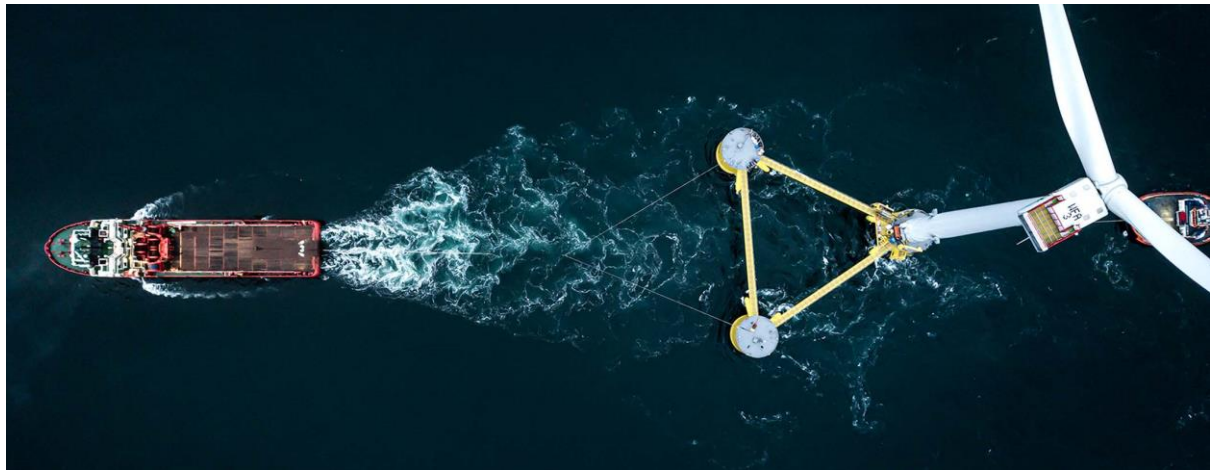




Blue Gem Wind

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REPORT

Blue Gem Wind Project Intertidal Habitat Report 2020

BGW Document No.:	ERE-CON-ITP-CON-ENV-0107 Rev 02
Contractor Document No.:	OEL_ROVERE0420_TCR_INT_V04
Document Status:	IFR
Phase:	PS
Class:	1
Contractor Entity:	Offshore Wind Consultants Ltd, 6 Bevis Marks, London EC3A 7BA



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Document History

Rev	Date	Authored	Reviewed	Approved	OWC Approval	Modifications
04	2020-05-22	Ross Griffin	Katie Cross Marja Aberson Sam Strutton	Sam Strutton		[Add list of modifications]



Ocean Ecology

Marine Surveys, Analysis & Consultancy

Erebus Floating Offshore Wind Farm Intertidal Habitat Report 2020

REF: OEL_ROVERE0420_TCR_INT_V04



Details

Version	Date	Description	Author(s)	Reviewed By	Approved By
V01	14/12/2020	Draft issued to client	Karen Boswarva, Elena Cappelli	Gary Robinson	Ross Griffin
V02	19/03/2021	Revised following client comment	-	Gary Robinson	Ross Griffin
V03	07/04/2021	Revised following client comment	-	Elena Cappelli	Ross Griffin
V04	10/05/2021	Final Issue	-	Elena Cappelli	Ross Griffin

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Abbreviations

BSH	Broadscale Habitat
CAA	Civil Aviation Authority
DEM	Digital Elevation Model
EMODnet	European Marine Observation and Data Network
EUNIS	European Nature Information System
FLOW	Floating Offshore Windfarm
GPS	Global Positioning System
GSD	Ground-Sampling Distance
INNS	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MNCR	Marine Nature Conservation Review
NERC	Natural Environment and Rural Communities
NRW	Natural Resources Wales
OEL	Ocean Ecology Ltd
OWF	Offshore Wind Farm
PfCO	Permission for Commercial Operations
RPQs	Remote Pilot Qualification
SAC	Special Area of Conservation
SBE1	Simply Blue Energy 1
UAV	Unmanned Aerial Vehicle
WTGs	Wind Turbines Generators

4. Non-Technical Summary

This report presents the findings of two principle intertidal surveys, conducted at the proposed landfall location options for the Project Erebus Floating Offshore Wind development export cable route. The key aim was to characterise and map the benthic habitats present across the foreshore as part of a wider programme of characterisation surveys of the export cable corridor and array areas.

The surveys took place at West Angle Bay and Sawdern Point between the 16th and 17th October 2020 and involved the collection of Unmanned Aerial Vehicle (UAV) aerial imagery accompanied by core and quadrat sampling to gather detailed information on the benthic communities present for subsequent biotope mapping purposes. A full suite of images, cores and quadrats were collected across the full extent of the intertidal foreshore at each site between Mean Low Water Springs (MLWS) and Mean High Water Springs (MHWS).

In West Angle Bay, an intricate landscape was encountered with a narrow band of coarse sediments (A2.11) giving way to a large area of littoral sand (A2.2 and A2.21) in the upper shore and rocky habitats (A1.11, A1.214 and A3.211), including rockpools (A1.4), in the mid to lower shore. West Angle Bay was also flanked by rock cliffs and ledges, at times covered in lichens and/or angiosperms (B3.1, B3.2 and B3.3).

A typical zonation was observed in Sawdern Point; this included supralittoral rocks and cliffs covered in lichens and green seaweeds (B3.11) and upper shore zones characterised by rocky habitats and biotopes supporting a number of marine invertebrates, fucoids (A1.1131, A1.2141, A1.212) and red seaweeds (A1.125). The lower shore was characterised by fine sand supporting the polychaete *Lanice conchilega* (A2.245) with patches of rocks covered in *Laminaria digitata* (A3.2111). Very low-density dwarf eelgrass (*Zostera noltei*) shoots were observed on the very low shore at the northern end of the Sawdern Point survey area whilst low lying veneers of honeycomb worm (*Sabellaria alveolata*) tube aggregations were recorded on the lower shore at the southern end. The slipper limpet *Crepidula fornicata*, an Invasive Non-Native Species (INNS), was also observed across the Sawdern Point survey area in low densities.

All EUNIS rock classifications observed at both West Angle Bay and Sawdern Point were deemed to form part of the designated Annex I 'reef' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC and included under 'Littoral Rock: Intertidal boulder communities/estuarine rocky habitats' on the list of Section 7 Habitats of Principle Importance under the Environment (Wales) Act (2016). No specific guidelines exist to assess whether rocky shores in the intertidal zone can qualify as Annex I reefs; however, the general rule is that if intertidal rocky habitats extend continuously into the subtidal area then they qualify as Annex I reefs. To note that supralittoral rock and ledges were observed above mean high water spring (MHWS) mark across the survey area and assigned under Annex I reef; however, these features are located outside of the boundaries of the intertidal survey area, so no further details are provided for

these biotopes. The sandy sediment habitats at both West Angle Bay and Sawdern Point were also deemed to be representative of the designated Annex I habitat 'mudflats and sandflats not covered by seawater at low tide' and under 'Littoral Sediment: Intertidal mudflats' on the list of Habitats of Principle Importance under Section 7 of the Environment (Wales) Act (2016). As such, Annex I 'mudflats and sandflats not covered by seawater at low tide' can be assigned to three broad categories based on the type of substrate and fauna they support; across the survey area as a whole, including both West Angle Bay and Sawdern Point, they were deemed to be all clean sands able to support amphipod crustaceans and polychaete worms. To note that other sediment types were present across the survey area (e.g. mixed sediment) which are not an Annex I habitat or protected under Section 7 of the Environment (Wales) Act (2016).

There were no observations of shore dock (*Rumex rupestris*) along the upper shore areas of both West Angle Bay and Sawdern Point which is designated as an Annex II species of the Pembrokeshire Marine/Sir Benfro Forol SAC and there was no evidence of biogenic reef.

5. Introduction

5.1. Project Erebus

Blue Gem Wind is the developer and seabed leaseholder for Project Erebus, a proposed floating offshore wind (FLOW) development in the Celtic Sea region. The project is located approximately 44 km southwest of the Pembrokeshire coastline, in an outline area of interest of approximately 43.5 km². Project Erebus will include both offshore and onshore infrastructure which includes:

- 6-10 floating Wind Turbine Generators (WTGs) with associated semi-submersible platforms and mooring infrastructure
- inter-array cables
- a single export cable route to landfall
- onshore cabling between landfall and the grid connection
- onshore substation at the grid connection point.

Four potential cable routes were initially proposed, with two primary potential landfall locations at West Angle Bay and Sawdern Point, and optional landfall locations at Freshwater West A, and Freshwater West B. Only the two primary landfall locations were taken forward during the survey (West Angle Bay and Sawdern Point) with approximate export cable route length ranging between 44.5 km at West Angle Bay and 48.7 km at Sawdern Point.

5.2. Project Background

Ocean Ecology Limited (OEL) were commissioned by Rovco to undertake a Phase I intertidal mapping survey. The survey involved the collection of Unmanned Aerial Vehicle (UAV) imagery, Phase I walk over survey and Phase II quadrat and core sample data to characterise and map the soft-and-hard substrates and associated benthic communities of two potential landfall locations (Figure 2). The key objective was to map the distribution and extent of individual or groups of broadscale habitats, biotopes, biotope complexes and life forms present with a focus on confirming the presence/absence of any habitats and/or features of conservation interest across the landfall locations (e.g. reef habitats and seagrass beds).

This report provides a summary of the survey methodologies employed and detailed mapping of the habitats encountered during the survey. Habitats were determined through detailed interpretation of the UAV imagery, walkover and sample data allowing for the determination of EUNIS habitats and biotopes (where possible) and subsequent creation of full coverage mapping across the survey areas.

5.3. Current Understanding

Existing intertidal habitat mapping (EMODnet) suggests the habitats present within the survey areas primarily consist of intertidal sandy shores with moderate-high energy intertidal rock representative of a number of Habitats of Principal Importance under the Environment (Wales) Act (2016) including 'Littoral Rock', 'Littoral Sediment' and 'Supralittoral rock'.

Biogenic habitats (e.g. biogenic reefs, seagrass beds, saltmarsh) are known to occur throughout Milford Haven but identified in only a few sheltered locations in the outer reaches, such as around Dale, Sawdern Point and West Angle Bay.

Milford Haven waterway is a hot spot for invasive non-native species (Mieszowska 2011) including slipper limpet (*Crepidula fornicata*), Japanese wireweed (*Sargassum muticum*), and wakame (*Undaria pinnatifida*). Modification of habitat and associated communities is observable in areas of high density of invasive species although this is thought to generally be limited to impacts of *C. fornicata* on the known subtidal maerl beds.

5.3.1. Pembrokeshire Marine/Sir Benfro Forol Special Area of Conservation

The intertidal survey areas are located within the Pembrokeshire Marine/Sir Benfro Forol Special Area of Conservation (SAC) (Figure 2). The Pembrokeshire Marine/Sir Benfro Forol SAC extends from just north of Abereddy on the north Pembrokeshire coast to just east of Manorbier in the south including the entirety of the Milford Haven Waterway, the largest estuary in Wales. The SAC also includes the coast of the islands of Ramsey, Skomer, Grassholm, Skokholm, the Bishops and Clerks and The Smalls. The site encompasses open marine areas and coast; estuary and intertidal areas, that together support a wide range of different marine habitats and wildlife, some of which are unique in Wales.

Pembrokeshire Marine/Sir Benfro Forol SAC is a multiple interest site that has been selected for the presence of eight marine Annex I habitat features, and seven Annex II species features, seven of which are thought to occur within the intertidal survey areas. For the qualifying habitats and species, the Pembrokeshire Marine SAC is considered to be one of the best areas in the UK for:

- 1160 Large shallow inlets and bays
- 1130 Estuaries
- 1170 Reefs
- 1364 Grey seal (*Halichoerus grypus*)

and to support a significant presence of:

- 1130 Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- 1140 Mud-flats and sand-flats not covered by seawater at low tide
- 1150 Coastal lagoons
- 8330 Submerged or partially submerged sea caves

- 1110 Sandbanks which are slightly covered by seawater all the time
- 1102 Allis shad (*Alosa alosa*)
- 1103 Twaite shad (*Alosa fallax*)
- 1099 River lamprey (*Lampetra fluviatilis*)
- 1095 Sea lamprey (*Petromyzon marinus*)
- 1355 Otter (*Lutra lutra*)
- 1441 Shore dock (*Rumex rupestris*)

The features are distributed throughout the SAC with no single feature occupying the entire SAC and with features overlapping in some locations. The SAC boundary and the general location of the Annex I habitat features are shown in Figure 1. These are indicative maps as the extent of most features is not known precisely and some, such as sandbanks, are dynamic and can be highly mobile (NRW 2018).

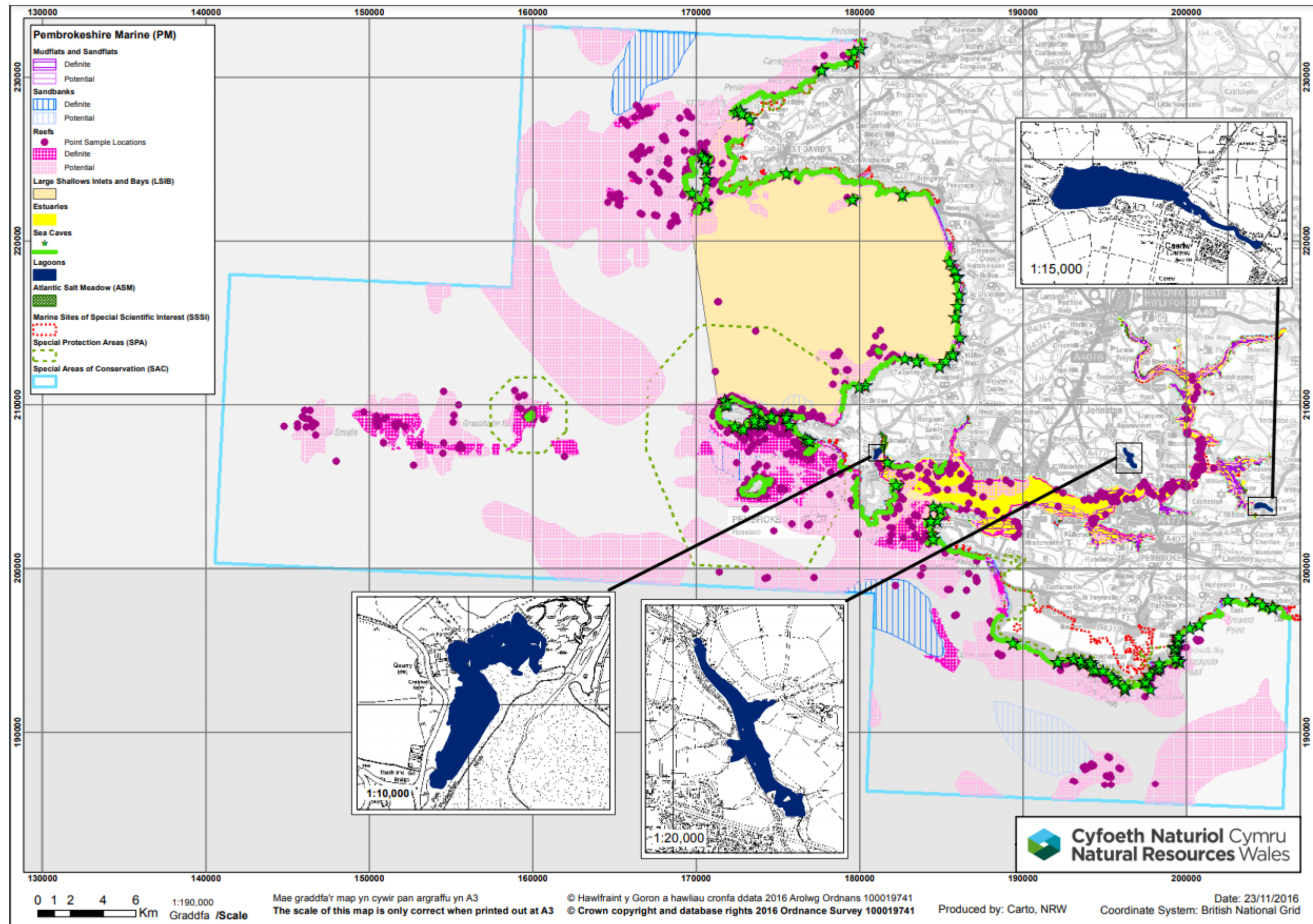


Figure 1 Location and extent of the Pembrokeshire Marine/Sir Benfro Forol SAC. Source: [Lle Geo-Portal for Wales](http://lle.geo-portal.org.uk).



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Figure 2 Location of the intertidal survey areas at EREBUS export cable landfalls in West Angle Bay and Sawdern Point located within the Pembrokeshire Marine/Sir Benfro Forol SAC.

6. Methods

6.1. Survey Design

The intertidal surveys covered the entirety of the 500 m cable corridors at each location extending from Mean Low Water Springs (MLWS) to Mean High Water Springs (MHWS). An UAV survey was undertaken to collect high-resolution imagery across the survey areas at low water. Additionally, a total of 111 quadrat (58 at West Angle Bay and 53 at Sawdern Point) and 34 core locations (28 at West Angle Bay and 6 at Sawdern Point) were selected across the survey areas to supplement the Phase I walkover survey and UAV imagery and inform subsequent habitat / biotope mapping.

6.2. Survey Methods

6.2.1. Phase I Walkover Survey

The Phase I intertidal survey was undertaken during spring tides using ESRI ArcCollector on a Bad Elf GPS & GLONASS (2.5 m accuracy) enabled tablet device in consideration of guidance in the Marine Monitoring Handbook (Davies et al. 2001), CCW Handbook for Marine Intertidal Phase I Survey and Mapping (Wyn et al. 2006) and latest guidance for characterising intertidal rocky shore and sediment habitats (NRW 2019a b). During the walkover survey, EUNIS classifications were assigned in consideration of the latest Joint Nature Conservation Committee (JNCC) guidance (Parry 2019). These were correlated to the Marine Habitat Classification for Britain and Ireland (MNCRI) and, where possible, boundaries of habitats / biotopes were tracked as polygons in ESRI ArcCollector. A detailed intertidal survey log and field notes are provided in Appendix I.

Representative examples of each habitat / biotope encountered were photographed. Additionally, the distribution of any features of conservation interest were recorded using photographs and GPS fixes where encountered. The presence of any Invasive Non-Native Species (INNS) was also to be noted and their location recorded. Other information recorded included general site conditions, sediment surface features (e.g. *Lanice conchilega* tube aggregations), sediment type and characteristics, topography and evidence of any anthropogenic pressures.

Target notes were taken at any notable change in habitat / substrate and identified the presence of any notable features (e.g. intertidal rockpools). These were accompanied by GPS fixes and close-up photographs of each feature, along with general site photographs. Aspect images to the North, East, South and West from each sample location was also taken.

6.2.2. UAV Mapping

The UAV mapping was carried out in consideration of JNCC guidance for use of UAVs in marine benthic monitoring (Crabb et al. 2019). All flights were conducted by OELs Qualified UAV Pilots

(Remote Pilot Qualification (RPQs) under its Permission for Commercial Operations (PfCO) (CAA ID: 2654) granted by the Civil Aviation Authority (CAA). The UAV used was a DJI Phantom 4 multi-rotor quadcopter. The flight(s) were pre-planned using in Drone Deploy software (Plate 1) at a flight height of 60 m to achieve an orthomosaic Ground-Sampling Distance (GSD) of 1-3 cm/px with an accuracy¹ of 5-10 m and 100% area coverage. Line orientation was determined within Drone Deploy to maximise survey efficiency.



Plate 1 UAV Flight Plans for West Angle Bay (left) and Sawdern Point (right) designed in Drone Deploy.

6.2.3. Phase II Sampling

ESRI ArcCollector was used on a Bad Elf GPS & GLONASS (2.5m accuracy) enabled tablet device to navigate between core and quadrat sampling stations located across areas of soft and hard substrate throughout the survey area.

6.2.3.1 Quadrat Sampling

Areas representative of each key hard substrate habitat present across the intertidal zone and at different tidal heights were assessed by recording the epibiotaxa present in randomly placed 0.25 m² (0.5 m x 0.5 m) quadrats. Identification was taken to species level where possible in the field. Any cryptic taxa not identified in the field was retained and identified in the laboratory. At each quadrat location the substrate was subject to a visual inspection and presence of surface features (accretions, algae, fauna, etc.) recorded. Quadrats taken on areas of soft sediment were subject to observations of sediment type and characteristics including colour, smell and texture. A high-resolution photograph was taken directly above the quadrat (in plan view) for subsequent analysis, and a further four photographs were taken in a north, east, south and west orientation.

6.2.3.2 Core Sampling

¹ Measured as Root Mean Square Errors (RMSE).

Areas representative of each key soft substrate habitat present across the intertidal zone and at different tidal heights were assessed by collecting a 0.01 m² hand core sample to a depth of 15 cm. The core sample was used to characterise the macrobenthic communities present and to visually characterise the physical nature of the sediments. Sediment cores were visually inspected for sediment composition against principal sediment fractions (Gravel >2mm, Sand <2mm>63µm and Mud <63µm) to determine sediment type. All core samples were sieved and inspected in-situ with fauna identified in the field before the sediment was reinstated. Five photographs were also taken at each core location: the first directly above the sediment (in plan view) and the following four in a north, east, south and west orientation.

6.3. Analysis

6.3.1. UAV Imagery Analysis

Following initial screening to remove any erroneous images, all images collected during the UAV mapping flights underwent Terrain (2D) processing in the Drone Deploy software and were 'stitched' together to generate orthomosaic and Digital Elevation Model (DEM) outputs² for the intertidal survey area. Achieved image resolution was ~12 mega pixels with an average orthomosaic image density of 8 images per pixel. A detailed processing and output quality report for each intertidal survey area is provided in Appendix 3.

The outputs were then used as base maps in GIS to facilitate subsequent habitat / biotope mapping by visual interrogation and delineation of boundaries.

6.3.2. EUNIS Classification Mapping

EUNIS habitats and biotopes were identified in line with JNCC guidance on assigning benthic biotopes (Parry 2019) to allow the communities to be mapped and allow comparison with existing data. All habitat / biotope determination was undertaken through consideration of the following:

- Existing habitat mapping (derived from EMODnet)
- UAV imagery interpretation
- Review and interpretation of target field notes and quadrat imagery
- General site imagery

² Note that Ground Control Points (GCPs) were not used to georeference the DEM outputs using real-time kinematic (RTK) GPS coordinates. As such the real-world position of the DEM output are presented subject to error associated with the drone's GPS accuracy whilst the elevation data is presented relative to the take off position of the drone rather than absolute elevation (i.e. Mean Sea Level - MSL). **As such the DEM outputs were only used to broadly inform the habitat mapping and should not be used for construction planning and/or navigation purposes.**

6.3.3. Features of Interest

After assigning EUNIS habitats and biotopes to the survey area based on UAV imagery analysis and phase II data (quadrats and cores), an assessment of the presence of Annex I habitats and habitats included in the list of Section 7 Habitats of Principal Importance under the Environment (Wales) Act (2016) was carried out, and where appropriate, the extent of these features was calculated.

Where intertidal rocky biotopes were identified based on the EUNIS classification, it was assessed whether these qualified as Annex I reefs by assessing if they were connected to subtidal Annex I reefs (JNCC 2015). To note that Annex I reefs are a primary reason for the selection of Pembrokeshire as marine SAC; however, no specific guidance exists to assess whether intertidal rocky features qualify as Annex I reefs other than whether they connect to subtidal Annex I reefs. Littoral Rock habitats of principal importance listed under Section 7 of the Environmental (Wales) Act 2016, and recurring across the survey area, include 'Intertidal boulder communities' and 'Estuarine rocky habitats.'

Another feature of interest across the survey area is the presence of Annex I 'mudflats and sandflats not covered by seawater at low tide' described as structures made of a range of sediments, from coarse sand to mud, submerged at high tides and exposed at low tide. Three broad categories: clean sand, muddy sands and mud can make up this type of Annex I habitat based on the dominant substrate/fauna present (JNCC 2015). To note that this is a qualifying feature of the Pembrokeshire Marine/Sir Benfro Forol SAC but not a primary reason for the site selection as SAC. This would correspond to 'Intertidal mudflats' as a habitat of principal importance under Section 7 of the Environment (Wales) Act 2016.

7. Results

7.1. Survey Progress

The Phase I intertidal walk over and Phase II sampling was undertaken at West Angle Bay and Sawdern Point during spring tides on October 16th and 17th 2020, respectively. Table 1 provides a summary of the sampling undertaken and information collected during the surveys

Table 1 Summary of sampling undertaken and information collected during the intertidal survey.

Sampling	West Angle Bay	Sawdern Point
Quadrats	58	53
Sediment Cores	28	6
Target Notes	86	59
UAV imagery	318 images	82 images

7.2. UAV Survey

UAV mapping was undertaken at West Angle Bay and Sawdern Point around low water on October 16th and 17th, 2020 respectively. An 18-minute flight was undertaken at West Angle Bay and a 7-minute flight at Sawdern Point. Flight height was maintained at 60 m for both flights and weather conditions (e.g. wind / precipitation) remained favourable for data collection throughout.

The UAV flight of West Angle Bay successfully captured 318 high-resolution nadir images across a coverage area of 0.4 km² to produce a high resolution orthomosaic model (GSD = 2.38 cm/px) and DEM (GSD = 9.52 cm/px) (Figure 3) with average RSME accuracy level of 1.72 m.

The UAV survey of Sawdern Point successfully captured 82 high-resolution nadir images across a coverage area of 0.03 km² to produce a high resolution orthomosaic model (GSD= 2.26 cm/px) and DEM (GSD = 11.33 cm/px) (Figure 4) with average RSME accuracy level of 1.46 m.

Example aerial images are provided in Plate 2. The full orthomosaic, DEM and 3D model outputs are provided as Appendix III along with processing reports.



Plate 2 Example UAV imagery at West Angle Bay showing exposed rocky shore with algal communities in the lower shore at West Angle Bay (left) and bare rock in the upper shore grading into soft sediment habitats in the lower shore at Sawdern Point (right).

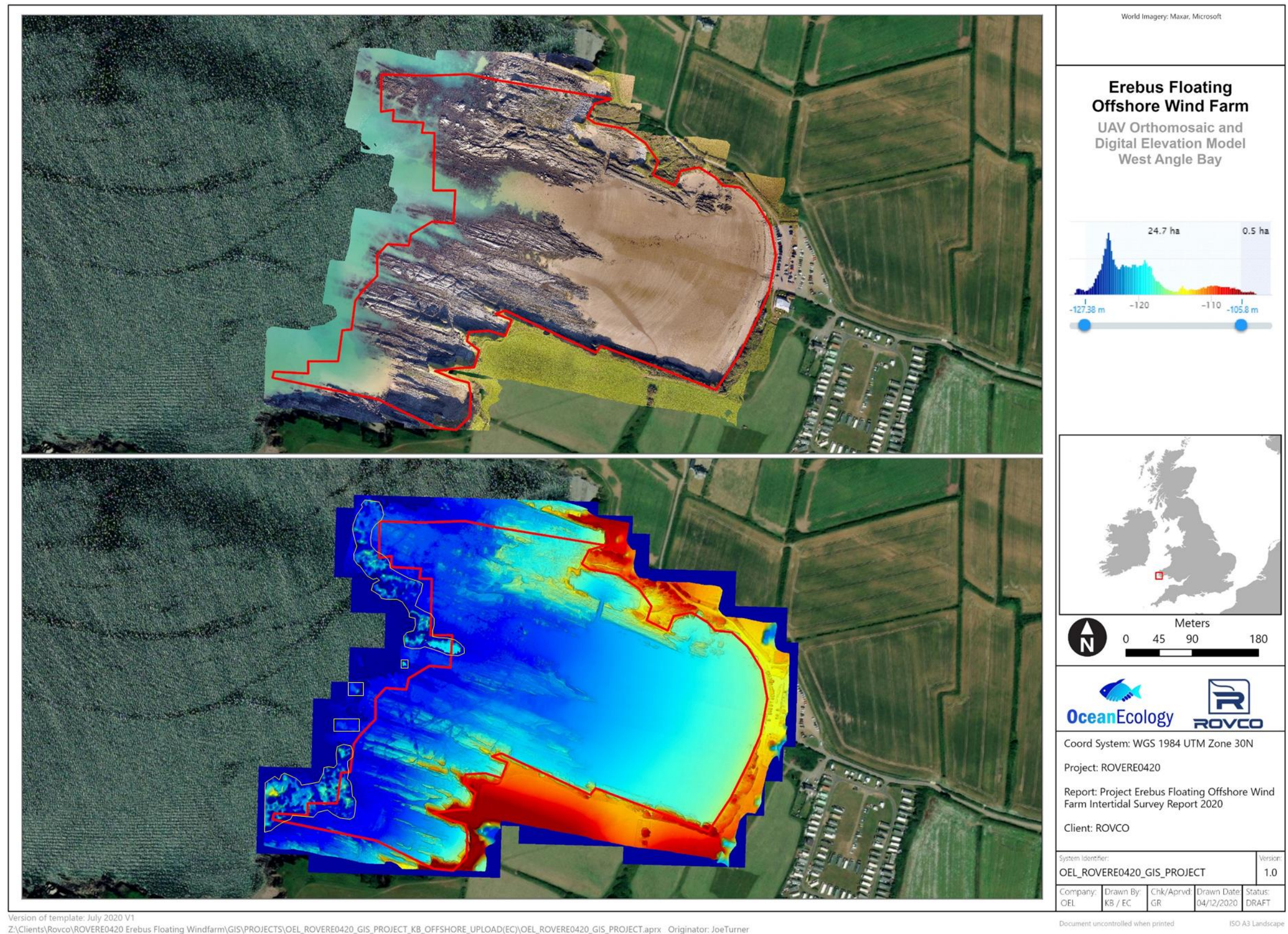
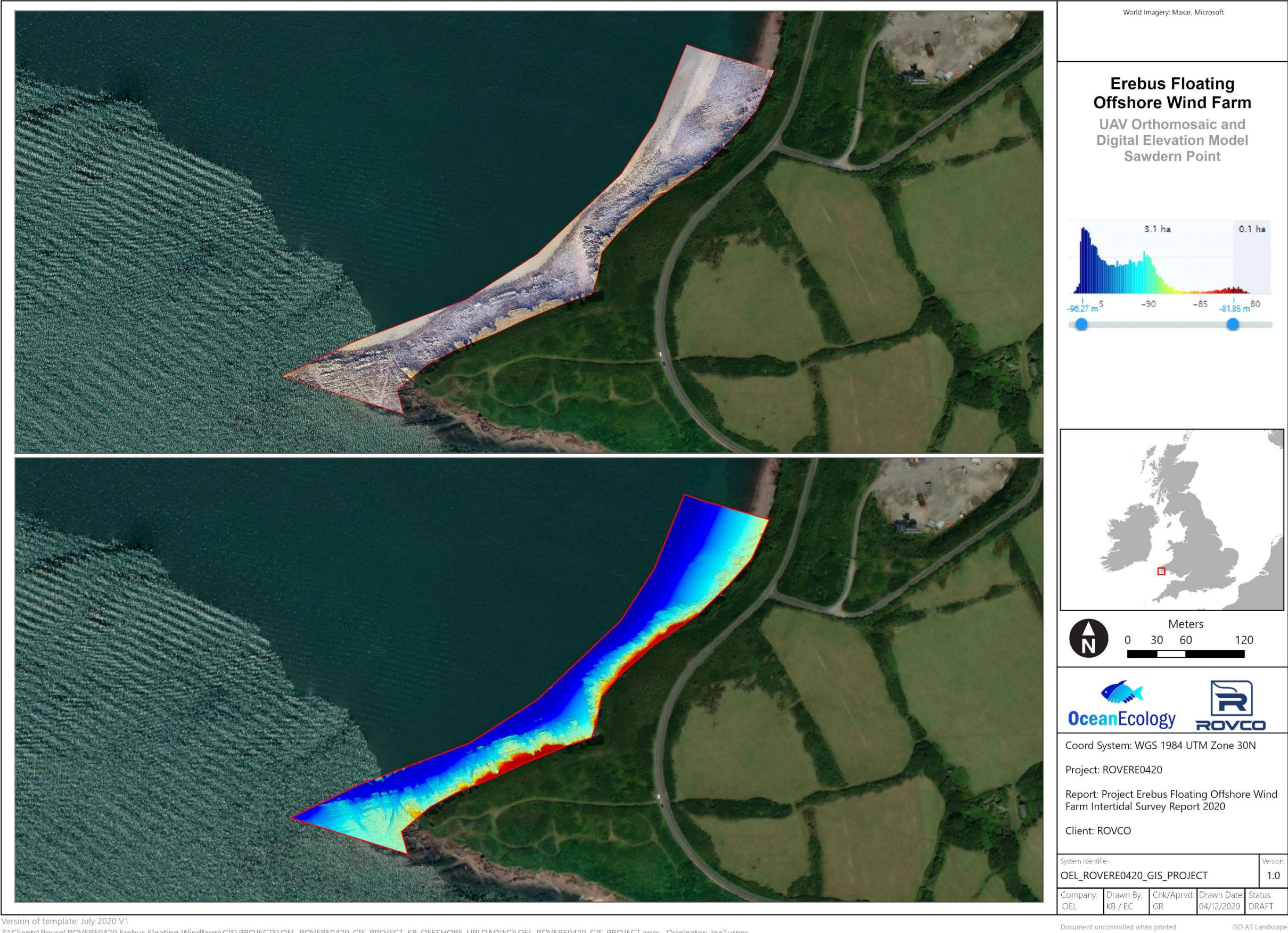


Figure 3 UAV orthomosaic (top) and Digital Elevation Model (DEM) (bottom) generated from the UAV imagery collected during the intertidal survey of West Angle Bay. NB artefacts in the DEM model caused by water surface are identified with a yellow bounding polygon.



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Figure 4 UAV orthomosaic (top) and Digital Elevation Model (DEM) (bottom) generated from the UAV imagery collected during the intertidal survey of Sawdern Point.

7.3. Phase I Sampling

In total, target notes were taken at 145 locations (86 at West Angle Bay and 59 at Sawdern Point) to provide localised information on habitats and features of interest present across the intertidal areas to assist in ground truthing of UAV aerial imagery (Figure 5).

7.4. Phase II Sampling

7.4.1. Sediment Cores and Quadrats

In total, 34 sediment cores (28 at West Angle Bay and 6 at Sawdern Point) and 111 quadrats (58 at West Angle Bay and 53 at Sawdern Point) were analysed in the field to allow for assigning of EUNIS classifications in situ. Phase II sampling is summarised in Plate 3 and mapped in Figure 5.

Sediment cores were visually inspected for sediment composition against principal sediment fractions (Gravel >2mm, Sand <2mm>63µm and Mud <63µm) to determine sediment type at West Angle Bay to be predominantly Sand (19 out of 28 cores) with small areas of coarser sediments from Gravelly Sand (3 cores) to Sandy Gravel (2 cores) and Gravel (4 cores). The six cores collected at Sawdern Point had sediment types ranging from Gravel and Gravelly Sand (two cores for each sediment type) to Sand and Muddy Sand (one core each). Conspicuous fauna present at the core locations was noted. In West Angle Bay, coarse sediments were barren while worm casts were observed in finer sandy sediments. These included errant polychaetes of the family Phyllodocidae (paddle worms) and of the genus *Nephtys* (catworms), as well as tubes of *Owenia* and the sand mason worm *Lanice conchilega*. Similarly, at Sawdern Point coarse sediments were barren while sandy sediments supported the polychaete *L. conchilega*. Detailed field notes are provided in Appendix I. All field photographs are provided as Appendix IV.



Plate 3 Top left: Quadrat sample at Sawdern Point (Object ID 58). Top right: Kelp dominated rocky shore at Sawdern Point (Object ID 57). Bottom left: Sieved core sample at West Angle Bay (Object ID 140). Bottom right: Upper-shore sandy sediment at West Angle Bay (Object ID 140).



Figure 5 Location of target notes, sediment cores, and quadrats collected at West Angle Bay (top) and Sawdern Point (bottom).

7.5. Habitat / Biotope Mapping

7.5.1. West Angle Bay

There was a total of 8 unique biotopes (EUNIS level 5 or above) from 12 Broad Scale Habitats (BSH) (EUNIS Level 3) (Table 2) observed across the West Angle Bay survey area as mapped in Figure 6. The designation status of each is set out in Table 2 and discussed further in Section 7.6.

The upper shore was characterised by a band of shingle and gravel (A2.11) giving way to a narrow strandline (A2.21) followed by a wide area of littoral sand and muddy sand (A2.2) grading into rocky habitats moving seawards (A1.1, A1.2, A1.3 and A1.4). The flanks of the survey area were bordered by rock cliffs and ledges, at times covered in lichens and / or angiosperms (B3.1, B3.2 and B3.3) (Table 2, Figure 6 and Plate 7).

A north to south zonation as well as a seaward gradient characterised West Angle Bay. High to moderate energy rocky habitats (A1.1 and A1.2) were encountered in the mid shore at the north and south ends of the survey area grading into rocks dominated by mussel and/or barnacle (A1.11) and *Fucus serratus* (A1.214) in the middle section of the intertidal area. Rockpools were scattered across the mid shore (A1.41, A1.42 and A1.45). The lower and extreme lower shore was characterised by a mosaic of rocks, from cobbles to exposed bedrock, covered in *Laminaria digitata* (A3.211) and *F. serratus* (A1.214). A "corridor" of sandy sediments (A2.2) in the central portion of West Angle Bay extending toward the sea included patches of sand supporting the polychaete *L. conchilega* typical of the biotope A2.245.

All EUNIS rock classifications observed at West Angle Bay were deemed to form part of the designated Annex I 'reef' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC as they continued into the subtidal zone (Figure 6, Table 2; see section 6.3.3 for details on how Annex I features were determined and further information in the Environmental Baseline Survey report (OEL 2021). Overall, Annex I reefs covered a total extent of 84,020.7 m² (0.084 km²). Plate 4 illustrates examples of Annex I reefs encountered across West Angle Bay. To note that supralittoral rock and ledges above the MHWS mark were observed across West Angle Bay and reported in Table 2, however these lay outside of the boundaries of the intertidal survey area, so no further details are provided about these biotopes.

The sandy sediment habitats observed at West Angle Bay were deemed to be representative of the designated Annex I habitat 'mudflats and sandflats not covered by seawater at low tide' and covered a total extent of 57,750.8 m² (0.058 km²). Three broad categories (clean sand, muddy sands and mud) can make up this type of Annex I habitat (JNCC 2015) and based on the UAV imagery and Phase II data, Annex I 'mudflats and sandflats not covered by seawater at low tide' across West Angle Bay appear to belong to the type 'clean sands' inhabited by amphipod crustaceans and some polychaete worms (Figure 6 and Table 2). Plate 5 illustrates examples of Annex I mudflats and sandflats not covered by seawater at low tide encountered

across West Angle Bay. To note that not all the intertidal sedimentary habitats present at West Angle Bay were deemed to be Annex I features or protected under Section 7 of the Environment (Wales) Act 2016 (Table 2).

A summary of EUNIS classifications recorded during the Phase I walkover survey is provided in Appendix II along with supporting example photographs. The full set of intertidal photographs collected across the West Angle Bay survey area are provided as Appendix IV. The EUNIS classification and Annex I habitat mapping presented in Figure 6 is provided in GIS format as Appendix V.

Table 2 Key EUNIS classifications recorded at West Angle Bay.

EUNIS BSH	EUNIS Code	EUNIS Description	Designation Status
A1.1-High energy Littoral Rock	A1.113	<i>Semibalanus balanoides</i> , <i>Patella vulgata</i> and <i>Littorina</i> spp. on exposed to moderately exposed or vertical sheltered eulittoral rock	Annex I 'Reef' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC (EC Habitats Directive)
A1.2-Moderate energy Littoral Rock	A1.212	<i>Fucus spiralis</i> on full salinity exposed to moderately exposed upper eulittoral rock	
	A1.214	<i>Fucus serratus</i> on moderately exposed lower eulittoral rock	
A1.3-Low energy Littoral Rock	A1.314	<i>Ascophyllum nodosum</i> on very sheltered mid eulittoral rock	'Littoral Rock: Intertidal boulder communities/ Estuarine rocky habitats' Habitat of Principle Importance (Environment (Wales) Act Section 7)
A1.4-Features of Littoral Rock	A1.41	Communities of littoral rockpools	
	A1.42	Communities of rockpools in the supralittoral zone	
	A1.45	Ephemeral green or red seaweeds (freshwater or sand-influenced) on non-mobile substrata	
A2.1-Littoral Coarse Sediment	A2.11	Shingle (pebble) and gravel shores	
	A2.111	Barren littoral shingle	
A2.2-Littoral Sand and Muddy Sand	A2.21	Strandline	Annex I 'Mudflats and sandflats not covered by seawater at low tide' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC (EC Habitats Directive)
	A2.22	Barren or amphipod-dominated mobile sand shores	
	A2.23	Polychaete/amphipod-dominated fine sand shores	
	A2.231	Polychaetes in littoral fine sand	
	A2.245	<i>Lanice conchilega</i> in littoral sand	'Littoral Sediment: Intertidal mudflats' Habitat of Principle

EUNIS BSH	EUNIS Code	EUNIS Description	Designation Status
			Importance (Environment (Wales) Act Section 7)
A2.4 - Littoral mixed sediments	A2.4	Littoral mixed sediments	
A3.2 - Atlantic and Mediterranean moderate energy infralittoral rock	A3.2111	<i>Laminaria digitata</i> on moderately exposed sublittoral fringe bedrock	Annex I 'Reef' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC (EC Habitats Directive)
B3.1 - Supralittoral rock (lichen or splash zone)	B3.11	Lichens or small green algae on supralittoral and littoral fringe rock	Annex I 'Reef' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC (EC Habitats Directive)
	B3.111	Yellow and grey lichens on supralittoral rock	
B3.2 - Unvegetated rock cliffs, ledges, shores and islets	B3.23	Temperate Atlantic sea-cliffs and rocky shores	'Supralittoral rock' Habitat of Principle Importance (Environment (Wales) Act Section 7)
B3.3 - Rock cliffs, ledges and shores, with angiosperms	B3.3	Rock cliffs, ledges and shores, with angiosperms	
J4.6 - Pavements and recreation areas	J4.6	Pavements and recreation areas	

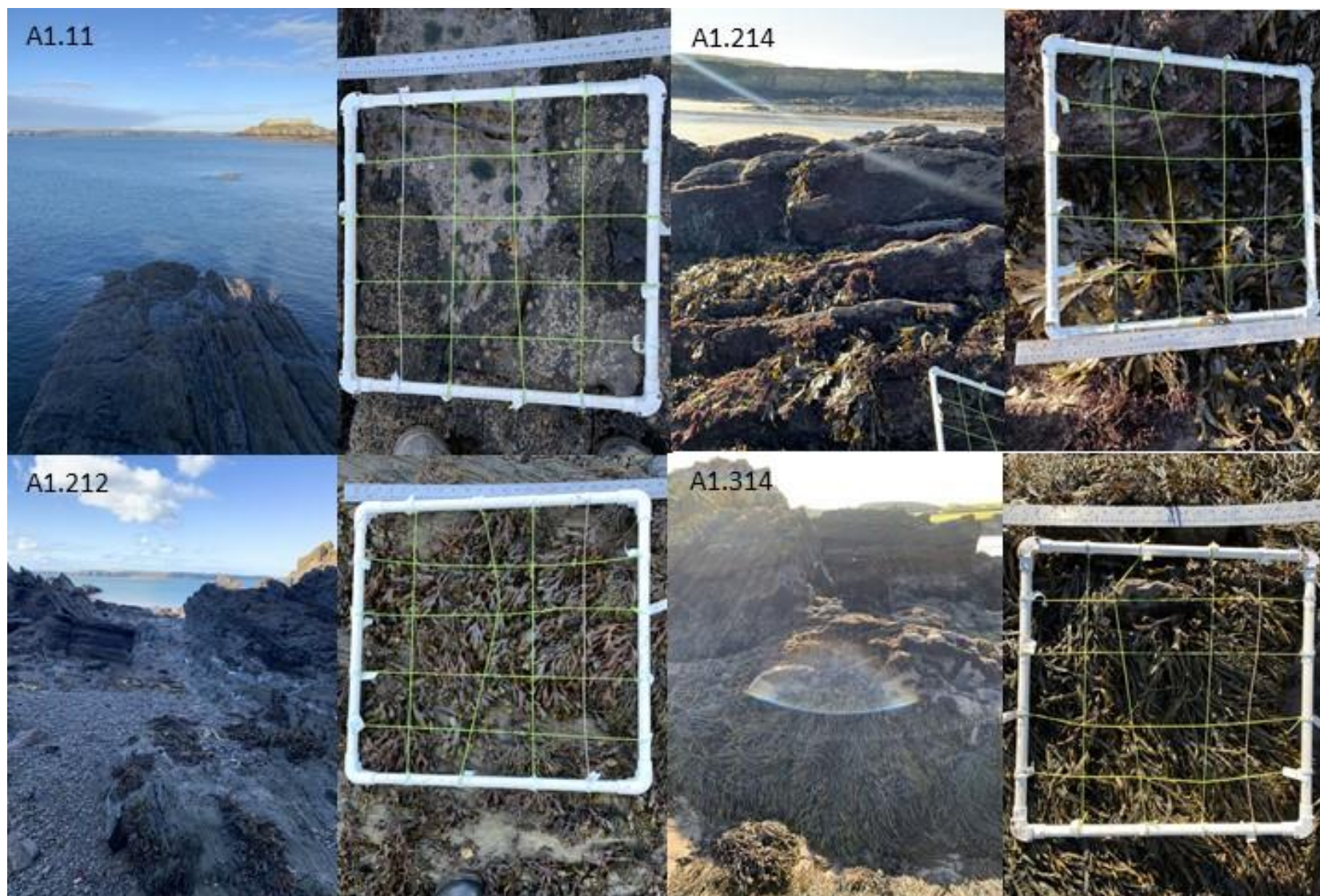


Plate 4 Example images of Annex I reef habitats/Section 7 'Littoral Rock' encountered in West Angle Bay.



Plate 5 Example images of Annex I mudflats and sandflats not covered by seawater at low tide/Section 7 'Littoral Sediment' encountered in West Angle Bay.

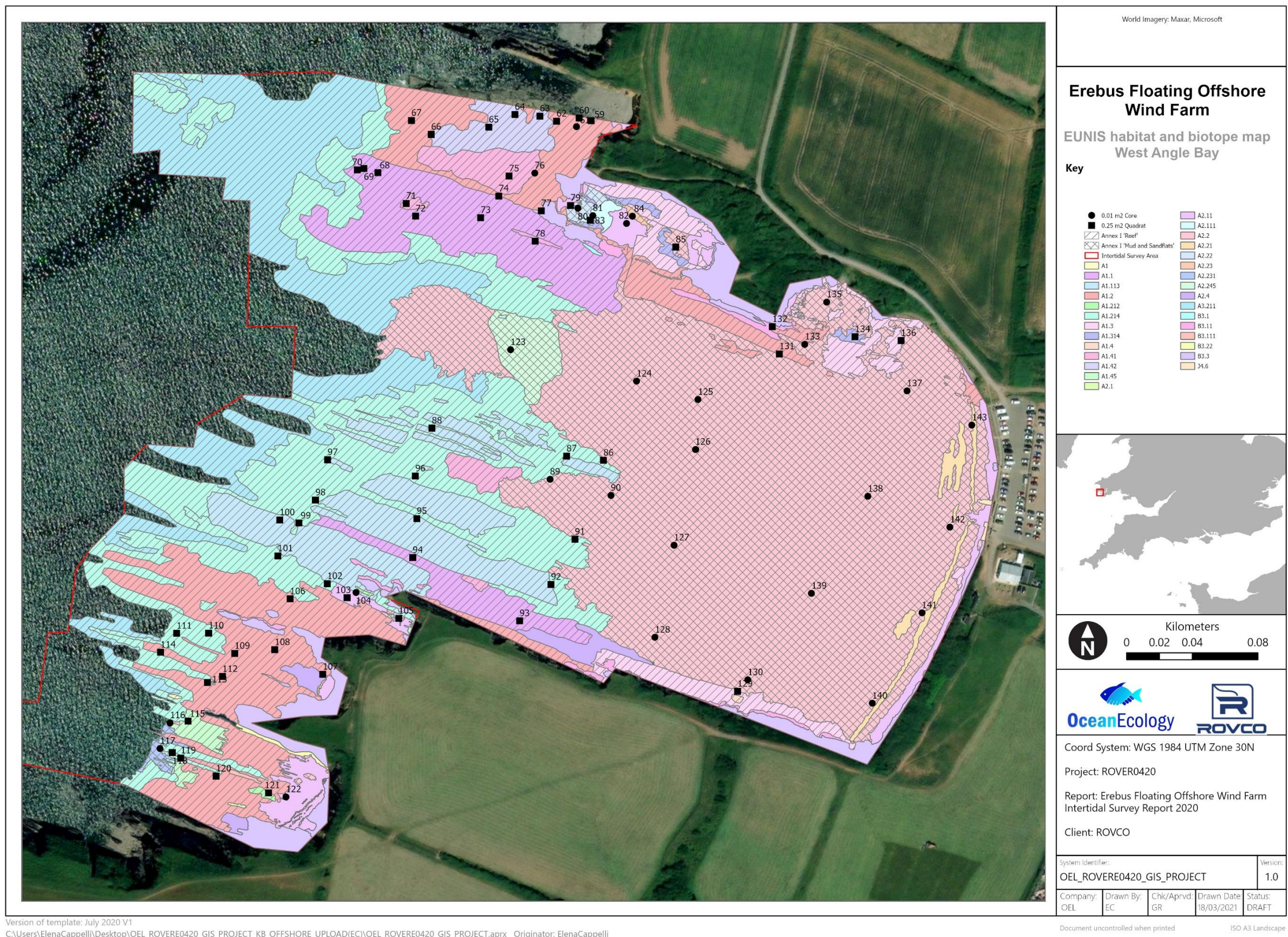


Figure 6 EUNIS habitat and biotope mapping with sampling locations visited during the intertidal survey of West Angle Bay.

7.5.2. Sawdern Point

There was a total of 16 unique biotopes (EUNIS level 5 or above) from 9 BSH (Table 4) observed across the Sawdern Point survey area as mapped in Figure 7. The designation status of each is set out in Table 4 and discussed further in Section 7.6.

The majority of the survey area at Sawdern Point was characterised by a high energy littoral rock habitat (A1.1). This dominant habitat was fringed by supralittoral and littoral fringe rock covered in lichens or small green algae (B3.11) in the upper shore and by littoral sand (A2.245) in the lower shore; while it was interspersed with other rocky habitats of different exposures (e.g. A1.2 and A1.3) in the middle shore. Barren littoral shingle (A2.111) and coarse sand (A2.221) were mostly localised in the upper to mid shore of the northern reaches of Sawdern Point (Table 4 and Figure 7).

A clear zonation characterised the central and southern areas of Sawdern Point where lichens or small green algae occurred on supralittoral and littoral fringe rock (B3.11) giving way in the upper to middle shore to exposed bedrock and large boulders representative of biotopes A1.1131 and A1.1133. The middle to lower shore was composed of a mosaic of rocky habitats covered in red seaweeds (*Mastocarpus stellatus* and *Chondrus crispus* (A1.125)) and fucoids, including *Fucus serratus* (A1.2141 and A1.2142), *Fucus spiralis* (A1.212, A1.312), *Fucus vesiculosus* (A1.213, A1.313), and *Ascophyllum nodosum* (A1.151, A1.314). The lower shore was predominantly dominated by sand supporting the polychaete *L. conchilega* (A2.245) with patches of rocks covered in *L. digitata* supporting a wide variety of fauna including the bryozoan *Electra pilosa*, the topshells, Trochidae and the velvet swimming crab *Necora puber* (A3.2111) (Figure 7). In the northern extent of Sawdern Point, barren littoral shingle (A2.111) and barren littoral cobbles and pebbles (A1.2) characterised the upper shore (Plate 7) while a band of sediments in the mid shore was made up of coarse sand (A2.221).

A summary of notable taxa identified at Sawdern Point is presented below in Table 3 with a detailed description of notable taxa identified during the surveys provided in Section 7.6.

Table 3 Notable taxa found during the intertidal survey at Sawdern Point.

Taxon	Major Group	Designation	No. of images	Stations present (Object ID)
<i>Crepidula fornicata</i>	Mollusca	INNS	2	58
<i>Sabellaria alveolata</i>	Annelida	Annex I in reef form ³	5	47, 53, 57, 58
<i>Zostera noltei</i>	Seagrass	IUCN Red list Least Concern	1	40

³ No *S. alveolata* in biogenic reef form recorded.

All EUNIS rock classifications observed at Sawdern Point were deemed to form part of the designated Annex I 'reef' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC as they continued into the subtidal zone (Figure 7 and Table 4; see section 6.3.3 for details on how Annex I features were determined and OEL 2021 for environmental baseline survey report). Overall, Annex I reef at Sawdern Point covered a total extent of 20,748.3 m² (0.027 km²). Plate 6 illustrates examples of Annex I reefs encountered across Sawdern Point. To note that supralittoral rock and ledges above the MHWS mark were observed across Sawdern Point and reported in Table 4, however these lay outside of the boundaries of the intertidal survey area, so no further details are provided about these biotopes.

The sandy sediment habitats observed at Sawdern Point were deemed to be representative of the designated Annex I habitat 'mudflats and sandflats not covered by seawater at low tide' and covered a total extent of 4,657.3 m² (0.0047 km²). Based on the UAV imagery and Phase II data, Annex I 'mudflats and sandflats not covered by seawater at low tide' at Sawdern Point appear to belong to the type 'clean sands' inhabited by amphipod crustaceans and some polychaete worms (Table 4 and Figure 7). To note that not all the intertidal sedimentary habitats present at Sawdern Point were deemed to be Annex I features or protected under Section 7 of the Environment (Wales) Act 2016 (Table 4).

A summary of EUNIS classifications recorded during the Phase I walkover survey is provided in Appendix II along with supporting example photographs. The full set of intertidal photographs collected across the Sawdern Point survey area are provided as Appendix IV. The EUNIS classification and Annex I habitat mapping presented in Figure 6 is provided in GIS format as Appendix V.

Table 4 Key EUNIS classifications recorded at Sawdern Point.

EUNIS BSH	EUNIS Code	EUNIS Description	Designation Status
A1.1-High energy Littoral Rock	A1.125	<i>Mastocarpus stellatus</i> and <i>Chondrus crispus</i> on very exposed to moderately exposed lower eulittoral rock	Annex I 'Reef' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC (EC Habitats Directive) 'Littoral Rock: Intertidal boulder communities/ Estuarine rocky habitats' Habitat of Principle Importance (Environment (Wales) Act Section 7)
	A1.151	<i>Ascophyllum nodosum</i> , sponges and ascidians on tide-swept mid eulittoral rock	
	A1.1131	<i>Semibalanus balanoides</i> , <i>Patella vulgata</i> and <i>Littorina</i> spp. on exposed to moderately exposed or vertical sheltered eulittoral rock	
	A1.1133	<i>Semibalanus balanoides</i> and <i>Littorina</i> spp. on exposed to moderately exposed eulittoral boulders and cobbles	
A1.2-Moderate energy Littoral Rock	A1.212	<i>Fucus spiralis</i> on full salinity exposed to moderately exposed upper eulittoral rock	
	A1.213	<i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock	
	A1.2141	<i>Fucus serratus</i> and red seaweeds on moderately exposed lower eulittoral rock	
	A1.2142	<i>Fucus serratus</i> and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders	
A1.3-Low energy Littoral Rock	A1.312	<i>Fucus spiralis</i> on sheltered upper eulittoral rock	
	A1.313	<i>Fucus vesiculosus</i> on moderately exposed to sheltered mid eulittoral rock	
	A1.314	<i>Ascophyllum nodosum</i> on very sheltered mid eulittoral rock	
A1.4-Features of Littoral Rock	A1.421	Green seaweeds (<i>Enteromorpha</i> spp. and <i>Cladophora</i> spp.) in shallow upper shore rockpools	
A2.1-Littoral Coarse Sediment	A2.111	Barren littoral shingle	Annex I 'Mudflats and sandflats not covered by seawater at low tide' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC (EC Habitats Directive) 'Littoral Sediment: Intertidal mudflats' Habitat of Principle Importance (Environment (Wales) Act Section 7)
A2.2-Littoral Sand and Muddy Sand	A2.221	Barren littoral coarse sand	
	A2.245	<i>Lanice conchilega</i> in littoral sand	
A2.8-Features of Littoral Sediment	A2.82	Ephemeral green or red seaweeds (freshwater or sand-influenced) on mobile substrata	
A3.2 - Atlantic and Mediterranean moderate energy infralittoral rock	A3.2111	<i>Laminaria digitata</i> on moderately exposed sublittoral fringe bedrock	Annex I 'Reef' feature of the Pembrokeshire Marine/Sir Benfro Forol

			SAC (EC Habitats Directive) 'Littoral Rock: Intertidal boulder communities/ Estuarine rocky habitats' Habitat of Principle Importance (Environment (Wales) Act Section 7)
B3.1 - Supralittoral rock (lichen or splash zone)	B3.11	Lichens or small green algae on supralittoral and littoral fringe rock	Annex I 'Reef' feature of the Pembrokeshire Marine/Sir Benfro Forol SAC (EC Habitats Directive) 'Supralittoral rock' Habitat of Principle Importance (Environment (Wales) Act Section 7)



Plate 6 Example images of Annex I reef habitats/Section 7 'Littoral Rock' encountered in Sawdern Point.



Figure 7 EUNIS habitat and biotope mapping with sampling locations visited during the intertidal survey of Sawdern Point.



Plate 7. A) Intertidal rockpool with green seaweed (West Angle Bay – Object ID 64). B) Exposed bedrock with cobbles and pebbles (West Angle Bay – Object ID 122). C) Supralittoral rock covered in lichens and green seaweed (West Angle Bay – Object ID 64) D) Large boulders with cobbles and pebbles (Sawdern Point – Object ID 24).

7.6. Features of Interest

7.6.1. Annex I & II Habitats/Species

Both survey areas were dominated by large areas of rocky habitat comprising a mosaic of exposed bedrock, boulders and cobbles (Plate 7); these were deemed to be representative of different biotopes spanning from high to low energy rock habitats some supporting dense beds of kelp (*Laminaria digitata* and *Laminaria saccharina*) along the sublittoral fringe. All EUNIS rock classifications assigned during these surveys were deemed to form part of the designated Annex I 'reef' (geogenic) feature of the Pembrokeshire Marine/Sir Benfro Forol SAC. No specific guidelines exist to determine whether intertidal rocky biotopes correspond to Annex I reefs, however the Marine Habitat Classification for Britain and Ireland (JNCC 2015) states that '*intertidal areas are only included within this Annex I type where they are connected to subtidal reefs*'. Based on the habitat mapping presented here and on existing EMODnet mapping, as well as descriptions of the Pembrokeshire Marie/Sir Benfro Forol SAC, intertidal rocky features do extend from the intertidal zone into the subtidal zone, meaning that these features can be deemed Annex I reefs (also see the Environmental Baseline Survey report , (OEL 2021) for details on subtidal habitats. Annex I reefs in the Pembrokeshire Marine/Sir Benfro Forol SAC are currently deemed to be in an overall 'Unfavourable' conservation status (NRW 2018). This is largely because of the impacts of the high levels of nutrients in the water column within the Milford Haven waterway and high levels of chemicals such as tributyltin compounds (TBT), mercury and its compounds and brominated diphenylether (BDPE) on the structure and functioning of the feature. Despite this, the rocky shores of the Milford Haven Waterway (including those at West Angle and Sawdern Point) are considered to be in favourable conditions when considering their distribution and extension and the fauna they support (Mieszkowska 2014, Bunker 2015, NRW 2018).

The sandy sediment habitats observed were also deemed to be representative of the designed Annex I habitat 'mudflats and sandflats not covered by seawater at low tide'. In both survey areas (West Angle Bay and Sawdern Point) mudflats and sandflats belonged to the clean sands type which can support amphipod crustaceans and a number of polychaete worms. This qualifying feature of the Pembrokeshire Marine/Sir Benfro Forol SAC has been recently assessed as in overall 'Unfavourable' conservation status (NRW 2018). This is largely due to the dominance of opportunistic macroalgae and a degraded invertebrate community at several intertidal mudflat and sandflat sites together with relatively high contaminant levels in the sediments.

There was no Annex I biogenic reef recorded.

The presence of a very limited population of shore dock (*Rumex rupestris*) is a primary reason for designation of the Pembrokeshire Marine/Sir Benfro Forol SAC. There were no observations of this Annex II species during the survey of both intertidal landfall areas.

7.6.2. Habitats of Principle Importance

Habitats and biotopes assigned as Annex I 'reef' (geogenic) habitats from both intertidal cable landfall areas were deemed to be included under 'Littoral Rock: Intertidal boulder communities/estuarine rocky habitats' on the list of Section 7 Habitats of Principle Importance under the Environment (Wales) Act (2016). Both intertidal landfall locations also have sediment expanses and exposed bedrock / cliffs in the upper shore falling under the 'Littoral Sediment: Intertidal mudflats' and 'Supralittoral rock' Section 7 Habitats of Principle Importance, respectively. There were no Section 7 species of principal importance recorded. To note that not all sediment habitats and biotopes were assigned as Annex I and/or Section 7 (Table 2 and Table 4).

7.6.3. INNS

The invasive non-native slipper limpet (*C. fornicata*) was recorded in low numbers on rocky substrate at two quadrat locations (16 and 20 individuals per m² at quadrat locations 008 and 037 respectively) at Sawdern Point (Table 3 and Plate 4). No other INNS were recorded across the two survey areas.

7.6.4. Other Features of Note

The Honeycomb worm *Sabellaria alveolata* was recorded in low lying veneers of tube aggregations at quadrat locations 057 and 058 on the very lower shore at the south western end of the Sawdern Point survey area (Plate 8 and Table 3). In line with the *S. spinulosa* reefiness assessment presented in Gubbay 2007, the *de facto* assessment used for assessing *S. alveolata* reef, as discussed in the Natural Resources Wales (NRW) guide to characterising and monitoring *Sabellaria* reefs (NRW 2019b) these aggregations were not deemed to meet the criteria of Annex I 'biogenic reef, due to their low lying (<2 cm) and patchy nature combined with their limited extent (<25 m). The aggregations were found on cobble/boulder substrate however that was representative of Annex I 'geogenic reef' in its own right.

Sparse *Zostera noltei* shoots were also recorded interspersed with dense *L. conchilega* at core location 040 on the very the lower shore at the northern end of the Sawdern Point survey area (core location 40) (Table 3).



Plate 8 Left: Live and dead *Crepidula fornicata* at (Sawdern Point - Object ID 08). Middle: *Sabellaria alveolata* veneer (Sawdern Point - Object ID 57). Sparse *Zostera noltei* shoots at (Sawdern Point - Object ID 40).

8. Discussion

This report presents the findings and habitat mapping outputs of the intertidal surveys conducted across the two potential landfall locations as part of the site characterisation studies for the Project Erebus FLOW. The surveys took place at West Angle Bay and Sawdern Point in Milford Haven and involved the collection of Unmanned Aerial Vehicle (UAV) aerial imagery accompanied by core and quadrat sampling. The key objective was to map the distribution and extent of individual or groups of BSH, biotopes, biotope complexes and life forms present with a focus on confirming the presence/absence of any habitats and/or features of conservation interest across the landfall locations (e.g. reef habitats and seagrass beds).

An intricate complex of habitats and biotopes characterised West Angle Bay. The flanks of this survey area were bordered by supralittoral rock and ledges above the MHWS mark, at times covered in lichens and/or angiosperms (EUNIS B3.1, B3.2 and B3.3) encasing a wide area of littoral sand and muddy sand (A2.2) in the upper shore, and various rocky habitats and biotopes in the mid to lower shore. These rocky habitats and biotopes included bedrock and large boulder covered in *S. balanoides* and *P. vulgata* (A1.113) and in *Fucus serratus* (A1.214) as well as supralittoral and littoral rockpools (A1.41, A1.42 and A1.45). The low and extreme low shores were characterised by bedrock, boulders and cobbles covered in *Laminaria digitata* (A3.211) supporting a number of marine invertebrates.

A clear zonation was observed across Sawdern Point, the full range of which was more evident in the central and southern reaches of this site. This included lichens or small green algae on supralittoral and littoral fringe rock (B3.11) giving way in the upper to mid shore to exposed bedrock and large boulders representative of biotopes A1.1131 and A1.1133. The mid to lower shore was composed of a mosaic of rocky habitats supporting red algae (A1.125) and fucoids (e.g. A1.2141 and A1.212) and intertidal rockpools (A1.421); while the lower shore was mostly dominated by sand supporting the polychaete *L. conchilega* (A2.245) with patches of cobbles and boulders covered in *L. digitata* (A3.2111). Sediments were more prevalent in the northern portion of Sawdern Point where coarse sand, pebble and shingle occurred in the upper to mid shore. All areas of the Sawdern Point intertidal area were bordered by supralittoral rock and ledges above the MHWS mark.

All EUNIS rock classifications observed at Sawdern Point (20,748.3 m² – 0.027 km²) and West Angle Bay (84,020.7 m² – 0.084 km²) were deemed to form part of the designated Annex I 'reef' feature (mix of stony reef and bedrock) of the Pembrokeshire Marine/Sir Benfro Forol SAC which, on a whole, is currently deemed to be in an 'Unfavourable' conservation status (NRW 2018). This is largely as a result of the impacts of the high levels of nutrients in the water column within the Milford Haven waterway and high levels of chemicals such as tributyltin compounds (TBT), mercury and its compounds and brominated diphenylether (BDPE) on the structure and functioning of the feature. Despite this, rocky shores across the Pembrokeshire Marine/Sir Benfro Forol SAC (including those at West Angle and Sawdern Point) are considered

to be in favourable condition when components such as 'Distribution and extent' and 'Typical species' are assessed (Mieszkowska 2014, Bunker 2015, NRW 2018). To note that the assignation of intertidal rocky shore as Annex I reef habitats has been assigned based on the continuation of these rocky features to the subtidal zone (JNCC 2015). This continuation had been assessed based on UAV imagery, existing EMODnet mapping and results from the Environmental Baseline Survey Report (OEL 2021) which focussed on the subtidal habitats off West Angle Bay and Sawdern Point. The latter showed that the same EUNIS habitat occurs in the intertidal zone as well as in the subtidal zone, namely A3.2, indicating the presence of a connected feature. Having said this, no specific guidelines for intertidal habitats exist to precisely assign rocky habitats under Annex I reef habitats. Conversely, for subtidal features there are specific categories (e.g. extent, elevation, % coverage) that need to be satisfied for subtidal rocky substrates to qualify as Annex I stony reefs (Irving 2009).

The sandy sediment habitats observed at Sawdern Point ($4,657.3 \text{ m}^2 - 0.0047 \text{ km}^2$) and West Angle Bay ($57,750.8 \text{ m}^2 - 0.058 \text{ km}^2$) were deemed to be representative of the designated Annex I habitat 'mudflats and sandflats not covered by seawater at low tide' which, on a whole, is currently deemed to be in an 'Unfavourable' conservation status (NRW 2018) also due to high levels of water column nutrients and sediment contaminants. Additionally, unfavourable conditions for this feature were also scored for the component 'Typical species' as an impoverished invertebrate community was observed at these sites (NRW 2018; Green & Camplin, Morris & Perry). In both survey areas (West Angle Bay and Sawdern Point) mudflats and sandflats belonged to the clean sands type which can support amphipod crustaceans and a number of polychaete worms. To note that not all sedimentary habitats were deemed to be Annex I features (Table 2 and Table 4).

There were no observations of the Annex II plant species *Rumex rupestris* during the survey of both intertidal landfall areas. Whilst records of this species within the Pembrokeshire Marine/Sir Benfro Forol SAC are limited to Watery Bay and Hooper's Point (Hudson 2012) its presence in the vicinity of the landfall locations is possible due to the prevalence of ledges and cliff that boarder the upper extent of the survey areas (i.e. the MHWS mark). It should be noted that its absence above the MHWS mark fringing the two the survey areas cannot be confirmed based on the intertidal survey data alone.

The invasive non-native slipper limpet (*C. fornicata*) was recorded in low numbers on rocky substrate at two quadrat locations at Sawdern Point. It should be noted that the individuals observed at quadrat location 008 were recorded in an area of pebble/cobble substrate comprised of a high density of dead *C. fornicata* shells (Plate 8) suggesting a notable population of *C. fornicata* may be present in the vicinity of this location. Milford Haven waterway is a hot spot for invasive non-native species (Mieszkowska 2011) and therefore the presence of *C. fornicata* is not unexpected. The Milford haven population of *C. fornicata* is well established since its first introduction in 1953 with its subtidal and intertidal distribution throughout the ria well documented (Bohn et al. 2015).

The Honeycomb worm *Sabellaria alveolata* was recorded in low lying veneers of tube aggregations at two quadrat locations on the very lower shore at the south western end of the Sawdern Point survey area. Due to their low lying (<2 cm) and patchy nature, combined with their limited extent (<25 m), these aggregations were not deemed to meet the criteria of Annex I 'biogenic reef' (NRW 2019b) although were found on cobble/boulder substrate that was representative of Annex I 'geogenic reef' in its own right.

Sparse *Zostera noltei* shoots were also recorded interspersed with dense *Lanice conchilega* at a single location on the very lower shore at the northern end of the Sawdern Point survey area. This area was not deemed to represent a seagrass bed due to the very low density of attached shoots. It should, however, be noted that the latest guidance for conducting assessments of seagrass beds (NRW 2019b) recommends surveys should be conducted between August to September in order to capture the period of peak biomass prior to the plants transitioning into a senescence phase during the autumn with storms causing dying shoots to break off thus reducing above ground shoot density. As such, the absence of a seagrass bed at the Sawdern Point landfall cannot be fully confirmed as the shoots observed during the mid-October survey suggest a seagrass bed in a state of dieback could potentially have been present. It should also be noted that *Zostera marina* shoots were also recorded during the subtidal habitat assessment along a transect that extended close to this area indicating that that this potential intertidal bed could extend into the subtidal.

9. References

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10. Appendices (Not provided with this copy)

Appendix I – Intertidal survey data log and field notes

Appendix II - Summary of EUNIS classifications recorded during the Phase I & II walkover survey

Appendix III - UAV orthomosaic & DEM outputs

Appendix IV - Site & sample photographs

Appendix V – EUNIS Classification and Annex I Habitat mapping GIS