Mara Seaweed Ltd

St Andrews Bay Method Statement

Details

Version	Date	Description	Author(s)	Revised by
V1.3	11/07/2022	Final version	Stevie Jarron	DB-C, FH

Updates

Section	Description	Page

Index

01 Introduction

St Andrews Bay Method Statement

Mara Seaweed Ltd (Mara) is an established Seaweed shore harvesting and processing company with a workforce in place to sustainably hand harvest seaweed species from the Fife coast and process in their Edinburgh factory. Founded in 2011, Mara have been pioneering developments in harvesting, sourcing and processing seaweed. Today, Mara enjoy international success as one of the UK's most innovative seaweed brands.

Mara have begun the Marine Scotland Pre-Application Process (PAC) to license a new, purpose built Seaweed Farm. A proposed site been identified as suitable for Seaweed Cultivation 6nm from the Fife coast in St Andrews Bay. Mara's intention is to have the necessary consent in place to put the first equipment in the water by late Autumn 2022. Seeding lines in Nov 2022 to Feb 2023 will produce a harvestable crop in late spring and early summer 2023. To give perspective to operations of this relatively new industry to decision makers and stakeholders, we will set out some of the timings, scale and techniques to be used. A chart of the site is seen on the next page (Fig 1).

The outer boundaries of the full proposed Algal Farm site are:

56 ° 23.025 ' N 002 ° 37.256 ' W
56 ° 23.433 ' N 002 ° 35.873 ' W
56 ° 22.587 ' N 002 ° 34.890 ' W
56 ° 22.147 ' N 002 ° 36.315 ' W

The license application and associated documents (such as this) will have the critical information required for MS-LOT to be confident that an approach to the statutory consultees will lead to an award of consent for the licence.

This document "Mara, St Andrews Bay Method Statement" is a comprehensive document that details Mara's commitment to adhere to best practice when considering other users of the environment, both human and wildlife alike.

The attachments, "Mara, St Andrews Bay Seaweed Farm Application" & "StAB application additional coordinates form" are the official application forms for Marine Scotland's Licencing Operations Team (MS-LOT).

Mara's commitment to "Scotland's National Marine Plan" can been seen in attachment "Mara, St AB - Scotland's National Marine Plan – General Planning Principles".

Mara's commitment to wildlife and environmental preservation and wellbeing can be found in the attachment "Mara - St Andrews Bay Environmental Responsibilities".

The document "Mara Navigational Risk Assessment and MEAC", gives the site description, risks involved and navigation buoys and lights marking the site. Also included is a Marine Emergency Action Card, in preparation for deployment of the equipment. At this point, contractors have not been finalised or dates of deployment set.

02 Pre-Application Process (PAC)

As per the Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013, Mara Seaweed Ltd commenced their PAC process on 14th April by informing MS-LOT and a list of other statutory Consultees and Stakeholders of their intentions to apply for an Algal License consent and by placing an advert of the plans in the Fife Courier for publication in Monday 18th April's edition. Mara also notified all of their plans to hold a Pre-Application Consultation event regarding the proposed Marine Licence application on 31st of May 2022 via Zoom link. This was extended to a combined Zoom and in-person event in response to a stakeholder request that it be so.

This process is designed to allow Statutory Consultees and Stakeholders the ability to consult with Mara about their plans and allow for any changes or mitigation if needed before a Marine License Application is lodged. A report of the PAC process can be seen in the attachment "Mara, StAB PAC Report".

Two early sites were identified in 2020 as possibilities for seaweed farming. Through early consultation between Mara, local fishermen and their representative bodies, it was seen that these sites would be too disruptive to activity in highly utilised fishing grounds and were discarded by Mara. The new proposed site, selected by Mara to both actively take into consideration the feedback from that discussion and continue to offer a commercially viable farm, is in an area rarely used by local fishermen as the sandy substate of the seabed is poor for prawn hole (nephrop) formation and lacks the rocky habitat enjoyed by lobsters and other crabs.

Mara hope this collaborative approach to working with the local fisherman will win their trust and show that Mara aspire to show due consideration of all members of the water using community and integrate effectively with pre-existing activity.

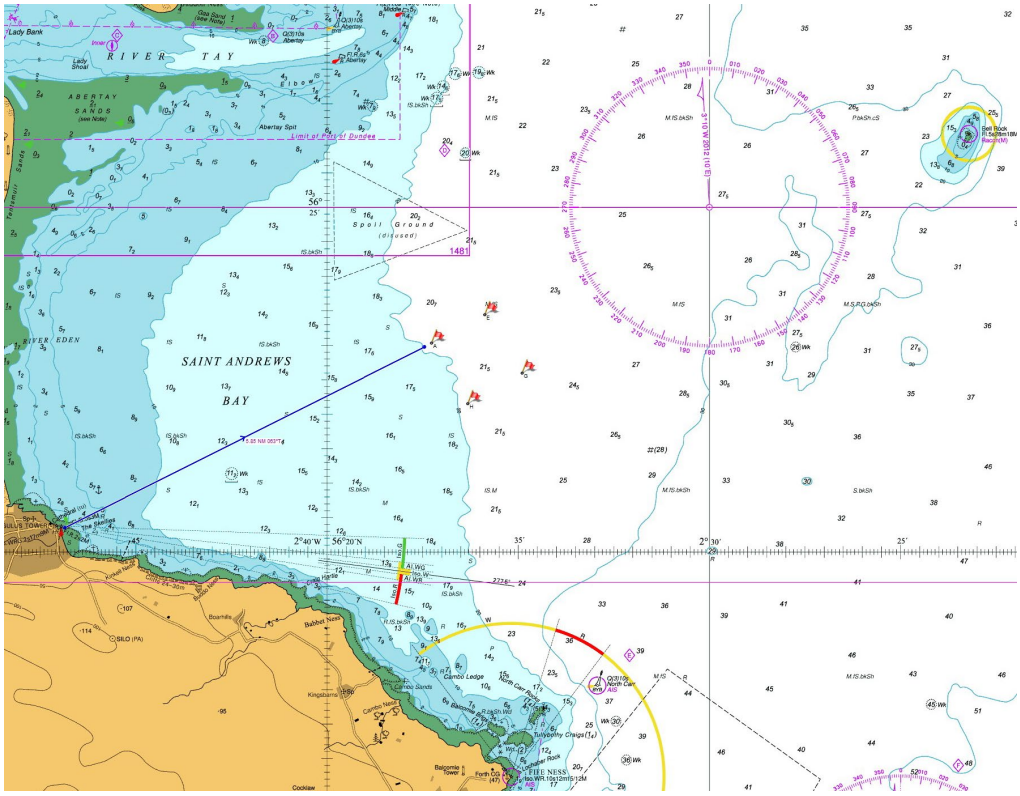

Fig 1. Chart showing location of the proposed seaweed farm in relation to St Andrews, Fife.

03 Site Designations

The area of the proposed Seaweed Farm lies in the 'Outer Firth of Forth and St Andrews Bay Complex SPA' (Special Protected Area) - https://sitelink.nature.scot/site/10478. The JNCC (Joint Nature Conservation Committee) comments "The Outer Firth of Forth and St Andrews Bay Complex is an extensive SPA off the south-east coast of Scotland. It stretches from Arbroath in the North to St Abb's Head in the South and encompasses the Firth of Forth, the outer Firth of Tay and St Andrews Bay. The waters in this SPA attract one of the largest and most diverse marine bird concentrations in Scotland and the site is classified for the protection of 21 seabird and waterbird species."

The proposed farm site also lies close to (5nm), but not within, the Firth of Tay and Eden Estuary SPA - https://sitelink.nature.scot/site/8501 and the Firth of Tay and Eden Estuary SAC (Special Area of Conservation) - https://sitelink.nature.scot/site/8257. These designations protect the estuarine habitats of shifting sandbanks, mudflats and reedbeds that are home to large numbers of resident, passage and seasonal nesting or roosting wetland birds and home to harbour seals. The Eden Estuary is also a Local Nature Reserve.

The Abertay Sands, a sandy spit that is formed at the southern entrance to the Firth of Tay from Tentsmuir Point is a Geological Conservation Review Site and a National Nature Reserve - https://sitelink.nature.scot/site/9203. None of Mara's activities will affect these designations.

Mara has been closely consulting with all the diverse stakeholder groups from the earliest concept phases of this project. The proposed site in St Andrews Bay was chosen for this Seaweed Cultivation farm project as it is away from rocky reefs and muddy seabed, the favoured location for lobster and nephrop creel and trawl fisheries.

There are no biogenic reefs recorded at the site (eg *sabellaria spinulosa*) with the substrate fine shifting sand. EUNIS habitat classification A5.1 sublittoral coarse sand & A5.2 sublittoral sand (depending on the detail level of the map): BGS Offshore, Marine Sediment, Sand – anchors and subsurface structures will be set on soft sediment, clear of any rocky reefs. A helical screw anchor system will require shorter lines, have a smaller area footprint and less seabed than conventional heavy block anchor systems.

04 Seed Stock and INNS (Invasive Non-Native Species)

Mara currently hold licenses for shore harvesting along the Fife coasts. Any seaweed required for seed stock will be sustainably harvested as part of their usual harvesting operations. Seaweeds produce millions of spores per plant, so a small amount of seaweed of less than approximately 50kg can feasibly seed a hundred kilometres of growing lines. Only native species will ever be grown on Mara's farm and seed stock taken from the east Fife shore only. No seed stock of non-native species will be brought in. All equipment used will be thoroughly washed before and after use to prevent the spread of INNS. Cards showing the common INNS species will be supplied to staff and contractors to identify potential INNS growth on the farm structure.

Mara are applying for consent to cultivate several Seaweed species – *alaria esculenta, laminaria digitata* and *saccharina latissima* as these are species for which seeding techniques have already been developed for cultivation. Mara will also apply for consent to farm *palmaria palmata* but at this time, the seeding technique for this species is not available.

Under the Minute of Agreement, file ref FI-28-5, between the Crown Estate and Mara (formerly Celtic Sea Spice Company) Mara has the wild harvest license for an approximately 32km stretch of the East Neuk coastline with the following quotas for the species mentioned above:

- 22,773kg pa of *palmaria palmata*
- 64,298kg pa of *laminaria digitata*
- 5,972kg pa of *alaria esculenta*
- 6,569kg pa of *saccharina latissima*

All samples required to be harvested for seedstock will be taken as, and represent a tiny proportion of, these quotas.

Other species, such as *laminaria hyperborea, himanthalia elongata, porphyra species, osmundea pinnatifida* and *ulva lactuca* may be applied for in future, but at this time there is no technique for their culturing. These are all native species and are found growing wild locally.

05 Wildlife and the environment

As the first major aquaculture site on the East Coast of Scotland in what is still a relatively novel industry, Mara is aware that this may be a new experience to Statutory Bodies and Stakeholders alike. Mara has been closely consulting with all the diverse stakeholder groups from the earliest concept phases of this project. A specific report on this topic can be found in attachment "Mara - St Andrews Bay Environmental Responsibilities".

Mara is aware of the potential of an impact on wildlife, most notably seabirds, which the area is designated as a SPA for. As the photograph in the next section of this document shows (Fig 2., Section 6), virtually all the structure and growing lines are held subsurface (2m to 5m depth). The ropes are kept tensioned to avoid crossing or rubbing. There are no nets to tangle birds underwater in and diving gannets will see the weeded lines and avoid them. There will be extensive ornithology reports created by the windfarm companies that are constructing huge wind farms from Montrose Bank down to the Firth of Forth. These huge windfarms sit on the edge of or are within the SPA and have been given consent to operate, so it is hoped that the evidence they provided can be used by Marine Scotland and the interested Statutory Consultees and Stakeholders to allay fears over the impact of Mara's seaweed farm and speed up any decision making to not delay the Application process.

There have been various designs and line layouts trialled to cultivate seaweed, mostly in Argyll. There have been no reports of bird entanglement in farm ropes. Any waste generated from the project will be disposed of ashore through local, certified commercial waste disposal. All ropes and equipment will be stored ashore during fallow periods of the farm (May to Oct). And all cleaning of ropes and equipment will be done ashore. There are no Special Waste requirements envisaged.

At 6nm from shore the proposed farm site will be well away from any nesting birds. Feeding birds will not be disturbed by the farm. Birds are often seen roosting on the buoys of similar seaweed and mussel lines on the west coast and northern isles. Vessel operations will always be conducted in daylight and during operational phases, utilising the existing vessels that fish the local waters. Harvesting of the seaweed lines involves clear cutting the seaweed away from the rope and both are brought ashore for onward processing or cleaning respectively.

Benthic Shading – Seaweed cultivation lines are placed out at sea on the farm in late autumn and the lines over-winter there with little or no growth on the lines until spring. The seaweed on the lines grows rapidly February through to April and is all harvested out by end of May. The seaweed lines are well spaced 5m apart to prevent them rubbing and with the low angles of the sun in the spring months the estimate of shading of the seabed and water column is less than 1% in Dec, less than 4% in Jan, less than 7% in Feb, less than 10% in Mar, less than 15% by end of April and the seaweed is harvested out by end of May. A conservatively high

figure of ~15% shading at this point in late spring should pose no detrimental effect to the benthic communities of the seafloor, 20m to 25m below the Seaweed Farm.

The chosen site of the seaweed farm is light sand seabed which does not hold wild seaweed plants that require sunlight for photosynthesis. It is therefore hoped that the seaweed farm will have a negligeable effect from shading on the wider marine environment. In fact, there is some evidence that seaweed farms have a positive impact on biodiversity; for example, by acting as a nursery for crustaceans and small fish.

Seaweed Cultivation requires no input other than sunlight, creates a clean new habitat whilst it grows and other than a week at deployment in Oct/Nov and a few weeks harvest in Apr/May, minimum wildlife disturbance is taking place. It will be an organic, truly sustainable and indeed regenerative industry if allowed to begin and given the opportunity to flourish.

06 Visual Impact and other marine users

The proposed Seaweed Farm will have the lowest possible profile and will be situated in remote waters away from the coast. Visual impact is kept to a minimum by the Seaweed Farm's low profile; indeed the most visible indicator of the farm will be Cardinal Mark buoys placed to clearly mark the outer limits of the site for mariners. A specific report on this topic can be found in attachment "Mara - Navigational Risk Assessment and MEAC".

The farm site is sufficiently far from shore to mitigate almost entirely any negative aesthetic impact of the Fife coast as well as being at a distance beyond the usual travel of pleasure craft, windsurfers and other watersport enthusiasts. The transit lanes from the major port of Dundee to construct and service new windfarms being built off the Firth of Forth to the south are clear to the east of the site. The site will be marked by flashing white Cardinal Marks at its outer edges as specified by the NLB and MCGA in this application process.

The site is within reach of the ports and harbours of the East Neuk of Fife and Mara intend to use the locally available crews, vessels and shore facilities to operate their proposed farm. This will bring economic and social benefits to the communities of the area.

Fig 2 - Shore view of SWMID seaweed farm on Loch Scridain, Mull.

Whilst Mara will use a different structure, the above image exemplifies the low visual impact of the farm as most of the structure and growing lines are sub-surface. The farm in the Fig 2 has 9km of growing lines (max 30km) in the water. The farm is in the foreground. The ripples in the distance are from a passing creel boat, who's creel buoy can be seen in the middle foreground. The local vessels support work at the site and are still able to fish the rocky shore side as they did before.

07 Seeding Process

Mara's target seaweed cultivation species Atlantic Wakame (*alaria esculenta*), Oar Weed (*laminaria digitata*) and Sugar Kelp (*saccharina latissima*) are large brown seaweeds or kelps found on lower littoral and sub-littoral rocks exposed to strong wave action across Fife. The plant seeds into the water in late Nov through to early January, through fruiting bodies that develop near the base of the plants in the case of Wakame or along their fronds in the other species. Seeded stock is sourced from local shore sites and will be cultured onto growing medium at commercial hatcheries that are emerging around Scotland and beyond.

Dulse (*palmaria palmata*) is a valuable small, red seaweed hand harvested by Mara and also native to Fife. It is a valuable seaweed but the technology to cultivate it is not fully developed at this time. Mara are including this species in their application in anticipation of the technology to viably farm dulse becoming available at a future date. More information on Mara and their products can be found here - https://maraseaweed.com.

The volumes of seeding plants required to be collected will be very small, representing less than 0.5% of the quantity currently sustainably harvested by Mara under Crown Estate license and will be gathered from the license area. The species to be farmed all grow abundantly locally (although not, particularly with Scottish Wakame and Sugar Kelp, in a manner that lend themselves to wild harvesting). There are no chemical additions or treatments used for the seaweed growing process. The small sample amounts of seaweed gathered are used under laboratory conditions to propagate large amounts of fertile seed. This can be stored for long periods to suit operation needs.

08 String method versus direct seeding deployment

2 main methods are used to deploy seaweed cultivation lines; string and direct seeding.

Deploying seaweed on string is a well used and developed method of seaweed cultivation and is currently the main deployment method for seaweed cultivation. fertile seaweed spores are sprayed and allowed to settle onto spools that have thin string wound round them. This is done in controlled conditions in an aquarium seen here.

Narrow ropes (10mm or 12mm) are passed through the seeded spools and laced together. These seaweed lines are deployed by existing small creel vessels or other fishing vessels at the Seaweed Farm. Although an effective growing method, the delicate nature of the spooled string requires slow and careful deployment, which is inefficient to do at scale.

There is an alternative method; direct seeding, where propagated material is affixed to ropes directly instead of the string spools as a medium. This method is a relatively new development with several advantages over the string method and Mara's preferred option. With this method, the pre-seeded ropes are run directly into the water, avoiding the time consuming and delicate task of the string method.

With both methods, the seeded lines are strung out in horizontal lines, each 200m long. The farm structure is tensioned to keep the lines taught and at a n optimum growing depth below the surface (2m to 5m). Line deployment is done between mid October and early November, or late January to early February. Growth of juvenile plants rapidly start to grow in late February as day length grows. Plants are ready to harvest as early as late March through into late May.

09 Harvesting Process

Regular monitoring of seaweed growth will be done via visits to the seaweed farm by small vessels from St Andrews Harbour. This will decide the optimum harvest periods. Harvesting will be a reversal of the process using the same style of vessels.

The plants will have grown rapidly through March and by April and into May, will be in their prime condition for the food market that Mara service.

Each year, environmental factors alter the actual crop yield (as in any sort of farming). Mara are planning against harvest weights of 5kg per linear meter of line for Scottish Wakame, and up to 8kg a metre for Sugar Kelp, in mid to late April when the plants are at their best. Higher yields can be achieved by allowing the plants to grow longer, but they will begin to suffer from biofouling, the build up of none target species of other algaes and other sealife that abound in Scottish waters in late spring and through the summer. As each unit of seaweed growing lines hold 5 x 200m of growing line, each could expect to yield 5 tonnes of Wakame and 8 Tonnes of Sugar kelp by mid April.

Automated harvesting machines are being developed which will use a simple roller frame with cutting heads that will trim the useable frond of the plant into bins or boxes while leaving the rope and growing base (stype and holdfast) of the plant intact. This coppicing capability may be used to allow multiple harvests from these rapid growing plants.

10 Vessel use and operational cycle

The farm will be deployed in 3 phases. The 1st phase is hoped to be in the water by the end of 2022. The 2nd phase in the years 2024 or 2025 and the 3rd phase in the years 2027 or 2028. This will depend on how the market and business grows and these dates are a guide only.

During the deployment phases, Dynamic Positioning (DP) work vessels will be brought in to accurately lay anchor blocks or heliacal screws on the seabed. The work time on site of these vessels should be no more than a week in the 1st and 2nd phases and 2 weeks for the 3rd larger phase.

At all other parts of the operational cycle of the farm, Mara will contract the services of small local vessels and use the shoreside resources from St Andrews harbour or other Fife ports.

Seaweed Cultivation is a winter crop with the deployment of seaweed lines (Oct/Nov) and (Jan/Feb) and the harvesting of the matured seaweed plants (late Mar to late May). This may see quite intense vessel and shoreside activity at these periods. The rest of the year the seaweed farm will either be fallow or largely left unattended while the seaweed grows. Vessels will visit the farm weekly to inspect the site to check on the structures (part of the license conditions) and to check on plant growth and crop quality.

The initial expected cost of the Seaweed Farm will be in the region of £1.4m, so the marine licence application fee will be £2,520. Mara Seaweed Ltd, the proposed license holder and site owners, will pay immediately by BACS to begin the process.

The farm will be deployed in 3 phases. Mara will undertake regular monitoring of seaweed growth and duty of care over lines. A register of vessel movements and observations will be kept and available upon request from relevant authorities.

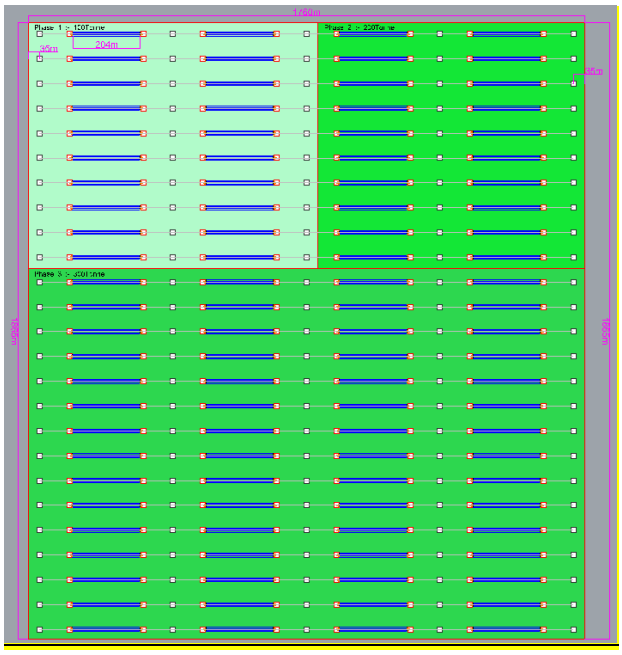

Fig 3 – Phased deployment of longlines at St Andrews Bay site

Phase 1 - The first phase will consist of 20 units of 200m x 5 longlines. Mara's desire is to have a substantial seaweed farm at the site. To do this, the aim is to deploy some lines of the 1st phase in Nov/Dec 2022 to begin seaweed cultivation for a first harvest in April/May 2023 (Fig 3 – top left). The 1st phase may not all be deployed in one year.

Phase 2 - The second phase will consist of a further 20 units of 200m x 5 longlines. A 2nd phase is envisaged for the years 2024 or 2025 (Fig 3 – top right). This will see Mara potentially double the size of the farm. As the seaweed farm begins to provide harvests for Mara's new processing facility in Glenrothes, Mara will evaluate the timing of the 2nd phase of development. If required a review of the impacts of the 1st Phase of the farm can be undertaken before deployment of the 2nd phase.

Phase 3 - The third phase will consist of a further 60 units of 200m x 5 longlines. A 3rd phase in the years 2027 or 2028 (Fig 3 – bottom 3/5 of farm) will depend on how the market and business grows and these dates are a guide only. If the scale of the farm is a concern to the Statutory Consultees, then Mara may separate the 3rd phase into a further license application so full scrutiny can be given to the expansion of the farm.

The anchoring system used will be robust to ensure farm's stability but use the minimum amount of infrastructure possible to reduce the footprint of the site and reduce seabed impact. The anchoring system will be removeable if required as is all the in-water equipment being used.

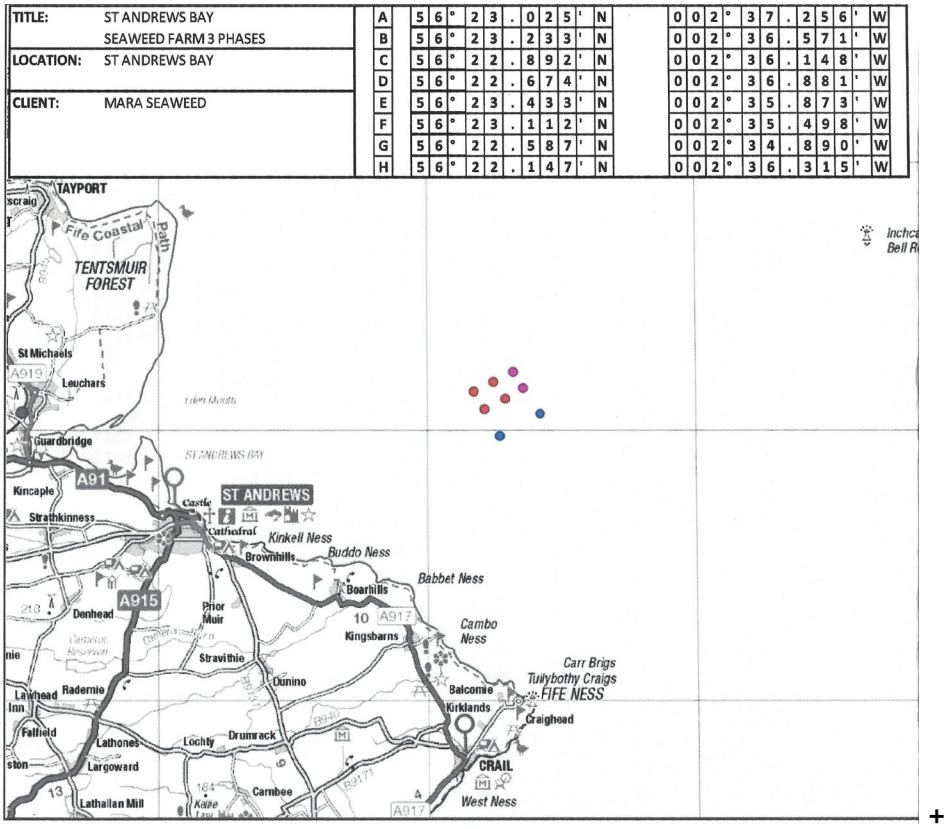

Fig 4 - St Andrews Bay map and Mara seaweed farm coordinates of the 3 phases of the farm.

11 Onward Processing

To keep the seaweed to the highest standard the product needs to be brought to shore and loaded onto temperature controlled vehicles, then to be processed as soon as possible.

Drying is one processing method, essentially lowering the water content without using excessive heat (which would cook the plant) similar to herb processing. This creates a stable, storable product that can be rehydrated as an ingredient. The bulk of Mara's seaweeds will go through a drying process.

Other processing routes for seaweed are blanching with steam, which creates a cooked product, or brining with salt water to preserve the seaweed for later processing. Seaweed can also be used directly as a wet, fresh ingredient with shorter shelf life. Ensiling is a method where the seaweed is sealed into a container devoid of air and the natural breakdown of the plant commences, similar to silage making of mown grasses. This is a route of processing used when the seaweeds are used for their novel chemical composition for pharmaceuticals and biopolymers. Mara may at some point in the future supply seaweed to other companies, but their initial plans are to grow and process seaweeds for drying in their own facilities for their own food products.

12 Structure and operations

An ADCP (acoustic Doppler current profiler) was deployed at the proposed site for a full lunar cycle over December 2021 into January 2022; these readings were combined with longer term wave, tide and storm data for the location to build a detailed understanding of the maximum wave height, current speeds and other stresses the farm can be expected to be subject to.

The farm has been modelled with appropriate hydrodynamic software to ensure the design will be sufficiently robust that the most extreme possible conditions to be found in the area will remain well within the tolerances of the structure. Indeed an unrealistic combination of the worst factors (i.e. the effect of the worst winter storms impacting the farm when it is most heavily laden with seaweed biomass) was modelled and found to be within tolerance.

Additionally the proposed design has already been used and proven in licensed farms on the west coast (e.g. New Wave Foods Ltd, Aird na Cuille, south end Sound of Kererra near Oban).

Cetacean Entanglement - Whilst there have been no reported cases of entanglement of cetaceans in kelp longline farming (Kraus et al., 2005[1]; NOAA, 2016[2]), Mara Seaweed Ltd are designing their Seaweed Farm with cetacean safety in mind. Most cases of cetacean entanglement seem to be from discarded fishing gear (ghost fishing) or from loose mooring lines or creel ropes. The farm design at St Andrews Bay will ensure that lines are taut and well-spaced to allow cetaceans to safely pass through the site.

As part of the Application process, Marine Scotland, MCGA and NLB ask for a navigational risk assessment, which includes emergency contact details to various organisations. BDMLR and the Scottish Entanglement Alliance will be there as contact numbers if there is any concern over a cetacean in our farm lines.

[1]https://www.researchgate.net/publication/7704221_North_Atlantic_Right_Whales_in_Crisis
[2]https://media.fisheries.noaa.gov/dam-migration/wcr_2016_whale_entanglements_3-26-17_final.pdf

13 Economic and Social Case for approval

[redacted]

14 Future Work and support

At this time, processing will be done at Mara's Edinburgh site and their new site in Glenrothes. In time there may be need to develop further processing facilities closer to their growing site to take on the increased volumes.

As the farm is established and harvests grow, a shore base, office and storage facilities, purpose built deployment and harvesting vessels plus contracted equipment, staff and other consumables will be required to ensure the continued success of this venture.