Save Port Quin Bay Group

Public Consultation Submission in response to the Further Information Document submitted by Biome Algae and Camel Fish regarding MLA/2023/00307 and MLA/2023/00308

22nd November 2024

Contents

Introduction

This public consultation submission (the 'submission') is in response to the further information document put out for public consultation on 30/10/24, titled 'MMO Redacted Biome and Camel Fish MMO FIR 1 and 2 September 2024.pdf' and referred to in this submission as 'the Document'. It covers the two separate Marine Licence Applications (MLAs) of both Biome Algae and Camel Fish (the 'applicants'), which are being assessed cumulatively by the MMO.

The submission presents evidence specific to the information and assertions presented by the applicants in the Document. It does not seek to reiterate objections made in the previous round of consultation. It has been produced with input from conservation organisations, environmental and social scientists, local businesses, the local community and members of the general public. It may be referred to by members of the public who wish to make their own individual representations to the MMO.

In this submission we present a series of topic-specific sections[1] that examine the applicants' further information in detail and provide evidence that fundamentally undermine their self-written claims that there will be 'no significant impact' or 'no Likely Significant Effect' resulting from their proposals. Throughout, we highlight a disturbing amount of false and misleading information that has been presented to the MMO in an attempt to downplay the scale of the project and the associated risks to the environment and other users of Port Quin Bay.

The topic-specific sections are:

1. Project Infrastructure: The applicants significantly understate the scale of the proposed infrastructure. They provide no single, clear description of the project – the various sections covering 'farm infrastructure' are repetitive and contain inconsistencies and basic miscalculations.
2. Sediment Assessment: The applicants falsely characterise the seabed under the proposed farms as '*coarse sediment*' which, they say, is '*not a supporting habitat for marine mammals in terms of prey*'. The evidence is categorical: the seabed is 'sand' or 'sandy gravel', which is essential habitat for prey species of locally prevalent birds and mammals, including those protected by the SAC, MCZ and SSSI.
3. Habitat Loss and Entanglement Risk: The applicants have misrepresented, through bias and in some cases false interpretation, academic research papers that are key to their assertions of no significant impact or no LSE, particularly with regard to habitat loss and entanglement risk.
4. Safe Anchorage: The applicants are unable to support their assertion that the risk to cargo vessels using the safe anchorage in Port Quin Bay is As Low As Reasonably Practicable (ALARP), rather the evidence shows that the area will be lost as an essential safe anchorage.

[1] We use the term 'sections' to avoid confusion with the applicants 'Chapters'. We were unable to provide a chapter-by-chapter analysis due to repetition and inconsistencies in the Document.

5. Project Feasibility: The proposal is clearly speculative. The evidence shows it is not deliverable due to the scale, schedule and location proposed. This is in terms of cost, carbon footprint, logistics and lack of markets for farmed seaweed.
6. Consultation and Engagement: The applicants continue to misrepresent stakeholder support. The avoidance of transparency in consultation and stakeholder engagement began in 2023 and remains apparent in the Document.
7. Areas of Aquaculture Potential: The Applicants continue to apply an incorrect interpretation of the site suitability maps provided by the MMO, seeking to justify, retrospectively, their selection of Port Quin as a suitable site. This provides a definitive assessment of this error.
8. Bird Impact Assessment: A community member has reviewed the Bird Impact Assessment, exposing fundamental flaws and highlighting risks associated with conducting a self-assessment without consulting subject-matter experts.
9. Geology Review: The applicants have failed to take account of a nearby dredging disposal site and the unusual geology and mineralogy conditions of the Bay. This is a significant omission given the potential uses of the algae for human / animal consumption and agricultural fertilisers.

Collectively, these chapters constitute a substantial evidence base for the MMO and its primary advisors that categorically shows the additional information provided by the applicants does not allow the MMO to conclude that the proposed seaweed projects comply with the objectives of the South West Marine Plan and associated policies; and that the applications should therefore be rejected. This is further outlined in the accompanying document 'Policy Summary Table'.

We would like to note, formally, additional problems with the Document, which, while they may not be relevant to the MMO's review of the evidence, do reflect the unprofessional and opaque approach taken by the applicants.

First, the Document is written by the applicants themselves with no independent expert review. As such, it is biased and lacking in objectivity. Second, against the clear instruction of the MMO to remove repetition and not include superfluous information, the applicants have delivered a 624-page document full of both. Third, the proliferation of basic errors and inconsistencies within the document, highlighted in this submission, are cause for concern. Finally, errors with chapter number and the use of images of text sections make the document difficult to navigate.

It is concerning that this has resulted in additional burden on public bodies and the general public in reviewing proposals that should never have passed the screening stage. We have engaged with DEFRA and the MMO separately on these matters and are encouraged that Michelle Willis, Acting CEO of the MMO, is undertaking a 'comprehensive review' of the recent licence applications for large-scale seaweed farms, coordinated by Biome Algae Ltd.

Port Quin appears to have become a test-case. We hope that lessons are learned by the MMO that will support legitimate businesses applying for seaweed farm licences at the right scale and in the right location in future.

1. Project Infrastructure

Key Points

The proposed project requires a huge footprint on the seabed – **2,950 concrete blocks**, weighing **33,875.3 tonnes**, representing a **loss of up to 14,160m^2 of essential habitat**. This highlights the scale of infrastructure required to operate static long-line farms in North Cornwall conditions.

This information is not clearly set out in the Document, rather it is derived from partially redacted information in the Appendices, which are intended to provide supplementary and technical information only.

In the main Document, written by the applicants themselves, project infrastructure details are presented in a false and misleading way, with multiple inconsistencies and erroneous calculations. For example:

- At no point in the Document do the applicants refer to the Arc Marine calculations that 5x concrete blocks are required for each anchor point (2,950 total), indeed they state falsely that only 1 is required per anchor point (576 total).
- They falsely state that the concrete blocks are 1.8m^3. They are not. They are 2m x 2m x 2m with a total volume of 5.34m^3 (accounting for holes in the structure) according to Arc Marine.
- They do not, at any point, state that the concrete blocks will require a seabed footprint of up to 14,160m^2, as advised by Arc Marine, rather they prefer to express this as a percentage of the overall layout of the farm (they give a false figure of 1.14%).
- They exclude from their calculations the anchor points and concrete blocks that are required to secure the marker buoys.

Provision of a clear and accurate project description is fundamental to conducting Habitats Regulations Assessments. The primary advisors will likely rely on the content of the main Document to be accurate and may only read the Chapters that are relevant to them. By masking the true extent of the infrastructure and mis-characterising the seabed (see *Chapter 2 – Sediment Assessment*), the applicants are misleading consultees by downplaying the significance of the risks.

Evidence Review

We already know that the proposed seaweed farm is large-scale, as per accepted definitions.[2]

The Document reveals the true extent of the infrastructure required to secure the proposed farm to the seabed given conditions on the north coast of Cornwall. This information, however, is only shown in the (redacted) Arc Marine Mooring Design Document (Appendix X) and the (unredacted) Marine Archaeological Report (Appendix VI).

[2] 'Large-scale' seaweed farms are those requiring more than 50 x 200m lines (Campbell et al, 2019). The proposed farm consists of 288 x 160m lines.

The applicants themselves do not provide a clear and transparent description of the infrastructure in those parts of the Document they wrote themselves. This is particularly so with reference to the number and size of the concrete blocks (referred to by the applicants as 'eco-blocks') required to anchor the long lines and marker buoys to the seabed (see table).

Table: Discrepancies between information from the Arc Marine and Archaeology reports (Appendices V and X) and Biome Algae / Camel Fish's description of farm infrastructure.

	Appendix V and X	Biome Algae / Camel Fish
Number of anchor points	**590** (576 for longlines and 14 for marker buoys)	**288** (x2 = 576)*
Number of concrete blocks per anchor point	**5**	**1**
Total number of concrete blocks	**2,950**	288 per site (**576** total)
Concrete block size	L/W/H – 2m Volume – **5.341m^3**	**1.8m^3****
Total concrete block footprint	**11,800m^2 - 14,160m^2**	518.4m^3 (x2 = **1,036.8m^3**)***
% of total farm area (100.8ha) covered by blocks	**1.4%**	**1.14%**
Surface weight of each concrete block	**11,483.15kg**	Not specified
Total weight of required concrete blocks	**33,875.3 tonnes**	Not specified

** Figures in parentheses are derived, not explicitly stated in the Document.*

*** Applicants have mistaken l/w/h for volume and used the wrong sized block (possibly that used in Torbay).*

**** Applicants use m^3 to express area, not m^2, and mistakenly multiply 288 x 1.8 to reach the figure stated.*

This section focuses primarily on the anchoring system. Analysis on the other infrastructure requirements is included in Section 5 of this submission, Project Feasibility. Although this is also not clearly set out in the Document, the proposed farms will also require:

- 14 navigational buoys
- 2,304 x 300l buoys
- 576 x 160m header lines
- 4,608 drop lines
- 590 riser lines
- 46,080 seed lines

How do the applicants describe the infrastructure in the Document?

Various incomplete and conflicting descriptions of the anchoring system and concrete block requirements are presented in the main parts of the Document, written by the applicants, as follows:

Chapter 5: Infrastructure Assessment, provides a limited description of the anchorage system determined by Arc Marine to ensure stability, stating:

> *It was determined 29.5 tonnes submerged weight[3] would be required for absolute stability across 50-year storm conditions with Port Quin Bay. This weighting will also be applied to main navigational markers.* (p.43)

[Note the applicants do not include the 14 navigational markers that also require anchor points in their calculations.]

Chapters 9, 10, and 11, the Habitats Regulations Assessments (SAC, MCZ and Salmonids) repeat the following text in Annex Table 1, Proposed Plan or Project Details:

> *Cumulatively, this would involve installing 288 longlines across both sites at full capacity, which occupies 10% of the total required footprint of the farms (see chapter 4 and 5). The longlines are 160 m long, secured using 100% recycled eco-blocks.* (p.148, 172, 197)

Appendix III, Biosecurity Plan falsely states that just 2 'eco-blocks' will be used per long line:

> *Each site will have a total of 144 long lines (headlines) deployed as permanent infrastructure... There will be 2 eco-blocks on each line and a total of 288 eco-blocks will stabilise the headlines on the seafloor for each site.* (p.381)
>
> *The eco-blocks are 1.8m^3. A line requires 2 ecoblocks. Therefore, a total of 288 eco-blocks will be used per site. The potential area displaced by eco-blocks on the seabed is 518.4 m^3 per site.* (p.382).

[Note the error in the maths - area calculation assumes 1.8m^2 per block, rather than 3.24m^2; and the expression of area as m^3 rather than m^2.]

Appendix V: Marine Navigational Safety Assessment and Emergency Action Plan, states:

> *The main infrastructure of the farm is a series of long-lines (288 x 160 m spaced 20 m apart) that are anchored to the sea floor with eco-blocks (Figure 7, Chapter 5 and Appendix I).* (p.419)

[3] Note that to achieve 29.5 tonnes 'submerged weight' requires 5x concrete blocks with a surface weight of 11.48 tonnes each = 57.4 tonnes (Arc Marine, p.600).

Despite this false and inconsistent description, it is clear that Biome Algae and Camel Fish are fully aware of the infrastructure specifications they intend to use. For example, they calculate that the blocks will take up 1.14% of the total farm footprint.

> *For a both farm sites, the eco-block anchors will occupy a total of 1.14% of the total farm footprint, with the remaining 8.86% comprising ropes and floats for 288 longlines (maximal site capacity for both farms).* (p.44)

This calculation is based on the requirement for 5x 2m^3 (footprint 4m^2) concrete blocks, as follows:

- 5x blocks X 576 anchor points = 2880
- 2880 x 4m^2 = 11,520m^2
- 11,520m2 / 100.8ha (1,008,000m2) x 100 = 1.14%

What do the Arc Marine and Archaeological assessments state?

Despite the applicants' efforts to hide the scale and nature of the infrastructure components by redacting the Document on the grounds that it contains "*commercially sensitive information / IP*" (p.43), the redactor failed to notice that the key information redacted from the Arc Marine report was set out on p.51 of the MDMS Archaeology Report (p.539 of the Document):

10.1 Overview of Construction Impacts

10.1.1 The proposed development would involve the construction of a seaweed farm, comprising two adjacent blocks, separated by a 50 m gap. The expected design life for the seaweed farm is 50 years.

10.1.2 Each block will comprise 144 no. 160 m long-lines, orientated north-south and spaced 20 m apart. The long-lines will be arranged in columns of four (4), amounting to 72 no. columns in total across the whole farm. The total physical farmed area (based on infrastructure alone) is 10.08 ha.

10.1.3 Gravity-based anchors have been selected as the most suitable option for the Site, namely the RC2000 reef cube®. Individual anchor weight for optimum stability will be 29.5 tonnes, equating to 5 no. cubes. The typical seabed footprint of one anchor point (five cubes) is c. 20 m^2. A total of 576 no. anchor points are required across the 288no. long-lines, resulting in the use of 2,880 no. cubes, with a seabed footprint of 11,520 m^2.

The Arc Marine report, while heavily redacted, can be read in conjunction with the information revealed in the archaeological report. The key points are set out in section 6.1 of the report, p.591 of the Document:

6.1 Conclusions

The following conclusions can be drawn:

- Screw anchors have been considered as not feasible for the Port of Quin site.
- The required submerged weight is [redacted] at each anchor point. This is based on stability in worst case 50 yr storm conditions and includes code defined safety factors.
- A submerged weight of [redacted] equates to 5-off [redacted]® at each anchor point.
- [redacted]-off RC2000 cubes has a worst-case seabed footprint, of 6 m x 4 m per anchor point assuming a configuration where all the cubes are in contact with the seabed. This equates to a worst-case surface area footprint on the seabed of [redacted] m^2 per anchor point.
- Using [redacted]-off RC2000 [redacted]® per anchor point the current configuration of long lines will remain stable and on-station in 50 yr storm conditions (assuming the integrity of the configuration is maintained).

Note that Arc Marine provides a 'worst-case' seabed footprint calculation of 6m x 4m per anchor point. This would increase the total footprint (using the correct figure of 590 anchor points) to 14,160m^2, which is 1.4% of the 'total farm footprint'. Biome Algae and Camel Fish have chosen the lesser number here, ignoring the precautionary principle.

Information relating to the size (length, volume and density) as well as the submerged and surface weights of the concrete blocks (which Arc Marine call 'reef cubes') are shown in the calculations at the end of their report, on pages 598 and 600 of the Document. From this we derive the total weight of the required blocks – **33,875.3 tonnes of concrete**.

4.0 INPUT DATA

4.1 Standard reef cube properties

$\rho_c := 2150\ kg \cdot m^{-3}$

$V_{RC2000} := 5.341\ m^3$

$l_{RC2000} := 2\ m$

5.1 Submerged weights

$m_{RC2000} := V_{RC2000} \cdot \rho_c$	Mass in air RC2000	$m_{RC2000} = 11483.15\ kg$
$\omega_{RC2000} := V_{RC2000} \cdot g \cdot (\rho_c - \rho_w)$	Submerged weight RC2000	$\omega_{RC2000} = 6008.63\ kgf$

2. Sediment Assessment

Key Points

- Biome Algae and Camel Fish still have not undertaken any site-specific research to establish the nature of the seabed under the farms, despite this being fundamental to the risk assessments concerning species, habitats and infrastructure design.
- The applicants have changed the characterisation of the seabed under the farms from 'subtidal sand' in the original application to 'coarse sediment' in the new Document. This is emphasised 75 times in the document, and is sometimes (in the HRA, for example) referred to as 'very coarse sediment.'
- The sole reference source used by the applicants for its 1-page sediment assessment (Chapter 6) is Defra's MAGIC Map. This is a broad scale, predictive dataset not suitable for site specific assessments. It is superseded by more recent, better-quality sources that are easily accessible, which are set out below.
- Even within the Document, the independently prepared MDMS Archaeological Report (Appendix VI) and the Port of Quin (*sic*) Kelp Farm Mooring Design report (Appendix X) refer to these more robust data sources and characterise the seabed as 'sand' in their assessments, contradicting the applicants' own assessment.

As stated in the EcoSpan review of the MLAs submitted to the MMO previously:

> *Subtidal sands and gravels are Habitats of Principal Importance, as listed on Section 41 of the Natural Environmental and Rural Communities (NERC) Act 2006. Should eco-blocks or oil rig anchors become the adopted approach to mooring infrastructure, then this could result in both a loss of priority habitat and/or loss/change in high intensity sandeel spawning ground.*

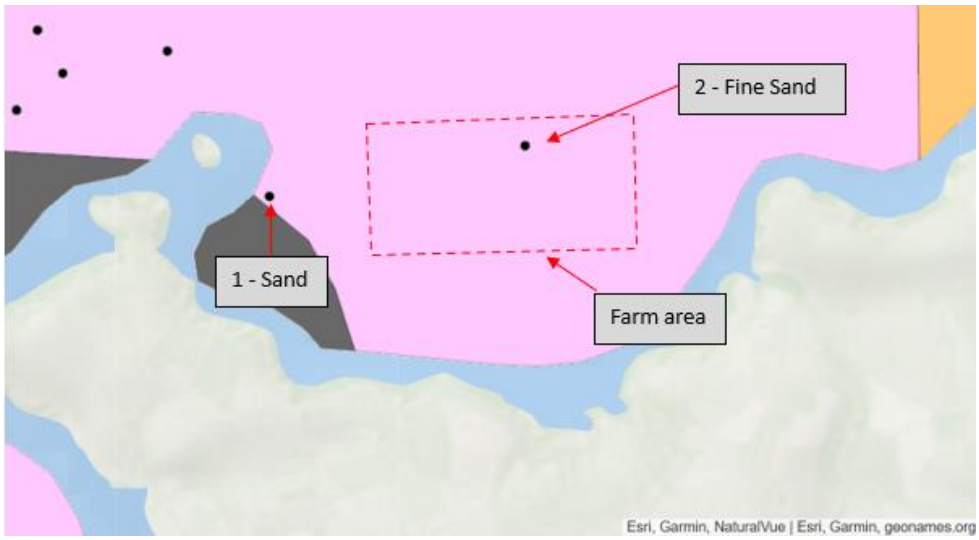
It is not possible to conclude 'no significant risk' or 'no Likely Significant Effect' based on the evidence available.

We believe the applicants did not select the site based on an assessment of the sediment type; that they are misleading the MMO and primary advisors by characterising the seabed as coarse sediment, despite the evidence (including that presented in their own submission by 3rd parties); and that they are doing this to downplay the environmental risks associated with the proposed farm.

Evidence Review

The applicants characterise the seabed under the proposed farms as '**coarse sediment**' and base this on historic, low resolution geological maps. It is not 'coarse sediment'. More detailed and recent sources, such as the BGS's GeoIndex Offshore (link), show that it is '**sandy gravel**', which is essential habitat for protected species, notably in this case the harbour porpoise (SAC feature) and puffins (SSSI feature). The BGS portal includes a grab sample taken directly under the proposed farm that found 'fine sand,' with additional grab samples confirming 'sand' to the west.

Figure 1 - BGS map showing location of the physical samples in relation to the farm area. The area shown in pink is classified as 'sandy gravel'.



The issue is fundamental because characterising the seabed as 'coarse sediment' is the basis for the applicants' conclusion of '**no significant risk**' in Chapter 7 (Marine Mammal Impact Assessment); and Chapter 8 (Bird Impact Assessment, Pentire Peninsular SSSI); and '**no Likely Significant Effect**' in Chapter 9 (Habitats Regulations Assessment: Special Area of Conversation (*sic*)).

In this review, we provide evidence in relation to the following questions:

1. What are the applicants proposing to put on the seabed, and why?
2. What do the applicants say about the seabed under the proposed farms and associated habitat risk?
3. What do the applicants' independent Archaeological Assessment and Mooring Design consultants say about the seabed under the proposed farms?
4. What does the best available data tell us is under the proposed farms?
5. How have the applicants misrepresented the evidence?
6. What are the implications of this? How does this affect the application?

1. What are the applicants proposing to put on the seabed, and why?

The initial application considered three approaches to anchoring the long line system to the seabed - oil-rig anchors, screw anchors and eco-block gravity anchors. At the time, they considered screw anchors to be preferential due to the minimal footprint on the seabed and eco-blocks being at risk of movement due to sediment conditions:

> *This is more favourable than using high tonnage concrete blocks that will shift with the sediment.* (Biome Habitat Regulations Assessment: Marine Conservation Zone (MCZ), p.6, 12)

In the updated application, the Arc Marine Mooring Design report (Appendix X) states screw anchors were discounted for various reasons, including that:

"…caution was expressed by two screw anchor suppliers with regards to the feasibility of their screw anchors in sandy Gravel (sG) seabeds…" (p.561)

The applicants, on the recommendation of Arc Marine, have therefore selected a gravity-based system, using gravity-based anchors, or concrete blocks, referred to throughout the Document as 'eco-blocks'.

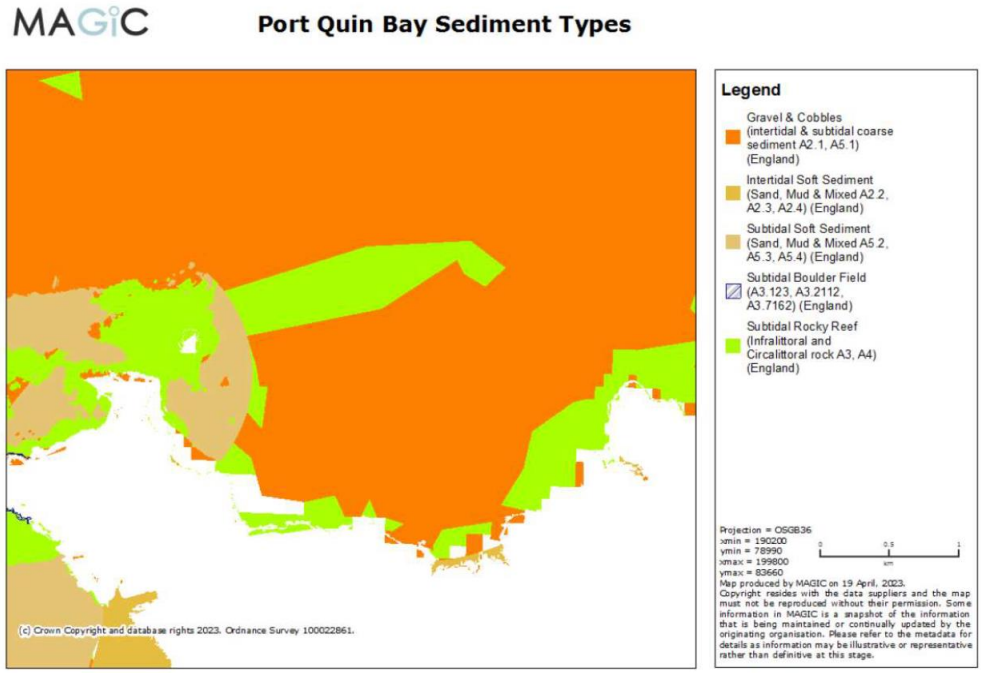
Due to the dynamic coastal conditions on the North Cornwall coastline Arc Marine have calculated that the **576 anchor points** (590 when you factor in the navigational markers) will require a total of **5 x 11.48 tonne concrete blocks each** to adequately secure the system, which equates to **2,950 eco-blocks in total**. That's **33,875 tonnes of concrete** with a footprint of **11,800m² – 14,160m²**. (See: 1. Project Infrastructure, above).

2. What do the applicants say about the seabed under the proposed farms and associated habitat risk?

The applicants dedicate a single page to their 'Sediment Assessment' (Chapter 6, p.47) consisting of five lines of text and map. The say:

The proposed farms are located over coarse sediment (subtidal coarse sediment A5.1). This is a lower sensitivity sediment type and is conserved within the adjacent MCZ (Figure 1.0). The proposed farms are not located within rocky reef regions or a small area of lower sensitivity soft subtidal sediment (A5.2, A5.3 and A5.4 sand/muddy sand) which lies at distance to the west of the proposed sites. As well as further east behind Mouls Island, within the MCZ.

They include the following map, titled *Figure 1.0: Sediment type within Port Quin Bay and surrounds (DEFRA Magic Map).*



The applicants have changed their characterisation of the seabed since the initial application. In the *Seabed, Fisheries and Marine Mammals Assessments* they originally said:

> *"At the proposed farm location, the benthic environment is subtidal sand".* (p.2)

In the updated Document, the applicants characterise the seabed as 'coarse sediment' and make multiple (75) references to this in support of their assessments. Examples are given here.

> *"A very important factor in selecting the site was sediment type within the Bay. Coarse sediment is not a supporting habitat for marine mammals in terms of prey. There are very little fish present. Sand eels will likely be present to the west of the proposed farms over the sandy deposit, where they can also spawn – providing a food source for mammals (porpoise for example) and birds".* (p.19)

> *"The coarse sediment over which the proposed farms will be located does not provide a critical supporting habitat for prey species – which would be provided by the muddy sand to the west and within the MCZ, further west and the wider SAC (sand eels for example)". (p.65)*

> *"However, it is important to note that given the nature of the sediment in the majority of the Bay (coarse) and under the proposed farms, porpoise will not be excluded from important feeding grounds within the SAC".* (p.79)

> *"…the sites are located over coarse sediment (primary sediment in the Bay) and therefore would not compromise foraging".* (p.87)

> *"However, Biome and Camel Fish have purposefully selected sites that are over coarse sediment to ensure we are not impacting critical supportive habitat for prey".* (p.90)

> *"The coarse sediment habitat which forms the seabed at the proposed location of the farms has been identified as very coarse, stable sediment (chapter 6 and Appendix I). Sand and fine sediment are not features within it, with the sediment closer to gravel and sitting on solid bedrock".* (p.141)

And so on.

3. What do the applicants' independent Archaeological Assessment and Mooring Design consultants say about the seabed under the proposed farms?

The three independent technical reports included in the Document are:

- Appendix VI: MDMS Port Quin Seaweed Farm Marine Archaeological Assessment
- Appendix X: Port of Quin Kelp Farm: Mooring Design (May 2024)
- Appendix VII: UXO Report

The archaeological report details the origins of the sediment within Port Quin Bay and the wider area. British Geological Society records have been used to determine the sediment across the site and study area as **sandy gravel**, with supporting maps presented.

Figure 2: Archaeologist's report to the applicants includes the following map, with the source (BGS) included (p.504).

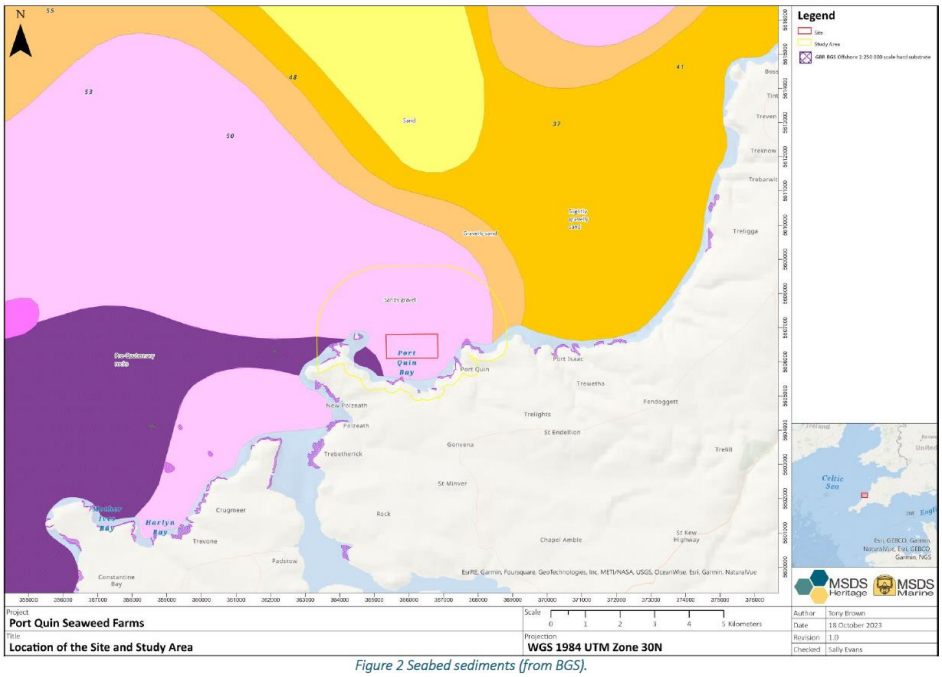


Figure 2 Seabed sediments (from BGS).

The report also shows the grab samples directly under the location of the proposed farm and several from within the study area, recording 'fine sand' and 'sand' as the seabed sediment (p.505).

The sediment type is also a critical component of the Arc Marine mooring design assessment, as the seabed roughness directly relates to the weight required to provide mooring stability. The geotechnical data provided in section 3.13 of the assessment (p.582, see below) states the assumed sediment type is 'fine sand' (see *Figure 3* below). This is further reinforced through the selection of their roughness coefficient of $1*10^{-5}$ (fine sand range). Other references are made to sandy gravel as a sediment type within the review of screw anchors (p.561).

Additionally, the UXO Report cites the MSDS report: *'The seabed expected at the site for munition burial and movement assumption is taken from the MSDS report® stating sand and gravels as the seabed sediment. Due to the small size of the expected UXO it would be prudent to assume that UXO remaining within the site would have some degree of coverage and burial'.* This is significant when assessing the movement and burial of small UXO expected in the farm area. (p.622*)*

Figure 3: Arc Marine classifies the seabed as 'fine sand' for the purposes of its calculations (p.582).

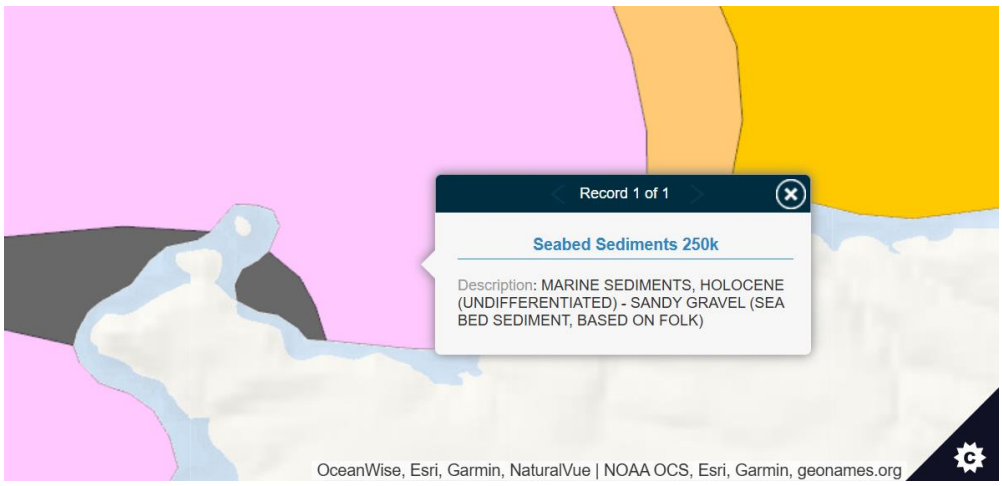
Table 9 Soil parameters

Parameter	Value	Ref
Soil type/stratigraphy	Assumed to be homogeneous over the depths of interest	
Vertical stiffness	>50 kN/m^2	
Seabed roughness	1 x 10^{-5} m	Assumed based on fine sand
Unit soil weight	11.75 kN/m^3	
Internal friction angle (angle of repose)	30°	

4. What does the best available data tell us is under the proposed farms?

The broad scale, predictive dataset used by the applicants (Defra's MAGIC Map) is just one of various publicly available data sources. The British Geological Society publish an additional broad scale seabed sediment layer on the GeoIndex Offshore portal (link), a comprehensive resource compiling shallow geology and geophysics data collected as either part of regional or local mapping work, or provided to the BGS by third parties. The BGS Seabed Sediments 250k dataset shows that the seabed is '**sandy gravel**'.

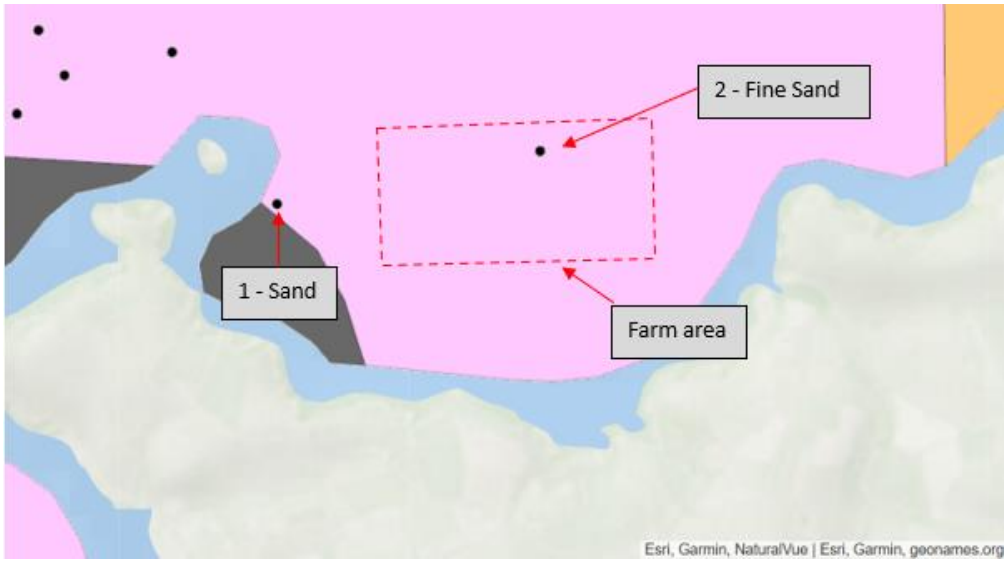
Figure 4 - BGS 250k Seabed Sediment dataset, showing the proposed farm area as 'sandy gravel'.



While the 250k Seabed Sediment map is broad scale and shouldn't be used for detailed site-specific assessment, additional datasets can be used to build confidence in the sediment type, including records of physical samples.

The record below, also accessed on the BGS GeoIndex Offshore map, shows one sample within the perimeter of the proposed site, and one located ~400m to the west of the site. Both samples fall within the Sandy Gravel layer in BSG 250k mapping. Sample 1 was returned as 'Sand' and Sample 2 as 'Fine Sand'.

Figure 5 - Location of the physical samples in relation to the farm area



Observed data further demonstrates that the farm is in an area of sand, rather than gravel and cobbles, as implied by the applicant. One diver's account, for example, states that the bed material around the wreck, The Sphene, which is slightly further offshore, is also sand: *"Being completely surrounded by sand you're not going to get lost."* (link).

Figure 6 - Extract from the Marine Archaeology Assessment showing the location of 'The Sphene' marked as W_002 to the north of the farm area

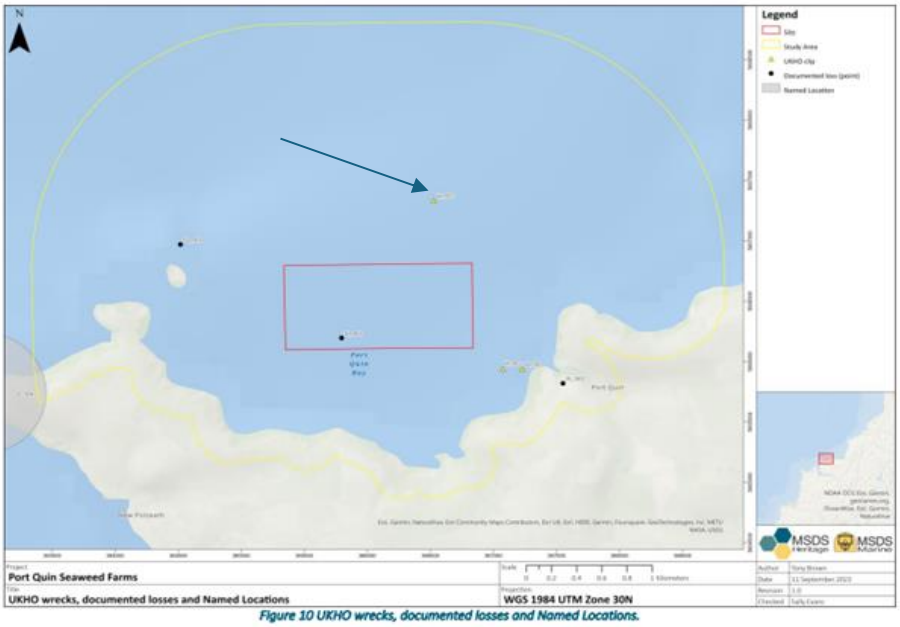


Figure 10 UKHO wrecks, documented losses and Named Locations.

Port Quin Seaweed Farms
Marine Archaeology Assessment – 2023/MSDS2326S/1

5. How have the applicants misrepresented the evidence?

The most obvious question to ask from the Magic Map sediment data, which anyone with the most basic scientific background would ask, is why the 'subtidal soft sediment' layer stops abruptly in a neat radius to the east of the Mouls. This boundary is used by the applicants to claim that this sandy area "*lies at a distance to the west of the proposed sites*."

The reason for the abrupt radius cut off is that this represents a layer of higher resolution data from a survey undertaken in support of the Padstow Bay and Surrounds MCZ by CEFAS and the Environment Agency (see link). The radius represents the spatial extent of the survey. The following three maps clearly demonstrate this.

Figure 7: MAGIC map showing MCZ boundary, with 'subtidal soft sediment' layer ending in an abrupt radius to the west of the proposed farm site.

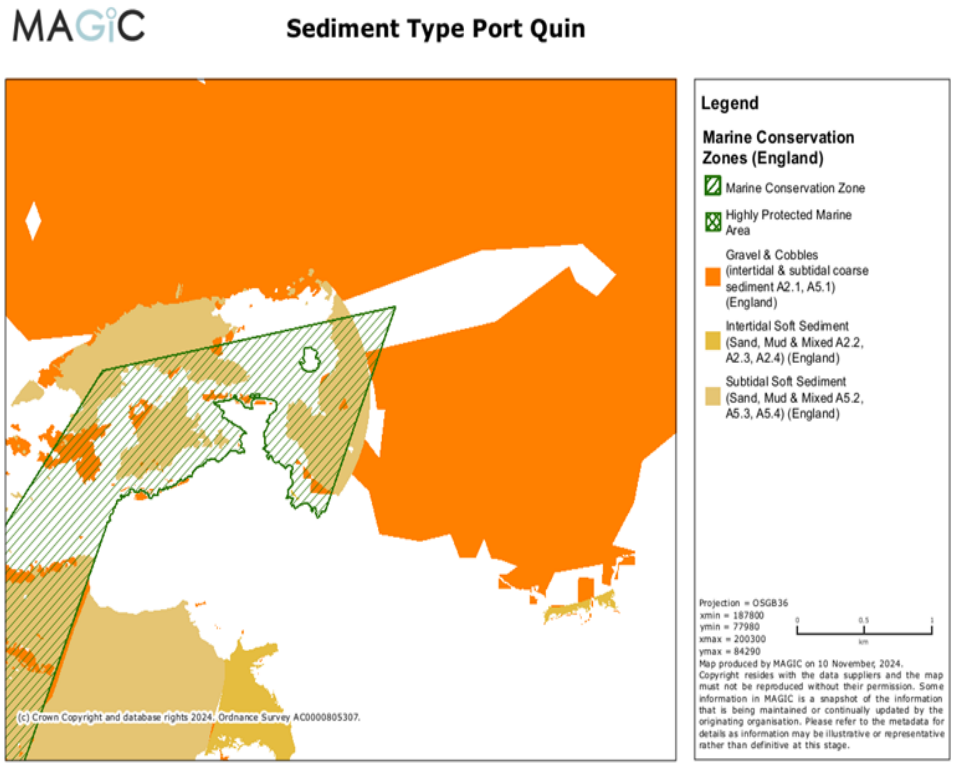


Figure 8: The spatial extent of the survey conducted in 2015 for the MCZ, showing subtidal sand extending to the boundary of the survey area to the west of Port Quin Bay

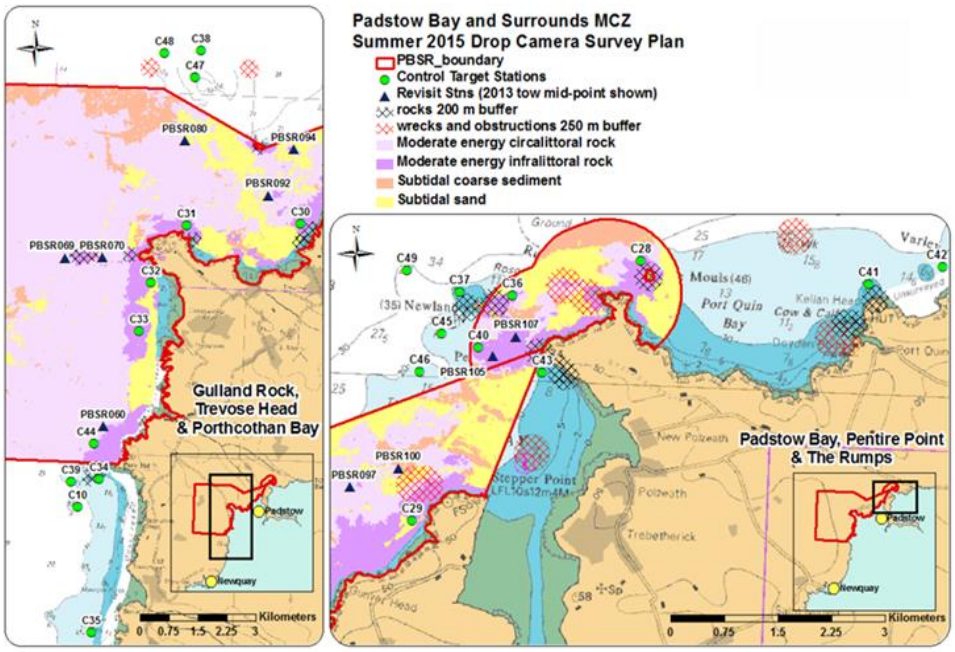
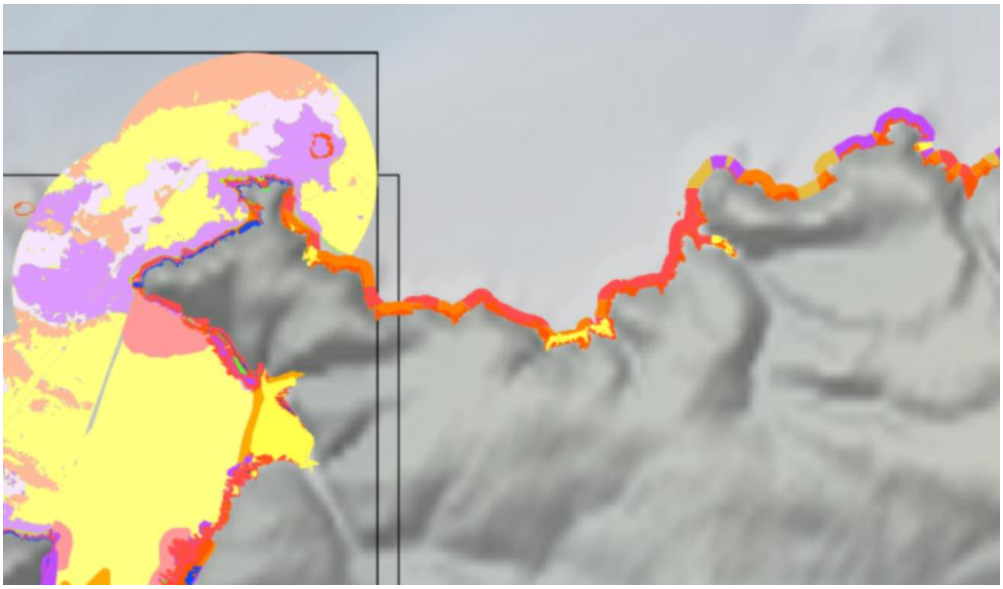


Figure 3. The Padstow Bay and Surrounds MCZ 2015 inshore baseline survey plan. Target sampling stations within the MCZ boundary have been mapped over the EUNIS Level 3 Broadscale Habitat layer from Downie and McIlwaine (2015) .

Figure 9: EMODnet – Eunis 2007 / 2019 habitat maps, another data source showing the radius extend of the MCZ survey data clearly (link)



It is simply not rational – and certainly not precautionary – to assume, as the applicants do, that the sand deposits do not extend further into Port Quin Bay.

6. What are the implications of this? How does this affect the application?

The following sections of the Document are fundamentally flawed. The applicants' assessments are not supported by the evidence, are therefore not precautionary, and are therefore contrary to the UK Marine Plan and relevant Habitat Regulations.

Chapter 6: Sediment Assessment

This has been shown, with evidence, to be inaccurate and false.

Chapter 7: Marine Mammal Assessment

Applicants state that:

> *The overall risk to critical habitats is* ***not significant*** *as the sites are located on coarse sediment which is not a critical feeding habitat for local marine mammals.* (p.91)

The site is located over sand / sandy gravel, which is an essential habitat for prey species for marine mammals. The risk cannot be assessed as 'not significant'.

Chapter 8: Bird Impact Assessment, Pentire Peninsular SSSI

Applicants state that:

> *There is a small area of sandy mud to the east of Mouls and west of the proposed farm sites which are located well within the coarse sediment seabed. It is likely the guillemots utilize the sandy mud located outside of the proposed farms for foraging of sand eels and crustaceans. And sandy mud sediment further east in Port Isaac Bay. Sand eels, herring and crustaceans are not found within coarse sediment – a fact attested to by a range of local fishermen including potters – as they all stated there is very little if anything to catch in that section of the Bay. The proposed farms are not located over critical feeding habitat and will not displace the birds from critical feeding habitat.* (p.110)

And:

> *The overall risk to critical habitats is* ***not significant*** *as the sites are located on coarse sediment which is not a critical feeding habitat for the seabirds assessed.* (p.138)

The site is located over sand / sandy gravel, which is an essential habitat for prey species of bird species identified in the Document, including puffins, guillemots and razorbills. The risk cannot be assessed as 'not significant'.

Chapter 9: Habitats Regulations Assessment: Special Area of Conversation (*sic*)

Applicants state that:

> *The screening HRA supplied by both applicants, pertinent to the current applications, related to habitat 'loss' clearly identifies no LSE's from the installation of the eco-blocks. This is based on the best available science. The facts that can be clearly established at the screening stage are* [various listed, including]*:*
>
> - The habitat is a low-sensitivity habitat (coarse). (p.145)

And:

> *The full assessment does not result in a significant adverse effect on SAC site integrity (AEOSI). Mitigation is not required.* (p.147)

And:

> *… there are no likely significant effects (LSE) from the proposed projects and FAC will remain maintained for the conservation objectives of the SAC… The eco-blocks will occupy a very small percentage of the seabed habitats within the total SAC, do not penetrate the sediment, are stable and located on very coarse sediment used by porpoise for nonfeeding purposes at depth of 10-17m maximum and at distance from sandy sediment supporting prey species.* (p.164)

The site is located over sand / sandy gravel, which is an essential habitat for prey species for the harbour porpoise (feature of the SAC). The third conservation objective of the Bristol Channel Approaches SAC is to ensure the condition of supporting habitats and processes, and the availability of prey is maintained (link). HRA screening cannot conclude that there is no LSE resulting from the proposed farm. There is a clear Likely Significant Effect.

Concluding comment

The evidence above shows that Biome Algae and Camel Fish have presented false and misleading information to the MMO in support of their Marine Licence Applications. They have changed their narrative from the initial application, ignoring best available information (including that used by their own consultants), to mislead the MMO and its advisors into believing that environmental risks are less significant than the evidence suggests.

3. Habitat Loss and Entanglement Risk

The applicants state in relation to marine mammals (Chapter 7, p.91) and birds (Chapter 8, p.137):

> *The overall risk assessment for marine mammal / bird entanglement within static longline farms and disturbance for the proposed Port Quin farms is not significant…*

In Chapter 9, Habitats Regulations Assessment: Special Area of Conversation (*sic*) they conclude that there is 'no Likely Significant Effect' on the conservation objectives of the Bristol Channel Approaches SAC.

They say very little in relation to habitat loss, having concluded, falsely, that the proposed farms are not sited over critical habitat (see 3. Sediment Assessment, above).

In this section, we review the evidence put forward by the applicants as the basis of these assertions, particularly their use of references to scientific studies. We provide evidence that the information is presented with **selection bias** – involving selective citations designed to support the application, and omission of findings from the same sources that raise reasonable scientific doubt as to likely effects. In the worst cases, the applicants have **deliberately misrepresented published research** to underplay the environmental risk associated with the proposed project.

The overall conclusion is that there is a significant risk of habitat loss; and the risk of entanglement cannot be considered 'not significant'.

Key Points

1. **The farm will cover a larger portion of Port Quin Bay than the applicants claim, resulting in significant habitat loss.**

The applicants state the farm will cover 18-19% of the 'bay area'. We clarify the bay area below (*Figure 1)*, indicating that the percentage covered by the site is 28%. They falsely cite research to claim that anything below 32% is safe for marine mammals. The research actually refers to a bay that was 32% covered in mussel farms, which had a "severe impact" on dolphins.

2. **The literature on entanglement is more cautious than the applicants claim.**

The applicants rely on extensive references to support their conclusion that entanglement risk is not significant (no LSE). While it is true the research shows few instances of mammal or bird entanglement in long-line farms, the same research highlights that this may be due to a lack of data and reporting; that large-scale farms carry a higher risk; and that entanglement risk must be assessed in detail on a case-by-case basis. We provide quotes from the cited literature that balance the applicants' own conclusion of 'no LSE.'

3. **The farm overlaps critical habitat, which increases the risk of habitat loss and entanglement significantly. The applicants did not consider this when selecting Port Quin Bay.**

The applicants assert that PQB is located over 'coarse sediment' and is therefore not critical habitat for foraging and other behaviours for marine mammals and birds. This has been shown

to be false (see 3. Sediment Assessment above). The studies referenced in the application consistently state that the siting of farms to avoid overlap with sensitive habitats is the critical factor in reducing risk. The applicants are unable (and do not try) to demonstrate the site was selected to avoid overlap.

4. **The nature of the equipment is more risky than they claim, particularly given N. Cornwall conditions.**

They use longline mussel farm infrastructure as a proxy to make an assessment of entanglement risk. However, there are some important distinctions, including the depth below the surface of the long lines (just 1m); and the vast number (46,080) of seed lines that will dangle 5.5 m below the longlines at harvest, creating an 880m^2 curtain beneath each of the 288 longlines for birds and mammals to navigate.

5. **There is a specific risk with seaweed farming that any potential habitat benefits are removed each year as a result of harvesting.**

This is a moot point, as any claimed ecological benefits (e.g. from concrete blocks providing seabed structure or seaweed providing habitat for species) constitutes a change to the natural habitat – in this case, essential habitat for marine mammal and bird prey species. However, the failure of the applicants to mention this risk demonstrates clear bias, as they focus solely on potential benefits rather than reported knowledge gaps and risks.

6. **The applicants falsely claim that the removal (harvesting) of seeded lines from July to October will reduce risk of entanglement.**

POLPIP survey data shows July-October to be a particularly busy period for marine mammals and sea birds in Port Quin Bay. However, most cetaceans, pinnipeds and sea birds can be seen in the bay all year round. The majority of the infrastructure will remain in place after harvest, and will continue to be a displacement, disturbance and entanglement risk to marine animals.

We provide evidence to support each of these points below.

Evidence Review

1. **The farm will cover a larger portion of Port Quin Bay than the applicants claim, resulting in significant habitat loss.**

In Chapter 1, the applicants state:

> *Port Quin Bay covers an area approximately between 5.54 and 5.16 km^2. The proposed seaweed farms cumulatively occupy 1 km^2 of the nearshore centre of the Bay. This represents between 18-19.37% of the Bay area total. And is below the 32% level of coverage which could restrict essential habitat use for certain marine mammals (Ribeiro et al. 2007).* (p.19)

The applicants cite Ribeiro et al. 2007 (link) in support of the "below the 32% level…" assertion 5 times, in the Marine Policy Assessment, the Marine Mammal Impact Assessment (twice), the

Bird Impact Assessment, and the National Landscape Assessment. In the Bird Impact Assessment, they extend this to say:

> *And is below the 32% level of coverage which could restrict essential habitat use for certain marine mammals* ***and may be applicable to birds*** *(Ribeiro et al. 2007).* (p.127)

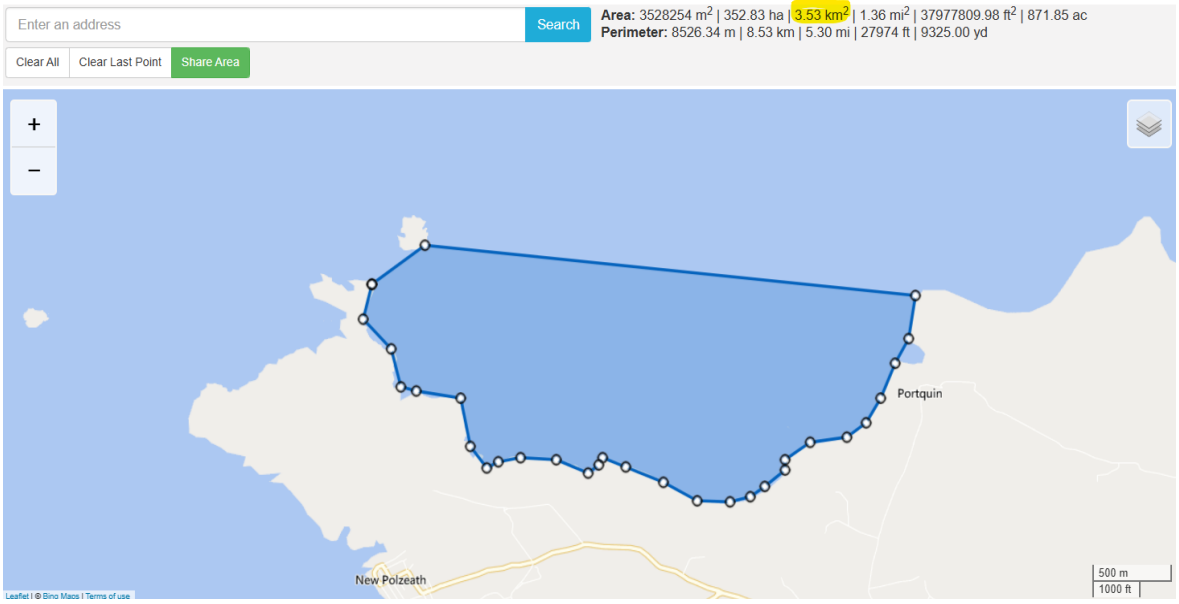
The figure of 32% in Ribeiro et al. (2007) is falsely represented here. The research paper, which studies interactions between Chilean dolphins and salmon and mussel farms in Yaldad Bay, Chile, actually states:

> *The absence of Chilean dolphins in those areas covered by mussel lines in Yaldad Bay is indicative that animals are being excluded from, and limited of, available space. Considering the narrow coastal area mostly used by Chilean dolphins (comprising depths between five and ten m), more than 32% is covered by mussel farming. This has a severe impact since it appears to be restricting access to a substantial portion of coastal waters potentially important for essential behaviours.* (Ribeiro et al. 2007, p.127).

There is no mention of the applicability of the research to birds in the referenced material.

This misrepresentation is exacerbated by the applicants' miscalculation of the approximate area of Port Quin Bay and the percentage of the Bay that will be covered by the farm. They do not explain how they calculate a figure of "between 5.54 and 5.16km^2". As can be seen from the figure below, the area of the Bay is closer to 3.53km^2 and the percentage of the Bay that will be covered by the project is therefore closer to 28%, not the 18-19.37% presented.

Figure 1: Showing the extent of Port Quin Bay



In the Marine Mammals Assessment, the applicants go on to state:

> *Ribeiro et al. 2007 reported that Chilean dolphins would use Bay areas with less than 30% coverage by longline farms, but were absent from areas with 60% coverage. Anything above 32% was considered a concern if it restricted use of essential habitat.* (P.56)

Again, this is a clear misrepresentation of the referenced material. The 30% and 60% figures do not refer to total Bay area, rather to individual 100m x 100m cells within the Bay, which were

defined as the units of research. The coverage figures refer to the percentage of each cell that was occupied by a mussel farm.

> *The entire area was divided into 100×100 m cells for further analysis (1589 cells in total).* (Ribeiro et al. 2007, p.121)

> *Contrary to salmon farms, mussel farming appeared to directly influence Chilean dolphin habitat use and movement patterns. Dolphins used those cells with slight mussel coverage (1–30%) with little intensity and appeared to avoid cells with over 60% mussel coverage. (Ribeiro et al. 2007, p.127)*

It should be noted that the proposed farm, at 100ha, equates to 100 'cells' of this size, with a 100% coverage by the longline farms as per Ribeiro's research methodology. That represents a significant restriction on dolphin habitat.

It is inconceivable that Dr Angela Mead, one of the applicants, a marine scientist with 28 years' experience, could misinterpret this research unwittingly. The conclusions the applicants draw from Ribeiro et al. 2007 are presented in a way that is clearly false and misleading.

2. The literature on entanglement is more cautious than the applicants claim.

The applicants cite numerous references to support their conclusions in the Marine Mammal Impact Assessment (Chapter 7) and Bird Impact Assessment (Chapter 8) that the risk of entanglement and disturbance is "not significant". A review of the sources cited show that the applicants are guilty of selection bias, that referenced research findings have not been presented in a balanced way, and that the risks cannot reasonably be assessed as "not significant".

In the table below we set out some examples of how the applicants have cited scientific research papers ('global studies') to support their assertion that risk of disturbance and entanglement is "not significant". Alongside this, we provide a sample of direct quotes from the same sources that provide a more balanced view and that demonstrate misrepresentation or selection bias.

Table 1. Selected quotes from the Document and from the associated references (emphasis added).

Reference citations in the Document	Actual quotes from the same reference sources
Price et al. 2017, Protected Species & Marine Aquaculture Interactions - link	
• *Considering studies over decades and globally extensive areas of aquaculture in coastal waters, entanglements with longline farms are rare (Price et al. 2017).* (P.56) • *Considering studies over decades and globally extensive areas of aquaculture in coastal waters, entanglements with longline farms are rare **if at all** (Price et al. 2017).* (p.99) • *Pinnipeds (seals) do not feed on shellfish (or seaweed) and are less likely to visit farms (Nash et al. 2000, Wursig & Gailey 2002). Following a global review, Price et al. 2017 could find no reported interactions (or negative interactions) of those species with longline farms.* (P.57) • *In New Zealand, where some 22,000 Ha of coastline is covered by active longline farms, entanglement is considered low risk, if best management practices are followed (Price et al. 2017).* (P.58)	• *Although the last decade has seen an increase in the amount of information available about how protected species may be affected by offshore marine aquaculture gear, there are still many unanswered questions and uncertainty. There remains overall **a general lack of scientific reporting on entanglement frequency and severity** of resulting injuries, mortality rates associated with interactions, effective deterrent methods, and technological innovation to reduce interactions and decrease harm if contact occurs. Importantly, negative data—scientifically collected data reflecting the lack of interactions with protected species—is also lacking. **This makes it difficult to know if the paucity of reported incidents is due to low numbers of interactions or failure to detect and report them**. However, the growth of the aquaculture industry worldwide is drawing attention to the potential environmental impacts of offshore aquaculture, including impacts to protected species. (p.39)* • *Several studies in Admiralty Bay, New Zealand have focused on potential habitat exclusion of dolphins in nearshore waters. **There is evidence that dolphins may be fully or partially excluded from areas nearshore where mussel farms are located**. (p.13)*
Campbell et al. 2019, The Environmental Risks Associated With the Development of Seaweed Farming in Europe - Prioritizing Key Knowledge Gaps - link	
• *Campbell et al. 2019 states that entanglement of marine mammals related to aquaculture*	• *Whilst current small-scale cultivation projects are considered 'low risk,' an expansion of the industry that includes **'large-scale' cultivation will necessitate a more complete***

cannot be ruled out 100% but that risks are low. (p.58)	***understanding of the scale dependent changes** in order to balance environmental risks with the benefits that seaweed cultivation projects can offer.* (p.1) [Note that Campbell et al. consider 'large-scale' seaweed farms as those requiring more that 50 x 200m lines. The proposed farm consists of 288 x 160m lines.] ● ***Entanglement of animals cannot be ruled out, even when assuming cultivation practices will be managed to reduce the likelihood of entanglement.** Small-medium scale cultivation projects pose a similar threat of entanglement to many existing aquaculture activities as mooring and cultivation equipment will utilize similar technologies, and **as large-scale cultivation projects will inherently require a greater infrastructure the risk will be increased**.* (p.7) ● ***There is limited evidence to suggest whether marine mammals and other megafauna will avoid or be attracted to cultivation activities** and any responses are likely to be location- and species-specific. Cultivation activities may enhance foraging opportunities for some species, and although this would be a positive interaction it could lead to a greater risk of entanglement if poorly managed. (Campbell et al. 2019, p.7)*
Clement et al. 2013, LITERATURE REVIEW OF ECOLOGICAL EFFECTS OF AQUACULTURE, Effects on Marine Mammals - link	
● *Clement et al. 2013 suggests that tensioned farms located out of main offshore migratory routes and foraging grounds, combined with low reported incidences of farm entanglement globally, mean entanglement risk for marine mammals is likely to be low with few negative interactions anticipated globally (not significant). (p.58-59)*	● ***Very little has been documented on the possible adverse interactions between seaweed or herbivorous species culture and marine mammals**. While the physical presence of the farm will have similar risks (i.e., habitat modification and entanglement risks) to other types of aquaculture structures, the overall impacts are expected to be less.* (p.4-14). ● ***Physical interactions between aquaculture and marine mammals can lead to an increased risk of entanglement in structures** or non-biological wastes from farm production. The risk of entanglement increases as it tends to attract predators to any associated aggregations of wild fish.* (Table 4.9: Entanglement caused by farming of lower trophic level species, p. 4-15). ● ***The presence of farm structures and their associated activities can potentially exclude or modify how particular species of marine mammals use critical or***

	sensitive habitats**. Present research has highlighted that the nature of the exclusion greatly depends on the type of culture method and the particular marine mammal species present in the cultivation area. **Whales and particular dolphin species tend to be more sensitive to such disturbances, while pinnipeds and other dolphin species (such as common and bottlenose dolphins) may actually be attracted to the novel structures and/or habitat. (Table 4.8: Habitat modification and/or exclusion caused by farming of lower trophic level species, p.4-14).
Sagar, 2013, LITERATURE REVIEW OF ECOLOGICAL EFFECTS OF AQUACULTURE, Seabird interactions – link	
• *Sagar 2013 produced a comprehensive report on the issue of seabird interaction with aquaculture. The risk is acknowledged, but in the context of 22,000 ha of nearshore farms, there have been very few reports of seabird deaths as a result of entanglement in aquaculture facilities. Non-lethal effects to be considered are habitat exclusion and ingestion of marine litter but in combination with entanglement, they are considered non-significant. (p.98)*	• *The location of the farm within the range of seabirds and the conservation status (which is a measure of the risk of extinction) of those seabird species are the main factors that may lead to issues of sustainability and conservation concern. **Of particular concern are the location of farms in relation to breeding and feeding sites** and the operational procedures of regular farm activities. **Siting of farms close to breeding and feeding sites may lead to disturbance of the seabirds, the consequences of which will depend upon the conservation status of the species affected.*** (p.7)

3. **The farm overlaps critical habitat, which increases the risk of habitat loss and entanglement significantly. The applicants did not consider this when selecting Port Quin Bay.**

As noted, the applicants consider the risk of habitat loss as 'not significant,' on the basis of their assertion that the seabed under proposed farm is 'coarse sediment' and does not therefore constitute critical habitat for marine mammals or birds.

> *A very important factor in selecting the site was sediment type within the Bay. Coarse sediment is not a supporting habitat for marine mammals in terms of prey. There are very little fish present.* (p.19)

This assertion is factually incorrect (see Section 3, Sediment Assessment). The seabed is actually sand / sandy gravel, which does constitute supporting habitat for marine mammal and bird prey species. The applicants themselves recognise that careful site selection is necessary to avoid habitat loss and entanglement risk:

> *Therefore, siting farms on non-foraging habitats is an important factor in reducing risks to marine mammals found in coastal waters.* (p.56)

We do not repeat here the evidence presented above regarding the seabed, however we do show below a number of quotes from the references that emphasise the critical importance of site selection:

> *Management strategies to avoid impacts are done on a case-by-case basis primarily by siting in areas which minimize the likelihood of overlap with migration routes or critical habitats.* (Price et al. p.13).
>
> *Recommended management strategies include careful site selection to avoid threatened, endangered or protected bird species' home ranges, critical breeding and foraging habitats and migration routes.* (Price et al. p.36).
>
> *As discussed previously, the most important factor in limiting adverse effects of aquaculture on marine mammals in New Zealand is to avoid overlapping with critical habitats and/or traditional migration routes.* (Clement et al. 2013, p.14)
>
> *Effective management can be achieved by careful site selection that avoids key foraging areas of seabird species with restricted habitat requirements.* (Sagar p.14)
>
> *Entanglement related injuries and mortalities are a critical conservation problem. Siting of cultivation activities is a crucial consideration to avoid negative environmental interactions. There is limited evidence to suggest whether marine mammals and other megafauna will avoid or be attracted to cultivation activities and any responses are likely to be location- and species-specific.* (Campbell et al. 2019, p.7)
>
> *For most impact pathways good site selection to avoid sensitive areas, farm design and farm management are important considerations in the mitigation of risk.* (Campbell et al. 2019, p.15)

The applicants provide no information that demonstrates they conducted a site selection or alternatives analysis that included habitat as a criteria justifying the selection of Port Quin Bay. We note, for example, that the site was selected before the applicants sought environmental data on habitats and species in response to the FIRs. This is presumably as a result of Biome Algae's split from Penmayn in Port Isaac in April / May 2023, and turning to Port Quin as a last resort.

The focus on avoidance as the key factor to reducing risk is also consistent with SWMP Policies relevant to this discussion, including:

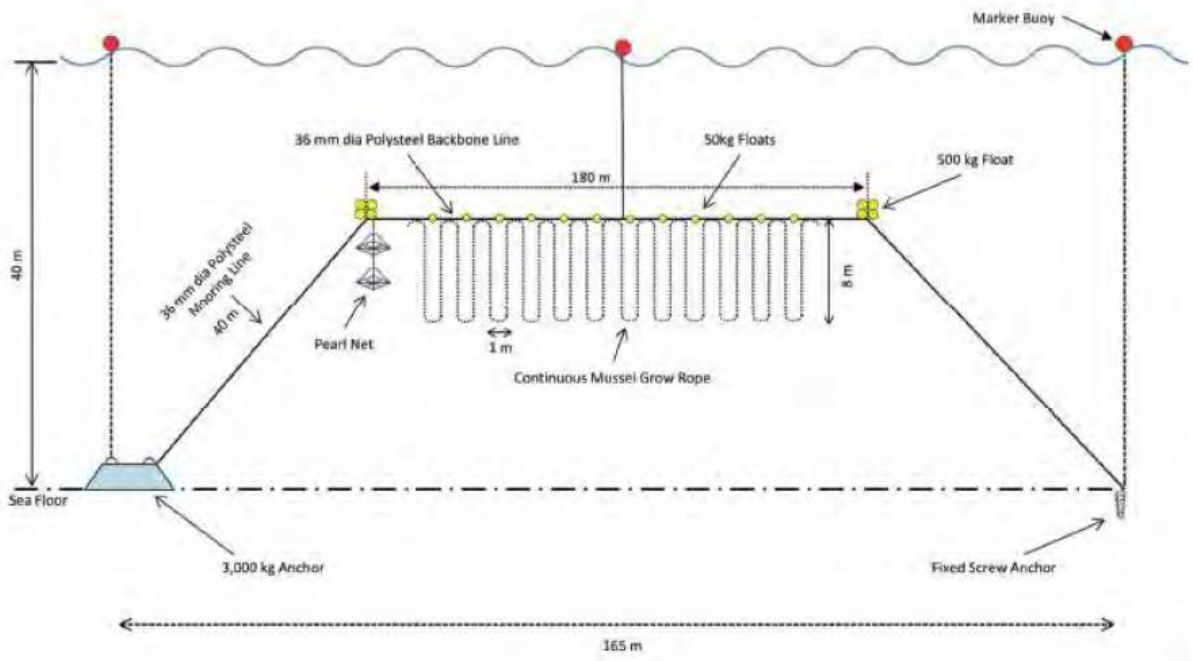
- SW-BIO-1, 2 & 3 Biodiversity
- SW-HAB-1 Biodiversity
- SW-DIST-1 Disturbance
- SW-FISH-3 Fisheries
- SW-MPA-2 Marine protected areas

The above-mentioned SWMP Policies all state that projects that may have direct, significant or just adverse impacts must demonstrate that they will, in order of preference: (a) avoid; (b) minimise or (c) mitigate adverse impacts so they are no longer significant.

4. The nature of the equipment is more risky than the applicants claim, particularly given N. Cornwall conditions.

In their 'Global Assessment of Entanglement Risk' (p.51), the applicants state the following and provide a generic example of a mussel longline structure:

> *Biome and Camel Fish have based the infrastructure design used to farm the seaweed on the structures used in longline mussel farms, as described in Price et al. 2017 (Figure 2.0). Therefore, studies conducted on marine mammal interactions and entanglement risk associated with mussel longlines is an excellent proxy for the farming methods to be employed at the two proposed farm sites.* (p. 51).



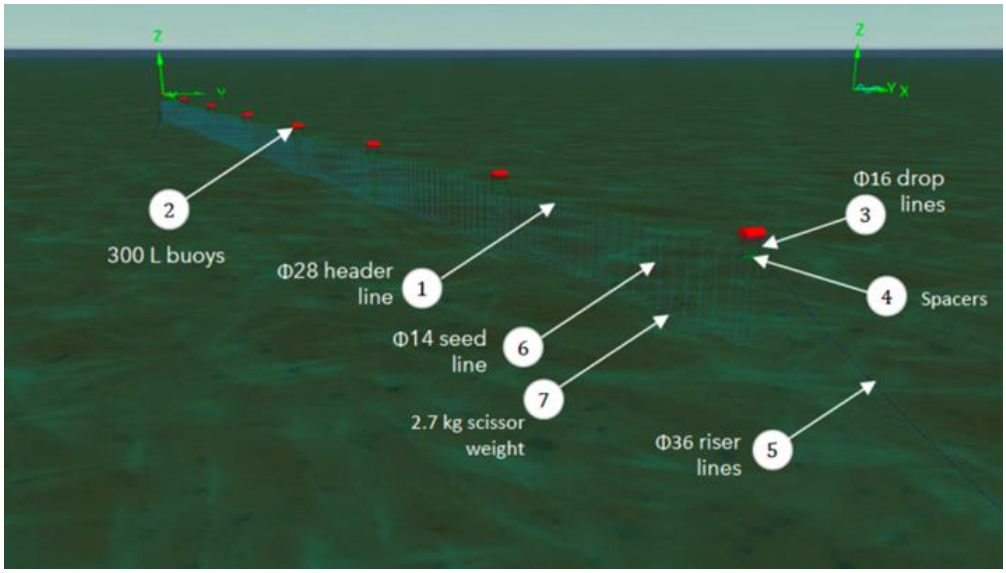
We do not agree with this statement. Whilst there are similarities in the infrastructure, it is understood that the Biome Algae/Camel Fish/Arc Marine infrastructure proposed for Port Quin Bay has multiple elements which increase the risk of marine mammal entanglement above that which could be considered ALARP.

These include, but are not limited to:

- Site selection (water depth, habitat)
- Farm size
- Seed line proliferation
- Effect of sea conditions / potential for gear loss
- Barrier effect

One of the key differences is the minimum **water depth** at the proposed farm site (10-17m). This is a lot shallower than the schematic shown (40m) and will result in the creation of a significant barrier relative to depth, increasing entanglement risk. The projected depth of the header lines is 1-2 metres (it is unclear in the Document), the seed lines, weighted by 'scissor weights' result in a drop of 4m from the header lines, and the maximum growth of sugar kelp, according to the applicants, will be 1.5m. This will result in a ~5.5m barrier in the centre of the water column.

Figure 2: Arc Marine rendition of the seaweed farm longline structure



The **proliferation of seed lines** poses a significant entanglement risk. We understand that these will be catenary ropes (dangling from two fixed points on the header lines), approximately 9m in length (the actual length is redacted in the Document – the MMO can ascertain if this estimate is accurate). There will be **46,080 seed lines** across the 288 long lines. These 9m long, 14mm diameter ropes are necessarily lighter than other lines in the system, with the likelihood of significant swing and movement in the swell. Note also that much thinner lines containing the seaweed spores / seeds are wrapped around the seed lines during deployment. A video of this in action can be found on Biome Algae's website (link). **With such a large number of seed lines, it is simply unrealistic to expect that there will be no lost gear given N. Cornwall conditions.**

A source familiar with the Torbay seaweed farm stated that household bricks are used as the 'scissor weights' to weigh down the seed lines. This may be cost effective (a 3-Hole Facing Brick, 219mm x 100mm x 67mm has a weight of 2.7kg) comes in at 79p, presumably far less when purchasing 92,160 of them. In the dynamic waters of Port Quin Bay, house bricks on 14mm rope will swing significantly. This will be of great interest to adolescent seals and dolphins which are

playful and curious by nature. It cannot be concluded that the risk of entanglement in the seed line catenaries, at this scale and in these waters, is not significant.

The applicants cite no evidence other than their own experience (of farming on a much smaller scale in more benign waters) in relation to the **risk of lost gear**. They fail to mention reported incidents of gear loss from the farm operated by Biome Algae in Torbay, for example:

Figure 3: Facebook post from Marine Farm Services, 6 Dec 2023.[4]

Other long line mussel and seaweed farmers we have spoken to confirm that lost gear is not uncommon. The majority of these operators experience gear loss, predominantly of buoys, in considerably calmer waters than those found at Port Quin. In exposed, offshore locations, losses are reported as more significant.

The danger of loss of gear is mostly as a result of chafe. The more dynamic the conditions, the higher the risk. Swell and wave action cause the buoys to twist and turn, fraying the connection with the drop line. Once loose, the 1-2m drop line itself spins in the swell, creating a significant entanglement risk, before fraying and breaking loose at the connection with the header line. This drop line is then loose in the water, creating a further entanglement risk. There has been no fatigue assessment focussing on mooring design, with assessment of the design life of the wider infrastructure also being deferred.

The **barrier effect** is also not covered in the Document. In the weeks before harvest, the biomass and infrastructure will create an 880m^2 'seaweed curtain' running north-south across the bay on each of the 288 long lines. That is, the farm area of 1,440m x 700m will have 288 'seaweed curtains' hanging 5.5m deep and 160m long. This is a significant barrier in the route taken by seals and auks from the Mouls to the rich foraging grounds beneath the farm site. It is no wonder that the research has found that marine mammals and birds avoid long-line farms.

[4] This incident was not reported to the MMO, in breach of licence conditions. The MMO is currently investigating.

Taking the Atlantic puffin as an example, an individual bird will be at increased risk of entanglement, and may be forced to expend more energy to fly further to access foraging grounds. This impact may then have indirect effects on birds in areas that may be some distance from the farm site, due to increased competition at other foraging sites, potentially causing further reductions in fitness affecting reproductive success. This barrier effect, which has been shown to exist in longline farms, may also increase the risk of disorientation, displacement or entanglement for marine mammals which use Port Quin Bay when foraging.

The **sea conditions** have been underestimated in the Document. Please see 6. Project Feasibility. The **scale of the farm** is also discussed in the Introduction and section 6 of this submission. We note again reference sources cited by the applicants, which make clear that large-scale farms such as this pose greater risk:

> *…as large-scale cultivation projects will inherently require a greater infrastructure the risk will be increased.* (Campbell et al. 2019, p.7)

5. There is a specific risk with seaweed farming that any potential habitat benefits are removed as a result of harvesting

The applicants cite, most frequently, studies undertaken through Exeter University based on research conducted at the Torbay and St Austell seaweed (and mussel) farms. These are primarily Corrigan et al., 2022, 2023, 2024a and 2024b. We do not dispute the valuable research that shows the potential for largely temporal habitat provisioning benefits associated with seaweed farms, however we note two points.

First, this is a moot point. The potential habitat benefits from seaweed farms are most relevant in terms of nature restoration, not as a replacement for an existing natural habitat. As noted, the proposed farm area is over sand / sandy gravel, which is essential habitat for prey species of marine mammals and birds. Habitat 'creation', which may result from the seaweed farms, is likely to alter existing conditions, which would result in a negative impact and require further assessment.

Second, the applicants repeatedly state the following:

> *Corrigan et al. 2024 have established seaweed farms attract a range of fish, which feed and find shelter underneath the farm and within the eco-blocks. When harvested, the fish will disperse to the natural ecosystems within the Bay (kelp beds, sandy mud). (p.105, 110, 114, 118, 170, 218)*

They choose not to include in the Document highly relevant findings from the same study, as follows:

> *However, **as seaweed biomass was harvested through the summer, valuable fish habitats were seemingly lost**, whereas cultivated mussel lines offered more temporally stable habitat due to overlapping interannual growth cycles.* (p.155)

> *The habitat provisioning for seaweed cultivation lines, however, is **markedly affected by harvesting, with dramatic declines in fish abundance and richness subsequent to crop removal** highlighting that farms are not a replacement for natural kelp habitats.* (p.159)

This is yet more evidence of selection bias and lack of independent review of the applicants' self-written document.

6. The applicants falsely claim that the removal (harvesting) of seeded lines between July – October will reduce risk of entanglement.

The applicants state:

> Removing *the tensioned seed ropes over July, August, September and October (1/3 f* [sic] *the year) further reduces the risk of marine entanglement for marine mammals during this period. Which is important as these are recorded as peaks across many of the groups of mammals*. (p.78)

First, by claiming this is important, they are presenting their operational schedule as a mitigation to an accepted risk – entanglement – and that the risk is higher when populations of marine mammals are most prevalent.

Dolphin sightings in Cornwall are most frequent between April and October, so there is an overlap between April and July (minimum) when the barrier effect of pre-harvest seaweed will be at its peak. Also, dolphins can be spotted all year round. In North Cornwall, they are seen particularly around Port Isaac and Pentire Point (Port Quin Bay being between the two), according to Cornish Compass – link).

Humpback whales are another species at risk. A migrating humpback, 'Minstrel', was spotted in Port Quin Bay, closer to the shore than the farm site, in February 2024 (link). This would be a time of year when the seaweed farm seed lines are fully deployed. It also contradicts the applicants statement that:

> *Humpback whales are noted to be at their peak (Ireland and Scotland) in Summer and Autumn and have been spotted within the Bay seascape in September. Due to their size, humpbacks are unlikely to venture into the shallower areas of the Bay where the proposed farms are to be located (10-15 m depths) (Pers comm, researcher, AFBI).* (p.67)

According to Cornwall Wildlife Trust (link):

> *More and more humpback whales are being seen in UK seas every year and sightings have increased significantly in the last five years in Cornwall. Winter is the time that humpback whales are most likely to visit our Cornish waters. It is believed they come into the shallow seas around Cornwall to feed.*

Harbour porpoises can be seen in Cornwall from January to December, but are most commonly seen in early spring or late autumn. Some of the best places to see porpoises in Cornwall include Padstow and Rock (CWT, Cornwall Mammal Group, Sealife Safaris).

Grey seals are a native species which breed in North Cornwall and can be seen all year round. Pupping occurs between August and December. After about three weeks, pups will begin their first moult and will enter the sea for the first time in search of food. This is the young seals' dispersal stage, when they are yet to learn what is a threat and what is not. This makes them very vulnerable to human disturbance. Over the next two to four years the seals go through their juvenile and adolescent stages when they are at their most playful and inquisitive (link).

With regard to marine mammal interactions with fishing gear and aquaculture infrastructure, Clark et al. 2021 state:

> *A curious animal will investigate, play and even bite novel structures that they encounter. Under-tensioned ropes or lines are dangerous when an animal comes in contact with them, becomes spooked or naturally rolls and wraps the lines around themselves, and becomes entangled (e.g., Clement 2013). Based on global reviews of seabird and marine mammal entanglements in both stationary fishing and aquaculture gear (e.g., moorings, floating sub-surface lines and/or pot-type lines), similar risks are likely with existing types of seaweed farm gear and structures (e.g., Benjamins et al. 2014, Knowlton et al. 2012).*

4. Safe Anchorage

The applicants have assessed the impact of the proposals on potential loss of safe anchorage within Port Quin Bay. This assessment has been updated following evidence submitted by the public that identified false and misleading information in the original application documents. The revisited conclusion from the applicants is that the proposals will result in ALARP status. We object to these findings and have provided the following evidence for consideration.

The South West Marine Plan (SWMP) Policy SW-CO-1 identifies that space is essential for marine activities to function, listing anchorage as a specific example. This is also relevant for SW-PS-1.

A precedent has been set where all recent SWMP aquaculture licences have been conditioned to preserve safe anchorage. '*Licensed activities must not encroach on any recognised anchorage, either charted or noted in nautical publications.*' (L/2023/00169/1, L/2023/00028/1, L/2022/00127/1).

1. Denoted anchorage location

EU Directive 2002/59 establishes a community vessel traffic monitoring and information system. According to the Directive, "ship in need of assistance" means, without prejudice to the provisions of the SAR Convention concerning the rescue of persons, a ship in a situation that could give rise to its loss or an environmental or navigational hazard. A "place of refuge" means a port, the part of a port or another protective berth or anchorage or any other sheltered area identified by a Member State for accommodating ships in distress.

The SWMP technical annex defines a harbour as a place of safety for ships and other waterborne vessels; harbours provide safe anchorage mooring for shipping both commercial and recreational, recognising that harbours can be natural. (p.346). From these two definitions, it is clear that Port Quin Bay should be considered as a place of refuge / harbour rather than anchorage relating to a discreet coordinate on a map.

The denoted point of anchorage varies depending on mapping sources, some of which appear much closer to the application site than stated. Regardless of the explicit location of the denoted anchorage, the wider bay is used by cargo vessels and is strategically important on the North Cornwall coast, as evidenced in previous submissions. AIS data reinforces that the wider bay is treated as a 'sheltered area identified by a Member State' by cargo vessel operators. The exact location of anchorage is dictated by a range of factors including sea state, weather conditions and vessel dimensions, critically the length and draught.

The applicants take the denoted location of the safe anchorage as explicit, rather than considering the context of the wider area within the bay, jeopardising ALARP.

2. Periods of utilisation

The applicant has used EMODNET data to derive cargo vessel usage within the bay. This contains coarse 1km grid cells. Detailed AIS data is available, and the applicants have been provided with a list of vessel names. This has not been incorporated into their assessment and has not informed their understanding of anchorage trends within Port Quin Bay.

A single 1km grid cell was interrogated, despite the farm area spanning a minimum of two cells, which contains additional vessel data, given the proposals spanning 1.4km of the center of the bay.

The applicants claim:

> *The larger vessels captured within the data (likely including the cargo vessels listed above) are not specifically utilizing the safe anchorage point each time but are either transitioning through or temporarily anchored within the wider bay.* (p.473)

This re-emphasises that the applicants are not treating the bay as an anchorage area, rather the explicit coordinate presented on mapping. It also claims that some cargo vessels are simply transitioning through the bay, diminishing the importance of the safety provided while at anchor. This is easily disproved by reviewing AIS data rather than coarse 1km pixels. There is also no logic behind a cargo vessel transitioning through the bay, entirely contained between two headlands 3km apart, with no destination feature other than the anchorage.

Having undertaken a detailed review of vessel AIS data, it is clear that each cargo vessel was at anchor in Port Quin Bay, and all except one of these cargo vessels anchored in an area that overlaps with the proposed farm perimeter as shown in Figure 1.

There are also concerns about the format that the EMODNET data has been presented in. The applicants state that '*data is presented on an annual basis'* to better reflect the impact against farming seasons. Seasonality is irrelevant for this assessment as the infrastructure remains in situ all year, along with the exclusion zone.

Table 9.0 in the FIR is titled as '*Number of cargo and military vessel hours spent within a 1km2 area of Port Quin Bay each year from 2017 -2023'* and labelled as 'h/yr/km2/year'. The subsequent paragraph states that this assesses 'larger cargo vessels' although there is no definition for this criterion.

This implies low levels of occupancy, ranging from between 0hrs and 3.31hrs per year. Only when reading the subsequent text, it becomes apparent that this is actually monthly averaged figures. Even when multiplied by 12, these totals understate the duration cargo vessels were at anchor in the immediate vicinity of the bay, likely due to the selection of a single EMODNET grid cell.

AIS data demonstrates that the minimum duration a cargo vessel was at anchor in the bay was 6 hours, the maximum 58 hours and the average anchor duration was 26 hours, with an annual breakdown provided in Table 1.

Table 1 – Annual hours at anchor for vessel type 'cargo' extracted from AIS data per Global Fishing Watch.

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Hours	**96**	**-**	**36**	**20**	**43**	**-**	**-**	**-**	**9**	**23**	**38**	**6**

This omits all vessels outside of vessel type 'cargo', so should be treated as conservative. Examples of such omitted vessels, which ranged in size up to 70m and with a draft of over 4.5m, were identified in the earlier submissions.

3. Location of anchorage

Again, it is worth clarifying that a single 1km2 grid cell of EMODNET data has been used to determine the positioning of anchorage by the applicants. The farm straddles at least 2 cells. While a cell to the west of the chosen grid cell by the applicants shows anchorage hours recorded, this aggregates anchorage across the entire 1km2 area, skewing the perception of anchorage of cargo vessels in the westernmost aspects of the bay. This is evidenced in Figure 1.

The applicants have misinterpreted this to claim that:

> *Alternative locations around the farm perimeter are usable for general anchorage and access and would accommodate displacement at traffic levels indicated.* (p.475)

This is not correct; cargo anchoring activity is almost exclusively located within the farm footprint, primarily due to the necessary depth to achieve safe clearance. This is covered further below.

> *If we assume (unlikely worst case scenario) all the larger vessels accessing the Bay across a full year need to use the safe anchorage (multiple extreme weather events or vessel issues) to safeguard human life: at the traffic levels indicated, vessel sizes indicated, relative size of the open access channel between the farms and Mouls/coastline for access and the fact vessels can and do anchor in the 1km2 west adjacent to the farms, the proposed farms will not prevent them from accessing the Bay for shelter or the safe anchorage point.* (p.475)

Using coarse EMODNET data to evidence this claim is inappropriate and fundamentally flawed. All except one vessel's anchorage area interacts with the farm perimeter. This shows a clear necessity for anchoring in 10m+ of water depth, while remaining in the wind and wave shadow of the headland and the Mouls Island.

Creating an exclusion zone around the farm area will displace all anchoring within the existing anchoring area. The applicants clearly feel that this is appropriate and does not impact achieving ALARP. The justification for this is that a channel remains available for the displaced anchorage between the farm location and the Mouls. This is entirely inappropriate as a substitute anchorage location for a number of reasons covered below.

Figure 1. AIS density data for vessel type cargo ranging from 2013 to present day. The red line reflects the proposed site. Black circles denote recorded anchorage range per vessel. The blue line follows the 10m depth contour and the yellow circle reflects an indicative 400m anchorage range in the suggested channel.

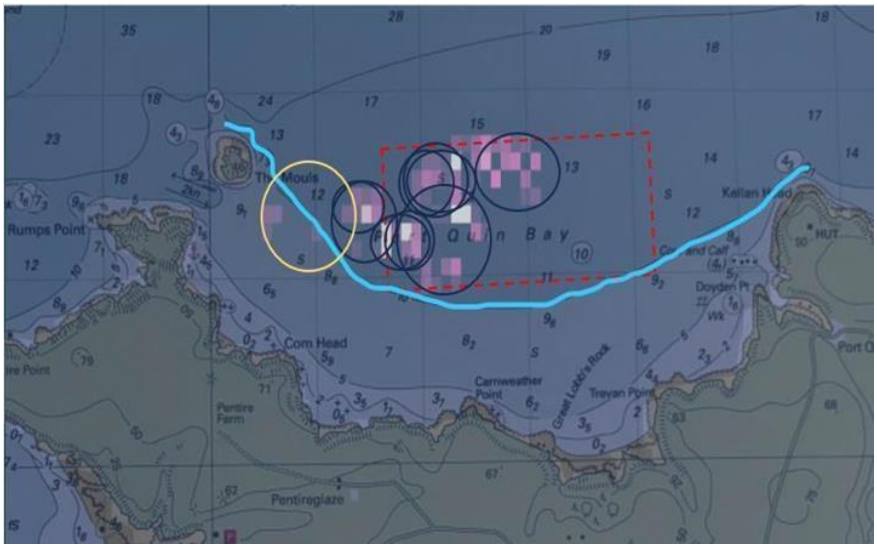


Figure 1 clearly demonstrates that the farm siting would displace all but one cargo vessel that has recently anchored in Port Quin Bay. The trend is to anchor in a minimum of 10m depth, and this correlates with the applicant's under-keel assessment and still water draught range of the observed cargo vessels, which extend up to 6.5m. A dynamic draft assessment presents a safe clearance depth in excess of 10m, however vessels have been observed in the bay that require a safe clearance depth of 13m which even further reduces the available anchorage area, see Table 2.

Vessel movement when at anchor is unavoidable, even more so in adverse conditions, when anchorage is most likely to be sought. Analysing the AIS data demonstrates that the anchor swinging circles utilised by a cargo vessel in Port Quin Bay averages at a 300m diameter. This area is extended up to 400m for multiple vessels. This correlates with www.marintraffic.com data where anchor swinging circles have been reviewed for similar vessel sizes, including vessels previously observed at anchor within Port Quin Bay.

The applicants argue that an '*open access channel*' is provided within the area to the west of the farm. The yellow circle (Figure 1) demonstrates the location proposed by the applicants for safe anchorage for the displaced cargo vessels. This is unviable for the following reasons:

(a) Bathymetry

There is insufficient depth to safely anchor the observed cargo vessels to the west of the proposals. The applicants have included an under-keel assessment that can be extrapolated as per the table below:

Table 2 Vessel draft and safe clearance depth, adapted from the applicants under keel assessment.

Still water draft (m)	Dynamic draft (m)	Safe clearance depth (m)
0.95	1.482	**1.927**
1.75	3.134	**4.074**
3.1	5.228	**6.796**
4.5	7.59	**9.87**
6	10.116	**13.15**

The still water draft for cargo vessels observed in Port Quin Bay is typically between 4.5m and 6m, therefore a safe clearance depth of 9.87m to 13.15m is required for anchorage. There is a strong correlation with these figures and the observed anchorage locations. This is directly in conflict with the farm site, which is within 10-17m of water. The 10m contour line on Fig.1 demonstrates this, alongside the insufficient area retained outside of the farm perimeter of sufficient depths. Vessels have been observed in the bay that require a safe clearance depth of >13m, which even further reduces the viability of anchorage outside of the farm area.

This proves the need to consider the wider bay as the safe anchorage area, rather than the variable denoted location, which the applicant's reference as being in 4-5m of water. There is

direct conflict between the proposals and the principles of ALARP. This is reinforced by the following applicant comments:

> *'In terms of the safe anchorage location in depths of 8-9 m, significantly larger vessels would be unlikely to use the designated safe anchor point but can still access shelter within the perimeters of the proposed farm.'* (p.478)

The inference that anchorage of larger vessels could anchor 'within the perimeters' of the farm shows a clear lack of awareness of the risks involved of anchoring cargo vessels in close proximity to infrastructure.

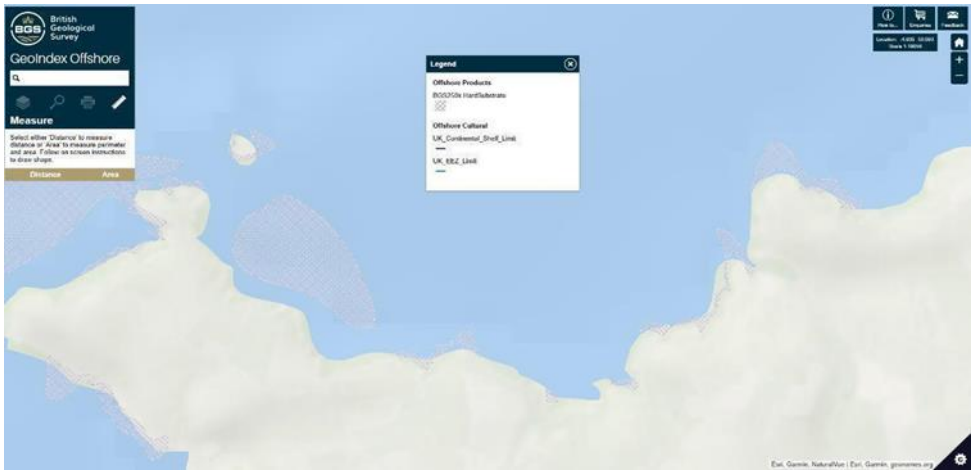
(b) Proximity to obstructions

Setting aside the clear conflict with safe clearance depth in the proposed channel to the west of the site, it would also require the anchorage swinging circle to come within ~100m of both the Mouls Island to the east and the farm perimeter to the west. This is clearly introducing a significant risk, and removing safe tolerance that may be required to enter anchorage arrangement, subsequent manoeuvring, impacts of adverse weather and any unforeseeable issues. Having freeboard is essential during rescue and emergency situations, and being confined between a steep island and complex farm infrastructure presents significant hazard.

(c) Bedrock

In addition to inadequate water depth and risk of collision, there is also a large area of hard substrate in this location. It is recognised that anchoring on this type of substrate is unfavourable, and can increase the risk of dragging anchor. This further reduces the safety of anchoring in this location.

Figure 2. Map of bedrock, BGS 250k Hard Substrate mapping layer, accessed through BGS GeoIndex Offshore.



(d) Proxy vessels

The Jubilee Queen is used in the anchorage assessment as a proxy vessel to demonstrate that there is a viable channel to the west of the farm site. The Jubilee Queen is a 25m passenger vessel that's stationed within the Camel Estuary, and as such its operation is tidally limited. Being 1/3rd of the size of the cargo vessels that utilise the bay, there is no merit in its inclusion.

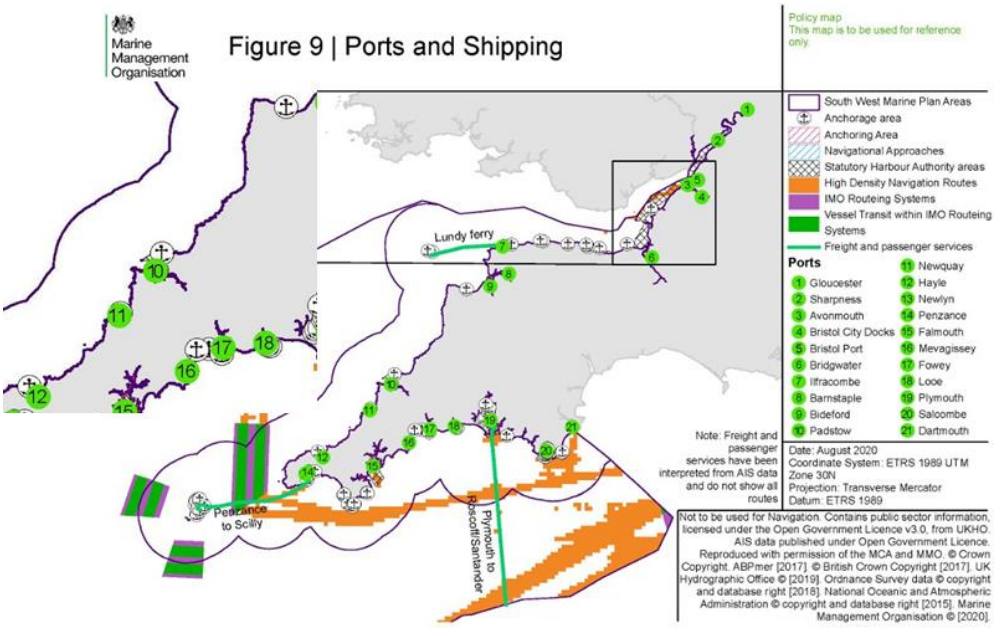
The Jubilee Queen is well known to operate in shallow water that would be completely inappropriate for Cargo Vessels as shown in Figure 3.

Figure 3. (L) Jubilee Queen entering Port Quin inlet (charted depth <2m) and (R) Jubilee Queen 'touching the bridge' (Charted depth 0m) – (R photo taken from social media – image credit remains Debbie Bate Photography).

4. Alternative anchorage locations

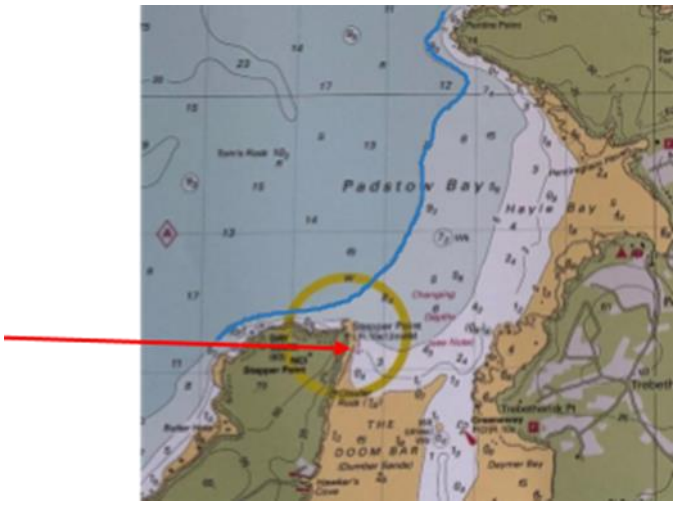
The applicants state that an alternative anchorage is available 2km away at Stepper Point. This is not consistent with the SWMP Policy Mapping (fig.4) which does not highlight Stepper Point as an anchorage area (noting the term 'area' rather than 'point').

Figure 4. Ports and Shipping Policy Map, extract from p112 of the SWMP Technical Annex.



It is immediately apparent that the bathymetry in this location is completely inappropriate for larger vessels that currently utilise Port Quin Bay. A safe clearance depth could only be achieved with vessels of still water drafts of less than 2m.

Figure 5. Denoted safe anchorage at Stepper Point, and blue line highlighting 10m depth contour.



The incompatibility of alternative anchorage at this location is further evidenced by a review of AIS, where no cargo vessel presence has been detected in the area over the past 10 years. Conversely, Port Quin is shown as a strategically important location for cargo ship anchorage, shown in Figure 6.

A further review of more minor anchorage locations not shown within the SWMP Policy Map shows that there are no additional denoted sites between Port Quin and Clovelly to the north and Newquay to the south, with the exception of Trevone Bay. However, due to the bathymetry and presence of rocky outcrops, this is also considered unviable for displaced cargo vessels. This can again be confirmed with zero records of cargo class vessels within the wider anchorage locations at Stepper and Trevone for more than 10 years.

Figure 6. AIS data for Vessel type Cargo between January 2012 and present day, from Global Fishing Watch.

5. Incident response

(a) GB Row Endurance

The applicants have responded to concerns raised around the rescue of GB Row Endurance earlier in the year. These concerns have not been allayed.

The applicants fail to recognise that the rescue efforts would have been operating at the perimeter of the farm during incredibly challenging weather conditions. During nighttime and in gale force

winds, it would have been impossible to clearly identify the edge of the farm infrastructure. The inference of taking a Tamar-class lifeboat (16.3m long and 5.3m wide) through a <19m channel in these conditions are questionable. Especially given the likely movement of a 160m longline fixed with only two end anchor points, over the course of 700m.

The applicant states:

> *'In addition, if the farms had been installed, the surface buoys, securely attached to the appropriately, stable anchored headlines could have potentially provided an emergency option for tying/anchoring the rowing vessel whilst awaiting rescue if absolutely necessary.'* (p.476)

This is entirely inappropriate, trying to tie off a drifting vessel in 67mph winds and associated sea conditions in itself would have been perilous. Not to mention the additional loadings placed on the anchor blocks. This has not been calculated, is likely to exceed the design capacity and should not be touted as an option to increase marine safety.

No recognition has been given to the risk of the proposals on similar rescue situations. If the vessel in distress had drifted a further 100m it would have entered the farm site, making the situation much more hazardous. This is also just an example of the scenarios that warrant a safe anchorage area to be protected from encroachment or displacement, rather than occupied by significant infrastructure that could easily be located well clear of the limited number of safe anchorage sites on the coast.

(b) Skopelos Sky

I note the applicant has ignored all raised concerns associated with the Skopelos Sky incident. I really do encourage you to look at the following account to understand how critical the entire Port Quin Bay area was to preserving life. The Greek Freighter Skopelos Sky | RNLI

If it weren't for the unobstructed bay, allowing the Skopelos Sky to freely manoeuvre in a figure of eight across the bay in F12 winds and awesome seas, it is very likely that there would have been fatalities on that night. This is clearly not in keeping with the principles of ALARP, and raises serious concerns about the approach to considerations to safe anchorage within the bay.

5. Project Feasibility

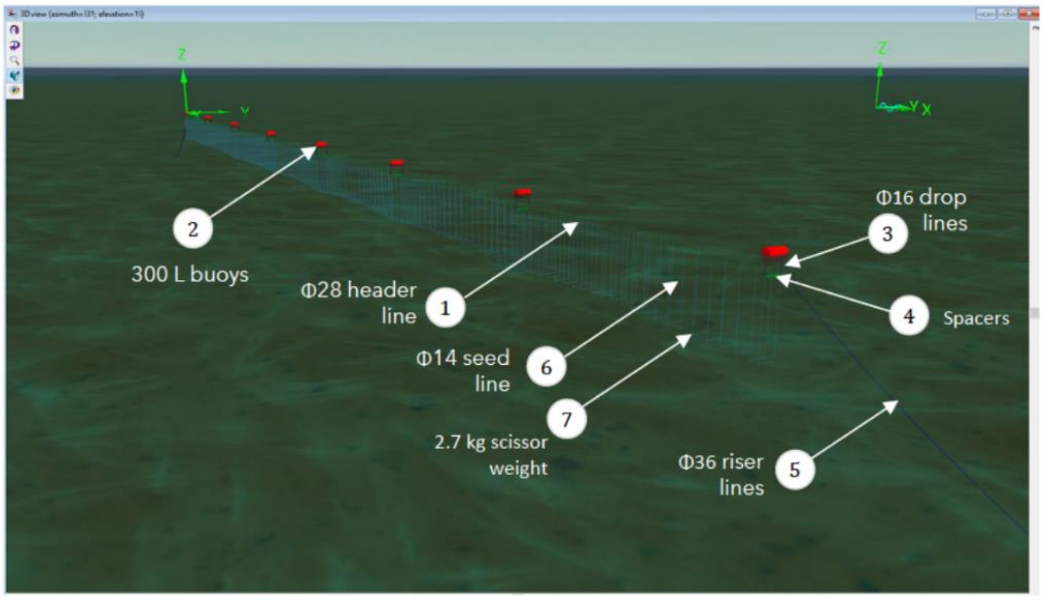
The proposal is clearly speculative. The evidence shows it is not deliverable due to the scale, schedule and location proposed. This is in terms of cost, logistics, carbon footprint, and lack of markets for farmed seaweed.

1. Cost

We already know that the proposed seaweed farm is large-scale, as per accepted definitions.[5] The true scale of the project is now discernible from the Document, despite best efforts of the applicants to mask this by not providing a clear project description and attempting to redact key information. Section 1 of this submission, Project Infrastructure, focused on the anchoring system, which requires 2,950 concrete blocks. In addition, the project requires:

- 14 navigational buoys (8 for the corners and 6 for the midpoints)
- 2,304 x 300l long line buoys (each long line has 8 of these)
- 576 x 160m header lines (each of the 288 long line has 2x header lines)
- 4,608 drop lines (2 per 300l buoy)
- 590 riser lines (2 per long line, one at each end, 14 independent navigational marker risers)
- 46,080 seed lines (160 per long line)

This information can be clearly derived from the schematic presented in the Arc Marine report (Appendix X to the document, p.573).



Here, we set out some conservative cost estimates associated with these capital expenditure items. This does not include deployment costs (flat barge for 36 days x 3-4 seasons, etc.), labour, fuel etc. Nor have we made an estimate of operational expenditure. The total figure of £5.8m is

[5] 'Large-scale' seaweed farms as those requiring more than 50 x 200m lines. The proposed farm consists of 288 x 160m lines. Campbell et al, 2019.

clearly not reliable as it is based on estimates (provided through consultation with aquaculture businesses), but is indicative that the project, as proposed, involves significant CAPEX costs.

Item	#	Total length of lines (m)	Unit cost (£)	Total cost (£)
Concrete blocks	2,950		1,500	4,425,000
Navigational buoys	14		500	7,000
Long line buoys	4,608		150	691,200
Header lines	576	92,160	2	184,320
Drop lines	2,304	2,304	1	2,304
Riser lines	576	17,280	3	51,840
Seed lines	46,080	414,720	1	414,720
				5,776,384

It is clear that the project is not economically feasible as proposed, considering the applicants state the farms will be fully deployed within 3-4 years of licencing. The project cost that appears on the application is £150k per licence. This is orders of magnitude from reality, highlighting a lack of due diligence when assessing the economic viability of the proposals.

Given the current debt position of Biome Algae Ltd., it must be assumed that the intention is to secure a licence as a means to seek finance that will cover this debt and support a much smaller operation within the licenced area to allow the company to start small and scale. The applicants clearly have neither the intention nor means to deploy £millions over the 3-4 year period stated.

Even if the proponents were able to secure financing, there is a clear risk that the business will fail and go into administration. Trinity House raised this as a concern, noting that TH would be left with the cleanup liability in such a scenario. The applicants respond simply that:

> *The applicants have had discussions with the Crown regarding decommissioning and they have their own internal due diligence that they conduct to make sure that there are adequate funds available by the applicants for decommissioning.* (p.431)

At the very least, the Crown Estate should ensure that adequate insurance is secured by the applicants to cover decommissioning costs in the event of business failure; and should consider a requirement for a decommissioning bond.

2. Logistics

Assessing logistical feasibility requires consideration of (a) constraints due to prevailing site conditions (wave, tide, weather etc.); and (b) the nature, scale and schedule of the proposed activities (installing infrastructure, deploying seed lines and harvesting). We show here that both these factors render the proposed project unfeasible.

(a) Prevailing conditions

The applicant draws multiple parallels to operation in comparable conditions on the South Cornwall coast. One of the key differences is the level of site exposure. Buck et al. 2024 determines that distance from the coast has minimal relevance with regard to the equipment or species required, or suited to, the site. Rather the physical parameters of a site (depth, waves and

currents) are considered to be the principal considerations. In this publication, a site with a wave height of up to 6m is considered as exposed.

This comfortably places Port Quin in the 'exposed' category, where the south coast examples would be considered more sheltered. Positioning aquaculture within exposed locations has been linked to a range of disadvantages, including the need for larger and more powerful vessels, shortened operating windows, increased risks of structural failure, cultured biomass loss and increased risks of marine mammal entanglement and for human health and safety (Gagnon 2024).

Tidal limitations

Padstow Harbour is tidally influenced and runs dry during low tides. Given the stated 8 hour working day identified by the applicants (p.41), operation would span two thirds of a tide cycle. Taking 13th November 2024 as an example, low tide was at 09:09. This would delay deployment to site, compressing a working window, where light becomes a constraint, setting at 16:35. While no further analysis will be undertaken, this will have an influence on deployment windows, and queries the decision to operate from a tidal harbour.

Wind

Deployment and harvest activities will be dependent on lifting infrastructure into place, for example the use of flat barges to deploy the 2,950 concrete blocks or winching heavily laden seed lines. Wind speed will become an important factor when operating. Historic wind speed hasn't been analysed as part of this assessment, but should be considered as an additional constraint not always associated with wave heights.

Wave climate

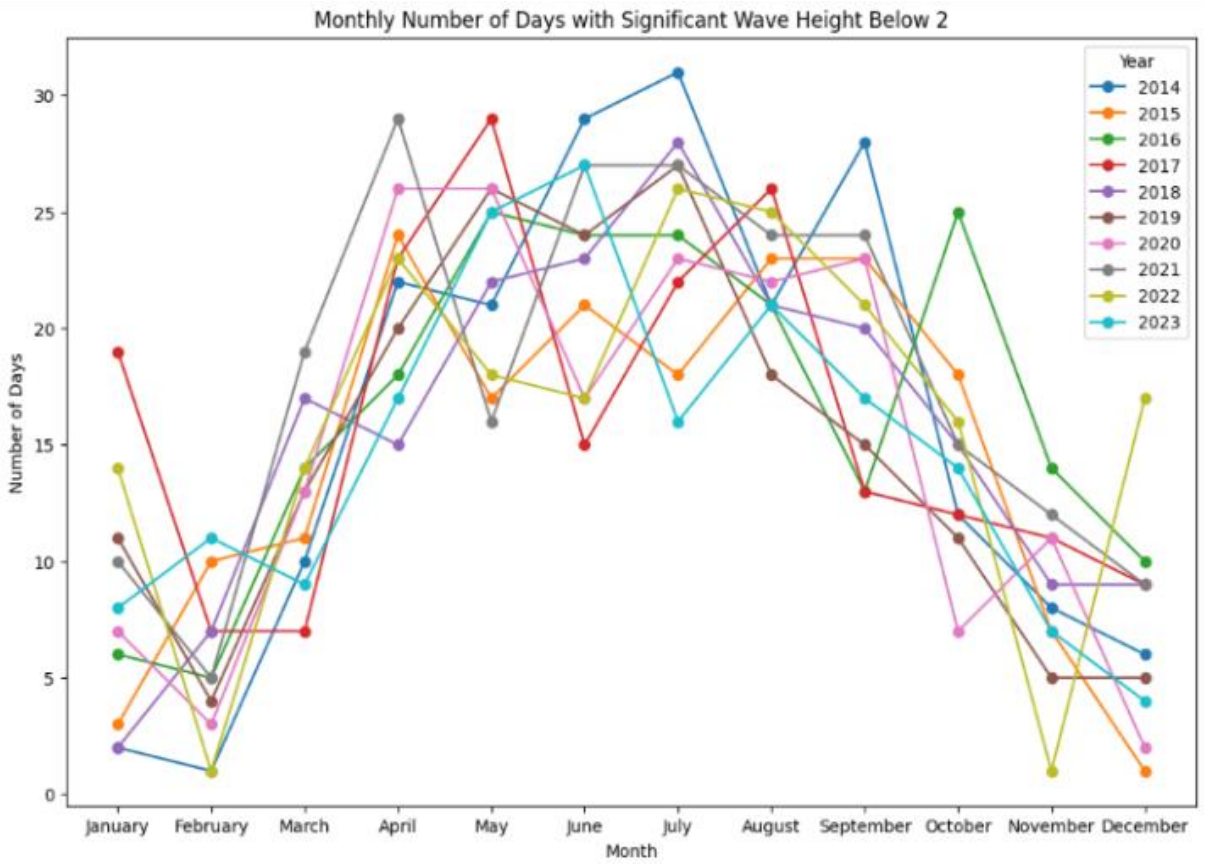
Biome Algae have partnered with Rockabill Marine Design, to design an aquaculture work vessel, preemptively named the Seaweed Queen, which is proposed as the work boat on the new site. This has been designed to MCA Workboat Code Edition 2. When discussed with Rockabill Marine Design, it was confirmed that the operating tolerance was 2m significant wave height. The applicants also state they will limit deployment and harvest activities to 'calm' conditions, and use 'safe' sea conditions throughout their Safety Assessment and Risk Matrices.

While the applicants don't define 'calm' or 'safe' sea conditions, the World Meteorological Organisation adopts the Douglas Sea Scale (link) where calm ranges up to a 0.1m wave height. Given the dynamic coastal conditions, and times of deployment, this is an unrealistically low threshold to operate at.

To allow a more realistic approach to operating windows, waves up to a 2m significant wave height will be considered as operable when undertaking further assessment. All wave statistics have been taken from observed data at Perranporth Wave Buoy. Environment Agency State of the Nation data has previously been used to demonstrate transferability with the farm site. To understand how the wave climate on the North Cornwall coast could impact activity, the table and chart below have been compiled.

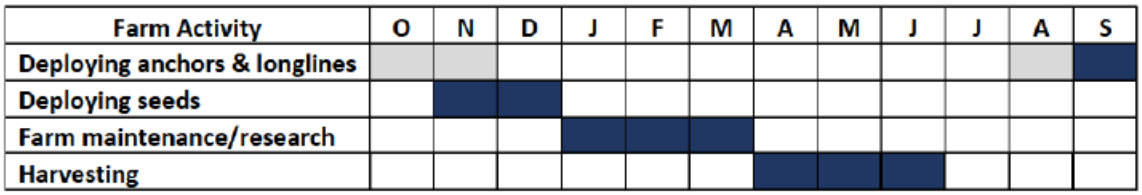
Table - Number of days per month where the peak significant wave height was below 2m, using National Coastal Monitoring data for Perranporth.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	2	1	10	22	21	29	31	21	28	12	8	6
2015	3	10	11	24	17	21	18	23	23	18	7	1
2016	6	5	14	18	25	24	24	21	13	25	14	10
2017	19	7	7	23	29	15	22	26	13	12	11	9
2018	2	7	17	15	22	23	28	21	20	15	9	9
2019	11	4	13	20	26	24	27	18	15	11	5	5
2020	7	3	13	26	26	17	23	22	23	7	11	2
2021	10	5	19	29	16	27	27	24	24	15	12	9
2022	14	1	14	23	18	17	26	25	21	16	1	17
2023	8	11	9	17	25	27	16	21	17	14	7	4
Average	**8.2**	**5.4**	**12.7**	**21.7**	**22.5**	**22.4**	**24.2**	**22.2**	**19.7**	**14.5**	**8.5**	**7.2**



(b) Nature, scale and schedule of proposed activities

The Document contains numerous inconsistencies in its various descriptions of the dates associated with key work windows, as set out in the 'Operational Profile' sections of chapter 7, 8, 9, 10, 11, 12 and 14. We therefore use the description from Chapter 4: Operational Profile Port Quin Farms, as the basis of our assessment. Chapter 4 includes the following operational profile chart (p.40).



Farm Activity	O	N	D	J	F	M	A	M	J	J	A	S
Deploying anchors & longlines												
Deploying seeds												
Farm maintenance/research												
Harvesting												

Figure 1.0: Operational profile over a typical farming season

Mooring anchor deployment

The applicants provide a confusing description of the timing proposed for installation of the main infrastructure.

> *Construction works will be completed over 3-4 years, requiring approximately 36 days total during that period. Once deposited, the ecoblocks will last the lifetime of the farm. Eco-blocks will be deployed from July to early November for the first 3-4 years only. Farms will operate across the as* (sic) *described in chapter 4.* (p148)

[Note the inclusion of July in this statement as an option for infrastructure deployment.]

They imply that just 36 days of deployment time will be required over 3-4 years. This would equate to installing 82 x 11.48 tonne concrete blocks each operational day. Assuming a secondary vessel is available to provide a continuous supply of blocks, blocks would need to be continuously deployed in less than 10 minutes each. If the applicants meant to say 36 days per year over 3-4 years (144 days total), that would still mean more than 20 blocks being installed a day.

Elsewhere in the document, claims have been made that state only 288 eco blocks are being used, rather than the 2,950 determined by the mooring assessment. If we assume that this is a mistake, and the 36 days relates to the lower figure, it would stand that 8 blocks can be deployed per day, a more realistic figure. Taking this number and applying it to the 2,950 concrete blocks required, this would require 369 days of activity.

Solely considering the 2m significant wave height threshold, and not considering tidal and weather constraints, it would require operating during all available windows, 7 days a week, throughout August, September, October and November for a period of 10 years.

Deploying seed lines

P.41 states that two vessels can seed 8 lines a day, requiring 36 days at full capacity. With the 10-fold increase in the linear metres of farm capacity in the latest submission, it is surprising that the applicants have retained the claim that seeding can be undertaken at the same rate as before, however this figure will be used.

The ‘Operational Profile’ states deploying seeds will be undertaken in November and December each year. Using the last ten years of observed wave data, there are on average 15.7 days across both November and December where the significant wave heights are below 2m. This is less than half of the required time to deploy, before tide and wind considerations are applied.

Assuming that this activity will have to expand into October, it would still only equate to 30.2 days of favourable conditions. Considering this is based on a ten year average, there are occasions in the dataset where this would be as low as 20 days across all three months. There are only 2 years (2016 & 2021) where 36 days deployment (including weekends) would be possible, prior to considering wind and tides.

Harvesting

P.41 states that harvesting will occur from April to June each season. At full capacity 36-72 days are required. Despite wave conditions being more favourable during this period, there are still only 66.6 days on average across the three months where significant wave heights are below 2m. Only two years, 2014 & 2021, saw sufficient periods both coming in at 72 days. Again, this is before any wind and tide considerations, operating 7 days a week.

Processing of seaweed

We note that the project does not contain any description of the quantities of seaweed anticipated to be harvested, nor the logistics considerations for landing the product, transporting or processing it. Other linked applications (e.g. Aqua Botanika, Combe Martin) suggest that up to 1,500 tonnes of seaweed may be harvested on a 100ha farm, potentially significantly more using the Arc Marine design. This will require considerable logistics, including dedicated capacity at Padstow Harbour, as well as forward transport. The environmental and social impacts of this have not been assessed. Padstow is an extremely congested port, there is already competition for space on the quay.

3. Carbon footprint

The applicants have made general assertions concerning the potential for seaweed to sequester carbon depending on its various end uses. For example:

> *Seaweed farming has potential to combat climate change in-situ (pending research) and through seaweed-derived products that can reduce or avoid carbon*. (p.109)

However, there is no consideration of the carbon footprint of the infrastructure, nor of the emissions that will be generated during installation, operations and processing. These will likely be significant and must be offset against the carbon sequestration potential of seaweed products.

The most significant carbon footprint aspect of the proposed project relates to the use of recycled concrete blocks for the infrastructure. Mostert et al., 2021 (link), conducted a detailed study of the carbon footprint associated with various types of recycled concrete. They concluded that the climate footprint of recycled concrete ranged between 308 – 315kg of CO2-eq per 1m^3 of RC concrete. Below, we apply a conservative estimate of 300kg CO2-eq per 1m^3 to calculate the carbon footprint of the concrete blocks:

- 2,950 concrete blocks required
- 5.341m^3 per concrete block = 15,756m^3 total

- 300kg CO2-eq per 1m^3
- 4,727 tonnes of carbon total

To offset this would require the purchase of 4,727 carbon credits. Earthly.com was selling Biome Algae carbon credits for $36 / ton of CO2-eq (before they withdrew support for BA when we pointed out that BA was failing to comply with Earthly's minimum carbon standard). This would result in a total cost to offset the concrete blocks alone of **$170,000**.

4. Lack of markets / over supply concerns

The lack of a viable market for farmed seaweed in the UK significantly undermines the applicants' proposal to create a large-scale farm and shows that development of a 100ha operation over the next 3-4 years is clearly not feasible. It is clear from the analysis of costs and logistics constraints that the applicants are intending to start small and scale over a longer period than that stated. They have not been transparent in this.

To date in England, the MMO has issued licences covering a total of 366ha. See table at end of this section. Of this, 300ha (82%) have been licenced in the SW recently, all linked to Biome Algae. These are: St Austell Bay (West Country Mussels); Bideford (Algapelago); and Port Isaac (Penmayn).

A further 212ha has been applied for, of which 100.8ha is in Port Quin and 111.4ha is in Combe Martin (Aqua Botanika). These are also linked to Biome Algae, and we know that their other application for a 100.6ha farm at Gerrans Bay was withdrawn due to local opposition.

Of the 300ha licenced in the SW, a total of approx. 3 ha are currently being farmed:

- West Country Mussels is currently farming 2 x 150m lines of seaweed alongside mussel lines, despite having a licence for 180 x 150m lines.
- Algapelago are farming 2 hectares.
- Penmayn has not yet started farming.

The main reason for this is that there are currently no viable markets for farmed seaweed at this scale. West Country Mussels applied for a licence variation to convert its seaweed hectarage to joint mussel and seaweed farming, stating that they had been misled that the price they would receive for a kilo of farmed seaweed would be £3-4, where in fact they achieved £1. And Algapelago have notified the MMO that they intend to add an additional 3ha of shellfish longlines to "diversify income and improve risk resilience", having learned that seaweed farming alone is not economically viable.

As a result, we can see the following:

- The MMO has already issued licences for a hectarage that far exceeds the capacity of the market.
- Starting small and scaling is the only viable approach to developing the sector – this does not justify the large-scale farms being applied for by Biome Algae and its partners.

Table (overleaf): Licence applications for seaweed farms in England, Biome Algae linked applications highlighted (Source: MMO)

#	MLA REFERENCE	NAME	LOCATION	APPLICATION DATE	SIZE (HA)	PLANNED DURATION	STATUS
19	MLA/2018/00437	Nearshore Seaweed Cultivation of Native Species	Off of Norfolk Coast	01/10/2018	1540	27 years	Withdrawn
1	MLA/2023/00227	Nearshore seaweed cultivation of native species	North Devon, off Combe Martin	25/05/2023	111.42	30 years	Applied - under review
7	MLA/2023/00180	Seaweed Farm, North Cornwall	Port Isaac	28/04/2022	100	25 years	Licence Granted
10	MLA/2021/00328	Seaweed Farm, North Devon	Bideford Bay, North Devon	19/07/2021	100	25 years	Licence Granted
11	MLA/2021/00413	Seaweed Farm St Austell Bay, Cornwall	St Austell, Cornwall	21/09/2021	100	15 years	Licence Granted
20	MLA/2023/00371	Seaweed Farm in Gerrans Bay	Gerrans Bay, Cornwall	31/08/2023	55.3	50 years	Withdrawn
21	MLA/2023/00370	Seaweed Farm in Gerrans Bay	Gerrans Bay, Cornwall	31/08/2023	55.3	50 years	Withdrawn
2	MLA/2023/00307	Seaweed Farm in Port Quin Bay	Port Quin Bay, North Cornwall	12/07/2023	50.4	50 years	Applied – under review
3	MLA/2023/00308	Seaweed Farm in Port Quin Bay	Port Quin Bay, North Cornwall	03/08/2023	50.19	50 years	Applied – under review
22	MLA/2022/00183	Seaweed Farm Outside Torbay	Outside of Torbay, Devon	05/05/2022	47	50 years	Withdrawn
8	MLA/2023/00242	Continuing Seaweed Aquaculture at the Seagrown Farm	Yorkshire Coast nr Scarborough	04/06/2023	25	15 years	Licence Granted
12	MLA/2017/00386/2	Seaweed and Mussel Aquaculture off the Yorkshire Coast	Scarborough	23/09/2017	25	5 years	Licence Granted
5	MLA/2024/00501	Southcoast Seaweed Farm	South Coast, off Portsmouth	16/06/2024	24.96	40 years	Applied – under review
6	MLA/2024/00086	Ocean Origin	Swanage bay & Ringstead bay	14/02/2024	16.41	10 years	Applied – under review
23	MLA/2022/00023	Kelp Farm in Babbacombe Bay, Devon	Babbacombe Bay, Devon	20/01/2022	13.2	5 years	Withdrawn
18	MLA/2021/00154	Suffolk Seaweed Farm	Suffolk, off Dunwich	26/03/2021	12	9 years	Withdrawn
24	MLA/2023/00165	Channelled Atlantic seaweed farm	East Devon Coast	12/04/2023	10	20 years	Withdrawn
15	MLA/2020/00583	Green Ocean Kelp Farm: Portland	Portland Harbour	18/12/2020	6	4 years & 3 months	Licence Granted
9	MLA/2020/00475	Seaweed Aquaculture Off the North Norfolk Coast	Off the North Norfolk Coast	27/10/2020	5	10 years	Licence Granted
25	MLA/2024/00500	Southcoast Seaweed Farm	Solent, Isle of Wight	16/09/2024	5	51 years	Withdrawn
26	MLA/2019/00367	Aquaculture: Seaweed Farm	Off Milford on Sea	20/08/2019	4	5 years	Withdrawn
13	MLA/2020/00249	Green Ocean Kelp Farm - Brixham	Brixham	23/06/2020	3	5 years	Licence Granted
4	MLA/2024/00328	Bio-remediation scheme and seaweed farm - Isle of Wight	Isle of Wight, off Sandown	19/06/2024	2.3	10 years	Applied – under review
14	MLA/2020/00380/1	Nearshore Seaweed Cultivation of Native Species	Off of Torquay	07/09/2020	2	10 years	Licence Granted
29	MLA/2022/00385	Kelping the Sea	Burniston beach, North Yorkshire	28/08/2022	0.0005	3 months	Licence Refused
16	MLA/2020/00585	Licence to deposit and remove pre-seeded seaweed ropes within an active licensed aquaculture site	St Austell Bay, Cornwall	21/12/2020	Seaweed ropes attached to 8 already existing longlines within an active aquaculture site.	29 years	Licence Granted
17	MLA/2021/00356	Small Scale Nearshore Kelp Farm Pilot Test Site	Off Chichester	15/08/2021	2 x 20m lines	9 months	Licence Granted
27	MLA/2020/00012	Seaweed and Polyculture Farm	Solent	08/01/2020	Not specified	10 years	Withdrawn
28	MLA/2021/00496	Seaweed and sea vegetables farming and harvest	Druridge Bay, Northumberland	23/11/2021	40 lines of seaweed	5 years	Licence Refused

6. Consultation and Engagement

1. Summary

Proper consultation and engagement are the corner-stone of complex project delivery, more so in contested settings. The applicants' approach of false information and misrepresentation have featured from initial pre-engagement, through to the FIR responses in the Document.

The scale and nature of the project has been downplayed to minimise perceived concerns. Stakeholders, primary advisors and technical experts have been fabricated or mis-represented, and support from individuals has been exaggerated and applied across entire stakeholder groups.

The impact of false information in skewing public and primary advisor perception has previously been evidenced. These concerns have not been resolved through provision of The Document.

2. Social Licence to Operate

In their 'Handbook on Social Licence to Operate for Seaweed Cultivation', published in 2020, long before the Port Quin Bay applications were submitted, the Scottish Association for Marine Science (SAMS) sets out the simple steps towards, and positive outcomes for, Social Licence to Operate (SLO), including the following advice:

> *Having or not having SLO can affect the viability of an operation or development. Not having SLO can cost time, money, and reputation and can limit access to new sites for development. Having SLO can increase reputation through local support and provide opportunities for expansion. The scientific literature identifies several ways to improve industry-community relationships. These include:*

- Understanding the local social context for the industrial activity
- Ensuring that communities have enough information about the activity and can participate in decision-making about it
- Engaging in early, on-going and quality communication between communities and industry
- Building relationships between individuals in the community and the company
- Understanding that economic, environmental and social sustainability are important concerns for communities
- Ensuring that there are local benefits
- Recognizing that local solutions may be perturbed by external parties such as national or international NGOs or company management boards
- Dealing adaptively with communities, responding to changes in them, in the industry, and the economy
- Being fair and transparent in making decisions that affect the community or local workers

Social licence to operate is a term that was first used in the mining industry, and is now used widely to describe the relationships that industries have with local communities. It can empower communities to seek benefits from industries that have social and environmental costs, and provides a framework for industries to go beyond legal compliance with environmental and social regulations. These costs can include the use of space, environmental and visual degradation, and

disruptions to normal social life. Achieving SLO, according to the Handbook, begins with Information and Consultation, followed by Collaboration and Empowerment.

The steps to this are clearly set out in the following table:

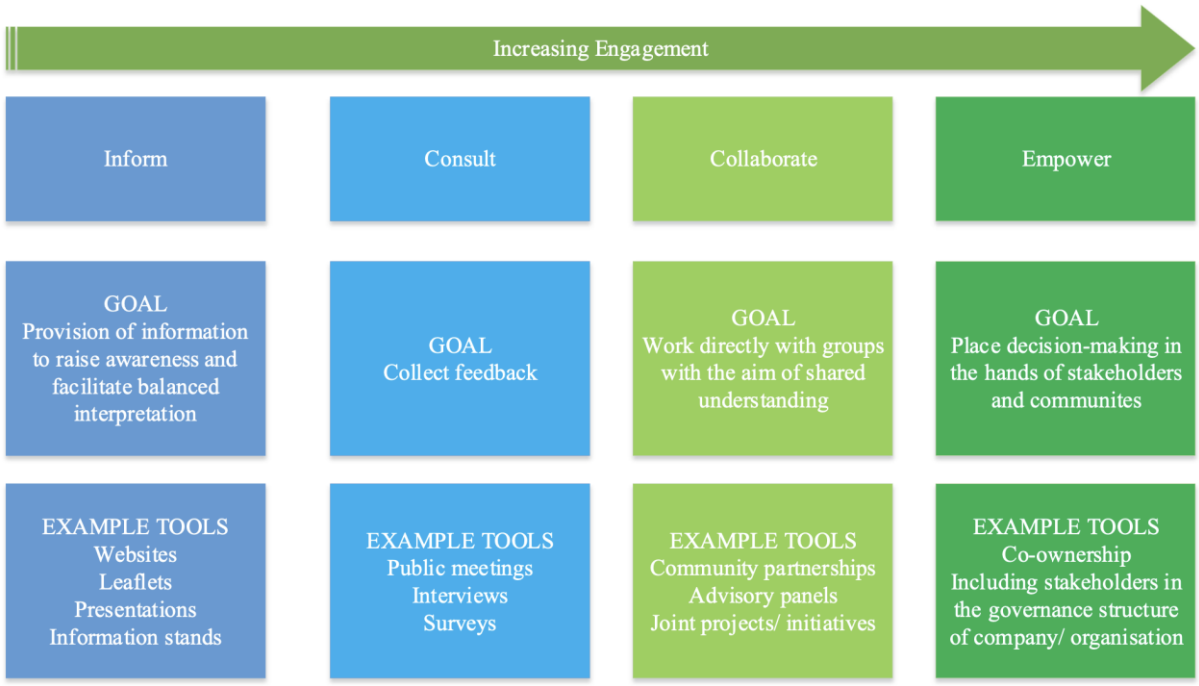


Figure 1. Types of engagement according to goals and with provision of some examples of how they can be carried out.

None of the bullet points above, nor any of the goals or tools in the above table, were adopted by the applicants for the Port Quin Bay farm. This disregard for community involvement, and stakeholder engagement, has led to distrust, and has increased opposition to the proposal.

3. The importance of engagement in the marine licencing process

The South West Marine Plan emphasises the importance of early engagement and appropriate consultation with a range of stakeholders through all stages of project development. Specifically, pre-application engagement is identified as helping to '*remove uncertainty, support efficient decision-making and reduce resource required'* (p.65 SWMP).

There are a number of specific policies within the SWMP that rely on appropriate consultation and engagement in order to identify potential adverse impacts. Only once identified, can they follow the principles of avoid, minimise and mitigate adverse impacts so they are no longer significant. This is the cornerstone of the SWMP, and determination based on anything other than adequate and transparent engagement is likely to jeopardise the determination process, leaving decision makers open to challenge and associated reputational harm.

The Aarhus Convention is a legally binding global agreement that gives citizens and civil society the right to access information, participate in environmental decision-making, and seek justice. It's considered a key instrument in environmental democracy. The convention mandates public participation in the marine licensing decision making process. As such, stakeholders, including local communities and environmental groups, can provide input and express concerns during the application review process.

4. Biome Algae and Camel Fish's narrative of community engagement

The production of The Document by the applicant lacks independent input and contains a high degree of bias when representing community involvement, suggesting a level of support for the proposals. This is markedly separate to the lived experience of the community and stakeholders who have felt misrepresented and ignored throughout the process. The community has had to fight to make its voice heard.

One metric of engagement used by the applicant is number of days in total for public consultation. This is a statutory obligation under Section 68 of the MCAA 2009 and has no reflection on the level of engagement undertaken within the community. In reality, the 56 days referenced (p.18) is a reflection of the applicants placing initial notices in unsuitable locations, geographically discreet from the community impacted.

> *'The MMO has concluded that the public notice was not placed in such a manner to bring the application to the attention of persons likely to be interested in it. '*

During the public consultation period of February to March 2024, an overwhelming and unprecedented level of opposition was voiced. 95% of the 700+ responses were objections. The applicants clearly understand the importance of this backlash. Following a much smaller number of objections to Biome Algae's application at Gerrans Bay, the applicant withdrew citing:

> *'as responsible operators, we also recognize that it is important to support and have the support of the communities within which we operate. As a result, we will respectfully withdraw our current application.'* Official statement – 5th January 2024

Rather than recognising the inability to operate without a social licence in Port Quin Bay, the applicants persist without community support, presenting this overwhelming opposition in a disingenuous manner:

> *'We have consulted with the public who have shown both support and have submitted representations in the form of concerns. We address those concerns within this document.'* (p.404).

Despite this statement, very little, if anything, has been done to rebuild trust within the community. Stakeholders are still being misrepresented, and consultees have been fabricated. No further community engagement events have been held, and no attempts have been made to contact those who raised opposition. No doubt this will become apparent during the third round of public consultation.

Rather than encourage and advocate for consultation to ensure concerns were addressed, the applicants made a deliberate attempt to discourage the MMO from undertaking a third round of public consultation. In emails to the MMO from the applicant they insinuate that the public did not 'have the competence to assess' the Document, stating that a third round was unprecedented. This is a clear attempt to avoid obligations under the MCAA 2009. Why wouldn't they want the public to have sight of the Document, if they claim it fully addresses concerns (p404)?

5. Evidence of false representation

The MMO has received numerous objections from stakeholders omitted from the pre-engagement log, as well as objections from those who have been misrepresented within the log. These objections have not been repeated here as the initial comments will stand for consideration

during licence determination. Clearly the narrative around pre-engagement can not be redefined during subsequent stages of the project.

Sailing representation

Port Quin Bay is within an RYA General Boating Area shown as an area of high sailing potential on Explore Marine Plans, which supports anecdotal references to leisure use within the bay.

> *The applicants reached out directly to sailing clubs (evidenced) and received responses: they had no objection to the proposed site. The applicants also contacted the RYA for sailing data from seaTRK and Coast Atlas.* (P.343)

Despite initial objections on these grounds, the sailing clubs are still being referenced with no evidence to substantiate this claim, and both the Port Isaac and Port Quin sailing clubs have been fabricated. Objections have been received from members of the Port Isaac Rowing club. Claims to ensure the proposed farm areas are not within main racing areas (sailing) relates to the withdrawn Gerrans Bay application, and are irrelevant to this submission.

The RYA were contacted to request seaTRK and Coast Atlas data, but this has not been included in the applications. Rather anecdotal evidence from the applicants, fabricated sailing clubs and coarse datasets such as EMODnet have been used. The 'evidence' referenced is an email exchange with the RYA enquiring about data availability.

Padstow Harbour Masters

The applicants state:

> *We have pre-consulted with the local Harbour Master's. They initially raised no objections and provided a letter of support. However, since the applications have been ongoing the Harbour Masters have been made an assessor for these licence applications so they can no longer provide the letter of support.* (P.403).

This is not accurate. Padstow Harbour Commissioners issued a public statement on 23rd February 2023 to the Save Port Quin Trust with the following justification for withdrawing support:

> *'It was decided on the bases that appropriate consultation has evidently not been undertaken thoroughly with relevant stakeholders, and after receiving evidence to suggest that there is conflicting and ambiguous information contained within the application, and that PHC are requested by the MMO as consultees, to provide comment on the application which may possibly require a comprehensive study and report, the Commissioners voted favourably to withdraw the letter of support.'*

This has clearly been framed as a procedural issue within the Document, rather than genuine and evidence-based claims of conflicting and misleading information within the initial submission.

Agriculture

The applicants state:

> *We have consulted with land-based farmers in the Port Quin region and they have raised no objection. They have provided letters of support for the applications.* (P.404).

This is not true. Multiple 'land-based farmers' in Port Quin have objected to the proposals and will continue to submit objections to this effect. A sole letter of support from a prior contact of the

applicant, who operates in the 'Port Quin region' does not reflect an entire stakeholder group, as implied. A single representative within the stakeholder group has been cherry-picked for consultation, with no equal opportunity for farmers more directly within Port Quin.

Tourism operators

Tourism is a significant employer across Cornwall, and Port Quin is no exception. There are a concerning number of local operators who have been omitted through all stages of consultation.

> *During pre-engagement stakeholders regarded as legitimate users of the sea that operate businesses and actively make a livelihood from working on the sea responded with having no objection.* P262

> *We have consulted with local charter companies and boat tour businesses (4) and they have raised no objections. They have provided us with a letter of support.* P.403

Objections have been raised by tourism operators. The sole letter of support was from a fishing trip operator who does not operate within Port Quin Bay.

RNLI

There are multiple references to engagement with the RNLI, where they are claimed to have assessed the impacts of the proposals on public safety.

> *Both applicants [Camel Fish & Biome Algae] have consulted with the RNLI on a local and wider basis. This is in reference to rescue missions where the RNLI may need to navigate through the farm directly.* P.433

> *The RNLI vessel at Port Isaac is a D-class (LB1) lifeboat which is 5m long and 2m wide. The main RNLI vessel at Padstow is a Tamar-class lifeboat (Spirit of Padstow) and is 16.3 m long and 5.3 m wide.... both vessels will be able to directly access through the proposed farms given vessel sizes and the regularly spaced, fully open sea channels between longlines (20 m spacing minimum).* P.433

> *Moving through the farm is also possible for vessels with low draft (ribs, leisure boats, paddle boards, kayaks etc.) due to the minimum 20 m wide open channels between longline rows.* ***This has also been assessed with the RNLI.*** P.281

The claims are implausible and unevidenced and should not have a bearing on the determination of the proposals. The MMO are encouraged to test the validity of these claims directly with the RNLI.

Claims of a minimum 20m wide spacing are also disingenuous, as lateral forcing will create a dynamic channel between the long lines. The twin long lines spaced 1m apart also result in a maximum of 19m between channels, before movement of the surface buoys and lines are considered. The catenaries are also likely to be dynamic, given 5.5kg of weight spread over 9m line. A total of 29.5 tonnes submerged weight is required at each anchor point to maintain overturning stability, such are the loadings on the anchor point. This does not occur without significant deflection of the mooring lines.

Port Quin

One place that appears to have been avoided during the application process, and is absent from the Document, is the village of Port Quin and the surrounding area. The stakeholders working in

Port Quin include three long-established family farms, all with land overlooking the farm site, the last remaining Port Quin fisherman, the only boat tour company operating from Port Quin, and the residents whose homes overlook the bay. To our knowledge, all of these stakeholders oppose the farm applications, submitting objections in March, or made no comment. The only mention of the village is in relation to the Port Quin Sailing Club which, as we have established, does not exist.

6. Engagement with the fishing community

Despite claims by the applicant of support from the potting community, the sole potter who operates out of Port Quin Bay has not been consulted, doesn't appear on any engagement logs, and does not support the proposals.

When assessing the Demersal Gear Fisheries impact, a statement from Pentire Fishing Limited is used. They also feature as an original letter of support and in the engagement log, yet this company is owned by one of the applicants, Camel Fish. This is not appropriate.

> *…demersal gear fishing landings at Padstow will be caught in the area of the Port Quin Bay… This data infers those activities such as trawling and dredging are not commonplace within the Bay area. This is further supported by our engagement with* ***Pentire Fishing Limited,*** *they discussed that they were the only fishers with a trawling vessel that was active within the bay and they fully supported our proposed licenced site."* P.228

Further claims that netting will not be impacted are inaccurate, there have been multiple occasions where trawling has been observed within the proposed site. At present there is a clear attempt to understate the displaced netting activity. A position of 'no impact' across the board, despite datasets showing trawling activity within the proposed farm area is contradictory. Only through transparency can the impact be considered.

Figure 2. Trawler operating within the farm footprint on 27th October 2024.

In the Document, the applicants state:

> *None of the fishers interviewed which represents operators in Port Quin Bay and Port Isaac Bay were opposed to the proposed Port Quin Bay sites for seaweed farming. There was opposition to the licenced Port Isaac farm.* (p.215)

The applicants clearly chose not to 'interview' fishers who had expressed opposition in the previous consultation round. The Padstow and Port Isaac fishers, as with many stakeholders in

the area, were given a misleading picture of the proposed farms. The applicants significantly down-played the scale of the farm, presenting a much less ambitious proposal. The applicants faced at least three Padstow fishers at the public meeting on 27th February, who had attended the meeting to voice their strong opposition. One fisherman submitted a clear opposition to these applications in March this year, stating:

> *I am a fisherman and I fish for crab and lobster close to all the proposed seaweed farms in Port Quin and Port Isaac. I am an individual and by no means speak for the industry. There are varying views from fishermen on Padstow harbour from full support to complete disdain for these proposals".*

In the same submission, this person goes on to say:

> *"I personally cannot support either of these proposals due to the covert nature in which they have been submitted to the MMO. The lack of information available and the absolute silence as the site increased by 25X from what was initially communicated to a handful of fishermen".*

These statements directly contradict the narrative presented by the applicants in the Document.

7. Conclusion

Lack of transparent consultation was the trigger for the considerable backlash from the community against the Port Quin Bay applications. This backlash has led to immense pressure on the applicants, and a substantial increase in costs, due to revised licence application fees. It has also highlighted that the requirement for social licence to operate is an absolute necessity, particularly in emerging industries such as seaweed aquaculture. Change, especially on the scale of this proposal, is always difficult for communities to embrace, but early information-sharing and opportunities for collaboration could have resulted in a more positive outcome for all.

7. Aquaculture areas of potential

This assessment considered the evolution of claims made in support of MLA/2023/00307&8 associated with site suitability and specifically the MMOs 'Strategic Areas of Aquaculture Potential', defined in MMO1184.

The Document states that an updated Marine Policy Assessment has been undertaken, and that this should be interpreted cumulatively with previously provided information. As such, this review will also draw in pertinent claims made by the applicants prior to submission of the FIR document.

1. Summary

The suitability of a site for aquaculture production is of fundamental importance and GIS is ideally suited for assessment (Falconer et al., 2018) (link). As such, site suitability should have been an initial consideration when undertaking a feasibility assessment. This approach is supported by the SWMP.

The applicant's interpretation of 'areas of potential' has changed throughout the application process. Initially the Marine Policy Assessment mis-represented the MMOs mapping data, claiming that Port Quin **was** in an area suitable for seaweed aquaculture.

> *The proposed location of the project is also in an area that is indicated by the MMO (GIS mapping) as a suitable area for seaweed farming within the UK. Marine Policy Assessment* (p.5).

This is not correct; Port Quin is not identified as an area suitable for seaweed aquaculture. When concerns around this misrepresentation were raised by a member of the public at the community event in February, the applicant showed that they had incorrectly interpreted this dataset, as captured in the meeting minutes:

> *'Q: An audience member commented that the MMO data does not show that Port Quin is a suitable location for seaweed farming – and that there was no indication to suggest that PQ is indeed a suitable area when a constraint layer is applied to the MMO mapping. Please demonstrate from the MMO data that Port Quin is a suitable area for seaweed farming.*
>
> *A: A Mead attempted to explain about the scales used on the diagrams (unsuitable to suitable) and that her understanding was that where no scale was indicated was due to no data, otherwise it would reflect as unsuitable.*
>
> *This explanation was not accepted by the audience. A Mead will verify with the MMO.*

In the FIR Document, the position has changed to argue that Port Quin Bay is **not** in an area shown as suitable for seaweed aquaculture, however it is a viable site. The evidence provided to support this claim relates to locations that have produced small volumes of seaweed, with yields ranging from 5T to 40T. The applicant claims that these are all outside of areas of suitability. This is not correct. They further claim that Port Quin is within the merged layer of aquaculture potential is irrelevant as this does not relate to seaweed aquaculture.

As initial site selection and feasibility was assessed ahead of the application, the applicants applied the incorrect interpretation of site suitability. Having been made aware of this error by the public, the applicants have adjusted their position. They seek to force the justification for why this site **could** be appropriate, rather than use this information to steer the initial feasibility assessment prior to application to a more sustainable location.

This is a further symptom of the sunk cost fallacy, where significant money and resource has been spent on the premise of incorrect interpretation of MMO Policy Mapping.

2. Relevance within the South West Marine Plan

The SWMP aims to provide a policy framework to guide sustainable development, protection, and improvement of the marine environment in the South West region of England. In the context of site selection, the SWMP provides the following:

> *Consideration of the South West Marine Plan and its Technical Annex, alongside the UK Marine Policy Statement, is recommended **at the earliest stage**. The South West Marine Plan will help:*
>
> - *assess the viability of a proposal, helping to identify the best locations and discount those that are unviable, saving time and money*
> - *identify other activities and developments that may influence or be influenced by a proposal*

The SWMP should act as a means to steer sites to suitable locations. The MMO have only published one dataset that spatially represents site suitability for aquaculture, MMO1184.

> *The Explore Marine Plans digital service should also be used alongside this plan.*

The SWMP Technical Annex is even more explicit in referencing the areas of suitability mapping.

> *If siting new aquaculture infrastructure, proponents may find it useful to refer to the strategic areas of sustainable aquaculture production layer in Figure 5 or on Explore Marine Plans. This layer does not delineate areas where policy SW-AQ-2 applies, rather it indicates optimum areas for sustainable aquaculture (refer to policy SW-AQ 1) that may also be of interest to proponent....*
>
> *Also of interest are the individual species suitability maps that are shown under the same category.*

3. MMO1184 – Identification of areas of aquaculture potential in English Waters

The MMO commissioned MMO1184 to identify areas of aquaculture potential, with a goal of using literature and spatial modelling to determine where key aquaculture species could be cultured based on environmental conditions necessary for their growth and the constraint of farming infrastructure.

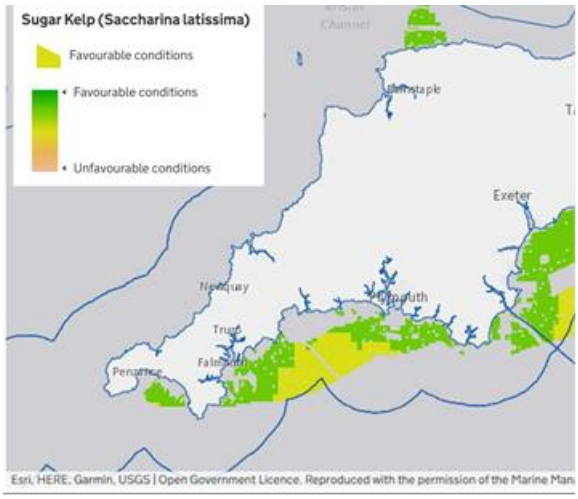
There are two key stages within the process, a review of environmental conditions for growth such as sea surface temperature, salinity, light and chemical composition. This generated a layer representing where certain species of aquaculture **could** grow.

What the mapping does not consider at this stage is wider factors to inform the suitability of aquaculture, the **"should** we grow seaweed here?" question, such as environmental designations and conflicting water users. Further data processing was required to translate this into a practical layer that should be used to identify locations where conflict with existing infrastructure and water users can be minimised.

> *The output of this study will be combined with other information by the Marine Management Organisation (MMO), such as marine activities distributions and intensities, vessel routing schemes etc., to identify the most suitable locations for farming (i.e. optimizing the farm yield, while reducing potential conflicts with other uses or activities in the marine area).* – MMO 1184

The 'Strategic areas of sustainable aquaculture production' map is shown as a Policy Map within the SWMP Technical Annes. Policy maps principally define spatially discrete areas, for example where defined activities, resources, designations, leases or licences exist. SWMP Technical Annex (p.29).

Figure 1 – Areas of suitability for Sugar Kelp, taken from Explore Marine Plans.



4. What evidence has been provided to dispute MMO1184's findings?

To dispute the finding of MMO1184, robust evidence should be provided that outweigh the evidence based used in its creation. Farming practices in Devon and Cornwall have been used as a demonstration of viability in locations shown as unsuitable. This is a disingenuous approach to suggest the site-specific conditions elsewhere in the Marine Plan area can be applied to Port Quin Bay. This principle is not appropriate. The underlying statement that farms are all outside of areas of suitability is also wrong.

> *According to the current MMO interactive spatial maps, seaweed species cannot be farmed in St Austell Bay, Cornwall, Torbay – South Devon, Porthallow – South Cornwall or Bideford Bay in North Devon. (p.215)*

Despite being repeated three times in The Document, this is not the case and once again conflates the drivers for the areas of suitability mapping.

Figure 2– Suitable areas for seaweed species growth – from MMO1184 (p.53)

Figure 15: Suitable areas (optimal and suboptimal areas combined) for seaweed species growth off the English coast, obtained by intersecting the environmental variables shown in the appropriate section of Annex 2. For method see Section 4.3.

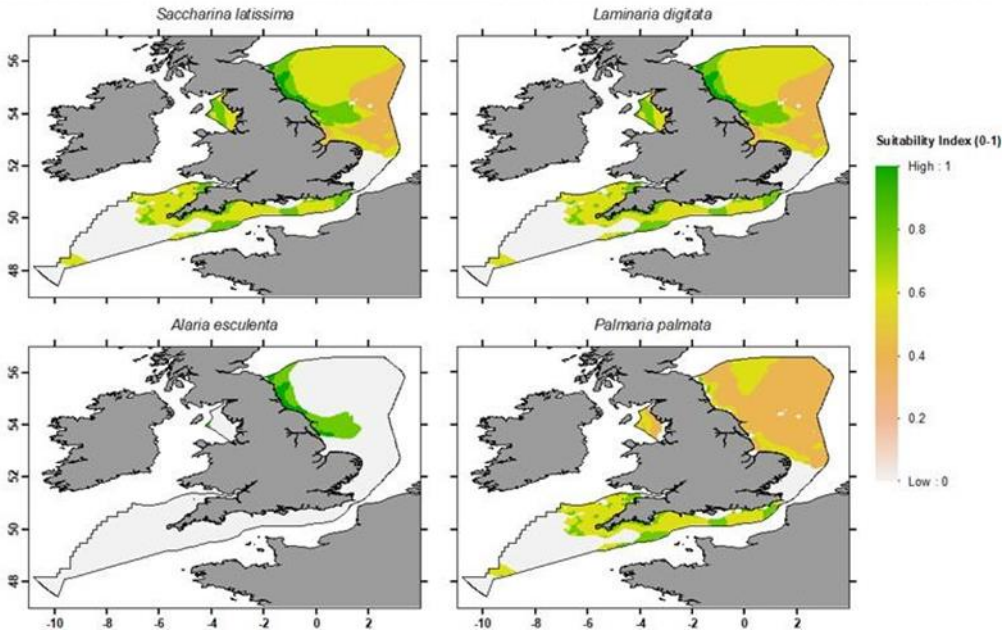


Figure 2 shows that the environmental conditions are supportive of seaweed growth around the SW coast for all species except Alaria esculenta. This disproves the statement that *'MMO interactive spatial maps, seaweed species cannot be farmed'.* Subsequent steps are undertaken to the mapping to understand where seaweed farming is sustainable through the application of technical constraints.

> *The output of this study will be combined with other information by the Marine Management Organisation (MMO), such as marine activities distributions and intensities, vessel routing schemes etc., to identify the most suitable locations for farming (i.e. optimizing the farm yield, while reducing potential conflicts with other uses or activities in the marine area).* – MMO 1184.

5. Does the mapping show the referenced sites are outside areas of suitability?

Porthallow

The Document claims that the MMO mapping shows that seaweed species cannot be farmed in Porthallow. No production volumes are provided, but sugar kelp is said to have been produced since 2019, therefore disproving the MMO's mapping.

When reviewing the site location on Explore Marine Plans, the farm is in the immediate vicinity of an area identified as high suitability for Sugar Kelp farming. The radial exclusion zone that covers the direct farm area is linked to a point feature under 'Historically Significant Shipwrecks'. A 500m exclusion has been applied to this feature, represented by the star in Fig.3.

Figure 3. Extract from Corrigan et al., 2023b.pdf showing the location of Porthallow Seaweed Farm, overlaid with MMO1184 areas of suitability for Sugar Kelp.

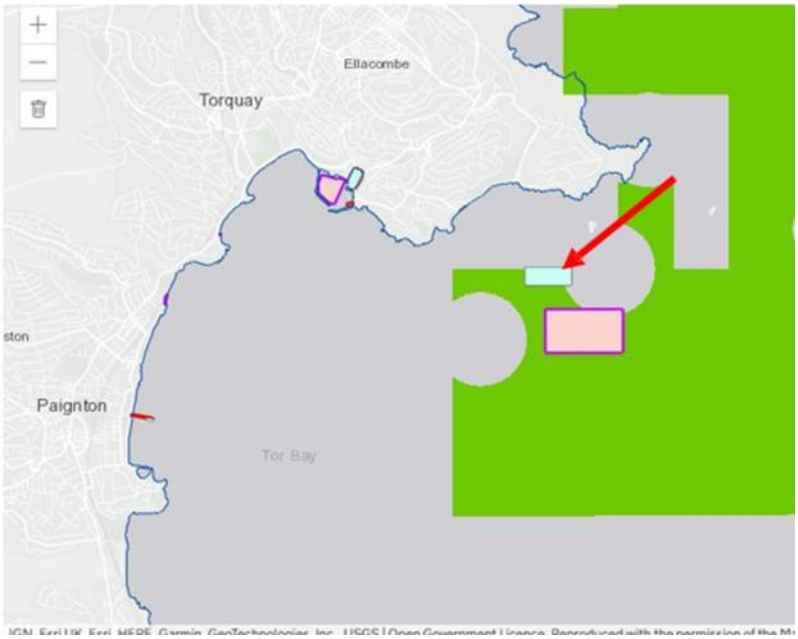
St Austell

The farm location is less than 4km away from an area shown as high suitability for seaweed aquaculture. The operator holds a licence (L/2023/00028/1) for a 100ha seaweed farm that is not in operation. They have also previously submitted a variation request to diversify the vacant seaweed farm as it isn't economically viable. This is not a good advocate location to demonstrate seaweed farm suitability.

Torbay

The Document states that MMO mapping shows Torbay is in an area where seaweed cannot be farmed, despite small volumes of sugar kelp having been farmed. This statement is incorrect. The farm area is within an area designated as favourable for sugar kelp farming.

Figure 4. Location of Torbay Seaweed Farm in (red arrow) in relation to areas of high suitability for sugar kelp (green) – Explore Marine Plans



6. Are these sites relevant to Port Quin?

Of the four sites identified in the document that are used to evidence limitations with MMO mapping, one directly overlaps an area of high suitability, one is ~20m away from an area of high suitability (only excluded due to a local wreck) and another is within 4km. This shows that these three farms are either in or within a close proximity to the broad scale mapping areas of suitability. Port Quin is located 90 km along the coast from the closest area of any level of suitability. Bideford has filed an exemption to move away from seaweed monoculture as it is not considered economically viable. This is not an accurate substitute of data to demonstrate Port Quin is a viable location for seaweed aquaculture.

By looking at the technical constraints, the overarching factor influencing suitability is wave height.

> *In terms of peak wave height, a clear transition is noticeable, along the South coast, between the East and West of England, from the estuary of the Thames and Wash (with <2m peak wave height), to the Celtic Sea with peak wave height of approximately 9m*. MMO1184

The impact of wave action on site feasibility has been looked at in more detail within 6, Project Feasibility. Buck et al 2024 determines that site exposure is one of the most critical factors when considering site placement. The wave heights are notably higher at the proposed Port Quin site in comparison to Porthallow, St Austell Bay and Torbay.

A good proportion of the English waters (58%, equivalent to approximately 29,000km2) would present optimal or suboptimal conditions for growth and farming of Sugar Kelp and Oarweed. - MMO1184

Strategically, forcing aquaculture into unsuitable locations makes little sense at a Marine Plan level and goes against the principles of sustainability and planning for an integrated marine environment. It increases the cost and scale of infrastructure and associated risk. Port Quin has been excluded as an area of suitability owing to the exposed nature of the site. The very same conditions have contributed to a significant increase in anchor weight requirements from 576 1.8m*1.8m*1.8m blocks to 2,950 2m*2m*2m concrete blocks.

No consideration has been applied to fatigue assessment, nor has the possibility of a catastrophic loss of the farm during storm events been considered. The resilience of the proposals have also not been assessed against a changing climate. Appropriate site placement would have significantly reduced these risks and resultant environmental impacts.

8. Bird Impact Assessment

[This section presents a report to the Save Port Quin Bay Group from a local community member, who wishes to remain anonymous.]

I have been asked by the Save Port Quin Bay Group to respond to Chapter 8 of the document MMO FIR 1 and FIR 2, September 2024, MLA/2023/00307 and MLA/2023/00308 ('the Document'), regarding proposals for a 100.8 hectare site in Port Quin Bay, North Cornwall for the construction of seaweed farm infrastructure. Chapter 8 constitutes a Bird Impact Assessment, with a focus on the Pentire Site of Special Scientific Interest.

The Marine Management Organisation has asked for further information pertaining to

7.3 Impacts on Ornithology
It has been noted that that the cliffs around Port Quin Bay are home to a number of seabirds with a significant colony of Puffin present on Moul's Island. This area also forms part of the Pentire Peninsula Site of Special Scientific Interest (SSSI). The MMO ask that you give consideration to the impacts on species present within the SSSI and how the construction and operation of the project will impact these.

I note the applicants' objectives to

- Assess the risks to protected birds within seaweed farms globally and within Port Quin.
- Assess the risk of noise and disturbance on protected birds from the proposed seaweed farming operations.
- Discuss a proposed monitoring program.

Initial thoughts

This chapter is composed of large sections of copy and paste information about the resident auk population. I have to admit that were I marking it, I would have utilised my red pen and removed much of this as irrelevant and merely "filler". The inclusion of such details as "Puffins fly for their food (up to 88 km/hr, wings beating 400 x a minute) and equally fly under water when foraging. Adults weight between 320-450g." on Page 103, whilst interesting in and of itself, it is again both irrelevant and grammatically awkward. Red Pen.

The length of these passages of loose context began to concern me as, in my experience, this tactic of "style over content" tends to indicate a basic lack of understanding of the subject, a lack of study, and a desire to just tick the exercise off. I was also intrigued to see copy and pasted sections of Seal Research Trust data, which I have had the privilege of access to in the past, as the POLPIP other species data is invaluable. I question whether the Seal Research Trust gave permission for this, as much of it is sensitive and not for public view. I will raise this with SRT directly.

My interest was piqued enough, though, to wade through the rest of the document. Perhaps this is out of my remit, but I would like to outline my further thoughts here

1. The copy and paste exercise continues up until the (very thorough) Marine Archaeological Report on P488
2. The insistence, on multiple pages, that Port Quin Bay has a coarse substrate is not true. This is also contradicted in the Archaeological Report and the Engineering Report. The sea bed is sandy. Diving birds can be seen foraging widely across the area
3. Attempting to get a full picture of the infrastructure, I discovered some contradictions. The document states 288, 1.8m3 concrete blocks per site, P360 and elsewhere, however the Marine Engineering Report suggests 2m3 concrete blocks in clusters of 5, to a value of 5760 for the site. Can that be right? The footprint of this is repeatedly stated as 288 x 1.8 to arrive at 518.4m3 (not "cubed", surely, and should the sum not be 1.8 x 1.8 x 288, in this instance?). The 518.4 figure is in contradiction to the figure suggested in the Engineering Report which indicates a worst case footprint of 20m2 per anchor point, amounting to 11520m2 for the total site. This is a considerable discrepancy. Who am I to believe?
4. I am not an expert, but I would say that maximum and projected wave heights for the bay are somewhat low.
5. The data on current strength, P46 & elsewhere, do not appear to take into account the squeeze between Mouls Island and the Rumps. There is a marked acceleration here which would have an effect on the westward edge of the site.
6. In my opinion, when Port Quin is in a blow, the site would be impassable. The dynamic nature of this tight area cannot be underestimated. Have the RNLI at Padstow, Rock and Port Isaac been consulted on this? Port Quin Bay is also a safe anchorage area used frequently by very large tankers and container ships, and by any vessel caught in rough weather. There does not seem to be any mitigation for this essential haven anywhere. I dread to think what impact this proposal might have on large vessels in distress.
7. Where does the figure of "between 5.54 and 5.16 km2" to describe the area of Port Quin Bay come from, P19? The area of Port Quin Bay is in the region of 3km2.
8. I'm afraid that stating that the site is 0.52% of the Cornwall North water body, P15, is, although accurate, meaningless.
9. "Prior to the farms, trawling or netting for fish was not practiced, as the fishers found the coarse sediment does not support commercial fish or shellfish populations", P44&45.

Much of this sentence is untrue. A Port Isaac fisherman used to regularly tow a trawl through Port Quin Bay and found it very productive.

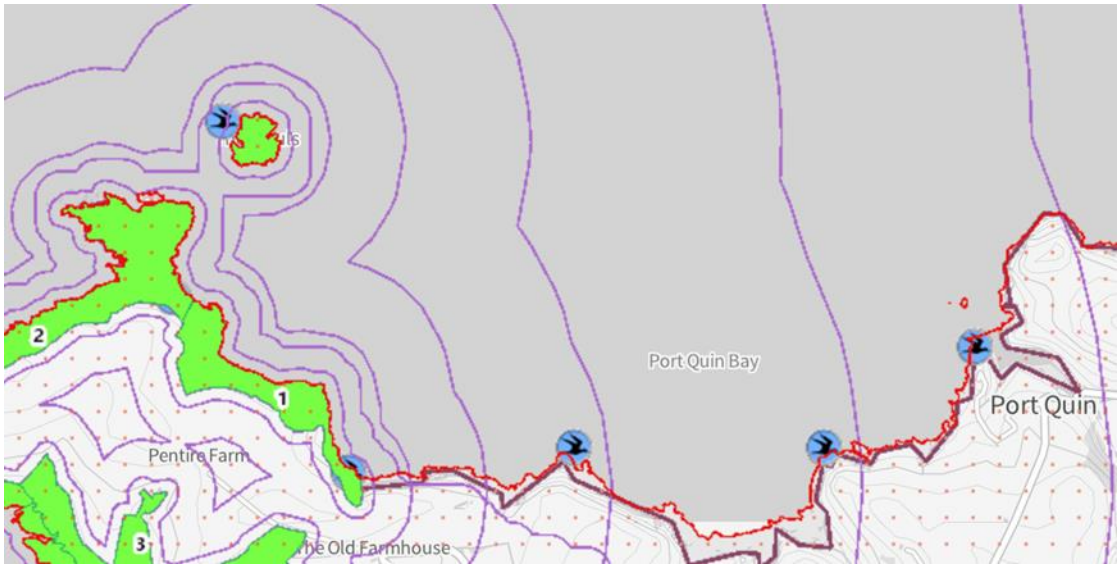
This rather grainy photograph is of the Susie B, belonging to Camel Fish Ltd. She is seen here trawling in Port Quin Bay on Sunday 10th November 2024.

More detail

P95 “600m + from the Pentire Peninsular SSSI”. This distance is inconsistent in this chapter, elsewhere I believe “750 +” is the figure used. Regardless, Natural England state that “The SSSI IRZs only indicate Natural England’s assessment of likely risk to the notified features of terrestrial SSSIs and those SACs, SPAs or Ramsar sites that they underpin. There are other sites designated for nature conservation in the coastal and marine environment that are not underpinned by terrestrial SSSIs”. As far as I understand it, applicants are required to contact Natural England in cases such as Port Quin due to the critical habitat for prey species within the bay. See Fig 1 below.

I believe the “isobars” in the image indicate the diminishing impact a proposal may have on the SSSI, but are there to show the scope of impact on the surrounding foraging area for the nesting auks on Mouls Island. Mouls Island is also home to cormorants and shags which forage the same area.

Fig 1. From DEFRA MAGIC MAP https://magic.defra.gov.uk/MagicMap.aspx



I would imagine that any development here would create a significant barrier.

P97 “Birds were perching”. Seabirds have never had the need for introduced perching, this suggested advantage is meaningless.

P98 The suggestion that ingestion of “marine litter” is non-lethal and non-significant, is ludicrous. An estimated one million birds die as a result of plastic every year. Macroplastics in the sea are identified as food, they are ingested by adult birds, and fed, unwittingly, to chicks. The chicks ingest the plastic and are less likely to survive to adulthood. Plastic reduces the volume of the stomach, which often leads to starvation, and dead seabirds are found in huge numbers with stomachs that are full of plastic waste.

Microplastics are an increasingly pervasive problem. Studies are still scarce, but microplastics can be ingested not just directly, but through preying on fish and crustaceans

which have themselves ingested microplastics. These infinitesimal particles carry pollutants from the manufacturing process, phthalates for example, but also other compounds such as organochlorine pesticides. These pollutants are not just ingested, but actually concentrated once they enter an animal's system, causing failure in the liver in particular.

I have very little knowledge of the process of growing and harvesting seaweed at this proposed scale, but, although I could not fathom the exact calculation, there would appear to be hundreds of thousands of metres of nylon rope used across the site.

In a recent study by Plymouth University, focussing on microplastics being released from marine rope, various data sets were published. When studying a 50m length of rope they found that each time new rope is hauled it could release between 700 and 2000 microplastic pieces, and that used rope could release anywhere up to 40,000 fragments. Using these figures, if we estimated, conservatively, that the amount of rope over the entire site was in the region of 400000 metres, that would equate to the introduction of anything up to 320 million microplastic particles each time the ropes are hauled. This does not account for the inevitable fibre loss through constant chafe that the infrastructure would be subject to. The Plymouth study can be found here

https://www.plymouth.ac.uk/news/maritime-rope-could-be-adding-billions-of-microplastics-to-the-ocean-every-year

Staying on the subject of plastic pollution for a moment, I have a concern about the general down-playing of gear loss, P58 and elsewhere. In particular the assertion that buoys are lost "infrequently", P72. With 8, 300 litre buoys along each of 288 lines, totalling 2304, the risk of loss as the seaweed farm grows towards capacity, increases exponentially. You only have to walk over the beaches in the area to find multiple buoys lost from static line gear, or simply washed from fishing vessels. I would suggest that loss of buoys in this dynamic environment would be inevitable and regular rather than infrequent.

On this point, what are the calculations regarding the impact on the stability of the infrastructure of the reduction in buoyancy resulting from loss of just one of the 8, 300 litre buoys along just one line? Broadly, I can envisage sag in the line should one of the more central buoys be lost, but would it not be more catastrophic should a buoy be lost above one of the mooring lines? Has this been accounted for? My concern is not for the infrastructure per se, I hasten to add, but for the increased entanglement risk to seabirds and marine mammals.

Apologies, I had not intended to rattle on so comprehensively.

Back to P98. The document states that the applicants do not intend to interfere with seabirds present in Port Quin Bay. If you refer again to Fig 1, you will notice that the site will be flanked on 3 sides by nesting seabirds, and it will also be frequented by many vagrant species. How could the applicants hope to not interfere? Direct interference, as suggested here, is not the full story at all, however. Even when there is no flush response (causing an animal to flee), the more subtle behavioural and physiological responses to intrusions, or disturbance, include increases in alarm calling, more rapid heart rates and increased stress

hormones, this can be found in research by Ellenberg et al. (2006), and substantial increases in body temperature by as much as two degrees, found in Regel and Pütz (1997). Unfortunately, these physiological stress responses have been shown to be associated with reduced survival and reduced breeding success. My opinion is that any increased activity in the area would create at least this level of disturbance, whatever mitigating efforts were put in place.

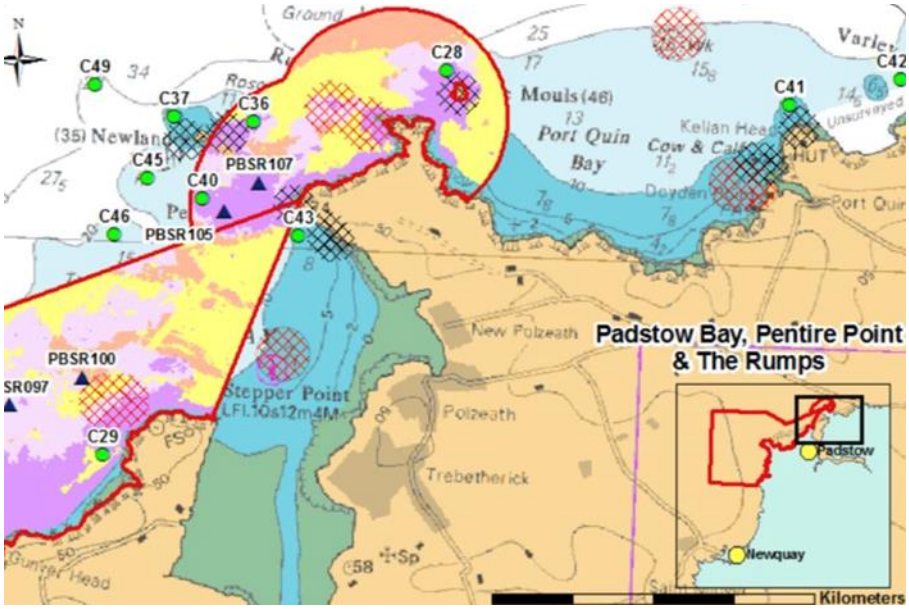
P100 The document quotes Clement et al. 2013 which suggests “siting farms where there is little to no overlap with critical habitat (foraging). Site selection to minimize or avoid spatial overlap with species significant home ranges, critical breeding grounds and main migratory routes”. But the applicants have clearly paid no attention to this, siting themselves adjacent to all these features.

P101 “This is the only population of puffins in North Cornwall”. The actual statistic is that this is the only breeding group of puffins on the South West peninsula. A more alarming statement.

Also, the same paragraph contains the proclamation that “Mouls is the only island suitable for the puffins to breed on in the region”. There is no reference for this, and I do not believe it to be true. There are many other potential island habitats all along the coast. The small puffin colony on Mouls Island is there because, of all the other potential sites, this one is the most likely to yield a successful breeding season. This is due to the lack of disturbance, lack of predators and abundance of prey species in the bay.

P105 Again, this insistence on “coarse” sediment. The sea bed is sand/sandy gravel. This has always been the case, and if you factor in the topography, current, prevailing wind and wave direction you would be in no doubt that any sand west of the proposed site will be shifting eastwards.

Fig 2. This image clearly shows that the sand “to the east of Mouls and west of the proposed farm sites”, P105, is the outer extent of a survey area, and is not an indication of the sediment beyond its scope. This image is publicly available.



P111 “the presence of black and white Razorbills (Auks) on Mouls Island”. I’d like to know what other colour of razorbills there are. This has just been copy and pasted from somewhere else.

P115 “Therefore, the only active farming activity during their breeding season is harvesting”. Yes, by far the busiest time, I presume.

P118 “The farm structure (20 m open-ended channels) and infrastructure only occupying 10% maximum of the proposed farm footprints (10.08 Ha of 100.8 Ha), the majority of the licenced sites remain open sea for flocking, foraging and diving – although quite a shallow site (10-15m)”. This is an odd statement. As I understand it, the entire 100.8 hectare site will have infrastructure across it, it is not as if only a corner of it will be taken up. Whilst the 10.08 figure might be correct mathematically, it will not detract from the barrier effect of the farm in its entirety. The caveat of the shallowness of the site is also strange, as the shallower the water, the less energy is needed to dive it, the more food is made readily available, the greater the chance of survival.

P124 “may provide additional food resources for birds”. Currently the seabirds present in Port Quin Bay do not require this. My fear is that the barrier effect of the proposed farm will make the whole sea bed inaccessible.

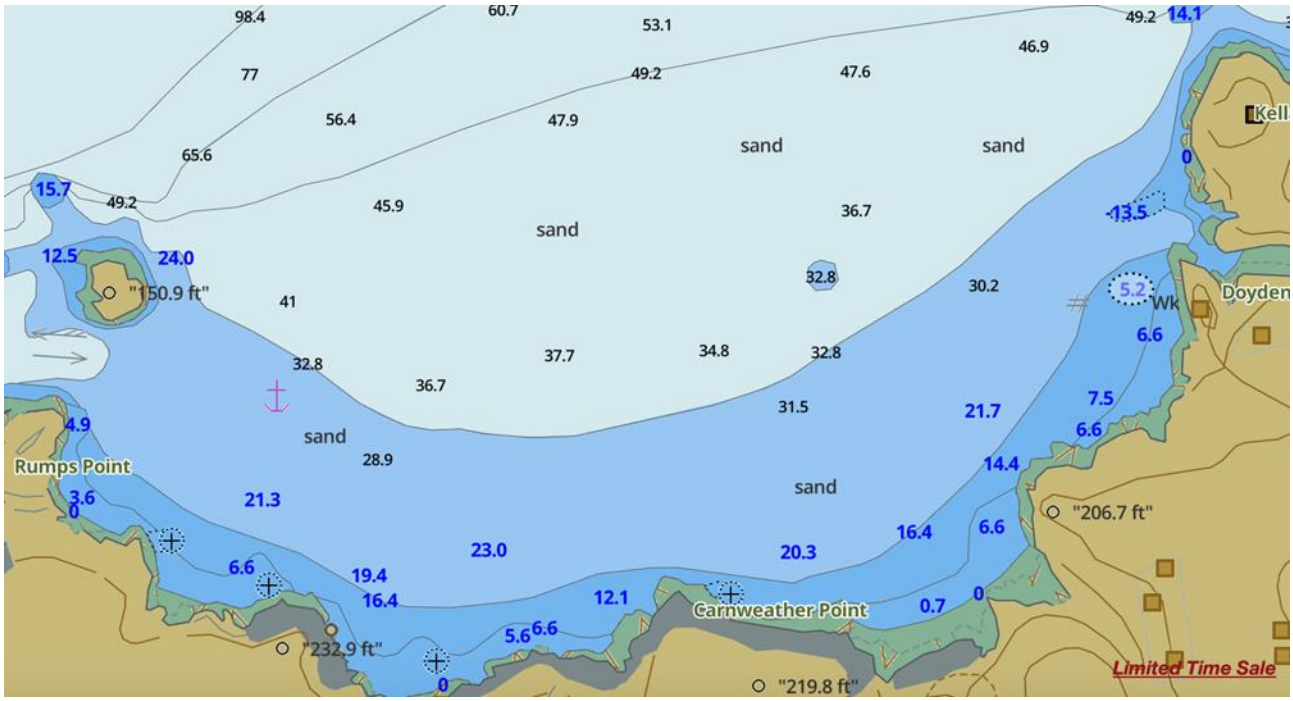
P124 Describing this farm proposal as “a de facto MPA” is a touch overblown.

P127 Here are these strange percentages again.

P127 “Figure 14.0: Illustration of west channel distance between farms and Mouls Island (approx. 700 m). Vessel is the Jubilee Queen (passenger vessel) 25 m long x 8 m wide, for context”. This is a nonsense. Is the applicant attempting to explain perspective to a child? “This object is small and quite close, but that object is large and far away”. The photograph is meant to provide context, but for whom? If you know the bay, as I do, you will question it, if you have never visited, you are none the wiser from viewing this image. As with much of this document, the reader is being asked to take the applicants’ word for it. I’m afraid that

this is just another example of the “smoke and mirrors” approach that can be found throughout.

P128 “A very important factor in selecting the site was sediment type within the Bay (Figure 8.0). Coarse sediment is not a supporting habitat for birds in terms of prey. There are very little fish present”. Now this one made me chuckle. Sandeels, in my opinion, are “very little fish”, certainly in comparison to the giant tuna we’ve been seeing along the coast in recent weeks, so if there are “very little fish present” that is probably what they are! I shouldn’t mock, but it is an unfortunate Freudian slip. However, little fish ARE present because the sediment is sand, a critical habitat for prey species for auks, cetaceans and our native grey seals.



I had to pull out this quote which caught my eye, “The applicants selected buoys that are of a shape and colour to minimise disturbance to migratory birds and visual disturbance generally”, P351. This is my final red pen. Sea birds, as all birds, are attracted to colour. It is believed that they understand bright colours to indicate health and vitality, although quite how they came to this conclusion I do not know. There is no such thing as a particular shape or colour which would minimise disturbance to migratory birds. Tacking on “visual disturbance generally” is tacky.

Conclusion

I’m not sure that this section is necessary, considering my input so far.

I have wandered far from my remit, but I think that a responsible person should always speak up in the face of something quite so irresponsible.

This document is overlong and weak, and it is littered with misleading statements and exaggeration. I do not believe that the applicants have any knowledge of, nor particular care for, seabirds, nor of marine wildlife in general. I do not believe that any thought has been

given to the environment of Port Quin Bay, and that this proposal is purely a commercial venture.

I cannot understand how this proposal is still live. I also cannot fathom why it is being left to members of the public such as myself, to struggle through this ill-conceived and ill-prepared document and to prepare what I have been told must be compelling evidence against this proposal, when there is a licencing authority in place whose job it is to do this.

I fear for the future of our coastal areas.

I object strongly to this application and advise rejecting it immediately.

November 2024

9. Geological Concerns

[This section presents a document prepared for the Save Port Quin Bay Group by a local community member, who wishes to remain anonymous.]

Introduction

> *"Significant knowledge gaps remain regarding seaweed-specific food hazards and their mitigation; a resource-intensive challenge that can inhibit sustainable policies. This is particularly concerning for rapidly expanding* Saccharina latissima *(sugar kelp) crops, a brown seaweed that is known to accumulate heavy metals linked to food hazards. Exposure of farmed and wild kelps to heavy metals from human activities is highly likely in many coastal locations. For centuries, industrial manufacturing and agricultural operations have contaminated coastal habitats with toxic heavy metals. These heavy metals are often found in areas associated with nutrient-rich runoff that can have a positive effect on kelp growth rate, highlighting a need to understand how toxins accumulate into kelp tissues in areas with high suitability for seaweed production. Further, heavy metals persist in the environment long past the industrial activities that introduce them, meaning that areas seemingly pristine for kelp aquaculture might still be at risk due to human activities long past. Research has also shown that climate change and subsequent shifts to water column properties can increase the availability and toxicity of such contaminants in the water column."* (Shaughnessy 2023)

The seabed in Port Quin Bay is contaminated by existing offshore heavy metal ore veins, mine waste, contaminated stream sediments and material from weathered basalts. The Padstow Harbour Commissioners' disposal site for dredged material from the Camel Estuary being less than 1.5nms from the proposed farm site only adds to the potential toxicity in the area. The fact that wild and farmed seaweed absorbs these heavy metals, rare earths, and toxic organic compounds, is of great concern when considering the applications for such a large farm site.

Regarding absorption by farmed seaweed, the applicants state that

> *"In fact, seaweed removes nutrient loads (including N, P and K) through absorption and creation of seaweed biomass. This is called bioremediation, is a valuable ecosystem service and improves water quality within the local water catchment area"*

The applicants also state that

> *"According to the Environment Agency (EA), the water quality at the proposed location is good. This is in accordance with the Water Framework Directive (WFD) standard. Data sets have been used to assess these important factors. These combined factors will allow for seaweed to be grown for various purposes including human consumption, fertiliser, animal feed, bioplastic, and biofuel (Evans and Critchley, 2014; Kim et al., 2017)"*

And:

> *"The seaweed will undergo testing to ensure it meets basic standards related to food safety, feed safety and fertiliser safety. Much of this is determined by the water quality and contents in the catchment area. The highwater body status of Cornwall North will ensure a viable product for the business"*.

However, the actual WFD status is Moderate for Ecology and the chemical status no longer requires assessment but failed in the last assessment in 2019. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680002

This report has been written using available research documents including the internet, publications, maps, commissioned rock analysis and local knowledge.

Basic Geology and Mining

The area between Polzeath and Port Quin is a historic mining area, where Antimony, Lead and Zinc lodes outcrop on the cliffs, other elements present to a lesser extent are Copper, Bismuth, Iron and Arsenic. The most noticeable remains of historic mining are located at Pentire and Gilson's Cove, 'Dines 1956; Mindat.org'. The small mines in this area date back to Elizabethan times and probably earlier, they produced toxic Antimony, Lead and Silver which were processed from the equally toxic ores. This area has the highest concentration of toxic Antimony ores in the UK. The mineral veins are sporadic and outcrop usually in the vicinity of the elvan and micro gabbro dykes, which occur in the cliffs, inland and almost certainly offshore in Lundy Bay. There are 4 small streams in this area and a larger one at Port Quin, the stream at Port Quin dissects the disused Port Quin Antimony mine lodes at only 400 metres from the shoreline. The water from these streams flow into Lundy Bay, they cut through part of the inland plateau mining area which rises to nearly 140 metres above sea level. The soil and stream sediments show some Antimony, Arsenic and Lead contamination, as shown by the attached, (Annexes A-C) British Geological Survey Geochemical Survey of the Environment (BGS GBASE) maps. This mineral deposition is associated with Middle Devonian to Lower Carboniferous volcano-sedimentary basinal successions between 420 and 300 million years ago, (BGS Interactive Geology Map of the UK) and the toxic sediments would have been carried into Lundy Bay since that period.

The cliffs in this area are relatively unstable, due to weaknesses caused by the mineralisation, and this material has been eroded by natural weathering and by the action of the sea and has been carried into the bay for millions of years adding further to the contamination. More intense mineralisation is associated with 10 micro gabbro dykes that outcrop in the cliffs between Rumps point and Kellan Head, (BGS Mapping information.) Which would indicate that there is similar mineralisation in the vicinity of the micro gabbro outcrop around Mouls Rock and the reef, which is situated offshore at the western edge of Lundy Bay and into the bay itself. This area also has high Potassium and Phosphorus levels in the soil and stream sediments; Potassium in this area is usually associated with the weathering of Feldspar in the underlying granite, and Phosphorus from the weathering of volcanic phosphates, although not toxic to plants/seaweeds at reasonable levels, it indicates that other potentially toxic elements and compounds may be present from the weathered granite in the bay, and could boost toxic chemical absorption by farmed seaweed. The Lundy Bay sediment map (provided by Biome in their response to FIR) shows that there are reefs, cobbles and gravel in the bay and these would act like a natural ball mill with the action of the tides and would further break down potentially harmful compounds from the local submerged rocks. Twenty-four toxic minerals have been recorded at the Pentire and Port Quin Mines, 'Mindat.org' and it would be difficult to predict how these compounds are currently reacting with the seawater, and what exactly the seaweed would eventually absorb.

Offshore Magnetic Anomaly

A substantial magnetic anomaly is located offshore approximately 5 miles north of the proposed seaweed farm (BGS mapping information). This also runs inland from the Boscastle and Tintagel area in a south easterly direction. This is associated with the Tintagel Volcanic Formation, a band of mineral rich ultramafic rocks of exhalative volcanic origin. Basaltic rock is usually responsible for this type of magnetic anomaly and a specimen of typical local magnetic Basalt was collected and sent to Petrolab the specialist rock analysis company; their report is a PDF Attachment 1 to this report. Page 5 of the report details the mineral abundance. The basalt is fairly complex, and these minerals are likely to be present in the waters at or near to the proposed seaweed farm site. The chromite, apatite and monazite are of particular interest, the chromite being toxic and potentially the monazite and apatite. The last two minerals are volcanic phosphates and may exacerbate heavy metal uptake by farmed seaweed. Another possibly atypical basalt specimen was also examined by X-ray fluorescence spectroscopy which gave a remarkable reading of heavy metals, (Annex D) even if a small percentage of these elements are absorbed then this would be of concern.

Dredged Material Dumping

In reference to this, the applicants state that

> *"Port Quin Bay is not considered a highly developed, industrial area and this is reflected in its good WFD status. The following activities are were* [sic] *assessed within the transitional Bay area:*
>
> - *No current marine disposal"*

This is not correct.

Padstow Harbour Commissioners have recently gained licence from the MMO for their 10-year dredging plan to dump nearly 160,000 tons of lightly, but nevertheless contaminated material from the Camel estuary, within a short distance (1.1nm) of the proposed Port Quin seaweed farm site. The dredged material will be dumped in water with an average depth of thirty metres and is released in a circular motion, allowing the dispersal of fine material in a wide pattern. Given the prevailing tides and wind, much of this material will drift directly towards the proposed farm site.

The contaminated dredged material would appear to be primarily associated with the marine industry and is the residue from anti-corrosion and anti-fouling procedures, paints, and preservatives. There is a likelihood that dredging further away from the port area would also collect historic mine waste and heavy metals from the local mineral rich volcanic rocks. It was not clear from the licence application the potential depth that the dredged material would be recovered from. The only study of Camel Estuary sediments that is currently available, 'Pirrie-et al 2000' that details some of the areas affected by local mine waste, is limited to the east of Gentle Jane. There were only five shallow 90 cm cores assessed, and relatively low levels of As, Cu, Pb, Sn, W, Zn and Zr were detected, and the rare earths Ce, La, and Y, and all were believed to have originated from the Sn stockwork mines near Lanivet, however these heavy metals have also been reported in stream sediments from the Pendoggett area (Sir Arthur Russell notes) and some heavy metals in the river Camel

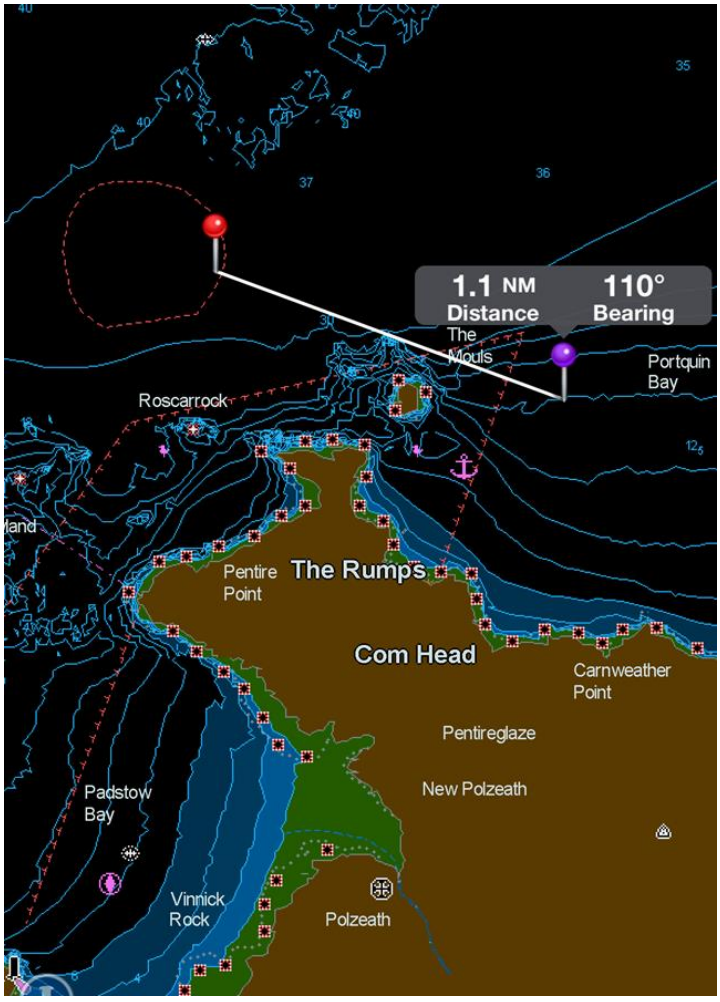
sediments may originate from this area as well, and the Port Quin streams may also be similarly contaminated.

Some of the area being dredged will have the residue of similar Basaltic rock to the specimen Petrolab analysed. It is likely that this would contain Cr, Fe, Ti, Zr and rare earths. It is likely that the dredging would also collect material from weathered very local mineral veins and mine waste, and would probably include As, Cu, Pb, Sb and Zn, as well as some heavy metals from the more distant Lanivet mines.

Conclusion

This report outlines the unusual geology, and mineralogy of the seabed and the surrounding cliff line and hinterland of Lundy Bay, both examined and predicted. The abundance, complexity and variety of minerals and the way that they can potentially interact together and with the seawater, does not appear to have been researched by the applicants, in fact there is little mention of the geology in the response to the MMO FIR. The occurrence of magnetic minerals, heavy metals, rare earths and volcanic phosphates is far from an ideal location to site a seaweed farm where the algae may be used for human, animal consumption and agricultural fertilisers. It would be logical for further research to be carried out to carefully examine the geology of the seabed at Port Quin Bay and assess the uptake of toxic substances by seaweeds, without this study the use of this area is far too risky.

Fig. 1: Distance from disposal site to western edge of farm site (approx) Source: Navionics



Annexes:

A: British Geological Survey geochemical baseline survey of the environment (bgs-gbase):

- Antimony in shallow soils map.
- Antimony in stream sediments map.

B: bgs-gbase

- Arsenic in shallow soils map.
- Arsenic in stream sediments map.

C. bgs-gbase

- Lead in shallow soils map.
- Lead in stream sediments map.

D: PDF Attachment: Petrolab Report: MP82989(a) Tintagel Volcanic Formation

References:

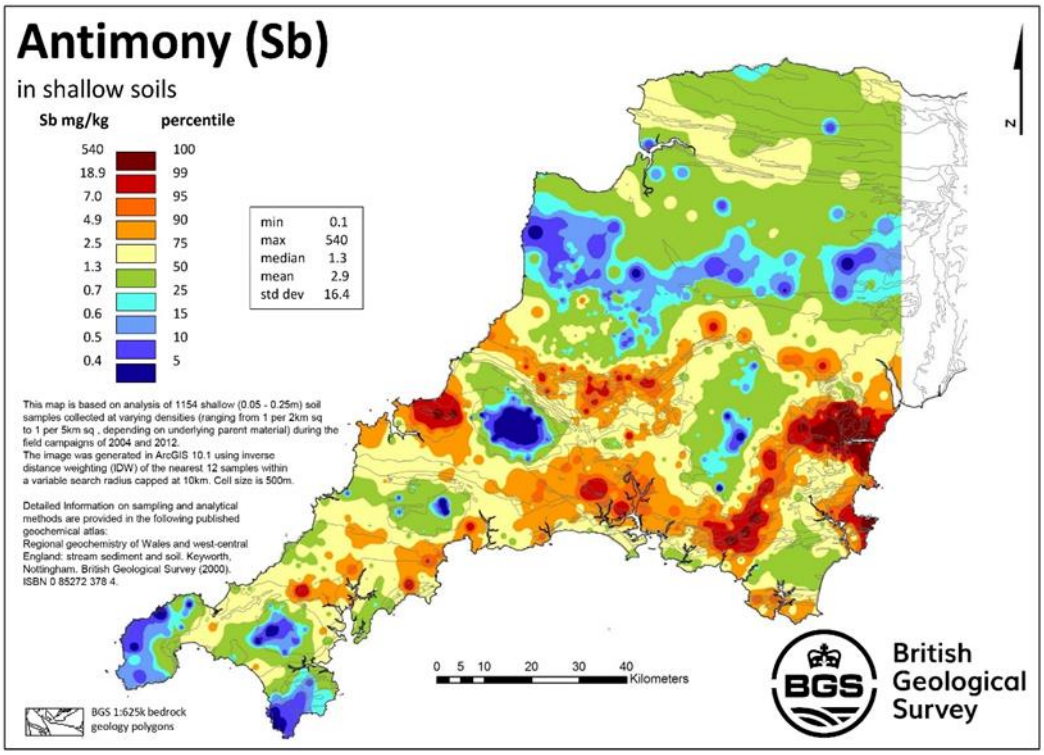
The Metalliferous Mining Region of South-West England Volume 2: H G Dines 1956

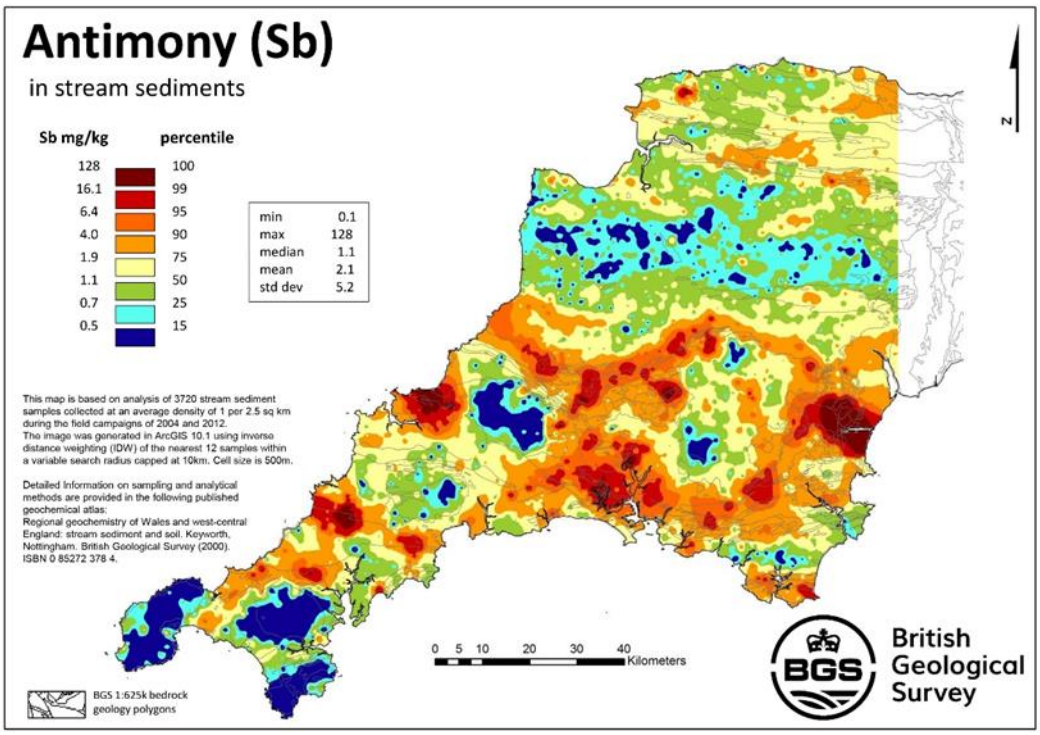
Impact of mining on sedimentation; the Camel and Gannel estuaries, Cornwall January 2000, D Pirrie, M Power, A Payne, G S Camm, P D Wheeler

Evidence of elevated heavy metals concentration in wild and farmed sugar kelp (Saccharinan latissimi) in New England, Science Report October 2023: Brianna K Shaughnessy, Brian P Jackson, Jarrett EK Byrnes.

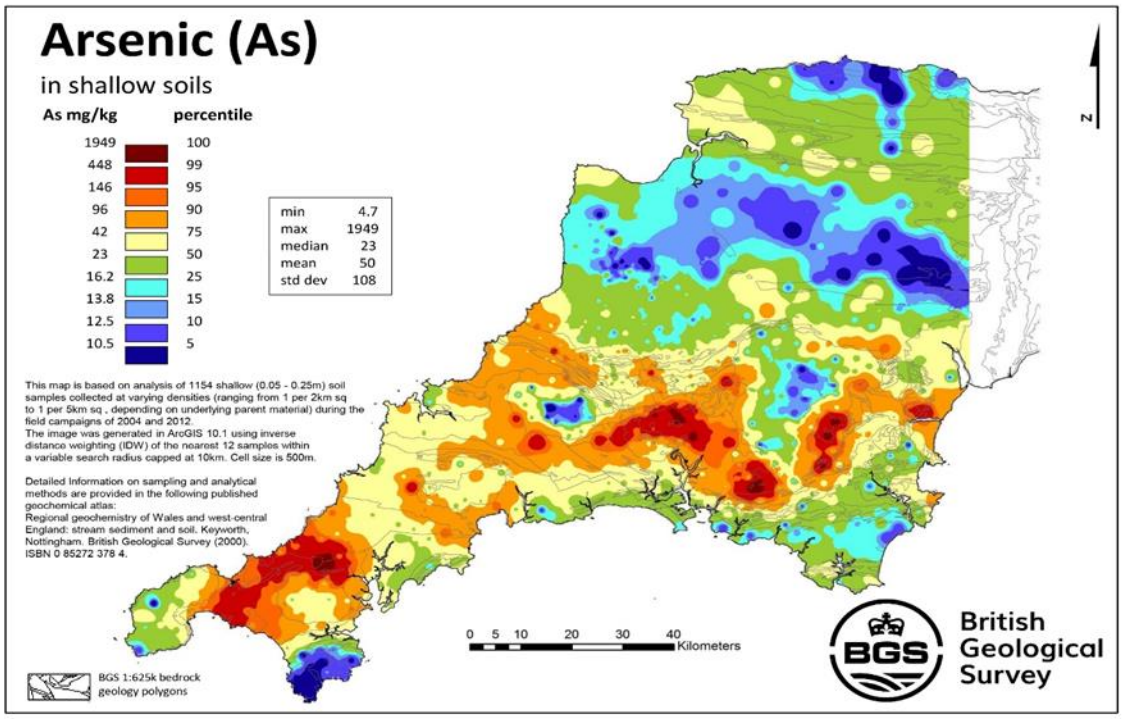
Marine Pollution Bulletin Volume 206 September 2024 Understanding heavy metal toxicity: Implications on human health, marine ecosystems and bioremediation strategies: Abhay B Fulke, Siddnat Rantanpal, Swati Sonker.

Annex A


Antimony (Sb)
in shallow soils
Sb mg/kg
percentile
540 100
18.9 99
7.0 95
4.9 90
2.5 75
1.3 50
0.7 25
0.6 15
0.5 10
0.4 5
min 0.1
max 540
median 1.3
mean 2.9
std dev 16.4
This map is based on analysis of 1154 shallow (0.05 - 0.25m) soil samples collected at varying densities (ranging from 1 per 2km sq to 1 per 5km sq , depending on underlying parent material) during the field campaigns of 2004 and 2012.
The image was generated in ArcGIS 10.1 using inverse distance weighting (IDW) of the nearest 12 samples within a variable search radius capped at 10km. Cell size is 500m.
Detailed Information on sampling and analytical methods are provided in the following published geochemical atlas:
Regional geochemistry of Wales and west-central England: stream sediment and soil. Keyworth, Nottingham. British Geological Survey (2000).
ISBN 0 85272 378 4.
0 5 10 20 30 40
Kilometers
BGS 1:625k bedrock geology polygons
BGS
British Geological Survey
N


Antimony (Sb)
in stream sediments
Sb mg/kg
percentile
128 100
16.1 99
6.4 95
4.0 90
1.9 75
1.1 50
0.7 25
0.5 15
min 0.1
max 128
median 1.1
mean 2.1
std dev 5.2
This map is based on analysis of 3720 stream sediment samples collected at an average density of 1 per 2.5 sq km during the field campaigns of 2004 and 2012.
The image was generated in ArcGIS 10.1 using inverse distance weighting (IDW) of the nearest 12 samples within a variable search radius capped at 10km. Cell size is 500m.
Detailed Information on sampling and analytical methods are provided in the following published geochemical atlas:
Regional geochemistry of Wales and west-central England: stream sediment and soil. Keyworth, Nottingham. British Geological Survey (2000).
ISBN 0 85272 378 4.
0 5 10 20 30 40
Kilometers
BGS 1:625k bedrock geology polygons
BGS
British Geological Survey
N

Annex B


Arsenic (As)
in shallow soils
As mg/kg
percentile
1949 100
448 99
146 95
96 90
42 75
23 50
16.2 25
13.8 15
12.5 10
10.5 5
min 4.7
max 1949
median 23
mean 50
std dev 108
This map is based on analysis of 1154 shallow (0.05 - 0.25m) soil samples collected at varying densities (ranging from 1 per 2km sq to 1 per 5km sq , depending on underlying parent material) during the field campaigns of 2004 and 2012.
The image was generated in ArcGIS 10.1 using inverse distance weighting (IDW) of the nearest 12 samples within a variable search radius capped at 10km. Cell size is 500m.
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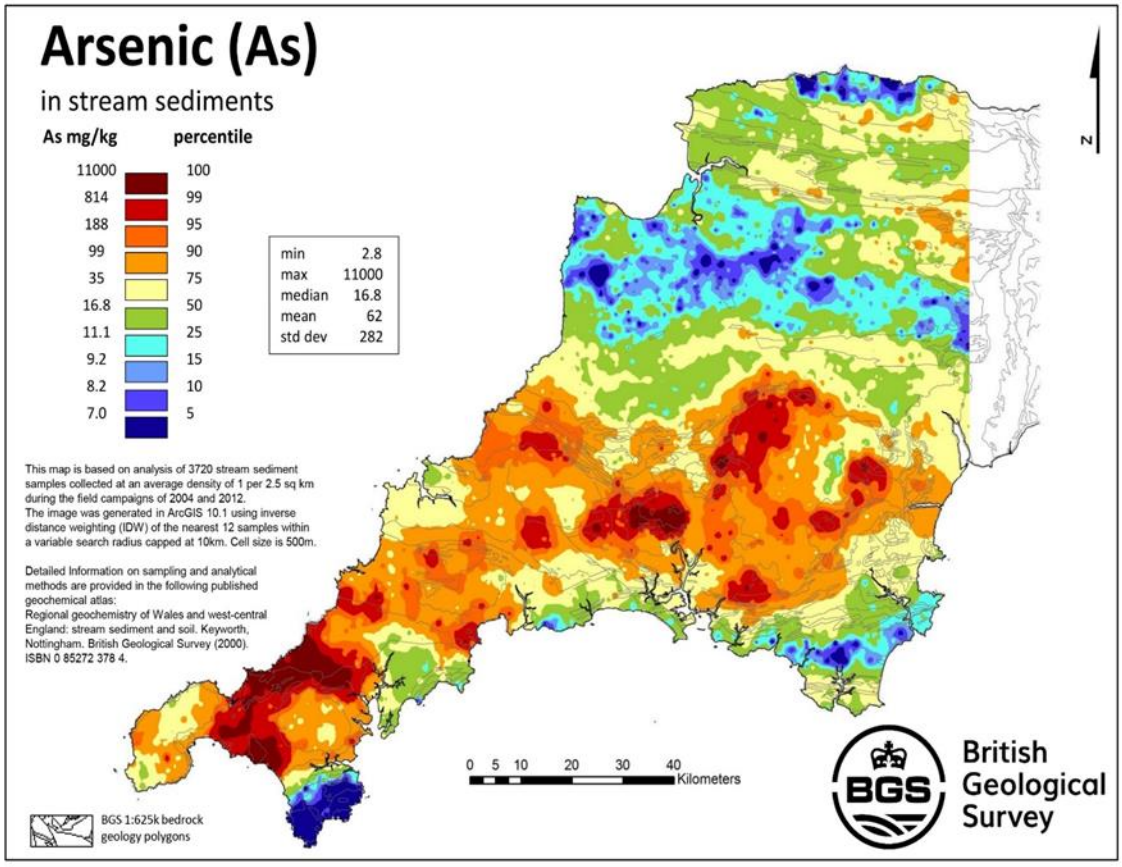
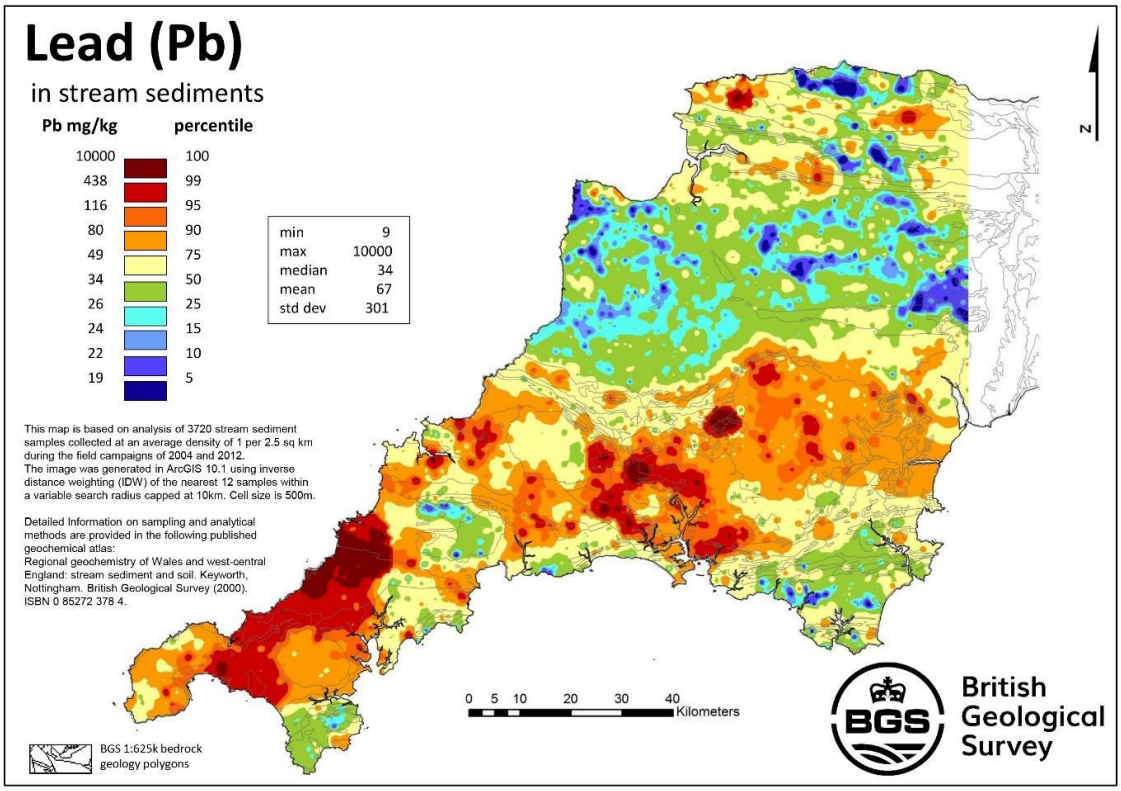
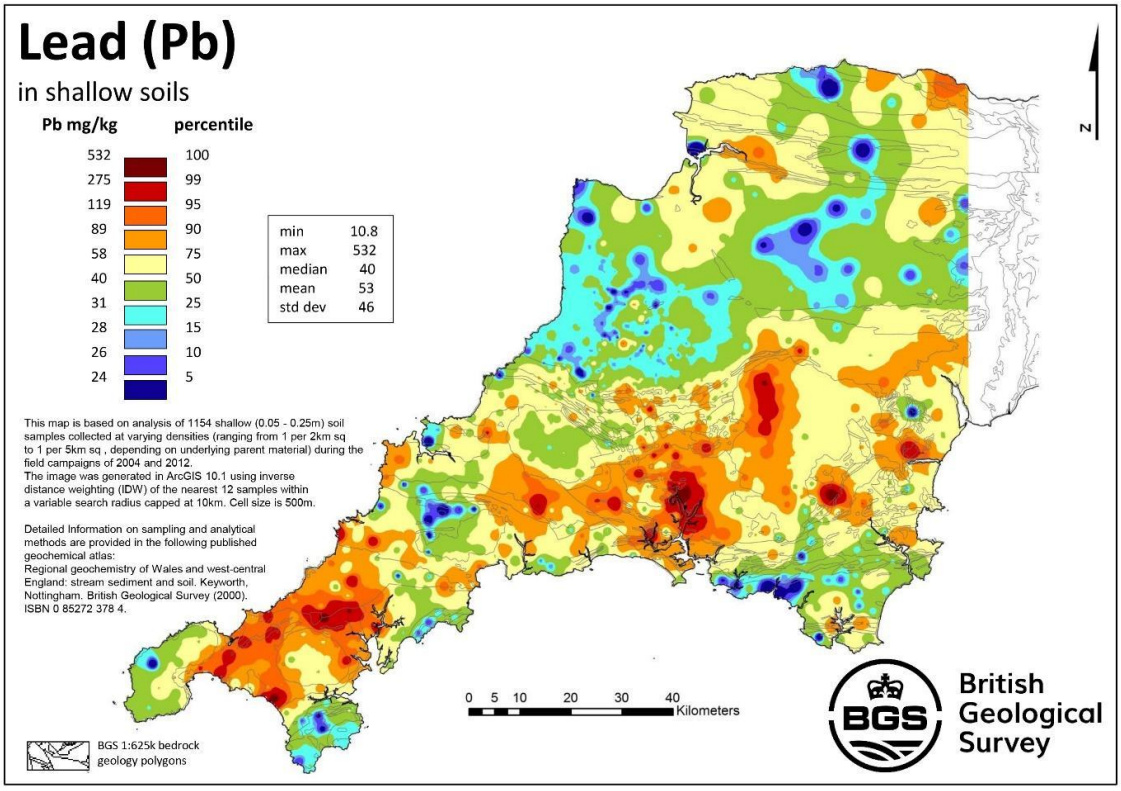
N
0 5 10 20 30 40 Kilometers
BGS 1:625k bedrock geology polygons
BGS
British Geological Survey


Arsenic (As)
in stream sediments
As mg/kg
percentile
11000 100
814 99
188 95
99 90
35 75
16.8 50
11.1 25
9.2 15
8.2 10
7.0 5
min 2.8
max 11000
median 16.8
mean 62
std dev 282
This map is based on analysis of 3720 stream sediment samples collected at an average density of 1 per 2.5 sq km during the field campaigns of 2004 and 2012.
The image was generated in ArcGIS 10.1 using inverse distance weighting (IDW) of the nearest 12 samples within a variable search radius capped at 10km. Cell size is 500m.
Detailed Information on sampling and analytical methods are provided in the following published geochemical atlas:
Regional geochemistry of Wales and west-central England: stream sediment and soil. Keyworth, Nottingham. British Geological Survey (2000). ISBN 0 85272 378 4.
N
0 5 10 20 30 40 Kilometers
BGS 1:625k bedrock geology polygons
BGS
British Geological Survey

Annex C


Lead (Pb)
in stream sediments
Pb mg/kg
percentile
10000 100
438 99
116 95
80 90
49 75
34 50
26 25
24 15
22 10
19 5
min 9
max 10000
median 34
mean 67
std dev 301
This map is based on analysis of 3720 stream sediment samples collected at an average density of 1 per 2.5 sq km during the field campaigns of 2004 and 2012.
The image was generated in ArcGIS 10.1 using inverse distance weighting (IDW) of the nearest 12 samples within a variable search radius capped at 10km. Cell size is 500m.
Detailed Information on sampling and analytical methods are provided in the following published geochemical atlas:
Regional geochemistry of Wales and west-central England: stream sediment and soil. Keyworth, Nottingham. British Geological Survey (2000).
ISBN 0 85272 378 4.
N
0 5 10 20 30 40
Kilometers
BGS 1:625k bedrock geology polygons
BGS
British Geological Survey


Lead (Pb)
in shallow soils
Pb mg/kg
percentile
532 100
275 99
119 95
89 90
58 75
40 50
31 25
28 15
26 10
24 5
min 10.8
max 532
median 40
mean 53
std dev 46
This map is based on analysis of 1154 shallow (0.05 - 0.25m) soil samples collected at varying densities (ranging from 1 per 2km sq to 1 per 5km sq , depending on underlying parent material) during the field campaigns of 2004 and 2012.
The image was generated in ArcGIS 10.1 using inverse distance weighting (IDW) of the nearest 12 samples within a variable search radius capped at 10km. Cell size is 500m.
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N
0 5 10 20 30 40
Kilometers
BGS 1:625k bedrock geology polygons
BGS
British Geological Survey

Annex D

Portable X-Ray Fluorescence Spectrometer test sheet Tintagel Volcanic Formation Basalt

Measurement name: SAMPLE 1
Measurement time: 26.03.2024
Timestamp: 1711437995816

Device: X-MET XRF Analyzer (808100)
Device serial:

Measurement method: Metal_FP

Element	Concentration	MIN	MAX	+/-	Pass/Fail
Fe	81.613 %	90.000 %	100.000 %	0.430 %	
Ti	10.806 %	-	-	0.333 %	
Sr	2.745 %	-	-	0.033 %	
Mn	1.223 %	0.700 %	0.900 %	0.088 %	
V	0.856 %	0.150 %	1.000 %	0.086 %	
Zr	0.849 %	-	-	0.018 %	
Zn	0.318 %	-	-	0.033 %	
Sn	0.271 %	-	-	0.045 %	
Ni	0.244 %	-	0.250 %	0.058 %	
Sb	0.198 %	-	-	0.055 %	
Nb	0.195 %	-	-	0.011 %	
Pd	0.181 %	-	-	0.027 %	
Ag	0.154 %	-	-	0.030 %	
In	0.121 %	-	-	0.037 %	
Co	0.117 %	-	-	0.026 %	
Cd	0.111 %	-	-	0.033 %	
Cu	-	-	0.350 %	-	
Mo	-	-	0.500 %	-	
Cr	-	0.800 %	1.100 %	-	
As	-	-	-	-	
Se	-	-	-	-	
Br	-	-	-	-	
Ta	-	-	-	-	
W	-	-	-	-	
Re	-	-	-	-	
Ir	-	-	-	-	
Pt	-	-	-	-	
Au	-	-	-	0.046 %	
Hg	-	-	-	-	
Pb	-	-	-	-	
Bi	-	-	-	-	