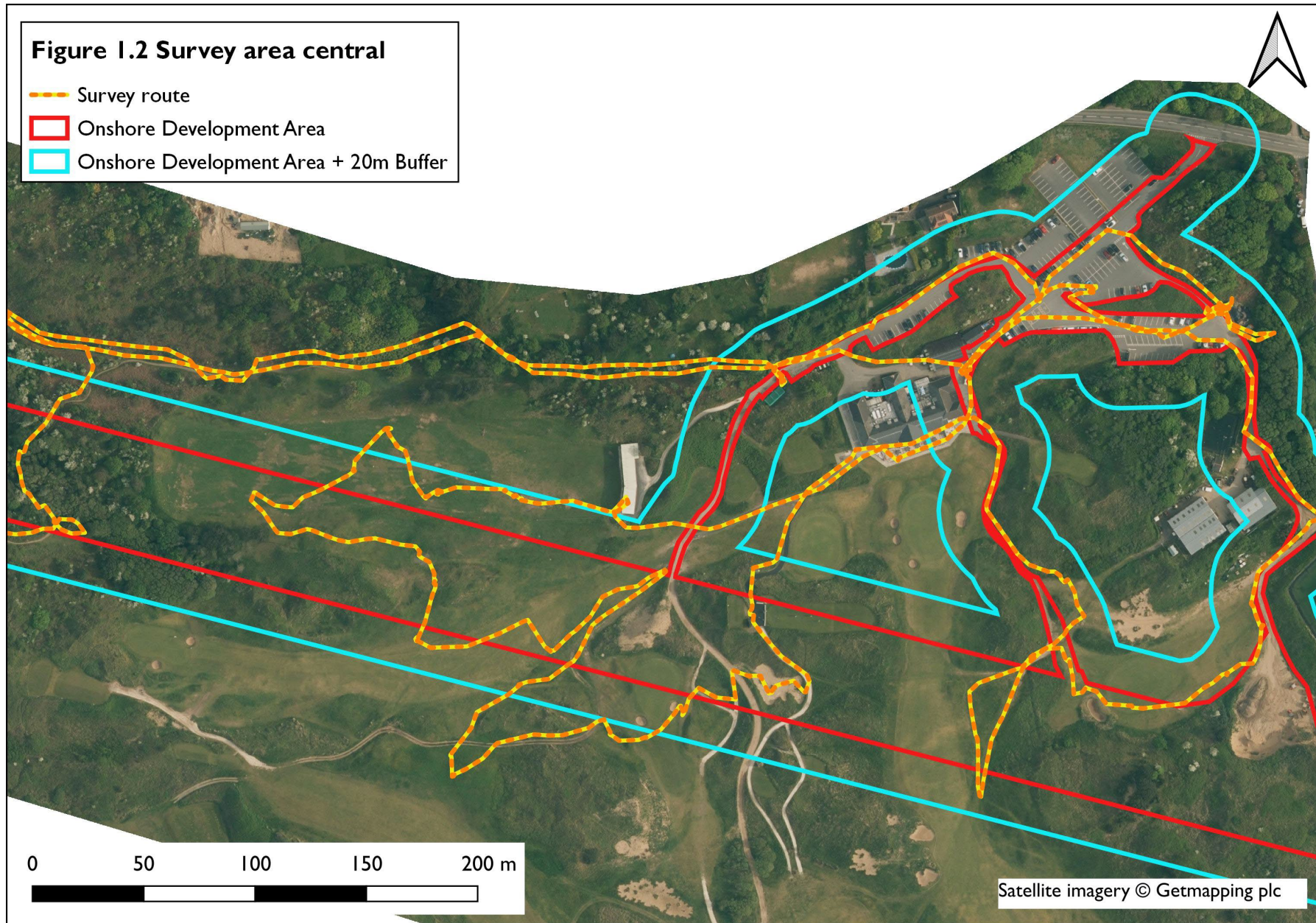
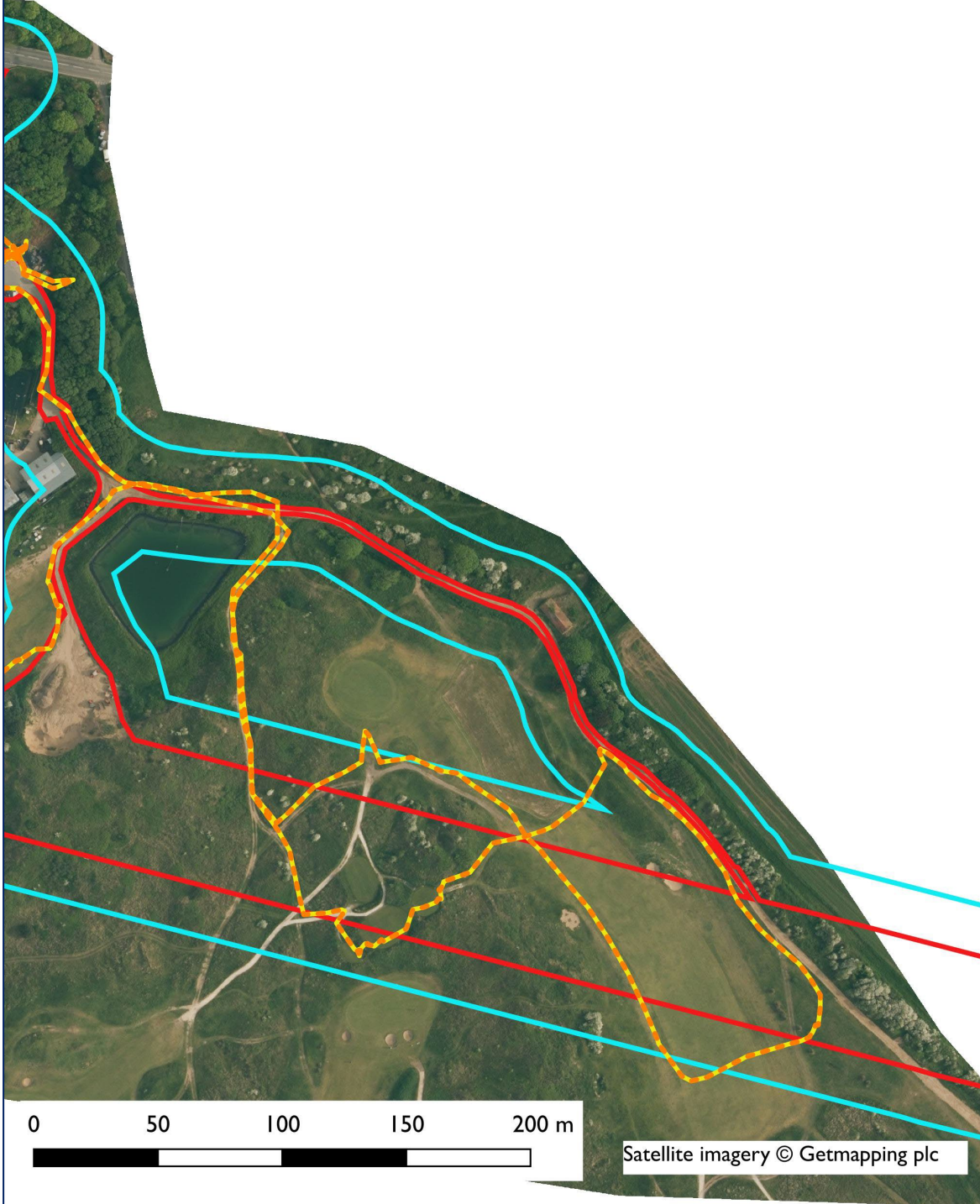


Figure 1.3. Survey area east

- Survey route
- ▭ Onshore Development Area
- ▭ Onshore Development Area + 20m Buffer



3. RESULTS

No Petalwort was found within the survey area and its habitats were considered to be unequivocally unsuitable for it.

Stabilised sand dunes in the western part of the survey area were found to be predominantly dry and elevated and covered in coarse vegetation defined by mixtures of Marram *Ammophila arenaria*, Atlantic Ivy *Hedera hibernica*, Bracken *Pteridium aquilinum* and Bramble *Rubus fruticosus* agg. among extensive and dense stands of mixed scrub.

Small patches of open dune grassland kept short and free of scrub by rabbit browsing supported more diverse vascular communities but were also well-drained. Characteristic bryophytes of the dunes included *Syntrichia ruraliformis*, *Pseudoscleropodium purum*, *Homalothecium lutescens*, *Brachythecium rutabulum*, *Rhynchostegium megapolitanum*, *Barbula unguiculata* and *Streblotrichum convolutum* var. *convolutum*.

No dune slacks were present, although one large willow-dominated depression held damp ground. This was a man-made feature of unknown purpose comprising a series of parallel low ridges and ditches. Now disused, it has been colonised by a dense and tangled stand of Grey Willow *Salix cinerea* and White Willow *S. alba* over Greater Pond-sedge *Carex riparia* and Bramble. It was considered far too overgrown and shaded to support Petalwort.

In Saunton Golf Course, the focus of the survey was short turf in low-lying fairways, greens and the driving range. Roughs, bunkers and elevated ground generally were all considered completely unsuitable for Petalwort.

The course lies over partially reclaimed dunes and the fairways, greens and driving range appear to be carefully managed to optimise drainage and maintain a very short uniform sward of fine-leaved grasses. As such, they offered no habitat to Petalwort either. Small, heavily trampled patches of bare or sparsely vegetated ground were occasionally associated with the fairways or ground between them. These areas supported communities of small pioneering species e.g. Annual Meadow-grass *Poa annua*, Common Whitlowgrass *Erophila verna*, Parsley-piert *Aphanes arvensis*, Buck's-horn Plantain *Plantago coronopus* and small annual mouse-ears *Cerastium* spp. Such areas also supported a few common pioneering bryophytes, including *Bryum rubens*, *B. dichotomum*, and *B. argenteum*. None offered potential habitat to Petalwort.

Appendix I lists all 44 common and widespread bryophyte taxa seen in the course of the survey.

4. CONCLUSIONS

The nearest confirmed extant population of Petalwort to the proposed cabling route across the northern end of Braunton Burrows SAC is in Beach Head Slack, approximately 1.3 km to the south (Pilkington, 2023b). After leaving Saunton Golf Course the cabling route is outside the SAC and well away from its other populations of Petalwort.

The nearest known Petalwort to any part of the Onshore Development Area is in the disused Broadsands car park at the southern end of the SAC. However, the nearest population there is approximately 300m from the proposed cabling route across the Crow Point car park.

It is reasonable to conclude, therefore, that the proposed onshore cabling for White Cross Offshore Windfarm will have no impact on the population of Petalwort in Braunton Burrows.

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APPENDIX I. INVENTORY OF SPECIES

Scientific name

Amblystegium serpens
Barbula unguiculata
Brachythecium albicans
Brachythecium rutabulum
Bryum algovicum var. rutheanum
Bryum argenteum
Bryum capillare
Bryum dichotomum
Bryum pseudotriquetrum
Bryum radiculosum
Bryum rubens
Cratoneuron filicinum
Cryphaea heteromalla
Didymodon fallax
Didymodon insulanus
Didymodon nicholsonii
Didymodon vinealis
Frullania dilatata
Funaria hygrometrica
Grimmia pulvinata
Homalothecium lutescens
Homalothecium sericeum
Hylacomia delphus triquetrus
Hypnum cupressiforme var. lacunosum
Hypnum cupressiforme var. resupinatum
Kindbergia praelonga
Lewinskya affinis
Metzgeria furcata
Myriocoleopsis minutissima
Orthotrichum tenellum
Oxyrrhynchium hians
Plenogemma phyllantha
Pseudocrossidium hornschuchianum
Pseudoscleropodium purum
Rhynchostegium confertum
Rhynchostegium megapolitanum
Rhytidiadelphus squarrosus
Streblotrichum convolutum var. commutatum
Streblotrichum convolutum var. convolutum
Syntrichia ruraliformis
Tortula muralis
Trichostomum brachydontium
Ulota bruchii
Zygodon viridissimus

Vernacular name

Creeping Feathermoss
Bird's-claw Beardmoss
Whitish Feathermoss
Rough-stalked Feathermoss
Drooping Threadmoss
Silver-moss
Capillary Threadmoss
Bicoloured Bryum
Marsh Bryum
Wall Threadmoss
Crimson-tuber Threadmoss
Fern-leaved Hookmoss
Lateral Cryphaea
False Beardmoss
Cylindric Beardmoss
Nicholson's Beardmoss
Soft-tufted Beardmoss
Dilated Scalewort
Bonfire Moss
Grey-cushioned Grimmia
Yellow Feathermoss
Silky Wall Feathermoss
Big Shaggy-moss
Great Plaitmoss
Supine Plaitmoss
Common Feathermoss
Wood Bristlemoss
Forked Veilwort
Minute Pouncewort
Slender Bristlemoss
Swartz's Feathermoss
Frizzled Pincushion
Hornschuch's Beardmoss
Neat Feathermoss
Clustered Feathermoss
Megapolitan Feathermoss
Springy Turf-moss
Sardinian Bird's-claw Beardmoss
Lesser Bird's-claw Beardmoss
Sandhill Screwmoss
Wall Screwmoss
Variable Crisp-moss
Bruch's Pincushion
Green Yokemoss

Annex 3: Inventory of species recorded during the field surveys

Amblystegium serpens Creeping Feathermoss
Barbula unguiculata Bird's-claw Beardmoss
Brachythecium albicans Whitish Feathermoss
Brachythecium rutabulum Rough-stalked Feathermoss
Bryum algovicum var. *rutheanum* Drooping Threadmoss
Bryum argenteum Silver-moss
Bryum capillare Capillary Threadmoss
Bryum dichotomum Bicoloured Bryum
Bryum pseudotriquetrum Marsh Bryum
Bryum radiculosum Wall Threadmoss
Bryum rubens Crimson-tuber Threadmoss
Cratoneuron filicinum Fern-leaved Hookmoss
Cryphaea heteromalla Lateral Cryphaea
Didymodon fallax False Beardmoss
Didymodon insulanus Cylindric Beardmoss
Didymodon nicholsonii Nicholson's Beardmoss
Didymodon vinealis Soft-tufted Beardmoss
Frullania dilatata Dilated Scalewort
Funaria hygrometrica Bonfire Moss
Grimmia pulvinata Grey-cushioned Grimmia
Homalothecium lutescens Yellow Feathermoss
Homalothecium sericeum Silky Wall Feathermoss
Hylocomiadelphus triquetrus Big Shaggy-moss
Hypnum cupressiforme var. *lacunosum* Great Plaitmoss
Hypnum cupressiforme var. *resupinatum* Supine Plaitmoss
Kindbergia praelonga Common Feathermoss
Lewinskya affinis Wood Bristlemoss

Metzgeria furcata Forked Veilwort
Myriocoleopsis minutissima Minute Pouncewort
Orthotrichum tenellum Slender Bristlemoss
Oxyrrhynchium hians Swartz's Feathermoss
Plenogemma phyllantha Frizzled Pincushion
Pseudocrossidium hornschuchianum Hornschuch's Beardmoss
Pseudoscleropodium purum Neat Feathermoss
Rhynchostegium confertum Clustered Feathermoss
Rhynchostegium megapolitanum Megapolitan Feathermoss
Rhytidiadelphus squarrosus Springy Turf-moss
Streblotrichum convolutum var. *commutatum* Sardinian Bird's-claw Beardmoss
Streblotrichum convolutum var. *convolutum* Lesser Bird's-claw Beardmoss
Syntrichia ruraliformis Sandhill Screwmoss
Tortula muralis Wall Screwmoss
Trichostomum brachydontium Variable Crisp-moss
Ulota bruchii Bruch's Pincushion
Zygodon viridissimus Green Yokemos