Mocean Energy Orkney Blue Star 10 Test 2026

Project-specific Environmental Management Plan (PEMP)

Final

Report to Mocean Energy

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1 INTRODUCTION

1.1 BACKGROUND

Mocean Energy, based in Edinburgh, is developing wave energy converters (WECs) for various applications from small-scale off-grid use to large, utility-scale projects. Its core technology is its hinged raft WEC, which consists of two hulls with novel shapes connected by a single hinge. Wave forcing, and the hulls' dynamics cause a rotation about the hinge, which is converted to electricity via a power take-off system.

Mocean Energy is undertaking a project funded by EuropeWave[1] to test an updated version of the WEC known as Blue Star 10. Testing is planned to be undertaken in an area to the east and offshore of Deerness, Orkney for 12 months during 2026 & 2027. The primary purpose of testing is to gather performance data and learnings from deployment of the device in order to inform further development of Mocean's Wave Energy Converter designs. This project will not involve grid connection.

This work builds upon a previous successful deployment by Mocean at the same site in Deerness under Marine Licence MS-00008757 issued in March 2021 and associated Marine Licence Variation MS-00010315 issued in June 2023.

This Project Environmental Management Plan (PEMP) has been produced to support a Marine Licence application under Part 4, Section 54 of the Marine (Scotland) Act 2010 for this deployment.

Table 4 presents the results from the environmental assessment of the Project; a process which draws together, in a systematic way, an assessment of a project's likely significant environmental effects. This helps to ensure that the importance of the predicted effects, and the scope for reducing any adverse effects through mitigation, are fully understood by the public and the competent authority.

1.2 CONTENTS OF THE PEMP

This PEMP details the proposed mitigation, monitoring and management measures for all stages of the project including installation/construction, operation and maintenance (O&M) and decommissioning/final removal of all equipment.

Mocean Energy are committed to updating and improving this PEMP through consultation and as more data, information and experience is gathered. In addition, they are committed to working closely with stakeholders and other developers to ensure that all mitigation and monitoring activities are conducted in line with best practice and best available knowledge at all times. Mocean Energy will also strive to actively engage with other developers and stakeholders to address the key issues and uncertainties associated with wave energy development through targeted research initiatives where such opportunities arise.

[1] https://www.europewave.eu/

2 CONSTRUCTION METHOD STATEMENT

2.1 PROJECT OVERVIEW

The following activities are proposed:

- Refurbishment and installation;
- Operation and maintenance; and
- Decommissioning/final removal of all equipment.

2.2 PROJECT LOCATION

The Blue Star 10 will be installed at a location to the east of Deerness, Orkney (see

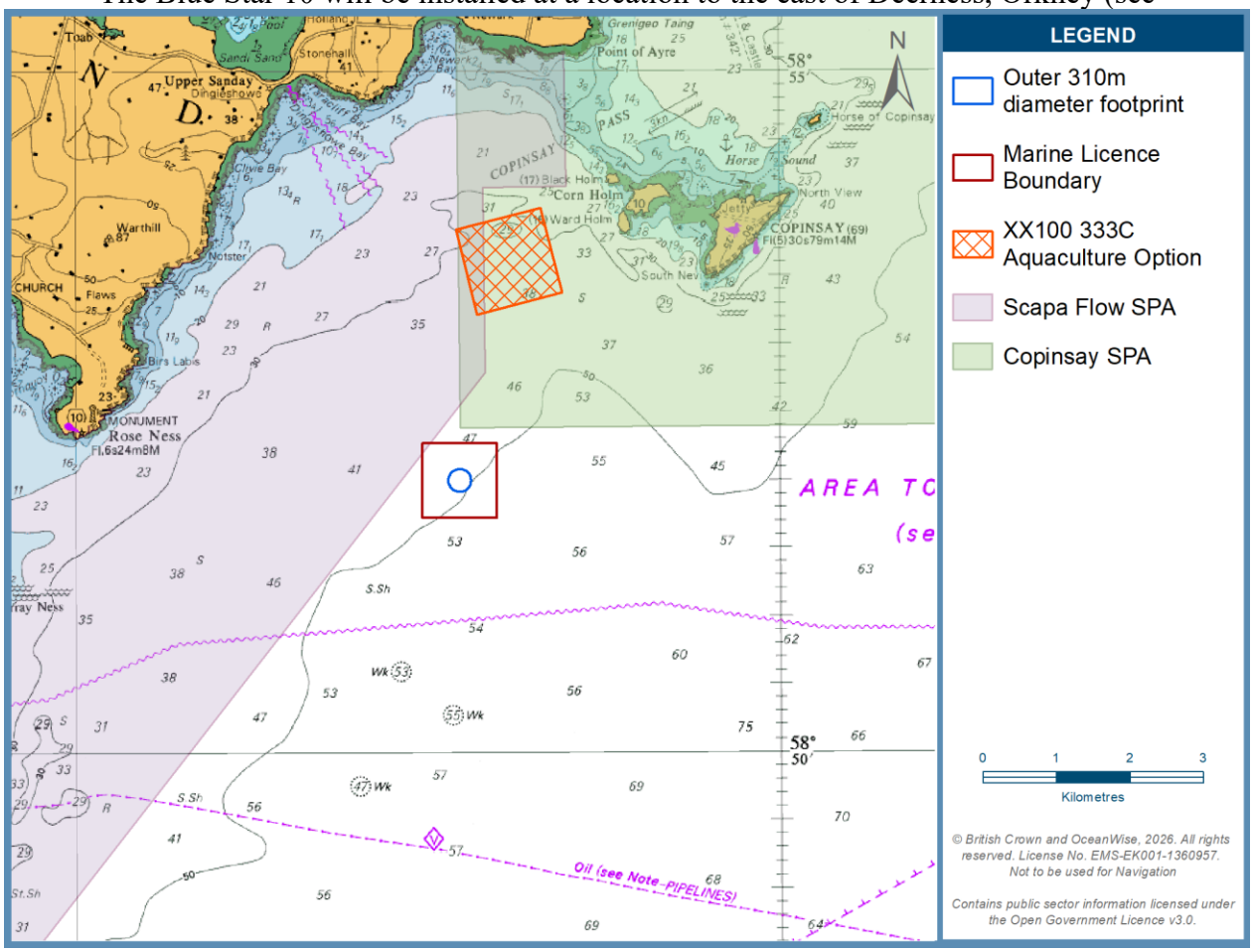

Figure 2-1). The licence boundary required for installation of the device is specified in Table 1. The precise location of the device and anchors (within the licence boundary provided) will be determined prior to anchor installation and will be confirmed (post-installation) with Marine Scotland Licensing Operations Team (MS-LOT) upon submission of the formal Table of Deposits (Form FEP5). This flexibility in the installation location is required to ensure that no obstructions exist in proximity of the anchoring locations on the seabed.

Table 1 Coordinates of licence boundary

Point	Longitude	Latitude
NW	-2.75142	58.8711
NE	-2.75148	58.86194
SE	-2.7338	58.8619
SW	-2.73373	58.87106

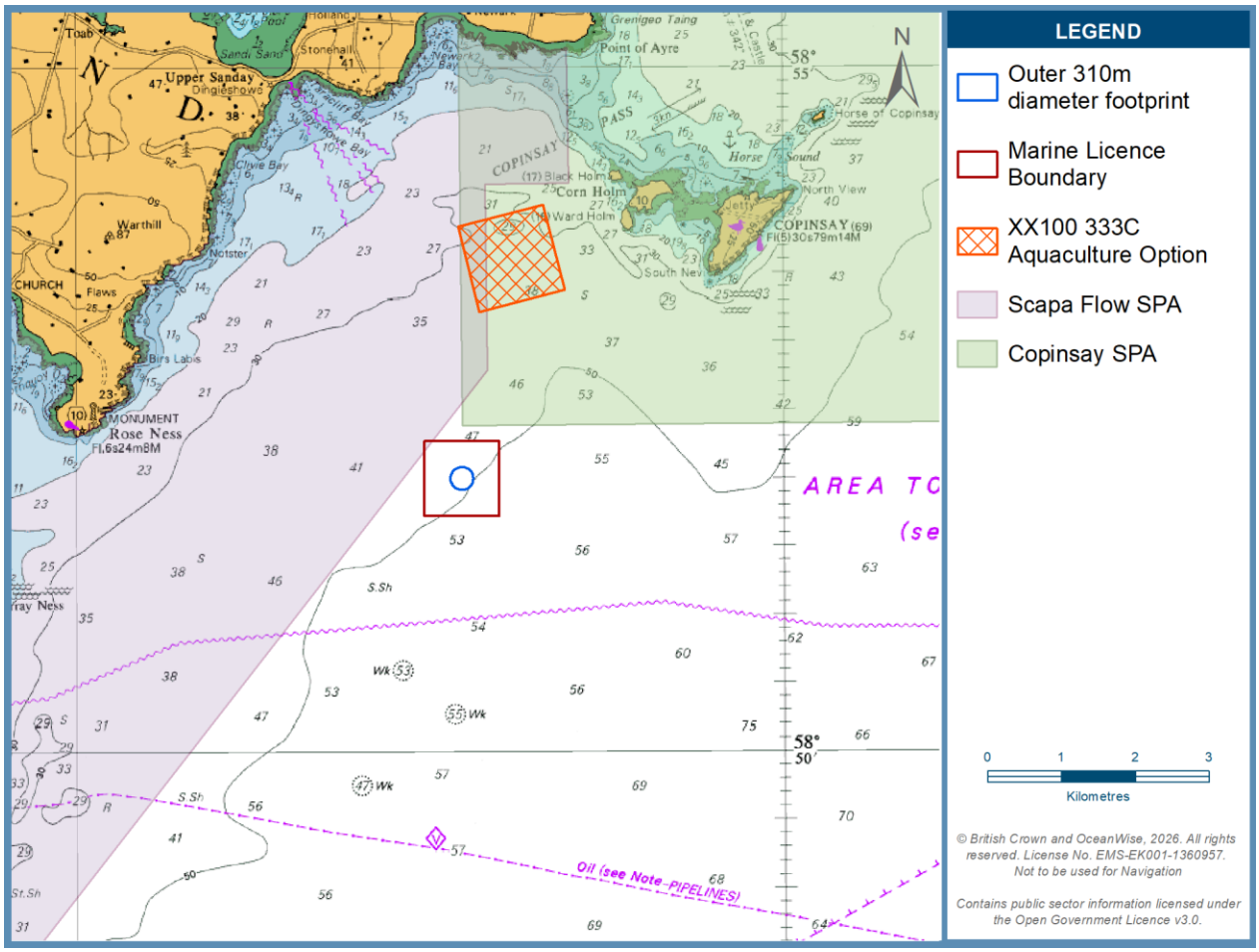

Figure 2-1 Proposed licence and deployment area at Test Site

2.3 PROJECT SCHEDULE, TIMINGS AND COMMENCEMENT DATES

The proposed installation, operation, maintenance and decommissioning schedule (indicative) for the Project is shown in Appendix A. The anticipated date of installation of the Blue Star 10 and its associated mooring system is Q3 2026. The operational period of the test is anticipated to last up to 12 months. To allow some contingency in the programme, the marine licence application is requested to cover an 18-month period. Thereafter, all equipment will be completely removed from site.

At all times, onsite works will be subject to Mocean Energy's HSE Plan and Mocean Energy's Operations Plan, which are managed by Mocean Energy to minimise any potential conflicts and maximise any opportunities that may arise.

2.4 TECHNICAL DESCRIPTION OF COMPONENTS

Hull Structure

The Blue Star 10 consists of two yellow painted steel hulls connected at a hinge through a pair of steel hinge pins. The key dimensions of the machine are given in Table 2. Figure 2-2 shows a visualisation of the machine on the pier. Figure 2-3 shows a visualisation of the machine deployed at sea; however, the mooring lines are not shown here. Note that in both figures, the machine will be painted yellow. Figure 2-4 gives the general arrangement of the machine.

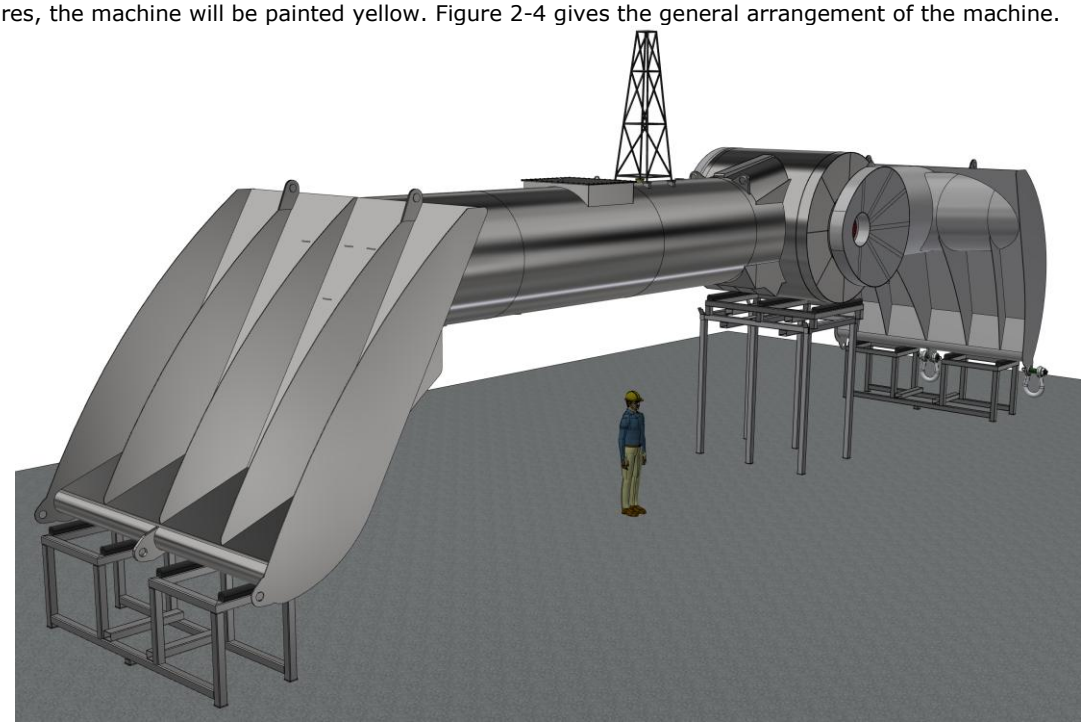

Figure 2-2 Blue Star 10 visualisation on pier.

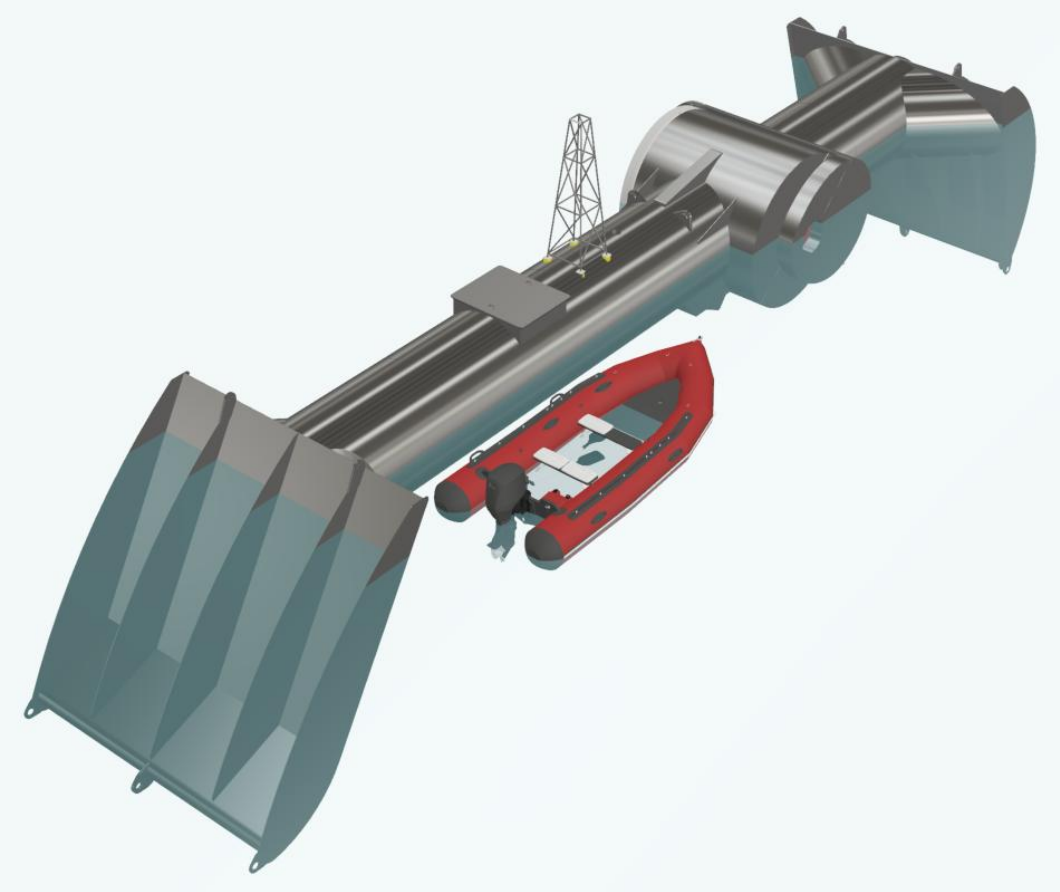

Figure 2-3 Blue Star 10 visualisation as deployed at sea.

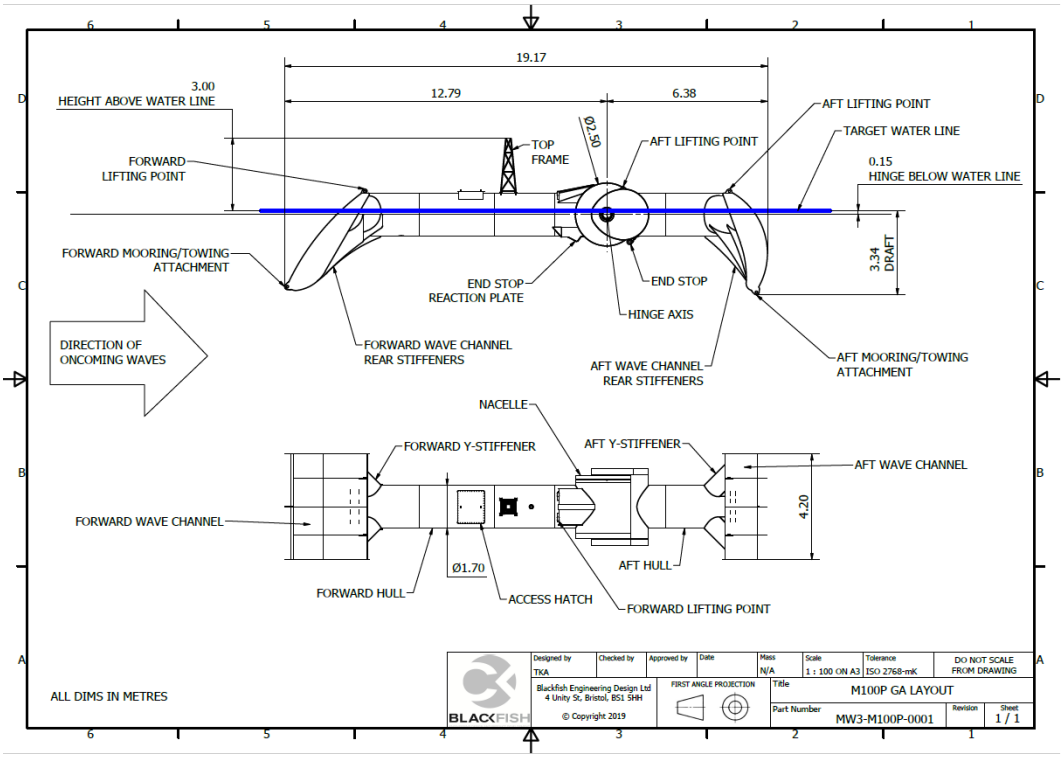

Figure 2-4 Blue Star 10 Drawing with dimensions

Table 2 Key dimensions of the Blue Star 10

Dimension	Units	Value
Length overall	m	19.2
Beam	m	4.2
Draft	m	3.4
Mass	tonnes	60

Internal Systems

The rotation of the aft hull with respect to the forward hull drives an updated generator. Power from the generator is then conditioned and used onboard the WEC to power local system. Power beyond that needed to power on-board systems is stored in batteries. Once the batteries are fully charged, excess power is dissipated through an onboard dump resistor. Key onboard systems that use power include: the control, communications, cooling, instrumentation, and navigation lighting.

Moorings System Overview

Figure 2-5 shows the construction of the mooring system. The system is made of 3 mooring lines, the mooring attachment points are attached to a 4m bridle at the forward mooring point on the WEC. The mooring system with uses subsurface buoys, is a semi taut system and is considered a full catenary system.

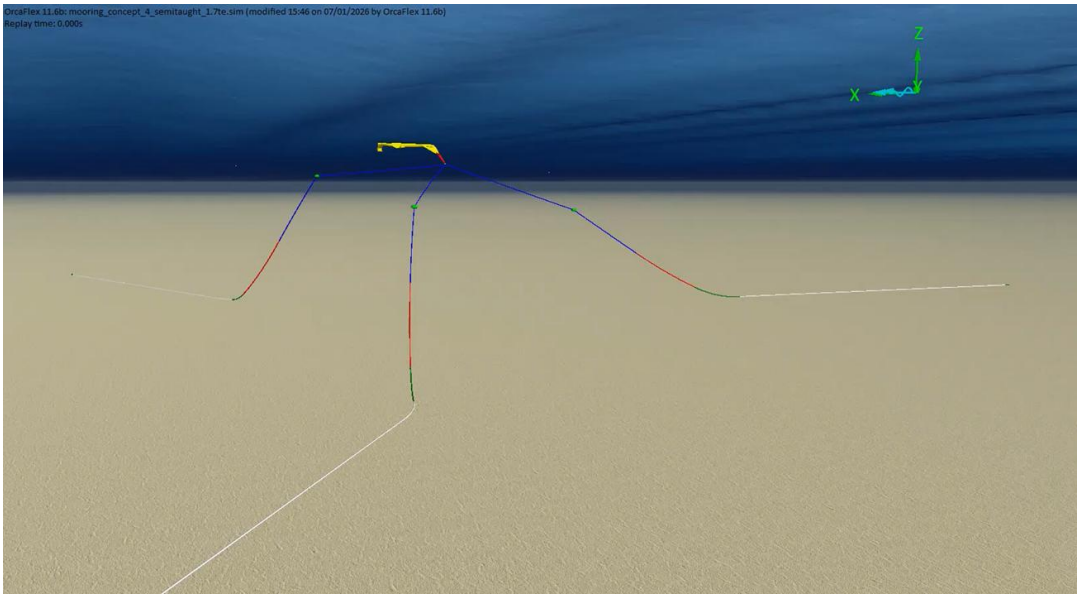

Figure 2-5 Mooring configuration

The design may be subject to further optimisation in advance of deployment. Therefore, a conservative allowance of 175m on each mooring leg is presented as this allows for minor changes that may occur during detailed design. This results in a total footprint of the mooring spread of 310 m diameter.

The anchors will be gravity-based foundations. No drilling will be required for their installation.

When the Blue Star 10 is not connected to the mooring system (i.e. prior to installation or during maintenance), the mooring system will be held in place by a surface buoy.

Umbilical

Depending upon further funding which has not yet been confirmed, there is potential to add an umbilical to the WEC during the testing programme in 2026, in order to demonstrate the potential to power a temporary piece of equipment placed on the seabed (e.g. a remotely operated vehicle docking station and/or a battery) as proof of concept. This would not provide power to shore and hence would not be grid connected. The umbilical would be integrated with the mooring system and would not involve excursion of any equipment outside of the consented area.

Ancillary Scientific Equipment

In addition to the WEC, a Wave Rider (or similar) measurement buoy, including its own mooring and anchor, will be anchored in the vicinity of the WEC within the licence boundary to measure metocean conditions.

2.5 OPERATIONAL PLANS AND METHODOLOGIES

2.5.1 Construction and installation

The vessel spread required for installation is shown in Table 3. Further details of the vessels likely to be used for the deployment are provided in the Vessel Management Plan in 0.

Table 3 Vessels utilised for installation

Vessel Type	Task
Multi Cat (x1)	Anchor and Mooring installation/removal. Device installation and removal. At-sea battery charging and power demonstration.
Rigid Hulled Inflatable Boat (RHIB) (x1)	At-sea visual inspection. Wave Rider installation and removal.

Figure 2-6 Example vessel of Multi Cat

Figure 2-7 Example vessel of RHIB

Mooring installation

The proposed mooring installation phases are described below:

- preliminary phase: anchor and ground chain installation
- deployment phase: The device is towed to site and final mooring arrangements and hook-up are made.

It is good practice to decouple where possible the installation of anchors from loadout, and this normally helps de-risk the project in terms of weather exposure.

Gravity based anchors are the preferred approach for the moorings. It is proposed that the anchors and ground chain will be installed before the device and buoyed off for easy pick up. The synthetic mooring lines will either be installed the day before the platform load-out or on the day. Mooring design guidance states that synthetic lines should only be left on the seabed for temporary phases due to the perceived risk of sediment ingress which can cause internal abrasion. In reality, modern ropes are well protected from such abrasion.

Prior to device installation and while the device is at quayside for maintenance, the mooring system will remain deployed and buoyed off to a surface buoy within the licence boundary.

Device installation

It is anticipated that the installation of the anchors will be completed in 1 day and connecting the Blue Star 10 will be completed within 1 further day. It is expected that the Blue Star 10 device can be installed in conditions of significant wave heights (Hs) of less than 1.5m.

Assuming the Nylon ropes are pre-installed with anchors and left onsite while waiting for the WEC installation, the following installation process is proposed (this will be confirmed with the appointed marine installation contractor):

a. The WEC is towed onsite with pennants[2] on
b. The mooring ropes are retrieved from surface buoys
c. The mooring ropes are connected to preinstalled pennants on WEC
d. The WEC is pulled towards the last anchor to connect the last mooring line and provide pretension to the system

2.5.2 Device testing

The device testing will consist of running the machine under normal operating conditions at the deployment site, collecting data with onboard instrumentation, logging that data, and sending some of it back to a control centre on shore via wireless signals. Onboard instrumentation will measure parameters needed to assess power absorption, engineering quantities like loads, and to monitor the health of the machine.

2.5.3 Maintenance

The device has been designed so that regular maintenance is not required. However, because it is a prototype, it is anticipated that during performance testing, maintenance and inspection will be performed approximately every 4 months. Additional unplanned maintenance may also be necessary.

[2] The mooring pennant is a short length of line that forms part of the mooring system near the WEC.

Maintenance activities will take place across three different locations, depending upon nature and duration of the activity:

- **On Station:** As much routine and responsive maintenance as possible will take place at the proposed deployment location.
- **Sheltered Mooring:** There is a designated sheltered mooring location nearby in Holm Sound where the device will be moored temporarily where a sheltered sea state is required for specific maintenance activities.
- **Hatston Quay:** For maintenance activity requiring the device to be lifted out of the water, Hatston Quay in Kirkwall will be used.

2.5.4 Monitoring

During deployment, the device will be monitored 24/7 by the Mocean Team using the Graphic User Interface ("GUI") and its related alarms. In addition to the GUI, the device will also include an AIS transponder which can be monitored in case of communications failure with the device. An emergency response plan will be in place which will identify contacts, contractors, process and procedures for responding to any unplanned excursion of the device.

2.5.5 Decommissioning

Decommissioning will involve the removal of the Blue Star 10 and all associated equipment. This will be a reverse of the installation procedures outlined in Section 2.5.1. The device is planned to be removed from site by a Multi Cat vessel in 1 day, and its mooring lines and anchors, and the Wave Rider buoy are planned to be removed from site by a Multicat vessel in 1 further day.

2.6 THIRD PARTY VERIFICATION

Third Party Verification (TPV) will be undertaken by Orkney based Orcades Marine Management Consultants Ltd ('Orcades Marine'). Any mooring/anchoring changes will have been reviewed and approved by Orcades Marine prior the deployment.

Orcades Marine uses 360 TPV which provides a holistic approach to readiness assurance covering engineering design, locational suitability, operability, regulatory and license compliance, as well as cost-effectiveness and invest-ability. 360 TPV brings confidence to project developers, insurers, investors, authorising bodies, customers, test facilities, and government. 360 TPV provides an opportunity to benefit from the experience of those who have gone before, through independent, incisive insight and improves the likelihood of success.

360 TPV maximises opportunities for success, minimizes uncertainty, and manages risk by having an experienced, independent team evaluate your technology, project and/or organisation and provide feedback on the status that exists and consequences that could arise. Orcades 360 TPV team takes a holistic approach; makes use of proven expertise and unparalleled global ocean energy experience.

2.7 ENVIRONMENTAL CONDITIONS AND NAVIGATION

A proposed navigation and lighting plan is provided in Appendix C.

A high-level overview of constraints in the deployment area is provided in the following sections.

Marine Traffic:

The area is used by a variety of marine traffic as illustrated in Figure 2-8. The deployment site is located such that it avoids the areas of highest recorded traffic density.

Predicted tidal velocities: A model was used to predict the local tidal velocities in the area. The outputs indicated that Copinsay has the effect of increasing tidal velocities to the North-east of the area. In addition, the increased predicted velocity off Copinsay suggests deployment towards the north-east of the deployment area would be less suitable for the device.

Copinsay SPA, Scapa Flow SPA and SHEFA Cable: Copinsay SPA is approximately 0.2 km to the north-east, while Scapa Flow SPA overlaps with the NW corner of the proposed Marine Licence boundary. The SHEFA cable lies approximately 1.3 km to the south of the proposed site. These are illustrated in Figure 2-9 which was generated from a Proximity Check via Crown Estate Scotland (CES) as part of the Marine Licence application.

Existing Seabed Survey Data: SNH report no. 446: An assessment of the conservation importance of species and habitats identified during a series of research cruises around Scotland (2011)[3] had several sample locations in the vicinity of the proposed deployment site (Figure 2-10). The SNH survey findings indicated that suitable seabed conditions for a deployment were present at the location ultimately chosen for a more detailed site-specific benthic survey.

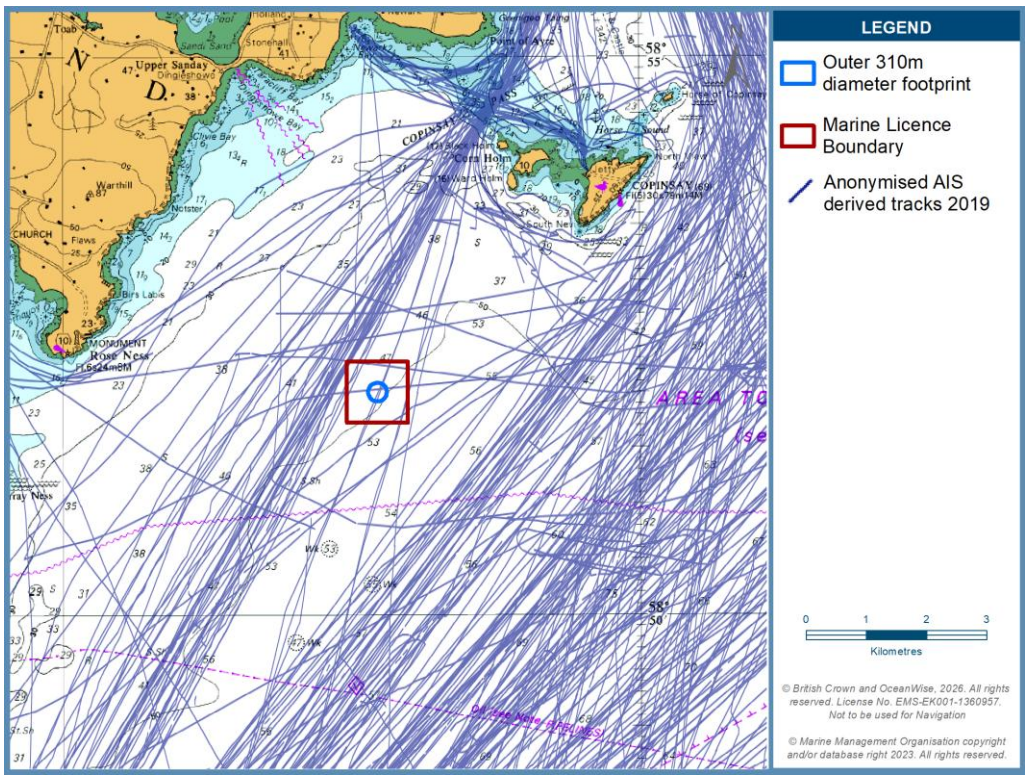

Figure 2-8 Vessel Traffic Analysis

[3] https://www.nature.scot/doc/naturescot-commissioned-report-446-assessment-conservation-importance-species-and-habitats

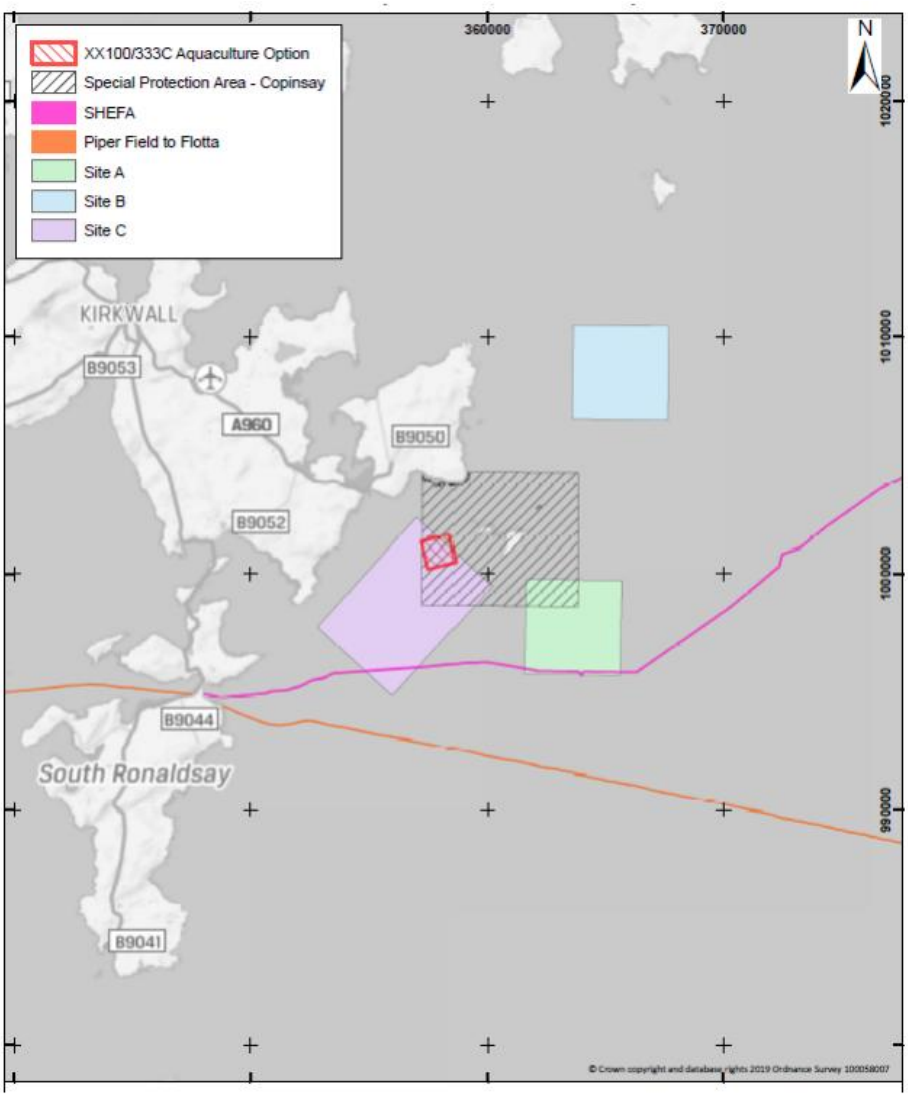

Figure 2-9 Original CES Proximity Check Results

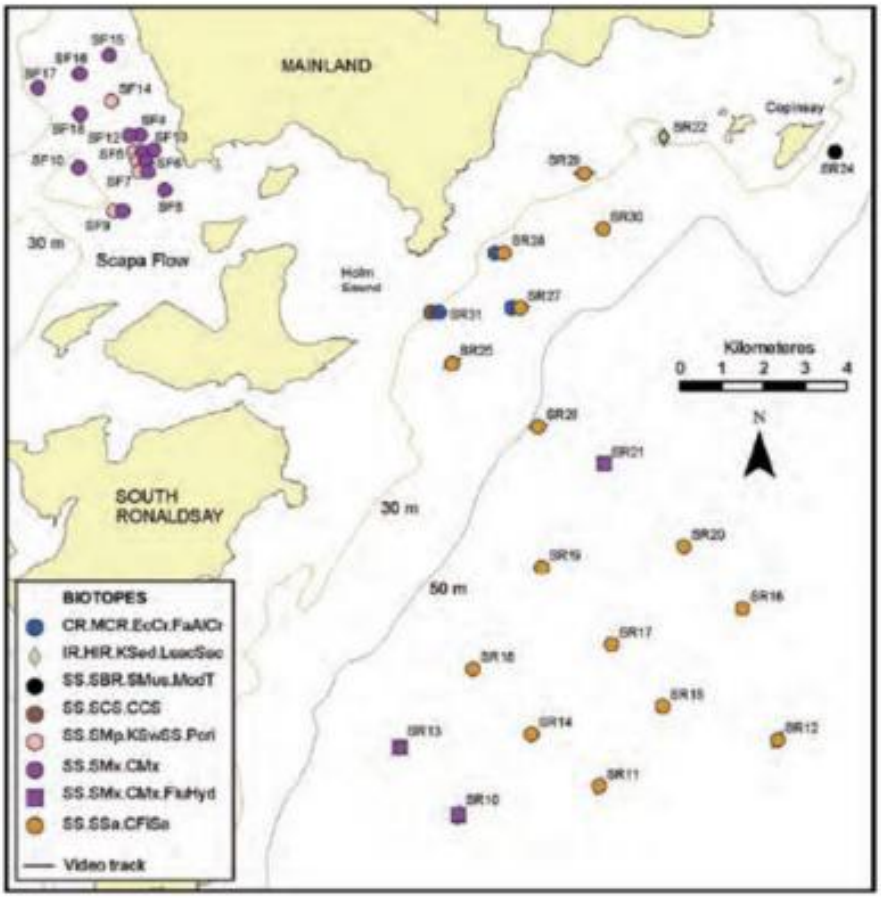

Figure 2-10 Identified biotopes within the area (from SNH report no. 446)

Benthic

A Remotely-Operated Underwater Vehicle (ROV) and Vessel Mounted Acoustic Doppler Current Profile (VMADCP) survey was conducted on behalf of Mocean Energy by Aquatera in an area east of Burray in September 2019 (Figure 2-11). The primary aim of this survey was to identify a potential deployment site that was feasible from both a technical and environmental perspective. Potential sites were initially identified via the VMADCP survey with video footage collected at these preferred sites to investigate the condition of the seabed by characterising seabed habitats and species present within each survey area.

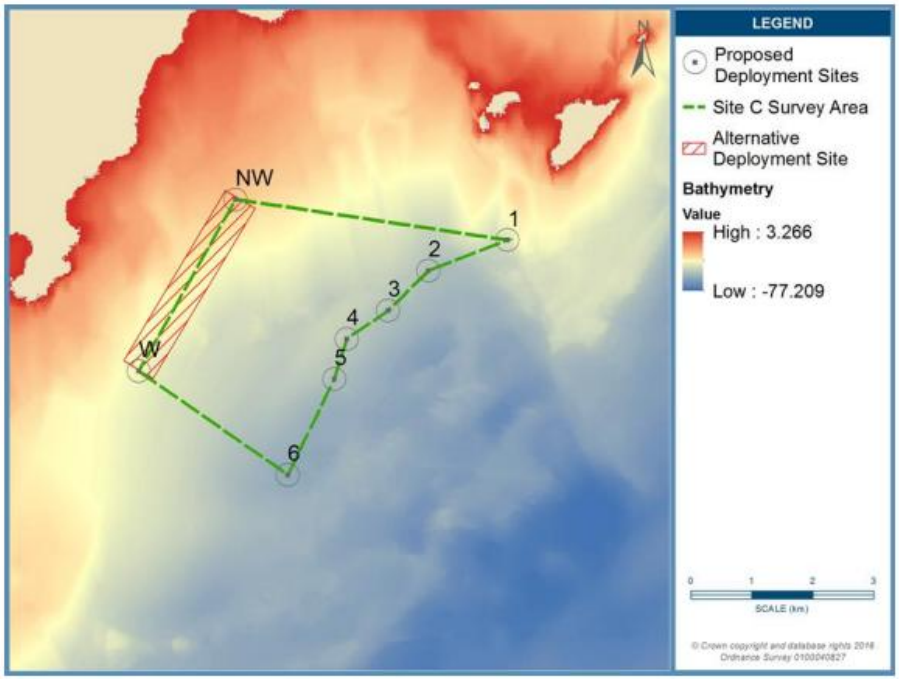

Figure 2-11 Benthic/VMADCP Survey Search Area

Water depths at the deployment site (vicinity of Site 4 and 5) were approximately between 50 and 53 m. Sediment characteristics within this area generally alternated between pronounced fine sandy ripples with sparse echinoderm epifauna, and coarser-grained heterogeneous sands with increased amounts of shell fragments. Throughout the mixed sediments hermit crabs were commonly observed along with (possible) tufts of macroalgae.

The seabed habitats observed at the vicinity of the deployment site displayed characteristics of the following biotopes as described below:

- The majority of the area observed were dominated by pronounced fine sandy ripples and appeared generally barren with regards to faunal diversity, with widely scattered echinoderms including Asterias rubens and brittle stars (possible *Ophiura*). This habitat may resemble the SS.SSa.CFiSa ('Circalittoral fine sand') biotope complex, however further in-depth biotope classifications could not be assigned for these areas due to the lack of key characteristic species associated with specific biotope types.
- There were also occasional patches of increased mixed sediments and shell material appears similar to the SS.SCS.CCS ('Circalittoral coarse sediment') biotope complex, however only hermit crabs (*Pagurus bernhardus* – a characteristic species of the biotope complex) were observed throughout these areas and therefore a more in-depth biotope classification could not be assigned.

The findings of the survey appear consistent with a previous survey conducted by SNH, which reported the presence of SS.SSa.CFiSa to the east of Holm Sound, where there were few signs of infaunal life and a sparse epifaunal community mainly composed of widely scattered echinoderms. Where there were hard rock substrates observed in the study, a low-diversity encrusting community of serpulid worms, bryozoans, coralline algae and *Echinus esculentus* were found in association and therefore the rocky habitat was assigned to the CR.MCR.EcCr.FaAlCr biotope.

3 ENVIRONMENTAL ASSESSMENT AND MANAGEMENT PLAN

Potential environmental impacts and residual effects that could arise from the proposed activities set out in Section 2 were considered in the preparation of the environmental mitigation, monitoring and management plan presented in this section. This involved a proportionate consideration of the potential magnitude of impacts of the Project on the existing environment. Spatial extent, scale (size, amount, volume and intensity), duration, frequency and timing, reversibility and sensitivity of receptors, are all factors for consideration of the magnitude of impact. Professional expert judgement was used to determine the likely significance of any residual effects.

The results of the assessment of potential residual impacts and proposed mitigation/monitoring measures are outlined and described within the context of the proposals in Table 4.

Table 4 Residual effects and mitigation/monitoring measures

Potential impact	Receptor	Assessment of residual effect(s)	Proposed mitigation and monitoring measure(s) and reporting
All phases including construction and installation, operation and maintenance and decommissioning			
Disturbance from support vessel activity – vessel noise and presence	Cetaceans Seals Basking sharks Marine birds	The Blue Star 10 and its moorings and anchors will be installed using one standard Multicat work vessel, assisted by a RHIB. Installation activities will be completed over two days. Maintenance and inspection will be performed approximately every four months throughout testing. It is possible that unplanned onsite maintenance will occur. There is one designated seal haul-out in the wider vicinity of the deployment site (at Copinsay, see Appendix figure B.3). The vessel transit route will also pass through Copinsay Special Protection Area (SPA) designated for breeding Northern fulmar, great black-backed gull (*Larus marinus),* common guillemot (*Uria aalge*), black-legged kittiwake (*Rissa tridactyla*) and breeding seabird assemblage and Scapa Flow SPA designated to protect breeding red-throated diver (*Gavia stellata*) and wintering marine birds including great northern diver (*Gavia immer*), black-	**Adherence to SMWWC** Relevant measures from the Scottish Marine Wildlife Watching Code (SMWWC) (SNH, 2017) will be implemented by Mocean Energy and all marine contractors. These will include: • Speed will be reduced to 6 knots when any marine mammals or birds are sighted within or near to transit routes, where consistent with crew and navigational safety and the completion of constrained operations. • A steady speed and course will be maintained where possible if a marine mammal approaches a project vessel. • Care will be taken to avoid splitting up groups and mothers and young. • Minimum approach distances (as stated in the SMWWC) for vessels on approach to marine mammals and birds will be adhered to, although this may be varied according to species and circumstance. • Sudden unpredictable changes in speed, direction and engine noise will be avoided to avoid disturbance to any marine mammals in the vicinity. • Rafts of birds will not be intentionally broken up or flushed. • During the seabird breeding season (April to August inclusive) vessel transit corridors will be at least 50 m from shore in the vicinity of cliff-nesting seabirds to avoid disturbance. **Vessel Management Plan** A Vessel Management Plan has been developed which will be implemented to help ensure a minimum approach distance is adhered to when passing designated seal haul-outs and to minimise disturbance to marine birds (refer to draft VMP in 0). **Reporting**

Potential impact	Receptor	Assessment of residual effect(s)	Proposed mitigation and monitoring measure(s) and reporting
		throated diver (*Gavia arctica*), Slavonian grebe (*Podiceps auritus*), common eider (*Somateria mollissima*), long-tailed duck (*Clangula hyemalis*), red-breasted merganser (*Mergus serrator*) and European shag (*Gulosus aristotelis*) (see Appendix figure B.3). The Vessel Management Plan includes measures to ensure a minimum approach distance is adhered to when passing designated seal haul-outs and when passing marine birds. No significant effects on any sensitive species are expected from this low level of vessel activity.	The Vessel Management Plan will be maintained throughout the Project. Any changes will be agreed in advance with MD-LOT.
Introduction of marine non-native species (MNNS) (via vessels, devices or other equipment)	Various	The WEC will be refurbished in Dundee prior to transportation to Kirkwall via road. The WEC will be towed from Hatston Pier to the site for final deployment using a local contractor in Orkney. Therefore, there is no potential for the introduction of MNNS via vessels or from the device itself.	No specific mitigation is proposed during the deployment and operation of the Blue Star 10 WEC.
Habitat creation and Fish Aggregation Device (FAD) effects due to	Benthic species and habitats Fish and shellfish	It is likely that fish will aggregate around the Blue Star 10 WEC device.	No specific mitigation is proposed in relation to this impact during the deployment and operation of the Blue Star 10 WEC.

Potential impact	Receptor	Assessment of residual effect(s)	Proposed mitigation and monitoring measure(s) and reporting
introduction of new structures	(gadoids and crustaceans)	No significant effects are anticipated from the deployment of a single hinged raft WEC device of this type.	
Construction and installation			
Seabed disturbance from installation of the mooring system.	Benthic species and habitats Demersal fish and shellfish	During installation of the mooring system there is potential for minimal disturbance to seabed habitat and to benthic species including demersal fish and shellfish. No drilling is proposed with respect to the mooring system installation therefore potential disturbance is considered to be highly localised and temporary. A benthic survey carried out in September 2019 confirmed that the deployment area is consistent with a previous survey conducted by SNH, which reported the presence of SS.SSa.CFiSa to the east of Holm Sound, where there were few signs of infaunal life and a sparse epifaunal community mainly composed of widely scattered echinoderms. Where there was hard rock substrates observed in the study area, a low-diversity encrusting community of serpulid worms, bryozoans, coralline algae and *E. esculentus* were found and therefore the rocky habitat was assigned to the CR.MCR.EcCr.FaAlCr biotope[4].	No specific mitigation is proposed in relation to this impact during the deployment and operation of the Blue Star 10 WEC.
Underwater noise from mooring system installation leading to disturbance	Cetaceans Seals Basking sharks	Gravity-based foundations will be used therefore no drilling is required.	No mitigation required.

[4] Mocean Site C Benthic and VMADCP Survey Report (Aquatera 2019)

Operation and maintenance			
Displacement of marine mammals, basking sharks and marine birds due to the presence of the device	Marine mammals, basking shark and marine birds	The introduction of new structures into the environment has the potential to displace marine mammals, basking sharks and marine birds from the immediate surrounding area. The presence and operation of a single Blue Star 10 WEC and its associated anchors and moorings with an overall footprint of 0.05 km^2 is not expected to adversely affect marine mammals, basking shark and marine birds which will still be able to inhabit and pass through the area.	No specific mitigation is proposed in relation to this impact during the deployment and operation of the Blue Star 10 WEC.
Underwater noise from WEC operation leading to disturbance	Cetaceans Seals Basking sharks	There is no risk of injury or death from underwater noise generated by a single operating WEC. No anticipated significant effects are expected from the Blue Star 10 WEC.	No specific mitigation or monitoring is proposed in relation to this impact during the deployment and operation of the Blue Star 10 WEC.
Entanglement in mooring lines or cables leading to injury or death	Cetaceans Basking shark	A study commissioned by Scottish Natural Heritage (SNH) concluded that moorings associated with marine renewable energy devices are unlikely to pose a major threat in terms of entanglement risk to cetaceans and basking sharks due to the size and mass of the moorings. However, there is a greater risk for large baleen whales[5] due to their large size and foraging habits (Benjamins *et al*. 2014).	No specific mitigation or monitoring is proposed in relation to this impact during the deployment and operation of the Blue Star 10 WEC. **Reporting** Any notable events will be recorded and reported to Marine Scotland no later than 24 hours after observation.

[5] Such as the fin whale *Balaenoptera physalus*, or humpback whale *Megaptera novaeangliae.*

		There is a very low likelihood of occurrence of large baleen whale species at the site with humpback whale a very occasional visitor to Orkney waters (Evans et al, 2010) The presence of a single WEC and associated semi-taut mooring system comprising 3 subsurface buoys and 3 nylon mooring lines, covering a small footprint (0.05 km^2) is not expected to result in any significant entanglement risk for large baleen whale species or other cetaceans or basking sharks.	
Presence of WEC and associated infrastructure leading to barrier effects	Cetaceans Seals Basking sharks	The presence of a single Blue Star 10 WEC and associated infrastructure is not expected to result in any significant barrier effects for marine mammals or basking sharks.	No specific mitigation or monitoring is proposed in relation to this impact.
Changes to hydrodynamics and sediment regime	Hydrodynamic and physical processes	The presence of a single Blue Star 10 WEC and associated infrastructure is not expected to result in any significant changes to hydrodynamics and sediment regime.	No specific mitigation or monitoring is proposed in relation to this impact.
Electromagnetic Field (EMF) effects	Diadromous fish, gadoids and elasmobranchs	EMF effects are not expected to be a significant issue for the Blue Star 10 WEC as there is no umbilical connection from the device to shore and therefore there are no significant length of electrical cables associated with the device.	No specific mitigation or monitoring is proposed in relation to this impact.

4 REFERENCES

Benjamins, S., Harnois, V., Smith, H.C.M., Johanning, L., Greenhill, L., Carter, C. and Wilson, B. (2014). Understanding the potential for marine megafauna entanglement risk from renewable marine energy developments. Scottish Natural Heritage Commissioned Report No. 791.

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5 APPENDICES

APPENDIX A PROJECT PROGRAMME

Activity	Project Week																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Mooring Installation	X																												
Device Installation		X																											
Testing		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Maintenance – On Station																X													
Device & Mooring Removal																													
Contingency																													

Activity	Project Week																											
	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Mooring Installation																													
Device Installation																													
Testing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Maintenance – On Station					X																		X						
Device & Mooring Removal																								X					
Contingency																									X	X	X	X	X

APPENDIX B VESSEL MANAGEMENT PLAN (VMP)

B.1 INTRODUCTION

This VMP details the anticipated type and number of vessels that will be used during the construction and installation, maintenance and decommissioning of the Blue Star 10 at the Test Site. It also highlights the likely ports and transit routes that will be used during all phases of the Project.

B.2 VESSEL DETAILS

The selection and contracting of vessels is primarily driven by market conditions, vessel availability and ultimately, cost. Therefore, the actual vessels will be selected near to the time of works. Mocean Energy will confirm the project vessel spread at the earliest possible opportunity prior to works commencing as required (as per normal maintenance activities). The vessels presented in the following figures and Appendix Table B.1 are indicative of the vessels likely to be used.

Appendix figure B-1 Example Multi Cat vessel

Appendix Figure B.2 Example Rib vessel

Appendix Table B.1 Vessel information (FOR MAIN VESSELS ONLY)

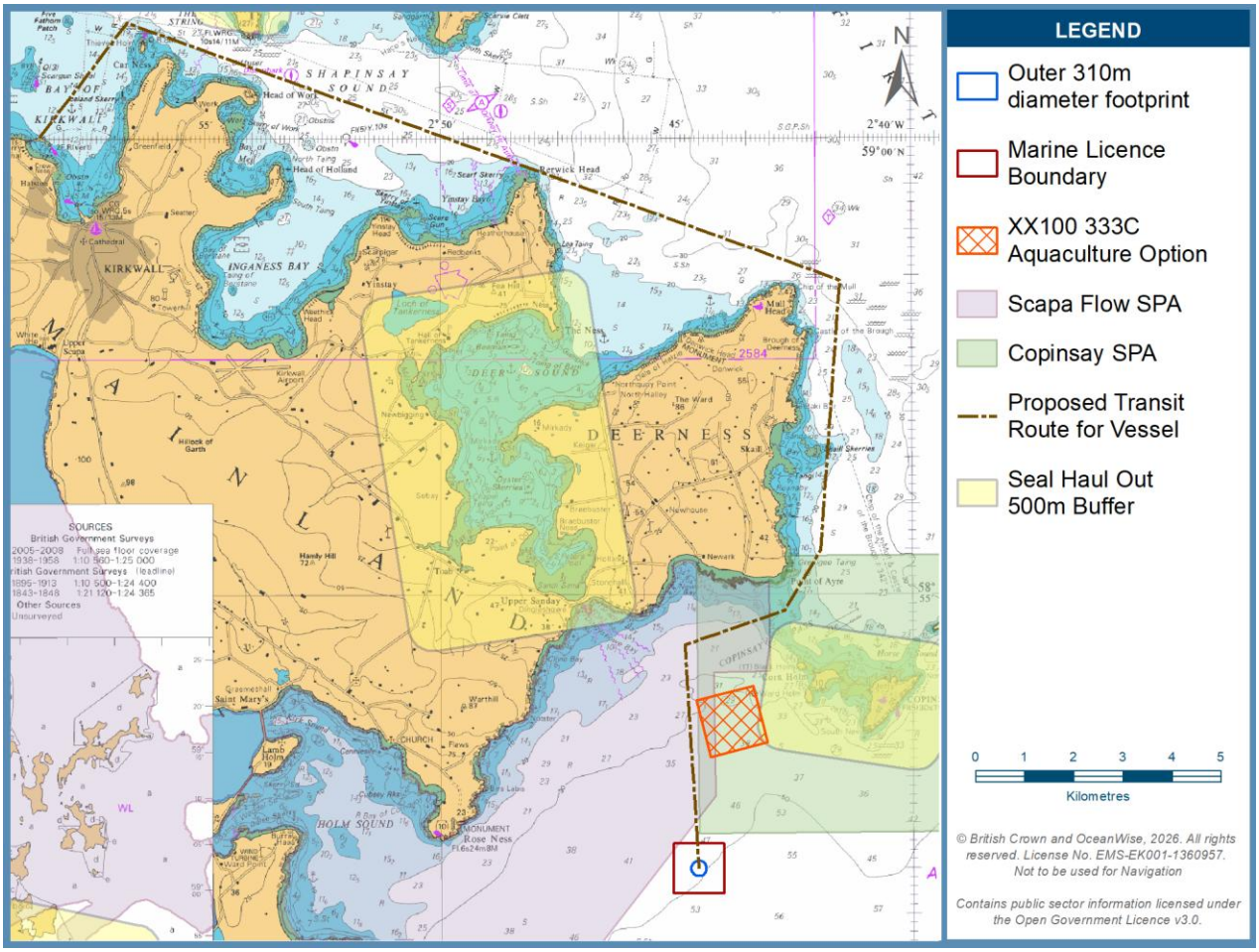
	MV C-FENNA	MV C-ODYSSEY	GREEN ISLE
Flag state	UK	UK	UK
Port	Kirkwall	Kirkwall	Stromness
Year of build	2013	2011	2015
Type	Neptune Eurocarrier 2611	Multiworker Twenty6	Damen
Length	26.5 m	26 m	27.7 m
Beam O.A.	11 m	10.5 m	12.5 m
Draught	2.6 m	2.5 m	2.9 m

B.3 VESSEL ROUTES

Indicative vessel transit routes between Hatston Pier and the test site are presented in Appendix figure B.3. The same route will be used for all phases of the deployment. Vessels will as far as possible avoid passing within 500 m of any identified designated seal haul-out site when in transit. Designated seal haul-outs with a surrounding 500 m buffer and suggested vessel routes in close proximity to the test site are provided in Appendix figure B.3.

All vessels operated by Mocean Energy and all marine contractors will adhere to the following measures from the Scottish Marine Wildlife Watching Code (SNH, 2017) to minimise disturbance to marine mammals and birds:

- Speed will be reduced to 6 knots when any marine mammals or birds are sighted within or near to transit routes, where consistent with crew and navigational safety and the completion of constrained operations.
- A steady speed and course will be maintained where possible if a marine mammal approaches a project vessel.
- Care will be taken to avoid splitting up groups and mothers and young.
- Minimum approach distances (as stated in the SMWWC) for vessels on approach to marine mammals and birds will be adhered to, although this may be varied according to species and circumstance.
- Sudden unpredictable changes in speed, direction and engine noise will be avoided to avoid disturbance to any marine mammals in the vicinity.
- Rafts of birds will not be intentionally broken up or flushed.
- During the seabird breeding season (April to August inclusive) vessel transit corridors will be at least 50 m from shore in the vicinity of cliff-nesting seabirds to avoid disturbance.



Appendix figure B.3 Transit Route

A designated Marine Operations Manager/Marine Superintendent is responsible for the discharge of relevant licence conditions whilst at sea. This will be Mocean Energy's Operations Manager, Yan Gunawardena.

APPENDIX C NAVIGATION AND LIGHTING PLAN

The proposed navigation and lighting arrangements are as follows:

1. Main WEC structure above waterline painted yellow
2. A mast or similar structure to be fixed to the WEC. At the top of the mast at a minimum height above waterline of 3.0 metres, a yellow flashing light with a characteristic of: Flash 1 every 5 seconds with a visibility of 3 miles
3. A passive radar reflector to be fixed on the mast
4. Close to the top of the mast below the light to be fitted with a yellow "St Andrews" cross special mark. The bars of the cross should be at least 75 cm long x 15 cm wide
5. An AIS transmitter appropriate for an AtoN (Aid to Navigation)

Note that there may be a requirement from the regulator for additional buoyage in the form of Cardinal marks and/or Special marks to mark the surrounding area.

Navigation warnings and communications plan

Navigation warnings will be communicated through Notices to Mariners (NtoM) to inform mariners of circumstances which affect the safety of navigation. It is the responsibility of the developer (Mocean Energy) to ensure that Notices to Mariners are issued. NtoM's will be disseminated as widely as possible and should include at least the following recipients:

- UK Hydrographic Office
- Maritime and Coastguard Agency (MCA) through the local MRCC (Shetland)
- Northern Lighthouse Board (NLB)
- Kingfisher Fortnightly
- Orkney Islands Council Harbour Authority
- RYA
- Orkney Fisheries Association
- Orkney Fishermen's Society
- Scottish Fisheries Federation

Notice to Mariners must be issued well in advance of any operations being undertaken to allow promulgation through the appropriate channels, and for the marine installation phase the NtoM may be required to be published in the local newspaper for at least two weeks prior to installation.

The NtoM should contain the following information:

- Details of works program including period & purpose
- Duration and start and stop dates
- Positions of maximum extent of projected works
- Details of lights, buoys and other navigational aids
- Proposed routes of vessels involved in installation (from port to site)
- Changes to existing routing measures/vessel movement
- Details of any areas to be avoided
- Vessels not involved in works with the device should avoid the area.
- Proposed positions of devices and other associated features on completion of works
- Instructions to vessels

- That vessels involved in the works will keep a listening watch on VHF Channel 16

The NtoM will be specific and kept concise bearing in mind that the information will be broadcast on radio by the local Harbour Authority.

NtoM's will be issued 14 days prior to the commencement of marine works. Once the installation is completed then the NtoM will be cancelled and an amended NtoM will be issued simultaneously to cover the operating period. Any further significant changes which may affect navigation will be dealt with by cancelling and re-issuing a NtoM such as the decommissioning phase. On completion of decommissioning and the site is cleared the NtoM will be cancelled.

APPENDIX D COMMITMENT S TABLE/REGISTER

To be completed following issue of Marine Licence.

Ref	Issue	Commitment or action	Responsibility	Timescales	Status

APPENDIX E RELEVANT MARINE LICENCE CONDITIONS

To be completed following issue of Marine Licence.