

WEDUSEA | OE Buoy

Project-specific Environmental Monitoring Programme

EMEC Billia Croo Wave Test Site

March 2026



Purpose

Mitigation and monitoring measures have been identified following a review of the project specific environmental impacts, taking into consideration the site-wide environmental description or environmental appraisal and associated guidance provided by EMEC. This document describes developer-identified mitigation, monitoring and management measures associated with the proposed project including any statutory reporting mechanisms. For a detailed description of the company, device, and project, please refer to the Project Information Summary.

Document History

Revision	Date	Description	Originated by	Reviewed by	Approved by
001	06/02/2023	Draft	AS (EMEC)	DL (EMEC)	SB (Ocean Energy)
002	22/05/2025	Revised Draft	AM (EMEC)	DL (EMEC)	SB (Ocean Energy)
003	10/07/2025	Final Draft	AM (EMEC)	DL (EMEC)	SB (Ocean Energy)
003 v2	10/09/2025	Final Draft with requested revisions	AM(EMEC)	DL(EMEC)	
003 v3	10/03/2026	Final draft post gap analysis	AM (EMEC)	DL (EMEC)	

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1 Technology

1.1 Device Overview

The OE Buoy is a full-scale floating oscillating water column (OWC) device that uses an air turbine, mounted on the deck to generate electricity for export to the grid.

The OE Buoy device is 32m long and 16m wide with a maximum draft of 9.8 m and constructed using around 550 tonnes of steel. The design schematic of the device is shown in Figure 1 and Figure 2 where the black portion of the device is below the waterline and the yellow part is above. The Buoyancy chamber, with a volume of 1,874 cu.m., houses the machinery space in a watertight environment with usable space of 1,500 cu.m to house electrical and ancillary equipment. The construction using steel results in a highly reusable material enabling the future Circular Economy after industrial roll-out.

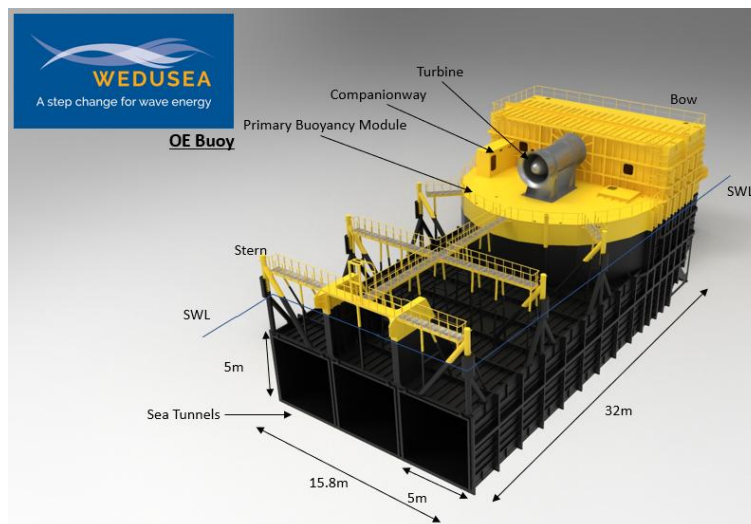


Figure 1. Design schematic of OE Buoy 1MW OWC



Figure 2. WETS OE Buoy being towed from Portland Oregon

2 Environmental Monitoring

The following sections describe the potential key environmental impact(s) considered relevant to the installation, operation, maintenance and decommissioning of the OE Buoy device at EMEC’s test site. Within the following sections is a summary of the proposed monitoring and mitigation measures relating to each potential impact pathway for the relevant project phase. Any key findings from the monitoring will be disseminated to the regulator, Marine Directorate, and appropriate advisors, e.g., Nature Scot.

2.1 Disturbance/Displacement

Increased anthropogenic activity within the marine environment can potentially cause changes in the behaviour of receptors, particularly sensitive receptors such as cetaceans, seals, basking sharks and marine birds. There is potential to cause spatial displacement of essential activities for certain species due to increased activity in the area. This is likely to be most prevalent during the installation phase when there will be marked increase in vessel traffic accessing the site. In order to determine the significance of such a potential impact, there is a requirement to understand the importance of the habitat and the availability of alternative habitat elsewhere. The frequency of the impact in terms of duration will also be crucial in determining the significance of the impact. As the proposed testing location at the Billia Croo test site is close to the coastline, bird species utilising coastal breeding sites may be affected by the increased vessel traffic in the area. In addition, there is the potential to affect birds foraging success or moulting, if the testing is located within a key foraging area or a moulting site. Vessels are only expected to be onsite for a maximum of one week in which device installation and vessel mooring removal should be completed. The temporary nature of the increase vessel traffic onsite is not expected to cause any significant impacts to seals, cetaceans, basking sharks and marine birds in the vicinity of the Billia Croo scale test site. Similar disturbance effects due to increased vessel traffic are expected on the decommissioning of the device.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within disturbance/displacement.

Table 1. Proposed monitoring and mitigation measures relevant to the impact pathway disturbance/displacement

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation			
Vessel activity – noise and presence may cause minor disturbance/displacement (including when transiting to and from site)	Cetaceans, seals, basking sharks, seabirds	Mitigation: Comply with the Scottish Marine Wildlife Watching Code (SMWWC), including the following measures: <ul style="list-style-type: none"> Steady course and speed throughout operation. Reduction of speed upon 	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
		sighting of receptor. <ul style="list-style-type: none"> • Minimum approach distances will be adhered to. • Sudden changes in speed, direction and engine noise will be avoided. • Vessel will maintain at least 50m distance from coast during seabird breeding season. Vessels will only be onsite for the minimum period of time required.	
Potential Installation of device and anchors – noise and presence may cause minor disturbance/displacement	Cetaceans, seals, basking sharks	Mitigation: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.
Operation			
Presence of device may cause very minor disturbance	Cetaceans, seals, basking sharks	No mitigation or monitoring is proposed	N/A
Decommissioning			
Vessel activity – noise and presence may cause minor disturbance/displacement (including when transiting to and from site)	Cetaceans, seals, basking sharks, seabirds	Mitigation: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.
Potential installation of vessel mooring – noise and presence may cause minor disturbance/displacement	Cetaceans, seals, basking sharks	Mitigation: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.

2.2 Acoustic impact

Noise disturbance can occur from the presence of vessels, drilling activities, anchoring, and survey activities. The creation of noise must be placed in the context of the existing environment, as other anthropogenic sources of marine noise may already be present within the area and mask the impact of any additional acoustic outputs. It is unlikely acute effects such as non-auditory/auditory tissue damage would be experienced as a consequence of the acoustic outputs from this project but behavioural effects due to disturbance are possible.

Noise disturbance effects may cause mobile species, such as cetaceans, seals and fish to move away from the immediate proximity of the installation site over the short term, but the impact is likely to be highly localised and temporary. Currently there is little known regarding importance of hearing underwater and hearing thresholds for diving birds but there is the potential for it to cause displacement, avoidance, reduction in foraging success or it may have no effect.

It is anticipated that the installation operation of the Device and moorings will be completed in as short a timescale as possible, therefore, it is not expected that any significant effects to marine mammals, fish or marine birds will result from the installation phase. Additionally, no piling is expected to occur within the project as a DEA has been selected. The same is true for maintenance and decommissioning operations.

As part of the Billia Croo section 36 conditions, EMEC will develop an Acoustic Monitoring Plan to be submitted to and approved by Marine Directorate. Any protocols outlined in this plan will be adhered to by the developer. This will be confirmed with Marine Directorate at least three months before any deployment.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within acoustic impact.

Table 2. Proposed monitoring and mitigation measures relevant to the impact pathway acoustic impact

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation			
Vessel activity – noise from increased activity will cause minor acoustic impact	Cetaceans, Seals, Basking Sharks	<p>Mitigation: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.</p> <p>Monitoring: Potentially monitoring noise using static and drifting passive acoustic recorders if funding is available.</p>	<p>Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.</p> <p>A report will be produced if the data collection is conducted.</p>
Operation			
Noise from device generating may cause minor acoustic impact	Cetaceans, Seals, Basking Sharks	<p>Monitoring: Potentially monitoring noise using static and drifting passive acoustic recorders if funding is</p>	<p>A report will be produced if the data collection is conducted</p>

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
		available. This will be in addition to 9 cameras on board	
Decommissioning			
Vessel activity – noise from increased activity will cause minor acoustic impact	Cetaceans, Seals, Basking Sharks	Mitigation: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.

2.3 Collision and Entanglement Risk

It is unknown whether the potential exists for cetaceans, seals and basking shark to become entangled in mooring/wire lines of the size and dimensions required to tow the device or moor the multicat vessels that will potentially be used during this operation. Dynamic Position (DP) vessels may also be used for the installation whereby no vessel mooring lines will be present. Entangled animals may drown or starve because they are restricted by mooring lines. It is assumed the mooring lines used within this project will not present a risk to diving seabirds. Marine mammals and basking sharks may suffer physical trauma and infections from a striking event involving vessels used during installation and decommissioning. In addition, entangled animals may also be unable to avoid vessels like they normally would, thus increasing the risk of collision. However, with lines under tension and the diameter of the ropes used being sufficient enough to deter entanglement, this is unlikely to occur.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within collision and entanglement risk.

Table 3. Proposed monitoring and mitigation measures relevant to the impact pathway collision and entanglement risk

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation and decommissioning			
Vessel collision with large marine organisms	Cetaceans, Seals, Basking Sharks	Mitigation: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.
Entanglement of large marine organisms in potential temporary boat moorings	Cetaceans, Seals, Basking Sharks	Mitigation: Mooring lines will be kept onsite for as short a period as possible.	Any events will be reported to the regulator as soon as possible on return to shore.

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
		Monitoring: Regular inspections of the device will include the hawser lines, and any instances of entanglement will be recorded and reported as soon as possible	
Entanglement with device tow lines	Cetaceans, Seals, Basking Sharks	<p>Monitoring: Potential for sensors, or cameras depending on funding available.</p> <p>Mitigation: Winching process is slow and infrequent, lines primarily taut.</p>	Any events will be reported to the regulator as soon as possible on return to shore.

2.4 Biofouling and non-native species (NNS) introduction

Biofouling is the settlement of biological organisms on man-made structures. Fouling is often a gradual accumulation of organisms which develops over time. Biofouling may consist of microorganism such as bacteria or protozoa or macro-organisms such as barnacles or seaweed. Once installed, the device, and associated anchors will be deployed onsite for an extended period of time. This period is expected to provide fouling species an opportunity to settle and grow to maturity. The spread of non-native organisms can occur through a variety of means including shipping, transport of fish or shellfish, scientific research and public aquaria. These invasive non-native species can threaten marine diversity. Various guidelines and standards have been referred to in developing the proposed mitigation and monitoring measures (IMO, 2011). It is anticipated that a certain level of biofouling will accumulate, although it is not expected to pose a significant risk to introducing non-native species as movements will be limited to UK waters only. However, the introduction of hard substrate into the marine environment may also act as a 'stepping-stone' for non-native species. A device may act as locations for non-native species to grow in the area and thus provide a stepping-stone for colonization. Detrimental impacts of non-native species on native biota can occur through competition, predation, herbivory, habitat alteration and disease.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within biofouling and the introduction/transfer of non-native species.

Table 4. Proposed monitoring and mitigation measures relevant to the impact pathway biofouling and introduction of non-native species

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation			

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Introduction of non-native species (via vessel or equipment)	Benthic species and habitats, and benthic fish and shellfish	Mitigation: Where possible & practical local vessel and equipment will be used, reducing the potential for introduction of NNS. Compliance with good practice measures.	Any deviance from the good practice measures will be reported.
Operation			
Accumulation of biofouling on devices and anchors may alter local ecosystem	Benthic species and habitats, and benthic fish and shellfish	Mitigation: Fouling resistant paint may be used (e.g., silicone based) but toxic (e.g., copper based) paint is not anticipated. The devices will be cleaned periodically.	N/A
Decommissioning			
Introduction of non-native species (via vessel or equipment)	Benthic species and habitats, and benthic fish and shellfish	Mitigation: Where possible & practical local vessel and equipment will be used, reducing the potential for introduction of NNS. Compliance with good practice measures.	Any deviance from the good practice measures will be reported.

2.5 Habitat Creation

The installation and physical presence of the device will inherently result in direct habitat loss. However, colonisation of the introduced structures may have the potential to function as artificial reefs or fish aggregating devices. The increase in the local reef extent may be limited due to the size of the device therefore diminishing the significance of this impact. This artificial substrate could alter the nature and composition of the species present and may enable non-native species to colonise and potentially spread to other areas.

Cetacean, seal and seabird distribution may be influenced by prey distribution and associated prey habitat. The physical presence of the device may offer enhanced foraging efficiency for some species.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within habitat creation.

Table 5. Proposed monitoring and mitigation measures relevant to the impact pathway habitat creation

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation			
Fish aggregation device (FAD) effect and colonisation of fouling organisms due to introduction of device	Benthic species and habitats, and fish and shellfish	No significant impacts are expected; therefore, no specific monitoring measures are proposed.	N/A
Creation of habitat around installed infrastructure	Benthic species and habitats, and fish and shellfish	Monitoring: There is a likelihood of reef effects around the device. There is no proposed monitoring measure however, when the opportunity arises, any video footage of the device will be analysed to quantify the level of reefing taking place.	Findings from analysis will be reported to the regulator as and when available.

2.6 Seabed Clearance

During the installation phase, the deployment of vessel moorings and device will cause a temporary loss of benthic habitat. Small amounts of lost habitat may diminish populations of species that are recorded as rare. However, the vessel moorings and device tend to have a small footprint and are temporary deposits.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within seabed clearance.

Table 6. Proposed monitoring and mitigation measures relevant to the impact pathway seabed clearance

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
All project phases			
Seabed clearance and habitat loss/disturbance from installation and removal of temporary vessel mooring equipment	Benthic species and habitats, and fish and shellfish	Mitigation: Drop-camera will be used during device installation and if any sensitive receptors are identified during installation, then these areas will be avoided through micro-siting of the device and	N/A

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
		lines/chains on the seabed.	
Installation of device causes damage to cultural heritage or archaeological objects within the site.	Cultural heritage and archaeological objects	Mitigation: The appropriate consultation with Historic Environment Scotland (HES) will be undertaken if cultural heritage or archaeological objects are found during this operation.	The regulator and HES will be consulted if any cultural or archaeological objects are found during the operation.
Potential scouring/habitat disturbance due to movement of temporary mooring lines	Benthic species and habitats, and fish and shellfish	Mitigation: Drop-camera surveys will be conducted during deployment and decommissioning	Any damage to the seabed will be reported to Marine Directorate and NatureScot.

2.7 Discharges to the Marine Environment

Benthic species may be exposed to materials such as paints, hydraulic fuels and antifouling compounds originating directly from the device. Accidental spillages from installation or maintenance vessels could also occur. Spillages pose a risk to marine mammals, fish, seabirds and benthic communities and can cause direct effects at the time of the spill or can result in chemical accumulation in body tissues leading to lagged effects on health and breeding success.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway for discharges to the marine environment.

Table 7. Proposed monitoring and mitigation measures relevant to the impact pathway discharges to the marine environment

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
All project phases			
Leakage of fuel or chemicals from vessels involved with installation, maintenance and decommissioning can enter the food-web at any trophic level.	Potentially whole local ecosystem	Mitigation: Vessel crews should follow standard procedures to avoid fuel and chemical spills. Suitable spill kits should be onboard all	Any incidents will be reported to the regulator as soon as possible.

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
		vessels involved in the project.	
Operation			
Corrosion of materials used to construct device introduce toxins to environment and disrupt ecosystem dynamics.	Potentially whole local ecosystem	Mitigation: N/A	N/A

3 Cultural Heritage Impacts

3.1 Prehistoric sites

Inferences can be made on the potential for the survival of prehistoric deposits in the area of Billia Croo from coring, bathymetric, side scan sonar (SSS) and sub-bottom profile (SBP) data obtained by various surveys in and close to the test site and observations made during numerous diving operations at various devices and in the general area by SULA Diving.

SSS surveys combined with data from SBP surveys and other studies indicate that there is a transition from exposed bedrock (inshore) to mobile sandy sediments around the 20-25 m contour. Surficial deposits in the area of the EMEC test site are predominantly mobile or featureless sand interspersed with intermittent glacial erratic's and patches of coarser sediment interpreted as glacial till deposits since they tend to correlate with areas of deeper sediment deposition and a change in seabed topography. Where present, deposits appear to be 1-10 m thick, overlying bedrock.

In summary, in the offshore lease area, the extension area, and the route to shore at Billia Croo (inshore lease area), the potential for the survival of prehistoric deposits is negligible-low, especially because most of the site is exposed bedrock, or mobile sediments comprising sandy gravels and gravelly sands.

3.2 Shipwrecks, aircraft and obstructions

No marine cultural heritage statutory designations have been identified in the Billia Croo test site area. The Penguin 1 device which currently sits on the seabed near Berth 5 is charted as an obstruction **by UK Hydrographic Office (UKHO) reports following its previous deployment and sinking**. However, there are no other existing wrecks within the area nor others shown on the relevant UKHO charts.

A total of fifteen shipwrecks were identified for this area. No exact wreck positions are known, but the records must be taken as indicative of the potential for wrecks (and artefacts) having been present in the area at some point in time. Considering the nature of the shoreline, the weather and sea conditions experienced along this coast, it is unlikely that the vessels remain intact and in the reported area of foundering, or that any remains survive. The majority of vessels lost in the area were wooden sailing ships stranded in the shallows and many are listed as being broken up and salvaged at the time. Those that came ashore in heavy weather were inevitably broken up by the sea on the rock-strewn coastline. Similarly, later vessels of iron construction were the result of stranding's and, given the exposed rocky nature of the

coastline and environmental conditions in the area, are not likely to remain intact unless buried in sediment

Multi-beam bathymetry and side scan sonar tend not to be able to distinguish between the wreck and the geology of the seabed. Magnetometry is the only method of determining if a wreck may be present. Given that the area is mostly exposed bedrock and any sediment being shallow and mobile, it is unlikely that much, if anything, survives and nothing has been observed during SULA Diving investigations in the area.

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