



**Draft Phase 1 Project-specific
Environmental Monitoring
Programme (PEMP)**

Version 4

Report to Tocardo Tidal Energy Ltd

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1 INTRODUCTION

1.1 BACKGROUND

Tocado Tidal Power (Tocado) is planning to deploy a Temporary Floating Structure (TFS) which will have a single T2 tidal turbine attached (275kW capacity) at the European Marine Energy Centre's (EMEC's) Fall of Warness tidal test site in March 2017. The device is anticipated to be operational for up to 18 months and will be sited at a temporary location within the test site, utilising Scotrenewables' SR250 cable. This Project-specific Environmental Monitoring Programme (PEMP) has been prepared to support the following necessary licence applications:

- Marine Licence under Marine (Scotland) Act 2010, Part 4 Marine Licensing;
- Licence to disturb marine species (EPS licence) under The Conservation (Natural Habitats) Regulations 1994; and
- Licence to disturb basking sharks (*Cetorhinus maximus*) under The Wildlife and Countryside Act 1981 and the Nature Conservation (Scotland) Act 2004 (W&CA)

This PEMP should be read in parallel with the Project Information Summary (PIS) (Tocado, 2017) which includes details of the proposal, and the project components.

1.2 CONTENTS OF THE PEMP

A draft of this PEMP will be submitted as part of all licence applications. The PEMP acts as a project-specific annex to the EMEC Fall of Warness Environmental Appraisal (EMEC, 2014¹). The PEMP addresses the environmental issues identified by the EMEC environmental appraisal, focusing on areas particularly relevant to the planned operations and installation activities of this deployment. This document details the proposed mitigation and monitoring measures for the deployment during all stages of the project including installation/construction, operation and maintenance (O&M) and decommissioning.

Tocado will update and improve this PEMP through consultation and as more data, information and experience is gathered. Tocardo is 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. Tocardo will also actively engage with other developers and stakeholders to address the key issues and uncertainties associated with tidal energy development through targeted research initiatives. It should be noted that this PEMP is for Phase 1 of the deployment, a separate PEMP will be produced in relation to Phase 2 (refer to PIS (Tocado, 2017)).

¹ EMEC, (2014) *EMEC Fall of Warness Test Site: Environmental Appraisal* [online] Available at: http://www.emec.org.uk/?wpfb_dl=168 Accessed 08 December 2016.



2 CONSTRUCTION METHOD STATEMENT

The Construction Method Statement (CMS) for the TFS device has been requested for submission with the PEMP. This chapter provides details of the activities proposed for installation, operation and decommissioning.

2.1 PROJECT OVERVIEW

The following activities are proposed:

- Construction and installation
 - Installation of gravity anchor support system and moorings;
 - Installation of TFS device;
 - Connection of umbilical cable to EMEC's subsea cable; and
 - Installation of scientific instrumentation (including Acoustic Doppler Current Profilers (ADCPs)).
- Operation and maintenance
- Decommissioning of device and equipment

The long term Phase 2 deployment will be addressed in a future separate PEMP which will be developed in consultation with Marine Scotland and Scottish Natural Heritage (SNH). A draft will be issued for comment at least three months prior to the commencement of Phase 2.

2.2 PROJECT LOCATION

The TFS device will be installed at a temporary location within EMEC's Fall of Warness tidal test site (Figure 2.1). This is in the southeast of the EMEC test site, and will utilise the ScotRenewables SR250 cable. The coordinates of the anchors and device are detailed within Table 2.1. The licence boundary required for installation of the TFS device is provided in * Anchors will be within the licence boundary, deposited anchor locations will be confirmed with Marine Scotland upon submission of the formal Table of Deposits.



Table 2.2. The precise location (within the licence boundary provided) will be determined prior to anchor installation. This flexibility in the installation location is required to ensure that no obstructions exist in proximity of the anchoring locations on the seabed. Coordinates will be provided to MS-LOT upon the completion of installation along with a Table of Deposits.

Table 2.1 Indicative coordinates of gravity anchors and TFS within the Fall of Warness*

	Latitude	Longitude
Anchor point 1	59°8.6786'N	2°48.4494'W
Anchor point 2	59°8.6971'N	2°48.3901'W
Anchor point 3	59°8.5000'N	2°48.2445'W
Anchor point 4	59°8.5183'N	2°48.1871'W
TFS	59°8.5975'N	2°48.3162'W

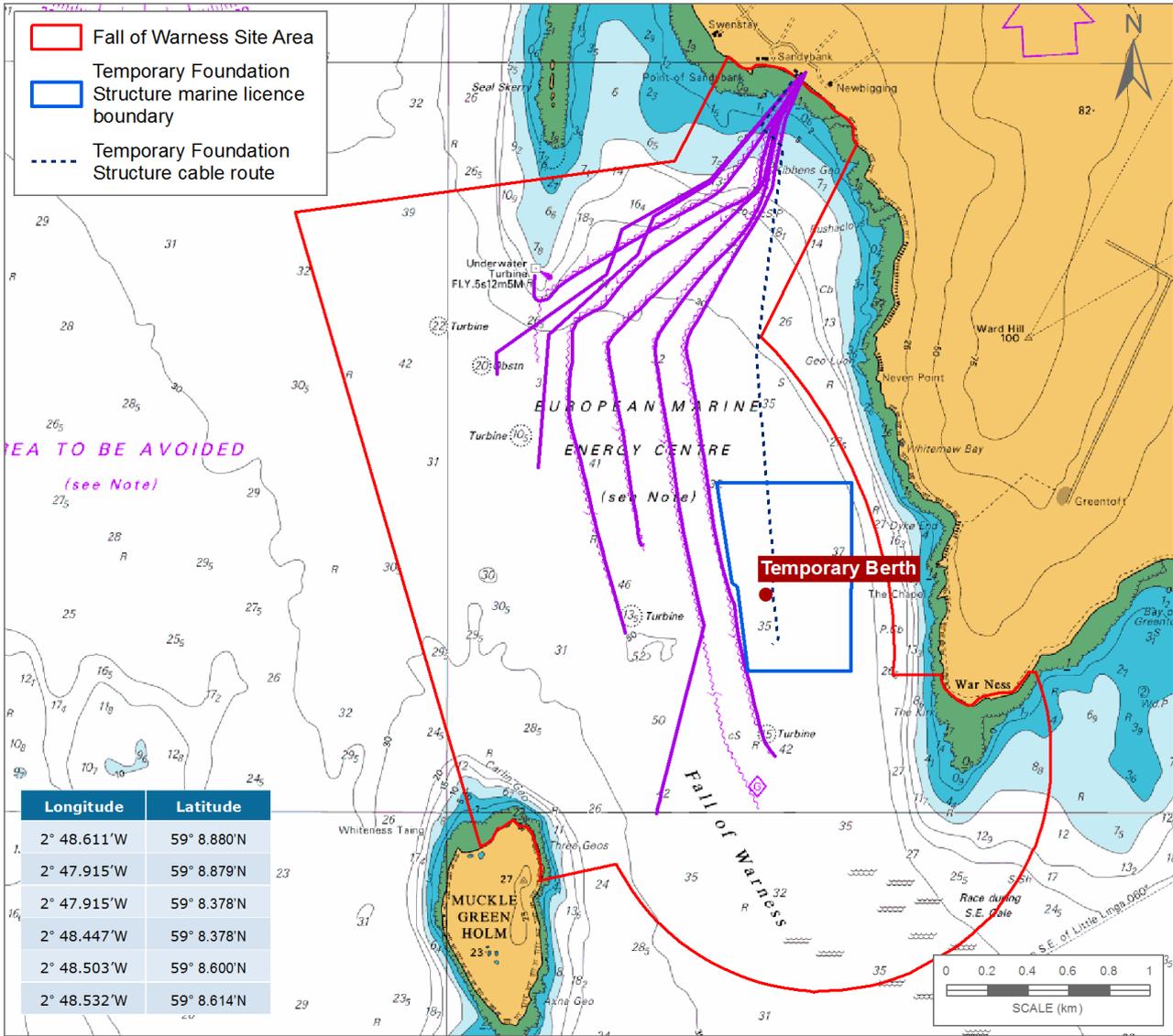
* Anchors will be within the licence boundary, deposited anchor locations will be confirmed with Marine Scotland upon submission of the formal Table of Deposits.



Table 2.2 Coordinates of licence boundary

Latitude	Longitude
59° 8.880' N	2° 48.611' W
59° 8.879' N	2° 47.915' W
59° 8.378' N	2° 47.915' W
59° 8.378' N	2° 48.447' W
59° 8.600' N	2° 48.503' W
59° 8.614' N	2° 48.532' W

Figure 2.1 Fall of Warness deployment site area and device locations and moorings



2.3 PROJECT SCHEDULE, TIMINGS AND COMMENCEMENT DATES

The anticipated installation, operations, maintenance and decommissioning schedule for the deployment are shown in Table 2.3. The anticipated date of installation of the device and its associated gravity anchors is February 2017. The operational period is anticipated to last for 12 months, with a maximum of 18 months, thereafter the TFS platform will be completely removed from site.

At all times, onsite works will be subject to EMEC's Permit to Work system, which is managed by EMEC to minimise any potential conflicts and maximise any opportunities that may arise.

Table 2.3 Anticipated installation, operations and decommissioning schedule

Activity	2017				2018	
	Q1	Q2	Q3	Q4	Q1	Q2
Installation of gravity anchors and mooring lines	*					
Installation of TFS	*					
Operations/Maintenance	*	*	*	*	*	
Removal of TFS					*	

2.4 TECHNICAL DESCRIPTION OF COMPONENTS

A technical description of each of the components to be deployed can be found in Section 3 of the Project Information Summary (Tocado, 2016).

2.5 OPERATIONAL PLANS AND METHODOLOGIES

2.5.1 Construction and installation

Installation of gravity anchors and moorings

For detailed installation plans please refer to the PIS and Construction Method Statement (CMS), the information here summarises the installation procedures relevant to environmental mitigation and monitoring.

The TFS device will be held in place using four gravity anchors consisting of steel chain inside a welded steel box (8m x 8m and weighing up to 100 tonnes each). Initially, installation of vessel moorings will take place over a period of two days to aid in the installation of gravity anchors. A standard multi-cat type vessel will be required for installation of the gravity anchors, which will be lowered to the seabed. The four-point mooring system will consist of nylon lines that run to ground chain which then attach to the gravity anchor. Each mooring line will be around 190m with the total mooring spread of the TFS device being 380m from end to end and 66m side to side. Installation of the gravity anchors for the device is expected to be completed in four days.

Before installation of the anchors, a temporary chain which is 20 tonnes in weight will be pulled along the seabed. The holding force is determined up to the moment where the chain starts to drag over the coarse sand. With this test, the accurate drag coefficient at that site is determined. With that coefficient in place, a safe amount of clump weight can be determined.

EMEC has confirmed that the anchors and moorings will not require any sea surface marker as the equipment will be placed on the seabed and will not pose a hazard to navigation.



The vessel spread required for installation is shown in Table 2.4. Further details of the vessels likely to be used for the deployment are provided in Appendix B.

Table 2.4 Vessels utilised for installation

Vessel type	Task
Multi-cat (x2) (see Figure 2.2)	The vessel will be used to transport and install the gravity anchors and to tow the TFS platform out to the site. The vessel will remain on site whilst the device is installed. A second multi-cat may be used to provide assistance
Workboat (see Figure 2.3)	The workboat is manoeuvrable around the site while the multi-cat is temporarily moored.
Rigid inflatable boat (RIB), or similar (see Figure 2.3 Example support vessel – Workboat US Ukmoor)	A RIB will be used to assist with the towing and installation of the device



Figure 2.4)

Figure 2.2 Example multi-cat vessel MV C-Salvor



Figure 2.3 Example support vessel – Workboat US Ukmoor



Figure 2.4 Example support vessel – rigid inflatable boat (RIB)

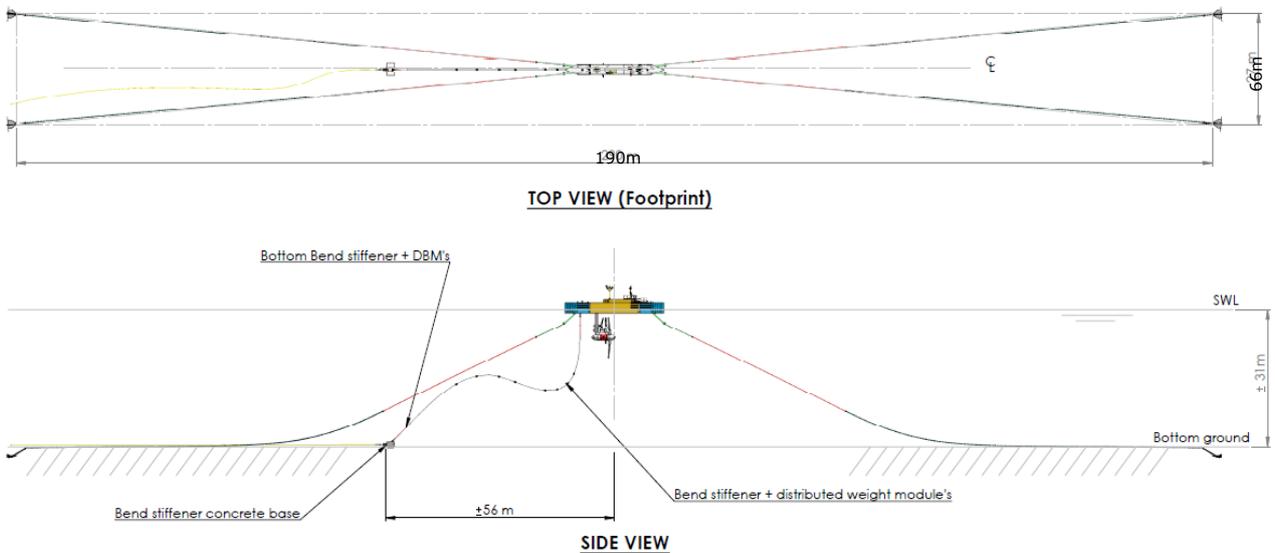


Device installation

Technical details of the TFS device can be found in Section 3 of the Project Information Summary (Tocado, 2017).

The TFS platform and T2 tidal turbine will be transported to Orkney via road for deployment at the EMEC Fall of Warness site. The TFS platform is easily assembled and deployed owing to its modularity and ability to be towed behind a standard multi-cat vessel. The T2 turbine will be attached to the TFS platform while still onshore at Hatston Pier. The device will then be crane-lifted into the water and then one multi-cat vessel will be used to tow the platform, assisted by a second multi-cat, workboat and small support craft such as a RIB, out to site. The mooring lines and umbilical cable will be attached at the surface. Installation of the TFS is expected to take 1 day.

Figure 2.5 Indicative mooring view of TFS, gravity anchors not shown here, but will be used (not to scale)



Connection of umbilical cable to EMEC's subsea cable

The EMEC electrical cables run from the sub-station on Eday to each berth location (refer to Figure 2.1). For this deployment the existing ScotRenewables SR250 electrical cable will be connected through a tail cable to the TFS device. Prior to the recovery of the existing cable end a pre-mobilisation ROV survey will be carried out to survey the cable and termination box. The cable end is fitted with a dry-mate wet connector which will then be raised to the surface and plugged into the end of the tail cable. The tail cable has the same specification as the subsea cable, but is supported by thick rubber bend stiffeners. The bend stiffeners prevent damage to the tail cable from bending, vibrations and inline tension. The tail cable is connected on board the TFS at the junction box.

The option currently being considered for connecting the tail cable with EMEC's subsea cable termination box is:

- Prepare subsea cable:
- Test cable first, and safe padlock the electrical works;
- Lift the export cable onto the vessel deck;
- Splice the cable and fit the dry-mateable connector;
- Connect the tail cable;
- Lower connector and cables to seafloor while holding the end of the tail cable;
- Hoist the end of the tail cable through the TFS; and
- Connect it.

As the cable is double armoured extra protection is not required. When hoisting and lowering cables, extra care has to be taken to prevent kinks and other damages.

The final task is to carry out a post installation ROV survey. This will include the recording of the precise position of the termination box as laid, debris clearing and demobilisation of all associated equipment. It is anticipated that the installation of the anchors will be completed in four days, the electrical connection in two days, and connecting the TFS device will be completed within one day. The TFS can be installed in conditions of Hs 0.5m and less than 1.5m/s tidal flow.

Installation of scientific instrumentation

It is planned to install and operate one or two Acoustic Doppler Current Profilers (ADCPs) similar to that shown in Figure 2.6. The ADCPs will be installed on the TFS device and mounted in a horizontal position. This allows Tocardo to examine the effects on water currents up and downstream of the device. No seabed mounting is required.

Figure 2.6 Typical ADCP



2.5.2 Operations and maintenance

Technical monitoring of the project components will occur remotely by equipment installed on the TFS platform and T2 turbine. However, Tocardo may deploy an ROV to inspect the device and its anchors at some stage during the deployment period. Pitch and roll, which are relative to the water current direction, can be extracted from the ADCP measurements. A GPS module monitors the exact position of the TFS. Monitoring the GPS location and the power output of the turbine directly indicates the mooring line integrity.

During the operational phase Tocardo will monitor the device and carry out any necessary maintenance. During this time the full spectrum of demonstration testing will be undertaken. A monitoring system will provide signals about vibrations, temperature and possible internal leakages of important components of the turbine unit. Tocardo will benefit from their previous experience with monitoring procedures gained during operation of T2 turbines at the Eastern Scheldt storm surge barrier and on the TFS platform in the Wadden Sea near Texel in the Netherlands.

Removal and inspection of scientific instrumentation, mooring lines, electrical cables and umbilical cables/data connections are required for up to 18 months after the deployment.

Planned and unplanned maintenance is expected throughout 2017 and 2018 (detailed in Table 2.5 Planned and unplanned visits to TFSTable 2.5). It is envisaged that the device may be removed, and visited multiple times during that period.

Table 2.5 Planned and unplanned visits to TFS

	Planned/unplanned	Frequency	Max Hs
On board inspection	Planned	2 times	0.5m
Public relation visits	Planned	2-6 times	0.5m
Inspection mooring lines and anchors with diver or ROV	Unplanned	Once	1.0m
Removal upon significant damage	Unplanned	Once	1.5m

Retrieval of the device will follow the reverse of the installation method as presented here. The TFS device will be detached from its moorings and subsea-cable, and towed back to port. The device will then be redeployed utilising the same method of installation as outlined in Section 2.5.1.

2.5.3 Decommissioning

Decommissioning will involve the retrieval of the TFS device and will be a reverse of the installation procedures outlined in Section 2.5.1. The TFS device, its mooring lines and gravity anchors will be removed from site within 18 months of deployment. The existing subsea cable will remain in situ and is the responsibility of Scotrenewables under a separate Marine Licence and Decommissioning Plan.

Tocado will submit a draft decommissioning plan including the TFS, to accompany the marine licence application.



3 MITIGATION AND MONITORING PLAN

3.1 DESCRIPTION OF RECEPTORS AND POTENTIAL RESIDUAL IMPACTS

A review of the EMEC Fall of Warness Test Site Environmental Appraisal identified a number of potential residual impacts that are considered relevant to the proposed deployment. Navigational impacts associated with device deployment will be discussed within the Device-specific Addendum to the EMEC Tidal Energy Test Site Navigational Risk Assessment (Tocado, 2017). These impacts and proposed mitigation/monitoring measures are outlined and described within the context of the proposals in Table 3.1.



Table 3.1 Residual impacts and mitigation/monitoring measures

Potential residual impact	Receptor	Summary of impact	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 (seaducks, divers)	The TFS device and gravity anchors will be installed using one standard multi-cat work vessel, assisted by a second multi-cat, workboat and a RIB. Installation activities will be completed over 7 days, therefore, no significant effects on any sensitive species are expected from this low level of vessel activity.	<p>Adherence to SMWWC</p> <p>Relevant measures from the Scottish Marine Wildlife Watching Code (SMWWC) will be implemented by Tocardo and all marine contractors. These will include:</p> <ul style="list-style-type: none"> • 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. Specifics will be agreed with SNH and listed in the CEMD and implemented. • 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 50m from shore in the vicinity of cliff-nesting seabirds to avoid disturbance. <p>Reporting</p> <p>Compliance with and any deviations from these measures will be reported in the first Environmental Monitoring Report which will be submitted four weeks after device commissioning.</p>



Potential residual impact	Receptor	Summary of impact	Proposed mitigation and monitoring measure(s) and reporting
			<p>Vessel Management Plan</p> <p>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 (refer to draft VMP in Appendix B).</p> <p>Reporting</p> <p>The Vessel Management Plan will be maintained throughout the project. Any changes will be agreed in advance with Marine Scotland.</p>
Introduction of marine non-native species (MNNS) (via vessels, devices or other equipment)	Benthic species and habitats Benthic fish and shellfish	Local vessels which follow good practice measures will be used, therefore there is very low potential for introduction of MNNS via vessels. The TFS and T2 tidal turbine have previously been installed in the Wadden Sea, however they will be removed from this location and cleaned before being transported by road to Orkney. No new antifouling will be applied. Therefore, the risk of introduction of MNNS is considered to be very low and no significant impacts are expected as a result of the proposals.	<p>Implement industry good practice measures</p> <p>Good practice measures as detailed in Alien Invasive Species and the Oil and Gas Industry² 2011 Guidelines for the Control and Management of ships' biofouling to minimise the transfer of invasive aquatic species³. Code of Practice on Non-native Species⁴ will be implemented including:</p> <ul style="list-style-type: none"> • Maintain a Biofouling Management Plan, which includes details of: <ul style="list-style-type: none"> ○ Antifouling paints used ○ Biofouling inspections ○ Removal of biofouling ○ Waste management • Removal of any biofouling in the area of its origin before deployment of the TFS device at EMEC. • Use anti-fouling paints that comply with AFS convention and national legislation suitable for the specific application. The anti-fouling on the device presently (Intersleek 1100-SR-PIC) is conforming this legislation and convention.

² Available at: <http://www.ipieca.org/publication/alien-invasive-species-and-oil-and-gas-industry>

³ Available at: <http://www.imo.org/en/OurWork/Environment/Biofouling/Documents/MEPC.1-Circ.792.pdf>

⁴ Available at: www.scotland.gov.uk/Resource/0039/00393567.pdf



Potential residual impact	Receptor	Summary of impact	Proposed mitigation and monitoring measure(s) and reporting
			<ul style="list-style-type: none"> Undertake maintenance to ensure integrity of paint coverage <p>Reporting: A Biofouling Management Plan will be submitted along with the first Environmental Monitoring Report, four weeks after device commissioning.</p>
Habitat creation and fish aggregation device (FAD) effects due to introduction of new structures	Benthic species and habitats Fish and shellfish (gadoids and crustaceans)	It is likely that fish will aggregate around the device during slack water and periods of lower tidal flow. No significant effects are expected and no specific mitigation or monitoring measures are proposed.	No specific mitigation or monitoring is proposed in relation to this impact during the deployment and operation of the TFS and single T2 turbine. Tocado will contact ORJIP Ocean Energy to engage the programme's Steering Group and Network to identify other/additional potential opportunities to undertake strategic research around the device. Tocardo would welcome any support in these endeavours from Marine Scotland and SNH.
Operation and maintenance			
Underwater noise from turbine operation leading to disturbance	Cetaceans Seals Basking sharks	There is no risk of injury or death from underwater noise generated by operating turbines. Tocado do not plan to monitor noise from the TFS device, however, in a subsequent deployment at the same site in which a device with 5 turbines will be installed, the noise signature will be determined using a methodology that will be agreed with SNH and Marine Scotland. Further information on this will be provided in a separate future PEMP for Phase II. Results from this study will be provided to Marine Scotland and SNH upon completion.	Tocado propose to monitor the noise signature of a separate device planned for deployment in 2018. Monitoring of noise from the TFS device is not considered appropriate as it only has one turbine and will only be on site for up to 18 months. The ability to characterise the noise signature of the long term device is considered more useful for reducing scientific uncertainty. It is recognised that quality acoustic data from the operation of single devices is necessary to inform EIA and HRA for larger scale projects. Tocardo would welcome any additional acoustic research by interested parties around the device during its operation at EMEC.
Entanglement in mooring lines or cables leading to	Cetaceans Basking shark	A study commissioned by Scottish Natural Heritage (SNH) concluded that moorings associated with marine renewable energy devices are unlikely to pose	Through the GPS location and orientation, the measured loading on the turbines, and the ADCP data, the status of the device is monitored. This will allow Tocardo to immediately determine if any changes or failures in the



Potential residual impact	Receptor	Summary of impact	Proposed mitigation and monitoring measure(s) and reporting
injury or death		<p>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 baleen whales⁵ due to their large size and foraging habits (Benjamins <i>et al.</i> 2014).</p> <p>No anticipated significant impacts are expected from the presence of four mooring lines and a single cable.</p>	<p>moorings occur, allowing any necessary inspections/ maintenance to be undertaken as soon as possible.</p> <p>Safety alarms are programmed to notify emergency response personnel through text messages and emails. Tocardo and its assigned emergency response contractor (Orkney based) will receive these messages and act according to the ERP procedures.</p> <p>Reporting</p> <p>Any notable events will be recorded and reported to Marine Scotland no later than 24 hours after observation.</p>
Presence of tidal device and associated infrastructure leading to barrier effects	Cetaceans Seals Basking sharks	<p>The presence of an additional single floating device with one turbine, within the Fall of Warness test site is not expected to result in any significant barrier effects for marine mammals or basking sharks.</p> <p>The EMEC Fall of Warness Test Site Environmental Appraisal (EMEC, 2014) considers the maximum-case scenario of multiple devices deployed at the site, where all available berths within the test site are developed and operating at capacity. The proposed device deployment falls within the project envelope description detailed in Annex 1 of the Environmental Appraisal.</p> <p>The Environmental Appraisal concluded the potential for any barrier effects on cetaceans, seals and basking sharks at the Fall of Warness is low and not considered to be significant at a population level.</p>	<p>No specific mitigation or monitoring is proposed in relation to this impact.</p>
Changes to hydrodynamics and sediment regime	Hydrodynamic and physical processes	<p>No important impacts of relevance to hydrodynamics or physical processes are expected from developments at Fall of Warness.</p>	<p>No specific mitigation or monitoring is proposed in relation to this impact.</p>

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



Potential residual impact	Receptor	Summary of impact	Proposed mitigation and monitoring measure(s) and reporting
<p>Collision with turbine blades leading to injury or death</p>	<p>Cetaceans Seals Basking sharks Marine birds (diving species e.g. seaducks, cormorants and shags, auks) Diadromous fish, gadoids</p>	<p>Tocado are proposing to deploy a single device with one rotor which poses a possible risk to marine mammals in the area. The project is within a designated test facility.</p>	<p>To date, no collision events have been recorded during monitoring around operating tidal turbines at EMEC or indeed at any other tidal turbine deployment. It is recognised however, that monitoring and analysis to date has not yet reached a level to reduce uncertainty around this perceived risk. It is further recognised that quality data around this issue is necessary to inform EIA and HRA for future tidal energy projects.</p> <p>To further reduce uncertainty around this issue, fully automated and integrated collision monitoring and data analysis systems are required. It is hoped that these will be further developed through existing strategic research initiatives including the Scottish Government’s Demonstrator Project at MeyGen’s Inner Sound site during 2017.</p> <p>In the absence of cost effective, fully integrated collision risk monitoring systems, combinations of existing instruments, software packages and extensive long-term analysis would be required to detect any potential collision events. This type of near field monitoring would still be highly unlikely to provide data to better inform understanding of evasion and avoidance behaviour which is critical to reducing uncertainty regarding collision risk or data to improve collision risk models to inform EIA/HRA for future projects.</p> <p>No specific mitigation or monitoring is proposed for this Phase 1 deployment. This will be agreed with SNH and approved by MS-LOT prior to commissioning of the device. This PEMP is for Phase 1. A separate PEMP and associated monitoring plans for Phase 2 will be developed in consultation with MS-LOT and SNH.</p> <p>Tocado will contact ORJIP Ocean Energy to engage the programme’s Steering Group and Network to identify other/additional potential opportunities to undertake strategic research around the device. Tocardo would welcome any support in these endeavours from Marine Scotland and SNH.</p>



Potential residual impact	Receptor	Summary of impact	Proposed mitigation and monitoring measure(s) and reporting
			<p>Furthermore, Tocado would welcome any additional research by other interested parties around the device during its operation at EMEC; particularly around avoidance and evasion behaviour.</p> <p>Tocado will endeavour to undertake research, as detailed within the Supplementary Research Plan (Appendix A).</p>
Electromagnetic field (EMF) effects	Diadromous fish, gadoids and elasmobranchs	EMF effects are not expected to be a significant issue for a single device and a single 41mm diameter electrical cable.	No specific mitigation or monitoring is proposed in relation to this impact.



4 APPENDICES

APPENDIX A SUPPLEMENTARY RESEARCH PLAN

Tocado will actively pursue opportunities to undertake and facilitate strategic environmental research around the device and the wider test site during the project and will work closely with Marine Scotland and Scottish Natural Heritage to develop any research plans. Furthermore, Tocado would welcome any additional research by other interested parties around the TFS device during its operation at EMEC; particularly around avoidance and evasion behaviour.

Topics of particular interest include:

- Near-field monitoring to inform collision risk assessment and to gather information on wildlife behaviour around operating turbines;
- Further development of instrumentation and methodologies for detecting potential collision events around operational tidal turbines and arrays; and
- Establishment of an acoustic 'evidence base' for operational devices and arrays.



APPENDIX B VESSEL MANAGEMENT PLAN (VMP)

B.1 INTRODUCTION

This VMP details the type and number of vessels that will be used during the installation, operation and maintenance and decommissioning of Tocado's TFS deployment at EMEC's Fall of Warness test site. It also highlights the likely ports and transit routes that will be used during all phases of the deployment.

B.2 VESSEL DETAILS

Deployment of the TFS gravity anchors and device will be undertaken using a multi-cat vessel assisted by a support vessel such as a second multi-cat, a workboat and a RIB. The multi-cats are likely to be (or similar to) the MV C-vessels shown in Figures B.1-B.4 and a typical RIB is shown in Figure B.5. Vessel information is provided in Appendix table B.1.

Appendix Figure B.1 Example multi-cat vessel MV C-Salvor



Appendix Figure B.2 Example multi-cat vessel MV C-Odyssey



Appendix Figure B.3 Example multi-cat vessel MV C-Chariot



Appendix Figure B.4 Example support vessel – Workboat



Appendix Figure B.5 Example support vessel – rigid inflatable boat (RIB)



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. Tocardo will confirm the project vessel spread with Marine Scotland at the earliest possible opportunity prior to works commencing as required (as per normal maintenance activities).

Appendix table B.1 Vessel information

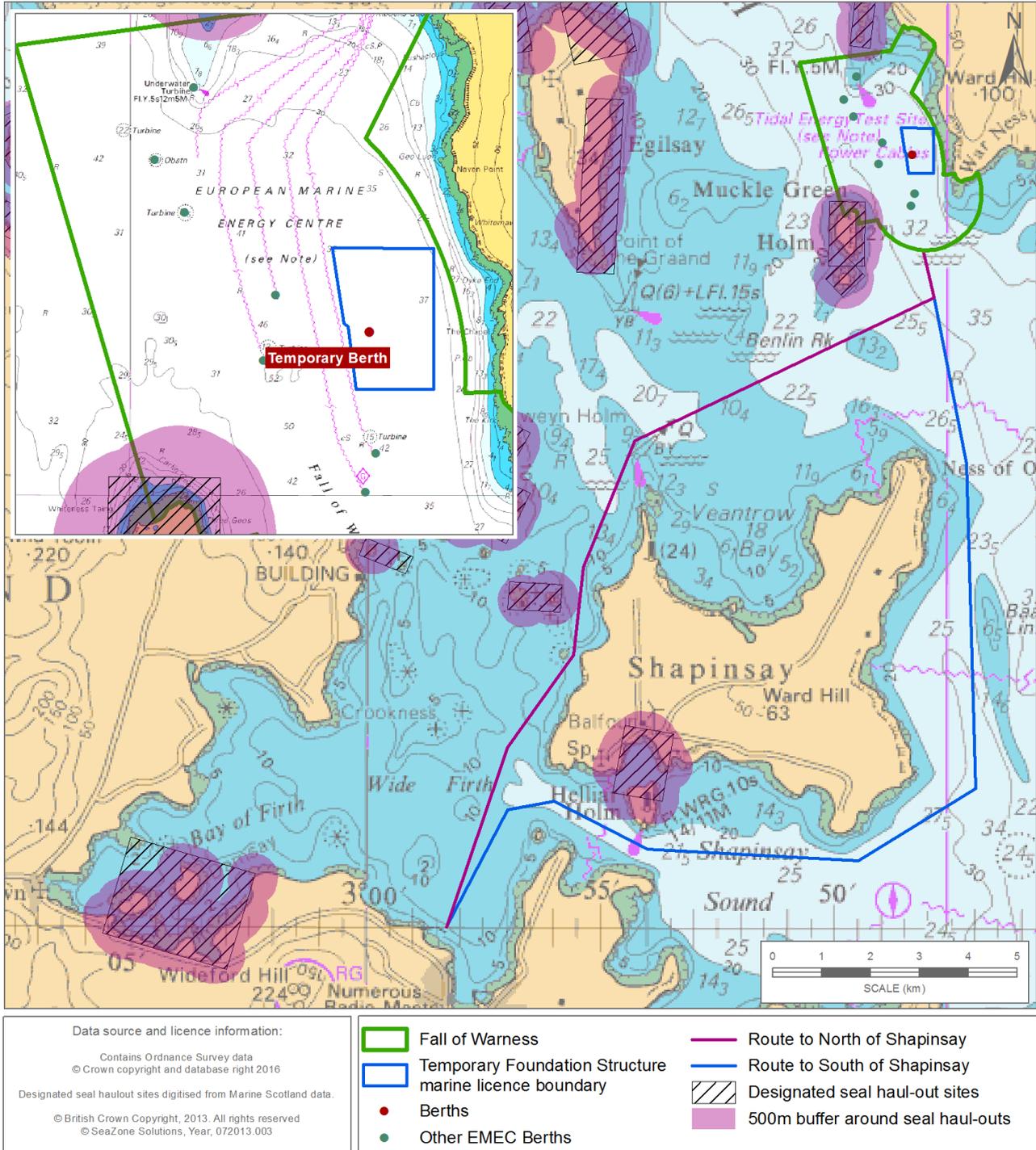
	MV C-Salvor	MV C-Odyssey	MV C-Chariot	US Ukmoor	Parker Baltic
Flag state	UK	UK	UK	UK	TBC
Port	Kirkwall	Kirkwall	Kirkwall	Kirkwall	TBC
Year of build	2011	2011	2014	1984	TBC
Type	Multiworker (MCA Workboat class 2)	Multiworker Twenty6 (MCA Cat 1)	Multiworker (MCA Cat 1)	Workboat (MCA Cat 2)	Rigid Inflatable Boat
Length	23.3m	26m	23.8m	16m	7.50m
Breadth	9.5m	10.5m	9.6m	5.5m	3.16m
Draught	2.3m	2.5m	2.25m	1.5m	1m

B.3 VESSEL ROUTES

Vessels are likely to use ports at Hatston in Kirkwall and Kirkwall Harbour. The transit routes between these ports and the test site are shown in Appendix Figure B.6. Vessels will avoid passing within 500m of any identified seal haul-out site when in transit. Seal haul-outs with a 500m buffer and suggested vessel routes in close proximity to the Fall of Warness test site are provided in Appendix Figure B.6.



Appendix Figure B.6 Transit routes to site and seal haul-outs with 500m buffer



A designated Marine Operations Manager/Marine Superintendent is responsible for the discharge of relevant licence conditions whilst at sea. Tocardo is in the progress of appointing one.



APPENDIX C COMMITMENTS TABLE/REGISTER

Appendix table C.2 Commitments register

Ref	Issue	Commitment or action	Responsibility	Timescales	Status
1	Marine Operations	Detailed method statements to be applied throughout and a marine coordinator with significant experience will be employed to oversee the operation. Where practicable vessel crews will have experience of Orkney or similar waters. Vessels to be checked for sound status before hire; cleaned of any bulk or deck contaminants and will follow good maritime practice at all times.	Tocado	Contractor selection, mobilisation & operation	Ongoing
2	Communications	Ensure communication systems are clear and do not interfere with local marine communications systems.	Tocado	Design	Ongoing
3	Environmental Incidents	Oil spill contingency plans will be drafted and adhered to in the event of an incident.	Tocado	Design Installation and operation phases	Ongoing
4	Materials and emissions	Where practicable limit fuel use and minimise engine exhaust emissions.	Tocado	Installation and operation phases	Ongoing
5	Device marking and notice to mariners	The device will be charted in accordance with UKHO requirements and all relevant notices to mariners will be issued by developers as per EMEC SOP063.	Tocado	Design Installation and operation phases	Ongoing
6	Mitigation of potential environmental impacts	<p>The following mitigation measures will be applied prior to, during and following all relevant works:</p> <p>Transportation of the TFS device to deployment site via road, to mitigate risk of biofouling.</p> <p>Monitoring the status of the device with sensors 24/7, to immediately determine if any changes or failures in the moorings occur, allowing any necessary inspections/maintenance to be undertaken as soon as possible.</p> <p>Vessel transit routes will not enter within at least 500m of any seal haul-out sites wherever possible.</p> <p>The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to wherever possible.</p>	Tocado	All phases	Not started



Ref	Issue	Commitment or action	Responsibility	Timescales	Status
7	Survey and monitoring of potential environmental impacts	The following monitoring measures will be applied prior to, during and following all relevant works: Installation of GPS sensors onto the device to allow Tocado to immediately determine any changes/failures in the mooring system.	Tocado	Installation and operation	Ongoing
8	Reporting	The following reports/documents will be prepared and submitted for consultation and review: Table of deposits (form FEP5) following installation and device commissioning Environmental Monitoring Report 28 days after device commissioning	Tocado		
9	Contingency planning	Develop emergency response plans in accordance with EMEC ERP procedures.	Tocado	Design	Ongoing
10	Local contracting	Where appropriate skills and services are available locally, every effort will be made to work with local companies and to develop ongoing support capacity for tidal energy operations in Orkney	Tocado	Contractor selection	Ongoing

Note: Mitigation measures specific to navigation risks are included in the Device-specific Addendum to the EMEC Tidal Energy Test Site NRA (Tocado, 2017).



APPENDIX D RELEVANT MARINE LICENCE CONDITIONS

TBC FOLLOWING DETERMINATION

