BIOSECURITY PLAN FOR THE PROPOSED CÂR-Y-MÔR ST JUSTINIAN'S THREE HECTARE SEAWEED AND SHELLFISH FARM

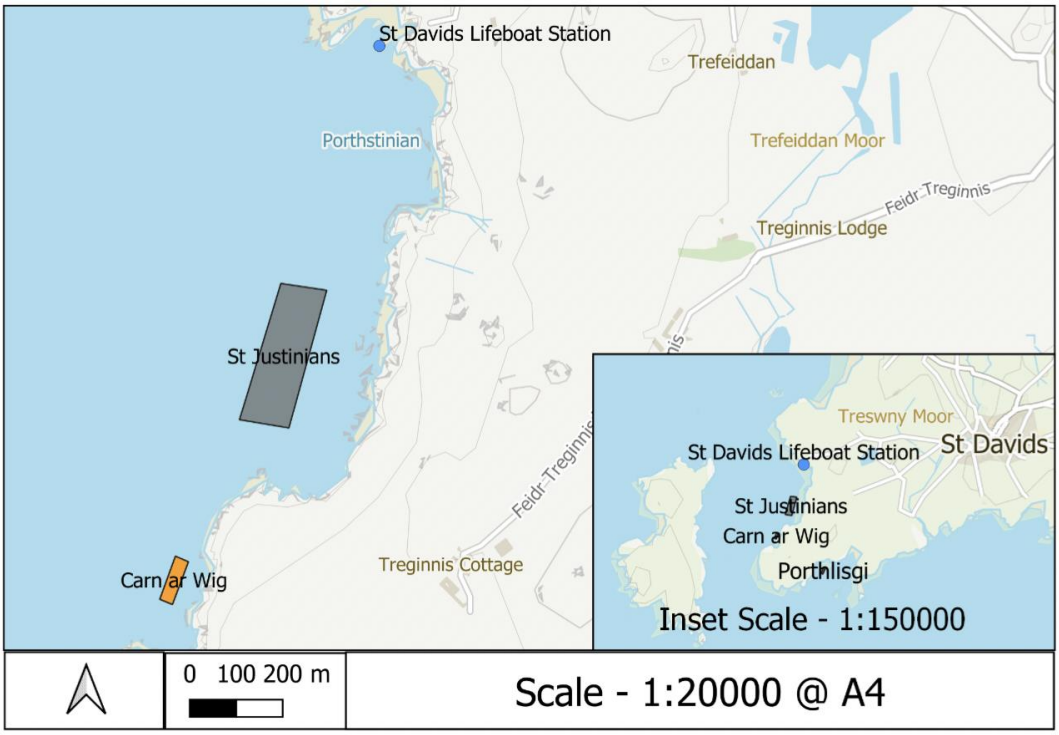

Figure 1. Proposed location of new three hectare integrated multi-trophic ocean farm, (St Justinian's site), black outline, grey infilled box. Existing trial site, (Carn ar Wig), Black outline, orange infill.

Table 1. Longitude and latitude for the area occupied by the proposed St Justinian's ocean farm installation.

Longitude	Latitude
-5.312440965606686	51.87332853640763
-5.3137350082397505	51.87070162364426
-5.3121900558471715	51.87054263792684
-5.311006965606687	51.87319753571296

1. Development name

Câr-y-Môr.

St Justinians 3D ocean farming site.

2. Description of operation

2.1 Introduction

Câr-y-Môr has started a pioneering regenerative ocean farming system off of the St Davids Peninsula in Pembrokeshire. There are two trial sites by St Justinians and Porthlysgi. These trial sites have grown-on from indigenous seed stock, all collected from within the area of the farms siting. The crops grown are Sugar Kelp (*Saccharina latissima*), Oarweed (*Laminaria digitata*), Laver (*Porphyra sp.*) and Dulse (*Palmaria palmata*), and three local species of shellfish - Scallop (*Pectin maximus*), Oyster (*Ostrea edulis*) and Mussels (*Mytilus edulis*). This farming method uses no fertiliser, pesticides, agricultural land or freshwater. It is a sustainable, low impact, low to negative carbon system. It creates a source of food, soil conditioning, medicines, neutraceuticals and many more Natural Products.

Câr-Y-Môr's long term goal is to continue ocean farming with the addition of a commercial kitchen for food, medicines, cosmetics and related products. The development of a research lab and education centre - ultimately to learn, inspire and teach others to replicate this ocean farming method across Wales and the World. Regenerative ocean farms across Wales will enhance local marine biodiversity and the well-being of local communities, stimulate sustainable ocean jobs creation and give young people a route into an integrated Welsh seafood sector.

2.2 Location of proposed 3D Ocean Farm Site

The location of the proposed three-hectare site (Labelled St Justinians) is 500 meters north east of the Carn ar wig trial site. This location has been chosen as the preferred choice due to high suitability of the surrounding marine environment, the successful tests at the trial farms, and the accessibility. The site is located in Ramsey Sound in a shallow open bay on the east side of the sound (Table 1).

Table 2. Coordinates of the proposed site at St Justinians.

St Justinians Proposed Site	
Longitude	Latitude
-5.312440965606686	51.87332853640763
-5.3137350082397505	51.87070162364426
-5.3121900558471715	51.87054263792684
-5.311006965606687	51.87319753571296

2.3 In-water infrastructure design

The design of the farm is to be installed in two phases. The Phase 1 and Phase 2 are represented by 125 m marine grade aquaculture long-lines in 8 (4 seaweed lines and 4 shellfish lines intercalated) rows to make a 125 m x 100 m area site. 11 fifteen inch A floats for the seaweed lines and 5 250L pencil floats for the shellfish lines, respectively. A total of 88 fifteen-inch A floats and 40 pencil floats.

- The seaweed farm is oriented long-line running north to south.

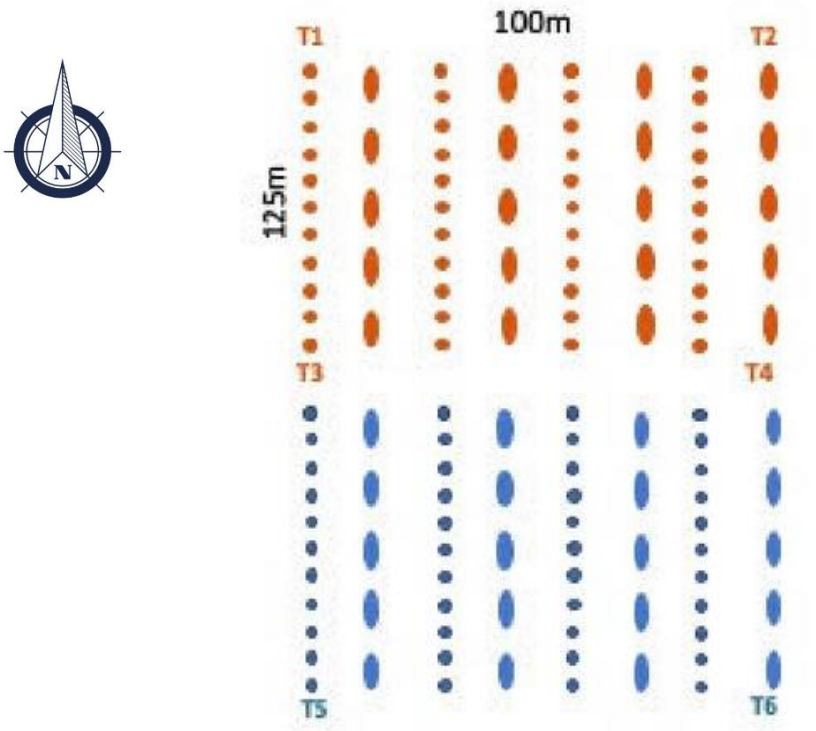

Figure 2. PROPOSED FARM : Plan view of sea surface.

Phase 1 four trinity house yellow special mark buoys are represented by T1-T4. 44 orange circles represent 4 seaweed lines each with 11 fifteen-inch yellow A floats. 20 orange shapes represent 4 shellfish lines each with 5 pencil floats (250 litre)

Phase 2 two trinity house special marks buoys are represented by T5-T6.

44 blue circles represent 4 seaweed lines each with 11 fifteen-inch A floats .

20 blue shapes represent 4 shellfish lines each with 5 pencil floats (250 litre).

2.4 Growing schedule and harvesting protocol

The macroalgae species are planted out in October/November and harvested April/May. The seaweed lines are lifted using an onboard crane. The seaweeds are cut with a knife and the harvested biomass is stuffed into 50kg nets bags. 500kg of harvest returned to port. The biomass is washed in freshwater and air dried.

Shellfish can be harvested year-round. The lantern nets holding Scallops or mussels are lifted by onboard crane and returned to shore. All returning equipment is jet washed in fresh water and air dried.

2.5 On-site operational vessel design and build

Minimum Size

10m x 4m Flat Bottom barge / pontoon with a 1m hull depth and cargo hold 2,5 x 1 x 0,9m.

One Hydraulic Deck crane lifting 500 kg at 2,7m outreach in lightship condition (worst case) results in 1,8-degree heel, 1/2t Hydraulic Pot / Line Hauler Mounted on the Port Bow corner.

The draft @ full load (8200 kg) Should be no more than 0,25 m and be capable of being coded to MCA COP 4 and 20 nm.

Small Open Back Cuddy type wheelhouse at stern.

Maximum power of 2 x 115HP outboards with Hydraulic steering and in full load condition should be capable of a minimum top speed of 12 kn.

To include a fully compliant Electronics and safety Equipment

Railings to 1m along both sides; Stern, removable working section on port side, Heavy duty Dive ladder on transom.

2.6 Plan Period

The biosecurity plan will be valid for a year from when infrastructure is put into the water. It will be reviewed on an annual basis.

2.7 Biosecurity Manager/Officer

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Robert Lewis 07746363136. Growalternative@yahoo.co.uk

Car-Y-Mor, Clegyr Uchaf, St Davids, Haverfordwest, Pembrokeshire, SA62 6QN

3. Information related to environmental conditions affecting biosecurity

Table 3. Environmental conditions affecting biosecurity

Salinity	Enter salinity in ppt. measured using hand-held salinity meter at site
Marine Features present	See document "*Environmental Impact Assessment*"

3.1. Non-native species known to be present in and around Car-Y-Mor farm site. Based on the UK Government Invasive Non-Native Species Portal and the Joint Nature Conservation Committee.

Common name	Species name	Closest records in Wales	Notes	Taxonomic group
Freshwater hydroid	Cordylophora caspia	South Wales	Low salinity	Hydrozoa
Swim-bladder nematode	Anguillicoloides crassus		In fish	Nematode worm
Australian tube worm	Ficopomatus enigmaticus	Abereiddy	Formation of large reefs, replacing natural habitat	Polychaete worm
A polychaete tubeworm	Hydroides elegans		Potential for biofouling and smothering	Polychaete worm
A polychaete tubeworm	Hydroides ezoensis		Potential for biofouling and smothering	Polychaete worm
Darwin's barnacle	Austrominius modestus	Widespread	Intertidal hard substrata. Widespread and common around most of UK	Barnacle
Japanese skeleton shrimp	Caprella mutica	Holyhead harbour	Potential for biofouling and smothering	Caprellid amphipod
An amphipod	Monocorophium sextonae	St Brides Bay	Potential to displace native species	Gammarid amphipod
Sideswimmer, amphipod	Gammarus tigrinus	Milford Haven	Low salinity	Gammarid amphipod
Say mud crab	Dyspanopeus sayi	Swansea docks	Burrows in sediments	Decapoda
Dwarf crab	Rhithropanopeus harrisii	Cardiff Docks (1996)		Decapoda
Chinese mitten crab	Eriocheir sinensis	Swansea Bay	Burrows in estuarine sediments	Decapoda
Asian shore crab	Hemigrapsus sanguineus	Aberthaw	Potential threat to mussel and oyster growing	Decapoda

Brush-clawed shore crab	Hemigrapsus takanoi		Potential to displace native species	Decapoda
Slipper limpet	Crepidula fornicata	Solva harbour	Seabed habitat, but could be brought in on live adult bivalves	Gastropod mollusc
American sting winkle	Urosalpinx cinerea		Muddy estuarine seabed	Gastropod mollusc
American jack knife clam	Ensis leei	Dale Bay	Burrows in sediments	Bivalve mollusc
Dark Falsemussel	Mytilopsis leucophaeata	Saundersfoot	Low salinity	Bivalve mollusc
Asian date mussel,	Arcuatula senhousia		Sheltered, soft sediments	Bivalve mollusc
Pacific oyster	Crassostrea gigas	Milford Haven	Formation of intertidal reefs, replacing natural habitat	Bivalve mollusc
Tufty-buff bryozoan	Tricellaria inopinata	Milford Haven	Potential for biofouling	Bryozoan
Orange ripple bryozoan	Schizoporella japonica	Holyhead marina	Prefers low salinity	Bryozoan
Red ripple bryozoan	Watersipora subatra	Milford Haven	Potential for biofouling. Low energy conditions?	Bryozoan
Carpet Sea-squirt	Didemnum vexillum	Holyhead harbour	Great potential for biofouling and smothering. Highest concern.	Ascidian
Orange-tipped sea squirt	Corella eumyota	Milford Haven	Potential for biofouling and smothering. Already well established	Ascidian
Compass sea squirt	Asterocarpa humilis	Milford Haven	Sheltered conditions	Ascidian
San Diego sea squirt	Botrylloides diegensis	Dale Bay	Potential for biofouling and smothering	Ascidian
Orange cloak sea squirt	Botrylloides violaceus	Milford Haven	Potential for biofouling and smothering	Ascidian
Leathery sea squirt	Styela clava	Skomer	Potential for biofouling and smothering, but already widely spread around UK	Ascidian
Harpoon weed	Asparagopsis armata	Skokholm	Potential for biofouling and smothering.	Red alga
Hook weed	Bonnemaisonia hamifera	Widespread	No known impacts	Red alga
Siphoned Japan Weed	Dasysiphonia japonica	Skokholm	Potential for biofouling and smothering	Red alga
A filamentous red alga	Melanothamnus harveyi	Milford Haven	Already widely spread around UK	Red alga
Pom-pom weed	Caulacanthus okamurae	South Pembrokeshire	Exposed rocky shores	Red alga

Worm Wart Weed	Agarophyton vermiculophyllum		Low energy conditions	Red alga
Devil's Tongue Weed	Grateloupia turuturu	Milford Haven	Potential to displace native species	Red alga
Wireweed	Sargassum muticum	Widespread	Low energy conditions	Brown alga
Japanese kelp, wakame	Undaria pinnatifida	Milford Haven	Low energy conditions	Brown alga
Green sea fingers	Codium fragile subsp. fragile	St Brides Bay	Potential for biofouling and smothering	Green alga

4. Site activities which have a significant risk of introducing or spreading non-native species

Table 4. Site activities affecting biosecurity.

1	400kg anchors placed on benthic zone.
2	100meters 35mm ground chain on benthic zone.
3	Oyster cages. 1mx0.8mx0.8m. 20 phase 1. 20 phase 2. Paced on benthic zone.
4	Marine grade; aquaculture ropes and lantern nets suspended in water column.
5	Buoys on surface. Six aluminium trinity house marker buoys. 44 of 15” A floats. 20 of 250 litre pencil floats.
6	Sea Farm Vessel. Transfer from landing dock to site and return. 1km journey each way.
7	Monitoring. Scuba divers, Remote Operated Vehicle (ROV).
8	Seeded macroalgae lines tied onto site infrastructure.
9	Juvenile (spats) of bivalves placed into lantern nets and oyster cages.

5. Details of how each of the activities have the potential to increase the risk of introduction or onward spread of marine non-native species.

The Sea-farm infrastructure creates a vector for the spread of Invasive Non-Native Species (INNS) due to the following reasons;

- The infrastructure is static in the water column creating a habitat for INNS growth
- The infrastructure is in a fully saline environment giving INNS a good environment for growth.

The Sea-farm vessel creates a vector for the spread of Invasive Non-Native Species INNS) due to the following reasons;

- The vessel when not in operation is static in the water column creating a habitat for INNS growth
- The vessel when not in operation is in a fully saline environment giving INNS a good environment for growth.
- The vessel when in operation travels between the launch port and the sea-farm enabling the spread of INNS between these two locations.

Monitoring of the farm.

- R.O.V. can be used in other sites around the country.
- Scuba equipment can be used in other sites around the country.

Juvenile macroalgae and bivalve planting.

- If seed stock is from a different location, then spores or spats of INNS could be present.

6. Biosecurity control measures: Instructions for staff, contractors and other site users

Table 5. Biosecurity control measures.

Where	Who	What	When
The sea-farm infrastructure	Farm operator. Contractor.	Visual inspection	Weekly, weather dependent
		Underwater imaging of sample area. ROV and underwater camera on extension pole.	Regular intervals, minimum monthly.
Launch Port	Vessel Operator	Visual inspection	Before and after every use
On land	Farm operator	Cleaning work materials, (hands, tools, collection bags, lantern nets, oyster cages etc.) with fresh water and air drying.	After every visit.
Monitoring	Contractor, farm operator	Thoroughly clean equipment with freshwater and air dry.	Before and after every use.

7. Site surveillance and reporting protocol.

- Visual inspections of the farm site will take weekly, weather permitting.
- Visual inspections include lifting sample sections of sea-farm infrastructure out of the water and observing signs of INNS on infrastructure or cultivars.
- If INNS is identified on any of the infrastructure, crops or vessel, the harbour master, Natural Resources Wales and any other relevant stakeholders will be notified immediately. Identified INNS will be included in annual environmental reports to Natural Resources Wales should they be requested.
- Suspected INNS to be removed, photographed and placed into a sealable container for inspection by qualified marine biologist.
- If the risk is deemed to be significant, the compromised infrastructure will be removed from the site using the sea-farm vessel for further inspection and cleaning.
- When compromised infrastructure is removed from water, images of INNS will be taken and shared with relevant authorities and entered the sea-farm biosecurity logbook. Logbook both paper and digital in vessel cabin.
- Any tools or equipment used during farm inspection (e.g., boathooks, winches, knives, lifejackets) will be cleaned in pressurised freshwater and left to air dry on land prior to reuse.
- Spread of the species mentioned in *Table 2.* is unlikely due to;
    - Jellyfish species are present most commonly in the summer period where there is little or no activity on the sea-farm. Strong currents likely to dislodge stuck individuals.
    - The site vessel travels a very short distance, it doesn't leave the bay. No bilge tanks on boat.
    - All seeded lines and juvenile stock closely inspected before deployment. Any sign of INNS set aside and sent for analysis, NRW informed.
    - All monitoring equipment will be cleaned in fresh water and air dried.

8. Contingency plan

Action	Responsibility	Source/Location of Equipment
Replacement equipment will be sought.	Biosecurity Manager (Section 2.7)	Obtain equipment from reputable supplier, preferable existing supplier.

9. Location of biosecurity logbook

The biosecurity logbook can be found in the cab of the boat, near to the helm. Digital copy in Car-Y-Mor office and stored on cloud server.

The logbook will be accessible to; all users and visitors of the sea-farm, the harbour master, and any other relevant stakeholders.

10. Plan review date

The plan will be reviewed yearly before the start of the seaweed growing season (September). Staff members will be enced to attend INNS workshops when available. A laminated ID guide will be created with most likely to be found INNS described. This will allow for easier identification and a more in-depth biosecurity plan review.