EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

Shapinsay Sound Scale Test Site Test Support Buoy:

Marine Licence Application – Supporting Documentation

November 2020




Document History

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1 Introduction

Established in 2003, The European Marine Energy Centre (EMEC) Ltd is the first and only centre of its kind in the world to provide developers of both wave and tidal energy converters with purpose-built, accredited open-sea testing facilities. In addition to EMEC's grid-connected sites, EMEC offers real-sea test sites in the less challenging conditions of Scapa Flow and Shapinsay Sound. These sites provide a more flexible sea space helping close the gap from tank testing and acting as a stepping-stone towards larger scale projects. Such accessible real sea testing enables marine energy developers and suppliers to learn lessons more cheaply, reducing the need for large vessels.

The scale sites are suitable for, but not limited to, the following testing activities:

- Device testing
- Component testing
- New tools, techniques and supply chain solutions
- Monitoring corrosion, biofouling and acoustic instrument packages
- Anchoring, cabling, subsea hub and wet-mate connectors
- Installation tests
- Rehearsal activities
- Testing ROVs and vessel activities
- Operation and maintenance tests
- Training
- Health and safety procedures
- Decommissioning trials
- Research projects

EMEC has various infrastructure available to facilitate testing activities. Bespoke test support buoys can be provided, allowing developers to dissipate electricity generated by their devices and record data. Pre-installed anchor points provide mooring options, and an area of seabed is available for rehearsal or deployment of other tools and techniques. Each test site comprises one berth with pre-laid foundation and attachment points. The pre-laid foundations comprise 5m x 5m x 2m gravity-base frames loaded with densecrete blocks for equipment moorings.

Figure 1. EMEC's test support buoy

This document has been developed to support a marine licence application, under the Marine (Scotland) Act 2010, for the temporary deployment of a test support buoy (TSB) when required and associated moorings. Although the TSB only required three moorings, this licence will also cover a fourth mooring for the purposes of testing novel designs when required.

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2 Site description

EMEC's non-grid connected scale test sites are situated adjacent from the Orkney mainland.

2.1 Shapinsay Sound tidal test site

The Shapinsay Sound tidal test site is located offshore from Head of Holland along the south coast of Shapinsay Sound. The significant wave height can reach 2.47m with an average of 0.38m. The site has water depths of between 21-25m and a typical tidal flow of 1.1m/s during spring tides and 0.4m/s during neaps. The area of the test site is approximately 0.36km^2 (0.4km x 0.9km).

2.1.1 Location

The scale test site is situated offshore from Head of Holland along the south coast of Shapinsay Sound. Table 3 provides the coordinates of the boundary corners of the site.

Table 1. Boundary coordinates (WGS 840 for Scapa Flow scale test site

Test Site	Corner A	Corner B	Corner C	Corner D
Shapinsay Sound	**59° 00.45'N**	**58° 59.72'N**	**59° 00.20'N**	**59° 00.00'N**
	002° 53.35'W	**002° 52.05'W**	**002° 51.75'W**	**002° 53.56'W**

Figure 2 below shows the location and depth range of the test site. The area within the dark blue rectangle is leased by EMEC from the Crown Estate Scotland for the purpose of operating the scale test site. This marine licence application is for the continued deployment of EMEC's infrastructure within the boundaries of this area.

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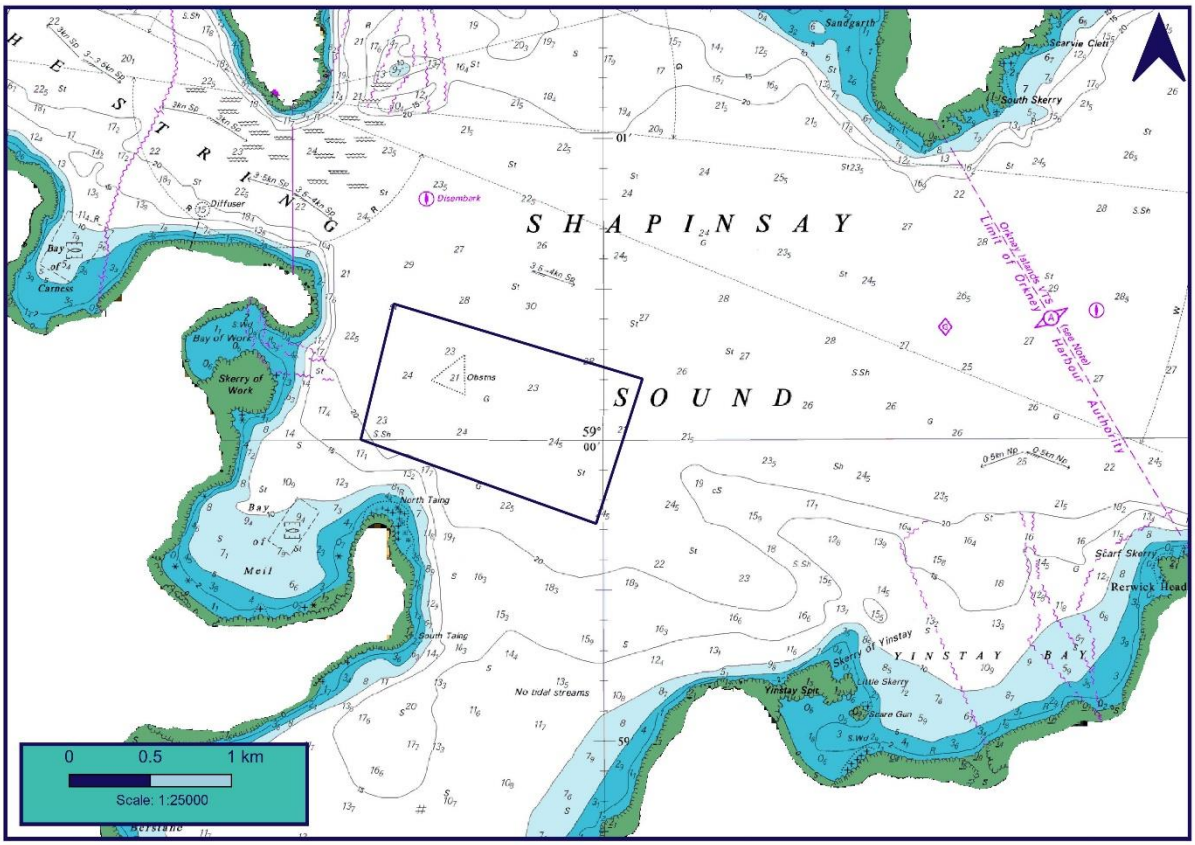

Figure 2. Shapinsay Sound scale test site (marked in dark blue)

2.2 Facilities

The scale test sites offer flexibility to the developers allowing the developers to choose between the following possibilities:

- Use of the leased area, providing own moorings and means of power dissipation
- Use of the leased area and EMEC moorings but providing own power dissipation
- Use of the leased area, EMEC moorings and EMEC test support buoy

2.3 Proposed marine licence boundary

The following figure (Figure 3) shows the proposed marine licence boundary outlined in red and the site boundary outlined in blue.

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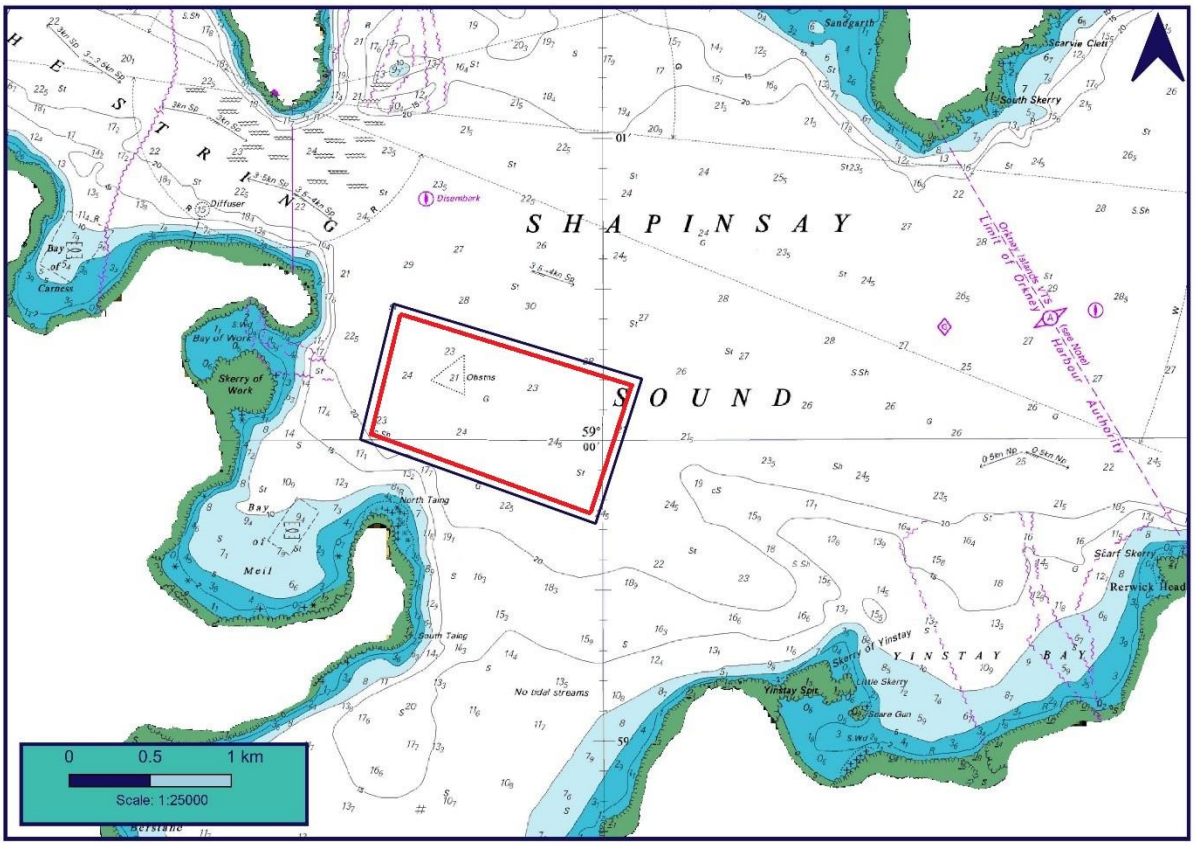

Figure 3. Shows proposed marine licence boundary (red boundary) and site boundary (blue line)

2.3.1 Test support buoy

The test support buoy (TSB) can be connected to a test device or equipment to aid power transmission and control and communications. It is a 7m diameter, 2m high structure which serves three key purposes, which are as follows:

- Equipped to supply power but can also act as a power sink to allow load-dumping of any electricity generated by the device under test as heat dissipated to air;
- Enables measurement of device performance and facilitates data transfer to shore via wireless technology allowing developers to monitor performance remotely;
- Enables testing of novel mooring designs; and
- Equipped to act as a navigational aid when present on the site.

EMEC have two TSBs, one for each of its scale test sites. The TSBs can be deployed to support a developer's testing programme (there may be occasions when a developer does not require the services of the TSB when testing their device). The TSB can also be used to test novel mooring designs. It may also be necessary to install the TSB in advance of a device being deployed on site. Deployments and infrastructure present at the site will be promulgated to other mariners through the usual mechanisms e.g. Notice to Mariners, updating of UK Hydrographic Office charts.

2.4 Deployment

It is expected that this licence will cover all TSB deployments for a period of 5 years. During these five years, the TSB will be deployed and removed from site as and when required. Marine Scotland will be informed of any plans to deploy the TSB through submission of a

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Project Information Summary (PIS) which will include all relevant information. Standard procedures will also be followed by EMEC and the marine contractors when carrying out works on-site (e.g. Notice to Mariners).

Deployment of the TSB would be expected to take place over a one day time period. A multi-cat vessel would transport and deploy the TSB via a lifting mechanism. The multi-cat vessel would depart from Stromness harbour or Hatston pier and would take all necessary precautions as listed in the Environmental assessment. For removal, it would be the reverse of installation.

This PIS will also cover the soonest expected deployment of the TSB which will be to support testing of a novel mooring design scheduled for January 2021.

2.5 Moorings

If no additional moorings are required, the TSB will use three individual chain moorings attached to three individual GBAs.

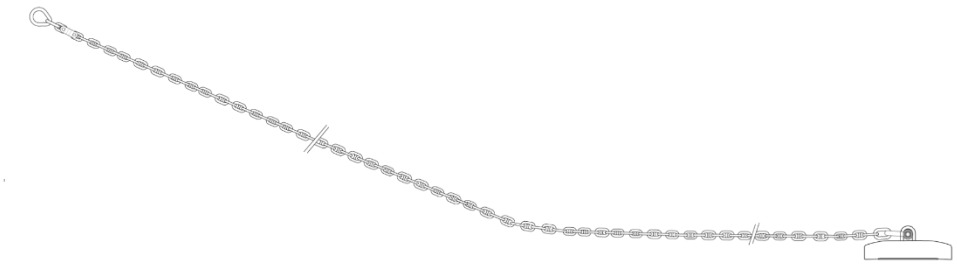

Figure 4. Typical mooring line configuration for the TSB

Table 2. List of materials associated with TSB mooring line

Components:	Qty:
ø=24mm, Pear link	1
H-Link DN24mm	1

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ø=24mm, L=104 m, Studlink Chain Section	1
ø=24mm, End link	1
Gravity Base Anchor (covered by another licence)	1

2.6 Additonal moorings

As mentioned previously, the TSB can be used for testing novel mooring designs. The TSB is typically anchored to three permanently installed GBAs, while a fourth GBA must be installed temporarily to accommodate novel mooring testing. All GBAs are covered by another licence. This means that there could be either three or four moorings associated with the TSB deployment. Marine Scotland will be informed before each deployment as to the number of moorings associated with the TSB. If testing a novel mooring concept, specifications will be submitted to Marine Scotland before deployment, and further consultation may be required before deployment.

This PIS will also cover the soonest expected novel mooring testing, TFI Marine, which is scheduled for January 2021.

2.6.1 TFI Marine

TFI Marine have developed a taut mooring solution incorporating its innovative elastomeric tethers to produce a more silent mooring system. The elastomers are designed to elongate by up to 150%, millions of times annually. TFI Marine plans to test their flagship product, the D400, at Shapinsay Sound by incorporating it into an additional chain mooring. The testing period is scheduled for January 2021 although this could be delayed slightly. The testing period is expected to last 6-12 months which should be enough time for TFI Marine to validate their modelling. The mooring configuration is shown in Figure 3 and Table 2 lists the materials associated with this mooring line.

The fourth mooring line associated with the D400 will also have three 5t clump weights as this mooring line will be taking a higher proportion of the load.

The mooring line on which the TFI D400 will be tested can be considered the fourth mooring line associated with the TSB and will be anchored to a temporary GBA, which is covered by another licence.

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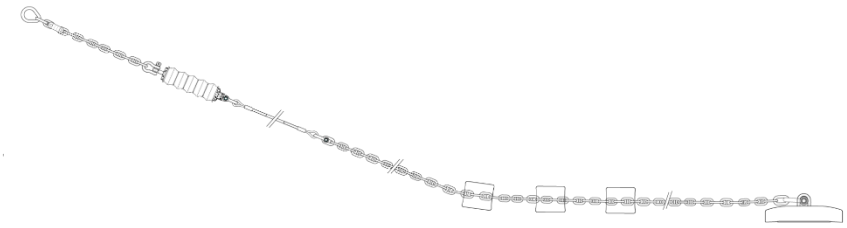

Figure 5. The chain mooring that will allow testing of the TFI D400

Table 3. list of materials associated with D400 mooring line

Components:	Qty:
ø=72mm, Pear link	1
H-Link DN72mm	1
ø=72mm, L=5 m, Studlink Chain Section	1
Joining Shackle 72 mm	3
TFI D400 Spring	1
ø=60mm, L=28 m, Dyneema Rope Section (*Please note that depending on the lead time wire rope could be considered)*	1
ø=72mm, L=80 m, Studlink Chain	1
5Tonne Clump Weights	3
ø=72mm, End link	1
Gravity Base Anchor (covered by another licence)	1

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2.7 Maintenance schedule

When the TSB is installed onsite for longer periods of time, it may be necessary to conduct minor maintenance work. If this work requires divers, a methodology will be submitted to the regulator four weeks prior to works commencing.

Marine Scotland will be notified in advance of maintenance activities via a Notice to Mariners.

2.8 Removal and decommissioning

The TSB and associated moorings will be removed from the site once the given testing period has concluded. The only infrastructure to be left on the site after removal of the TSB and moorings are the three permanent GBAs, however, a separate licence application will cover these.

3 Environmental receptors

An Environmental Description of the site was originally prepared when the site was established. An update of this document is available on request from EMEC, or through it's website (http://www.emec.org.uk/facilities/scale-test-sites/)

3.1 Physical conditions

As the Orkney Islands are situated off the north coast of Scotland, they experience high exposure levels with frequent gale force winds and rain. Frequent mobile depressions affect the area with low cloud and rain being the prevailing weather conditions. However, during the winter months, temperatures generally do not fall as low as those experienced across the Scottish mainland; the archipelago of islands benefits from a mild maritime climate.

Water depths across the area compare well with existing Admiralty Chart data, although the 20m contour extends 140m further west than previously thought to be the case. A number of contacts across the area have been identified which were assumed to be boulders or rocks, with the exception of one contact near the centre of the area which may be a wreck.

The site specific benthic survey (Biotikos, 2010) reported that the type of sediment encountered reflects the degree of water movement that the site experiences, with little fines and a variety of rock and shell fragment size. Surficial sediments generally comprised maerl, maerl fragments, coarse sand, shell fragments, large shell fragments and stones. Some Lanice tubes and large stones were present also (Biotikos, 2010).

3.2 Marine mammals

A wildlife observation project commenced at the Scapa Flow test site in April 2010 to gain site description and species data. The observation project was completed in March 2013 as it was deemed that sufficient data had been collected to realise a site characterisation. Fully-trained observers carried out the observations through regular scanning of the test site by telescope (20x - 60x magnification). Further information regarding the observation project can be obtained from the Marine Scotland Information website (http://marine.gov.scot/) or can be requested from EMEC.

The following table provides a list of the marine mammal species sighted during the observation project.

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Table 4. Marine mammal species counts at the Shapinsay Sound site for the period June 2010 - March 2013 (EMEC, 2013b)

SEALS	Summer	Winter	Total
Harbour seal	145	235	**380**
Grey seal	174	144	**318**
Unidentified seal	62	168	**230**

CETACEANS & OTHER	Summer	Winter	Total
Harbour porpoise	80	45	**125**
Minke whale	0	0	**0**
White Sided dolphin	0	0	**0**
Risso's Dolphin	12	0	**12**
Orca	5	0	**5**
Unidentified cetacean	0	0	**0**
Basking shark	3	0	**3**
Otter (European)	3	0	**3**

3.3 Marine birds

The wildlife observation project also captured seabirds sighted across the Scapa Flow test site (EMEC, 2013b). A summary of the observations is provided in the table below.

Table 5. Bird species counts at the Shapinsay Sound site for the period June 2010 - March 2013 (EMEC, 2013b)

BIRDS	Summer	Winter	Total
American Wigeon	0	1	**1**
Arctic Skua	48	0	**48**
Arctic tern	2060	0	**2060**
Black guillemot	9395	7365	**16760**
Black-headed Gull	94	1014	**1108**
Black scoter	68	285	**353**
Black throated Diver	0	15	**15**
Common guillemot	3469	674	**4143**
Cormorant	191	1727	**1918**
Diver Sp.	0	66	**66**
Eider Duck	12590	20770	**33360**
Fulmar	2462	6567	**9029**
Gannet	290	324	**614**
Goldeneye	2	135	**137**
Great Black-backed Gull	921	1561	**2482**
Great Crested Grebe	0	3	**3**
Great Northern Diver	1088	5420	**6508**
Great Skua	220	3	**223**
Grey Phalarope	0	1	**1**

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BIRDS	Summer	Winter	Total
Greylag Goose	5285	2669	**7954**
Herring Gull	361	1212	**1573**
Iceland Gull	0	10	**10**
Kittiwake	142	234	**376**
Lesser Black-backed Gull	29	2	**31**
Little Auk	0	5	**5**
Long Tailed Duck	6117	9197	**15314**
Mallard	29	355	**384**
Manx Shearwater	8	0	**8**
Mew Gull	774	3889	**4663**
Mute Swan	14	2	**16**
Northern Shoveler	0	14	**14**
Puffin	50	2	**52**
Razorbill	782	81	**863**
Red Breasted Merganser	478	2294	**2772**
Red Throated Diver	295	571	**866**
Sandwich Tern	9	2	**11**
Shag	7304	17241	**24545**
Shelduck	113	10	**123**
Slavonian Grebe	223	2051	**2274**
Surf scoter	1	9	**10**
Teal	44	1782	**1826**
Velvet scoter	1	9	**10**
Wigeon	44	1782	**1826**
Unidentified Auk	894	229	**1123**
Unidentified Diver	1	3	**4**
Unidentified Duck	0	128	**128**
Unidentified Gull	122	1271	**1393**
Unidentified Tern	87	290	**377**
Unidentified Bird	0	0	**0**

3.4 Fish

Despite few fish studies for the site, generalised statements regarding the fish species present at the site can be inferred from the location of the test site and the known seabed conditions. Species typical of north Scottish waters are expected to inhabit the Shapinsay Sound test site, for instance: pollack *Pollachius pollachius*, saithe *Pollachius virens*, ling *Molva molva*, ballan wrasse *Labrus bergylta* and cuckoo wrasse *Labrus mixtus* (EMEC, 2011). Less abundant species include poor cod *Trisopterus minutes*, goldsinny wrasse *Ctenolabrus rupestris*, conger eel *Conger conger* and cod *Gadus morhua* (which is widely distributed around Orkney in the summer months).

There are also migratory and seasonal species that are expected to inhabit the site, e.g., migratory mackerel *Scomber scombrus*, juvenile and non-spawning adult monkfish *Lophius*

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piscatorius and gurnard *Triglidae spp*. The site has also overlaps with an area identified as a potential spawning area for commercially important fish species, e.g. herring, lemon sole, sand eels, spratt. Saithe, lemon sole, sandeel and sprat use the area as a nursery ground year-round (Coull *et al*., 1998).

3.5 Benthos

Moore (2009) report that most sites examined in the Pentland Firth and Orkney area display a community typical of circalittoral tideswept rocky communities. Diversity is low and the community is dominated by a fauna of the acorn barnacle *Balanus crenatus* and the Dahlia anemone *Urticina feline*. The habitats are predominantly sandy, sand-scoured rock or mixed substrates of sand and stones. Considering the location and tidal properties of the site in Shapinsay Sound, it would be expected to support a similar habitat.

The site contained areas of rippled fine or medium sand and mixed substrate areas, with pebbles, cobbles and boulders on a bed of sand. The sandy areas supported a sparse epibiota of portunid crabs, the common starfish *Asterias rubens* and scattered fragments of live maerl. This corresponds to the 'Infralittoral fine sand' biotope (SS.SSa.IFiSa). In the mixed substrate areas the stones were encrusted with barnacles, Pomatoceros (a group of species that deposits calcareous tubes), bryozoans and yellow and red sponges. A patchy turf of the bryozoans *Flustra foliacea* and *Securiflustra securifrons* was also reported. The biota is regarded as a rather poor example of the '*Flustra foliacea* and colonial ascidians on tide-swept exposed circalittoral mixed substrata' biotope (CR.HCR.XFa.FluCoAs.X).

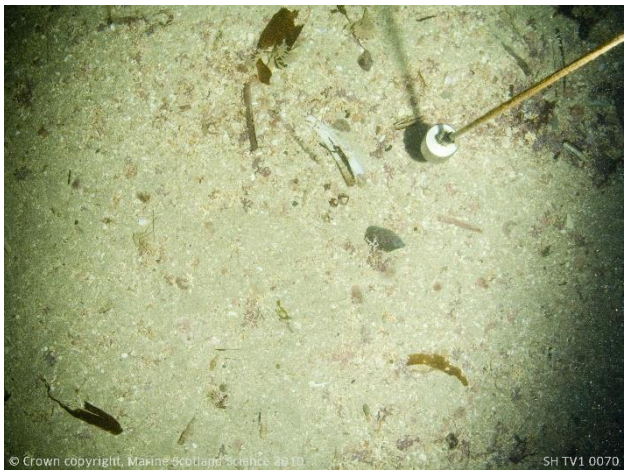

Figure 6. Shapinsay Sound, showing sparse scatter of live epifauna and drift algae

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Figure 7. Shapinsay Sound, showing cobbles, boulders and pebbles with erect algae

3.6 Conservation areas

The Shapinsay Sound site is not located within any designated conservation areas. The nearest site is Den Wick SSSI, 8 km from the development site. The site is within approximately 10 km of a number of locally and nationally important sites; it is possible that some of these sites may support populations of species which use the Shapinsay Sound site and wider Shapinsay Sound area for foraging. It is also important to acknowledge that the test site is located within a wider area of Orkney coastline and inshore habitats which represent, in some cases, nationally and internationally important regions of conservation interest which have been identified as Special Areas of Conservation (SACs), Special Protection Areas (SPAs) (including some areas for which extended marine boundaries have recently been established) and National Scenic Areas amongst others.

Table 6. Designated sites near to Shapinsay Sound test site

Site and Distance from test site	Details
Mill Dam RSPB Reserve - 4.1 km north north west	Described by the RSPB as an ideal place for birds throughout the year. In summer, large numbers of breeding wildfowl (including pintails, redshanks and wigeons) are present whilst in the winter migrating whooper swans and other birds can be sighted.
Den Wick SSSI - 8 km south east	Designated for its geological interest, Den Wick represents one of the best examples of a multiple till section in Orkney.
Keelylang Hill and Swartabeck Burn SSSI - 8.3 km south west	These moorlands are important for the density and diversity of the bird community they support and in particular for the variety and numbers of birds of prey; more than 18 species of moorland birds breed in the Keelylang/Swartabeck area. Of national importance are the thirty three traditional Hen Harrier sites of which the minimum number occupied in any year is estimated at 7 (~2% of the British population). In addition more than 1% of the national population of Merlin nest on the site along with a significant proportion (~10%) of Orkney's short-eared owls. Both species occur at a density higher than elsewhere in the islands.
Orkney Mainland Moors SPA - 8.3 km south west	The predominant habitats include extensive areas of blanket bog, acid grassland, wet and dry heath, acidic raised-mire and calcareous valley mire. Sheltered valleys and dales support willow scrub, tall-herb and flush vegetation. This site qualifies as a SPA by regularly

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	supporting populations of European importance of the Annex I species hen harrier, red-throated diver and short-eared owl. The hen harrier population on this site is one of the largest and the densest in Britain. The short-eared owl is widely dispersed across its British distribution and Orkney Mainland Moors is one of the few sites to support significant numbers.
Mull Head LNR - 8.5 km south east	This site contains coastal grassland heath and sea cliffs that are colonised by hundreds of seabirds. There is a small colony of greater black-backed gull and pairs of great skua. Red-throated diver may be seen here and there is the chance of observing Peregrine also. Seals are a common sight in the seas and it may be possible to observe otters on the shoreline.
Hobbister RSPB reserve - 10.8 km south west	This reserve hosts sea cliffs, saltmarsh, moorland and sandflats. Hen harriers, short-eared owls and red-throated divers nest on the moorland. Red-breasted mergansers and black guillemots can be seen also.
Waulkmill SSSI - 11.9 km south west	This encompasses a wide range of nature conservation interests including a sandflat and well vegetated shingle spit behind which one of the more extensive areas of saltmarsh in Orkney has developed. Fragments of freshwater marsh also occur at the edge of the saltmarsh. These cliffs are considered to form one of the best general moths and butterfly habitats in Orkney. One species, *Coleophora vigaureae*, occurs here in its only known locality in Orkney. The surrounding areas of mature heather and shrub growth are frequented by breeding moorland birds.

4 Environmental assessment

A full Environmental Impact Assessment has not been completed with respect to this application. As this application is for the continued deployment of infrastructure at the site, with only one additional gravity based anchor, there are not expected to be any additional environmental impacts associated with the works pertaining to this application. Although this application is for the TSB licence, the environmental assessment will also cover the GBAs associated with the deployment to provide further context.

4.1 Environmental monitoring

During the additional gravity base anchor installation and removal, normal precautions will be adhered to. Any necessary changes will be agreed with Marine Scotland in advance.

The following table provides an overview of the proposed mitigation and monitoring measures that will be employed at the site. If there are any unexpected deviations from the proposed measures, these will be reported on no later than 48 hours from the event. Figure 4 provides the location of the designated haul out sites referred to in the proposed measures.

Table 7. Proposed mitigation and monitoring measures

Measure summary	Description
During all vessel movements to and from site, a minimum approach distance will be adhered to when passing designated seal haul-outs.	A distance of greater than 500m from any designated seal haul-out site will be maintained. Such an exclusion zone around haul-out sites will be maintained unless personnel or vessel safety does not permit.
	The sensitive periods for both grey and harbour seals will be considered when planning maintenance work. The sensitive period for grey seals is understood to be between September

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Measure summary	Description
	and December whereas, for harbour seals, it is late May to August.
During all works onsite and vessel movements to and from site, the relevant measures within the Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Vessel speeds will be reduced to 6 knots when marine mammals or birds are sighted within or near transit routes, where personnel or navigational safety is not compromised.
	In the event of a marine mammal approaching a vessel associated with the works, the course of the vessel will be maintained at a steady speed.
	Particular care will be taken to ensure groups and mothers and young are not disturbed/split.
	As stated in the SMWWC, minimum approach distances for vessels will be adhered to.
	Sudden changes in speed, duration and engine noise will be avoided to reduce any disturbance to marine mammals in the vicinity.
	Rafts of birds will not be intentionally flushed.
	If maintenance activity is undertaken during the seabird breeding season (likely to be between April and August), a vessel transit corridor of at least 50m from the shoreline will be maintained.

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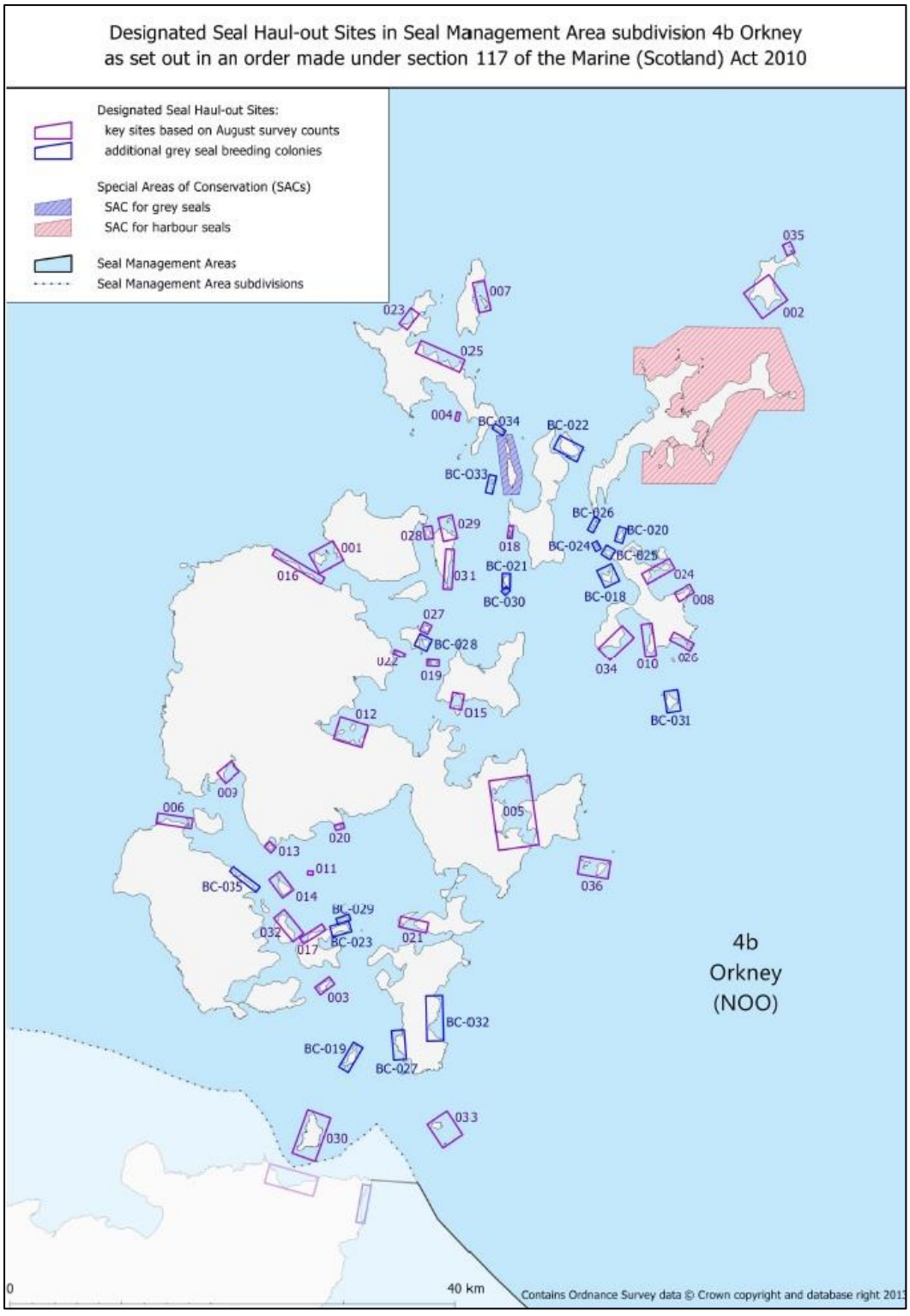

Figure 8. Designated seal haul-out sites in Seal Management Area subdivision 4b Orkney as set out in an order made under section 117 of the Marine (Scotland) Act 2010

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5 Navigational risk assessment

A site-wide assessment considering all potential navigational impacts that could occur during operation of a scale test site including the installation, operation, maintenance and decommissioning of a wave device at the Shapinsay Sound test site was conducted. This assessment has been submitted as supporting documentation to this application, see Shapinsay Sound Scale Tidal Site Navigational Risk Assessment (NRA) (EMEC, 2019). As part of the NRA, Automatic Identification System (AIS) and Vessels Monitoring System (VMS) data were used to assess the existing traffic patterns at the test site.

5.1 Shipping and fishing activity/other users

Commercial shipping (mostly tankers) is recorded to the north of the test site. The majority of commercial traffic is associated with cargo transits in and out of the Kirkwall Bay. The majority of commercial vessels on transit are at least 0.2 nm north of the site.

Very few fishing vessels pass through the test area, with the highest densities recorded to the north and west of the site. Those to the west of the site are fish carrier vessels transiting to the aquaculture site within the Bay of Meil. It is known from consultation that smaller vessels may engage in potting very close inshore.

5.2 Assessment

As the site-wide NRA includes EMEC's infrastructure (deployed GBAs and TSB), the assessment will remain true and the appropriate mitigation measures should be applied. These mitigation measures have been summarised in the table below.

Table 8. Embedded mitigation measures

Embedded mitigation measure	Description
PPE Requirement	Maintenance teams to wear suitable PPE when working on the devices, including life jackets.
Training of staff	Staff to be trained to the required standards for their work and have suitable local knowledge of regulations and operations in the Orkney Islands.
ERCoP	ERCoP for site has been developed and agreed with the MCA and SAR bodies.
NTM and Promulgation	In addition to NtM, EMEC's Maritime Safety Information Standard Operating Procedures (SOP) ensures that all key navigational consultees are informed prior to any works. Distribution could include HMCG, Orkney Harbours (available via Orkney Islands Council Marine Services website), Orkney Marina noticeboards (as necessary), Orkney Fisheries Association, Scottish Fisheries Federation and UKHO. Stakeholders are targeted with information about relevant projects based on their activities and location.
Incident monitoring and reporting	EMEC to encourage incident/near miss reporting and monitor any safety issues at the test site. If necessary, risk control to be reviewed. Risk assessments to be reviewed following any incidents.

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EMEC Procedures	EMEC has a number of SOPs and standards in place to reduce navigation risks, such as:
	• Task risk assessment;
	• Control of work
	  ○ Permit to work;
	  ○ Permit to access site;
	• Hazard identification reporting; and
	• Maritime safety information.

Charting	Site is marked on nautical charts.
Site Monitoring	EMEC's SCADA system provides real-time status information, trends, alarms and remote-control access to facilitate a safe working environment, comprehensive assessment and safe operation of the sites. Note – only relevant if test support buoy is deployed
Liaison with local stakeholders	EMEC regularly liaises with key local stakeholders to identify any potential issues as soon as possible. Regular updates include information regarding upcoming deployments and significant operations at the site.
500m advisory ATBA	A 500m advisory ATBA exists around all test devices located at EMEC test sites.

5.3 Hazard identification and risk

A Hazard Identification and Risk Assessment (HIRA) was conducted as part of the Shapinsay Sound Scale Tidal Site Navigational Risk Assessment (EMEC, 2019). This HIRA included the identification of the hazards and necessary controls associated with the test site infrastructure and deployment of TSB. As this application is for the continued deployment of the GBAs and installation of one additional GBA, it is not expected that an HIRA will be required in connection with any of the work relating to this application.

6 References

EMEC, 2019. Shapinsay Sound Scale Tidal Site Navigational Risk Assessment. European Marine Energy Centre. REP317.

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Moore, C. G., 2009. Preliminary assessment of the conservation importance of benthic epifaunal species and habitats of the Pentland Firth and Orkney Islands in relation to the development of renewable energy schemes. Scottish Natural Heritage Commissioned Report No. 319.

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Annex A: Description of test support buoy

The test support buoy comprises a main 415V switchboard, Load Banks, Communications package and both AC and DC UPS systems. The buoy acts as a controlled load and measurement point for the test devices. Two low power distribution boards with spare capacity are housed within the distribution compartments of the main switchboard. The main switchboard is of modular design so can be modified readily providing a flexible package for a wide range of applications. The parameters, status signals and CCTV video stream being transmitted across the communications to the EMEC base station / SCADA. The buoy package is self-contained and does not need physical connection to the shoreline. Two 250m umbilical cables, one for power and the other for controls and communications, connect the buoy to the test device. The buoy comes complete with its own navigational aids (amber beacon 3 nautical miles with yellow St Christopher Cross; solar, mains and battery fed) mounted on the enclosure roof. The roof has additional space to accommodate additional instruments and meters, if required

Section	Image	Dimensions
Platform		7 metres diameter x 2 metres high; draft when laden 0.5m; weight approx. 12 tonnes
Container		Standard 8ft container housing switchgear etc. Topgear includes solar powered navaid and loadbanks, CCTV; weight approx. 2.5 tonnes

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Section	Image	Dimensions
Umbilical		250mm umbilical comprising 415V power and copper data comms cables, dry mate connectors both ends
Mooring lines and shackles		120 tonne shackles for connecting ropes to GBAs on seabed; 3 x 100 metre ropes for Shapinsay Sound site; 3 x 140 metre ropes for Scapa Flow site
Surface buoyancy units for mooring lines		6 x MCMC 500kg/10MSW buoys – 3 per buoy (one per mooring line)

Annex A: Drawing of Infrastructure

Figure 8 shows the layout of the Shapinsay Sound test site infrastructure. The pink dashed outline is an internal boundary used by EMEC and does not represent the extent of the test site boundary. ‘Power / data Buoy 1’ refers to the Test Support Buoy (TSB) referenced in this document.

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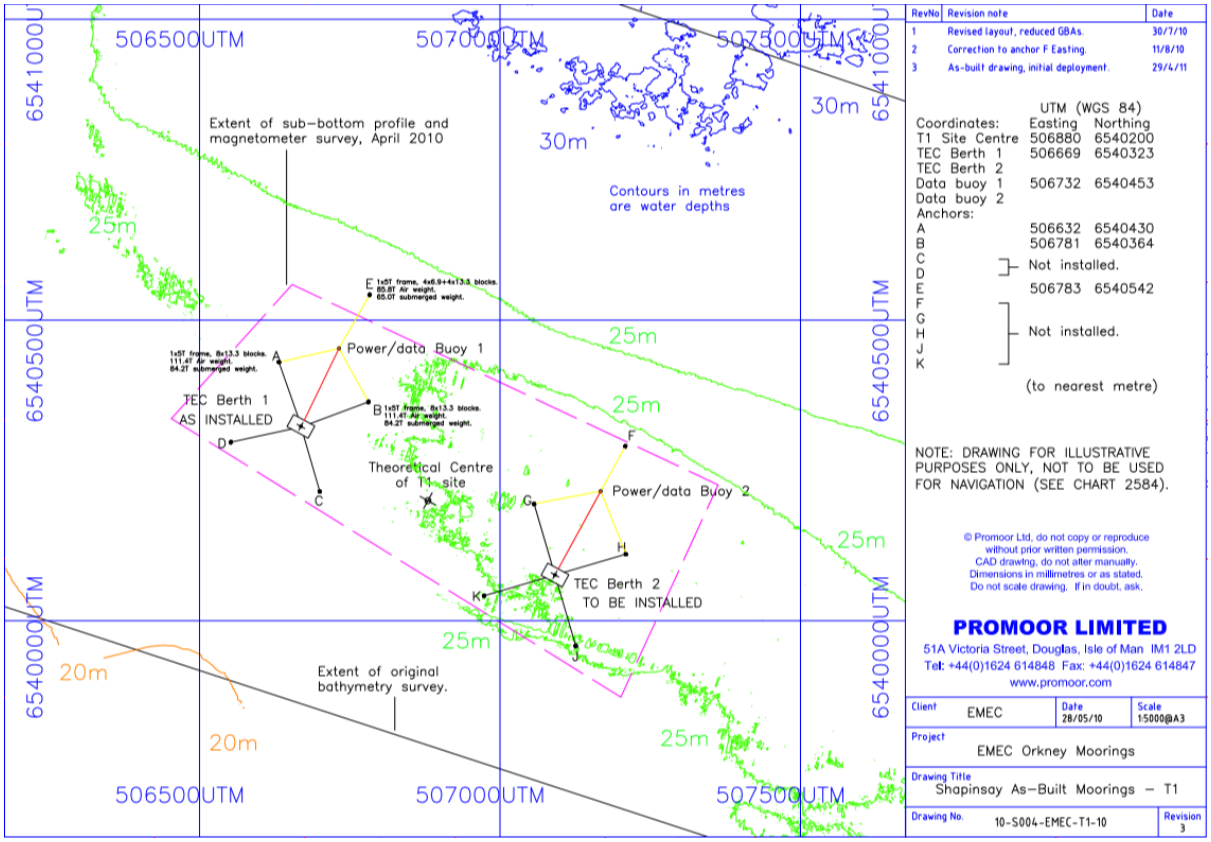

Figure 9. As built layout of the Shapinsay Sound scale test site

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